Mine Area Investigation Report

Submitted to:

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Distribution List

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1.0 INTRODUCTION

Golder Associates USA Inc. (Golder, now a part of the WSP family of companies) was retained by Cyprus Amax Minerals Company (Cyprus Amax) to perform an investigation of the former mine area at the Former Satralloy Site located in Cross Creek Township, Jefferson County, Ohio (the Site).

1.1 Background

The former mine area (see Remedial Investigation [RI] Figure 1.1-2) is in the northern upland area of the Site and includes the abandoned workings of the Kolmont No. 1 Coal Mine operated by the Wayne Coal Company in the 1920s-1930s. Surface mining occurred adjacent to the underground workings and within portions of the underground mine footprint for an undermined period of time.

The purpose of the Mine Area Investigation (MAI) described in this document was to determine if the former mine area is suitable for placement of slag as part of remediation and to provide pre-design data for remedial actions.

The MAI was conducted in accordance with the following workplans approved by OEPA:

- Workplan for Phase 1 Mine Area Investigation submitted July 16, 2020.
- Workplan for Phase 2 Mine Area Investigation submitted January 28, 2021.
- Workplan for Decommissioning Monitoring Well RBH-2 submitted November 1, 2021.

1.2 Purpose and Scope

The purpose of the Mine Area Investigation was to:

- Determine if the Former Mine Area is suitable for placement of slag as part of remediation.
- Provide hydrogeologic data for developing a groundwater monitoring program for a consolidated stockpile of slag.
- Provide engineering data for design of the consolidated slag stockpile.

This report documents the investigation and evaluates the mine area investigation data. Figure 1.1 illustrates drilling, sampling, and geophysical data collection locations in the mine area as described in the following sections.

2.0 SITE OVERVIEW

As described in the RI Report, stratigraphic units at the Site are composed of the Pennsylvanian age Monongahela and Conemaugh Groups. The major stratigraphic marker is the Pittsburgh Coal Bed forms the basal unit of the Monongahela Group. The formations encountered for the MAI include the Pittsburgh Formation lower portion of the Monongahela Group and the Casselman Formation beginning beneath the Pittsburgh No 8. Coal horizon.

The topography of the Site rises about 500 feet above the lowland floodplain of Cross Creek to a plateau surface. In the north, the Site is largely an upland plateau and consists of heavily wooded areas with slag from former Site operations. The upland area also includes a 5.3-acre area where chromite ore was stockpiled (Chromite Ore Storage Area) southwest of the mine area as part of the U.S. Government’s strategic mineral stockpile program between 1956 and 1959.

2.1 Former Mine Area

The Ohio Department of Natural Resources (ODNR) abandoned Mines program scan of the December 1924 mine map of Kolmont Mine No. 1 provides the best documentation of the location and extent of room-and-pillar mining and surface mining in the former mine area (Figure 2.1). The publication Geology of Jefferson County (Lamborn, 1930) describes the average thickness of minable Pittsburgh Coal in Cross Creek Township as 4 feet 7 inches where present.

2.1.1 Topography

The topography of the former mine area within the boundary of the Site has been modified by surface and underground mining of a sub-horizontal coal seam. Mine spoils form elongate ridges surrounding the perimeter of the mine workings. Generally, mine spoils and disturbance of the surface related to coal mining are restricted to the areas above 1,050 feet mean sea level (ft MSL), though sloughing of mine spoils and fill materials extends below 1,000 ft MSL on the northern and eastern slopes.

Section 3.3.1 of the RI Report describes variations in topography in the former mine area between 1968 and the LiDAR topography collected in 2006. Following alterations to surface topography from mining operations, aerial photography reviewed after 1956 indicate further alterations following start-up of plant operations including significant re-grading of the former mine area underway in 1966. Additional surface topography details found during the MAI investigation are described in Section 4.0.

2.1.2 Bedrock

Bedrock units comprising surface outcrops at the Site are part of the Appalachian Basin, a thick sequence of sediments that collected regionally over time and were subsequently lithified. Regional bedrock structure interpreted by the United States Geological Society (USGS; RI Figure 1.4-2) shows that the Site is located southwest of a line that connects the Pittsburgh-Washington Structural Discontinuity and the Highlandtown fault.

Regional bedrock strata dip at less than 1° (0.1° to 0.4°) to the southeast (Condit 1912). During the RI, Condit's observation was substantiated for the Site strata based on a three-point problem using the estimated footwall elevations of the Pittsburgh Coal (same coal targeted by the Kolmont Mine). This assessment found the Pittsburgh Coal in the vicinity of the Site to dip to the southeast at 0.2°.

A detailed subset of the regional geologic cross section showing the portion that corresponds to the geology on-strike with the Site is provided as Figure 1.4-4 in RI. There is generally a good correspondence between the lithologies observed at the Site and the geologic interpretation provided in the regional geologic cross section.

2.1.3 Lithology and Stratigraphy

Located just west of the central trough of the Appalachian basin, bedrock at the Site is comprised of lithified sequences of shallow marine and terrestrial sediments. These sediments were deposited in regularly repeating sequences identified as cyclothems. A cyclothem (when present as a complete sequence) comprises limestone, sandstone, siltstone and/or mudstones with the upper sequence composed of coal seams or stringers.

The bedrock stratigraphic units at the Site have been identified as being composed of the Pennsylvanian age (323 to 299 million years old) Monongahela and Conemaugh groups (USGS & Ohio Geological Survey 2005). Section 1.4.3.2 of the RI Report summarizes characteristics of each group.

In eastern Ohio, the Conemaugh Group is further delineated into the Casselman and Glenshaw formations. The significant members of the Casselman formation include Summerfield limestone, Connellsville and Morgantown sandstones, and Skelly limestone. Ames limestone is the upper significant formation boundary of the Glenshaw formation beneath the Casselman.

3.0 MINE AREA INVESTIGATION DATA COLLECTION

The MAI was completed using an adaptive approach while implementing concurrent field investigations activities. Five primary types of data collection were conducted, these include:

- Surface Geophysics
- Borehole Drilling and Monitoring
- Hydrogeologic Data Collection
- Water Quality Sampling
- Geotechnical Sampling

Preliminary data evaluation was completed following each field task with those findings incorporated into final plans for other subsequent activities as described in the following sections. Golder utilized tools to acquire geo-referenced field data for review and to provide updates to reconnaissance, drilling, and sampling plans directly to the field team.

Prior to beginning MAI field work, existing roads were graded and cleared for geophysical and drilling access by the Interim Action contractor. A new access road was prepared extending from near MW-111 to MW-113 (Figure 1.1). Existing roads were also graded in the northwestern area of the mine area in the fall of 2021. Underground utilities were cleared, and a site-wide ground penetration permit was issued by Cyprus Amax.

3.1 Surface Geophysics

Surface geophysical data collection is used to provide a spatially extensive data set over the approximately 37 acres which comprises the former mine area.

3.1.1 Overview

Three phases of surface geophysical investigations at the Site were completed as part of the MAI.

- Phase 1 was completed in November 2020 to help optimize and guide planning for the 2021 MAI field program.
- Phase 2 was completed to expand the geographic extent of data, inform the conceptual site model of the entire mine area, and locate specific monitoring wells where geophysical data suggest groundwater flow paths may exist.
- Phase 3 was completed to fill a potential gap in understanding subsurface conditions in the mine area.

Figure 1.1 provides a map of the geophysical transects, monitoring wells, and water sampling locations relative to site boundaries and other features.

3.1.1.1 Phase 1

The Phase 1 effort focused on implementing seismic refraction and Electrical Resistivity Imaging (ERI) techniques to investigate:

- Potential voids/former mine workings

- Hydrogeologic conditions
- Potentially impacted groundwater
- Geologic subsurface conditions including fill/overburden thickness, bedrock topography, and identification of structural features

This initial investigation was intended to provide a proof of concept for the surface geophysics investigation with the goal of using these surface data-collection strategies to improve the subsurface investigations. Using these approaches, demonstrable data were used to guide placement of borings and well installations during the drilling program. The Phase 1 transects for both (electrical resistivity imaging) ERI and seismic refraction totaled approximately 3,000 linear feet, are shown in red in Figure 1.1 and are summarized in Table 3-1 (in text). Final investigation coverage was based on accessibility and practicality for conducting the survey work and efforts were made to eliminate any health or safety incidents by avoiding steep slopes, unstable ground, and areas of dense vegetation. Line 2 was decided to be low priority for the Phase 1 effort and data collection was not possible with the time available. After scouting the topography for a potential sixth line it was determined extreme changes in slope would make data collection impractical. In general, investigation implementation was time-efficient, data was of quality anticipated, and no health or safety incidents were noted during the Phase 1 geophysical investigation.

Table 3-1: Phase 1 Investigation Coverage

Geophysical Line Number (GL20)	Refraction Line Length (ft)	ERI Line Length (ft)
1	910	1,090
3	510	550
4	230	410
5	380	550
6	650	690
Total Length	**2,680**	**3,290**

3.1.1.2 Phase 2

Following the November 2020 Phase 1 geophysical investigation, proposed drilling locations and target depths were revised and adjusted using the Phase 1 geophysical results. In May and June 2021, the Phase 2 geophysical investigation (task 320 of the MAI) was completed and included a surface seismic refraction (to determine depth to rock/thickness of fill), ERI, and electromagnetic induction (EM) with total line distance of approximately 4,200 feet (Table 3-2 in text) to expand the geographic extent of data and inform the conceptual site model of the entire mine area. Phase 2 line locations, shown in green in Figure 1.1, were field located to take advantage of existing site access roads and trails. Where practical geophysical data were collected adjacent to drilling locations (and subsequent monitoring well locations) to allow for correlation of data.

Table 3-2: Phase 2 Investigation Coverage

Geophysical Line Number (GL21)	Refraction Line Length (ft)	ERI Line Length (ft)
7*	A = 460, B = 920	1,810
8	460	550
9	230	350
10	920	1110
11	460	690
Total Length	**3,450**	**4,160**

Note: *Line 7 broken into two sections (7A and 7B) for seismic refraction due significant curve in alignment

3.1.1.3 Phase 3

Following completion of both Phase 1 and Phase 2 geophysical investigations, areal extent of both geophysical and borehole data was reviewed with FMI. It was determined that additional ERI in the northwest corner of the mine area would fill a potential gap in understanding of subsurface conditions. Two additional ERI lines (PH3-1 and PH3-2) were collected in October 2021 (purple lines in Figure 1.1) to complete the surface geophysical investigation of the mine area (Table 3-3 in text). Two additional monitoring wells were also completed in the northwest corner of the mine area during November 2021.

Table 3-3: Phase 3 Investigation Coverage

Geophysical Line Number	ERI Line Length (ft)
PH3-1	690
PH3-2	690

3.1.1.4 Time Lapse Electrical Resistivity

Two electrical resistivity imaging transects were selected for repeated measurements over the course of a quarter (three months) to generate a time-lapse dataset of subsurface electrical resistivity to identify if precipitation events and changes in groundwater flow can be detected and/or mapped. By evaluating a time-lapse dataset collected from a fixed array of surface electrodes, subtle changes in resistivity can be identified and used to infer preferential flow paths of groundwater, changes in perched water quantity and/or quality, and ultimately better inform the conceptual site model for the entire former mine area.

Time-lapse geophysical monitoring was conducted between October 2020 and January 2021. This involved installation of a semi-permanent geophysical monitoring system using ERI to collect large, high-density datasets using two separate arrays of surface electrodes. Because electrical resistivity measurements are highly repeatable, ERI can measure very small changes in subsurface properties over time and provide greater spatial resolution than using monitoring wells. The method is sensitive to changes in fluid content, saturation, and composition, as well as subsurface temperature. Consequently, this approach was designed to provide enhanced information regarding the extent and nature of groundwater conditions encountered without the need for repeat water quality sampling. The same equipment used for Phases 1, 2, and 3 electrical resistivity investigations was used for the time lapse monitoring and is discussed in Section 3.2.

3.1.2 Geophysical Methods

Phases 1 and 2 involved use of both seismic refraction and ERI techniques over the same transects to collect multiple datasets. Phase 2 also included the use of electromagnetic induction (EM) using a Geonics LTD EM31 instrument along all accessible former mine area access roads and trails to rapidly generate a dataset of shallow (0 to 16 feet below ground surface [ft bgs]) apparent conductivity of the subsurface and identify any unknown seeps, springs, or areas of potentially impacted shallow groundwater. For the Phase 3 and time-lapse geophysical investigations ERI was used exclusively. The following section describes these techniques and applications to the MAI.

3.1.2.1 Electrical Resistivity Imaging

ERI is an electrical geophysical method that measures the resistivity (or conversely, conductivity) of the subsurface and then images the data as a 2-dimensional profile. Electrical measurements are made using an automated meter and high voltage power source connected to a linear series of metal stakes (electrodes). The meter applies a potential difference to the ground surface in a fixed sequence of electrode pairs and measures the resulting current between them. A reverse model then calculates the electrical conditions at depth based on surficial measurements. The product of the modelling process is a profile showing resistivity (measured in Ohm-m) of the subsurface. The data may identify contrasts or anomalies associated with highly resistive bodies such as air-filled voids, bedrock, or low moisture zones, or low resistive bodies such as water-filled voids or fractures, saturated soil, and impacted soil or groundwater.

3.1.2.2 Seismic Refraction

Seismic refraction investigations are conducted to measure the velocity of seismic energy in the subsurface with the goal of mapping bedrock stratigraphy and soil overburden thickness. The method relies on an acquisition system made up of a seismograph, a linear array of geophone acoustic receivers, and a seismic source. Soundings along the geophone array generate seismic waves traveling through soil (relatively slow) and bedrock (relatively fast). A velocity contrast between the soil and bedrock is detectable in the arrival travel times measured between fixed receivers and a 2-dimensional profile can be generated to image the soil and rock contact at depth. Refraction profiles are often used to map bedrock topography but can also provide observations on bedrock competency based on seismic p-wave velocity. Used on conjunction with ERI, a bedrock and overburden thickness profile aids in confirming electrical contrasts associated with bedrock, soil, or groundwater.

3.1.3 Data Collection, Instrumentation, and Processing

ERI data were collected using an Advanced Geosciences, Inc. (AGI) SuperSting engineering resistivity meter with and 56 channels. ERI Data was processed using Res2D resistivity modelling software. Seismic refraction data was acquired using a Geometrics Geode seismograph and 24 channel 4.5 Hz geophone array with a sledgehammer and HDPE plate source. Seismic data were processed into velocity models using Seisimager2D Pickwin V4.0.1.3 and Plotrefa V2.9.1.6, profile data were produced as grids and contoured in Golden Software's Surfer V22.

All seismic and ERI data were collected long the same 10-foot stationing for each survey transect. Seismic profiles are 50 to100 feet short on line ends to accommodate for off-end shot locations. Each survey transect consists of several seismic spreads with a 20 to 60 ft overlap to ensure confidence where data were affected by ambient noise. Line location and elevation data incorporated into geophysical models were collected using a Hemisphere S321 DGPS Smart Antenna with Atlas corrections.

3.1.4 Data Summary

Data collected the Phase 1 geophysical investigation are graphically presented in Figures 3.1 through 3.4 and summarized below.

The upper panels of each of these figures depict modeled electrical resistivity values of the subsurface beneath each transect. Where a borehole location from the MAI is close enough to project on a resistivity profile, it is shown as a purple line. Since ERI measures the contrasting electrical properties of the subsurface material, these data are useful for identifying the top of bedrock surface, changes in lithology, weathering, fracturing, saturated zones, and changes in pore fluid chemistry such as salinity, pH or total dissolved solids.

In the MAI dataset, low resistivity areas (blue zones with resistivity less than 50 ohm-meters) are interpreted to be areas with groundwater potentially impacted either by coal mining (low pH, high TDS) or slag. High resistivity areas (“warm” colors of orange, red, and brown with resistivity above 580 ohm-meters) are interpreted to represent intact rock with little pore water at depth or relatively well-draining soils and fill in the near surface.

The lower panel(s) of Figures 3.1 through 3.4 depict 2-dimensional profiles of the velocity of seismic compressional waves (p-waves) over the length of each refraction survey line. Seismic refraction models are interpreted with respect to geologic conditions and based primarily on the seismic velocity structure. The velocity models are plotted using colored contours between 900 and 12,000 feet per second (fps) with a contour interval of 100 fps. For the former mine area, the following three material type interpretations were made:

- Cool colors (purple and blue) represent relatively low seismic velocity material, up to approximately 3,000 fps, and are interpreted to be loose fill, soil, colluvium and/or alluvium.
- Warm colors (green to yellow), 3,000 to 6,400 fps, represent moderate velocity material interpreted to be more compacted/dense material such as dense colluvium, residuum, or highly weathered rock.
- Orange and red colors represent relatively high seismic velocity material, over 6,400 fps, interpreted to be rock-like colluvium, cemented slag or bedrock.

Data from the Phase 2 geophysical investigation are graphically presented in Figures 3.5 through 3.11 using the same color-contoured modeled electrical resistivity values of the subsurface beneath each transect.

Phase 3 geophysical investigation data are graphically presented in Figure 3.12 using the same format described for Phase 2.

For the time-lapse geophysical monitoring data, modeled electrical resistivity values of the subsurface beneath each transect for each measurement date are presented in side-by-side panels of Figures 3.13, 3.14 and 3.15. These datasets were evaluated for correlation to precipitation events, multi-parameter transducer data, and water quality data collected during the MAI in Section 5.0.

3.2 Borehole Drilling, Data Collection, and Well Installation

The Phase 2 MAI Work Plan proposed 16 boreholes to characterize the existing former mine area subsurface conditions and identify unacceptable conditions for slag placement and contaminant risk pathways. Emphasis was placed on shallow water that would be most likely to be relevant to the remedy design. Drilling locations were determined based on review of historical mining records, existing topographic data within the proposed capping footprint, daylighting groundwater or seeps observed, and surficial geophysical data described in Section 3.1. Actionable criteria for siting boreholes included potential locations of water-bearing voids or subsurface drainage pathways based on georeferenced maps of historic mining activity, areas of probable groundwater flow indicated by site topography and seep locations, and conductive anomalies identified in electrical resistivity profiles.

Some drilling locations targeted specific areas where surficial geophysics identified shallow groundwater:

- MW-108 – based on Phase 1 ERI indicating a potential shallow flow zone suggested by low electrical resistivity (high conductivity)
- MW-114 – based on Phase 2 ERI and shallow EM indicating a potential shallow flow zone suggested by low electrical resistivity (high conductivity)
- MW-116 and MW-117 – based on Phase 1 and Phase 3 ERI and shallow EM anomalies indicating low electrical resistivity (high conductivity)

Sixteen initial borings (MW-101 to MW-115, including MW-107-D and -107-S) were completed between May-July 2021. Two additional boreholes (MW-116 and MW-117) were completed in November 2021 in the western and northwestern portions of the former mine area to further investigate this area. All borings were completed with groundwater monitoring wells and/or vibrating wire piezometers targeting subsurface flow zones identified during drilling operations and subsequent downhole geophysical logging. Table 3-4 describes the location and well completion details for all locations.

Borings were completed with sonic drilling methods using a Prosonic 600C or Prosonic Spider model track-mounted drill with water circulation. Soil and rock core samples were collected in 10-foot runs using a 4-inch inner diameter core barrel. Sonic coring was advanced in 6-inch or 7-inch outer diameter steel casing in unconsolidated overburden soil and fill. Casing was further advanced through bedrock where voids or unstable annular materials were encountered.

The boreholes terminated below one or more relatively shallow (i.e., less than 100 feet) water bearing zones. After completing the initial boreholes in the central portion of the former mine area at higher elevations (MW-113 and MW-112), the initial drilling results indicated three potential flow zones. These observations provided guidance as drilling proceeded around the perimeter of the former mine allowing for improved targeting of the first water-bearing unit.

3.2.1 Borehole Data Collection

All borehole data was logged continuously by an onsite geologist recording lithology, color, water content, relative strength, and structural features using digital and traditional methods. Rock cores were collected from the bedrock boreholes, placed in temporary core boxes, and documented photographically. Borehole logs are included in Appendix A. Photographs of cores are included in Appendix C. Samples of unconsolidated materials were stored in sealed plastic bags or plastic buckets for potential geotechnical analyses.

Downhole geophysical logging was performed for each boring location to provide additional information on subsurface flow zones and stratigraphy and to guide installation of monitoring wells. Downhole geophysical logs were recorded using a Mount Sopris Instruments Matrix interface, MX-series winch, and field laptop. The downhole geophysical logging program included collection of natural gamma activity, fluid temperature and conductivity, borehole caliper, and acoustic and optical televiewer imaging data. Geophysical logging was conducted following the completion of drilling at each location and preceded well installation. For each borehole a full or partial suite of downhole logs were completed based on the requirements of the drilling location and field schedule limitations.

Golder geologists performed groundwater recovery tests to assist in the identification of water-bearing stratigraphic units. Recovery tests were performed at the termination of the sonic coring run in open hole conditions. A submersible pump was lowered to the current boring depth to purge drilling fluid and formation water from the borehole. After the pump was removed the onsite geologist monitored the water level over approximately 10 minutes on stepped time intervals. Following the recovery test drilling would resume and significant flow zones were noted. Casing was advanced to seal any flow zones identified up-hole of subsequent recovery tests when necessary.

A summary table of available logging data for each borehole is presented in Table 3-5 and downhole geophysical logs are presented in Appendix B.

3.2.2 Data Summary

The drilling program confirmed the presence of variable surficial materials and the anticipated subsurface geology throughout the former mine area.

- Portions of the Pittsburgh Formation are intact through the center portion of the former mine area (MW-108, -112, and -113), including abandoned underground mine workings. The former underground mine voids were encountered at two locations beneath largely intact Pittsburgh Formation bedrock. Water was not observed in the voids identified at MW-111 (46 to 55 ft bgs) and MW-109 (40.4 to 54 ft bgs).
- The first water bearing groundwater encountered in the former mine area was found in calcareous siltstone and silty limestone limited to the remaining intact Pittsburgh formation above the former Pittsburgh No. 8 coal zone and referred to as the Lower Pittsburgh Zone in this report. The potential thickness of this unit varies depending in the depth of rock above the former coal bed and precipitation, though less than a few feet of saturation was observed during the MAI.
- The second water bearing groundwater is encountered at the limestone/siltstone interface below beneath the former Pittsburgh No. 8 coal zone, stratigraphically under the coal zone which is the top of the Casselman formation, and referred to as Under Coal Zone in this report). This flow zone ranges from 12-15 feet thick where present. The Pittsburgh formation was not present along the northern slope near MW-103 in modern time, and no evidence of any groundwater in the equivalent zone was observed. Though surface mining did occur along the eastern and southern slopes, the thickness of the No. 8 coal bed and presence of any Pittsburgh formation prior to mining is uncertain at locations MW-104, MW-105 and MW-106.
- The third water bearing groundwater encountered throughout the former mine area was found in limestone observed 30-40 feet below the Under Coal Zone, or equivalent. Screens in this “Upper Casselman” zone generally target flow zones beginning in the limestone layer (referred to as Upper Casselman in this report). The flow zone is estimated to be 20-30 feet thick.
- Surficial geology outside of the former underground mine workings consists of mine tailings and related fill materials ranging from 20 to 52 feet around the perimeter and 66 feet at MW-115. The surficial fill was likely deposited during early surface and underground mining operations prior to the 1930s and grading operations that took place in the1960s.
- Slag and slurry deposits form historical smelting operations are present in three areas in the former mine (see RI Report Figure 3.3-1). No additional slag and slurry deposits were identified during the MAI.
- In the former mine area, multiple aquifers are present as shallow perched zones that overlie low permeability shales, limestones, and clays.

- The regional groundwater system is approximately 270 feet below the base of the Kolmont Coal in deep underlying fractured bedrock.
- The regional groundwater system occurs at an elevation that is approximately equal to or slightly above the elevation of Cross Creek.

Water bearing zones were encountered in every borehole, though potential yields varied among the boreholes based on drilling observations. In addition to drilling observations, logs of key downhole geophysics data were used to determine optimal screen intervals for well installation. Table 3-5 describes the downhole geophysics logs prepared for each borehole and a brief explanation of the rational for each well screen interval. Target depths were limited at some locations due to difficult sub-surface conditions (mine voids) or the presence of slag.

3.3 Geotechnical Samples

After completing the initial round of drilling, unconsolidated samples were evaluated based on lithological descriptions. Samples were composited within each borehole and lithologic group to prepare 13 samples for analysis of particle size and Atterberg Limits. Laboratory results are summarized in Table 3-6.

Five samples were prepared compositing several boreholes together for analysis of moisture-density (Proctor) and permeability analysis after reviewing the initial results. Laboratory results for the composite samples are summarized in Table 3-7.

3.4 Well Installation and Hydrogeologic Data Collection

Monitoring wells were constructed by installing 0.01 slotted schedule 40 PVC well screens with solid casing extended above grade. Well construction details are provided on the borehole logs (Appendix A). Where two or more target water bearing zones were identified, a combination of well screens and/or vibrating wire piezometers were constructed in the borehole to provide water elevation data.

The monitoring wells were developed after allowing adequate time for the well seal and grout to sufficiently cure and settle in general accordance with Appendix H of the RI/FS Workplan and OEPA guidance. Purge water was discharged adjacent to the wells in accordance with the RI/FS Workplan. Well development included cycles of surging and purging until field parameters (pH, specific electric conductance [conductivity], temperature, and turbidity) of the well water stabilized per the following criteria:

- pH within +/- 0.1 Standard Units (SU)
- Conductivity within 3%
- Temperature within +/- 1 degree Celsius (^{o}C)
- Turbidity within 10%, or is less than 10 nephelometric turbidity units (NTU)

Low yields and high initial turbidity at several well locations required additional well development.

3.4.1 Transducer and Piezometer Monitoring

Transducer instrumentation and collection of water quality was initiated in autumn 2020 at existing monitoring wells RBH-1 and RBH-2 wells and three flowing seeps (SSW-121, SSW-241 and SSW-242). These In-Situ Aqua Troll (AT) transducers provide pressure data and high-resolution conductivity data about water quality variability through the hydrologic cycles. Transducers located in shallow seeps are removed when extended freezing temperatures are expected and re-installed when forecasts improve.

Dedicated In-Situ Rugged Troll (XD) pressure and temperature-only transducers were installed in selected wells to obtain continuous records of groundwater elevations in conjunction with vibrating wire piezometers (VWP) installed in three boreholes. This monitoring data will be downloaded periodically to support the MAI and baseline monitoring program.

To collect additional data from both flow zones screened in MW-114, Golder installed AT transducers to collect additional conductivity data. The AT previously installed in RBH-2 was re-deployed following its decommissioning along with an un-used AT probe. The AT previously installed at SSW-121 was moved to SSW-245 to further enhance data collection in conjunction with time-lapse geophysical monitoring.

After reviewing seep conductivity data, it became apparent that the transducer precision was unreliable due to relatively high turbidity of shallow flowing water and potentially interferences, such as relatively low pH.

Table 3-8 summarizes transducer and piezometer locations deployed for the MAI. Monitoring locations are also shown in Figure 3.16.

3.4.2 Slug Tests

Golder performed slug tests in 11 MAI wells. Static water levels were measured using an electronic water level meter prior to testing, and In Situ or HOBO pressure transducers deployed to capture water level responses during testing. Either a 3-foot or 5-foot slug (depending on water column height and expected rate of recovery) was used to displace water in a series of falling head (slug in) and rising head (slug out) tests. At least one rising and falling head test was performed in each well. Data were extracted using an In Situ RuggedReader at the completion of the tests.

Each slug test was analyzed using AQTESOLV Pro v4.50, an aquifer testing software, to calculate hydraulic conductivities. Hydraulic conductivities were estimated using a curve match on a semi-log drawdown versus time graph and either the Bouwer and Rice Method (1976) or the Hvorslev Method (1951). The Bouwer and Rice and Hvorslev methods are used to analyze partially penetrating, single-well slug tests in confined or unconfined aquifers and assume steady state flow. Additionally, the hydraulic conductivities were calculated using a generalized Hvorslev Method solution, which yielded hydraulic conductivities within a half magnitude of the curve match results, except for test MW-115 OUT where the transducer was removed before the water level adequately recovered. Hydraulic conductivity estimates for each slug test are summarized in Table 3-9.

3.4.3 Synoptic Water Elevations

Synoptic groundwater gauging events were completed in January and February 2022 to determine MAI potentiometric surfaces (see Table 3.10). Of the monitored hydrostratigraphic units, monitoring wells screened within the Lower Pittsburgh Formation contained the highest groundwater elevations when measured in February 2022, measured between approximately 1093 and 1121 feet NAVD88. Groundwater elevations in monitoring wells screened within the Under Coal Zone, which is situated beneath the Lower Pittsburgh Formation, were between 1040 feet and 1070 feet NAVD88 in February 2022, and monitoring wells screened within the lowest monitored unit, the Upper Casselman Formation, were between 1004 feet and 1040 feet NAVD88 in February 2022.

Between January and February 2022, groundwater elevations increased in the Lower Pittsburgh Formation by an average of 2.3 feet, in the Under Coal Zone by an average of 1.9 feet, and in the Upper Casselman Formation by an average of 1.3 feet.

In addition to synoptic gauging events, pressure transducers are installed in select monitoring wells across the site. Table 3-11 (in text) shows the hydrostratigraphic unit, transducer start date, the minimum and maximum observed elevations, and corresponding dates. The range in observed water levels may not be representative of a full hydrologic cycle due to the to the limited time period of transducer deployment. Groundwater elevations are expected to be highest during the wet spring months (i.e., April to June) and lowest during the drier fall months (October to November).

Table 3-11: Mine Area Formation Pressure Transducer Data (as of February 28, 2022)

Transducer Location	Hydrostratigraphic Unit	Transducer Start Date	Minimum Elevation (ft NAVD88)	Minimum Elevation Date	Maximum Elevation (ft NAVD88)	Maximum Elevation Date
MW-101-D	Upper Casselman	9/9/2021	1035.67	10/29/2022	1040.14	2/28/2022
MW-101-S	Under Coal Zone	9/9/2021	1065.56	12/6/2021	1069.18	2/28/2022*
MW-103	Upper Casselman	9/9/2021	1012.67	10/30/2021	1013.37	1/11/2022
MW-105-D	Upper Casselman	9/9/2021	1009.79	11/1/2021	1011.39	2/5/2022
MW-105-S	Under Coal Zone	9/9/2021	1046.91	12/11/2021	1050.65	2/26/2022
MW-106	Upper Casselman	9/9/2021	1010.66	10/30/2021	1011.84	2/26/2022
MW-111	Under Coal Zone	9/9/2021	1059.78	10/16/2021	1063.15	2/26/2022
MW-114-D	Upper Casselman	11/30/2021	1002.42	11/30/2021	1004.94	2/26/2022
MW-114-S	Under Coal Zone	10/28/2021	1038.55	12/25/2021	1040.78	2/26/2022

Note:*Synoptic elevation. Transducer data after 1/20/2022 not yet available.

3.4.4 Long term Groundwater Elevation and Conductivity Monitoring Well Data

Transducer and piezometer monitoring of groundwater elevations and conductivity in select locations throughout the former mine area is on-going. Five conductivity recording transducers were installed in MW-114-S, MW-114-D, and three seeps expressing on the southern slope of the mine area. These locations correspond with one of the time-lapse geophysical data monitoring locations. This high-resolution conductivity data about water quality in the Under Coal and Upper Casselman flow zones will be used to access variability throughout the hydrologic cycle. Preliminary hydrograph plots of data recorded to-date is provided in Figures 3.17 through 3.34.

3.5 Water Quality Sampling

Ground and surface water samples were collected in general accordance with Appendix H of the RI/FS Workplan and OEPA guidance. Sampling procedures were modified when a sufficient volume of water could not be collected as described in Section 3.5.2.

3.5.1 Site Surface and Cross Creek Water Sampling

To investigate potential impacts to groundwater and flow paths through the former mine area Golder collected water samples from Site Surface Water (SSW) drainages/ponds, seeps, and from Cross Creek Water (CCW) near the base of the former mine area. Though sampling was planned for many SSW locations previously sampled for the RI (see RI Figure 3.11-1), no visual evidence of flow was observed at several legacy locations (SSW-02, SSW-043, SSW-05, SSW-081, SSW-11, SSW-13, SSW-23, SSW-28) during reconnaissance in June through November 2021.

Golder conducted additional field reconnaissance in the former mine area immediately following well installation to identify any potential seeps that may be associated with groundwater flow zones observed in the new boreholes. No new seeps were identified at the following locations:

- On the eastern slope of the former mine area from the mine perimeter road down slope to approximately 950 feet NAVD88.
- On the northern slope of the former mine area from the mine perimeter road down slope to approximately 980 feet NAVD88.
- The western slope from the mine road between MW-109 and MW-111 and geophysical transect line 3.

New surface water and/or seep locations were identified in the following locations (Figure 1.1):

- Surface water discharging from approximately 10 feet beneath the surface of slag in the southwestern portion of the slurry bowl: SSW-281. Flow was observed and sampled in July, but no flow was observed in November.
- A seep discharging above a wet area delineated near the southeastern corner of the mine perimeter road: SSW-111.
- Seeps discharging on the southern slope of the former mine area ranging in elevations from 975 to 1045 feet NAVD88: SSW-245, 246, and 247.
- A pond located in the northwestern portion of the former mine area between MW-101 and MW-109 with an approximate elevation of 1085 feet NAVD88: SSW-30.

Cross Creek Water samples were collected from two previously sampled locations during the RI (see RI Figure 3.12-1): Upstream (US-01) and CCW-01. A new sampling location was identified upstream from CCW-09 near any potential impacts from surface water related to seeps near the eastern base of the former mine area. This location is designated CCW-09A (Figure 1.1).

Three Cross Creek water in-stream samples were collected on July 30 and November 18, 2021. Cross Creek in-stream sampling procedures are described in Section 3.12.1 of the RI Report.

3.5.2 Groundwater Sampling

Golder competed 2 sampling events and collected 52 groundwater samples for the MAI. The first sampling event occurred June 28 through and July 23, 2021. The second sampling event occurred November 3 through December 1, 2021. Samples were collected from all new mine area wells with the exception of those with insufficient volume at the time of sample collection (MW-107-S, MW-108, and MW-109). Samples were also collected from RI monitoring wells completed in bedrock aquifers. (RBH-1, RBH-2, RBA-4D, and KMW-02).

RI Appendix H low-flow purging and sampling procedures were used for all monitoring well samples. Due to very low yield and high turbidity measured in three wells (MW-103, MW-105-D, and MW-112-D), Golder collected groundwater samples by installation Rigid Porous Polyethylene (RPP) samplers, as described in the RI Report (Section 3.10), for a minimum of 14 days. RI Appendix H Minimum/No Purge Sampling procedures were utilized during both sampling events for MW-115 and for during second event for MW-114-D. Well development was repeated at five locations (MW-102, MW-113, MW-114-D and MW-115) after the initial round of groundwater sampling yielded sub-optimal turbidity readings during low-flow sampling.

3.5.3 Data Summary

This MAI include the collection and analysis of 100 water quality samples during the summer and fall of 2021, including field duplicates. The dataset includes samples collected from:

- Twenty (20) monitoring wells installed for the MAI and five (5) existing monitoring well locations
- Twenty-two (22) SSW locations, including six (6) not sampled during the RI
- Three (3) CCW locations, including one (1) new location added for the MAI

Water Quality analytical results and field parameter measurements collected during the MAI are summarized in the following tables:

- Groundwater Analytical Results – Table 3-12
- Site Surface Water Analytical Results – Table 3-13
- Cross Creek Water Analytical Results – Table 3-14

4.0 TOPOGRAPHY AND GEOLOGY OF THE FORMER MINE AREA

Surface topography of the former mine area is dominated by anthropogenetic disturbances around portions of the Pittsburgh formation that remain intact above the No. 8 coal bed.

The thickness of the remaining Pittsburgh formation above the Pittsburgh Coal ranges from 65 to 42 feet from east to west (MW-113 to MW-109) and includes the underground workings on the Kolmont No. 1 mine map (Figure 2.2). Surface elevations in the former mine area are highest in the eastern portion of this area near MW-112 at 1,132 feet NAVD88.

Surface mining, pillar-robbing, and additional grading conducted between the 1920s and 1960s modified topography resulting in large areas of mine spoil fill deposits and subsequent erosion. Boundaries for surface mining and pillar robbing on the south of the mine have been interpreted by reviewing multiple lines of evidence (borehole data, geophysics, aerial photography, and available topographic contours). Significant surface features consisting of mine spoils or other fill materials include:

- Placement of mine spoils along the northern and eastern slopes during early surface mining activity and construction of mine rail and roads for access to underground mine addicts on the north side of the Kolmont No.1 mine. Mine spoils visible in a 1938 aerial photograph extend downward to approximately 1,000 ft MSL.
- The existing mine perimeter road is constructed on this fill material. A large volume of this material was then graded to create a ridge parallel to the northern boundary of the intact Pittsburg formation and a corresponding valley between. This “fill ridge” extends into the northwestern corner of the former mine area and site property line. The base of the valley formed by this fill is likely a thin limestone layer beneath the No. 8 coal which was surface mined.
- A large volume of mine spoils forms a pile with an elevation of 1,130 feet NAVD88 in the southwestern corner of the former mine area. Aerial photography and lithology logged from MW-115 indicate this pile consists of fill placed above the residual coal and limestone encountered at 1,060 and 1,050 feet NAVD88, respectively. This material extends 70 feet below the surface at the pile’s highest elevation.
- The surface depression in the central former mine area (see MW-107-S and 107-D in Figure 1.1) contains slag/slurry transported to this depression through a slurry pipe from the factory buildings. The depth of

material is 26 feet bgs at MW-107-D where coal residuals and fill were encountered above limestone at 1048 feet NAVD88.

Surface drainage channels are generally present beginning at elevations 1,060-1,070 feet NAVD88 and are distributed outward from the ridge tops in the vicinity of the Former Mine Area (see RI Figure 1.4-6). Surface drainages from the Site feed into Cross Creek from the northern and eastern slopes. Surface drainage from the southern slope flows into the northern lowland areas of the Site. A smaller drainage area on the western former mine area slope drains west toward Cross Creek. Cross Creek forms the lowest topographic expression at the Site and ranges in elevation from about 710 feet (northwest of the Site) to 690 feet (northeast of the Site).

Historic surface drainage channels are indicated on the 1904 USGS topographic map (Figure 4.1) and appear in the same general areas as present-day drainages except for a channel near MW-103, in the northeastern portion of the former mine area surveyed in 1902 and shown in USGS topographic maps through the 1940s. Mine spoil placement and erosion fill this channel which previously extended to approximately 1,120 ft MSL. Topographic differences between early maps and present-day topography provide additional evidence for placement of mine spoils, slag and other fill.

In the subsurface, the major stratigraphic marker at the Site is the Pittsburgh Coal (coal #8) which forms the basal unit of the Monongahela Group, regionally described as the Pittsburgh Formation. Only a small portion of the lower Monongahela Group Pittsburgh Formation strata are preserved above the Pittsburgh Coal at the Site due to removal by natural weathering and disturbance from mining operations. Below the Pittsburgh Coal, exposed bedrock at the Site is composed exclusively of Conemaugh Group Casselman formation lithified sediments.

Three water bearing zones were initially identified in wells MW-113 and MW-112. The first zone is found only in the Pittsburgh formation (Lower Pittsburgh) where sufficient thickness is present. The second zone occurs near the top of limestone immediately below the former Pittsburgh No 8. coal horizon where present (Under Coal Zone). The third zone, identified throughout the former mine area, occurs near a lower limestone unit in the upper portion of the Casselman Formation (Upper Casselman Zone), typically 30-40 feet below the bottom of the former Pittsburgh No 8. Coal zone.

Figure 4.2 and Figure 4.3 provides cross sections of the former mine area. The encountered water bearing zones are each shown with fill and spoils overlying the surface and flanks of the upland.

5.0 HYDROLOGY OF THE FORMER MINE AREA

Recharge in the former mine area infiltrates as low conductivity precipitation through soil, unconsolidated sediments and spoils and rock via interconnected pores and fractures until it reaches a less porous layer (aquitard), at which point most of the flow is redirected outward along the top of the aquitard to express on surface slopes as seeps. Groundwater that does continue to migrate downward through fractures and pore space to lower layers is subjected to the same process by underlying aquitards (perching layers) until the remaining water (if any) reaches the regional groundwater table.

Electrical resistivity data can be interpreted to infer the spatial pattern of water occurrence in the subsurface. Near the highest elevations of the former mine area (where the Monongahela Group is thickest), the uppermost perched layer (lower Pittsburgh) can be seen as low electrical resistivity zones in GL20-1 and GL20-6 (blue colors in Figures 3.1 and 3.4, respectively). The electrical resistivity data indicate continuity of these low resistivity zones between the high elevations of the former mine area and the seep locations along the north, south, and eastern flanks of the former mine area suggesting the majority of this water expresses as seeps along these slopes (see Section 5.2). Additionally, it appears the thickness of this top-most perched water unit is limited to a few feet of saturated thickness based on the electrical resistivity models and observations from monitoring wells screened in this interval. Lower Pittsburgh Formation perched groundwater elevations measured in February 2022 were between approximately 1093 and 1121 feet NAVD88.

No perched water was encountered in underground mine voids at the two locations, MW-111 (46 to 55 ft bgs) and MW-109 (40.4 to 54 ft bgs), where voids were identified during the MAI drilling. The absence of water within underground mine voids and continuity of low resistivity zones at or just above the coal elevations suggests the lower Pittsburgh water bearing zone drains primarily horizontally and where historic mining has occurred, horizontal drainage is enhanced, preventing significant pooling of groundwater in mined layer (see Section 5.3).

Sharp contrasts in electrical resistivity below approximately 1093 feet elevation and the presence of limestone in nearly all boreholes at the base of the Pittsburgh No. 8 coal support the hydrologic model of the siltstones acting as an aquitard and groundwater perching under the coal zone in limestone.

Electrical resistivity and seismic refraction data appear to indicate heterogeneous model resistivity and seismic velocity below the coal, where zones of lower resistivity and p-wave velocity may be interpreted as preferential flow paths for groundwater, several of these zones were targeted for drilling (e.g., MW-101, MW-102, MW-103, MW-107, MW-108, MW-114, MW-116, and MW-117). At least some groundwater was encountered and sampled at each of these locations. Both geophysical data and observations from drilling support the concept of flow of recharge from precipitation at the surface to groundwater through multiple perched water-bearing units of limited extent. By targeting zones with the greatest likelihood of groundwater flow for installation of monitoring wells, characterization of the perched water within the Under Coal Zone and the Upper Casselman Formation provided confidence in the nature and extent of water in the former mine area.

5.1 Recharge and Discharge

Approximately 6 inches of annual rainfall in Ohio (about 15% of total precipitation) has the potential to infiltrate surface soils and recharge groundwater (Brown 1994). Observations of water levels in the Under Coal Zone indicate rapid responses to precipitation events (Figure 5.1). The observed water levels in the Upper Casselman and Regional Bedrock (Figures 5.2 and 5.3) do not show these rapid responses to precipitation events, indicating that infiltration travels through overlying strata. In the shallow units, observed water level increases are up to approximately 5 feet, which is consistent with the anticipated recharge based on rainfall estimates and rock properties.

Seeps have been identified in the former mine area during several site reconnaissance efforts beginning in 2006. In addition to seeps targeted and sampled during the RI, additional locations were identified during reconnaissance completed in conjunction with the MAI in 2021 including surveys completed on adjacent slopes of new well locations on the eastern and northern slopes. Seep locations are selected for sampling and monitoring when field observations indicate perineal flow conditions. In some areas with frequent seeps, such as the southern slope, the best locations were selected based on flow and elevation. Due to the variable thickness of colluvial deposits from mine spoils covering rock outcrops, it is possible that seeps identified at lower elevations may include water flowing through colluvium mixing with water from bedrock aquifers.

Several seeps with perineal flow have been identified and sampled on the southern and western slopes of the former mine area, most frequently ranging in elevations of 1,030 to 1,050 ft MSL (e.g., SSW-111, -241, -242 and -171). Groundwater discharge from this elevation range is likely associated with the Under Coal Zone. Seeps are also present on these slopes between 980 and 1,020 ft MSL (e.g., SSW-174 and -247), and may be discharging groundwater from the Upper Casselman zone. Seep discharges on the western slope flow into a natural drainage channel (SSW-03) which disperses onto a plateau before reaching Cross Creek on the western side of the Site.

A drainage channel has not been formed in thicker deposits of colluvium on the southern slope resulting in sheet flow of water and the formation of wetland areas down to the former Upper Rail Spur where water flows through surface drainage channels.

Seep discharges at similar elevations have not been identified on the northern or eastern slopes of the former mine area. This likely reflects a combination of the dip of the units to the south, hydraulic gradient (discussed below) and thick colluvial deposits. One exception on the northern slope is the seep SSW-026 identified just above the rocky base of the westerly flowing drainage cut on the northern property line at approximately 994 ft MSL. Groundwater from SSW-026 may also be mixed with water from the adjacent former mining operations north of the property line which also flows into the same drainage channel.

Two seeps and associated surface ponding and drainage below have been identified near the toe of the eastern slope of the former mine area. Groundwater from these seeps discharge (SSW-121 and SSW-131) likely reflects discharge from the perched units and travel through thick colluvium (Section 6.0).

One new seep identified during the MAI (SSW-281) expresses groundwater emitting from the slag/slurry placed in the surface depression described above. Flow was observed and sampled during the initial phase of MAI field work in July 2021 and March 2022, but water was not observed in November 2021.

5.2 Surface Water

Surface water drainage features and flow directions are shown in RI, Figure 1.4.-6. For RI discussion purposes, the Site was divided into several major drainage basins, as shown in the figure. A topographic ridge runs generally northeast-southwest through the center of the Site. These features establish the overall drainage directions. Runoff from the Site ultimately flows into Cross Creek.

Surface drainage from the former mine area is predominantly in drainage basin B with less drainage to basin C, D and E. These waters ultimately enter Cross Creek north of the Plant Area.

In the Former Mine Area, surface depressions located to the north have open water (non-jurisdictional) (see SSW-15 and SSW-16 in MAI Figure 1.1). Another small intermittent pond is mapped immediately west of MW-104, though surface water was not present in this depression during the MAI investigation. These ponds are located at approximately the same elevation as the former mine workings. Based on a review of surface topography and surface water drainage features, discharge from these depressions is likely to the north, possibly contributing to the observed seepage at SSW-026 and flow in the defined drainage along the northern property boundary (RI, Figure 1.4-6).

A pond located in the northwestern portion of the former mine area (see SSW-30 in MAI Figure 1.1) above slag/slurry deposited in the shallow valley formed between the underground mine workings and mine spoil/fill material. The pond surface elevation was approximately 1,088 ft MSL during the MAI, which is approximately 7 feet above the top of a residual coal layer and 9 feet above the top of the mine void encountered at MW-109. This pond is likely recharged from surface stormwater and, may receive seepage from the adjacent Lower Pittsburgh formation above the No. 8 coal when this unit is saturated. Discharge from this pond is likely to the northwest through unconsolidated fill materials rather than vertically through lower permeability slag/slurry fill.

A small series of wetland areas has been mapped along a bench west of the former Kolmont No. 1 mine between 1,060 and 1,070 ft MSL (see SSW-17 in Figure 1.1). These wet areas are likely formed from shallow water seeping from the Under Coal Zone along the base of the No 8. Coal bed.

A larger series of wetland areas are mapped on the southern slope of the former mine area. These wet areas are formed from seeps discharging from the Under Coal and Upper Casselman zones. Several seep discharges suitable for sample collection and monitoring have been selected with elevations corresponding to the flow zones identified during the MAI.

Another series of wetland areas are mapped between 850 and 775 ft MSL approaching the toe of the eastern slope of the MAI. These wet areas are likely formed by seeps discharging from the Under Coal Zone and migrating downslope in the thick colluvium from the former mine area (see Section 6.0 for further explanation).

5.3 Groundwater

Groundwater occurs in the colluvium, fractured calcareous siltstones, silty limestone and limestones occurring at the former mine area. These permeable units allow water to migrate until it reaches a less porous layer (aquitard), at which point most of the flow is redirected along the top of the aquitard to express on surface slopes as seeps.

The three primary hydrostratigraphic units described earlier which provide most of the groundwater flow in the former mine area from shallow to deep are:

- Lower Pittsburgh - calcareous siltstone and silty limestone limited to the remaining intact Pittsburgh formation above the Pittsburgh No. 8 coal zone.
- Under Coal Zone - a limestone layer beneath the former Pittsburgh No. 8 coal zone, stratigraphically under the coal zone which is the top of the Casselman formation.
- Upper Casselman - a limestone observed 30-40 feet below the Under Coal Zone, when present.
- Despite the void created during the mining of the Pittsburgh No. 8 coal, water does not appear to have accumulated within the mined cavity indicating that the permeability of the underlying Under Coal Zone is sufficiently high to transmit the majority of water to the seeps.

These water bearing units in the former mine area overlie low permeability shales, limestones, and clays. The regional groundwater system is approximately 270 feet below the base of the Kolmont Coal in deep underlying fractured bedrock. This regional groundwater system occurs at an elevation that is approximately equal to or slightly above the elevation of Cross Creek.

5.3.1 Groundwater Flow Direction

Groundwater potentiometric maps were generated using groundwater elevation data collected during the January and February 2022 synoptic gauging events. These events represent the minimum and maximum synoptic water levels recorded to-date. Site-specific groundwater elevations from each synoptic event were used to prepare groundwater elevation contours for the Under Coal Zone and the Upper Casselman Formation, shown in Figures 5.4 and 5.5. The Pittsburgh formation, including the former coal bed, was not present at boreholes MW-102 and MW-103, which infers there is no Under Coal flow zone along the northern perimeter of the former mine area. Horizontal gradients were calculated using February 2022 elevations. The Under Coal Zone horizontal gradient was approximated using a three-point problem (MW-117-S, MW-104-S, and MW-114-S) as 0.0202 feet per foot (ft/ft) generally toward the south. The potentiometric surface in the Upper Casselman Formation generally mimicked the Under Coal Zone. The horizontal groundwater gradient in the Upper Casselman Formation was 0.0244 ft/ft (MW-117-D, MW-104-D, and MW-114-D) toward the south.

The lower horizontal gradient of the Under Coal Zone compared to the Upper Casselman is consistent with the observed hydraulic conductivity (Table 3-9). Generally, the Under Coal Zone hydraulic conductivity values are higher than the Upper Casselman, indicating less impedance to flow and lower horizontal hydraulic gradients. The gradient to the south observed in both of these water bearing zones follows the dip of the beds.

5.3.2 Vertical Hydraulic Gradients

Vertical hydraulic gradients, the preferential flow direction and magnitude between two hydrologic units, are calculated between eight well pairs across the site. The vertical hydraulic gradient is calculated by dividing the difference in groundwater elevations by the difference in screen midpoint elevation. Well pairs are screened between the Lower Pittsburg and Under Coal Zone (MW-112-S/D), and the Under Coal Zone and Upper Casselman Formation (MW-101-S/D, MW-104-S/D, MW-105-S/D, MW-114-S/D, MW-116-S/D, MW-117-S/D). Because groundwater has not accumulated in MW-107-S, the well pair screened between the Slurry Bowl slag and Under Coal Zone (MW-107-S/D) is omitted from this analysis. Groundwater elevations collected during the January and February 2022 synoptic events were used to estimate vertical hydraulic gradients, which ranged from 0.6 ft/ft in MW-117-S/D during both events to 1.3 ft/ft at MW-105-S/D during both events. A positive vertical gradient indicates a downward direction of flow. Vertical gradients were consistent in well pairs between January and February.

Former mine area monitoring well synoptic water levels were measured September 8 and November 2, 2021. Synoptic water levels were measured again on January 26, 2022, after completing development and sampling of monitoring wells MW-116 and MW-117. Table 3-11 provides a summary of water levels measured during these events. Table 3-15 summarized vertical gradients for well pairs completed in the former mine area based on January 2022 water level measurements.

Table 3-15: Mine Area Paired Well Vertical Gradients

Well	Date	Groundwater Elevation (ft NAVD88)	Screen Top (ft NAVD88)	Screen Bottom (ft NAVD88)	Screen Midpoint (ft NAVD88)	Vertical Gradient (ft/ft)
MW-101-S	1/26/2022	1066.94	1058.69	1048.69	1053.69	0.71
MW-101-D	1/26/2022	1038.2	1020.95	1005.95	1013.45	
MW-104-S	1/26/2022	1054.32	1054	1049	1051.5	0.86
MW-104-D	1/26/2022	1018.99	1015.54	1005.54	1010.54	
MW-105-S	1/26/2022	1048.46	1042.81	1037.81	1040.31	1.30
MW-105-D	1/26/2022	1009.9	1015.66	1005.66	1010.66	
MW-112-S	1/26/2022	1117.53	1115.25	1105.25	1110.25	0.99
MW-112-D	1/26/2022	1050.63	1047.53	1037.53	1042.53	
MW-114-S	1/26/2022	1039.54	1029.61	1022.11	1025.86	1.15
MW-114-D	1/26/2022	1004.69	1000.67	990.67	995.67	
MW-116-S	1/26/2022	1061.89	1058.55	1048.55	1053.55	0.90
MW-116-D	1/26/2022	1019.46	1013.77	998.77	1006.27	
MW-117-S	1/26/2022	1061.85	1055.04	1045.04	1050.04	0.64
MW-117-D	1/26/2022	1039.36	1022.67	1007.67	1015.17	

The vertical gradients are considerably higher than the horizontal gradients, indicating that flow is impeded in the vertical direction. This observation is consistent with the conceptualization that groundwater mostly flows along the hydrostratigraphic unit along the dip of the bed and that migration of water downward through fractures and pore space to lower layers is the secondary pathway for water. The underlying aquitards (perching layers) significantly reduce the water that can travel though the former mine area to reach the regional groundwater table.

5.4 Time-varying Geophysical Data Observations and Summary

As described in Section 3.0, three phases of geophysical investigations utilizing seismic refraction, Electrical Resistivity Imaging (ERI), and electromagnetic induction (EM) techniques were completed to identify potential voids/former mine workings, hydrogeologic conditions, potentially impacted groundwater, and geologic subsurface conditions including fill/overburden thickness, bedrock topography, and identification of structural features as described in the MAI data report. The resultant datasets have been used to enhance understanding of subsurface conditions among monitoring wells and seeps.

Following the completion of the three phases of geophysics, a program to monitor changes in geophysical signature at key locations was established within the MAI. Two electrical resistivity imaging transects were selected for repeated measurements over the course of a quarter (October 2021 and January 2022) to generate a time-lapse dataset of subsurface electrical resistivity to identify if precipitation events and changes in groundwater flow can be detected and/or mapped.

By evaluating a time-lapse dataset collected from a fixed array of surface electrodes, subtle changes in resistivity can be identified and used to infer preferential flow paths of groundwater, changes in perched water quantity and/or quality, and inform the conceptual site model for the entire former mine area. This approach provided repeated imaging of about 84,000 square feet of the MAI subsurface and provided information about the representativeness of the groundwater monitoring wells by providing a wider view of the conditions within the monitored areas.

Along the mine access road, south and downhill (also downgradient) of the slag pile where MW-107 is located, ERI data collected during the Phase 2 geophysical investigation indicates a significant variation in subsurface resistivity (corresponding to water quality) in the vicinity of MW-114. A time-lapse ERI line (TL1) was established approximately centered on MW-114 and repeat measurements of electrical resistivity were collected over 10 times using the same set of electrodes. An additional time-lapse ERI line (TL2) was established in the northwest portion of the mine area centered near SSW-17 (Figure 1.1). Modeled electrical resistivity values of the subsurface beneath each transect for each measurement date are presented in side-by-side panels of Figures 3.13, 3.14 and 3.15. The two time-lapse ERI lines are topographically downhill of existing piles of slag at the surface.

Initial evaluation of the modeled subsurface electrical resistivity below each of the time-lapse transects suggested little variation in distribution or change in apparent resistivity. However, grid differencing (subtraction of gridded data of one model from another) reveals subtle changes in the subsurface resistivity profiles between data collection events.

Figures 5.6 and 5.7 present two-dimensional sections of change in apparent resistivity below Line TL1 between the first October 20, 2021 data collection event, used as a baseline, and subsequent data collection events. At elevations below 1000 feet, very little change in resistivity occurs. A trend of decreasing resistivity between 40 and 130 feet along TL1 is most prominent in the difference between latest measurement event (January 13, 2022) and earliest (baseline) measurement event (October 20, 2021). We interpret this change to be the result of increased moisture in the soil and fill along this portion of the line. At MW-114D, which is approximately 10 feet south of 280 feet along TL1 and screened from approximately 991 to 1001 feet elevation, no significant change in resistivity is apparent. Some minor changes in resistivity at elevations from 1040 to 1000 feet (generally in the Under Coal Zone) do appear in most differencing datasets, however a clear pattern is not recognized.

Figure 5.8 presents two-dimensional sections of change in apparent resistivity below Line TL2 between the first November 19, 2021 data collection event, used as a baseline, and subsequent data collection events. Along TL2 changes in resistivity are limited to a decrease in resistivity centered around 360 to 400 feet along the line and at an elevation of approximately 1040 feet.

To evaluate correlations to precipitation events, multi-parameter transducer data, and water quality data collected during the MAI, ERI data were compared to MW-114 data. MW-114 is approximately 10 feet south of 300 feet along TL1 and was instrumented with a multi-parameter transducer. MW-114D is screened from approximately elevation 991 to 1001 feet. Time lapse data collected over 10 dates were modeled as shown in Figures 3.13 and 3.14. The apparent resistivity at elevation 995 feet was taken at each time interval and converted to a conductivity value (in milliSiemens per meter, mS/m). This ERI point conductivity is compared with the specific conductance data from the MW-114D transducer in the top panel of Figure 5.9. MW-114D has low flow and it appears specific conductance did not stabilize until approximately December 9, 2021. After this period, it appears ERI point conductivity and specific conductance correlate well with one another.

Additionally, ERI point conductivity was compared to daily precipitation data from a nearby weather station (in Wintersville, OH). The lower panel of Figure 5.9 presents ERI point conductivity at MW-114 with daily precipitation data for the period where time-lapse ERI data were collected. The ERI point conductivity at this depth suggest a relatively stable flow condition.

Generally, the time-varying geophysical data indicates that the distribution of lower resistivity (higher conductivity) water is stable in the two areas that were evaluated. These areas were specifically chosen because observed water quality and groundwater gradients indicated these as pathways of potential water migration away from the former mine area. Shallow wetting of colluvium was observed, but there was limited evidence of vertical transport pathways or enhanced vertical flows in the areas investigated.

6.0 GEOCHEMISTRY OF THE FORMER MINE AREA

Geochemical conditions in the various environmental media at the former mine area are affected by interactions between slag, surficial, and underlying geologic materials, surface water and groundwater, and the atmosphere. Thus, geochemical conditions vary across the former mine area both spatially and temporally.

Recharge towards the center of the former mine area, where coal in the shallow subsurface is primarily located, results in elevated concentrations of trace metals, sulfate, and lower pH values. Groundwater that encounters slag, currently concentrated at the southern and northeast ends of the former mine area boundary, undergoes an increase in pH and increasing concentrations of calcium and alkalinity. Beneath the Under Coal Zone lies the Upper Casselman Zone, which is a sandstone unit with a greater vertical hydraulic conductivity than the overlying Under Coal Zone.

As water migrates downwards, oxygen is consumed, slightly oxidizing to reducing conditions are observed, and groundwater is affected by coal and slag mix. Groundwater at the former mine area migrates more than 300 feet before entering the regional bedrock aquifer. The regional bedrock aquifer has distinctly different geochemical characteristics which include circumneutral pH, slightly reducing conditions, and lower sulfate concentrations (<10 mg/L). The vertical distance between the bottom of the Upper Casselman Zone and the top of the regional bedrock aquifer is approximately 330 feet.

The most common natural forms of chromium, the primary COPC at the Site, are trivalent Cr(III) and hexavalent Cr(VI). Cr(III) is frequently found in particulate form, whereas Cr(VI) is the more mobile dissolved species. Chromium can be transported through subsurface groundwater or stormwater runoff. Attenuation of chromium typically occurs through one the following processes (USEPA 2007):

1) Precipitation of metal chromates, Cr(III) oxyhydroxide or Cr(III) sulfide

2) Co-precipitation of Cr as a trace component in oxyhydroxides or sulfides of iron or manganese

3) Adsorption of chromate to iron oxyhydroxides, iron sulfides, or other mineral surfaces

Arsenic is an additional COPC observed at the Site. It is naturally present, and not a result of slag. Arsenic can be present as either trivalent As(III) or pentavalent As(V), with adsorption of As(V) onto iron oxides in oxidizing environments being one of the principal controls on arsenic mobility. Thus, reducing conditions which favor As(III) promote mobilization of arsenic in most natural groundwater systems. Attenuation of arsenic generally occurs through one of the following processes (USEPA 2007):

4) Precipitation of metal arsenates or arsenites, or precipitation of arsenic sulfides

5) Co-precipitation of arsenic as a trace component in oxyhydroxides or sulfides of iron or manganese

6) Adsorption to iron oxyhydroxides, iron sulfides, or other mineral surfaces

Manganese concentrations exceeding OEPA's MCL of 0.3 mg/L were observed in most groundwater samples at the Site (Table 3-12). Manganese is naturally elevated in groundwater across western Ohio (OEPA 2017). Additionally, manganese concentrations are typically greater than 1 mg/L in streams which have been impacted by acid rock drainage from coal mines (Hem 1985). Dissolved manganese in natural-water systems is nearly always present as divalent Mn(II) (Hem 1985). Attenuation of manganese generally occurs through precipitation of manganese oxides due to oxidizing conditions or an increase in pH.

6.1 Groundwater

Groundwater samples were collected from three primary groundwater units in the MAI. In downward order they are the Lower Pittsburgh, Under Coal Zone, Upper Casselman Zone, and the bedrock aquifer. Groundwater samples were collected between June and December 2021. The following sections discuss each groundwater unit as they relate to Site COPCs.

6.1.1 Lower Pittsburgh Formation and Under Coal Zone

Groundwater samples were collected from the Lower Pittsburgh and the Under Coal Zone monitoring wells over two sampling periods: July and November 2021. There is only one well with sufficient water to sample in the Lower Pittsburgh formation (MW-112-S), therefore this section focuses on the Under Coal Zone. The water quality monitoring data used for the geochemical evaluation can be described as follows:

- The major ion water composition of groundwater was generally consistent between summer and winter sampling events (Ca-SO_4 or Ca-HCO_3) although groundwater samples collected from wells along the eastern former mine area did vary (MW-104-S and MW-105-S Figure 6.1). pH values obtained from these wells were generally lower (<5.75 for MW-104-S and MW-105-S) than pH values recorded from all other Under Coal Zone wells (circumneutral). Additionally, seasonal changes in pH (decreasing during winter) and ORP (increasing during winter) in MW-104-S and MW-105-S were also observed. These wells are screened below a thicker layer of colluvium (which likely contains spoils with iron sulfide minerals such as pyrite) and no coal was observed in the boring. Oxidation of these spoils during winter months may be creating acidic groundwater conditions and result in seasonal changes in water type in MW-104-S and MW-105-S.

- Hexavalent chromium was not detected in any groundwater sample collected from Under Coal Zone. Chromium concentrations exceeded the 0.1 mg/L for total chromium in well MW-115. Chromium concentrations in all other samples collected from wells screened in the Under Coal Zone/Pittsburgh Formation were at or near the detection limit (0.0025 mg/L). Based on the measured ORP and pH of Lower Pittsburgh and Under Coal Zone groundwater samples, chromium, if present, would likely occur as Cr(III), the less mobile oxidation state of chromium (Figure 6.2).

- Arsenic exceeded 0.01 mg/L in samples collected from MW-105-S (0.011 mg/L), MW-106 (0.012 mg/L), and MW-115 (0.18 mg/L). Based on the measured ORP and pH of Lower Pittsburgh and Under Coal Zone samples, arsenic is likely present as As(V), which readily adsorbs to iron hydroxides (Figure 6.3).
- Manganese concentrations exceeded 0.3 mg/L in 21 out of 24 groundwater samples and ranged in concentration from non-detect to 8.7 mg/L. The circumneutral to low pH observed in nearly all groundwater samples represents conditions favorable for the mobility of aqueous manganese.
- Elevated sulfate concentrations in Under Coal Zone groundwater indicate that Coal Mine Drainage (CMD) is the likely source. As such, the manganese observed in the Under Coal Zone samples likely also originates from coal.
- Water quality samples from the Lower Pittsburgh at MW-112-S tend to be more variable seasonally reflecting more rapid recharge in this shallow water bearing zone.

6.1.2 Upper Casselman Zone

Groundwater samples were collected from the Upper Casselman zone monitoring wells over two sampling periods: July and November/December 2021. The water quality monitoring data used for the geochemical evaluation can be described as follows:

- The major ion water composition of Upper Casselman groundwater was generally consistent between summer and winter sampling events ($Na-SO_4$, $Ca-SO_4$, or $Na-HCO_3$) (Figure 6.4). The ORP and pH were generally consistent between seasons. Samples collected from MW-116-D and MW-117-D, located upgradient, were elevated in pH (>8) relative to other samples in the MAI and similar in water type ($Na-HCO_3$) to bedrock aquifer groundwater samples, which were also elevated in pH.
- Hexavalent chromium was not detected in any groundwater sample collected from the Upper Casselman Zone. Chromium concentrations exceeded the 0.1 mg/L for total chromium in wells MW-102 and MW-113. All other chromium concentrations in groundwater collected from wells screened in the Upper Casselman Zone were at or near detection limit (0.0025 mg/L). Based on the ORP and pH of Upper Casselman zone, chromium is potentially precipitating as $Cr(OH)_3$, limiting the amount of dissolved chromium in groundwater (Figure 6.5).
- Arsenic exceeded 0.01 mg/L in samples collected from MW-106 (0.012 mg/L) and MW-113 (0.017 mg/L). Based on the ORP and pH of Upper Casselman samples, arsenic is generally present as As(V), which readily adsorbs to iron hydroxides (Figure 6.6).
- Manganese concentrations exceeded 0.3 mg/L in 15 out of 20 groundwater samples, and ranged in concentration from non-detect to 5.6 mg/L. Additionally, the circumneutral pH observed in nearly all groundwater samples represents conditions favorable for the mobility of aqueous manganese.
- Elevated sulfate concentrations in Upper Casselman groundwater indicate that CMD is the likely source. As such, the manganese observed in the Upper Casselman samples likely also originates from coal.

6.1.3 Bedrock Aquifer

Three bedrock aquifer samples were collected from KMW-02, RBH-03, and RBA-4D during both summer and winter sampling events. The water quality monitoring data used for the geochemical evaluation can be described as follows:

- The major ion water composition of bedrock groundwater was consistent between summer and winter sampling events (Na-Cl or Na-HCO_3; Figure 6.7). Samples collected from RBA-04D were elevated in sodium (1,400 to 1,500 mg/L) and chloride (2,400 to 2,600 mg/L) relative to other bedrock aquifer samples, potentially indicating the dissolution of evaporite minerals or cation exchange in the bedrock aquifer. Generally, pH in bedrock aquifer samples was elevated (pH 8.0 to 8.8 in KMW-02 and RBH-03, respectively) and ORP was lower (-169 to -217 for KMW-02 and -161 to -283 for RBH-03) relative to the other sampled units.
- Hexavalent chromium was not detected in any groundwater sample collected from the bedrock aquifer. Only 3 of 12 bedrock groundwater samples tested above the detection limit for chromium. Based on the ORP and pH of bedrock aquifer samples, chromium is likely precipitating as $Cr(OH)_3$, limiting the amount of dissolved chromium in groundwater (Figure 6.8).
- Arsenic in from RBH-03 was 0.16 mg/L, but was below or just slightly above the detection limit (0.00075 mg/L) in all samples collected from KMW-02 and RBA-4-D. Based on the ORP and pH of bedrock samples, arsenic is generally present as As(V) which readily adsorbs to iron hydroxides (Figure 6.9).
- Manganese concentrations in all bedrock groundwater samples and ranged in concentration from 0.026 to 0.085 mg/L. The higher pH of the bedrock groundwater than the other units may result in manganese being less mobile.

6.2 Seeps

Two rounds of samples were collected from MAI seeps in 2021; the first round of samples was collected in July and the second in November. The following bullets summarize seep water chemistry as it relates to Site COPCs:

- Hexavalent chromium was not detected in seep samples in the former mine area. Chromium was below the detection limit in 11 of 20 seep samples and the remaining 9 samples tested below the calibration limit.
- Major ion water composition varied little between the two sample rounds, indicating that the water source and composition of each seep were generally consistent between winter and summer (Figure 6.10). Additionally, ORP and pH were generally consistent between seasons.
- Lower pH and higher ORP are observed in seeps associated with groundwater discharges from the Under Coal Zone and Upper Casselman (the south face of the former mine area).
- Elevated sulfate concentrations (>900 mg/L) in all seep samples suggest that oxidation of iron sulfide minerals is decreasing pH and increasing ORP (Figure 6.11).
- Cr(III) species are likely the stable phase in all seeps (Figure 6.12).
- Manganese concentrations exceeded 0.3 mg/L in 17 out of 20 seep samples, and ranged in concentration from non-detect to 31 mg/L. The circumneutral to low pH observed in nearly all seep samples indicates pH conditions favorable for the mobility of aqueous manganese. Elevated sulfate concentrations in the seeps indicate that CMD is the likely source of manganese.

- Arsenic was reported only at low concentrations in seep samples (max concentration of 0.0037 mg/L). Oxidized conditions in seep samples indicate that arsenic is likely present as As(V) (Figure 6.13), which has generally limited mobility due to adsorption by iron oxides.
- A trilinear (Piper) diagram was generated for samples collected from seeps, the Under Coal Zone, the Upper Casselman formation, and the bedrock aquifer to facilitate the identification of water types (Figure 6.14). Seep samples were water type Ca-SO_4, the same water type as the majority of groundwater samples collected from the Under Coal Zone (12 of 14 Under Coal Zone samples were also Ca-SO_4).
- A sample collected from seep SSW-041 displayed a water type of Ca-HCO_3; this seep is located southwest of the former mine area, contains little sulfate (130 mg/L) compared to other seep samples, and is not associated with the water bearing units investigated for the MAI. As such, SSW-041 may be hydrogeologically disconnected from the former mine area.
- Groundwater samples collected from the Upper Casselman formation displayed a range of water types (Na-HCO_3, Na-SO_4, Ca-SO_4) mixed between the Under Coal Zone/Seep Samples water type (Ca-SO_4) and the bedrock aquifer sample water type (Na-HCO_3), reflecting the spatial variability of the overlying coal thickness and heterogenous colluvium above the water bearing unit. Only two Upper Casselman groundwater samples, MW-104-D and MW-106, displayed a water type similar to the Under Coal Zone/Seep samples; at these locations preferential flow paths between the units may exist.
- The trilinear diagram (Figure 6.14) provides support to the geochemical conceptual model that clays of the Under Coal Zone cause groundwater to travel along horizontal planes to their ultimate discharge zone (the seeps) while limiting vertical migration of groundwater from the Under Coal Zone to the underlying Upper Casselman.

6.3 Surface Water

RI COPCs present in the ponds and flowing surface waters are dissolved chromium, manganese and cobalt. Manganese concentrations may increase from the ponds to the downgradient SSW-026 seep, but synoptic data are not available from the two sample locations.

Hexavalent chromium was not detected in former mine area ponds (SSW-12, SSW-16, SSW-30) and surface water, except at the following locations:

- SSW-281: This new SSW location identified during the MAI is a small drainage channel expressing from slag/slurry fill in the depression around MW-107 S/D (see Section 5.1).
- SSW-24 and SSW-25: Cr(VI) detections from these lower elevations in the channel drainages are consistent with historical detections during the RI
- SSW-071: This seep is not in the former mine area and detections are consistent with historical RI results. The MAI work plan included sampling other “RI” seeps outside the former mine area, however, SSW-071 was the only seep flowing during the investigation.

Some ponded water near the Former Mine Area has pH values less than 3.5 and concentrations of sulfate, iron, manganese, and calcium consistent with interactions with coal deposits in the region. The presence of lower-permeability clays underlying the coal and the ponding of water indicates that vertical migration of water downward to underlying units and/or bedrock is limited. Observed surface drainage features are the primary flow pathway away from the former mine area. Water flowing overland to the north from the former mine area likely merges with water at SSW-026 and then follows a natural drainage to Cross Creek. Manganese concentrations seem to increase from the former mine area to the seeps located near the northern property boundary.

7.0 SUMMARY AND CONCLUSIONS

This report documents the data collected, analyses and interpretation of the former mine area at the Site. The MAI focuses on understanding if the former mine area is suitable for placement of slag as part of remediation, providing hydrogeologic data for developing a groundwater monitoring program for a consolidated stockpile of slag, and providing engineering data for design of the consolidated slag stockpile.

The investigation included site reconnaissance, several stages of geophysical data collection which allowed for refinement and targeting of borehole drilling and logging and monitoring well installation. In total 18 boreholes were drilled providing 1,424 feet of borings resulting in the installation of 25 monitoring wells and 3 vibrating wire piezometers. Other activities included a field campaign to identify and sample surface water (including seeps) and select-existing and newly-installed monitoring wells. A total of two monitoring events were completed providing 53 groundwater and 49 surface water/seep water quality samples. Additional geophysical data collection was completed to improve the understanding of the subsurface conditions in key areas and provide time-varying data over about 84,000 square feet.

The surface and shallow subsurface of the former mine area is dominated by anthropogenic disturbances around portions of the Pittsburgh formation that remain intact above the No. 8 coal bed. Portions of the Pittsburgh Formation are intact through the center portion of the former mine area (MW-108, -112, and -113), including abandoned underground mine workings. The thickness of the remaining Pittsburgh formation above the Pittsburgh Coal ranges from 65 to 42 feet from east to west (and includes the underground workings on the Kolmont No. 1 mine map (Figure 2.2). The Pittsburgh formation was not present along the northern slope near MW-103 in modern time. Though surface mining did occur along the eastern and southern slopes of the former mine area, the thickness of the No. 8 coal bed and presence of any Pittsburgh formation prior to mining is uncertain at locations MW-104, MW-105 and MW-106. Voids were encountered within the former underground mine at two locations. Water was not observed in the mine voids.

Surficial geology outside of the former underground mine workings consists of mine tailings and related fill materials ranging from 20 to 52 feet around the perimeter and 66 feet at MW-115. The surficial fill was likely deposited during early surface and underground mining operations prior to the 1930s and grading operations that took place in the1960s. The surface depression in the central former mine area contains slag/slurry transported to this depression through a slurry pipe from the factory buildings. The depth of slag/slurry material is 26 feet bgs at MW-107-D. Ponded water in contact with this slag/slurry material has observed RI COPCs.

Three perched, water bearing zones are present in the upper portion of the mine area. The first zone is found only in the Pittsburgh formation (Lower Pittsburgh) where sufficient unit thickness is present and there are only a few feet of saturated thickness. The second zone occurs near the top of limestone immediately below the former Pittsburgh No 8. coal horizon where present (Under Coal Zone). The third zone, identified throughout the former mine area, occurs near a lower limestone unit in the upper portion of the Casselman Formation (Upper Casselman Zone), typically 30-40 feet below the bottom of the former Pittsburgh No 8. Coal zone. These perched zones overlie low permeability shales, limestones, and clays. The regional groundwater system, which occurs at about the Cross Creek elevation, is approximately 270 feet below the base of the Kolmont Coal in deep underlying fractured bedrock.

Water levels in the Under Coal Zone indicate rapid responses to precipitation events, demonstrating that this perched unit is directly recharged. The observed water levels in the Upper Casselman and Regional Bedrock do not show these rapid responses, indicating that infiltration is reduced and delayed through overlying strata. In the shallow units, observed water level increases are up to approximately 5 feet, which is consistent with the anticipated recharge based on rainfall estimates and rock properties.

The vertical gradients are considerably higher than the horizontal gradients, further indicating that flow is impeded in the vertical direction. As recharge enters the former mine area, flow occurs through soil, unconsolidated sediments and spoils and rock via interconnected pores and fractures until it reaches the Under Coal Zone, at which point most of the flow is redirected outward to express on surface slopes as seeps. The geochemical signature of the Under Coal Zone is consistent with the geochemistry of the seeps in the vicinity of the former mine area. The consistency of the hydraulic gradients and geochemistry strongly support the conclusion that the main flow path in the former mine area is through the Under Coal Zone. Dry voids were observed stratigraphically above this flow zone and a confining unit exists below this zone resulting in the perched condition. Therefore, the Under Coal Zone is likely sufficiently conductive to channel most of the recharge to the seeps.

The underlying, perched water bearing zone, the Upper Casselman, generally does not respond to precipitation events and has a distinctly different geochemical signature that is intermediate between the Upper Coal zone and bedrock groundwater. There is no indication that these units are in direct hydraulic communication, but rather that the slow vertical migration from the Under Coal Zone to the Upper Casselman results in a water quality transitioning to the bedrock geochemical signature. Based on the observed potentiometric surface and elevation of seeps, it appears some of the Upper Casselman water also contributes to observed seeps and surface flows.

COPCs that have been identified as part of the RI are present in some MAI water quality samples, however these detections are not due to slag-water interactions relevant to the main flow paths away from the former mine area. Importantly, given the presence of slag in the central portion of the former mine area, there were no observations Cr(VI) in the groundwater in the former mine area (Lower Pittsburgh, Under Coal Zone, and Upper Casselman). Based on the ORP and pH of the samples, Cr(III) species are likely the stable phase in all seeps, Cr(III) is both much less toxic and much less soluble and mobile in the environment than Cr(VI). Similarly, oxidized conditions in seep samples indicate that arsenic is likely present as As(V), which has limited mobility due to adsorption by iron oxides. The seep pH conditions are favorable for the mobility of aqueous manganese which is likely sourced from CMD.

Downward migration of water through fractures and pore space to lower layers below the Under Coal Zone is a secondary flow pathway. Water quality samples and time-lapse geophysics indicate stable geochemical conditions in the subsurface. As a result, with the underlying aquitards (perching layers) significantly reduce the water that can travel though the former mine area to reach the regional groundwater table.

The key conclusions from the MAI are:

- The former mine area was significantly altered due to mining and industrial activities, resulting in thick deposits of spoils.
- Remaining coal is centrally located in the former mine area and voids are present, and these voids are not filled with water.
- The primary flow pathway for infiltrating water is from the Under Coal Zone to seeps.
- Surface water in contact with slag has measurable RI COPCs, including Cr(VI).
- The geochemistry along the primary flow paths results in reduction of Cr(VI) to Cr(III) in groundwater.

- Very little, if any, water infiltration in the former mine area is transported to regional groundwater via groundwater flow pathways.
- The results of this investigation support the suitability of the former mine area as a site for placement of Site slag.

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Tables

Table 3-4: Mine Area Investigation - Well Locations and Construction
(all measurement units in feet unless indicated)

Location ID	Date Start	Date End	Final Depth	Northing	Easting	Well ID	Ground Elevation	Top Casing Elevation	Well Diameter (inch)	Stick-up Height	Top of Screen Depth from Ground	Base of Screen Depth from Ground	Top of Screen Elevation	Bottom of Screen Elevation
MW-101	6/21/2021	6/22/2021	98	242600.811	2478641.975	MW-101-D	1094.25	1096.78	2	2.51	73.32	88.32	1020.95	1005.95
						MW-101-S	1094.25	1096.76	2	2.53	35.54	45.54	1058.69	1048.69
MW-102	6/28/2021	6/29/2021	90	242374.813	2478864.429	MW-102	1092.49	1095.12	2	2.64	73.47	83.47	1019.01	1009.01
MW-103	6/17/2021	6/17/2021	78	242460.123	2479623.878	MW-103	1065.18	1067.78	2	2.6	53.54	58.54	1011.64	1006.64
MW-104	6/15/2021	6/16/2021	68	242040.473	2479828.122	MW-104-D	1071.35	1074.84	2	3.49	55.81	65.81	1015.54	1005.54
						MW-104-S	1071.35	1074.75	2	3.4	17.35	22.35	1054	1049
MW-105	6/10/2021	6/11/2021	68	241726.864	2479660.329	MW-105-D	1072.61	1075.11	2	2.5	56.95	66.95	1015.66	1005.66
						MW-105-S	1072.61	1075.16	2	2.55	29.8	34.8	1042.81	1037.81
MW-106	6/3/2021	6/4/2021	70	241370.719	2478660.37	MW-106	1060.19	1062.23	2	2.04	53.3	68.3	1006.89	991.89
MW-107-D	6/2/2021	6/2/2021	48	241630.408	2479188.166	MW-107-D	1083.79	1086.23	2	2.44	38.89	47.89	1044.9	1035.9
MW-107-S	6/3/2021	6/3/2021	27	241635.084	2479187.609	MW-107-S	1083.79	1086.55	2	2.76	4.94	14.94	1078.85	1068.85
MW-108	5/20/2021	5/21/2021	58	242016.373	2479050.841	MW-108	1123.07	1125.27	2	2.2	27.87	37.87	1095.2	1085.2
MW-109	5/26/2021	6/27/2021	67	242457.263	2478483.434	MW-109	1120.2	1122.63	2	2.43	18.87	31.87	1101.33	1088.33
MW-110	6/24/2021	6/24/2021	38	242440.247	2478680.635	MW-110	1080.73	1083.27	2	2.54	23.59	33.59	1057.14	1047.14
MW-111	5/24/2021	5/26/2021	68	242013.839	2478779.626	MW-111	1111.9	1114.65	2	2.75	58.69	67.69	1053.21	1044.21
MW-112	5/13/2021	5/20/2021	142.6	242010.563	2479230.85	MW-112-D	1130.75	1132.44	2	2.69	82.22	92.22	1047.53	1037.53
						MW-112-S	1130.75	1132.47	1	2.73	14.49	24.49	1115.25	1105.25
MW-113	5/5/2021	5/13/2021	177.4	242133.157	2479530.458	MW-113	1126.21	1128.79	2	2.56	111.44	131.44	1014.79	994.79
MW-114	6/7/2021	6/8/2021	68	241351.838	2479185.219	MW-114-D	1049.27	1050.98	2	1.71	48.6	58.6	1000.67	990.67
						MW-114-S	1049.27	1051.04	2	1.77	19.66	27.16	1029.61	1022.11
MW-115	5/28/2021	6/1/2021	88	241773.634	2478887.203	MW-115	1125.69	1128.17	2	2.48	79.46	87.46	1046.23	1038.23
MW-116	11/9/2021	11/11/2021	80	242344.151	2478319.43	MW-116-D	1073.58	1076.57	2	2.99	59.81	74.81	1013.77	998.77
						MW-116-S	1073.58	1076.55	2	2.97	15.03	25.03	1058.55	1048.55
MW-117	11/12/2021	11/13/2021	90	242759.712	2478427.667	MW-117-D	1095.94	1098.84	2	2.91	73.26	88.26	1022.67	1007.67
						MW-117-S	1095.94	1098.82	2	2.89	40.89	50.89	1055.04	1045.04

Table 3-5: Mine Area Investigation - Well Construction Rationale
(all measurement units in feet)

	Downhole Geophysics Data Collection						Rationale for Selected Well Screen Interval	Geology Code
Well ID	Magn Field Tilt - Azimuth	Caliper	Natural Gamma	Fluid Temp & Conductivity	OTV Image	ATV Amplitude		
MW-101-D	X	-	X	X	X	X	Screened based onflow zone confirmed by DHG and targeting flow zone associated with MW-113.	Upper Casselman
MW-101-S	X	-	X	X	X	X	Screened based on drilling observations and recovery tests indicating shallow flow.	Under Coal Zone
MW-102	X	-	X	X	X	X	Pre-mining surface was below former coal bed. Screened based on flow zone confirmed by DHG and targeting flow zone associated with MW-113.	Upper Casselman
MW-103	X	X	X	X	X	-	Pre-mining surface was below former coal bed. Screened based on water observations beneath native soil boundary and targeting flow zone associated with MW-113.	Upper Casselman
MW-104-D	X	X	X	X	X	X	Screened based onflow zone confirmed by DHG and targeting flow zone associated with MW-113.	Upper Casselman
MW-104-S	X	X	X	X	X	X	Screened based on drilling observations and recovery tests indicating shallow flow.	Under Coal Zone
MW-105-D	X	X	X	X	X	X	Screened based onflow zone confirmed by DHG and targeting flow zone associated with MW-113.	Upper Casselman
MW-105-S	X	X	X	X	X	X	Screened based on drilling observations sand recovery tests indicating shallow flow, possibly associated with filled drainage cut.	Under Coal Zone
MW-106	X	X	X	X	X	X	Screened based on flow zone confirmed by DHG and targeting zone screened in MW-113. VPW installed in flow zone identified beneath former coal layer based on drilling observations.	Upper Casselman
MW-107-D	X	X	X	-	X	-	Terminated and screened in limestone beneath former coal layer to avoid potential vertical cross-contamination to lower flow zones.	Under Coal Zone
MW-107-S	-	-	-	-	-	-	Approximate 10-foot step-off from MW-107-D. Screen based on presence of water to 15 ft in MW-107-D.	Slurry Bowl PMS
MW-108	X	X	-	-	-	X	Screened based on shallow high conductivity zone identified by surface geophysics and drilling observations.	Lower Pittsburg
MW-109	-	-	-	-	-	-	Void encountered from 40-56 ft with potential for additional weak roof collapse. Terminated and sealed borehole above void and screened in shallow flow zone above coal layer identified by prior surface geophysics.	Lower Pittsburg
MW-110	X	-	X	X	X	X	Terminated and screened in shallow flow zone beneath former coal layer elevation, confirmed by DHG , to prevent vertical cross-contamination to lower flow zones.	Under Coal Zone
MW-111	x	X	X	X	X	X	Void encountered from 46 to 55 ft. Proceeded through permanent outer casing installed through void. Screened flow zone beneath coal floor based on drilling observations	Under Coal Zone

Table 3-5: Mine Area Investigation - Well Construction Rationale
(all measurement units in feet)

	Downhole Geophysics Data Collection						Rationale for Selected Well Screen Interval	Geology Code
Well ID	Magn Field Tilt - Azimuth	Caliper	Natural Gamma	Fluid Temp & Conductivity	OTV Image	ATV Amplitude		
MW-112-D	X	X	X	X	X	X	Screened based on flow zone confirmed in coal bed by DHG and recovery tests; VPW installed @117 ft in flow zone screened @MW-113.	Under Coal Zone
MW-112-S	X	X	X	X	X	X	Screened shallow flow zone observed near surface during drilling.	Lower Pittsburgh
MW-113	X	X	X	X	X	X	Screen based on flow zone and fractures confirmed by DHG; VPW installed @93 ft to evaluate possible flow zone beneath coal bed and vertical gradient	Upper Casselman
MW-114-D	X	X	X	X	X	X	Screen based on flow zone confirmed by DHG and recovery tests, targeting same zone screened in MW-113.	Upper Casselman
MW-114-S	X	X	X	X	X	X	Screen based on surface geophysics, DHG, and drilling observations.	Under Coal Zone
MW-115	X	X	X	X	x	x	Screened based on overnight recovery test and DHG targeting flow zone beneath former coal bed.	Under Coal Zone
MW-116-D	-	-	-	-	-	-	Screen based on drilling observations and targeted Upper Casselman flow zone.	Upper Casselman
MW-116-S	-	-	-	-	-	-	Screened based on shallow high conductivity zone identified by surface geophysics, and drilling observations.	Under Coal Zone
MW-117-D	-	-	-	-	-	-	Screen based on drilling observations and recovery tests, targeted Upper Casselman flow zone.	Upper Casselman
MW-117-S	-	-	-	-	-	-	Screened based on shallow high conductivity zone identified by surface geophysics, and drilling observations.	Under Coal Zone

Table 3-6: Soil Particle Size and Atterberg Limits Results

Sample ID	Date Collected	USCS Soil Classification	Atterberg Limits			% Gravel	% Sand	% Fines	Grain Size Distribution		
			Liquid Limit	Plastic Limit	Plasticity Index				% Finer 3/4"	% Finer #4	% Finer #200
MW-101 (0-28)	6/22/2021	-	-	-	-	1	44	55	100	99	55
MW-102 (0-42)	6/28/2021	CL	40	24	16	2	36	62	100	98	62
MW-103 (0-28)	6/17/2021	-	-	-	-	27	37	36	80	43	36
MW-103 (28-58)	6/17/2021	SC	31	19	12	23	29	48	85	77	48
MW-104 (0-8)	6/15/2021	-	-	-	-	16	47	37	85	84	37
MW-104 (8-18)	6/15/2021	SM				28	45	27	74	72	27
MW-105 (3.5-5)	6/10/2021	SM	33	25	8	12	41	47	96	88	47
MW-105 (8-11.5)	6/10/2021	-	-	-	-	20	42	38	84	80	38
MW-111 (0-3)	5/24/2021	CL	35	21	14	0	31	69	100	100	69
MW-113 (4-9)	5/5/2021	CL	33	20	13	7	19	74	99	93	74
MW-114 (0-14)	6/7/2021	-	-	-	-	48	19	33	63	52	33
MW-115 (0-28)	5/28/2021	-	-	-	-	28	40	32	76	72	32
MW-115 (28-68)	5/28/2021	SC	25	15	10	28	37	35	11	72	35
MW-116 (5-12)	11/9/2021	CL	46	26	20	8	26	66	99	92	66

Table 3-7: Soil Composite Sample Permeability Results

Sample Identification	Sample Length1 (cm)	Sample Diameter1 (cm)	Sample Initial Dry Density (lbf/ft^3)	Maximum Dry Density (lbf/ft^3)	Achieved Compaction (%)	Initial Moisture (%)	Optimum Moisture (%)	Effective Stress (kPa)	Back Pressure (kPa)	Gradient	Average Hydraulic Conductivity (cm/s)
MW-101/102	12.137	10.328	110.3	119.9	0.9199	14.9	12.9	21	480	13	2.50E-07
MW-103	9.671	7.481	110.6	120.7	0.9163	13.7	11.6	21	410	15	8.10E-07
MW-104/105	11.773	10.211	99.4	107.7	0.9229	17	15	21	480	16	2.20E-06
MW-108/111/112/113	9.599	7.468	115.1	124.6	0.9238	13.6	12	21	410	15	8.10E-07
MW-114/115	11.825	10.288	116.4	126.8	0.9180	11.7	9.8	21	480	13	1.30E-06
MW-116	9.77	7.515	100.2	109.4	91.6000	15.2	15.8	21	410	17	7.30E-07

Table 3-8: Satralloy MAI Transducer and Piezometer Locations

Location	Instrument	Flow Zone	Installation Notes
BaroTroll	Baro Troll 500	Site Weather Station	Installed 9/2/2020
MW-101-S	Rugged Troll 200	Under Coal	Installed 9/9/2021
MW-105-S	Rugged Troll 200	Under Coal	Installed 9/9/2021
MW-111	Rugged Troll 200	Under Coal	Installed 9/9/2021
MW-114-S	Aqua Troll 200 (30 PSI)	Under Coal	Installed 10/28/2021
VPW-113	Slope Indicator 700 kPa	Under Coal	Logging initiated 9/9/2021
VPW-106	Slope Indicator 700 kPa	Under Coal	Logging initiated 9/9/2021
MW-101-D	Rugged Troll 200	Upper Casselman	Installed 9/9/2021
MW-103	Rugged Troll 200	Upper Casselman	Installed 9/9/2021
MW-105-D	Rugged Troll 200	Upper Casselman	Installed 9/9/2021
MW-106	Rugged Troll 200	Upper Casselman	Installed 9/9/2021
MW-114-D	Aqua Troll 200 (100 PSI)	Upper Casselman	Installed 11/30/3021
VPW-112	Slope Indicator 700 kPa	Upper Casselman	Logging initiated 9/9/2021
SSW-241	Aqua Troll 200 (30 PSI)	Seep	Installed 9/3/2020 - Warm Season Only*
SSW-242	Aqua Troll 200 (30 PSI)	Seep	Installed 9/3/2020 - Warm Season Only*
SSW-121	*Aqua Troll 200 (30 PSI)*	*Seep*	*Installed 9/20/2020 - Removed 7/16/2021**
SSW-245	Aqua Troll 200 (30 PSI)	Seep	Installed 7/16/2021 - Warm Season Only*
RBH-01	Aqua Troll 200 (100 PSI)	Site-Wide Perched Bedrock	Installed 9/3/2020
RBH-02	*Aqua Troll 200 (100 PSI)*	*Site-Wide Perched Bedrock*	*Installed 9/3/2020 - Removed 7/21/2021*

Notes:
* Seep transducers removed when forecasted temperatures are below freezing; re-installed in Spring.

Table 3-9: Mine Area Investigation Slug Test Results

Location	Flow Zone	K, hydraulic conductivity (ft/sec)	K, hydraulic conductivity (ft/day)
MW-101-S in	Under Coal	6.97E-05	6.02
MW-101-S out	Under Coal	8.07E-05	6.97
MW-101-S in2	Under Coal	6.83E-05	5.90
MW-101-S out2	Under Coal	8.63E-05	7.45
MW-104-S in	Under Coal	7.11E-04	61.46
MW-104-S out	Under Coal	6.33E-04	54.72
MW-104-S in2	Under Coal	6.11E-04	52.81
MW-104-S out2	Under Coal	6.33E-04	54.00
MW-107-D in	Under Coal	2.93E-06	0.42
MW-107-D in2	Under Coal	2.83E-06	0.35
MW-107-D out2	Under Coal	4.22E-06	0.36
MW-114-S in	Under Coal	1.46E-04	12.59
MW-114-S out	Under Coal	1.57E-04	13.56
MW-114-S in2	Under Coal	1.53E-04	13.19
MW-114-S out2	Under Coal	1.52E-04	13.10
MW-115 in	Under Coal	1.65E-05	1.42
MW-115 out	Under Coal	1.61E-05	1.39
MW-116-S in	Under Coal	1.52E-05	1.32
MW-116-S out	Under Coal	1.52E-05	1.31
MW-116-S in2	Under Coal	1.73E-05	1.5
MW-116-S out2	Under Coal	1.64E-05	1.41
MW-117-S in	Under Coal	2.41E-05	2.08
MW-117-S out	Under Coal	2.93E-05	2.53

Location	Flow Zone	K, hydraulic conductivity (ft/sec)	K, hydraulic conductivity (ft/day)
MW-101-D in	Upper Casselman	1.46E-06	0.13
MW-101-D out	Upper Casselman	1.54E-06	0.13
MW-101-D in2	Upper Casselman	1.83E-06	0.16
MW-102 in	Upper Casselman	6.94E-07	0.06
MW-104-D in	Upper Casselman	5.80E-04	50.11
MW-104-D out	Upper Casselman	5.51E-04	47.61
MW-104-D in2	Upper Casselman	5.49E-04	47.45
MW-104-D out2	Upper Casselman	4.60E-04	39.72
MW-113 in	Upper Casselman	1.53E-06	0.13
MW-113 out	Upper Casselman	1.30E-06	0.11

Table 3-10: Mine Area Synoptic Groundwater Elevations
(all measurement units in feet)

Well ID	9/8/2021		11/2/2021		1/26/2022		2/28/2022	
	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
MW-101-D	58.43	1038.35	60.96	1035.82	58.58	1038.20	57.14	1039.64
MW-101-S	28.42	1068.34	29.66	1067.10	29.82	1066.94	27.58	1069.18
MW-102	58.37	1036.75	60.42	1034.70	59.32	1035.80	57.82	1037.3
MW-103	54.78	1013.00	55.05	1012.73	55.43	1012.35	54.9	1012.88
MW-104-D	55.81	1019.03	56.25	1018.59	55.85	1018.99	53.74	1021.1
MW-104-S	19.47	1055.28	21.28	1053.47	20.43	1054.32	18.15	1056.6
MW-105-D	65.11	1010.00	65.41	1009.70	65.21	1009.90	64.2	1010.91
MW-105-S	25.70	1049.46	27.83	1047.33	26.70	1048.46	25.11	1050.05
MW-106	50.83	1011.40	51.20	1011.03	51.00	1011.23	50.45	1011.78
MW-107-D	43.61	1042.61	43.38	1042.84	43.14	1043.08	41.86	1044.36
MW-107-S	DRY	-	17.86	1068.69	17.87	1068.68	DRY	-
MW-108	DRY	-	39.98	1085.29	40.07	1085.20	DRY	-
MW-109	DRY	-	DRY	-	30.78	1091.85	29.55	1093.08
MW-110	20.28	1062.99	23.75	1059.52	22.31	1060.96	18.55	1064.72
MW-111	53.74	1060.91	54.55	1060.10	54.50	1060.15	52.69	1061.96
MW-112-D	82.94	1050.50	84.07	1049.37	82.81	1050.63	81.6	1051.84
MW-112-S	15.83	1117.64	16.52	1116.95	15.94	1117.53	12.55	1120.92
MW-113	109.74	1019.05	110.15	1018.64	109.71	1019.08	107.68	1021.11
MW-114-D	46.01	1004.97	45.80	1005.18	46.29	1004.69	46.14	1004.84
MW-114-S	10.92	1040.11	11.43	1039.60	11.50	1039.54	10.57	1040.46
MW-115	81.53	1046.64	82.52	1045.65	81.99	1046.18	80.8	1047.36
MW-116-D	-	-	72.05 *	1004.52 *	57.11	1019.46	53.8	1022.77
MW-116-S	-	-	15.14 *	1061.41 *	14.66	1061.89	13.07	1063.48
MW-117-D	-	-	66.07 *	1032.77 *	59.48	1039.36	59	1039.84
MW-117-S	-	-	39.22 *	1059.6 *	36.97	1061.85	33.52	1065.3

Notes:
* = Measured following installation and development 11/30 and 12/1/2021.

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-101-D 7/15/2021	MW-101-D 11/3/2021	MW-101-S (FD) 11/3/2021	MW-101-S 7/15/2021	MW-101-S 11/3/2021	MW-102 7/19/2021	MW-102 11/18/2021	MW-103 12/1/2021	MW-103 7/30/2021	MW-104-D 7/16/2021
Metals												
Aluminum	Total	ug/L	600	< 34	88	1700	53	2500	160	-	-	140
Aluminum	RPP	ug/L	-	-	-	-	-	-	-	< 34	< 34	-
Aluminum	Dissolved	ug/L	< 34	69	< 34	< 34	< 34	< 34	< 34	-	-	< 34
Antimony	Total	ug/L	0.88 J	4.6	< 0.57	< 0.57	0.64 J	1.8 J	0.99 J	-	-	< 0.57
Antimony	RPP	ug/L	-	-	-	-	-	-	-	< 0.57	< 0.57	-
Antimony	Dissolved	ug/L	0.89 J	5.7	< 0.57	< 0.57	< 0.57	1.9 J	1.3 J	-	-	< 0.57
Arsenic	Total	ug/L	< 0.75	1.4 J	5.1	6.4	5.7	1.1 J	< 0.75	-	-	< 0.75
Arsenic	RPP	ug/L	-	-	-	-	-	-	-	< 0.75	< 0.75	-
Arsenic	Dissolved	ug/L	< 0.75	1.5 J	5.5	4.8 J	5.2	< 0.75	< 0.75	-	-	< 0.75
Barium	Total	ug/L	56	42	11	33	11	68	32	-	-	12
Barium	RPP	ug/L	-	-	-	-	-	-	-	21	28	-
Barium	Dissolved	ug/L	53	48	10	13	11	46	34	-	-	10
Beryllium	Total	ug/L	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	-	-	< 0.62
Beryllium	RPP	ug/L	-	-	-	-	-	-	-	< 0.62	< 0.62	-
Beryllium	Dissolved	ug/L	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	-	-	< 0.62
Cadmium	Total	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	-	-	< 0.20
Cadmium	RPP	ug/L	-	-	-	-	-	-	-	< 0.20	< 0.20	-
Cadmium	Dissolved	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	-	-	< 0.20
Calcium	Total	ug/L	160000	66000	550000	520000	580000	180000	230000	-	-	500000
Calcium	RPP	ug/L	-	-	-	-	-	-	-	500000	440000	-
Calcium	Dissolved	ug/L	170000	73000	570000	530000	540000	180000	250000	-	-	480000
Chromium, Total	Total	ug/L	65	< 2.5	< 2.5	16	< 2.5	190	25	-	-	7.5
Chromium, Total	RPP	ug/L	-	-	-	-	-	-	-	< 2.5	< 2.5	-
Chromium, Total	Dissolved	ug/L	13	6.3	< 2.5	2.5 J	< 2.5	3.3 J	7.4	-	-	< 2.5
Chromium, Hexavalent	Total	ug/L	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	-	-	< 7.0
Chromium, Hexavalent	RPP	ug/L	-	-	-	-	-	-	-	< 7.0	< 7.0 H	-
Cobalt	Total	ug/L	3.1	1.1	34	21	33	7.8	2	-	-	1.4
Cobalt	RPP	ug/L	-	-	-	-	-	-	-	2.7	1.6	-
Cobalt	Dissolved	ug/L	2.6	1.3	32	20	30	3.8	1.8	-	-	1.2
Copper	Total	ug/L	36	< 1.7	< 1.7	2.1	< 1.7	8.6	< 1.7	-	-	< 1.7
Copper	RPP	ug/L	-	-	-	-	-	-	-	< 1.7	< 1.7	-
Copper	Dissolved	ug/L	14	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	-	-	< 1.7
Iron	Total	ug/L	990	390	12000	14000	12000	3900	350	-	-	5000
Iron	RPP	ug/L	-	-	-	-	-	-	-	270	< 47	-
Iron	Dissolved	ug/L	140	550	12000	12000	12000	< 47	72 J	-	-	4800
Lead	Total	ug/L	< 0.45	< 0.45	< 0.45	1.7	< 0.45	2.2	< 0.45	-	-	< 0.45
Lead	RPP	ug/L	-	-	-	-	-	-	-	< 0.45	< 0.45	-
Lead	Dissolved	ug/L	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	-	-	< 0.45
Magnesium	Total	ug/L	38000	17000	140000	120000	140000	32000	37000	-	-	92000
Magnesium	RPP	ug/L	-	-	-	-	-	-	-	51000	52000	-
Magnesium	Dissolved	ug/L	39000	19000	140000	120000	140000	31000	39000	-	-	90000
Manganese	Total	ug/L	620	280	7200	4400	7000	630	270	-	-	430
Manganese	RPP	ug/L	-	-	-	-	-	-	-	1400	980	-
Manganese	Dissolved	ug/L	620	310	6900	4300	6600	540	290	-	-	400
Mercury	Total	ug/L	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	-	-	< 0.13
Mercury	RPP	ug/L	-	-	-	-	-	-	-	-	< 0.13	-
Mercury	Dissolved	ug/L	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	-	-	< 0.13
Nickel	Total	ug/L	45	4.3	100	76	98	110	19	-	-	5.8
Nickel	RPP	ug/L	-	-	-	-	-	-	-	2.8	3	-
Nickel	Dissolved	ug/L	29	7.1	97	70	93	40	17	-	-	3.6
Potassium	Total	ug/L	8000	5600	6300	5700	6400	8200	7000	-	-	9200
Potassium	RPP	ug/L	-	-	-	-	-	-	-	4800	6600	-

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-101-D 7/15/2021	MW-101-D 11/3/2021	MW-101-S (FD) 11/3/2021	MW-101-S 7/15/2021	MW-101-S 11/3/2021	MW-102 7/19/2021	MW-102 11/18/2021	MW-103 12/1/2021	MW-103 7/30/2021	MW-104-D 7/16/2021
Potassium	Dissolved	ug/L	8300	6200	6200	5300	6000	7800	7600	-	-	8800
Selenium	Total	ug/L	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	1.3 J	< 0.89	-	-	< 0.89
Selenium	RPP	ug/L	-	-	-	-	-	-	-	< 0.89	0.99 J	-
Selenium	Dissolved	ug/L	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	1.4 J	< 0.89	-	-	< 0.89
Silver	Total	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	-	-	< 0.053
Silver	RPP	ug/L	-	-	-	-	-	-	-	< 0.053	< 0.053	-
Silver	Dissolved	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	-	-	< 0.053
Sodium	Total	ug/L	180000	160000	9700	17000	10000	200000	96000 B	-	-	22000
Sodium	RPP	ug/L	-	-	-	-	-	-	-	270000	210000	-
Sodium	Dissolved	ug/L	190000	180000	10000	17000	9800	200000	100000 B	-	-	22000
Thallium	Total	ug/L	< 0.20	0.22 J	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	-	-	< 0.20
Thallium	RPP	ug/L	-	-	-	-	-	-	-	< 0.20	< 0.20	-
Thallium	Dissolved	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	-	-	< 0.20
Zinc	Total	ug/L	28	< 15	< 15	29	< 15	< 15	< 15	-	-	< 15
Zinc	RPP	ug/L	-	-	-	-	-	-	-	< 15	710	-
Zinc	Dissolved	ug/L	17 J	< 15	< 15	20	< 15	< 15	< 15	-	-	< 15
Geochemistry												
Alkalinity, Bicarbonate as Ca	Total	ug/L	340000	310000	330000	360000	320000	300000	250000	390000	360000	360000
Alkalinity, Carbonate as CaC	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	340000	310000	330000	360000	320000	300000	250000	390000	360000	360000
Chloride	Total	ug/L	5900	3600	2700	2400	2700	3500	2600	150000	160000	12000
Hardness	Total	ug/L	620000	270000	2200000	2300000	2100000	720000	890000	1500000	1400000	1700000
Nitrate as N	Total	ug/L	< 360	< 180	< 180	< 180	< 180	< 180	< 180	< 360	< 180 H	< 36
Phosphorus	Total	ug/L	44 J	< 17	45 J	90 J	43 J	68 J	< 17	< 17	< 17	25 J
Sulfate	Total	ug/L	710000	360000	1800000	1800000	1800000	700000	870000	1600000	1300000	1400000
Sulfide	Total	ug/L	< 580	< 580	< 580	< 580	< 580	< 580	< 580	-	-	< 580
Total Dissolved Solids	Total	ug/L	-	-	-	-	-	-	-	2400000	2600000	-
Field Parameters												
Conductivity, field measurec	Total	ug/L	1.86	1.211	-	3.026	2.838	1.851	1.883	3.176	2.722	2.562
Dissolved Oxygen, field mea	Total	ug/L	2010	740	-	90	440	4030	3990	-	-	160
Oxidation Reduction Potenti	Total	ug/L	58	-45.5	-	-27	-13.5	138	133.4	8	108	-34.6
pH, field measured	Total	ug/L	7.3	7.42	-	6.67	6.5	7.38	6.91	7.61	7.11	6.67
Temperature, field measure	Total	C	19.7	11.9	-	17	12.4	16.1	10.3	13	22.8	15.5
Total Dissolved Solids, field	Total	mg/L	-	-	-	-	-	-	-	3472	2115	-
Turbidity, field measured	Total	ntu	22.6	12.3	-	6.92	4.6	85.3	15.5	-	-	13.7

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
H3 = Sample was received and analyzed past holding time.
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-104-D 11/4/2021	MW-104-S 7/19/2021	MW-104-S 11/4/2021	MW-105-D 12/1/2021	MW-105-D 7/30/2021	MW-105-S 7/20/2021	MW-105-S 7/23/2021	MW-105-S 11/17/2021	MW-106 7/20/2021	MW-106 (FD) 7/20/2021
Metals												
Aluminum	Total	ug/L	90 B	20000	26000 B	-	-	5600	-	180	38 J	38 J
Aluminum	RPP	ug/L	-	-	-	< 34	< 34	-	-	-	-	-
Aluminum	Dissolved	ug/L	< 34	19000	26000 B	-	-	-	6200	< 34	< 34	< 34
Antimony	Total	ug/L	< 0.57	< 0.57	< 0.57	-	-	< 0.57	-	< 0.57	1.1 J	1.1 J
Antimony	RPP	ug/L	-	-	-	< 0.57	1.5 J	-	-	-	-	-
Antimony	Dissolved	ug/L	< 0.57	< 0.57	< 0.57	-	-	-	< 0.57	< 0.57	1.1 J	1.0 J
Arsenic	Total	ug/L	< 0.75	< 0.75	1.0 J	-	-	11	-	< 0.75	< 0.75	< 0.75
Arsenic	RPP	ug/L	-	-	-	< 0.75	< 0.75	-	-	-	-	-
Arsenic	Dissolved	ug/L	< 0.75	< 0.75	< 0.75	-	-	-	11	< 0.75	< 0.75	0.76 J
Barium	Total	ug/L	9.8	16	9.3	-	-	12	-	110	22	22
Barium	RPP	ug/L	-	-	-	24	25	-	-	-	-	-
Barium	Dissolved	ug/L	7.9	15	2.9 J	-	-	-	9.9	110	21	21
Beryllium	Total	ug/L	< 0.62	8.2	11	-	-	2.4	-	< 0.62	< 0.62	< 0.62
Beryllium	RPP	ug/L	-	-	-	< 0.62	< 0.62	-	-	-	-	-
Beryllium	Dissolved	ug/L	< 0.62	7.9	11	-	-	-	3	< 0.62	< 0.62	< 0.62
Cadmium	Total	ug/L	< 0.20	2.3	2.2	-	-	0.49 J	-	< 0.20	< 0.20	< 0.20
Cadmium	RPP	ug/L	-	-	-	< 0.20	< 0.20	-	-	-	-	-
Cadmium	Dissolved	ug/L	< 0.20	2.2	2.3	-	-	-	0.60 J	< 0.20	< 0.20	< 0.20
Calcium	Total	ug/L	420000	140000	110000	-	-	350000	-	110000	410000	410000
Calcium	RPP	ug/L	-	-	-	54000	130000	-	-	-	-	-
Calcium	Dissolved	ug/L	420000	130000	110000	-	-	-	300000	120000	400000	400000
Chromium, Total	Total	ug/L	< 2.5	8.7	6.8	-	-	< 2.5	-	< 2.5	< 2.5	< 2.5
Chromium, Total	RPP	ug/L	-	-	-	< 2.5	< 2.5	-	-	-	-	-
Chromium, Total	Dissolved	ug/L	< 2.5	6	5.1	-	-	-	< 2.5	< 2.5	< 2.5	< 2.5
Chromium, Hexavalent	Total	ug/L	< 7.0	< 7.0	< 7.0	-	-	< 7.0 H	-	< 7.0	< 7.0 HH3	< 7.0 HH3
Chromium, Hexavalent	RPP	ug/L	-	-	-	< 7.0	< 7.0 H	-	-	-	-	-
Cobalt	Total	ug/L	0.43 J	100	110	-	-	110	-	0.27 J	2.9	2.9
Cobalt	RPP	ug/L	-	-	-	0.28 J	2.3	-	-	-	-	-
Cobalt	Dissolved	ug/L	0.44 J	98	110	-	-	-	110	0.27 J	2.8	2.8
Copper	Total	ug/L	< 1.7	43	41	-	-	< 1.7	-	< 1.7	< 1.7	< 1.7
Copper	RPP	ug/L	-	-	-	< 1.7	< 1.7	-	-	-	-	-
Copper	Dissolved	ug/L	< 1.7	42	42	-	-	-	< 1.7	< 1.7	< 1.7	< 1.7
Iron	Total	ug/L	4700	1500	4400	-	-	32000	-	160	490	490
Iron	RPP	ug/L	-	-	-	< 47	130	-	-	-	-	-
Iron	Dissolved	ug/L	4400	1400	3300	-	-	-	27000	88 J	330	340
Lead	Total	ug/L	< 0.45	< 0.45	1.5	-	-	< 0.45	-	< 0.45	< 0.45	< 0.45
Lead	RPP	ug/L	-	-	-	< 0.45	< 0.45	-	-	-	-	-
Lead	Dissolved	ug/L	< 0.45	< 0.45	< 0.45	-	-	-	< 0.45	< 0.45	< 0.45	< 0.45
Magnesium	Total	ug/L	78000 F1	34000	33000	-	-	65000	-	19000	89000	88000
Magnesium	RPP	ug/L	-	-	-	15000	33000	-	-	-	-	-
Magnesium	Dissolved	ug/L	79000 F1	32000	33000	-	-	-	57000	19000	84000	86000
Manganese	Total	ug/L	370	3900	4100	-	-	6100	-	18	330	320
Manganese	RPP	ug/L	-	-	-	37	370	-	-	-	-	-
Manganese	Dissolved	ug/L	370	3700	4300	-	-	-	5600	21	310	320
Mercury	Total	ug/L	< 0.13	< 0.13	< 0.13	-	-	< 0.13	-	< 0.13	< 0.13	< 0.13
Mercury	RPP	ug/L	-	-	-	-	< 0.13	-	-	-	-	-
Mercury	Dissolved	ug/L	< 0.13	< 0.13	< 0.13	-	-	-	< 0.13	< 0.13	< 0.13	< 0.13
Nickel	Total	ug/L	< 1.5	230	260	-	-	240	-	< 1.5	3.2	3.1
Nickel	RPP	ug/L	-	-	-	< 1.5	3	-	-	-	-	-
Nickel	Dissolved	ug/L	< 1.5	220	260	-	-	-	230	< 1.5	3	2.9
Potassium	Total	ug/L	8100	1000	1000	-	-	1900	-	1700	9800	9600
Potassium	RPP	ug/L	-	-	-	3500	7000	-	-	-	-	-

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-104-D 11/4/2021	MW-104-S 7/19/2021	MW-104-S 11/4/2021	MW-105-D 12/1/2021	MW-105-D 7/30/2021	MW-105-S 7/20/2021	MW-105-S 7/23/2021	MW-105-S 11/17/2021	MW-106 7/20/2021	MW-106 (FD) 7/20/2021
Potassium	Dissolved	ug/L	8100	930 J	680 J	-	-	-	1600	1700	9700	9800
Selenium	Total	ug/L	< 0.89	1.2 J	1.4 J	-	-	< 0.89	-	< 0.89	< 0.89	< 0.89
Selenium	RPP	ug/L	-	-	-	1.1 J	2.8 J	-	-	-	-	-
Selenium	Dissolved	ug/L	< 0.89	0.95 J	0.99 J	-	-	-	< 0.89	< 0.89	< 0.89	< 0.89
Silver	Total	ug/L	< 0.053	< 0.053	< 0.053	-	-	< 0.053	-	< 0.053	< 0.053	< 0.053
Silver	RPP	ug/L	-	-	-	< 0.053	< 0.053	-	-	-	-	-
Silver	Dissolved	ug/L	< 0.053	< 0.053	< 0.053	-	-	-	< 0.053	< 0.053	< 0.053	< 0.053
Sodium	Total	ug/L	18000	3200	2700	-	-	6200	-	4200	140000	130000
Sodium	RPP	ug/L	-	-	-	38000	63000	-	-	-	-	-
Sodium	Dissolved	ug/L	18000	3000	2600	-	-	-	5500	4300	140000	150000
Thallium	Total	ug/L	< 0.20	0.79 J	0.90 J	-	-	0.31 J	-	< 0.20	< 0.20	< 0.20
Thallium	RPP	ug/L	-	-	-	< 0.20	< 0.20	-	-	-	-	-
Thallium	Dissolved	ug/L	0.71 J	0.31 J	0.20 J	-	-	-	0.33 J	< 0.20	< 0.20	< 0.20
Zinc	Total	ug/L	< 15	470	480	-	-	360	-	< 15	< 15	< 15
Zinc	RPP	ug/L	-	-	-	< 15	15 J	-	-	-	-	-
Zinc	Dissolved	ug/L	< 15	470	480	-	-	-	390	< 15	< 15	< 15
Geochemistry												
Alkalinity, Bicarbonate as Ca	Total	ug/L	330000	< 2600	< 2600	-	-	48000	-	340000	410000	420000
Alkalinity, Carbonate as Ca	Total	ug/L	< 2600	< 2600	< 2600	-	-	< 2600	-	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	330000	< 2600	< 2600	-	-	48000	-	340000	410000	420000
Chloride	Total	ug/L	9000	1800	1800	19000	31000	7300	-	1100	2500	2500
Hardness	Total	ug/L	1700000	< 12000	510000	350000	530000	1400000	-	460000	1600000	1600000
Nitrate as N	Total	ug/L	< 360	220	120	1700	< 180 H	< 180	-	< 180	< 180	< 180
Phosphorus	Total	ug/L	< 17	160	36 J	< 17	-	-	120	< 17	< 17	44 J
Sulfate	Total	ug/L	1500000	< 350	660000	140000	340000	1200000	-	89000	1400000	1400000
Sulfide	Total	ug/L	< 580	< 580	< 580	-	-	< 580	-	< 580	< 580	< 580
Total Dissolved Solids	Total	ug/L	-	-	-	300000	810000	-	-	-	-	-
Field Parameters												
Conductivity, field measure	Total	ug/L	2.45	1.052	1.22	0.641	1.06	2.239	-	1.799	2.738	-
Dissolved Oxygen, field mea	Total	ug/L	400	4800	860	-	-	260	-	170	450	-
Oxidation Reduction Potenti	Total	ug/L	-17.2	461.9	544.7	56	61	42.6	-	138.9	23.7	-
pH, field measured	Total	ug/L	6.84	4.49	3.38	7.35	7.48	5.59	-	4.71	6.84	-
Temperature, field measure	Total	C	12.3	15.7	14	11.3	17.7	15.5	-	12.5	16.6	-
Total Dissolved Solids, field	Total	mg/L	-	-	-	4494	7808	-	-	-	-	-
Turbidity, field measured	Total	ntu	5.2	7.14	1.23	-	-	16	-	2.59	10.3	-

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
H3 = Sample was received and analyzed past holding time.
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-106 11/17/2021	MW-107-D 7/20/2021	MW-107-D 7/23/2021	MW-107-D 11/5/2021	MW-110 7/19/2021	MW-110 11/4/2021	MW-111 7/2/2021	MW-111 11/5/2021	MW-112-D 12/1/2021	MW-112-D 7/30/2021
Metals												
Aluminum	Total	ug/L	16000	7400	-	77	< 34	72 B	720	45 J	-	-
Aluminum	RPP	ug/L	-	-	-	-	-	-	-	-	< 34	< 34
Aluminum	Dissolved	ug/L	17000	-	< 34	< 34	< 34	< 34	< 34	< 34	-	-
Antimony	Total	ug/L	< 0.57	< 0.57	-	< 0.57	1.1 J	0.71 J	0.59 J	1.1 J	-	-
Antimony	RPP	ug/L	-	-	-	-	-	-	-	-	0.63 J	3.7
Antimony	Dissolved	ug/L	< 0.57	-	< 0.57	< 0.57	1.3 J	< 0.57	< 0.57	0.97 J	-	-
Arsenic	Total	ug/L	12	7.3	-	1.4 J	0.89 J	3.6 J	2.2 J	1.8 J	-	-
Arsenic	RPP	ug/L	-	-	-	-	-	-	-	-	1.4 J	2.2 J
Arsenic	Dissolved	ug/L	12	-	1.1 J	1.6 J	1.3 J	2.9 J	< 0.75	1.9 J	-	-
Barium	Total	ug/L	8.9	66	-	12	23	27	27	23	-	-
Barium	RPP	ug/L	-	-	-	-	-	-	-	-	32	68
Barium	Dissolved	ug/L	9.9	-	16	11	25	22	22	22	-	-
Beryllium	Total	ug/L	5	< 0.62	-	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	-	-
Beryllium	RPP	ug/L	-	-	-	-	-	-	-	-	< 0.62	< 0.62
Beryllium	Dissolved	ug/L	5.1	-	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	-	-
Cadmium	Total	ug/L	0.52 J	< 0.20	-	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	-	-
Cadmium	RPP	ug/L	-	-	-	-	-	-	-	-	< 0.20	< 0.20
Cadmium	Dissolved	ug/L	0.63 J	-	< 0.20	< 0.20	0.23 J	< 0.20	< 0.20	< 0.20	-	-
Calcium	Total	ug/L	270000	530000	-	500000	360000	310000	520000	530000	-	-
Calcium	RPP	ug/L	-	-	-	-	-	-	-	-	360000	240000
Calcium	Dissolved	ug/L	290000	-	480000	470000	350000	280000	610000	510000	-	-
Chromium, Total	Total	ug/L	3.9 J	24	-	3.9 J	< 2.5	< 2.5	26	< 2.5	-	-
Chromium, Total	RPP	ug/L	-	-	-	-	-	-	-	-	< 2.5	< 2.5
Chromium, Total	Dissolved	ug/L	3.9 J	-	< 2.5	< 2.5	< 2.5	< 2.5	4.8 J	< 2.5	-	-
Chromium, Hexavalent	Total	ug/L	< 7.0	< 35 HH3	-	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	-	-
Chromium, Hexavalent	RPP	ug/L	-	-	-	-	-	-	-	-	< 7.0	< 7.0 H
Cobalt	Total	ug/L	100	34	-	29	5.2	6.5	20	15	-	-
Cobalt	RPP	ug/L	-	-	-	-	-	-	-	-	7.6	0.31 J
Cobalt	Dissolved	ug/L	110	-	28	27	5.5	5.9	21	14	-	-
Copper	Total	ug/L	< 1.7	55	-	< 1.7	< 1.7	< 1.7	2.3	3.1	-	-
Copper	RPP	ug/L	-	-	-	-	-	-	-	-	< 1.7	< 1.7
Copper	Dissolved	ug/L	< 1.7	-	140	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	-	-
Iron	Total	ug/L	23000	39000	-	29000	1400	5400	15000	28000	-	-
Iron	RPP	ug/L	-	-	-	-	-	-	-	-	690	< 47
Iron	Dissolved	ug/L	24000	-	22000	28000	1500	4500	18000	28000	-	-
Lead	Total	ug/L	< 0.45	6.1	-	< 0.45	< 0.45	< 0.45	1	< 0.45	-	-
Lead	RPP	ug/L	-	-	-	-	-	-	-	-	< 0.45	< 0.45
Lead	Dissolved	ug/L	< 0.45	-	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	-	-
Magnesium	Total	ug/L	56000	100000	-	93000	52000	50000	170000	190000	-	-
Magnesium	RPP	ug/L	-	-	-	-	-	-	-	-	89000	62000
Magnesium	Dissolved	ug/L	58000	-	91000	88000	51000	45000	190000	180000	-	-
Manganese	Total	ug/L	5600	2000	-	1800	610	1000	1100	1100	-	-
Manganese	RPP	ug/L	-	-	-	-	-	-	-	-	1000	17
Manganese	Dissolved	ug/L	6000	-	1800	1700	600	890	1100	1100	-	-
Mercury	Total	ug/L	< 0.13	< 0.13	-	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	-	-
Mercury	RPP	ug/L	-	-	-	-	-	-	-	-	-	< 0.13
Mercury	Dissolved	ug/L	< 0.13	-	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	-	-
Nickel	Total	ug/L	230	68	-	62	12	9.5	65	40	-	-
Nickel	RPP	ug/L	-	-	-	-	-	-	-	-	14	< 1.5
Nickel	Dissolved	ug/L	240	-	55	59	13	8.7	63	36	-	-
Potassium	Total	ug/L	1400	7400	-	5300	5400	4700	6500	6400	-	-
Potassium	RPP	ug/L	-	-	-	-	-	-	-	-	6700	5400

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-106	MW-107-D	MW-107-D	MW-107-D	MW-110	MW-110	MW-111	MW-111	MW-112-D	MW-112-D
			11/17/2021	7/20/2021	7/23/2021	11/5/2021	7/19/2021	11/4/2021	7/2/2021	11/5/2021	12/1/2021	7/30/2021
Potassium	Dissolved	ug/L	1400	-	5200	5000	5400	4200	6700	6100	-	-
Selenium	Total	ug/L	< 0.89	< 0.89	-	< 0.89	3.1 J	< 0.89	< 0.89	< 0.89	-	-
Selenium	RPP	ug/L	-	-	-	-	-	-	-	-	< 0.89	2.9 J
Selenium	Dissolved	ug/L	< 0.89	-	< 0.89	< 0.89	3.7 J	< 0.89	< 0.89	< 0.89	-	-
Silver	Total	ug/L	< 0.053	< 0.053	-	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	-	-
Silver	RPP	ug/L	-	-	-	-	-	-	-	-	< 0.053	< 0.053
Silver	Dissolved	ug/L	< 0.053	-	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	-	-
Sodium	Total	ug/L	5000	34000	-	31000	110000	93000	22000	24000	-	-
Sodium	RPP	ug/L	-	-	-	-	-	-	-	-	110000	120000
Sodium	Dissolved	ug/L	5200	-	30000	29000	120000	78000	22000	24000	-	-
Thallium	Total	ug/L	0.37 J	< 0.20	-	< 0.20	0.26 J	< 0.20	0.30 J	0.28 J	-	-
Thallium	RPP	ug/L	-	-	-	-	-	-	-	-	< 0.20	< 0.20
Thallium	Dissolved	ug/L	0.39 J	-	< 0.20	< 0.20	1.1	< 0.20	0.21 J	0.55 J	-	-
Zinc	Total	ug/L	340	42	-	< 15	< 15	< 15	37	< 15	-	-
Zinc	RPP	ug/L	-	-	-	-	-	-	-	-	< 15	16 J
Zinc	Dissolved	ug/L	360	-	< 15	< 15	< 15	< 15	32	< 15	-	-
Geochemistry												
Alkalinity, Bicarbonate as Ca	Total	ug/L	< 2600	270000	-	240000	330000	350000	410000	390000	330000	160000
Alkalinity, Carbonate as Ca(	Total	ug/L	< 2600	< 2600	-	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	< 2600	270000	-	240000	330000	350000	410000	390000	330000	160000
Chloride	Total	ug/L	6500	9800	-	9700	2600	1300	2000	1700	7100	9000
Hardness	Total	ug/L	1000000	2000000	-	1800000	1900000	1100000	2000000	2200000	1300000	-
Nitrate as N	Total	ug/L	< 36	< 180	-	2400	< 180	< 180	< 360 H	< 360	< 360	< 180 H
Phosphorus	Total	ug/L	270	-	40 J	< 17	21 J	< 17	100	32 J	< 17	-
Sulfate	Total	ug/L	1200000	1700000	-	1700000	930000	900000	1800000	1900000	1300000	1100000
Sulfide	Total	ug/L	< 580	< 580	-	< 580	< 580	< 580	< 580	< 580	-	-
Total Dissolved Solids	Total	ug/L	-	-	-	-	-	-	-	-	2100000	1900000
Field Parameters												
Conductivity, field measured	Total	ug/L	2.379	3.235	-	2.618	2.121	1.893	3.315	3.03	2.426	1.9
Dissolved Oxygen, field mea	Total	ug/L	500	170	-	950	1810	1320	610	530	-	-
Oxidation Reduction Potenti	Total	ug/L	11.7	-109.7	-	-54	-49.1	-60.4	-79.3	-81.9	0	194
pH, field measured	Total	ug/L	6.65	6.77	-	6.69	7.01	7.02	6.39	6.54	7.23	7.86
Temperature, field measure	Total	C	14.4	21.2	-	14	19.4	12.9	16.8	12.6	10.4	20.2
Total Dissolved Solids, field	Total	mg/L	-	-	-	-	-	-	-	-	1810	1440
Turbidity, field measured	Total	ntu	3.22	14	-	4.03	4.03	19	37.5	7.41	-	-

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
H3 = Sample was received and analyzed past holding time.
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-112-S 7/20/2021	MW-112-S 11/17/2021	MW-113 7/1/2021	MW-113 11/18/2021	MW-114-D 11/22/2021	MW-114-D 7/1/2021	MW-114-S 7/1/2021	MW-114-S 11/5/2021	MW-115 7/21/2021	MW-115 11/22/2021
Metals												
Aluminum	Total	ug/L	< 34	< 34	51000	5000	10000	4600	270	45 J	220000	1300
Aluminum	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Aluminum	Dissolved	ug/L	110	< 34	300	1200	4100	210	39 J	< 34	6400	< 34
Antimony	Total	ug/L	< 0.57	< 0.57	1.6 J	1.1 J	0.99 J	0.94 J	< 0.57	< 0.57	9.1 J	0.68 J
Antimony	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Antimony	Dissolved	ug/L	< 0.57	< 0.57	1.1 J	0.85 J	0.83 J	0.92 J	< 0.57	< 0.57	0.59 J	< 0.57
Arsenic	Total	ug/L	< 0.75	< 0.75	17	1.7 J	4.5 J	1.4 J	5.4	4.2 J	180	0.87 J
Arsenic	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Arsenic	Dissolved	ug/L	< 0.75	< 0.75	0.77 J	< 0.75	2.7 J	< 0.75	4.8 J	3.9 J	4.3 J	< 0.75
Barium	Total	ug/L	120	< 2.2	530	91	120	63	17	13	2200	30
Barium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Barium	Dissolved	ug/L	120	< 2.2	38	45	67	40	15	11	86	18
Beryllium	Total	ug/L	< 0.62	< 0.62	3.6 ^+	< 0.62	0.95 J	< 0.62 ^+	< 0.62 ^+	< 0.62	16	< 0.62
Beryllium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Beryllium	Dissolved	ug/L	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62 ^+	< 0.62 ^+	< 0.62	< 0.62	< 0.62
Cadmium	Total	ug/L	< 0.20	< 0.20	0.33 J	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 2.0	< 0.20
Cadmium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Cadmium	Dissolved	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Calcium	Total	ug/L	130000	< 580	380000	300000	150000	230000	570000	540000	840000	530000
Calcium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Calcium	Dissolved	ug/L	140000	< 580	370000	270000	130000	230000	530000	450000	540000	520000
Chromium, Total	Total	ug/L	< 2.5	< 2.5	990	27	15	26	< 2.5	< 2.5	2000	3.7 J
Chromium, Total	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Chromium, Total	Dissolved	ug/L	< 2.5	< 2.5	9.7	5.3	6.1	< 2.5	< 2.5	< 2.5	30	< 2.5
Chromium, Hexavalent	Total	ug/L	< 7.0	< 7.0	< 7.0	< 7.0	R3	< 14	< 7.0	< 7.0	< 14	R3
Chromium, Hexavalent	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Cobalt	Total	ug/L	1.7	< 0.19	38	5.5	7.1	6.4	61	53	260	16
Cobalt	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Cobalt	Dissolved	ug/L	2.1	< 0.19	14	3.9	3.9	4.6	56	46	43	15
Copper	Total	ug/L	< 1.7	< 1.7	41	3	13	4.8	< 1.7	< 1.7	440	3.2
Copper	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Copper	Dissolved	ug/L	< 1.7	< 1.7	< 1.7	< 1.7	6	< 1.7	< 1.7	< 1.7	10	< 1.7
Iron	Total	ug/L	62 J	< 47	41000	2900	12000	3400	24000	24000	410000	3300
Iron	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Iron	Dissolved	ug/L	130	< 47	250	660	4900	200	22000	21000	33000	2200
Lead	Total	ug/L	< 0.45	< 0.45	61	4.5	8.1	2.5	< 0.45	< 0.45	280	1.6
Lead	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Lead	Dissolved	ug/L	< 0.45	< 0.45	0.48 J	1	3.3	< 0.45	< 0.45	< 0.45	8.1	< 0.45
Magnesium	Total	ug/L	22000	< 200	86000	72000	55000	81000	150000	160000	240000	190000
Magnesium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Magnesium	Dissolved	ug/L	21000	< 200	77000	67000	51000	80000	140000	130000	180000	190000
Manganese	Total	ug/L	290	< 6.2	2300	690	430	710	5700	5100	8700	820
Manganese	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Manganese	Dissolved	ug/L	430	< 6.2	1400	550	260	670	5100	4500	3800	780
Mercury	Total	ug/L	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 1.3	< 0.13
Mercury	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Mercury	Dissolved	ug/L	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
Nickel	Total	ug/L	2.5	< 1.5	490	22	19	26	86	82	1400	49
Nickel	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Nickel	Dissolved	ug/L	3.1	< 1.5	120	13	9.8	15	80	71	110	45
Potassium	Total	ug/L	2500	< 220	15000	11000	11000	12000	6200	5900	87000	8300
Potassium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-112-S 7/20/2021	MW-112-S 11/17/2021	MW-113 7/1/2021	MW-113 11/18/2021	MW-114-D 11/22/2021	MW-114-D 7/1/2021	MW-114-S 7/1/2021	MW-114-S 11/5/2021	MW-115 7/21/2021	MW-115 11/22/2021
Potassium	Dissolved	ug/L	2600	< 220	14000	11000	9400	11000	5800	5100	12000	7700
Selenium	Total	ug/L	< 0.89	< 0.89	8.1	< 0.89	1.5 J	1.3 J	< 0.89	< 0.89	< 8.9	< 0.89
Selenium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Selenium	Dissolved	ug/L	< 0.89	< 0.89	< 0.89	< 0.89	1.3 J	1.3 J	< 0.89	< 0.89	< 0.89	< 0.89
Silver	Total	ug/L	< 0.053	< 0.053	0.26 J	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.53	< 0.053
Silver	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Silver	Dissolved	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053
Sodium	Total	ug/L	7300	< 330	110000	170000 B	230000	190000	28000	27000	150000	70000
Sodium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Sodium	Dissolved	ug/L	8400	< 330	130000	190000 B	230000	180000	26000	22000	150000	70000
Thallium	Total	ug/L	< 0.20	< 0.20	1.8	< 0.20	0.77 J	< 0.20	< 0.20	< 0.20	3.4 J	0.22 J
Thallium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Thallium	Dissolved	ug/L	< 0.20	< 0.20	0.43 J	< 0.20	0.57 J	< 0.20	< 0.20	< 0.20	< 0.20	0.32 J
Zinc	Total	ug/L	< 15	< 15	120	< 15	33	20	21	< 15	1200	19 J
Zinc	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Zinc	Dissolved	ug/L	18 J	< 15	< 15	< 15	16 J	< 15	20	20	77	< 15
Geochemistry												
Alkalinity, Bicarbonate as Ca	Total	ug/L	360000	< 2600	340000	330000	280000	310000	280000	320000	430000	480000
Alkalinity, Carbonate as Ca(	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	360000	< 2600	340000	330000	280000	310000	280000	320000	430000	480000
Chloride	Total	ug/L	1400	< 280	19000	6900	35000	29000	4000	4400	9200	2700
Hardness	Total	ug/L	580000	< 2400	1300000	1100000	600000	910000	2000000	2300000	1500000	2300000
Nitrate as N	Total	ug/L	< 180	< 36	< 360H	< 360	1600	< 180	< 180	< 360	< 720	< 360
Phosphorus	Total	ug/L	< 17	< 17	2100	120	170	150	< 17	< 17	1200	430
Sulfate	Total	ug/L	88000	< 350	1200000	1200000	760000	950000	1800000	2000000	2000000	1900000
Sulfide	Total	ug/L	< 580	< 580	< 580	< 580	-	< 580	< 580	< 580	< 580	-
Total Dissolved Solids	Total	ug/L	-	-	-	-	-	-	-	-	-	-
Field Parameters												
Conductivity, field measured	Total	ug/L	0.921	0.807	2.529	2.412	-	2.301	3.142	2.974	3.752	-
Dissolved Oxygen, field mea	Total	ug/L	950	670	4490	4120	-	4420	130	170	750	-
Oxidation Reduction Potenti	Total	ug/L	26	90.7	48	62.1	-	124	-104.6	-30	-24.3	-
pH, field measured	Total	ug/L	7.09	6.9	6.84	6.84	-	7.18	6.56	6.59	6.56	-
Temperature, field measure	Total	C	20.6	14.7	19	12.7	-	18.3	12.6	13.6	17.1	-
Total Dissolved Solids, field	Total	mg/L	-	-	-	-	-	-	-	-	-	-
Turbidity, field measured	Total	ntu	7.78	4.23	1000	240	-	202	4.97	2.64	181	-

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
H3 = Sample was received and analyzed past holding time.
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-116-D 12/1/2021	MW-116-S 11/30/2021	MW-117-D 12/1/2021	MW-117-S 11/30/2021	KMW-02 6/28/2021	KMW-02 11/9/2021	RBA-04D 6/28/2021	RBA-04D 11/9/2021	RBH-01 6/29/2021	RBH-01 11/16/2021
Metals												
Aluminum	Total	ug/L	13000	330	14000	60	90	170	300	41 J	210	140
Aluminum	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Aluminum	Dissolved	ug/L	6700	78	4400	< 34	< 34	< 34	< 34	< 34	< 34	< 34
Antimony	Total	ug/L	2.7	< 0.57	2.1	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	0.84 J	< 0.57
Antimony	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Antimony	Dissolved	ug/L	3	< 0.57	2.4	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	0.75 J	< 0.57
Arsenic	Total	ug/L	4.0 J	3.1 J	3.1 J	< 0.75	< 0.75	0.85 J	< 0.75	< 0.75	3.1 J	5.1
Arsenic	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Arsenic	Dissolved	ug/L	3.0 J	2.7 J	1.5 J	< 0.75	< 0.75	< 0.75	< 0.75	0.89 J	2.4 J	4.7 J
Barium	Total	ug/L	150	25	240	12	400	390	7200	6300	26	26
Barium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Barium	Dissolved	ug/L	110	21	110	11	400	400	7000	6100	22	27
Beryllium	Total	ug/L	0.70 J	< 0.62	0.81 J	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62 ^+	< 0.62
Beryllium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Beryllium	Dissolved	ug/L	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62 ^+	< 0.62
Cadmium	Total	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Cadmium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Cadmium	Dissolved	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Calcium	Total	ug/L	17000	650000	24000	640000	30000	29000	96000	88000	220000	130000
Calcium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Calcium	Dissolved	ug/L	16000	670000	22000	640000	30000	30000	100000	86000	200000	150000
Chromium, Total	Total	ug/L	29	2.9 J	28	6.2	< 2.5	3.5 J	5.1	5.5	3.1 J	< 2.5
Chromium, Total	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Chromium, Total	Dissolved	ug/L	16	< 2.5	8.6	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Chromium, Hexavalent	Total	ug/L	< 35	< 7.0	< 14	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0 H	< 7.0
Chromium, Hexavalent	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Cobalt	Total	ug/L	9.4	16	6.6	4.2	< 0.19	< 0.19	0.74 J	< 0.19	0.80 J	0.58 J
Cobalt	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Cobalt	Dissolved	ug/L	5.3	17	2.2	4.1	< 0.19	< 0.19	0.23 J	< 0.19	0.65 J	0.46 J
Copper	Total	ug/L	22	< 1.7	14	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
Copper	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Copper	Dissolved	ug/L	13	< 1.7	5.2	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
Iron	Total	ug/L	21000	10000	11000	4200	680	530	1600	890	3100	2400
Iron	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Iron	Dissolved	ug/L	11000	9900	3600	4100	310	310	840	720	2200	2400
Lead	Total	ug/L	8.4	0.73 J	7.9	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45
Lead	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Lead	Dissolved	ug/L	4.8	0.51 J	2.6	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45
Magnesium	Total	ug/L	6500	140000	7200	91000	7300	7500	27000	24000	46000 F1	28000
Magnesium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Magnesium	Dissolved	ug/L	5100	140000	5700	91000	7400	7500	26000	23000	42000	31000
Manganese	Total	ug/L	320	3200	200	2800	42	45	64	44	500	300
Manganese	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Manganese	Dissolved	ug/L	200	3200	91	2900	35	42	44	41	440	330
Mercury	Total	ug/L	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
Mercury	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Mercury	Dissolved	ug/L	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
Nickel	Total	ug/L	25	47	23	12	< 1.5	< 1.5	2.4	2.5	3.3	< 1.5
Nickel	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Nickel	Dissolved	ug/L	15	48	8	10	< 1.5	< 1.5	< 1.5	< 1.5	2.4	< 1.5
Potassium	Total	ug/L	6400	4500	7600	3300	4400	4700	8700	8300	3100	2800
Potassium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	MW-116-D 12/1/2021	MW-116-S 11/30/2021	MW-117-D 12/1/2021	MW-117-S 11/30/2021	KMW-02 6/28/2021	KMW-02 11/9/2021	RBA-04D 6/28/2021	RBA-04D 11/9/2021	RBH-01 6/29/2021	RBH-01 11/16/2021
Potassium	Dissolved	ug/L	5300	4600	5300	3300	4400	4700	8600	8000	2700	3000
Selenium	Total	ug/L	1.8 J	< 0.89	2.3 J	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	3.8 J	< 0.89
Selenium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Selenium	Dissolved	ug/L	1.7 J	< 0.89	2.2 J	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	3.1 J	< 0.89
Silver	Total	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	0.11 J	< 0.053
Silver	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Silver	Dissolved	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	0.058 J	< 0.053
Sodium	Total	ug/L	260000	9600	170000	7300	69000	74000	1500000	1400000	84000 F1	130000
Sodium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Sodium	Dissolved	ug/L	280000	9700	190000	7400	70000	72000	1500000	1400000	77000	130000
Thallium	Total	ug/L	< 0.20	1.2	< 0.20	< 0.20	< 0.20	< 0.20	0.37 J	< 0.20	0.21 J	< 0.20
Thallium	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Thallium	Dissolved	ug/L	< 0.20	1.2	< 0.20	< 0.20	0.32 J	< 0.20	< 0.20	< 0.20	0.65 J	< 0.20
Zinc	Total	ug/L	58	31	35	< 15	< 15	< 15	< 15	< 15	< 15	< 15
Zinc	RPP	ug/L	-	-	-	-	-	-	-	-	-	-
Zinc	Dissolved	ug/L	35	25	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15
Geochemistry												
Alkalinity, Bicarbonate as Ca	Total	ug/L	510000	380000	330000	310000	210000	190000	340000	310000	410000	460000
Alkalinity, Carbonate as CaC	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	510000	380000	330000	310000	210000	190000	340000	310000	410000	460000
Chloride	Total	ug/L	13000	5100	1800	2100	34000	37000	2600000	2400000	2400	2400
Hardness	Total	ug/L	64000	2300000	84000	2000000	100000	120000	350000	320000	750000	550000
Nitrate as N	Total	ug/L	< 180	< 360	< 36	< 360	< 36	< 36	< 180	< 180	< 180	< 180
Phosphorus	Total	ug/L	2700	< 17	650	< 17	< 17	28 J	-	< 17	64 J	59 J
Sulfate	Total	ug/L	100000	1900000	120000	1800000	9700	8400	5400	3600 J	490000	320000
Sulfide	Total	ug/L	< 580	< 580	< 580	< 580	< 580	< 580 *-	< 580	< 580 *-	< 580	< 580
Total Dissolved Solids	Total	ug/L	-	-	-	-	-	-	-	-	-	-
Field Parameters												
Conductivity, field measured	Total	ug/L	1.206	3.228	0.897	2.952	0.509	0.4768	8.07	7.33	1.607	1.408
Dissolved Oxygen, field mea	Total	ug/L	4130	800	4990	180	50	220	-10	190	110	640
Oxidation Reduction Potenti	Total	ug/L	184.6	88	105.2	59.6	-216.5	-169.2	-144.2	-117.1	-93.9	-29
pH, field measured	Total	ug/L	8.41	6.64	8.07	7.12	8.04	8.12	7.42	7.5	6.89	6.99
Temperature, field measure	Total	C	11.2	12.3	13.3	12.5	15.1	15.1	16.3	14.6	13.7	11.1
Total Dissolved Solids, field	Total	mg/L	-	-	-	-	-	-	-	-	-	-
Turbidity, field measured	Total	ntu	1001	15	503	6.9	2.31	6.53	20.5	4.12	19.6	7.21

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous
Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
H3 = Sample was received and analyzed past holding time.
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	RBH-02 6/30/2021	RBH-03 6/29/2021	RBH-03 11/16/2021
Metals					
Aluminum	Total	ug/L	44000	170	170
Aluminum	RPP	ug/L	-	-	-
Aluminum	Dissolved	ug/L	15000	< 34	43 J
Antimony	Total	ug/L	1.2 J	< 0.57	< 0.57
Antimony	RPP	ug/L	-	-	-
Antimony	Dissolved	ug/L	1.1 J	< 0.57	< 0.57
Arsenic	Total	ug/L	15	160	160
Arsenic	RPP	ug/L	-	-	-
Arsenic	Dissolved	ug/L	4.9 J	160	160
Barium	Total	ug/L	1400	110	76
Barium	RPP	ug/L	-	-	-
Barium	Dissolved	ug/L	450	110	81
Beryllium	Total	ug/L	3.4 ^+	< 0.62	< 0.62
Beryllium	RPP	ug/L	-	-	-
Beryllium	Dissolved	ug/L	1	< 0.62	< 0.62
Cadmium	Total	ug/L	0.30 J	< 0.20	< 0.20
Cadmium	RPP	ug/L	-	-	-
Cadmium	Dissolved	ug/L	< 0.20	< 0.20	< 0.20
Calcium	Total	ug/L	27000	11000	5800
Calcium	RPP	ug/L	-	-	-
Calcium	Dissolved	ug/L	9300	11000	6300
Chromium, Total	Total	ug/L	160	< 2.5	< 2.5
Chromium, Total	RPP	ug/L	-	-	-
Chromium, Total	Dissolved	ug/L	49	< 2.5	4.1 J
Chromium, Hexavalent	Total	ug/L	< 70	< 7.0	< 7.0
Chromium, Hexavalent	RPP	ug/L	-	-	-
Cobalt	Total	ug/L	35	0.21 J	0.25 J
Cobalt	RPP	ug/L	-	-	-
Cobalt	Dissolved	ug/L	9.8	< 0.19	< 0.19
Copper	Total	ug/L	82	< 1.7	< 1.7
Copper	RPP	ug/L	-	-	-
Copper	Dissolved	ug/L	24	< 1.7	< 1.7
Iron	Total	ug/L	76000	270	380
Iron	RPP	ug/L	-	-	-
Iron	Dissolved	ug/L	22000	100	120
Lead	Total	ug/L	41	< 0.45	< 0.45
Lead	RPP	ug/L	-	-	-
Lead	Dissolved	ug/L	11	< 0.45	< 0.45
Magnesium	Total	ug/L	11000	3300	2000
Magnesium	RPP	ug/L	-	-	-
Magnesium	Dissolved	ug/L	3500	3300	2100
Manganese	Total	ug/L	1400	85	26
Manganese	RPP	ug/L	-	-	-
Manganese	Dissolved	ug/L	410	81	28
Mercury	Total	ug/L	0.14 J	< 0.13	< 0.13
Mercury	RPP	ug/L	-	-	-
Mercury	Dissolved	ug/L	< 0.13	< 0.13	< 0.13
Nickel	Total	ug/L	78	< 1.5	< 1.5
Nickel	RPP	ug/L	-	-	-
Nickel	Dissolved	ug/L	23	< 1.5	2.1
Potassium	Total	ug/L	12000	2400	2000
Potassium	RPP	ug/L	-	-	-

Table 3-12: Mine Area Investigation - Groundwater Analytical Results

Parameter	Fraction	Unit	RBH-02 6/30/2021	RBH-03 6/29/2021	RBH-03 11/16/2021
Potassium	Dissolved	ug/L	5300	2400	2100
Selenium	Total	ug/L	3.2 J	< 0.89	< 0.89
Selenium	RPP	ug/L	-	-	-
Selenium	Dissolved	ug/L	1.8 J	< 0.89	< 0.89
Silver	Total	ug/L	0.26 J	< 0.053	< 0.053
Silver	RPP	ug/L	-	-	-
Silver	Dissolved	ug/L	0.064 J	< 0.053	< 0.053
Sodium	Total	ug/L	220000	230000	260000
Sodium	RPP	ug/L	-	-	-
Sodium	Dissolved	ug/L	230000	230000	270000
Thallium	Total	ug/L	0.70 J	< 0.20	< 0.20
Thallium	RPP	ug/L	-	-	-
Thallium	Dissolved	ug/L	0.25 J	< 0.20	< 0.20
Zinc	Total	ug/L	150	< 15	< 15
Zinc	RPP	ug/L	-	-	-
Zinc	Dissolved	ug/L	48	< 15	< 15
Geochemistry					
Alkalinity, Bicarbonate as Ca	Total	ug/L	330000	330000	310000
Alkalinity, Carbonate as Ca	Total	ug/L	110000	11000	41000
Alkalinity, Total	Total	ug/L	440000	340000	350000
Chloride	Total	ug/L	54000	110000	150000
Hardness	Total	ug/L	110000	42000	32000
Nitrate as N	Total	ug/L	< 180	< 36	< 180
Phosphorus	Total	ug/L	650	200	190
Sulfate	Total	ug/L	49000	41000	33000
Sulfide	Total	ug/L	< 580	< 580	1700
Total Dissolved Solids	Total	ug/L	-	-	-
Field Parameters					
Conductivity, field measure	Total	ug/L	1.067	1.151	1.261
Dissolved Oxygen, field mea	Total	ug/L	60	-70	870
Oxidation Reduction Potenti	Total	ug/L	-140.1	-283.4	-160.9
pH, field measured	Total	ug/L	8.81	8.38	8.78
Temperature, field measure	Total	C	15.7	13.4	11.8
Total Dissolved Solids, field	Total	mg/L	-	-	-
Turbidity, field measured	Total	ntu	1000	5.68	5.75

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
H3 = Sample was received and analyzed past holding time.
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-026 7/15/2021	SSW-026 11/10/2021	SSW-03 7/14/2021	SSW-03 11/12/2021	SSW-041 7/15/2021	SSW-071 7/13/2021	SSW-071 (FD) 7/13/2021	SSW-071 11/11/2021	SSW-071 (FD) 11/11/2021
Metals											
Aluminum	Total	ug/L	-	-	950	92	-	100	180	160	2000
Aluminum	RPP	ug/L	6600	5600	-	-	130	-	-	-	-
Aluminum	Dissolved	ug/L	-	-	150	34 J	-	< 34	< 34	< 34	< 34
Antimony	Total	ug/L	-	-	< 0.57	< 0.57	-	< 0.57	< 0.57	< 0.57	< 0.57
Antimony	RPP	ug/L	< 0.57	< 0.57	-	-	< 0.57	-	-	-	-
Antimony	Dissolved	ug/L	-	-	< 0.57	< 0.57	-	< 0.57	< 0.57	< 0.57	< 0.57
Arsenic	Total	ug/L	-	-	0.77 J	< 0.75	-	< 0.75	< 0.75	< 0.75	1.7 J
Arsenic	RPP	ug/L	< 0.75	< 0.75	-	-	2.7 J	-	-	-	-
Arsenic	Dissolved	ug/L	-	-	< 0.75	< 0.75	-	< 0.75	< 0.75	0.92 J	< 0.75
Barium	Total	ug/L	-	-	35	28	-	43	45	41	72
Barium	RPP	ug/L	17	12	-	-	87	-	-	-	-
Barium	Dissolved	ug/L	-	-	29	30	-	44	43	42	41
Beryllium	Total	ug/L	-	-	< 0.62	< 0.62	-	< 0.62	< 0.62	< 0.62	< 0.62
Beryllium	RPP	ug/L	3	2.9	-	-	< 0.62	-	-	-	-
Beryllium	Dissolved	ug/L	-	-	< 0.62	< 0.62	-	< 0.62	< 0.62	< 0.62	< 0.62
Cadmium	Total	ug/L	-	-	< 0.20	< 0.20	-	< 0.20	< 0.20	< 0.20	< 0.20
Cadmium	RPP	ug/L	1.4	1.2	-	-	< 0.20	-	-	-	-
Cadmium	Dissolved	ug/L	-	-	< 0.20	< 0.20	-	< 0.20	< 0.20	< 0.20	< 0.20
Calcium	Total	ug/L	-	-	310000	390000	-	44000	47000	38000	42000
Calcium	RPP	ug/L	210000	210000	-	-	120000	-	-	-	-
Calcium	Dissolved	ug/L	-	-	320000	430000	-	46000	45000	41000	41000
Chromium, Total	Total	ug/L	-	-	< 2.5	< 2.5	-	47	51	31	110
Chromium, Total	RPP	ug/L	< 2.5	< 2.5	-	-	< 2.5	-	-	-	-
Chromium, Total	Dissolved	ug/L	-	-	< 2.5	< 2.5	-	48	46	28	28
Chromium, Hexavalent	Total	ug/L	-	-	< 7.0	< 7.0	-	45	44	33	28
Chromium, Hexavalent	RPP	ug/L	< 7.0	< 7.0	-	-	< 7.0	-	-	-	-
Cobalt	Total	ug/L	-	-	0.96 J	0.22 J	-	0.34 J	0.39 J	0.34 J	1.8
Cobalt	RPP	ug/L	430	110	-	-	1.4	-	-	-	-
Cobalt	Dissolved	ug/L	-	-	0.52 J	0.34 J	-	0.28 J	0.26 J	0.27 J	0.27 J
Copper	Total	ug/L	-	-	< 1.7	< 1.7	-	< 1.7	< 1.7	< 1.7	4
Copper	RPP	ug/L	1.7 J	2.4	-	-	< 1.7	-	-	-	-
Copper	Dissolved	ug/L	-	-	< 1.7	< 1.7	-	< 1.7	< 1.7	< 1.7	< 1.7
Iron	Total	ug/L	-	-	970	94 J	-	160	230	230	2800
Iron	RPP	ug/L	3800	18000	-	-	1900	-	-	-	-
Iron	Dissolved	ug/L	-	-	180	49 J	-	< 47	< 47	< 47	< 47
Lead	Total	ug/L	-	-	1	< 0.45	-	< 0.45	< 0.45	< 0.45	2.8
Lead	RPP	ug/L	1.2	0.61 J	-	-	< 0.45	-	-	-	-
Lead	Dissolved	ug/L	-	-	< 0.45	< 0.45	-	< 0.45	< 0.45	< 0.45	< 0.45
Magnesium	Total	ug/L	-	-	94000	120000	-	11000	11000	9200	10000
Magnesium	RPP	ug/L	65000	61000	-	-	21000	-	-	-	-
Magnesium	Dissolved	ug/L	-	-	100000	140000	-	11000	11000	10000	9900
Manganese	Total	ug/L	-	-	120	19	-	16	27	55	590
Manganese	RPP	ug/L	23000	14000	-	-	2100	-	-	-	-
Manganese	Dissolved	ug/L	-	-	24	6.6 J	-	< 6.2	< 6.2	< 6.2	< 6.2
Mercury	Total	ug/L	-	-	< 0.13	< 0.13	-			< 0.13	< 0.13
Mercury	RPP	ug/L	< 0.13	< 0.13 ^+	-	-	< 0.13	-	-	-	-
Nickel	Total	ug/L	-	-	2.9	< 1.5	-	< 1.5	< 1.5	< 1.5	4.2
Nickel	RPP	ug/L	260	190	-	-	< 1.5	-	-	-	-
Nickel	Dissolved	ug/L	-	-	1.7 J	2.3	-	< 1.5	< 1.5	< 1.5	< 1.5
Potassium	Total	ug/L	-	-	4900	4600	-	7100	7300	9200	9900

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-026 7/15/2021	SSW-026 11/10/2021	SSW-03 7/14/2021	SSW-03 11/12/2021	SSW-041 7/15/2021	SSW-071 7/13/2021	SSW-071 (FD) 7/13/2021	SSW-071 11/11/2021	SSW-071 (FD) 11/11/2021
Potassium	RPP	ug/L	2400	1800	-	-	2600	-	-	-	-
Potassium	Dissolved	ug/L	-	-	4900	5200	-	7600	7400	10000	10000
Selenium	Total	ug/L	-	-	< 0.89	< 0.89	-	< 0.89	< 0.89	< 0.89	0.93 J
Selenium	RPP	ug/L	< 0.89	< 0.89	-	-	< 0.89	-	-	-	-
Selenium	Dissolved	ug/L	-	-	< 0.89	< 0.89	-	< 0.89	< 0.89	< 0.89	< 0.89
Silver	Total	ug/L	-	-	< 0.053	< 0.053	-	< 0.053	< 0.053	< 0.053	< 0.053
Silver	RPP	ug/L	< 0.053	< 0.053	-	-	< 0.053	-	-	-	-
Silver	Dissolved	ug/L	-	-	< 0.053	< 0.053	-	< 0.053	< 0.053	< 0.053	< 0.053
Sodium	Total	ug/L	-	-	4000	4900	-	8100	8700	9000	9300
Sodium	RPP	ug/L	3300	2900	-	-	5000	-	-	-	-
Sodium	Dissolved	ug/L	-	-	4300	5200	-	8500	8600	9900	9800
Thallium	Total	ug/L	-	-	0.36 J	0.29 J	-	< 0.20	< 0.20	< 0.20	< 0.20
Thallium	RPP	ug/L	0.49 J	< 0.20	-	-	< 0.20	-	-	-	-
Thallium	Dissolved	ug/L	-	-	0.61 J	0.64 J	-	< 0.20	< 0.20	< 0.20	< 0.20
Zinc	Total	ug/L	-	-	< 15	< 15	-	< 15	< 15	< 15	18 J
Zinc	RPP	ug/L	250	180	-	-	< 15	-	-	-	-
Zinc	Dissolved	ug/L	-	-	< 15	< 15	-	< 15	< 15	< 15	< 15
Geochemistry											
Alkalinity, Bicarbonate as CaCO3	Total	ug/L	< 2600	-	210000	220000	320000	180000	180000	150000	150000
Alkalinity, Carbonate as CaCO3	Total	ug/L	< 2600	-	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	< 2600	-	210000	220000	320000	180000	180000	150000	150000
Chloride	Total	ug/L	1200	1100	1000	1800	1900	770 J	780 J	780 J	770 J
Hardness	Total	ug/L	780000	900000	1200000	1800000	390000	210000	230000	150000	150000
Hardness, Calcium Carbonate	Total	ug/L	510000	-	-	-	310000	-	-	-	-
Hardness, Magnesium Carbonate	Total	ug/L	270000	-	-	-	86000	-	-	-	-
Nitrate as N	Total	ug/L	< 36	420	< 180	190	< 180	230	220	220	220
Phosphorus	Total	ug/L	< 17	< 17	79 J	47 J	< 17	25 J	< 17	34 J	98 J
Sulfate	Total	ug/L	920000	920000	1100000	1600000 F1	130000	24000	24000	22000	22000
Sulfide	Total	ug/L	-	-	< 580	< 580	-	< 580	< 580	< 580	< 580
Total Dissolved Solids	Total	ug/L	-	1200000	-	-	-	-	-	-	-
Field Parameters											
Conductivity, field measured	Total	ug/L	1.483	-	1.872	1.5	0.7645	0.3715	-	-	-
Dissolved Oxygen, field measured	Total	ug/L	0	-	101100	-	-90	91800	-	-	-
Oxidation Reduction Potential, field measured	Total	ug/L	129	233	187	172	-62	3	-	156	-
pH, field measured	Total	ug/L	7.05	4.56	6.35	6.48	6.31	7.02	-	7.14	-
Temperature, field measured	Total	C	16.4	14.8	23.8	16	17.7	19.7	-	23.2	-
Total Dissolved Solids, field measured	Total	mg/L	-	-	-	-	-	-	-	-	-
Turbidity, field measured	Total	ntu	-	-	-	-	-	-	-	-	-

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
R = Data Rejected: Hexavalent chromium result exceeds total and/or dissolved chromium result for the same sample.
R2 = Data Rejected (Total and dissolved chromium non-detect).
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-111 7/15/2021	SSW-111 (FD) 7/15/2021	SSW-111 11/12/2021	SSW-12 7/14/2021	SSW-12 11/11/2021	SSW-121 7/14/2021	SSW-121 11/11/2021	SSW-131 7/14/2021	SSW-131 11/11/2021
Metals											
Aluminum	Total	ug/L	-	-	-	17000	17000	-	-	-	-
Aluminum	RPP	ug/L	8600	10000	14000	-	-	28000	20000	19000	27000
Aluminum	Dissolved	ug/L	-	-	-	16000 F1	17000	-	-	-	-
Antimony	Total	ug/L	-	-	-	< 0.57	< 0.57	-	-	-	-
Antimony	RPP	ug/L	< 0.57	< 0.57	< 0.57	-	-	< 0.57	< 0.57	< 0.57	< 0.57
Antimony	Dissolved	ug/L	-	-	-	< 0.57	< 0.57	-	-	-	-
Arsenic	Total	ug/L	-	-	-	< 0.75	< 0.75	-	-	-	-
Arsenic	RPP	ug/L	2.7 J	< 0.75	< 0.75	-	-	< 0.75	< 0.75	< 0.75	< 0.75
Arsenic	Dissolved	ug/L	-	-	-	< 0.75	< 0.75	-	-	-	-
Barium	Total	ug/L	-	-	-	13	10	-	-	-	-
Barium	RPP	ug/L	17	39	44	-	-	14	11	12	8.4
Barium	Dissolved	ug/L	-	-	-	12	11	-	-	-	-
Beryllium	Total	ug/L	-	-	-	9.1	8	-	-	-	-
Beryllium	RPP	ug/L	2.6	2.9	4.3	-	-	9.2	9.9	9.2	9.8
Beryllium	Dissolved	ug/L	-	-	-	9.3	7.9	-	-	-	-
Cadmium	Total	ug/L	-	-	-	2.1	2.2	-	-	-	-
Cadmium	RPP	ug/L	0.69 J	0.83 J	1.4	-	-	2.7	2.1	1.9	2.2
Cadmium	Dissolved	ug/L	-	-	-	2	2.1	-	-	-	-
Calcium	Total	ug/L	-	-	-	230000	220000	-	-	-	-
Calcium	RPP	ug/L	80000	87000	96000	-	-	190000	210000	200000	170000
Calcium	Dissolved	ug/L	-	-	-	220000	220000	-	-	-	-
Chromium, Total	Total	ug/L	-	-	-	2.9 J	< 2.5	-	-	-	-
Chromium, Total	RPP	ug/L	4.4 J	4.0 J	3.2 J	-	-	4.3 J	3.3 J	4.9 J	4.2 J
Chromium, Total	Dissolved	ug/L	-	-	-	3.0 J	< 2.5	-	-	-	-
Chromium, Hexavalent	Total	ug/L	-	-	-	< 7.0	R2	-	-	-	-
Chromium, Hexavalent	RPP	ug/L	< 7.0	< 7.0	< 7.0	-	-	< 7.0	< 7.0	< 7.0	< 7.0
Cobalt	Total	ug/L	-	-	-	66	49	-	-	-	-
Cobalt	RPP	ug/L	55	57	69	-	-	140	130	270	120
Cobalt	Dissolved	ug/L	-	-	-	63	50	-	-	-	-
Copper	Total	ug/L	-	-	-	5.7	4.3	-	-	-	-
Copper	RPP	ug/L	2	8.9	19	-	-	26	5.6	6	28
Copper	Dissolved	ug/L	-	-	-	5.9	5.1	-	-	-	-
Iron	Total	ug/L	-	-	-	230	110	-	-	-	-
Iron	RPP	ug/L	66000	54000	5200	-	-	4700	180	730	400
Iron	Dissolved	ug/L	-	-	-	170	75 J	-	-	-	-
Lead	Total	ug/L	-	-	-	< 0.45	< 0.45	-	-	-	-
Lead	RPP	ug/L	< 0.45	< 0.45	2	-	-	1.4	0.85 J	1.3	0.74 J
Lead	Dissolved	ug/L	-	-	-	< 0.45	< 0.45	-	-	-	-
Magnesium	Total	ug/L	-	-	-	73000	69000	-	-	-	-
Magnesium	RPP	ug/L	34000	34000	35000	-	-	47000	68000	67000	41000
Magnesium	Dissolved	ug/L	-	-	-	69000	69000	-	-	-	-
Manganese	Total	ug/L	-	-	-	8000	6400	-	-	-	-
Manganese	RPP	ug/L	3200	3400	3500	-	-	8100	8400	13000	7300
Manganese	Dissolved	ug/L	-	-	-	7600	6400	-	-	-	-
Mercury	Total	ug/L	-	-	-	< 0.13	< 0.13	-	-	-	-
Mercury	RPP	ug/L	< 0.13	< 0.13	< 0.13	-	-	< 0.13	< 0.13	< 0.13	< 0.13
Nickel	Total	ug/L	-	-	-	340	290	-	-	-	-
Nickel	RPP	ug/L	120	120	150	-	-	270	310	290	270
Nickel	Dissolved	ug/L	-	-	-	320	290	-	-	-	-
Potassium	Total	ug/L	-	-	-	2400	2300	-	-	-	-

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-111 7/15/2021	SSW-111 (FD) 7/15/2021	SSW-111 11/12/2021	SSW-12 7/14/2021	SSW-12 11/11/2021	SSW-121 7/14/2021	SSW-121 11/11/2021	SSW-131 7/14/2021	SSW-131 11/11/2021
Potassium	RPP	ug/L	5900	7100	4100	-	-	1800	2000	2200	1300
Potassium	Dissolved	ug/L	-	-	-	2200	2300	-	-	-	-
Selenium	Total	ug/L	-	-	-	< 0.89	< 0.89	-	-	-	-
Selenium	RPP	ug/L	< 0.89	< 0.89	< 0.89	-	-	< 0.89	< 0.89	< 0.89	1.3 J
Selenium	Dissolved	ug/L	-	-	-	0.91 J	< 0.89	-	-	-	-
Silver	Total	ug/L	-	-	-	< 0.053	< 0.053	-	-	-	-
Silver	RPP	ug/L	< 0.053	< 0.053	< 0.053	-	-	< 0.053	< 0.053	< 0.053	< 0.053
Silver	Dissolved	ug/L	-	-	-	< 0.053	< 0.053	-	-	-	-
Sodium	Total	ug/L	-	-	-	7300	6600	-	-	-	-
Sodium	RPP	ug/L	4700	5300	3400	-	-	5600	6500	6800	4900
Sodium	Dissolved	ug/L	-	-	-	6900	6700	-	-	-	-
Thallium	Total	ug/L	-	-	-	0.26 J	< 0.20	-	-	-	-
Thallium	RPP	ug/L	0.24 J	< 0.20	< 0.20	-	-	< 0.20	< 0.20	< 0.20	0.61 J
Thallium	Dissolved	ug/L	-	-	-	0.42 J	< 0.20	-	-	-	-
Zinc	Total	ug/L	-	-	-	390	350	-	-	-	-
Zinc	RPP	ug/L	160	250	340	-	-	480	380	360	450
Zinc	Dissolved	ug/L	-	-	-	370	350	-	-	-	-
Geochemistry											
Alkalinity, Bicarbonate as CaCO3	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Alkalinity, Carbonate as CaCO3	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Chloride	Total	ug/L	3200	2900	3000	4900	5300	4800	5200	5500	5000
Hardness	Total	ug/L	340000	360000	490000	880000	1000000	780000	1000000	870000	900000
Hardness, Calcium Carbonate	Total	ug/L	200000	220000	-	-	-	-	-	-	-
Hardness, Magnesium Carbonate	Total	ug/L	140000	140000	-	-	-	-	-	-	-
Nitrate as N	Total	ug/L	< 36	< 36	< 36	310	750	210 J	390	< 180	730
Phosphorus	Total	ug/L	21 J	< 17	< 17	44 J	78 J		< 17		< 17
Sulfate	Total	ug/L	560000	570000	560000	980000	1200000	980000	1000000	1100000	990000
Sulfide	Total	ug/L	-	-	-	< 580	< 580	-	-	-	-
Total Dissolved Solids	Total	ug/L	-	-	760000	-	-	-	1500000	-	1400000
Field Parameters											
Conductivity, field measured	Total	ug/L	1.008	-	-	1.534	-	1.61	-	1.567	-
Dissolved Oxygen, field measured	Total	ug/L	0	-	-	-	-	-	-	5300	-
Oxidation Reduction Potential, field measured	Total	ug/L	208	-	472	394	421	425	309	492	467
pH, field measured	Total	ug/L	5.19	-	4.39	3.83	4.38	3.71	5.35	3.29	4.26
Temperature, field measured	Total	C	17.3	-	14.9	26.6	11.7	19.8	14	17.5	11.8
Total Dissolved Solids, field measured	Total	mg/L	-	-	-	-	-	-	-	-	-
Turbidity, field measured	Total	ntu	-	-	-	-	-	-	-	-	-

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
R = Data Rejected: Hexavalent chromium result exceeds total and/or dissolved chromium result for the same sample.
R2 = Data Rejected (Total and dissolved chromium non-detect).
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-16 7/13/2021	SSW-16 11/10/2021	SSW-171 7/14/2021	SSW-171 11/12/2021	SSW-174 7/14/2021	SSW-174 11/12/2021	SSW-24 7/12/2021	SSW-24 11/10/2021	SSW-241 7/16/2021
Metals											
Aluminum	Total	ug/L	12000	28000	-	-	-	-	8000 F1	680	-
Aluminum	RPP	ug/L	-	-	490	49 J	130	< 34	-	-	23000
Aluminum	Dissolved	ug/L	8000	30000	-	-	-	-	110	120	-
Antimony	Total	ug/L	< 0.57	< 0.57	-	-	-	-	< 0.57	< 0.57	-
Antimony	RPP	ug/L	-	-	< 0.57	< 0.57	< 0.57	< 0.57	-	-	< 0.57
Antimony	Dissolved	ug/L	< 0.57	< 0.57	-	-	-	-	< 0.57	< 0.57	-
Arsenic	Total	ug/L	5.7	< 0.75	-	-	-	-	3.1 J	< 0.75	-
Arsenic	RPP	ug/L	-	-	3.7 J	1.7 J	< 0.75	< 0.75	-	-	< 0.75
Arsenic	Dissolved	ug/L	1.8 J	< 0.75	-	-	-	-	< 0.75	< 0.75	-
Barium	Total	ug/L	16	9.2	-	-	-	-	90	47	-
Barium	RPP	ug/L	-	-	55	34	13	11	-	-	14
Barium	Dissolved	ug/L	10	9.5	-	-	-	-	43	43	-
Beryllium	Total	ug/L	5	8.7	-	-	-	-	0.68 J	< 0.62	-
Beryllium	RPP	ug/L	-	-	< 0.62	< 0.62	< 0.62	< 0.62	-	-	6.9
Beryllium	Dissolved	ug/L	4.2	9.1	-	-	-	-	< 0.62	< 0.62	-
Cadmium	Total	ug/L	1.6	1.8	-	-	-	-	0.29 J	< 0.20	-
Cadmium	RPP	ug/L	-	-	< 0.20	< 0.20	< 0.20	< 0.20	-	-	3.6
Cadmium	Dissolved	ug/L	< 0.20	1.8	-	-	-	-	< 0.20	< 0.20	-
Calcium	Total	ug/L	140000	210000	-	-	-	-	310000	300000	-
Calcium	RPP	ug/L	-	-	510000	510000	340000	460000	-	-	260000
Calcium	Dissolved	ug/L	130000	230000	-	-	-	-	310000	320000	-
Chromium, Total	Total	ug/L	6.5	3.8 J	-	-	-	-	100	9.8	-
Chromium, Total	RPP	ug/L	-	-	< 2.5	< 2.5	< 2.5	< 2.5	-	-	< 2.5
Chromium, Total	Dissolved	ug/L	< 2.5	4.0 J	-	-	-	-	< 2.5	2.6 J	-
Chromium, Hexavalent	Total	ug/L	R3	< 7.0	-	-	-	-	< 7.0	< 7.0	-
Chromium, Hexavalent	RPP	ug/L	-	-	< 7.0	< 7.0	< 7.0	< 7.0	-	-	< 7.0
Cobalt	Total	ug/L	53	95	-	-	-	-	7.7	0.53 J	-
Cobalt	RPP	ug/L	-	-	5.3	5.4	0.64 J	< 0.19	-	-	560
Cobalt	Dissolved	ug/L	49	100	-	-	-	-	0.52 J	< 0.19	-
Copper	Total	ug/L	43	9.7	-	-	-	-	12	< 1.7	-
Copper	RPP	ug/L	-	-	< 1.7	< 1.7	< 1.7	< 1.7	-	-	5
Copper	Dissolved	ug/L	2	12	-	-	-	-	< 1.7	< 1.7	-
Iron	Total	ug/L	21000	2500	-	-	-	-	12000 F1	890	-
Iron	RPP	ug/L	-	-	5700	6200	160	< 47	-	-	40000
Iron	Dissolved	ug/L	17000	2600	-	-	-	-	160	130	-
Lead	Total	ug/L	0.94 J	< 0.45	-	-	-	-	9.2	0.73 J	-
Lead	RPP	ug/L	-	-	< 0.45	< 0.45	< 0.45	< 0.45	-	-	3.7
Lead	Dissolved	ug/L	< 0.45	< 0.45	-	-	-	-	0.53 J	< 0.45	-
Magnesium	Total	ug/L	46000	74000	-	-	-	-	97000	100000	-
Magnesium	RPP	ug/L	-	-	170000	160000	96000	130000	-	-	120000
Magnesium	Dissolved	ug/L	41000	78000	-	-	-	-	100000	100000	-
Manganese	Total	ug/L	3100	5400	-	-	-	-	420	37	-
Manganese	RPP	ug/L	-	-	17000	13000	4600	25	-	-	31000
Manganese	Dissolved	ug/L	3100	5600	-	-	-	-	190	6.8 J	-
Mercury	Total	ug/L		< 0.13 ^+	-	-	-	-	< 0.13	< 0.13 ^+	-
Mercury	RPP	ug/L	-	-	< 0.13	< 0.13	< 0.13	< 0.13	-	-	< 0.13
Nickel	Total	ug/L	170	240	-	-	-	-	28	2.7	-
Nickel	RPP	ug/L	-	-	6.4	7.3	2.2	< 1.5	-	-	740
Nickel	Dissolved	ug/L	150	250	-	-	-	-	1.7 J	< 1.5	-
Potassium	Total	ug/L	3500	2400	-	-	-	-	4900	3300	-

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-16 7/13/2021	SSW-16 11/10/2021	SSW-171 7/14/2021	SSW-171 11/12/2021	SSW-174 7/14/2021	SSW-174 11/12/2021	SSW-24 7/12/2021	SSW-24 11/10/2021	SSW-241 7/16/2021
Potassium	RPP	ug/L	-	-	4200	3700	4300	3800	-	-	3400
Potassium	Dissolved	ug/L	3000	2400	-	-	-	-	3300	3400	-
Selenium	Total	ug/L	1.9 J	< 0.89	-	-	-	-	1.7 JB^+	< 0.89	-
Selenium	RPP	ug/L	-	-	< 0.89	< 0.89	< 0.89	< 0.89	-	-	< 0.89
Selenium	Dissolved	ug/L	< 0.89	< 0.89	-	-	-	-	1.5 JB^+	< 0.89	-
Silver	Total	ug/L	< 0.053	< 0.053	-	-	-	-	0.071 J	< 0.053	-
Silver	RPP	ug/L	-	-	< 0.053	< 0.053	< 0.053	< 0.053	-	-	< 0.053
Silver	Dissolved	ug/L	< 0.053	< 0.053	-	-	-	-	< 0.053	< 0.053	-
Sodium	Total	ug/L	2200	2800	-	-	-	-	46000	43000	-
Sodium	RPP	ug/L	-	-	5500	5300	4300	5300	-	-	5000
Sodium	Dissolved	ug/L	1900	2900	-	-	-	-	49000	45000	-
Thallium	Total	ug/L	< 0.20	0.24 J	-	-	-	-	0.41 J	< 0.20	-
Thallium	RPP	ug/L	-	-	< 0.20	< 0.20	< 0.20	< 0.20	-	-	0.34 J
Thallium	Dissolved	ug/L	< 0.20	0.23 J	-	-	-	-	0.40 J	< 0.20	-
Zinc	Total	ug/L	250	310	-	-	-	-	55	< 15	-
Zinc	RPP	ug/L	-	-	< 15	< 15	< 15	< 15	-	-	1000
Zinc	Dissolved	ug/L	230	330	-	-	-	-	< 15	< 15	-
Geochemistry											
Alkalinity, Bicarbonate as CaCO3	Total	ug/L	< 2600	< 2600	350000	310000	-	240000	220000	200000	< 2600
Alkalinity, Carbonate as CaCO3	Total	ug/L	< 2600	< 2600	< 2600	< 2600	-	< 2600	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	< 2600	< 2600	350000	310000	-	240000	220000	200000	< 2600
Chloride	Total	ug/L	750 J	940 J	1600	1600	1100	1700	22000	19000	1500
Hardness	Total	ug/L	610000	880000	2000000	2300000	1300000	1800000	1200000	1200000	1300000
Hardness, Calcium Carbonate	Total	ug/L	-	560000	1300000	-	860000	-	-	790000	640000
Hardness, Magnesium Carbonate	Total	ug/L	-	320000	690000	-	400000	-	-	430000	480000
Nitrate as N	Total	ug/L	< 180	< 36	< 180	3300	< 180	99 J	56 J	< 180	< 36
Phosphorus	Total	ug/L	950	59 J			< 17	< 17	290	27 J	
Sulfate	Total	ug/L	700000	1100000	1900000	1800000	1200000	1500000	1100000	1100000	1600000
Sulfide	Total	ug/L	2900	< 580 *-	-	-	-	-	< 580	< 580 *-	-
Total Dissolved Solids	Total	ug/L	-	-	-	2600000	-	2200000	-	-	2100000
Field Parameters											
Conductivity, field measured	Total	ug/L	1.216	1.73	2.994	-	2.073	-	2.1	-	2.142
Dissolved Oxygen, field measured	Total	ug/L	11000		400	-	0	-	87500	-	-70
Oxidation Reduction Potential, field measured	Total	ug/L	-148	463	-62	-20	-3	178	272	162	299
pH, field measured	Total	ug/L	5.55	3.66	6.93	6.61	7.49	6.78	5.42	5.5	4.48
Temperature, field measured	Total	C	21.3	11.3	17.3	9.9		9.8	20.7	20.7	16.6
Total Dissolved Solids, field measured	Total	mg/L	-	1263	-	-	-	-	-	-	-
Turbidity, field measured	Total	ntu	-	-	-	-	-	-	-	-	-

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
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R = Data Rejected: Hexavalent chromium result exceeds total and/or dissolved chromium result for the same sample.
R2 = Data Rejected (Total and dissolved chromium non-detect).
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-241 11/10/2021	SSW-242 7/15/2021	SSW-242 11/10/2021	SSW-245 7/15/2021	SSW-245 11/11/2021	SSW-246 7/15/2021	SSW-246 11/11/2021	SSW-247 7/15/2021	SSW-247 11/11/2021
Metals											
Aluminum	Total	ug/L	-	-	-	-	-	-	-	-	-
Aluminum	RPP	ug/L	21000	26000	25000	15000	11000	150	< 34	9200	390
Aluminum	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Antimony	Total	ug/L	-	-	-	-	-	-	-	-	-
Antimony	RPP	ug/L	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57
Antimony	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Arsenic	Total	ug/L	-	-	-	-	-	-	-	-	-
Arsenic	RPP	ug/L	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	1.3 J
Arsenic	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Barium	Total	ug/L	-	-	-	-	-	-	-	-	-
Barium	RPP	ug/L	17	9.2	7.2	49	15	16	14	25	16
Barium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Beryllium	Total	ug/L	-	-	-	-	-	-	-	-	-
Beryllium	RPP	ug/L	6.8	8	8.4	3.7	3.4	< 0.62	< 0.62	2.9	< 0.62
Beryllium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Cadmium	Total	ug/L	-	-	-	-	-	-	-	-	-
Cadmium	RPP	ug/L	3.7	1.9	1.3	0.85 J	0.62 J	< 0.20	< 0.20	1.1	< 0.20
Cadmium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Calcium	Total	ug/L	-	-	-	-	-	-	-	-	-
Calcium	RPP	ug/L	250000	210000	210000	270000	210000	370000	330000	330000	370000
Calcium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Chromium, Total	Total	ug/L	-	-	-	-	-	-	-	-	-
Chromium, Total	RPP	ug/L	4.7 J	< 2.5	3.0 J	3.4 J	3.1 J	4.5 J	< 2.5	3.5 J	< 2.5
Chromium, Total	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Chromium, Hexavalent	Total	ug/L	-	-	-	-	-	-	-	-	-
Chromium, Hexavalent	RPP	ug/L	< 7.0	< 7.0	< 7.0	< 7.0 H	< 7.0	< 7.0 H	< 7.0	< 7.0	< 7.0
Cobalt	Total	ug/L	-	-	-	-	-	-	-	-	-
Cobalt	RPP	ug/L	510	130	130	63	59	0.47 J	< 0.19	93	65
Cobalt	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Copper	Total	ug/L	-	-	-	-	-	-	-	-	-
Copper	RPP	ug/L	13	14	8.6	23	12	< 1.7	< 1.7	8.2	< 1.7
Copper	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Iron	Total	ug/L	-	-	-	-	-	-	-	-	-
Iron	RPP	ug/L	23000	33000	26000	4200	5400	190	< 47	5300	80000
Iron	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Lead	Total	ug/L	-	-	-	-	-	-	-	-	-
Lead	RPP	ug/L	4.5	< 0.45	0.50 J	< 0.45	< 0.45	< 0.45	< 0.45	1.7	< 0.45
Lead	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Magnesium	Total	ug/L	-	-	-	-	-	-	-	-	-
Magnesium	RPP	ug/L	100000	98000	96000	110000	78000	140000	110000	140000	150000
Magnesium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Manganese	Total	ug/L	-	-	-	-	-	-	-	-	-
Manganese	RPP	ug/L	29000	8800	9000	5600	4800	7.8 J	< 6.2	5200	6400
Manganese	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Mercury	Total	ug/L	-	-	-	-	-	-	-	-	-
Mercury	RPP	ug/L	< 0.13 ^+	< 0.13	< 0.13 ^+	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
Nickel	Total	ug/L	-	-	-	-	-	-	-	-	-
Nickel	RPP	ug/L	680	300	300	130	120	< 1.5	< 1.5	120	71
Nickel	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Potassium	Total	ug/L	-	-	-	-	-	-	-	-	-

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-241 11/10/2021	SSW-242 7/15/2021	SSW-242 11/10/2021	SSW-245 7/15/2021	SSW-245 11/11/2021	SSW-246 7/15/2021	SSW-246 11/11/2021	SSW-247 7/15/2021	SSW-247 11/11/2021
Potassium	RPP	ug/L	3300	2300	2100	5000	4400	3500	2900	3500	6500
Potassium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Selenium	Total	ug/L	-	-	-	-	-	-	-	-	-
Selenium	RPP	ug/L	1.3 J	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89
Selenium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Silver	Total	ug/L	-	-	-	-	-	-	-	-	-
Silver	RPP	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053
Silver	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Sodium	Total	ug/L	-	-	-	-	-	-	-	-	-
Sodium	RPP	ug/L	4900	7900	8100	11000	10000	86000	66000	10000	10000
Sodium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Thallium	Total	ug/L	-	-	-	-	-	-	-	-	-
Thallium	RPP	ug/L	1.2	< 0.20	0.27 J	< 0.20	0.23 J	< 0.20	< 0.20	< 0.20	0.23 J
Thallium	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Zinc	Total	ug/L	-	-	-	-	-	-	-	-	-
Zinc	RPP	ug/L	980	570	560	230	210	< 15	< 15	240	29
Zinc	Dissolved	ug/L	-	-	-	-	-	-	-	-	-
Geochemistry											
Alkalinity, Bicarbonate as CaCO3	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	370000	360000	-	17000
Alkalinity, Carbonate as CaCO3	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	-	< 2600
Alkalinity, Total	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	370000	360000	-	17000
Chloride	Total	ug/L	1300	4500	4300	3100	3100	12000	9500	2700	3400
Hardness	Total	ug/L	1100000	920000	1000000	1300000	1000000	1600000	1600000	1600000	1800000
Hardness, Calcium Carbonate	Total	ug/L	-	510000	-	680000	-	930000	-	830000	-
Hardness, Magnesium Carbonate	Total	ug/L	-	410000	-	470000	-	570000	-	560000	-
Nitrate as N	Total	ug/L	< 180	< 36	< 180	< 36	< 36	< 360	120	< 36	< 360
Phosphorus	Total	ug/L		< 17	< 17	46 J	< 17			77 J	< 17
Sulfate	Total	ug/L	1400000	1300000	1300000	1400000	1000000	1400000	1500000	1600000	1900000
Sulfide	Total	ug/L	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	Total	ug/L	2000000	-	1700000	1900000	1400000	2400000	2300000	2300000	2800000
Field Parameters											
Conductivity, field measured	Total	ug/L	-	1.858	-	2.073	-	2.467	-	2.28	-
Dissolved Oxygen, field measured	Total	ug/L	-	0	-	2430	-	2360	-	0	-
Oxidation Reduction Potential, field measured	Total	ug/L	342	297	342	410	437	77	44	363	375
pH, field measured	Total	ug/L	5.68	4.83	3.82	3.08	3.78	6.02	6.06	3.32	4.98
Temperature, field measured	Total	C	15.2	15.7	13.9	17.6	18.4	16.9	25.4	17.8	22.6
Total Dissolved Solids, field measured	Total	mg/L	-	-	-	-	-	-	-	-	-
Turbidity, field measured	Total	ntu	-	-	-	-	-	-	-	-	-

Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
R = Data Rejected: Hexavalent chromium result exceeds total and/or dissolved chromium result for the same sample.
R2 = Data Rejected (Total and dissolved chromium non-detect).
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-25 7/12/2021	SSW-25 11/10/2021	SSW-281 7/12/2021	SSW-30 7/12/2021	SSW-30 11/2/2021
Metals							
Aluminum	Total	ug/L	2800	4000	100	200	62
Aluminum	RPP	ug/L	-	-	-	-	-
Aluminum	Dissolved	ug/L	68	55	100	36 J	< 34
Antimony	Total	ug/L	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57
Antimony	RPP	ug/L	-	-	-	-	-
Antimony	Dissolved	ug/L	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57
Arsenic	Total	ug/L	2.0 J	2.0 J	< 0.75	1.1 J	1.6 J
Arsenic	RPP	ug/L	-	-	-	-	-
Arsenic	Dissolved	ug/L	< 0.75	< 0.75	< 0.75	1.2 J	1.2 J
Barium	Total	ug/L	62	71	21	3.6 J	3.6 J
Barium	RPP	ug/L	-	-	-	-	-
Barium	Dissolved	ug/L	42	41	21	< 2.2	2.7 J
Beryllium	Total	ug/L	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62
Beryllium	RPP	ug/L	-	-	-	-	-
Beryllium	Dissolved	ug/L	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62
Cadmium	Total	ug/L	0.32 J	0.21 J	< 0.20	< 0.20	< 0.20
Cadmium	RPP	ug/L	-	-	-	-	-
Cadmium	Dissolved	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Calcium	Total	ug/L	270000	290000	85000	28000	35000
Calcium	RPP	ug/L	-	-	-	-	-
Calcium	Dissolved	ug/L	280000	280000	85000	29000	30000
Chromium, Total	Total	ug/L	50	120	710	4.5 J	9.2
Chromium, Total	RPP	ug/L	-	-	-	-	-
Chromium, Total	Dissolved	ug/L	15	42	710	< 2.5	6.9
Chromium, Hexavalent	Total	ug/L	7.1 JH	29	660	< 7.0 H	< 7.0
Chromium, Hexavalent	RPP	ug/L	-	-	-	-	-
Cobalt	Total	ug/L	3.9	5.3	< 0.19	0.26 J	< 0.19
Cobalt	RPP	ug/L	-	-	-	-	-
Cobalt	Dissolved	ug/L	0.36 J	0.33 J	< 0.19	0.21 J	< 0.19
Copper	Total	ug/L	6.1	6.9	< 1.7	< 1.7	< 1.7
Copper	RPP	ug/L	-	-	-	-	-
Copper	Dissolved	ug/L	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
Iron	Total	ug/L	4900	6500	< 47	350	300
Iron	RPP	ug/L	-	-	-	-	-
Iron	Dissolved	ug/L	110	120	< 47	68 J	< 47
Lead	Total	ug/L	4	4.2	< 0.45	< 0.45	< 0.45
Lead	RPP	ug/L	-	-	-	-	-
Lead	Dissolved	ug/L	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45
Magnesium	Total	ug/L	89000	96000	< 200	2900	2900
Magnesium	RPP	ug/L	-	-	-	-	-
Magnesium	Dissolved	ug/L	95000	94000	< 200	3000	2500
Manganese	Total	ug/L	600	1800	< 6.2	22	< 6.2
Manganese	RPP	ug/L	-	-	-	-	-
Manganese	Dissolved	ug/L	210	880	< 6.2	< 6.2	< 6.2
Mercury	Total	ug/L		< 0.13 ^+	< 0.13		< 0.13
Mercury	RPP	ug/L	-	-	-	-	-
Nickel	Total	ug/L	15	19	< 1.5	< 1.5	< 1.5
Nickel	RPP	ug/L	-	-	-	-	-
Nickel	Dissolved	ug/L	1.5 J	1.5 J	< 1.5	< 1.5	< 1.5
Potassium	Total	ug/L	3500	4000	1100	3500	4300 B

Table 3-13: Mine Area Investigation - Site Surface Water Analytical Results

Parameter	Fraction	Unit	SSW-25 7/12/2021	SSW-25 11/10/2021	SSW-281 7/12/2021	SSW-30 7/12/2021	SSW-30 11/2/2021
Potassium	RPP	ug/L	-	-	-	-	-
Potassium	Dissolved	ug/L	3200	2900	1100	3600	3700 B
Selenium	Total	ug/L	< 0.89	< 0.89	1.5 JB^+	< 0.89	< 0.89
Selenium	RPP	ug/L	-	-	-	-	-
Selenium	Dissolved	ug/L	< 0.89	< 0.89	1.2 JB^+	< 0.89	< 0.89
Silver	Total	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053
Silver	RPP	ug/L	-	-	-	-	-
Silver	Dissolved	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053
Sodium	Total	ug/L	43000	37000	1000	430 J	410 JB
Sodium	RPP	ug/L	-	-	-	-	-
Sodium	Dissolved	ug/L	46000	36000	1000	390 J	1200 B
Thallium	Total	ug/L	0.62 J	< 0.20	0.40 J	< 0.20	< 0.20
Thallium	RPP	ug/L	-	-	-	-	-
Thallium	Dissolved	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Zinc	Total	ug/L	120	130	< 15	< 15	< 15
Zinc	RPP	ug/L	-	-	-	-	-
Zinc	Dissolved	ug/L	34	31	< 15	< 15	22
Geochemistry							
Alkalinity, Bicarbonate as CaCO3	Total	ug/L	200000	240000	< 2600	15000	98000
Alkalinity, Carbonate as CaCO3	Total	ug/L	< 2600	< 2600	16000	94000	< 2600
Alkalinity, Total	Total	ug/L	200000	240000	190000	110000	98000
Chloride	Total	ug/L	20000	16000	500 J	280 J	300 J
Hardness	Total	ug/L	1200000	1100000	210000	120000	110000
Hardness, Calcium Carbonate	Total	ug/L	-	710000	-	-	-
Hardness, Magnesium Carbonate	Total	ug/L	-	390000	-	-	-
Nitrate as N	Total	ug/L	< 180	< 180	1300	< 36	41 J
Phosphorus	Total	ug/L	44 J	23 J	25 J	83 J	< 17
Sulfate	Total	ug/L	1100000	1100000	4700	3100	4400
Sulfide	Total	ug/L	< 580	< 580 *-	34000	< 580	< 580
Total Dissolved Solids	Total	ug/L					
Field Parameters							
Conductivity, field measured	Total	ug/L	1.879	1.898	0.8873	0.2725	-
Dissolved Oxygen, field measured	Total	ug/L	94600	-	98100	14780	-
Oxidation Reduction Potential, field measured	Total	ug/L	64	208	33	40	-
pH, field measured	Total	ug/L	8.58	6.67	11.74	10.82	-
Temperature, field measured	Total	C	29.8	15.1	23.8	30.1	-
Total Dissolved Solids, field measured	Total	mg/L	-	1390	-	-	-
Turbidity, field measured	Total	ntu	-	-	-	-	-

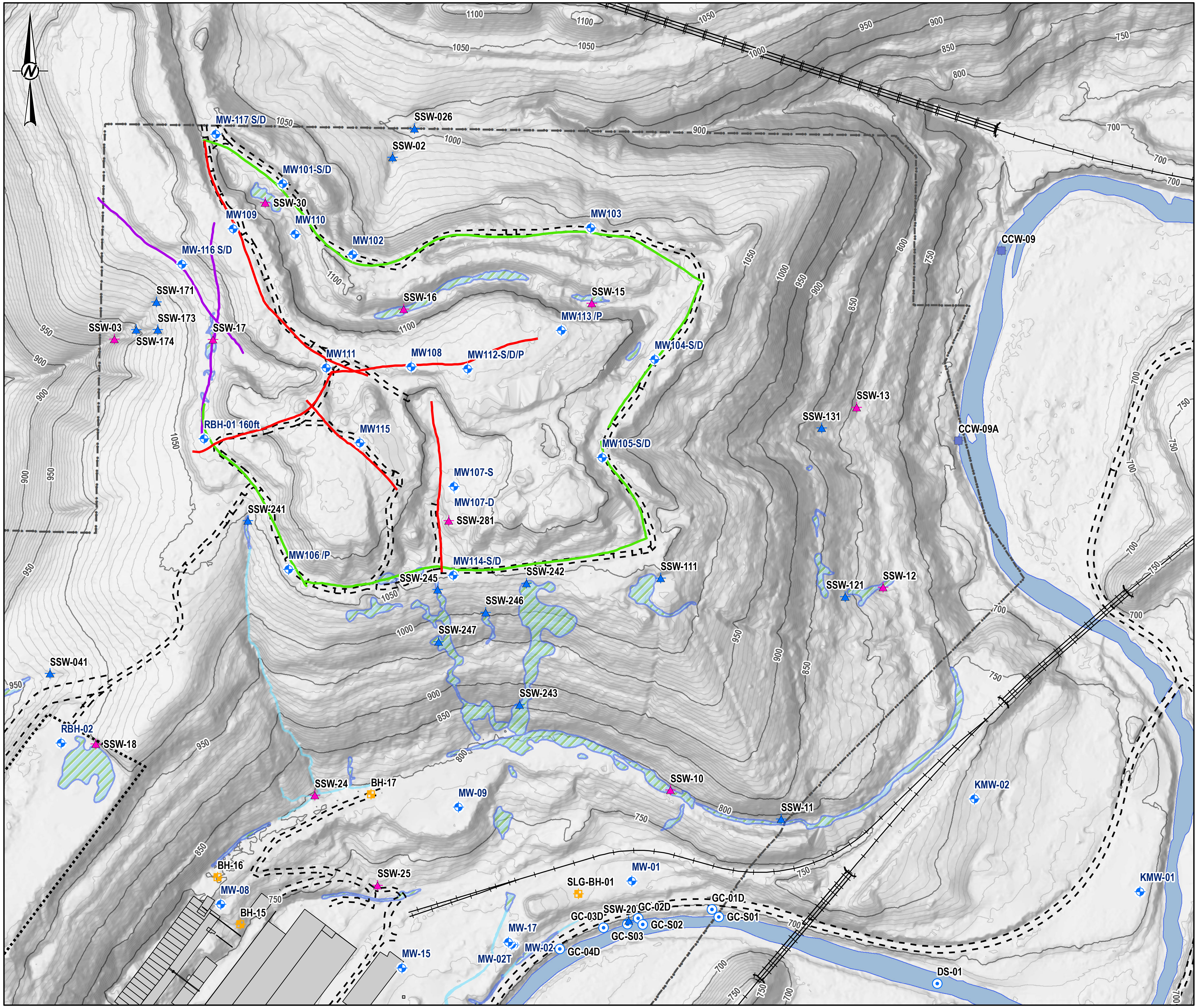
Notes:
FD = Field duplicate
-- = Not analyzed
RPP = Composite sample collected using a Rigid Porous Polyethylene passive/diffusive sample device.
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
F1 = Recovery in matrix spike samples (MS/MSD) is outside the quality control limits.
^+ = Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
H = Sample was prepped or analyzed beyond the specified holding time.
R = Data Rejected: Hexavalent chromium result exceeds total and/or dissolved chromium result for the same sample.
R2 = Data Rejected (Total and dissolved chromium non-detect).
R3 = Data Rejected (Hexavalent Chromium non-detect, however dilution resulted in detection limits exceeding more than 2x the detected total and/or dissolved chromium detections).

Table 3-14: Mine Area Investigation - Cross Creek Water Analytical Results

Parameter	Fraction	Unit	US-01 7/30/2021	US-01 (FD) 7/30/2021	US-01 11/18/2021	US-01 (FD) 11/18/2021	CCW-09A 7/30/2021	CCW-09A 11/18/2021	CCW-10 7/30/2021	CCW-10 11/18/2021
Metals										
Aluminum	Dissolved	ug/L	250	240	< 34 U	< 34 U	57	< 34 U	< 34 U	62
Antimony	Dissolved	ug/L	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57
Arsenic	Dissolved	ug/L	0.85 J	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75
Barium	Dissolved	ug/L	38	38	37	38	37	36	37	35
Beryllium	Dissolved	ug/L	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62
Cadmium	Dissolved	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Calcium	Dissolved	ug/L	79000	78000	87000	91000	120000	130000	120000	120000
Chromium, Total	Dissolved	ug/L	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Chromium, Hexavalent	Total	ug/L	< 7.0 H	< 7.0 H	-	-	< 7.0 H	-	< 7.0 H	-
Cobalt	Dissolved	ug/L	0.37 J	0.32 J	< 0.19 U	< 0.19 U	0.23 J	< 0.19 U	0.22 J	< 0.19 U
Copper	Dissolved	ug/L	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
Iron	Dissolved	ug/L	300	280	100	86 J	57 J	66 J	< 47	120
Lead	Dissolved	ug/L	0.49 J	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45
Magnesium	Dissolved	ug/L	20000	19000	24000	24000	46000	51000	46000	48000
Manganese	Dissolved	ug/L	46	44	16	16	27	14	20	13
Mercury	Dissolved	ug/L	-	-	< 0.13	< 0.13	-	< 0.13	-	< 0.13
Nickel	Dissolved	ug/L	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Potassium	Dissolved	ug/L	4100	3800	2900	3000	4300	3700	4300	3300
Selenium	Dissolved	ug/L	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89	< 0.89
Silver	Dissolved	ug/L	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053	< 0.053
Sodium	Dissolved	ug/L	27000	26000	24000 B	25000 B	27000	23000 B	27000	23000 B
Thallium	Dissolved	ug/L	2.1	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Zinc	Dissolved	ug/L	15 J	< 15	< 15	< 15	< 15	< 15	< 15	< 15
Geochemistry										
Alkalinity, Bicarbonate as CaCO3	Total	ug/L	120000	120000	140000	140000	140000	160000	140000	160000
Alkalinity, Carbonate as CaCO3	Total	ug/L	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600	< 2600
Alkalinity, Total	Total	ug/L	120000	120000	140000	140000	140000	160000	140000	160000
Chloride	Total	ug/L	45000	45000	34000	34000	38000	29000	37000	31000
Hardness	Total	ug/L	260000	290000	440000	1700000	510000	530000	530000	540000
Nitrate as N	Total	ug/L	1400 H	1400	340	340	1200	220	1200	150
Phosphorus	Total	ug/L	300	350	47 J	21 J	220	< 17	210	< 17
Sulfate	Total	ug/L	150000	150000	210000	210000	330000	420000	330000	400000
Sulfide	Total	ug/L	< 580	< 580	< 580	< 580	< 580	< 580	< 580	< 580
Field Parameters										
Conductivity, field measured	Total	ug/L	0.6413	-	0.355	-	0.9108	0.06	0.9155	0.15
Oxidation Reduction Potential, field	Total	ug/L	154	-	209	-	165	214	145	217
pH, field measured	Total	ug/L	7.83	-	7.42	-	7.4	7.3	7.46	7.33
Temperature, field measured	Total	C	22.7	-	12	-	21.8	14.5	21.6	15.7
Total Dissolved Solids, field measu	Total	mg/L	455700	-	23500	-	660100	10	664100	60

Notes:
FD = Field duplicate
-- = Not analyzed
Lab Qualifiers:
< = Not detected; value is the detection limit.
J = Estimated value: generally where value is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL).
B = Analyte was detected in the associated Method Blank.
H = Sample was prepped or analyzed beyond the specified holding time.

Figures



LEGEND

- ▲ SEEP LOCATION
- ▲ SURFACE WATER LOCATION
- ■ CROSS CREEK WATER LOCATION
- ◎ CROSS CREEK DISCHARGE LOCATION
- ◈ MONITORING WELL
- ◈ SLAG LOCATION
- — PHASE 1 GEOPHYSICS TRANSECT
- — PHASE 2 GEOPHYSICS TRANSECT
- — PHASE 3 GEOPHYSICS TRANSECT
- ┼ RAILROAD
- ▭ PROPERTY BOUNDARY
- ▭ GARY SMITH PROPERTY BOUNDARY
- ▭ ROADS
- ▭ EXISTING FACILITY
- ▭ TRIBUTARY
- ▨ WETLAND
- ▭ CROSS CREEK
- — ELEVATION CONTOUR (5-FT INTERVAL)
- — ELEVATION CONTOUR (50-FT INTERVAL)

0 250 500

1 " = 313 FT FEET

NOTE(S)

1. GOLDER ASSOCIATES USA INC. (MONITORING WELL, SEEP LOCATION, SURFACE WATER LOCATION, CROSS CREEK WATER LOCATION, SLAG LOCATION, GEOPHYSICS TRANSECT LOCATIONS, CROSS CREEK DISCHARGE LOCATION, FACILITY/PROPERTY BOUNDARY, RAILROAD, ROADS, PROPERTY BOUNDARY, TRIBUTARY, WETLAND, TOPOGRAPHIC CONTOUR)
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET
3. MONITORING WELL LABELS: -S/D = NESTED WELLS PAIR, -S = SHALLOW SCREEN, -D = DEEP SCREEN, /P = VIBRATING WIRE PIEZOMETER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

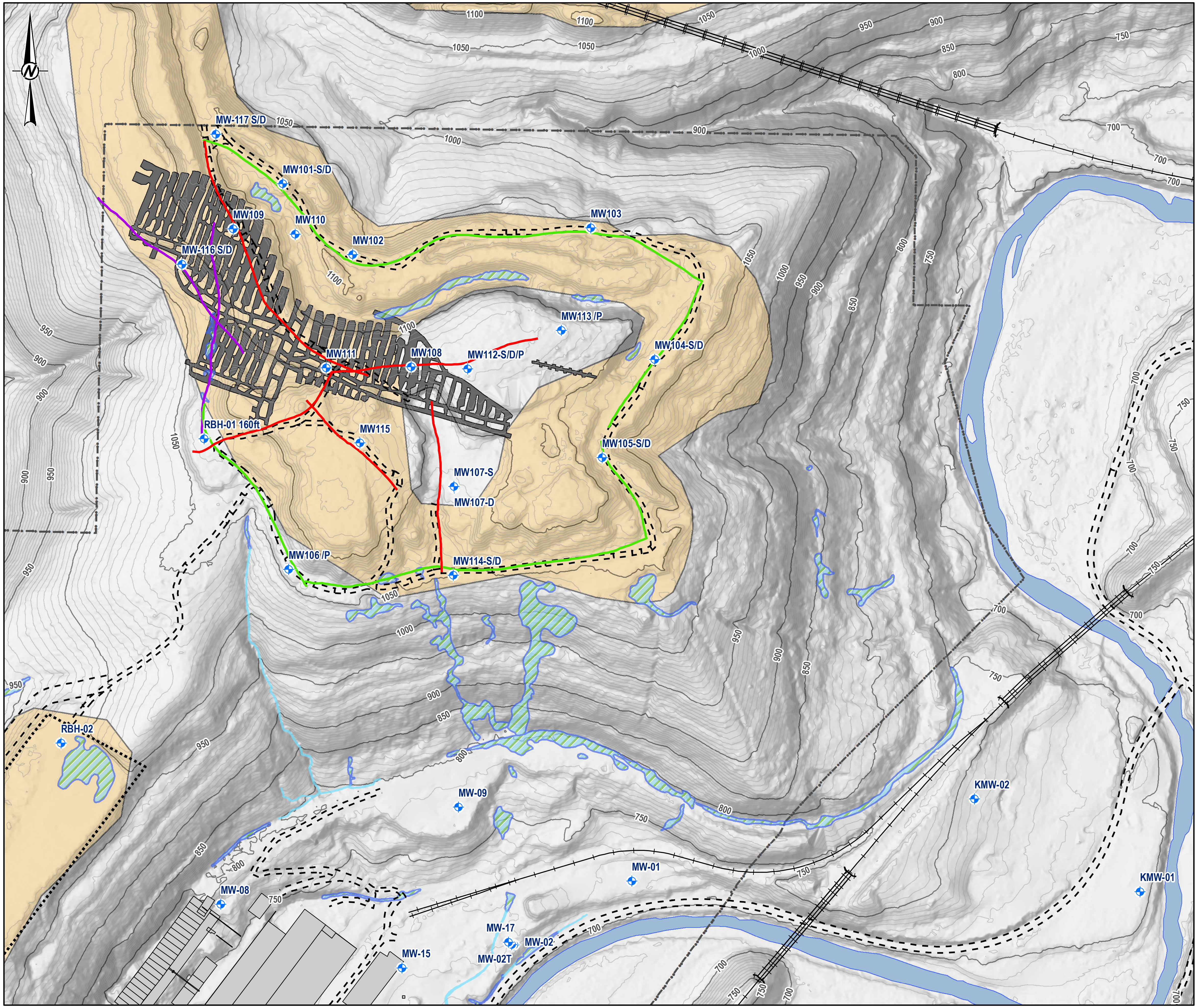
TITLE
GEOPHYSICS TRANSECTS, MONITORING WELLS, AND SAMPLE LOCATIONS

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-26
DESIGNED	BI
PREPARED	BM
REVIEWED	BI
APPROVED	

PROJECT NO.	REV.	FIGURE
12393309X10	A	1.1



LEGEND

- ⌖ MONITORING WELL
- PHASE 1 GEOPHYSICS TRANSECT
- PHASE 2 GEOPHYSICS TRANSECT
- PHASE 3 GEOPHYSICS TRANSECT
- RAILROAD
- PROPERTY BOUNDARY
- GARY SMITH PROPERTY BOUNDARY
- ROADS
- POSSIBLE EXTENT OF SURFACE MINING
- EXISTING FACILITY
- TRIBUTARY
- ▨ WETLAND
- CROSS CREEK
- ELEVATION CONTOUR (5-FT INTERVAL)
- ELEVATION CONTOUR (50-FT INTERVAL)

0 250 500

1 " = 313 FT FEET

NOTE(S)

1. GOLDER ASSOCIATES USA INC. (MONITORING WELL, GEOPHYSICS TRANSECT LOCATIONS, FACILITY/PROPERTY BOUNDARY, RAILROAD, ROADS, PROPERTY BOUNDARY, TRIBUTARY, WETLAND, TOPOGRAPHIC CONTOUR)
2. OHIO DEPARTMENT OF NATURAL RESOURCES (POSSIBLE EXTENT OF SURFACE MINING, URL: HTTPS://GIS2.OHIODNR.GOV/MAPVIEWER/?CONFIG=OHIOMINES)
3. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET
4. MONITORING WELL LABELS: -S=SHALLOW SCREEN, -D=DEEP SCREEN, -P=PIEZOMETER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

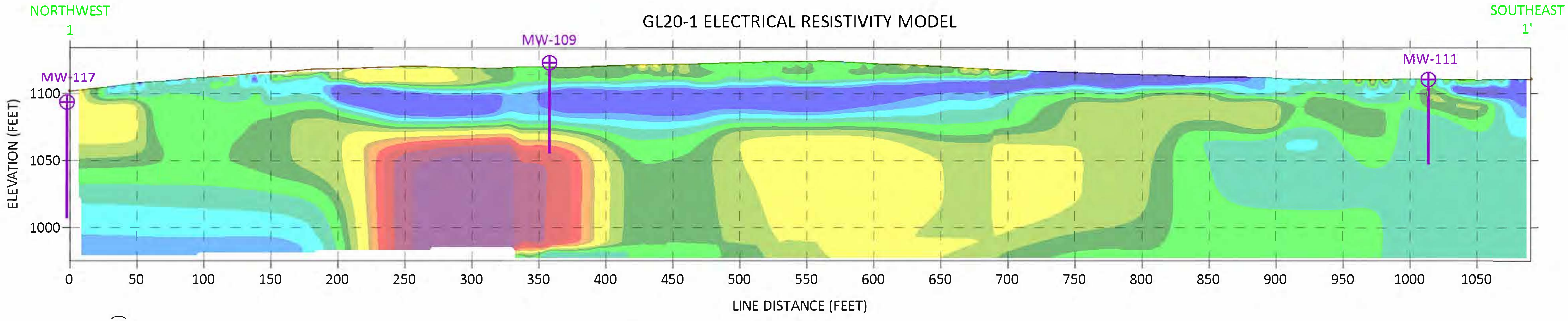
TITLE
HISTORICAL MINING ACTIVITIES

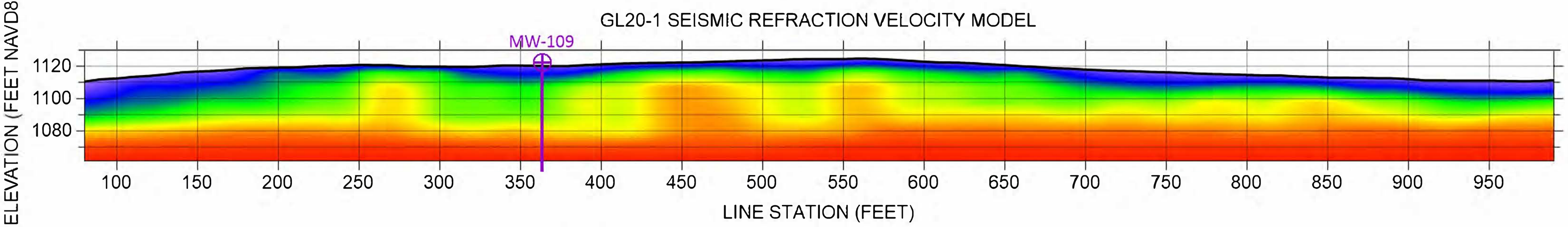
CONSULTANT
GOLDER
MEMBER OF WSP

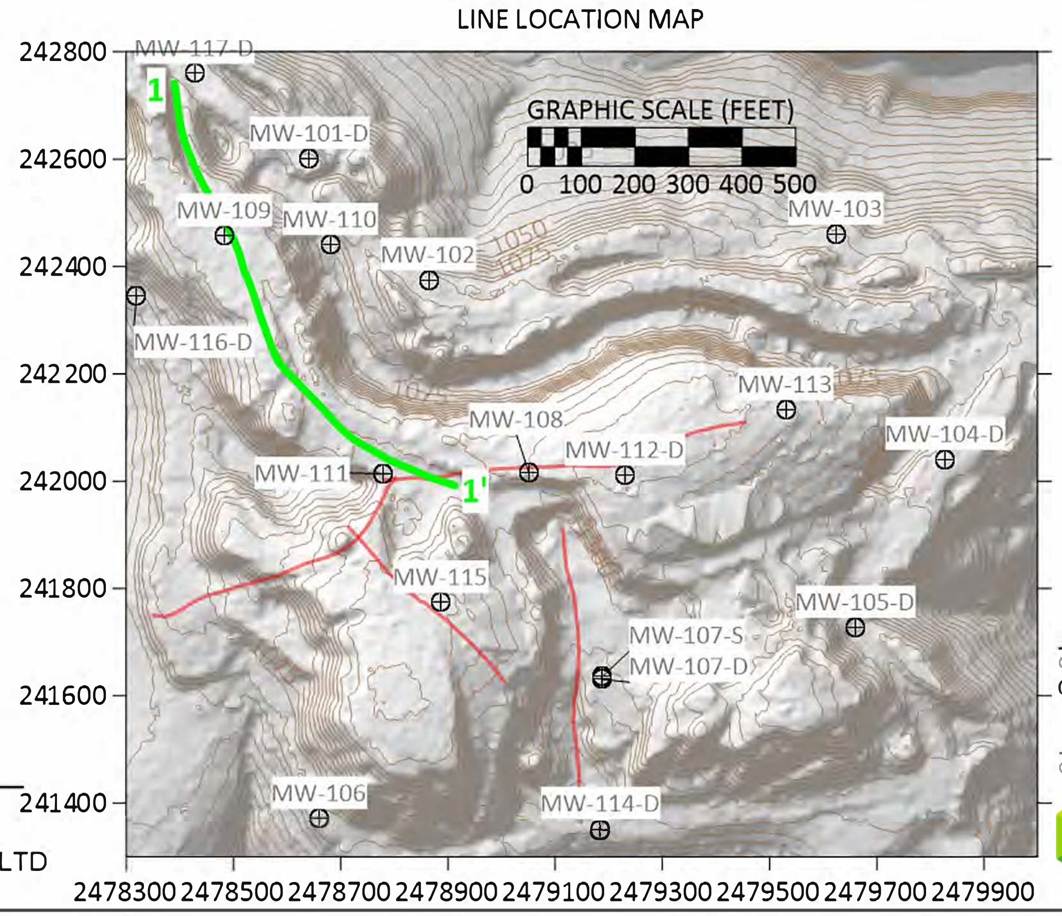
YYYY-MM-DD	2022-05-26
DESIGNED	BI
PREPARED	BM
REVIEWED	BI
APPROVED	

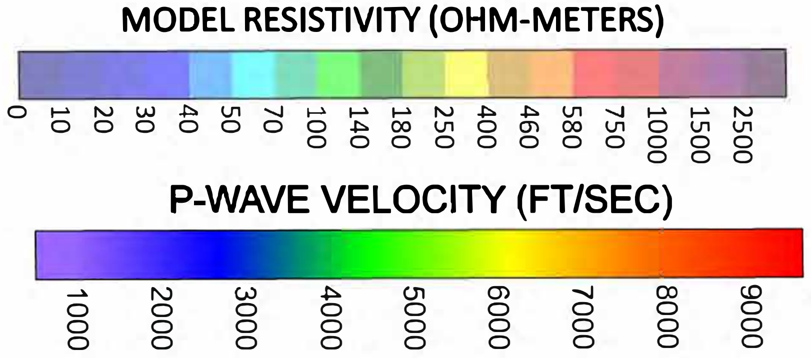
PROJECT NO. 12393309X10
REV. A
FIGURE 2.1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0







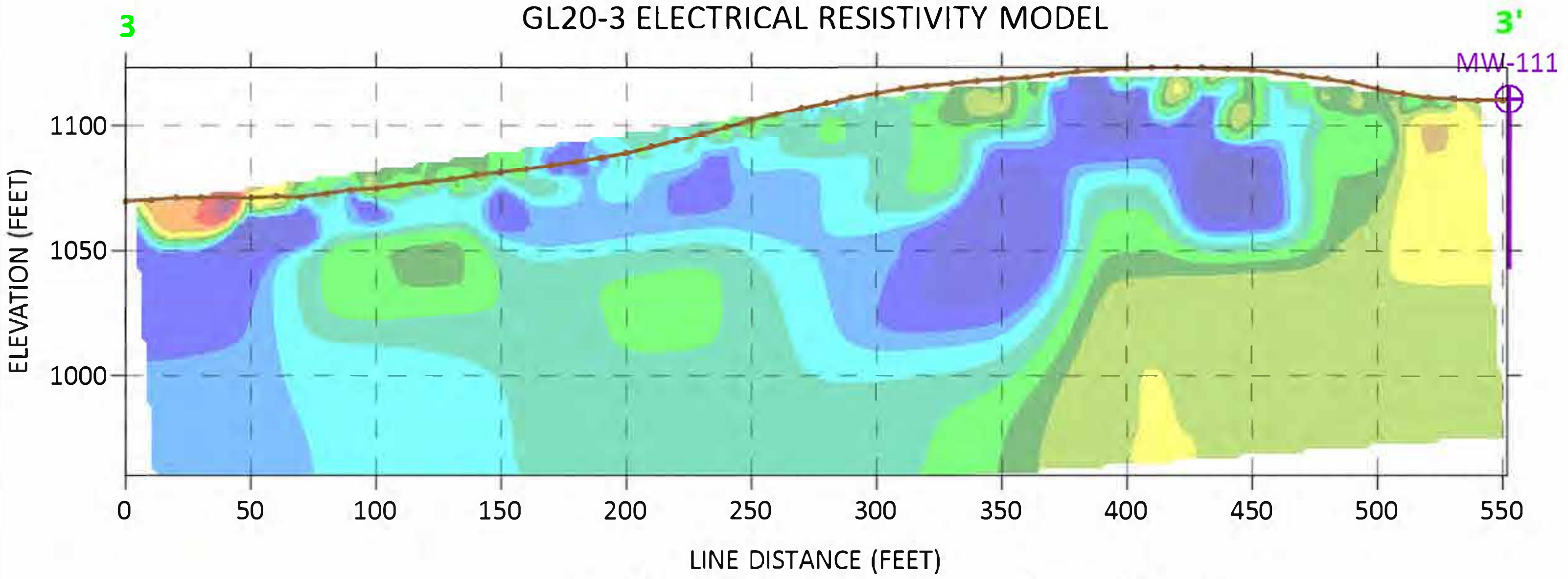


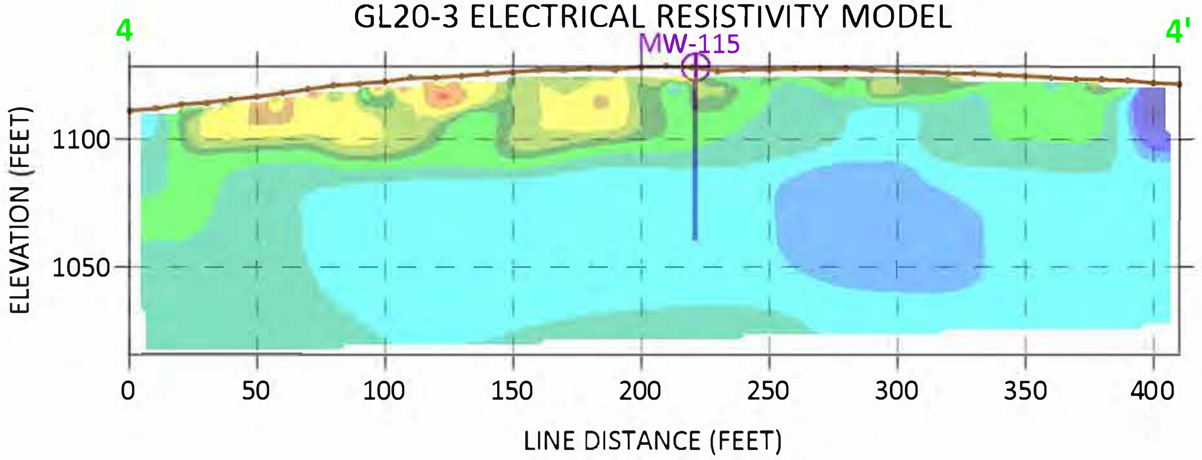
NOTES

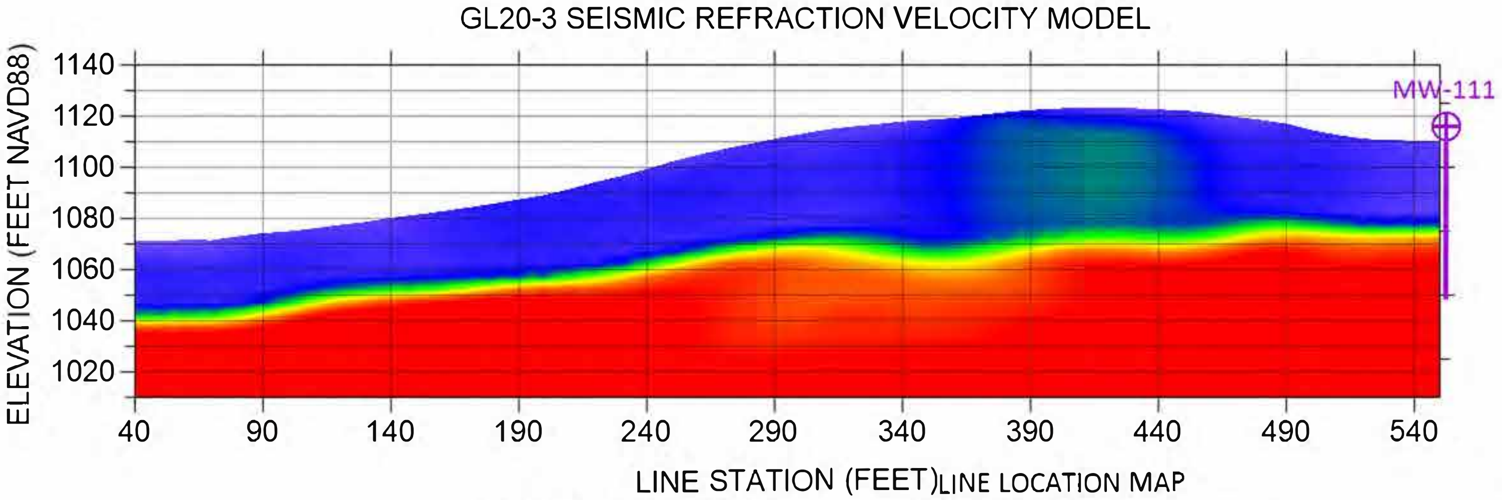
1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

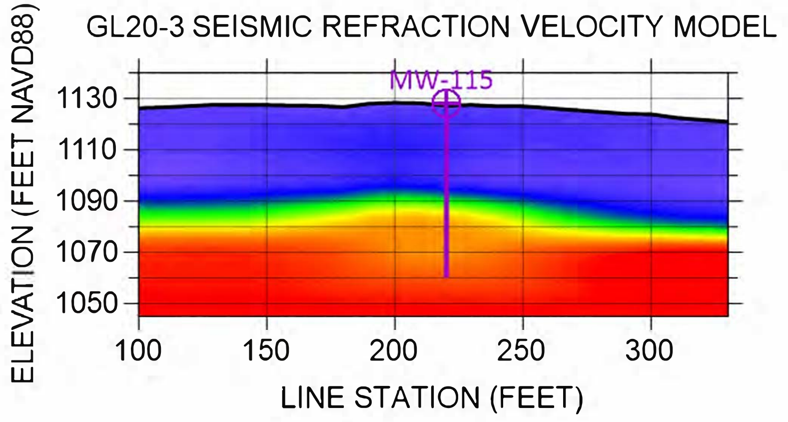
CLIENT	CYPRUS AMAX MINERALS COMPANY
PROJECT	FORMER SATRALLOY SITE FORMER MINE AREA INVESTIGATION
CONSULTANT	GOLDER MEMBER OF WSP
YYYY-MM-DD	2022-05-20
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD
TITLE	LINE GL20-1 PROFILES ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS PHASE 1 GEOPHYSICAL INVESTIGATION
PROJECT No	12393309x10
Rev	A
Figure	3.1

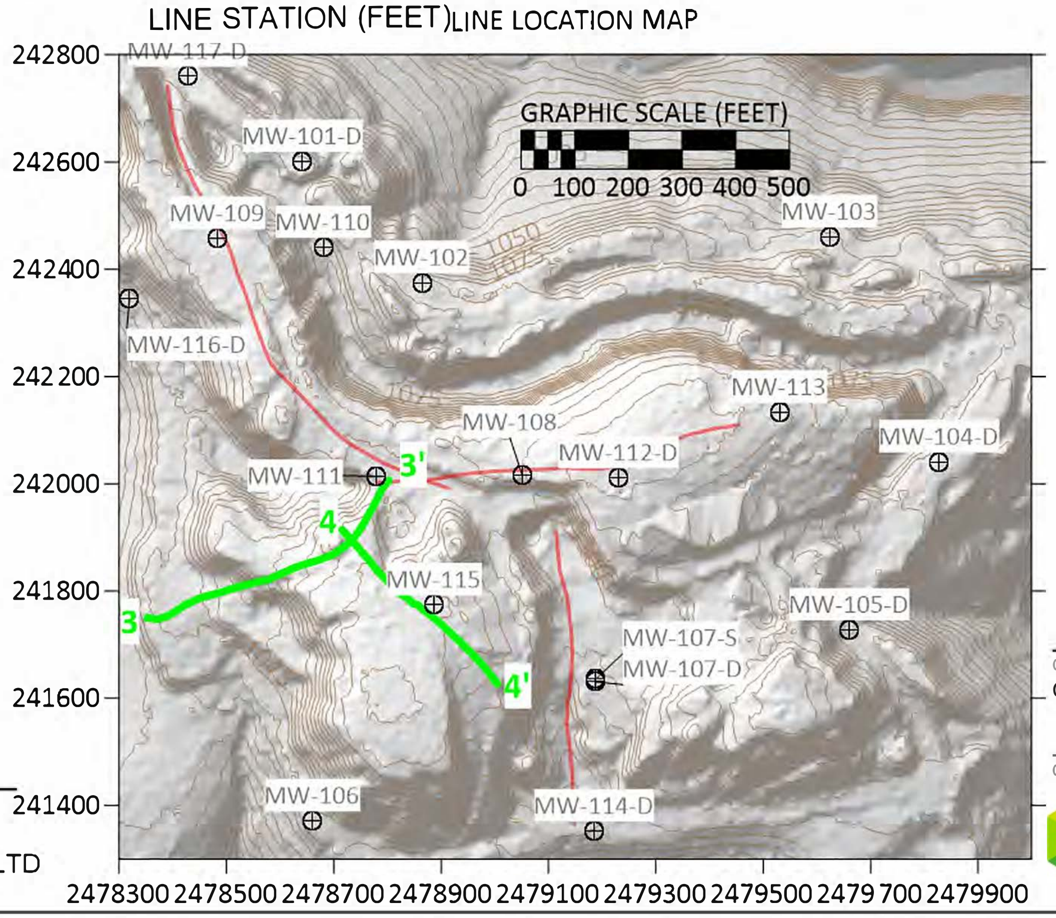
12393309 I0 NAI DATA REPORT FIGURE 3-3.srf | revised May 20 2022

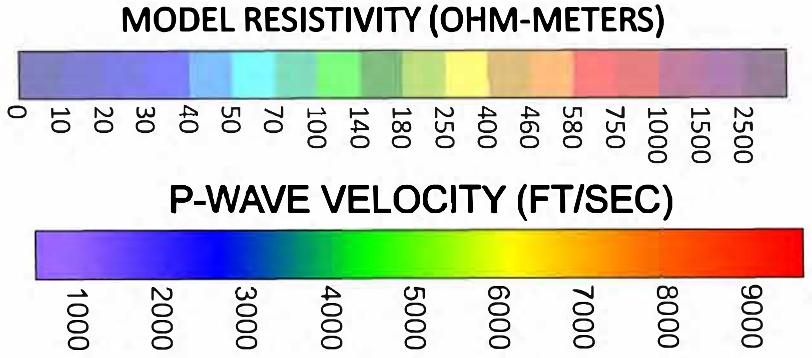












NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET

2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-02-04
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

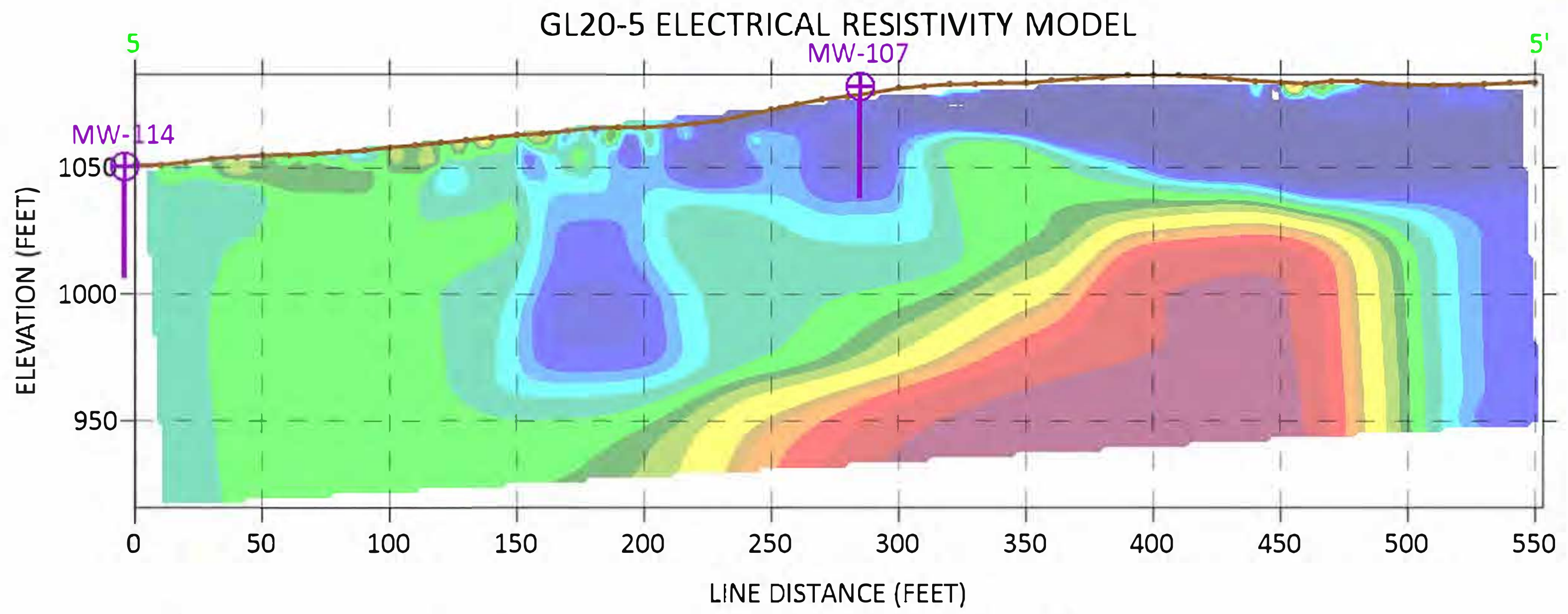
TITLE
LINE GL20-3 AND GL20-4 PROFILES
ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS
PHASE 1 GEOPHYSICAL INVESTIGATION

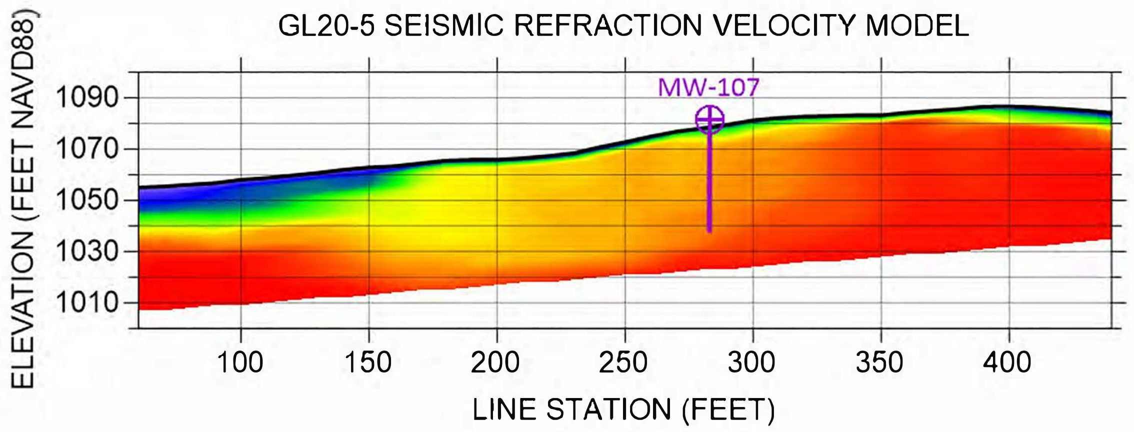
PROJECT No	Rev	Figure
12393309x10	A	3.2

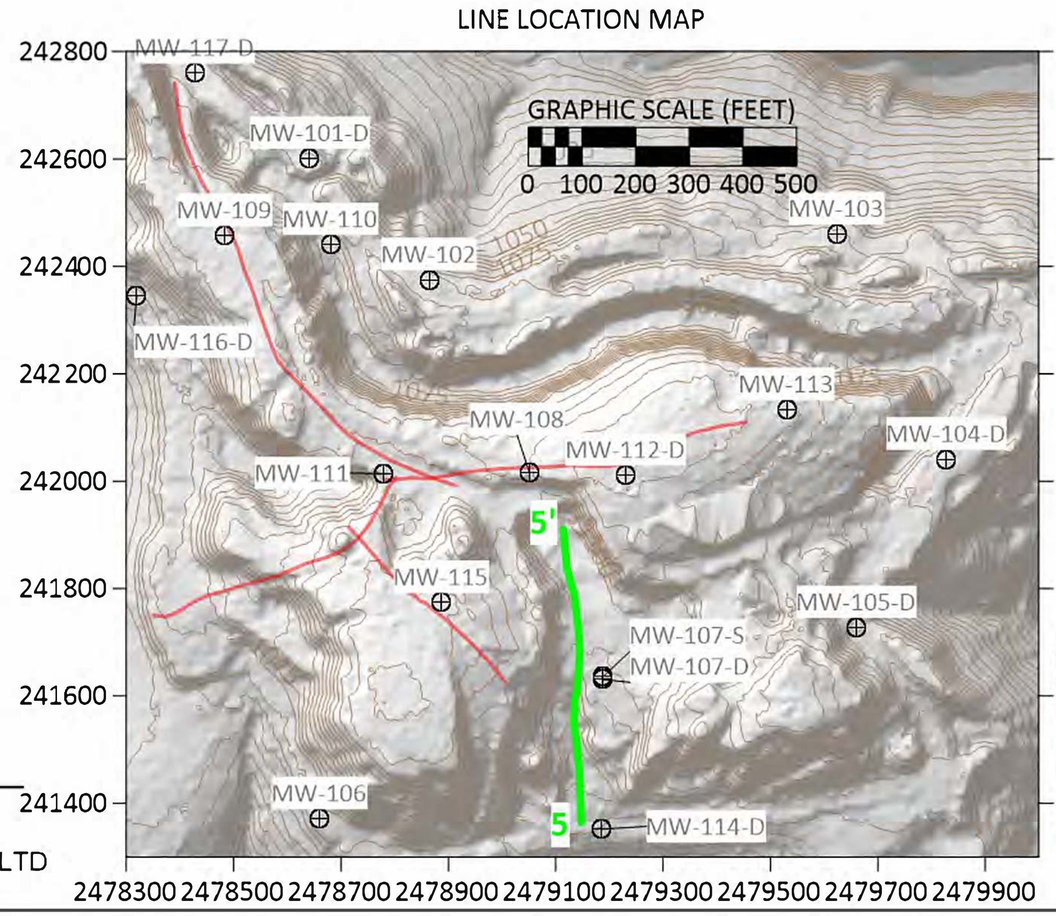
12393309.10 MAU DATA REPORT FIGURE 3-3.srf | revised February 04, 2022

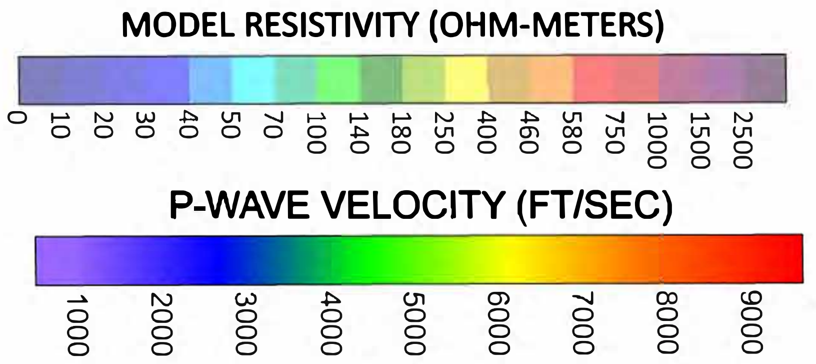
1 inch

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B









NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

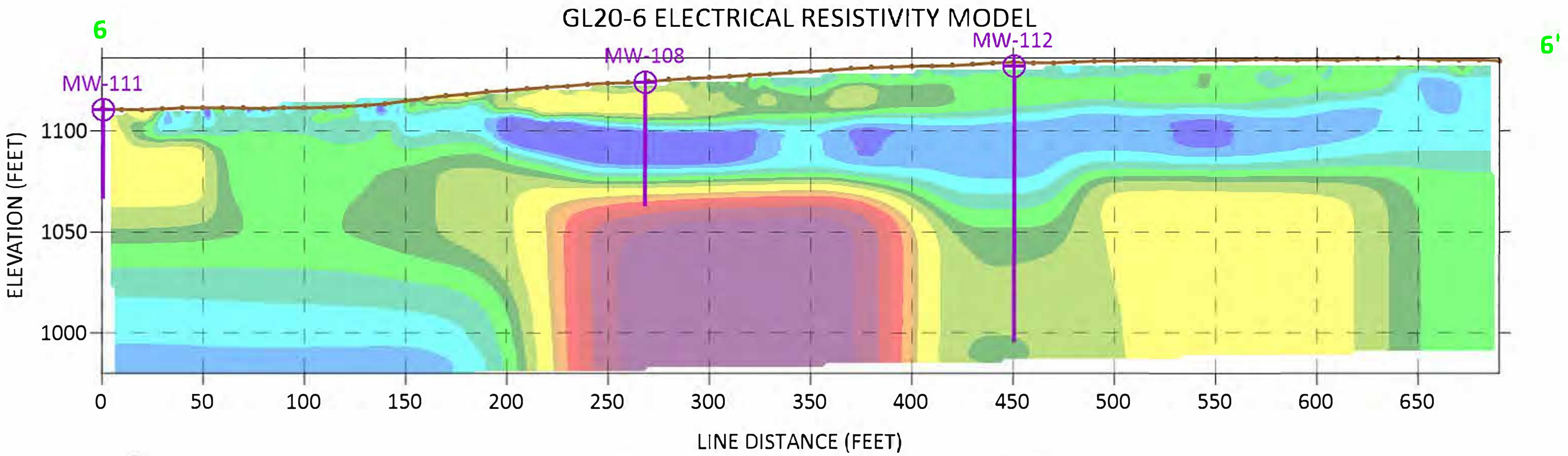
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

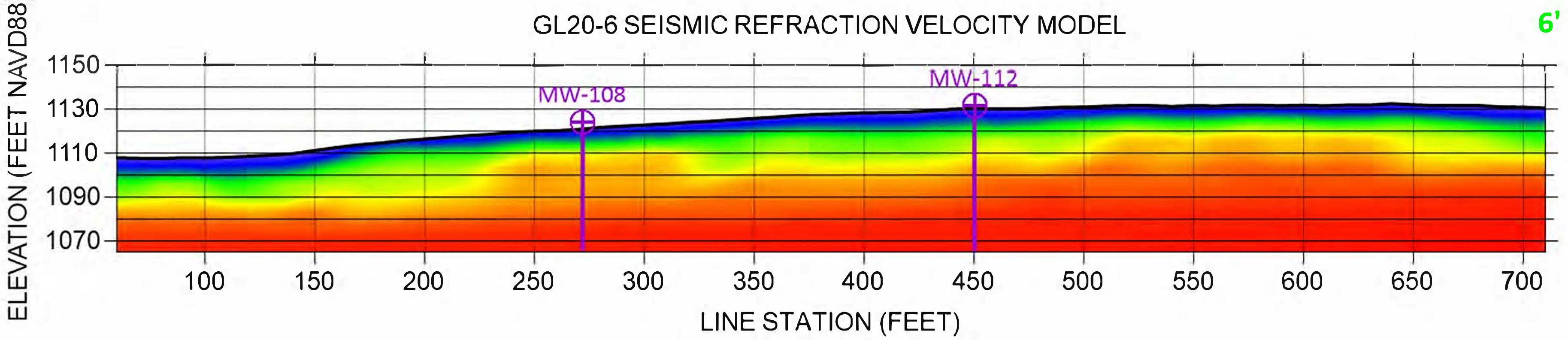
CONSULTANT
GOLDER
MEMBER OF WSP

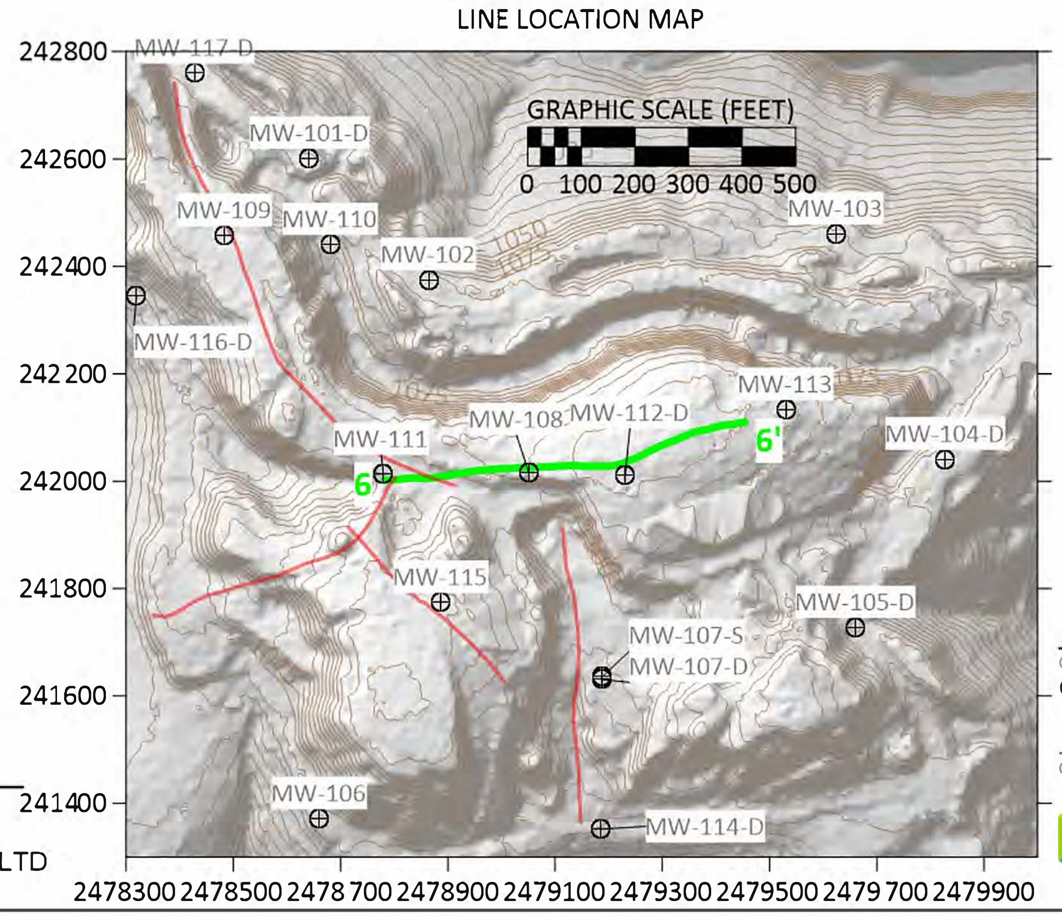
YYYY-MM-DD	2022-02-04
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

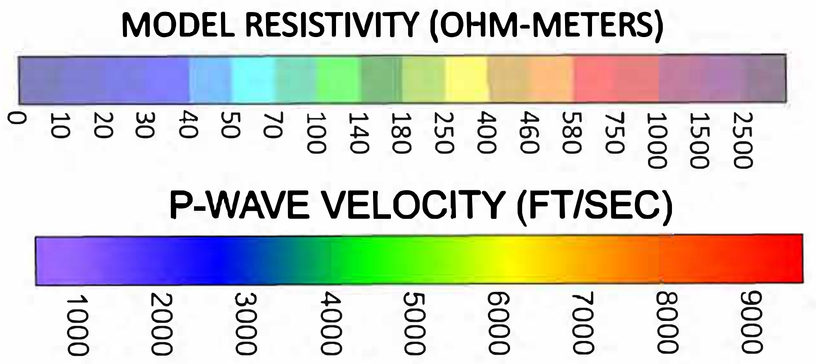
TITLE
LINE GL20-5 PROFILES
ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS
PHASE 1 GEOPHYSICAL INVESTIGATION

PROJECT No	Rev	Figure
12393309x10	A	3.3









NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

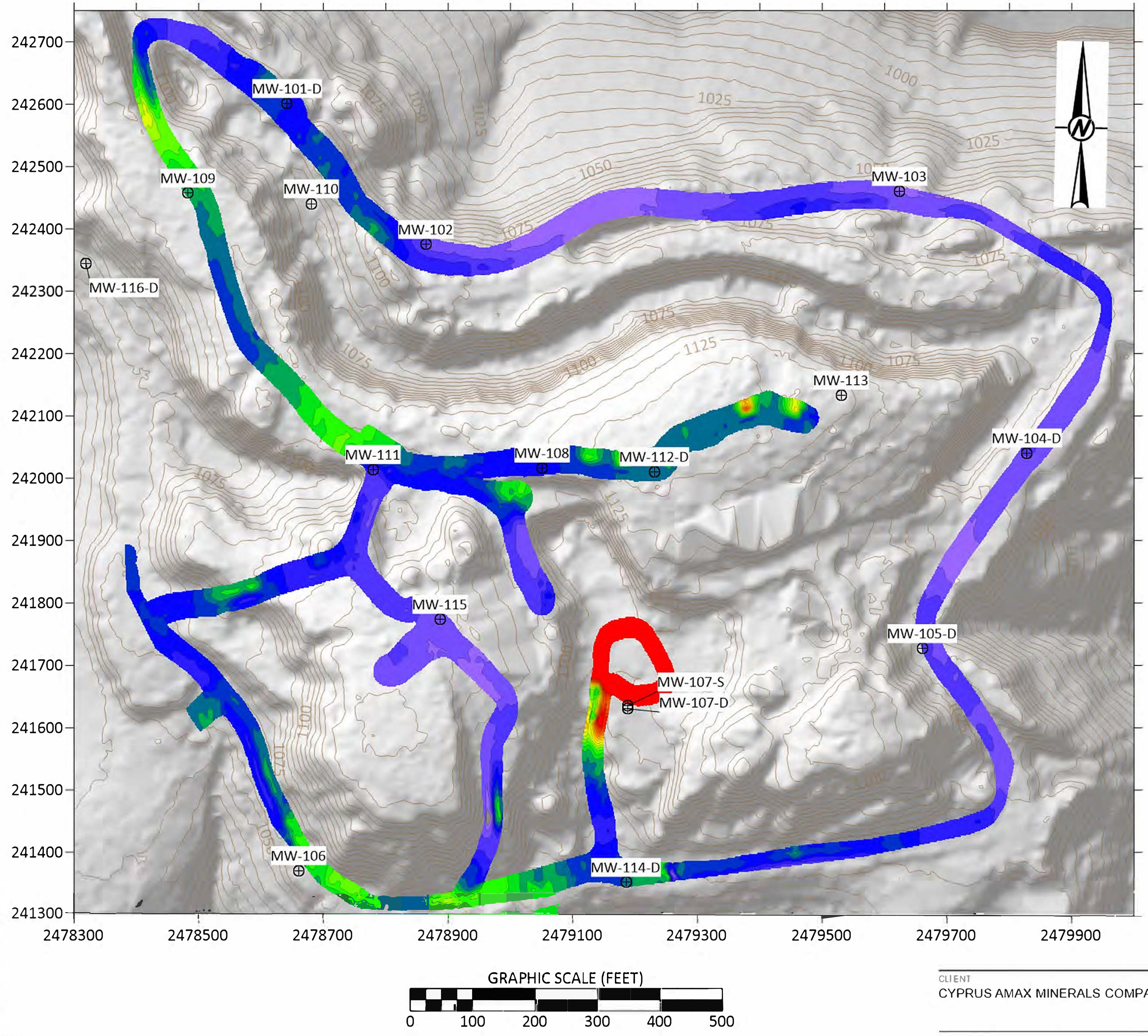
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

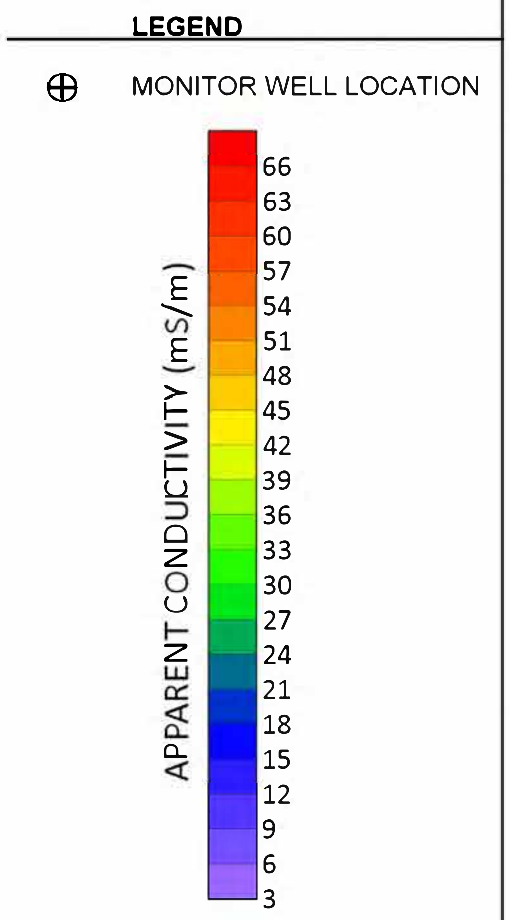
CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-20
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

TITLE
LINE GL20-6 PROFILES
ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS
PHASE 1 GEOPHYSICAL INVESTIGATION

PROJECT No	Rev.	Figure
12393309x10	A	3.4





NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-02-04
PREPARED	PEF
	PEF
REVIEW	DJB
APPROVED	NMD

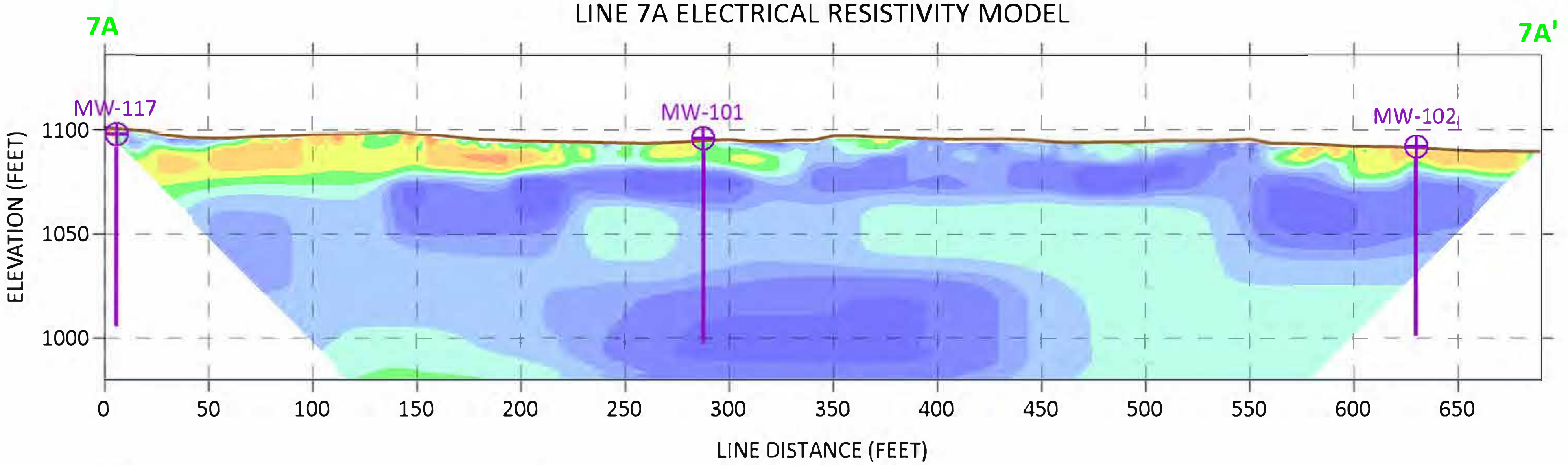
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
ELECTROMAGNETIC (EM) APPARENT CONDUCTIVITY
PHASE 2 GEOPHYSICAL INVESTIGATION

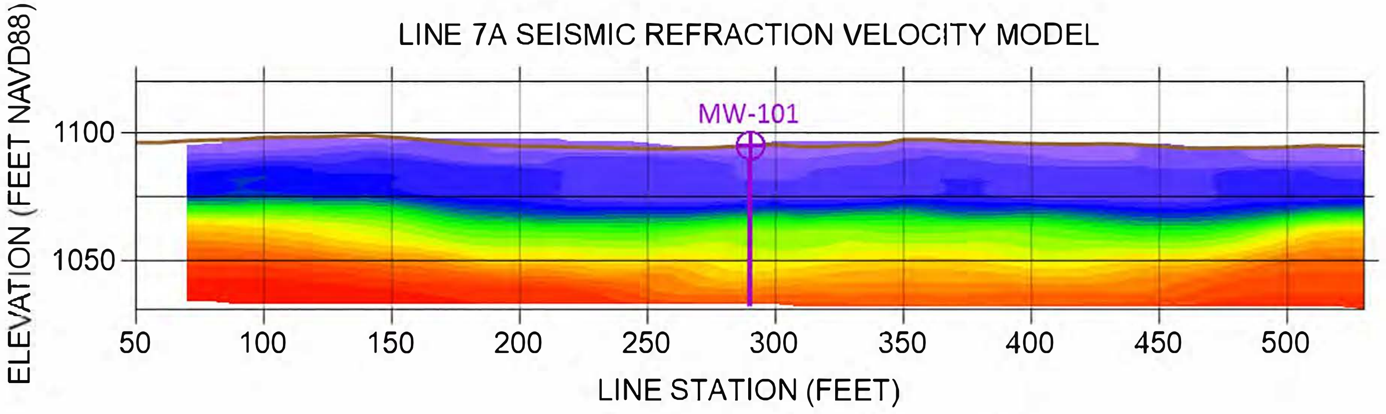
PROJECT No	Rev	Figure
12393309x10	A	3.5

12393309 10-MAJ DATA REPORT FIGURE 3-5.srf | revised: February 04, 2022

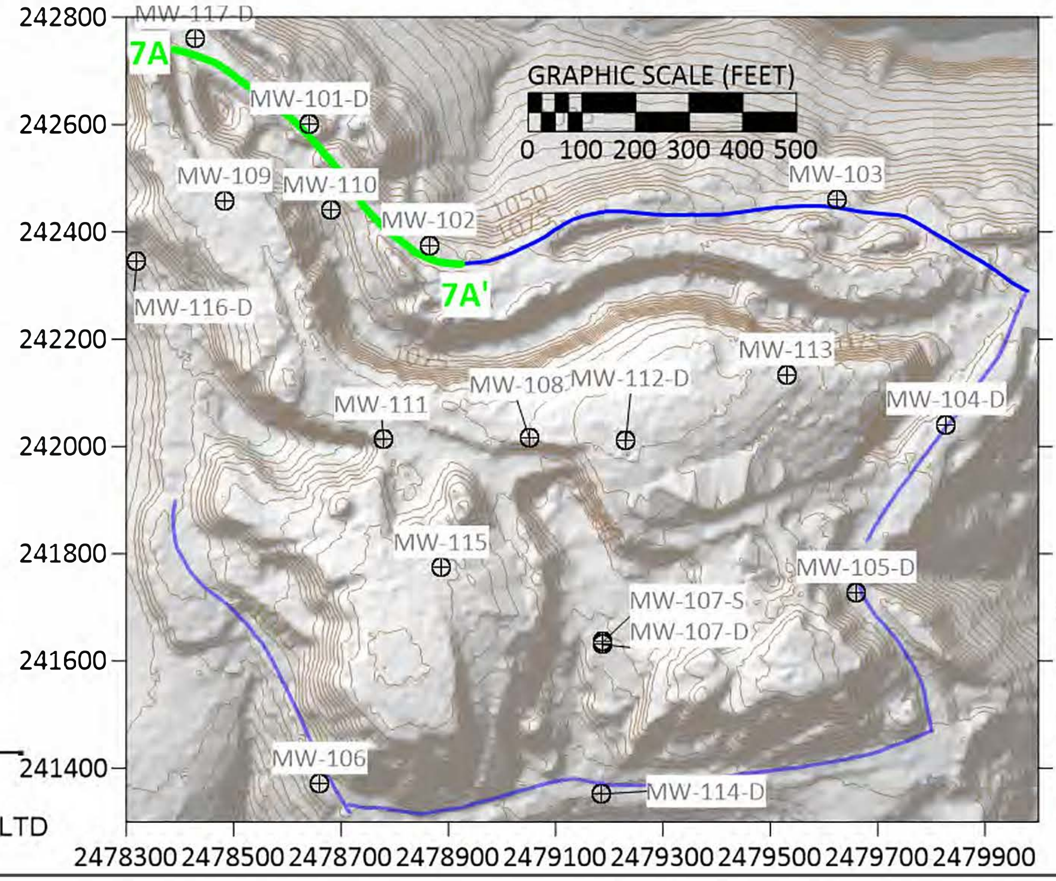
LINE 7A ELECTRICAL RESISTIVITY MODEL

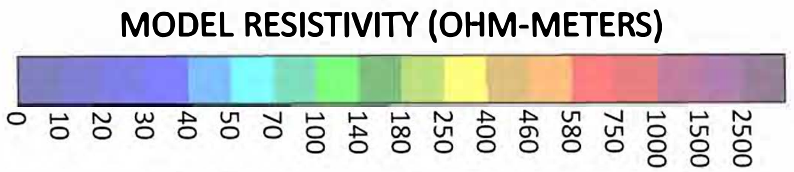


LINE 7A SEISMIC REFRACTION VELOCITY MODEL

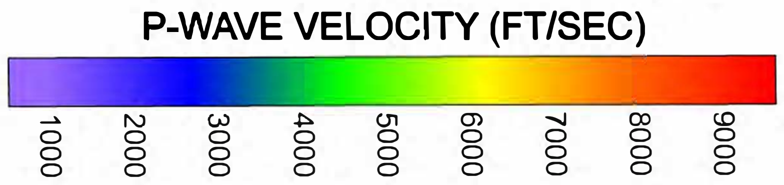


LINE LOCATION MAP





MODEL RESISTIVITY (OHM-METERS)



P-WAVE VELOCITY (FT/SEC)

NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

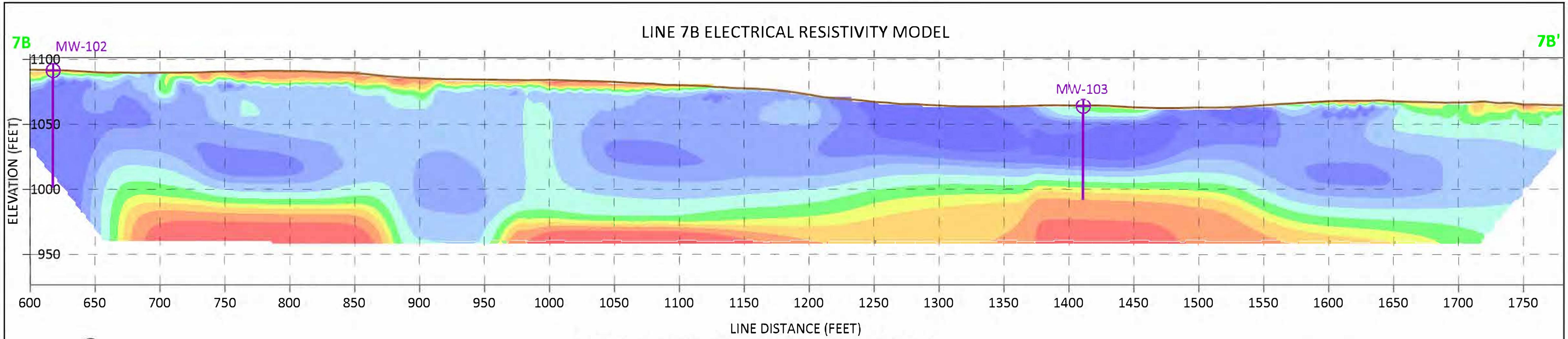
YYYY-MM-DD	2022-05-20
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

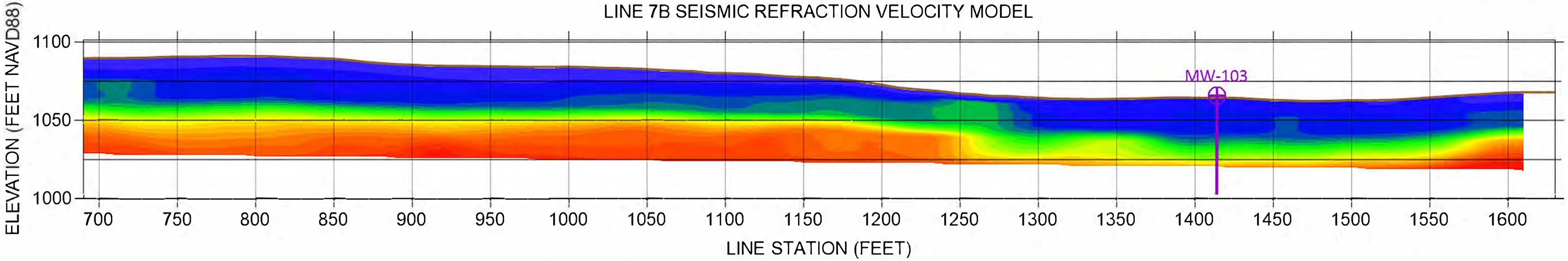
TITLE
LINE 7A
ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS
PHASE 2 GEOPHYSICAL INVESTIGATION

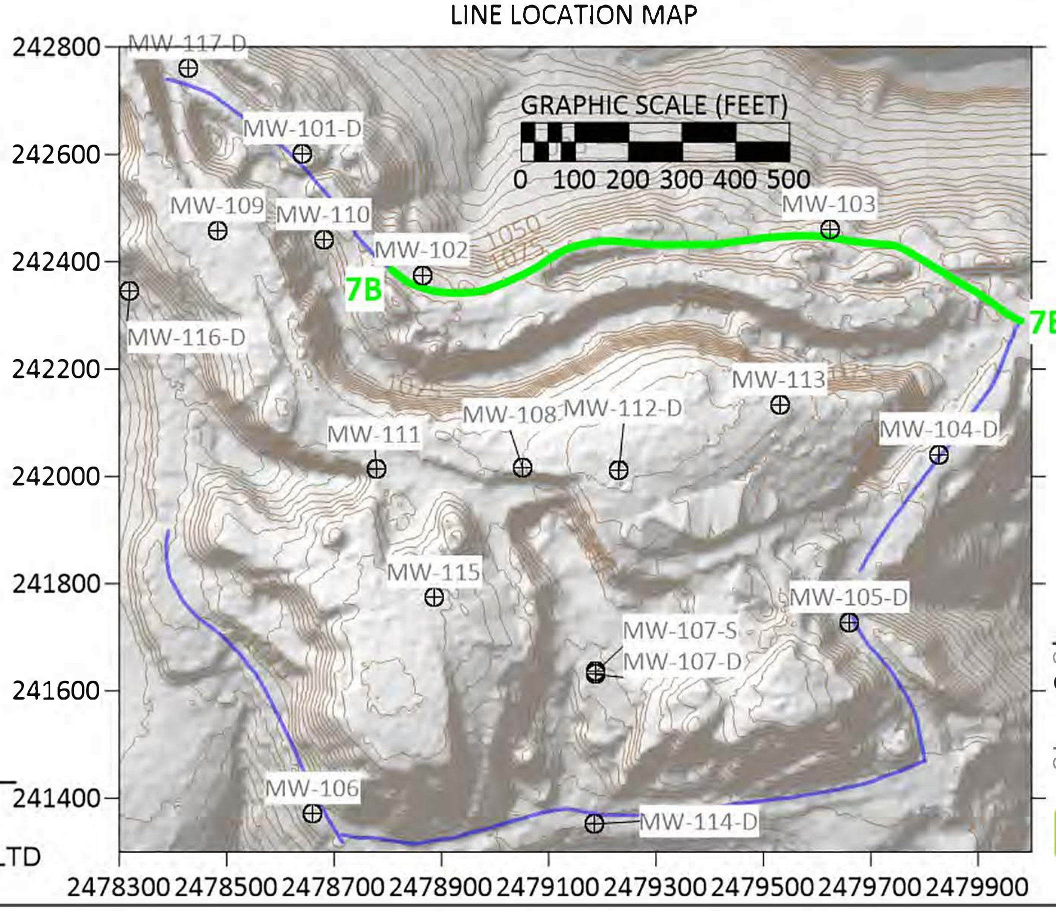
PROJECT No	Rev	Figure
12393309x10	A	3.6

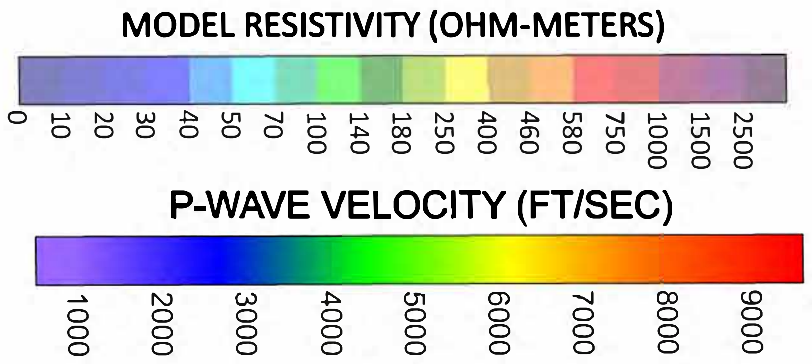
12393309\10-MAI DATA REPORT FIGURE 3-6.srf | revised May 20, 2022

1 inch
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B









NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

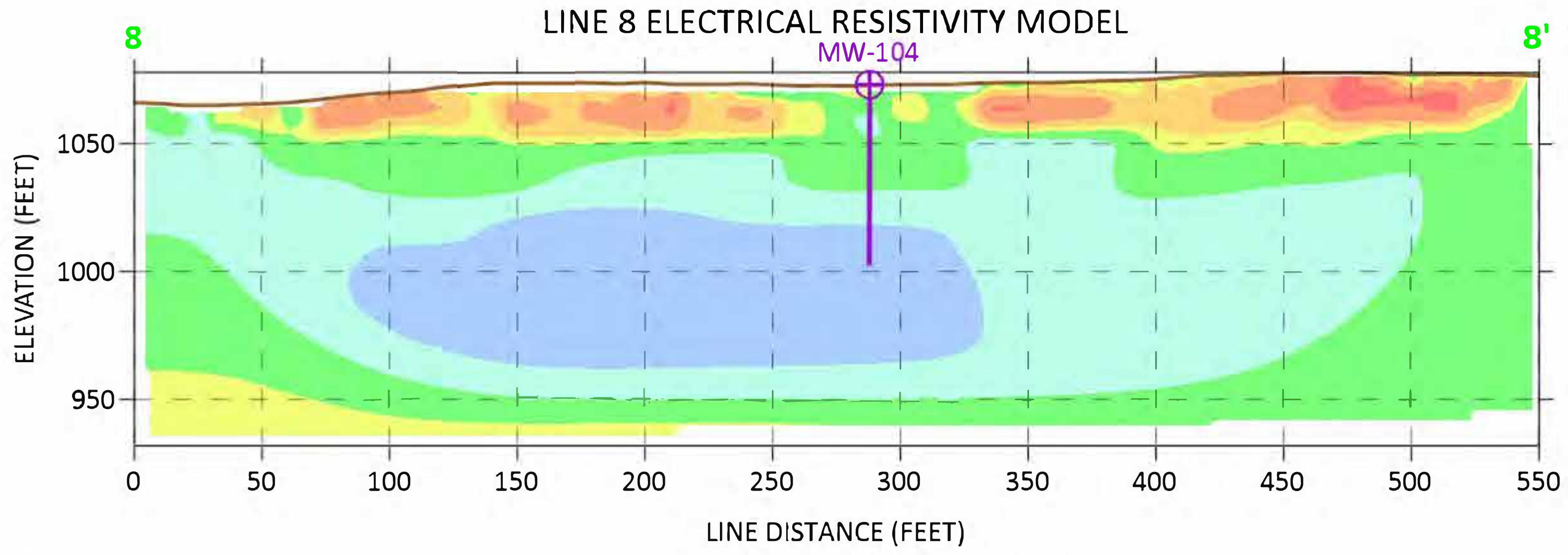
YYYY-MM-DD	2022-02-04
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

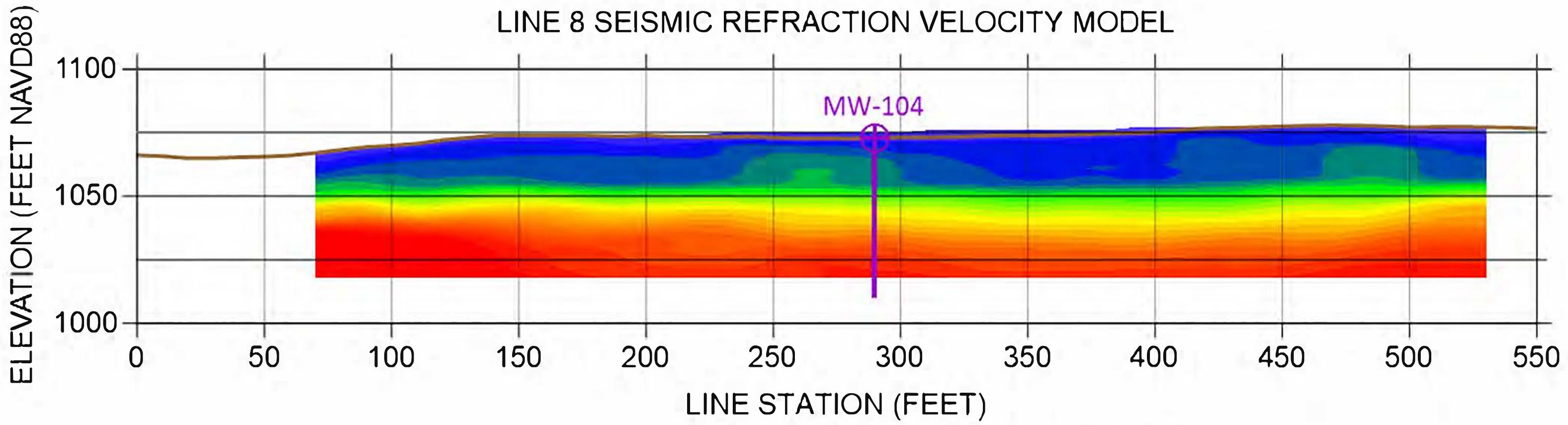
TITLE
LINE 7B
ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS
PHASE 2 GEOPHYSICAL INVESTIGATION

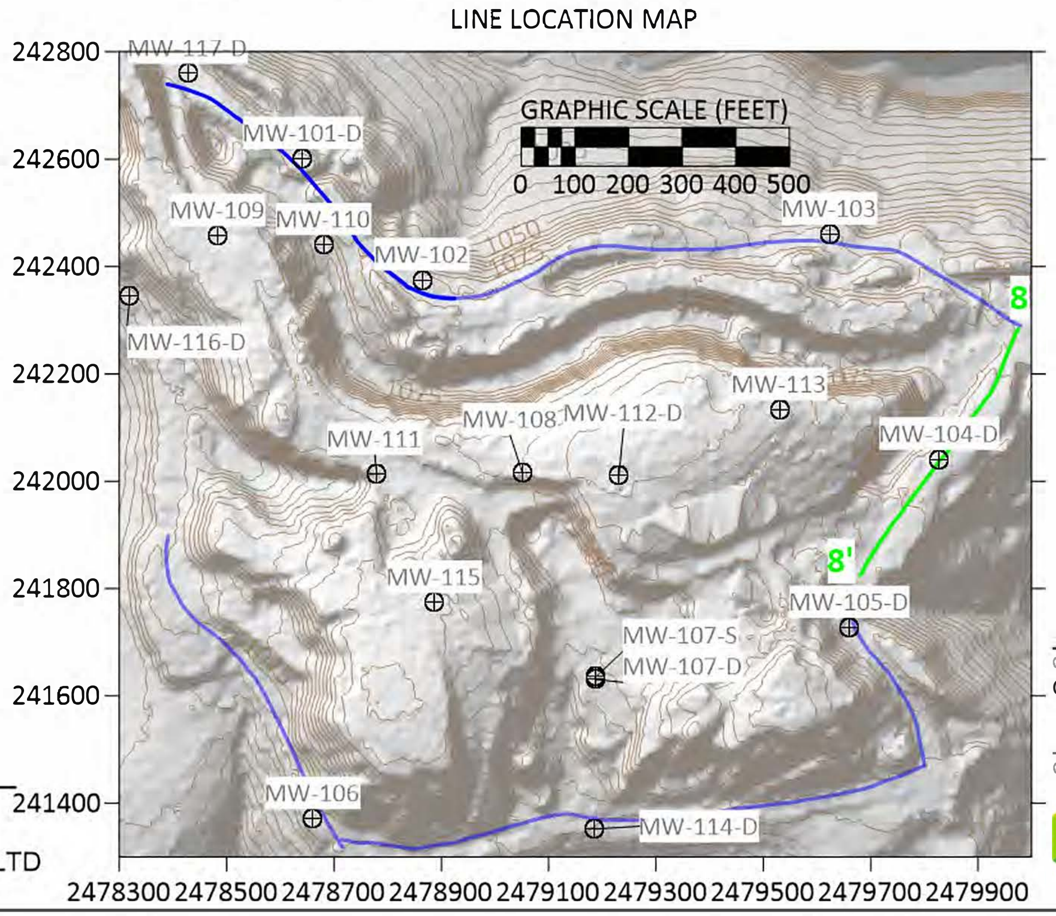
PROJECT No	Rev	Figure
12393309x10	A	3.7

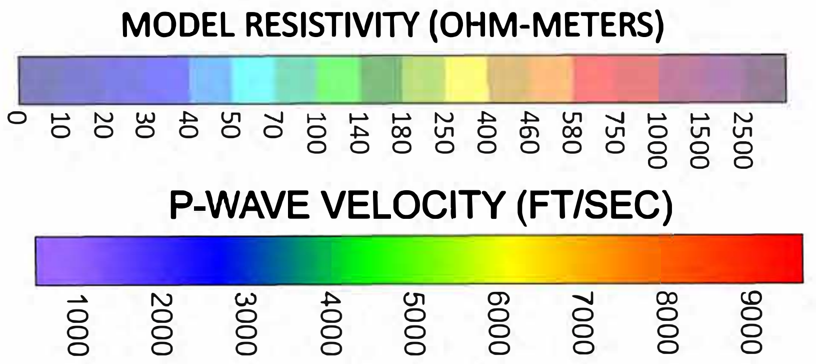
12393309|0-MA| DATA REPORT FIGURE 3-7 sr1 | revised February 04, 2022

1 inch
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B









NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

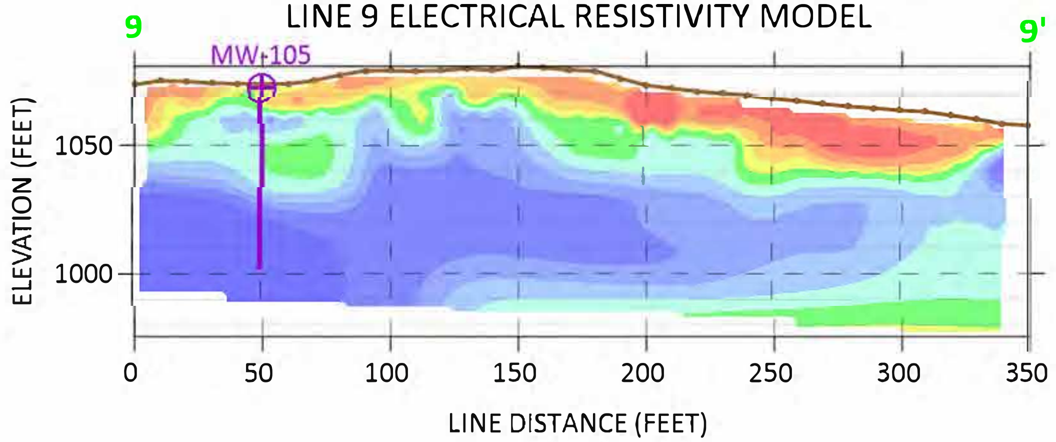
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

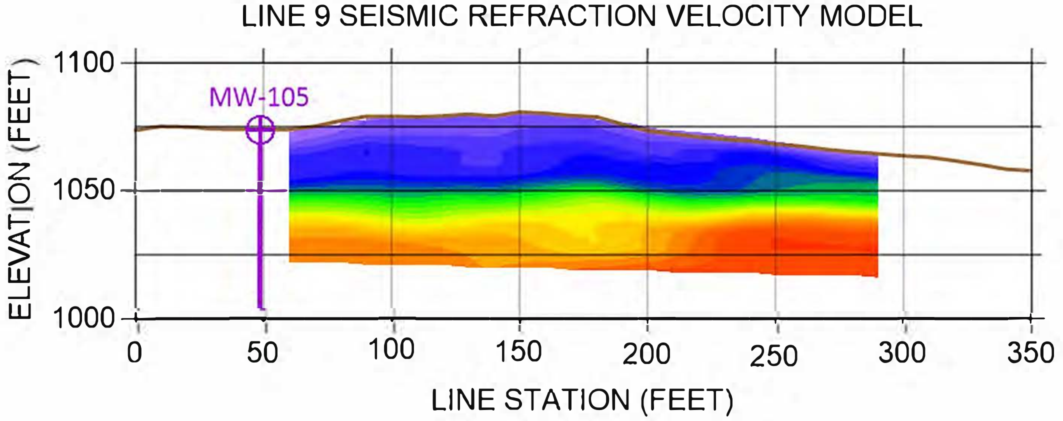
CONSULTANT
GOLDER
MEMBER OF WSP

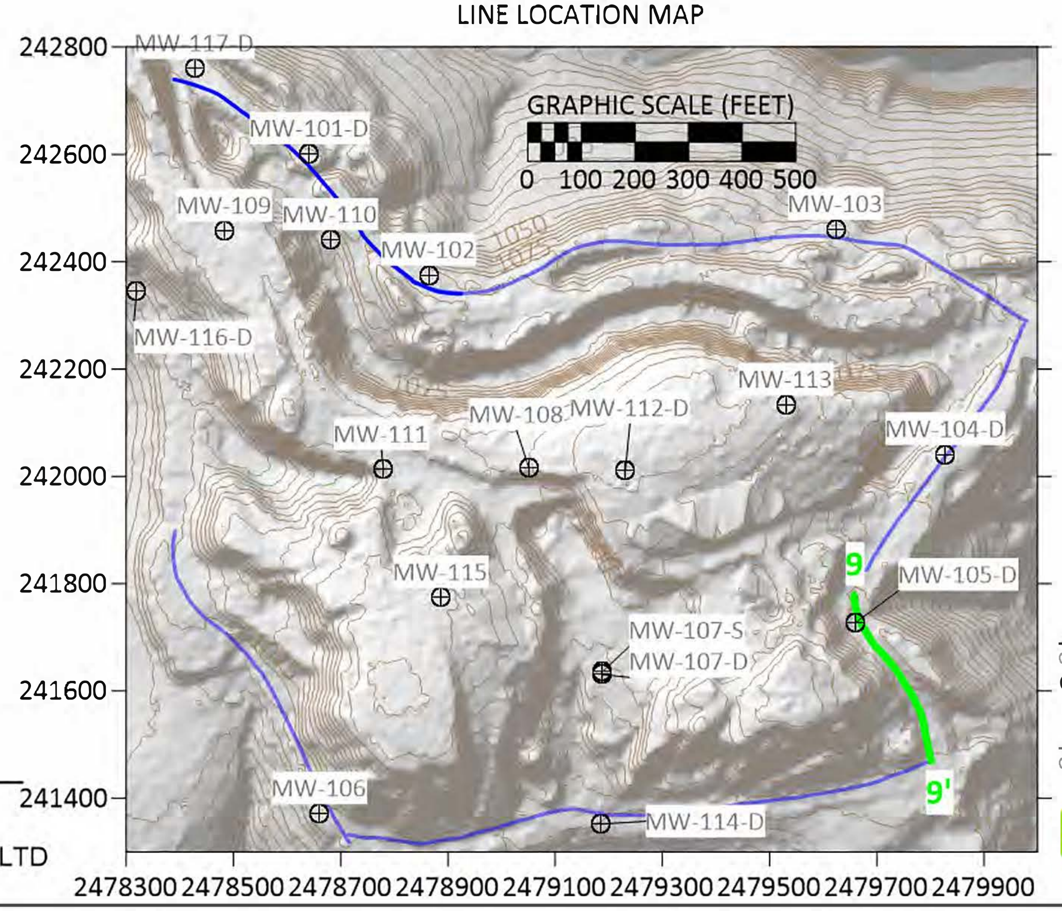
YYYY-MM-DD	2022-02-04
PREPARED	PEF
DESIGN	
REVIEW	
APPROVED	NMD

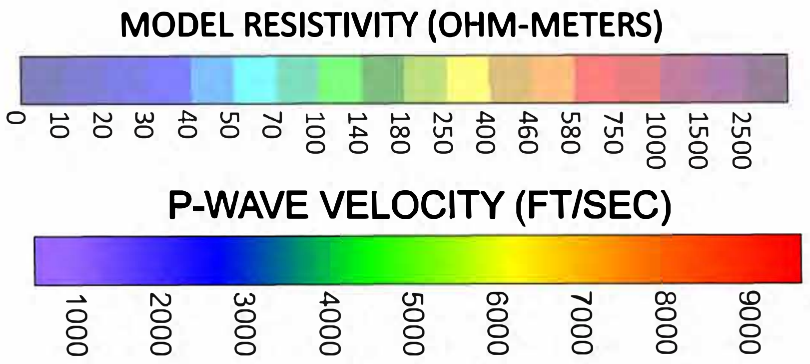
TITLE
LINE 8
ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS
PHASE 2 GEOPHYSICAL INVESTIGATION

PROJECT No	Rev.	Figure
12393309x10	A	3.8









NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

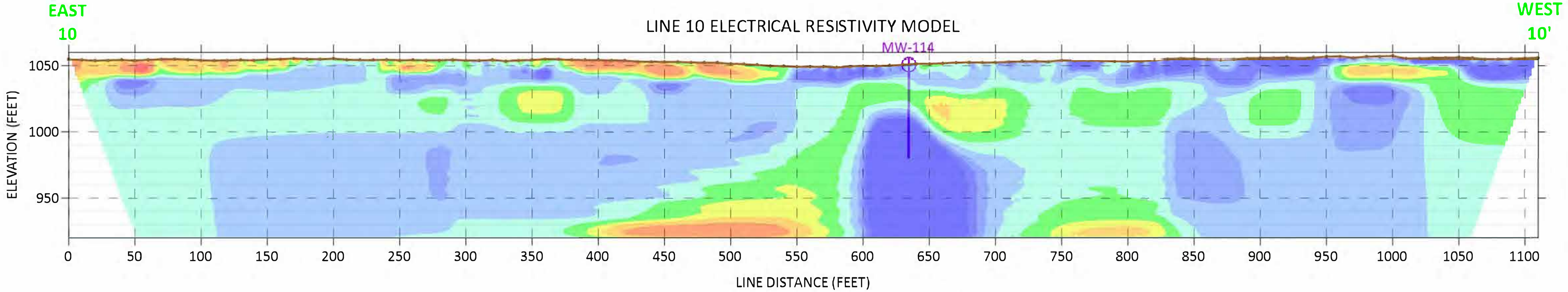
CONSULTANT

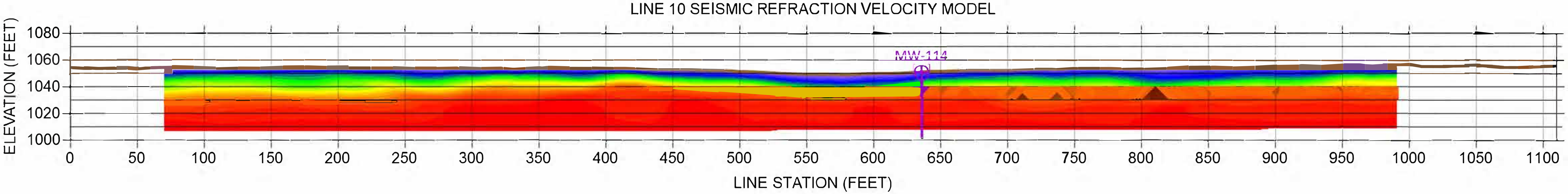
GOLDER
MEMBER OF WSP

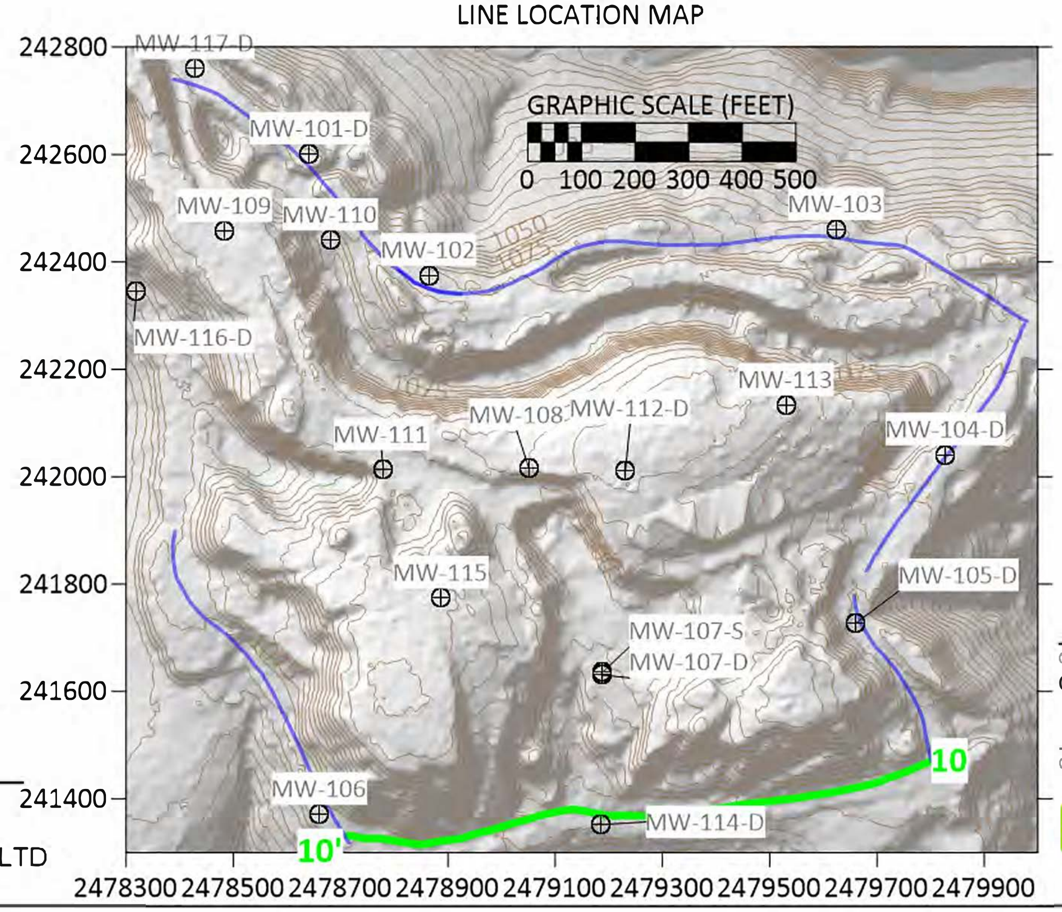
YYYY-MM-DD	2022-02-04
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

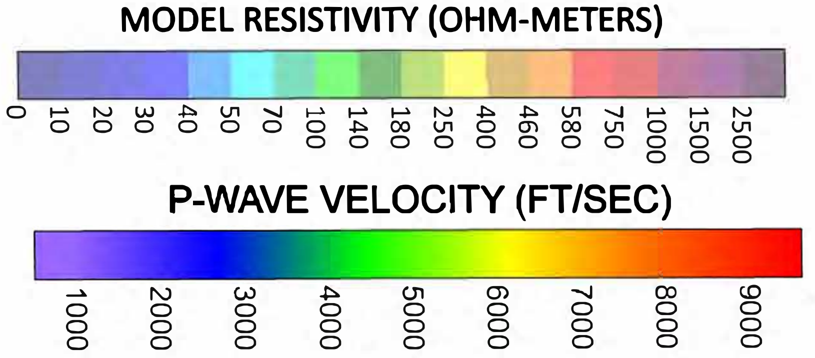
TITLE
LINE 9
ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS
PHASE 2 GEOPHYSICAL INVESTIGATION

PROJECT No	Rev	Figure
12393309x10	A	3.9



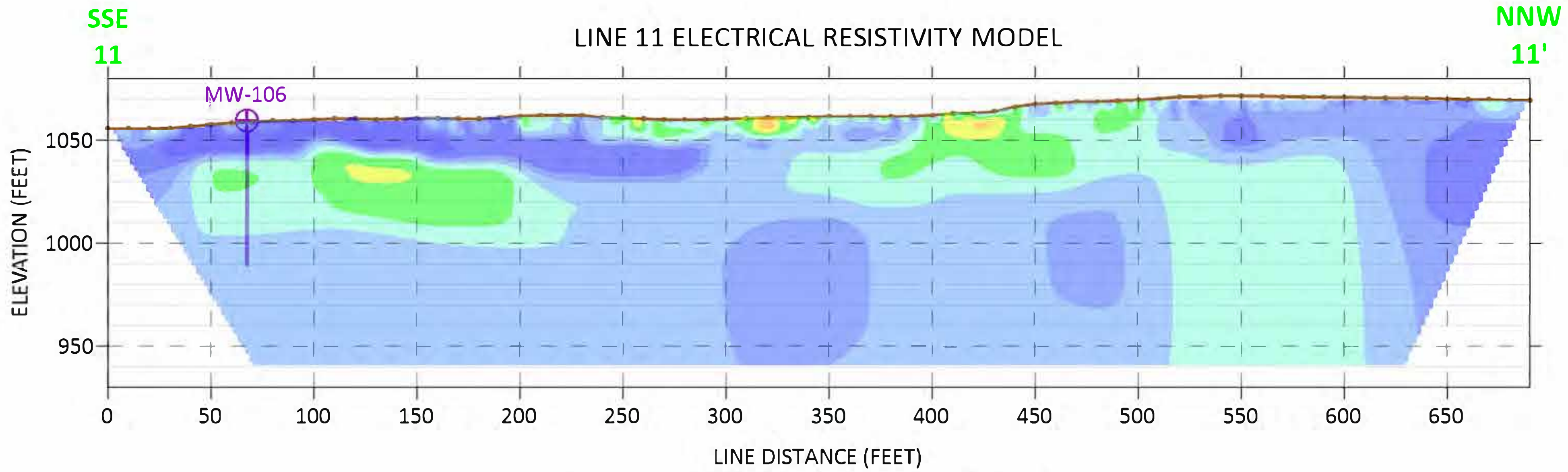


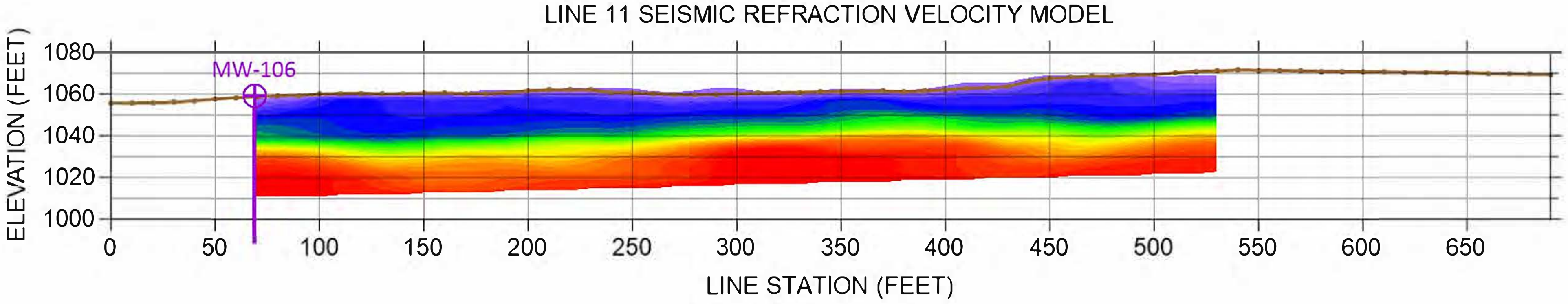


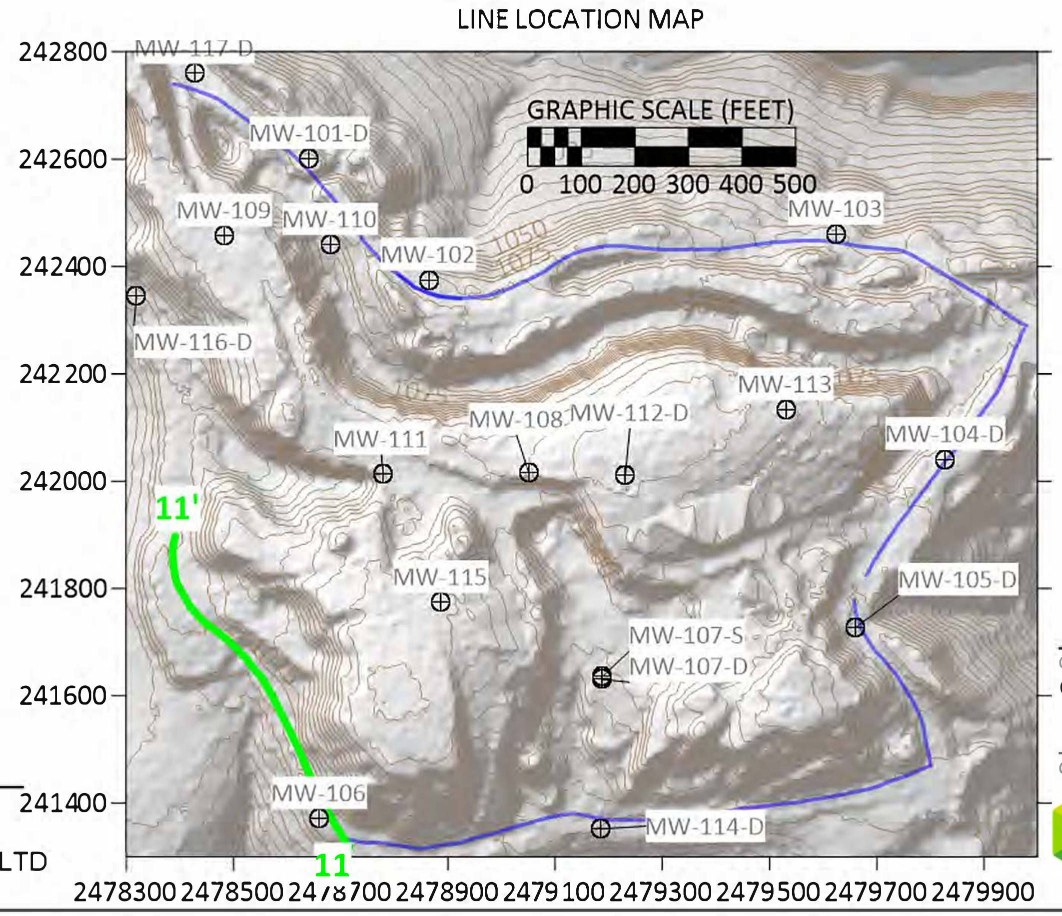


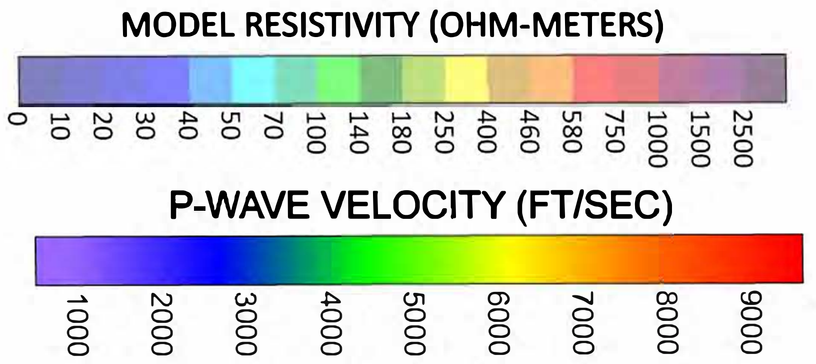
NOTES
1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT	CYPRUS AMAX MINERALS COMPANY
PROJECT	FORMER SATRALLOY SITE FORMER MINE AREA INVESTIGATION
CONSULTANT	GOLDER MEMBER OF WSP
YYYY-MM-DD	2022-05-20
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD
TITLE	LINE 10 ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS PHASE 2 GEOPHYSICAL INVESTIGATION
PROJECT No	12393309x10
Rev	A
Figure	3.10









NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-20
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

TITLE
LINE 11
ELECTRICAL RESISTIVITY & SEISMIC REFRACTION MODELS
PHASE 2 GEOPHYSICAL INVESTIGATION

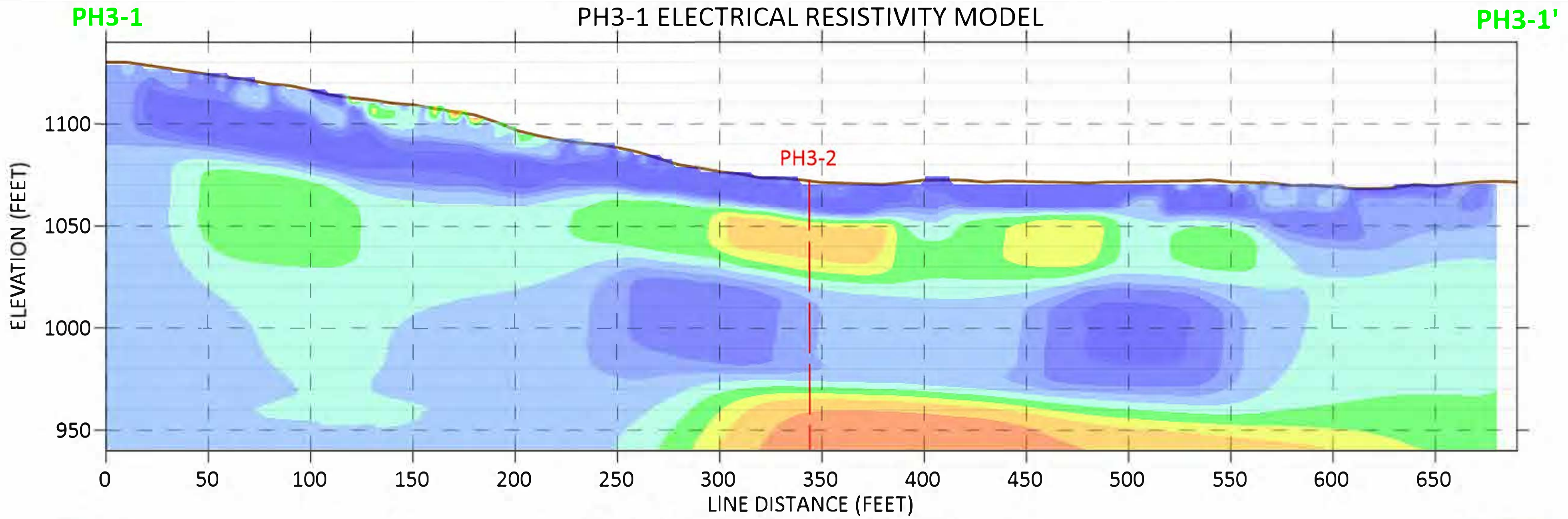
PROJECT No	Rev	Figure
12393309x10	A	3.11

12393309.10 MAI DATA REPORT FIGURE3-11.srf | revised May 20, 2022

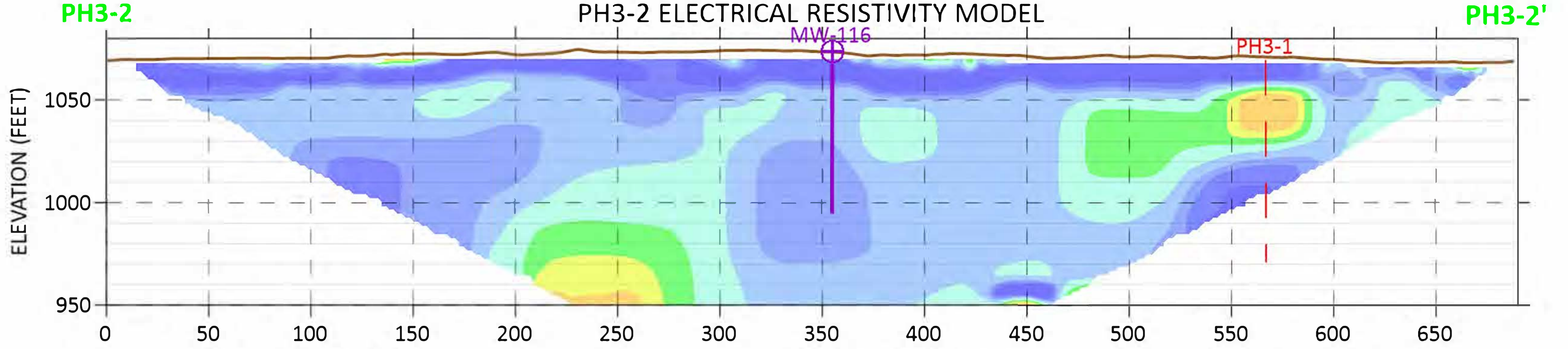
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 inch

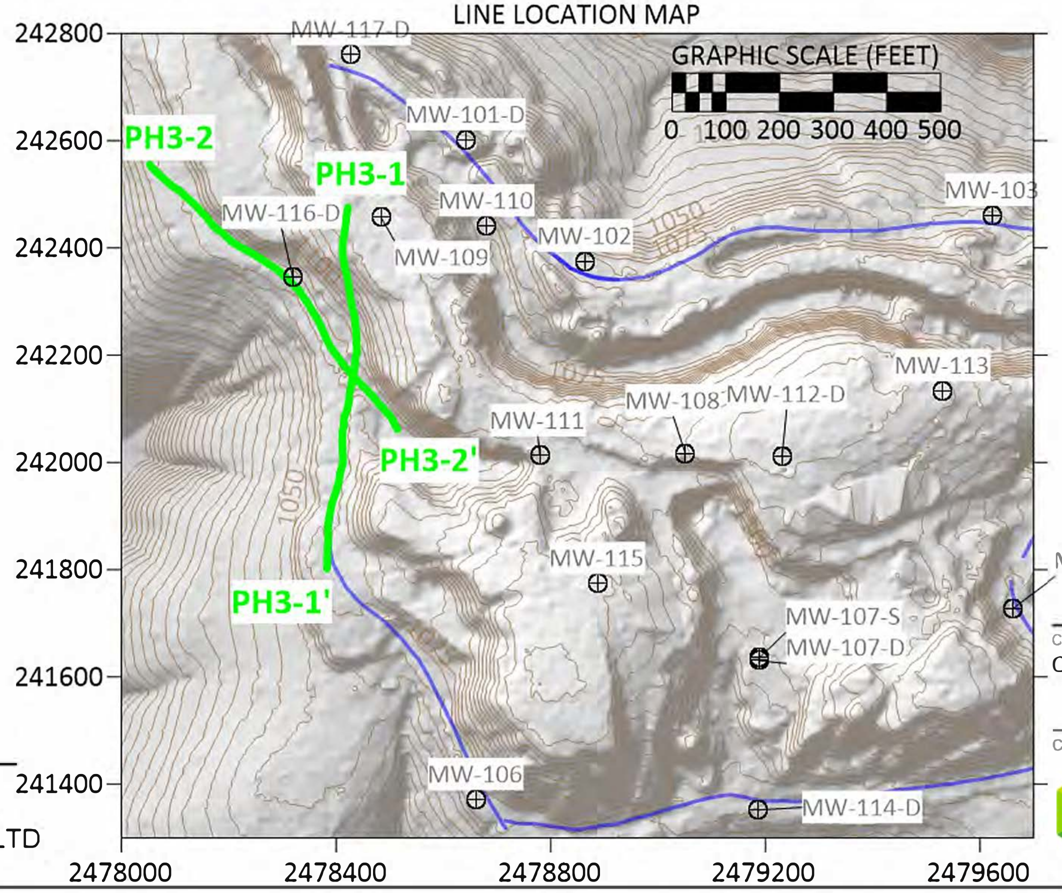
PH3-1 ELECTRICAL RESISTIVITY MODEL



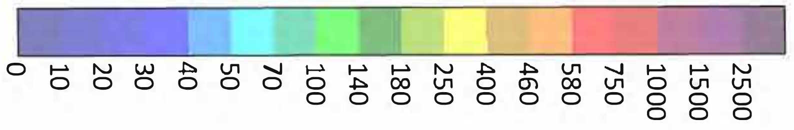
PH3-2 ELECTRICAL RESISTIVITY MODEL



LINE LOCATION MAP



MODEL RESISTIVITY (OHM-METERS)



NOTES

1) MAP DATUM: NAD83, OH EAST, US STATE PLANE FEET
2) EM DATA COLLECTED WITH GEOMETRICS LTD EM31 AND GNSS SATELLITE RECEIVER

CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-02-04
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

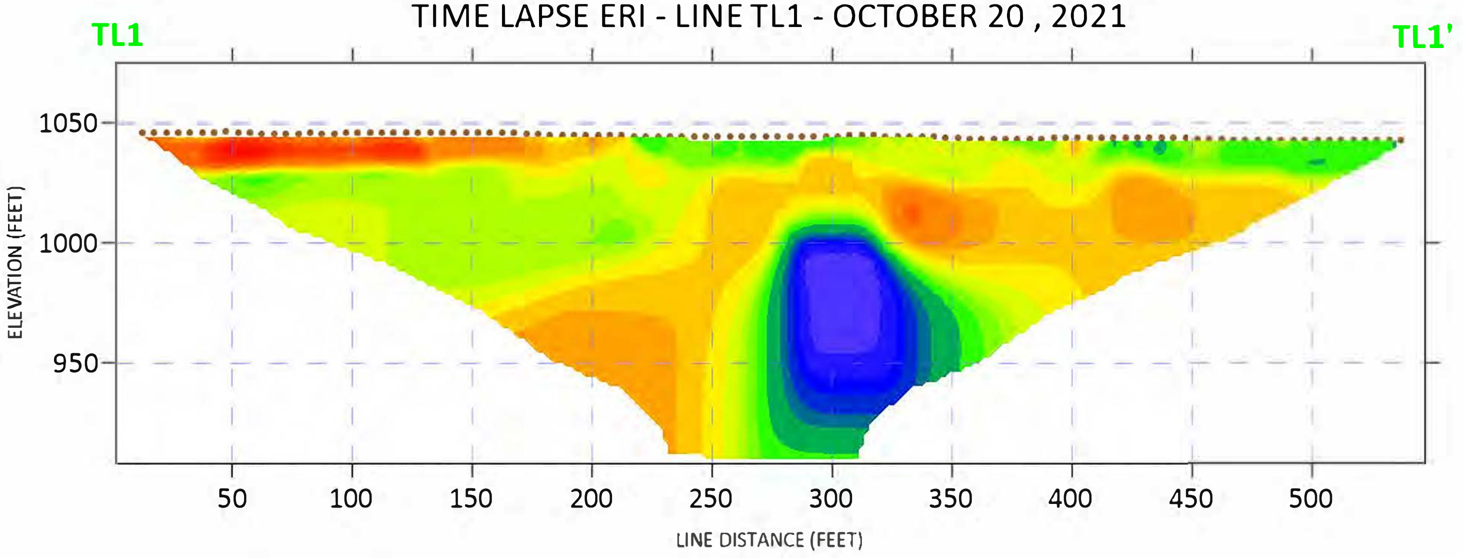
TITLE
LINES PH3-1 AND PH3-2
ELECTRICAL RESISTIVITY MODELS
PHASE 3 GEOPHYSICAL INVESTIGATION

PROJECT No 12393309x10
Rev A
Figure 3.12

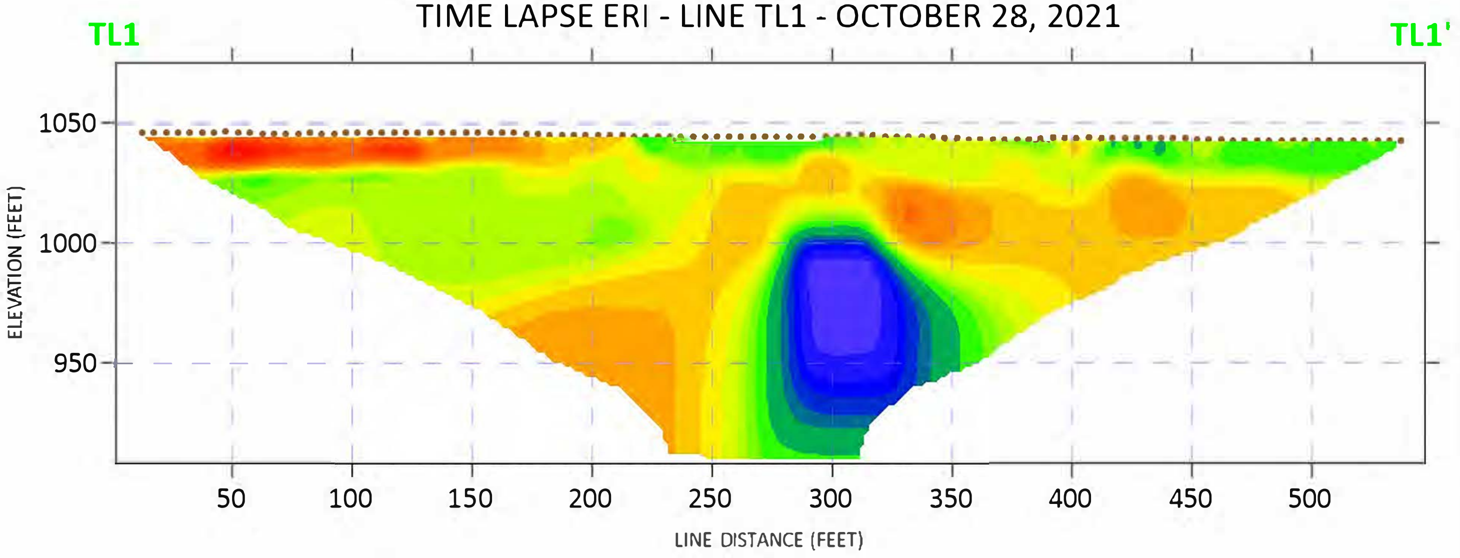
1 inch
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

12393309|0 MAJ DATA REPORT FIGURE 3-12.srf | revised: February 04, 2022

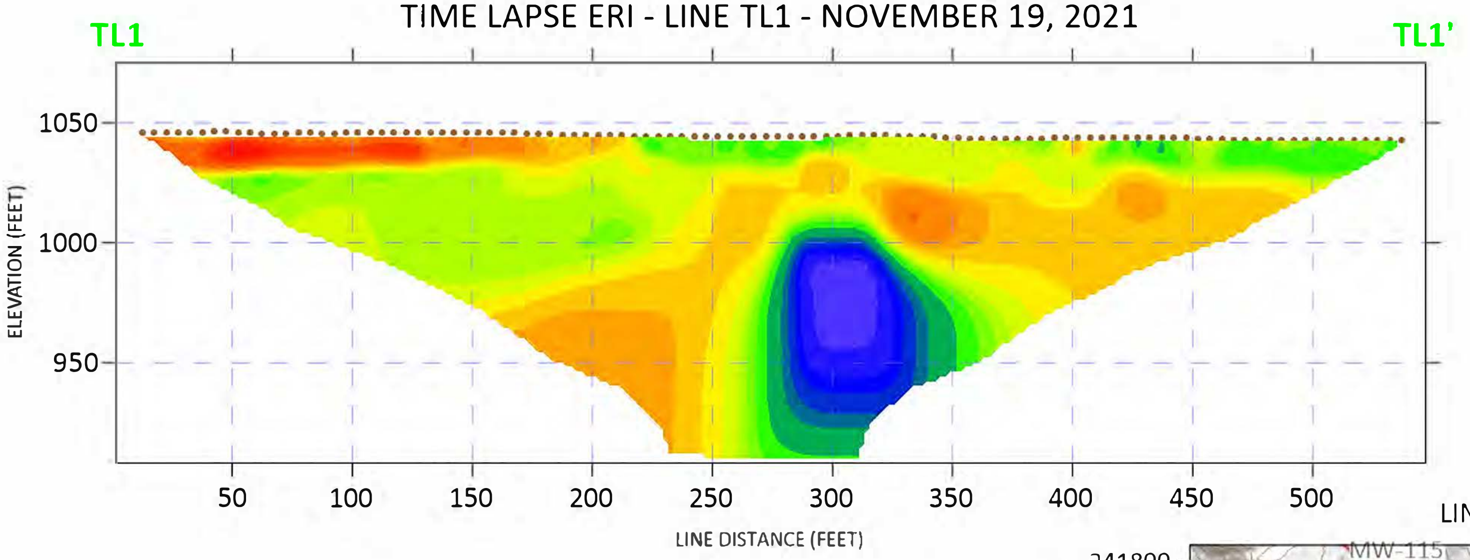
TIME LAPSE ERI - LINE TL1 - OCTOBER 20 , 2021



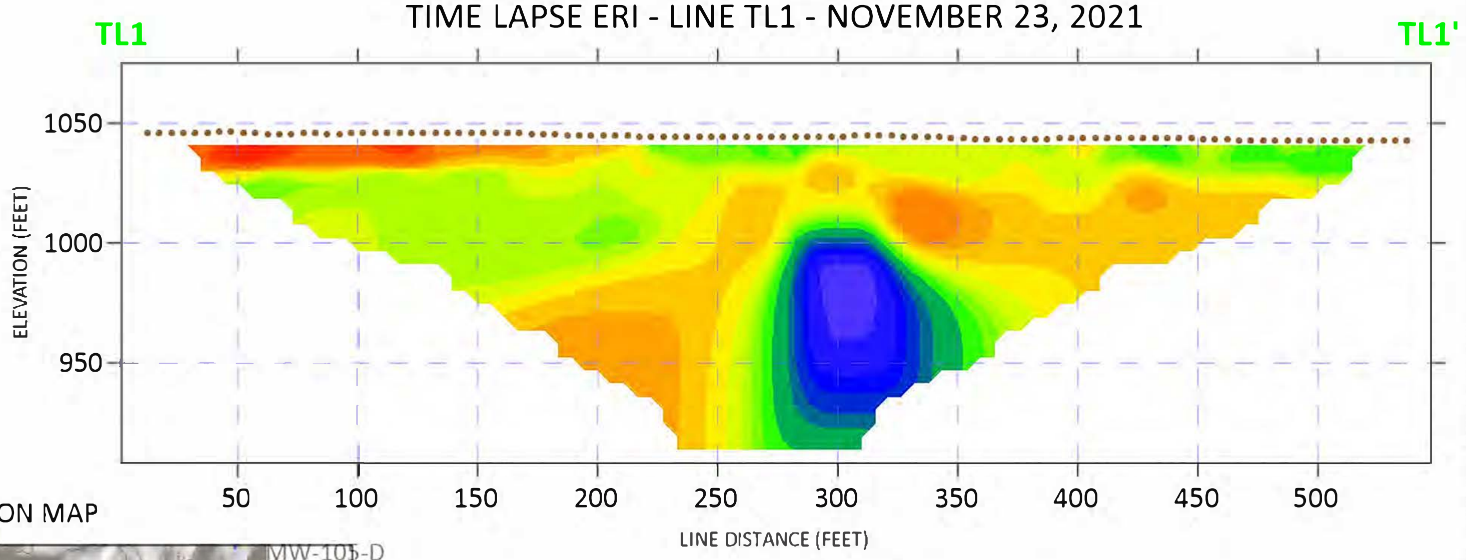
TIME LAPSE ERI - LINE TL1 - OCTOBER 28, 2021



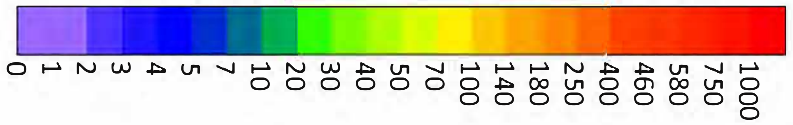
TIME LAPSE ERI - LINE TL1 - NOVEMBER 19, 2021



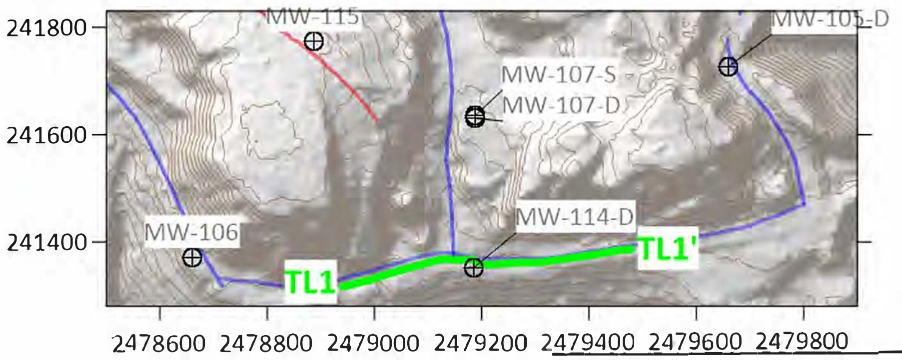
TIME LAPSE ERI - LINE TL1 - NOVEMBER 23, 2021



APPARENT RESISTIVITY (OHM-METERS)



LINE LOCATION MAP



NOTES

1) ELEVATION DATA (NAVD88) COLLECTED WITH HEMISHPERE C321 SUBFOOT DGPS AND VERIFIED WITH AVAILABLE LIDAR SUREY DATA

2) RESISTIVITY DATA COLLECTED USING 56-CHANNEL AGI SUPERSTING R8+, EXTENDED DIPOLE-DIPOLE ARRAY AND FIXED ELECTRODES

CLIENT
CYPRUS AMAX MINERALS COMPANY

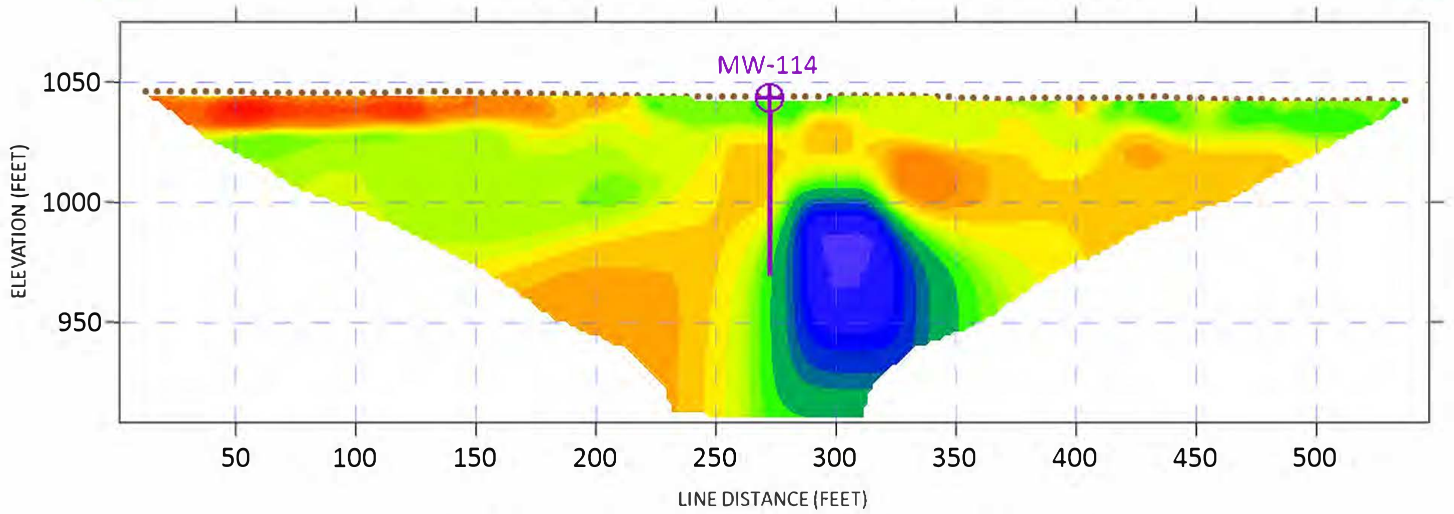
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

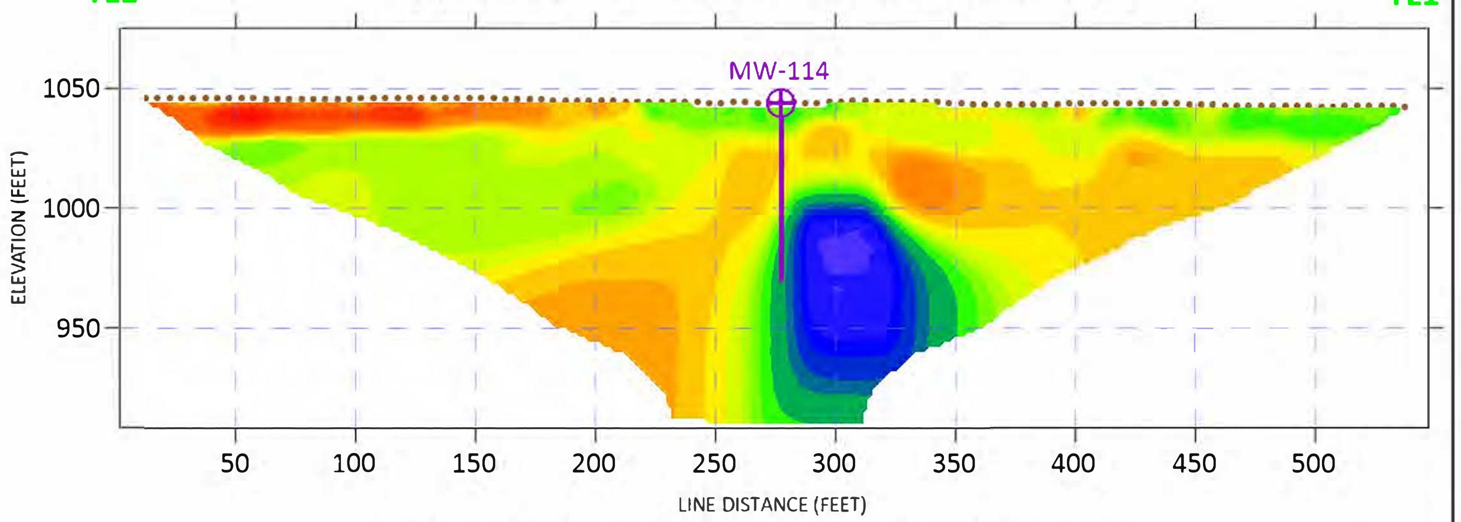
CONSULTANT
GOLDER
MEMBER OF WSP

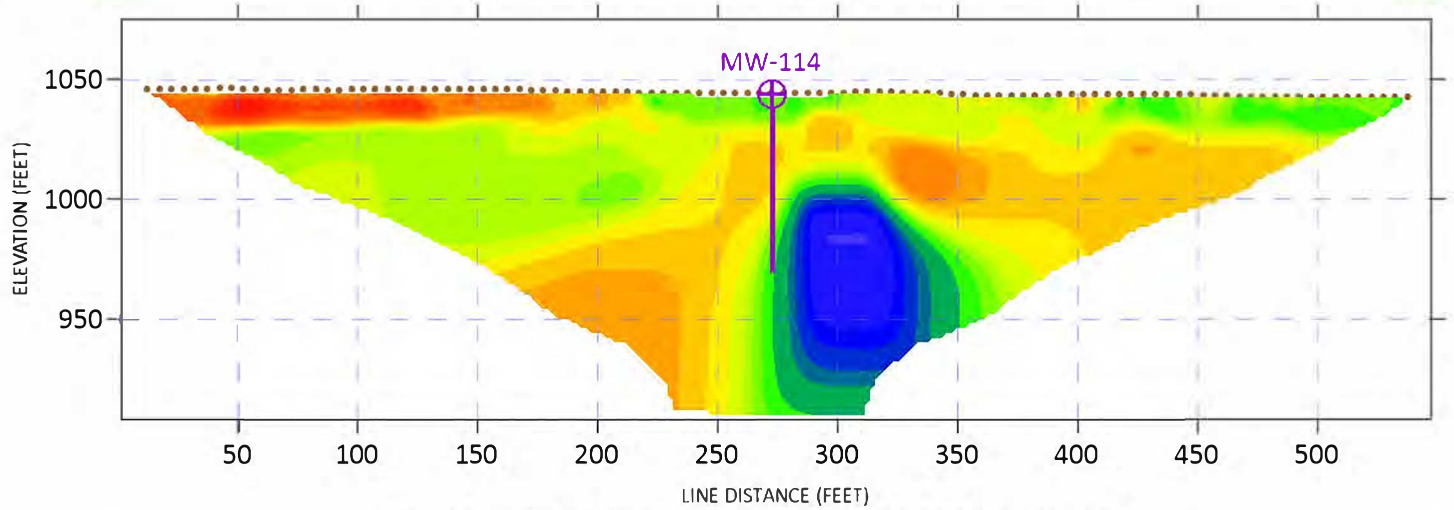
YYYY-MM-DD	2022-05-20
PREPARED	PEF
	PEF
REVIEW	DJB
APPROVED	NMD

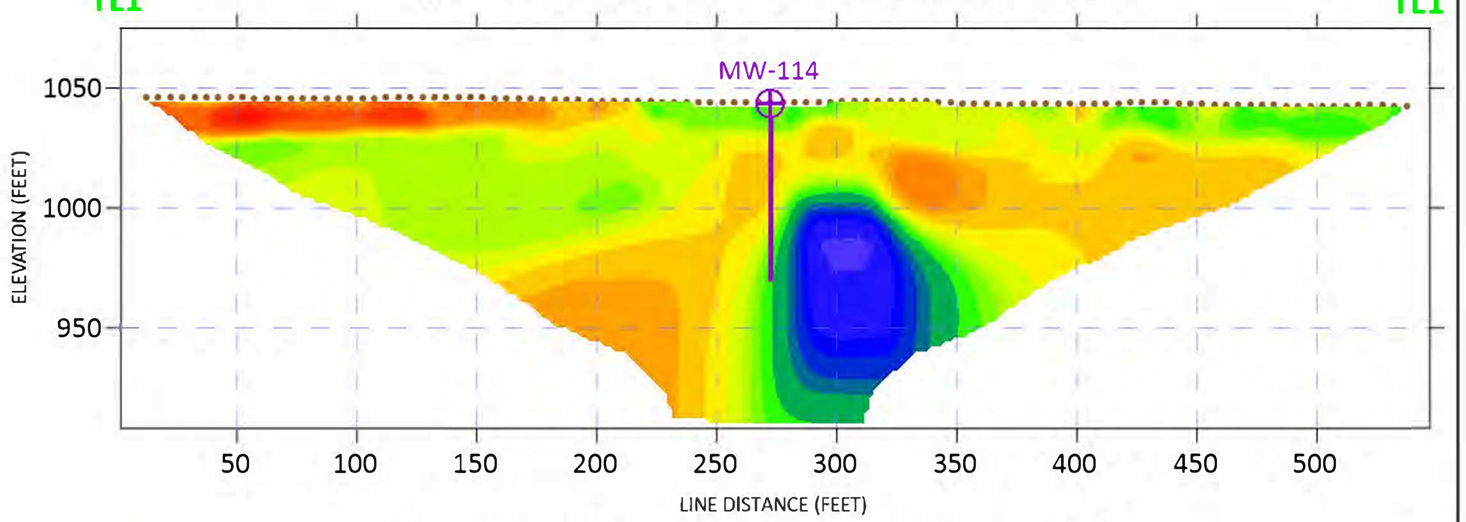
TITLE
TIME LAPSE ERI LINE TL1
2D MODEL RESISTIVITY SECTIONS
SHEET 1 OF 2

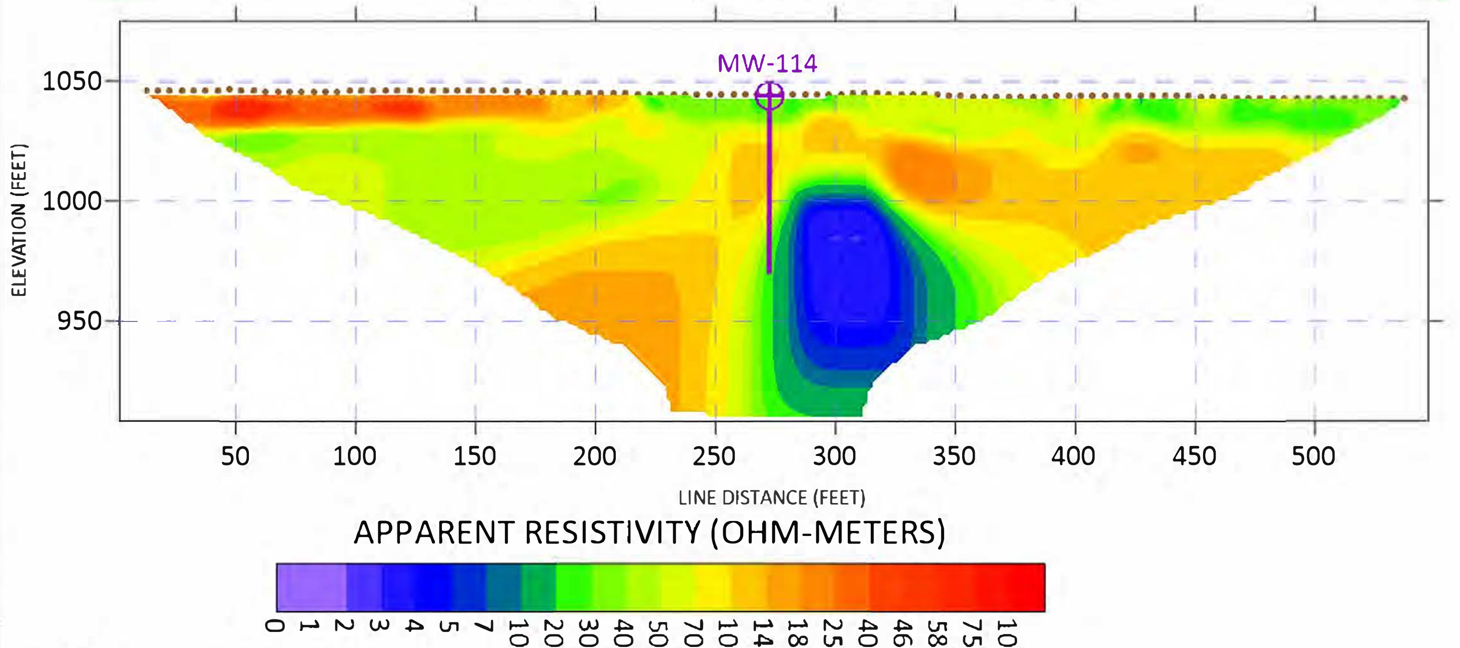
PROJECT No	Rev	Figure
12393309x10	A	3.13

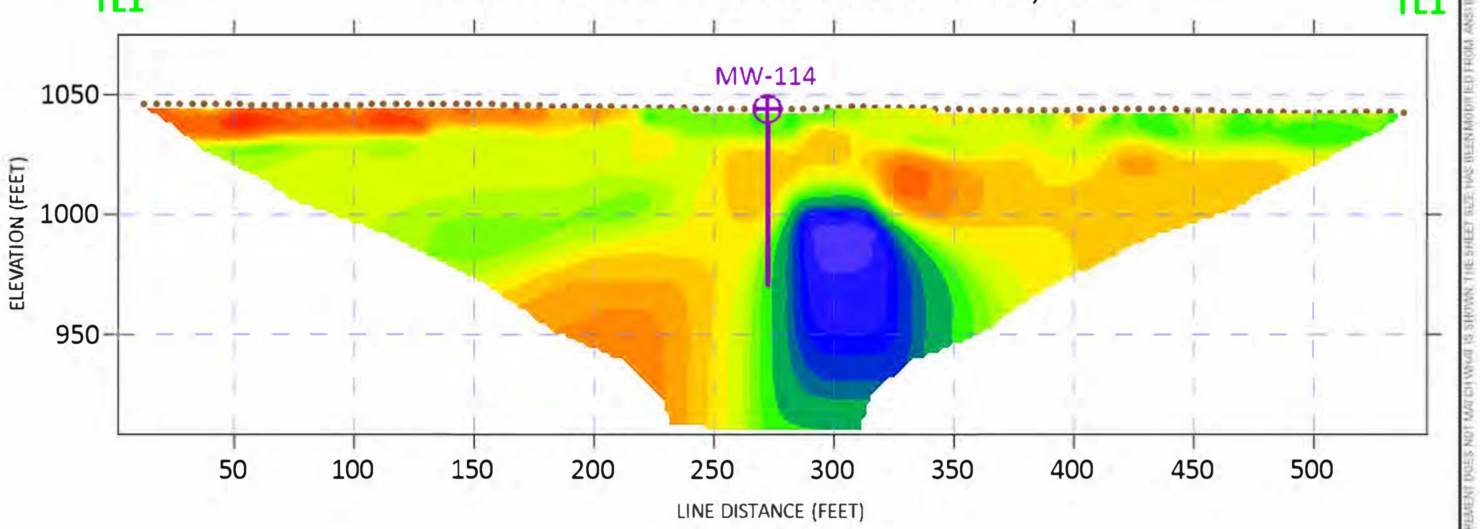

TIME LAPSE ERI - LINE TL1 - DECEMBER 02 , 2021


TIME LAPSE ERI - LINE TL1 - DECEMBER 09, 2021


TIME LAPSE ERI - LINE TL1 - DECEMBER 15, 2021


TIME LAPSE ERI - LINE TL1 - DECEMBER 20, 2021


TIME LAPSE ERI - LINE TL1 - DECEMBER 30 , 2021


TIME LAPSE ERI - LINE TL1 - JANUARY 13 , 2022

NOTES

1) ELEVATION DATA (NAVD88) COLLECTED WITH HEMISHPERE C321 SUBFOOT DGPS AND VERIFIED WITH AVAILABLE LIDAR SUREY DATA

2) RESISTIVITY DATA COLLECTED USING 56-CHANNEL AGI SUPERSTING R8+, EXTENDED DIPOLE-DIPOLE ARRAY AND FIXED ELECTRODES

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT

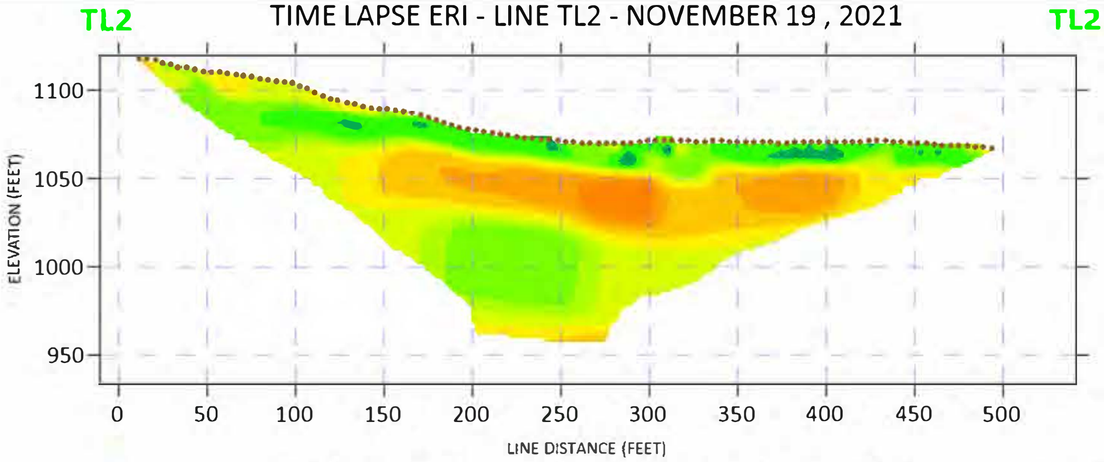
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-20
PREPARED	PEF
	PEF
REVIEW	DJB
APPROVED	NMD

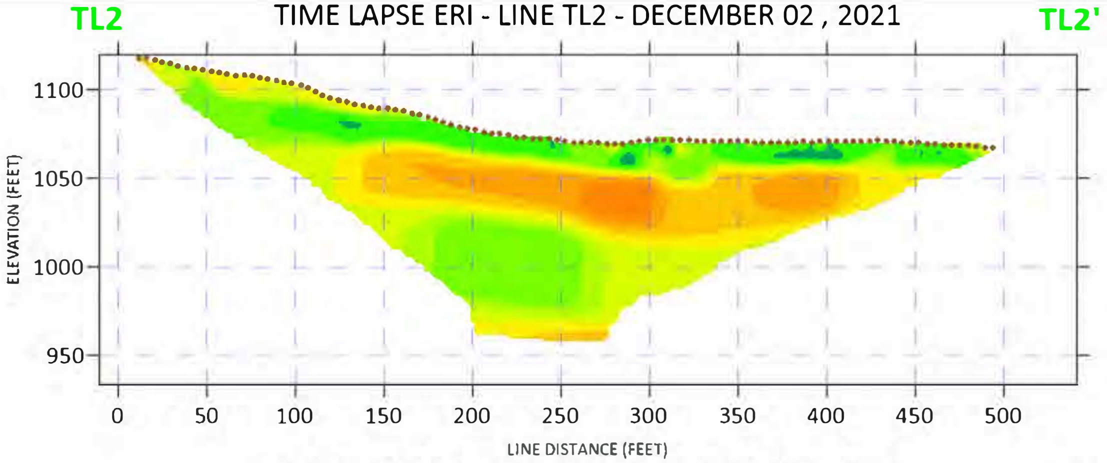
TITLE
TIME LAPSE ERI LINE TL1
2D MODEL RESISTIVITY SECTIONS
SHEET 2 OF 2

PROJECT No	Rev	Figure
12393309x10	A	3.14

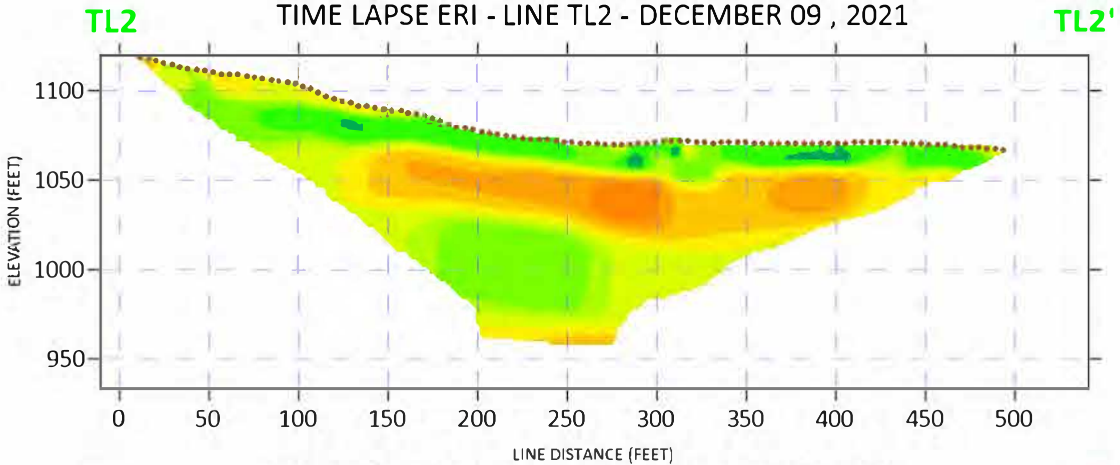
TIME LAPSE ERI - LINE TL2 - NOVEMBER 19 , 2021



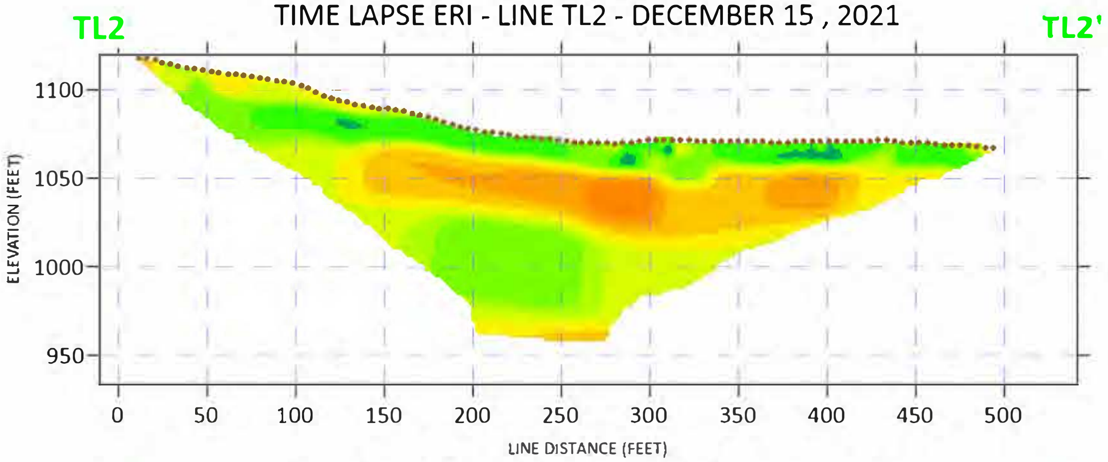
TIME LAPSE ERI - LINE TL2 - DECEMBER 02 , 2021



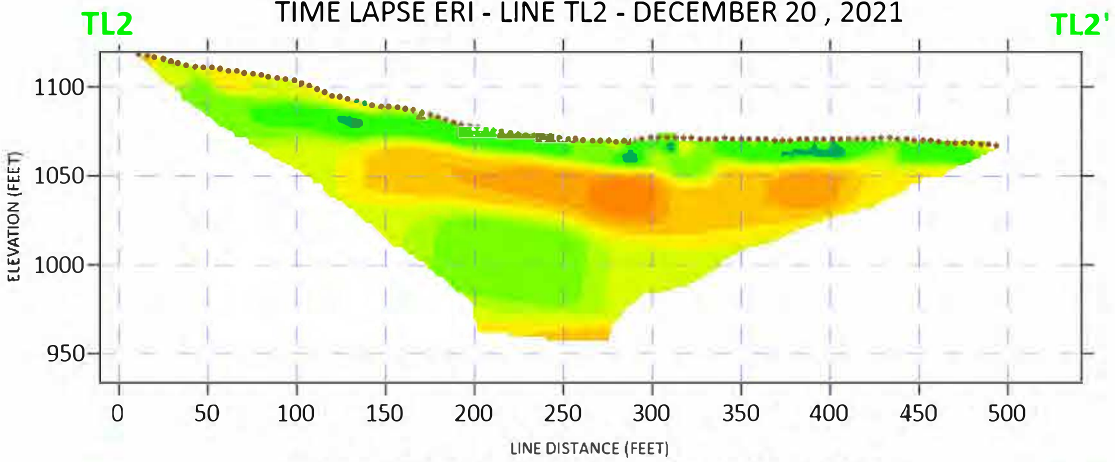
TIME LAPSE ERI - LINE TL2 - DECEMBER 09 , 2021



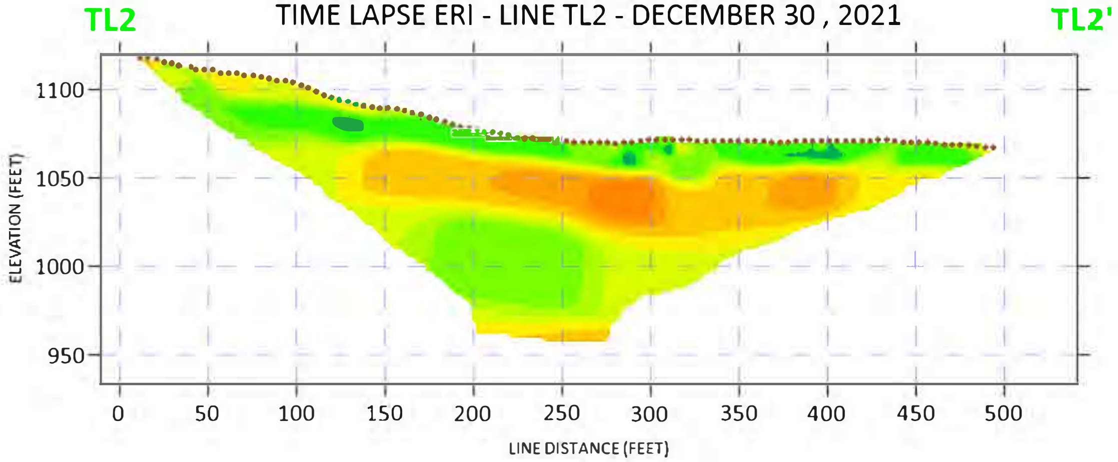
TIME LAPSE ERI - LINE TL2 - DECEMBER 15 , 2021



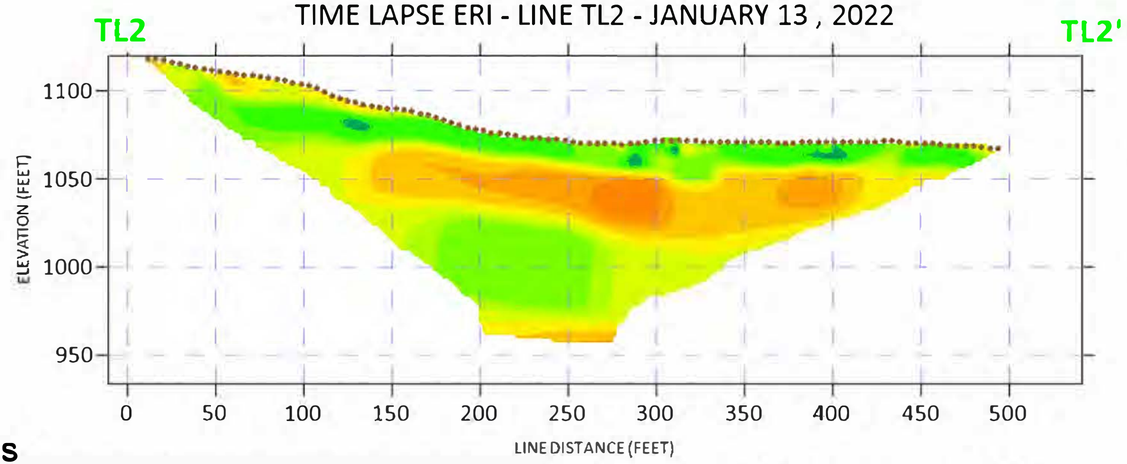
TIME LAPSE ERI - LINE TL2 - DECEMBER 20 , 2021



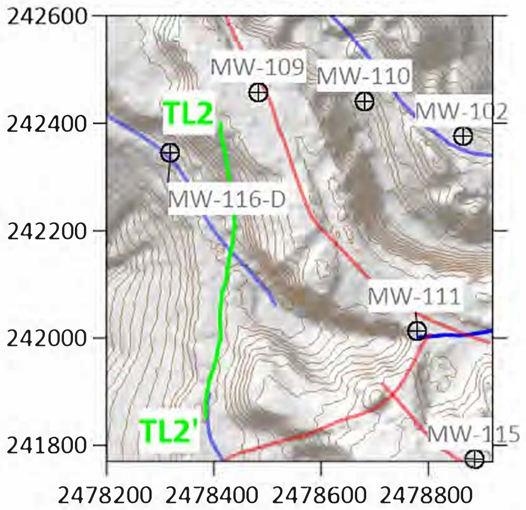
TIME LAPSE ERI - LINE TL2 - DECEMBER 30 , 2021



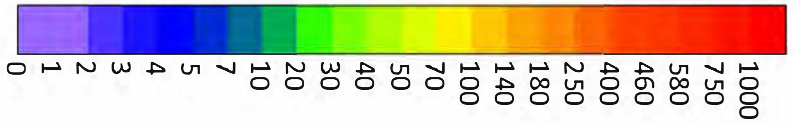
TIME LAPSE ERI - LINE TL2 - JANUARY 13 , 2022



LINE LOCATION MAP



APPARENT RESISTIVITY (OHM-METERS)



NOTES

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2) RESISTIVITY DATA COLLECTED USING 56-CHANNEL AGI SUPERSTING R8+, EXTENDED DIPOLE-DIPOLE ARRAY AND FIXED ELECTRODES

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

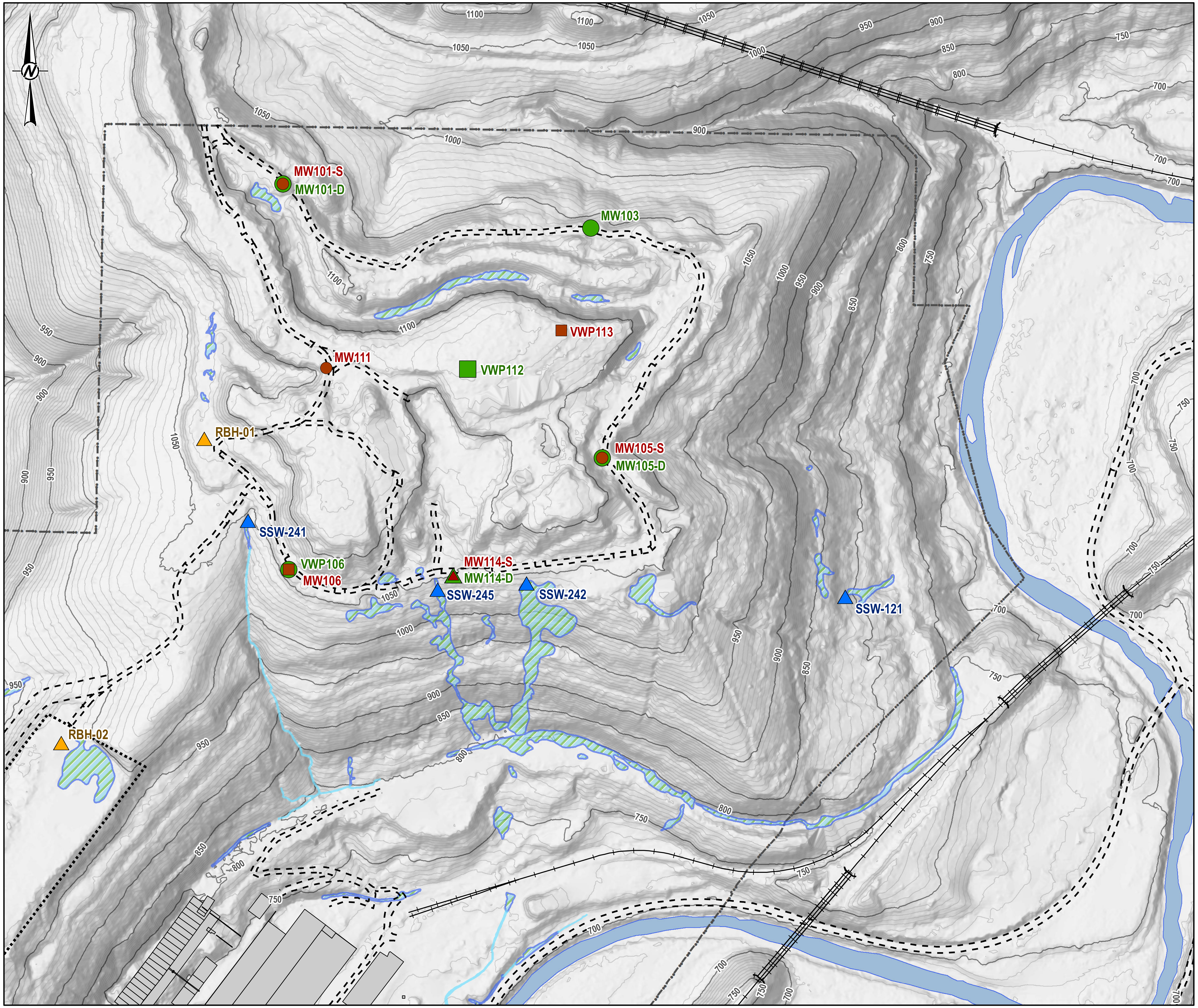
CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD 2022-05-21
PEF
PEF
REVIEW DJB
APPROVED NMD

TITLE
TIME LAPSE ERI LINE TL2
2D MODEL RESISTIVITY SECTIONS

PROJECT No 12393309x10
Rev A
Figure 3.15

1 inch
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

TRANSDUCER AND PIEZOMETER LOCATIONS

- ▲ AT - RBH MONITORING WELL
- ▲ AT - SEEPS
- ▲ AT - UNDER COAL ZONE
- ● XD - UNDER COAL ZONE
- ■ VWP - UNDER COAL ZONE
- ▲ AT - UPPER CASSELMAN ZONE
- ● XD - UPPER CASSELMAN ZONE
- ■ VWP - UPPER CASSELMAN ZONE
- ┼ RAILROAD
- ⬚ PROPERTY BOUNDARY
- ⬚ GARY SMITH PROPERTY BOUNDARY
- ⬚ ROADS
- ▭ EXISTING FACILITY
- ▭ TRIBUTARY
- ▨ WETLAND
- ▭ CROSS CREEK
- — ELEVATION CONTOUR (5-FT INTERVAL)
- — ELEVATION CONTOUR (50-FT INTERVAL)

0 250 500

1 " = 313 FT FEET

NOTE(S)

1. GOLDER ASSOCIATES USA INC. (TRANSDUCER AND PIEZOMETER LOCATIONS, FACILITY/PROPERTY BOUNDARY, RAILROAD, ROADS, PROPERTY BOUNDARY, TRIBUTARY, WETLAND, TOPOGRAPHIC CONTOUR)
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET
3. MONITORING WELL LABELS: -S=SHALLOW SCREEN, -D=DEEP SCREEN
4. TRANSDUCER AND PIEZOMETER LEGEND: AT = LEVEL/CONDUCTIVITY, XD = LEVEL, VPW = VIBRATING WIRE PIEZOMETER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
TRANSDUCER AND PIEZOMETER MONITORING LOCATIONS

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-27
DESIGNED	BI
PREPARED	BM
REVIEWED	BI
APPROVED	

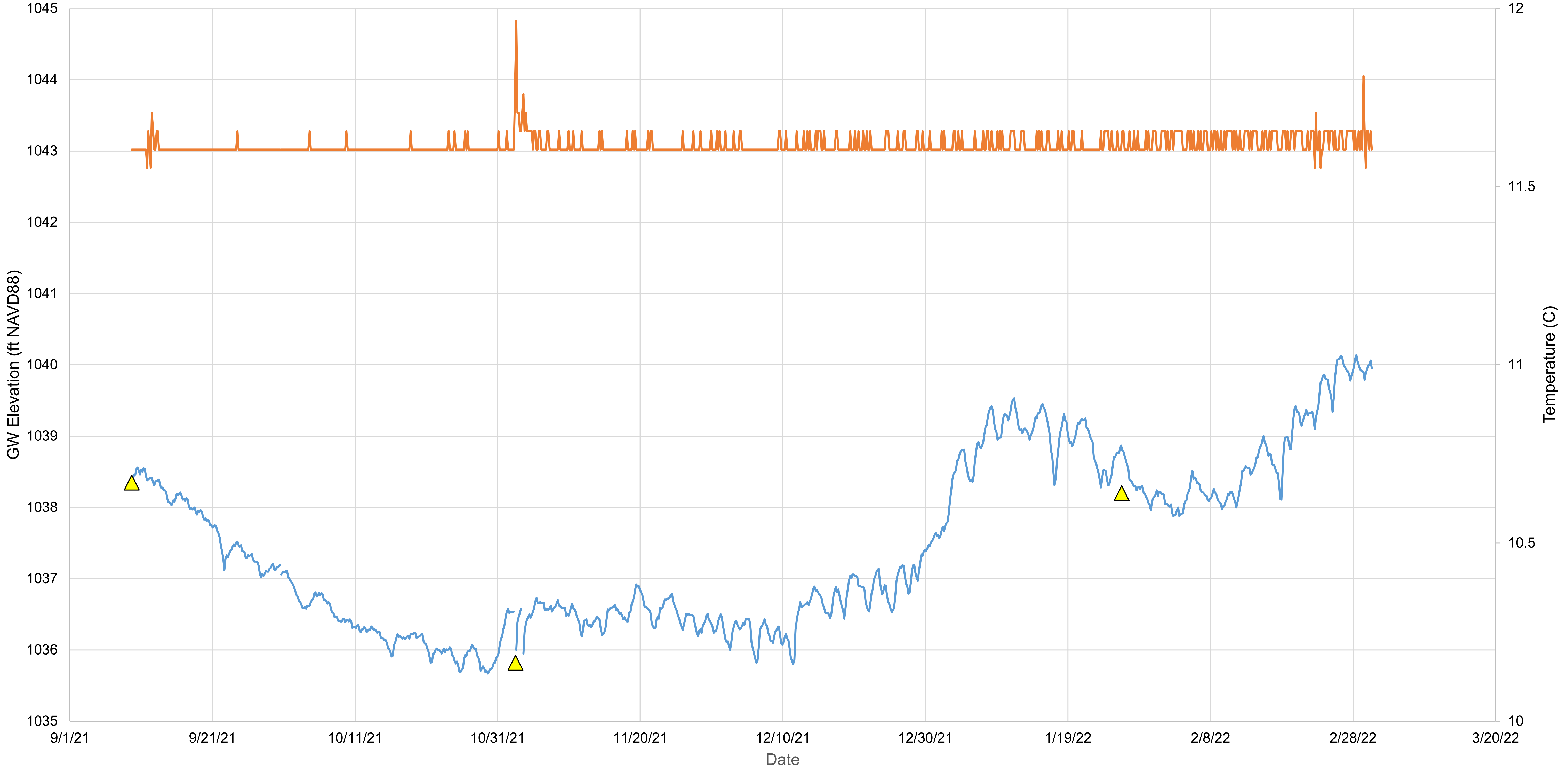
PROJECT NO.	REV.	FIGURE
12393309X10	A	3.16

PATH: O:\02-GIS Files\1239330910 Satralloy MAI\GIS\Maps\MXDs\MAI_Report_2022_01\Fig3-16_Transducer_Piezometer_Locations.mxd PRINTED ON: 2022-05-27 AT: 3:26:24 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD/XD Hydrographs_Version 2 | FILE NAME: MW-101-D.xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

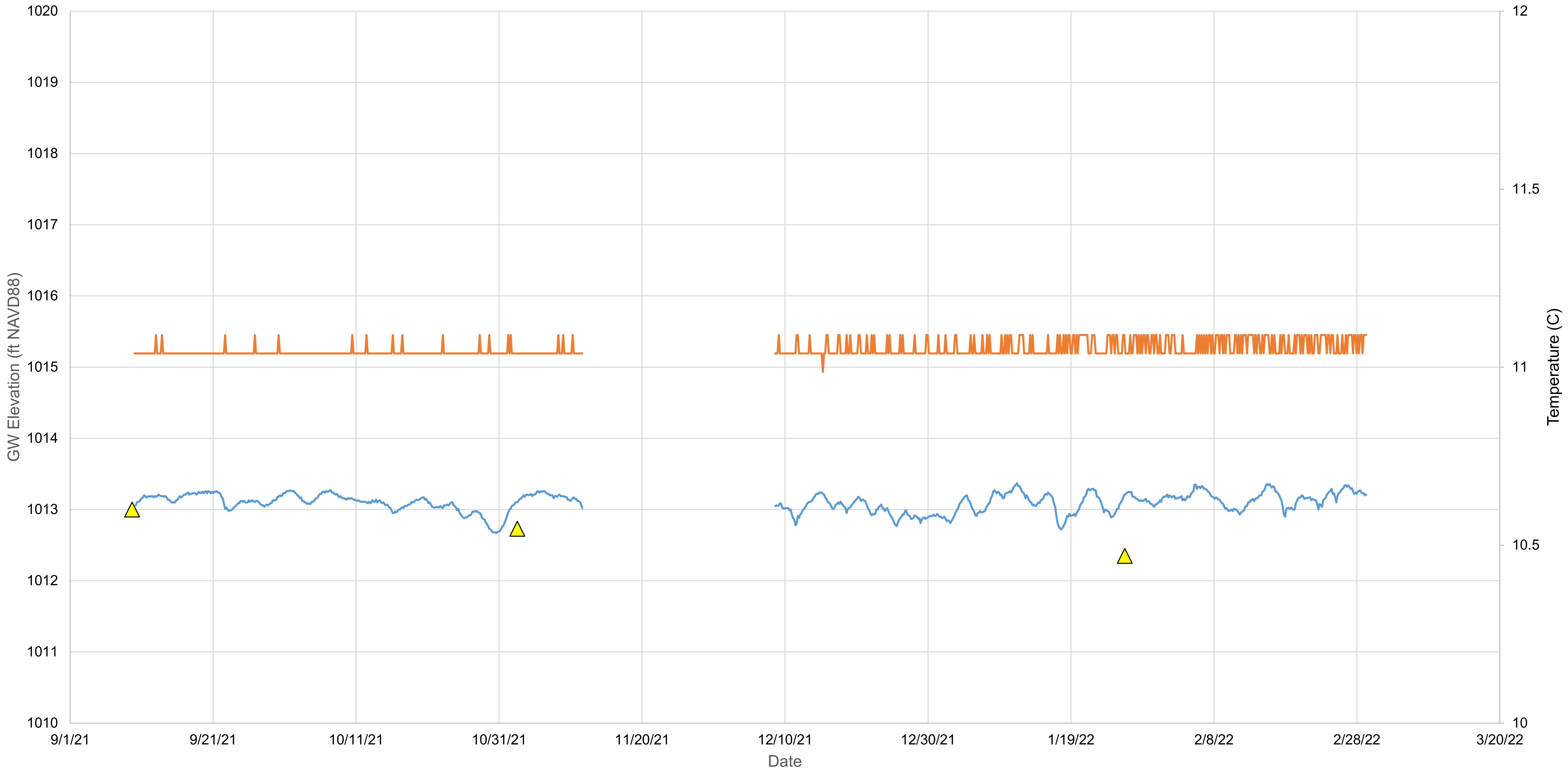
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
MW-101-D-Upper Casselman Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.17

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD/XD Hydrographs_Version 2 | FILE NAME: MW-103.xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

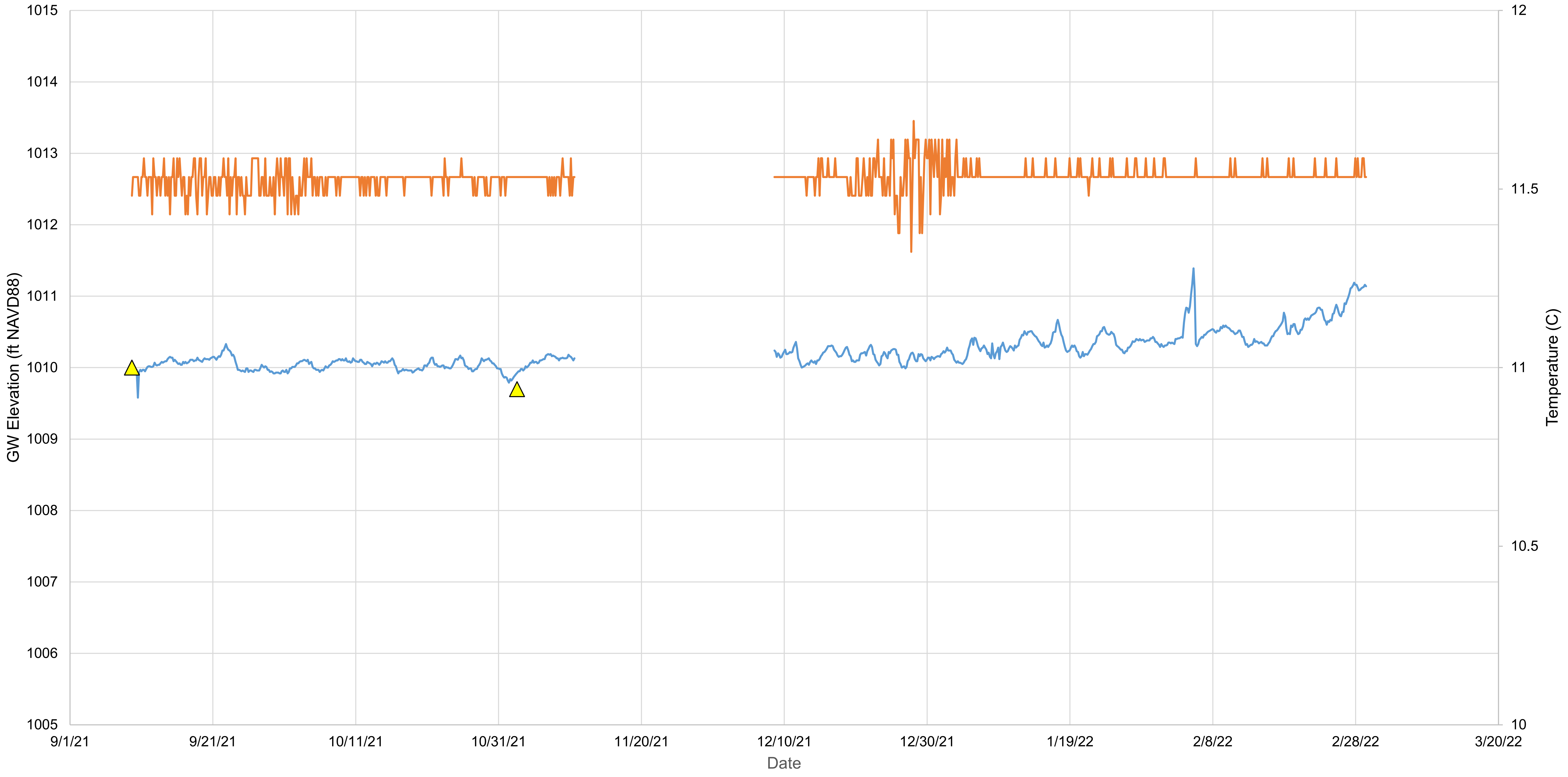
CONSULTANT

GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
MW-103-Upper Casselman Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.18



△ Manual Measurements

— GW Elevation (ft NAVD88)

— Temperature (C)

CLIENT
CYPRUS AMAX MINERALS COMPANY

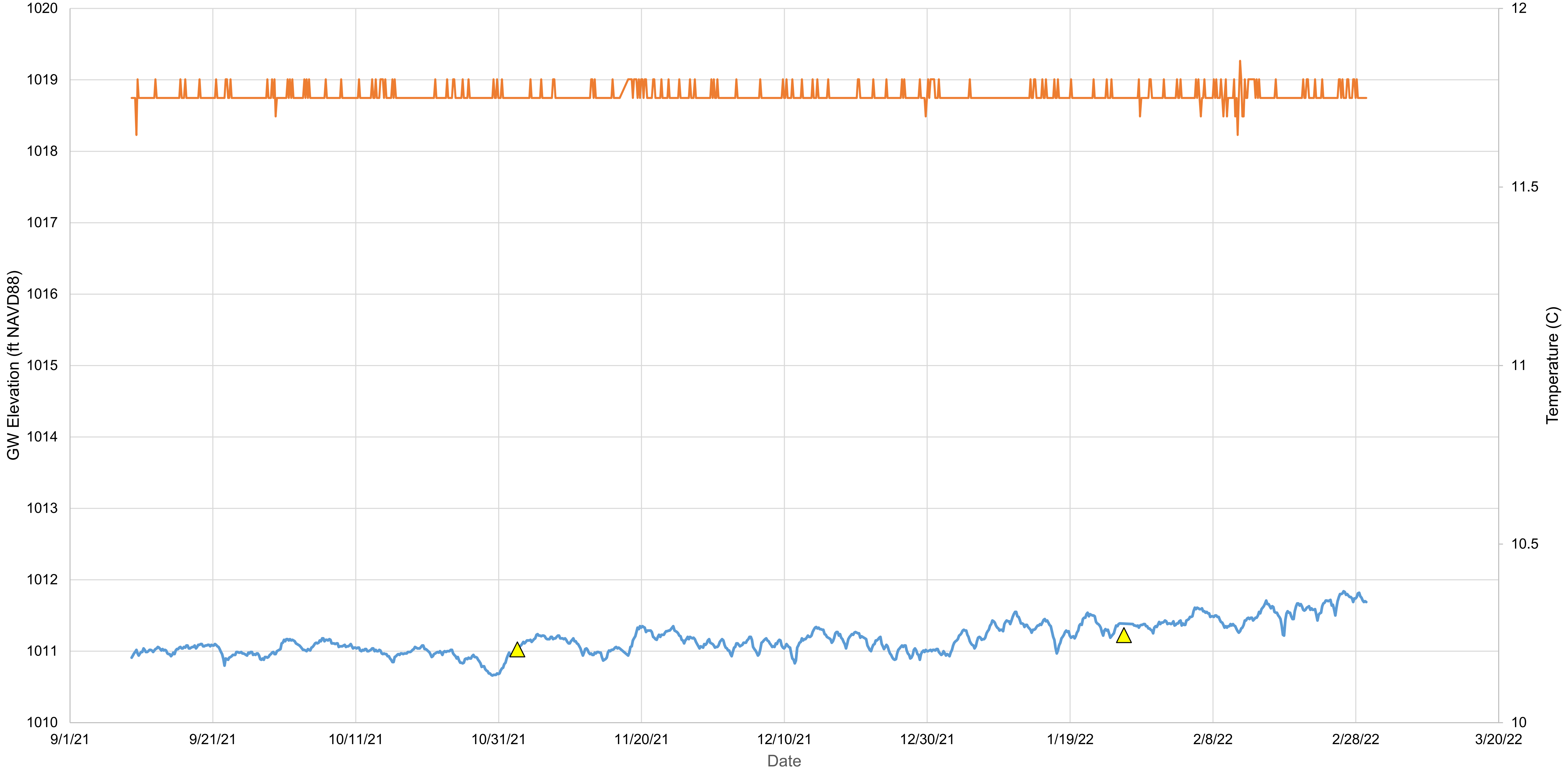
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
MW-105-D-Upper Casselman Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.19

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD/XD Hydrographs_Version 2 | FILE NAME: MW-106.xlsx



△ Manual Measurements

GW Elevation (ft NAVD88)

Temperature (C)

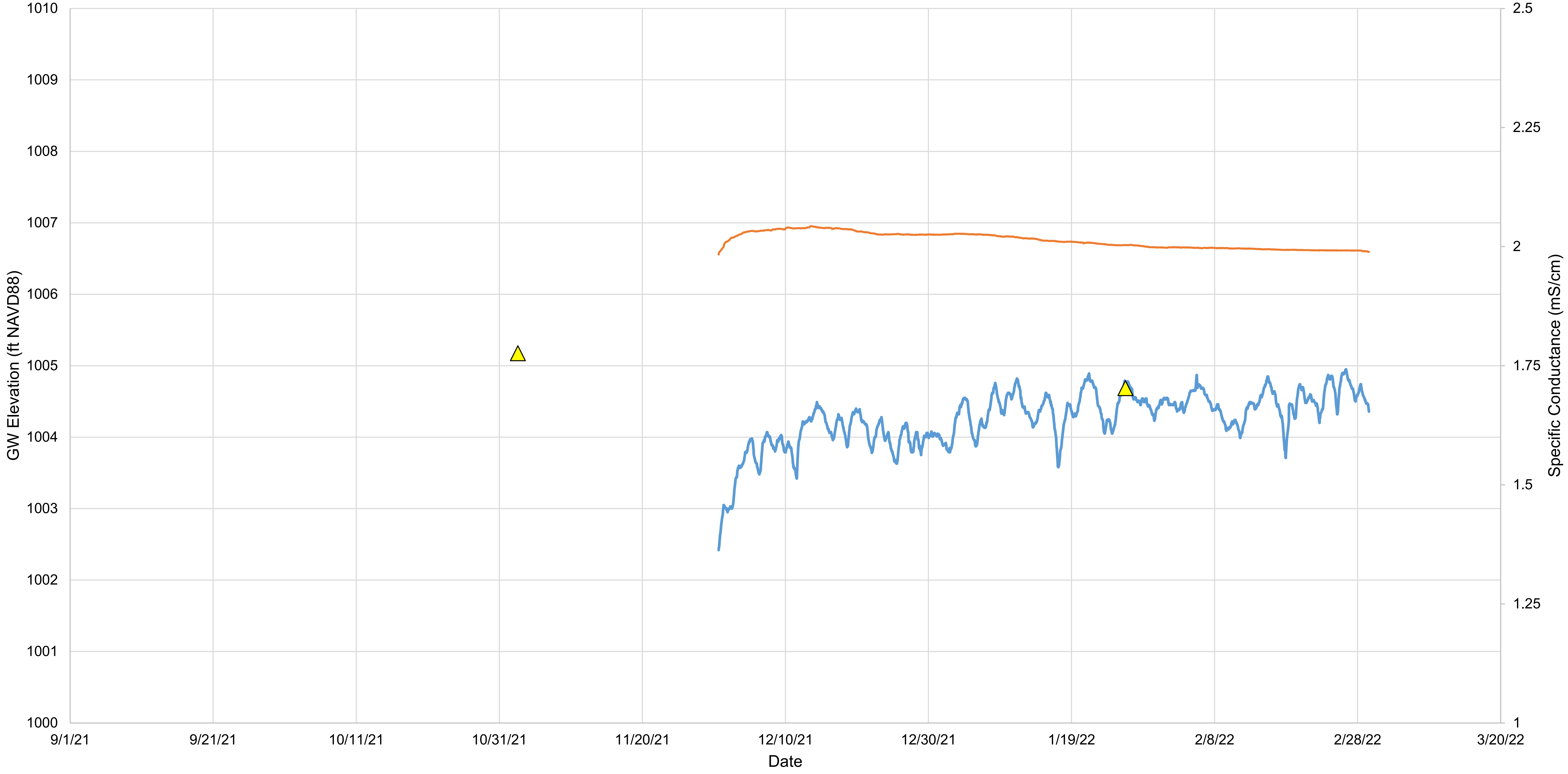
CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
MW-106-Upper Casselman Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.20



CLIENT
CYPRUS AMAX MINERALS COMPANY

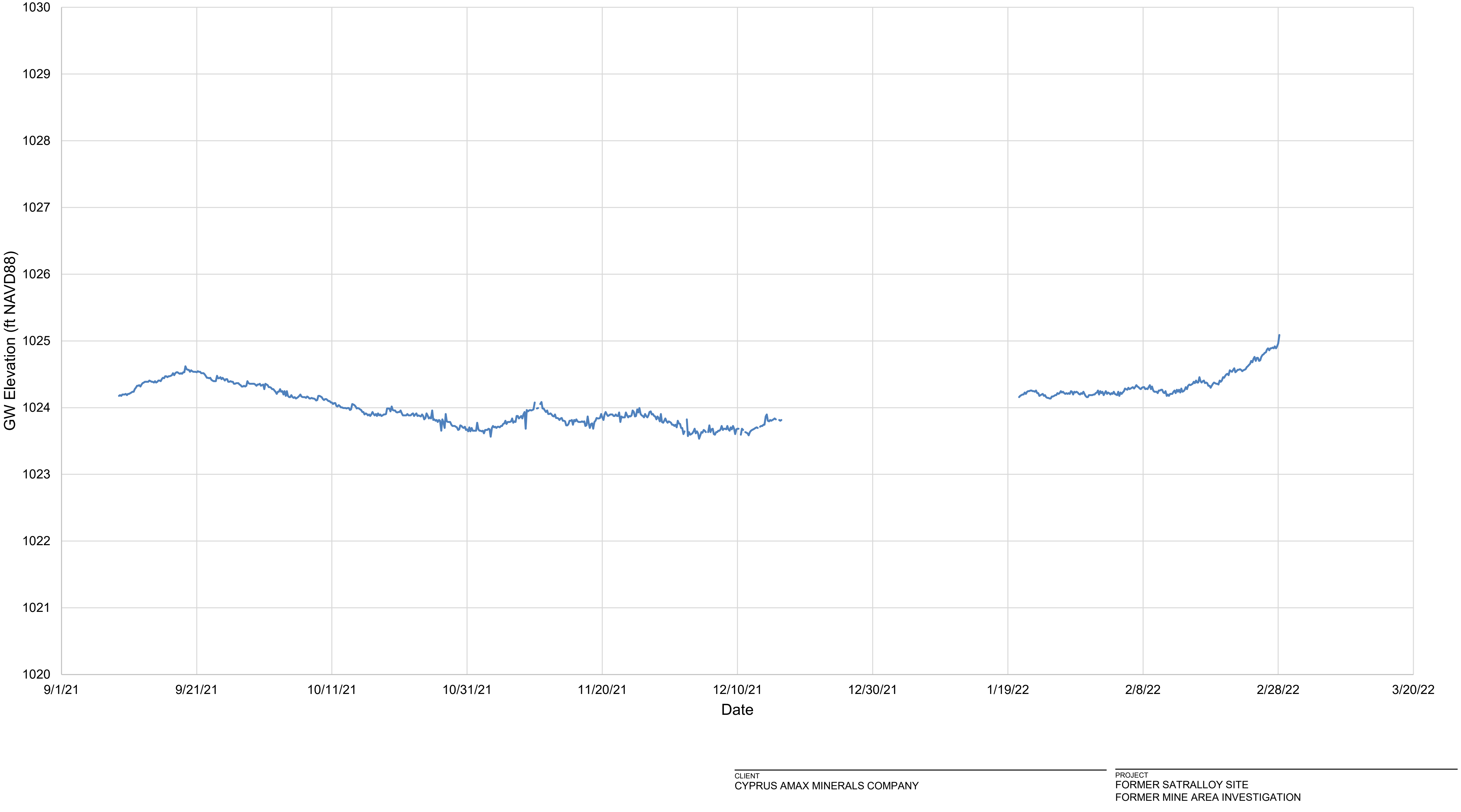
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
MW-114-D-Upper Casselman Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.21

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/VWP/VWP hydrographs - Version 2 | FILE NAME: VWQL_40462 MW112 (2021-09-30).xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
VPW-112-Upper Casselman Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.22

CLIENT
CYPRUS AMAX MINERALS COMPANY

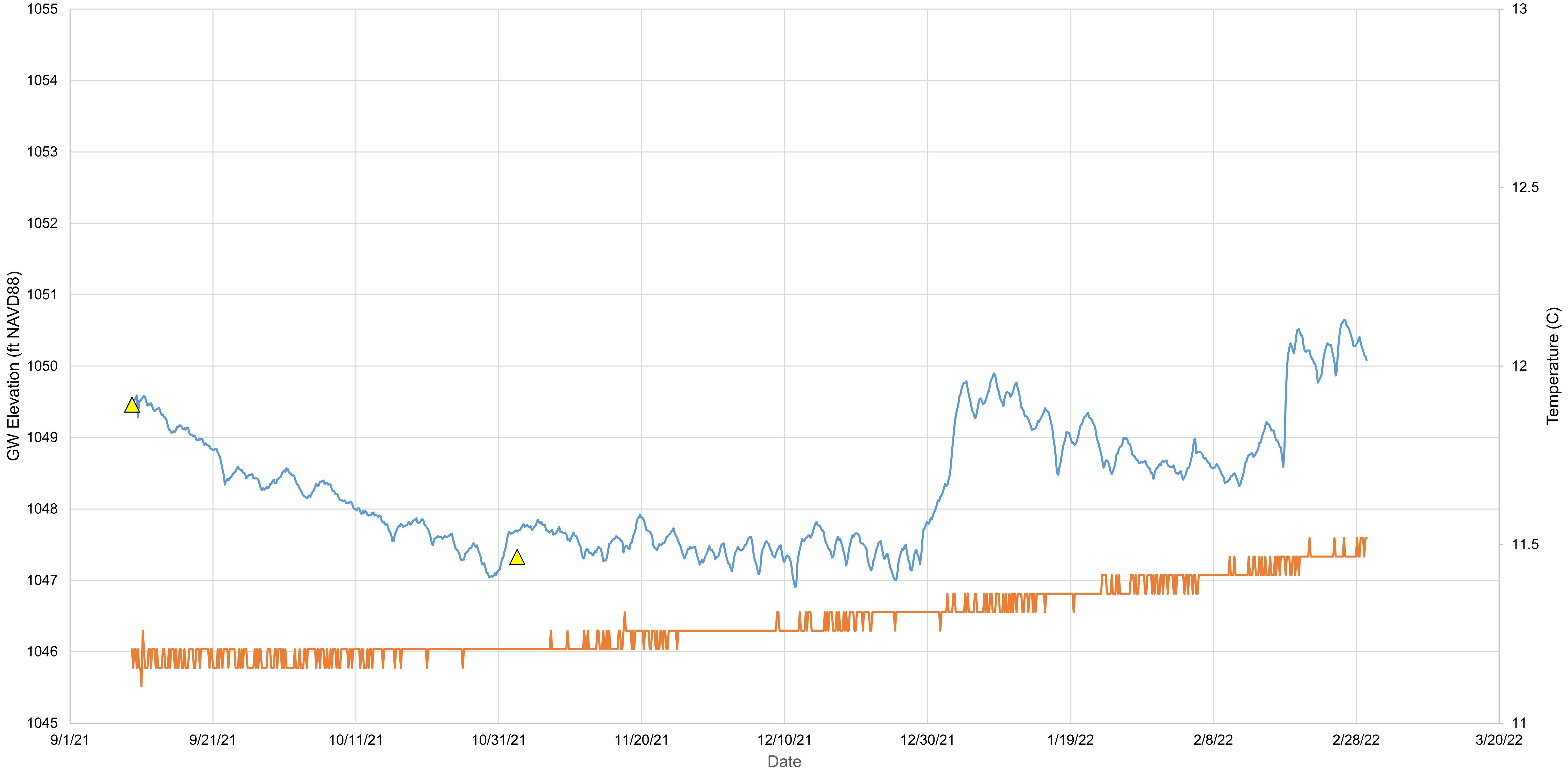
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
MW-101-S-Under Coal Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.23

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD/XD Hydrographs_Version 2 | FILE NAME: MW-105-S.xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
MW-105-S-Under Coal Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.24

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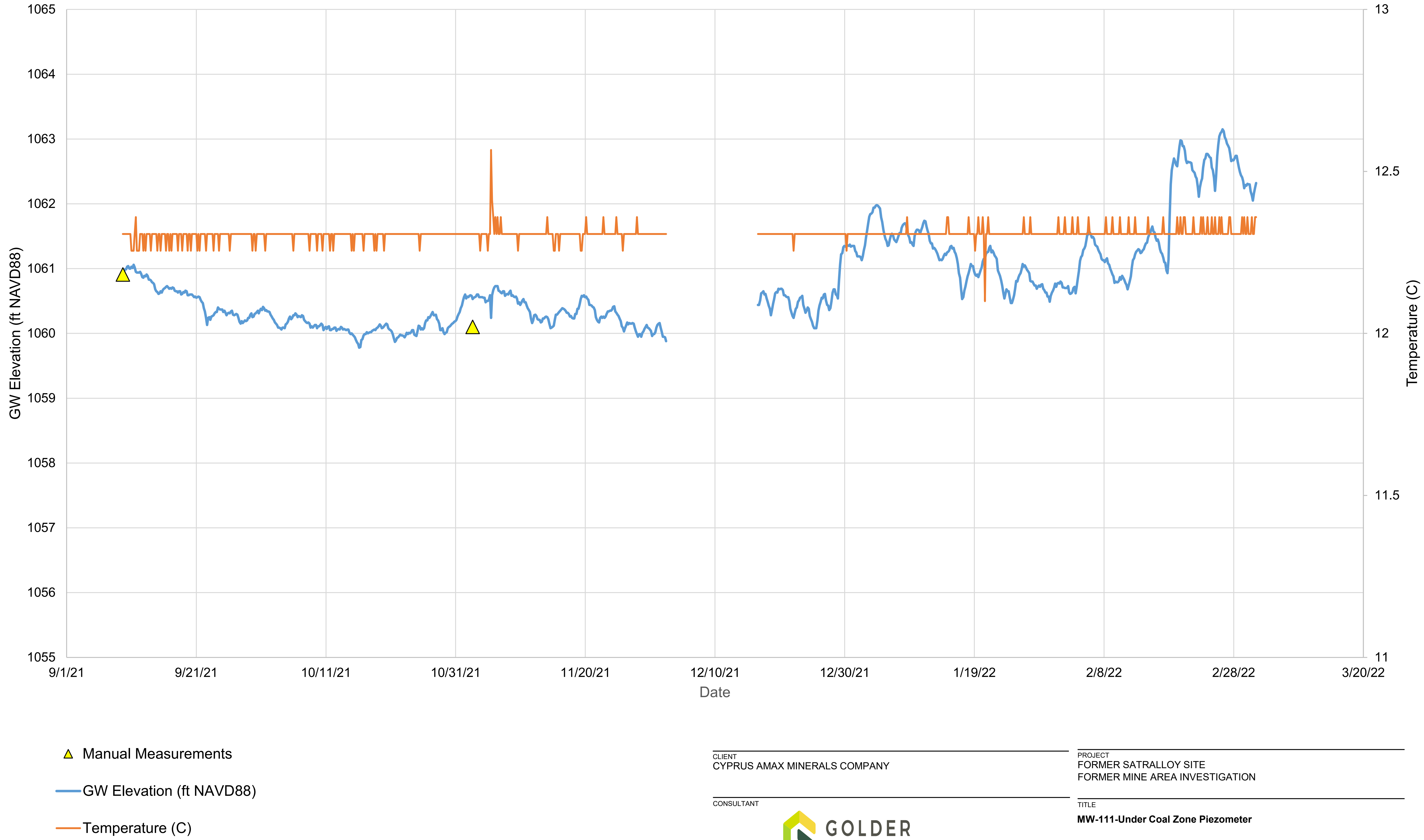


CLIENT
CYPRUS AMAX MINERALS COMPANY

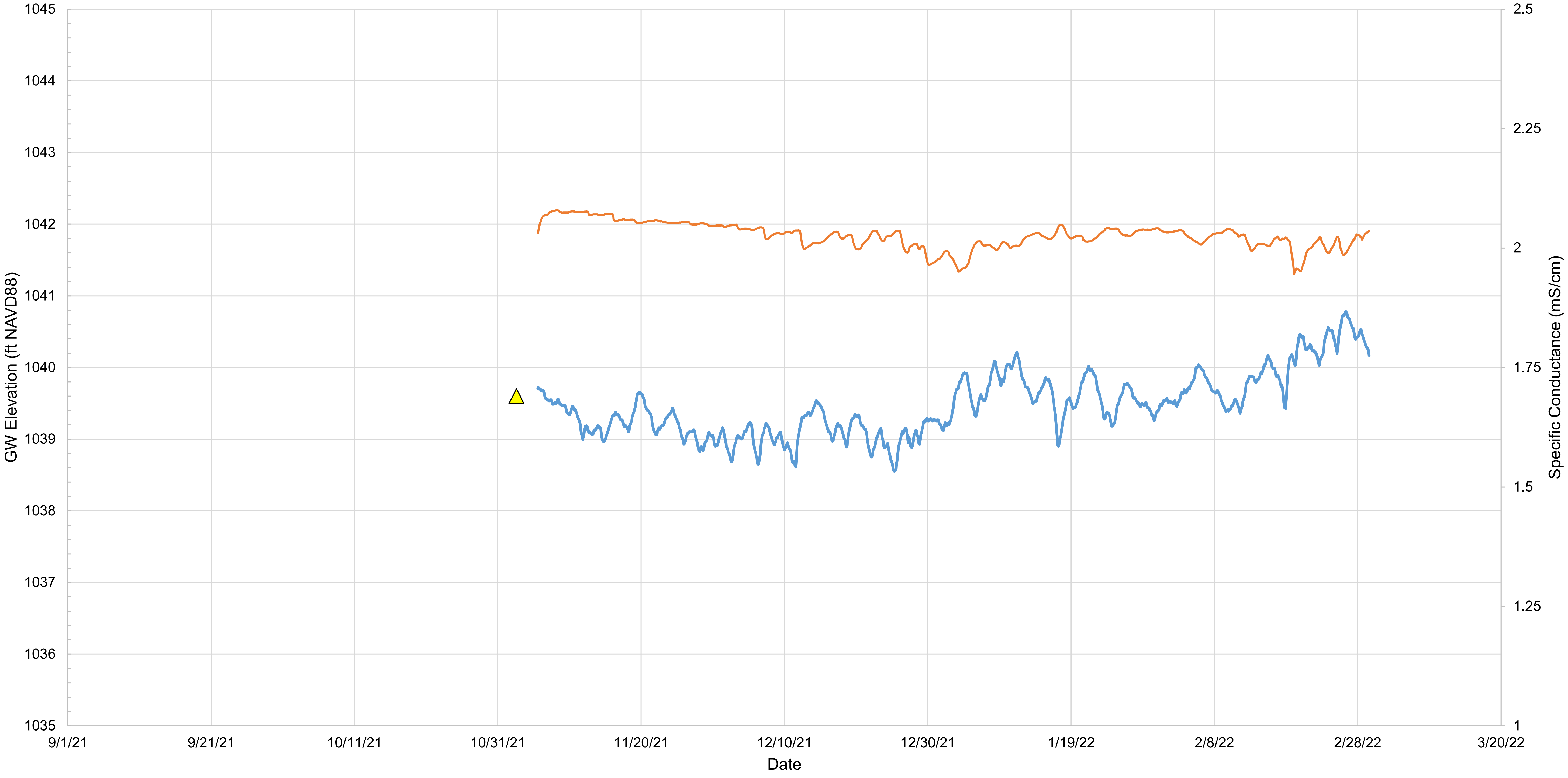
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
MW-111-Under Coal Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.25

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD/XD Hydrographs_Version 2 | FILE NAME: MW-114-S.xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

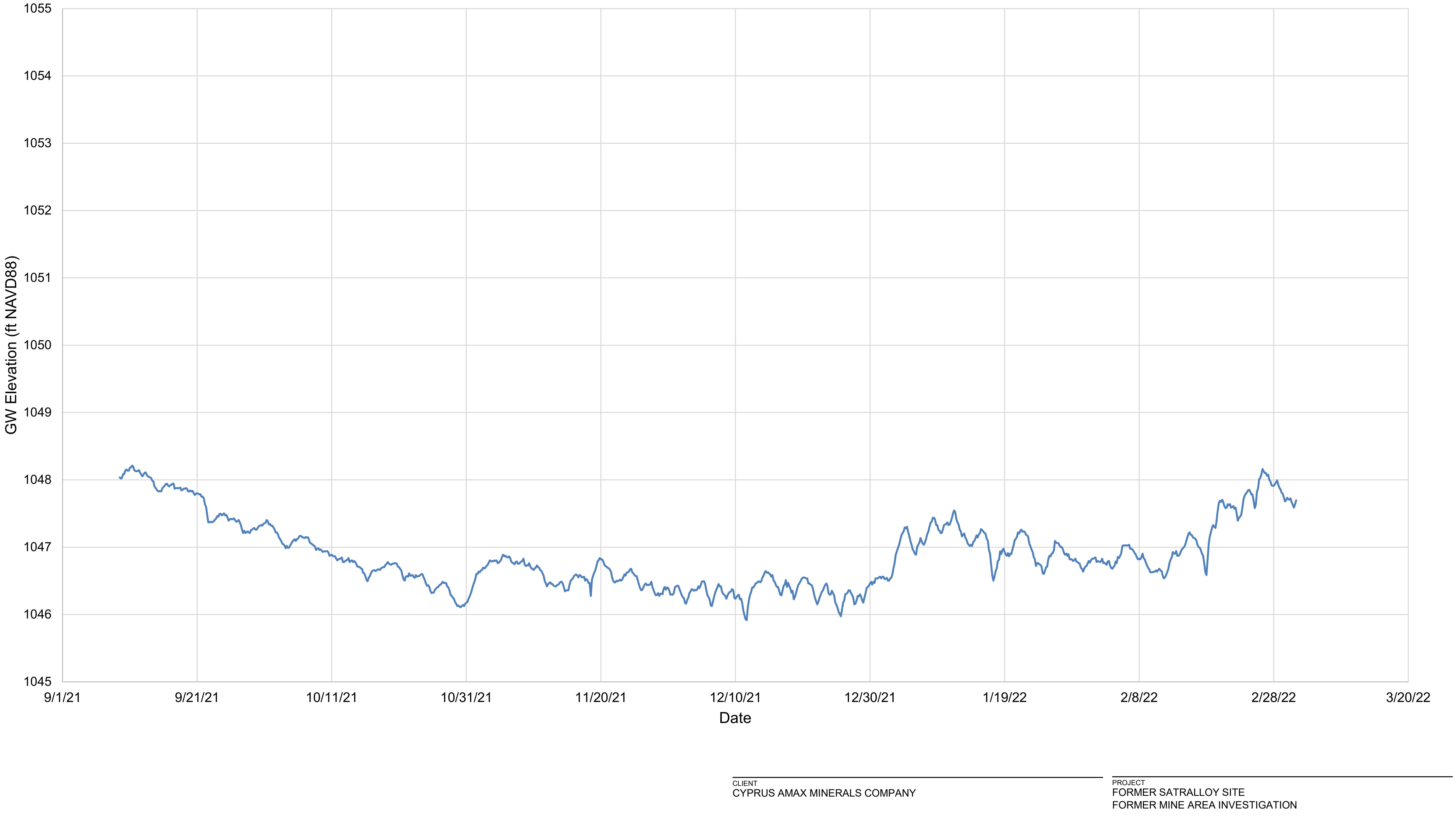
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
MW-114-S-Under Coal Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.26

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/VWP/VWP hydrographs - Version 2 | FILE NAME: VWQL_40214 MW113 (2021-09-30).xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

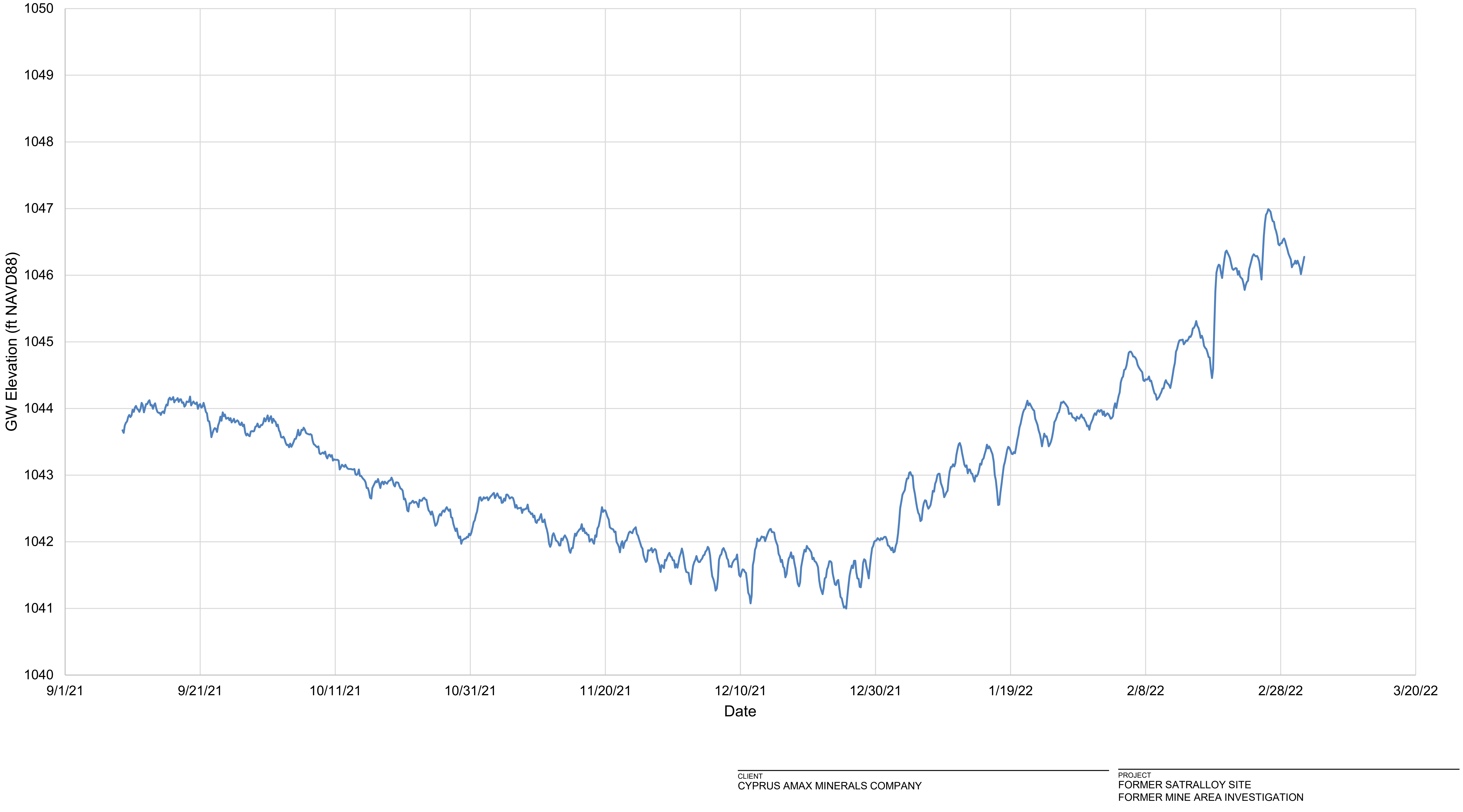
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
VPW-113-Under Coal Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.27

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/VWP/VWP hydrographs - Version 2 | FILE NAME: VWQL_41195 MW106 (2021-09-30).xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
VPW-106-Under Coal Zone Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.28

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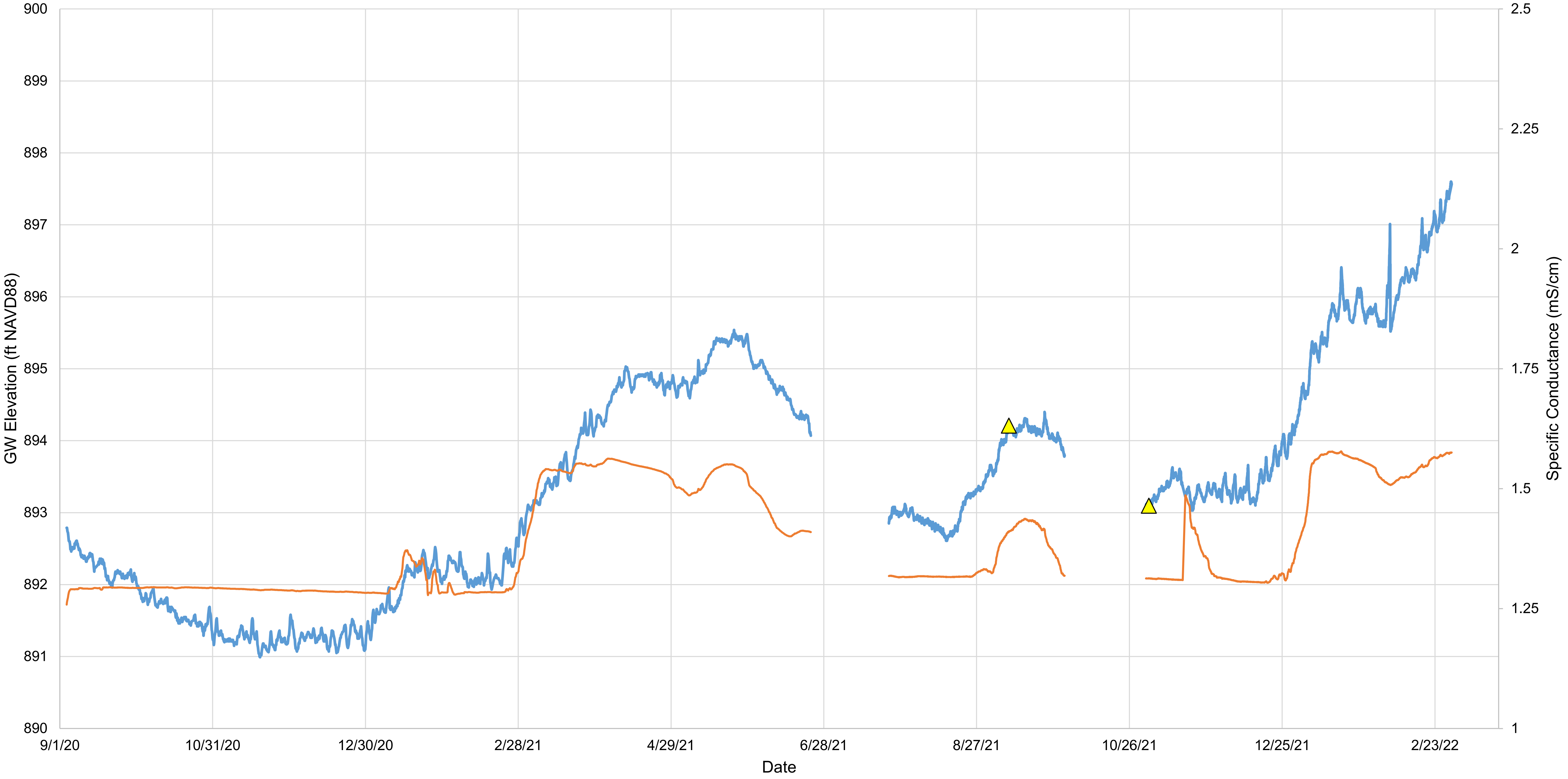


CLIENT
CYPRUS AMAX MINERALS COMPANY

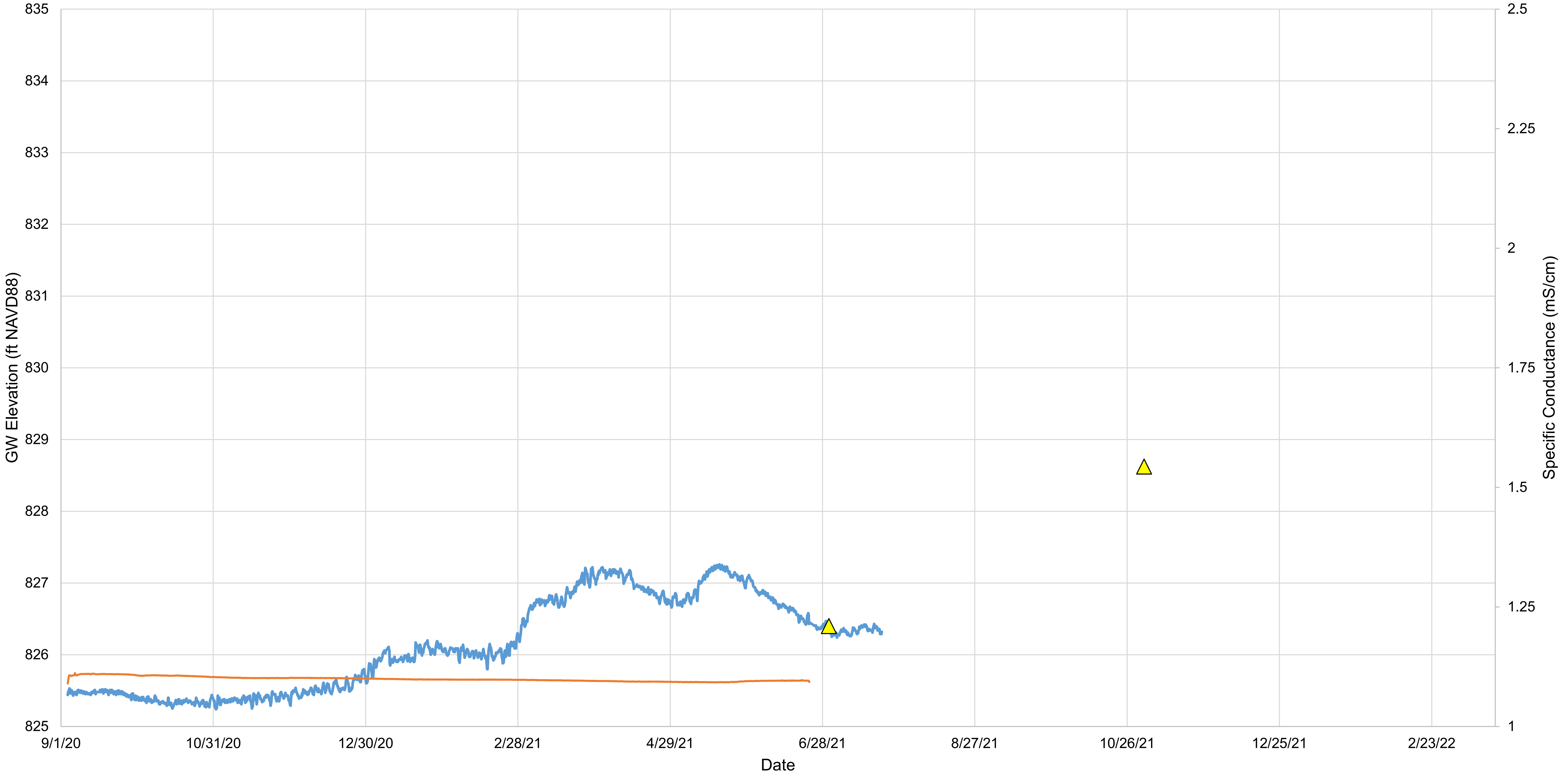
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
RBH-01-Regional Bedrock Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.29

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD/XD Hydrographs_Version 2 | FILE NAME: RBH-02.xlsx



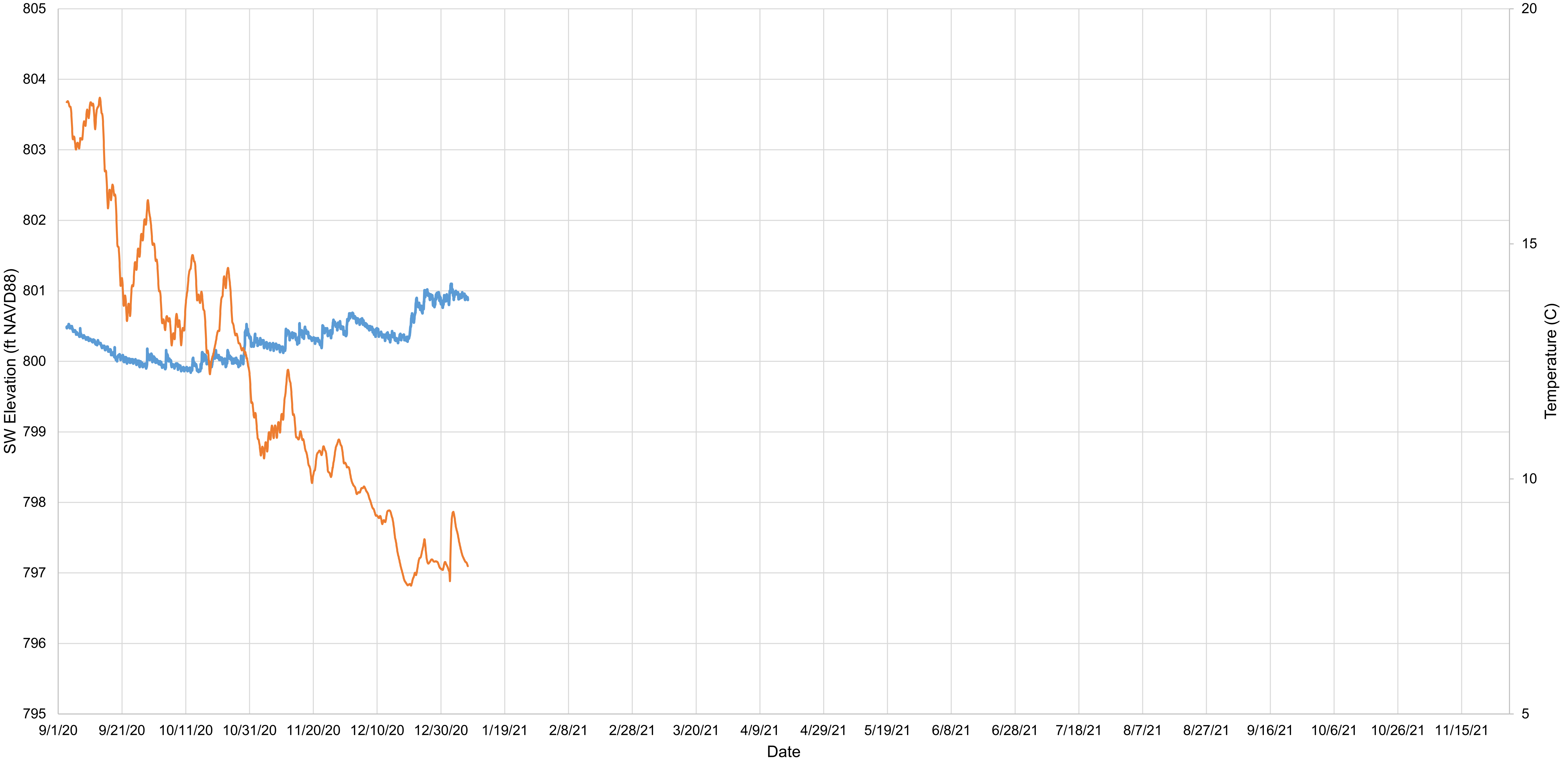
CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
RBH-02-Regional Bedrock Piezometer

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.30



CLIENT
CYPRUS AMAX MINERALS COMPANY

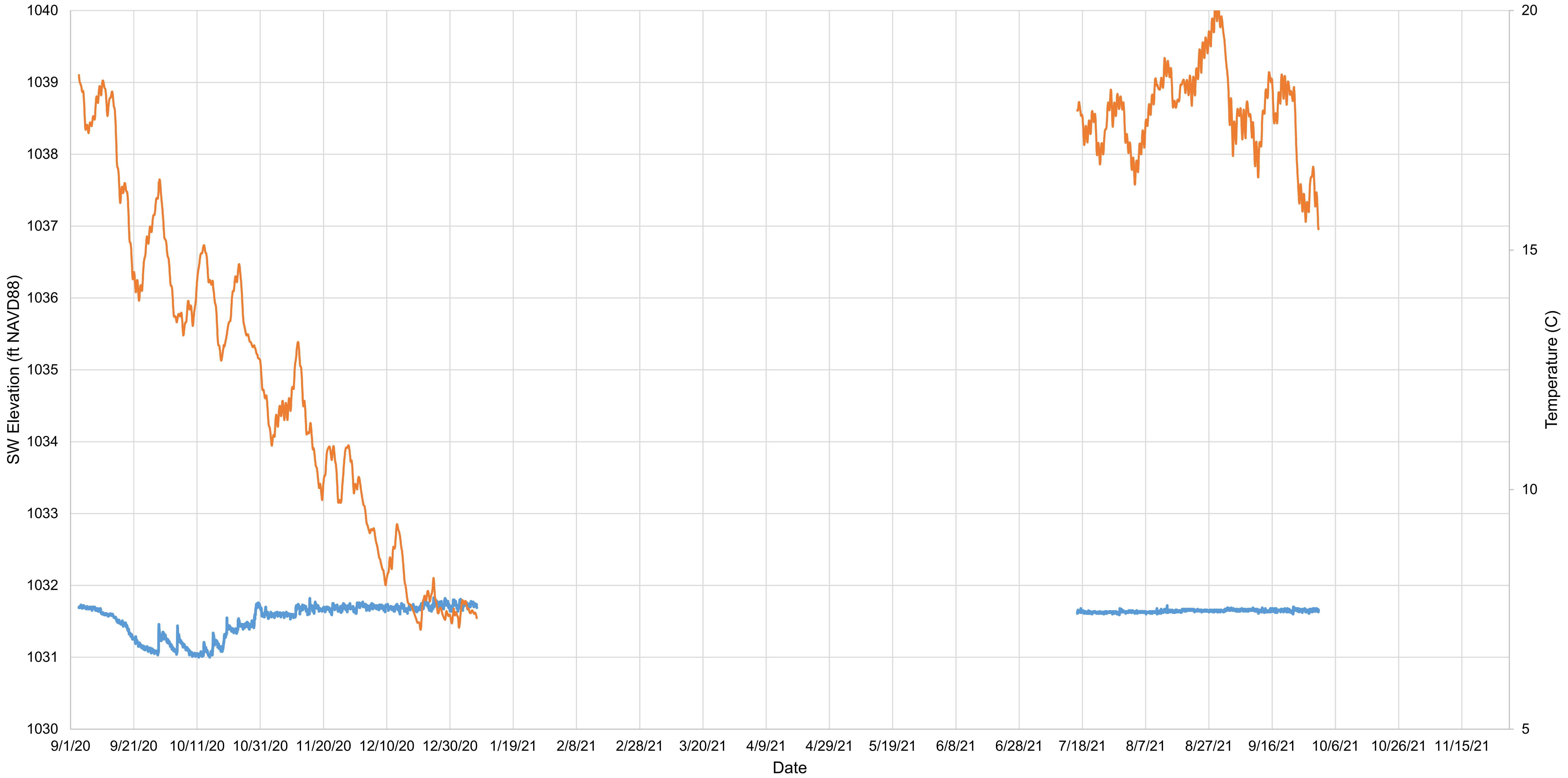
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
SSW-121

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.31

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD/XD Hydrographs_Version 2 | FILE NAME: SSW-241.xlsx



— SW Elevation (ft NAVD88)

— Temperature (C)

CLIENT
CYPRUS AMAX MINERALS COMPANY

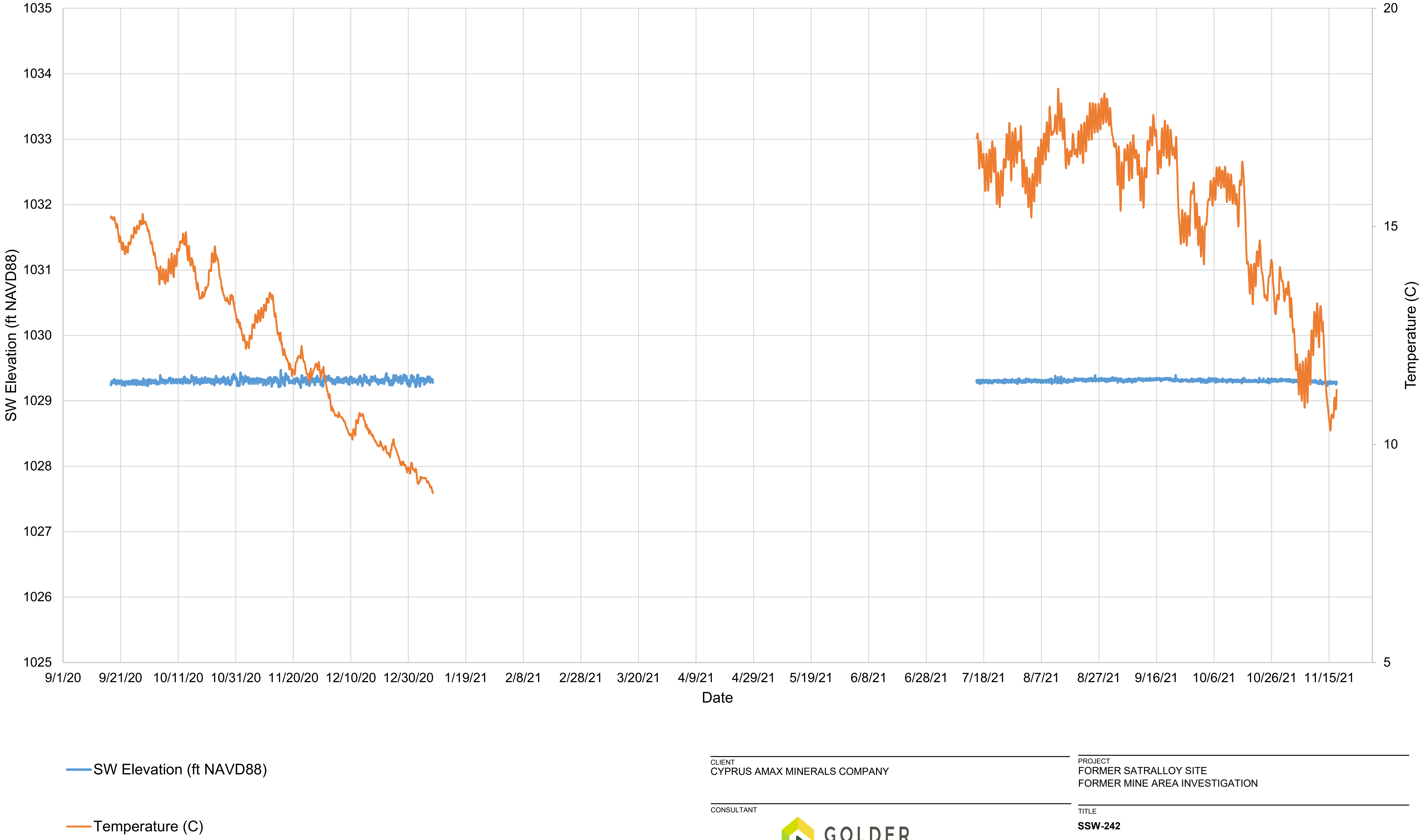
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
SSW-241

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.32

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD/XD Hydrographs_Version 2 | FILE NAME: SSW-242.xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

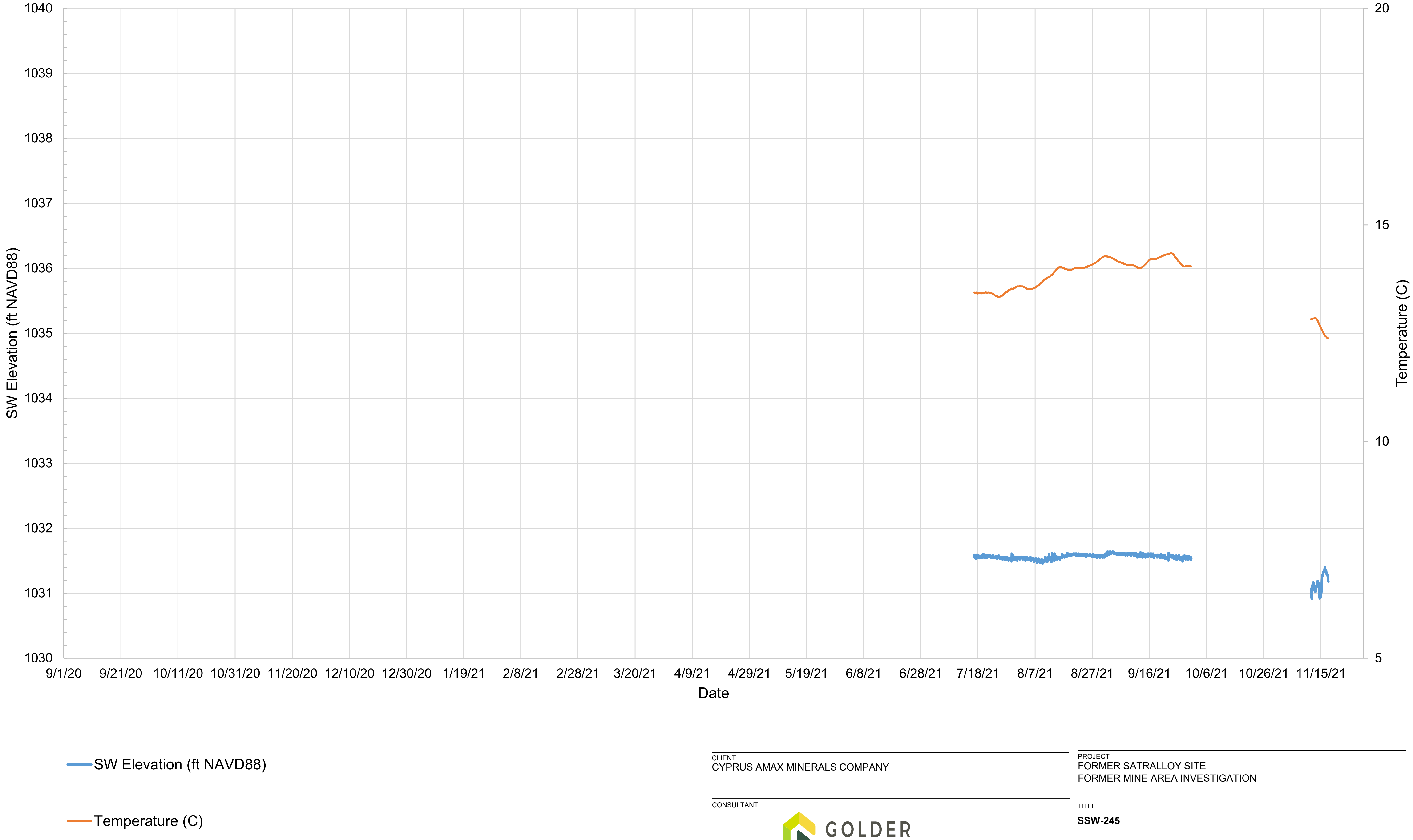
CONSULTANT

GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
SSW-242

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.33



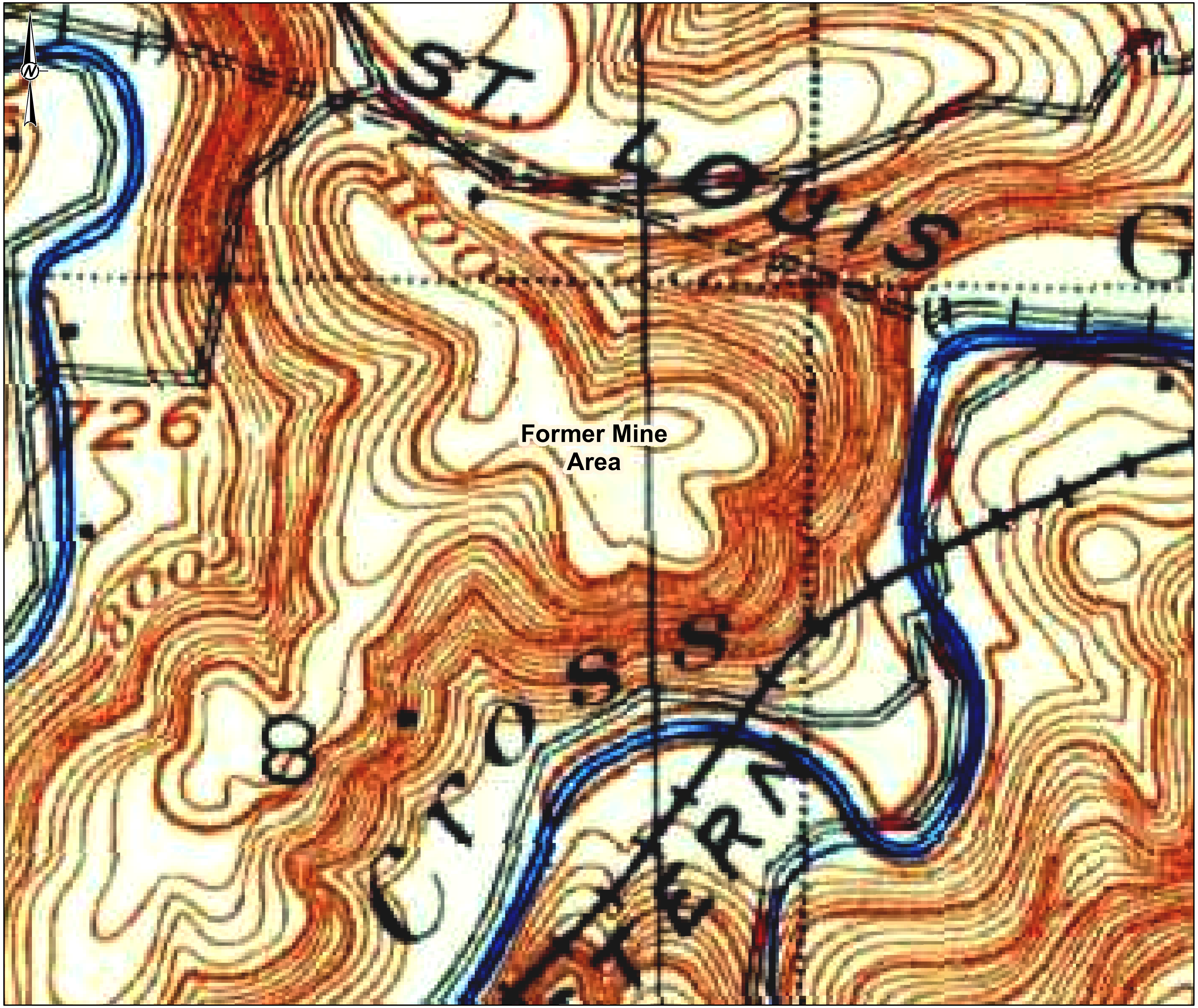
CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
SSW-245

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	3.34



0 250 500
1 " = 500 FT FEET

NOTE(S)
1. GOLDER ASSOCIATES USA INC.
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET
3. HISTORIC USGS TOPOGRAPHIC MAP, 15-MINUTE SERIES, 1935
4. TOPOGRAPHY SURVEYED IN 1902

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
HISTORIC USGS TOPOGRAPHIC MAP (1935)

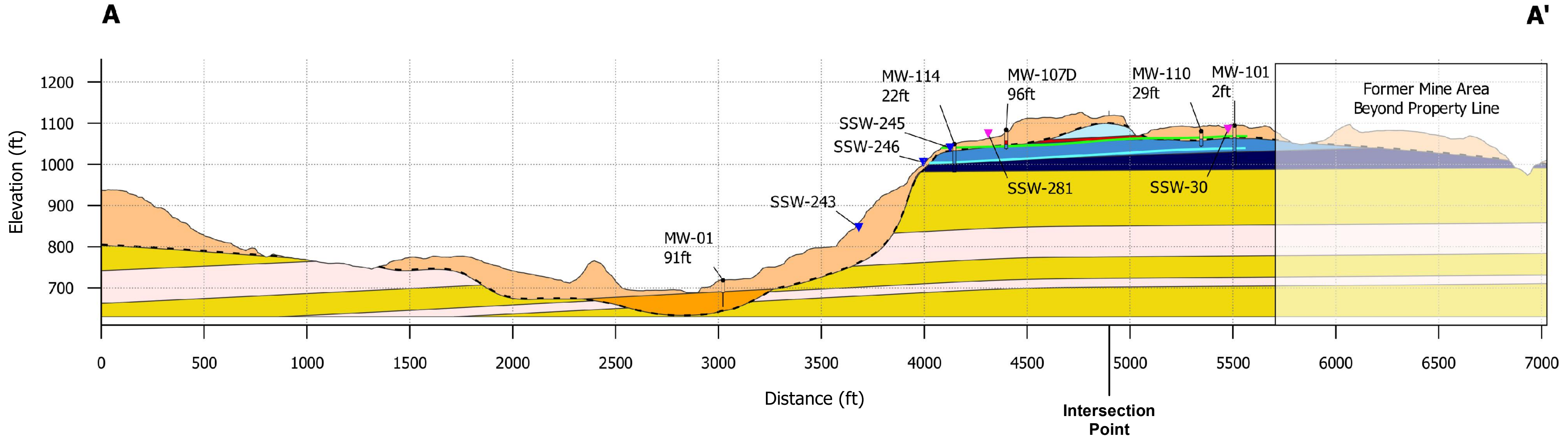
CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-06-02
DESIGNED	BI
PREPARED	BM
REVIEWED	BI
APPROVED	

PROJECT NO. 12393309X10
REV. A
FIGURE 4.1

PATH: O:\02-GIS Files\12393309\10 Satralloy MAI\GIS\Maps\MXDs\MAI_Report_2022_01\Fig4-1_1935Topo.mxd PRINTED ON: 2022-06-02 AT: 4:58:52 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
0 1 in



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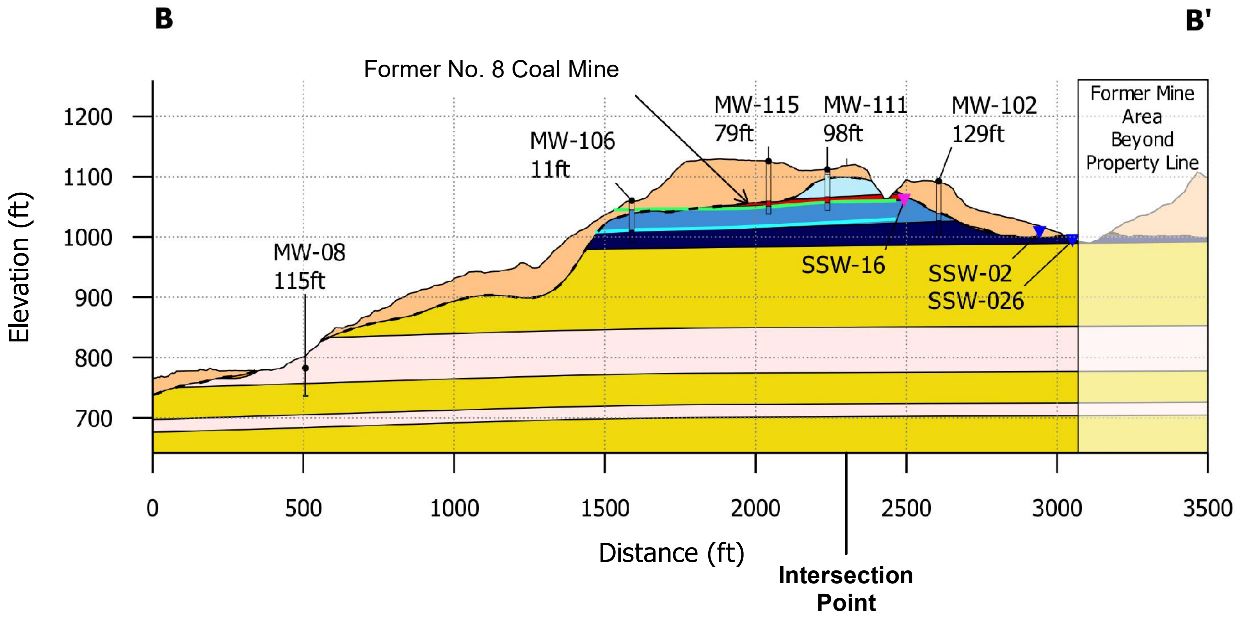
Vertical exaggeration: 2x

0ft 1000ft



LEGEND

SURFACE WATER FEATURE
- ▼ SURFACE WATER SEEP LOCATION
- ▼ SURFACE WATER LOCATION

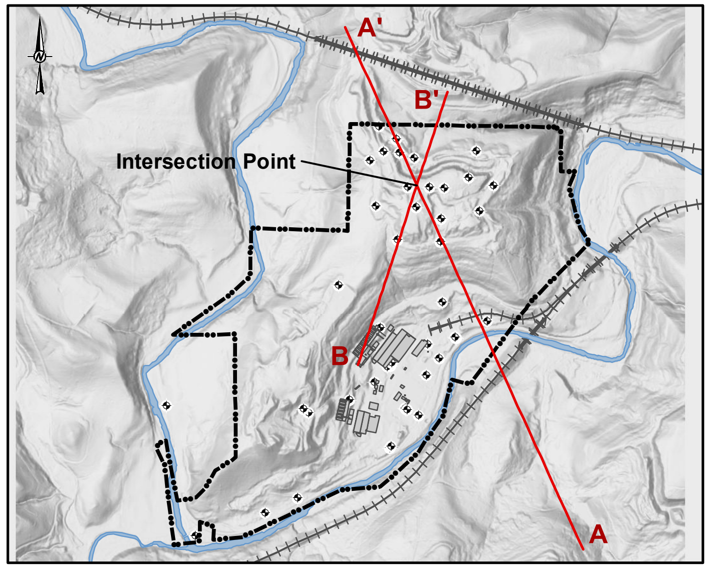
POTENTIOMETRIC SURFACE
- — UNDER COAL ZONE
- — UPPER CASSELMAN

MINE AREA DETAIL GEOLOGY
- ■ LOWER PITTSBURGH
- ■ FORMER NO. 8 COAL MINE
- ■ UNDER COAL ZONE
- ■ UPPER CASSELMAN

SITE-WIDE GEOLOGY
- ■ UNCONSOLIDATED
- ■ SANDSTONE
- ■ SHALE
- ■ VALLEY FILL

NOTE(S)

1. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET
2. HORIZONTAL DISTANCE OF BOREHOLE COLLAR FROM CROSS-SECTION SHOWN IN FEET BELOW BOREHOLE LABEL. FOR CROSS-SECTION A, BOREHOLES AND SURFACE WATER FEATURES WITHIN 100FT OF SECTION ARE SHOWN. FOR CROSS-SECTION B, BOREHOLES AND SURFACE WATER FEATURES WITHIN 150FT OF SECTION ARE SHOWN.
3. VERTICAL EXAGGERATION OF CROSS SECTIONS IS 2:1.



CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

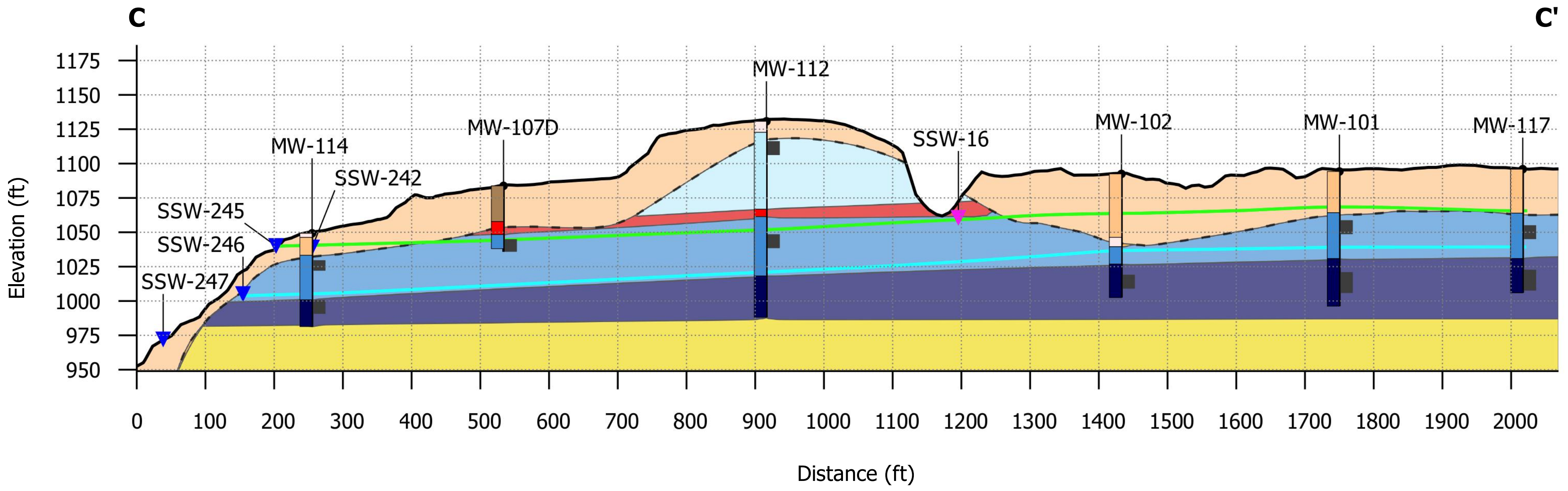
TITLE
HYDROGEOLOGIC CROSS-SECTIONS

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-06-02
DESIGNED	BI
PREPARED	BGM
REVIEWED	BI
APPROVED	

PROJECT NO.	REV.	FIGURE
12393309X10	A	4.2



Scale: 1:2,700

Vertical exaggeration: 2x

LEGEND

SURFACE WATER FEATURE

▼ SURFACE WATER SEEP LOCATION

▼ SURFACE WATER LOCATION

POTENTIOMETRIC SURFACE

— UNDER COAL ZONE

— UPPER CASSELMAN

MINE AREA DETAIL GEOLOGY

▨ UNCONSOLIDATED

▨ LOWER PITTSBURGH

🟥 FORMER NO. 8 COAL MINE

🟦 UNDER COAL ZONE

▨ UPPER CASSELMAN

🟨 SANDSTONE

UNCONSOLIDATED BOREHOLE GEOLOGY

▨ FILL / SPOILS

▨ SILT / CLAY

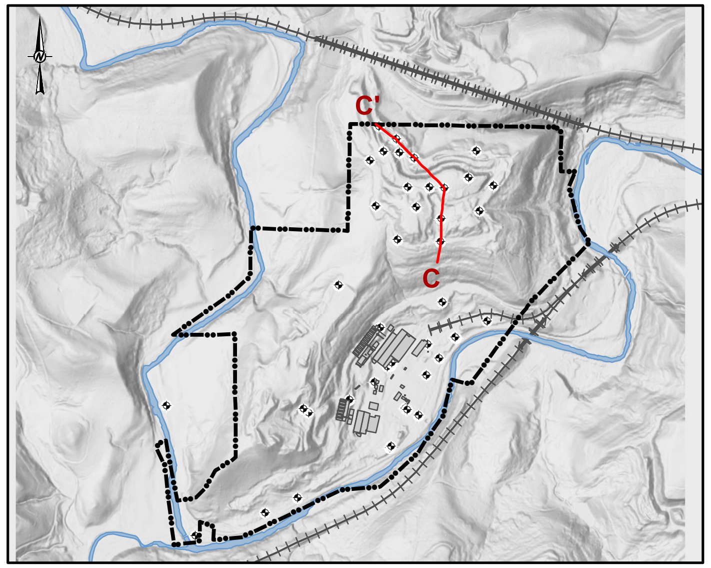
▨ PROCESSED MATERIAL

BOREHOLE INFORMATION

▨ SCREENED INTERVAL

NOTE(S)

1. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET
2. HORIZONTAL DISTANCE OF BOREHOLE COLLAR FROM CROSS-SECTION SHOWN IN FEET BELOW BOREHOLE LABEL. FOR CROSS-SECTION A, BOREHOLES AND SURFACE WATER FEATURES WITHIN 100FT OF SECTION ARE SHOWN. FOR CROSS-SECTION B, BOREHOLES AND SURFACE WATER FEATURES WITHIN 150FT OF SECTION ARE SHOWN.
3. VERTICAL EXAGGERATION OF CROSS SECTIONS IS 2:1.



CLIENT

CYPRUS AMAX MINERALS COMPANY

PROJECT

FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE

MINE AREA HYDROGEOLOGIC CROSS-SECTION

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-06-02
DESIGNED	BI
PREPARED	BGM
REVIEWED	
APPROVED	

PROJECT NO.
12393309X10

REV.
A

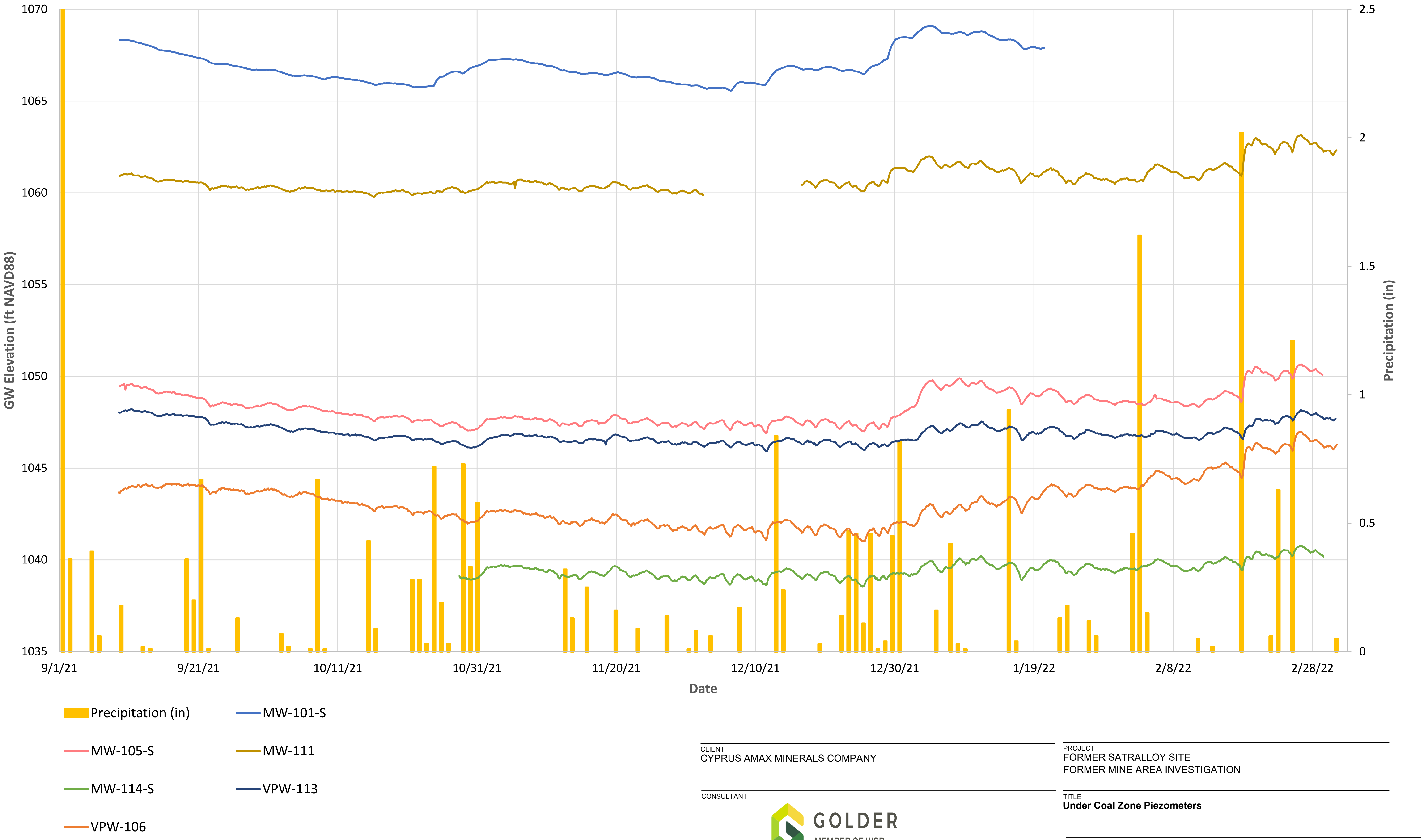
FIGURE
4.3

PATH: O:\02-GIS Files\1239330910 Satralloy MAI\GIS\Maps\MXDs\MAI_Report_2022_01\Fig5-8_CrossSection_MineArea.mxd PRINTED ON: 2022-06-02 AT: 12:56:41 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in
0

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD | FILE NAME: Under Coal Water elevation_precipitation.xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

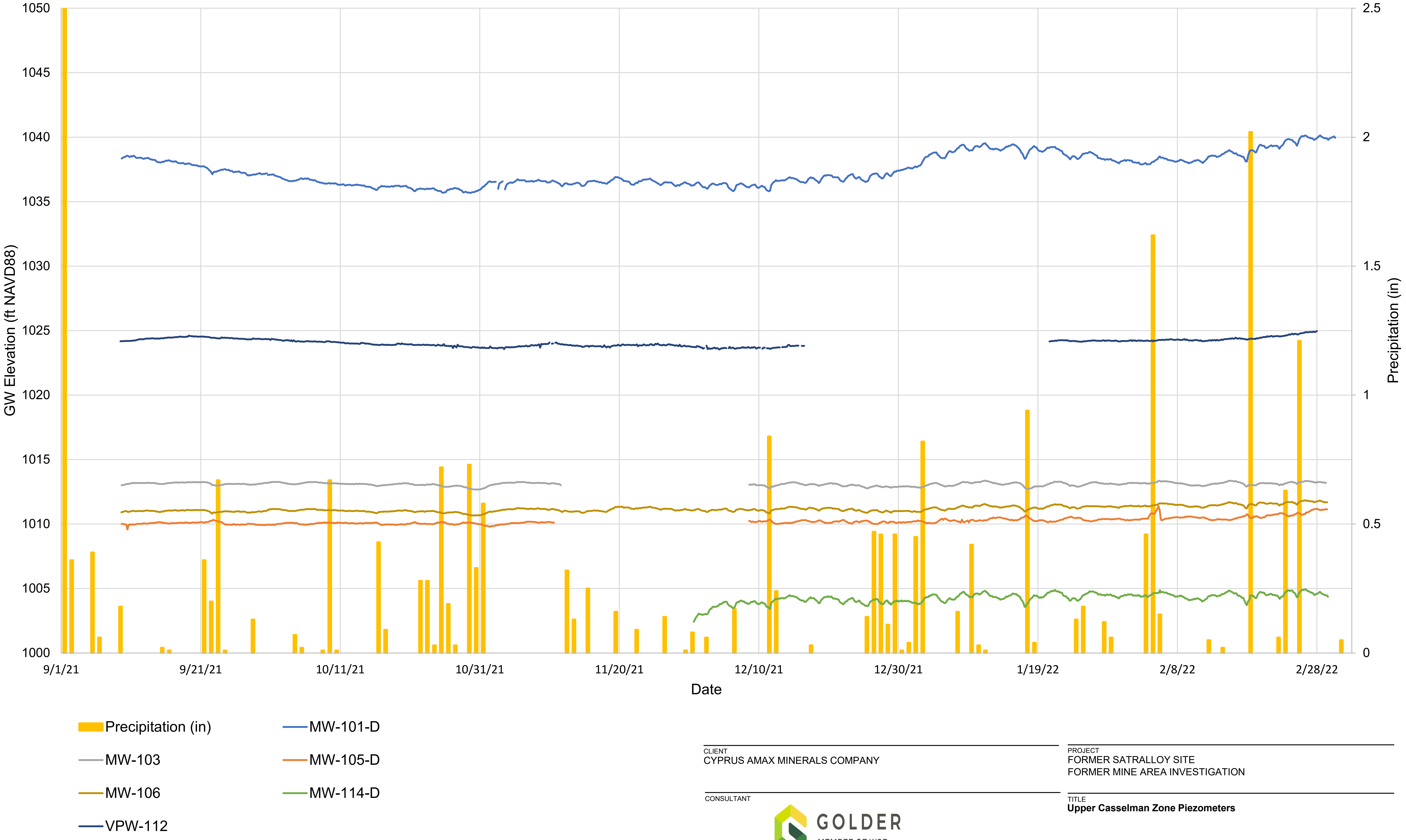
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
Under Coal Zone Piezometers

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	5.1

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD | FILE NAME: Precipitation_water Level_Upper Casselman.xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

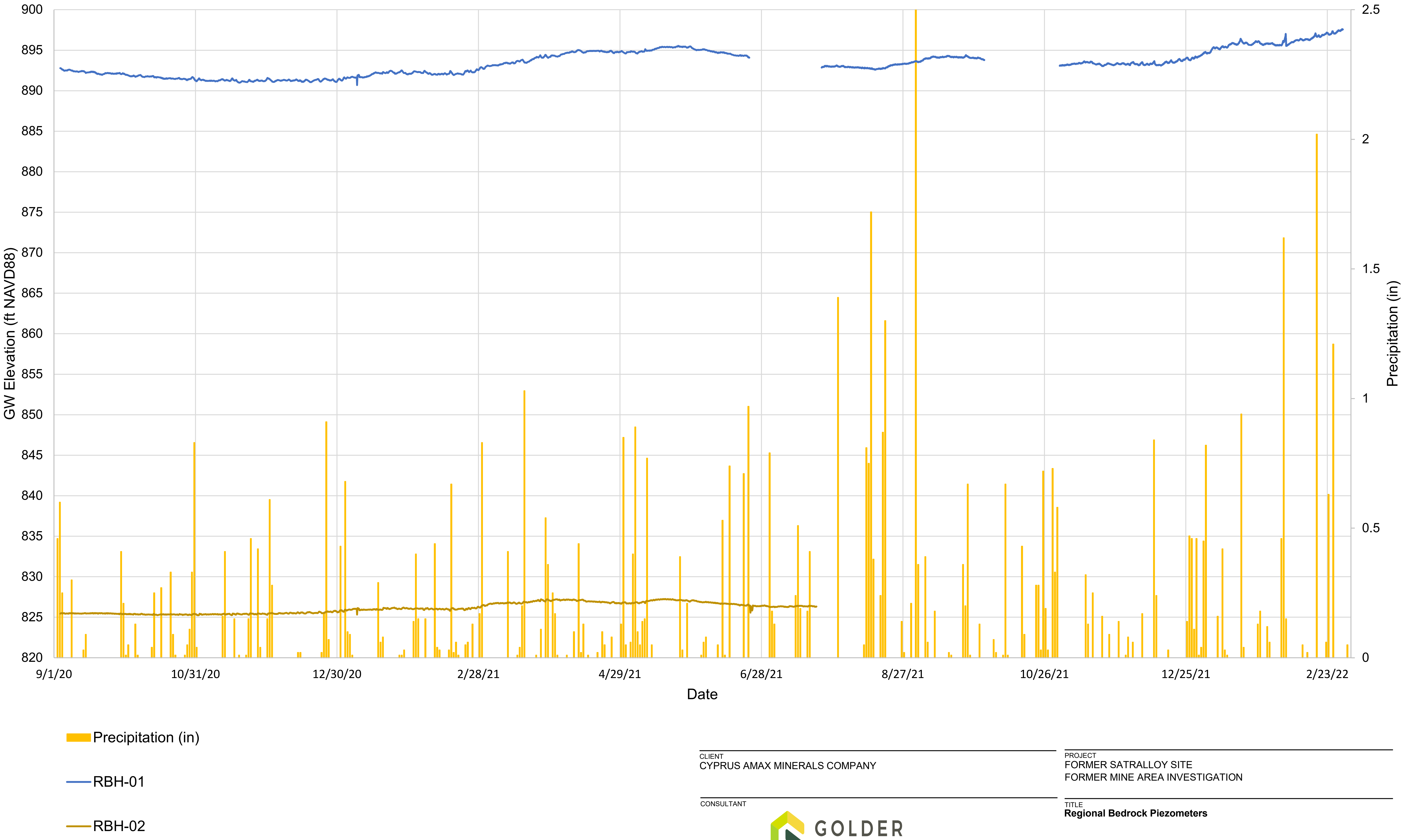
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Upper Casselman Zone Piezometers

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	5.2

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/Monitoring Data (XD VWP SWL)/XD | FILE NAME: RBHs-Water level-Precipitation.xlsx



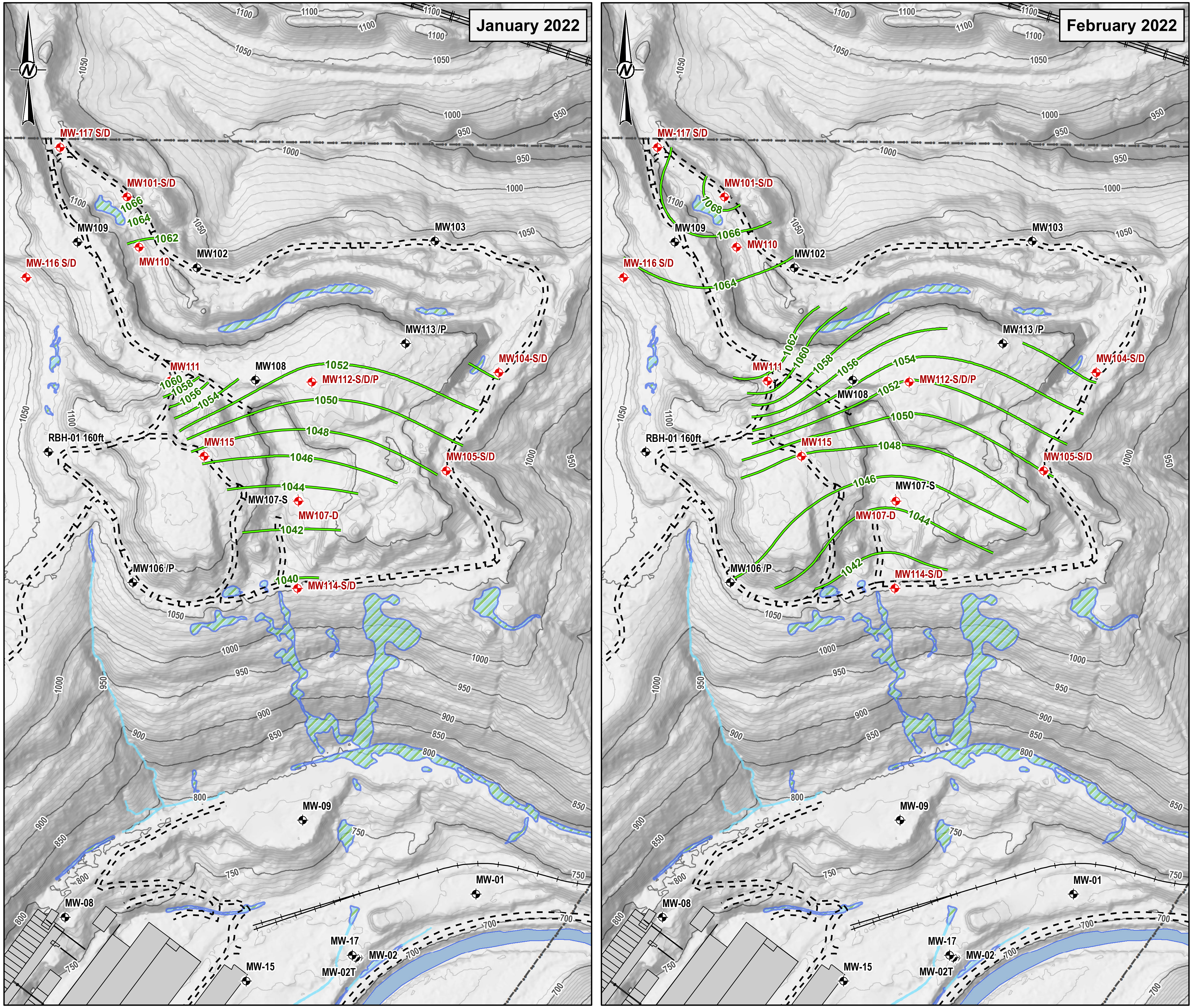
CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
Regional Bedrock Piezometers

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	5.3



LEGEND

- ⌖ MONITORING WELL/PIEZOMETER - UNDER COAL ZONE
- — POTENTIOMETRIC SURFACE CONTOURS
- ┼ RAILROAD
- ⬚ PROPERTY BOUNDARY
- ⬚ ROADS
- ▨ EXISTING FACILITY
- ▬ TRIBUTARY
- ▨ WETLAND
- ▬ CROSS CREEK
- — ELEVATION CONTOUR (5-FT INTERVAL)
- — ELEVATION CONTOUR (50-FT INTERVAL)

0 250 500

1 " = 313 FT FEET

NOTE(S)

1. GOLDER ASSOCIATES USA INC. (MONITORING WELL, POTENTIOMETRIC SURFACE CONTOURS, FACILITY/PROPERTY BOUNDARY, RAILROAD, ROADS, PROPERTY BOUNDARY, TRIBUTARY, WETLAND, TOPOGRAPHIC CONTOUR)
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET
3. MONITORING WELL LABELS: -S=SHALLOW SCREEN, -D=DEEP SCREEN, -P=PIEZOMETER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
POTENTIOMETRIC SURFACE - UNDER COAL ZONE

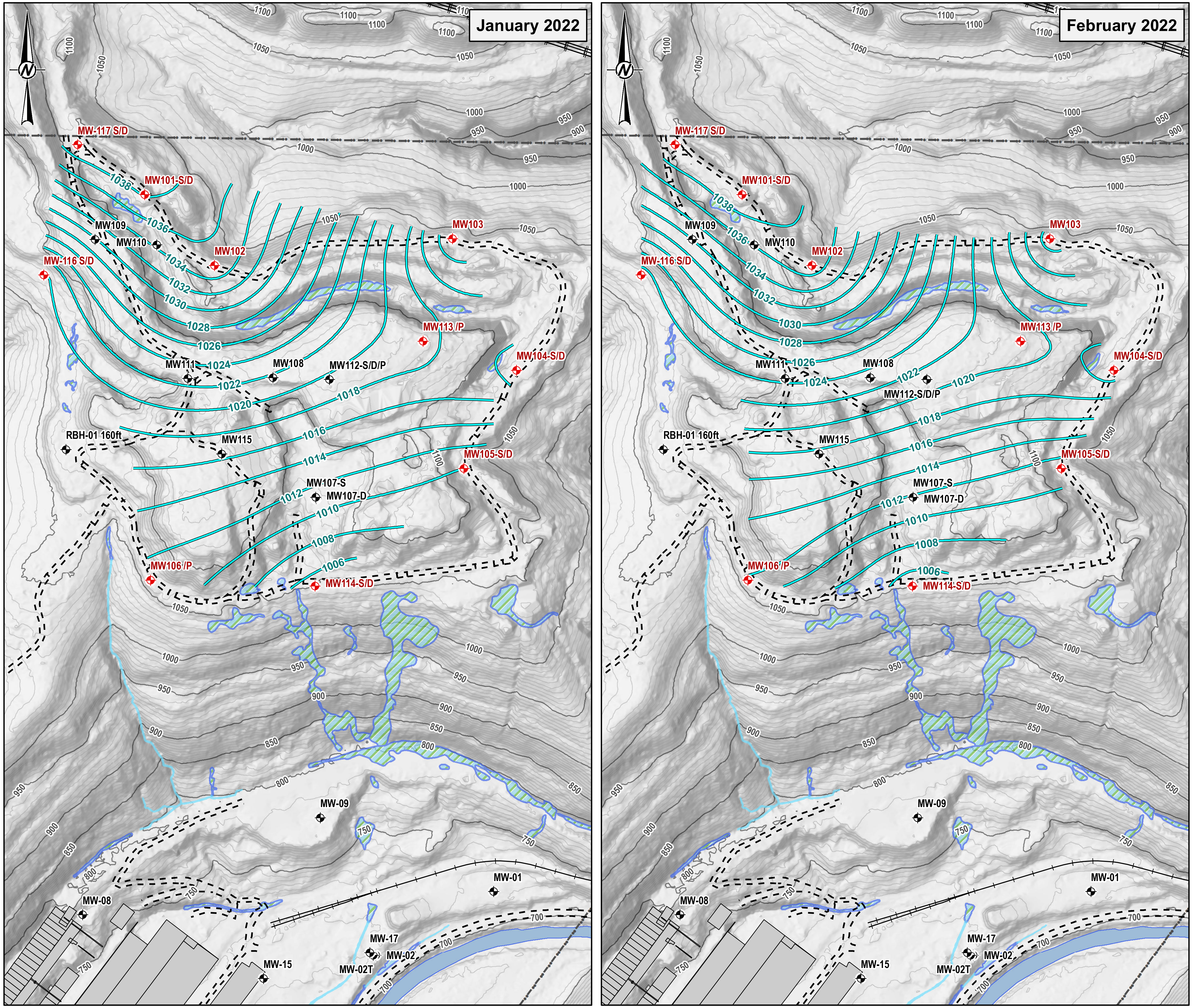
CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-26
DESIGNED	BI
PREPARED	BGM
REVIEWED	BI
APPROVED	

PROJECT NO. 12393309X10
REV. A
FIGURE 5.4

PATH: O:\02-GIS Files\12393309\10 Satralloy MAI\GIS\Maps\MXDs\MAI_Report_2022_01\Fig5-4_Potentiometric_UnderCoal.mxd PRINTED ON: 2022-05-26 AT: 4:07:11 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
0
1 in



LEGEND

- MONITORING WELL/PIEZOMETER - UPPER CASSELMAN
- POTENTIOMETRIC SURFACE CONTOURS
- RAILROAD
- PROPERTY BOUNDARY
- ROADS
- EXISTING FACILITY
- TRIBUTARY
- WETLAND
- CROSS CREEK
- ELEVATION CONTOUR (5-FT INTERVAL)
- ELEVATION CONTOUR (50-FT INTERVAL)

0 250 500
1 " = 313 FT
FEET

NOTE(S)

1. GOLDER ASSOCIATES USA INC. (MONITORING WELL, POTENTIOMETRIC SURFACE CONTOURS, FACILITY/PROPERTY BOUNDARY, RAILROAD, ROADS, PROPERTY BOUNDARY, TRIBUTARY, WETLAND, TOPOGRAPHIC CONTOUR)
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET
3. MONITORING WELL LABELS: -S=SHALLOW SCREEN, -D=DEEP SCREEN, -P=PIEZOMETER

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

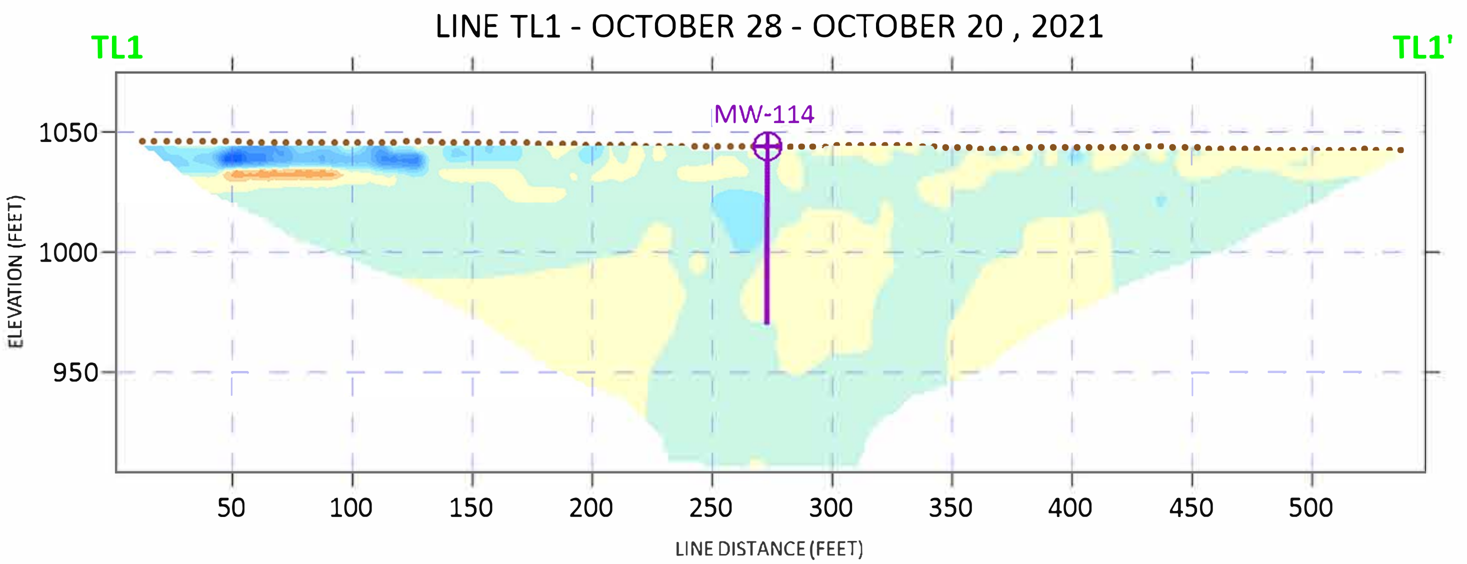
TITLE
POTENTIOMETRIC SURFACE - UPPER CASSELMAN ZONE

CONSULTANT
GOLDER
MEMBER OF WSP

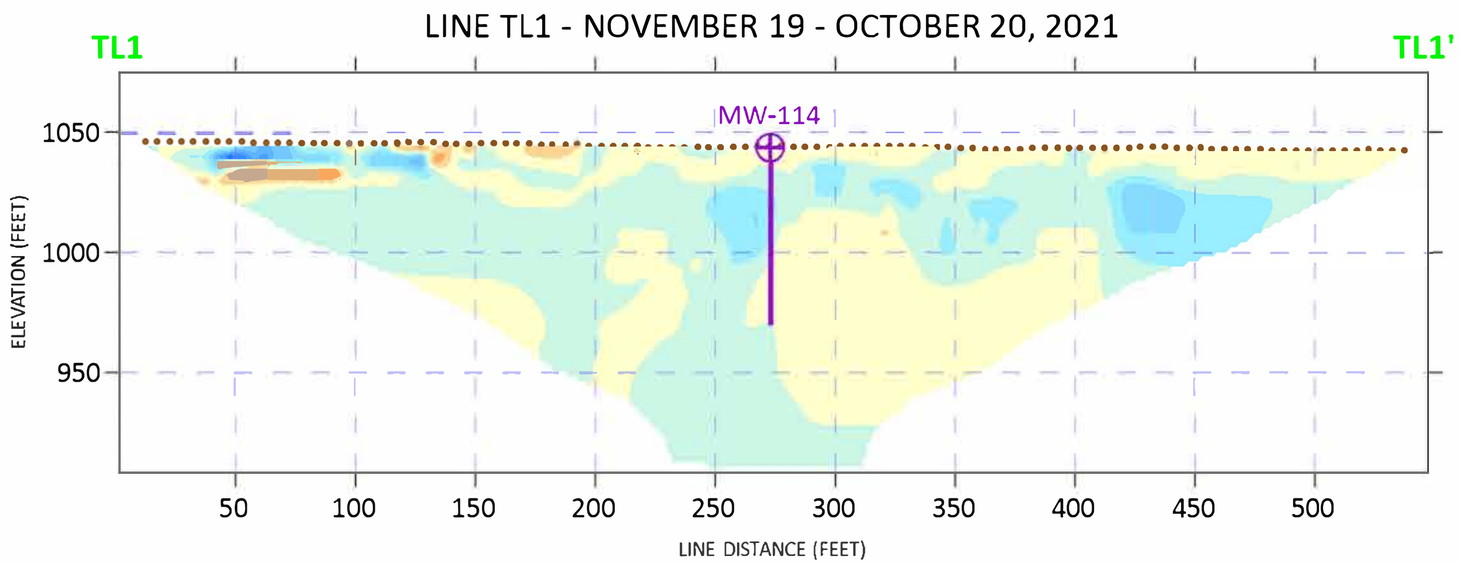
YYYY-MM-DD	2022-05-26
DESIGNED	BI
PREPARED	BGM
REVIEWED	BI
APPROVED	

PROJECT NO.	REV.	FIGURE
12393309X10	A	5.5

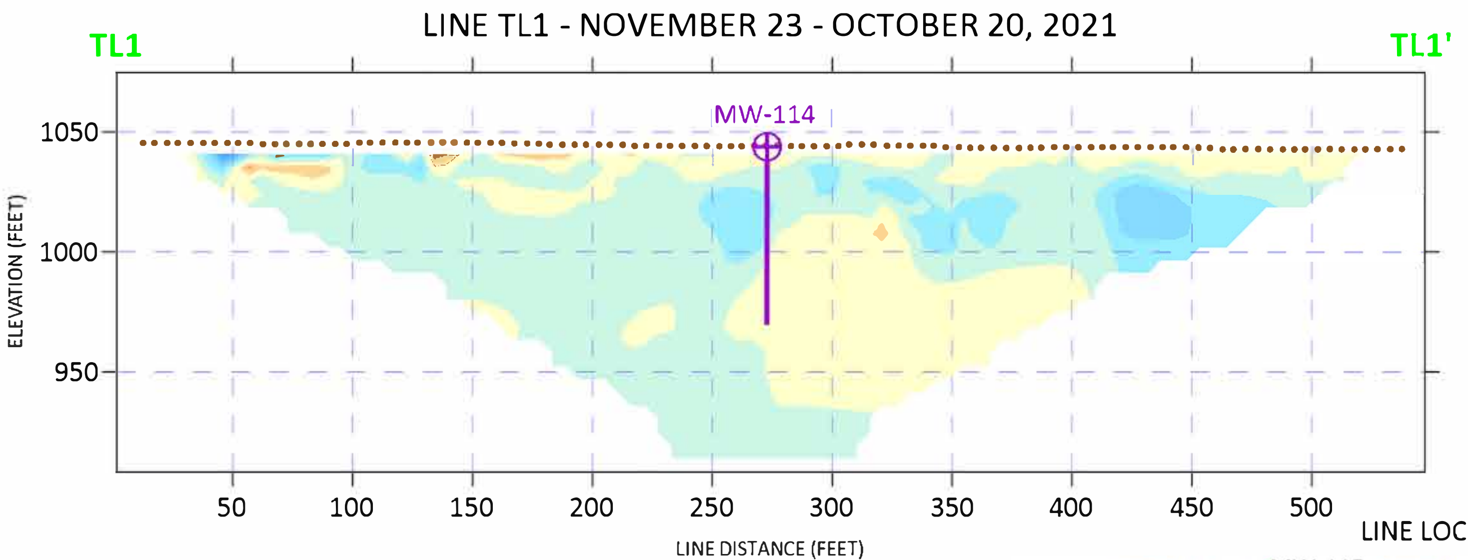
LINE TL1 - OCTOBER 28 - OCTOBER 20 , 2021



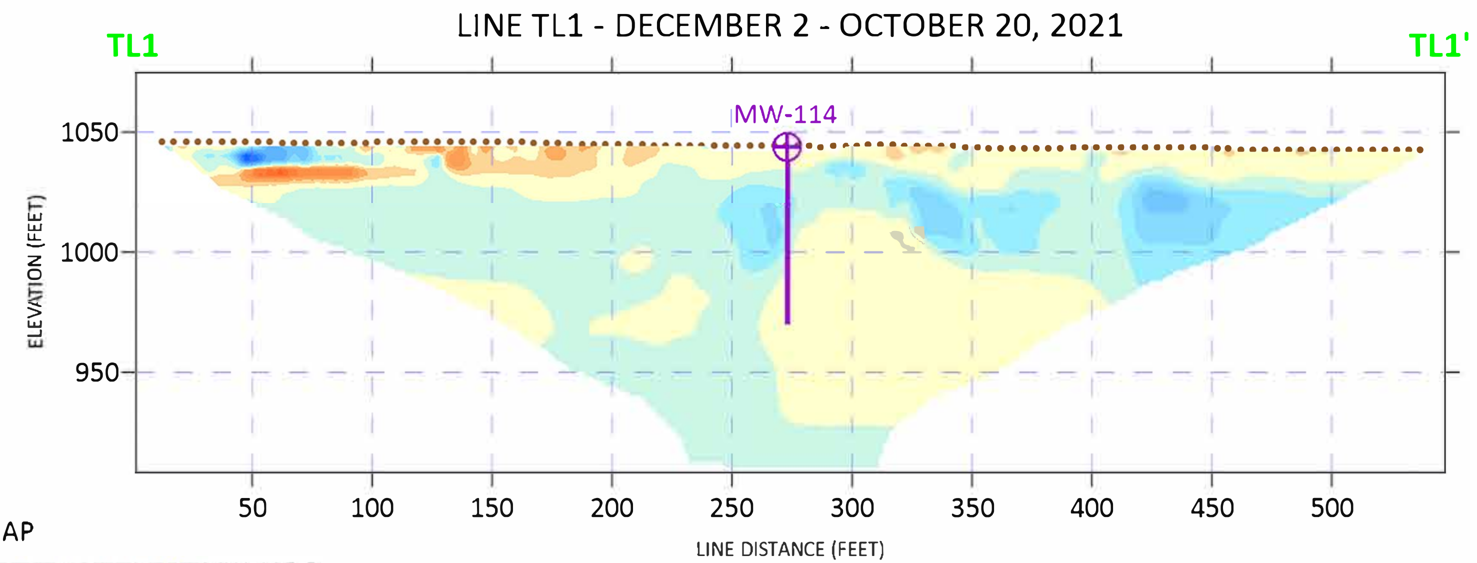
LINE TL1 - NOVEMBER 19 - OCTOBER 20, 2021

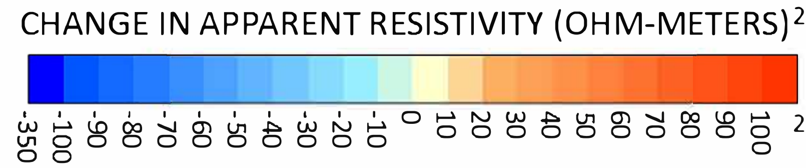


LINE TL1 - NOVEMBER 23 - OCTOBER 20, 2021

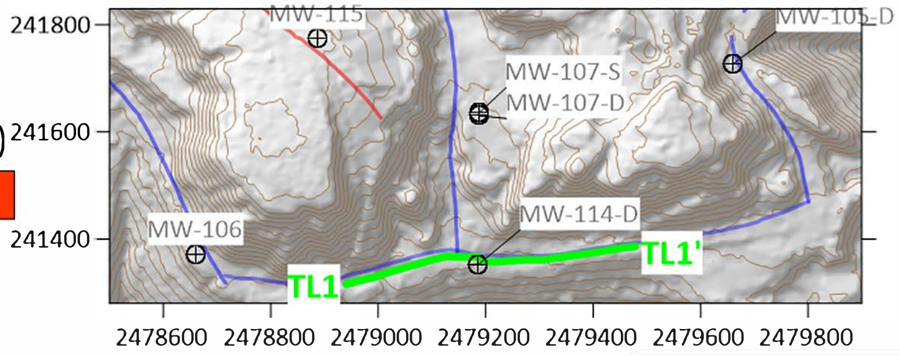


LINE TL1 - DECEMBER 2 - OCTOBER 20, 2021





LINE LOCATION MAP



NOTES

1) ELEVATION DATA (NAVD88) COLLECTED WITH HEMISHPERE C321 SUBFOOT DGPS AND VERIFIED WITH AVAILABLE LIDAR SUREY DATA

2) RESISTIVITY DATA COLLECTED USING 56-CHANNEL AGI SUPERSTING R8+, EXTENDED DIPOLE-DIPOLE ARRAY AND FIXED ELECTRODES

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

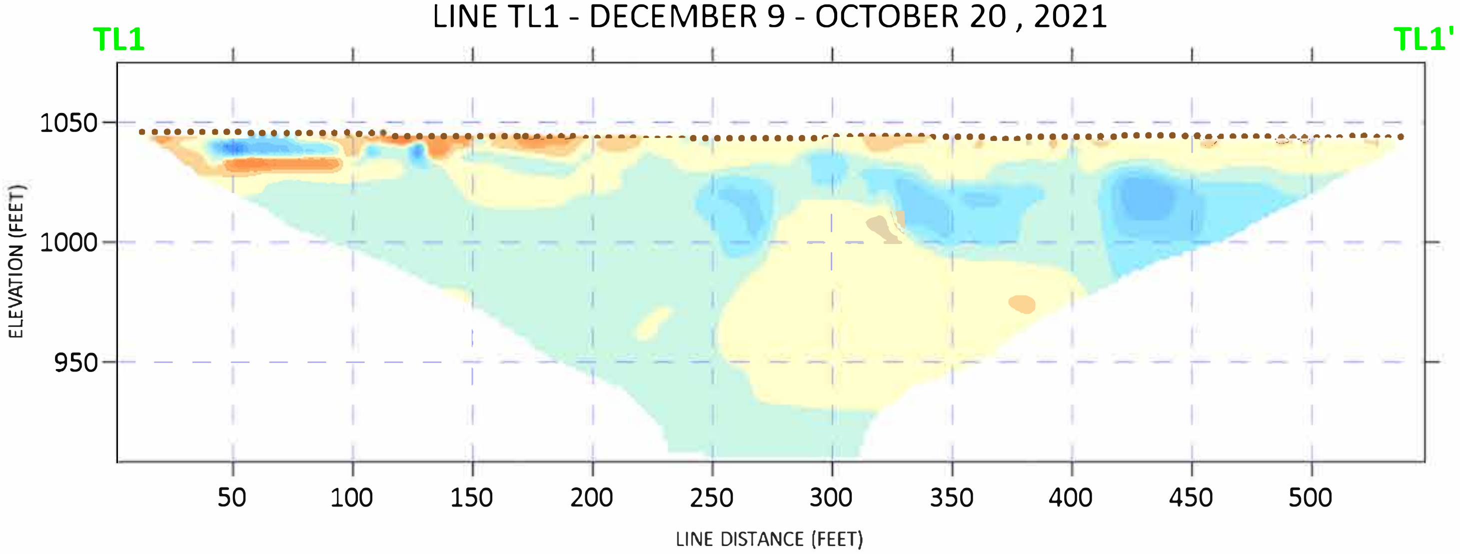
CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-25
PREPARED	PEF
	PEF
REVIEW	DJB
APPROVED	NMD

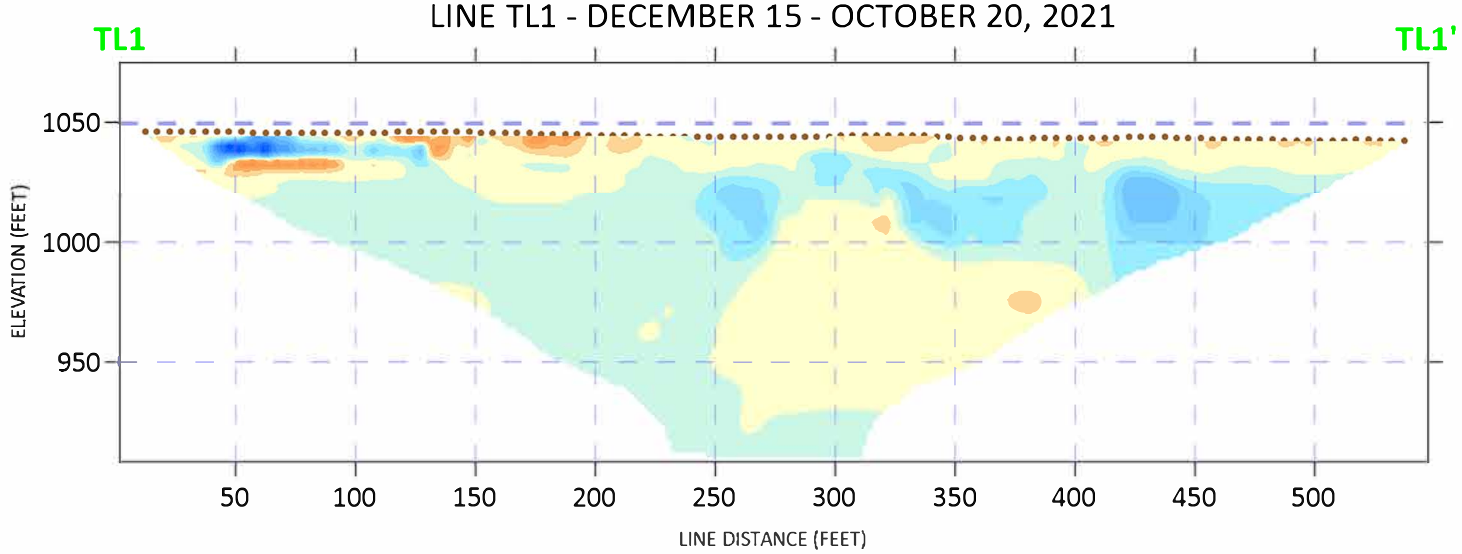
TITLE
TIME LAPSE ERI LINE TL1
MODEL RESISTIVITY DIFFERENCING
(SHEET 1 OF 2)

PROJECT No.	Rev.	Figure
12393309x10	A	5.6

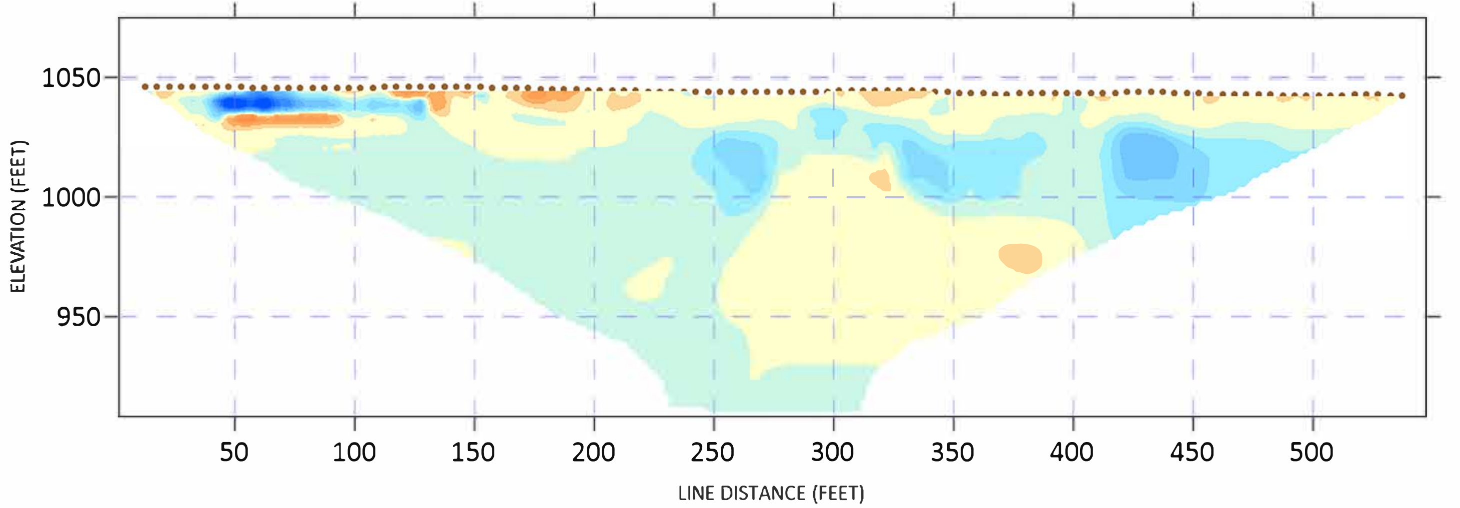
LINE TL1 - DECEMBER 9 - OCTOBER 20 , 2021



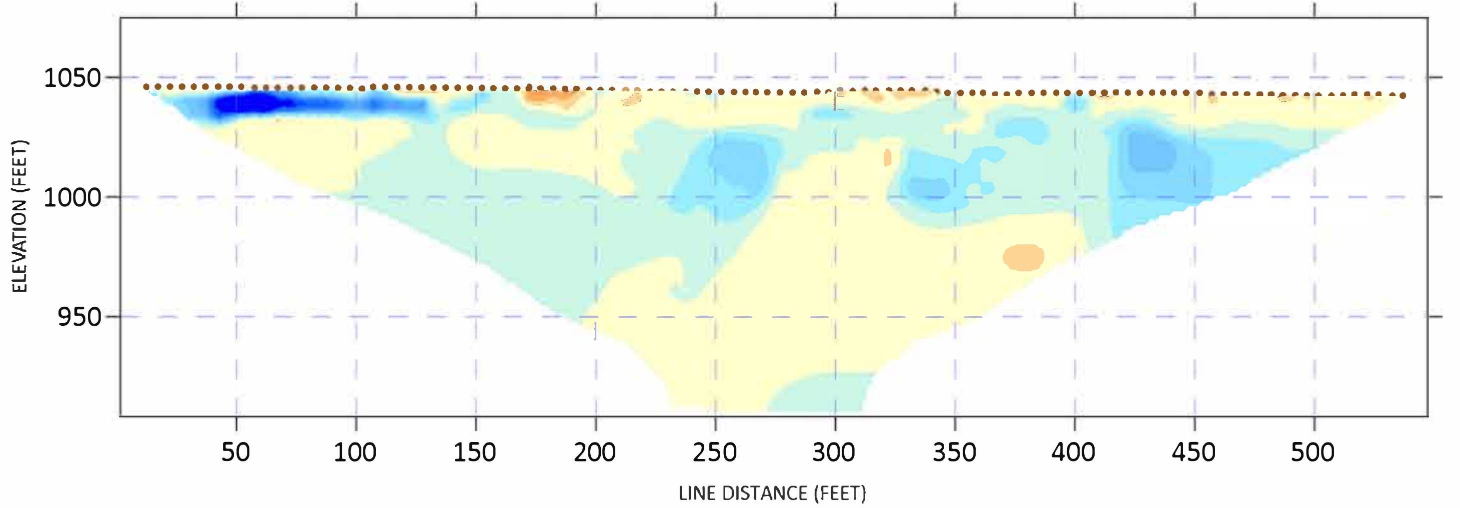
LINE TL1 - DECEMBER 15 - OCTOBER 20, 2021



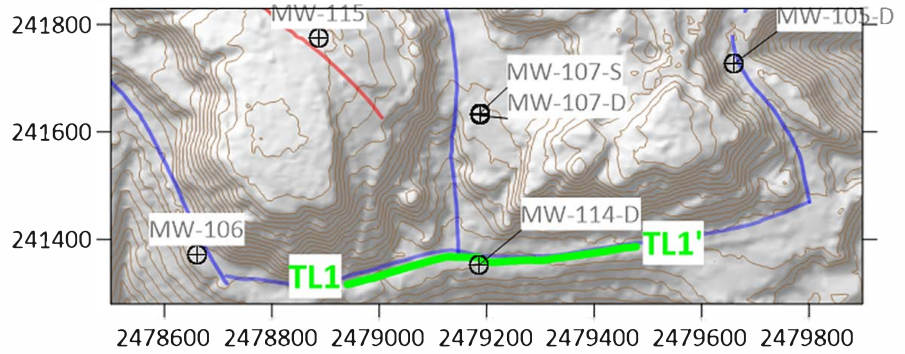
LINE TL1 - DECEMBER 20 - OCTOBER 20, 2021



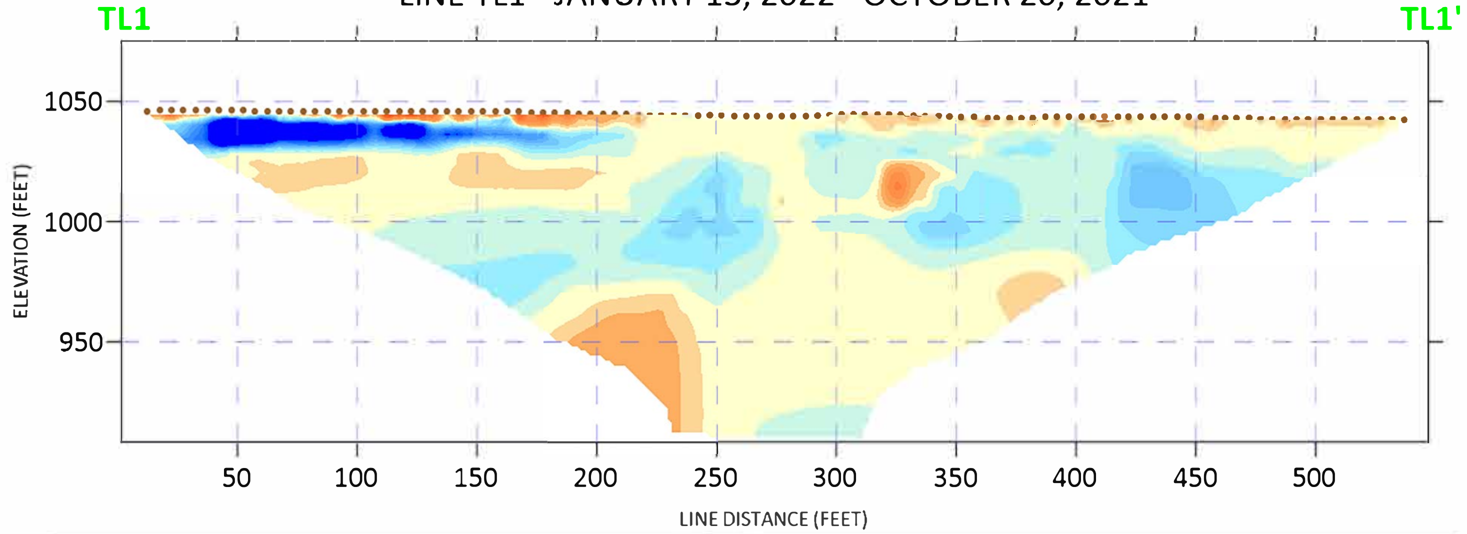
LINE TL1 - DECEMBER 30 - OCTOBER 20, 2021



LINE LOCATION MAP



LINE TL1 - JANUARY 13, 2022 - OCTOBER 20, 2021



CHANGE IN APPARENT RESISTIVITY (OHM-METERS)

NOTES

1) ELEVATION DATA (NAVD88) COLLECTED WITH HEMISHPERE C321 SUBFOOT DGPS AND VERIFIED WITH AVAILABLE LIDAR SUREY DATA

2) RESISTIVITY DATA COLLECTED USING 56-CHANNEL AGI SUPERSTING R8+, EXTENDED DIPOLE-DIPOLE ARRAY AND FIXED ELECTRODES

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

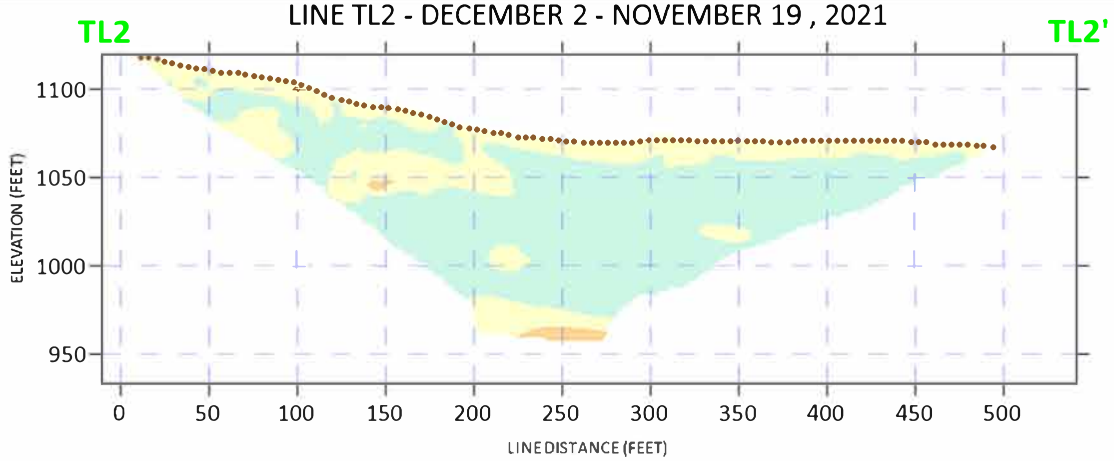
CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-25
PREPARED	PEF
REVIEW	DJB
APPROVED	NMD

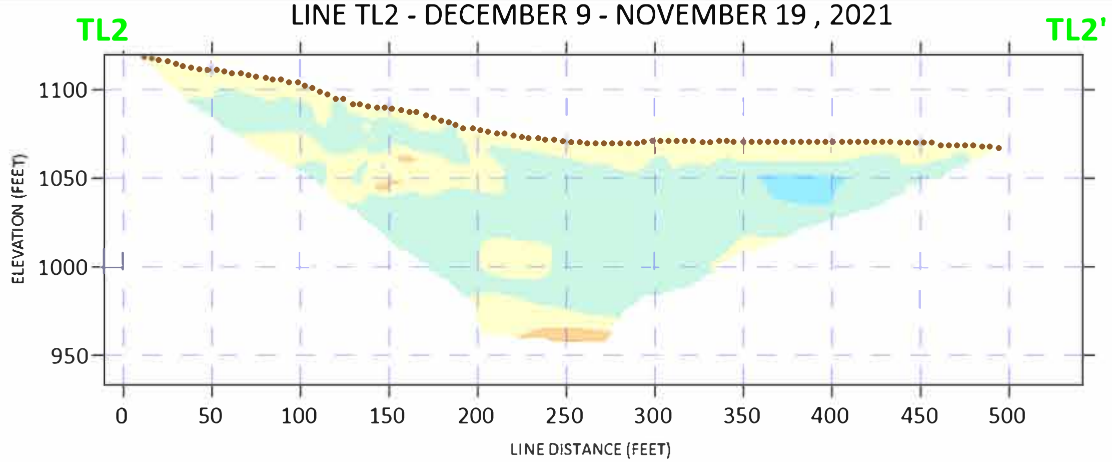
TITLE
TIME LAPSE ERI LINE TL1

PROJECT No.	Rev.	Figure
12393309x10	A	5.7

LINE TL2 - DECEMBER 2 - NOVEMBER 19 , 2021



LINE TL2 - DECEMBER 9 - NOVEMBER 19 , 2021



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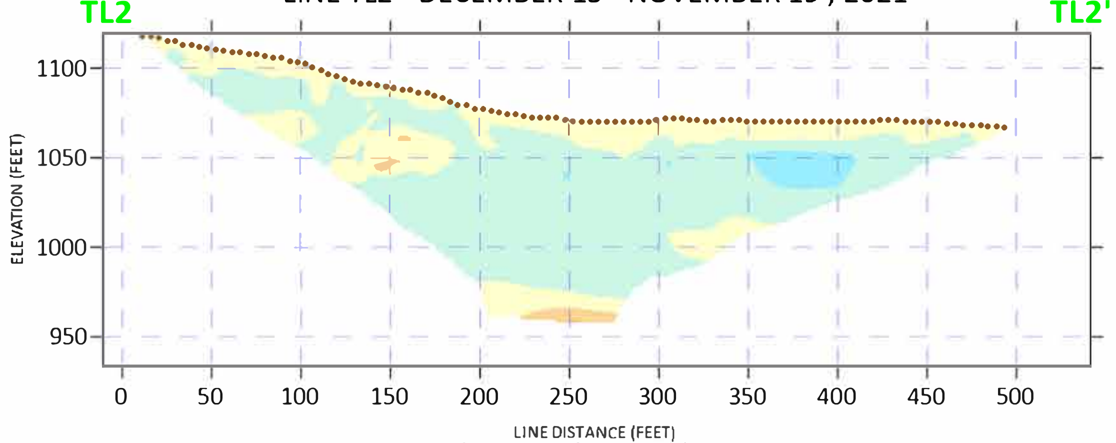
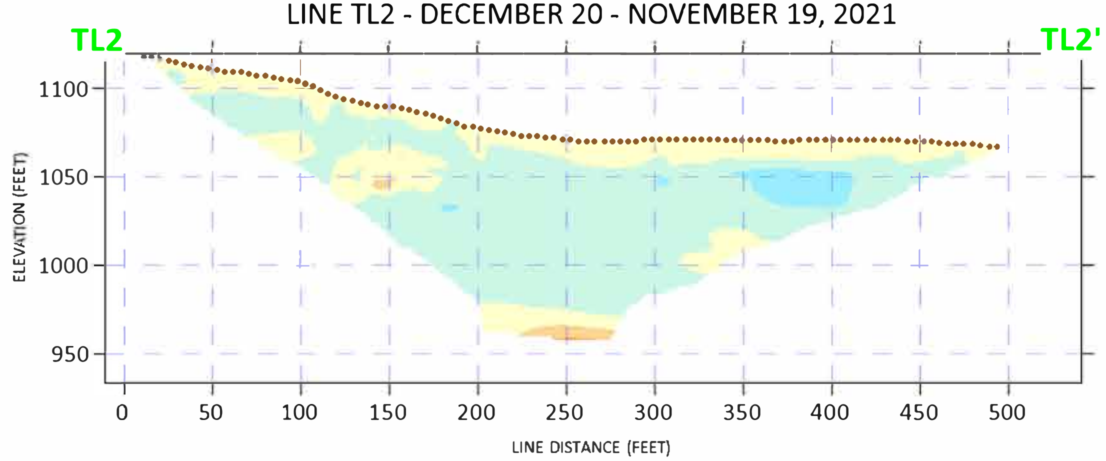
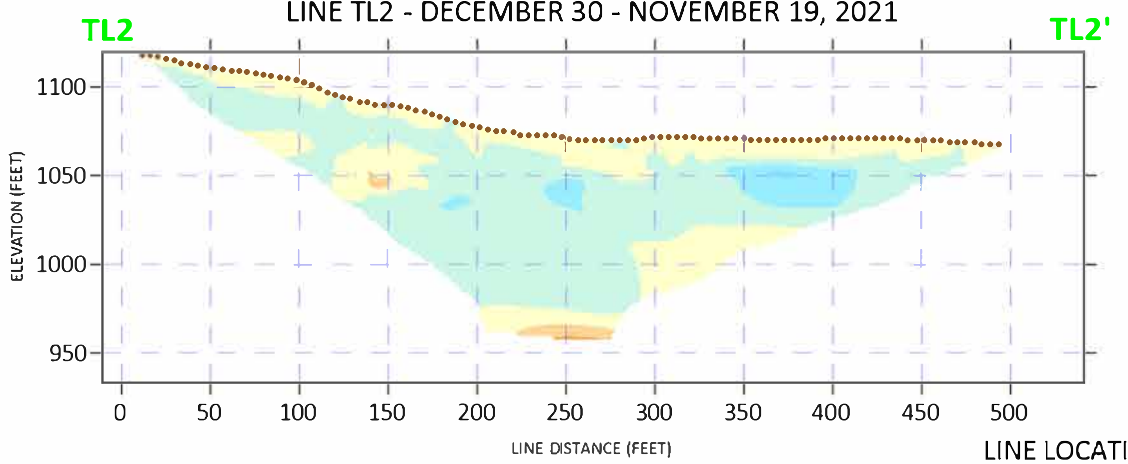


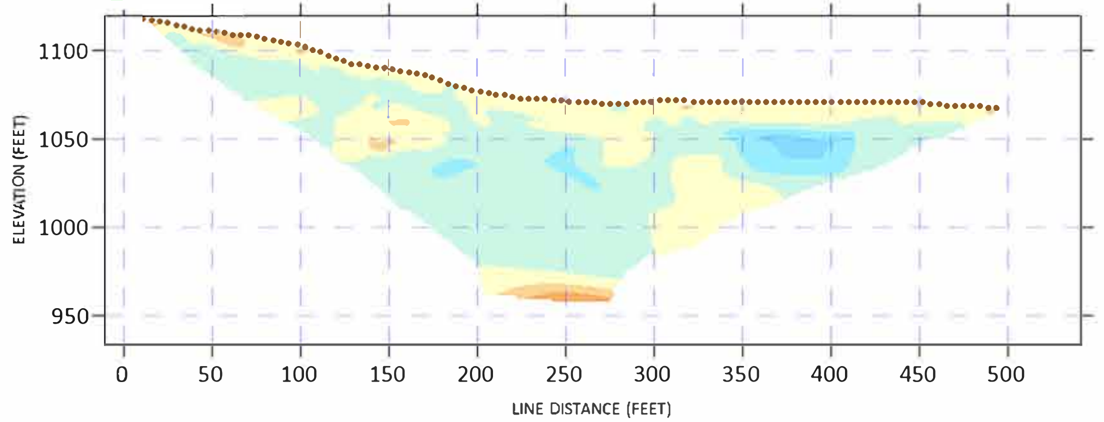
LINE TL2 - DECEMBER 20 - NOVEMBER 19, 2021



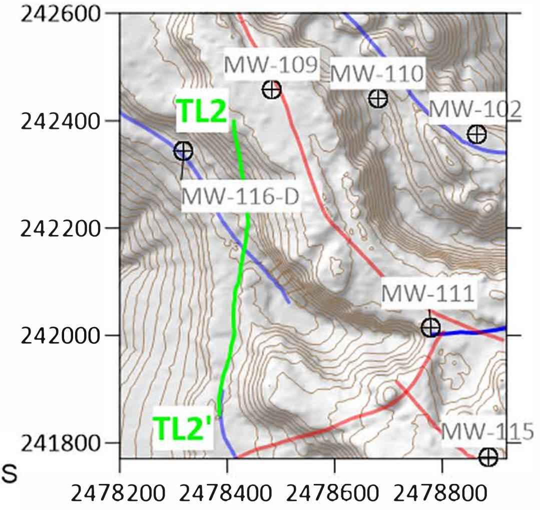
LINE TL2 - DECEMBER 30 - NOVEMBER 19, 2021



LINE TL2 - JANUARY 13, 2022 - NOVEMBER 19, 2021



LINE LOCATION MAP



APPARENT RESISTIVITY (OHM-METERS)

NOTES

1) ELEVATION DATA (NAVD88) COLLECTED WITH HEMISHPERE C321 SUBFOOT DGPS AND VERIFIED WITH AVAILABLE LIDAR SUREY DATA

2) RESISTIVITY DATA COLLECTED USING 56-CHANNEL AGI SUPERSTING R8+, EXTENDED DIPOLE-DIPOLE ARRAY AND FIXED ELECTRODES

CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-05-25
PREPARED	PEF
	PEF
REVIEW	DJB
APPROVED	NMD

TITLE
TIME LAPSE ERI LINE TL2
MODEL RESISTIVITY DIFFERENCING

PROJECT No.	Rev.	Figure
12393309x10	A	5.8

12393309|0 MA DATA REPORT FIGURE 3-15 of 1 | revised: May 25, 2022

1 inch
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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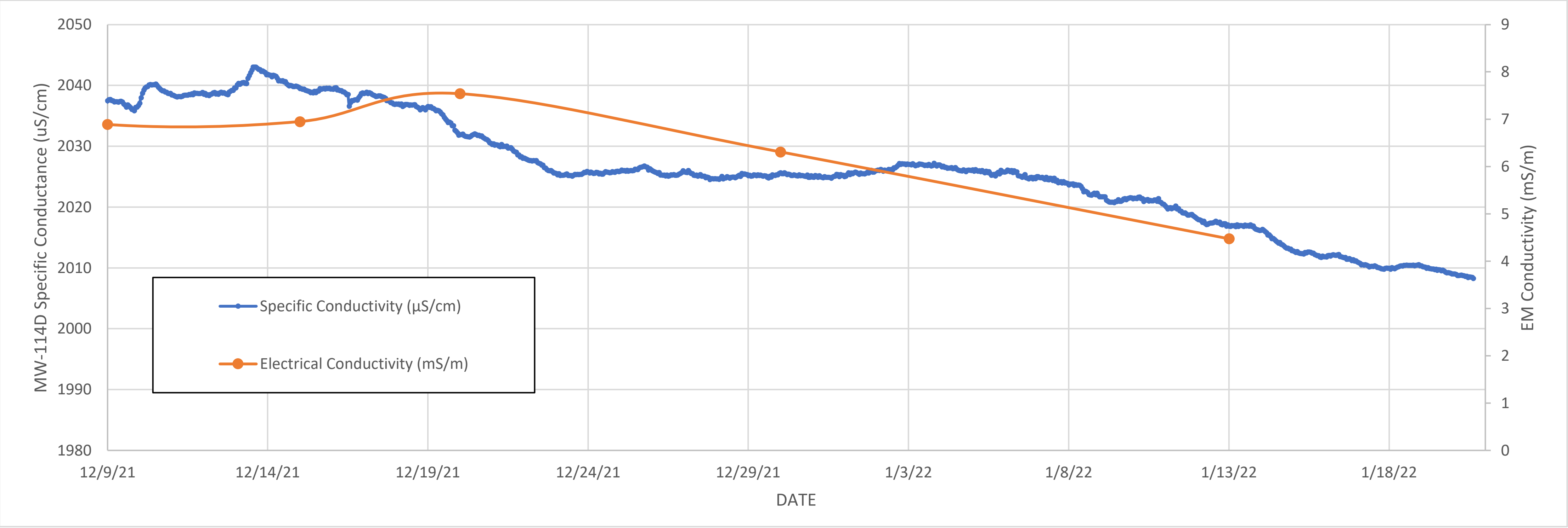
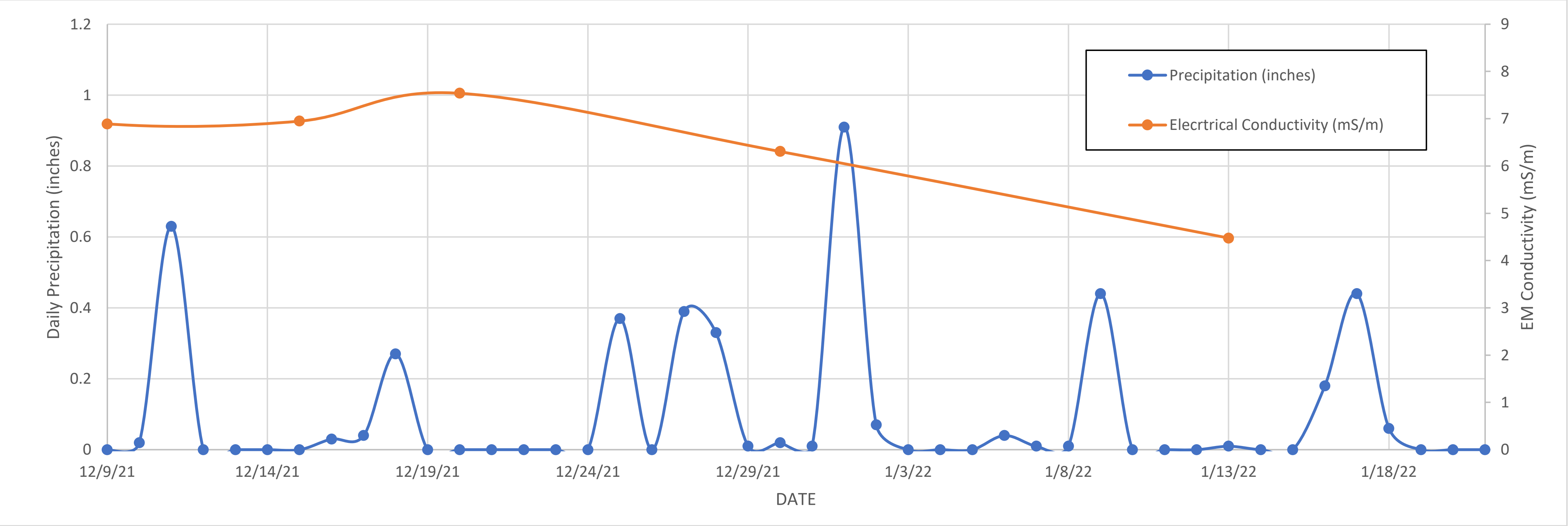




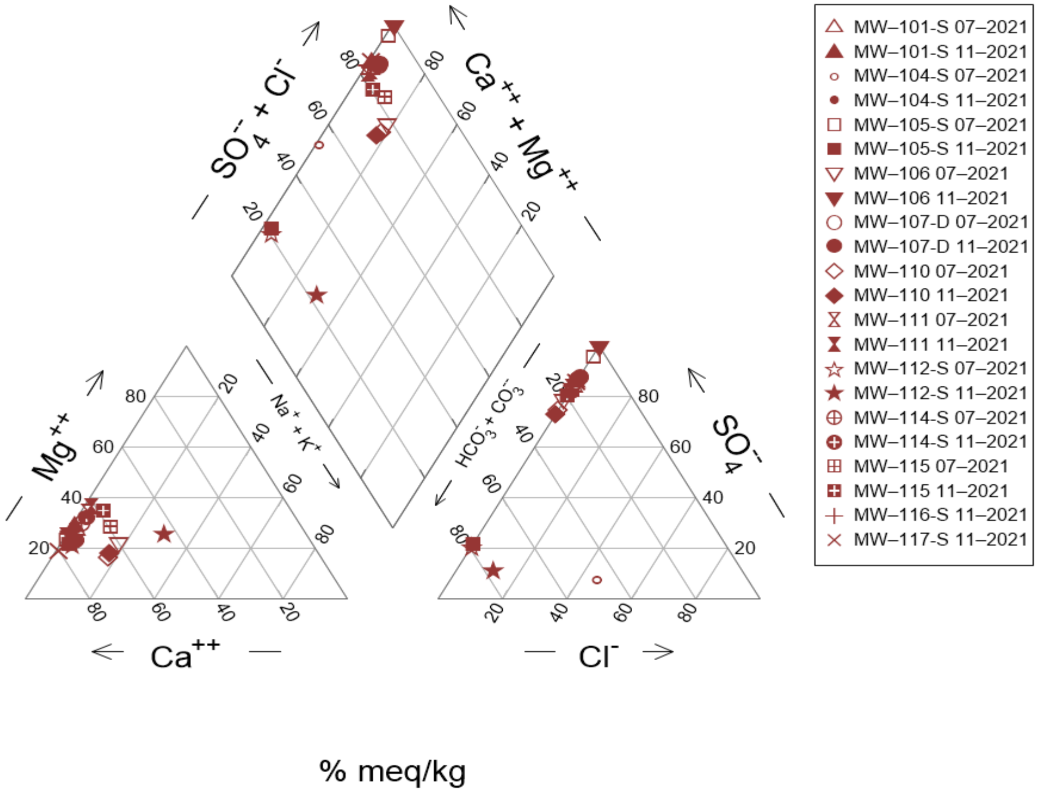
CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
TL1 EM CONDUCTIVITY VERSES MW-114D SPECIFIC CONDUCTANCE AND DAILY PRECIPITATION

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	5.9



CLIENT
CYPRUS AMAX MINERALS COMPANY

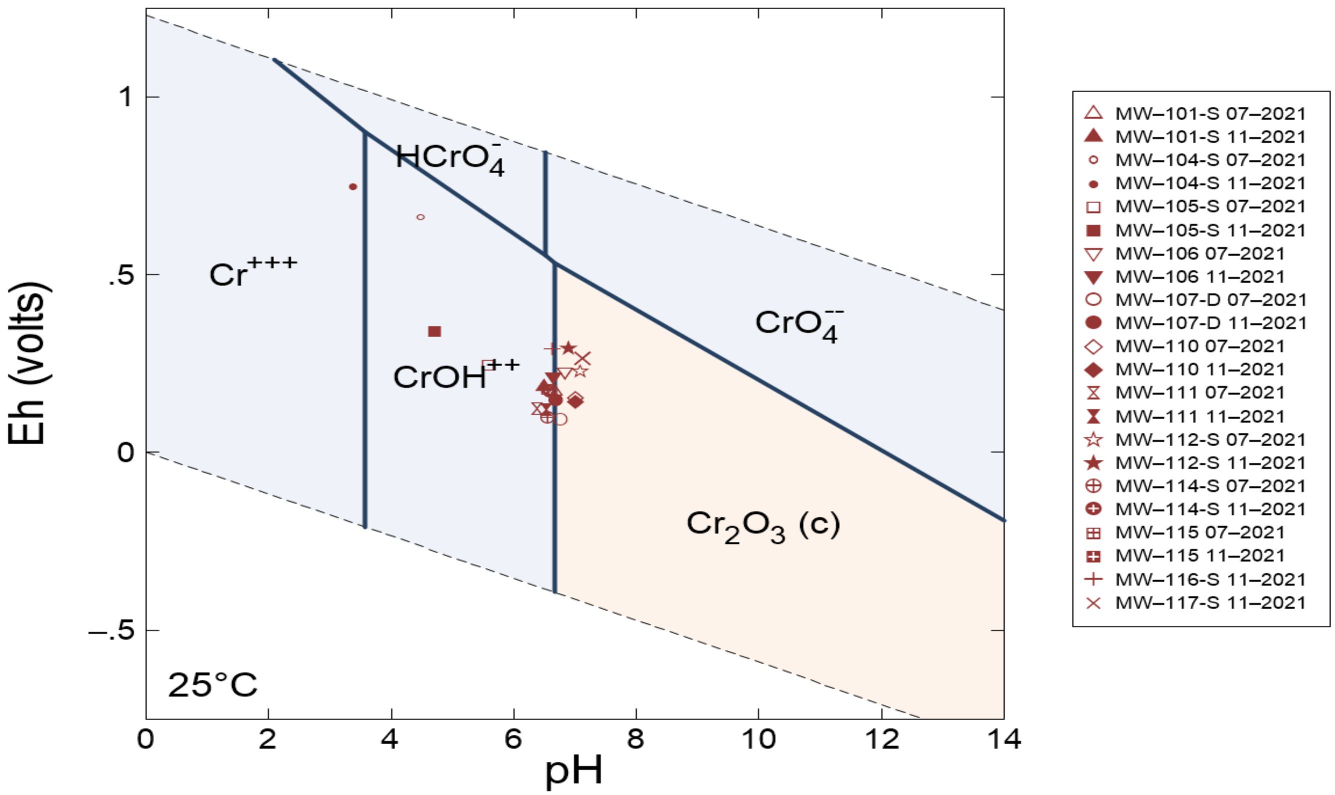
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT

GOLDER
MEMBER OF WSP

TITLE
Trilinear (Piper) Diagram of Under Coal Zone Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.1



CLIENT
CYPRUS AMAX MINERALS COMPANY

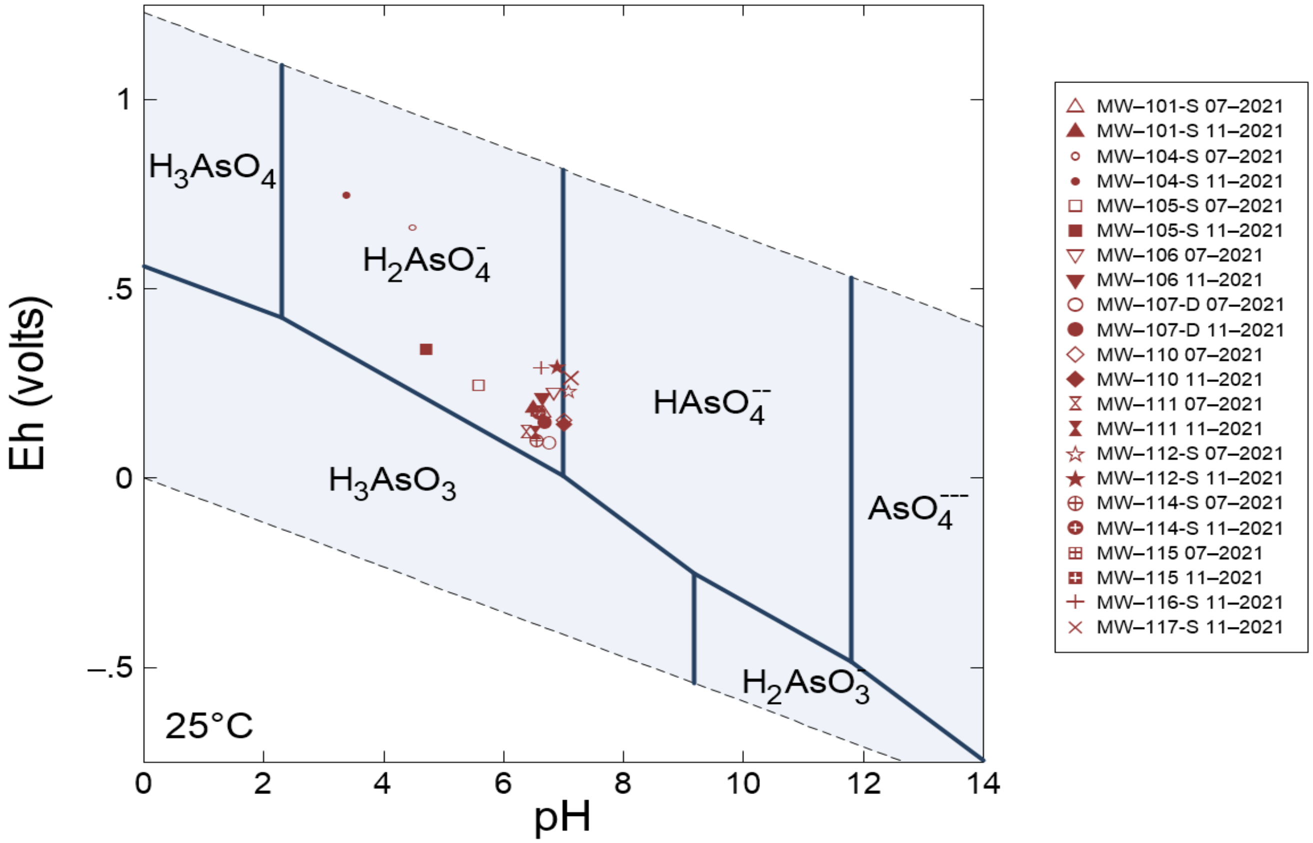
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Chromium Pourbaix Diagram for Under Coal Zone Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.2

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/400 - Evaluation Report (CSM)/Figures | FILE NAME: Figure Book (Geochem).xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

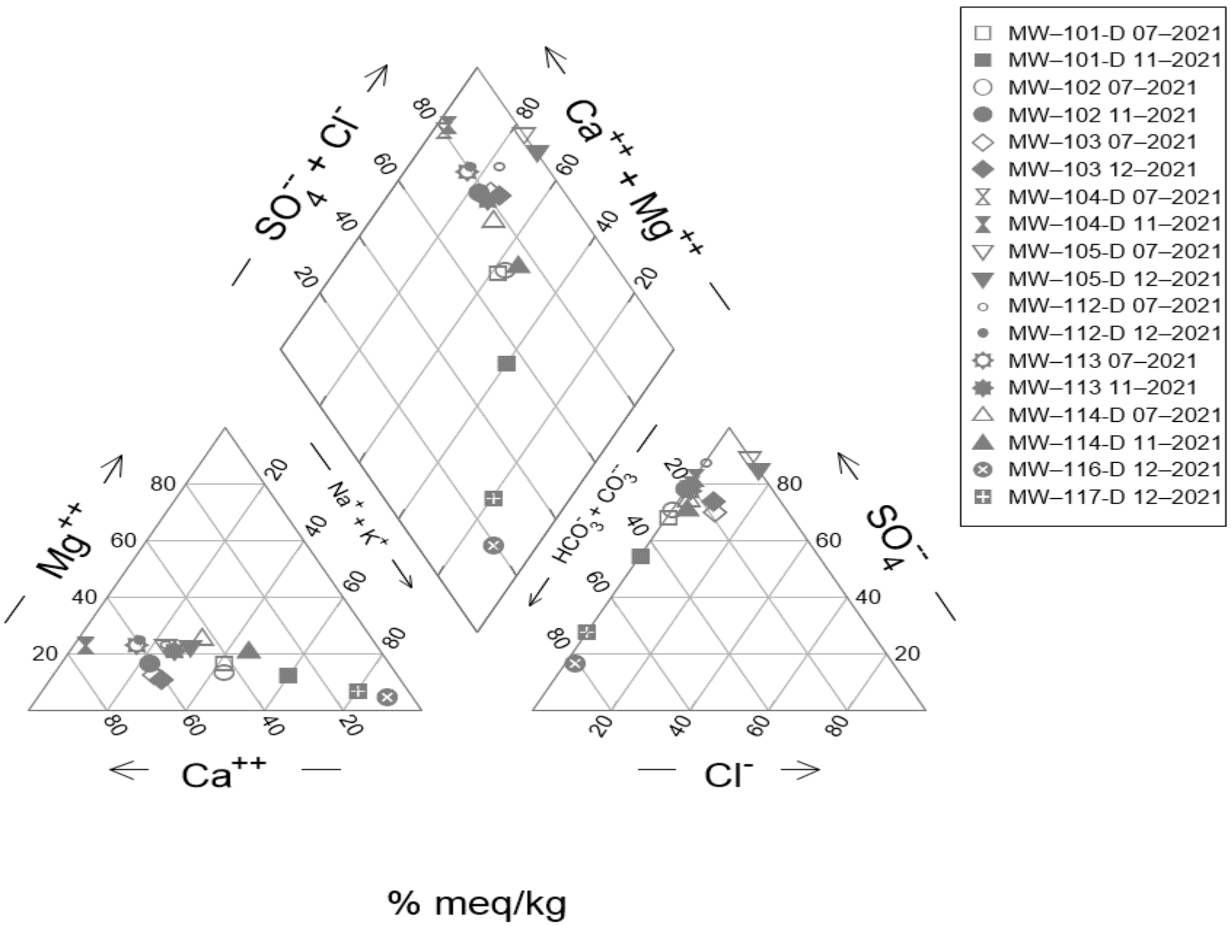
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Arsenic Pourbaix Diagram for Under Coal Zone Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.3

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/400 - Evaluation Report (CSM)/Figures | FILE NAME: Figure Book (Geochem).xlsx



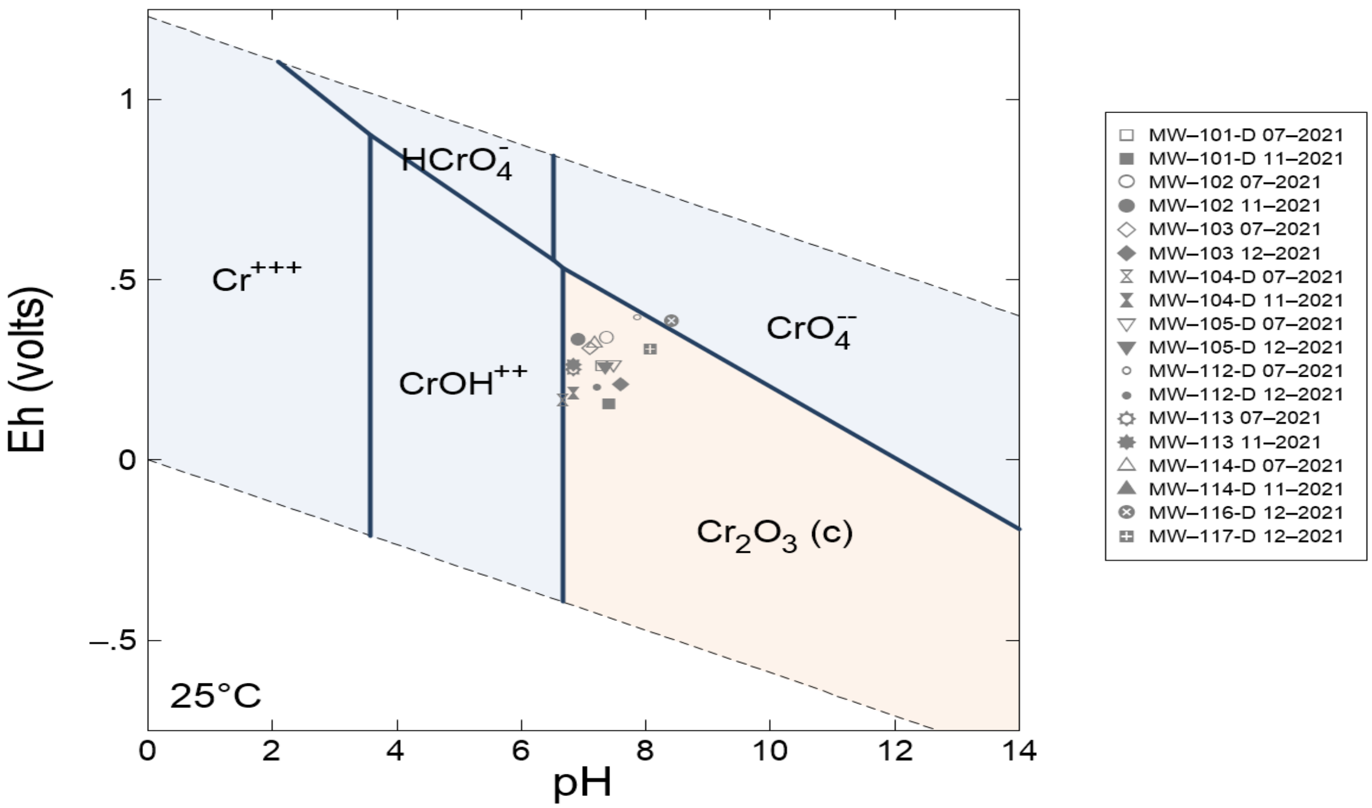
CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Trilinear (Piper) Digram of Upper Casselman Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.4



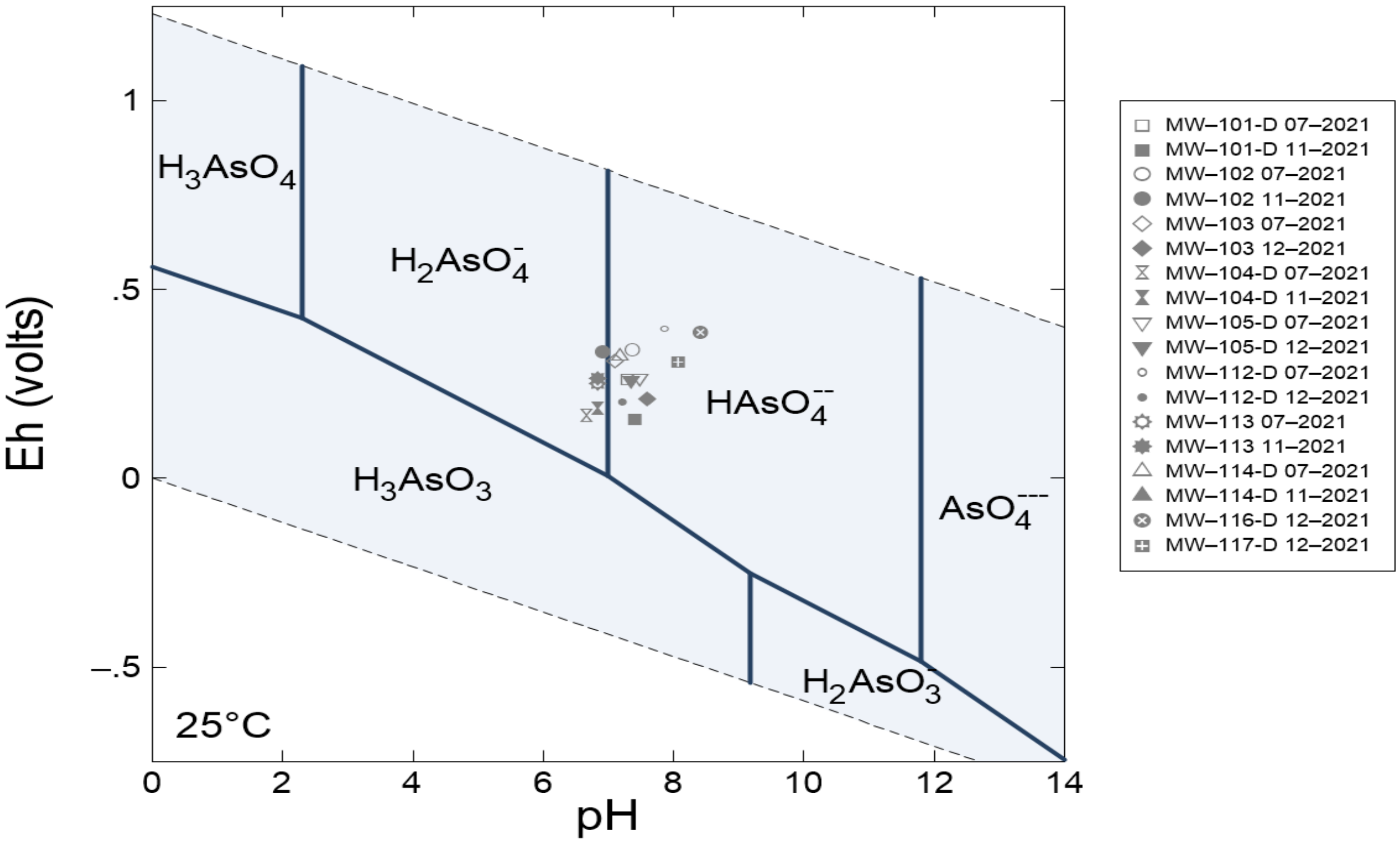
CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Chromium Pourbaix Diagram for Upper Casselman Zone Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.5



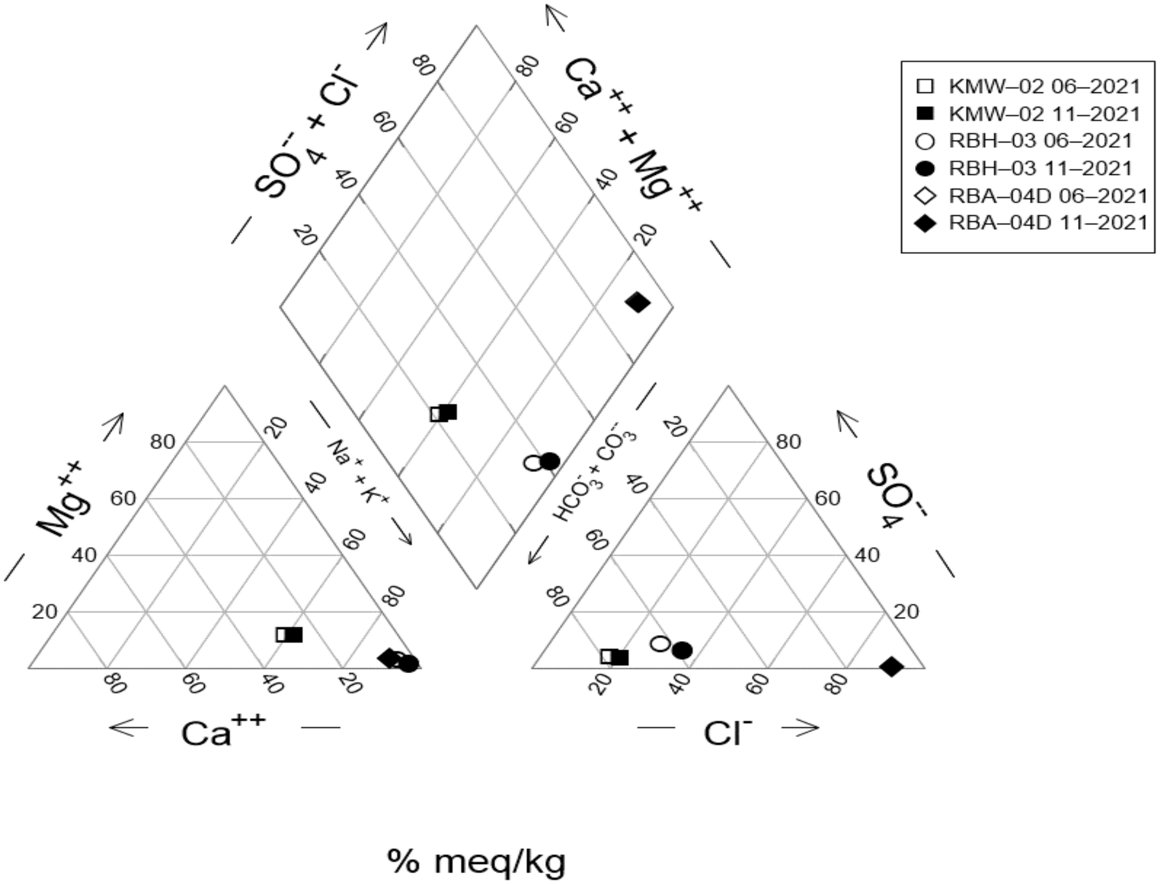
CLIENT
CYPRUS AMAX MINERALS COMPANY

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Arsenic Pourbaix Diagram for Upper Casselman Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.6



CLIENT
CYPRUS AMAX MINERALS COMPANY

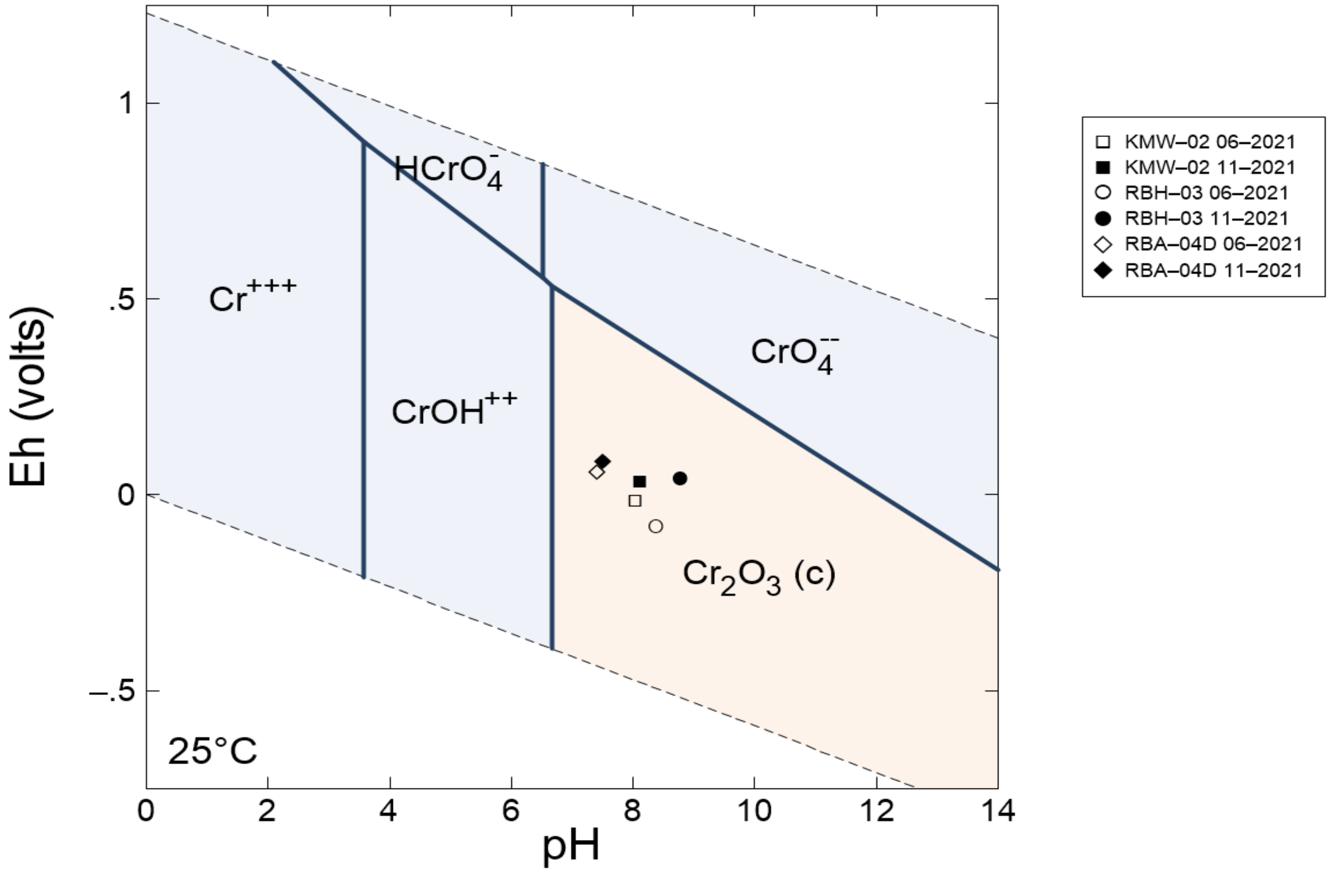
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Trilinear (Piper) Diagram of Bedrock Aquifer Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.7

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/400 - Evaluation Report (CSM)/Figures | FILE NAME: Figure Book (Geochem).xlsx



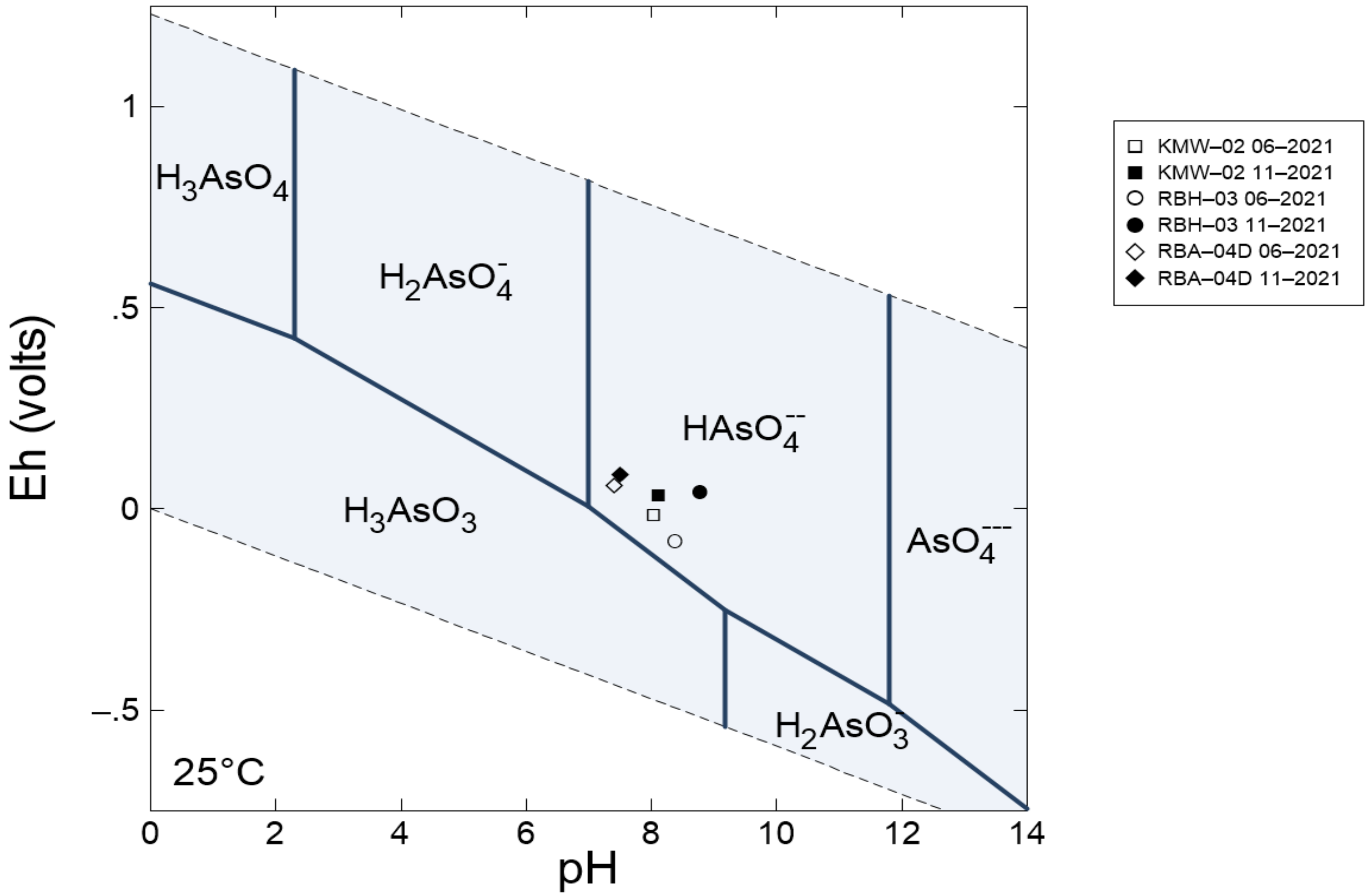
CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
Chromium Pourbaix Diagram for Bedrock Aquifer Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.8



CLIENT
CYPRUS AMAX MINERALS COMPANY

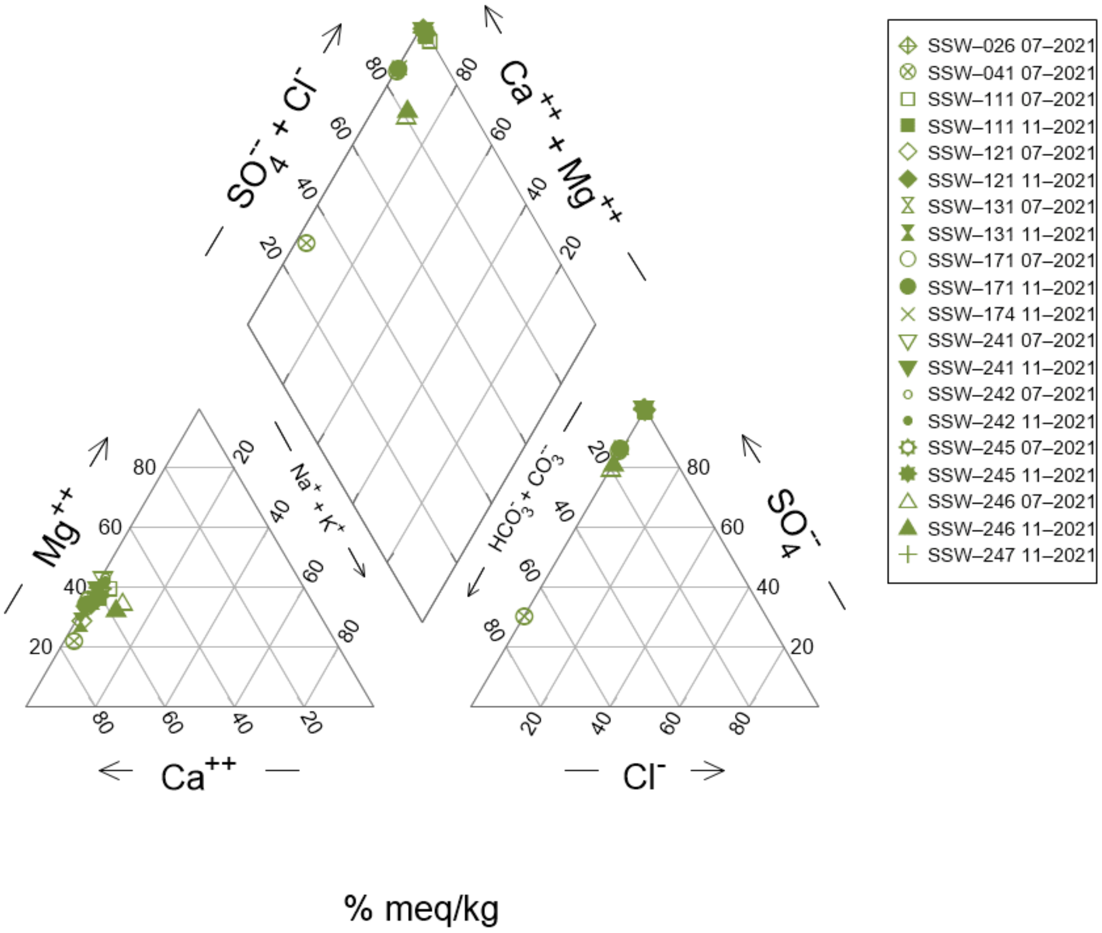
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Arsenic Pourbaix Diagram for Bedrock Aquifer Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.9

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/400 - Evaluation Report (CSM)/Figures | FILE NAME: Figure Book (Geochem).xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

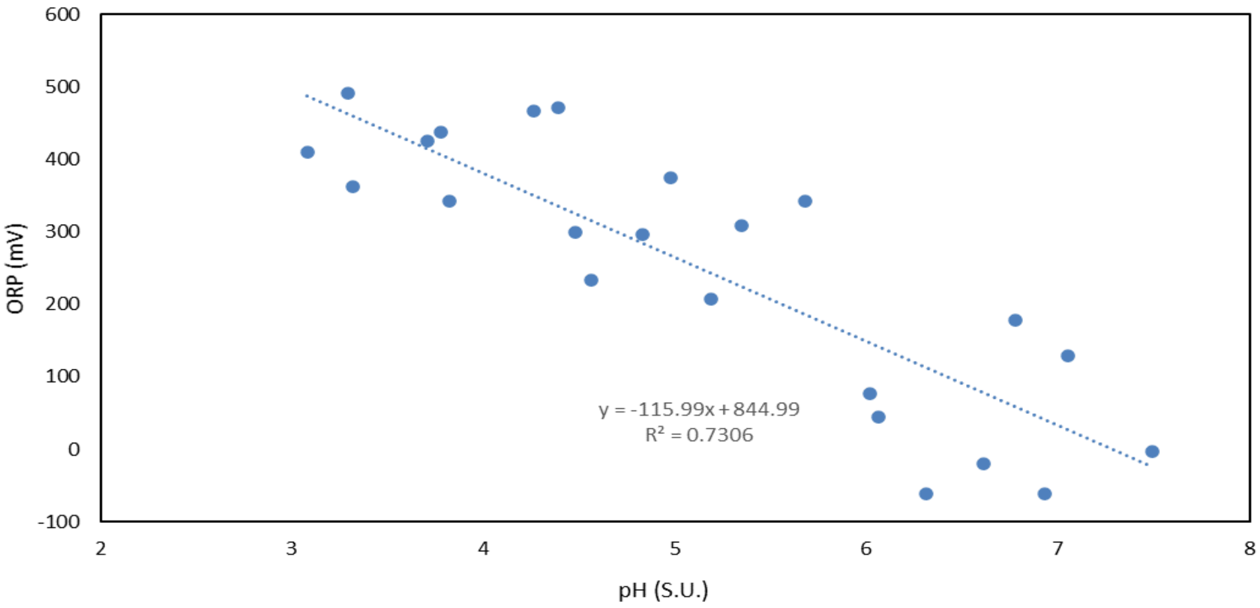
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Trilinear (Piper) Diagram of Seep Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.10

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/400 - Evaluation Report (CSM)/Figures | FILE NAME: Figure Book (Geochem).xlsx



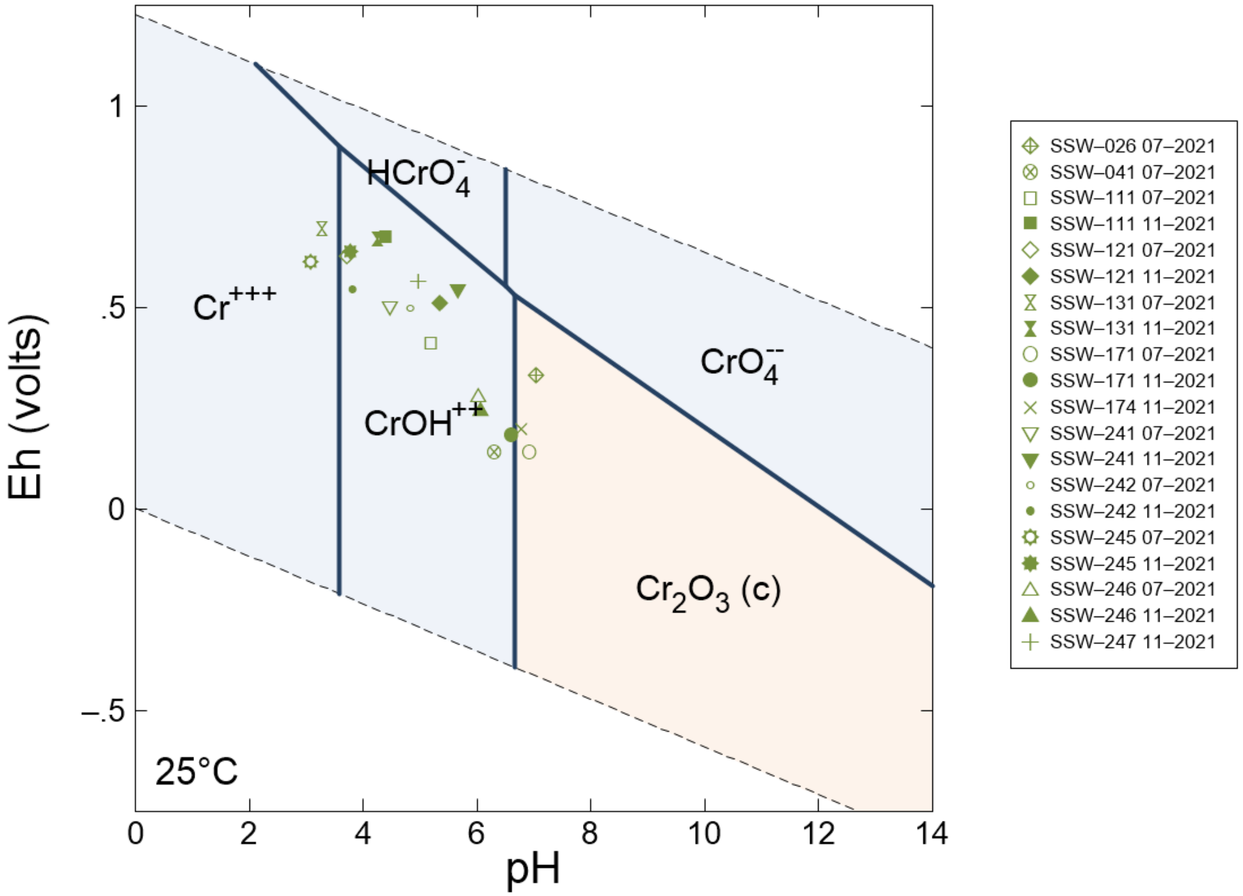
CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
pH versus ORP in Seep Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.11



CLIENT
CYPRUS AMAX MINERALS COMPANY

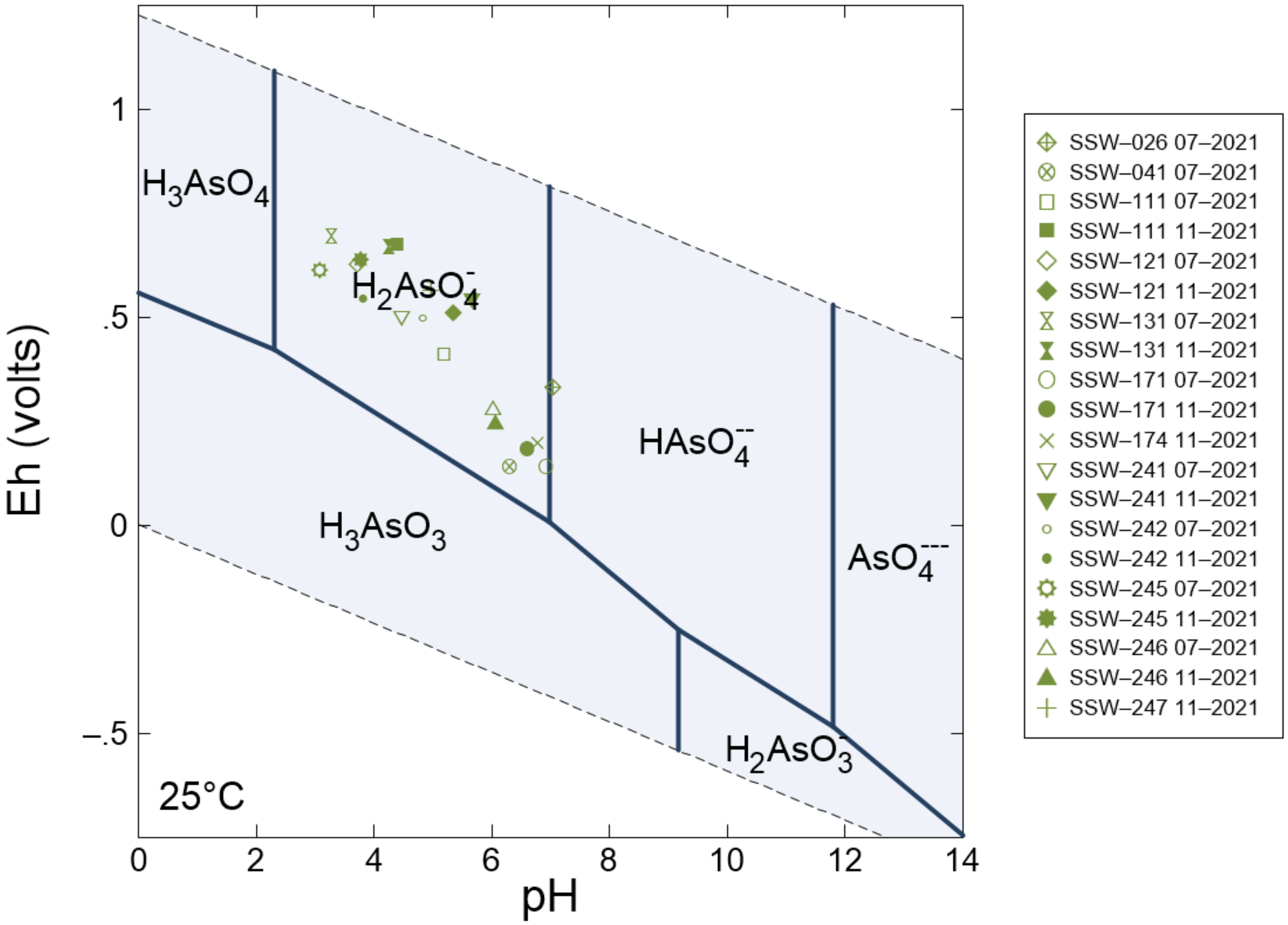
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Chromium Pourbaix Diagram for Seep Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.12

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/400 - Evaluation Report (CSM)/Figures | FILE NAME: Figure Book (Geochem).xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

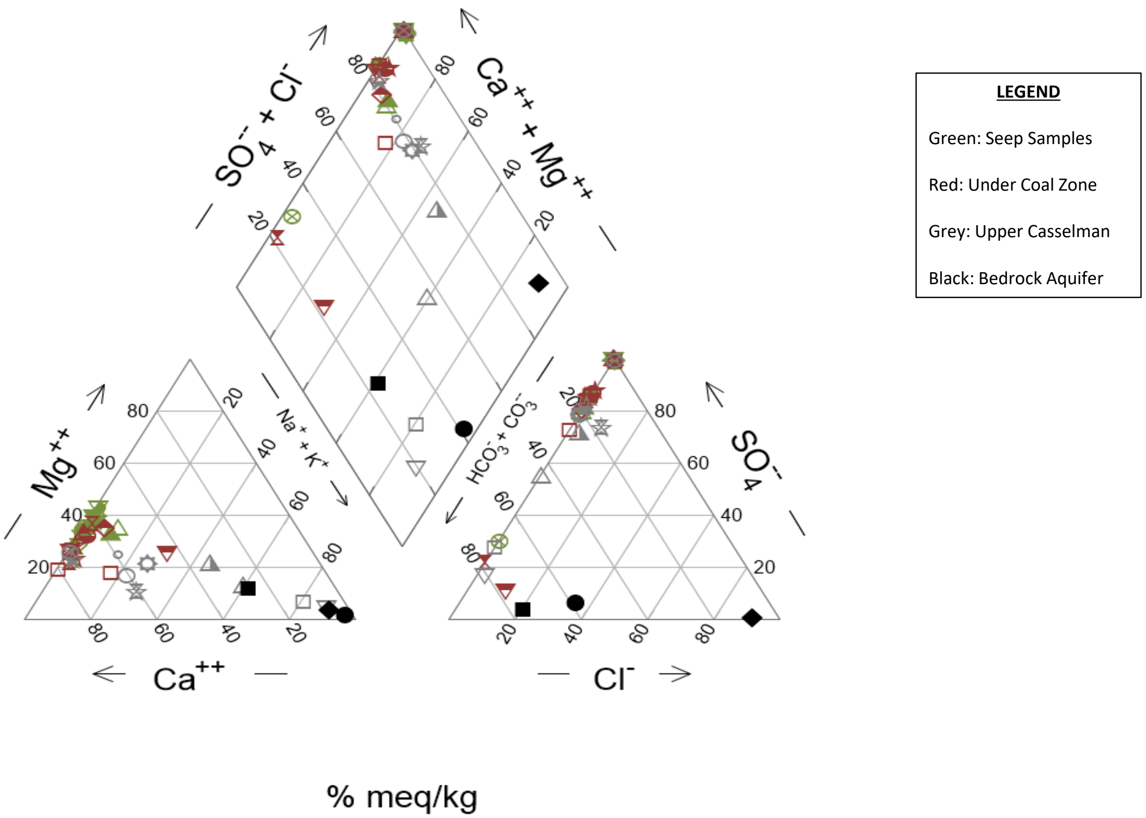
PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

CONSULTANT
GOLDER
MEMBER OF WSP

TITLE
Arsenic Pourbaix Diagram for Seep Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.13

PATH: https://golderassociates.sharepoint.com/sites/143623/Project Files/5 Technical Work/400 - Evaluation Report (CSM)/Figures | FILE NAME: Figure Book (Geochem).xlsx



CLIENT
CYPRUS AMAX MINERALS COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
FORMER SATRALLOY SITE
FORMER MINE AREA INVESTIGATION

TITLE
Trilinear (Piper) Diagram of Site Samples

PROJECT NO.	PHASE	REV.	FIGURE
12393309X10		A	6.14

APPENDIX A

Borehole Logs

BORING LOG STRATA PLOTS AND GEOLOGY CODES

Open Ground Cloud Project 12393309

Standard ASTM or USGS hatch patterns are used for all strata plots.

Geology Code colors are transposed over strata plots to indicate general material groupings or stratigraphic zones as follows:

🟧	Mine Spoils or Fill
🟪	Processed Materials (Slag, Slurry, Sludge, etc.)
🟨	Fine Grain Soils (C-M)
🟩	Coarse Grain Soils (S–G)
🟨	Sandstones (site-wide and below MAI area)
	Mine Area Only:
⬜	Lower Pittsburgh Stratigraphic Zone
🟩	Abandoned Mine Workings
⬛	Former Pittsburgh No 8 Coal Zone
🟦	Under Coal Stratigraphic Zone
🟪	Upper Casselman Stratigraphic Zone

GOLDER
MEMBER OF WSP

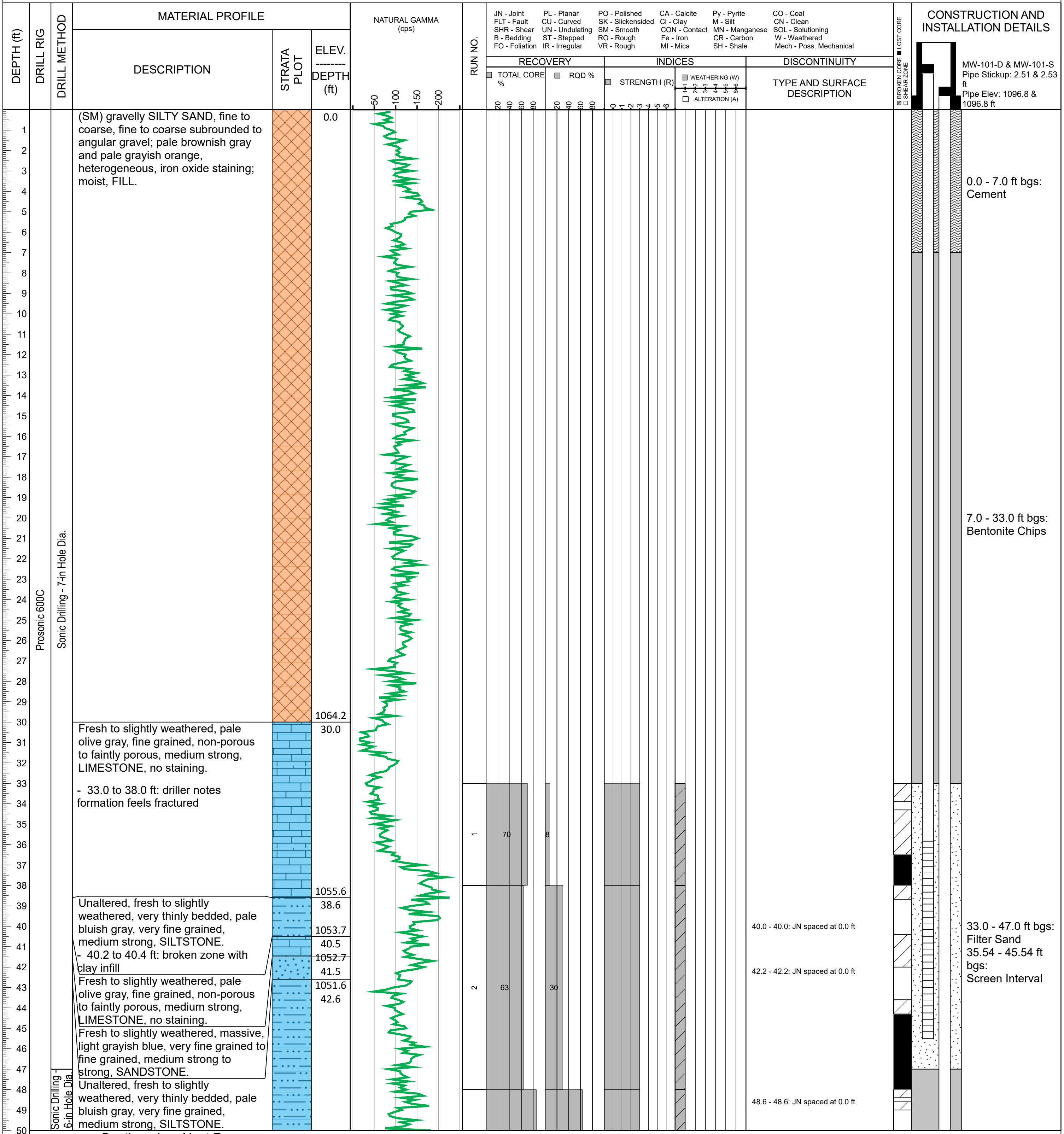
RECORD OF BOREHOLE: MW-101

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: June 21, 2021
END DATE: June 22, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1094.2 ft (Ground)
COORDINATES: N: 242600.8 ft E: 2478642.0 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

JN - Joint	PL - Planar	PO - Polished	CA - Calcite	Py - Pyrite	CO - Coal
FLT - Fault	CU - Curved	SK - Slickensided	Cl - Clay	M - Silt	CN - Clean
SHR - Shear	UN - Undulating	SM - Smooth	CON - Contact	MN - Manganese	SOL - Solutioning
B - Bedding	ST - Stepped	RO - Rough	Fe - Iron	CR - Carbon	W - Weathered
FO - Foliation	IR - Irregular	VR - Rough	MI - Mica	SH - Shale	Mech - Poss. Mechanical



DESCRIPTION	ELEV. / DEPTH (ft)
(SM) gravelly SILTY SAND, fine to coarse, fine to coarse subrounded to angular gravel; pale brownish gray and pale grayish orange, heterogeneous, iron oxide staining; moist, FILL.	0.0
Fresh to slightly weathered, pale olive gray, fine grained, non-porous to faintly porous, medium strong, LIMESTONE, no staining. - 33.0 to 38.0 ft: driller notes formation feels fractured	1064.2 30.0
Unaltered, fresh to slightly weathered, very thinly bedded, pale bluish gray, very fine grained, medium strong, SILTSTONE. - 40.2 to 40.4 ft: broken zone with clay infill	1055.6 38.6
Fresh to slightly weathered, pale olive gray, fine grained, non-porous to faintly porous, medium strong, LIMESTONE, no staining.	1053.7 40.5
Fresh to slightly weathered, massive, light grayish blue, very fine grained to fine grained, medium strong to strong, SANDSTONE.	1052.7 41.5
Unaltered, fresh to slightly weathered, very thinly bedded, pale bluish gray, very fine grained, medium strong, SILTSTONE.	1051.6 42.6

RUN NO.	TOTAL CORE %	RQD %
1	70	8
2	63	30

40.0 - 40.0: JN spaced at 0.0 ft
42.2 - 42.2: JN spaced at 0.0 ft
48.6 - 48.6: JN spaced at 0.0 ft

MW-101-D & MW-101-S
Pipe Stickup: 2.51 & 2.53 ft
Pipe Elev: 1096.8 & 1096.8 ft

0.0 - 7.0 ft bgs:
Cement

7.0 - 33.0 ft bgs:
Bentonite Chips

33.0 - 47.0 ft bgs:
Filter Sand
35.54 - 45.54 ft bgs:
Screen Interval

Continued on Next Page

HAMMER TYPE: N/A

REV:

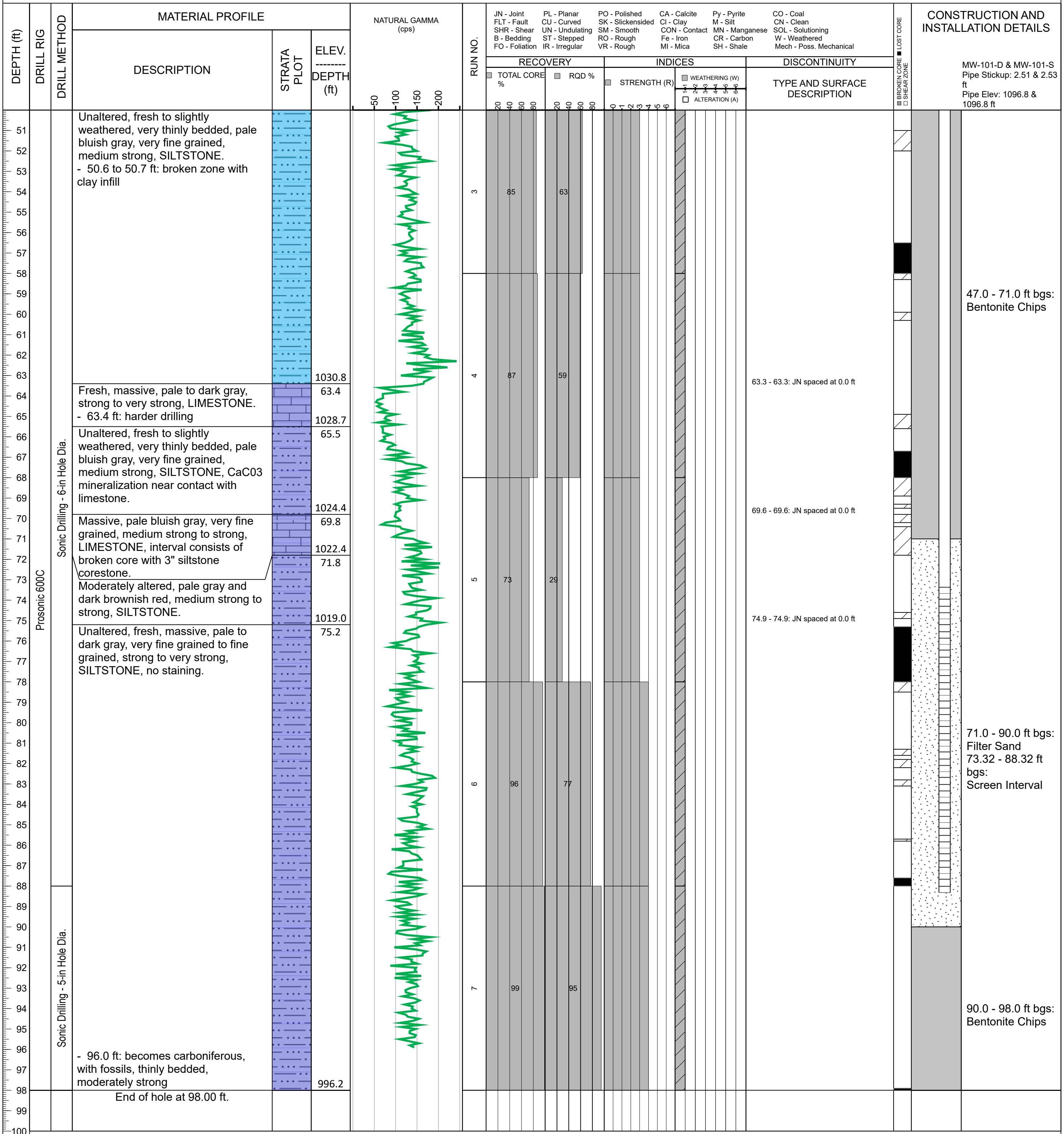
GOLDER
MEMBER OF WSP

LOGGED: Dan Bida
CHECKED: Bob Ireson

DATE: Jun 21, 2021
DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-101

CLIENT:	Cyprus Amax Minerals Company	START DATE:	June 21, 2021	ELEVATION:	1094.2 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	June 22, 2021	COORDINATES:	N: 242600.8 ft E: 2478642.0 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				



DESCRIPTION	ELEV. / DEPTH (ft)
Unaltered, fresh to slightly weathered, very thinly bedded, pale bluish gray, very fine grained, medium strong, SILTSTONE. - 50.6 to 50.7 ft: broken zone with clay infill	1030.8 / 63.4
Fresh, massive, pale to dark gray, strong to very strong, LIMESTONE. - 63.4 ft: harder drilling	1028.7 / 65.5
Unaltered, fresh to slightly weathered, very thinly bedded, pale bluish gray, very fine grained, medium strong, SILTSTONE, CaC03 mineralization near contact with limestone.	1024.4 / 69.8
Massive, pale bluish gray, very fine grained, medium strong to strong, LIMESTONE, interval consists of broken core with 3" siltstone corestone.	1022.4 / 71.8
Moderately altered, pale gray and dark brownish red, medium strong to strong, SILTSTONE.	1019.0 / 75.2
Unaltered, fresh, massive, pale to dark gray, very fine grained to fine grained, strong to very strong, SILTSTONE, no staining. - 96.0 ft: becomes carboniferous, with fossils, thinly bedded, moderately strong	996.2
End of hole at 98.00 ft.	

RUN NO.	TOTAL CORE %	RQD %
3	85	63
4	87	59
5	73	29
6	96	77
7	99	95

63.3 - 63.3: JN spaced at 0.0 ft

69.6 - 69.6: JN spaced at 0.0 ft

74.9 - 74.9: JN spaced at 0.0 ft

47.0 - 71.0 ft bgs: Bentonite Chips

71.0 - 90.0 ft bgs: Filter Sand
73.32 - 88.32 ft bgs: Screen Interval

90.0 - 98.0 ft bgs: Bentonite Chips

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

LOGGED: Dan Bida DATE: Jun 21, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-102

Sheet 1 of 2

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: June 28, 2021
END DATE: June 29, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1092.5 ft (Ground)
COORDINATES: N: 242374.8 ft E: 2478864.4 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

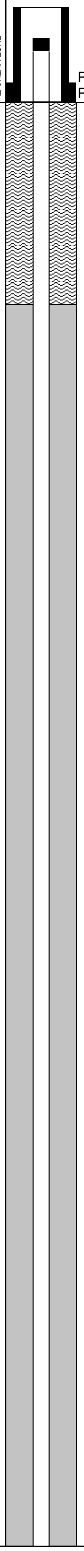
JN - Joint	PL - Planar	PO - Polished	CA - Calcite	Py - Pyrite	CO - Coal
FLT - Fault	CU - Curved	SK - Slickensided	Cl - Clay	M - Silt	CN - Clean
SHR - Shear	UN - Undulating	SM - Smooth	CON - Contact	MN - Manganese	SOL - Solutioning
B - Bedding	ST - Stepped	RO - Rough	Fe - Iron	CR - Carbon	W - Weathered
FO - Foliation	IR - Irregular	VR - Rough	MI - Mica	SH - Shale	Mech - Poss. Mechanical

DRILL RIG: Prosonic 600C
DRILL METHOD: Sonic Drilling - 6-in Hole Dia.

NATURAL GAMMA (cps): 50 100 150 200
RECOVERY: ▨ TOTAL CORE % 20 40 60 80; ▨ RQD % 20 40 60 80
INDICES: ▨ STRENGTH (R) 0 1 2 3 4 5 6; ▨ WEATHERING (W) ☐ ALTERATION (A) 1 2 3 4 5 6
DISCONTINUITY: TYPE AND SURFACE DESCRIPTION
▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE

DEPTH (ft)	MATERIAL PROFILE – DESCRIPTION	ELEV. / DEPTH (ft)
0.0	(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace sand, trace gravel; no staining; Topsoil / possible start of fill.	0.0
14.0	(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace sand, trace gravel; Fill composed of clay and coal debris.	1078.5 14.0
42.3	(SW-SM) SAND, fine, well graded, rounded to subrounded, some non plastic fines, trace gravel; Fine grained sand.	1050.2 42.3
46.2	(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace sand, trace gravel; Natural undisturbed soil.	1046.3 46.2

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.64 ft
Pipe Elev: 1095.1 ft

0.0 - 7.0 ft bgs: Cement

7.0 - 71.0 ft bgs: Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

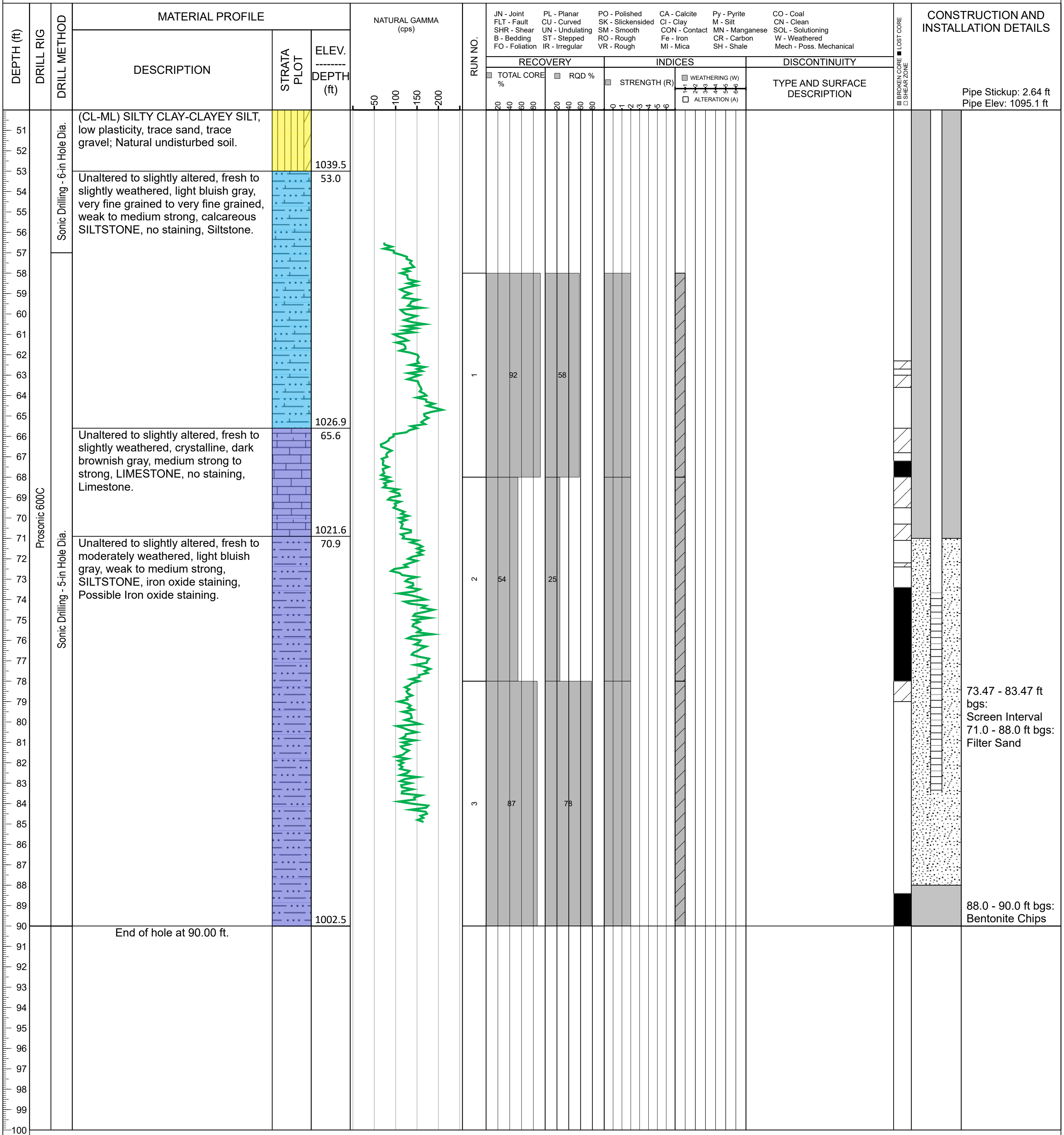
REV:

GOLDER MEMBER OF WSP

LOGGED: Ben Douvier DATE: Jun 28, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-102

CLIENT:	Cyprus Amax Minerals Company	START DATE:	June 28, 2021	ELEVATION:	1092.5 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	June 29, 2021	COORDINATES:	N: 242374.8 ft E: 2478864.4 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				



DESCRIPTION	ELEV. / DEPTH (ft)
(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace sand, trace gravel; Natural undisturbed soil.	1039.5
Unaltered to slightly altered, fresh to slightly weathered, light bluish gray, very fine grained to very fine grained, weak to medium strong, calcareous SILTSTONE, no staining, Siltstone.	53.0 1026.9
Unaltered to slightly altered, fresh to slightly weathered, crystalline, dark brownish gray, medium strong to strong, LIMESTONE, no staining, Limestone.	65.6 1021.6
Unaltered to slightly altered, fresh to moderately weathered, light bluish gray, weak to medium strong, SILTSTONE, iron oxide staining, Possible Iron oxide staining.	70.9 1002.5
End of hole at 90.00 ft.	

73.47 - 83.47 ft bgs:
Screen Interval
71.0 - 88.0 ft bgs:
Filter Sand

88.0 - 90.0 ft bgs:
Bentonite Chips

HAMMER TYPE: N/A	REV:

GOLDER
MEMBER OF WSP

LOGGED: Ben Douvier — DATE: Jun 28, 2021
CHECKED: Bob Ireson — DATE: Feb 04, 2022

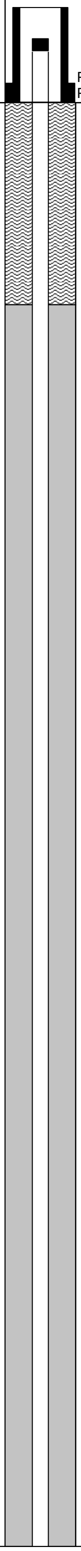
RECORD OF BOREHOLE: MW-103

Sheet 1 of 2

CLIENT:	Cyprus Amax Minerals Company	DATE:	June 17, 2021	ELEVATION:	1065.2 ft (Ground)
PROJECT:	Former Satralloy Site			COORDINATES:	N: 242460.1 ft E: 2479623.9 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

JN - Joint
FLT - Fault
SHR - Shear
B - Bedding
FO - Foliation
PL - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular
PO - Polished
SK - Slickensided
SM - Smooth
RO - Rough
VR - Rough
CA - Calcite
CI - Clay
CON - Contact
Fe - Iron
MI - Mica
Py - Pyrite
M - Silt
MN - Manganese
CR - Carbon
SH - Shale
CO - Coal
CN - Clean
SOL - Solutioning
W - Weathered
Mech - Poss. Mechanical

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	NATURAL GAMMA (cps) 50 100 150 200	RUN NO.	RECOVERY: TOTAL CORE % 20 40 60 80	RECOVERY: RQD % 20 40 60 80	INDICES: STRENGTH (R) 0 1 2 3 4 5 6	INDICES: WEATHERING (W) / ALTERATION (A) 1 2 3 4 5 6	DISCONTINUITY: TYPE AND SURFACE DESCRIPTION	▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE	CONSTRUCTION AND INSTALLATION DETAILS
														Pipe Stickup: 2.60 ft Pipe Elev: 1067.8 ft
0	Prosonic 600C	Sonic Drilling - 6-in Hole Dia.	MIXTURE of SOIL and ROCK - FILL - (SM) gravelly SILTY SAND, medium to coarse, subrounded to subangular, and non plastic fines, fine to coarse subrounded to subangular gravel; dark olive brown with pale orangish tan, weathered, iron oxide staining, no odor, weak HCL reaction; strong Sandstone, limestone, some coal; non-cohesive, dry, loose to compact, Mixed layers of fill, Sandstone, limestone, cal residium, moist at approximately 20feet bgs.		0.0									0.0 - 7.0 ft bgs: Cement
28			MIXTURE of SOIL and ROCK - FILL - (SC) gravelly CLAYEY SAND, medium to coarse, subrounded to subangular, and low plasticity fines, fine to coarse subrounded to subangular gravel; dark olive brown with pale orangish tan, weathered, iron oxide staining, no odor, no HCL reaction; strong Sandstone, limestone, some coal; cohesive, w ~ PL, Mixed layers of fill, Sandstone residiummoizt and approximately 31feet bgs.		1037.2 28.0									7.0 - 51.0 ft bgs: Bentonite Chips
50														



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HAMMER TYPE: N/A

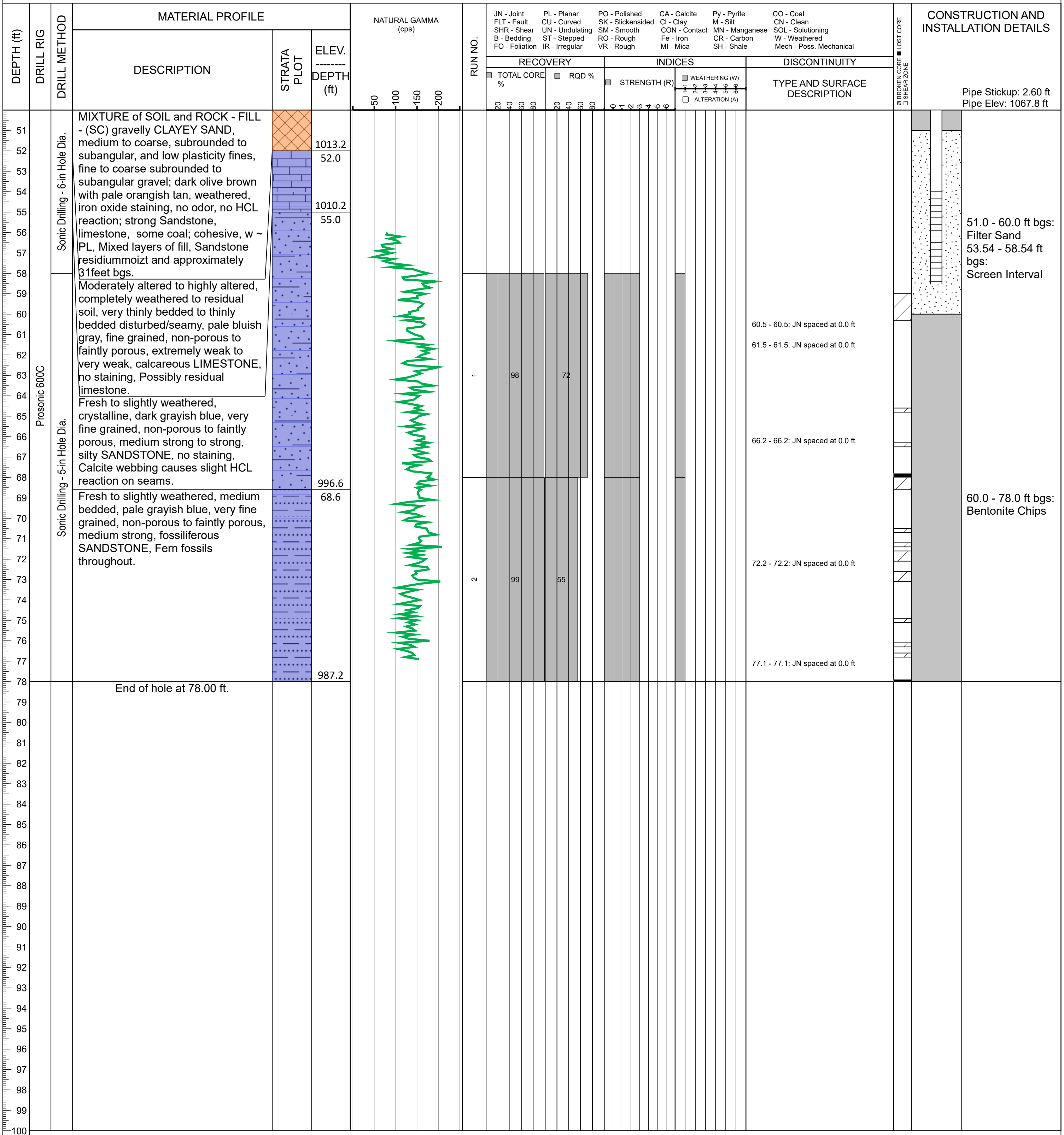
REV:

LOGGED: Andrew Adkins/Dan Bida DATE: Jun 17, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-103

Sheet 2 of 2

CLIENT:	Cyprus Amax Minerals Company	DATE:	June 17, 2021	ELEVATION:	1065.2 ft (Ground)
PROJECT:	Former Satralloy Site			COORDINATES:	N: 242460.1 ft E: 2479623.9 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				



DRILL RIG: Prosonic 600C

DRILL METHOD: Sonic Drilling - 6-in Hole Dia.; Sonic Drilling - 5-in Hole Dia.

DESCRIPTION	ELEV. -------- DEPTH (ft)
MIXTURE of SOIL and ROCK - FILL - (SC) gravelly CLAYEY SAND, medium to coarse, subrounded to subangular, and low plasticity fines, fine to coarse subrounded to subangular gravel; dark olive brown with pale orangish tan, weathered, iron oxide staining, no odor, no HCL reaction; strong Sandstone, limestone, some coal; cohesive, w ~ PL, Mixed layers of fill, Sandstone residiummoizt and approximately 31feet bgs.	1013.2 52.0
Moderately altered to highly altered, completely weathered to residual soil, very thinly bedded to thinly bedded disturbed/seamy, pale bluish gray, fine grained, non-porous to faintly porous, extremely weak to very weak, calcareous LIMESTONE, no staining, Possibly residual limestone.	1010.2 55.0
Fresh to slightly weathered, crystalline, dark grayish blue, very fine grained, non-porous to faintly porous, medium strong to strong, silty SANDSTONE, no staining, Calcite webbing causes slight HCL reaction on seams.	996.6 68.6
Fresh to slightly weathered, medium bedded, pale grayish blue, very fine grained, non-porous to faintly porous, medium strong, fossiliferous SANDSTONE, Fern fossils throughout.	987.2
End of hole at 78.00 ft.	

RUN NO.	TOTAL CORE %	RQD %
1	98	72
2	99	55

60.5 - 60.5: JN spaced at 0.0 ft

61.5 - 61.5: JN spaced at 0.0 ft

66.2 - 66.2: JN spaced at 0.0 ft

72.2 - 72.2: JN spaced at 0.0 ft

77.1 - 77.1: JN spaced at 0.0 ft

Pipe Stickup: 2.60 ft
Pipe Elev: 1067.8 ft

51.0 - 60.0 ft bgs: Filter Sand
53.54 - 58.54 ft bgs: Screen Interval

60.0 - 78.0 ft bgs: Bentonite Chips

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

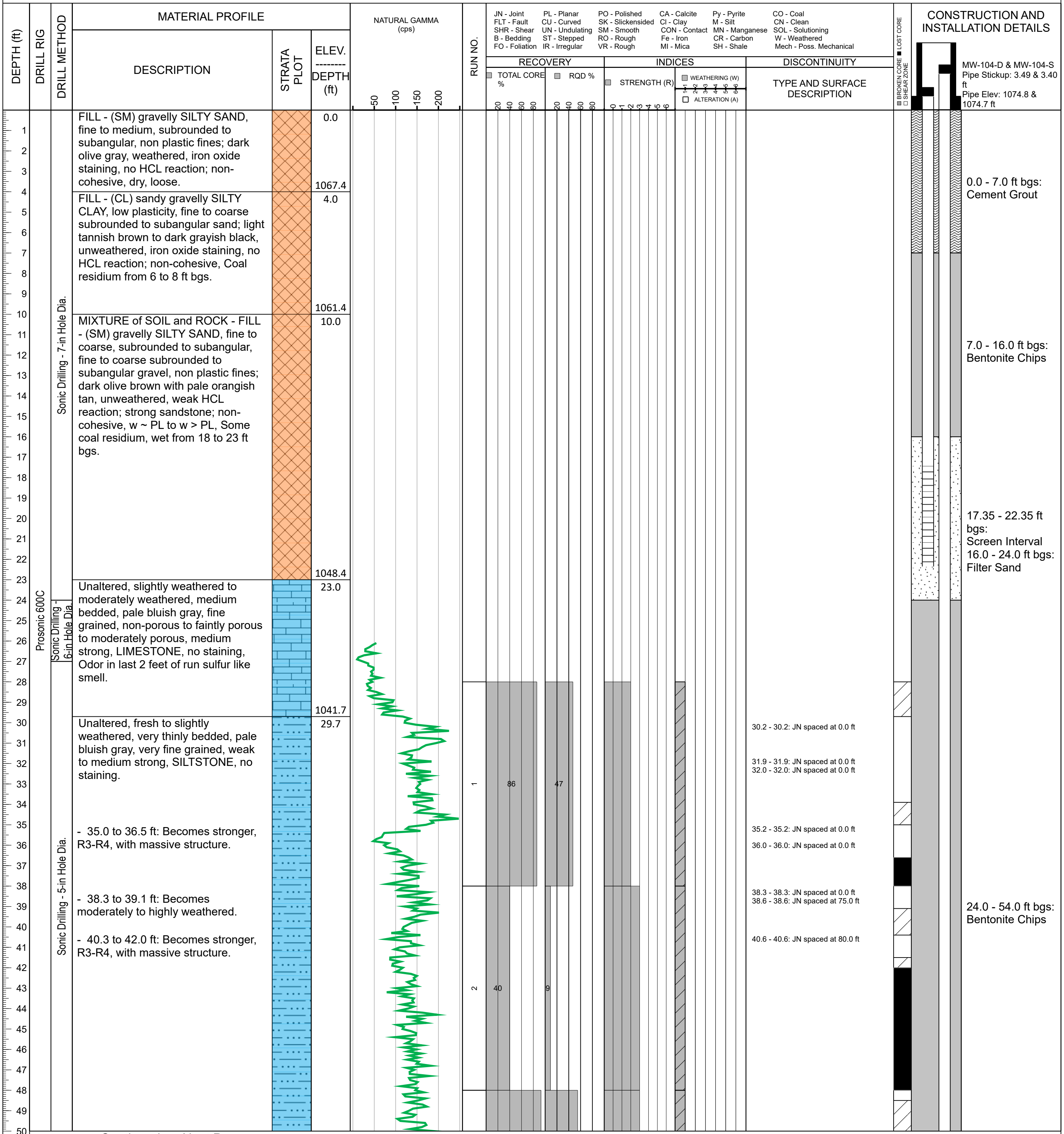
LOGGED: Andrew Adkins/Dan Bida DATE: Jun 17, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-104

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: June 15, 2021
END DATE: June 16, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1071.4 ft (Ground)
COORDINATES: N: 242040.5 ft E: 2479828.1 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88



JN - Joint
FLT - Fault
SHR - Shear
B - Bedding
FO - Foliation

PL - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

PO - Polished
SK - Slickensided
SM - Smooth
RO - Rough
VR - Rough

CA - Calcite
CI - Clay
CON - Contact
Fe - Iron
MI - Mica

Py - Pyrite
M - Silt
MN - Manganese
CR - Carbon
SH - Shale

CO - Coal
CN - Clean
SOL - Solutioning
W - Weathered
Mech - Poss. Mechanical

MATERIAL PROFILE DESCRIPTION	ELEV. -------- DEPTH (ft)
FILL - (SM) gravelly SILTY SAND, fine to medium, subrounded to subangular, non plastic fines; dark olive gray, weathered, iron oxide staining, no HCL reaction; non-cohesive, dry, loose.	0.0
FILL - (CL) sandy gravelly SILTY CLAY, low plasticity, fine to coarse subrounded to subangular sand; light tannish brown to dark grayish black, unweathered, iron oxide staining, no HCL reaction; non-cohesive, Coal residium from 6 to 8 ft bgs.	1067.4 4.0
MIXTURE of SOIL and ROCK - FILL - (SM) gravelly SILTY SAND, fine to coarse, subrounded to subangular, fine to coarse subrounded to subangular gravel, non plastic fines; dark olive brown with pale orangish tan, unweathered, weak HCL reaction; strong sandstone; non-cohesive, w ~ PL to w > PL, Some coal residium, wet from 18 to 23 ft bgs.	1061.4 10.0
Unaltered, slightly weathered to moderately weathered, medium bedded, pale bluish gray, fine grained, non-porous to faintly porous to moderately porous, medium strong, LIMESTONE, no staining, Odor in last 2 feet of run sulfur like smell.	1048.4 23.0
Unaltered, fresh to slightly weathered, very thinly bedded, pale bluish gray, very fine grained, weak to medium strong, SILTSTONE, no staining. - 35.0 to 36.5 ft: Becomes stronger, R3-R4, with massive structure. - 38.3 to 39.1 ft: Becomes moderately to highly weathered. - 40.3 to 42.0 ft: Becomes stronger, R3-R4, with massive structure.	1041.7 29.7

DISCONTINUITY TYPE AND SURFACE DESCRIPTION

30.2 - 30.2: JN spaced at 0.0 ft
31.9 - 31.9: JN spaced at 0.0 ft
32.0 - 32.0: JN spaced at 0.0 ft
35.2 - 35.2: JN spaced at 0.0 ft
36.0 - 36.0: JN spaced at 0.0 ft
38.3 - 38.3: JN spaced at 0.0 ft
38.6 - 38.6: JN spaced at 75.0 ft
40.6 - 40.6: JN spaced at 80.0 ft

CONSTRUCTION AND INSTALLATION DETAILS

MW-104-D & MW-104-S Pipe Stickup: 3.49 & 3.40 ft
Pipe Elev: 1074.8 & 1074.7 ft

0.0 - 7.0 ft bgs: Cement Grout

7.0 - 16.0 ft bgs: Bentonite Chips

17.35 - 22.35 ft bgs: Screen Interval
16.0 - 24.0 ft bgs: Filter Sand

24.0 - 54.0 ft bgs: Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

LOGGED: Andrew Adkins/Dan Bida DATE: Jun 15, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-104

Sheet 2 of 2

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: June 15, 2021
END DATE: June 16, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

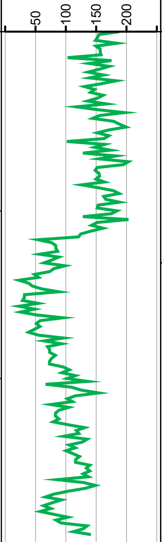
ELEVATION: 1071.4 ft (Ground)
COORDINATES: N: 242040.5 ft E: 2479828.1 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

JN - Joint
FLT - Fault
SHR - Shear
B - Bedding
FO - Foliation
PL - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular
PO - Polished
SK - Slickensided
SM - Smooth
RO - Rough
VR - Rough
CA - Calcite
CI - Clay
CON - Contact
Fe - Iron
MI - Mica
Py - Pyrite
M - Silt
MN - Manganese
CR - Carbon
SH - Shale
CO - Coal
CN - Clean
SOL - Solutioning
W - Weathered
Mech - Poss. Mechanical

MATERIAL PROFILE

DEPTH (ft)	DRILL RIG	DRILL METHOD	DESCRIPTION	ELEV. / DEPTH (ft)
50.6 – 56.2	Prosonic 600C	Sonic Drilling - 5-in Hole Dia.	Unaltered, fresh to slightly weathered, very thinly bedded, pale bluish gray, very fine grained, weak to medium strong, SILTSTONE, no staining. - 53.7 to 56.2 ft: Grades to carbonaceous siltstone, pale blueish gray and dark gray.	1015.2 56.2
56.2 – 62.0			Unaltered, fresh, massive, pale purplish gray, very fine grained, strong, LIMESTONE.	1009.4 62.0
62.0 – 68.0			Unaltered, fresh to slightly weathered, very thinly bedded, pale bluish gray, very fine grained, weak to medium strong, SILTSTONE, no staining. - 64.0 ft: Calcite nodules/pervasive alteration observed	1003.4
68.0			End of hole at 68.00 ft.	

NATURAL GAMMA (cps)



RUN NO.	TOTAL CORE %	RQD %
3	93	55
4	88	7

RECOVERY: TOTAL CORE % (20 40 60 80), RQD % (20 40 60 80)
INDICES: STRENGTH (R) (0 1 2 3 4 5 6); WEATHERING (W) / ALTERATION (A) (1 2 3 4 5 6)

DISCONTINUITY

TYPE AND SURFACE DESCRIPTION

50.6 - 50.6: spaced at 0.0 ft
50.8 - 50.8: JN spaced at 0.0 ft
51.4 - 51.4: JN spaced at 0.0 ft

52.5 - 52.5:

54.0 - 54.0: JN spaced at 0.0 ft

55.3 - 55.3: JN spaced at 76.0 ft

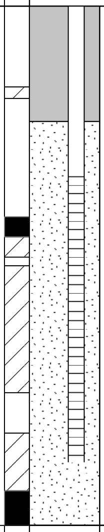
56.0 - 56.0: JN spaced at 0.0 ft
56.1 - 56.1: JN spaced at 0.0 ft

64.4 - 64.4: JN spaced at 0.0 ft
64.8 - 64.8: JN spaced at 0.0 ft

▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE

CONSTRUCTION AND INSTALLATION DETAILS

MW-104-D & MW-104-S
Pipe Stickup: 3.49 & 3.40 ft
Pipe Elev: 1074.8 & 1074.7 ft



55.81 - 65.81 ft bgs:
Screen Interval
54.0 - 68.0 ft bgs:
Filter Sand

HAMMER TYPE: N/A

REV:

LOGGED: Andrew Adkins/Dan Bida DATE: Jun 15, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

GOLDER MEMBER OF WSP

RECORD OF BOREHOLE: MW-105

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: June 10, 2021
END DATE: June 11, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

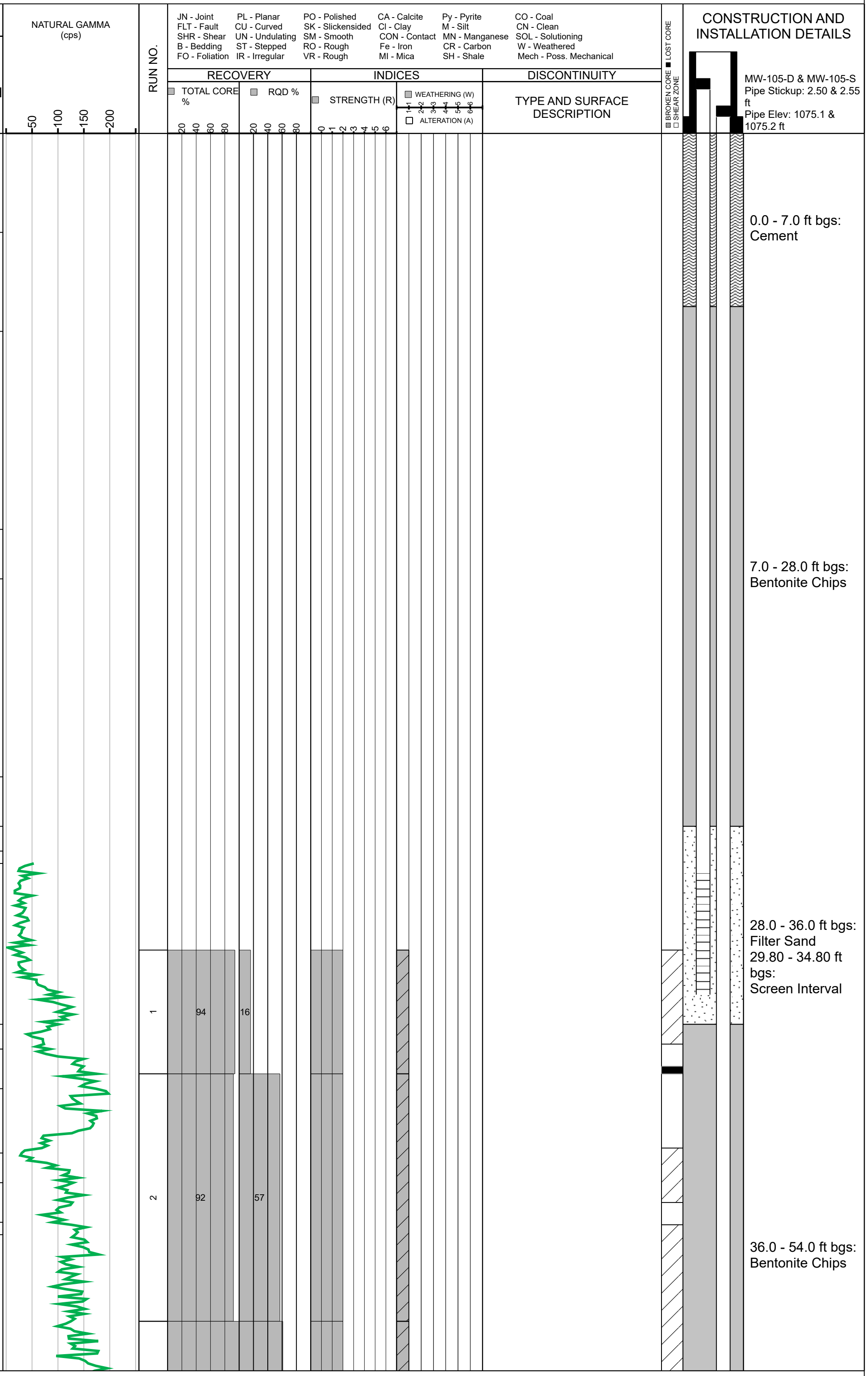
ELEVATION: 1072.6 ft (Ground)
COORDINATES: N: 241726.9 ft E: 2479660.3 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DRILL RIG: Prosonic 600C

DRILL METHOD: Sonic Drilling - 7-in Hole Dia.; Sonic Drilling - 6-in Hole Dia.; Sonic Drilling - 5-in Hole Dia.

MATERIAL PROFILE

DESCRIPTION	ELEV. -------- DEPTH (ft)
FILL - (SC) gravelly CLAYEY SAND, fine to coarse, fine to coarse subrounded to subangular gravel; pale grayish brown, heterogeneous; 5% by volume, subrounded to subangular cobbles/boulders; moist.	0.0
FILL - (CL) SILTY CLAY and SAND, low plasticity; dark brownish black; moist, consists of residual coal spoils/waste.	1068.6 4.0
FILL - (SC) gravelly CLAYEY SAND, fine to coarse, and low plasticity fines, fine to coarse subrounded to angular gravel; pale grayish brown and pale grayish tan, heterogeneous; moist.	1064.6 8.0
FILL - (SM) gravelly SILTY SAND, fine to coarse, fine gravel; pale grayish white to dark gray, heterogeneous; moist, consists of slag or ashy fill.	1056.6 16.0
FILL - (SC) gravelly CLAYEY SAND, fine to coarse, and low plasticity fines, fine to coarse subrounded to angular gravel; pale grayish brown and pale grayish tan, heterogeneous; moist.	1054.6 18.0
FILL - (CL) SILTY CLAY and SAND, low plasticity; dark brownish black; moist, consists of residual coal spoils/waste.	1046.6 26.0
FILL - (SC) gravelly CLAYEY SAND, fine to coarse, and low plasticity fines, fine to coarse subrounded to angular gravel; pale grayish brown and pale grayish tan, heterogeneous; moist.	1044.6 28.0
Completely weathered to residual soil, massive, pale to dark bluish gray, very fine grained, extremely weak, LIMESTONE.	1043.6 29.0
Fresh to slightly weathered, massive, dark gray, medium strong, LIMESTONE.	1043.1 29.5
Fresh to slightly weathered, very thinly bedded, pale bluish gray, weak to medium strong, SILTSTONE.	1036.6 36.0
Fresh, very thinly bedded, light grayish white to dark gray, fine grained to very fine grained, strong, SANDSTONE.	1035.6 37.0
Fresh, very thinly bedded, pale bluish gray, very fine grained, weak to medium strong, SILTSTONE.	1034.0 38.6
Fresh to slightly weathered, massive, dark gray, medium strong, LIMESTONE.	1031.4 41.2
Unaltered to slightly altered, fresh, pale bluish gray, medium strong, SILTSTONE, no staining.	1030.2 42.4
Unaltered to slightly altered, fresh to slightly weathered, crystalline, light tannish brown, weak to medium strong, LIMESTONE, no staining.	1028.6 44.0
Unaltered to slightly altered, fresh to slightly weathered, pale bluish gray, weak to medium strong, SILTSTONE, no staining.	1028.1 44.5



MW-105-D & MW-105-S
Pipe Stickup: 2.50 & 2.55 ft
Pipe Elev: 1075.1 & 1075.2 ft

0.0 - 7.0 ft bgs: Cement

7.0 - 28.0 ft bgs: Bentonite Chips

28.0 - 36.0 ft bgs: Filter Sand
29.80 - 34.80 ft bgs: Screen Interval

36.0 - 54.0 ft bgs: Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

LOGGED: Ben Douvier/Dan Bida DATE: Jun 10, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-105

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: June 10, 2021
END DATE: June 11, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1072.6 ft (Ground)
COORDINATES: N: 241726.9 ft E: 2479660.3 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

JN - Joint
FLT - Fault
SHR - Shear
B - Bedding
FO - Foliation

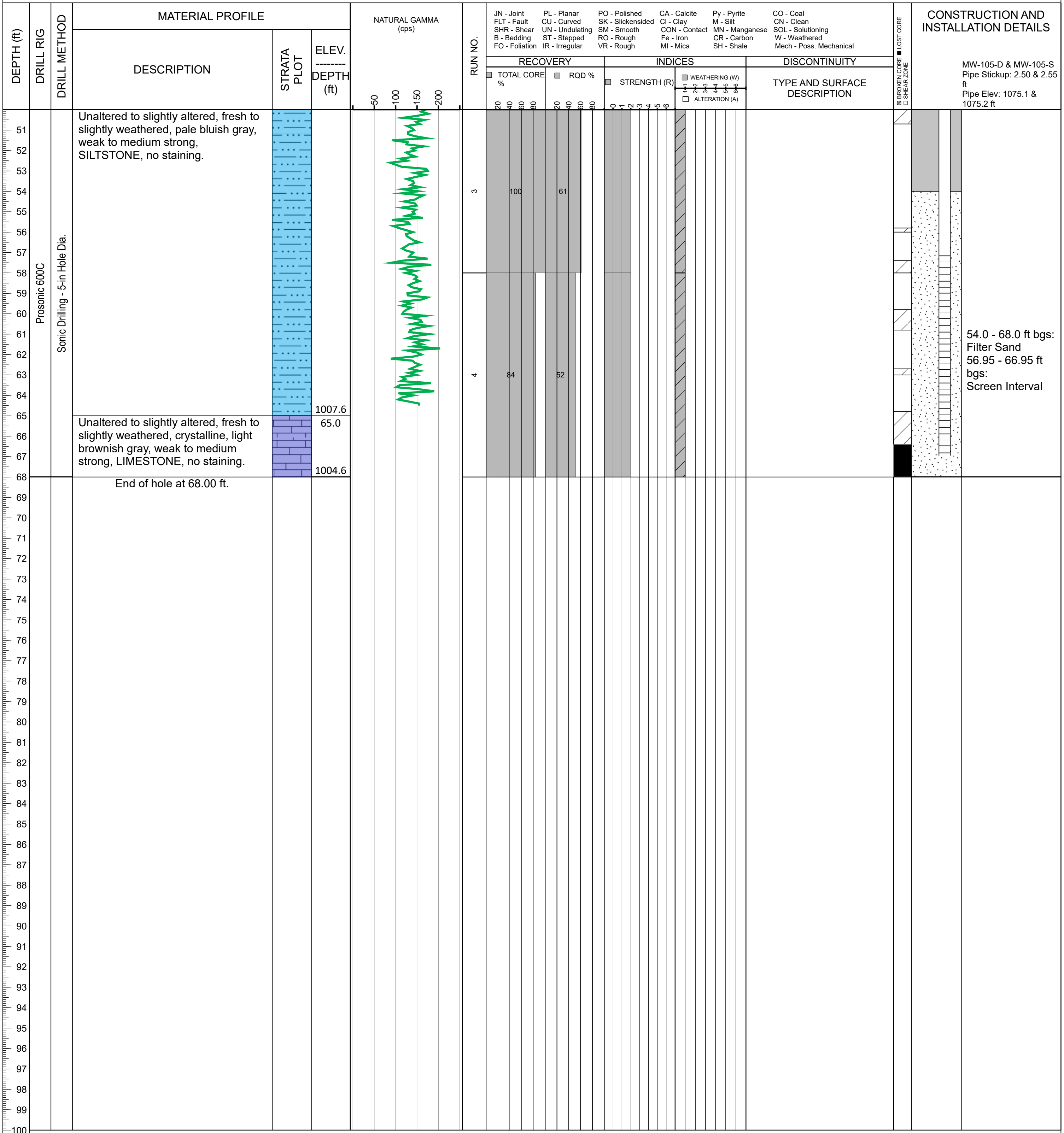
PL - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

PO - Polished
SK - Slickensided
SM - Smooth
RO - Rough
VR - Rough

CA - Calcite
CI - Clay
CON - Contact
Fe - Iron
MI - Mica

Py - Pyrite
M - Silt
MN - Manganese
CR - Carbon
SH - Shale

CO - Coal
CN - Clean
SOL - Solutioning
W - Weathered
Mech - Poss. Mechanical



Unaltered to slightly altered, fresh to slightly weathered, pale bluish gray, weak to medium strong, SILTSTONE, no staining.

Unaltered to slightly altered, fresh to slightly weathered, crystalline, light brownish gray, weak to medium strong, LIMESTONE, no staining.

End of hole at 68.00 ft.

HAMMER TYPE: N/A

REV:

LOGGED: Ben Douvier/Dan Bida DATE: Jun 10, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-106

Sheet 1 of 2

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: June 03, 2021
END DATE: June 04, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1060.2 ft (Ground)
COORDINATES: N: 241370.7 ft E: 2478660.4 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

JN - Joint, FLT - Fault, SHR - Shear, B - Bedding, FO - Foliation
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, SK - Slickensided, SM - Smooth, RO - Rough, VR - Rough
CA - Calcite, CI - Clay, CON - Contact, Fe - Iron, MI - Mica
Py - Pyrite, M - Silt, MN - Manganese, CR - Carbon, SH - Shale
CO - Coal, CN - Clean, SOL - Solutioning, W - Weathered, Mech - Poss. Mechanical

DRILL RIG: Prosonic 600C
DRILL METHOD: Sonic Drilling - 6-in Hole Dia. (0 - 27 ft); Sonic Drilling - 5-in Hole Dia. (27 - 50 ft)

MATERIAL PROFILE

DESCRIPTION	ELEV.	DEPTH (ft)
MIXTURE of SOIL and ROCK - FILL - (CL) SILTY CLAY, medium plasticity, some fine to coarse subrounded to subangular gravel; dark grayish black with pale orangish brown, weathered, bedded, medium sensitivity, no staining, no odor, no HCL reaction; cohesive, w ~ PL, soft, Coal and silty Clay bedded.		0.0
Moderately weathered to completely weathered, disturbed/seamy, dark blackish gray, very fine grained, moderately porous, very weak, COAL, no staining, residual coal.	1051.2	9.0
Slightly weathered to moderately weathered, pale gray, fine grained, non-porous to faintly porous, weak to medium strong, LIMESTONE, no staining.	1044.7	15.5
Sandy CLAYEY SILT, low plasticity, some gravel; pale gray, weathered, low sensitivity, no staining, no odor, moderate cementation, no HCL reaction, COLLUVIAL; non-cohesive, moist, compact.	1041.5	18.7
Slightly weathered to moderately weathered, pale gray, fine grained, non-porous to faintly porous, weak to medium strong, LIMESTONE, no staining.	1040.2	20.0
Moderately weathered to highly weathered, pale bluish gray, fine grained, non-porous to faintly porous to moderately porous, medium strong, SILTSTONE, no staining, void observed from 20-23 ft.	1038.8	21.4
Slightly weathered to moderately weathered, pale gray, fine grained, non-porous to faintly porous, weak to medium strong, LIMESTONE, no staining.	1033.2	27.0
Slightly weathered to highly weathered, pale bluish gray, fine grained, non-porous to faintly porous to moderately porous, medium strong to weak, SILTSTONE, no staining.	1031.2	29.0
Fresh to slightly weathered, pale bluish gray, fine grained, non-porous to faintly porous to moderately porous, weak to medium strong, SILTSTONE, no staining.	1023.2	37.0
Slightly weathered to moderately weathered, pale bluish gray, fine grained, non-porous to faintly porous to moderately porous, weak to medium strong, LIMESTONE, iron oxide staining.	1011.2	49.0

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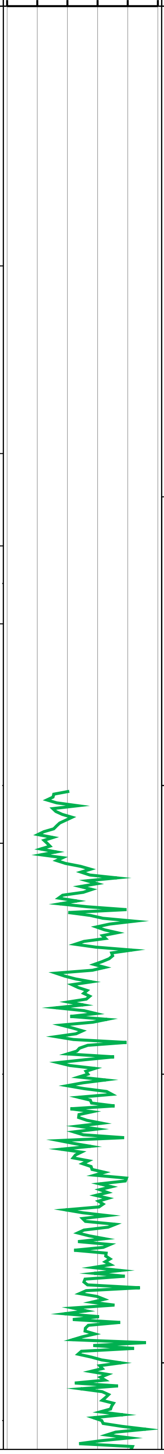
NATURAL GAMMA (cps)



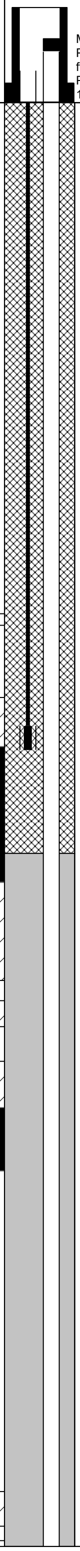
RUN NO.	TOTAL CORE %	RQD %
1	53	10
2	78	15
3	99	86

RECOVERY: TOTAL CORE %, RQD %
INDICES: STRENGTH (R), WEATHERING (W), ALTERATION (A)
BROKEN CORE ■ LOST CORE □ SHEAR ZONE

DISCONTINUITY — TYPE AND SURFACE DESCRIPTION

18.2 - 18.2: JN spaced at 0.0 ft
18.5 - 18.5: JN spaced at 78.0 ft
18.7 - 18.7: JN spaced at 0.0 ft
32.3 - 32.3: JN spaced at 0.0 ft
32.7 - 32.7: JN spaced at 0.0 ft, IR
38.1 - 38.1: spaced at 0.0 ft
40.5 - 40.5: spaced at 80.0 ft
43.0 - 43.0: spaced at 0.0 ft
43.1 - 43.1: JN spaced at 0.0 ft
44.6 - 44.6: spaced at 0.0 ft
44.7 - 44.7: JN spaced at 0.0 ft

CONSTRUCTION AND INSTALLATION DETAILS



MW-106 & VWP-106
Pipe Stickup: 2.04 & 2.00 ft
Pipe Elev: 1062.2 & 1060.2 ft

0.0 - 26.0 ft bgs: Bentonite/ Cement Grout

26.0 - 50.0 ft bgs: Bentonite Chips

HAMMER TYPE: N/A

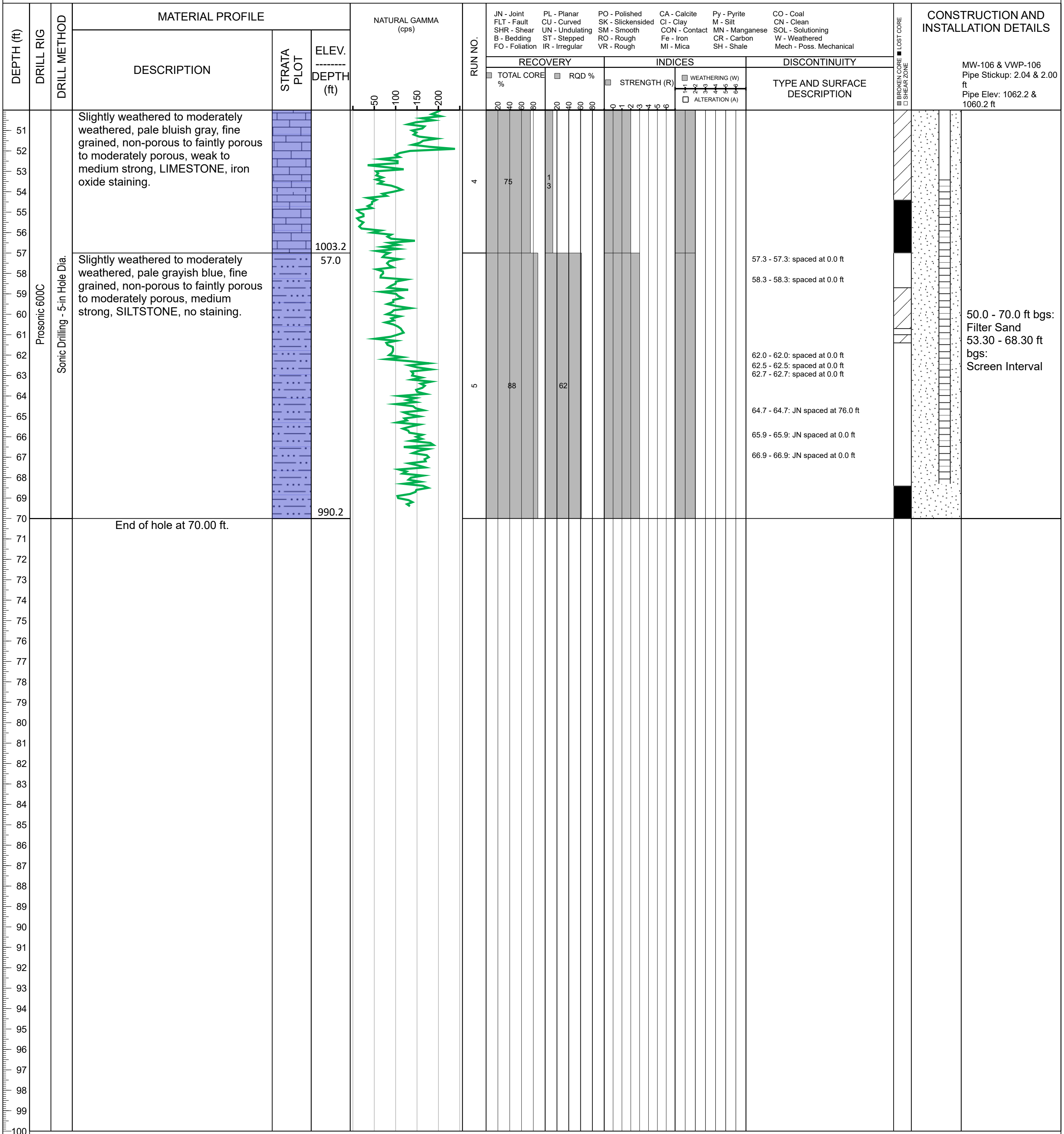
REV:

GOLDER MEMBER OF WSP

LOGGED: Andrew Adkins/Dan Bida DATE: Jun 03, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-106

CLIENT:	Cyprus Amax Minerals Company	START DATE:	June 03, 2021	ELEVATION:	1060.2 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	June 04, 2021	COORDINATES:	N: 241370.7 ft E: 2478660.4 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				



DESCRIPTION	ELEV. / DEPTH (ft)
Slightly weathered to moderately weathered, pale bluish gray, fine grained, non-porous to faintly porous to moderately porous, weak to medium strong, LIMESTONE, iron oxide staining.	1003.2
Slightly weathered to moderately weathered, pale grayish blue, fine grained, non-porous to faintly porous to moderately porous, medium strong, SILTSTONE, no staining.	57.0 990.2
End of hole at 70.00 ft.	

57.3 - 57.3: spaced at 0.0 ft
58.3 - 58.3: spaced at 0.0 ft
62.0 - 62.0: spaced at 0.0 ft
62.5 - 62.5: spaced at 0.0 ft
62.7 - 62.7: spaced at 0.0 ft
64.7 - 64.7: JN spaced at 76.0 ft
65.9 - 65.9: JN spaced at 0.0 ft
66.9 - 66.9: JN spaced at 0.0 ft

50.0 - 70.0 ft bgs:
Filter Sand
53.30 - 68.30 ft bgs:
Screen Interval

HAMMER TYPE: N/A

REV:

GOLDER
MEMBER OF WSP

LOGGED: Andrew Adkins/Dan Bida DATE: Jun 03, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-107D

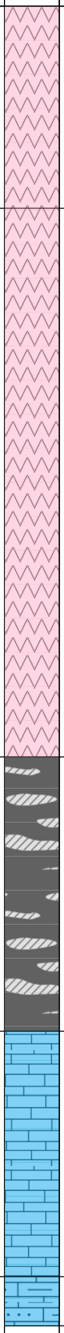
Sheet 1 of 1

CLIENT:	Cyprus Amax Minerals Company	DATE:	June 02, 2021	ELEVATION:	1083.8 ft (Ground)
PROJECT:	Former Satralloy Site			COORDINATES:	N: 241630.4 ft E: 2479188.2 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

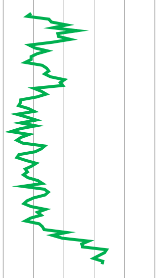
JN - Joint, FLT - Fault, SHR - Shear, B - Bedding, FO - Foliation, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, SK - Slickensided, SM - Smooth, RO - Rough, VR - Rough, CA - Calcite, CI - Clay, CON - Contact, Fe - Iron, MI - Mica, Py - Pyrite, M - Silt, MN - Manganese, CR - Carbon, SH - Shale, CO - Coal, CN - Clean, SOL - Solutioning, W - Weathered, Mech - Poss. Mechanical

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	ELEV. / DEPTH (ft)
0.0 - 7.0	Prosonic 600C	Sonic Drilling - 6-in Hole Dia.	Slightly weathered, very light grayish white, very fine grained, moderately porous, weak to strong, SLAG, no staining, Water at 2 feet bgs.	0.0
7.0 - 26.0			Moderately weathered to highly weathered, very light grayish white, very fine grained, moderately porous, weak to strong, SLAG, no staining, Water at 14.8 feet bgs, after blowing out hole dry for 5 min.	1076.8 7.0
26.0 - 35.5			Highly weathered to residual soil, dark blackish gray, very fine grained, non-porous to faintly porous, bituminous COAL, no staining, Coal residium or bony impure coal.	1057.8 26.0
35.5 - 44.0		Sonic Drilling - 5-in Hole Dia.	Slightly weathered, pale bluish gray, fine grained, non-porous to faintly porous, medium strong, LIMESTONE, no staining, No water dry for 20 min.	1048.3 35.5
44.0 - 48.0			Slightly weathered, pale bluish gray, very fine grained, non-porous to faintly porous, medium strong, LIMESTONE, no staining, Silty limestone.	1039.8 44.0 1038.1
48.0			End of hole at 48.00 ft.	

STRATA PLOT



NATURAL GAMMA (cps)

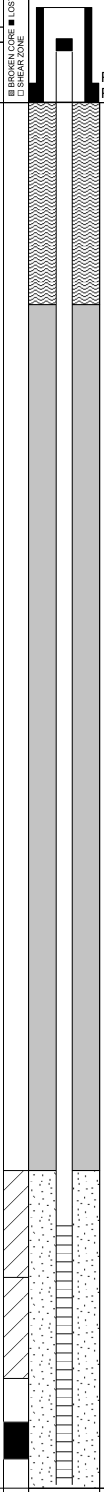


RUN NO.	RECOVERY TOTAL CORE %	RQD %	DISCONTINUITY TYPE AND SURFACE DESCRIPTION
1	87	23	44.5 - 44.5: JN spaced at 0.0 ft

INDICES: STRENGTH (R); WEATHERING (W); ALTERATION (A)

BROKEN CORE ■ LOST CORE / SHEAR ZONE

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.44 ft
Pipe Elev: 1086.2 ft

0.0 - 7.0 ft bgs:
Cement Grout

7.0 - 37.0 ft bgs:
Bentonite Chips

37.0 - 48.0 ft bgs:
Filter Sand
38.88 - 47.88 ft bgs:
Screen Interval

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

LOGGED: Andrew Adkins/Dan Bida DATE: Jun 02, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-107S

Sheet 1 of 1

CLIENT:	Cyprus Amax Minerals Company	DATE:	June 03, 2021	ELEVATION:	1083.8 ft (Ground)
PROJECT:	Former Satralloy Site			COORDINATES:	N: 241635.1 ft E: 2479187.6 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

JN - Joint	PL - Planar	PO - Polished	CA - Calcite	Py - Pyrite	CO - Coal
FLT - Fault	CU - Curved	SK - Slickensided	CI - Clay	M - Silt	CN - Clean
SHR - Shear	UN - Undulating	SM - Smooth	CON - Contact	MN - Manganese	SOL - Solutioning
B - Bedding	ST - Stepped	RO - Rough	Fe - Iron	CR - Carbon	W - Weathered
FO - Foliation	IR - Irregular	VR - Rough	MI - Mica	SH - Shale	Mech - Poss. Mechanical

RUN NO.

RECOVERY: ▨ TOTAL CORE % (20 40 60 80); ▨ RQD % (20 40 60 80)

INDICES: ▨ STRENGTH (R) (0 1 2 3 4 5 6); ▨ WEATHERING (W) (1 2 3 4 5 6); ☐ ALTERATION (A)

DISCONTINUITY: TYPE AND SURFACE DESCRIPTION

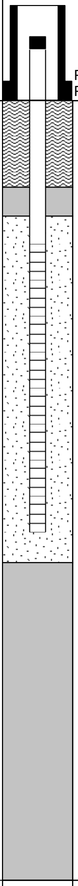
▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE

MATERIAL PROFILE

DEPTH (ft)	DRILL RIG	DRILL METHOD	DESCRIPTION	ELEV. -------- DEPTH (ft)
0.0 – 26.5	Prosonic 600C	Sonic Drilling - 5-in Hole Dia.	Moderately weathered to completely weathered, light grayish white, very fine grained to fine grained, non-porous to faintly porous to moderately porous, weak to medium strong, SLAG, no staining, No water after waiting 10 min run 1, no water after 1 hr run 2.	0.0
26.5 – 27.0			Completely weathered to residual soil, disturbed/seamy, dark bluish gray, very fine grained to fine grained, non-porous to faintly porous, very weak to weak, COAL, no staining.	1057.3 26.5 1056.8

End of hole at 27.00 ft.

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.76 ft

Pipe Elev: 1086.6 ft

0.0 - 3.0 ft bgs: Cement Grout

3.0 - 4.0 ft bgs: Bentonite Chips

4.94 - 14.94 ft bgs: Screen Interval

4.0 - 16.0 ft bgs: Filter Sand

16.0 - 27.0 ft bgs: Bentonite Chips

HAMMER TYPE: N/A

REV:

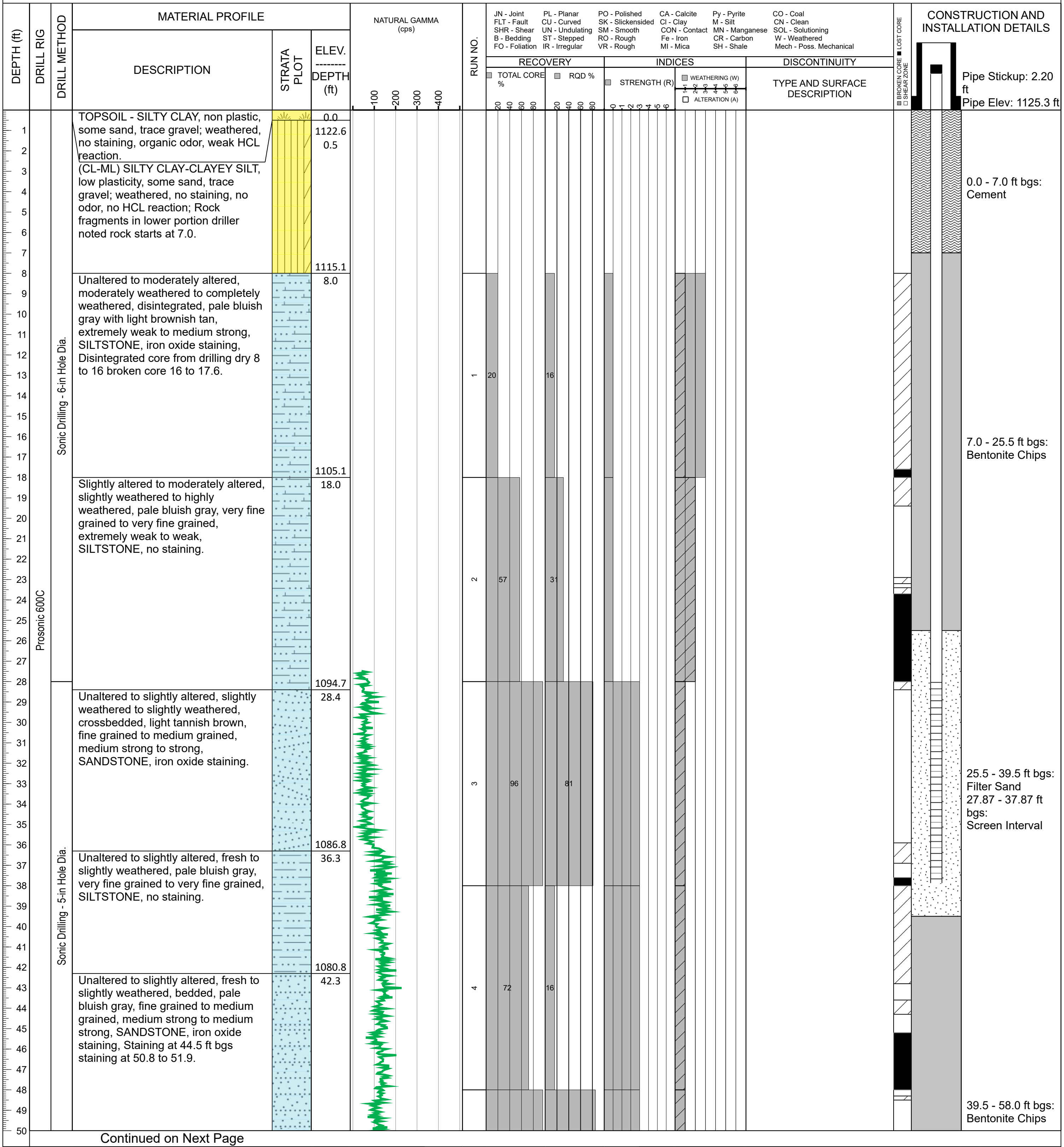
GOLDER MEMBER OF WSP

LOGGED: Andrew Adkins/Dan Bida DATE: Jun 03, 2021

CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-108

CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 20, 2021	ELEVATION:	1123.1 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	May 21, 2021	COORDINATES:	N: 242016.4 ft E: 2479050.8 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				



JN - Joint, FLT - Fault, SHR - Shear, B - Bedding, FO - Foliation
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, SK - Slickensided, SM - Smooth, RO - Rough, VR - Rough
CA - Calcite, Cl - Clay, CON - Contact, Fe - Iron, MI - Mica
Py - Pyrite, M - Silt, MN - Manganese, CR - Carbon, SH - Shale
CO - Coal, CN - Clean, SOL - Solutioning, W - Weathered, Mech - Poss. Mechanical

DESCRIPTION	ELEV. / DEPTH (ft)
TOPSOIL - SILTY CLAY, non plastic, some sand, trace gravel; weathered, no staining, organic odor, weak HCL reaction.	0.0
(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, some sand, trace gravel; weathered, no staining, no odor, no HCL reaction; Rock fragments in lower portion driller noted rock starts at 7.0.	1122.6 0.5
Unaltered to moderately altered, moderately weathered to completely weathered, disintegrated, pale bluish gray with light brownish tan, extremely weak to medium strong, SILTSTONE, iron oxide staining, Disintegrated core from drilling dry 8 to 16 broken core 16 to 17.6.	1115.1 8.0
Slightly altered to moderately altered, slightly weathered to highly weathered, pale bluish gray, very fine grained to very fine grained, extremely weak to weak, SILTSTONE, no staining.	1105.1 18.0
Unaltered to slightly altered, slightly weathered to slightly weathered, crossbedded, light tannish brown, fine grained to medium grained, medium strong to strong, SANDSTONE, iron oxide staining.	1094.7 28.4
Unaltered to slightly altered, fresh to slightly weathered, pale bluish gray, very fine grained to very fine grained, SILTSTONE, no staining.	1086.8 36.3
Unaltered to slightly altered, fresh to slightly weathered, bedded, pale bluish gray, fine grained to medium grained, medium strong to medium strong, SANDSTONE, iron oxide staining, Staining at 44.5 ft bgs staining at 50.8 to 51.9.	1080.8 42.3

RUN NO.	TOTAL CORE %	RQD %
1	20	16
2	57	31
3	96	81
4	72	16

Pipe Stickup: 2.20 ft
Pipe Elev: 1125.3 ft

0.0 - 7.0 ft bgs:
Cement

7.0 - 25.5 ft bgs:
Bentonite Chips

25.5 - 39.5 ft bgs:
Filter Sand
27.87 - 37.87 ft bgs:
Screen Interval

39.5 - 58.0 ft bgs:
Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

REV:

LOGGED: Dan Bida/Ben Douvier DATE: May 20, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-108

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: May 20, 2021
END DATE: May 21, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1123.1 ft (Ground)
COORDINATES: N: 242016.4 ft E: 2479050.8 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

JN - Joint	PL - Planar	PO - Polished	CA - Calcite	Py - Pyrite	CO - Coal
FLT - Fault	CU - Curved	SK - Slickensided	Cl - Clay	M - Silt	CN - Clean
SHR - Shear	UN - Undulating	SM - Smooth	CON - Contact	MN - Manganese	SOL - Solutioning
B - Bedding	ST - Stepped	RO - Rough	Fe - Iron	CR - Carbon	W - Weathered
FO - Foliation	IR - Irregular	VR - Rough	MI - Mica	SH - Shale	Mech - Poss. Mechanical

▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE

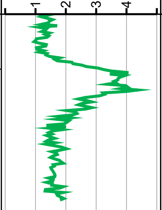
CONSTRUCTION AND INSTALLATION DETAILS

Pipe Stickup: 2.20 ft
Pipe Elev: 1125.3 ft

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	ELEV. / DEPTH (ft)	RUN NO.	RECOVERY TOTAL CORE %	RECOVERY RQD %
50–51.9	Prosonic 600C	Sonic Drilling - 5-in Hole Dia.	Unaltered to slightly altered, fresh to slightly weathered, bedded, pale bluish gray, fine grained to medium grained, medium strong to medium strong, SANDSTONE, iron oxide staining, Staining at 44.5 ft bgs staining at 50.8 to 51.9.	1071.2 51.9	5	96	85
51.9–58			Unaltered to slightly altered, fresh to slightly weathered, bedded, dark grayish black, weak to medium strong, carbonaceous SHALE, no staining, Intermixed shale and coal, interbedded shale and coal with 1/16th of an inch coal beds.	1065.7			

End of hole at 58.00 ft.

NATURAL GAMMA (cps)



INDICES: STRENGTH (R) 0 1 2 3 4 5 6; WEATHERING (W) 1 2 3 4 5 6; ALTERATION (A)

DISCONTINUITY: TYPE AND SURFACE DESCRIPTION

HAMMER TYPE: N/A

REV:

LOGGED: Dan Bida/Ben Douvier DATE: May 20, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-109

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: May 26, 2021
END DATE: May 27, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1120.2 ft (Ground)
COORDINATES: N: 242457.3 ft E: 2478483.4 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

JN - Joint	PL - Planar	PO - Polished	CA - Calcite	Py - Pyrite	CO - Coal
FLT - Fault	CU - Curved	SK - Slickensided	Cl - Clay	M - Silt	CN - Clean
SHR - Shear	UN - Undulating	SM - Smooth	CON - Contact	MN - Manganese	SOL - Solutioning
B - Bedding	ST - Stepped	RO - Rough	Fe - Iron	CR - Carbon	W - Weathered
FO - Foliation	IR - Irregular	VR - Rough	MI - Mica	SH - Shale	Mech - Poss. Mechanical

DRILL RIG: Prosonic 600C

DRILL METHOD: Sonic Drilling - 6-in Hole Dia.

MATERIAL PROFILE

DESCRIPTION	STRATA PLOT	ELEV. -------- DEPTH (ft)
(CL) SILTY CLAY, medium plasticity, some sand, some gravel; dark brown, no staining, no odor, no HCL reaction; cohesive, w ~ PL, soft.		0.0
Moderately weathered, thinly bedded, pale gray with pale brown, fine grained to medium grained, moderately porous, medium strong, SANDSTONE, iron oxide staining.		1119.2 1.0
Moderately weathered to highly weathered, massive, dark olive gray, very fine grained to fine grained, non-porous to faintly porous, weak, MUDSTONE, no staining.		1115.2 5.0
Moderately weathered, thickly bedded, pale olive gray mottled pale orange, fine grained, moderately porous, weak, silty LIMESTONE, iron oxide staining.		1111.2 9.0
Moderately weathered to highly weathered, medium bedded, pale bluish gray, very fine grained to fine grained, moderately porous, weak, clayey SILTSTONE, iron oxide staining.		1100.2 20.0
Fresh to slightly weathered, pale bluish gray, fine grained, non-porous to faintly porous, medium strong to strong, SILTSTONE.		1096.9 23.3
Moderately weathered, thinly bedded, dark blackish gray, fine grained, non-porous to faintly porous, weak to medium strong, SILTSTONE, no staining, Shale bedding.		1087.8 32.4
Completely weathered to residual soil, very thinly bedded, very dark gray with dark orange, very fine grained, moderately porous, very weak to weak, SHALE, Silty consistency.		1083.2 37.0
VOID from 40.4 to 54 feet.		1079.8 40.4

RECOVERY

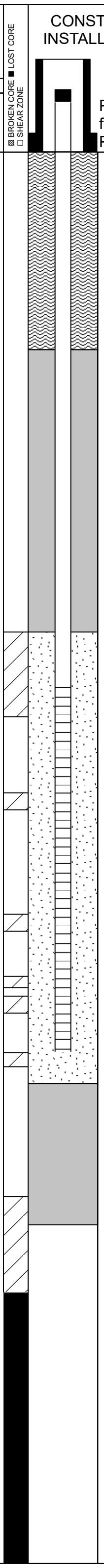
RUN NO.	TOTAL CORE %	RQD %
1	74	31
2	98	50
3	100	
3		

DISCONTINUITY

TYPE AND SURFACE DESCRIPTION

20.6 - 20.6: JN spaced at 0.0 ft
22.2 - 22.2: JN spaced at 0.0 ft
27.7 - 27.7: JN spaced at 0.0 ft
28.0 - 28.0: JN spaced at 0.0 ft
28.2 - 28.2: JN spaced at 0.0 ft
30.7 - 30.7: JN spaced at 0.0 ft
31.0 - 31.0: JN spaced at 74.0 ft
32.8 - 32.8: JN spaced at 0.0 ft
33.7 - 33.7: JN spaced at 0.0 ft
35.0 - 35.0: JN spaced at 0.0 ft
35.5 - 35.5: JN spaced at 0.0 ft
35.7 - 35.7: JN spaced at 0.0 ft

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.43 ft
Pipe Elev: 1122.6 ft

0.0 - 7.0 ft bgs: Cement Grout

7.0 - 17.0 ft bgs: Bentonite Chips

17.0 - 33.0 ft bgs: Filter Sand
18.87 - 31.87 ft bgs: Screen Interval

33.0 - 38.0 ft bgs: Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

LOGGED: Andrew Adkins/Mac Morrow DATE: May 26, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-109

CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 26, 2021	ELEVATION:	1120.2 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	May 27, 2021	COORDINATES:	N: 242457.3 ft E: 2478483.4 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

JN - Joint
FLT - Fault
SHR - Shear
B - Bedding
FO - Foliation

PL - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

PO - Polished
SK - Slickensided
SM - Smooth
RO - Rough
VR - Rough

CA - Calcite
CI - Clay
CON - Contact
Fe - Iron
MI - Mica

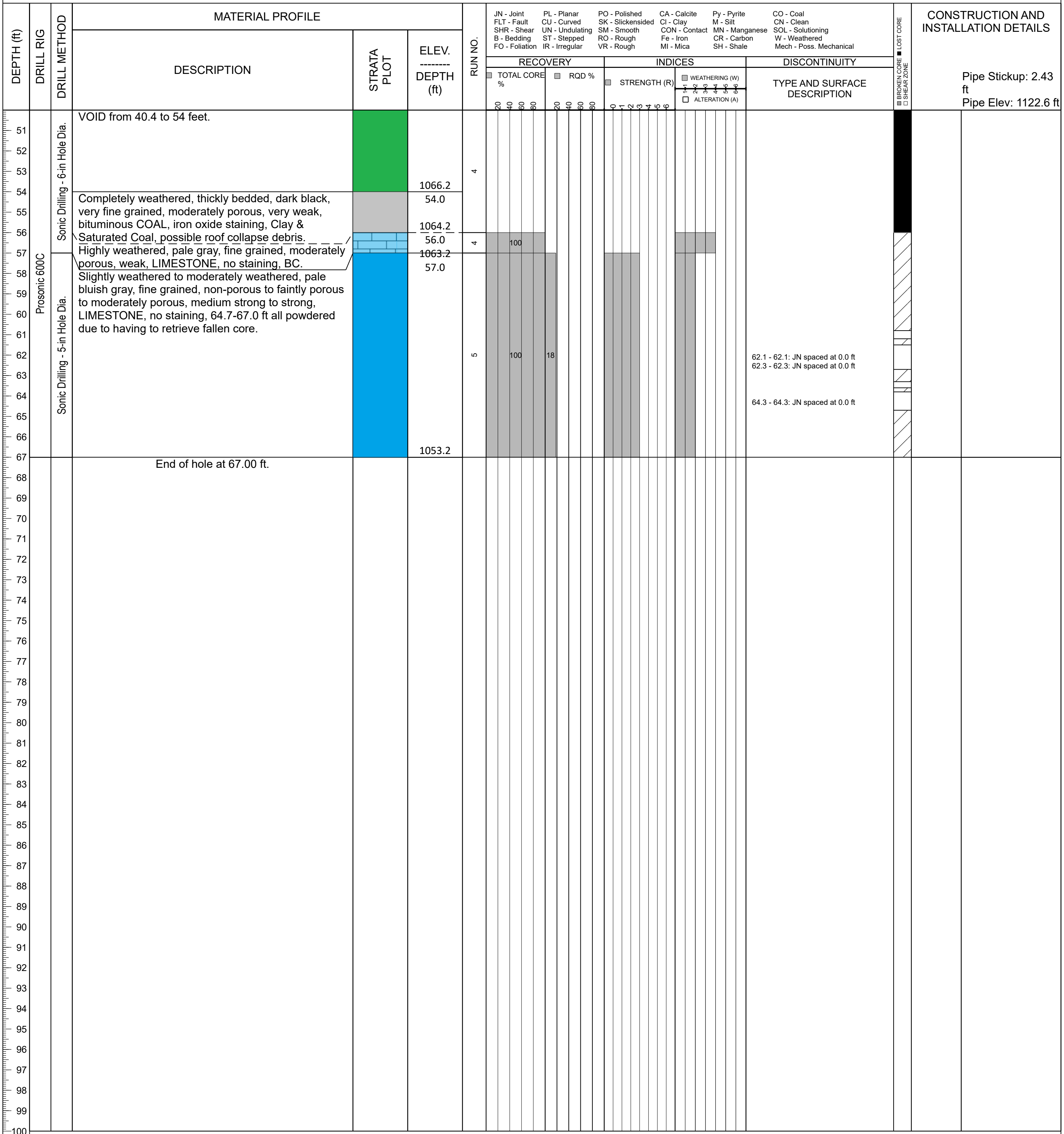
Py - Pyrite
M - Silt
MN - Manganese
CR - Carbon
SH - Shale

CO - Coal
CN - Clean
SOL - Solutioning
W - Weathered
Mech - Poss. Mechanical

▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE

CONSTRUCTION AND INSTALLATION DETAILS

Pipe Stickup: 2.43 ft
Pipe Elev: 1122.6 ft



DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	ELEV. -------- DEPTH (ft)	RUN NO.	RECOVERY TOTAL CORE %	RECOVERY RQD %	DISCONTINUITY TYPE AND SURFACE DESCRIPTION
Prosonic 600C	Sonic Drilling - 6-in Hole Dia.	VOID from 40.4 to 54 feet.	1066.2 54.0	4			
		Completely weathered, thickly bedded, dark black, very fine grained, moderately porous, very weak, bituminous COAL, iron oxide staining, Clay & Saturated Coal, possible roof collapse debris.	1064.2 56.0	4	100		
		Highly weathered, pale gray, fine grained, moderately porous, weak, LIMESTONE, no staining, BC.	1063.2 57.0				
	Sonic Drilling - 5-in Hole Dia.	Slightly weathered to moderately weathered, pale bluish gray, fine grained, non-porous to faintly porous to moderately porous, medium strong to strong, LIMESTONE, no staining, 64.7-67.0 ft all powdered due to having to retrieve fallen core.	1053.2	5	100	18	62.1 - 62.1: JN spaced at 0.0 ft 62.3 - 62.3: JN spaced at 0.0 ft 64.3 - 64.3: JN spaced at 0.0 ft
		End of hole at 67.00 ft.					

HAMMER TYPE: N/A

REV:

LOGGED: Andrew Adkins/Mac Morrow DATE: May 26, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-110

Sheet 1 of 1

CLIENT: Cyprus Amax Minerals Company
DATE: June 24, 2021
ELEVATION: 1080.7 ft (Ground)
PROJECT: Former Satralloy Site
COORDINATES: N: 242440.2 ft E: 2478680.6 ft
PROJECT NO: 12393309
INCLINATION: 90.0°
COORD SYS: SP OH North FIPS 3401 Ft
LOCATION: Jefferson County OH
CONTRACTOR: Cascade Drilling
HORZ DATUM: NAD83
VERT DATUM: NAVD88
NOTES: MAI PN: 1239330910.330

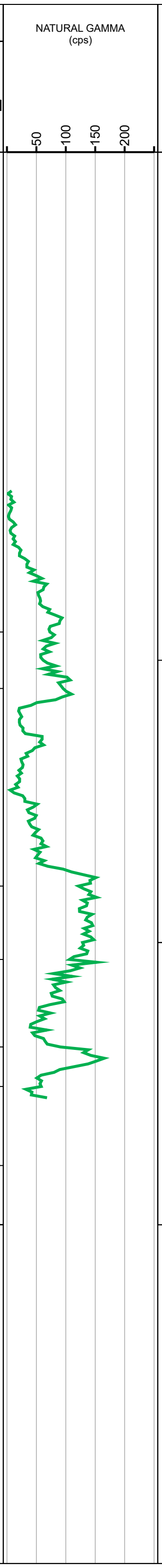
JN - Joint
FLT - Fault
SHR - Shear
B - Bedding
FO - Foliation
PL - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular
PO - Polished
SK - Slickensided
SM - Smooth
RO - Rough
VR - Rough
CA - Calcite
Cl - Clay
CON - Contact
Fe - Iron
MI - Mica
Py - Pyrite
M - Silt
MN - Manganese
CR - Carbon
SH - Shale
CO - Coal
CN - Clean
SOL - Solutioning
W - Weathered
Mech - Poss. Mechanical

DRILL RIG: Prosonic 600C

DRILL METHOD: Sonic Drilling - 6-in Hole Dia.; Sonic Drilling - 5-in Hole Dia.

MATERIAL PROFILE

DESCRIPTION	ELEV. -------- DEPTH (ft)
Pale whitish gray to light greenish gray, SLAG.	0.0
Weathered rock, residual soil.	1063.7 17.0
Fresh to slightly weathered, massive, pale olive brown, very fine grained, strong to very strong, LIMESTONE, no staining.	1061.7 19.0
Slightly weathered to moderately weathered, massive, pale bluish gray, very fine grained, weak to medium strong, SILTSTONE, no staining.	1054.7 26.0
Fresh, massive, light whitish gray and pale brownish gray, fine grained, strong to very strong, calcareous SANDSTONE, 36" corestone observed.	1052.1 28.6
Fresh to slightly weathered, massive, pale olive brown, very fine grained, strong to very strong, LIMESTONE, no staining.	1049.0 31.7
Slightly altered, slightly weathered to moderately weathered, massive, pale bluish gray and dark gray, very fine grained, weak to strong, SILTSTONE, no staining, CaCO3 alteration observed.	1047.6 33.1
End of hole at 38.00 ft.	1044.8



RUN NO.	RECOVERY TOTAL CORE %	RECOVERY RQD %
1	67	28
2	79	36

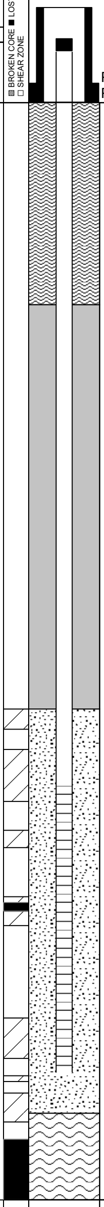
INDICES: STRENGTH (R); WEATHERING (W); ALTERATION (A)

DISCONTINUITY — TYPE AND SURFACE DESCRIPTION

26.3 - 26.3: JN spaced at 0.0 ft
28.6 - 28.6: JN spaced at 0.0 ft
31.6 - 31.6: JN spaced at 0.0 ft
35.7 - 35.7: JN spaced at 0.0 ft

▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.54 ft
Pipe Elev: 1083.3 ft

0.0 - 7.0 ft bgs: Cement

7.0 - 21.0 ft bgs: Bentonite Chips

21.0 - 35.0 ft bgs: Filter Sand
23.59 - 33.59 ft bgs: Screen Interval

35.0 - 38.0 ft bgs: Slough

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

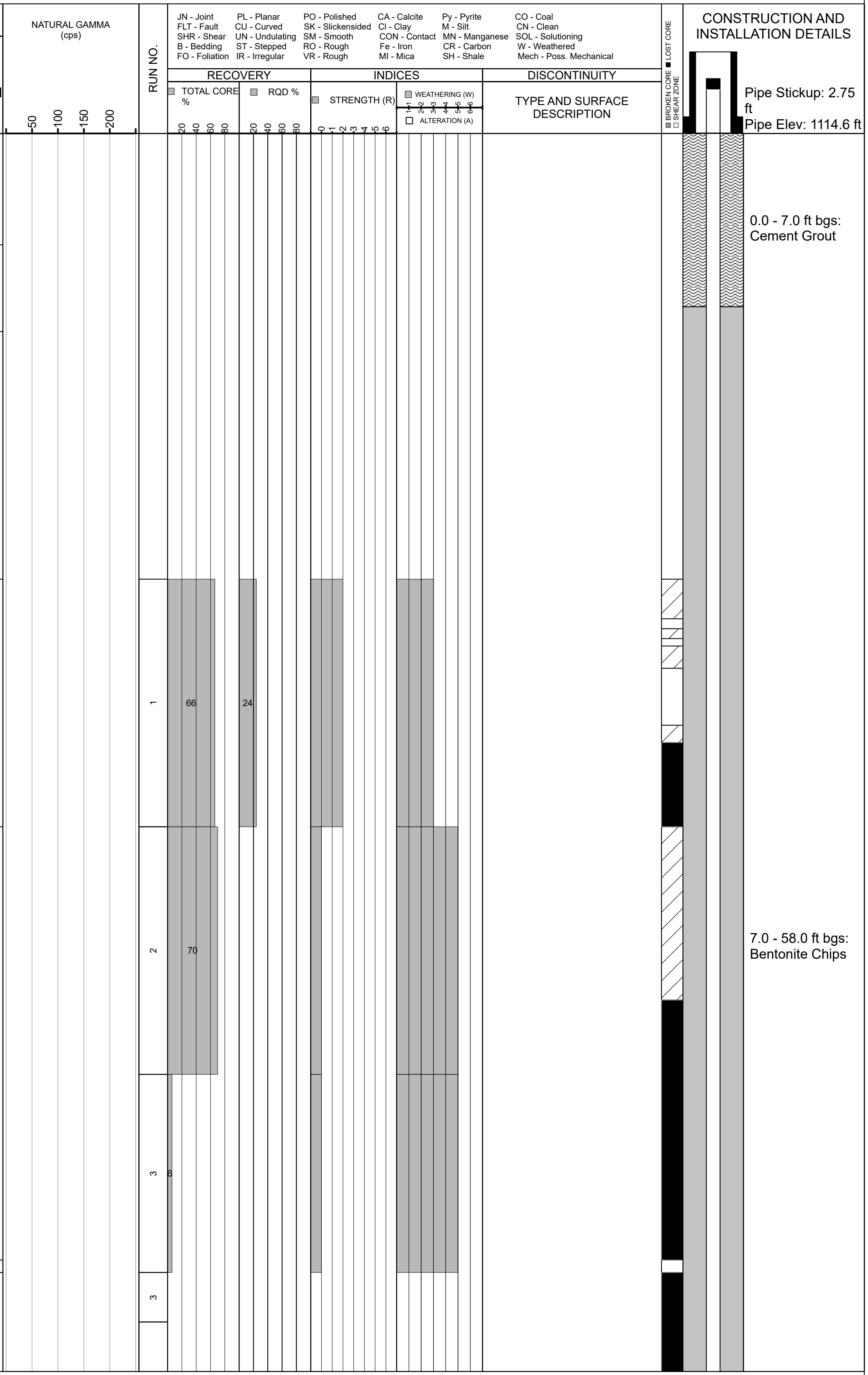
LOGGED: Dan Bida
DATE: Jun 24, 2021
CHECKED: Bob Ireson
DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-111

Sheet 1 of 2

CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 24, 2021	ELEVATION:	1111.9 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	May 26, 2021	COORDINATES:	N: 242013.8 ft E: 2478779.6 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	ELEV. -------- DEPTH (ft)
0 – 4.5	Prosonic 600C	Sonic Drilling - 6-in Hole Dia.	FILL - (CL) sandy SILTY CLAY, low plasticity, some gravel; dark orangish brown, unweathered, no staining, no odor, no HCL reaction; cohesive, w ~ PL, firm.	0.0
4.5 – 8.0			Gravelly sandy CLAYEY SILT, low plasticity, fine to medium rounded to subrounded sand, fine rounded to subangular gravel; pale yellowish brown mottled dark orange, weathered, iron oxide staining, no odor, no HCL reaction; weak mudstone; non-cohesive, w < PL, firm.	1107.4 4.5
8.0 – 18.0			Slightly weathered to moderately weathered, pale olive gray with pale orangish brown, fine grained to medium grained, non-porous to faintly porous, weak to medium strong, SANDSTONE, iron oxide staining.	1103.9 8.0
18.0 – 28.0			Moderately weathered to highly weathered, medium bedded, dark bluish gray with pale orangish brown, medium grained to coarse grained, moderately porous, weak to medium strong, SANDSTONE, iron oxide staining, Lost circulation at 19 feet highly fractured.	1093.9 18.0
28.0 – 45.5			Unaltered, completely weathered to residual soil, massive, very dark olive gray, very fine grained, highly porous, extremely weak, SHALE, no staining, Shale residium.	1083.9 28.0
45.5 – 50			Fresh to slightly weathered, medium bedded massive, black, very fine grained, moderately porous, very weak to weak, bituminous COAL, no staining, 46.0 -55.0 void possible mine. VOID 46.0 - 55.0.	1066.4 45.5 1065.9 46.0



Pipe Stickup: 2.75 ft

Pipe Elev: 1114.6 ft

0.0 - 7.0 ft bgs: Cement Grout

7.0 - 58.0 ft bgs: Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

LOGGED: Andrew Adkins DATE: May 24, 2021

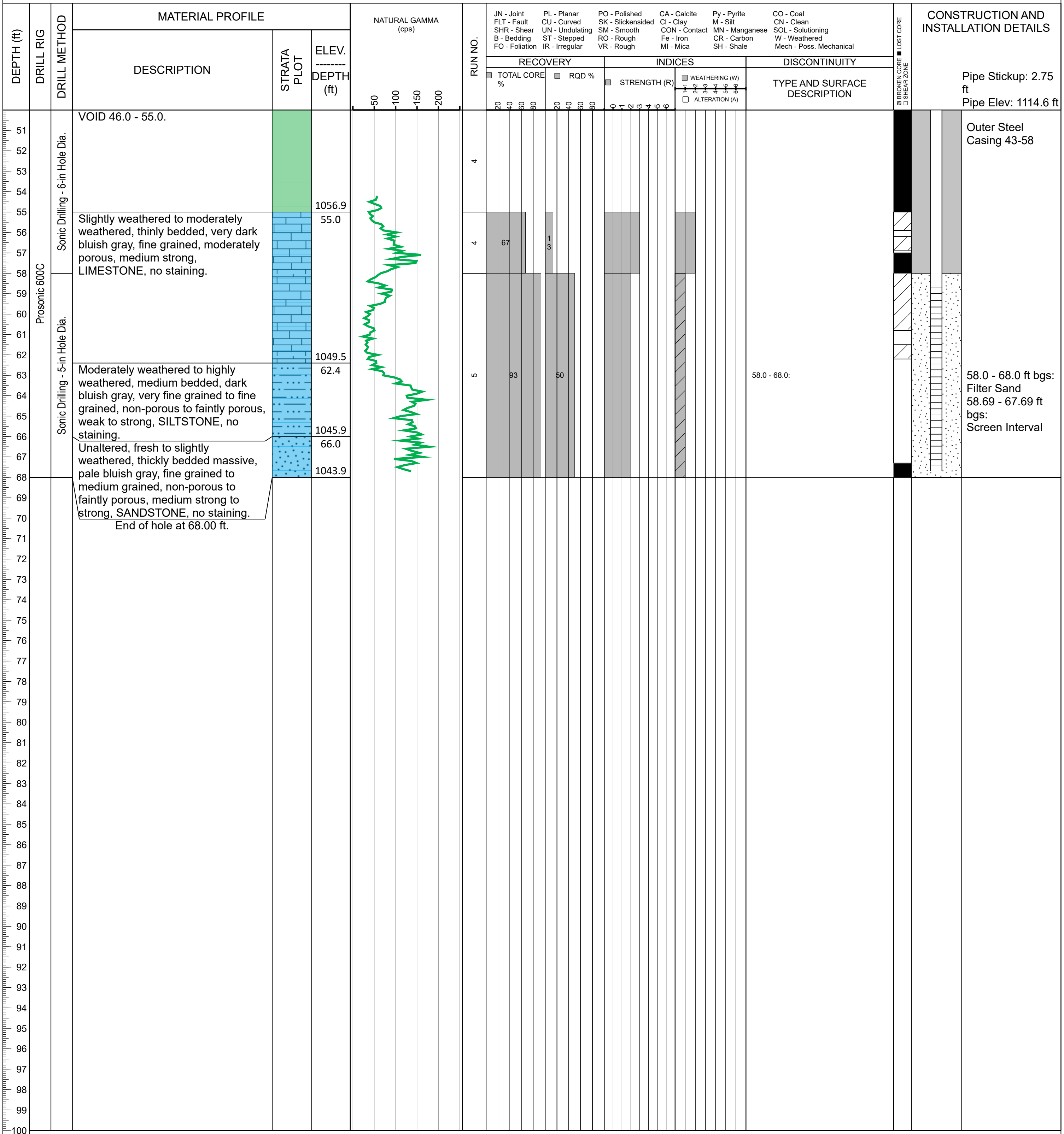
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-111

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: May 24, 2021
END DATE: May 26, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1111.9 ft (Ground)
COORDINATES: N: 242013.8 ft E: 2478779.6 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88



VOID 46.0 - 55.0.

1056.9
55.0

Slightly weathered to moderately weathered, thinly bedded, very dark bluish gray, fine grained, moderately porous, medium strong, LIMESTONE, no staining.

1049.5
62.4

Moderately weathered to highly weathered, medium bedded, dark bluish gray, very fine grained to fine grained, non-porous to faintly porous, weak to strong, SILTSTONE, no staining.

1045.9
66.0

Unaltered, fresh to slightly weathered, thickly bedded massive, pale bluish gray, fine grained to medium grained, non-porous to faintly porous, medium strong to strong, SANDSTONE, no staining.

1043.9

End of hole at 68.00 ft.

58.0 - 68.0:

Outer Steel Casing 43-58

58.0 - 68.0 ft bgs:
Filter Sand
58.69 - 67.69 ft bgs:
Screen Interval

HAMMER TYPE: N/A

REV:

GOLDER
MEMBER OF WSP

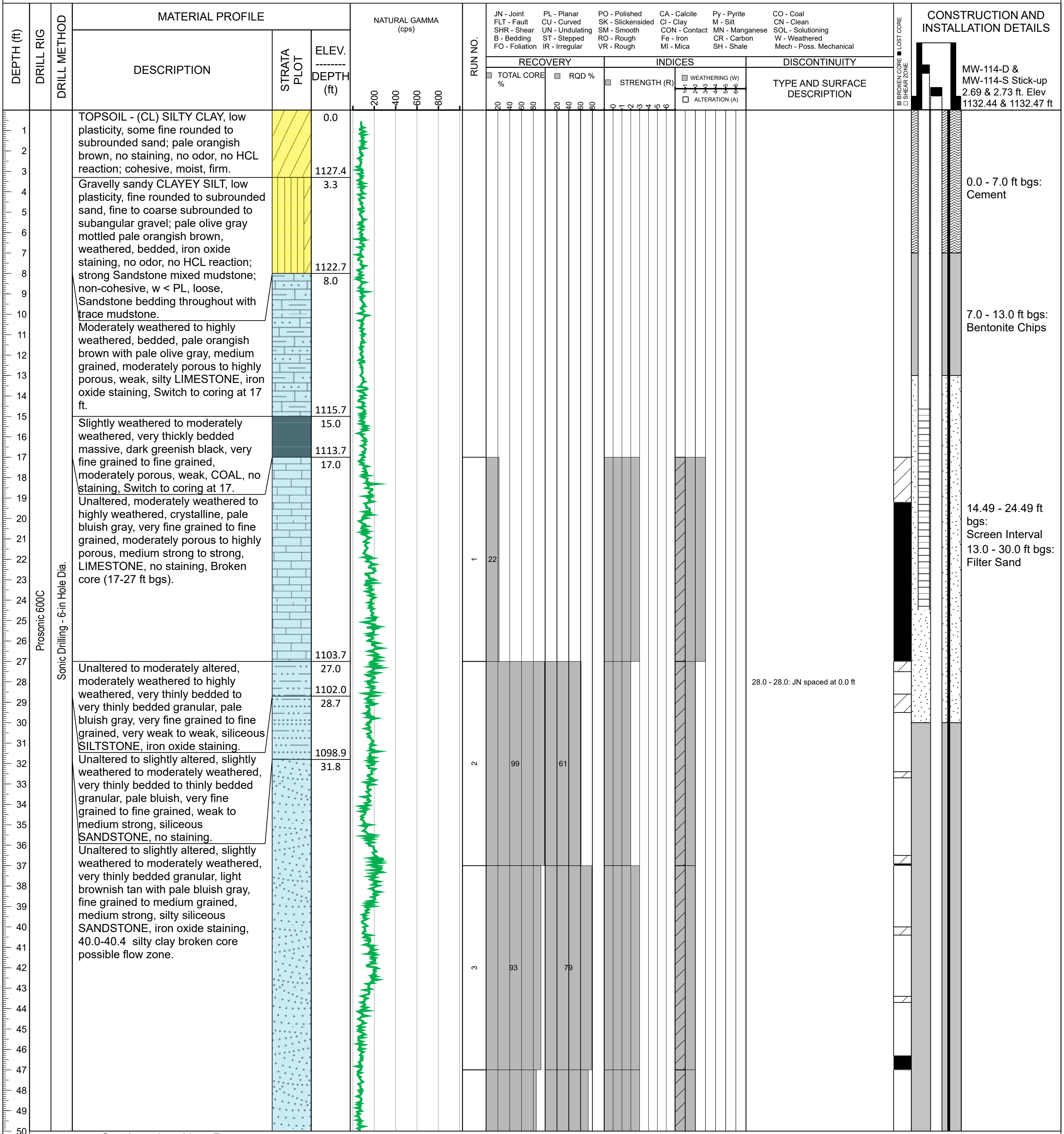
LOGGED: Andrew Adkins
CHECKED: Bob Ireson

DATE: May 24, 2021
DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-112

Sheet 1 of 3

CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 13, 2021	ELEVATION:	1130.7 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	May 20, 2021	COORDINATES:	N: 242010.6 ft E: 2479230.8 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Driller	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				



DESCRIPTION	ELEV. / DEPTH (ft)
TOPSOIL - (CL) SILTY CLAY, low plasticity, some fine rounded to subrounded sand; pale orangish brown, no staining, no odor, no HCL reaction; cohesive, moist, firm.	0.0
Gravelly sandy CLAYEY SILT, low plasticity, fine rounded to subrounded sand, fine to coarse subrounded to subangular gravel; pale olive gray mottled pale orangish brown, weathered, bedded, iron oxide staining, no odor, no HCL reaction; strong Sandstone mixed mudstone; non-cohesive, w < PL, loose, Sandstone bedding throughout with trace mudstone.	1127.4 3.3
Moderately weathered to highly weathered, bedded, pale orangish brown with pale olive gray, medium grained, moderately porous to highly porous, weak, silty LIMESTONE, iron oxide staining, Switch to coring at 17 ft.	1122.7 8.0
Slightly weathered to moderately weathered, very thickly bedded massive, dark greenish black, very fine grained to fine grained, moderately porous, weak, COAL, no staining, Switch to coring at 17.	1115.7 15.0
Unaltered, moderately weathered to highly weathered, crystalline, pale bluish gray, very fine grained to fine grained, moderately porous to highly porous, medium strong to strong, LIMESTONE, no staining, Broken core (17-27 ft bgs).	1113.7 17.0
Unaltered to moderately altered, moderately weathered to highly weathered, very thinly bedded to very thinly bedded granular, pale bluish gray, very fine grained to fine grained, very weak to weak, siliceous SILTSTONE, iron oxide staining.	1103.7 27.0
	1102.0 28.7
Unaltered to slightly altered, slightly weathered to moderately weathered, very thinly bedded to thinly bedded granular, pale bluish, very fine grained to fine grained, weak to medium strong, siliceous SANDSTONE, no staining.	1098.9 31.8
Unaltered to slightly altered, slightly weathered to moderately weathered, very thinly bedded granular, light brownish tan with pale bluish gray, fine grained to medium grained, medium strong, silty siliceous SANDSTONE, iron oxide staining, 40.0-40.4 silty clay broken core possible flow zone.	

CONSTRUCTION AND INSTALLATION DETAILS

MW-114-D & MW-114-S Stick-up 2.69 & 2.73 ft. Elev 1132.44 & 1132.47 ft

0.0 - 7.0 ft bgs: Cement

7.0 - 13.0 ft bgs: Bentonite Chips

14.49 - 24.49 ft bgs: Screen Interval

13.0 - 30.0 ft bgs: Filter Sand

Continued on Next Page

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

LOGGED: Andrew Adkins/Dan Bida DATE: May 13, 2021

CHECKED: Bob Ireson DATE: May 04, 2022

RECORD OF BOREHOLE: MW-112

CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 13, 2021	ELEVATION:	1130.7 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	May 20, 2021	COORDINATES:	N: 242010.6 ft E: 2479230.8 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Driller	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

DEPTH (ft) 51–100 | DRILL RIG: Prosonic 600C | DRILL METHOD: Sonic Drilling - 6-in Hole Dia.

MATERIAL PROFILE – DESCRIPTION

Unaltered to slightly altered, slightly weathered to moderately weathered, very thinly bedded granular, light brownish tan with pale bluish gray, fine grained to medium grained, medium strong, silty siliceous SANDSTONE, iron oxide staining, 40.0-40.4 silty clay broken core possible flow zone.

Unaltered to slightly altered, slightly weathered to moderately weathered, granular, dark grayish black, very fine grained to very fine grained, extremely weak to very weak, SILTSTONE.

Unaltered to slightly altered, slightly weathered to moderately weathered, thinly bedded to medium bedded granular, pale grayish blue, fine grained to medium grained, medium strong, SANDSTONE, iron oxide staining.

Unaltered to slightly altered, slightly weathered to moderately weathered, granular, light grayish black, very fine grained to very fine grained, very weak to very weak, SILTSTONE, no staining.

Unaltered to slightly altered, fresh to slightly weathered, laminated, dark blackish black, extremely weak to very weak, COAL, no staining.

Unaltered to slightly altered, slightly weathered to moderately weathered, granular, pale blackish gray, very fine grained to very fine grained, very weak to weak, SILTSTONE, no staining.

Unaltered to slightly altered, slightly weathered to moderately weathered, foliated, dark blackish black with light blackish gray, very fine grained to very fine grained, extremely weak to very weak, COAL, no staining, Interbedded siltstone in predominantly coal.

Unaltered, fresh to slightly weathered, crystalline, pale blackish gray, very fine grained to fine grained, very weak to weak, LIMESTONE, no staining.

Slightly weathered, granular, pale bluish gray, very fine grained to fine grained, non-porous to faintly porous, weak to medium strong, SILTSTONE.

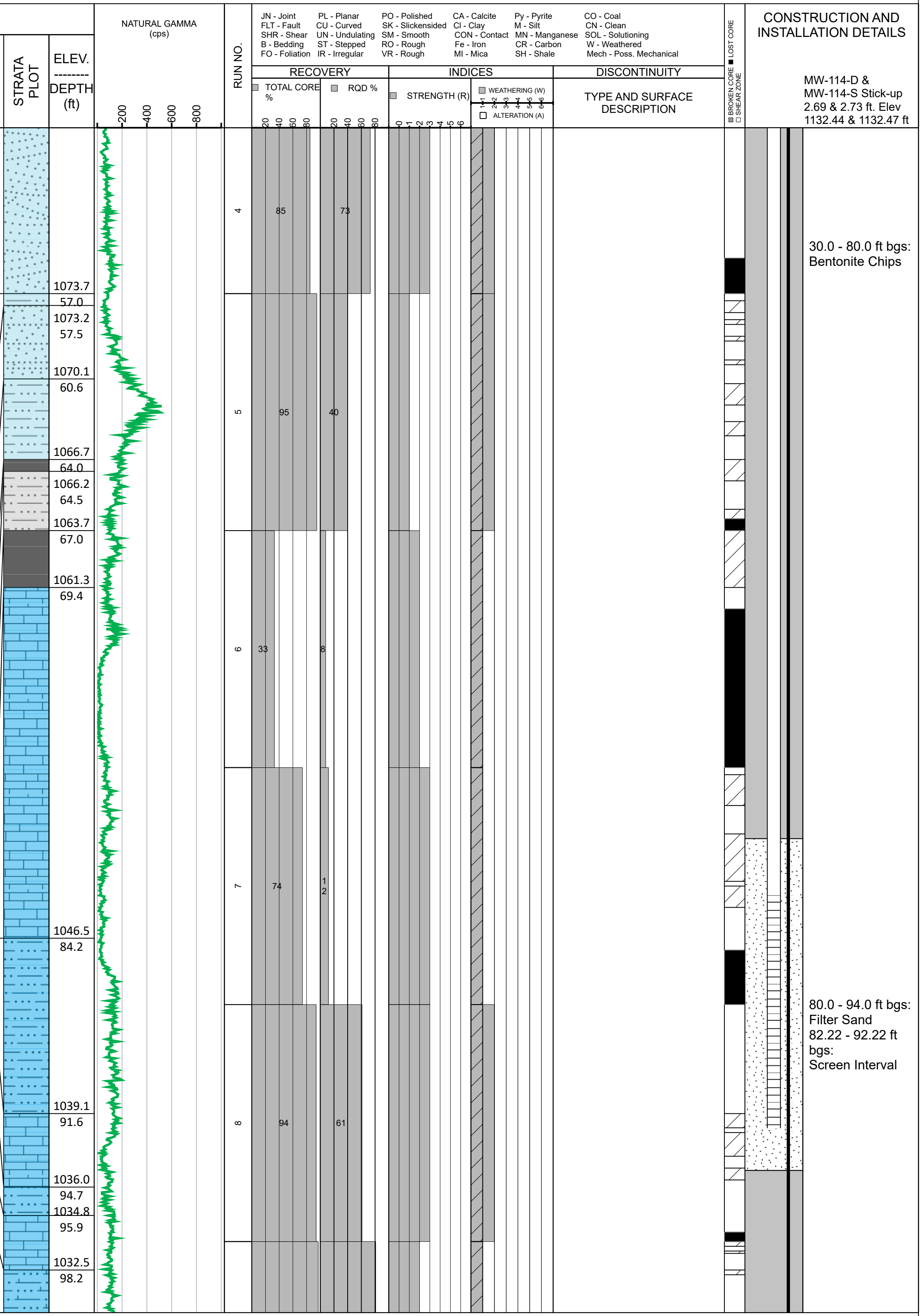
Unaltered to slightly altered, slightly weathered to moderately weathered, crystalline, pale bluish gray, weak, LIMESTONE, no staining.

Unaltered to slightly altered, slightly weathered to moderately weathered, granular, dark blackish gray, very fine grained to very fine grained, very weak to weak, SILTSTONE, no staining.

Unaltered to slightly altered, slightly weathered to moderately weathered, crystalline, pale bluish gray, LIMESTONE, no staining.

Unaltered to slightly altered, fresh to slightly weathered, granular, pale bluish gray, very fine grained to very fine grained, very weak to medium strong, SILTSTONE, no staining.

ELEV.	DEPTH (ft)
1073.7	57.0
1073.2	57.5
1070.1	60.6
1066.7	64.0
1066.2	64.5
1063.7	67.0
1061.3	69.4
1046.5	84.2
1039.1	91.6
1036.0	94.7
1034.8	95.9
1032.5	98.2



RUN NO.	TOTAL CORE %	RQD %
4	85	73
5	95	40
6	33	8
7	74	1 2
8	94	61

CONSTRUCTION AND INSTALLATION DETAILS

MW-114-D & MW-114-S Stick-up 2.69 & 2.73 ft. Elev 1132.44 & 1132.47 ft

30.0 - 80.0 ft bgs: Bentonite Chips

80.0 - 94.0 ft bgs: Filter Sand
82.22 - 92.22 ft bgs: Screen Interval

Continued on Next Page

HAMMER TYPE: N/A

REV:

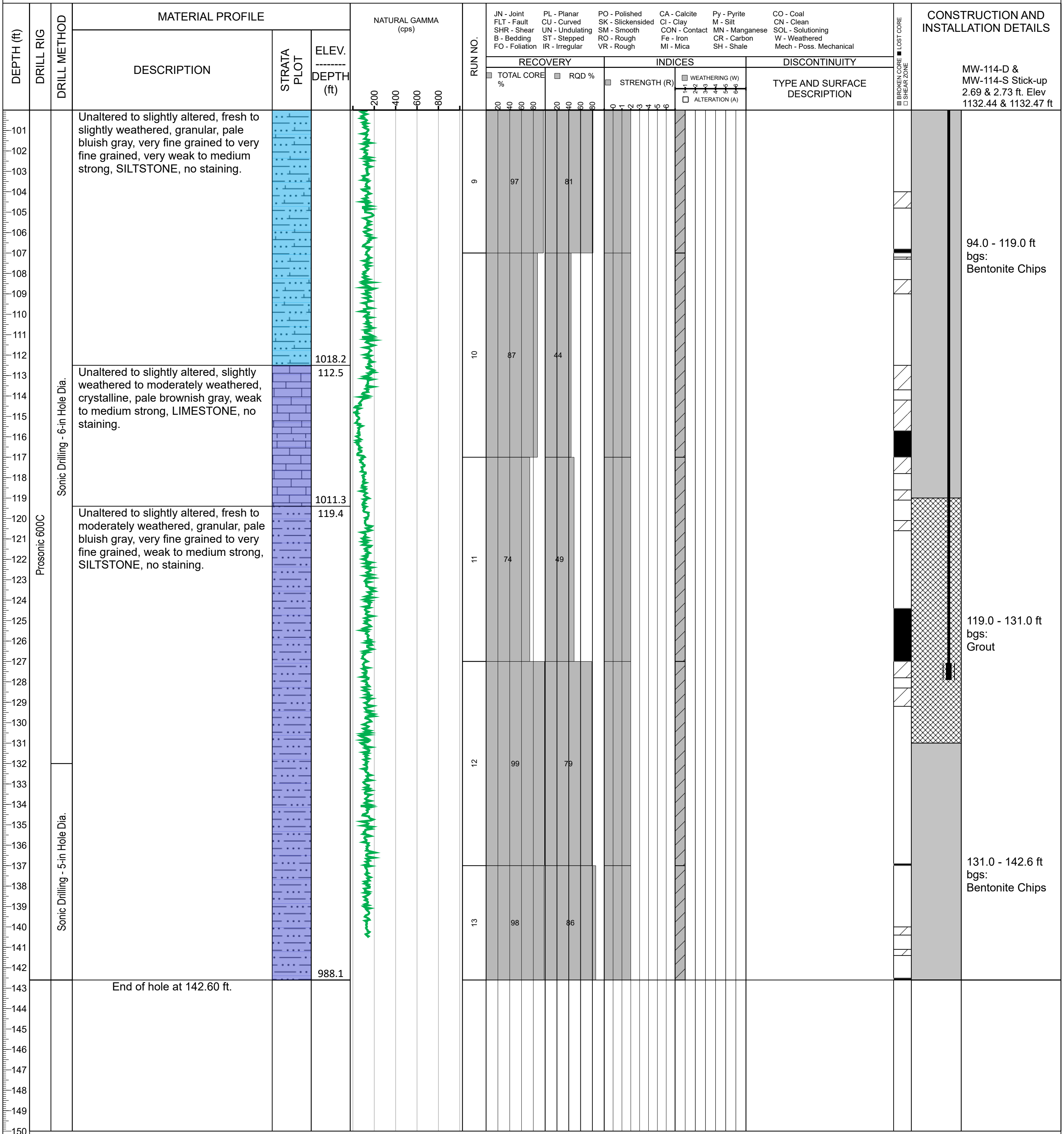
LOGGED: Andrew Adkins/Dan Bida DATE: May 13, 2021
CHECKED: Bob Ireson DATE: May 04, 2022

RECORD OF BOREHOLE: MW-112

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: May 13, 2021
END DATE: May 20, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Driller

ELEVATION: 1130.7 ft (Ground)
COORDINATES: N: 242010.6 ft E: 2479230.8 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88



DESCRIPTION	ELEV. -------- DEPTH (ft)
Unaltered to slightly altered, fresh to slightly weathered, granular, pale bluish gray, very fine grained to very fine grained, very weak to medium strong, SILTSTONE, no staining.	1018.2 112.5
Unaltered to slightly altered, slightly weathered to moderately weathered, crystalline, pale brownish gray, weak to medium strong, LIMESTONE, no staining.	1011.3 119.4
Unaltered to slightly altered, fresh to moderately weathered, granular, pale bluish gray, very fine grained to very fine grained, weak to medium strong, SILTSTONE, no staining.	988.1
End of hole at 142.60 ft.	

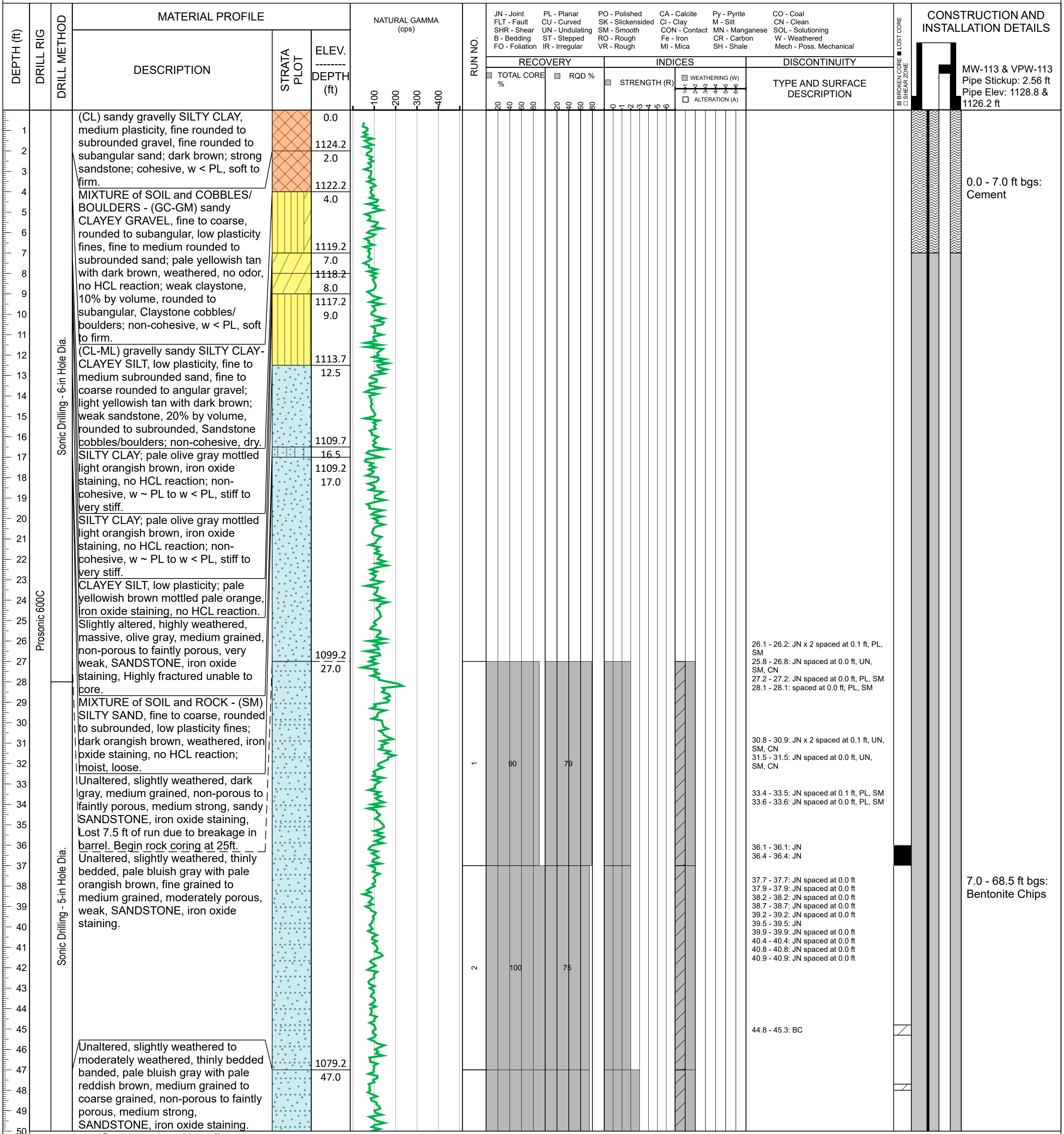
HAMMER TYPE: N/A

REV:

LOGGED: Andrew Adkins/Dan Bida DATE: May 13, 2021
CHECKED: Bob Ireson DATE: May 04, 2022

RECORD OF BOREHOLE: MW-113

CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 05, 2021	ELEVATION:	1126.2 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	May 13, 2021	COORDINATES:	N: 242133.2 ft E: 2479530.5 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				



JN - Joint
FLT - Fault
SHR - Shear
B - Bedding
FO - Foliation
PL - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular
PO - Polished
SK - Slickensided
SM - Smooth
RO - Rough
VR - Rough
CA - Calcite
Cl - Clay
CON - Contact
Fe - Iron
MI - Mica
Py - Pyrite
M - Silt
MN - Manganese
CR - Carbon
SH - Shale
CO - Coal
CN - Clean
SOL - Solutioning
W - Weathered
Mech - Poss. Mechanical

DESCRIPTION

(CL) sandy gravelly SILTY CLAY, medium plasticity, fine rounded to subrounded gravel, fine rounded to subangular sand; dark brown; strong sandstone; cohesive, w < PL, soft to firm.

MIXTURE of SOIL and COBBLES/ BOULDERS - (GC-GM) sandy CLAYEY GRAVEL, fine to coarse, rounded to subangular, low plasticity fines, fine to medium rounded to subrounded sand; pale yellowish tan with dark brown, weathered, no odor, no HCL reaction; weak claystone, 10% by volume, rounded to subangular, Claystone cobbles/ boulders; non-cohesive, w < PL, soft to firm.

(CL-ML) gravelly sandy SILTY CLAY-CLAYEY SILT, low plasticity, fine to medium subrounded sand, fine to coarse rounded to angular gravel; light yellowish tan with dark brown; weak sandstone, 20% by volume, rounded to subrounded, Sandstone cobbles/boulders; non-cohesive, dry.

SILTY CLAY; pale olive gray mottled light orangish brown, iron oxide staining, no HCL reaction; non-cohesive, w ~ PL to w < PL, stiff to very stiff.

SILTY CLAY; pale olive gray mottled light orangish brown, iron oxide staining, no HCL reaction; non-cohesive, w ~ PL to w < PL, stiff to very stiff.

CLAYEY SILT, low plasticity; pale yellowish brown mottled pale orange, iron oxide staining, no HCL reaction.

Slightly altered, highly weathered, massive, olive gray, medium grained, non-porous to faintly porous, very weak, SANDSTONE, iron oxide staining, Highly fractured unable to core.

MIXTURE of SOIL and ROCK - (SM) SILTY SAND, fine to coarse, rounded to subrounded, low plasticity fines; dark orangish brown, weathered, iron oxide staining, no HCL reaction; moist, loose.

Unaltered, slightly weathered, dark gray, medium grained, non-porous to faintly porous, medium strong, sandy SANDSTONE, iron oxide staining, Lost 7.5 ft of run due to breakage in barrel. Begin rock coring at 25ft.

Unaltered, slightly weathered, thinly bedded, pale bluish gray with pale orangish brown, fine grained to medium grained, moderately porous, weak, SANDSTONE, iron oxide staining.

Unaltered, slightly weathered to moderately weathered, thinly bedded banded, pale bluish gray with pale reddish brown, medium grained to coarse grained, non-porous to faintly porous, medium strong, SANDSTONE, iron oxide staining.

ELEV.	DEPTH (ft)
	0.0
1124.2	2.0
1122.2	4.0
1119.2	7.0
1118.2	8.0
1117.2	9.0
1113.7	12.5
1109.7	16.5
1109.2	17.0
1099.2	27.0
1079.2	47.0

RUN NO.	TOTAL CORE %	RQD %
1	90	79
2	100	75

TYPE AND SURFACE DESCRIPTION

26.1 - 26.2: JN x 2 spaced at 0.1 ft, PL, SM
25.8 - 26.8: JN spaced at 0.0 ft, UN, SM, CN
27.2 - 27.2: JN spaced at 0.0 ft, PL, SM
28.1 - 28.1: spaced at 0.0 ft, PL, SM
30.8 - 30.9: JN x 2 spaced at 0.1 ft, UN, SM, CN
31.5 - 31.5: JN spaced at 0.0 ft, UN, SM, CN
33.4 - 33.5: JN spaced at 0.1 ft, PL, SM
33.6 - 33.6: JN spaced at 0.0 ft, PL, SM
36.1 - 36.1: JN
36.4 - 36.4: JN
37.7 - 37.7: JN spaced at 0.0 ft
37.9 - 37.9: JN spaced at 0.0 ft
38.2 - 38.2: JN spaced at 0.0 ft
38.7 - 38.7: JN spaced at 0.0 ft
39.2 - 39.2: JN spaced at 0.0 ft
39.5 - 39.5: JN
39.9 - 39.9: JN spaced at 0.0 ft
40.4 - 40.4: JN spaced at 0.0 ft
40.8 - 40.8: JN spaced at 0.0 ft
40.9 - 40.9: JN spaced at 0.0 ft
44.8 - 45.3: BC

CONSTRUCTION AND INSTALLATION DETAILS

MW-113 & VPW-113
Pipe Stickup: 2.56 ft
Pipe Elev: 1128.8 & 1126.2 ft

0.0 - 7.0 ft bgs: Cement

7.0 - 68.5 ft bgs: Bentonite Chips

Continued on Next Page

REV:

HAMMER TYPE: N/A

LOGGED: Andrew Adkins	DATE: May 05, 2021
CHECKED: Bob Ireson	DATE: May 04, 2022

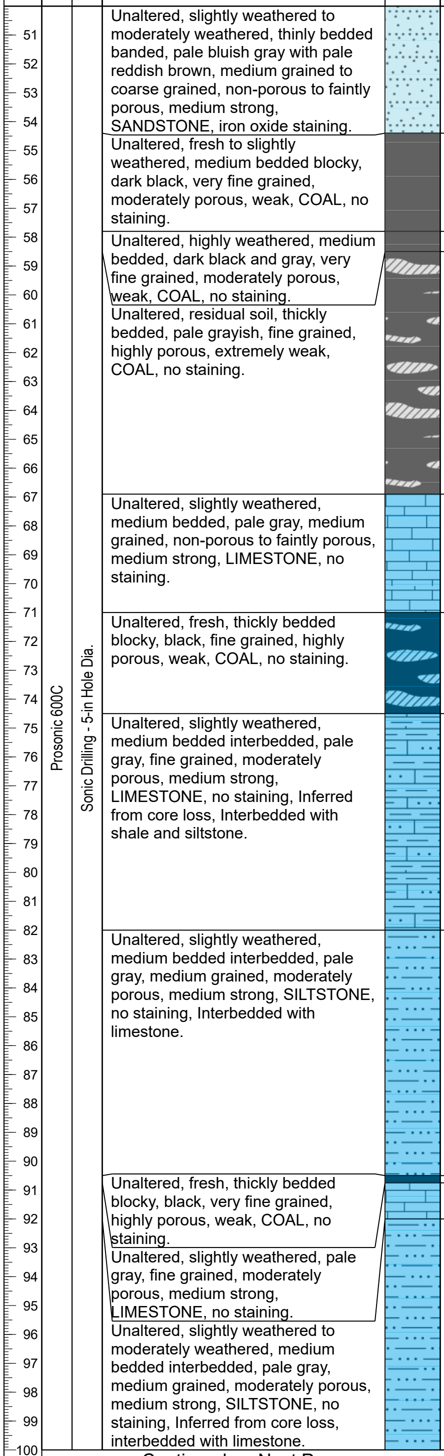
RECORD OF BOREHOLE: MW-113

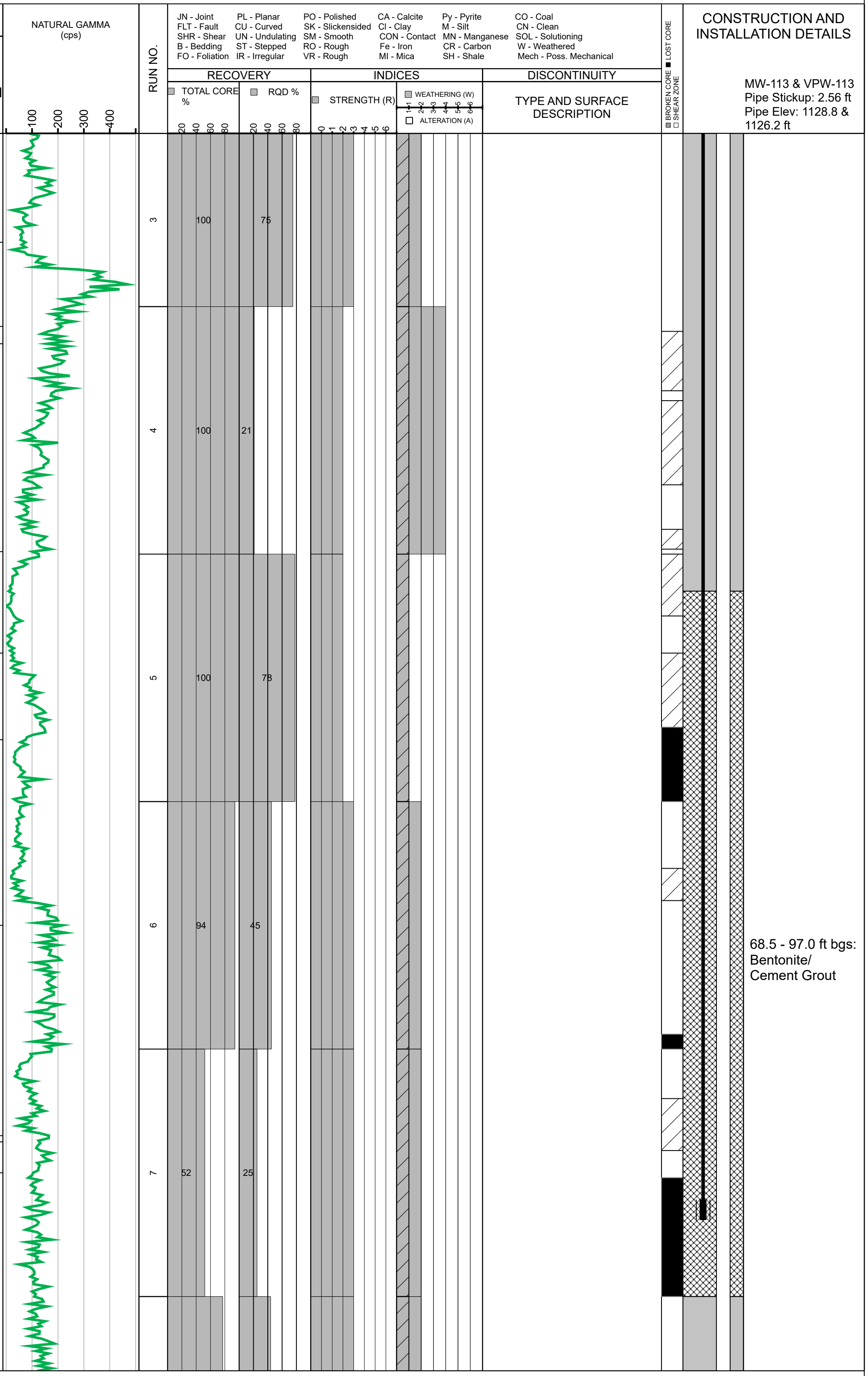
CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 05, 2021	ELEVATION:	1126.2 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	May 13, 2021	COORDINATES:	N: 242133.2 ft E: 2479530.5 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

DRILL RIG: Prosonic 600C

DRILL METHOD: Sonic Drilling - 5-in Hole Dia.

MATERIAL PROFILE DESCRIPTION	ELEV. -------- DEPTH (ft)
Unaltered, slightly weathered to moderately weathered, thinly bedded banded, pale bluish gray with pale reddish brown, medium grained to coarse grained, non-porous to faintly porous, medium strong, SANDSTONE, iron oxide staining.	1071.8 54.4
Unaltered, fresh to slightly weathered, medium bedded blocky, dark black, very fine grained, moderately porous, weak, COAL, no staining.	1068.4 57.8
Unaltered, highly weathered, medium bedded, dark black and gray, very fine grained, moderately porous, weak, COAL, no staining.	1067.7 58.5
Unaltered, residual soil, thickly bedded, pale grayish, fine grained, highly porous, extremely weak, COAL, no staining.	1059.3 66.9
Unaltered, slightly weathered, medium bedded, pale gray, medium grained, non-porous to faintly porous, medium strong, LIMESTONE, no staining.	1055.2 71.0
Unaltered, fresh, thickly bedded blocky, black, fine grained, highly porous, weak, COAL, no staining.	1051.7 74.5
Unaltered, slightly weathered, medium bedded interbedded, pale gray, fine grained, moderately porous, medium strong, LIMESTONE, no staining, Inferred from core loss, Interbedded with shale and siltstone.	1044.2 82.0
Unaltered, slightly weathered, medium bedded interbedded, pale gray, medium grained, moderately porous, medium strong, SILTSTONE, no staining, Interbedded with limestone.	1035.7 90.5
Unaltered, fresh, thickly bedded blocky, black, very fine grained, highly porous, weak, COAL, no staining.	1035.5 90.8
Unaltered, slightly weathered, pale gray, fine grained, moderately porous, medium strong, LIMESTONE, no staining.	1034.2 92.0
Unaltered, slightly weathered to moderately weathered, medium bedded interbedded, pale gray, medium grained, moderately porous, medium strong, SILTSTONE, no staining, Inferred from core loss, interbedded with limestone.	





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HAMMER TYPE: N/A

REV:

LOGGED: Andrew Adkins DATE: May 05, 2021

CHECKED: Bob Ireson DATE: May 04, 2022

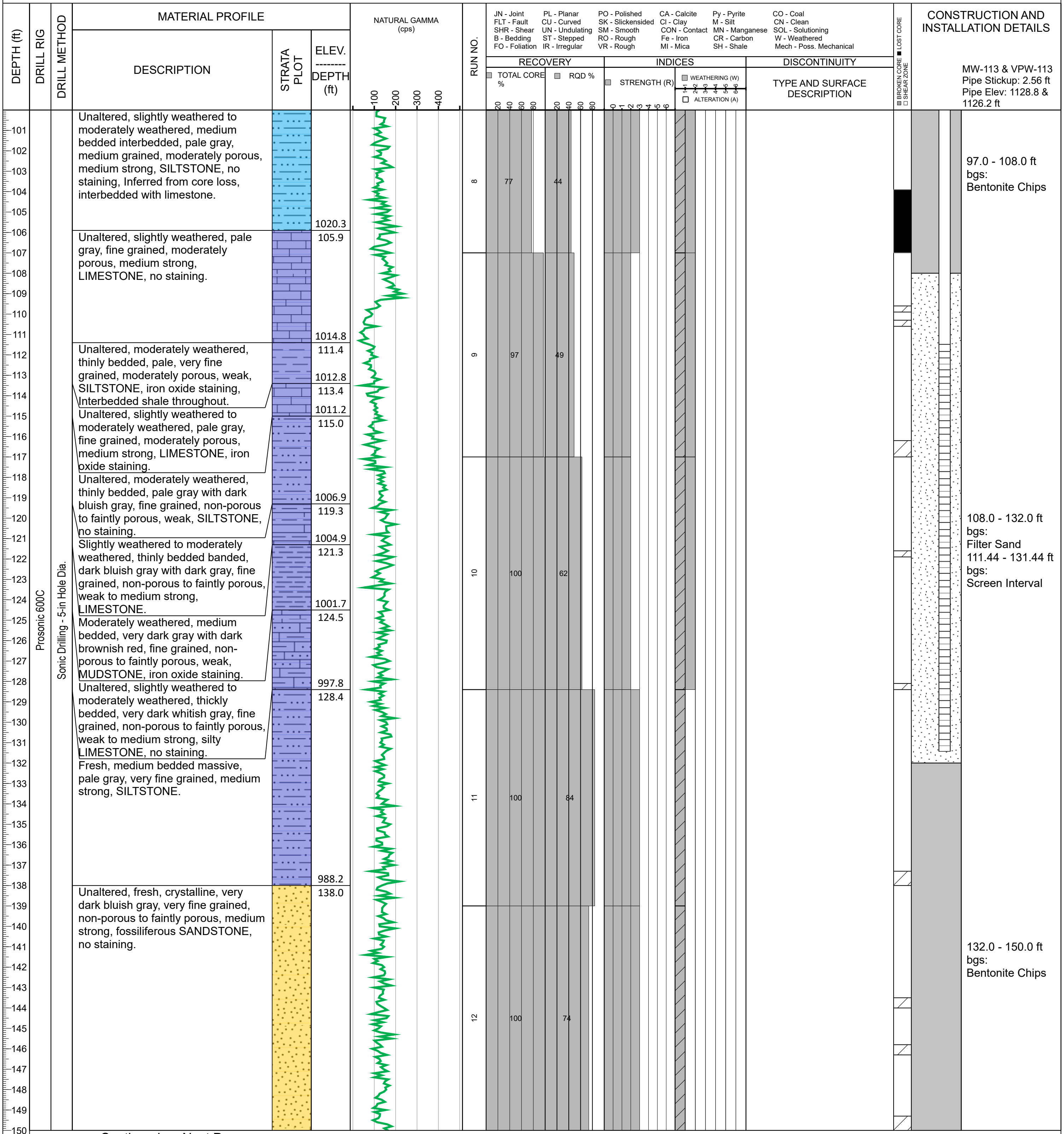
RECORD OF BOREHOLE: MW-113

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: May 05, 2021
END DATE: May 13, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1126.2 ft (Ground)
COORDINATES: N: 242133.2 ft E: 2479530.5 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

JN - Joint, FLT - Fault, SHR - Shear, B - Bedding, FO - Foliation
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, SK - Slickensided, SM - Smooth, RO - Rough, VR - Rough
CA - Calcite, CI - Clay, CON - Contact, Fe - Iron, MI - Mica
Py - Pyrite, M - Silt, MN - Manganese, CR - Carbon, SH - Shale
CO - Coal, CN - Clean, SOL - Solutioning, W - Weathered, Mech - Poss. Mechanical



DRILL RIG: Prosonic 600C
DRILL METHOD: Sonic Drilling - 5-in Hole Dia.

MATERIAL PROFILE

DESCRIPTION	ELEV. -------- DEPTH (ft)
Unaltered, slightly weathered to moderately weathered, medium bedded interbedded, pale gray, medium grained, moderately porous, medium strong, SILTSTONE, no staining, Inferred from core loss, interbedded with limestone.	1020.3 105.9
Unaltered, slightly weathered, pale gray, fine grained, moderately porous, medium strong, LIMESTONE, no staining.	1014.8 111.4
Unaltered, moderately weathered, thinly bedded, pale, very fine grained, moderately porous, weak, SILTSTONE, iron oxide staining, Interbedded shale throughout.	1012.8 113.4
Unaltered, slightly weathered to moderately weathered, pale gray, fine grained, moderately porous, medium strong, LIMESTONE, iron oxide staining.	1011.2 115.0
Unaltered, moderately weathered, thinly bedded, pale gray with dark bluish gray, fine grained, non-porous to faintly porous, weak, SILTSTONE, no staining.	1006.9 119.3
Slightly weathered to moderately weathered, thinly bedded banded, dark bluish gray with dark gray, fine grained, non-porous to faintly porous, weak to medium strong, LIMESTONE.	1004.9 121.3
Moderately weathered, medium bedded, very dark gray with dark brownish red, fine grained, non-porous to faintly porous, weak, MUDSTONE, iron oxide staining.	1001.7 124.5
Unaltered, slightly weathered to moderately weathered, thickly bedded, very dark whitish gray, fine grained, non-porous to faintly porous, weak to medium strong, silty LIMESTONE, no staining.	997.8 128.4
Fresh, medium bedded massive, pale gray, very fine grained, medium strong, SILTSTONE.	988.2 138.0
Unaltered, fresh, crystalline, very dark bluish gray, very fine grained, non-porous to faintly porous, medium strong, fossiliferous SANDSTONE, no staining.	

RUN NO.	TOTAL CORE %	RQD %
8	77	44
9	97	49
10	100	62
11	100	84
12	100	74

CONSTRUCTION AND INSTALLATION DETAILS

MW-113 & VPW-113
Pipe Stickup: 2.56 ft
Pipe Elev: 1128.8 & 1126.2 ft

97.0 - 108.0 ft bgs: Bentonite Chips

108.0 - 132.0 ft bgs: Filter Sand
111.44 - 131.44 ft bgs: Screen Interval

132.0 - 150.0 ft bgs: Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

REV:

LOGGED: Andrew Adkins DATE: May 05, 2021
CHECKED: Bob Ireson DATE: May 04, 2022

RECORD OF BOREHOLE: MW-113

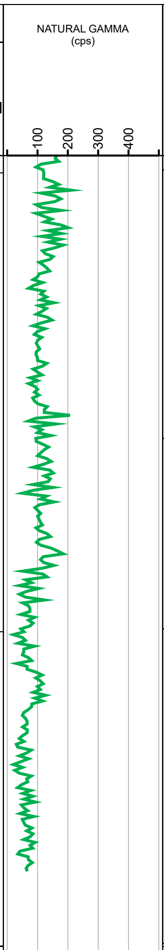
Sheet 4 of 4

CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 05, 2021	ELEVATION:	1126.2 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	May 13, 2021	COORDINATES:	N: 242133.2 ft E: 2479530.5 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

JN - Joint, FLT - Fault, SHR - Shear, B - Bedding, FO - Foliation
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, SK - Slickensided, SM - Smooth, RO - Rough, VR - Rough
CA - Calcite, Cl - Clay, CON - Contact, Fe - Iron, MI - Mica
Py - Pyrite, M - Silt, MN - Manganese, CR - Carbon, SH - Shale
CO - Coal, CN - Clean, SOL - Solutioning, W - Weathered, Mech - Poss. Mechanical

DRILL RIG: Prosonic 600C
DRILL METHOD: Sonic Drilling - 5-in Hole Dia.

DESCRIPTION	ELEV. / DEPTH (ft)
Unaltered, fresh, crystalline, very dark bluish gray, very fine grained, non-porous to faintly porous, medium strong, fossiliferous SANDSTONE, no staining.	975.6 150.6
Fresh to slightly weathered, very thinly bedded banded, dark bluish gray with very dark gray, fine grained to medium grained, non-porous to faintly porous, medium strong, SANDSTONE, no staining, Banded with mica throughout.	959.7 166.5
Fresh to slightly weathered, thinly bedded banded, dark bluish gray with very dark gray, medium grained to coarse grained, non-porous to faintly porous, very strong to extremely strong, SANDSTONE, no staining, Banded with mica throughout.	948.8
End of hole at 177.40 ft.	



RUN NO.	TOTAL CORE %	RQD %
13	100	99
14	100	79
15	100	89

RECOVERY: TOTAL CORE %, RQD %; INDICES: STRENGTH (R), WEATHERING (W), ALTERATION (A); DISCONTINUITY: TYPE AND SURFACE DESCRIPTION; BROKEN CORE ■ LOST CORE, SHEAR ZONE

CONSTRUCTION AND INSTALLATION DETAILS

MW-113 & VPW-113
Pipe Stickup: 2.56 ft
Pipe Elev: 1128.8 & 1126.2 ft

150.0 - 177.4 ft bgs: Grout

HAMMER TYPE: N/A

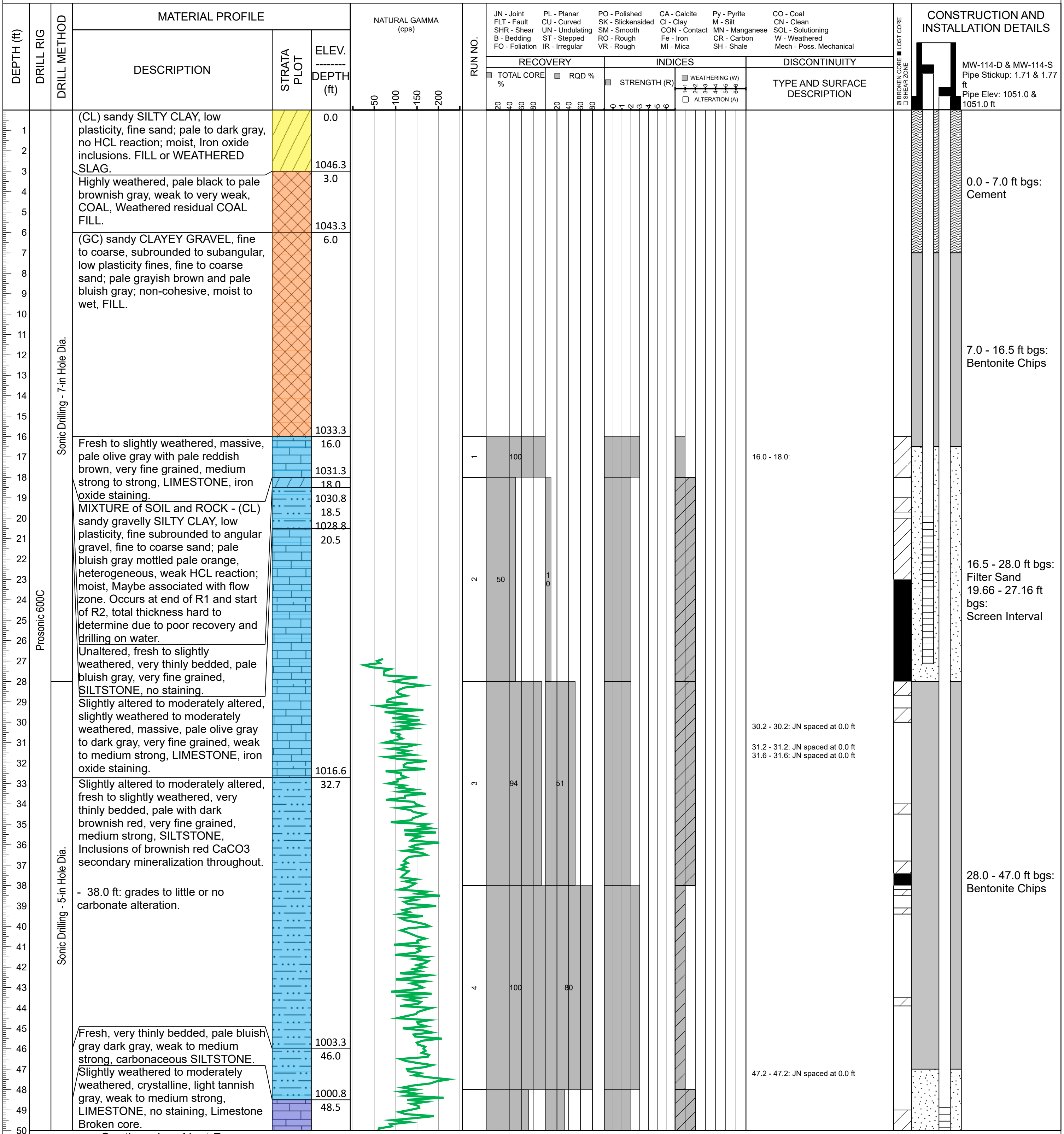
REV:

GOLDER MEMBER OF WSP

LOGGED: Andrew Adkins DATE: May 05, 2021
CHECKED: Bob Ireson DATE: May 04, 2022

RECORD OF BOREHOLE: MW-114

CLIENT:	Cyprus Amax Minerals Company	START DATE:	June 07, 2021	ELEVATION:	1049.3 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	June 08, 2021	COORDINATES:	N: 241351.8 ft E: 2479185.2 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				



JN - Joint	PL - Planar	PO - Polished	CA - Calcite	Py - Pyrite	CO - Coal
FLT - Fault	CU - Curved	SK - Slickensided	CI - Clay	M - Silt	CN - Clean
SHR - Shear	UN - Undulating	SM - Smooth	CON - Contact	MN - Manganese	SOL - Solutioning
B - Bedding	ST - Stepped	RO - Rough	Fe - Iron	CR - Carbon	W - Weathered
FO - Foliation	IR - Irregular	VR - Rough	MI - Mica	SH - Shale	Mech - Poss. Mechanical

DESCRIPTION	ELEV. / DEPTH (ft)
(CL) sandy SILTY CLAY, low plasticity, fine sand; pale to dark gray, no HCL reaction; moist, Iron oxide inclusions. FILL or WEATHERED SLAG.	0.0
Highly weathered, pale black to pale brownish gray, weak to very weak, COAL, Weathered residual COAL FILL.	1046.3 3.0
(GC) sandy CLAYEY GRAVEL, fine to coarse, subrounded to subangular, low plasticity fines, fine to coarse sand; pale grayish brown and pale bluish gray; non-cohesive, moist to wet, FILL.	1043.3 6.0
Fresh to slightly weathered, massive, pale olive gray with pale reddish brown, very fine grained, medium strong to strong, LIMESTONE, iron oxide staining.	1033.3 16.0
MIXTURE OF SOIL and ROCK - (CL) sandy gravelly SILTY CLAY, low plasticity, fine subrounded to angular gravel, fine to coarse sand; pale bluish gray mottled pale orange, heterogeneous, weak HCL reaction; moist, Maybe associated with flow zone. Occurs at end of R1 and start of R2, total thickness hard to determine due to poor recovery and drilling on water.	1031.3 18.0
Unaltered, fresh to slightly weathered, very thinly bedded, pale bluish gray, very fine grained, SILTSTONE, no staining.	1030.8 18.5
Slightly altered to moderately altered, slightly weathered to moderately weathered, massive, pale olive gray to dark gray, very fine grained, weak to medium strong, LIMESTONE, iron oxide staining.	1028.8 20.5
Slightly altered to moderately altered, fresh to slightly weathered, very thinly bedded, pale with dark brownish red, very fine grained, medium strong, SILTSTONE, Inclusions of brownish red CaCO3 secondary mineralization throughout. - 38.0 ft: grades to little or no carbonate alteration.	1016.6 32.7
Fresh, very thinly bedded, pale bluish gray dark gray, weak to medium strong, carbonaceous SILTSTONE.	1003.3 46.0
Slightly weathered to moderately weathered, crystalline, light tannish gray, weak to medium strong, LIMESTONE, no staining, Limestone Broken core.	1000.8 48.5

RUN NO.	TOTAL CORE %	RQD %
1	100	
2	50	1 0
3	94	51
4	100	80

16.0 - 18.0:

30.2 - 30.2: JN spaced at 0.0 ft

31.2 - 31.2: JN spaced at 0.0 ft

31.6 - 31.6: JN spaced at 0.0 ft

47.2 - 47.2: JN spaced at 0.0 ft

MW-114-D & MW-114-S
Pipe Stickup: 1.71 & 1.77 ft
Pipe Elev: 1051.0 & 1051.0 ft

0.0 - 7.0 ft bgs:
Cement

7.0 - 16.5 ft bgs:
Bentonite Chips

16.5 - 28.0 ft bgs:
Filter Sand
19.66 - 27.16 ft bgs:
Screen Interval

28.0 - 47.0 ft bgs:
Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

REV:

GOLDER
MEMBER OF WSP

LOGGED: Dan Bida/Ben Douvier DATE: Jun 07, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-114

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

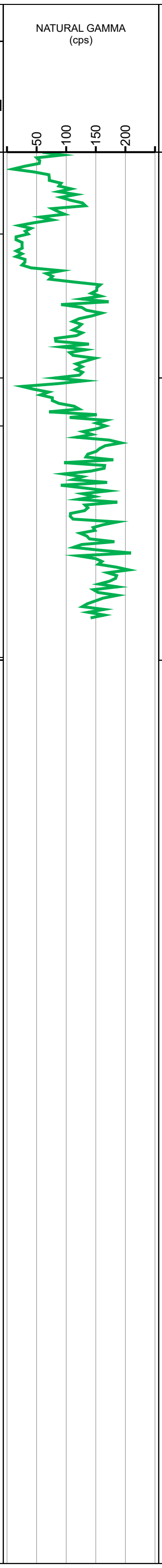
START DATE: June 07, 2021
END DATE: June 08, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1049.3 ft (Ground)
COORDINATES: N: 241351.8 ft E: 2479185.2 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

JN - Joint, FLT - Fault, SHR - Shear, B - Bedding, FO - Foliation
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, SK - Slickensided, SM - Smooth, RO - Rough, VR - Rough
CA - Calcite, CI - Clay, CON - Contact, Fe - Iron, MI - Mica
Py - Pyrite, M - Silt, MN - Manganese, CR - Carbon, SH - Shale
CO - Coal, CN - Clean, SOL - Solutioning, W - Weathered, Mech - Poss. Mechanical

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	ELEV. -------- DEPTH (ft)
50 – 52.9	Prosonic 600C	Sonic Drilling - 5-in Hole Dia.	Slightly weathered to moderately weathered, crystalline, light tannish gray, weak to medium strong, LIMESTONE, no staining, Limestone Broken core.	996.4 52.9
52.9 – 58.0			Slightly altered to moderately altered, slightly weathered to moderately weathered, very thinly bedded to very thinly bedded granular, pale bluish gray, very fine grained to very fine grained, weak to medium strong, clayey calcareous SILTSTONE, no staining, 55.2 to 58 lost core.	991.3 58.0
58.0 – 59.7			Slightly altered to moderately altered, slightly weathered to moderately weathered, crystalline, light tannish gray, weak to medium strong, LIMESTONE, no staining, Limestone broken core.	989.6 59.7
59.7 – 68			Unaltered to moderately altered, slightly weathered to moderately weathered, very thinly bedded to very thinly bedded, pale bluish gray, very fine grained to very fine grained, very weak to medium strong, clayey SILTSTONE, no staining.	981.4
68			End of hole at 68.00 ft.	

NATURAL GAMMA (cps)



RUN NO.	RECOVERY TOTAL CORE %	RECOVERY RQD %
5	72	33
6	99	76

INDICES: STRENGTH (R); WEATHERING (W); ALTERATION (A)

DISCONTINUITY – TYPE AND SURFACE DESCRIPTION

64.4 - 64.4: JN spaced at 0.0 ft
66.8 - 66.8: JN spaced at 0.0 ft
67.4 - 67.4: JN spaced at 0.0 ft

▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE

CONSTRUCTION AND INSTALLATION DETAILS

MW-114-D & MW-114-S
Pipe Stickup: 1.71 & 1.77 ft
Pipe Elev: 1051.0 & 1051.0 ft

47.0 - 60.0 ft bgs: Filter Sand
48.60 - 58.60 ft bgs: Screen Interval

60.0 - 68.0 ft bgs: Bentonite Chips

REV:

HAMMER TYPE: N/A

GOLDER
MEMBER OF WSP

LOGGED: Dan Bida/Ben Douvier DATE: Jun 07, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-115

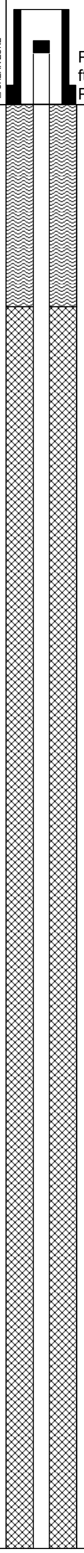
CLIENT:	Cyprus Amax Minerals Company	START DATE:	May 28, 2021	ELEVATION:	1125.7 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	June 01, 2021	COORDINATES:	N: 241773.6 ft E: 2478887.2 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330				

JN - Joint, FLT - Fault, SHR - Shear, B - Bedding, FO - Foliation
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, SK - Slickensided, SM - Smooth, RO - Rough, VR - Rough
CA - Calcite, CI - Clay, CON - Contact, Fe - Iron, MI - Mica
Py - Pyrite, M - Silt, MN - Manganese, CR - Carbon, SH - Shale
CO - Coal, CN - Clean, SOL - Solutioning, W - Weathered, Mech - Poss. Mechanical

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	STRATA PLOT	ELEV. -------- DEPTH (ft)	NATURAL GAMMA (cps) 50 100 150 200	RUN NO.	RECOVERY ▨ TOTAL CORE % 20 40 60 80	▨ RQD % 20 40 60 80	INDICES ▨ STRENGTH (R) 0 1 2 3 4 5 6	▨ WEATHERING (W) 1 2 3 4 5 6 ☐ ALTERATION (A)	DISCONTINUITY TYPE AND SURFACE DESCRIPTION	▨ BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE
	Prosonic 600C	Sonic Drilling - 6-in Hole Dia.	Gravelly CLAYEY SILT, low plasticity, some sand; dark olive gray, unweathered, no staining, no odor, no HCL reaction; 10% by volume, subrounded to angular, Sandstone cobbles/boulders; non-cohesive, soft.		0.0 1122.7 3.0								
			FILL - (SM) gravelly SILTY SAND, fine to coarse, rounded to angular, non plastic fines, fine to coarse subrounded to subangular gravel; dark olive gray to pale yellowish brown, weathered, iron oxide staining, no odor, strong HCL reaction; strong Sandstone and limestone, 30% by volume, subrounded to subangular, Sandstone and limestone cobbles/ boulders; Mixed weak fill rocky interbedded Sandstone and limestone boulders, easy to drill dry, hole dry.		1096.7 29.0								
			FILL - (SC) gravelly CLAYEY SAND, fine to coarse, subrounded to subangular, medium plasticity fines, fine to coarse subrounded to subangular gravel; dark orangish brown and dark greenish gray, weathered, iron oxide staining, no odor, no HCL reaction; weak sandstone, 15% by volume, subrounded to subangular, Sandstone cobbles/boulders; cohesive, w ~ PL, soft, Fil, changes to predominantly silty clay with gravel, sand, and cobbles.										

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.48 ft
Pipe Elev: 1128.2 ft

0.0 - 7.0 ft bgs: Cement Grout

7.0 - 74.0 ft bgs: Grout

Continued on Next Page

HAMMER TYPE: N/A

REV:

LOGGED: Andrew Adkins/Dan Bida DATE: May 28, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

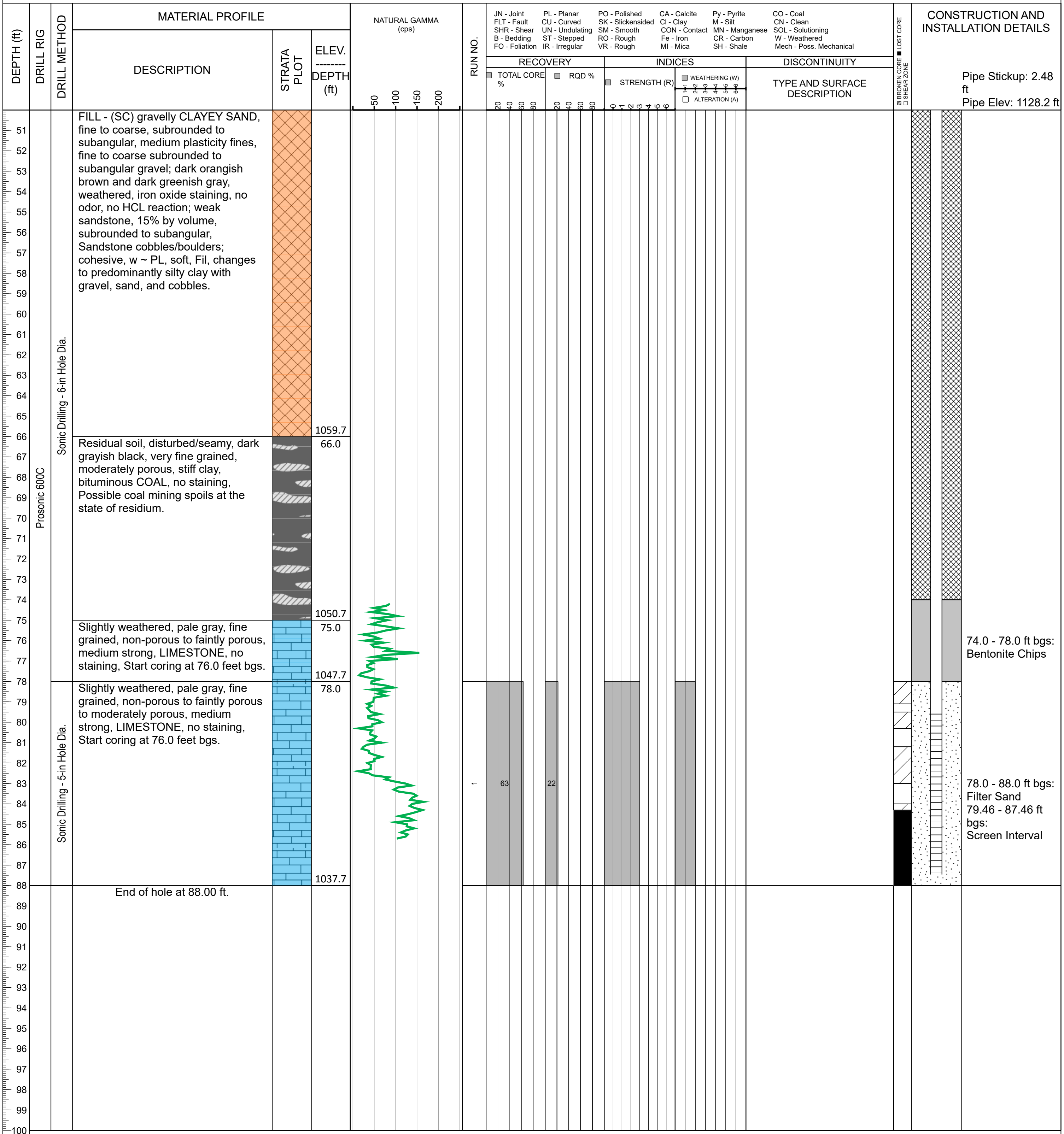
GOLDER
MEMBER OF WSP

RECORD OF BOREHOLE: MW-115

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: May 28, 2021
END DATE: June 01, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1125.7 ft (Ground)
COORDINATES: N: 241773.6 ft E: 2478887.2 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88



DESCRIPTION	ELEV. / DEPTH (ft)
FILL - (SC) gravelly CLAYEY SAND, fine to coarse, subrounded to subangular, medium plasticity fines, fine to coarse subrounded to subangular gravel; dark orangish brown and dark greenish gray, weathered, iron oxide staining, no odor, no HCL reaction; weak sandstone, 15% by volume, subrounded to subangular, Sandstone cobbles/boulders; cohesive, w ~ PL, soft, Fil, changes to predominantly silty clay with gravel, sand, and cobbles.	1059.7
Residual soil, disturbed/seamy, dark grayish black, very fine grained, moderately porous, stiff clay, bituminous COAL, no staining, Possible coal mining spoils at the state of residium.	66.0 1050.7
Slightly weathered, pale gray, fine grained, non-porous to faintly porous, medium strong, LIMESTONE, no staining, Start coring at 76.0 feet bgs.	75.0 1047.7
Slightly weathered, pale gray, fine grained, non-porous to faintly porous to moderately porous, medium strong, LIMESTONE, no staining, Start coring at 76.0 feet bgs.	78.0 1037.7
End of hole at 88.00 ft.	

Pipe Stickup: 2.48 ft
Pipe Elev: 1128.2 ft

74.0 - 78.0 ft bgs:
Bentonite Chips

78.0 - 88.0 ft bgs:
Filter Sand
79.46 - 87.46 ft bgs:
Screen Interval

HAMMER TYPE: N/A

REV:

LOGGED: Andrew Adkins/Dan Bida DATE: May 28, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-116

CLIENT:	Cyprus Amax Minerals Company	START DATE:	November 09, 2021	ELEVATION:	1073.6 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	November 11, 2021	COORDINATES:	N: 242344.2 ft E: 2478319.4 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330			HOLE LOC:	150 ft NE of SSW-171

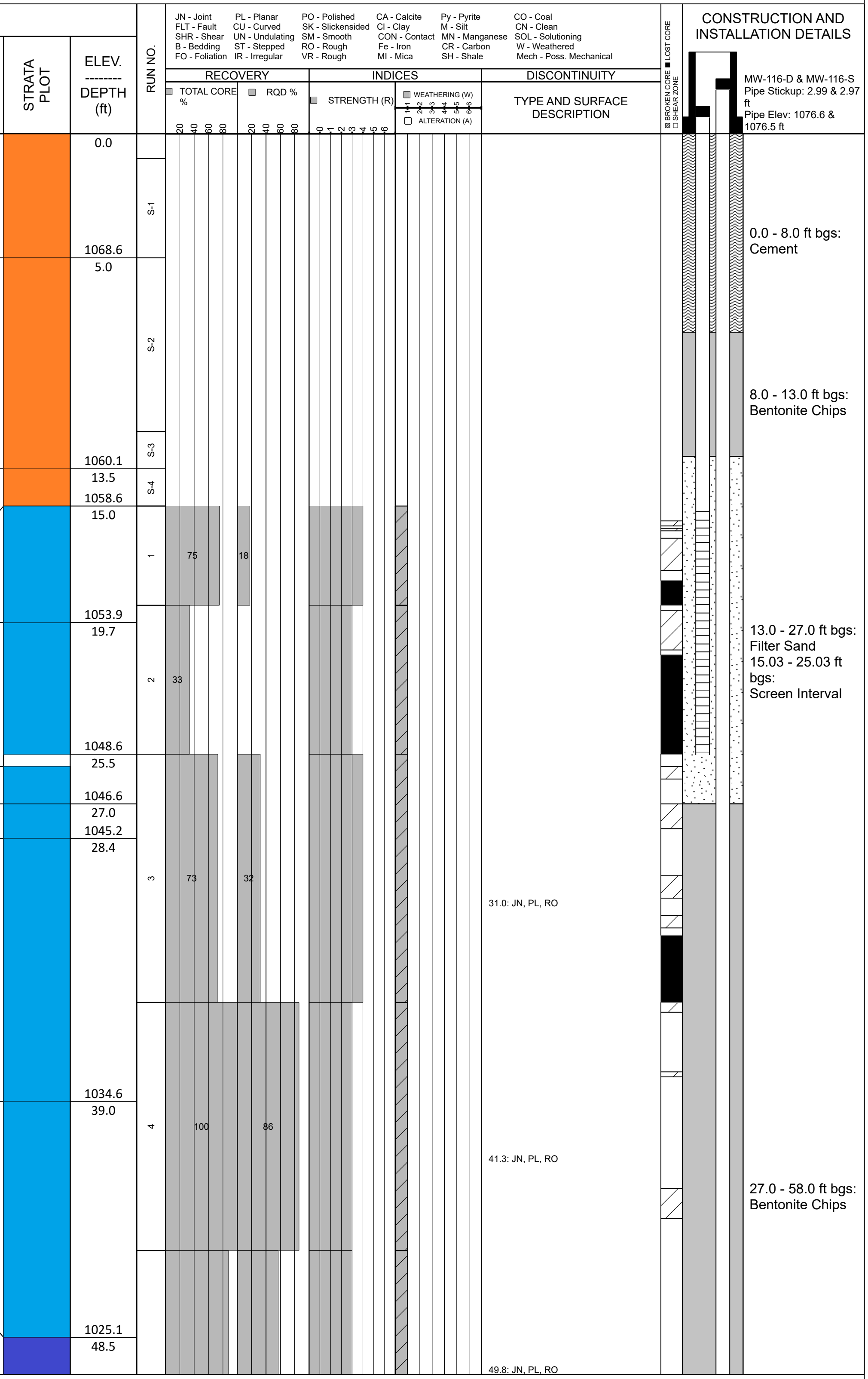
JN - Joint, FLT - Fault, SHR - Shear, B - Bedding, FO - Foliation
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, SK - Slickensided, SM - Smooth, RO - Rough, VR - Rough
CA - Calcite, Cl - Clay, CON - Contact, Fe - Iron, MI - Mica
Py - Pyrite, M - Silt, MN - Manganese, CR - Carbon, SH - Shale
CO - Coal, CN - Clean, SOL - Solutioning, W - Weathered, Mech - Poss. Mechanical

DRILL RIG: Prosonic Spider

DRILL METHOD: Sonic Drilling - 8-in Hole Dia. (0 - 25 ft); Sonic Drilling - 5-in Hole Dia. (25 - 50 ft)

MATERIAL PROFILE

DESCRIPTION	ELEV. -------- DEPTH (ft)
FILL - (CL) SILTY CLAY, medium plasticity, some fine to coarse sand, some fine to coarse subangular to angular gravel; light brownish gray mottled light brown, heterogeneous; moist, firm to stiff.	0.0
FILL - (CL) gravelly SILTY CLAY, medium plasticity, fine to coarse subangular to angular gravel, some fine to coarse sand; dark brownish gray mottled light brown, heterogeneous,; moist, firm to stiff.	1068.6 5.0
FILL - (GM) sandy SILTY GRAVEL, subangular to angular, non plastic fines; pale brownish orange, iron oxide staining; wet.	1060.1 13.5
Unaltered, fresh, massive, pale gray, very fine grained to fine grained, strong, LIMESTONE.	1058.6 15.0
Unaltered, fresh, thinly laminated, pale bluish gray, fine grained, medium strong, SILTSTONE, grains of mica observed.	1053.9 19.7
Unaltered, fresh, thinly laminated, pale bluish gray, fine grained, medium strong, SILTSTONE.	1048.6 25.5
Unaltered, fresh, massive, pale gray, very fine grained to fine grained, strong, LIMESTONE.	1046.6 27.0
Unaltered, fresh, massive, pale bluish gray, fine grained, strong, SILTSTONE.	1045.2 28.4
Unaltered, fresh, thinly laminated, pale bluish gray, fine grained, medium strong, SILTSTONE.	1034.6 39.0
Unaltered, fresh, massive, pale to dark gray, very fine grained to fine grained, strong, LIMESTONE, small marine fossils observed.	1025.1 48.5



RUN NO.	TOTAL CORE %	RQD %
1	75	18
2	33	
3	73	32
4	100	86

DISCONTINUITY – TYPE AND SURFACE DESCRIPTION
31.0: JN, PL, RO
41.3: JN, PL, RO
49.8: JN, PL, RO

CONSTRUCTION AND INSTALLATION DETAILS
MW-116-D & MW-116-S
Pipe Stickup: 2.99 & 2.97 ft
Pipe Elev: 1076.6 & 1076.5 ft

0.0 - 8.0 ft bgs: Cement
8.0 - 13.0 ft bgs: Bentonite Chips
13.0 - 27.0 ft bgs: Filter Sand
15.03 - 25.03 ft bgs: Screen Interval
27.0 - 58.0 ft bgs: Bentonite Chips

Continued on Next Page

HAMMER TYPE: N/A

REV:

LOGGED: Daniel Bida DATE: Nov 09, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-116

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: November 09, 2021
END DATE: November 11, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1073.6 ft (Ground)
COORDINATES: N: 242344.2 ft E: 2478319.4 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88
HOLE LOC: 150 ft NE of SSW-171

JN - Joint
FLT - Fault
SHR - Shear
B - Bedding
FO - Foliation
PL - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular
PO - Polished
SK - Slickensided
SM - Smooth
RO - Rough
VR - Rough
CA - Calcite
Cl - Clay
CON - Contact
Fe - Iron
MI - Mica
Py - Pyrite
M - Silt
MN - Manganese
CR - Carbon
SH - Shale
CO - Coal
CN - Clean
SOL - Solutioning
W - Weathered
Mech - Poss. Mechanical

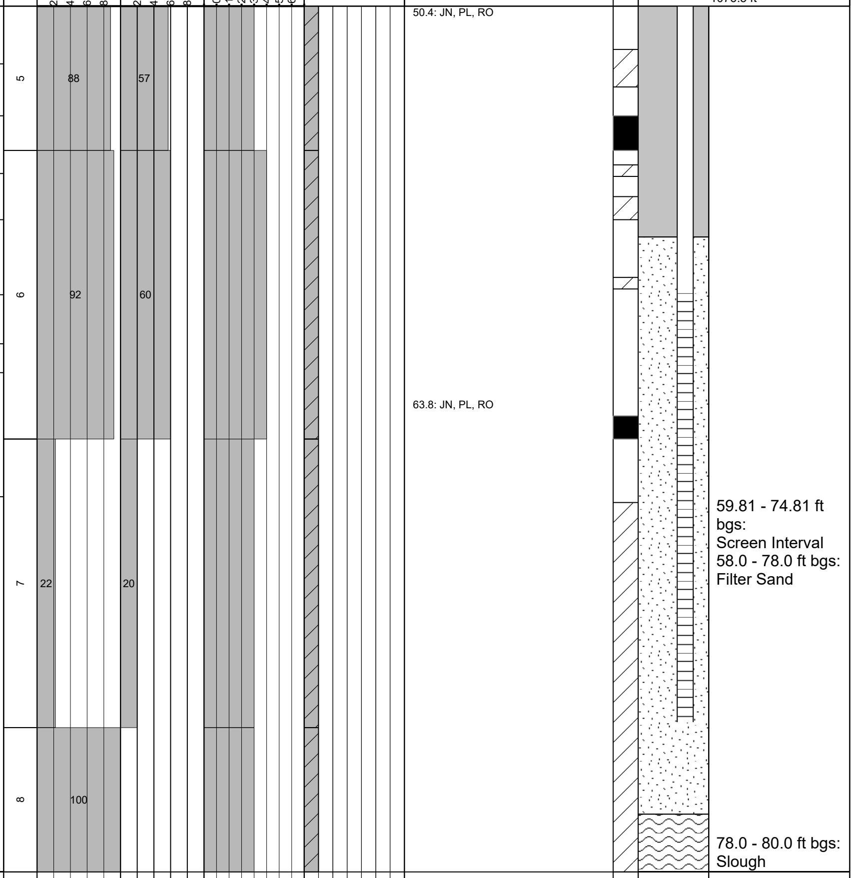
DRILL RIG: Prosonic Spider
DRILL METHOD: Sonic Drilling - 5-in Hole Dia.

DEPTH (ft)	MATERIAL PROFILE DESCRIPTION	ELEV. -------- DEPTH (ft)
50.0 - 52.0	Unaltered, fresh, massive, pale to dark gray, very fine grained to fine grained, strong, LIMESTONE, small marine fossils observed.	1021.6 52.0
52.0 - 53.8	Slightly altered, fresh, massive, pale grayish blue, very fine grained to fine grained, medium strong, LIMESTONE, moderately pervasive CaCO3 alteration.	1019.8 53.8
53.8 - 55.8	Unaltered, fresh, massive, pale gray, fine grained, strong, SILTSTONE.	1017.8 55.8
55.8 - 57.4	Unaltered, fresh, massive, pale gray to pale brownish gray, very fine grained to fine grained, strong, LIMESTONE.	1016.2 57.4
57.4 - 60.0	Slightly altered, fresh, massive, pale gray and dark grayish red, fine grained, strong, SILTSTONE, some reddish alteration mineral observed, appears cherty.	1013.6 60.0
60.0 - 61.7	Unaltered, fresh, thinly laminated, pale bluish gray, fine grained, medium strong, SILTSTONE.	1011.9 61.7
61.7 - 62.7	Fresh, massive, pale grayish blue, medium grained, strong, SANDSTONE.	1010.9 62.7
62.7 - 67.0	Unaltered, fresh, thinly laminated, pale bluish gray, very fine grained to fine grained, medium strong, SILTSTONE, inclusions of light gray CaCO3 alteration.	1006.6 67.0
67.0 - 80.0	Unaltered, fresh, thinly laminated, dark gray, fine grained, medium strong, SILTSTONE, grains of mica observed.	993.6
80.0	End of hole at 80.00 ft.	

RUN NO.	TOTAL CORE %	RQD %
5	88	57
6	92	60
7	22	20
8	100	

DISCONTINUITY – TYPE AND SURFACE DESCRIPTION
50.4: JN, PL, RO
63.8: JN, PL, RO

CONSTRUCTION AND INSTALLATION DETAILS
MW-116-D & MW-116-S
Pipe Stickup: 2.99 & 2.97 ft
Pipe Elev: 1076.6 & 1076.5 ft



59.81 - 74.81 ft bgs: Screen Interval
58.0 - 78.0 ft bgs: Filter Sand

78.0 - 80.0 ft bgs: Slough

HAMMER TYPE: N/A

REV:

LOGGED: Daniel Bida DATE: Nov 09, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-117

CLIENT: Cyprus Amax Minerals Company
PROJECT: Former Satralloy Site
PROJECT NO: 12393309
LOCATION: Jefferson County OH
NOTES: MAI PN: 1239330910.330

START DATE: November 12, 2021
END DATE: November 13, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade Drilling

ELEVATION: 1095.9 ft (Ground)
COORDINATES: N: 242759.7 ft E: 2478427.7 ft
COORD SYS: SP OH North FIPS 3401 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88
HOLE LOC: NW corner of property at guardrail

JN - Joint	PL - Planar	PO - Polished	CA - Calcite	Py - Pyrite	CO - Coal
FLT - Fault	CU - Curved	SK - Slickensided	Cl - Clay	M - Silt	CN - Clean
SHR - Shear	UN - Undulating	SM - Smooth	CON - Contact	MN - Manganese	SOL - Solutioning
B - Bedding	ST - Stepped	RO - Rough	Fe - Iron	CR - Carbon	W - Weathered
FO - Foliation	IR - Irregular	VR - Rough	MI - Mica	SH - Shale	Mech - Poss. Mechanical

DRILL RIG: Prosonic Spider
DRILL METHOD: Sonic Drilling - 5-in Hole Dia.

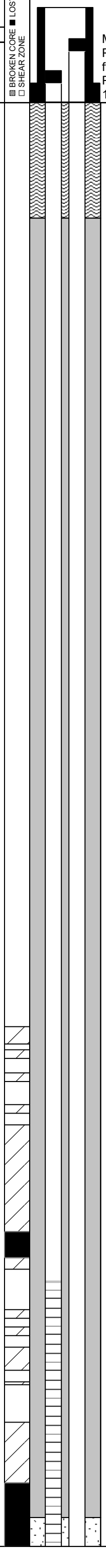
MATERIAL PROFILE

DESCRIPTION	ELEV. -------- DEPTH (ft)
(SM) gravelly SILTY SAND, fine to coarse, fine to coarse subangular to angular gravel, non plastic fines; pale grayish brown, heterogeneous; moist.	0.0
	1085.9
(GC) sandy CLAYEY GRAVEL, fine to coarse, subrounded to angular, low plasticity fines, fine to coarse sand; pale grayish brown, heterogeneous; moist.	10.0
	1082.9
(SM) gravelly SILTY SAND, fine to coarse, fine to coarse subangular to angular gravel, non plastic fines; pale grayish brown, heterogeneous; moist.	13.0
	1079.9
(GC) sandy CLAYEY GRAVEL, fine to coarse, subrounded to angular, low plasticity fines, fine to coarse sand; pale grayish brown, heterogeneous; moist.	16.0
	1073.9
(GM) sandy SILTY GRAVEL, fine to coarse, subangular to angular, fine to coarse sand; dark gray mottled light brown, heterogeneous, trace (0-5%); moist, dense to very dense.	22.0
	1070.9
COAL RESIDUUM, fine to coarse, trace layers of light brown fines, dark gray to black.	25.0
	1065.9
CLAYEY SILT, non plastic, some fine sand; dark grayish brown mottled pale orange, heterogeneous; moist, hard.	30.0
	1063.9
Unaltered, slightly weathered to fresh, massive, pale gray, very fine grained, strong to very strong, LIMESTONE, iron oxide staining 32-33 ft.	32.0
	1060.9
Unaltered, fresh, massive, light bluish gray, fine grained to medium grained, strong, SANDSTONE.	35.0
	1059.9
Unaltered, fresh, massive, pale gray, very fine grained, strong to very strong, LIMESTONE.	36.0
	1055.4
Unaltered, fresh, massive, light bluish gray, fine grained to medium grained, strong, SANDSTONE.	40.5
	1054.4
Slightly altered, fresh, thinly laminated, pale bluish gray and light brownish gray, fine grained, medium strong, SILTSTONE, moderately pervasive CaCO3 alteration.	41.5
	1052.9
Unaltered, fresh, massive, pale gray, very fine grained, strong, LIMESTONE, iron oxide staining 43-44 ft.	43.0
	1051.4
Slightly altered, fresh, thinly laminated, pale bluish gray and light brownish gray, fine grained, medium strong, SILTSTONE, moderately pervasive CaCO3 alteration.	44.5

DEPTH (ft)	RUN NO.	RECOVERY TOTAL CORE %	RECOVERY RQD %
0 - 10	S-1		
10 - 15	S-2		
15 - 20	S-3		
20 - 25	S-4		
25 - 30	S-5		
30 - 32	S-6		
32 - 40	1	98	34
40 - 50	2	78	27

INDICES: STRENGTH (R) 0 1 2 3 4 5 6; WEATHERING (W) 1 2 3 4 5 6; ALTERATION (A)
DISCONTINUITY: TYPE AND SURFACE DESCRIPTION
BROKEN CORE ■ LOST CORE ☐ SHEAR ZONE

CONSTRUCTION AND INSTALLATION DETAILS



MW-117-D & MW-117-S
Pipe Stickup: 2.91 & 2.89 ft
Pipe Elev: 1098.8 & 1098.8 ft

0.0 - 4.0 ft bgs: Cement

4.0 - 49.0 ft bgs: Bentonite Chips

40.89 - 50.89 ft bgs: Screen Interval

Continued on Next Page

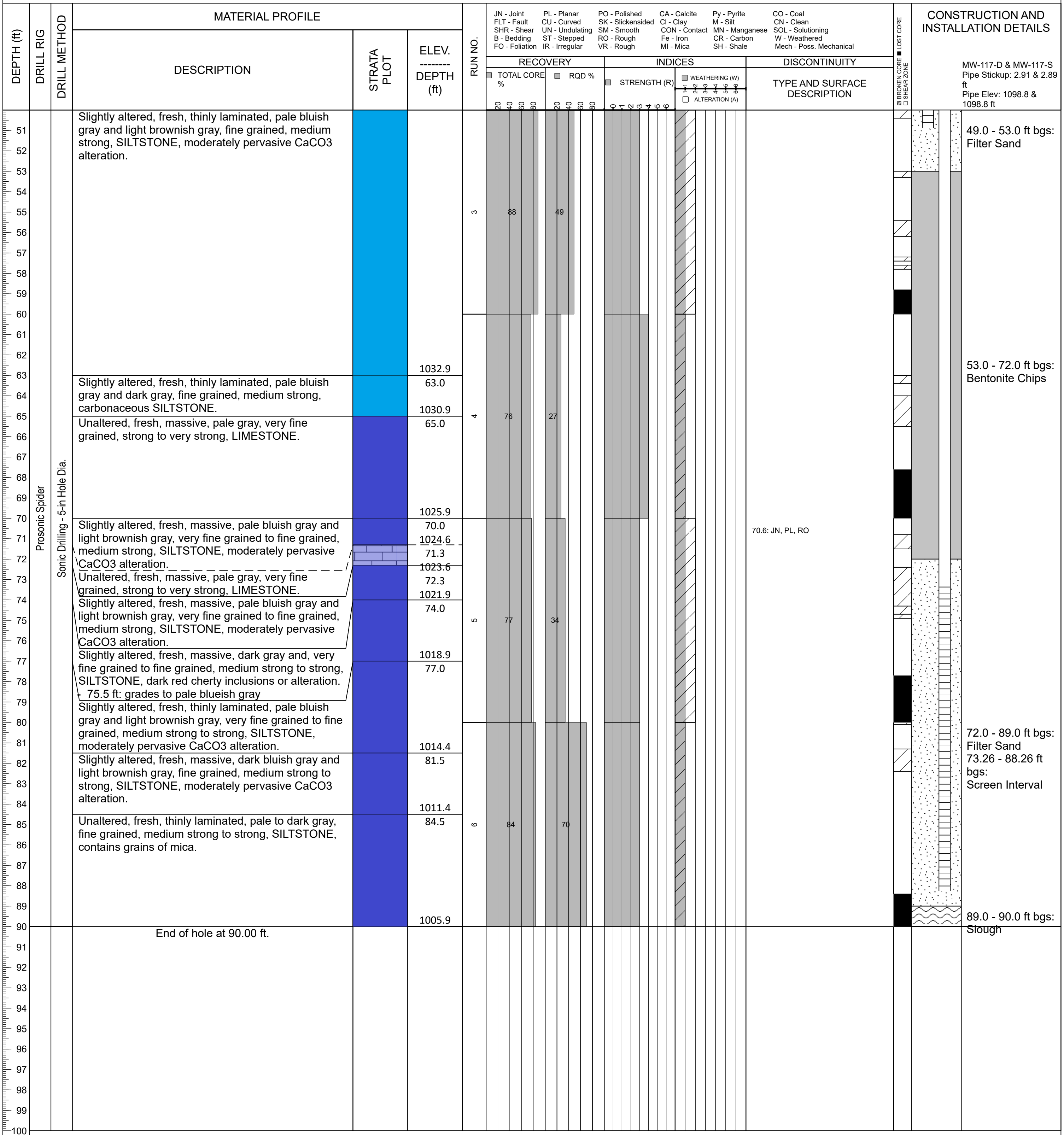
HAMMER TYPE: N/A

REV:

LOGGED: Daniel Bida DATE: Nov 12, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

RECORD OF BOREHOLE: MW-117

CLIENT:	Cyprus Amax Minerals Company	START DATE:	November 12, 2021	ELEVATION:	1095.9 ft (Ground)
PROJECT:	Former Satralloy Site	END DATE:	November 13, 2021	COORDINATES:	N: 242759.7 ft E: 2478427.7 ft
PROJECT NO:	12393309	INCLINATION:	90.0°	COORD SYS:	SP OH North FIPS 3401 Ft
LOCATION:	Jefferson County OH	CONTRACTOR:	Cascade Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88
NOTES:	MAI PN: 1239330910.330			HOLE LOC:	NW corner of property at guardrail



MATERIAL PROFILE

DESCRIPTION	ELEV. / DEPTH (ft)
Slightly altered, fresh, thinly laminated, pale bluish gray and light brownish gray, fine grained, medium strong, SILTSTONE, moderately pervasive CaCO3 alteration.	
Slightly altered, fresh, thinly laminated, pale bluish gray and dark gray, fine grained, medium strong, carbonaceous SILTSTONE.	1032.9 63.0
Unaltered, fresh, massive, pale gray, very fine grained, strong to very strong, LIMESTONE.	1030.9 65.0
Slightly altered, fresh, massive, pale bluish gray and light brownish gray, very fine grained to fine grained, medium strong, SILTSTONE, moderately pervasive CaCO3 alteration.	1025.9 70.0
Unaltered, fresh, massive, pale gray, very fine grained, strong to very strong, LIMESTONE.	1024.6 71.3
Slightly altered, fresh, massive, pale bluish gray and light brownish gray, very fine grained to fine grained, medium strong, SILTSTONE, moderately pervasive CaCO3 alteration.	1023.6 72.3
Slightly altered, fresh, massive, dark gray and, very fine grained to fine grained, medium strong to strong, SILTSTONE, dark red cherty inclusions or alteration. - 75.5 ft: grades to pale blueish gray	1021.9 74.0
Slightly altered, fresh, thinly laminated, pale bluish gray and light brownish gray, very fine grained to fine grained, medium strong to strong, SILTSTONE, moderately pervasive CaCO3 alteration.	1018.9 77.0
Slightly altered, fresh, massive, dark bluish gray and light brownish gray, fine grained, medium strong to strong, SILTSTONE, moderately pervasive CaCO3 alteration.	1014.4 81.5
Unaltered, fresh, thinly laminated, pale to dark gray, fine grained, medium strong to strong, SILTSTONE, contains grains of mica.	1011.4 84.5
	1005.9

End of hole at 90.00 ft.

RUN NO.	TOTAL CORE %	RQD %
3	88	49
4	76	27
5	77	34
6	84	70

DISCONTINUITY – TYPE AND SURFACE DESCRIPTION: 70.6: JN, PL, RO

CONSTRUCTION AND INSTALLATION DETAILS

MW-117-D & MW-117-S
Pipe Stickup: 2.91 & 2.89 ft
Pipe Elev: 1098.8 & 1098.8 ft

49.0 - 53.0 ft bgs: Filter Sand

53.0 - 72.0 ft bgs: Bentonite Chips

72.0 - 89.0 ft bgs: Filter Sand
73.26 - 88.26 ft bgs: Screen Interval

89.0 - 90.0 ft bgs: Slough

HAMMER TYPE: N/A

REV:

GOLDER MEMBER OF WSP

LOGGED: Daniel Bida DATE: Nov 12, 2021
CHECKED: Bob Ireson DATE: Feb 04, 2022

APPENDIX B

Downhole Geophysics Logs

GEOPHYSICAL RECORD OF BOREHOLE: MW-101

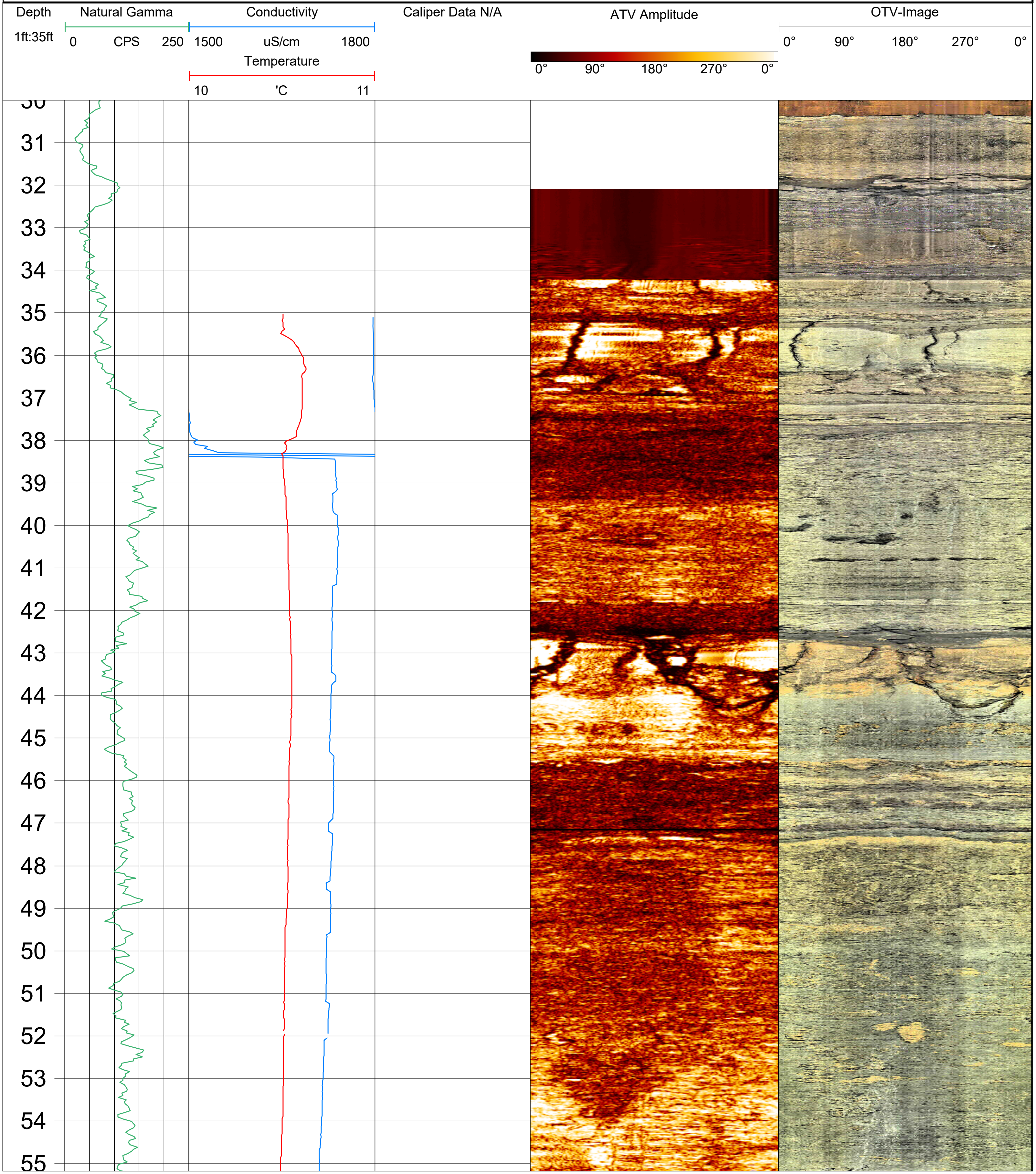
GOLDER
MEMBER OF WSP

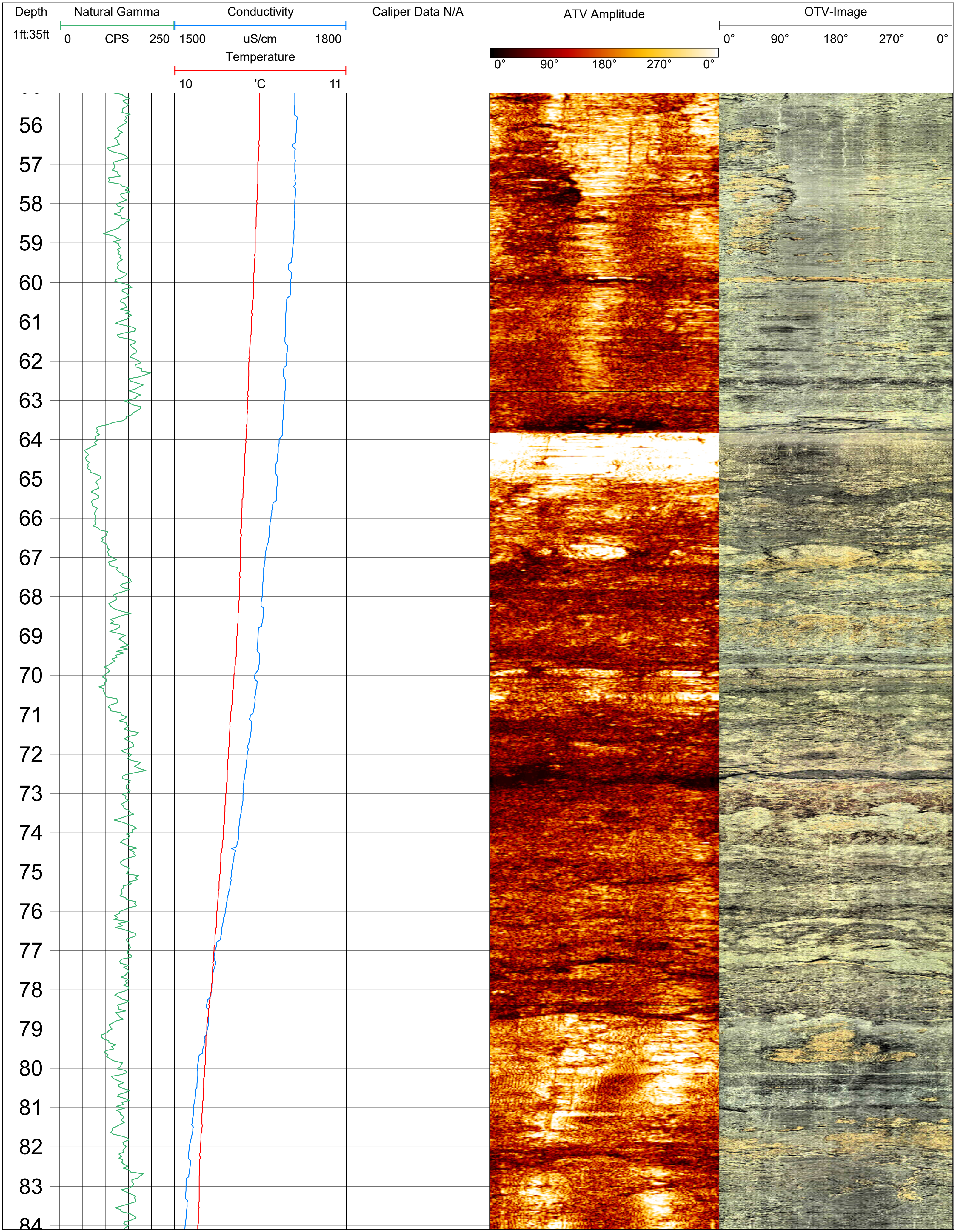
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 22-23, 2021

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1ft:35ft
Natural Gamma
0
CPS
250
Conductivity
1500
uS/cm
1800
Temperature
10
'C
11
Caliper Data N/A
ATV Amplitude
0°
90°
180°
270°
0°
OTV-Image
0°
90°
180°
270°
0°
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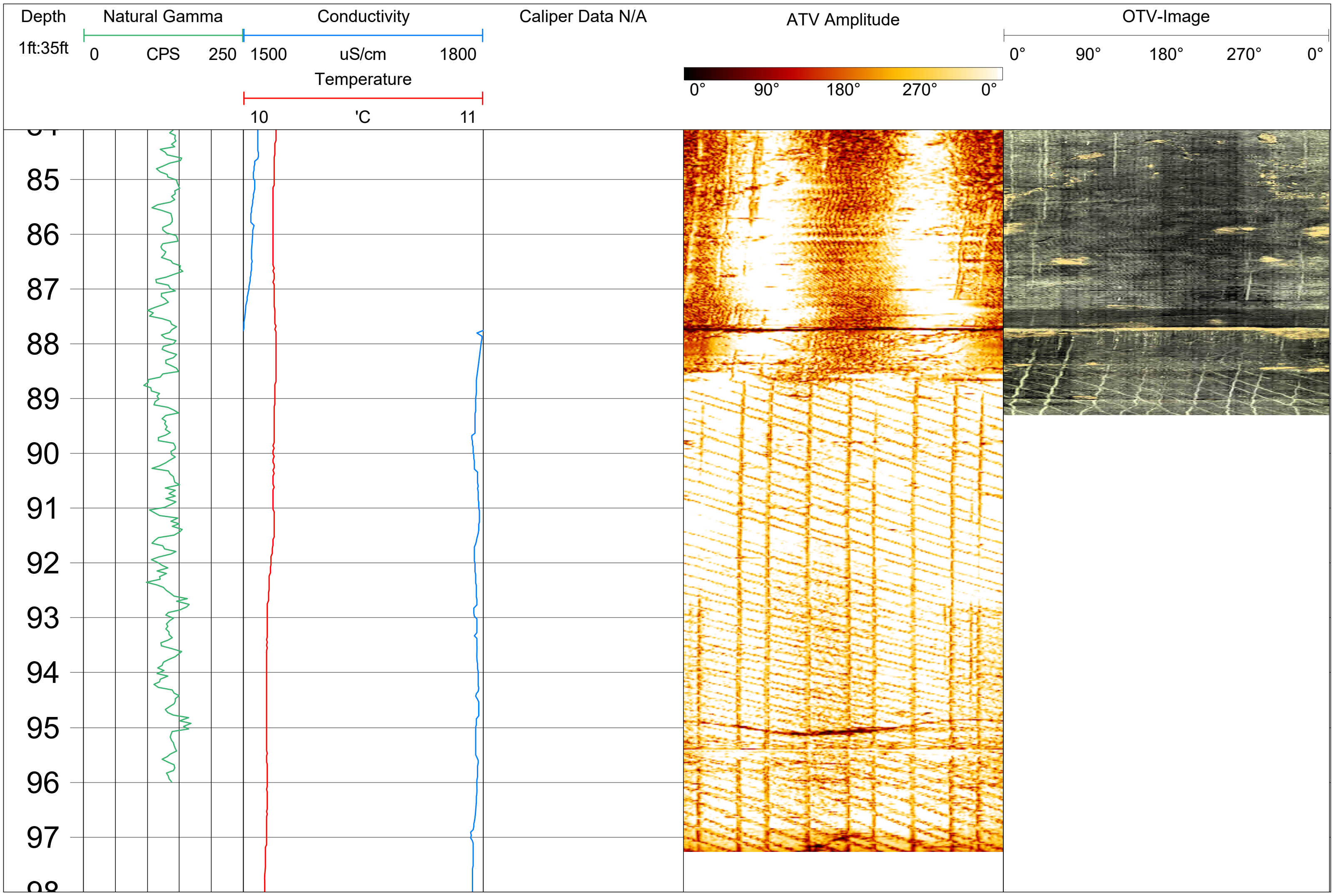
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Natural Gamma
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CPS
250
Conductivity
1500
uS/cm
1800
Temperature
10
'C
11
Caliper Data N/A
ATV Amplitude
0°
90°
180°
270°
0°
OTV-Image
0°
90°
180°
270°
0°
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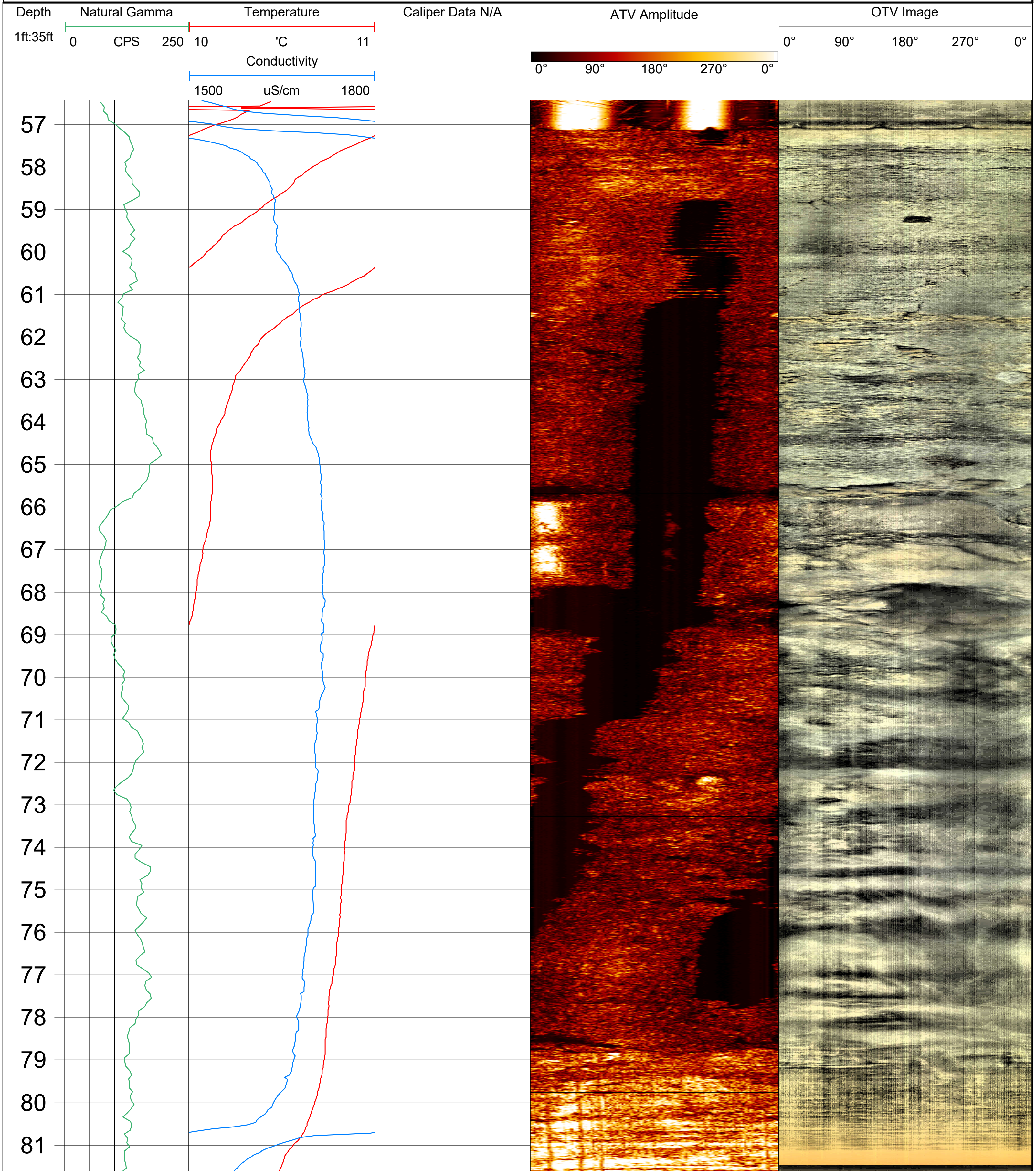
GEOPHYSICAL RECORD OF BOREHOLE: MW-102

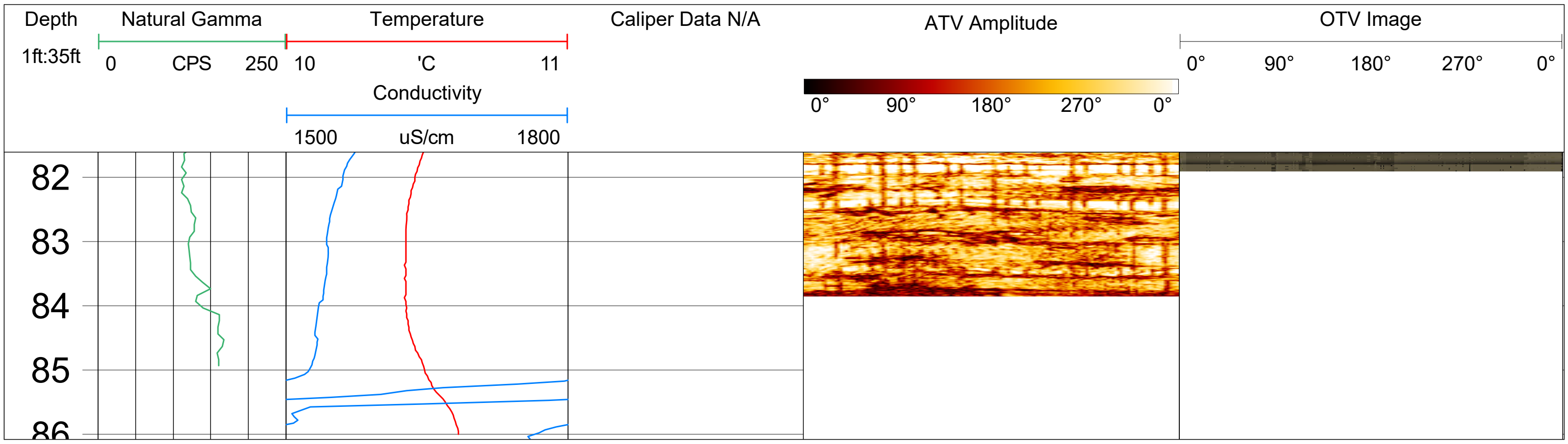
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 29, 2021

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Natural Gamma
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CPS
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Temperature
10
'C
11
Conductivity
1500
uS/cm
1800
Caliper Data N/A
ATV Amplitude
0°
90°
180°
270°
0°
OTV Image
0°
90°
180°
270°
0°
82
83
84
85
86

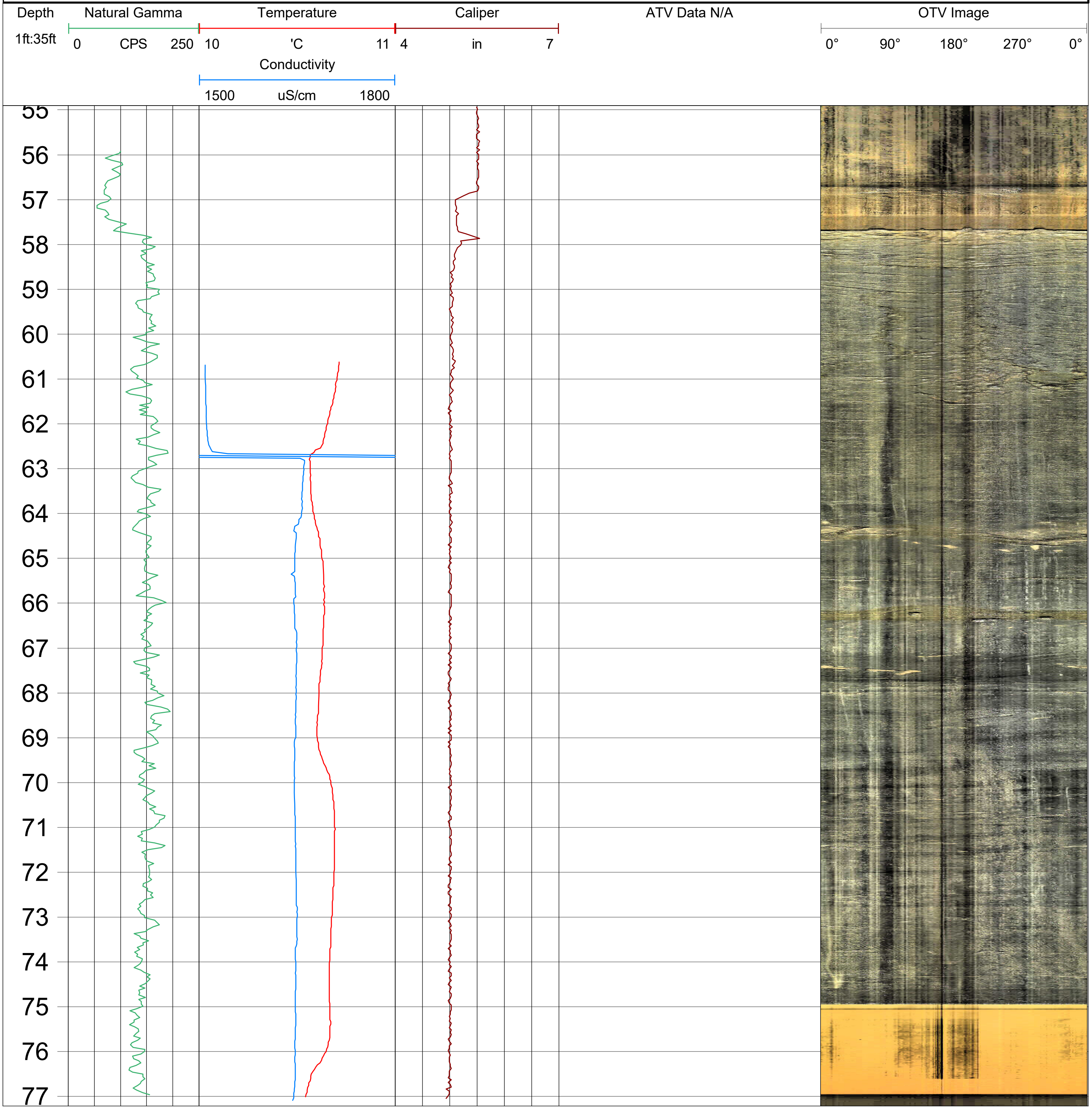
GEOPHYSICAL RECORD OF BOREHOLE: MW-103

Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 17-18, 2021



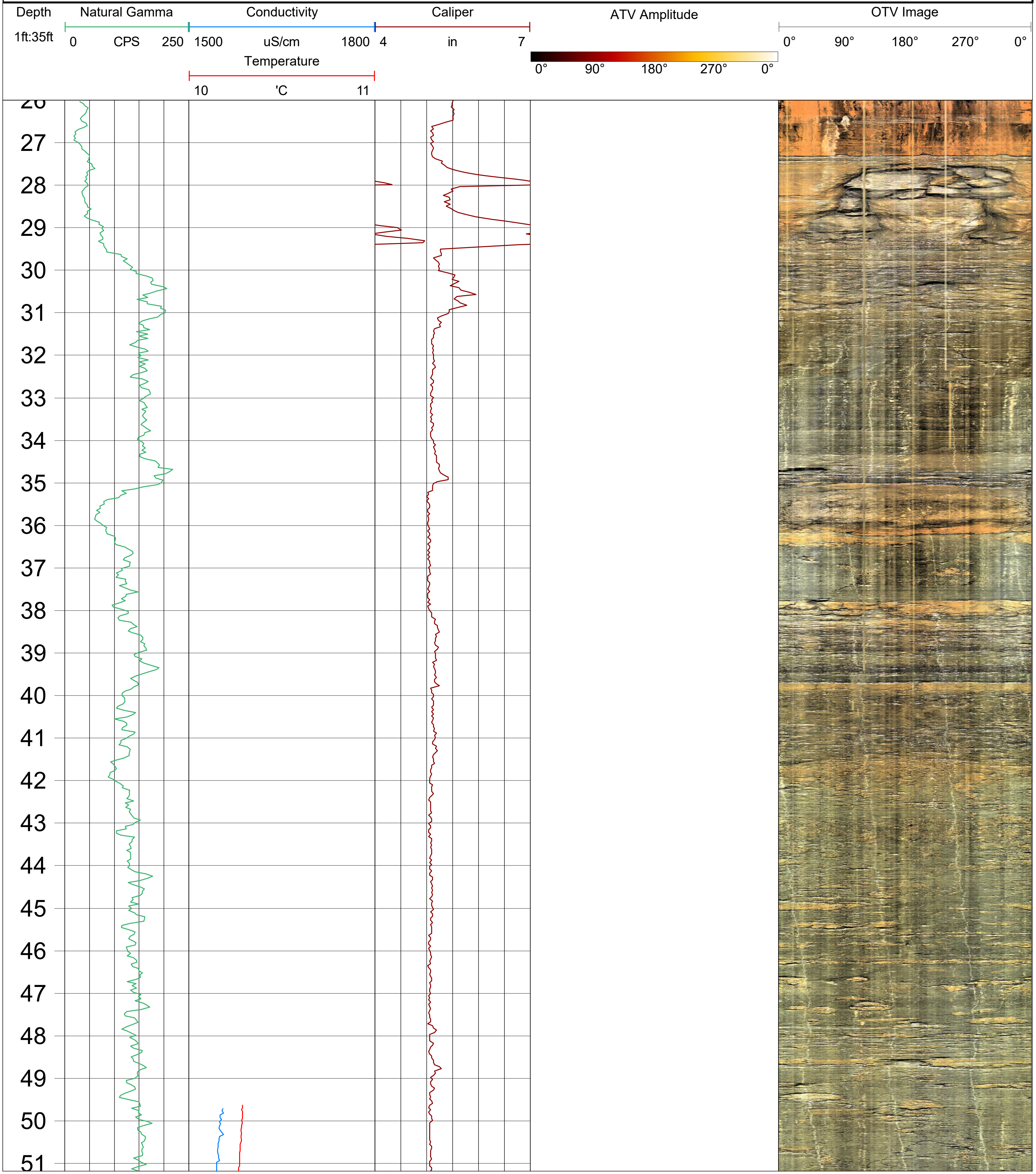
GEOPHYSICAL RECORD OF BOREHOLE: MW-104

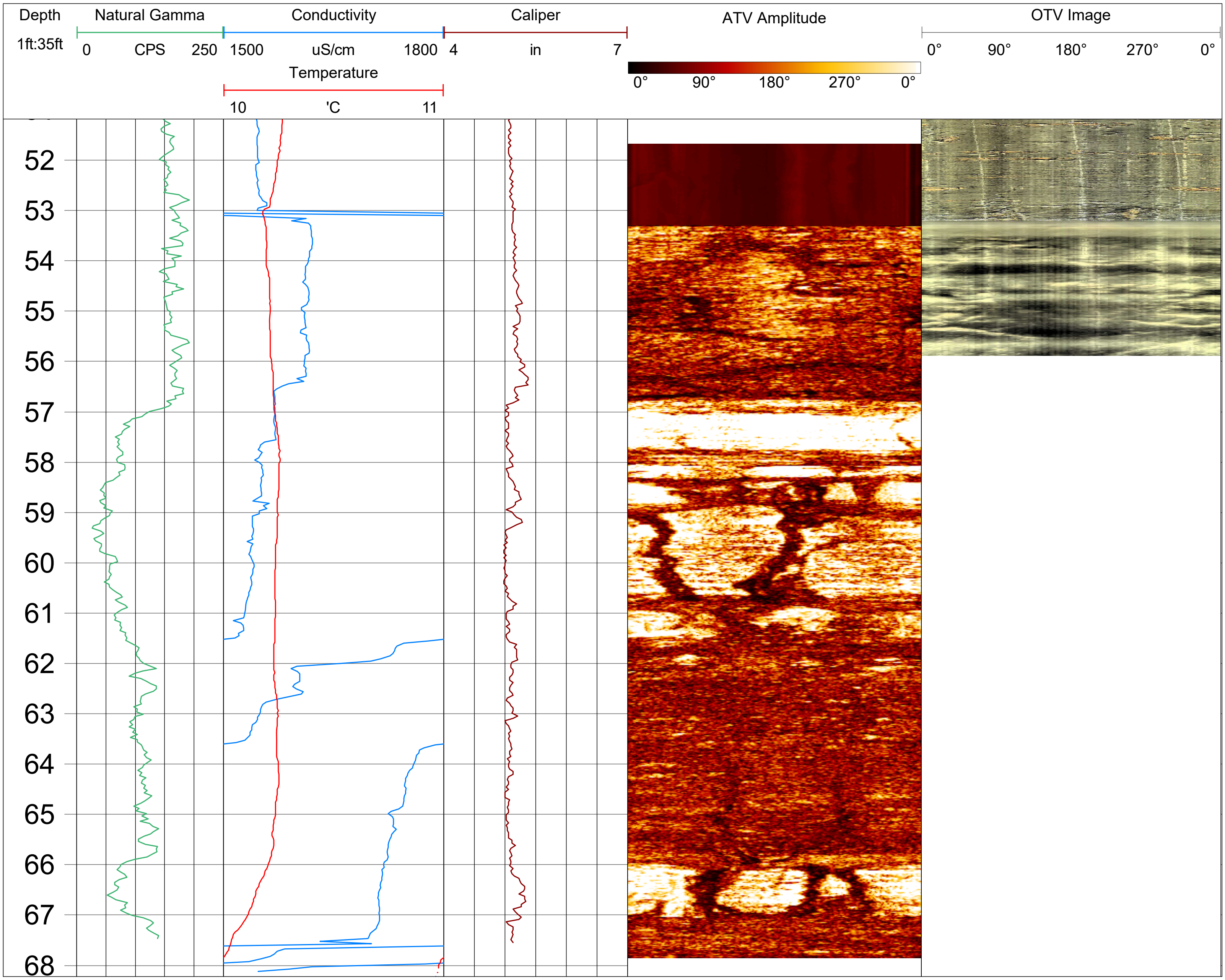
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 16, 2021

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1ft:35ft
Natural Gamma
0 CPS 250
Conductivity
1500 uS/cm 1800
Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
52
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68

GEOPHYSICAL RECORD OF BOREHOLE: MW-105

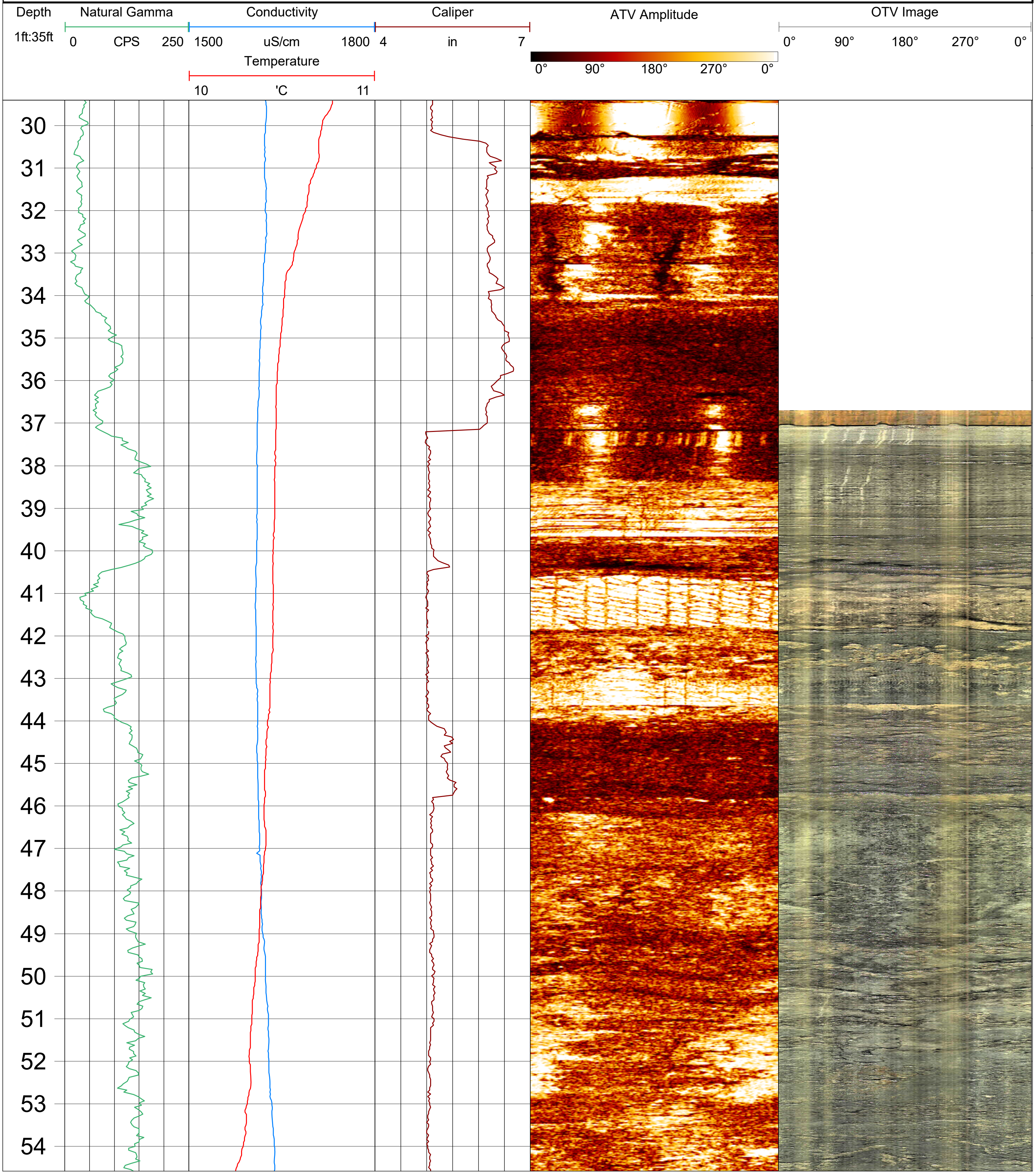
GOLDER
MEMBER OF WSP

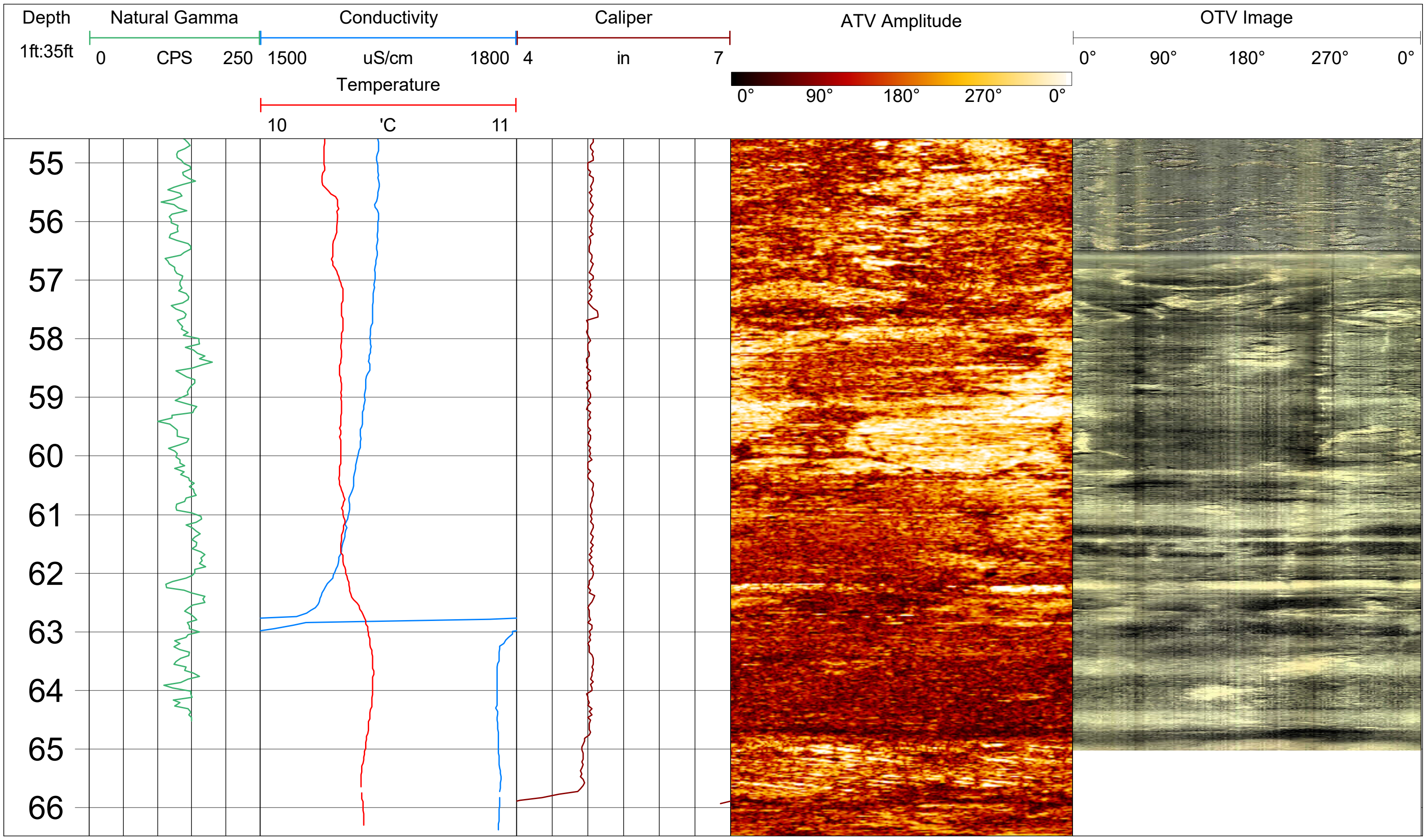
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 11, 2021

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Conductivity
1500 uS/cm 1800
Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
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61
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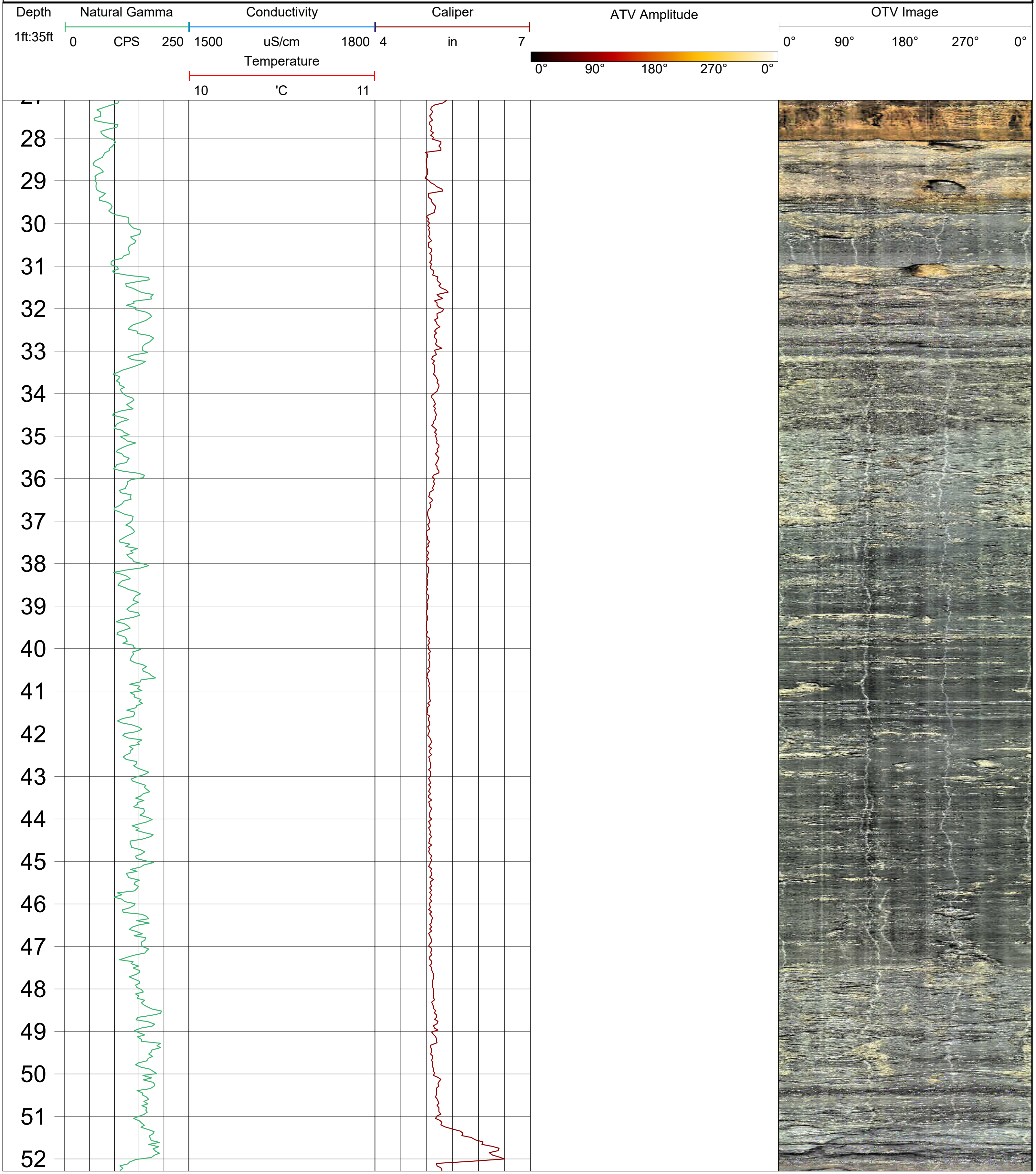
GEOPHYSICAL RECORD OF BOREHOLE: MW-106

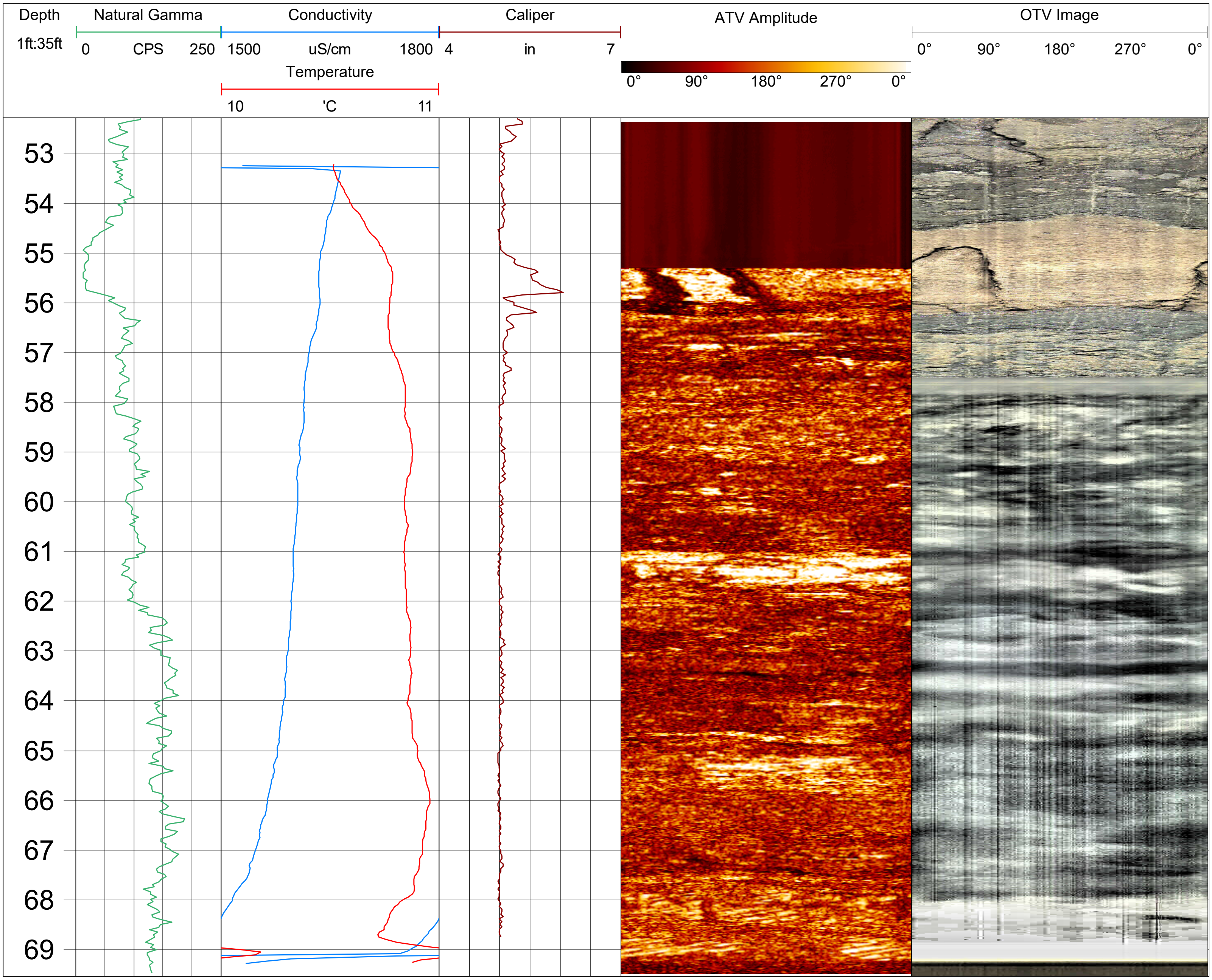
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 4, 2021

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1ft:35ft
Natural Gamma
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CPS
250
Conductivity
1500
uS/cm
1800
Temperature
10
'C
11
Caliper
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in
7
ATV Amplitude
0°
90°
180°
270°
0°
OTV Image
0°
90°
180°
270°
0°
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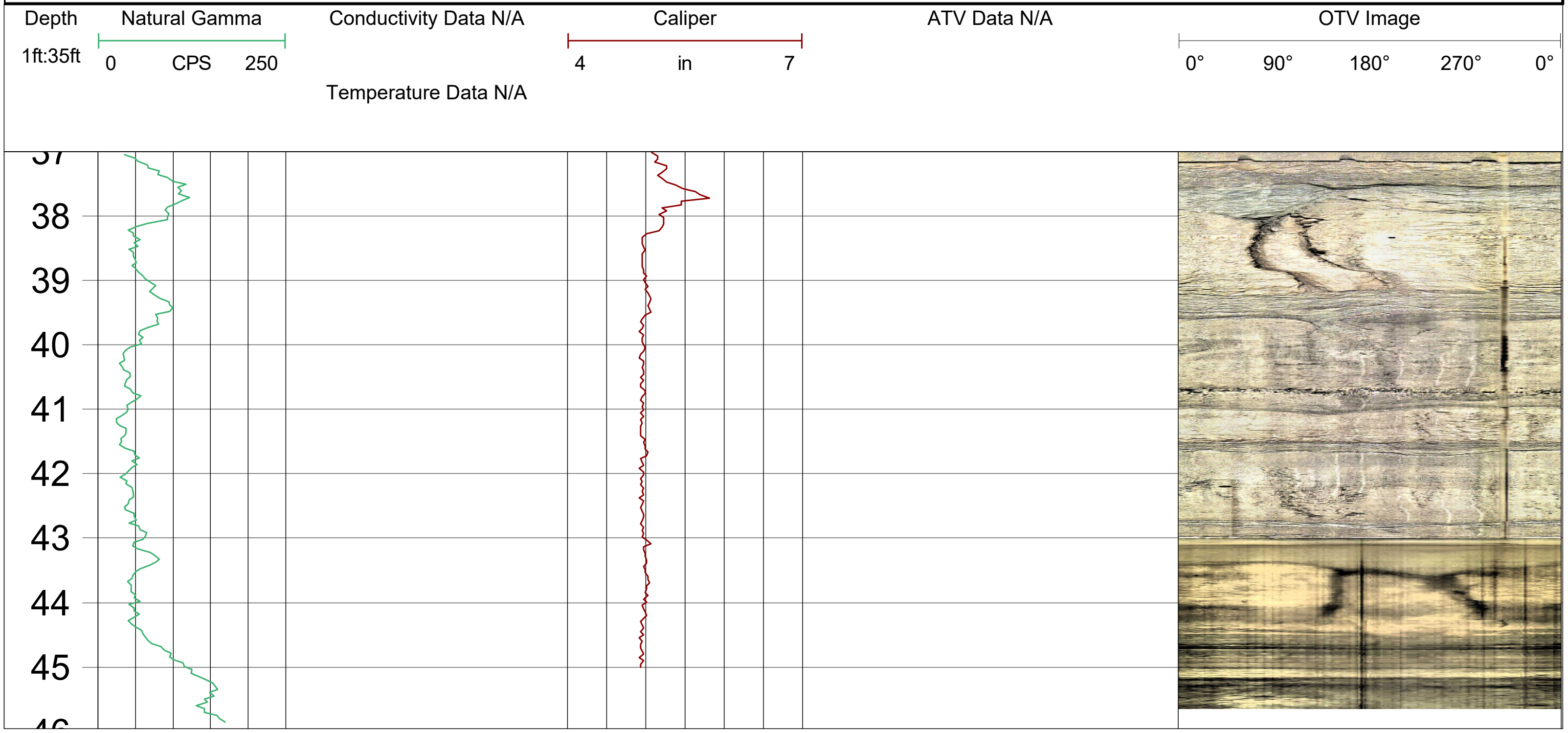
GEOPHYSICAL RECORD OF BOREHOLE: MW-107D

Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 2, 2021



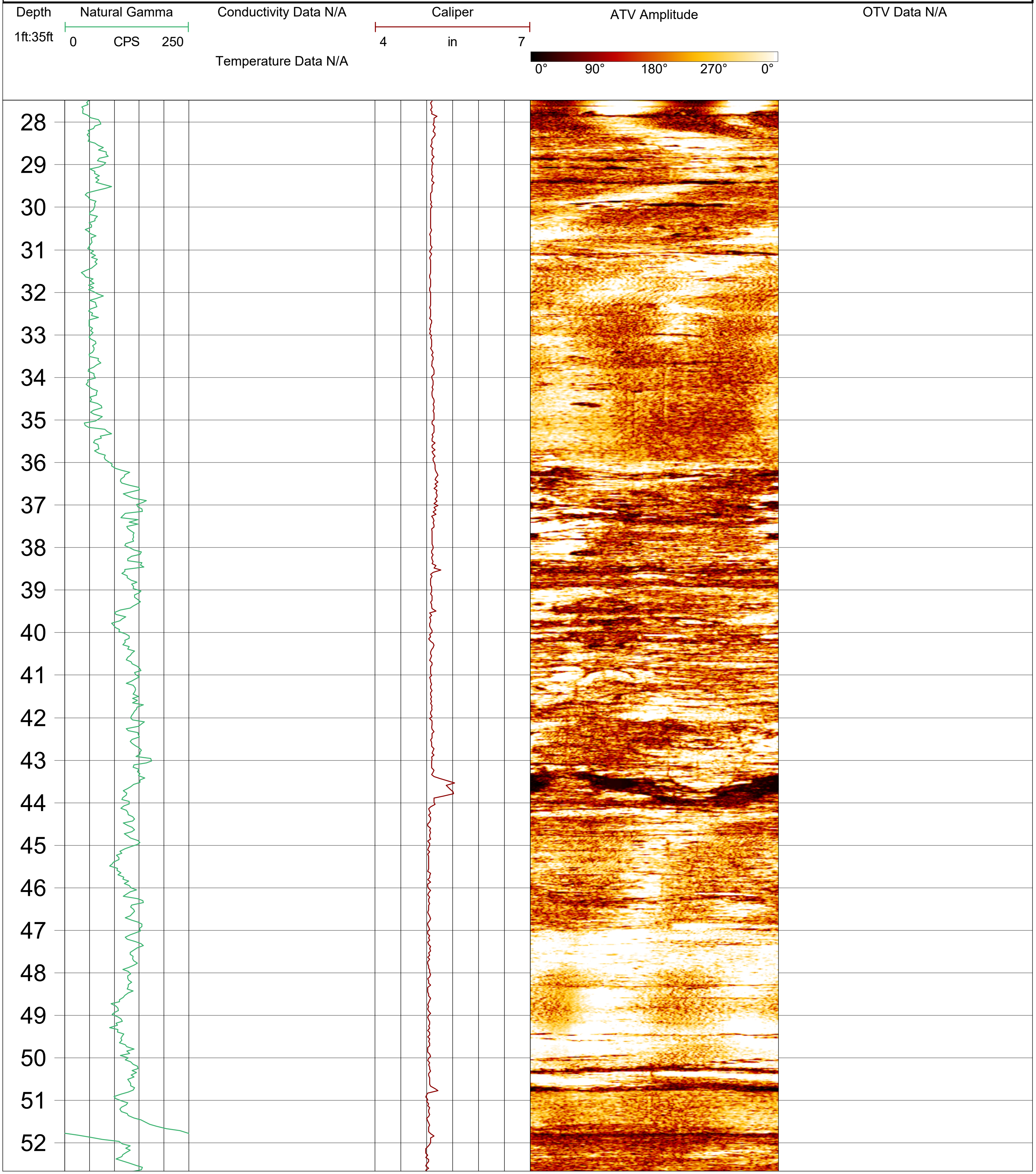
GEOPHYSICAL RECORD OF BOREHOLE: MW-108

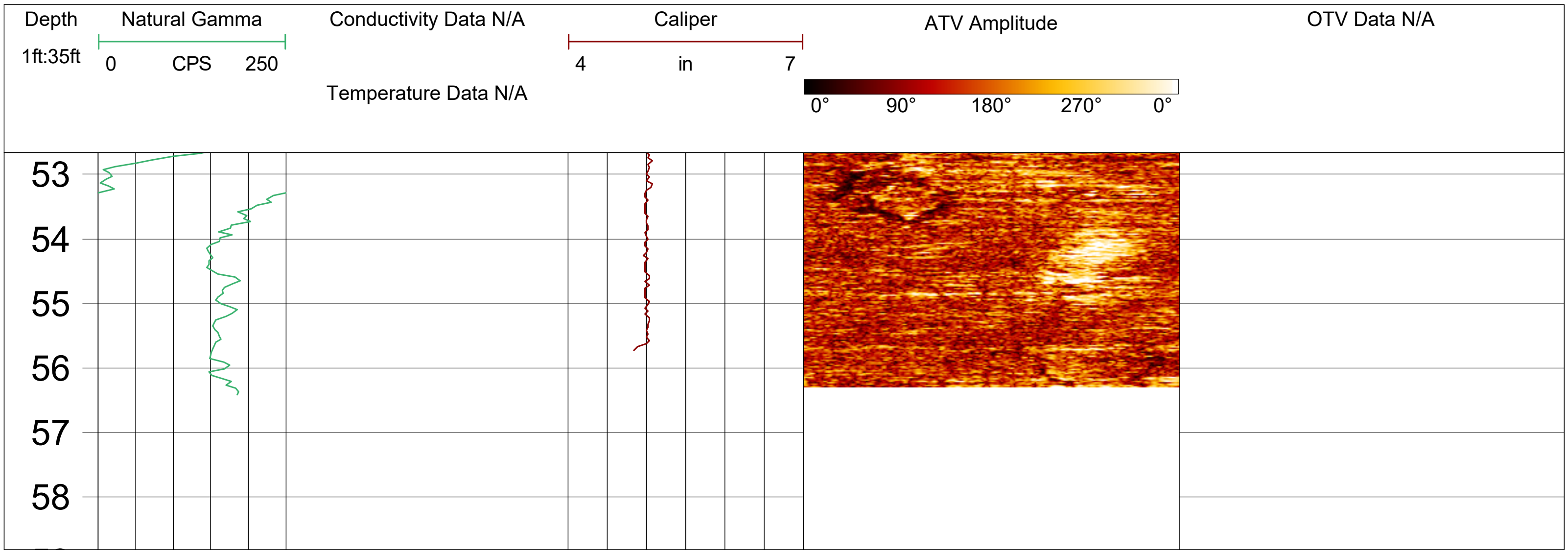
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: May 21, 2021

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CPS
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Conductivity Data N/A
Temperature Data N/A
Caliper
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in
7
ATV Amplitude
0°
90°
180°
270°
0°
OTV Data N/A
53
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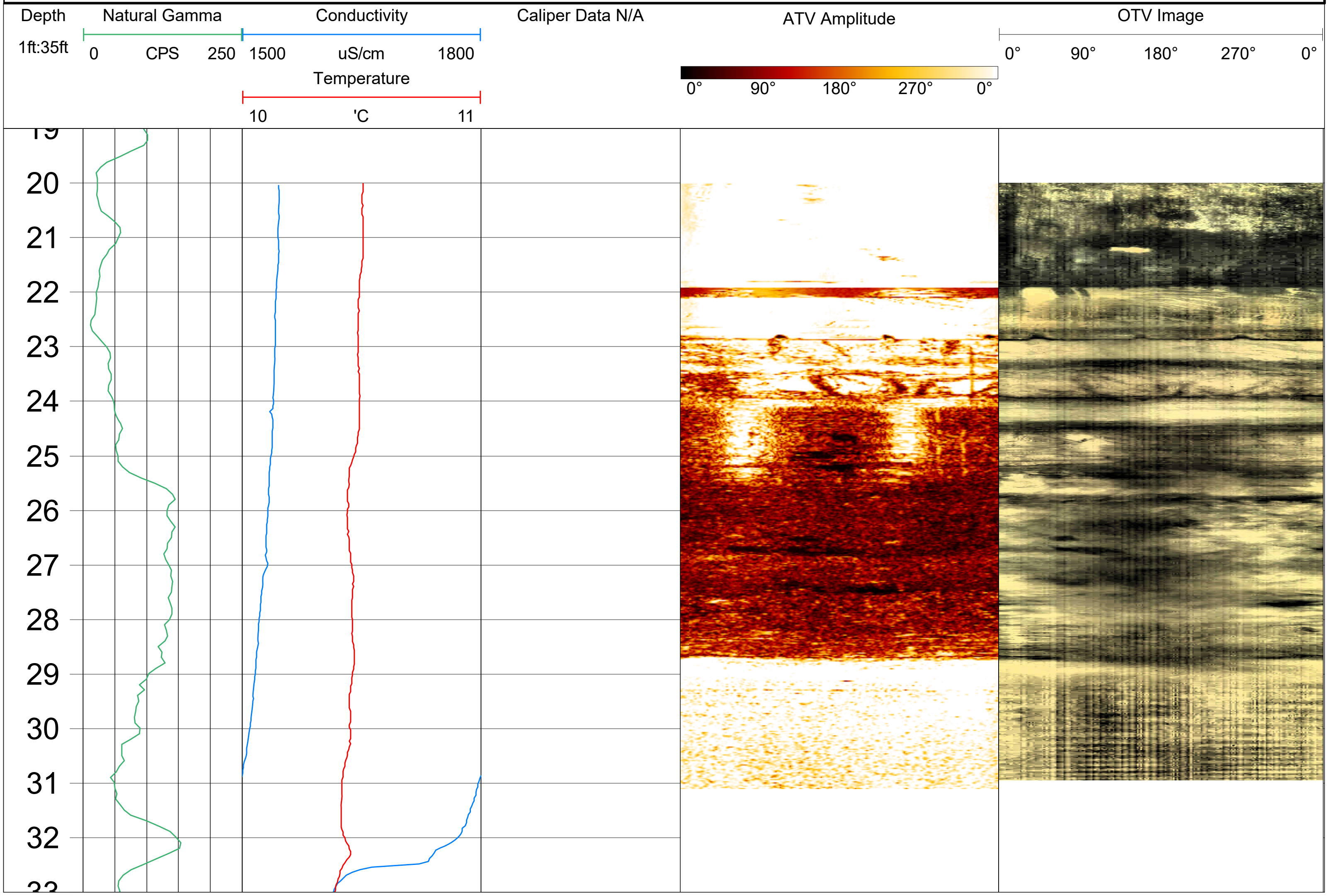
GEOPHYSICAL RECORD OF BOREHOLE: MW-110

Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

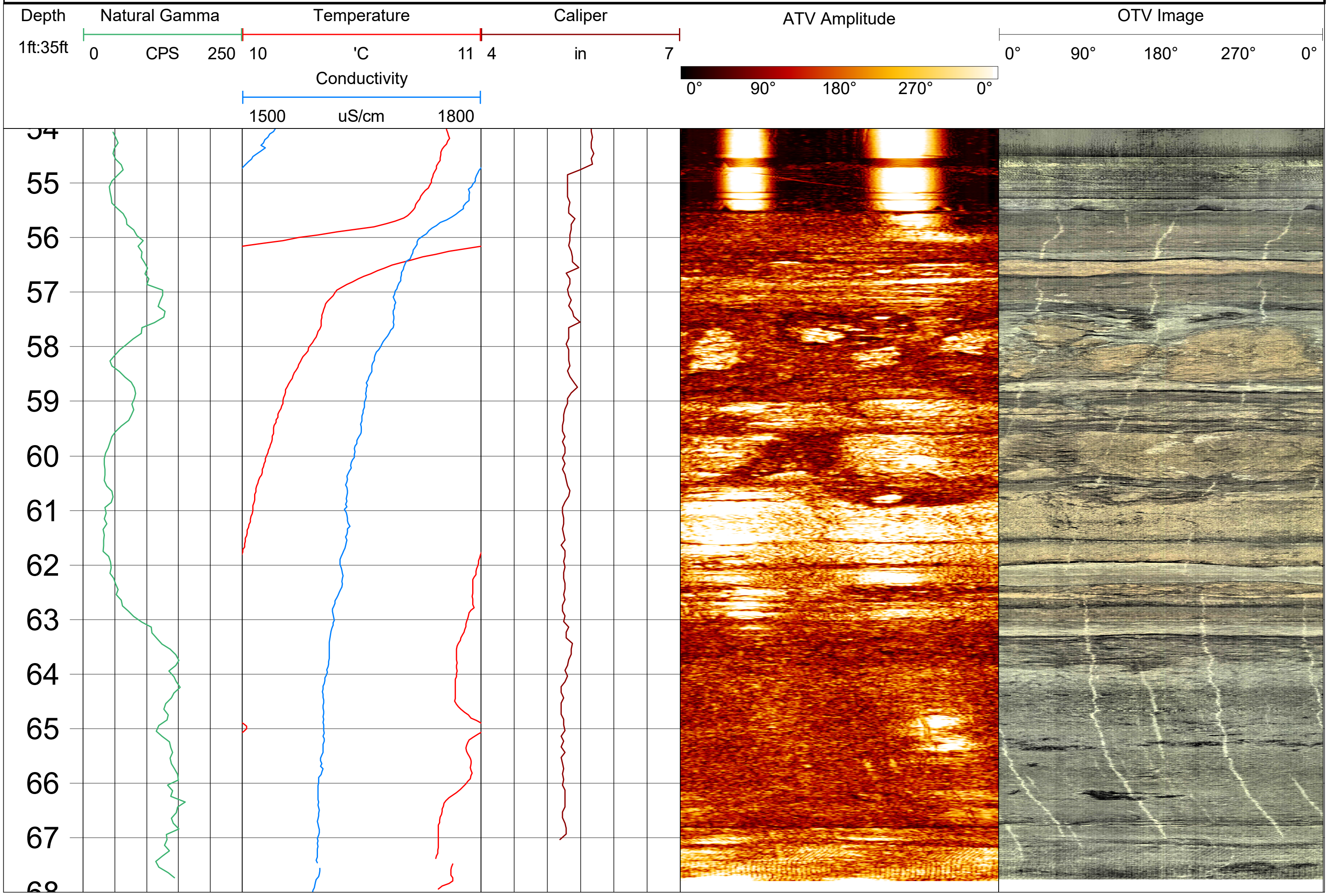
Date: June 25, 2021



GEOPHYSICAL RECORD OF BOREHOLE: MW-111

Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company Project Number: 12393309X10 Date: May 25, 2021



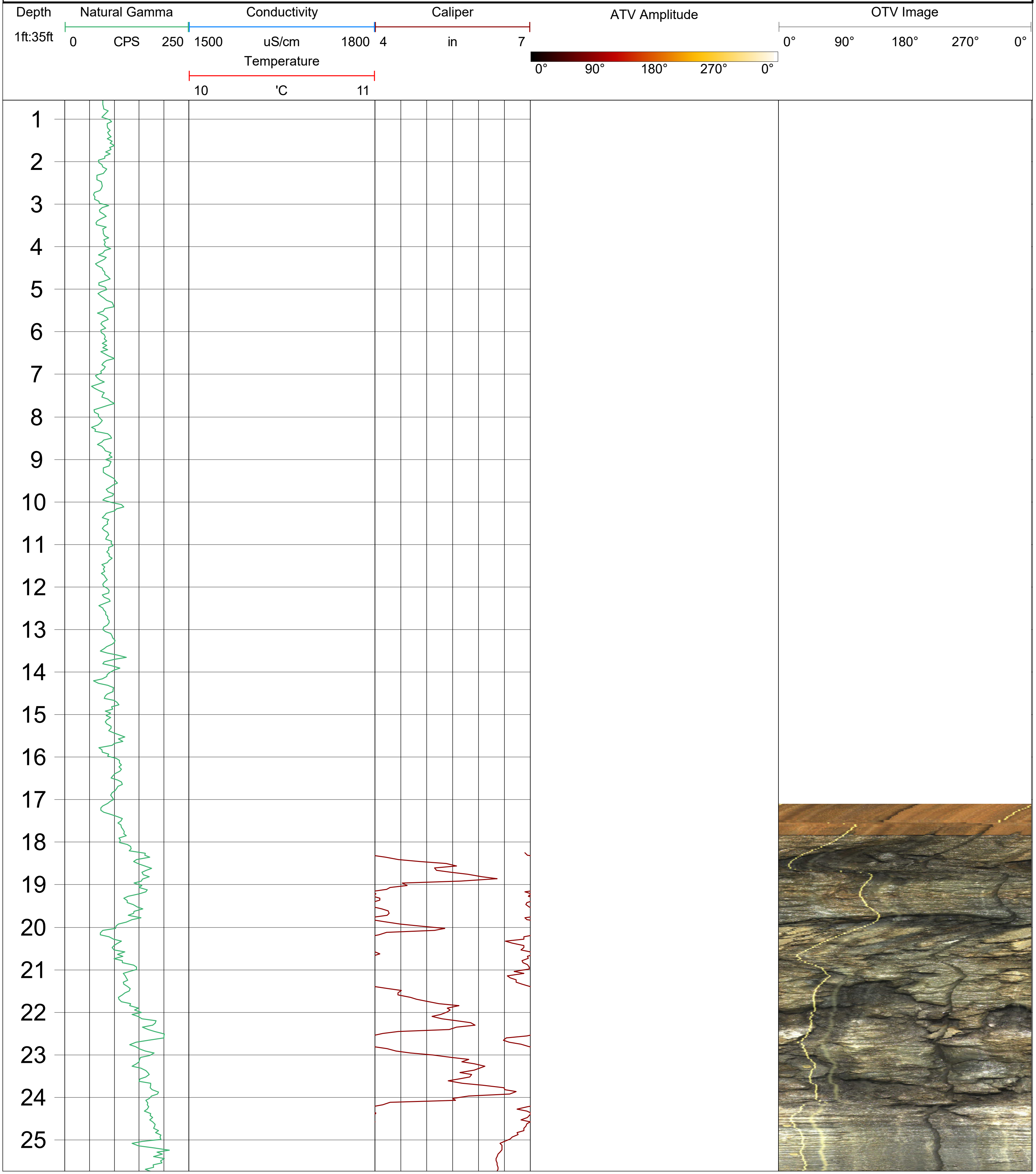
GEOPHYSICAL RECORD OF BOREHOLE: MW-112

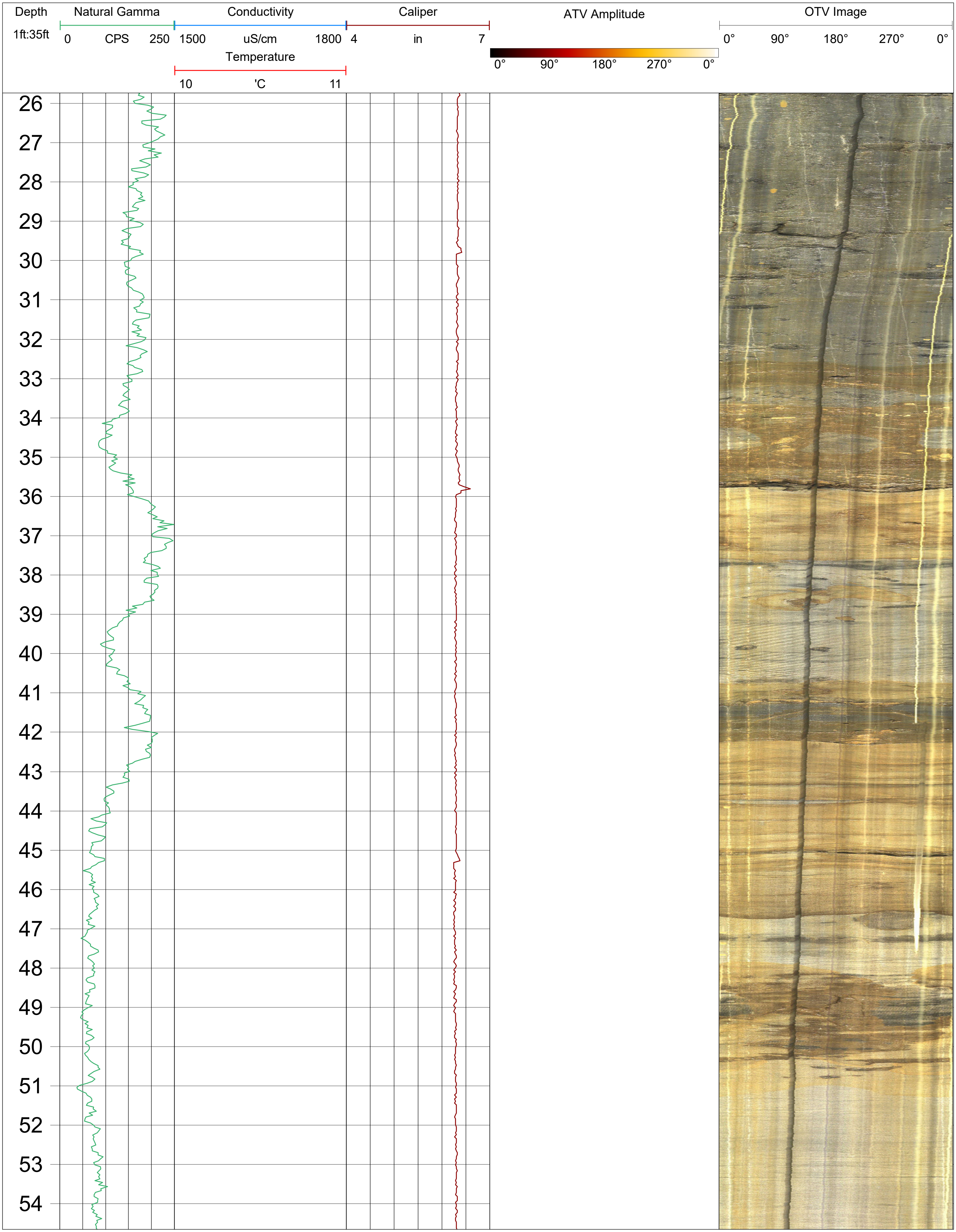
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: May 16-18, 2021

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Conductivity
1500 uS/cm 1800
Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
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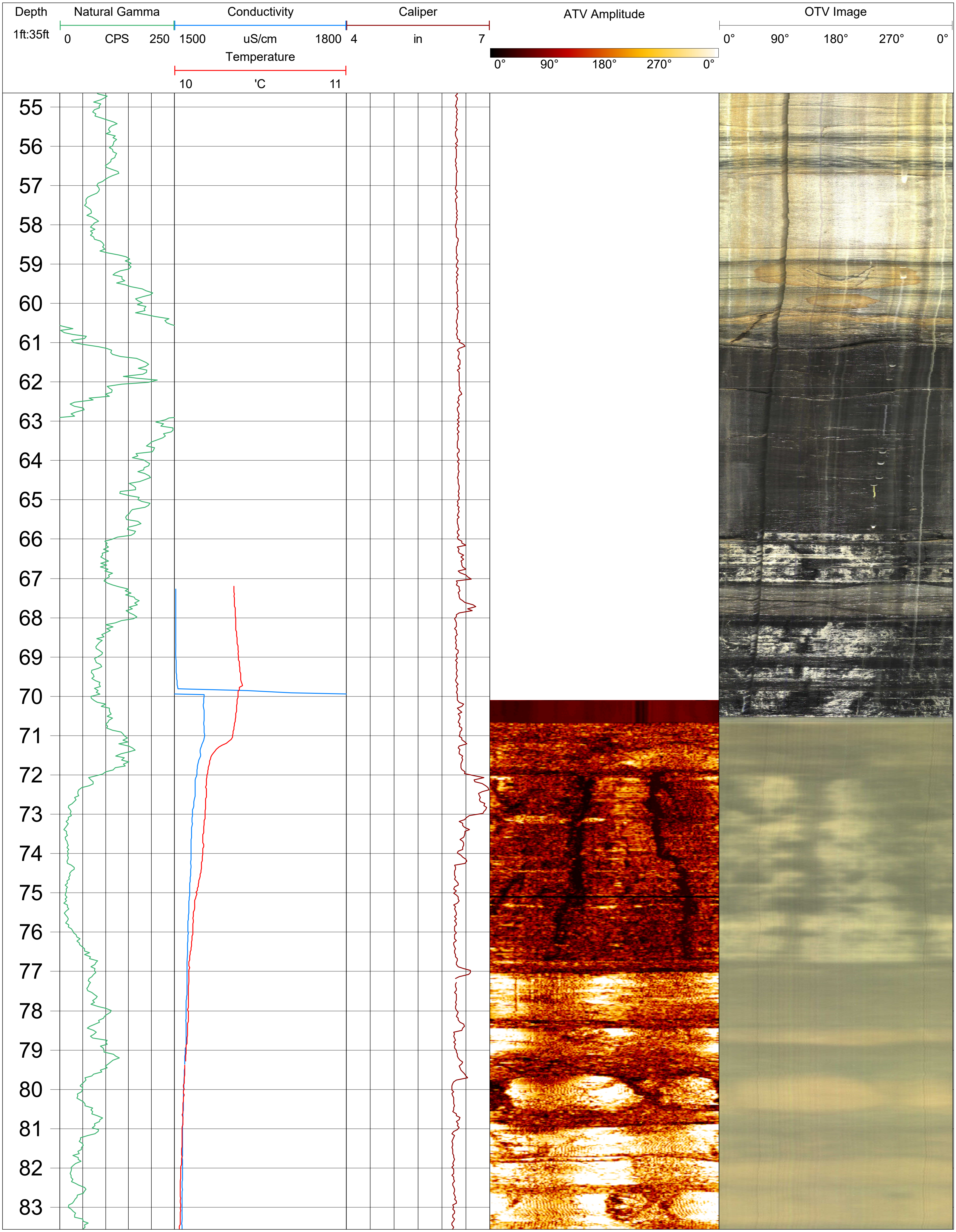
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Natural Gamma
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Conductivity
1500 uS/cm 1800
Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
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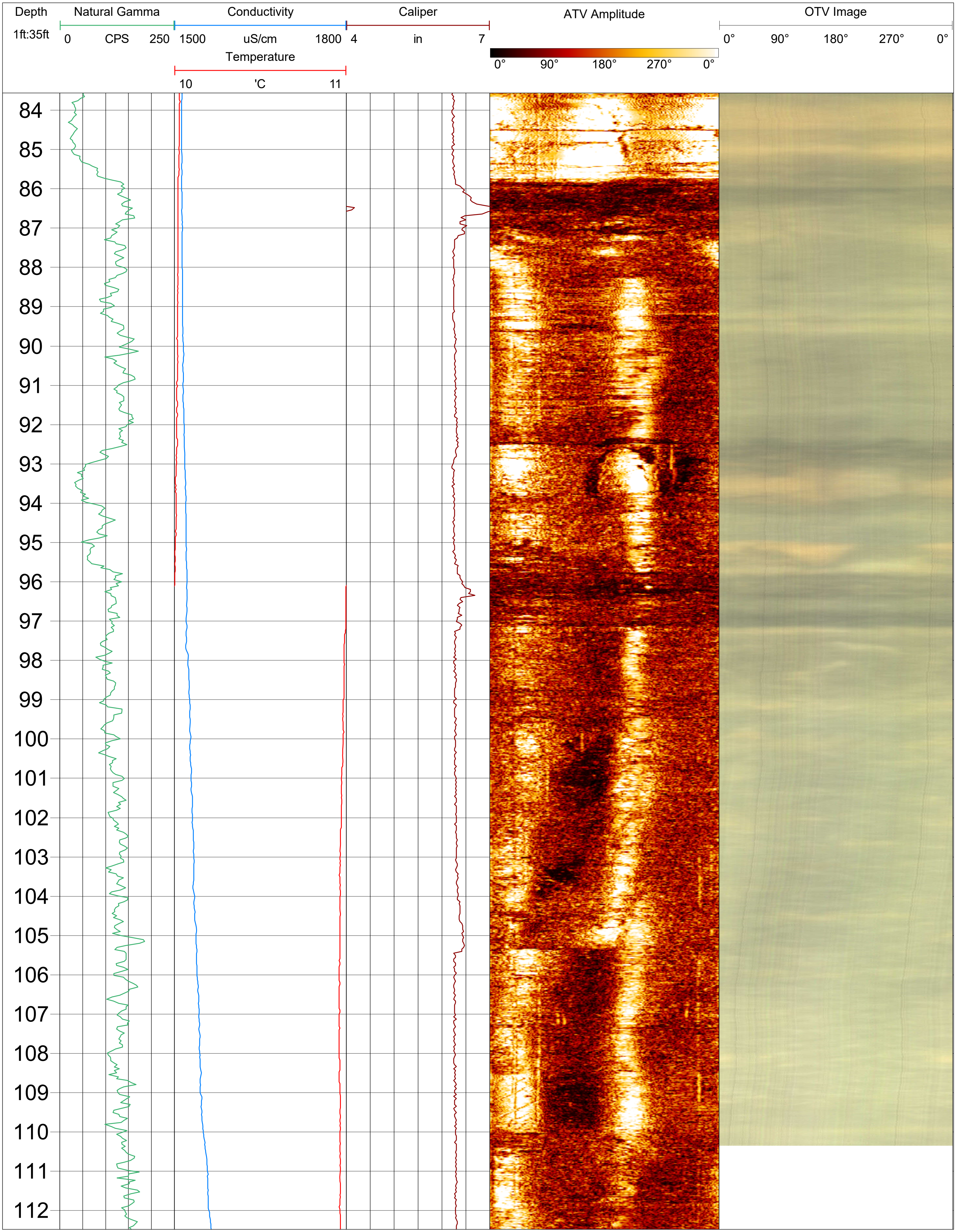
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Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
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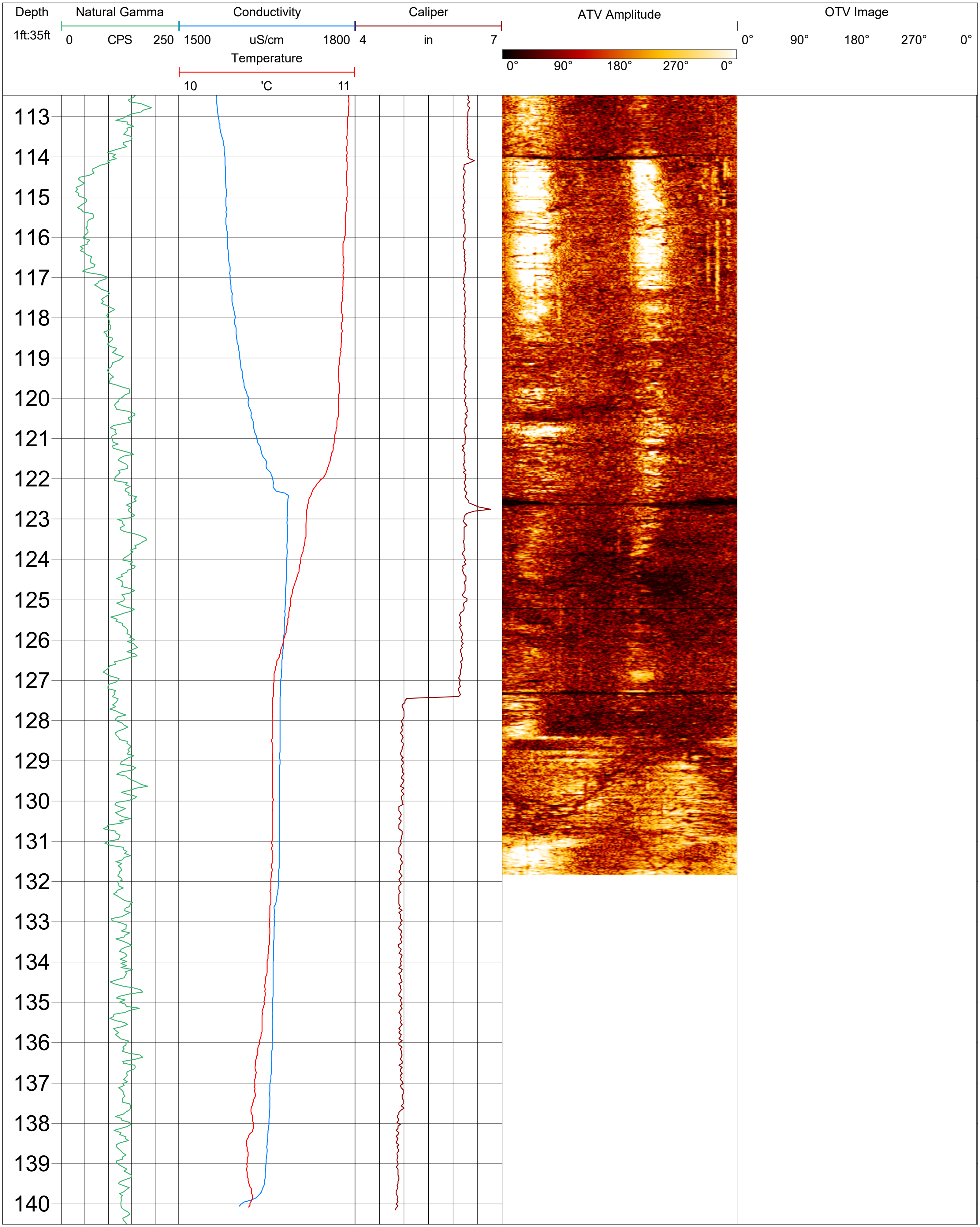
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Conductivity
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Temperature
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'C
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Caliper
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in
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ATV Amplitude
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OTV Image
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180°
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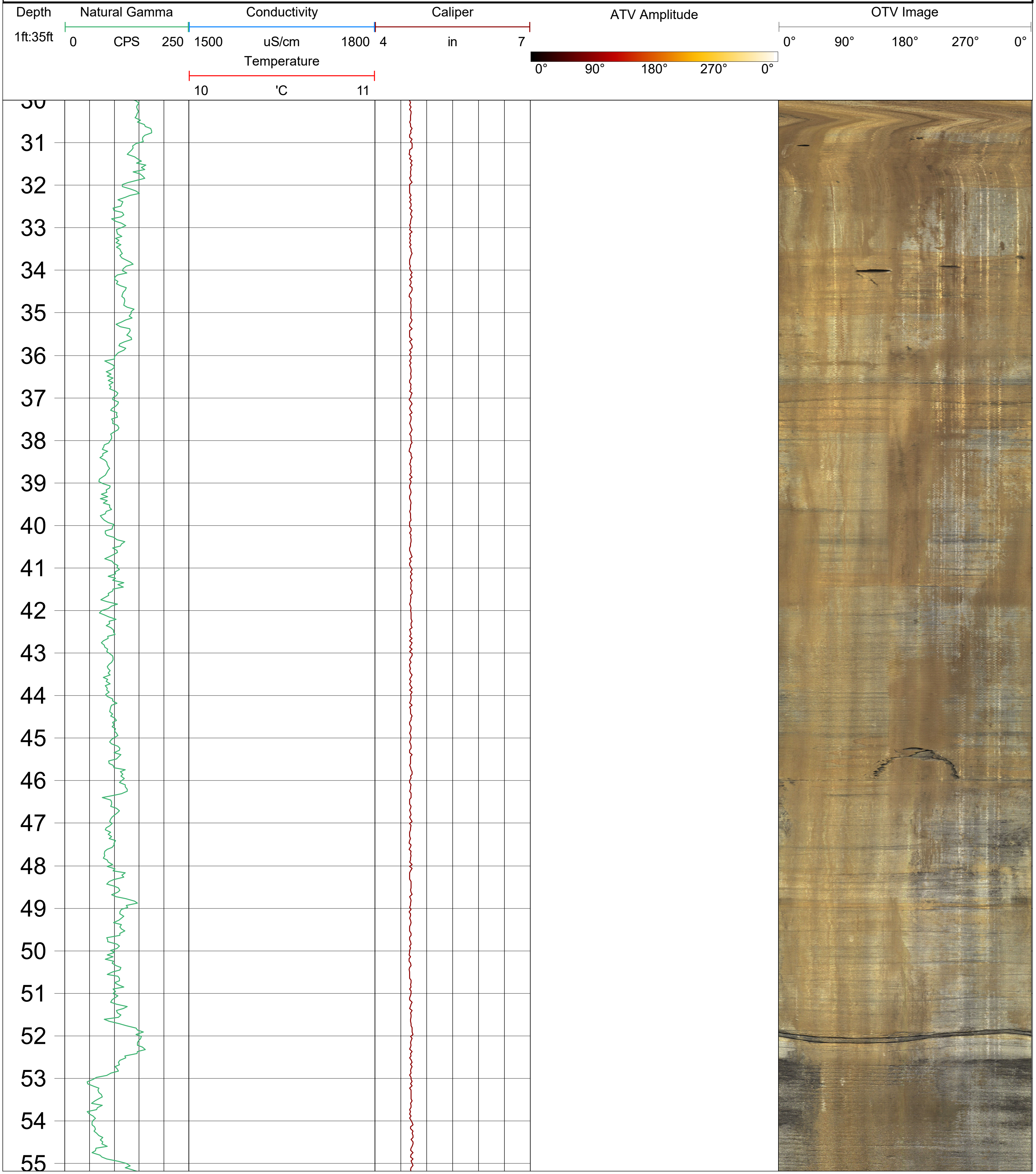
GEOPHYSICAL RECORD OF BOREHOLE: MW-113

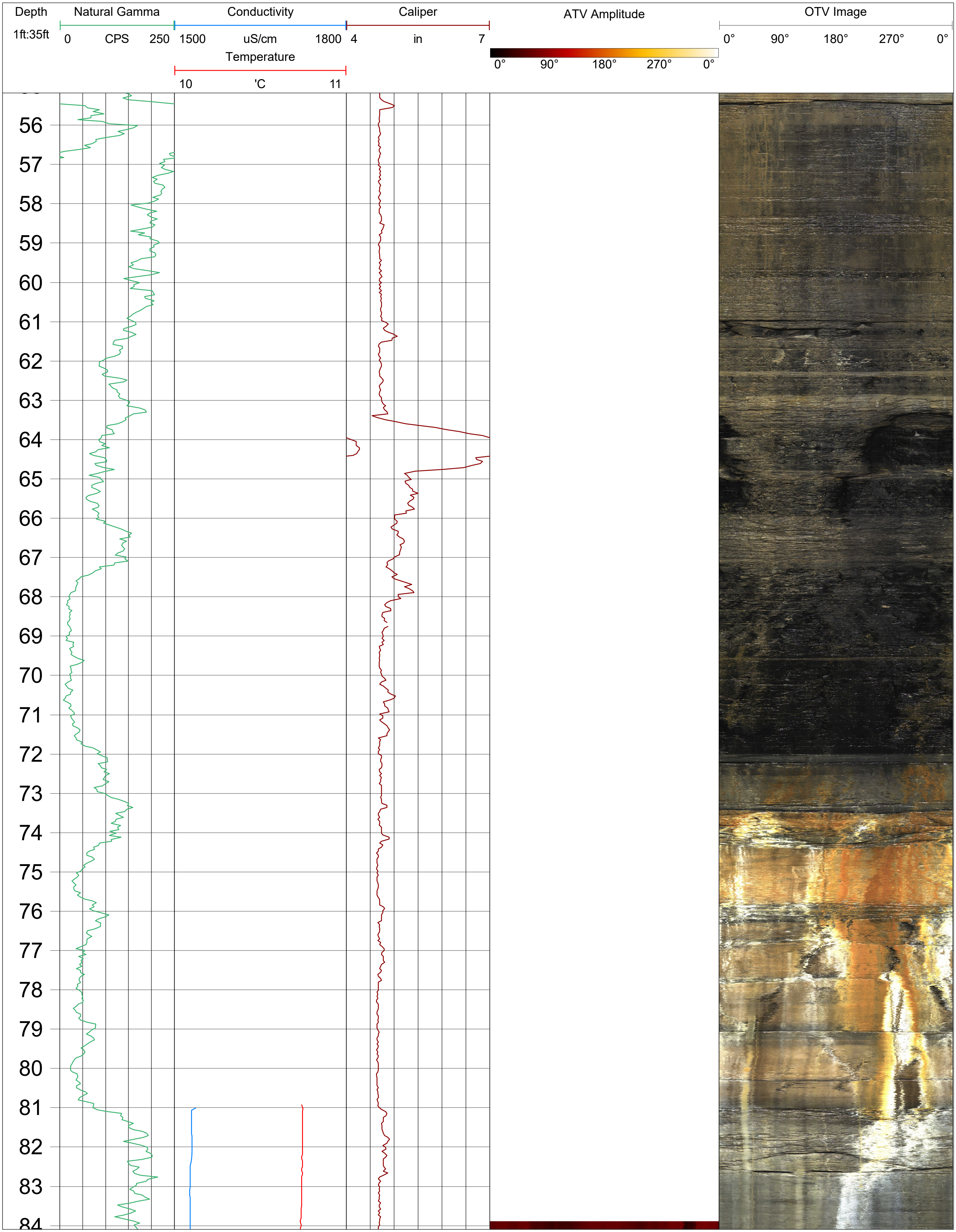
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: May 11, 2021

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Natural Gamma
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Conductivity
1500 uS/cm 1800
Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
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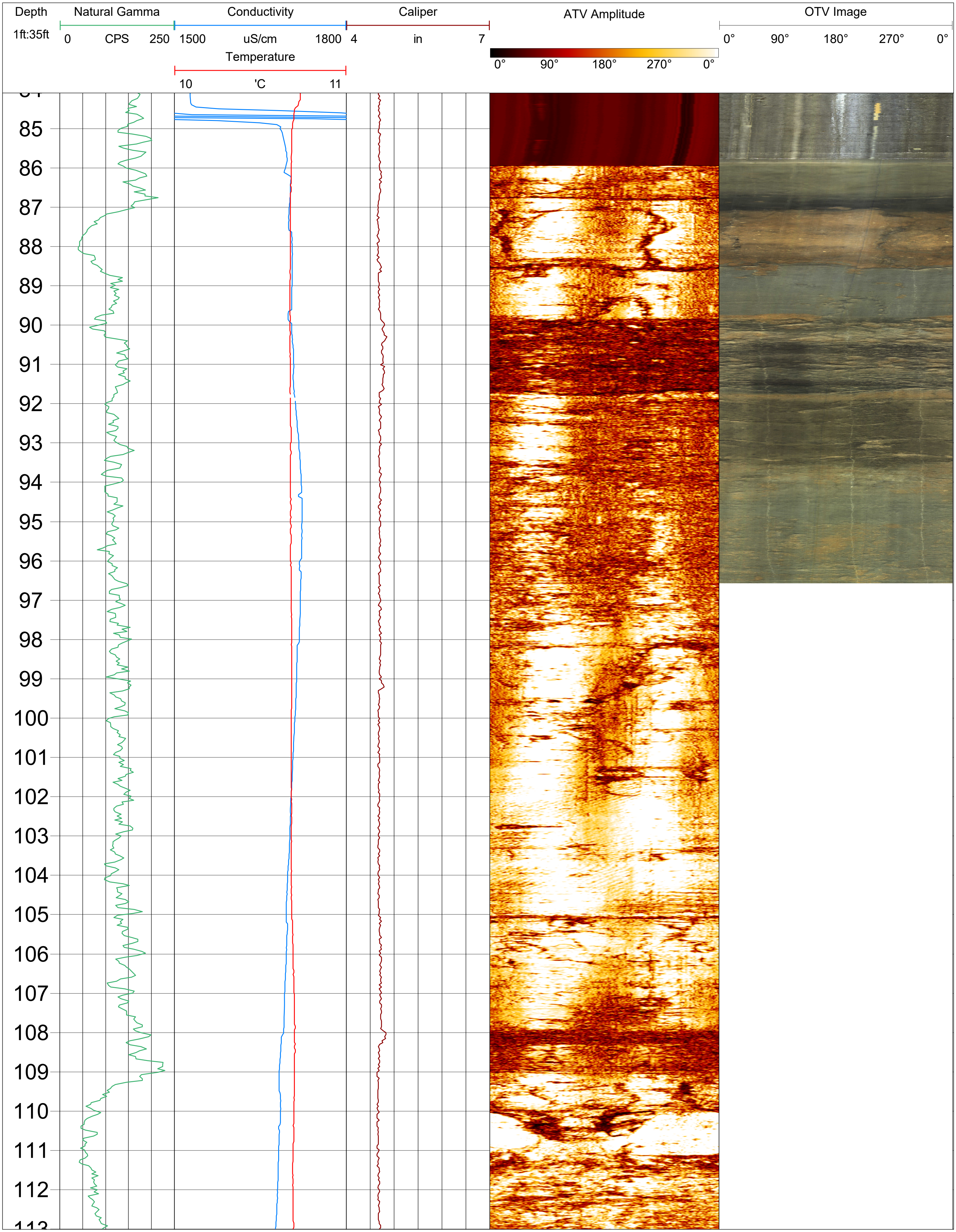
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Conductivity
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Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
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OTV Image
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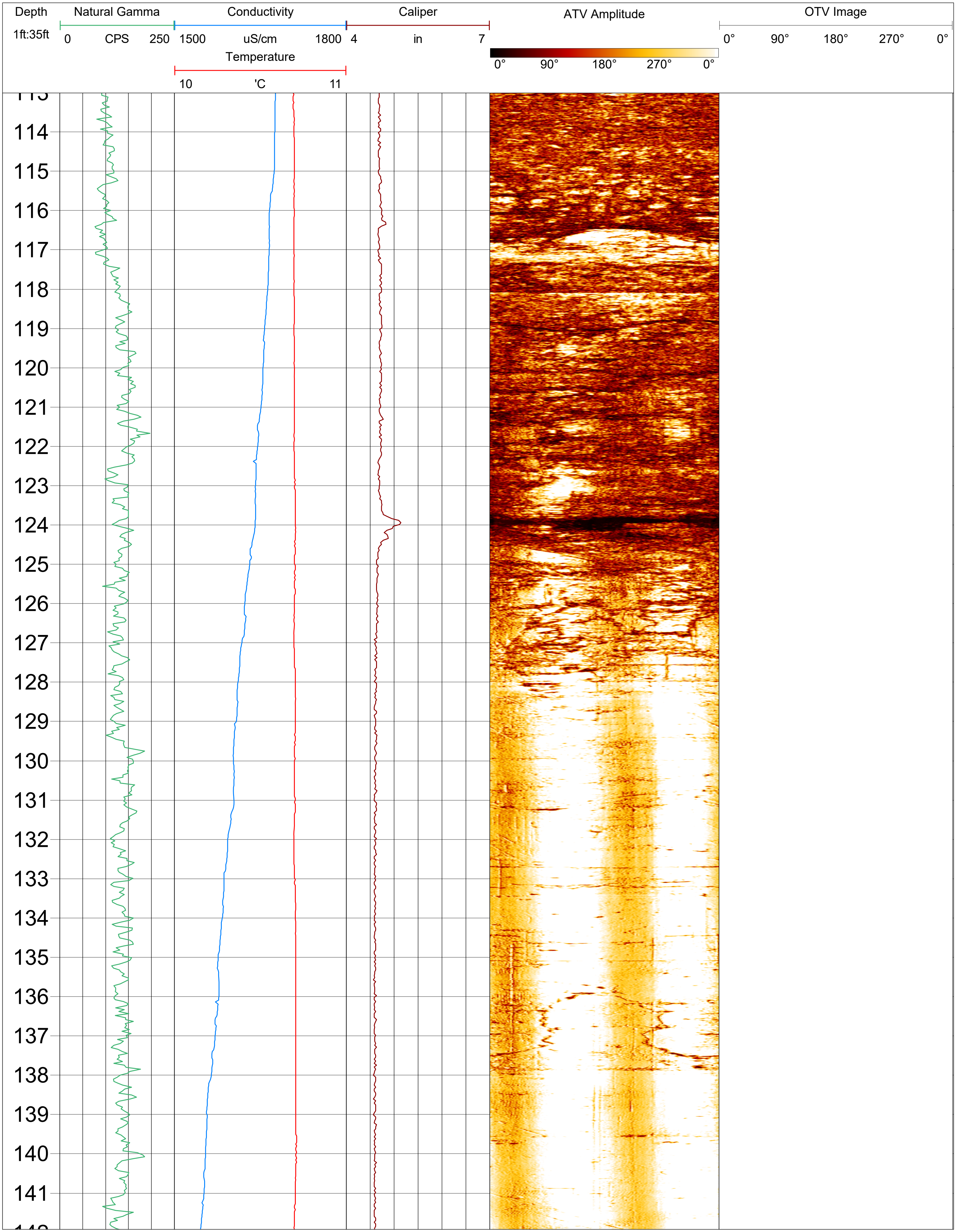
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Natural Gamma
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Conductivity
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Temperature
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Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
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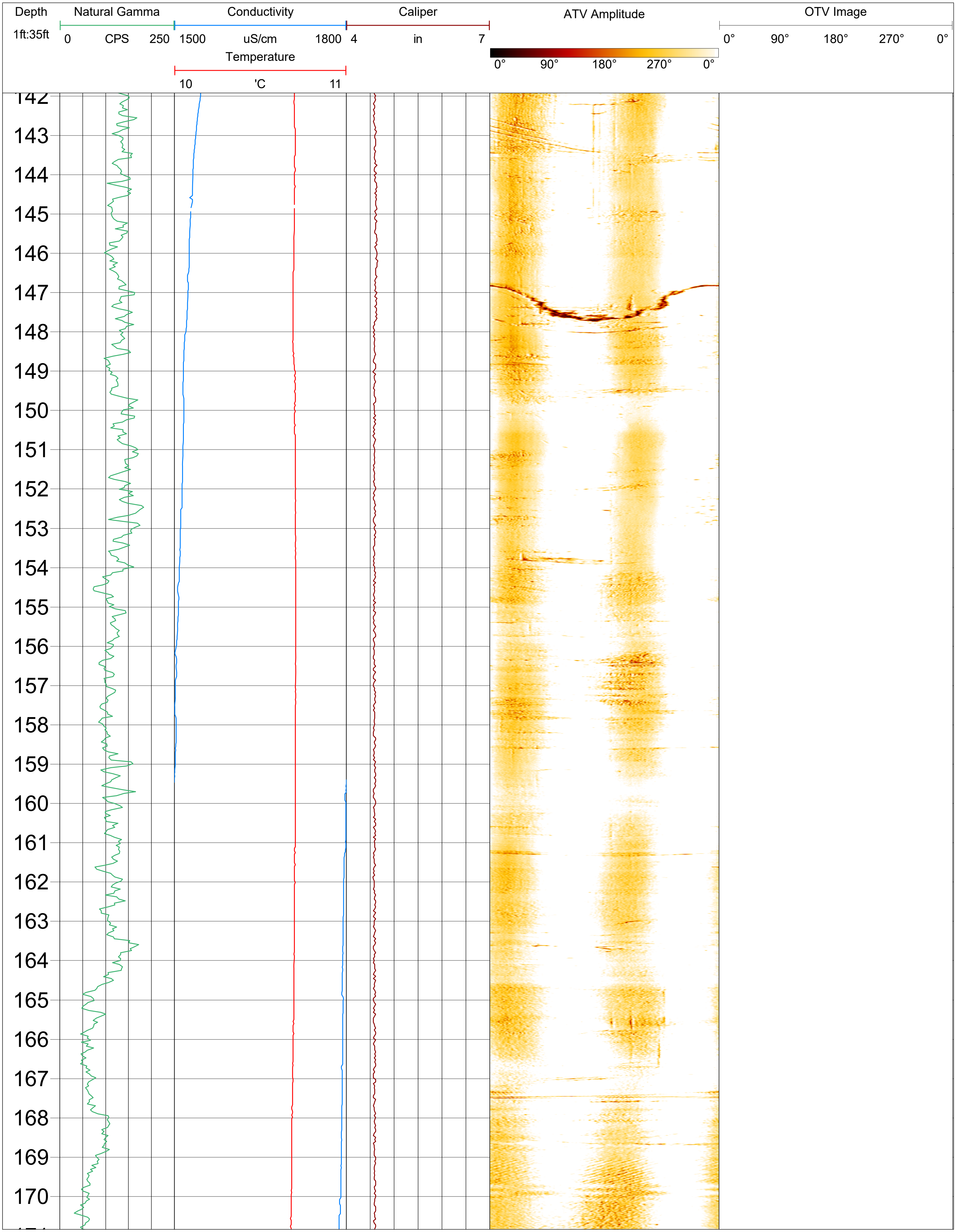
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Conductivity
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Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
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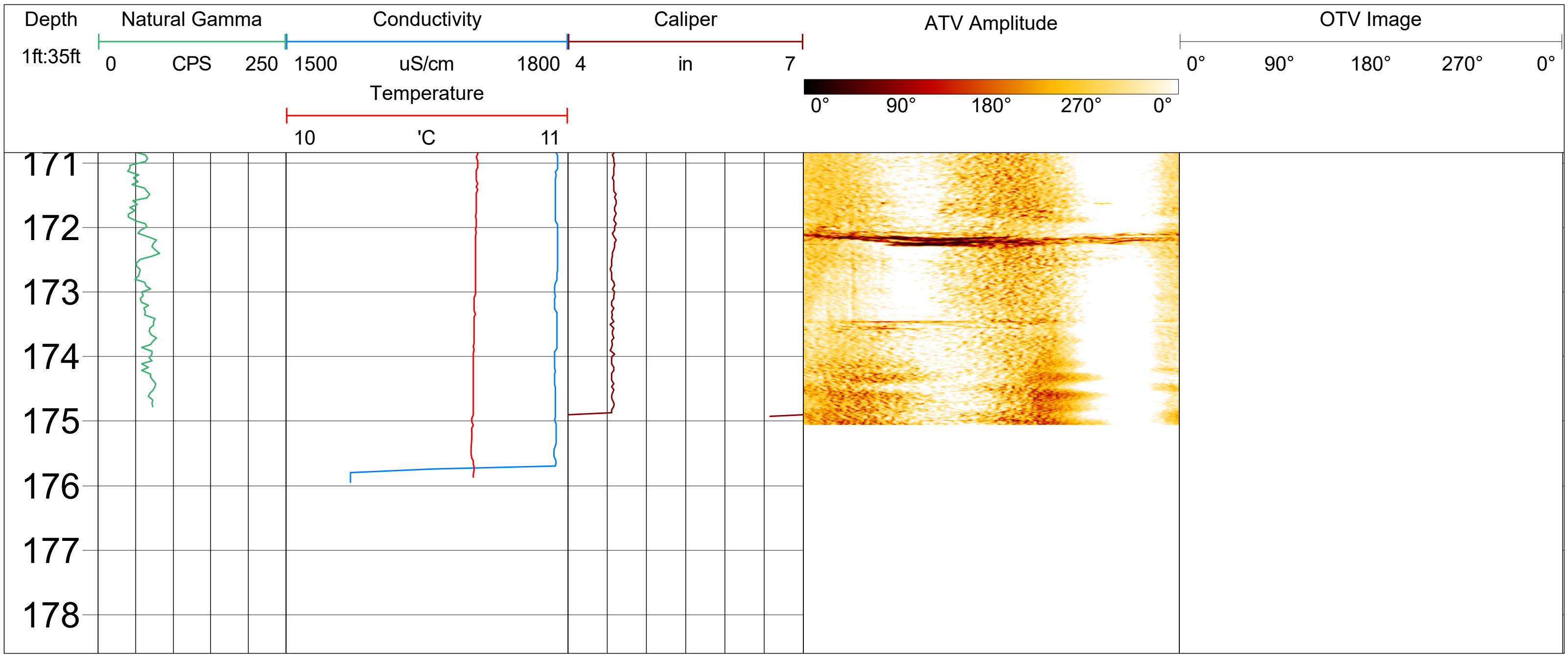

Depth
1ft:35ft
Natural Gamma
0
CPS
250
Conductivity
1500
uS/cm
1800
Temperature
10
'C
11
Caliper
4
in
7
ATV Amplitude
0°
90°
180°
270°
0°
OTV Image
0°
90°
180°
270°
0°
171
172
173
174
175
176
177
178

GEOPHYSICAL RECORD OF BOREHOLE: MW-114

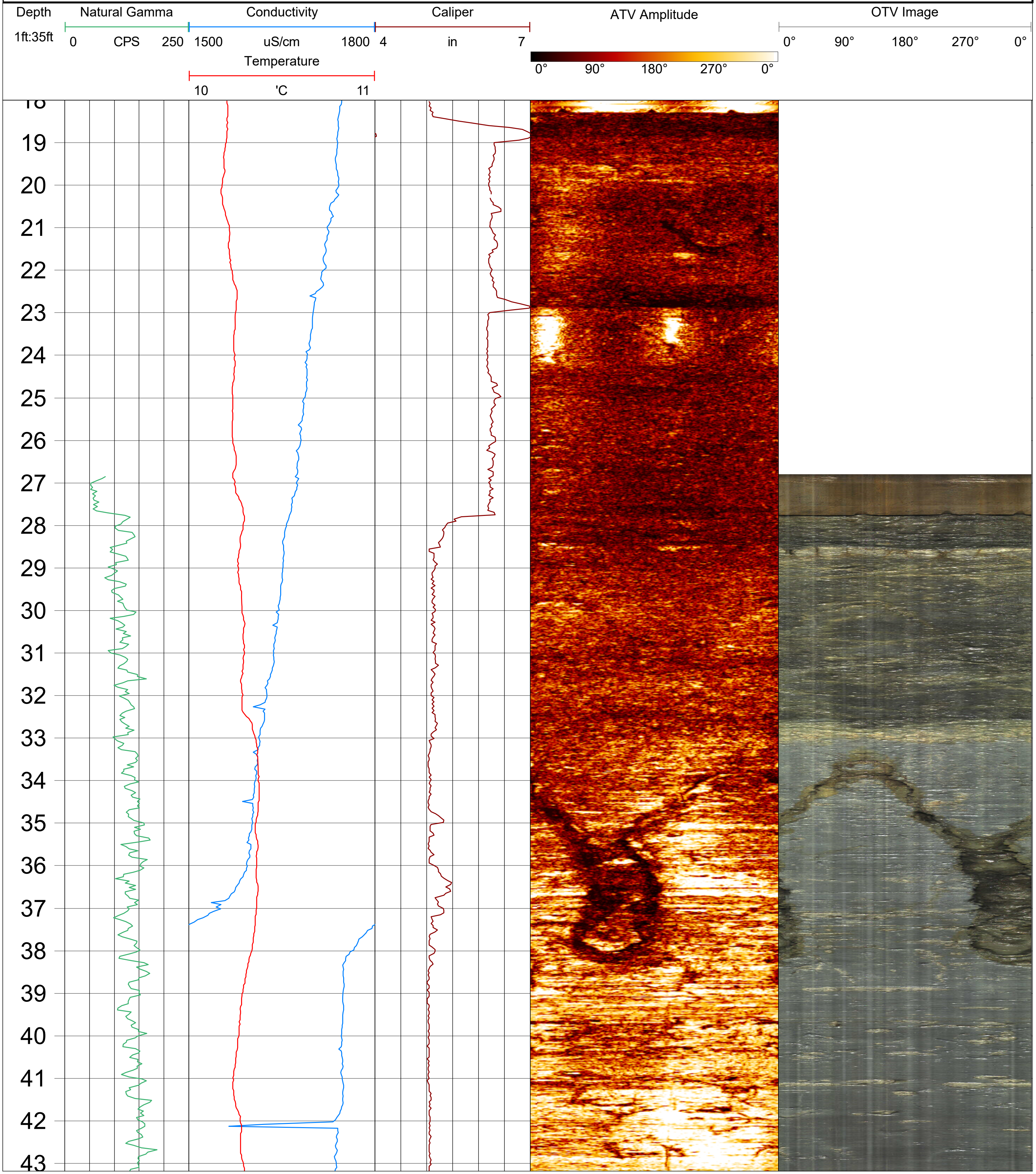
GOLDER
MEMBER OF WSP

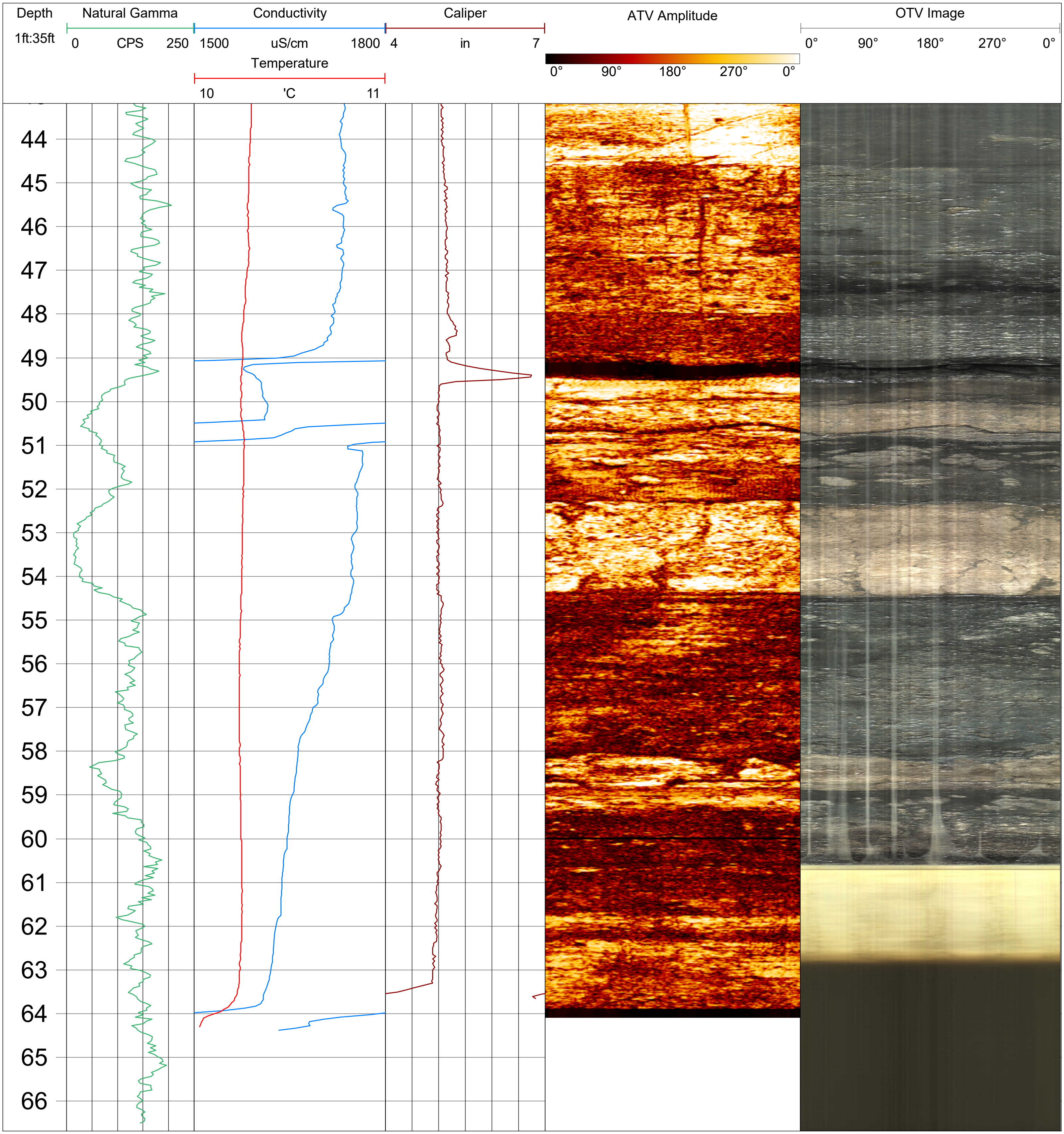
Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 8, 2021




Depth
1ft:35ft
Natural Gamma
0 CPS 250
Conductivity
1500 uS/cm 1800
Temperature
10 'C 11
Caliper
4 in 7
ATV Amplitude
0° 90° 180° 270° 0°
OTV Image
0° 90° 180° 270° 0°
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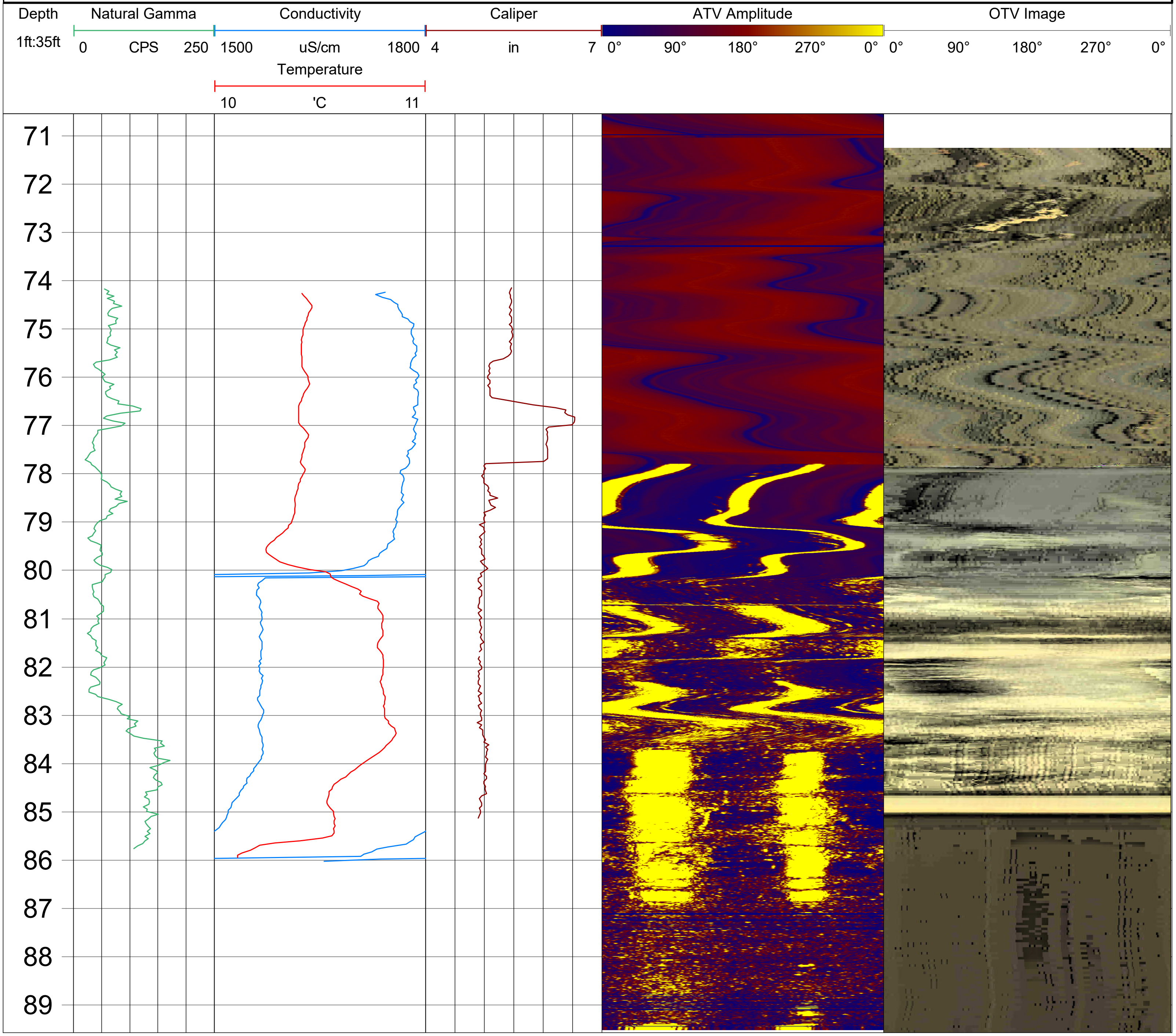
GEOPHYSICAL RECORD OF BOREHOLE: MW-115

Project Name: Former Satralloy Site
Former Mine Area Investigation

Client: Cyprus Amax Minerals Company

Project Number: 12393309X10

Date: June 1, 2021



APPENDIX C

Rock Core Photographs

MW-101 48 – 59.3 ft.	
MW-101 48 – 59.3 ft.	
MW-101 59.3 – 70.2 ft.	
MW-101 70.2 – 82.8 ft.	

MW-101 82.8 – 93 ft.	
MW-101 93 – 97.9 ft.	

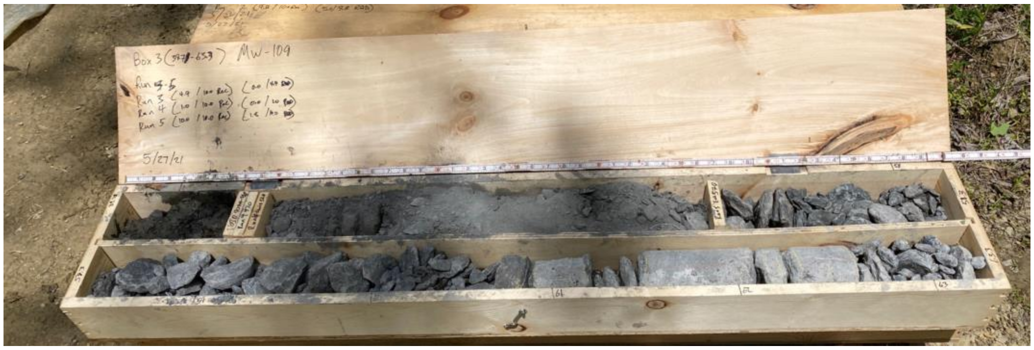
MW-102 58 – 68.7 ft.	
MW-102 68.7 – 82.9 ft.	
MW-102 82.9 – 88.4 ft.	

MW-104 28 – 39.4 ft.	
MW-104 39.4 – 54.9 ft.	
MW-104 54.9 – 65.5 ft.	
MW-104 65.5 – 68.0 ft	

MW-105 28.0 – 38.0 ft.	
MW-105 38.0 – 48.7 ft.	
MW-105 48.7 – 58.0 ft	
MW-101 58.0 – 66.4 ft	

MW-108 8.0 – 18.0 ft.	
MW-108 18.0 – 31.9 ft.	
MW-108 31.9 – 42.2 ft.	
MW-108 42.2 – 54.7 ft.	

MW-108 54.7 – 58.0 ft.	

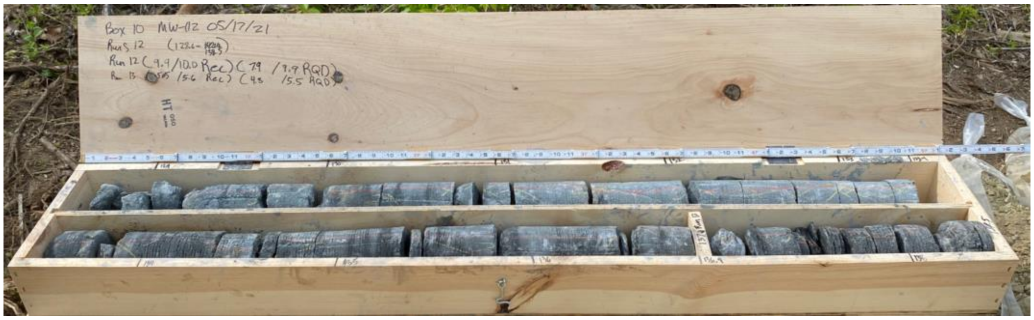
MW-109 17.0 – 29. ft.	
MW-109 29.6 – 39.7 ft.	
MW-109 39.7 – 63.3 ft.	
MW-109 63.3 – 67.0 ft.	

MW-110 21.0 – 31.2 ft.	
MW-110 31.2 – 38.0 ft.	

MW-111 18.0 – 31.3 ft.	
MW-111 31.3 – 61.2 ft.	
MW-111 61.2 – 67.3 ft.	

MW-112 17.0 – 34.6 ft.	
MW-112 34.6 – 44.1 ft.	
MW-112 44.1 – 54.4 ft.	
MW-112 54.4 – 65.5 ft.	

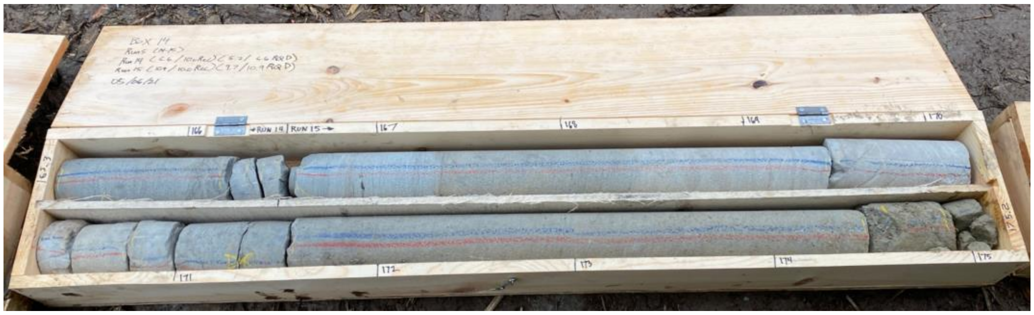
MW-112 65.5 – 82.4 ft.	
MW-112 82.4 – 94.7 ft.	
MW-112 94.7 – 104.7 ft.	
MW-112 104.7 – 114.9 ft.	

MW-112 114.9 – 128.6 ft.	
MW-112 128.6 – 138.5 ft.	
MW-112 138.5 – 142.6 ft.	

MW-113 27.0 – 36.8 ft.	
MW-113 36.8 – 46.6 ft.	
MW-113 46.6 – 56.4 ft.	
MW-113 56.4 – 65.9 ft.	

MW-113 65.9 – 78.4 ft.	
MW-113 78.4 – 90.3 ft.	
MW-113 90.3 – 103.4 ft.	
MW-113 103.4 – 116.5 ft.	

MW-113 116.5 – 126.2 ft.	
MW-113 126.2 – 136.1 ft.	
MW-113 136.1 – 145.8 ft.	
MW-113 145.8 – 155.6 ft.	

MW-113 155.6 – 165.3 ft.	
MW-113 165.3 – 175.2 ft.	
MW-113 175.2 – 177.4 ft.	

MW-114 16.0 – 30.8 ft.	
MW-114 30.8 – 41.3 ft.	
MW-114 41.3 – 50.8 ft.	
MW-114 50.8 – 63.1 ft.	

MW-114 63.1 – 67.9 ft.	

MW-115 78.0 – 84.3 ft.	

MW-116 15.0 – 29.9 ft.	
MW-116 29.9 – 42.5 ft.	
MW-116 42.5 – 51.8 ft.	
MW-116 51.8 – 63.3 ft.	

MW-116 63.3 – 80.0 ft.	

MW-117 32.0 – 42.8 ft.	
MW-117 42.8 – 54.8 ft.	
MW-117 54.8 – 66.0 ft.	
MW-117 66.0 – 77.7 ft.	

MW-117 80.0 – 90.0 ft.