Monitoring Well Work Proposal
Grassy Mountain Project

Prepared for

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SPF WATER ENGINEERING

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1. INTRODUCTION

This report presents a groundwater monitoring proposal for Calico Resources USA Corp's (Calico's) Grassy Mountain Project (Project). This report specifically addresses groundwater monitoring for the tailings storage facility (TSF), waste rock storage facility, and the process plant collection pond. This report intends to meet the requirements of Oregon Administrative Rules (OAR) Chapter 340, Division 40, Groundwater Quality Protection.

The purpose of the groundwater monitoring proposal is to detect any groundwater contamination resulting from these facilities occurring in the uppermost aquifer and any other potentially affected aquifers. The "uppermost aquifer" is defined in OAR 340-040 as the *geologic formation, group of formations, or part of a formation that contains the uppermost potentiometric surface capable of yielding water to wells or springs, and may include fill material that is saturated*.

Both up-gradient and down-gradient monitoring wells will be installed. The up-gradient wells will serve as background monitoring points. The down-gradient monitoring wells will serve as the down-gradient detection monitoring points to determine if the groundwater is being affected by leakage from the TSF, waste rock storage facility, or collection pond. The down-gradient detection monitoring points are expected to serve as the compliance points where groundwater-quality parameters must be at or below the permit-specific concentration limits or the concentration limit variance, unless other compliance points are required by the Oregon Department of Environmental Quality (ODEQ). The concentration limit is the maximum acceptable concentration of a contaminant allowed in groundwater at a compliance point. For new facilities, the permit-specific concentration limits shall be the background water quality for all contaminants.

In addition to the proposed monitoring wells, there are existing wells in the near vicinity of the Project facilities that are proposed be included in the monitoring well network.

This report outlines the purposes of the monitoring proposal, and then describes (1) area and local geological and hydrogeological conditions, (2) proposed monitoring well locations and construction, (3) existing monitoring wells, (4) groundwater monitoring approach and methods, (5) data analysis, and (6) reporting requirements.

2. PROJECT LOCATION

The Project is located in Malheur County, Oregon, approximately 22 miles south-southwest of Vale (Figure 1) and consists of two areas: the Mine and Process Area and the Access Road Area (Figure 2).

The Mine and Process Area is located on three patented lode mining claims and unpatented lode mining claims that cover an estimated 886 acres. These patented and unpatented lode mining claims are part of a larger land position that includes 419

unpatented lode mining claims and nine mill site claims on lands administered by the Bureau of Land Management (BLM) (Figure 2). All proposed mining would occur on the patented claims, with some mine facilities on unpatented claims. The Mine and Process Area is in all or portions of Sections 5 through 8, Township 22 South, Range 44 East (T22S, R44E) (Willamette Meridian).

The Access Road Area is located on public land administered by the BLM, and private land controlled by others (Figure 2). A portion of the Access Road Area is a Malheur County Road named Twin Springs Road. The Access Road Area extends north from the Mine and Process Area to Russell Road, a paved Malheur County Road. The Access Road Area is in portions of Section 5, T22S, R44E, Sections 3, 10, 11, 14, 15, 21 through 23, 28, 29, and 32, T21S, R44E, Sections 1, 12 through 14, 23, 26, 27, and 34, T20S, R44E, Sections 6 and 7, T20S, R45E, and Sections 22, 23, 26, 35, and 36, T19S, R44E (Willamette Meridian). The width of the Access Road Area is 300 feet (150 feet on either side of the access road centerline) to accommodate possible minor widening or re-routing and a potential powerline adjacent to the access road. There are several areas shown that are significantly wider than 300 feet on the Permit Area Map (Figure 2), which are areas where the final alignment has not yet been determined. The final engineering of the road will be consistent throughout, and within the Permit Area. The Access Road Area also includes a buffer on either side of the proposed road width for the collection of environmental baseline data. The road corridor will be 30 feet wide, which includes a 20-foot wide road travel width (10 feet on either side of the road centerline), two-foot wide shoulders on each side of the road, minimum one-foot wide ditches on each side of the road, and appropriate cut and fill. The Access Road Area totals approximately 876 acres.

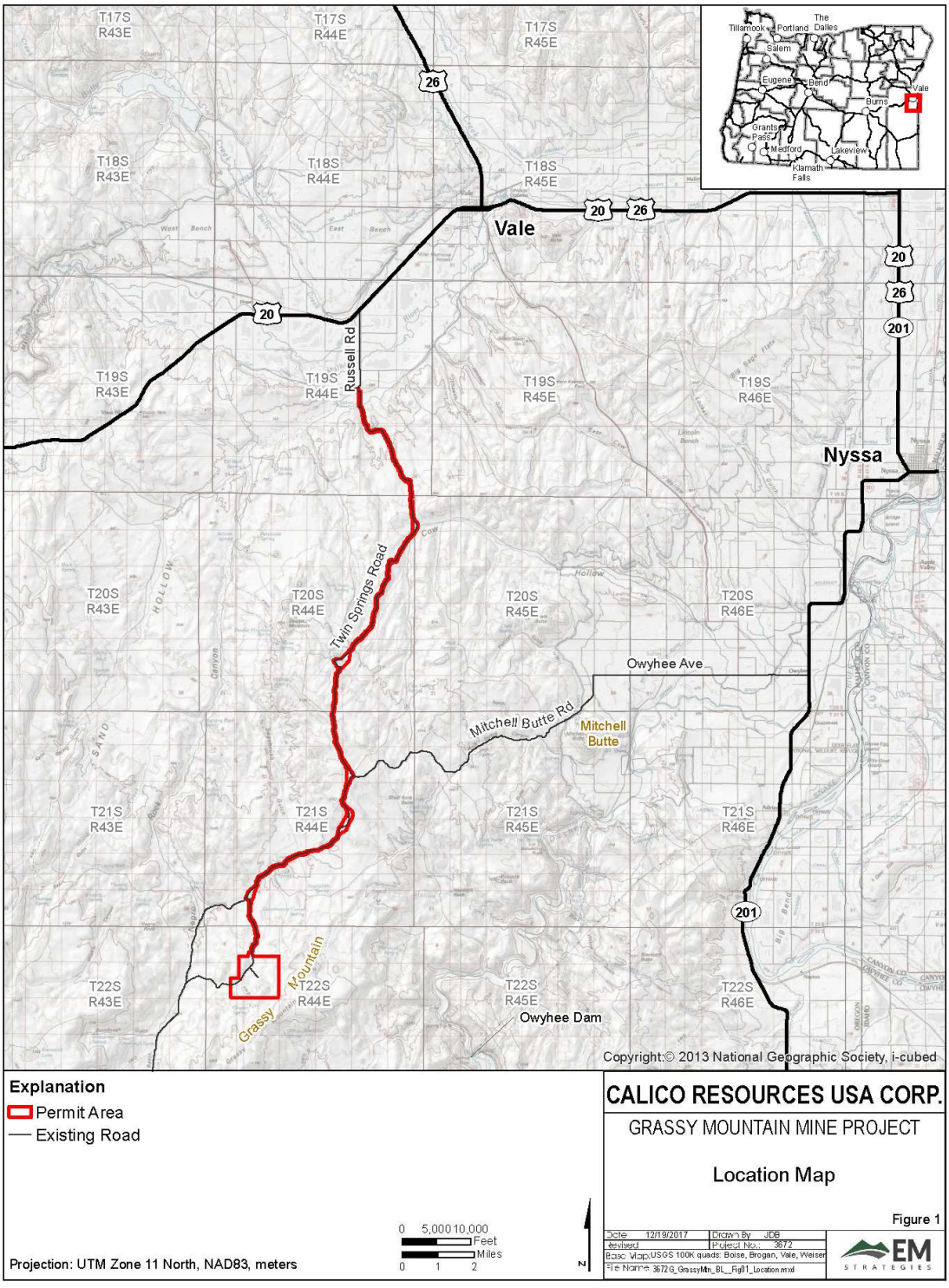

Figure 1. Location map

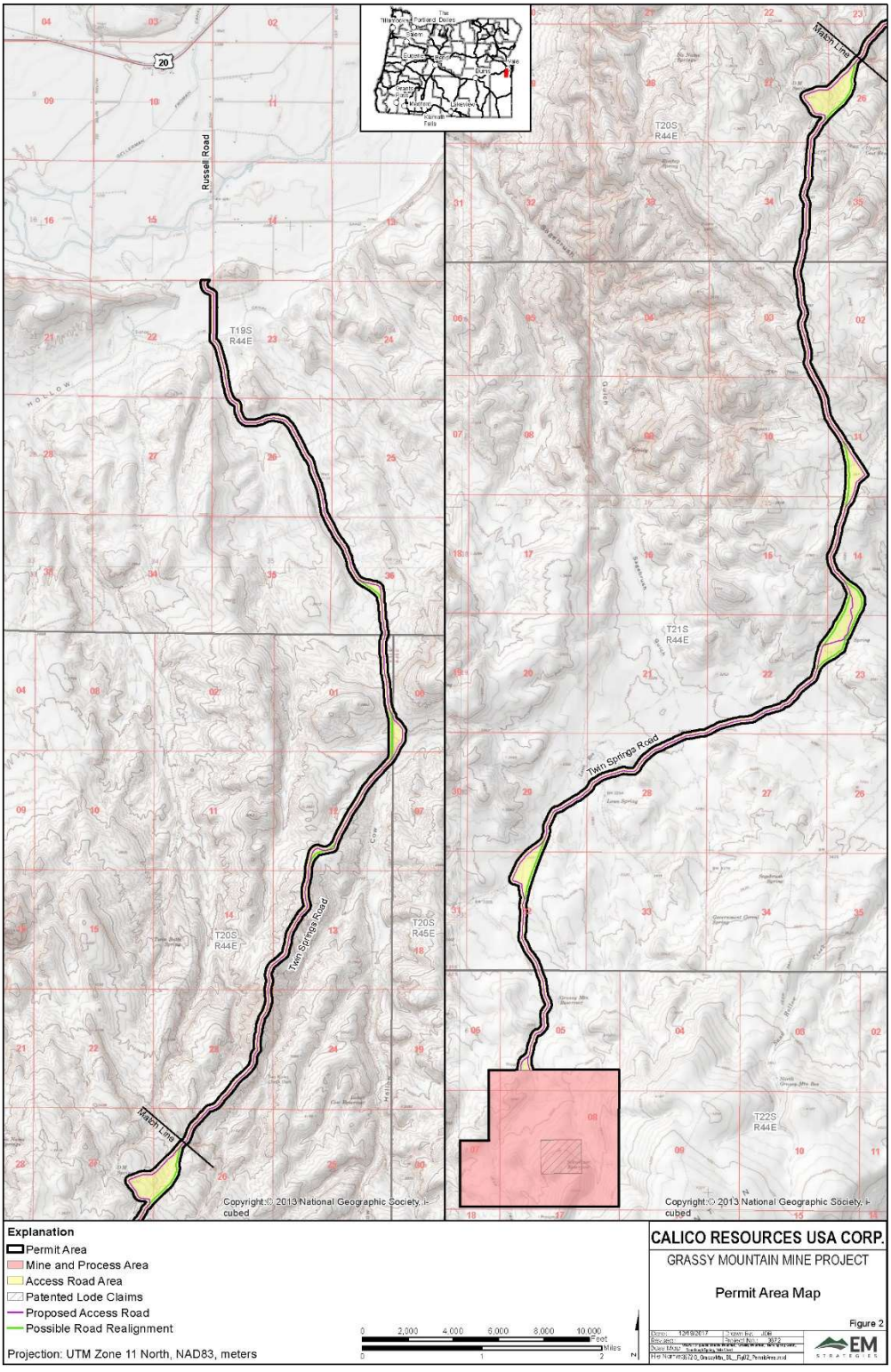

Figure 2. Permit area map

3. FACILITIES

3.1. Tailings Storage Facility

The following description of the TSF was obtained from the Geotechnical Data Report, Grassy Mountain Project, Malheur County, Oregon (Golder 2018) and the Preliminary Feasibility and Technical Report for the Grassy Mountain Gold and Silver Project Malheur County, Oregon (Mine Development Associates, 2018).

The proposed TSF will be located in a drainage northwest of the proposed Grassy Mountain mine site and associated process facilities, refer to the Project site layout map included in Appendix A. The bottom elevation of the TSF is at approximately 3,540 feet, along the base of the north embankment.

The TSF will require embankments on the north, west, and southwest sides of the drainage. The main embankment will be located at the north end. The north embankment will extend east-west across the drainage and will have an approximate maximum height of about 80 feet. The west and southwest embankments will range in height from about 10 feet to about 44 feet. The proposed TSF will cover approximately 110 acres.

The embankments will be constructed in stages with soil and/or rock materials obtained from on-site borrow sources. The TSF impoundment will include a composite lining system, including (from bottom to top): a prepared subgrade, an enhanced geosynthetic clay liner, HDPE geomembrane liner, a drainage layer, and a filter layer. An underdrain collection system consisting of perforated piping will be located within the impoundment drainage layer. The upstream slope of the embankments will utilize the same composite lining system, but without the underdrain collection system, drainage and filter layers.

A reclaim pond will capture all process solution collected in the TSF underdrain collection system. The reclaim pond is proposed north of the TSF. The reclaim pond will be lined, the lining system will consist of (from bottom to top): a prepared subgrade, an HDPE secondary geomembrane liner, an HDPE geonet, and an HDPE geomembrane primary liner. The geonet will serve as the leakage collection and recovery system.

Water collected from the reclaim pond and from the supernatant pool will be returned to the mill for use in the process circuit using independent return-water systems.

The TSF has been designed as a zero-discharge facility, capable of storing the 500-year, 24-hour storm event. Permanent and temporary stormwater diversions will collect and divert a majority of the stormwater runoff around the facility to a natural drainage located on the north side of the TSF.

3.2. Waste Rock Storage Facility

Waste rock from mining will ultimately be used as cemented rock fill (CRF) material. During operation, a stockpile of waste rock will be managed on the surface to be used

as CRF as needed. The waste rock storage facility will be located south and immediately adjacent to the TSF, refer to the Project site layout map included in Appendix A.

The waste rock storage facility will be a lined facility due to the potential sulfides in the waste rock material. The composite lining system will consist of (from bottom to top): prepared subgrade, an enhanced geosynthetic clay liner, an HDPE geomembrane liner, and a drainage layer. A collection system consisting of perforated piping will be installed within the drainage layer to collect any water coming in contact with the waste rock. The collection system will drain by gravity to the TSF reclaim pond.

3.3. Process Plant Collection Pond

The mine process facilities will be situated on a saddle between the proposed mine site and a knoll about 600 feet north of the mine portal. Diversion ditches will be constructed along the perimeter of the process facilities to prevent runoff from entering the facilities. The process facilities pad will include a system of ditches and culverts that will collect any precipitation that falls directly on the pad. Water collected will be directed by gravity towards a collection pond.

The collection pond is proposed northeast of the main process facilities, refer to the plant site general arrangement plan included in Appendix B. The pond volume will be approximately 110,000 ft^3 (823,000 gallons). The pond volume has been designed to accommodate the 100-year, 24-hour storm event while also accounting for sediment accumulation and freeboard. The pond will be double-lined with a fluid evacuation zone between the two liners. The bottom elevation of the pond is 3,675 feet.

4. GEOLOGY

4.1. Area Geology

The Grassy Mountain Geology and Soils Baseline Report (Abrams 2018) describes the surficial geology in the vicinity of the Project. The Mine and Process Area Geology map from the Geology and Soils Baseline Report is shown on Figure 3, along with the TSF and process plant.

The eastern portion of the TSF is underlain by geologic unit *Qal,* identified as Pleistocene and Holocene alluvium, and described as *unconsolidated and generally poorly sorted deposits or gravel, sand and silt accumulated along modern streams, drainages and floodplains* (Abrams 2018).

The western portion of the TSF and the process plant is underlain by geologic units *Tgs* and *Tgsc*, identified as Grassy Mountain Formation - undifferentiated and Grassy Mountain Formation - conglomerate. The Grassy Mountain Formation sedimentary units in the area of the process plant and proposed mine are silicified and strongly indurated (Abrams 2018).

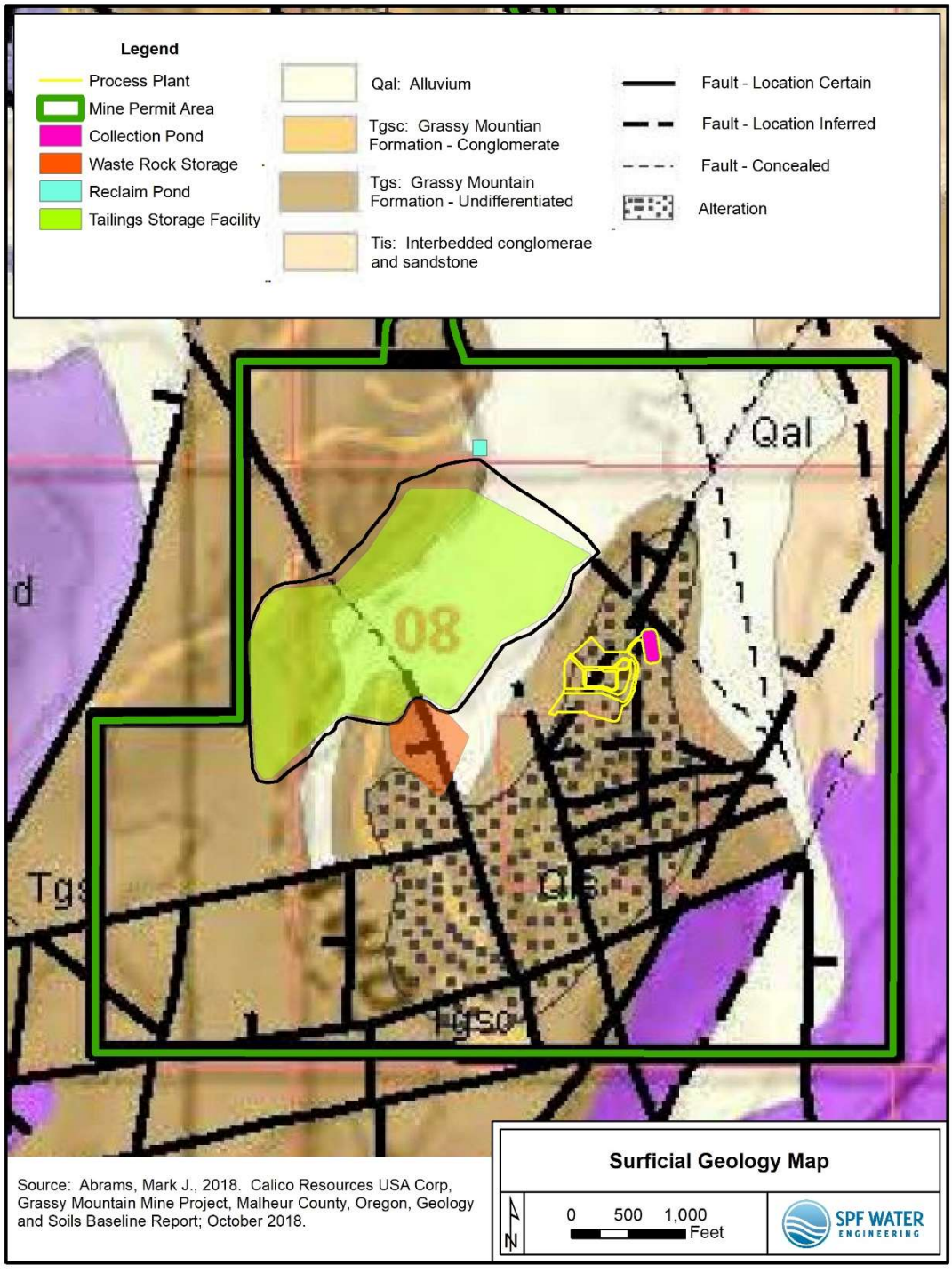

Figure 3. Surficial geology map

Geologic unit *Tgs* (Grassy Mountain Formation – undifferentiated) is described in the Geology and Soils Baseline Report as: *Arkosic sandstones and channel-fill granite clast conglomerates. Mainly white to tan arkosic sandstones. Includes Tgsc, channel fill conglomerates with abundant granite and rhyolite clasts in the upper part of the unit. Uppermost conglomerates locally contain rounded obsidian clasts and rare black chert clasts. Unit Tgs generally becomes finer grained upward and includes white bentonitic clays near the top of the section which, where overlain by unit Tgb often generated large landslide masses. Hot spring activity contemporaneous with the deposition of the arkoses is indicated by sinter beds Tgsn, and sinter boulders containing silicified reeds and wood near the Grassy mountain gold deposit. Unit Tgs is the host for both the Grassy Mountain and Crabgrass gold deposits*

Geologic unit *Tgsc* (Grassy Mountain Formation – conglomerate) is described as conglomerates found in the upper part of geologic unit *Tgs* (Abrams 2018).

A representative stratigraphic column of the geology near the Mine and Process Area from Abrams 2018 is provided as Figure 4. The Quaternary-age alluvium overlies the Grassy Mountain Formation in the lower elevation drainages, with the Grassy Mountain Formation siltstone, sandstone, and conglomerate exposed at the higher elevations in the Mine and Process Area. The Tuff of Kern Basin underlies the Grassy Mountain Formation.

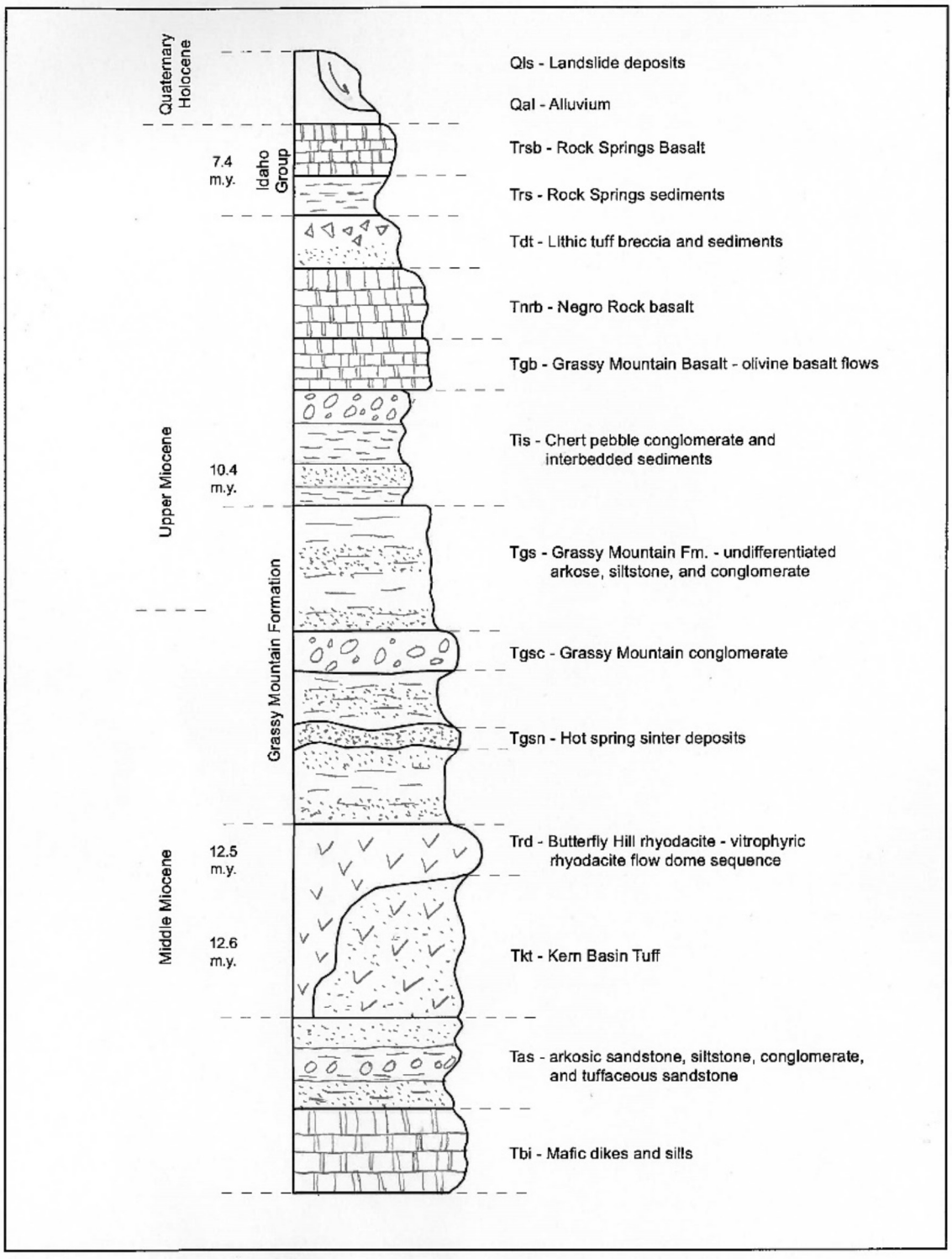

Figure 4. Representative stratigraphic column

4.2. Area Hydrogeology

4.2.1. **Aquifer System**

Groundwater in the general vicinity of the proposed mine site is found primarily within unconsolidated and semi-consolidated sandstone and conglomerate units of the Grassy Mountain Formation. The Grassy Mountain Formation generally strikes from east to west and dips towards the north. Discontinuous lenses of higher permeability sandstone and conglomerate form localized and compartmentalized water-bearing units that are interbedded with thick layers of low-permeability clay and clayey siltstone that impede groundwater flow. These sedimentary rocks are locally capped by basalt, alluvium and colluvium. The Grassy Mountain Formation is underlain by fine-grained lithic tuff, the Tuff of Kern Basin. The Grassy Mountain Formation is the host unit for the Grassy Mountain gold and silver deposit. A more detailed description of principal hydrogeological units can be found in the Grassy Mountain Gold Project Groundwater Characterization Report (SPF 2019b).

The aquifer system in the near vicinity of the proposed mine is typically found in silicified sediments or clay with very low hydraulic conductivity and high hydraulic gradients. Production and monitoring wells near the deposit completed in unconsolidated sediments and fractured basalt typically have short-term yields of less than 50 gpm. Long-term aquifer sustainability appears to be limited by negative hydraulic boundaries such as water-bearing zones of limited spatial extent, faulting, and/or silicification. Wells near the deposit completed in clay or silicified sediments have very low yields, generally less than 5 gpm.

The aquifer hydraulic conductivity increases down-gradient of the proposed mine where the sediments are not silicified. However, aquifer sustainability appears to be still affected by faulting and lithologic variability, with limited data suggesting that the Grassy Mountain Formation thins out moving north from the deposit. The Grassy Mountain fault zone also extends north of the deposit (RQV 2015). This fault zone acts as a barrier to groundwater flow based on testing of nearby wells; the most productive wells in the area are presumably located on the east side of the Grassy Mountain fault zone.

4.2.2. **Groundwater Flow**

Potentiometric surface maps are two-dimensional depictions of groundwater flow. In reality, groundwater flow occurs in three-dimensions. These maps, however, are useful for providing an indication of the overall, general groundwater flow direction and hydraulic gradient. Water-level data collected from the monitoring well network support the development of shallow and deep potentiometric surface maps (SPF 2019b).

The shallow surface can be considered representative of the regional aquifer system. The deep potentiometric surface is based on water-level data from deep wells only located near the deposit, and appears to be a function of high vertical gradient related to silicification, faulting, and steeply dipping beds. The groundwater conceptual model

is based on a single aquifer system that is supported by geology, water quality, potentiometric surface, and water-level data (SPF 2019b).

4.2.2.1. Shallow Potentiometric Surface

A groundwater elevation (potentiometric surface) contour map has been developed using the 2017 average water-level data from the shallow monitoring wells. This map is included as Figure 5. This map is considered representative of groundwater flow in the Project area. Potentiometric surface maps created using water-level data from 2013 through 2016 are included in the Grassy Mountain Gold Project Groundwater Resources Baseline Data Report (SPF 2019a).

Review of the shallow groundwater potentiometric surface maps suggests the following:

- The shallow potentiometric surface has remained relatively constant over the period of monitoring, generally without apparent seasonal influences. The consistent potentiometric surface reflects stable groundwater-level trends measured in individual wells over time.

- Groundwater flow generally occurs from the southeast to the northwest in the vicinity of the Project, from higher elevations along the base of Grassy Mountain (~4,000 feet amsl) to lower elevations along Negro Rock Canyon (~3,200 feet amsl). The groundwater elevations range from approximately 3,700 feet amsl (at well 57-1 southwest of the deposit) to approximately 3,220 feet (at well GW-5 northwest of the deposit).

- Local variations are apparent in the potentiometric surface, attributed to structural and/or spatial contrasts in aquifer permeability and vertical gradients possibly due to silicification. For example, steeper horizontal hydraulic gradients are apparent between wells 57-1 (completed from 108 to 138 feet) and GW-3 (completed from 320 to 350 feet) and between wells 59766 (completed from 25 to 45 feet) and GW-5 (completed from 204 to 224 feet) compared to other areas, likely due to differences in completion depth and resultant vertical gradient.

- Despite the local variations, the shallow well potentiometric surface suggests a single aquifer system. Despite differences in aquifer formation materials and well depths, the groundwater flow to the northwest towards lower elevation follows a relatively consistent pattern.

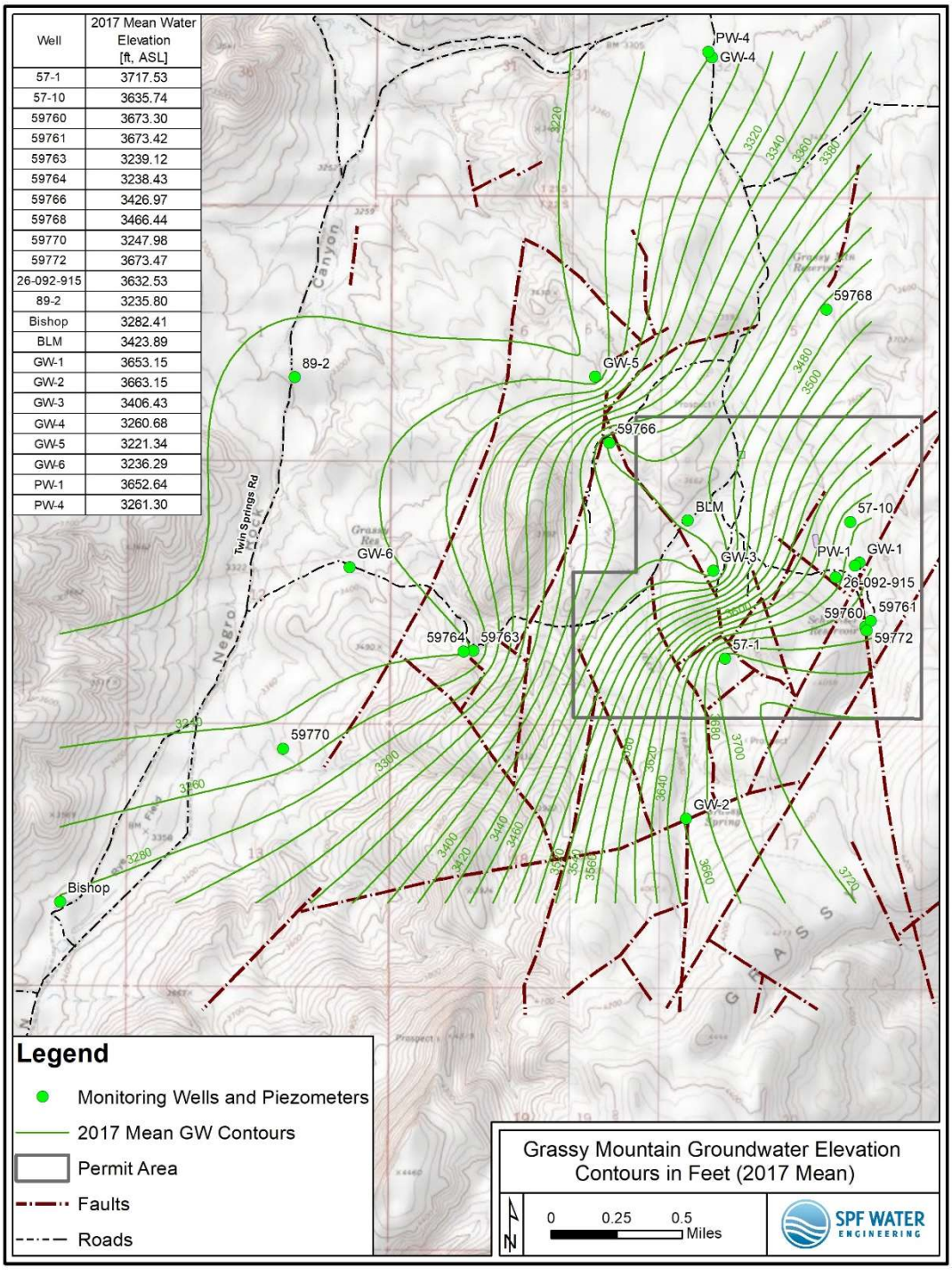

Figure 5. Shallow potentiometric surface

4.2.2.2. Deep Potentiometric Surface

A deep potentiometric surface was developed from water levels measured from two deep well completions (59762 and GMW17-32) and the average[1] of six vibrating wire piezometers (VWPs) installed at deep and intermediate depths (refer to the Grassy Mountain Gold Project Groundwater Resources Baseline Data Report for additional information). This potentiometric surface suggests the direction of groundwater flow in deeper water-bearing intervals is also toward the northwest in the vicinity of the deposit, from higher elevations along the base of Grassy Mountain to lower elevations along Negro Rock Canyon (Figure 6). These groundwater elevations range from approximately 3,150 feet amsl at the deposit to approximately 3,100 feet at the two monitoring wells just northwest of the deposit.

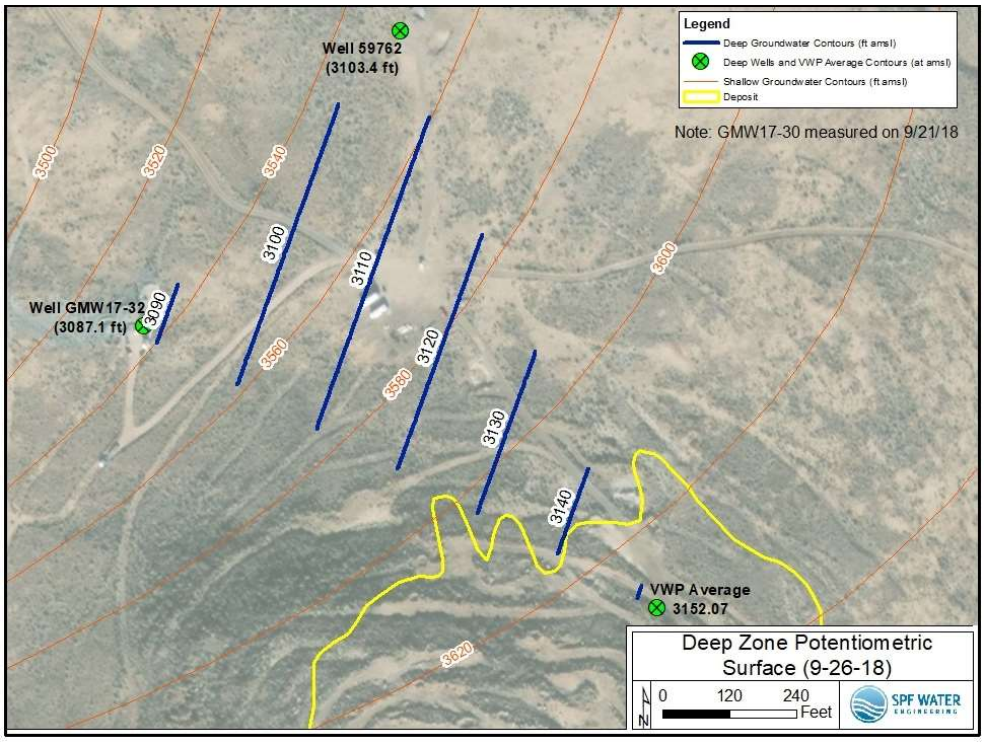

Figure 6. Deep potentiometric surface

[1] Although not a direct measurement of groundwater-level elevation, the average water level from the VWPs is considered to be the best approximation of deep groundwater elevation in the ore body vicinity due to local controls on potentiometric surface.

4.3. Local TSF Geology

4.3.1. **Geotechnical Boreholes**

A geotechnical field exploration program was conducted between November 30 and December 8, 2017, to support pre-feasibility design of the TSF and mine process facilities (Golder 2018). The program included drilling 12 borings to depths ranging from approximately 40 to 100 ft below the ground surface (bgs) at the TSF. An additional 6 borings were drilled at the TSF between March 20 and 26, 2017. These ranged in depth from 50.4 to 121.4 feet bgs. A map showing the borehole locations is included in Appendix C.

Soils were classified in accordance with the Unified Soil Classification System (UCSC) by Golder geologists. The following description of the subsurface conditions is taken from Golder 2018:

- Topsoil: Topsoil was estimated to have an average thickness of ½ foot across a majority of the site. Topsoil was generally comprised of dark brown, silty- to clayey-sands with non-plastic to low plastic fines.
- Quaternary deposits: These deposits include unconsolidated sediments deposited by water (alluvium) and accumulated material on exposed slopes (colluvium). These units are estimated to be Quaternary-age deposits based on Ferns et al, 1993. These materials were encountered across the site and consisted of sands, gravels, clays, and silts with thicknesses ranging from about 2 to 25 feet bgs. Generally, the upper portion of the deposit was classified as fine-grained soils described as lean and fat clay with varying amounts of sand and gravel and were underlain by coarse-grained soils described as clayey- to silty-sand, clayey- to silty-gravel, and poorly- to well-graded sand and gravel.
- Lacustrine deposits: Lacustrine deposits were encountered across a majority of the site and are primarily classified as lean to high plasticity clay with varying sand content. These deposits were not identified by Ferns et al, 1993. However, based on similar units in the region, these units are estimated to be Miocene-age deposits.
- Alluvium and beach deposits: Discontinuous alluvium and beach deposits were observed within the lacustrine clay deposits generally consisting of poorly-graded sand and silty sand. Due to the location of these deposits within the lacustrine clays, these deposits were estimated to be Miocene-age deposits.
- Arkosic sandstone: Part of the Grassy Mountain Formation generally consisting of fine- to coarse grained sands and are mapped as mid-Miocene in age (Ferns et al, 1993).
- Basalt: Upper Miocene olivine basalt flows observed in the hills east of the project area (Ferns et al, 1993).

Water was not noted in any of the boreholes. The soils were generally described as being moist, suggesting potential saturation.

4.3.2. **Cross-Sections**

Using the bore logs and UCSC classification developed by Golder, lithologic cross-sections were created through the TSF to describe subsurface stratigraphy. The bore logs used to create the lithologic cross-sections are included in Appendix D. The cross-sections are included in Appendix E. The cross-sections are labelled with the UCSC classification by Golder, while the color scheme reflects a more generalized classification as clay, gravel, sand, or silt (as interpreted by SPF Water Engineering). A map showing the location of the cross-sections in included as Figure 7.

The cross-sections generally show interbedded layers of clay and sand. At the north end of the TSF near the reclaim pond, there appears to be a clay layer 10 to 20 feet thick at the surface (below a thin layer of topsoil). Below this is a relatively thin layer of clayey sand (approximately 5 to 10 feet thick), underlain by a relatively thick clay zone at least 40 feet thick. Below this clay layer is another clayey sand zone that appears to be about 30 feet thick, underlain by a thin clay zone and then another layer of silty sand.

Moving southeast from the reclaim pond, the upper clay and sand zones appear to thicken, and may dip upwards with topography. South of the reclaim pond, a sand zone caps the upper clay layer observed near the reclaim pond. Through the center of the TSF, there is a surface layer of clayey to silty sand, 10 to 25 feet thick, underlain by a clay zone 25 to 40 feet thick. On the northwest side of the TSF, this clay zone is on the thinner end of that thickness range, and a sand zone is apparent below the clay. These layers appear to generally follow surface topography.

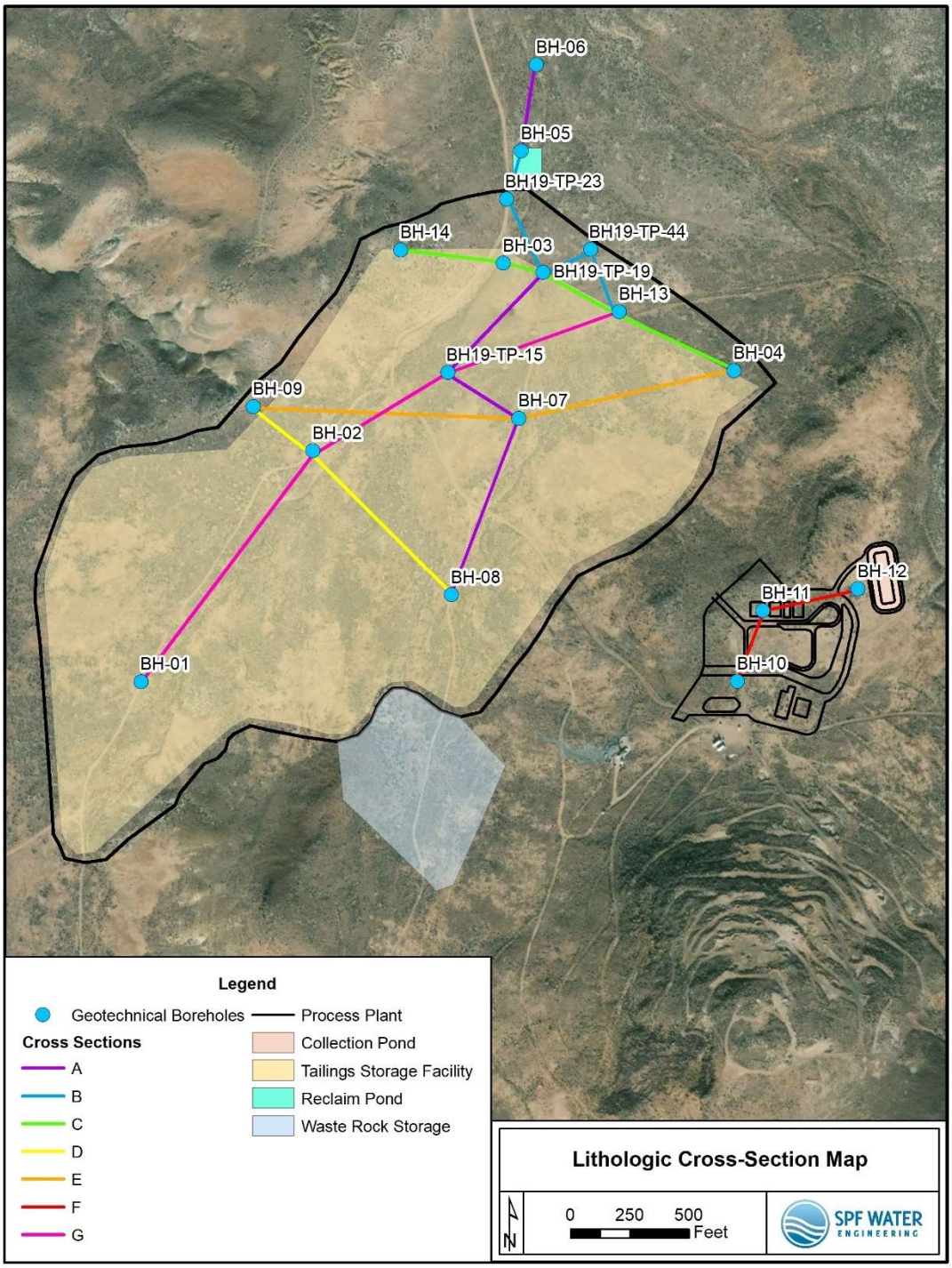

Figure 7. Lithologic cross-section map

4.3.3. **Field Permeability**

Field permeability (falling head) tests were also performed at six boreholes to estimate the hydraulic conductivity of subsurface soils (Golder 2018). Results are summarized on Table 1. The hydraulic conductivity values of the shallow alluvial sands are on the low end for sands, representative of silt and silty sand (Freeze and Cherry 1979).

Table 1. Estimated hydraulic conductivity (Golder 2018)

Borehole ID	Test Interval (feet bgs)	Material Description (UCSC Classification)	Estimated Hydraulic Conductivity (cm/s)
BH-2	20 to 25	Poorly Graded Sand (Beach Deposits)	1.1×10^{-6}
BH-3	2 to 4	Poorly Graded Sand (Overburden)	8.1×10^{-6}
BH-5	10 to 15	Poorly Graded Sand (Overburden)	4.6×10^{-6}
BH-6	22.8 to 24.8	Fat Clay (Lacustrine)	1.2×10^{-7}
BH-7	14.45 to 19.45	Poorly Graded Sand with Clay and Gravel (Overburden)	3.5×10^{-6}
BH-9	3.6 to 8.6	Poorly Graded Sand (Overburden)	5.4×10^{-5}

4.3.4. **Monitoring Wells**

In addition to the geotechnical boreholes, there are existing monitoring wells located in the near vicinity of the TSF that provide information on local hydrogeology. These monitoring wells are shown on Figure 8. Driller's reports are included in Appendix F.

The BLM well is located within the footprint of the TSF. The well is located at an elevation of approximately 3,580 feet. This well was constructed to a total depth of 175 feet. The well log describes clay to a depth of 170 feet and white sand between a depth of 170 and 175 feet. Groundwater was encountered at a depth of 165 feet. The well is reportedly screened from a depth of 159 to 166 feet. This log suggests that the lacustrine deposits encountered in the geotechnical bores extend to a depth of at least 170 feet in his area. The static water level in the well has varied between approximately 156 and 157 feet bgs during the baseline monitoring period (March 2013 through September 2018). This is equivalent to a water surface elevation of approximately 3423 to 3424 feet, refer to Figure 9.

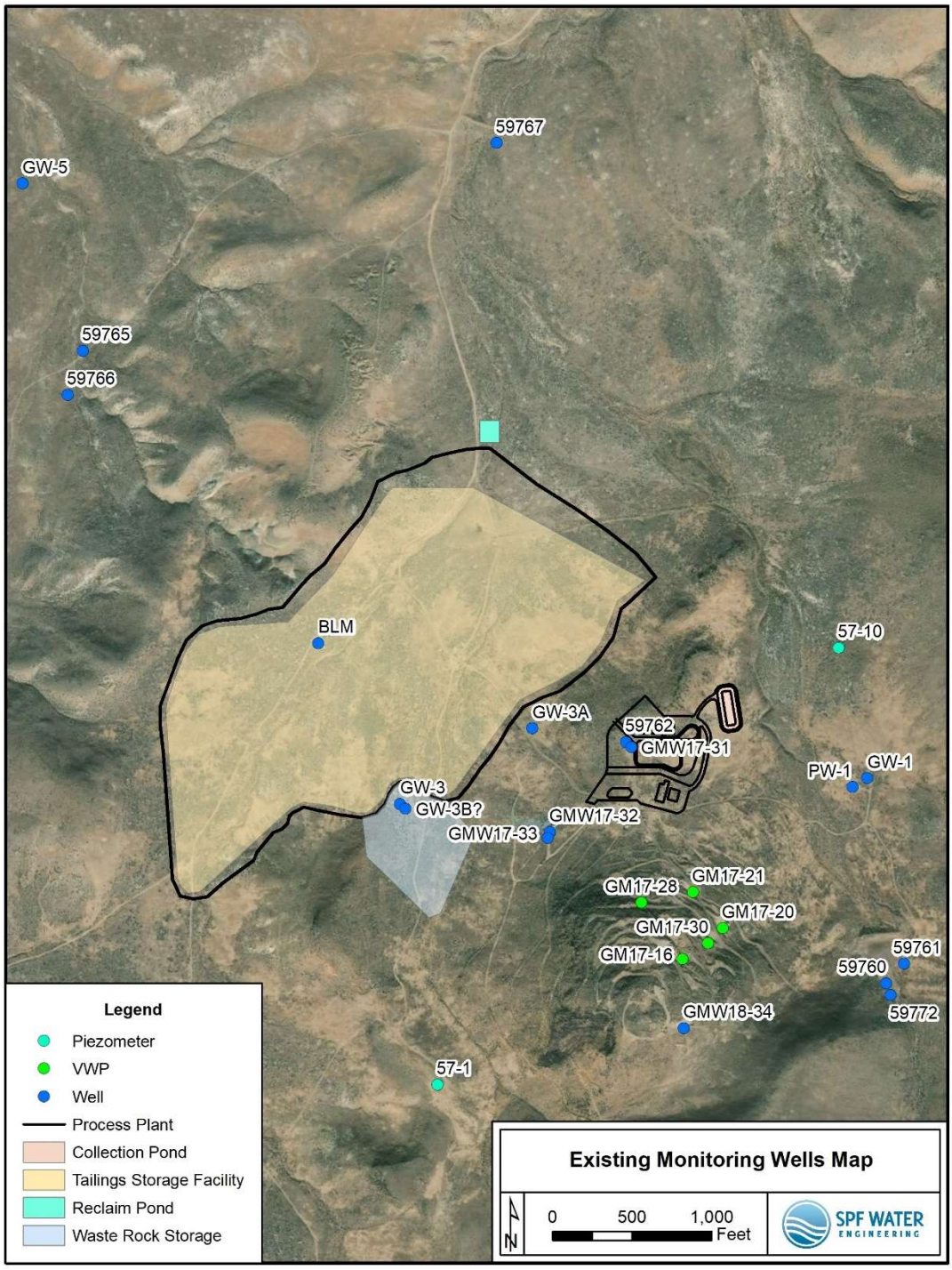

Figure 8. Existing monitoring wells map

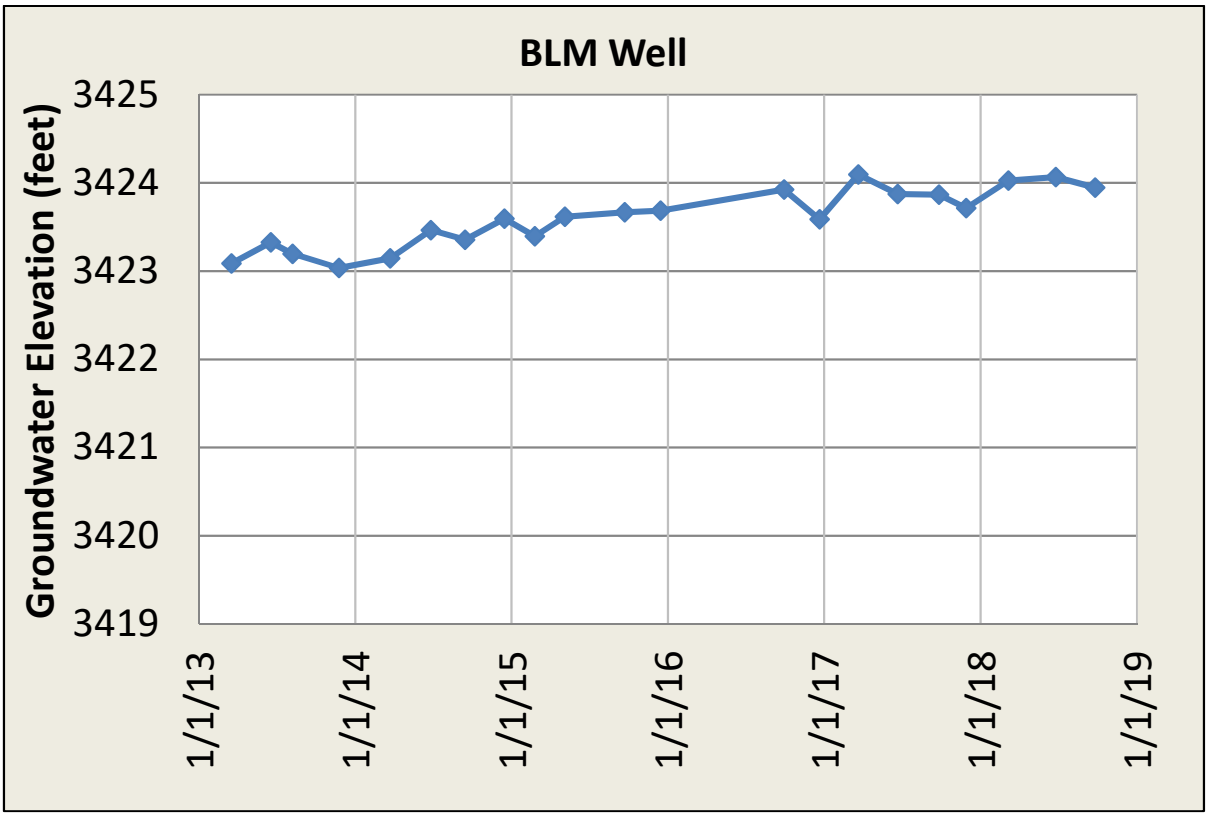

Figure 9. BLM well groundwater elevation

Well GW-3 is located southeast (up-gradient) of the TSF, at an elevation of approximately 3,630 feet. The driller's log describes clay to the total depth of 400 feet. These clay deposits are likely part of the same lacustrine deposits encountered in the geotechnical bores. Groundwater was not encountered during drilling. The well is reportedly screened from a depth of 320 to 350 feet. Groundwater was not observed during drilling of the well in 1989. However, groundwater has since entered the well. Between March 2013 and September 2017, the static water level measured in the well varied between approximately 223 and 224 feet bgs, equivalent to a water surface elevation ranging from 3406 to 3407 feet. Between September 2017 and September 2018, the static water level varied between approximately 224 and 228 feet bgs, equivalent to a water surface elevation ranging from about 3402 to 3406 feet. Figure 10 is a plot of groundwater elevation.

Well GW-3A is also located southeast (up-gradient) of the TSF and northeast of GW-3, at an elevation of approximately 3,640 feet. GW-3A was constructed to a total depth of 420 feet, encountering clay with silt and tuff to a depth of 300 feet and clay with silt and sandstone to total depth. The well is reportedly screened from a depth of 360 to 400 feet. Groundwater was not encountered during drilling nor following construction.

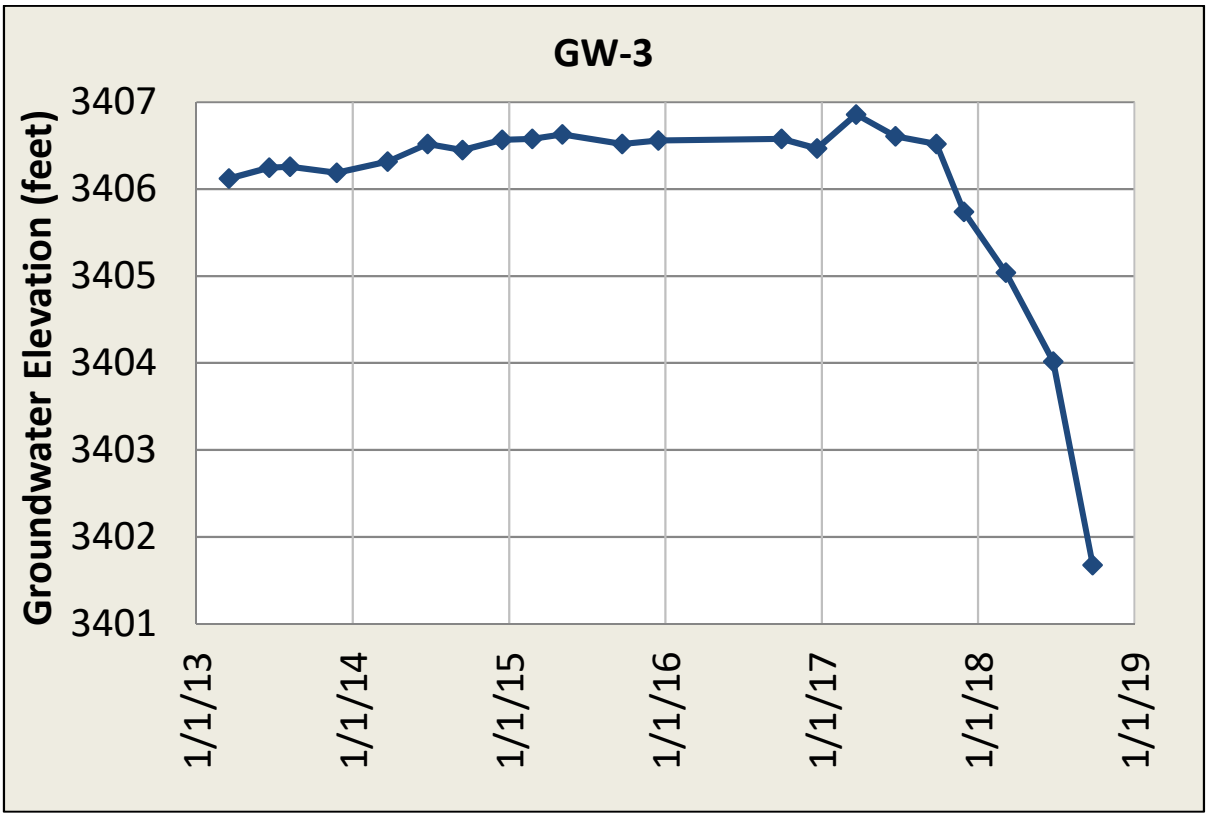

Figure 10. GW-3 groundwater elevation

Well 59766 is located northwest (down-gradient) of the TSF, at an elevation of approximately 3,457 feet. This well was constructed to a total depth of 76.5 feet. The well log describes layers of siltstone and sandstone to total depth, presumably sediments of the Grassy Mountain Formation. The alluvial and lacustrine deposits identified in the TSF geotechnical bores were not encountered. The well is reportedly screened from a depth of 25 to 45 feet. Groundwater was not observed during drilling of the well in 1993. However, groundwater has since entered the well. Between March 2013 and September 2018, the static water level measured in the well varied between approximately 27 and 30 feet bgs, equivalent to a water surface elevation ranging from 3427 to 3430 feet. Figure 11 is a plot of groundwater elevation.

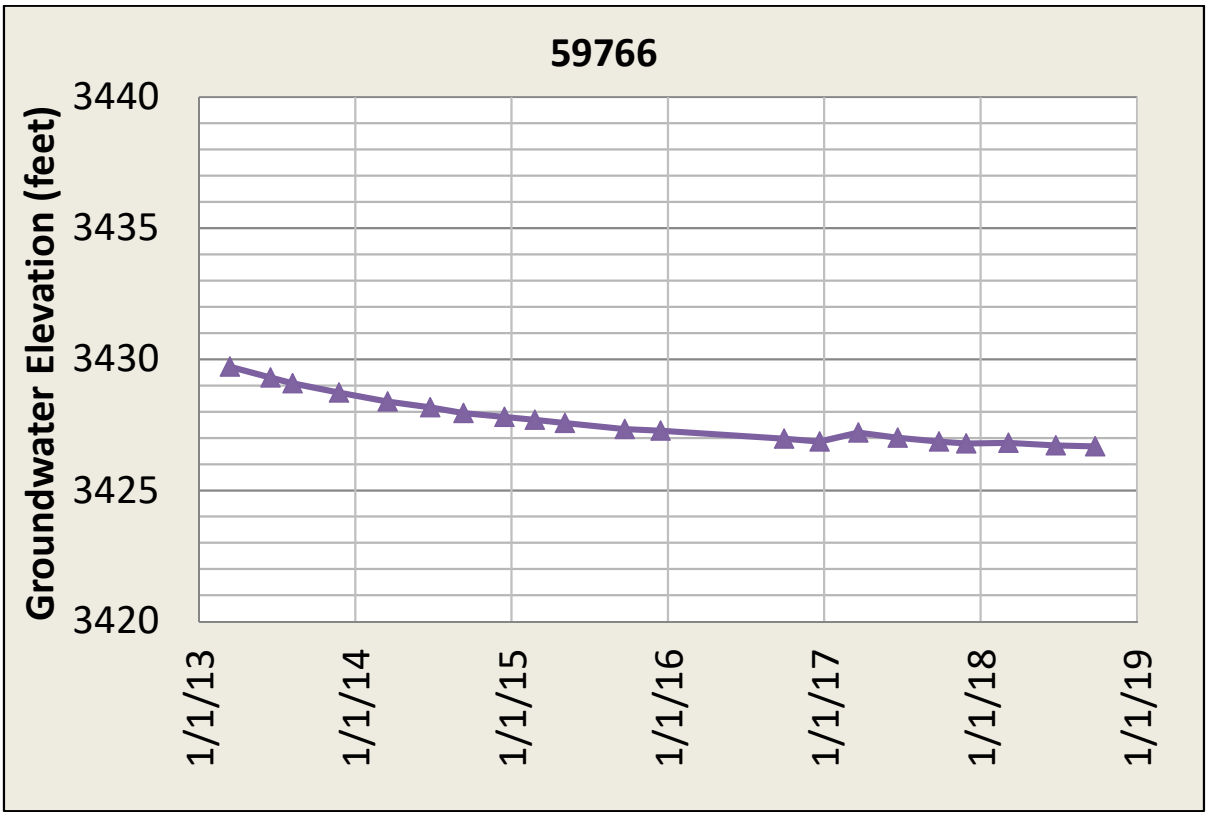

Figure 11. 59766 groundwater elevation

Well 59765 is also located northwest (down-gradient) of the TSF, about at an elevation of approximately 3,445 feet. This well was constructed to a total depth of 37 feet, with layers of siltstone and sandstone (Grassy Mountain Formation) to total depth. The alluvial and lacustrine deposits identified in the TSF geotechnical bores were not encountered. The well is reportedly screened from a depth of 28 to 36 feet. Groundwater was not observed during drilling of the well in 1993 nor following construction.

4.3.5. **Conclusions**

The geology near the TSF can be described as shallow alluvial deposits of sand and clay, underlain by lacustrine clay deposits with interbedded alluvial sand zones. The dip of the sediments generally appears to follow surface topography. The shallow sands do not appear to be water-bearing, but may be saturated to some degree. The alluvial sands have a relatively low hydraulic conductivity, on the order of 10^{-6} cm/s. Drilling of the BLM well, located in the TSF footprint, indicates that a sand zone at a depth of 170 feet is water-bearing. The BLM well has a static water level of approximately 154 and 155 feet bgs, or a water surface elevation of approximately 3423 to 3424 feet. This water surface elevation is over 100 feet lower in elevation than the bottom of the TSF.

4.4. Local Geology at Collection Pond

4.4.1. **Geotechnical Boreholes**

The geotechnical field exploration program described in Section 4.3.1 included drilling three (3) borings to depths ranging from 20 to 40 ft bgs at the mine process facilities, including the collection pond. A map from Golder (2018) showing the borehole locations is included in Appendix C. Soils were classified in accordance with the Unified Soil Classification System (UCSC) by Golder geologists.

4.4.2. **Cross-Sections**

One lithologic cross-section was developed through the process plant and collection pond (Cross Section F in Appendix E and on Figure 7). This section shows a clay layer at the surface, nearly 10 feet thick southwest of the pond, and about 30 feet thick just west of the pond. Below the clay layer is a sand zone at least 10 feet thick.

4.4.3. **Field Permeability**

None of the boreholes near the collection pond were field tested for permeability. However, testing of other boreholes indicates that the shallow alluvial sands in the area have a relatively low hydraulic conductivity, on the order of 10^{-6} cm/s.

4.4.4. **Monitoring Wells**

There are two monitoring wells constructed about 600 feet east of the collection pond (see Figure 8). These wells are not up-gradient or down-gradient of the pond but provide information on local hydrogeology. Driller's reports are included in Appendix F.

Well 59762 is located at an elevation of approximately 3,723 feet. This well was constructed to a total depth of 700 feet. The well log describes surface alluvium and then layers of siltstone and sandstone to a depth of 94 feet and clayey siltstone to total depth. The siltstone is described as silicified from a depth of 180 to 355 feet. These sediments are presumably sediments of the Grassy Mountain Formation. The well is reportedly screened from a depth of 537.5 to 657.5 feet.

Groundwater was not observed during drilling of the well in 1993. However, groundwater has since entered the well. Between March 2013 and September 2018, the static water level measured in the well varied between approximately 617 and 619 feet bgs, equivalent to a water surface elevation ranging from 3103 to 3105 feet. Figure 12 is a plot of groundwater elevation.

Well GMW17-31 is located at an elevation of approximately 3,720 feet. This well was constructed to a total depth of 520 feet in August 2017. The well bore log describes layers of sandstone, arkose, sinter, siltstone, tuff, and clay to the completion depth. Traces of silicified siltstone were observed as shallow as 41 feet and were encountered sporadically throughout the rest of the lithology. No water was encountered during the drilling. The well was screened from a depth of 458 to 498 feet.

A groundwater static water level has been measured in the well since March 2018, at a depth of approximately 497.6 feet bgs, equivalent to a water surface elevation of about 3,222.6 feet.

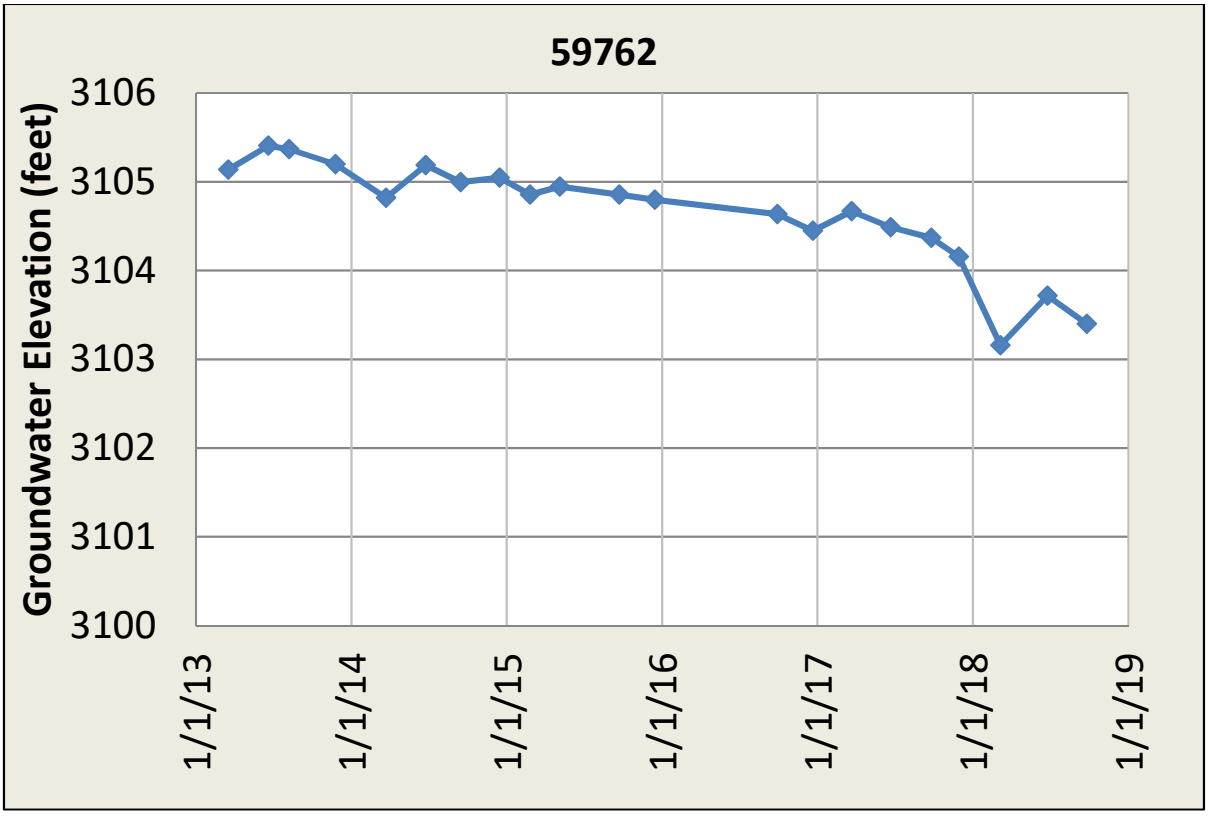

Figure 12. 59762 groundwater elevation

4.4.5. **Conclusions**

The geology near the collection pond can be described as shallow Quaternary-age alluvial deposits of sand and clay, underlain by Miocene-age lacustrine clay deposits with interbedded alluvial sand zones. Below the alluvial and lacustrine deposits are layers of siltstone, sandstone, and clayey siltstone of various degrees of silicification, to a depth of at least 700 feet. The Grassy Mountain Formation in this area has limited water-bearing potential, with an estimated hydraulic conductivity of 10^{-6} to 10^{-7} cm/s (SPF 2019b). The static water level in the near vicinity of the collection pond appears to be 500 to 600 feet bgs, or an elevation of between 3,100 and 3,200 ft asl. The water surface elevation is at least 475 feet below the bottom of the pond, although it is possible that saturated, non-water-bearing materials are present at shallower depths.

5. PROPOSED MONITORING WELLS

5.1. Introduction

New monitoring wells are proposed down-gradient of the TSF to detect contamination of any potentially affected aquifers resulting from this facility. The wells will also serve to detect contamination resulting from the TSF reclaim pond and the waste rock storage facility.

Wells are also proposed down-gradient of the process plant collection pond. The down-gradient well will be used to detect contamination of any potentially affected aquifers resulting from the collection pond.

A new deep up-gradient monitoring well is proposed to serve as a background water-quality monitoring point for the entire Project, including the TSF and the collection pond. This well will target the regional deep aquifer system; existing up-gradient wells will be used to monitor the regional shallow aquifer system up-gradient of the entire Project.

5.2. Location

The locations of the proposed monitoring wells are shown on Figure 13. There are six (6) proposed wells located down-gradient of the TSF. The six wells are proposed in two clusters, with a four-well cluster located down-gradient of the main north embankment and reclaim pond and a two-well cluster located down-gradient of the secondary west embankment. The wells in each cluster will be installed to target different depths to target potentially separate water-bearing zones.

One well is proposed down-gradient of the collection pond as shown on Figure 13. One well is proposed up-gradient of the entire Project, as shown on Figure 13.

5.3. Design Approach

5.3.1. **TSF Wells**

Available information on subsurface lithology indicates two (2) relatively shallow sand layers in the vicinity of the reclaim pond (refer to Figure 7 and lithologic cross-sections in Appendix E). One monitoring well (GMW19-2) will target a shallow sand zone, 5 to 10 feet thick, expected to occur at a depth of 20 feet bgs. Another monitoring well (GMW19-1) will target the deeper of the shallow sand zones, anticipated to be about 30 feet thick and found at a depth of 70 feet bgs. These sand zones are expected to be saturated, but with a relatively low hydraulic conductivity. Even though these wells are expected to have very low yields and may not produce adequate groundwater for sample collection, these shallow sand zones are considered to be where any leakage from the TSF or reclaim pond would be detected first. Water-level monitoring would detect the leakage, and this water could potentially be sampled.

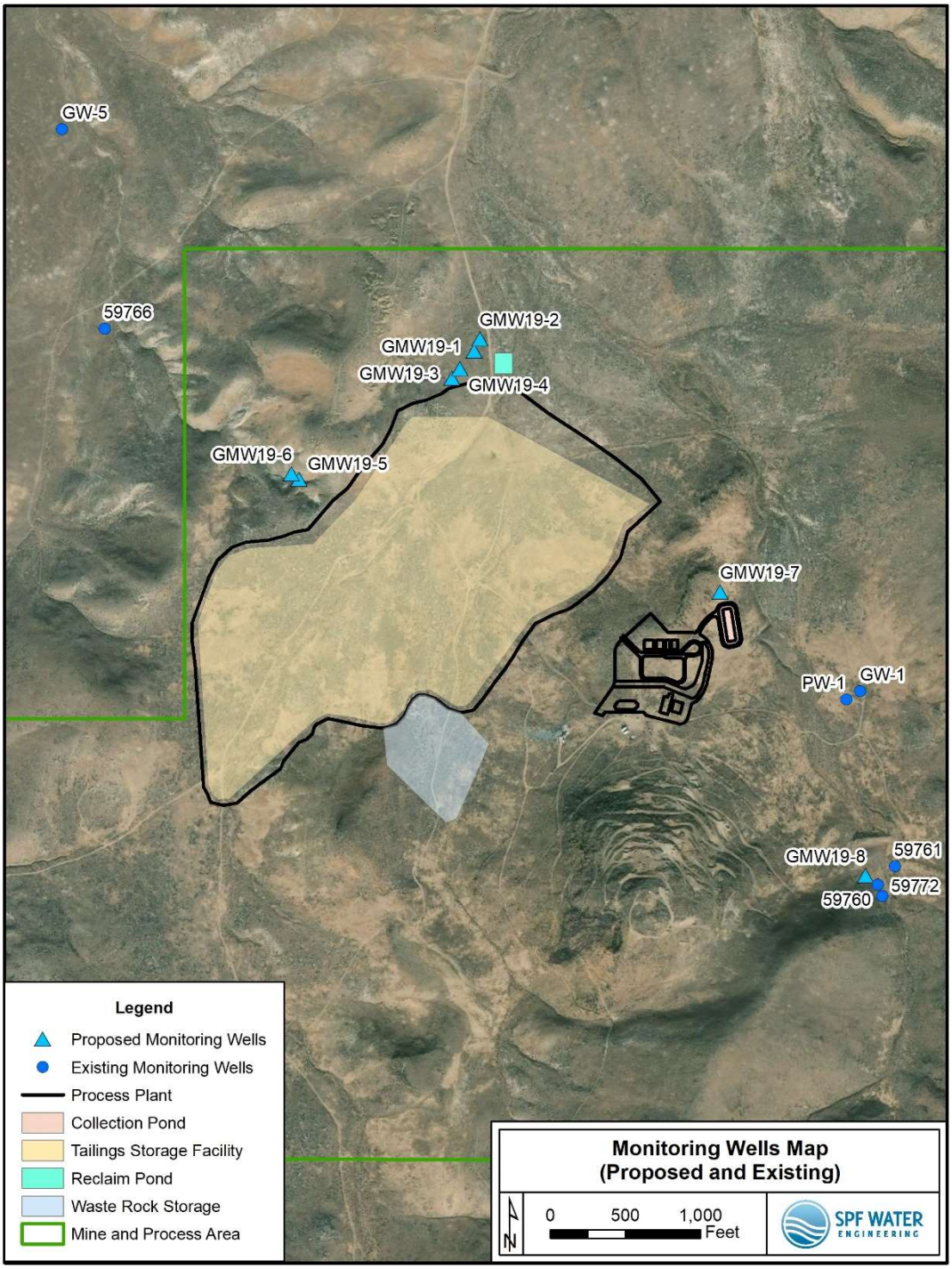

Figure 13. Monitoring wells map (proposed and existing)

A third well (GMW19-3) will target the regional shallow aquifer system, expected to occur in a sand layer at a depth of approximately 170 feet bgs. A well completed in this aquifer should produce adequate water for groundwater sampling. Given the extensive clay zones and elevation difference of over 100 feet between the bottom the TSF and the aquifer, it is unlikely that this aquifer could become contaminated by leakage from the TSF. However, a down-gradient well that can be sampled is an important component of the monitoring program.

A fourth well (GMW19-4) will be constructed to target the regional deep aquifer system, expected to occur at a depth of approximately 600 feet bgs. This depth is based on an estimated water surface elevation of about 3,000 feet for the deep aquifer system (refer to Figure 6). Monitoring of the deep aquifer is contemplated even though it is very unlikely that this aquifer could become contaminated by leakage from the TSF. There are extensive confining layers and an elevation difference of over 500 feet between the bottom the TSF and the deep aquifer.

Two other monitoring wells are proposed down-gradient of the secondary west embankment. One of these wells (GMW19-5) will target a shallow sand zone expected to occur from near ground surface to a depth of 25 feet bgs. The other well (GMW19-6) will target a deeper sand zone expected to be encountered at a depth of 50 feet bgs, and estimated to be about 20 feet thick.

These sand layers are expected to be saturated, but appear unlikely to yield appreciable groundwater. However, any leakage from the TSF would be expected to flow into one or both of these sand zones, where it could be detected by water-level monitoring and potentially sampled.

5.3.2. **Collection Pond Wells**

The subsurface lithology near the process plant collection pond appears to consist of a surface layer of clay, about 10 feet thick southwest of the pond and at least 30 feet thick near the pond (refer to Figure 7 and lithologic cross-sections in Appendix E). This clay layer is underlain by a sand zone at least 10 feet thick southwest of the pond and at least 20 feet thick west of the pond. The down-gradient well GMW19-7 will target this sand layer.

This sand zone is expected to be saturated, but is unlikely to yield appreciable groundwater due to a relatively low hydraulic conductivity. However, any leakage from the collection pond would be expected to flow into this sand zone, where it could be detected by water-level monitoring and potentially sampled to assess contamination. The silicified siltstone and sandstone underlying the surface sediments in the area of the collection pond has a very low hydraulic conductivity and is unlikely to yield adequate groundwater for sampling.

5.3.3. **Up-Gradient Wells**

One new up-gradient well is proposed to serve as background water-quality monitoring points for the entire Project, including the TSF and the collection pond. This well will be located where groundwater quality should not be affected by Project facilities (see Figure 13). The proposed well (GMW19-8) will be constructed to target the regional deep aquifer system, expected to occur at a depth of approximately 560 feet bgs. This depth is based on an estimated water surface elevation of about 3,200 feet for the deep aquifer system (refer to Figure 6). Background water-quality monitoring of the deep aquifer is anticipated even though this aquifer is unlikely to be contaminated by leakage from the TSF or collection pond. The presence of extensive confining layers and the elevation difference between the Project facilities and the deep aquifer should prevent any contamination.

Existing monitoring wells are proposed to serve as up-gradient background water-quality monitoring points for the entire Project. Additional information on these wells is provided in Section 6.4.

5.3.4. **Summary**

Monitoring well location, elevation, proposed depth, and proposed screen length are summarized in Table 2.

Table 2. Monitoring well information

Name	Location	Northing (UTM NAD83 Zone 11, Meters)	Easting (UTM NAD83 Zone 11, Meters)	Elevation (ft, amsl)	Proposed Depth (ft)	Proposed Screen Length (ft)
GMW19-1	down-gradient TSF	4,836,335.9	470,678.6	3,540	100	20
GMW19-2	down-gradient TSF	4,836,360.6	470,690.6	3,536	30	10
GMW19-3	down-gradient TSF	4,836,281.0	470,633.6	3,558	200	20
GMW19-4	down-gradient TSF	4,836,300.0	470,649.7	3,550	600	50
GMW19-5	down-gradient TSF	4,836,075.7	470,323.5	3,570	30	10
GMW19-6	down-gradient TSF	4,836,087.2	470,308.5	3,570	100	20
GMW19-7	down-gradient pond	4,835,847.2	471,177.9	3,682	50	20
GMW19-8	up-gradient Project	4,835,271.8	471,472.3	3,756	600	50

5.4. Conceptual Design

The proposed monitoring wells will be constructed with nominal 5-inch diameter PVC casing and screen. The well casing diameter will be adequate to allow for the installation of a 4-inch submersible pump for groundwater sampling.

Monitoring well construction will comply with State of Oregon monitoring well construction standards (Oregon Administrative Rules Chapter 260, Division 240, dated July 1, 2015). The contractor selected to construct the monitoring wells will have an Oregon Monitoring Well Constructor's License. The contractor shall provide notice to the Oregon Water Resources Department (OWRD) using a start card

Specific well construction details include:

- Monitoring wells will be constructed with a borehole diameter at least 4 inches larger than the nominal casing and screen diameter.
- Monitoring well casing and screen will be PVC, which is non-reactive with groundwater. PVC casing shall be spline-locking design, conforming to ASTM F-480. The casing shall be Schedule 40 for well depths of less than 100 feet and Schedule 80 for well depths of more than 100 feet.
- Casing diameter will be adequate to accommodate a 4-inch submersible pump for well testing and sampling.
- Screen slot size will be selected to be compatible with the filter pack grain size. Length of screen will depend on water-bearing formations encountered. Based on other monitoring wells in the area, it is anticipated that 0.020-inch slot screen will be used with No. 10-20 Colorado silica sand. Screen and filter pack size will be verified after drilling and examination of the drill cuttings.
- Centralizers will be installed to center well casing and screen in the borehole. Centralizers will be installed at the top and bottom of the screened interval and opposite the well casing every 20 to 50 feet depending upon total well depth.
- Filter pack (Colorado silica sand or equal) will be placed around the PVC screen. The filter pack will be clean, chemically inert, and well-rounded. The filter pack shall extend not more than 3 feet above the top of the screen and 1 foot below the bottom of the screen. Filter pack will be installed with a tremie pipe for uniform placement and to prevent bridging.
- Above the filter pack, at least 2 feet of fine-grained clean sand and/or at least 3 feet of hydrated granular bentonite will be placed to serve as a filter pack seal.
- An annular seal will be placed above the filter pack seal to ground surface, installed from the bottom through a grout (tremie) pipe. The seal material will be cement-bentonite grout, mixed at no more than 3.75 pounds of bentonite per 94-lb sack of cement (up to 5% bentonite by dry weight) with up to 7.8 gallons of water (5.2 gallons of water per 94-lb sack of cement plus 0.7 gallons of water per pound of bentonite). The water and bentonite will be mixed first, then the cement added to the slurry. The cement-bentonite grout will be weighed using ASTM Test Method

D-4380-84, and this weight must be within 10% of the specified 14.1 pounds per gallon before placing the grout.

- The annular seal will be placed in maximum 200-foot lifts to avoid excessive external pressure on well casing.
- The well seal shall be allowed to cure for 24 hours prior to well development.
- The top of the well casing will extend at least 18 inches above ground surface and be fitted with a vented, removable sanitary well cap.
- A protective steel shelter (12-inch mild steel casing, standard wall thickness) will be installed over the top of the PVC well casing. The steel shelter will include a locking cap or lid. The protective surface casing shall extend 6 inches above the top of the well casing and at least 3 feet into the ground.
- A well identification label with the start card number will be permanently attached to the surface casing in a visible location.
- A reinforced concrete pad (3 feet square, 4 inches thick) will be poured around the well head shelter. Three protective bollards will be placed around the well shelter. Each bollard shall be a metal post with a minimum diameter of 3 inches, set in and filled with concrete, and extending at least 3 feet above and 3 feet below ground surface. The bollards will be arranged in a triangular pattern, at least 2 feet from the surface casing.
- The monitoring well locations and elevations will be professionally surveyed soon after completion.

A conceptual monitoring well diagram is included in Appendix G.

5.5. Drilling Approach and Observations

The monitoring wells will be drilled by the air-rotary method, without temporary casing, if the borehole is stable. If the borehole is unstable then the well could be drilled either by the air-rotary method with temporary casing to maintain hole stability or by the mud-rotary method. If mud-rotary drilling is used, then geophysical logging will be used to identify sand zones.

Drill cuttings will be disposed of on patented land (private property). The expected source of water for drilling will be the existing on-site production wells PW-1, Prod-1, and PW-4.

The deepest well down-gradient of the TSF (GMW19-4) will be drilled first to gather information on subsurface lithology prior to drilling the other down-gradient wells.

During well drilling, a geologist will collect and evaluate drill cuttings for geologic interpretation. Formation samples will be collected at 5-foot intervals and at each significant change in lithology. Well driller observations and an examination of cuttings will be used to characterize the lithology, identify screen size and placement, and select filter pack. If the wells are drilled by mud-rotary, geophysical logging will be used to verify screen placement.

During air-rotary drilling, the presence of water can be detected when groundwater is encountered during drilling. All water-bearing zones encountered by the borehole will be noted by the supervising geologist. A rough estimate of water produced can be made by measuring the discharge of water during drilling.

5.6. Development

Following well completion, each well will initially be developed by air-lifting to remove drill water and fines, stabilize and settle the filter pack, and maximize well efficiency and capacity. Following air-lifting, any well that produces appreciable groundwater will be further developed with a test pump to document well capacity and production. Each well will be developed until the water produced is clear and free from sediment.

5.7. Monitoring Well Driller and Equipment

The selected well driller will have an Oregon Monitoring Well Constructor's License or work under the supervision of a licensed Monitoring Well Constructor. The selected well driller will have at least 5 years of experience drilling monitoring wells. All wells will be constructed under a bond. The well driller shall notify the Oregon Water Resources Department (OWRD) with a start card prior to starting well construction. The well driller will prepare and sign a monitoring well report for each monitoring well and submit to the OWRD within 30 days of well completion.

6. EXISTING MONITORING WELLS

6.1. Introduction

There are existing wells in the vicinity of the TSF and collection pond (Figure 8). Some of these wells are recommended to be used as additional down-gradient monitoring points to detect groundwater contamination. There are also existing wells located up-gradient of the Project facilities that are proposed to be used for background monitoring of the regional shallow aquifer system. The wells near the proposed facilities are described below, along with a recommendation for future use. The existing wells proposed for future monitoring are shown on Figure 13. Driller's reports are included in Appendix F.

6.2. TSF Wells

6.2.1. **BLM Well**

There has been baseline groundwater data (seven quarterly events) collected from the BLM well. The BLM well is located in the footprint of the TSF, and will be abandoned in accordance with State standards prior to construction of the TSF. Therefore, while it cannot be used as a future monitoring well, the quarterly data already collected does provide background water quality data in the near vicinity of the TSF.

6.2.2. **59766**

Well 59766 is located about 1,800 feet down-gradient of the TSF, at an elevation of approximately 3,457 feet. This well has a total depth of 76.5 feet, and a screened interval of 25 to 45 feet bgs. This well is completed in the Grassy Mountain Formation siltstone and sandstone.

The top and bottom of the screen are at elevations of 3,432 and 3,412 feet amsl, or over 100 feet below the bottom of the TSF. Given the distance and difference in elevation, well 59766 is not considered an ideal down-gradient monitoring location. However, it is still recommended that this well serve as a long-distance monitoring location. This well was included in the groundwater baseline monitoring program, with water-quality data collected during seven (7) different quarters in 2013 and 2014 (SPF 2019a). This well is equipped with a dedicated submersible pump for water-quality sampling.

6.2.3. **GW-5**

Well GW-5 is located about 3,000 feet down-gradient of the TSF, at an elevation of about 3,411 feet amsl. This well was drilled to a total depth of 265 feet, with tuff and clay reported on the bore log. The well was constructed with 2-inch Schedule 40 and 80 PVC casing and Schedule 80 PVC screen, screened from a depth of 203.5 feet to 223.5 feet (elevation of 3,207.5 feet amsl and 3,187.5 feet amsl respectively). The top of the screened interval is over 300 feet below the bottom of the TSF. The main water-bearing zone is reportedly between a depth of 220 and 265 feet bgs. The bore log and well as-built schematic is included in Appendix F.

A groundwater static water level has been measured in the well since September 2014, at a consistent depth of approximately 190 feet bgs, equivalent to a water surface elevation of about 3,221 feet. This water surface elevation is over 300 feet deeper that the bottom of the TSF.

GW-5 was reportedly sampled for water quality in the early 1990s (JMM 1991), but there is no evidence of more recent sampling. GW-5 was not included in the baseline water-quality monitoring well network.

It is recommended that GW-5 serve as a down-gradient monitoring well because of its location and because it apparently can yield adequate groundwater for sample collection. However, given its distance from the TSF, the difference in elevation, and differences on geology, the currently proposed new wells are also needed to provide better monitoring locations. GW-5 will need to be equipped with a 2-inch dedicated submersible pump for sampling.

6.3. Collection Pond Wells

6.3.1. **59762**

Well 59762 is located about 600 feet east of the collection pond. This well was constructed to a total depth of 700 feet, in silicified and non-silicified siltstone and

sandstone. The well is screened from a depth of 537.5 to 657.5 feet. The groundwater elevation in the well has varied from 3,103 to 3,105 feet amsl, over 500 feet below the bottom of the collection pond. Testing of this well in 2017 indicated a well yield of less than 1 gpm (SPF 2019b). Given the difference in elevation between the static water level in this well and the collection pond and the poor well yield, the usefulness of this well for detecting groundwater contamination from the pond is limited. It is recommended that this well not be included in the collection pond monitoring well network.

6.3.2. **GMW17-31**

Well GMW17-31 is located near 59762, about 600 feet east of the collection pond. This well was constructed to a total depth of 520 feet and screened from a depth of 458 to 498 feet bgs in silicified and non-silicified siltstone and claystone and tuff. No water was encountered during the drilling, but the well has a current groundwater elevation of about 3,222.6 feet amsl. This well does not have enough water to test and therefore should not be included in the collection pond monitoring well network.

6.4. Up-Gradient Wells

6.4.1. **59760**

Well 59760 is proposed to serve as an up-gradient background monitoring well (Figure 13). This well is located about 1,000 feet up-gradient of the proposed mine, at an elevation of approximately 3,755 feet. This well has a total depth of 205 feet, and a screened interval of 163 to 203 feet bgs. This well is completed in the regional shallow aquifer system, found locally in the Grassy Mountain Basalt (Abrams 2018). Between March 2013 and September 2018, the static water level measured in the well varied between approximately 85 and 87 feet bgs, equivalent to a water surface elevation ranging from 3,672 to 3,674 feet (see Figure 14).

Well 59760 was included in the groundwater baseline monitoring program, with water-quality data collected during seven (7) different quarters in 2013 and 2014 (SPF 2019a). This well is equipped with a dedicated submersible pump for water-quality sampling.

It is recommended that well 59760 serve as an up-gradient monitoring well because of its location, adequate yield to support groundwater sampling, and sampling history.

6.4.2. **59761**

Well 59761 is also located about 1,000 feet up-gradient of the proposed mine, near well 59760 (Figure 13). This well is proposed to serve as another up-gradient background monitoring well. This well has a total depth of 120 feet, and a screened interval of 97 to 117 feet bgs. This well is completed in the regional shallow aquifer system that occurs locally in the Grassy Mountain Basalt. The well's static water level varied between approximately 85 and 87 feet bgs between March 2013 and September 2018, equivalent to a water surface elevation ranging from 3,672 to 3,674 feet (see Figure 14).

Well 59761 was also included in the groundwater baseline monitoring program, with seven (7) different quarters of water-quality data collected in 2013 and 2014 (SPF 2019a). This well is equipped with a dedicated submersible pump for water-quality sampling. Well 59761 is proposed to serve as an up-gradient monitoring well.

6.4.3. **59772**

Well 59772 is also located near wells 59760 and 59761, up-gradient of the proposed mine (Figure 13). This well has a total depth of 207 feet, and a screened interval of 146 to 206 feet bgs. This well also targets the shallow aquifer system. The static water level measured in the well varied between approximately 91 and 93 feet bgs between March 2013 and September 2018, equivalent to a water surface elevation ranging from 3,672 to 3,674 feet (see Figure 14).

Well 59772 was also included in the groundwater baseline monitoring program, with seven (7) quarters of water-quality data. This well is equipped with a dedicated submersible pump. It is recommended that well 59772 serve as an up-gradient monitoring well.

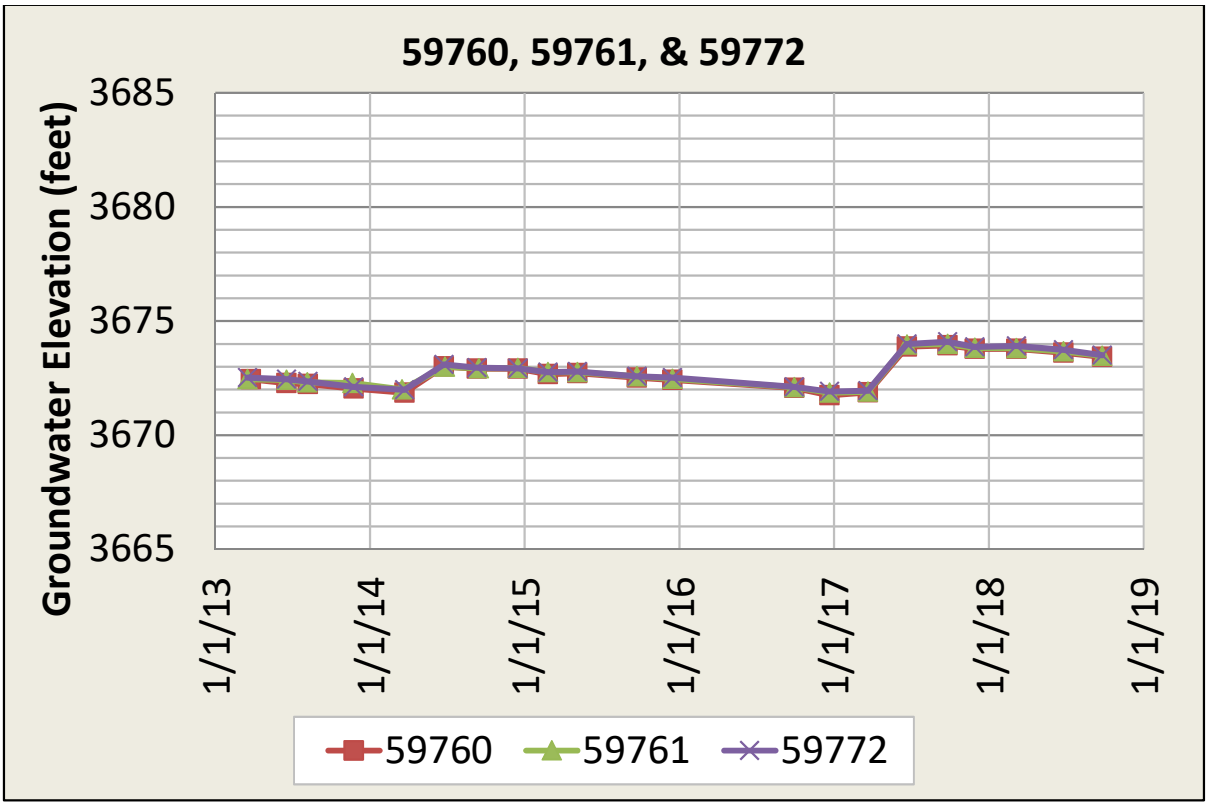

Figure 14. 59760, 59761, and 59772 groundwater elevations

6.4.4. **PW-1**

Well PW-1 is proposed to serve as an up-gradient background monitoring well (Figure 13). This well is located about 800 feet up-gradient of the proposed collection pond, at an elevation of approximately 3,702 feet. This well has a total depth of 555 feet, and a screened interval of 320 to 340 feet and 400 to 420 feet bgs. This well is completed in the regional shallow aquifer system, found locally in sediments of the Grassy Mountain Formation (Abrams 2018). Between March 2013 and September 2018, the static water level measured in the well varied between approximately 51 and 60 feet bgs, equivalent to a water surface elevation ranging from 3,655 to 3,646 feet (see Figure 14). The lower static water level observed between September 2016 and March 2018 was due to the well being used for drill water supply. The recent "normal" water surface elevation in the well is at an elevation of approximately 3,655 feet.

Well PW-1 was included in the groundwater baseline monitoring program, with water-quality data collected during seven (7) different quarters in 2013 and 2014 (SPF 2019a). This well is equipped with a submersible pump that can be used for water-quality sampling.

It is recommended that well PW-1 serve as an up-gradient monitoring well because of its location, adequate yield to support groundwater sampling, and sampling history.

6.4.5. **GW-1**

Well GW-1 is also proposed to serve as an up-gradient background monitoring well (Figure 13). This well is located near PW-1, about 850 feet up-gradient of the proposed collection pond, at an elevation of approximately 3,703 feet. This well has a total depth of 160 feet, and a screened interval of 135.5 to 155.5 feet bgs. This well is completed in the regional shallow aquifer system, found locally in sediments of the Grassy Mountain Formation (Abrams 2018). Between March 2013 and September 2018, the static water level measured in the well varied between approximately 51 and 55 feet bgs, equivalent to a water surface elevation ranging from 3,654 to 3,650 feet (see Figure 14). The lower static water level observed between September 2016 and March 2018 was due to pumping interference from PW-1. The recent "normal" water surface elevation in the well is at an elevation of approximately 3,654 feet.

Well GW-1 was included in the groundwater baseline monitoring program, with water-quality data collected during seven (7) different quarters in 2013 and 2014 (SPF 2019a). This well is equipped with a dedicated submersible pump used for water-quality sampling. Well GW-1 is recommended to be used as an up-gradient monitoring well.

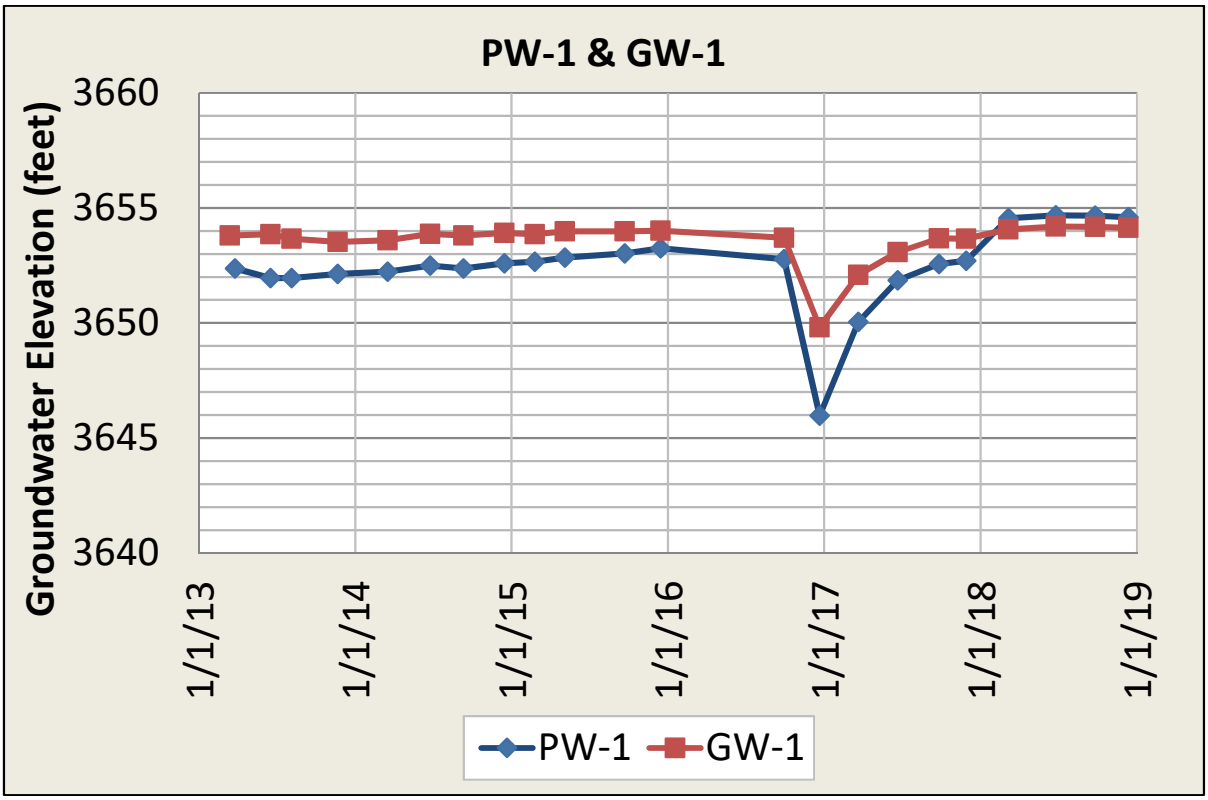

Figure 15. PW-1 and GW-1 groundwater elevations

7. GROUNDWATER MONITORING

7.1. Water-Level Monitoring

At each of the monitoring wells, the static water level will be manually measured and recorded prior to pumping (if sampled) using a non-stretch electric-line well sounder. To ensure consistency of water-level measurements, measurement points will be clearly identified on both the sampling form and physically on the well casing. For any dry wells, the sounder will be lowered to the bottom of the well. The deep well down-gradient of the TSF (GMW19-3) that will be constructed to target the regional shallow aquifer system will be equipped with a water-level transducer to continuously monitor and record water-level data.

Any wells that are in close proximity to each other (i.e. less than 500 feet) will all be measured for static water level prior to pumping any of the wells to eliminate any interference effects from pumping.

7.2. Water-Quality Sampling Approach

7.2.1. **Dedicated Pumps and Sampling Manifold**

Dedicated submersible pumps and water-level sounding tubes will be installed in each monitoring well that produces adequate water for sampling (at least 1 gpm). Dedicated pumps will eliminate the potential for cross contamination of water-quality samples. Pumps will be selected based on available well capacity as determined through development pumping. For any wells that are initially dry but eventually produce at least 1 gpm, temporary sampling pumps may be used until it can be confirmed that the wells are reliable producers and dedicated pumps are warranted.

Water-quality samples will be collected using a sampling manifold constructed of PVC and stainless steel. The manifold will allow for non-filtered sample collection, field-filtered samples for metals, and continuous monitoring of field water-quality parameters.

The existing wells PW-1, GW-1, 59766, 59760, 59761, 59772, and GW-5 are recommended for inclusion in the groundwater-quality sampling program. All of these wells except for GW-5 are already equipped with sampling pumps. Well GW-5 will need to be equipped with a pump.

7.2.2. **Purge Pumping**

All of the monitoring wells will be purged a minimum of three (3) casing volumes of water prior to sampling; purging is a standard practice to remove stagnant water prior to ground water sample collection. Purge water will be discharged to waste at the well site. During purge pumping, the pumping rate will be measured using a five-gallon bucket and stopwatch and recorded on the field data collection form. The appearance and odor of the purged water will be noted.

During purge pumping, field water-quality parameters (pH, temperature, electrical conductivity, specific conductance, and dissolved oxygen) will be continuously monitored. These field parameters will be monitored continuously during purging to ensure parameters are stable prior to sampling, indicating that the well is producing stable groundwater representative of the aquifer.

Field parameters are considered stable when consecutive measurements taken one (1) casing volume apart meet the following conditions: temperature within one (1) degree Celsius, pH within 0.3 standard pH units, and specific conductance measurements within 10% of each other (ODEQ 2009). At least three measurements of field water-quality data will be measured and recorded on the data collection form. The field equipment will be calibrated according to manufacturer recommendations each day of sampling. Personnel performing equipment calibration will be adequately trained. Results of calibration will be recorded on calibration forms.

7.2.3. **Water-Quality Sampling**

Where applicable, sampling procedures will follow the ODEQ Field Sampling Reference Guide (ODEQ 2010) and the ODEQ Water Monitoring and Assessment Mode of Operations Manual (ODEQ 2009).

Water-quality samples will be collected after purging at least three (3) casing volumes from the well and after field water-quality parameters have stabilized. For dissolved samples, samples will be filtered in the field using a disposable high-capacity field filter with 0.45 µm membrane.

Samples will be collected in bottles supplied by the laboratory with the appropriate preservative as required by the testing method. Samples will be collected by field personnel wearing nitrile gloves discarded after each use. Following collection, sample bottles will be properly labeled and immediately packed in a cooler with ice packs. Samples will be mailed to the laboratory with proper chain-of-custody documentation and procedures. This laboratory will be accredited by NELAP (National Environmental Laboratory Accreditation Program) for water analysis. Analytical methods will meet ODEQ reporting and detection limits.

7.2.4. **Quality Assurance / Quality Control**

Quality assurance and quality control (QA/QC) protocols will be implemented as described in the ODEQ Water Monitoring and Assessment Mode of Operations Manual (ODEQ 2009) and the ODEQ Quality Manual (ODEQ 2011). Specific QA/QC methods could include collection of equipment blanks, transfer blanks, and duplicate samples. The laboratory will perform internal QA/QC procedures, with results provided with the analytical results as a Level 2 analytical report. The Level 2 analytical report also typically includes a case narrative, analytical results, data qualifiers, sample receipt checklist, and chain of custody forms.

7.3. Water-Quality Analytes

Water-quality samples will be collected from all new monitoring wells that produce appreciable water. The proposed water-quality analytes are the same analytes that were sampled for during the groundwater baseline monitoring (SPF 2019a). The analytes include primarily metals (total and dissolved) and general geochemical parameters. A list of proposed analytes along with the laboratory testing method, the laboratory detection limit, and the reporting limit (five times the detection limit) are summarized in Table 3.

Table 3. Proposed list of water-quality analytes

Parameter	Laboratory Method of Analyses	Detection Limit	Reporting Limit	Sample Type
Aluminum, Al	EPA 200.7	0.03 mg/L	0.15 mg/L	total and dissolved
Total Arsenic	EPA 200.8	0.0002 mg/L	0.001 mg/L	total and dissolved
Barium, Ba	EPA 200.7	0.003 mg/L	0.015 mg/L	total and dissolved
Cadmium Low	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Calcium, Ca	EPA 200.7	0.2 mg/L	1 mg/L	total and dissolved
Chromium Low	EPA 200.8	0.0005 mg/L	0.002 mg/L	total and dissolved
Copper Low	EPA 200.8	0.0005 mg/L	0.0025 mg/L	total and dissolved
Iron, Fe	EPA 200.7	0.02 mg/L	0.05 mg/L	total and dissolved
Lead Low	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Magnesium, Mg	EPA 200.7	0.2 mg/L	1 mg/L	total and dissolved
Manganese Low	EPA 200.8	0.0005 mg/L	0.0025 mg/L	total and dissolved
Mercury, Hg (Low Level)	1631E	0.2 ng/L	0.5 ng/L	total and dissolved
Nickel Low	EPA 200.8	0.0006 mg/L	0.003 mg/L	total and dissolved
Potassium, K	EPA 200.7	0.3 mg/L	1.5 mg/L	total and dissolved
Selenium Low	EPA 200.8	0.0001 mg/L	0.00025 mg/L	total and dissolved
Silver Low	EPA 200.8	0.00005 mg/L	0.00025 mg/L	total and dissolved
Sodium, Na	EPA 200.7	0.3 mg/L	1.5 mg/L	total and dissolved
Zinc, Zn	EPA 200.7	0.01 mg/L	0.05 mg/L	total and dissolved
Antimony	EPA 200.8	0.0004 mg/L	0.002 mg/L	total and dissolved
Beryllium	EPA 200.8	0.00005 mg/L	0.00025 mg/L	total and dissolved
Bismuth	EPA 200.7	0.04 mg/L	0.2 mg/L	total and dissolved
Boron	EPA 200.8	0.0005 mg/L	0.001 mg/L	total and dissolved
Cobalt	EPA 200.8	0.00005 mg/L	0.00025 mg/L	total and dissolved
Gallium	EPA 200.7	0.1 mg/L	0.5 mg/L	total and dissolved
Lithium	EPA 200.7	0.02 mg/L	0.1 mg/L	total and dissolved
Molybdenum	EPA 200.8	0.0005 mg/L	0.0025 mg/L	total and dissolved
Scandium	EPA 200.7	0.1 mg/L	0.5 mg/L	total and dissolved
Strontium	EPA 200.7	0.01 mg/L	0.05 mg/L	total and dissolved
Thallium	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Tin	EPA 200.8	0.0004 mg/L	0.002 mg/L	total and dissolved
Titanium	EPA 200.7	0.005 mg/L	0.025 mg/L	total and dissolved
Vanadium	EPA 200.8	0.0002 mg/L	0.001 mg/L	total and dissolved
Uranium	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Nitrate+Nitrite (as N)	EPA 353.2	0.02 mg/L	0.1 mg/L	total
Ammonia Direct (as N)	EPA 350.1	0.05 mg/L	0.5 mg/L	total
Alkalinity	SM 2320B	2 mg/L	20 mg/L	total
Bicarbonate	SM 2320	2 mg/L	20 mg/L	total
Carbonate	SM 2320	2 mg/L	20 mg/L	total
Chloride, Cl	EPA 300.0	0.5 mg/L	2.5 mg/L	total
Conductivity	SM 2510B	1 umhos/cm	10 umhos/cm	total
Cyanide, Total	EPA 335.4	0.003 mg/L	0.01 mg/L	total
Cyanide, WAD	SM 4500	0.003 mg/L	0.01 mg/L	total
Fluoride, F	EPA 300.0	0.1 mg/L	0.5 mg/L	total
Hardness	SM 2340 B	calc	calc	total
pH	SM 4500-H B	0.1 C	0.1 C	total
Sulfate, SO4	EPA 300.0	0.5 mg/L	2.5 mg/L	total
Total Dissolved Solids	SM 2540C	10 mg/L	20 mg/L	total
Total Suspended Solids	SM 2540D	5 mg/L	20 mg/L	total
Total Phosphorus	EPA 365.1	0.01 mg/L	0.05 mg/L	total

7.4. Monitoring Frequency and Duration

The proposed water level and water-quality sampling will be conducted on a quarterly basis, with the first event conducted shortly after well construction and development. Background monitoring will occur at all new wells and at GW-5 for at least a year prior to any facility use to develop a reliable background water-quality signature. For the existing wells PW-1, GW-1, 59766, 59760, 59761, and 59772, seven (7) quarters of baseline groundwater-quality data have already been collected. This data is considered adequate to describe background water quality at these locations. For existing well GW-5, there are no recent water-quality data so this well will be monitored at the same frequency as the new wells.

Monitoring at all wells identified in this proposal (proposed and existing) will occur throughout operation of the mine. Monitoring will also be conducted after the mining operation as ceased, for a period of time determined by the permitting entity.

8. WATER-QUALITY DATA ANALYSIS

8.1. Water-Quality Standards

The permit-specific concentration limit is defined as the maximum acceptable concentration of a contaminant allowed in groundwater at a compliance point (down-gradient well). For new permitted facilities, the concentration limits are the background water quality (OAR 340-040). Water-quality sampling from the monitoring well network prior to mining activity will be used to establish background water quality.

8.2. Data Analysis Procedure

Background water-quality sampling results will be analyzed to develop the permit-specific concentration limit. Enough samples will be collected to conduct statistical analysis of the data points, including mean, median, and standard deviation. Sampling will adequately describe natural variability and establish reliable thresholds to determine if groundwater contamination is occurring.

A statistically significant increase in a water-quality parameter above the background concentration could indicate that the groundwater is being affected by leakage from the TSF, waste rock storage facility, or collection pond.

As with water-quality data, groundwater-level data will be recorded and analyzed statistically (mean, median, and standard deviation). The data will be plotted to identify trends and changes.

9. REPORTING REQUIREMENTS

9.1. Well Completion Reports

Following construction and testing of the new monitoring wells, a report will be prepared describing well drilling, construction, development, static groundwater level, and initial water-quality results. The reports will be transmitted to ODEQ for review and comment.

9.2. Scheduled Reporting

Following each monitoring event, water-quality data will be reported to ODEQ, in a format acceptable to the agency. The transmittal will include all data collected to date, with updated statistics including mean, median, and standard deviation. Background water-quality sampling prior to mining will be used to establish and recommend the maximum acceptable concentration of a contaminant allowed in groundwater at a monitoring well. Any sampling results collected during or after mining activity that significantly exceed the permit-specific concentration limit will be noted. Any significant changes in up-gradient water quality will also be identified. Data will be transmitted to ODEQ as soon as practical after receiving the analytical results from the laboratory.

Water-level data with statistical summaries will also be reported to ODEQ following each monitoring event. Updated plots of all water-level data will be included in the transmittal. Any statistically significant changes in water levels will be noted. Any wells that were previously dry but had measurable groundwater will be noted.

An annual report will be prepared summarizing the water-quality sampling and water-level monitoring results. The report will describe the wells monitored, the sampling and water-level measurement approaches, raw data, statistical summaries, data plots and trends, QA/QC results, and statistically significant changes potentially indicating groundwater contamination.

10. ACTION REQUIREMENTS

If monitoring indicates a significant increase in one or more water-quality parameters above the established concentration limit, the monitoring well will be immediately resampled following receipt and analysis of the water-quality results. If the resampling results also exceed the concentration limit, the following actions will be taken:

1. ODEQ will be notified of the results within 10 days of receipt of the laboratory analytical results; and
2. A Preliminary Assessment Plan (PAP) will be prepared within 30 days of receipt of the laboratory analytical results (unless an alternative schedule is approved by ODEQ). The PAP will evaluate the source and extent of the identified contaminant, and predict potential migration of the contaminant. The PAP will also assess what action, if any, is needed to prevent additional groundwater contamination as required

by ODEQ. A schedule will be presented for implementation of investigative activities.

ODEQ will review the PAP and may require a remedial investigation and/or feasibility study to protect groundwater quality, public health and safety, or the environment. The investigation will characterize the extent and nature of groundwater contamination, and provide information on the need for and selection of one or more remedial actions.

11. LIST OF PREPARERS

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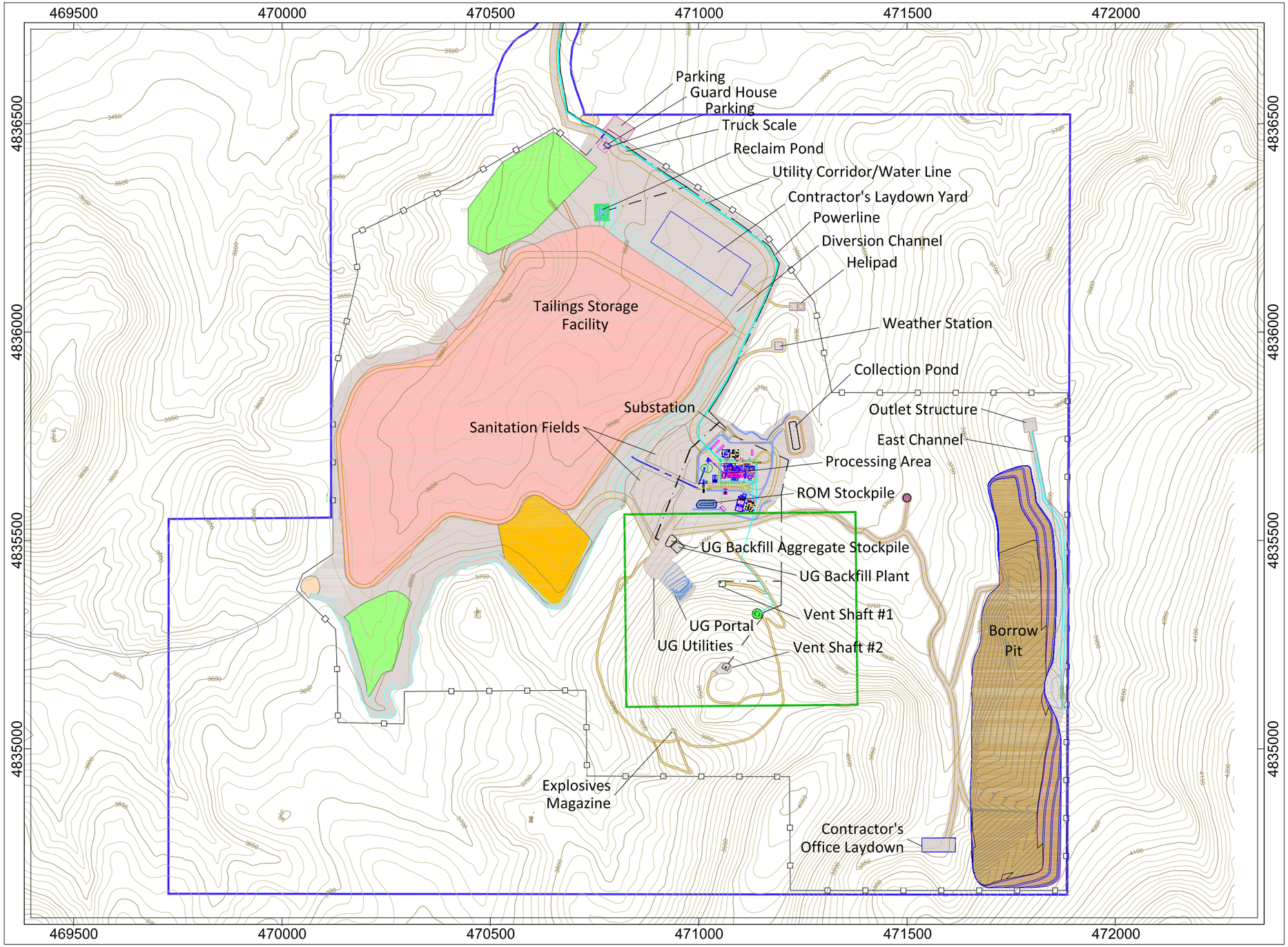
Appendix A
Project Site Layout Map



Coordinate System:
NAD 83 UTM Zone 11N
Units: Meters
Elevation: US Feet

- Permit Area
- Patented (Private) Land
- Topsoil Storage
- Disturbed Area
- Sediment Basin
- Waste Rock Storage
- Fence Line
- Power Line
- Water Line
- Diversion Channel
- Road
- Water Tank
- Water Well
- Contours (10-ft contour intervals)

0 200 400 Meters

N

MINE DEVELOPMENT ASSOCIATES

CALICO RESOURCE USA CORP.
GRASSY MOUNTAIN PROJECT
Site Layout Map

22-July-2019 Scale: as shown

Appendix B
Plant Site General Arrangement Plan

SEPTIC TANK
CULVERT
DITCH
PARKING
PLANT OFFICES & CHANGE HOUSE
LABORATORY
ADMINISTRATION BUILDING
PLANT WORKSHOP & WAREHOUSE
COLLECTION POND VOL: 110,000 ft³
CULVERT
CULVERT
DITCH
TP-B1
TP-B2
TP-B3
TP-B4
TP-B5
TP-B6
TP-A1
TP-A2
TP-A3
TP-A4
TP-A5
TP-A6
TP-C1
TP-C2
TP-C3
TP-C4
TP-C5
TP-C6
TP-C7
TP-C8
STOCKPILE & RECLAIM AREA
GOLDROOM
ELUTION AREA
REAGENT AREA
WATER SERVICE AREA
PAD EL. 3710' (NOM.)
GRINDING AREA
CIL AREA
DITCH
CRUSHING AREA
PAD EL. 3730' (NOM.)
TRUCK WASH
SUMP
ROM STOCKPILE
FUEL STORAGE
FUEL STORAGE
TRUCK WORKSHOP & WAREHOUSE
MINE OFFICE & CHANGE HOUSE
TO UG PORTAL

PRELIMINARY

50' 0 50' 100' 150' 200'
SCALE: 1"=50'

Safety in all we do

PARAMOUNT GOLD Nevada

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			E	LB	21JUN19	ISSUED FOR CLIENT REVIEW	LK		
			D	LB	08MAY19	ISSUED FOR CLIENT REVIEW	LK		
			C	LB	10APR2019	ISSUED FOR CLIENT REVIEW	LK		
			B	RK	05APR2019	ISSUED FOR CLIENT REVIEW	JTR		
			A	RK	04DEC2018	ISSUED FOR INTERNAL REVIEW	JTR		

DRAWN	RK	16NOV2018
DWG. CHECKED		
DESIGNED	JTR	16NOV2018
DES. APPR.		
PROJ. APPR.		

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Ausenco

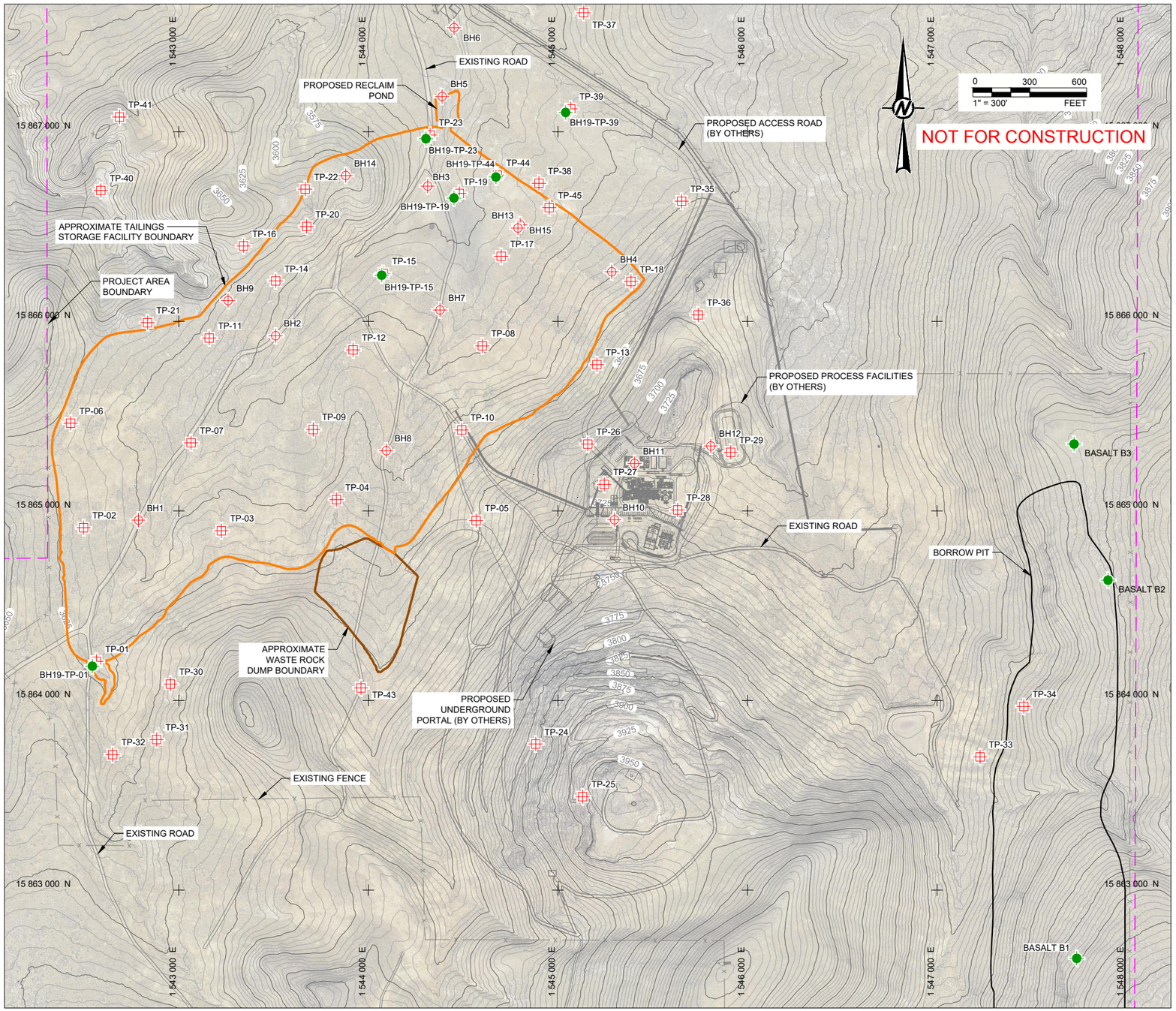
CLIENT PARAMOUNT GOLD NEVADA

TITLE GRASSY MOUNTAIN PROJECT
PLANT SITE
GENERAL ARRANGEMENT PLAN

PROJECT No.	SCALE	SIZE
101768	1" = 50'	D

DRAWING No. 101768-0000-G-102 REV E

Appendix C
Geotechnical Exploration Location Map



TEST PIT COORDINATES (UTM, ft)			
TEST PIT	EASTING (FT)	NORTHING (FT)	ELEVATION (FT)
TP-01	1,542,565.3	15,864,206.7	3,617.7
TP-02	1,542,497.3	15,864,911.7	3,616.6
TP-03	1,543,224.2	15,864,895.8	3,609.4
TP-04	1,543,831.2	15,865,060.3	3,614.1
TP-05	1,544,568.3	15,864,949.2	3,647.7
TP-06	1,542,428.9	15,865,463.4	3,617.3
TP-07	1,543,064.2	15,865,359.6	3,622.4
TP-08	1,544,601.4	15,865,870.8	3,572.8
TP-09	1,543,708.8	15,865,429.6	3,586.3
TP-10	1,544,492.0	15,865,427.3	3,607.3
TP-11	1,543,160.2	15,865,912.4	3,594.6
TP-12	1,543,919.3	15,865,849.8	3,586.1
TP-13	1,545,205.8	15,865,772.3	3,633.8
TP-14	1,543,510.8	15,866,213.8	3,581.6
TP-15	1,544,078.8	15,866,253.4	3,564.9
TP-16	1,543,341.5	15,866,398.0	3,616.9
TP-17	1,544,700.6	15,866,343.7	3,559.1
TP-18	1,545,385.1	15,866,210.6	3,610.8
TP-19	1,544,479.8	15,866,675.2	3,546.4
TP-20	1,543,674.3	15,866,500.6	1,099.2
TP-21	1,542,835.0	15,865,993.0	3,618.5
TP-22	1,543,666.7	15,866,697.8	3,615.4

TEST PIT COORDINATES (UTM, ft)			
TEST PIT	EASTING (FT)	NORTHING (FT)	ELEVATION (FT)
TP-23	1,544,325.5	15,866,983.4	3,541.1
TP-24	1,544,882.5	15,863,770.9	3,840.0
TP-25	1,545,130.2	15,863,492.7	3,942.5
TP-26	1,545,157.0	15,865,352.9	3,696.7
TP-27	1,545,244.9	15,865,140.2	3,718.5
TP-28	1,545,631.3	15,865,005.4	3,722.2
TP-29	1,545,911.0	15,865,309.8	3,680.3
TP-30	1,542,955.5	15,864,086.8	3,659.2
TP-31	1,542,882.5	15,863,794.1	3,656.6
TP-32	1,542,650.3	15,863,714.5	3,636.5
TP-33	1,547,227.2	15,863,702.5	3,788.9
TP-34	1,547,457.6	15,863,968.9	3,825.7
TP-35	1,545,652.6	15,866,634.2	3,596.6
TP-36	1,545,739.5	15,866,034.1	3,669.1
TP-37	1,545,135.8	15,867,628.8	3,562.5
TP-38	1,544,899.7	15,866,728.7	3,562.8
TP-39	1,545,067.3	15,867,121.1	3,565.4
TP-40	1,542,588.5	15,866,690.6	3,501.3
TP-41	1,542,686.7	15,867,078.2	3,549.6
TP-43	1,543,961.0	15,864,066.5	3,661.9
TP-44	1,544,680.1	15,866,771.8	3,554.4
TP-45	1,544,954.0	15,866,599.5	3,564.4

BOREHOLE COORDINATES (UTM, ft)			
BOREHOLE	EASTING (FT)	NORTHING (FT)	ELEVATION (FT)
BASALT B1	1,547,737.0	15,862,640.0	3,978.0
BASALT B2	1,547,902.0	15,864,635.0	3,904.0
BASALT B3	1,547,723.0	15,865,353.0	3,890.0
BH-01	1,542,786.9	15,864,951.6	3,599.7
BH-02	1,543,510.4	15,865,924.4	3,571.3
BH-03	1,544,312.6	15,866,713.9	3,530.9
BH-04	1,545,283.9	15,866,261.9	3,597.7
BH-05	1,544,388.7	15,867,186.2	3,528.2
BH-06	1,544,451.9	15,867,549.3	3,529.8
BH-07	1,544,377.8	15,866,060.4	3,566.9
BH-08	1,544,094.4	15,865,317.8	3,596.8
BH-09	1,543,260.0	15,866,109.6	3,596.8

BOREHOLE COORDINATES (UTM, ft)			
BOREHOLE	EASTING (FT)	NORTHING (FT)	ELEVATION (FT)
BH-10	1,545,297.7	15,864,953.6	3,732.8
BH-11	1,545,404.4	15,865,250.8	3,718.0
BH-12	1,545,806.0	15,865,342.4	3,691.2
BH-13	1,544,800.6	15,866,509.9	3,557.6
BH-14	1,543,880.5	15,866,769.4	3,600.8
BH-15	1,544,788.8	15,866,492.4	3,558.1
BH19-TP-01	1,542,543.4	15,864,181.3	3,617.7
BH19-TP-15	1,544,070.2	15,866,243.5	3,564.9
BH19-TP-19	1,544,451.3	15,866,650.7	3,546.4
BH19-TP-23	1,544,303.6	15,866,963.8	3,541.1
BH19-TP-39	1,545,040.8	15,867,102.0	3,565.4
BH19-TP-44	1,544,672.9	15,866,761.8	3,554.4

LEGEND

- PROJECT AREA BOUNDARY
- APPROXIMATE TAILINGS STORAGE FACILITY BOUNDARY
- 3600 EXISTING GROUND (5 FT CONTOURS) (NOTE 1)
- EXISTING ROAD
- BH-01 GOLDER 2017 BOREHOLE LOCATIONS (NOTE 4)
- TP-02 GOLDER 2017 TEST PIT LOCATIONS (NOTE 4)
- BH19-TP-01 GOLDER 2018 BOREHOLE LOCATIONS (NOTE 4)
- APPROXIMATE LIMIT OF BORROW PIT
- APPROXIMATE WASTE ROCK DUMP BOUNDARY

NOTE(S)

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY MDA ON MARCH 29, 2017 IN AN ELECTRONIC FILE TITLED "contours_2ft_expanded_project_area.dxf".
2. PROJECT AREA BOUNDARY PROVIDED BY PARAMOUNT ON JANUARY 12, 2017 IN AN ELECTRONIC FILE TITLED "grassymtn_updated_permitareaboundary.dxf".
3. EXISTING GROUND CONTOURS AND EXPLORATION LOCATIONS PRESENTED ARE IN NAD83 DATUM, ZONE 11.
4. LOCATIONS OF BOREHOLES AND TEST PITS WERE RECORDED USING A HAND-HELD GPS UNIT.
5. TP-42 WAS NOT EXCAVATED DUE TO ACCESS ISSUES AND IS NOT SHOWN IN SITE PLAN.

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2019-04-19	ISSUED FOR CLIENT REVIEW	JRP	JRP	MDB	CJM

SEAL

CLIENT
CALICO RESOURCES USA CORP
GRASSY MOUNTAIN PROJECT
MALHEUR COUNTY, OREGON

CALICO RESOURCES

CONSULTANT

GOLDER

GOLDER ASSOCIATES INC.
595 DOUBLE EAGLE COURT, SUITE 1000
RENO, NV 89521
USA
[+1] (775) 828-9604
www.golder.com

PROJECT
GRASSY MOUNTAIN
TAILINGS STORAGE FACILITY
DETAILED DESIGN

TITLE
GEOTECHNICAL EXPLORATION LOCATION MAP

PROJECT NO. 1663241 | REV. A | 3 of 28 | FIGURE G2

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

0 1 in

Path: \\vern\data\MDA\1663241 Grassy Mountain PFS\600_Drawings\PRODUCTION\CONSOLIDATED PERMIT\ | File Name: 1663241_G_001_Geotechnical drilling and site layout.dwg | Last Edited By: mstelngraeber Date: 2019-06-05 Time:3:52:22 PM | Printed By: MStelngraeber Date: 2019-06-07 Time:12:15:29 PM

Appendix D
Bore Logs

RECORD OF BOREHOLE BH-01

SHEET: 1 of 3

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 6, 2017 10:00
DRILLING END: December 6, 2017 15:45
COORDINATES: N: 15,864,952 E: 1,542,787

GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80)	WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0	0.5 TOPSOIL (SP), SAND, fine to medium sand, yellow brown and tan, trace low plasticity fines, homogeneous; dense, moist; estimated 5% fines, 95% sand (ALLUVIUM/COLLUVIUM)	SP		SS S1	11-19-22 **(41)**	14/18	41			
10		10.0	(CL), LEAN CLAY, few fine sand, gray-olive to brown, homogeneous; hard, moist; estimated 90% fines, 10% sand (LACUSTRINE)	CL		SS S2	13-43-49 **(92)**	19/18	92		10: Sample S2: %Fines = 89; %Sand = 11; PI = 25; LL = 46; %MC = 16	
15						SS S3	19-25-29 **(54)**	18/18	54			
20		20.0	(CH), FAT CLAY, trace fine sand, blue-gray to brown, homogeneous; very stiff to hard, moist; estimated 99% fines, 1%sand (LACUSTRINE)	CH		SS S4	5-7-13 **(20)**	20/18	20			
25						SS S5	9-12-18 **(30)**	22/18	30			
30						SS S6	6-10-12 **(22)**	24/18	22			
35												
40												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-01

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 6, 2017 10:00
DRILLING END: December 6, 2017 15:45
COORDINATES: N: 15,864,952 E: 1,542,787

SHEET: 2 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80)	WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
40	Hollow Stem Auger	40.0	(CH), FAT CLAY, trace fine sand, blue-gray to brown, homogeneous; hard, moist; estimated 99% fines, 1%sand (LACUSTRINE) *(continued)*	CH		SS S7	9-14-50/1" **(64/7")**	20 / 13		100		
45												
50						SS S8	8-15-38 **(53)**	22 / 18		53		
55												
60						SS S9	12-23-38 **(61)**	20 / 18		61		
65												
70						SS S10	38-50/1" **(50/1")**	7 / 7		100		
75												
80												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-01

SHEET: 3 of 3

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 6, 2017 10:00
DRILLING END: December 6, 2017 15:45
COORDINATES: N: 15,864,952 E: 1,542,787

GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
80		80.0									
	Hollow Stem Auger		(CH), FAT CLAY, trace fine sand, blue-gray to brown, homogeneous; hard, moist; estimated 99% fines, 1%sand (LACUSTRINE) *(continued)*	CH		SS S11	13-19-21 **(40)**	24 / 18	40		
85											
90						SS S12	9-13-47 **(60)**	20 / 18	60		
95											
100						SS S13	13-19-35 **(54)**	20 / 18	54		
		101.5	Bottom of borehole at 101.5 ft.								
105											
110											
115											
120											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-02

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 6, 2017 08:40
DRILLING END: December 6, 2017 09:30
COORDINATES: N: 15,865,924 E: 1,543,510

SHEET: 1 of 2
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0	0.5 TOPSOIL (SP), POORLY GRADED SAND WITH GRAVEL, fine to coarse sand, little fine to coarse subrounded to subangular gravel, trace high plasticity fines, light brown, heterogeneous, iron oxide staining; very dense, moist; estimated 5% fines, 70% sand, 25% gravel (ALLUVIUM/COLLUVIUM)	SP		SS S1	12-22-33 **(55)**	18/18	55		
10		10.0	(SC), CLAYEY SAND, tan, friable; very dense, moist; estimated 15% fines, 85% sand (ALLUVIUM/COLLUVIUM)	SC		SS S2	15-24-43 **(67)**	19/18	67		
15		15.0	(CH), FAT CLAY, trace fine sand, tan-gray to pink-brown, homogeneous; very stiff to hard, moist; estimated 99%fines, 1% sand (LACUSTRINE)	CH		SS S3	9-9-15 **(24)**	18/18	24		
20						SS S4	5-5-10 **(15)**	22/18	15		
25		25.0	(SP), POORLY GRADED SAND, fine to medium sand, trace low plasticity fines, very light gray, homogeneous; very dense, moist; estimated 3% fines, 97%sand (BEACH DEPOSITS)	SP		SS S5	8-24-37 **(61)**	20/18	61		
30		31.0	(CH), FAT CLAY, trace fine sand, light pink-brown to light tan, moderately fissured; hard, moist; estimated 99%fines, 1% sand (LACUSTRINE)	CH		SS S6	7-15-18 **(33)**	20/18	33		
35											
40											

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-02

SHEET: 2 of 2

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 6, 2017 08:40
DRILLING END: December 6, 2017 09:30
COORDINATES: N: 15,865,924 E: 1,543,510

GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
40		40.0									
		41.5		CH		SS S7	14-24-29 **(53)**	22 / 18	53		
			Bottom of borehole at 41.5 ft.								
45											
50											
55											
60											
65											
70											
75											
80											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-03

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 5, 2017 08:40
DRILLING END: December 5, 2017 14:30
COORDINATES: N: 15,866,714 E: 1,544,313

SHEET: 1 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0									
		0.5	TOPSOIL								
			(SP), POORLY GRADED SAND, fine to medium sand, few fine rounded to subrounded gravel, trace high plasticity fines, light brown, heterogeneous; medium dense, moist; estimated 5% fines, 85% sand; 10% gravel (ALLUVIUM/COLLUVIUM)	SP		SS S1	3-6-10 **(16)**	16/18	16		
5											
		8.0								8: Driller observed a change in material based on drill action	
			(CH), FAT CLAY WITH SAND, little fine to medium sand, dark tan and brown, homogeneous, iron oxide staining; very stiff to hard, moist; estimated 80% fines, 20% sand (LACUSTRINE)			SS S2	12-15-14 **(29)**	18/18	29	10: Sample S2: %Fines = 78; %Sand = 22; PI = 55; LL = 89; %MC = 29.9	
10											
15						SS S3	6-8-11 **(19)**	18/18	19		
20						SS S4	7-7-15 **(22)**	14/18	22		
25				CH		SS S5	8-7-10 **(17)**	18/18	17		
30						SS S6	8-13-16 **(29)**	20/18	29		
35											
40		40.0								40: Sample S7: %	

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-03

SHEET: 2 of 3

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 5, 2017 08:40
DRILLING END: December 5, 2017 14:30
COORDINATES: N: 15,866,714 E: 1,544,313

GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft	NOTES	ADDITIONAL LAB TESTING
40	Hollow Stem Auger	40.0	(CH), FAT CLAY, trace to few fine to medium sand, dark tan and brown, homogeneous, iron oxide staining; very stiff to hard, moist; estimated 95% fines, 5%sand (LACUSTRINE)	CH		SS S7	7-11-18 **(29)**	480 / 18	29	Fines = 96; % Sand = 4; PI = 99; LL = 124; %MC = 34.7	
45											
50						SS S8	8-14-25 **(39)**	20 / 18	39	50: Sample S8: %Fines = 93; %Sand = 7; PI = 198; LL = 227; %MC = 34.5	
55											
60						SS S9	8-14-20 **(34)**	22 / 18	34		
65											
70						SS S10	13-25-49 **(74)**	20 / 18	74		
75											
80											

PENETRATION RESISTANCE BLOWS / ft: 20 40 60 80
WATER CONTENT (%): W_p W W_l 20 40 60 80

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-03

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 5, 2017 08:40
DRILLING END: December 5, 2017 14:30
COORDINATES: N: 15,866,714 E: 1,544,313

SHEET: 3 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
80		80.0									
	Hollow Stem Auger		(CH), FAT CLAY, trace to few fine to medium sand, dark tan and brown, homogeneous, iron oxide staining; very stiff to hard, moist; estimated 95% fines, 5%sand (LACUSTRINE) *(continued)*			SS S11	20-41-50/5" **(91/11")**	20 / 17	100		
85											
90				CH		SS S12	48-50/2" **(50/2")**	12 / 8	100		
95											
100		100.2				SS S13	50/2" **(50/2")**	2 / 2	100		
			Bottom of borehole at 100.2 ft.								
105											
110											
115											
120											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-04

SHEET: 1 of 2

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 1, 2017 14:40
DRILLING END: December 1, 2017 17:45
COORDINATES: N: 15,866,262 E: 1,545,284

GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80)	WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0	0.5 TOPSOIL (SP), POORLY GRADED SAND, fine to medium sand, few fine rounded to subrounded gravel, trace high plasticity fines, light brown, heterogeneous; dense, moist; estimated 5% fines, 85% sand; 10% gravel	SP								
		3.5	(CH), FAT CLAY, light tan and light brown, moderately fissured, iron oxide staining; very stiff to hard, moist; estimated 100% fines (LACUSTRINE)			SS S1	6-7-16 **(23)**	18/18	23			
5												
10				CH		SS S2	4-11-19 **(30)**	19/18	30			
15						SS S3	4-11-19 **(30)**	11/18	30			
20		20.0	(CH), FAT CLAY, few fine to medium sand, light tan and gray, homogeneous; hard, moist; estimated 90%fines, 10% sand (LACUSTRINE)			SS S4	15-15-17 **(32)**	20/18	32			
25						SS S5	11-22-41 **(63)**	20/18	63			
30				CH		SS S6	5-12-15 **(27)**	20/18	27			
35						SS S7	10-22-28 **(50)**	20/18	50			
40											40: Sand content	

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-04

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 1, 2017 14:40
DRILLING END: December 1, 2017 17:45
COORDINATES: N: 15,866,262 E: 1,545,284

SHEET: 2 of 2
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
40	Hollow Stem Auger	40.0	(CH), FAT CLAY, few fine to medium sand, light tan and gray, homogeneous; hard, moist; estimated 90%fines, 10% sand (LACUSTRINE) *(continued)*	CH		SS S8	19-40-50/5" **(90/11")**	20 / 17	100	increases with depth	
45						SS S9	9-18-35 **(53)**	20 / 18	53		
50		51.5				SS S10	5-10-17 **(27)**	20 / 18	27		
			Bottom of borehole at 51.5 ft.								
55											
60											
65											
70											
75											
80											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-05

SHEET: 1 of 2

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 6, 2017 16:00
DRILLING END: December 6, 2017 17:30
COORDINATES: N: 15,867,186 E: 1,544,389

GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0									
		0.5	TOPSOIL (CH), FAT CLAY, trace sand, brown, heterogeneous; hard, moist; estimated 95% fines, 5%sand (LACUSTRINE)	CH		SS S1	9-13-18 **(31)**	12/18	31		
10		10.0	(SP), POORLY GRADED SAND, fine to coarse sand, few fine rounded to subrounded gravel, trace high plasticity fines, light brown, heterogeneous; dense, moist; estimated 5% fines, 85% sand, 10% gravel (ALLUVIUM/COLLUVIUM)	SP		SS S2	15-20-25 **(45)**	0/18	45		
						SS S3	10-18-20 **(38)**	19/18	38		
20		20.0	(CH), FAT CLAY, few fine to medium sand, dark tan and brown, homogeneous, iron oxide staining; very stiff to hard, moist; estimated 90% fines, 10% sand (LACUSTRINE)			SS S4	6-11-17 **(28)**	26/18	28		
25						SS S5	11-16-24 **(40)**	20/18	40		
30				CH		SS S6	7-14-14 **(28)**	26/18	28		
35											
40											

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-05

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 6, 2017 16:00
DRILLING END: December 6, 2017 17:30
COORDINATES: N: 15,867,186 E: 1,544,389

SHEET: 2 of 2
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
40		40.0									
		41.5	CH	CH		SS S7	20-31-30 **(61)**	19 / 18	61		
			Bottom of borehole at 41.5 ft.								
45											
50											
55											
60											
65											
70											
75											
80											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-06

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 7, 2017 15:00
DRILLING END: December 7, 2017 15:45
COORDINATES: N: 15,867,549 E: 1,544,452

SHEET: 1 of 1
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb & 340 lb Hammer, 30 inch drop)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0		0.0									
		0.5	TOPSOIL								
			(SP), POORLY GRADED SAND WITH GRAVEL, fine to coarse sand, little fine to coarse, subangular to angular gravel, trace low plasticity fines, brown, heterogeneous; very dense, moist; estimated <5% fines, 70% sand, 25% gravel (ALLUVIUM/COLLUVIUM)								
5				SP		SS S1	30-50/3" **(50/3")**	11 / 9	100		
10	Hollow Stem Auger	10.0									
			(CH), FAT CLAY, tan to olive, homogeneous, iron oxide staining; hard, dry to moist; estimated 100% fines (LACUSTRINE)			MC S2	16-14-16 **(30)**	18 / 18	30		
				CH							
15		15.0									
			(CH), FAT CLAY WITH SAND, little fine to medium sand, tan to light brown, homogeneous, iron oxide staining; hard, moist; estimated 85% fines, 15% sand (LACUSTRINE)			MC S3	14-20-26 **(46)**	20 / 18	46		
20				CH		SS S4	18-23-20 **(43)**	18 / 18	43		
25		25.0									
			(CH), FAT CLAY, olive-green, homogeneous, iron oxide staining; hard, dry to moist; estimated 100% fines (LACUSTRINE)	CH		MC S5	9-11-23 **(34)**	18 / 18	34		
		26.5	Bottom of borehole at 26.5 ft.								
30											
35											
40											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

BH-06
1 of 1

01 - GOLDER - BOREHOLE RECORD - DF STD US LAB E-M.GDT - 5/1/18 17:51
C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\GRASSY MOUNTAIN\BORINGLOGS.GPJ

RECORD OF BOREHOLE BH-07

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 1, 2017 11:40
DRILLING END: December 1, 2017 13:10
COORDINATES: N: 15,866,060 E: 1,544,378

SHEET: 1 of 2
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80)	WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0										
		0.5	TOPSOIL									
			(SP-SC), POORLY GRADED SAND WITH GRAVEL AND CLAY, fine to coarse sand, little fine to coarse, subrounded to subangular gravel, few low plasticity fines, light tan to gray, heterogeneous, iron oxide staining; very dense, dry to moist; estimated 10% fines, 70% sand, 20% gravel (ALLUVIUM/COLLUVIUM)	SP-SC		SS S1	19-25-27 **(52)**	12 / 18	52			
5												
						SS S2	25-29-33 **(62)**	18 / 18	62			
10												
						SS S3	19-29-36 **(65)**	17 / 18	65		15: : stained red from 15 to 25 feet:	
15												
						SS S4	23-28-30 **(58)**	20 / 18	58			
20												
		25.0										
			(CH), FAT CLAY, few fine sand, light gray-green to red-brown, moderately fissured, iron oxide staining; hard, moist; estimated 90% fines, 10% sand (LACUSTRINE)	CH		SS S5	13-18-20 **(38)**	20 / 18	38		25: Samples S5/S6/S7: %Fines = 91; %Sand = 9; PI = 45; LL = 66	
25												
						SS S6	9-11-19 **(30)**	20 / 18	30			
30												
						SS S7	8-12-24 **(36)**	22 / 18	36			
35												
40												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-07

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 1, 2017 11:40
DRILLING END: December 1, 2017 13:10
COORDINATES: N: 15,866,060 E: 1,544,378

SHEET: 2 of 2
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
40		40.0									
		41.5		CH		SS S8	13-25-29 **(54)**	20 / 18	54		
			Bottom of borehole at 41.5 ft.								
45											
50											
55											
60											
65											
70											
75											
80											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-08

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 1, 2017 08:36
DRILLING END: December 1, 2017 10:50
COORDINATES: N: 15,865,318 E: 1,544,094

SHEET: 1 of 2
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft	WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0	0.5 TOPSOIL (SC), CLAYEY SAND WITH GRAVEL, fine to coarse sand, little fine subrounded to subangular gravel, some high plasticity fines, brown, heterogeneous; medium dense, moist; estimated 20% fines, 50% sand, 30% gravel (ALLUVIUM/COLLUVIUM)	SC		SS S1	6-11-6 **(17)**	12/18	17			
10		10.0	(CH), FAT CLAY WITH SAND, little fine to medium sand, olive-brown brown, heterogeneous; very stiff to hard, moist; estimated 80% fines, 20% sand (LACUSTRINE)			SS S2	5-8-10 **(18)**	18/18	18			
15						SS S3	8-10-14 **(24)**	20/18	24			
20						SS S4	6-10-14 **(24)**	19/18	24			
25				CH		SS S5	7-16-26 **(42)**	19/18	42			
30						SS S6	6-10-10 **(20)**	20/18	20			
35						SS S7	8-13-17 **(30)**	20/18	30			
40												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-08

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 1, 2017 08:36
DRILLING END: December 1, 2017 10:50
COORDINATES: N: 15,865,318 E: 1,544,094

SHEET: 2 of 2
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
40		40.0									
	Hollow Stem Auger		(CH), FAT CLAY WITH SAND, little fine to medium sand, olive-brown brown, heterogeneous; very stiff to hard, moist; estimated 80% fines, 20% sand (LACUSTRINE) *(continued)*	CH		SS S8	8-17-19 **(36)**	20 / 18	36		
45						SS S9	7-11-15 **(26)**	20 / 18	26		
50		51.5				SS S10	9-23-26 **(49)**	20 / 18	49		
			Bottom of borehole at 51.5 ft.								
55											
60											
65											
70											
75											
80											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-09

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 7, 2017 08:30
DRILLING END: December 7, 2017 14:30
COORDINATES: N: 15,866,110 E: 1,543,260

SHEET: 1 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0									
		0.5	TOPSOIL								
			(SP), POORLY GRADED SAND, fine to medium sand, few high plasticity fines, tan and dark brown, homogeneous, iron oxide staining; dense to very dense, dry to moist; estimated 10% fines, 90% sand (ALLUVIUM/COLLUVIUM)	SP		SS S1	27-34-40 **(74)**	16/18	74		
5											
10						SS S13	9-13-33 **(46)**	20/18	46		
15						SS S3	50/2" **(50/2")**	1/2	100		
20						SS S4	41-50/5" **(50/5")**	14/11	100		
25		25.0									
			(CH), SANDY FAT CLAY, some fine to coarse sand, brown-yellowish and pink-brown, moderately fissured, iron oxide staining; very stiff, moist; estimated 70%fines, 30% sand (LACUSTRINE)			SS S5	9-11-13 **(24)**	17/18	24	25: Sample S5: %Fines = 68; %Sand =32; PI = 62, LL = 96	
30				CH		SS S6	8-11-13 **(24)**	20/18	24		
35											
40											

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-09

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 7, 2017 08:30
DRILLING END: December 7, 2017 14:30
COORDINATES: N: 15,866,110 E: 1,543,260

SHEET: 2 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft	WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
40	Hollow Stem Auger	40.0	(CH), SANDY FAT CLAY, some fine to coarse sand, brown-yellowish and pink-brown, moderately fissured, iron oxide staining; very stiff, moist; estimated 70%fines, 30% sand (LACUSTRINE) *(continued)*	CH		SS S7	6-10-14 **(24)**	26 / 18	24			
45												
50		50.0	(SP), POORLY GRADED SAND, fine to medium sand, trace low plasticity fines, tan, homogeneous; very dense, moist; estimated 3% fines, 97%sand (BEACH DEPOSITS)	SP		SS S8	17-35-46 **(81)**	20 / 18	81			
55												
60						SS S9	48-50/5" **(50/5")**	12 / 11	100			
65												
70		70.0	(CL), SANDY LEAN CLAY, some fine to medium sand, gray and blue-gray, homogeneous, iron oxide staining; hard, moist; estimated 70% fines, 30% sand (LACUSTRINE)	CL		SS S10	17-24-29 **(53)**	20 / 18	53			
75												
80		80.0										

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-09

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 7, 2017 08:30
DRILLING END: December 7, 2017 14:30
COORDINATES: N: 15,866,110 E: 1,543,260

SHEET: 3 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
80		80.0									
	Hollow Stem Auger		(CH), FAT CLAY, light blue-gray and dark blue-gray, homogeneous; hard, dry to moist; estimated 100% fines (LACUSTRINE)			SS S11	50/5" **(50/5")**	6 / 5	100		
85											
90				CH		SS 12	12-19-30 **(49)**	20 / 18	49		
95											
100						SS S13	9-13-33 **(46)**	20 / 18	46		
		101.5	Bottom of borehole at 101.5 ft.								
105											
110											
115											
120											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-10

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: November 30, 2017 11:15
DRILLING END: November 30, 2017 12:45
COORDINATES: N: 15,864,954 E: 1,545,298

SHEET: 1 of 1
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80)	WATER CONTENT (%) (W_p — W — W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0		0.0	TOPSOIL									
		1.0	(CL), LEAN CLAY WITH SAND, little fine sand, trace fine subrounded to subangular gravel, light tan, homogeneous; hard, moist; estimated 80% fines, 15%sand, 5% gravel (ALLUVIUM/ COLLUVIUM)			S1	0-0					
5	Hollow Stem Auger			CL		SS S2	10-15-18 **(33)**	16 / 18	33			
10		10.0	(SM), SILTY SAND, fine to coarse sand, some low plasticity fines, light gray, heterogeneous, iron oxide staining; very dense, moist; 15% fines, 85% sand (WEATHERED ARKOSIC SANDSTONE)			SS S3	12-19-33 **(52)**	16 / 18	52			
15				SM		SS S4	26-50/2" **(50/2")**	8 / 8		100		
20		20.2				SS	50/2" **(50/2")**	1 / 2		100		
			Bottom of borehole at 20.2 ft.									
25												
30												
35												
40												

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

BH-10
1 of 1

RECORD OF BOREHOLE BH-11

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: November 30, 2017 13:20
DRILLING END: November 30, 2017 15:00
COORDINATES: N: 15,865,251 E: 1,545,404

SHEET: 1 of 1
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	REC ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0		0.0									
		0.5	TOPSOIL								
			(CH), SANDY FAT CLAY, some fine to coarse sand, trace fine subrounded to subangular gravel, light tan to olive, homogeneous; stiff to hard, moist; estimated 60% fines, 37% sand, 3% gravel (ALLUVIUM/COLLUVIUM)								
5						SS S1	7-5-8 **(13)**	20 18	13	5: Sample S2: %Fines = 60; %Sand = 37; %Gravel = 3%; PI = 62, LL = 97	
10				CH		SS S2	12-13-19 **(32)**	19 18	32	10: S2 mottled with evaporite deposits but deposits do not react to HCL	
15						SS S3	12-14-15 **(29)**	18 18	29		
20	Hollow Stem Auger	20.0									
			(SC), CLAYEY SAND, fine to coarse sand, some high plasticity fines, light green-gray and, heterogeneous; very dense, moist; estimated 15% fines, 85%sand (ALLUVIUM/COLLUVIUM)	SC		SS S4	50 **(50/")**	7 6			100
25		25.0									
			(SP-SM), POORLY GRADED SAND WITH GRAVEL AND CLAY, fine to coarse sand, little fine subangular to angular gravel, few high plasticity fines, light brown, heterogeneous; very dense, moist; estimated 8% fines, 70% sand, 22% gravel (ALLUVIUM/COLLUVIUM)			SS S5	50 **(50/")**	8 6		25: No recovery from 25 to 39 feet, grab samples of cuttings taken at about 30 and 39 feet	100
30				SP-SM		SS S6	50/1" **(50/1")**	0 1			100
35						SS S7	50/1" **(50/1")**	0 1			100
		39.0				S8					
40			Bottom of borehole at 39.0 ft.								

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

BH-11
1 of 1

01 - GOLDER - BOREHOLE RECORD - DF STD US LAB E-M.GDT - 5/1/18 17:51
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RECORD OF BOREHOLE BH-12

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: November 30, 2017 15:40
DRILLING END: November 30, 2017 16:40
COORDINATES: N: 15,865,342 E: 1,545,806

SHEET: 1 of 1
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0									
		0.5	TOPSOIL								
			(CH), FAT CLAY, trace fine to medium sand, gray to very dark gray, moderately fissured, iron oxide staining; very stiff to hard, moist; estimated 98% fines, 2%sand (LACUSTRINE?)								
5						SS S1	12-12-11 **(23)**	10/18	23		
10						SS S2	5-10-13 **(23)**	19/18	23		
15			Color change to gray to dark gray.	CH		SS S3	9-13-14 **(27)**	22/18	27		
20						SS S4	10-14-17 **(31)**	19/18	31		
25						SS S5	11-12-16 **(28)**	21/18	28		
30						SS S6	9-14-18 **(32)**	20/18	32	30: Sample S6: %Fines = 97; %Sand = 3; PI = 62, LL = 103	
		31.5	Bottom of borehole at 31.5 ft.								
35											
40											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

BH-12
1 of 1

01 - GOLDER - BOREHOLE RECORD - DF STD US LAB E-M.GDT - 5/1/18 17:51
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RECORD OF BOREHOLE BH-13

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 2, 2017 08:30
DRILLING END: December 2, 2017 16:00
COORDINATES: N: 15,866,510 E: 1,544,801

SHEET: 1 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb & 340 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80)	WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
0		0.0										
		0.5	(CH), FAT CLAY WITH SAND, little fine to medium sand, tan, moderately fissured, iron oxide staining; very stiff, moist; 85% fines, 15% sand (LACUSTRINE)									
5	Hollow Stem Auger			CH		SS S1	7-9-11 **(20)**	18/18	20		5: Sample S1: %Fines = 86; %Sand = 14; PI = 63; LL = 92	
10		10.0	(CH), SANDY FAT CLAY, some fine to coarse sand, heterogeneous, iron oxide staining; very stiff to hard, olive to gray, moist; estimated 60% fines, 40% sand (LACUSTRINE)			SS S2	11-16-22 **(38)**	19/18	38			
15						SS S3	10-11-16 **(27)**	20/18	27		15: Sample S3: %Fines = 52; %Sand = 48; PI = 62; LL = 85	
20						SS S4	16-50/5" **(50/5")**	12/11		100		
25				CH		SS S5	10-12-18 **(30)**	24/18	30		25: Sample S5: %Fines = 67; %Sand = 33; PI = 55; LL = 77	
30		30.0	(CH), FAT CLAY, trace fine to coarse sand, heterogeneous, olive, iron oxide staining; very stiff to hard, moist; estimated 95% fines, 5% sand (LACUSTRINE)			MC S6	10-12-18 **(30)**	18/18	30		30: Sample S6: %Fines = 97; %Sand = 3; PI = 62, LL = 103	
35						SS S7	6-10-18 **(28)**	20/18	28			
40												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-13

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 2, 2017 08:30
DRILLING END: December 2, 2017 16:00
COORDINATES: N: 15,866,510 E: 1,544,801

SHEET: 2 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb & 340 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	NOTES	ADDITIONAL LAB TESTING
40	Hollow Stem Auger	40.0	(CH), FAT CLAY, trace fine to coarse sand, heterogeneous, olive, iron oxide staining; very stiff to hard, moist; estimated 95% fines, 5% sand (LACUSTRINE) *(CONTINUED)*	CH		SS S8	8-13-23 **(36)**	20 / 18	36		
45		45.0	(SM), SILTY SAND, fine to medium, some low plasticity fines, tan, friable, iron oxide staining; very dense, moist,;45% fines, 55% sand (ALLUVIUM/COLLUVIUM)	SM		SS S9	8-4-50/4" **(54/10")**	20 / 16	100		
50						SS S10	22-49-50/2" **(99/8")**	18 / 14	100		
55						SS S11	18-47-50/5" **(97/11")**	24 / 17	100		
60						SS S12	18-38-50/5" **(88/11")**	20 / 17	100		
65		65.0	(CH), FAT CLAY, gray and dark blue-gray, homogeneous; hard, moist; estimated 100% fines (LACUSTRINE)	CH		SS S13	9-13-47 **(60)**	20 / 18	60		
70											
75						SS S14	13-27-34 **(61)**	20 / 18	61		
80											

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-13

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 2, 2017 08:30
DRILLING END: December 2, 2017 16:00
COORDINATES: N: 15,866,510 E: 1,544,801

SHEET: 3 of 3
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb & 340 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
80		80.0	(CH), FAT CLAY, gray and dark blue-gray, homogeneous; hard, moist; estimated 100% fines (LACUSTRINE) *(continued)*								
85	Hollow Stem Auger			CH		SS 15	28-34-38 **(72)**	24 / 18	72		
90											
95											
100						SS S16	11-18-34 **(52)**	20 / 18	52		
		101.5	Bottom of borehole at 101.5 ft.								
105											
110											
115											
120											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Clay Johnson
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

RECORD OF BOREHOLE BH-14

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: December 8, 2017 08:45
DRILLING END: December 8, 2017 09:30
COORDINATES: N: 15,866,769 E: 1,543,881

SHEET: 1 of 1
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (Automatic hammer 140 lb Hammer, 30 inch drop)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	NOTES	ADDITIONAL LAB TESTING
0	Hollow Stem Auger	0.0	0.5 TOPSOIL								
			(SW-SM), WELL-GRADED SAND WITH SILT, fine to medium, few fine subangular gravel, little low plasticity fines, tan, homogeneous, iron oxide staining; dense to very dense, moist; estimated 15% fines, 78% sand, 7% gravel (WEATHERED ARKOSIC SANDSTONE)	SW-SM		SS S0					
5						SS S1	31-38-43 **(81)**	17/18	81		
10						SS S2	15-18-27 **(45)**	14/18	45		
15						SS S3	8-14-15 **(29)**	12/18	29		
20						SS S4	13-15-21 **(36)**	14/18	36		
25		26.1				SS S5	19-29-38 **(67)**	13/18	67	25: S5 mottled with calcite deposits (reacts to HCL)	
			Bottom of borehole at 26.1 ft.								
30											
35											
40											

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Colin Bloom
CHECKED: Margaret Pryor
REVIEWED: Russ Browne

Golder Associates

BH-14
1 of 1

01 - GOLDER - BOREHOLE RECORD - DF STD US LAB E-M.GDT - 5/1/18 17:51
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RECORD OF BOREHOLE TP-15

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 26 09:15
DRILLING END: 2019 March 26 15:45
COORDINATES: Not Surveyed

SHEET: 1 of 4
GS ELEV.: 3595.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	GRAIN SIZE Gravel Sand Fines	ADDITIONAL LAB TESTING
0		0.0	**(SM) SILTY SAND WITH GRAVEL,** fine to coarse, little non plastic fines, few fine gravels, yellow-brown, dry, loose to dense Density increasing with depth	3595.0	SM		SS 1	16-20-30 **(50)**	16/18	50		
10		10.5	**(CH) FAT CLAY**, medium to high plasticity, trace fine sand, gray and white, w<PL, hard, *possible lacustrine* Sand content decreasing with depth	3584.5	CH		MC 2	8-16-25 **(41)**	13/18	25.7 41		A, M, G
15							MC 3	17-29-38 **(67)**	17/18	18.9 67	PI = 38, PL = 28	
20							MC 4	13-38-48 **(86)**	16/18	13.6 86	PI = 30, PL = 22	A, M, G
25		25.0		3570.0								
		26.0	**(SM) SILTY SAND**, fine, non plastic fines, some fine sands, light gray mottled orange, dry, very dense, finer with depth	3569.0	SM		MC 5	19-23-28 **(51)**	17/18	15.0 51	PI = 40 PL = 22	A, M, G
30			**(CL) LEAN CLAY**, low plasticity, trace fine sand, light gray with orange stain on surfaces, w < PL, hard Mottled orange		CL		MC 6	17-28-45 **(73)**	16/18	13.4 73	PI = 29, PL = 19	A, M, G
		30.7		3564.3								
35			**(SC) CLAYEY SAND**, fine, some medium plasticity fines, light gray, damp. very dense Some vertical stratification, approximately 20-30% orange mottle		SC		MC 7	29-48-50/3" **(98/9")**	15/15	9.6 100	PI = 21, PL = 14	A, M, G
40		40.0		3555.0								

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-15

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 26 09:15
DRILLING END: 2019 March 26 15:45
COORDINATES: Not Surveyed

SHEET: 2 of 4
GS ELEV.: 3595.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (ASTM D1586, 140 lb hammer, 30 inch drop, Automatic hammer)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	GRAIN SIZE (Gravel / Sand / Fines)	ADDITIONAL LAB TESTING
40		40.0		3555.0								
		40.5	**(CL) LEAN CLAY**, low plasticity, trace fine sand, light gray and light yellow, w < PL, hard	3554.5	CL		MC 8	15-31-45 **(76)**	15/18	11.6 ○ 76 ■	PI = 17, PL = 18	
		41.0	**(SC) CLAYEY SAND**, fine to coarse, light gray and light yellow, dry, very dense	3554.0	SC							
45			**(CL) LEAN CLAY**, low plasticity, trace fine sand, light brown-gray and dark brown, laminated, w < PL, hard, *possible lacustrine*									
			Medium plasticity		CH		MC 9	12-20-28 **(48)**	18/18	48 ■		A, M, G
50			Mottled orange (~30%), increasing with depth				MC 10	8-17-28 **(45)**	18/18	32.3 ○ 45 ■	PI = 62, PL = 25	A, M, G
		51.0	**(ML) SILT**, non plastic, trace fine sand, brown-gray mottled orange, w < PL, hard	3544.0								
55					ML							
60		60.0		3535.0								
			(CH) FAT CLAY, medium plasticity, few fine sands, gray with black, w < PL, hard				MC 11	12-17-28 **(45)**	18/18	45 ■		A, M, G
65												
70			High plasticity, dark brown, stratified, w ~ PL, *possible lacustrine*		CH		MC 12	17-26-28 **(54)**	18/18	54 ■ 47.9 ○	PI = 78, PL = 38	A, M, G
75												
80												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-15

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 26 09:15
DRILLING END: 2019 March 26 15:45
COORDINATES: Not Surveyed

SHEET: 3 of 4
GS ELEV.: 3595.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (ASTM D1586, 140 lb hammer, 30 inch drop, Automatic hammer)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft; WATER CONTENT (%)	GRAIN SIZE (Gravel / Sand / Fines)	ADDITIONAL LAB TESTING
80		80.0		3515.0								
		81.5		3513.5	CH		MC 13	17-27-40 **(67)**	18/18	67		
			(SM) SILTY SAND, fine, some non-plastic fines, dark blue-gray, damp, very dense More fine sand with depth		SM							
85												
90		90.0		3505.0								
			(CH) FAT CLAY, medium plasticity, dark blue-gray, white clay fleck and vein scattered throughout, w < PL, hard		CH		MC 14	21-43-50/5" **(93/11")**	17/17	36.5	100 PI = 65, PL = 36	A, M, G
95												
100		100.3		3494.7								
		101.3	**(SC) CLAYEY SAND**, fine, some non-plastic fines, dark blue gray, dry, very dense	3493.7	SC		MC 15	17-28-32 **(60)**	18/18	60		
			(CH) FAT CLAY, high plasticity, gray-blue and white fleck scattered throughout, w ~ PL, hard		CH		MC 16	18-28-50/5" **(78/11")**	17/17	33.6	100 PI = 64, PL = 26	A, M, G
105												
110												
115			Medium plasticity, trace fine sand, w > PL									
120												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-15

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 26 09:15
DRILLING END: 2019 March 26 15:45
COORDINATES: Not Surveyed

SHEET: 4 of 4
GS ELEV.: 3595.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC ATT (in)	PENETRATION RESISTANCE BLOWS / ft 20 40 60 80 / WATER CONTENT (%) W_p W W_l 20 40 60 80	GRAIN SIZE Gravel Sand Fines 10 20 30 40 50 60 70 80 90	ADDITIONAL LAB TESTING
120		120.0		3475.0								
		121.4		3473.6	CH		MC 17	18-27-50/5" **(77/11")**	17/17	24.6 ○ 100 ■	PI = 43, PL = 23	A, M, G
			Bottom of borehole at 121.4 ft. Backfilled with bentonite chips.									
125												
130												
135												
140												
145												
150												
155												
160												

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-19

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 22 14:45
DRILLING END: 2019 March 23 13:45
COORDINATES: Not Surveyed

SHEET: 1 of 4
GS ELEV.: 3535.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) W_p W W_l (20 40 60 80)	GRAIN SIZE Gravel Sand Fines (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
0		0.0	0-1 ft ~ Topsoil **(CL) LEAN CLAY,** low plasticity, gray and light gray, w < PL, very stiff, *possible lacustrine* Density increasing with depth	3535.0	CL		SS	8-11-13 **(24)**	12/18	24		
10		10.0	**(ML) SILT,** low plasticity, light gray-green; white fleck scattered throughout with orange stain, w < PL, stiff	3525.0	ML		MS SS	4-8-11 **(19)**	22/24 14/18	19		A, M, G
15		15.4	**(CH) FAT CLAY** medium to high plasticity, yellow-brown with white specks and orange stain, w < PL, very stiff	3519.6	CH		MC	9-11-13 **(24)**	14/18	24 ○ 34.4	PI = 100, PL = 33	A, M, G
20							MS SS	4-7-9 **(16)**	24/24 18/18	16		A, M, G
25			Hard 25.7-26.7ft - heavy orange stain				MC	10-24-28 **(52)**	18/18	23.2 ○ 52	PI = 135, PL = 23	A, M, G
30		30.0	**(SC) CLAYEY SAND,** fine to medium, little high plasticity fines, light yellow-brown, w < PL, very dense	3505.0	SC		MC	19-24-28 **(52)**	18/18	27.1 ○ 52	PI = 101, PL = 26	A, M, G
35			37-42ft - trace gravels				MC	16-32-32 **(64)**	18/18	26.3 ○ 64	PI = 117, PL = 20	A, M, G
40												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-19

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 22 14:45
DRILLING END: 2019 March 23 13:45
COORDINATES: Not Surveyed

SHEET: 2 of 4
GS ELEV.: 3535.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) W_p W W_l (20 40 60 80)	GRAIN SIZE Gravel Sand Fines (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
40		40.0		3495.0								
		40.5	40ft - trace fine gravel	3494.5			MC	19-21-25 **(46)**	18/18	46 / 45.5	PI = 117, PL = 24	A, M, G
		41.5	**(CL-ML) SILTY CLAY,** very low plasticity, little fine sand, trace fine gravel, light gray with some orange mottle, w < PL, hard Sand content decreasing	3493.5	CL-ML							
			(CH) FAT CLAY, high plasticity, light brown-gray, w ~ PL, very stiff		CH							
45		45.0		3490.0			MC	28-50 **(50/")**	12/12	100		
			(ML) SANDY SILT, non plastic, some fine sand, olive-gray, damp, hard Sand content increasing with depth Orange stain (~50%)		ML							
50		50.0		3485.0								
			(CH) FAT CLAY, high plasticity fines, little fine sands, yellow-brown, w ~ PL, hard				MC	10-19-22 **(41)**	18/18	41 / 42.2	PI = 179, PL = 27	A, M, G
55												
60			Medium plasticity, dark gray, w ~ PL, hard		CH		MC	25-48-50 **(98)**	18/18	22.1 / 98	PI = 51, PL = 22	A, M, G
65												
70			More fine sands, gray, moist, very dense				MC	20-29-50 **(79)**	18/18	30.3 / 79	PI = 61, PL = 28	A, M, G
		71.5	**(CL) SILTY CLAY,** low plasticity, some fine sand, gray, moist, hard	3463.5	CL							
75		75.0		3460.0								
			(CH) FAT CLAY, high plasticity, dark gray, w < PL, hard		CH							
80												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-19

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 22 14:45
DRILLING END: 2019 March 23 13:45
COORDINATES: Not Surveyed

SHEET: 3 of 4
GS ELEV.: 3535.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: Elev	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (ASTM D1586, 140 lb hammer, 30 inch drop, Automatic hammer)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft	WATER CONTENT (%)	GRAIN SIZE	ADDITIONAL LAB TESTING
80		80.0	**(CH) FAT CLAY**, medium plasticity, dark gray, w < PL, hard *(continued)*	3455.0	CH		MC	21-39-50 **(89)**	18/18		20.9	PI = 41, PL = 21	A, M, G
85			87.5-88.5ft - Rig chatter in rock, no recovery										
90			90-90.5ft - Rig chatter in rock, no recovery				MC	50/4" **(50/4")**	4/4				
		92.0	**(SP-SM) POORLY GRADED SAND WITH SILT**, fine, little non plastic fines, trace gravel, light gray, dry, very dense, homogeneous	3443.0									
95													
100					SP-SM		MC	49-50/3" **(50/3")**	9/9				
105													
		108.0	**(CL) LEAN CLAY**, low plasticity, gray, w ~ PL, hard, stratified with black on layer surfaces	3427.0									
110			Evident swelling of clays		CL		MC	28-38-50/3" **(88/9")**	15/15		17.8	PI = 24, PL = 24	A, M, G
			Difficult drilling, sucking										
115		115.0		3420.0									
			(CH) FAT CLAY, medium plasticity, some fine sands, gray, dry, very dense		CH								
120													

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-19

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 22 14:45
DRILLING END: 2019 March 23 13:45
COORDINATES: Not Surveyed

SHEET: 4 of 4
GS ELEV.: 3535.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE: Depth	DESCRIPTION	SOIL PROFILE: Elev	USCS	GRAPHIC LOG	SAMPLES: SAMPLE TYPE & NUMBER	SAMPLES: BLOWS per 6 in (ASTM D1586, 140 lb hammer, 30 inch drop, Automatic hammer)	SAMPLES: REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	GRAIN SIZE (Gravel, Sand, Fines) (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
120		120.0		3415.0								
		121.4		3413.6	CH		MC	25-45-50/5" **(95/11")**	17 / 17	20.9 ○ — 100 ■	PI = 37, PL = 22	A, M, G
			Bottom of borehole at 121.4 ft. Backfilled with bentonite chips.									
125												
130												
135												
140												
145												
150												
155												
160												

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-23

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 20 13:30
DRILLING END: 2019 March 21 11:15
COORDINATES: Not Surveyed

SHEET: 1 of 4
GS ELEV.: 3550.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) W_p W W_l (20 40 60 80)	GRAIN SIZE Gravel Sand Fines (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
0		0.0	**(CH) FAT CLAY WITH GRAVEL**, medium plasticity, little coarse gravel, trace fine sand, light brown-gray, dry, soft	3550.0	CH							
5		5.0		3545.0			SS 1	12-50/4" **(50/4")**	10/10	100		
10		10.5	**(GC) CLAYEY GRAVEL**, coarse subrounded to subangular, little medium plasticity fines, trace fine sand, gray, dry, dense, logged from auger return (drill chatter)	3539.5	GC		SS 2	16-9-10 **(19)**	18/18	19		
15			**(CH) FAT CLAY**, high plasticity, trace fine gravels, gray, w ~ PL, very stiff *possible lacustrine*				MS 3		24/24			A, M, G
20			Gray-green, excavates blocky		CH		SS 4	5-6-6 **(12)**	18/18	12		
							MS 5		24/24			A, M, G
25							SS 6	5-8-10 **(18)**	18/18	18		
		26.5		3523.5			MS 7		20/20			A, M, G
30		30.0	**(SC) CLAYEY SAND**, fine, some low plasticity fines, light gray mottled orange, heterogeneous, iron oxide and black stain on surfaces, damp, medium dense, *possible lacustrine*	3520.0	SC		SS 8	5-8-10 **(18)**	18/18	18		
			(CH) FAT CLAY, high plasticity, green-gray, w ~ PL, hard				MC 9	17-25-18 **(43)**	18/18	43 41.7	PI = 68, PL = 31	A, M, G
35					CH		MC 10	10-20-25 **(45)**	17/18	45 41.7	PI = 101, PL = 34	A, M, G
40												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

TP-23

RECORD OF BOREHOLE TP-23

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 20 13:30
DRILLING END: 2019 March 21 11:15
COORDINATES: Not Surveyed

SHEET: 2 of 4
GS ELEV.: 3550.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in (ASTM D1586 140 lb hammer 30 inch drop Automatic hammer)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	GRAIN SIZE (Gravel Sand Fines) (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
40		40.0	**(CH) FAT CLAY**, high plasticity, green-gray, w ~ PL, hard *(continued)* Orange iron oxide mottle, increasing with depth Pink gray, w < PL	3510.0	CH		MC 11	12-15-50/4" **(65/10")**	16/16	29.4	100 PI = 58, PL = 24	A, M, G
45		45.0	**(CL) LEAN CLAY**, medium plasticity, light gray mottled orange, w ~ PL, hard Dark gray and dark red Pink gray	3505.0	CL		MC 12	15-28-48 **(76)**	18/18	22.8	76 PI = 26, PL = 23	
50		50.0	**(CH) FAT CLAY**, high plasticity, dark gray, w ~ PL, hard Trace fine sand	3500.0	CH		MC 13	30-38-50/4" **(88/10")**	16/16	19.5	100 PI = 50, PL = 20	A, M, G
55												
60		60.5	Orange mottle	3489.5								
		61.5	**(MH) ELASTIC SILT** non-plastic, light gray, w < PL, hard	3488.5	ML		MC 14	35-49-50 **(99)**	18/18	26.0	99 PI = 21, PL = 32	A, M, G
65			**(CH) FAT CLAY**, high plasticity, gray, w < PL, hard		CH							
70		70.0		3480.0								
			(SC) CLAYEY SAND, fine, some non-plastic fines, light gray, dry, very dense				MC 15	50/5" **(50/5")**	0/5		100	
75					SC							
80												

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-23

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 20 13:30
DRILLING END: 2019 March 21 11:15
COORDINATES: Not Surveyed

SHEET: 3 of 4
GS ELEV.: 3550.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) W_p W W_l (20 40 60 80)	GRAIN SIZE Gravel Sand Fines (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
80		80.0	**(SC) CLAYEY SAND,** fine, some non-plastic fines, light gray, dry, very dense *(continued)*	3470.0	SC		MC 16	49-50/4" **(50/4")**	10/10	100		
85												
90							MC 17	50/4" **(50/4")**	4/4	100		
95		98.0		3452.0								
100			**(CH) FAT CLAY**, high plasticity, dark brown, w < PL, hard, stratified Some gray		CH		MC 18	14-21-24 **(45)**	18/18	45		A, M, G
105												
110		110.0		3440.0			MC 19	37-50/3" **(50/3")**	9/9	100		
115			**(SP-SM) POORLY GRADED SILTY SAND,** fine, poorly graded, little non-plastic fines, light gray, damp, very dense		SP-SM							
120		120.0		3430.0								

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-23

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 20 13:30
DRILLING END: 2019 March 21 11:15
COORDINATES: Not Surveyed

SHEET: 4 of 4
GS ELEV.: 3550.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC ATT (in)	PENETRATION RESISTANCE BLOWS / ft 20 40 60 80 / WATER CONTENT (%) W_p W W_l 20 40 60 80	GRAIN SIZE Gravel Sand Fines 10 20 30 40 50 60 70 80 90	ADDITIONAL LAB TESTING
120		120.0		3430.0								
		121.3	**(CH) FAT CLAY**, high plasticity, light gray, w ~ PL, hard Dark brown, laminated	3428.7	CH		MC 20	17-37-50/4" **(87/10")**	16 16	25.1 100	PI = 40, PL = 24	A, M, G
			Bottom of borehole at 121.3 ft. Backfilled with bentonite chips.									
125												
130												
135												
140												
145												
150												
155												
160												

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-44

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 22 08:00
DRILLING END: 2019 March 22 14:00
COORDINATES: Not Surveyed

SHEET: 1 of 4
GS ELEV.: 3608.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80)	WATER CONTENT (%) W_p W W_l (20 40 60 80)	GRAIN SIZE Gravel Sand Fines (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
0		0.0	**(ML) SILT,** non plastic, little fine to coarse subrounded to subangular gravel, light yellow-brown, dry, loose to medium dense	3608.0	ML								
5		5.0	**(SP) POORLY GRADED SAND,** fine, poorly graded, little non plastic fines, white and brown-gray, dry, medium dense Fines content increasing with depth	3603.0	SP		SS 1	9-11-12 **(23)**	12/18	23			
10		9.0 10.0	**(SC) CLAYEY SAND,** fine, some medium plasticity fines, yellow-brown, damp, medium dense	3599.0 3598.0	SC								
			(CL) SANDY LEAN CLAY, low to medium plasticity, and some sand, red-brown, w ~ PL, stiff		CL		MS 2		24/24				A, M, G
		13.5	Yellow brown, w < PL Red brown, w ~ PL	3594.5			SS 3	5-6-7 **(13)**	16/18	13			
15			**(ML) SILT WITH SAND,** non-plastic, few fine sand, gray-brown mottled orange, w ~ PL, hard		ML		MC 4	40-50/3" **(50/3")**	9/9		100		
20		20.0	Yellow brown, more sands	3588.0									
			(CH) FAT CLAY, high plasticity fines, few fine sands, yellow-brown, white clay fleck scattered throughout, w ~ PL, very stiff		CH		MS 5		24/24				A, M, G
							SS 6	9-8-10 **(18)**	17/18	18			
25							MC 7	8-12-14 **(26)**	17/18	26	36.7	PI = 62, PL = 30	A, M, G
			Stain and white speckling increases										
30							MS 8		24/24				A, M, G
							SS 9	8-9-11 **(20)**	18/18	20			
35			Brown grey				MC 10	11-16-21 **(37)**	18/18	37	39.8	PI = 74, PL = 29	A, M, G
		38.0		3570.0									
40					SC								

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-44

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 22 08:00
DRILLING END: 2019 March 22 14:00
COORDINATES: Not Surveyed

SHEET: 2 of 4
GS ELEV.: 3608.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80) / WATER CONTENT (%) W_p W W_l (20 40 60 80)	GRAIN SIZE Gravel Sand Fines (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
40		40.0	**(SC) CLAYEY SAND,** fine, little medium plasticity fines, yellow-brown, moist, very dense *(continued)*	3568.0	SC		MC 11	16-24-29 **(53)**	18/18	28.3 ○ 53 ■	PI = 58, PL = 26	A, M, G
45			Few medium plasticity fines, trace fine gravel				MC 12	29-47-50 **(97)**	15/18	17.8 ○ 97 ■	PI = 33, PL = 22	A, M, G
50			Some medium plasticity fines Grades finer with depth				MC 13	15-32-40 **(72)**	18/18	22.5 ○ 72 ■	PI = 52, PL = 27	A, M, G
55												
60							MC 14	20-37-43 **(80)**	18/18	21.0 ○ 80 ■		A, M, G
65			Light gray with orange staining, trace fine gravel									
70		70.0		3538.0								
			(CH) FAT CLAY, medium plasticity, some fine to coarse sand, brown-gray mottled orange-red, w < PL, hard		CH		MC 15	17-27-50/5" **(77/11")**	17/17	30.7 ○ 100 ■	PI = 62, PL = 24	A, M, G
75			High plasticity, White clay fleck scattered throughout									
80		80.0		3528.0								

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-44

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 22 08:00
DRILLING END: 2019 March 22 14:00
COORDINATES: Not Surveyed

SHEET: 3 of 4
GS ELEV.: 3608.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in (ASTM D1586 140 lb hammer 30 inch drop Automatic hammer)	REC / ATT (in)	PENETRATION RESISTANCE BLOWS / ft (20 40 60 80)	WATER CONTENT (%) (W_p W W_l) (20 40 60 80)	GRAIN SIZE (Gravel Sand Fines) (10 20 30 40 50 60 70 80 90)	ADDITIONAL LAB TESTING
80		80.0	**(CL) LEAN CLAY,** low to medium plasticity, some fine to coarse sand, dark gray with white clay scattered throughout, w ~ PL, hard	3528.0	CL		MC 16	17-29-33 **(62)**	18/18	24.9	62	PI = 40, PL = 21	A, M, G
85													
90		91.4		3516.6			MC 17	37-38-50 **(88)**	18/18	26.3	88	PI = 48, PL = 24	A, M, G
95			**(CH) FAT CLAY,** medium plasticity, some fine to coarse sand, black brown and stratified with white clay flecks throughout, w < PL, hard, *lacustrine*		CH								
100		100.0		3508.0			MC 18	41-50/3" **(50/3")**	6/9		100		
105			**(CL) LEAN CLAY,** low plasticity, trace fine sand, very light gray, dry, hard		CL								
110							MC 19	35-42-50 **(92)**	18/18	17.9	92	PI = 16, PL = 25	A, M, G
115													
120													

Log continued on next page

DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

GOLDER

RECORD OF BOREHOLE TP-44

PROJECT: Grassy Mountain
PROJECT NO.: 1663241
LOCATION: Vale, Oregon

DRILLING START: 2019 March 22 08:00
DRILLING END: 2019 March 22 14:00
COORDINATES: Not Surveyed

SHEET: 4 of 4
GS ELEV.: 3608.0
TOC ELEV.: na
DATUM: Geodetic

DEPTH (ft)	BORING METHOD	SOIL PROFILE Depth	DESCRIPTION	Elev	USCS	GRAPHIC LOG	SAMPLES SAMPLE TYPE & NUMBER	BLOWS per 6 in ASTM D1586 140 lb hammer 30 inch drop Automatic hammer	REC ATT (in)	PENETRATION RESISTANCE BLOWS / ft 20 40 60 80	WATER CONTENT (%) W_p W W_l 20 40 60 80	GRAIN SIZE Gravel Sand Fines 10 20 30 40 50 60 70 80 90	ADDITIONAL LAB TESTING
120		120.0		3488.0							100		
		120.4		3487.6			MC 20	50/5" **(50/5")**	0 5				
			Bottom of borehole at 120.5 ft. Backfilled with bentonite chips.										
125													
130													
135													
140													
145													
150													
155													
160													

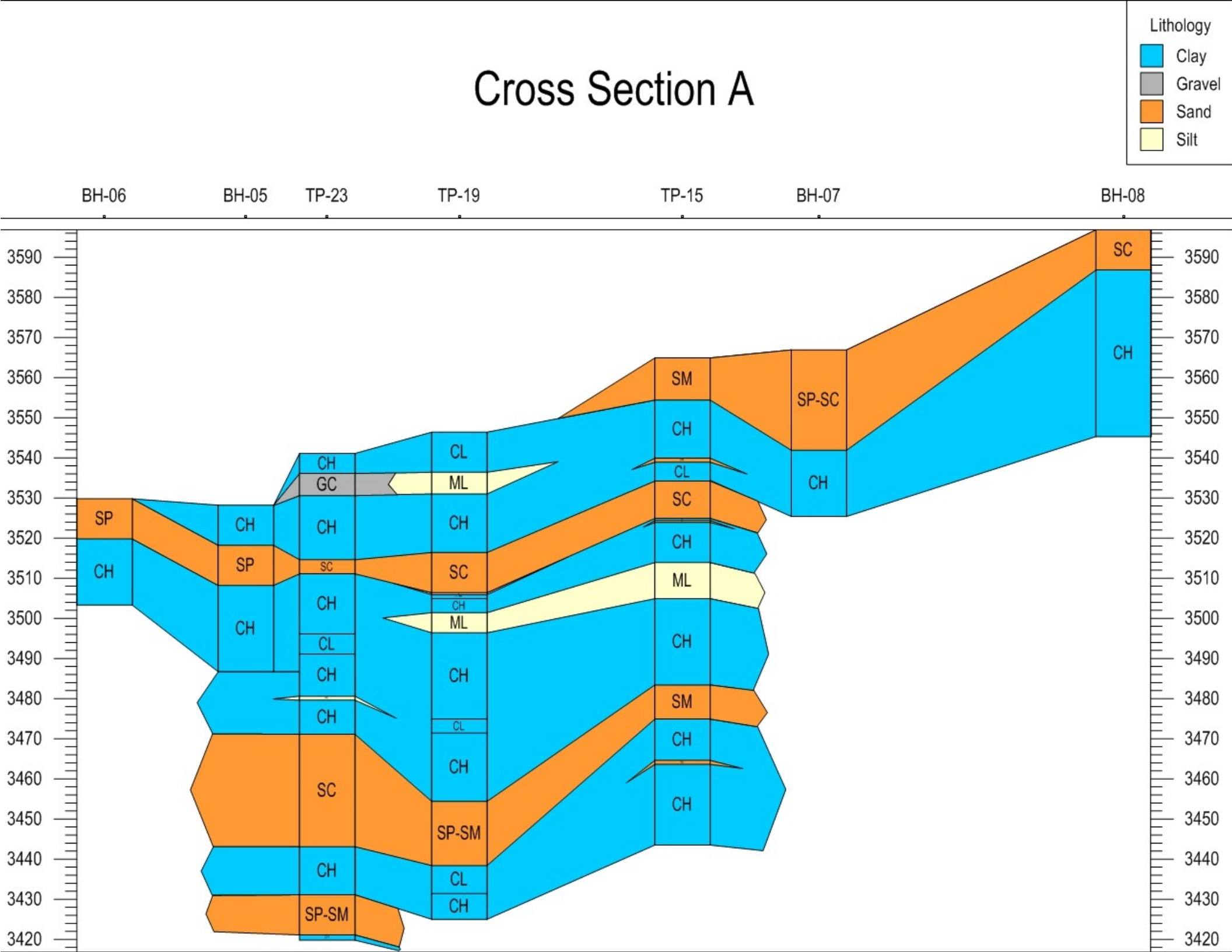
DRILLING CO.: Haz Tech
DRILLER: Jerod Willard
DRILL RIG: CME-75, Truck Mount

LOGGED: Brenda Borer
CHECKED: KDP
REVIEWED: SAM

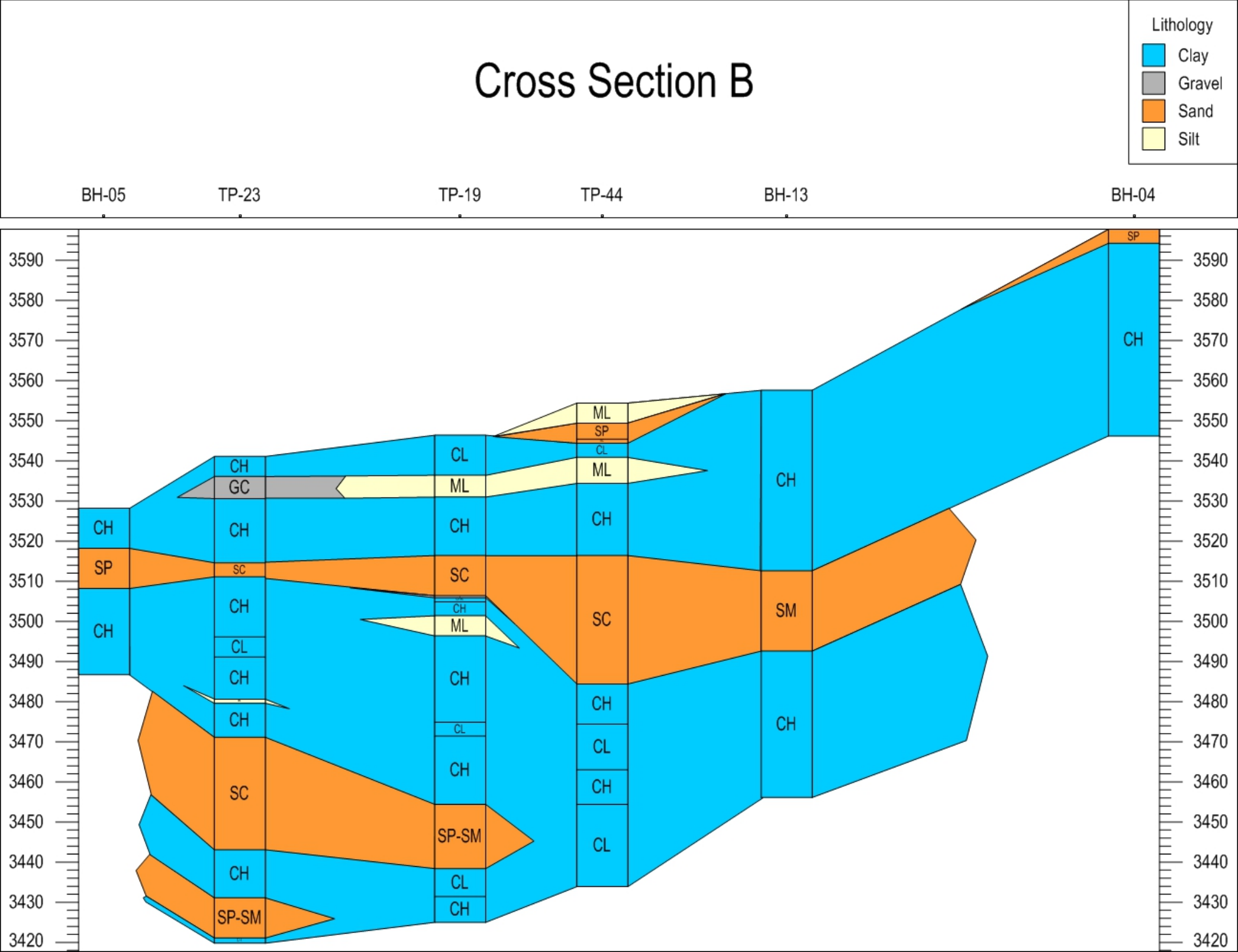
GOLDER

Appendix E
Lithologic Cross-Sections

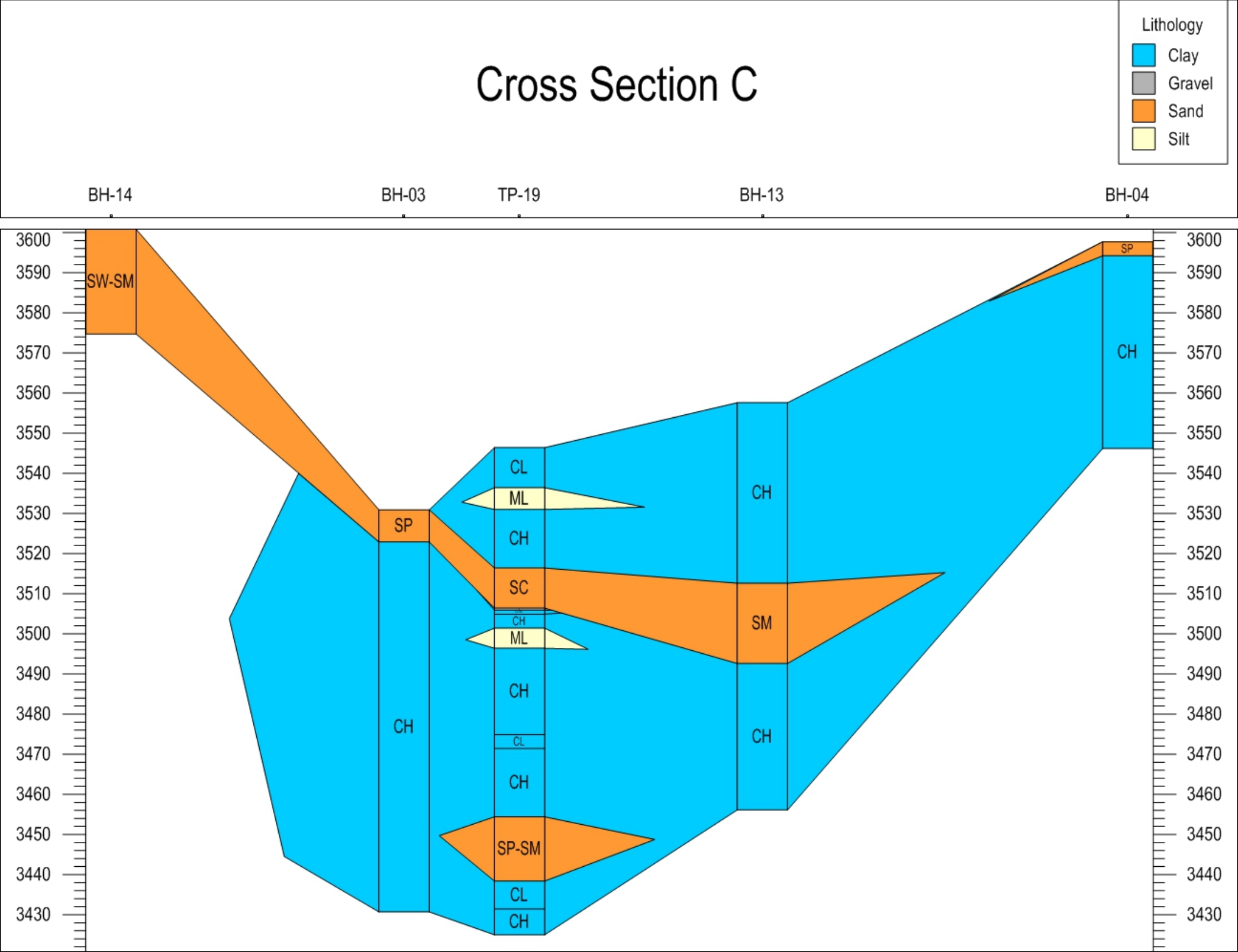
Cross Section A



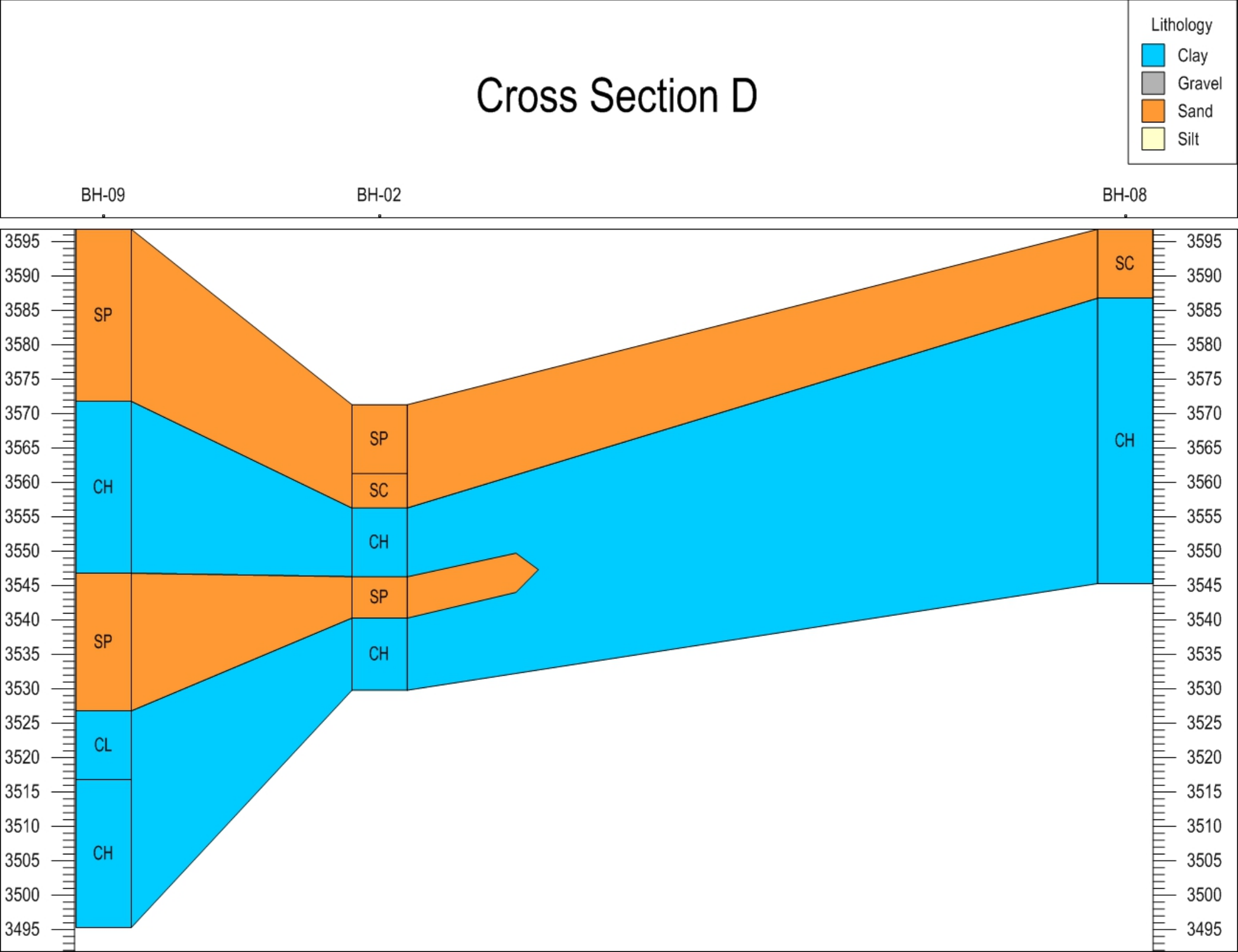
Cross Section B



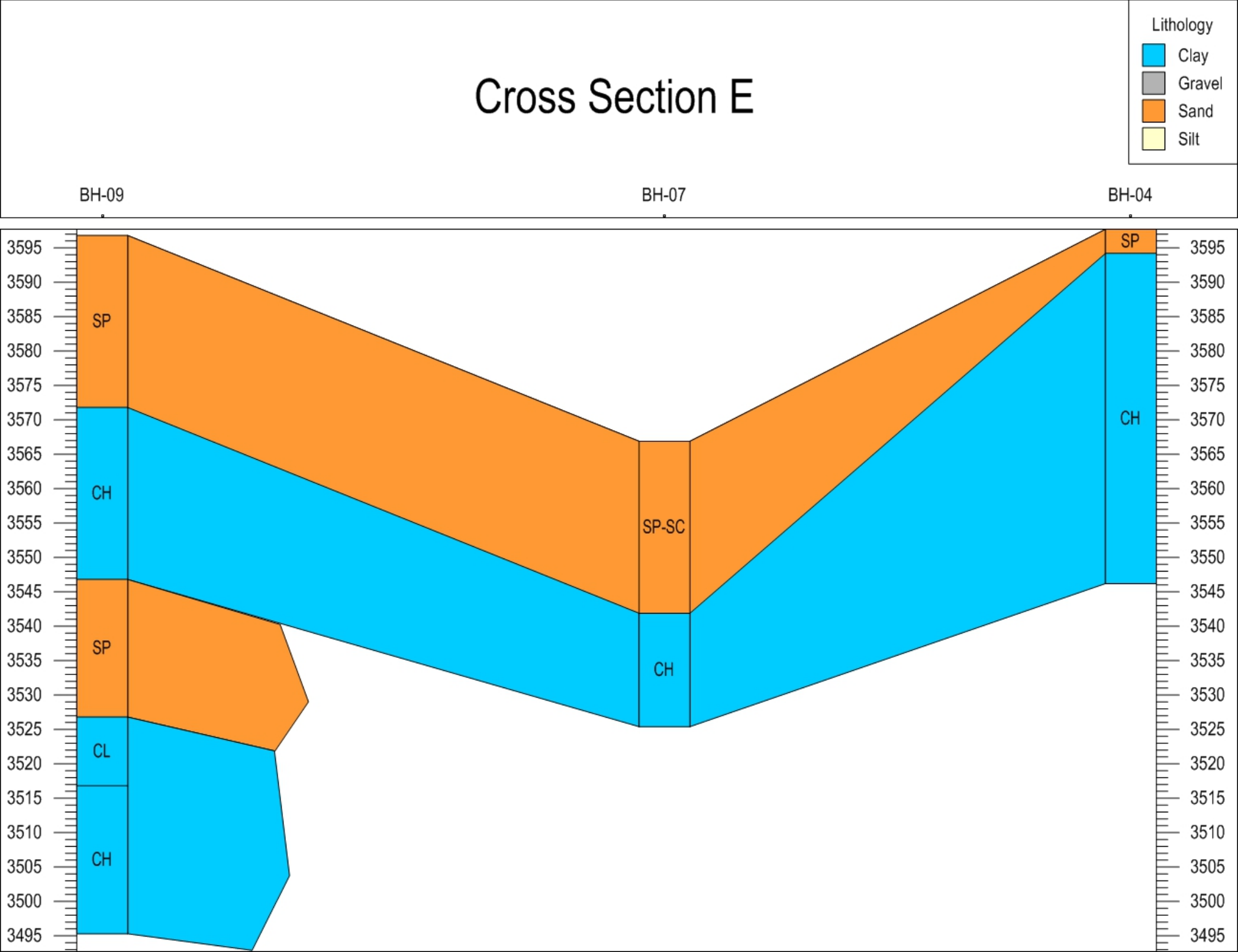
Cross Section C



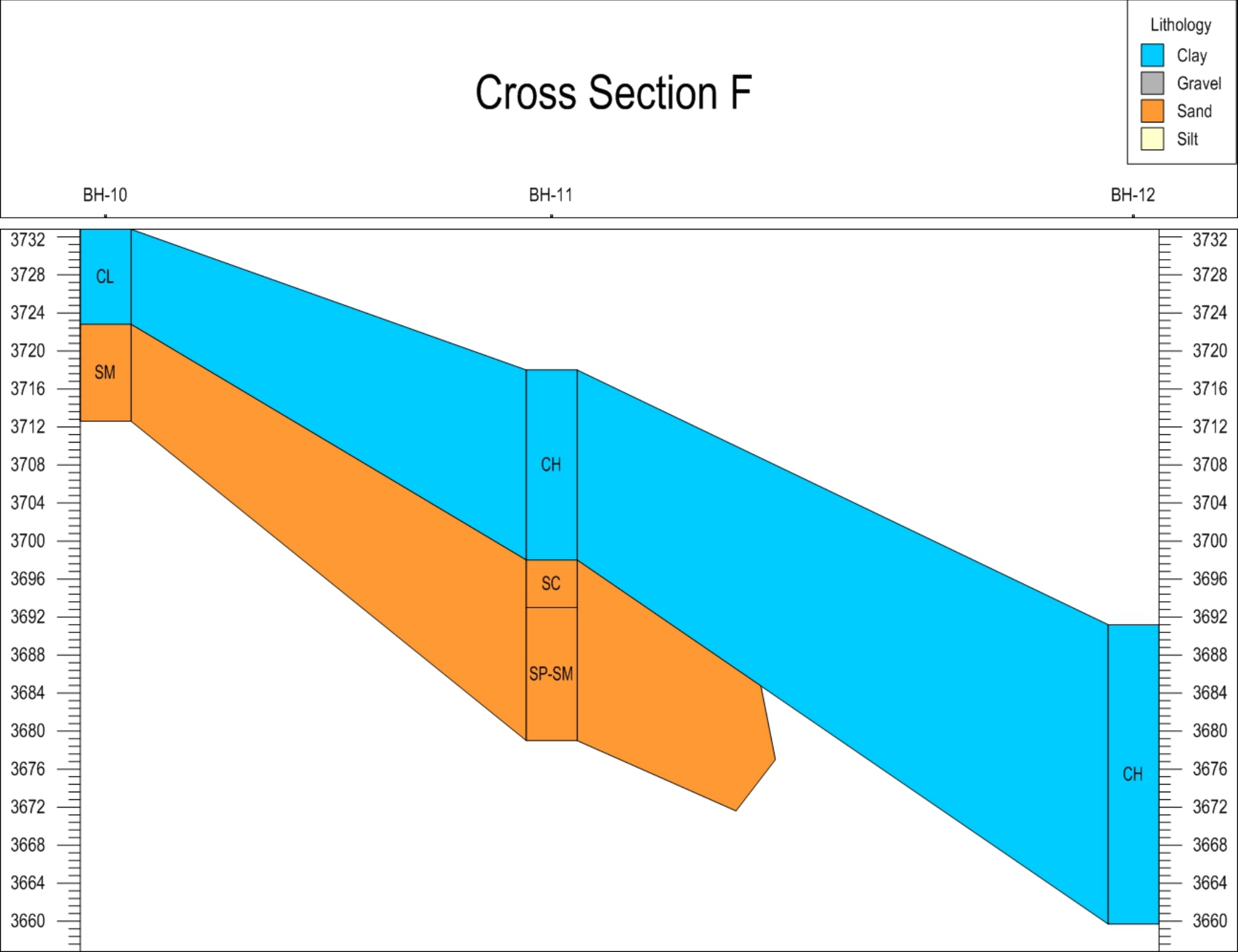
Cross Section D



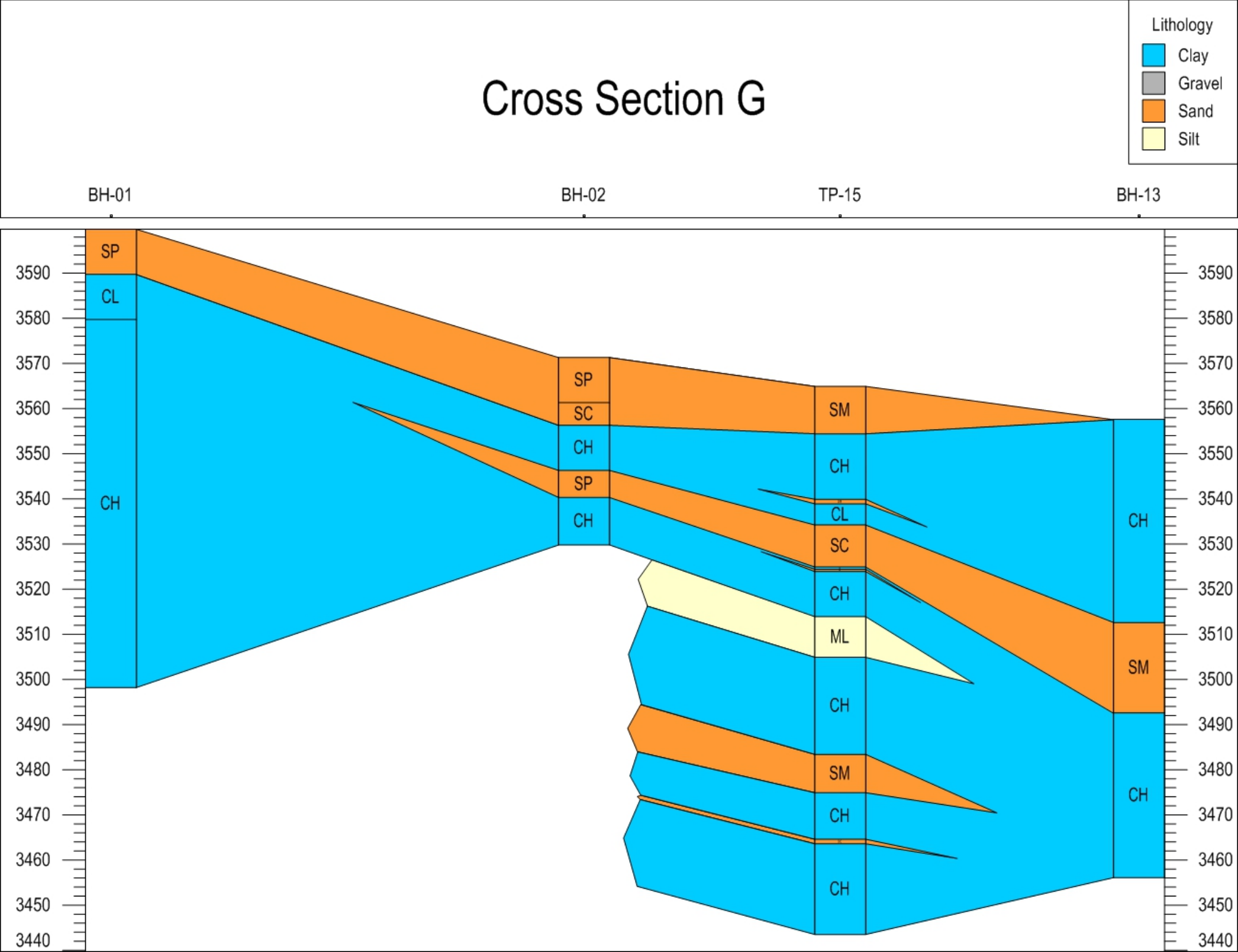
Cross Section E



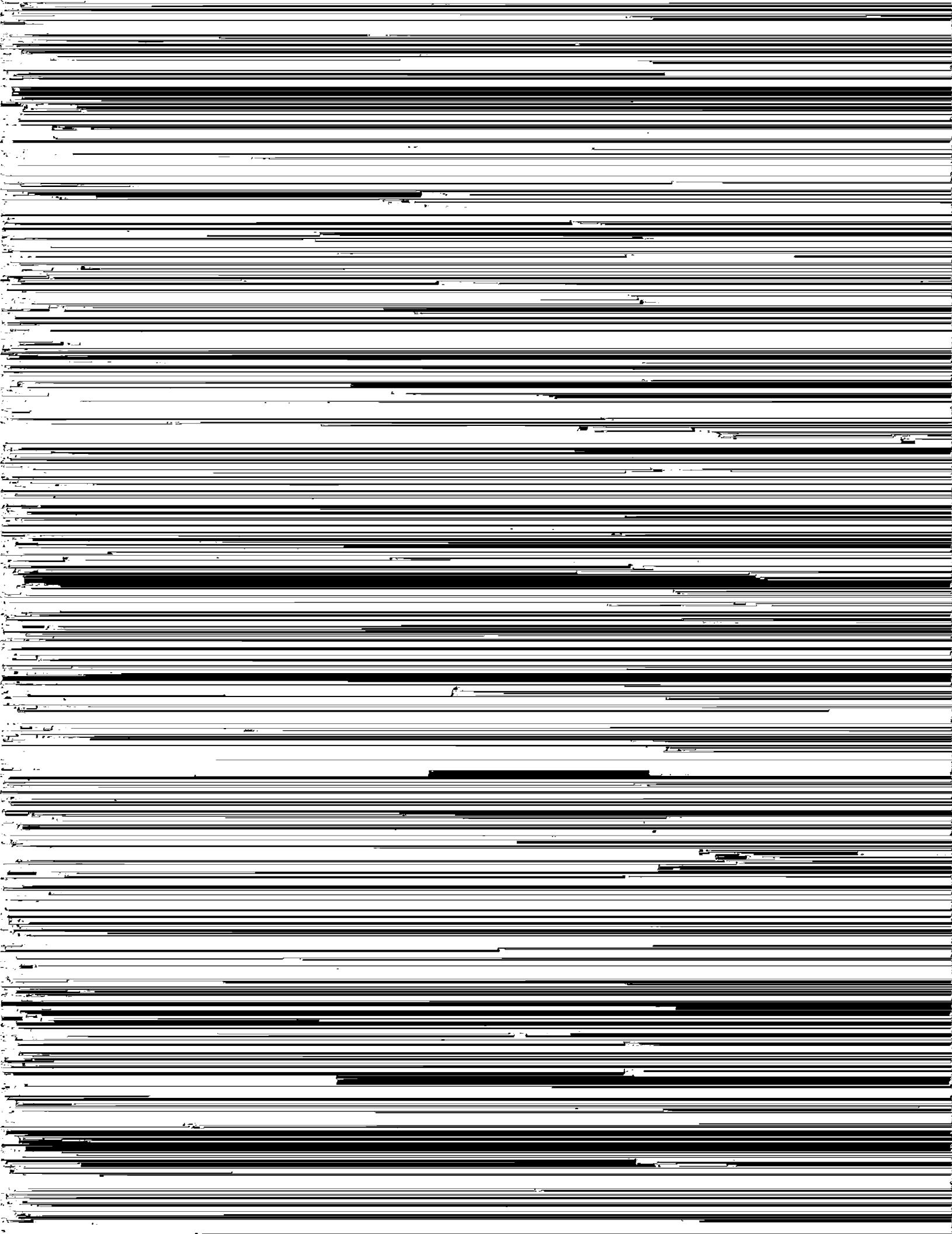
Cross Section F

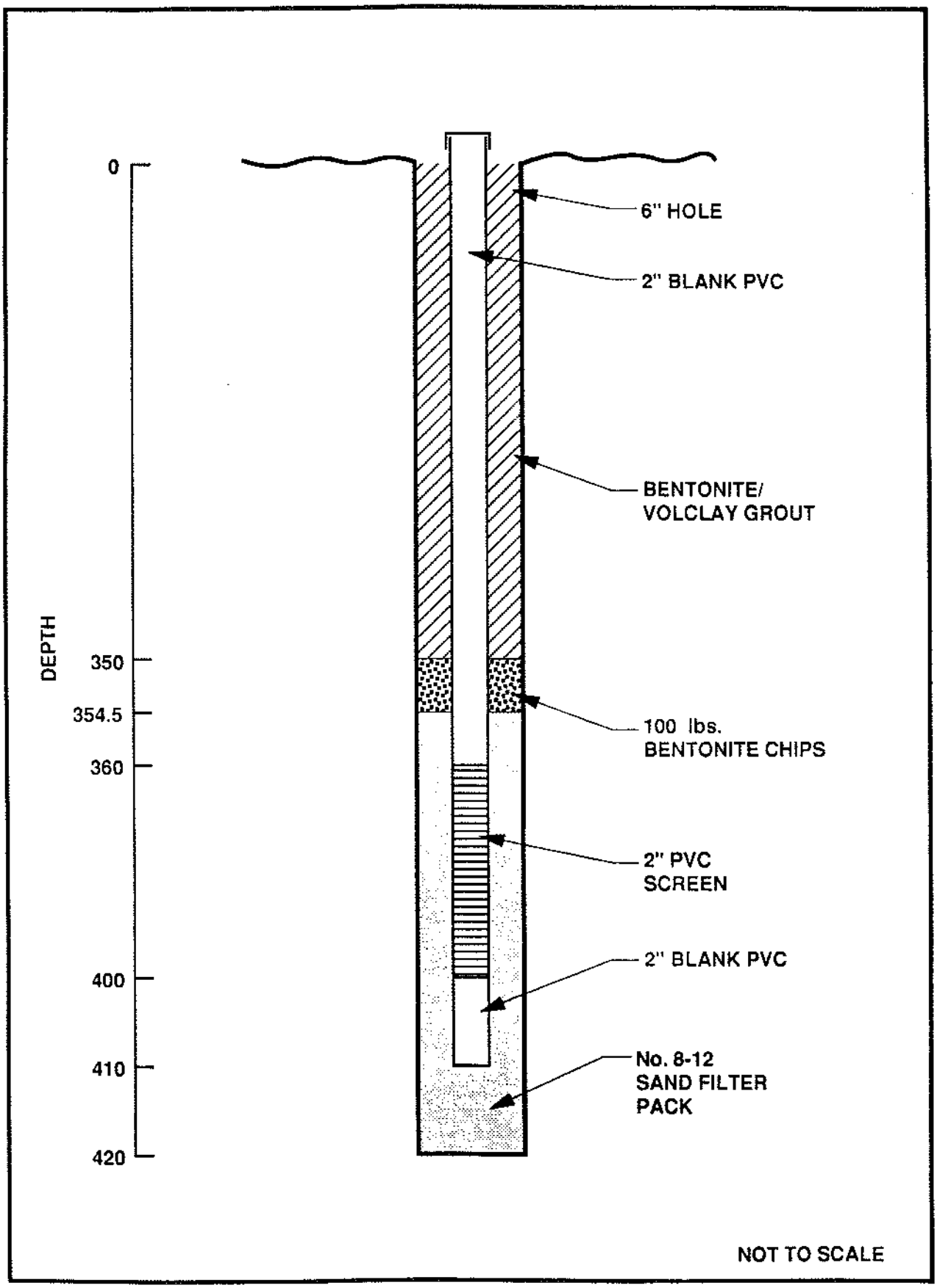


Cross Section G



Appendix F
Well Driller's Reports





ATLAS PRECIOUS METALS, GRASSY MTN. PROJECT

MONITOR WELL GW-3A

SPF 16.2

STATE OF OREGON
MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-095)

Start Card # 59766

(1) OWNER/PROJECT:

WELL NO. MWS-8

Name Newmont Gold

Address 318 A. Street

City West Vale State OR Zip 97018

(2) TYPE OF WORK:

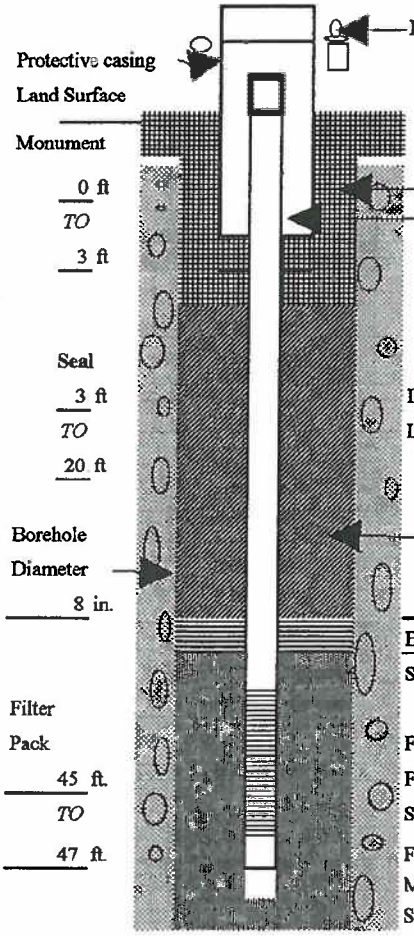
[X] New Construction [ ] Repair [ ] Recondition
[ ] Conversion [ ] Deepening [ ] Abandonment

(3) DRILLING METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable
[ ] Hollow Stem Aug. [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [ ] No [X] Depth completed well 45 ft.



Casing diameter 4 in. material PVC
Welded [ ] Threaded [X] Glued [ ]

Liner Diamter in.
Liner material
Welded [ ] Threaded [ ] Glued [ ]

Well Seal
Material cement-bent
Amount 4 bags
Bentonite plug >2 ft. thick

Screen Material
interval(s):
From: 25 To: 45
From: To:
Slot Size .020 in.

Filter Pack:
Material: Colorado Silica
Size 10-20 in.

(5) WELL TEST:

[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian
Permeability Yield N/A GPM
Conductivity pH
Temperature of water F/C Depth artesian flow found ft.
Was water analysis done? [ ] Yes [X] No
By whom?
Depth of strata to be analyzed. From To ft.
Remarks: bottom hole backfilled w/pellets&sand 47-76.5'
Name of supervising Geologist/Engineer M. Pappolardo

(6) LOCATION OF WELL By legal description

Well Location: County MALHEUR
Township 22S (N/S) Range 44E (W/E) Section 6
1. SE 1/4 of SE 1/4 of above section.
2. Street address of well location GRASSY MOUNTAIN
VALE, OREGON
3. Tax lot number of well location N/A
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

Dry to 45.5 Feet below land surface. Date: October 2, 1993
Artesian Pressure lb/sq.in. Date

(8) WATER BEARING ZONES:

Depth at which was first found

From	To	Estimated Flow Rate	SWL

(9) WELL LOG:

Ground elevation

Material	From	To	SWL
Gravely sandy loam, med. gray brown	0	10	
dry.			
Siltstone tan-gray	10	29	
Sandstone-yellow-tan	29	32.5	
Sandstone - orange	32.5	33.5	
Sandstone, yellow-tan	33.5	46.5	
Clayey siltstone, gray and tan with sand	46.5	48	
Sandstone, tan-brown	48	59	
Clayey siltstone w/sand, tan-gray	59	62	
Sandstone, yellow-tan	62	64	
Carbonaceous shale	64	68	
Siltstone, med. gray-brown			
Sandstone, tan-orange	68	71	
Sandstone, light tan	71	76.5	

Date Started 10-1-93 Completed 10-2-93

(unbonded) Monitor Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oergon well construction standards. Materials used and information reported above are true to the best knowledge and belief. MWC Number 10098
Signed [signature] Date 1/12/94

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction , alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief. MWC Number 10096
Signed [signature] Date 1-12-94

SPF 16-1

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-095)

Start Card # 59765

(1) OWNER/PROJECT:

WELL NO. MW-6

Name Newmont Gold

Address 318 A Street

City West Vale State OR Zip 97918

(2) TYPE OF WORK:

[X] New construction [ ] Repair [ ] Recondition
[ ] Conversion [ ] Deepening [ ] Abandonment

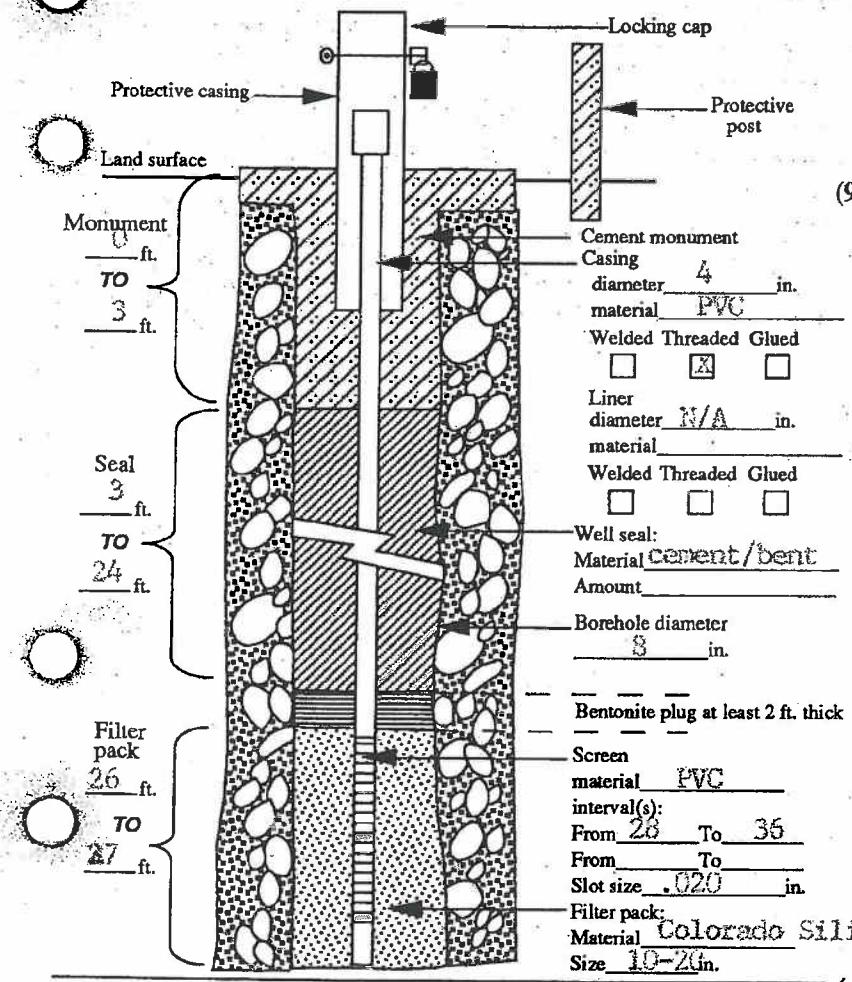
(3) DRILLING METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable
[ ] Hollow Stem Auger [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [ ] No [X]

Depth of completed well 36 ft.



Cement monument

Casing diameter 4 in. material PVC
Welded [X] Threaded [ ] Glued [ ]

Liner diameter N/A in. material
Welded [ ] Threaded [ ] Glued [ ]

Well seal: Material cement/bent Amount

Borehole diameter 8 in.

Bentonite plug at least 2 ft. thick

Screen material PVC interval(s): From 28 To 36 From To Slot size .020 in.

Filter pack: Material Colorado Silica Size 10-20 in.

(5) WELL TEST:

[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian

Permeability — Yield — GPM

Conductivity — PH —

Temperature of water Dry °F/C Depth artesian flow found — ft.

Was water analysis done? [ ] Yes [X] No

By whom? —

Depth of strata to be analyzed. From — ft. to — ft.

Remarks: Wet but no measurable water

Name of supervising Geologist/Engineer Mike Pappalardo

(6) LOCATION OF WELL By legal description

Well Location: County Malheur

Township 22S (N or S) Range 44E (E or W) Section 6

1. SE 1/4 of SE 1/4 of above section.
2. Street address of well location Grassy Mountain, Vale
3. Tax lot number of well location Unknown
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

23 Ft. below land surface. Date 10/04/93

Artesian Pressure lb/sq. in. Date

(8) WATER BEARING ZONES:

Depth at which water was first found —

From	To	Est. Flow Rate	SWL

(9) WELL LOG:

Ground elevation —

Material	From	To	SWL
Soil	0	2	
Sandy siltstone medium	2		
tan brown		5	
Silty sandstone medium	5		
brown silt green			
tinge friable		20	
Sandstone silty olive	20		
brown		26.5	
Clayey sandstone med.	26.5		
gray brown		29	
Sandstone medium gray	29		
brown		35	
Siltstone dark gray	35	36	
Clayey siltstone med	36		
dark gray		37	

Date started 10/03/93 Completed 10/04/93

(unbonded) Monitor Well Constructor Certification:

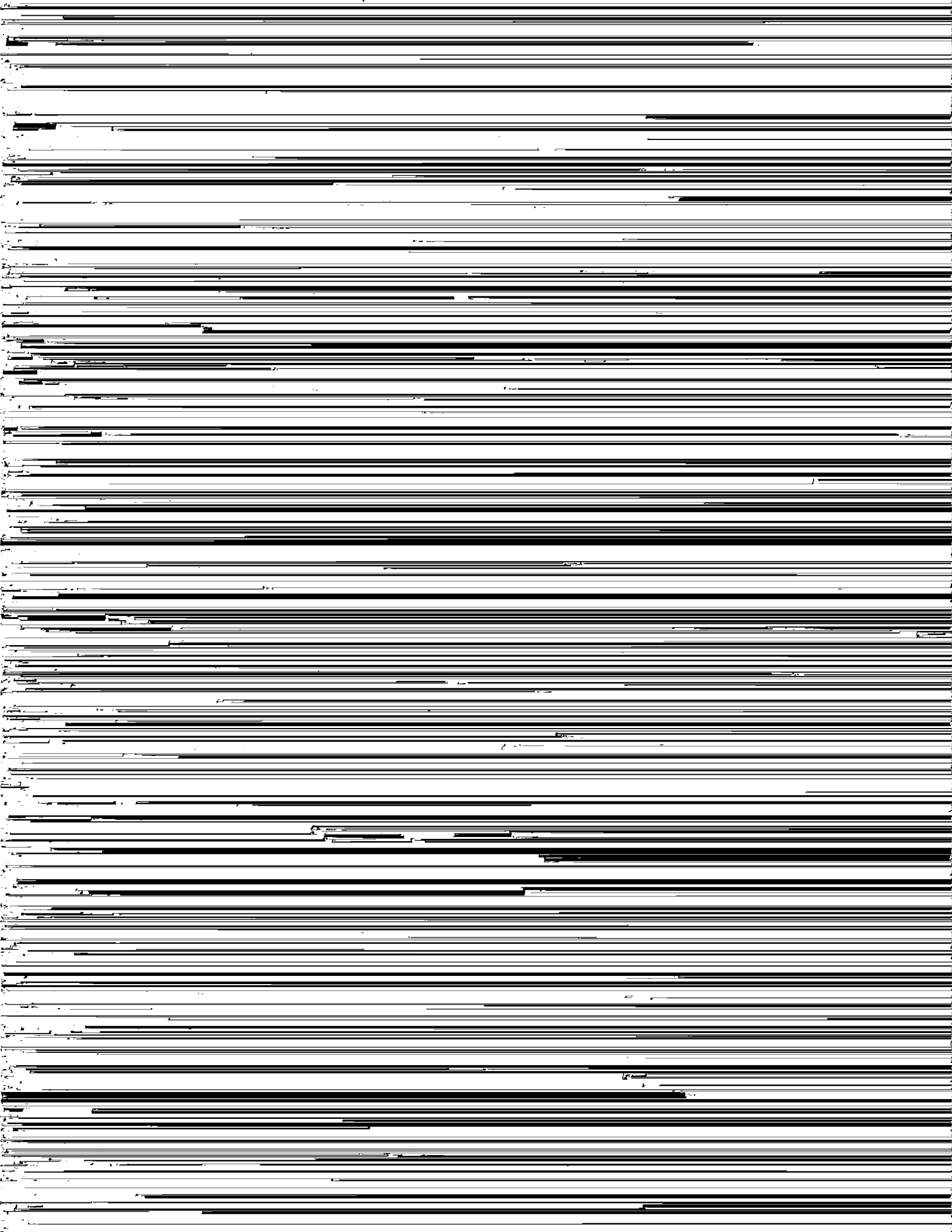
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed [signature] MWC Number 10718 Date 1/12/94

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed [signature] MWC Number 10046 Date 1-12-94



STATE OF OREGON
MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-0395)

WELL I.D. LABEL# L 125168

START CARD # 1035606

(1) LAND OWNER

Owner Well I.D. GMW-17-31

First Name _____ Last Name _____

Company CALICO RESOURCES USA CORP.

Address P O BOX Q

City VALE State OR Zip 97918

(2) TYPE OF WORK

☒ New ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

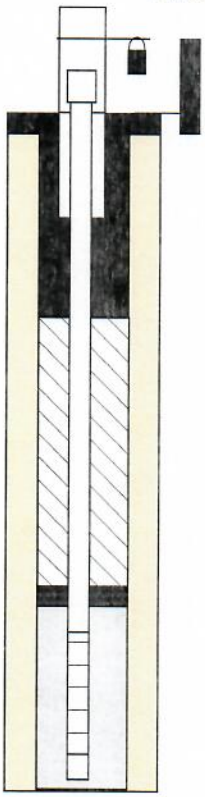
(3) DRILL METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 498.00 ft. Special Standard ☐



MONUMENT/VAULT Above Ground From _____ To _____

BORE HOLE Diameter 16 From 0 To 98

CASING Dia. 12 From ☒ 3 To 98 Gauge .250 Wld Thrd Material ◉ Steel ○ Plastic ☒ ☐

LINER Dia. _____ From ☐ _____ To _____ Gauge _____ Wld Thrd Material ○ Steel ○ Plastic ☐ ☐

SEAL From 0 To 38 Material Bentonite Chips Amount 36 Sacks Grout weight _____

SCREEN Casing/Liner Casing Material PVC Diameter 5 From 458 To 498 Slot Size 0.020

FILTER From 453 To 455 Material SAND SEAL Size of pack 20/40

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer SPF Water Engineering

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County MALHEUR Twp 22.00 S N/S Range 44.00 E E/W WM

Sec 8 SE 1/4 of the NW 1/4 Tax Lot 100

Tax Map Number _____ Lot _____

Lat ° ' " or 43.67387000 DMS or DD

Long ° ' " or -117.35963000 DMS or DD

○ Street address of well ◉ Nearest address

REFER TO GPS

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well			

Flowing Artesian? ☐ Dry Hole? ☒

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation 3711.00

Material	From	To
soft brown clay-top soil	0	3
brown decomposed sand & gravel	3	8
soft light brown sandstone	8	17
hard green sandstone	17	22
med. hard green sandstone	22	28
hard green sandstone	28	41
soft orange sandstone	41	47
soft red sandstone	47	55
sticky red clay	55	60
soft red clay some white clay strips	60	82
hard dark red strips of claystone	82	107
soft red & white clay	107	122
soft tan & red clay	122	142
med. hard red claystone	142	147
hard grey sandstone	147	157
med. hard orange, tan & red claystone	157	177
hard red yellow claystone	177	197
soft red clay	197	202
broken black basalt	202	212

Date Started 8/1/2017 Completed 11/30/2017

(unbonded) Monitor Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon monitoring well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 1896 Date 12/14/2017

Password : (if filing electronically) _____

Signed TONY HACKETT (E-filed)

(bonded) Monitor Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon monitoring well construction standards. This report is true to the best of my knowledge and belief.

License Number 1899 Date 12/14/2017

Password : (if filing electronically) _____

Signed SAM P KINGREY (E-filed)

Contact Info (optional) _____

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version:

MONITORING WELL REPORT -
continuation page

WELL I.D. LABEL# L 125168

START CARD # 1035606

(4) CONSTRUCTION

BORE HOLE

Dia	From	To
10	98	520

FILTER PACK

From	To	Material	Size
455	499	SILICA SAND	8/12

SEAL

Material	From	To	Amt	sacks/ lbs	grout weight
C5	0	453	200	S	14.1
Cement	38	98	41	S	15.6
Cement	499	520	9	S	15.6

CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
◉	○	5	☒	2	458	sch80	○	◉		☒
○	○						○	○		
○	○						○	○		
○	○						○	○		
○	○						○	○		
○	○						○	○		
○	○						○	○		
○	○						○	○		
○	○						○	○		
○	○						○	○		

SCREENS

Perf/ Screen	Casing/ Liner	Screen Dia	From	To	Scrn size/ slot width	Slot length	# of slots	Tele/ pipe size

(5) WELL TESTS

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(7) STATIC WATER LEVEL

Water Bearing Zones

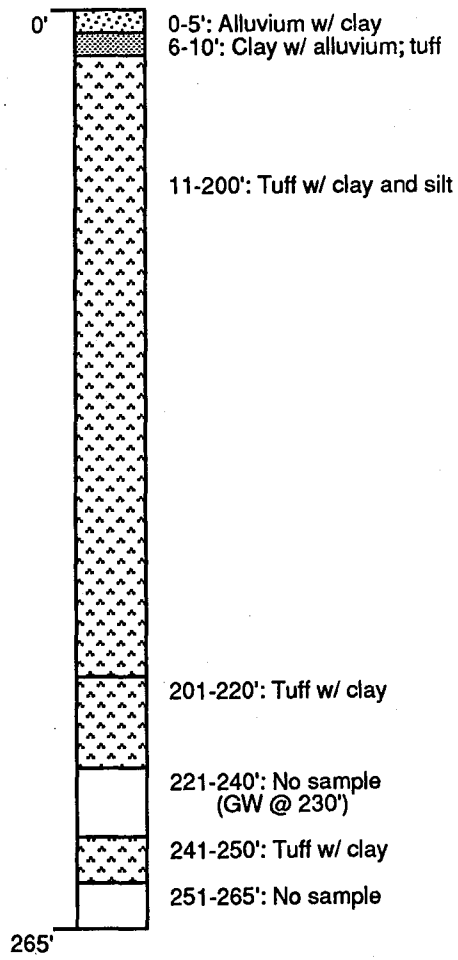
SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(8) WELL LOG

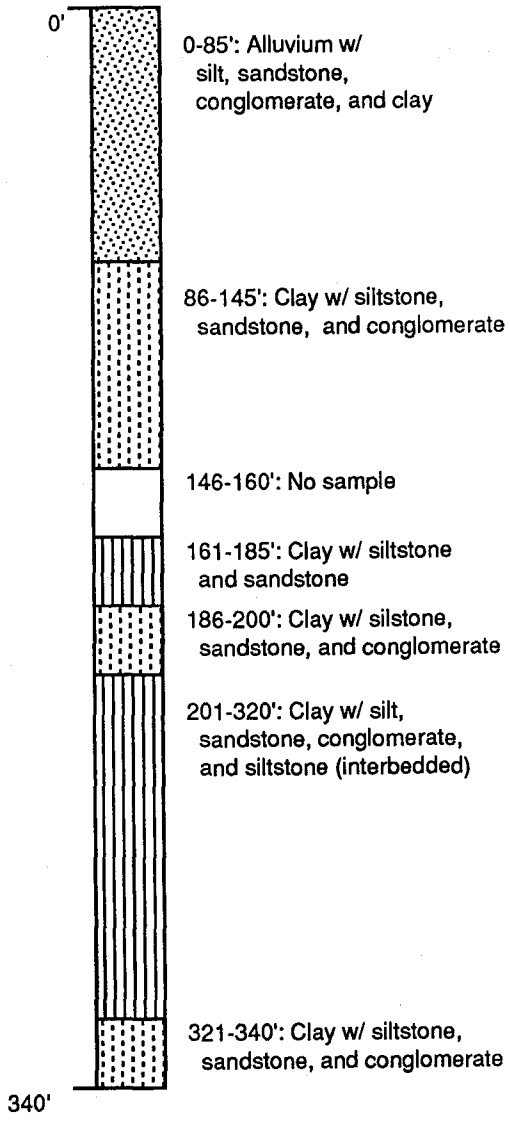
Material	From	To
med. hard multicolored sandstone	212	217
soft yellow orange grey clay	217	242
hard layers sandstone grey	242	258
soft tan clay	258	269
strips of grey clay & grey sandstone	269	309
hard brown glassy rock	309	319
soft tan & grey clay	319	336
hard brown glassy rock	336	337
soft tan clay	337	342
hard fractured brown rock	342	351
hard layers brown sandstone w/clay strip	351	385
hard brown rock	385	397
hard int. lyrs sndstne/clay in 1' strips	397	446
brown clay	446	454
hard brown sandstone	454	456
soft brown clay	456	459
hard layers brown sandstone	459	465
brown clay	465	481
hard sandstone brown	481	498
sticky brown clay	498	520

Comments/Remarks

additional drillers 1)Jake Kingrey _____
2)David Dutcher _____

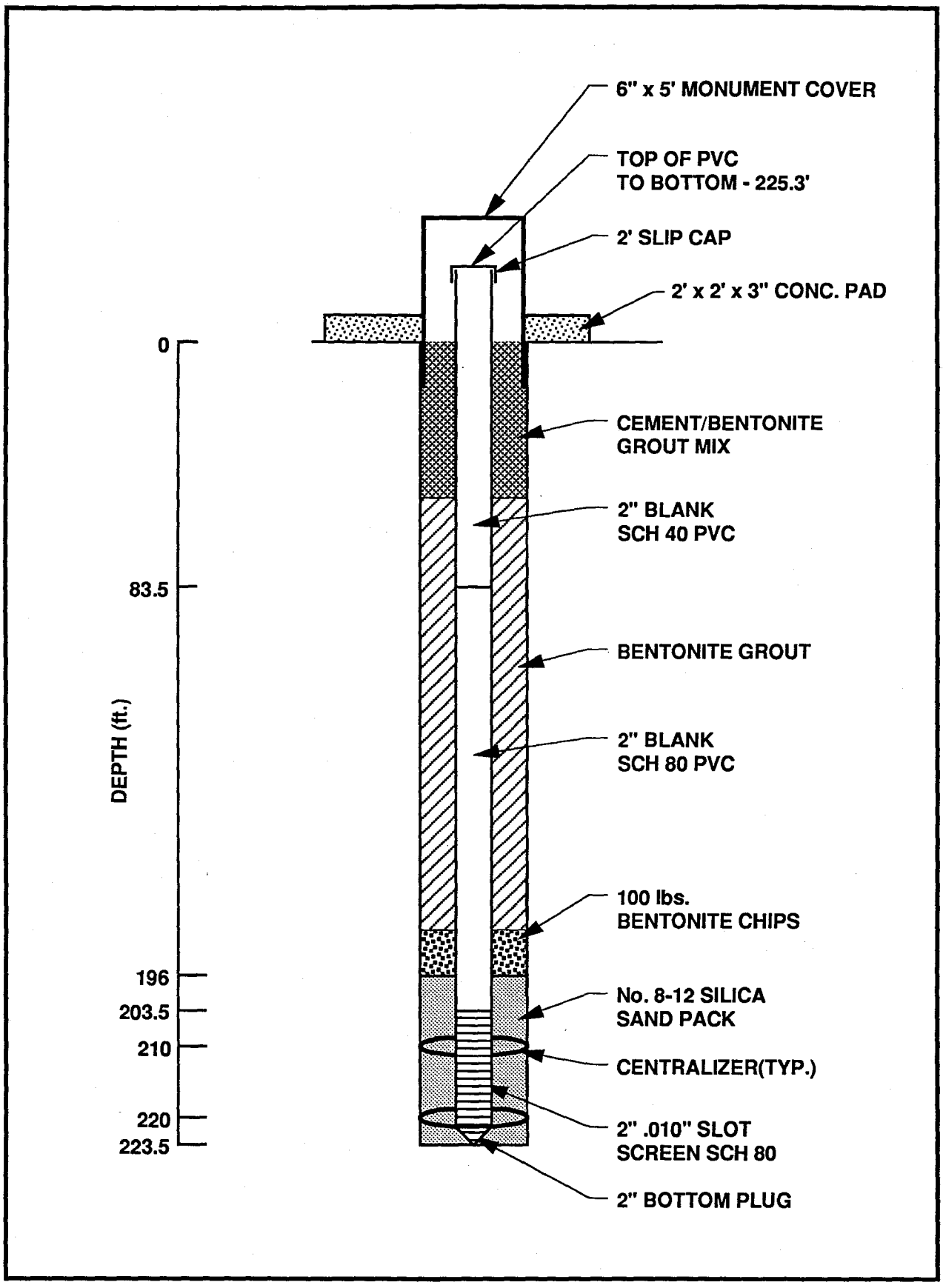


GW-5



GW-6

NOT TO SCALE



ATLAS PRECIOUS METALS, GRASSY MTN. PROJECT

MONITOR WELL GW-5

MACH 2974

RECEIVED JAN 18 1994 WATER RESOURCES DEPT. SALEM, OREGON

22S/44E/8dd

STATE OF OREGON
MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-095)

Start Card # 59760

(1) OWNER/PROJECT:

WELL NO. TW-1

Name Newmont Gold

Address 318 A. Street

City West Vale State OR Zip 97018

(2) TYPE OF WORK:

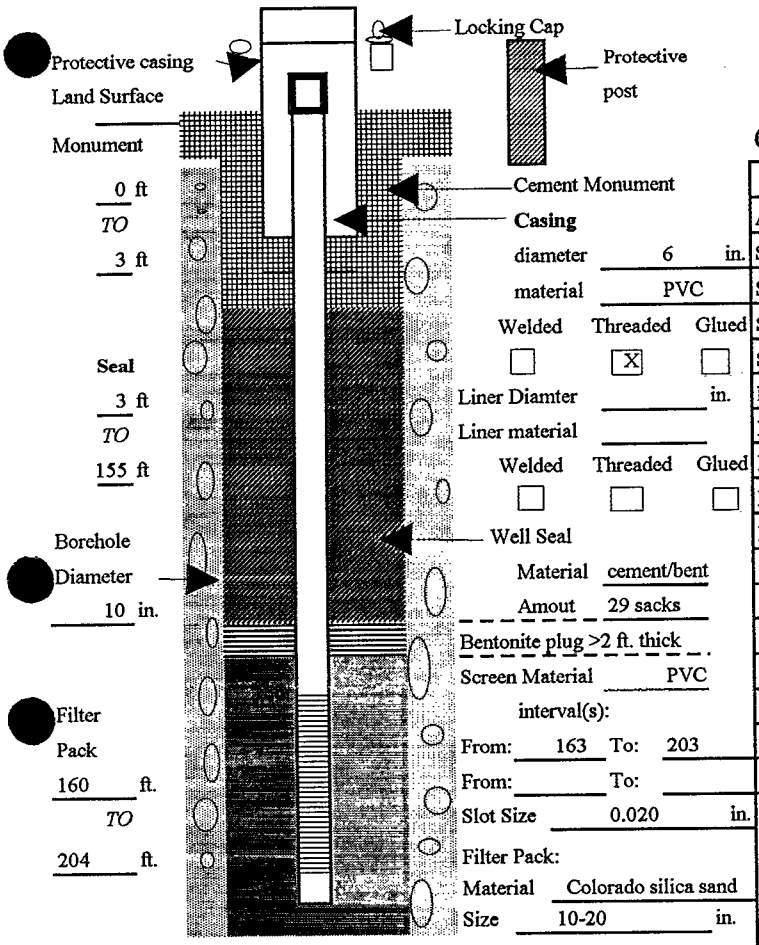
[X] New Construction [ ] Repair [ ] Recondition
[ ] Conversion [ ] Deepening [ ] Abandonment

(3) DRILLING METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable
[ ] Hollow Stem Aug. [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [ ] No [X] Depth completed well 203 ft.



Casing
diameter 6 in.
material PVC
Welded [ ] Threaded [X] Glued [ ]

Liner Diamter ____ in.
Liner material ____
Welded [ ] Threaded [ ] Glued [ ]

Well Seal
Material cement/bent
Amout 29 sacks
Bentonite plug >2 ft. thick

Screen Material PVC
interval(s):
From: 163 To: 203
From: ____ To: ____
Slot Size 0.020 in.

Filter Pack:
Material Colorado silica sand
Size 10-20 in.

(5) WELL TEST:

[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian
Permeability ____ Yield 45 GPM
Conductivity ____ pH ____
Temperature of water 56 F/C Depth artesian flow found ____ ft.
Was water analysis done? [ ] Yes [X] No
By whom? ____
Depth of strata to be analyzed. From ____ To ____ ft.
Remarks: ____
Name of supervising Geologist/Engineer M. Pappalardo

(6) LOCATION OF WELL By legal description

Well Location: County MALHEUR
Township 22S (N/S) Range 44E (W/E) Section 8
1. NW 1/4 of SE 1/4 of above section.
2. Street address of well location GRASSY MOUNTAIN, VALE, OR
3. Tax lot number of well location UNKNOWN
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

88 Feet below land surface. Date October 11, 1993
Artesian Pressure ____ lb/sq.in. Date ____

(8) WATER BEARING ZONES:

RECEIVED FEB 4 1994 WATER RESOURCES DEPT. SALEM, OREGON

Depth at which was first found

From	To	Estimated Flow Rate	SWL
160	205	45-50	88

(9) WELL LOG:

Ground elevation

Material	From	To	SWL
Alluvial silt with basalt float	0	11	
Siltstone, brown, with basalt pebbles	11	15	
Siltstone, Brown	15	40	
Siltstone, Brown, with basalt cobbles	40	65	
Siltstone, brown w/ increasing basalt	65	90	
Basalt, Red with 40% brown siltstone	90	109	
Basalt, Red and Black, vesicular, fine grained	109	160	
Basalt, vesicular w/clay in vesicles	160	185	
Basalt w/increased oxidation	185	200	
Basalt w/20% clays	200	205	

Date Started October 4, 1993 Completed October 11, 1993

(unbonded) Monitor Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oergon well construction standards. Materials used and information reported above are true to the best knowledge and belief. MWC Number 10098
Signed [signature] Date 1/12/94

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction , alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief. MWC Number 10096
Signed [signature] Date 1-12-94

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0050)

JAN 26 1994
WATER RESOURCES DEPT.
SALEM, OREGON

Malh 993

22S/44E/8aa

Start Card # 59761

9

(1) OWNER/PROJECT:

WELL NO. MW-2

Name Newmont Gold
Address 318 A Street
City West Vale State OR Zip 97918

(2) TYPE OF WORK:

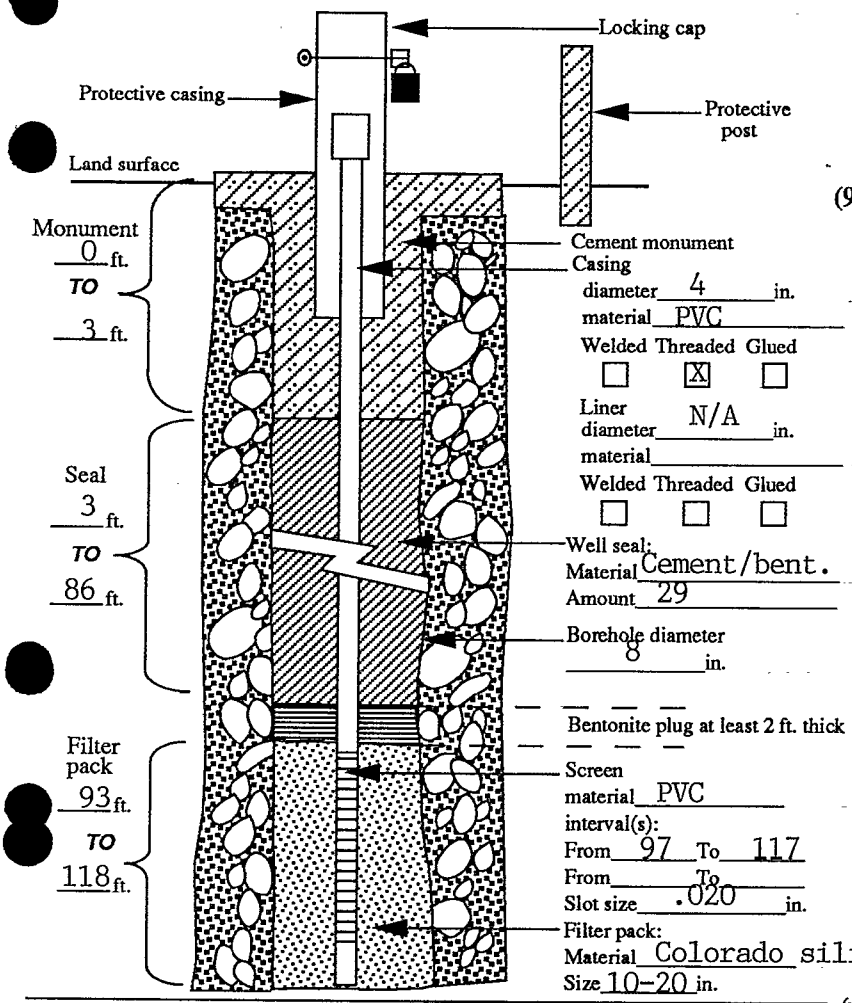
[X] New construction [ ] Repair [ ] Recondition
[ ] Conversion [ ] Deepening [ ] Abandonment

(3) DRILLING METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable
[ ] Hollow Stem Auger [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [ ] No [X] Depth of completed well 118 ft.



Cement monument
Casing diameter 4 in. material PVC
Welded [X] Threaded [ ] Glued [ ]
Liner diameter N/A in. material
Welded [ ] Threaded [ ] Glued [ ]
Well seal: Material Cement/bent. Amount 29
Borehole diameter 8 in.
Bentonite plug at least 2 ft. thick
Screen material PVC
interval(s): From 97 To 117
From To
Slot size .020 in.
Filter pack: Material Colorado silica Size 10-20 in.

(5) WELL TEST:

[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian
Permeability — Yield — GPM
Conductivity — PH —
Temperature of water 56 °F/C Depth artesian flow found — ft.
Was water analysis done? [ ] Yes [ ] No
By whom? —
Depth of strata to be analyzed. From — ft. to — ft.
Remarks: —

Name of supervising Geologist/Engineer Mike Pappalardo

(6) LOCATION OF WELL By legal description

Well Location: County Malheur
Township 22 (N or S) Range 44E (E or W) Section 8
1. NE 1/4 of NE 1/4 of above section.
2. Street address of well location Grassy Mountain, Vale
3. Tax lot number of well location Unknown
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

88 Ft. below land surface. Date 10/04/93
Artesian Pressure — lb/sq. in. Date —

(8) WATER BEARING ZONES:

Depth at which water was first found 100

From	To	Est. Flow Rate	SWL
100	120	60	88

(9) WELL LOG:

Ground elevation —

Material	From	To	SWL
Aluvian silt & cobbles	0	13	
Clayey siltstone brn	13	15	
Siltstone brown	15	36	
Clayey siltstone brn	36	65	
Siltstone with basalt	65	70	
Basalt with some	70		
siltstone		72.5	
Basalt	72.5	80	
Basalt with some	80		
calcite filling			
vesicles		92	
Basalt with fractures	92	105	
Basalt with clay seams	105	120	

Date started 10/02/93 Completed 10/04/93

(unbonded) Monitor Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed [signature] MWC Number 1098 Date 1/12/94

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed [signature] MWC Number 1096 Date 1/12/94

#19

MAIH RECEIVED 2984 JAN 18 1994 WATER RESOURCES DEPT. SALEM, OREGON

22S/44E/8dd

STATE OF OREGON
MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-085) Start Card # 59772

(1) OWNER/PROJECT:

WELL NO. MWS-13

Name Newmont Gold

Address 318 A. Street

City West Vale State OR Zip 97018

(2) TYPE OF WORK:

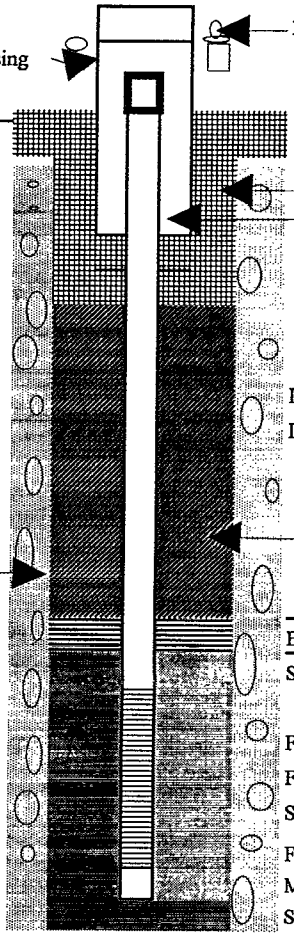
[X] New Construction [ ] Repair [ ] Recondition
[ ] Conversion [ ] Deepening [ ] Abandonment

(3) DRILLING METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable
[ ] Hollow Stem Aug. [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [ ] No [X] Depth completed well 207 ft.



Casing
diameter 4 in.
material PVC
Welded [ ] Threaded [X] Glued [ ]

Liner Diamter in.
Liner material
Welded [ ] Threaded [ ] Glued [ ]

Well Seal
Material Cement-bent
Amount 35
Bentonite plug >2 ft. thick

Screen Material PVC
interval(s):
From: 146 To: 206
From: To:
Slot Size .020 in.

Filter Pack:
Material: Colorado Silica
Size 10-20 in.

(5) WELL TEST:

[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian
Permeability Yield GPM
Conductivity pH
Temperature of water 51e F/C Depth artesian flow found ft.
Was water analysis done? [ ] Yes [X] No
By whom?
Depth of strata to be analyzed. From To ft.
Remarks:
Name of supervising Geologist/Engineer M. Pappolardo

(6) LOCATION OF WELL By legal description

Well Location: County MALHEUR
Township 22S (N/S) Range 44E (W/E) Section 8
1. SE 1/4 of SE 1/4 of above section.
2. Street address of well location GRASSY MOUNTAIN
VALE, OREGON
3. Tax lot number of well location N/A

RECEIVED

4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

FEB 4 1994

95 Feet below land surface. Date OCTOBER 19, 1993

Artesian Pressure lb/sq.in. Date

WATER RESOURCES DEPT. SALEM, OREGON

(8) WATER BEARING ZONES:

Depth at which was first found

From	To	Estimated Flow Rate	SWL
125	207	35	95'

(9) WELL LOG:

Ground elevation

Material	From	To	SWL
Brown silt and clayey silt	0	9	
with cobbles			
Brown siltstone with basalt	9	27	
pebbles			
Brown siltstone with some	27	137	
some claystone			
Basalt weathered and	137	156	
fractured			
Basalt, very weathered	156	165	
Basalt	165	207	

Date Started 10-18-93 Completed 10-19-93

(unbonded) Monitor Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oergon well construction standards. Materials used and information reported above are true to the best knowledge and belief. MWC Number 10098
Signed [signature] Date 1/12/94

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction , alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief. MWC Number 10096
Signed [signature] Date 1-12-94

PW-1

JAN 02 1990

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

WATER RESOURCES DEPT
SALEM, OREGON

Malh 2276

22s/44E/8ad

(START CARD) # W-14816

(1) OWNER:
Well Number:
Name Atlas Precious Metals Inc
Address 318 A St.
City Vale State OR Zip 97818

(2) TYPE OF WORK:
☑ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD
☑ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☑ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval Yes ☐ No ☑ Depth of Completed Well 420 ft.
Explosives used Yes ☐ No ☑ Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
14 3/4	0	28	PT Cement	0	28	19
			VOLCLAY	300	SURFACE	40 Sacks
			BENT Pellets	295	300	3 BUCKETS

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other T Remie
Backfill placed from ft. to ft. Material
Gravel placed from 555 ft. to 295 ft. Size of gravel .030

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+2	320	.250	☑	☐	☑	☐
	6"	340	400	"	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☑ Screens Type WIRE WOUND Material LOW CARBON

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
320	340	.030			6"	☐	☑
400	420	.030			6"	☐	☑
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
35		294	1 hr.

Temperature of water 64° F Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Malheur Latitude ' " Longitude ' "
Township 22S N or S, Range 44E E or W, WM.
Section 8 SE ¼ NE ¼
Tax Lot Lot Block Subdivision
Street Address of Well (or nearest address)

(10) STATIC WATER LEVEL:
52 ft. below land surface. Date 12-6-89
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found

From	To	Estimated Flow Rate	SWL
320	340	20	
400	420	20	
		40	

(12) WELL LOG:
Ground elevation

Material	From	To	SWL
SOIL	0	2	
CLAY	2	10	
BASALT	10	28	
BROWN CLAY	28	55	
SILTSTONE	55	130	
CLAY & GRAVEL	130	173	
CLAY & SAND	173	190	
BASALT	190	315	
BROWN CLAY	315	323	
BROWN CLAY & SAND	323	360	
BROWN SANDSTONE	360	395	
BLACK & RED SAND	395	408	
SANDSTONE COARSE	408	441	
CLAY & GRAVEL	441	447	
CLAY & SAND	447	555	

Date started 11/27/89 Completed 12-1-89

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

WWC Number
Signed Date

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 544
Signed Larry Burd Date 12/1/89

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GW-1

STATE OF OREGON

WATER WELL REPORT

(as required by ORS 537.765)

RECEIVED

FEB 16 1989

22S/44E/17CC

(START CARD) # 9258

(1) OWNER:

Well Number: 47-1 NAT

Name Atlas Precious Metals

Address 2025 Century Way

City Boise, State Id Zip 83709

(2) TYPE OF WORK:

☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☒ Other Monitoring

(5) BORE HOLE CONSTRUCTION:

Special Construction approval Yes ☒ No ☐ Depth of Completed Well 155.5 ft.

Explosives used Yes ☐ No ☒ Type ____ Amount ____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
12¼	160	122	Colo. Sand	160	122	9 sacks
12¼	122	115	Enviro Plug	122	115	2 sacks
12¼	115	+1	cement grout	115	+1	432 sacks

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other

Backfill placed from ____ ft. to ____ ft. Material see above

Gravel placed from ____ ft. to ____ ft. Size of gravel 8-12 sand

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12"	+2	8	250	☒	☐	☐	☐
					☐	☐	☐	☐
	4	+2	155.5	sch80	☐	☒	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) no shoe screw on plug

(7) PERFORATIONS/SCREENS:

☐ Perforations Method ____

☒ Screens Type Aardvark Material PVC

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
135.5	155.5	.020		4"		☒	☐
135.5	+2			4" PVC		☒	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
	NA		1 hr.
60		160	

Temperature of water NA Depth Artesian Flow Found 140

Was a water analysis done? ☐ Yes By whom ____

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ____

Depth of strata: ____

(9) LOCATION OF WELL by legal description:

SALEM, Malheur

County ____ Latitude ____ Longitude ____

Township 22S N or S, Range 44E E or W, WM.

Section 17 NW ¼ NW ¼

Tax Lot ____ Lot ____ Block ____ Subdivision ____

Street Address of Well (or nearest address) NA

(10) STATIC WATER LEVEL:

49 ft. below land surface. Date 1/21/89

Artesian pressure na lb. per square inch. Date ____

(11) WATER BEARING ZONES:

Depth at which water was first found 140- 160

From	To	Estimated Flow Rate	SWL
140	160	60	49

(12) WELL LOG:

Ground elevation 3698

Material	From	To	SWL
Brown Clay	0	35	0
Brown clay w/gravely sand	35	56	0
Blue Clay	56	122	0
Blue Clay & Gravel	122	140	?
Gravel	140	160	49

Date started 12/14/89 Completed 1/18/89

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

WWC Number 1202

Signed Robert W. Doty Date 2-13-89

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 325

Signed Robert W. Doty for William E. Doty Date 2-15-89

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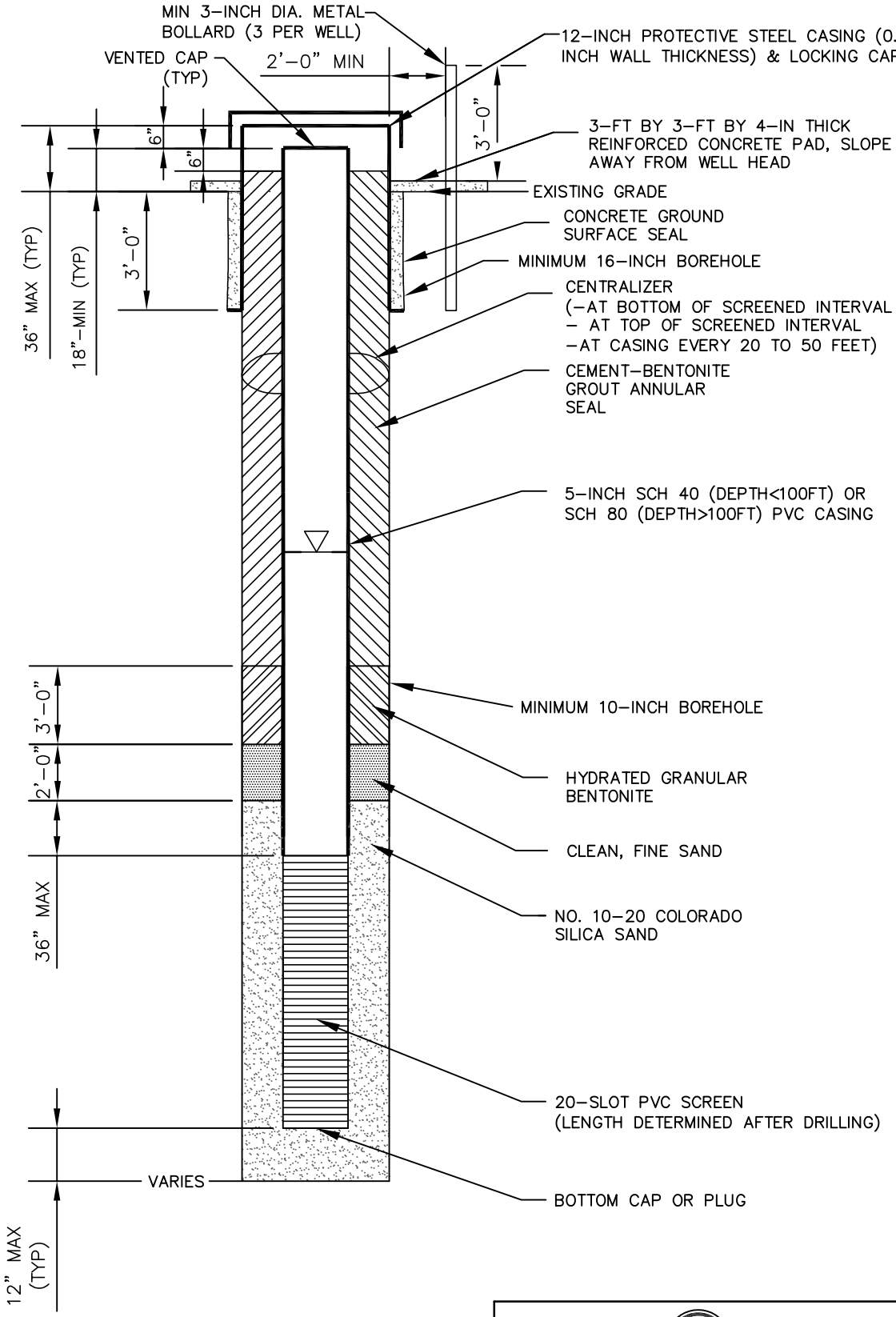
Appendix G
Conceptual Monitoring Well Diagram



SPF WATER ENGINEERING
300 East Mallard Drive, Suite 350
Boise, Idaho 83706
Tel (208) 383-4140 Fax (208) 383-4156

CALICO RESOURCES USA CORP
GRASSY MOUNTAIN PROJECT
MONITORING WELL CONCEPTUAL DESIGN

SCALE: NTS
DRAWN BY: EAM
PROJ.# 1294.0050