FINAL DATA SUMMARY REPORT

UPPER BLACKFOOT MINING COMPLEX

SECTION 35 DESIGN INVESTIGATION

Prepared for:

DEPARTMENT OF ENVIRONMENTAL QUALITY
Remediation Division
P.O. Box 200901
Helena, Montana 59620

April 5, 2013

PIONEER TECHNICAL SERVICES, INC.

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EXECUTIVE SUMMARY

This Data Summary Report (DSR) summarizes the data collected and gathered during the Upper Blackfoot Mining Complex (UBMC) Section 35 Repository Design Investigation. Field work for the investigation was performed in October and November 2012.

All work completed on this project followed the protocols described in the Section 35 Repository Design Investigation Sampling and Analysis Plan (SAP) (DEQ-Pioneer Technical Services, 2012a). Data presented in this report will be utilized in the Section 35 Repository Design and the UBMC remedial designs.

The following information is included in this DSR:

- Objectives of the investigation;
- Locations of all test pits and soil borings;
- Cross sections of subsurface soil, bedrock, and groundwater levels;
- Description of field sampling methods;
- Field documentation;
- Geochemical laboratory analytical test results;
- Geotechnical test results;
- Water level measurements;
- Deviations from the SAP; and
- Data validation of the laboratory analytical sample results.

A total of 13 test pits were located, field logged, and sampled during this investigation. Field data collection consisted of test pit location; date and time; weather conditions; soil profile/lithology descriptions including field soil classification using the Unified Soil Classification System (USCS); sample numbers; sample depth intervals; personnel present; and associated organization. Bulk/Grab soil samples were collected from the test pits during the investigation and selected samples were analyzed for geotechnical and chemical properties.

A total of 20 boreholes were located, drilled, sampled, and logged. Field data collection consisted of soil boring location; date and time; soil profile/lithology descriptions, including field USCS soil classification; sample numbers; sample depth intervals; personnel present; and associated organization. Selected samples from the soil borings were analyzed for geotechnical properties.

A total of 53 nested piezometers and/or monitoring wells were installed in the test pits and soil borings as described in the SAP or as determined appropriate during the investigation. Water level measurements were recorded after the installation of each piezometer and monitoring well. Water level data from previously installed monitoring wells (DEQ-Terragraphics, 2010) also were collected by Portage Inc. All available water level data for Section 35 were compiled into a single database to be used during repository design.

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LIST OF DOCUMENT REVISIONS

Revision No.	Author	Version	Description	Date
Rev 0	Team	Draft	For Client Review	1/22/13
Rev 1	Team	Revised Draft	Additional Client Review, DVR revisions	3/28/13
Rev 2	Team	Final	Final for Distribution	4/5/13
Rev 3				
Rev 4				

1.0 INTRODUCTION

This Data Summary Report (DSR) presents the results of field sampling and laboratory analysis activities that were completed between October 2, 2012 and January 18, 2013 to support the evaluation and design of a potential repository at Section 35 within the Upper Blackfoot Mining Complex (UBMC) located near Lincoln, Montana. Section 35 refers to the portion of section 35 northeast of Highway 279 in Township 15 N, Range 7 W. The information contained in this DSR was gathered following the objectives and procedures documented in the Section 35 Repository Design Investigation Sampling and Analysis Plan (SAP) (DEQ-Pioneer Technical Services, 2012a). Data presented in this DSR are intended to be used to evaluate alternatives and facilitate engineering design of a repository under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

This DSR presents the results of the investigation at Section 35. Duties completed under this investigation and described in this DSR include:

1. Geochemical/Geotechnical Investigation - test pitting and/or geotechnical soil boring investigation completed to define the nature and extent of the topsoil, native glacial till, buried alluvium/glacial outwash, and buried bedrock;
2. Geotechnical Sampling - bulk samples of the native glacial till, buried alluvium/glacial outwash, and bedrock were collected for geotechnical analysis to determine material classification, permeability, settlement, and strength information; and
3. Groundwater Investigation – the existing well network and new monitoring wells and piezometers were used to determine the configuration of the underlying alluvium, measure groundwater elevations, and determine groundwater flow direction and boundaries (if present). The well and piezometer network will be used to measure groundwater fluctuations and collect the data necessary to determine the cause of fluctuating water levels in the wells.

The following information is included in this report:

- Objectives of the investigation;
- Locations of all test pits and soil borings;
- Cross sections of subsurface soil, bedrock, and groundwater levels;
- Description of field sampling methods;
- Field documentation;
- Geochemical laboratory analytical test results;
- Geotechnical test results;
- Water level measurements;
- Deviations from the SAP; and
- Data validation of the laboratory analytical sample results.

1.1 INVESTIGATION OBJECTIVES

The purpose of this investigation, per the Task Order, was to "collect data to determine the cause of fluctuating water levels in the wells, choose the most protective location within Section 35 for

a repository, and ensure a protective design of that repository which meets applicable or relevant and appropriate legal requirements (ARARs)." Specifically, under the SAP, Pioneer Technical Services was tasked to:

1. Complete an investigation of Section 35 to identify the best location for a repository that is large enough to contain and isolate 1,000,000 cubic yards of mine waste and that blends the repository into the natural topography to the extent practical;
2. Collect the data necessary to determine the cause of fluctuating water levels across Section 35; and,
3. Collect additional data and information necessary to design a repository that meets ARARs.

The investigation and data collected from Section 35 to meet these objectives are summarized and presented in this DSR.

2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The UBMC is located approximately 15 miles east of Lincoln, Montana, in the headwaters area of the upper Blackfoot River (Figure 1). Section 35 is located approximately five miles west-southwest of the Mike Horse Dam and impounded tailings and is within the Upper Blackfoot Mining Complex (UBMC) (Figures 1 and 2).

2.2 SECTION 35 DESCRIPTION

Section 35 is located northeast of Highway 279 in the N1/2 of Section 35, T15N, R7W, and is approximately 360 acres in size (Figure 2).

Vegetation at Section 35 generally consists of native Douglas fir and lodge pole pine trees, harvest areas with sub-mature regeneration, sagebrush, and grasslands. Nora Creek, a small perennial creek, bisects Section 35, and the Blackfoot River flows through the west side of Section 35.

Surface geology of the Rogers Pass Area was mapped in 1987 by Whipple et al. (USGS, 1987). A portion of this map includes Section 35. The area, including Section 35, was mapped as Pleistocene glacial deposits. To the north and east of Section 35, the Spokane Formation (maroon to grayish red siltite and thinly interlaminated dark-red argillite) was mapped along with late Proterozoic diorite sills. Southwest of Section 35, the Crater Mountain volcanics cover an expansive area, and directly west the valley floor is mapped as Pleistocene glacial deposits and Quaternary alluvium. Directly northwest of Section 35, along the Blackfoot river, small sections of andesite and trachyte are mapped (USGS, 1987). Observations reported in previous Data Summary Reports for the UBMC have confirmed the presence of glacial deposits and volcanics within Section 35. (DEQ-Terragraphics, 2010).

2.3 PROJECT BACKGROUND AND SITE HISTORY

Historic mining activities in the UBMC resulted in the accumulation of large volumes of mine waste materials in the Mike Horse mine tailings dam and impoundment as well as mine waste materials and impacted soils placed or accumulated in Mike Horse Creek, Beartrap Creek, and Upper Blackfoot River and their associated floodplains. In 1975, a catastrophic flood caused the Mike Horse Dam to fail and release tailings, dam materials, and several thousand yards of hillside materials from the east end of the dam. A more complete description of the facility and regulatory and permitting history of the UBMC can be found in the Final Remedial Investigation Work Plan, Upper Blackfoot Mining Complex (DEQ-TetraTech, 2007).

The 2007 Action Memorandum (USFS, Helena National Forest, 2007) provided a recommendation for the removal of the Mike Horse Dam, impounded tailings, and tailings in the streams and floodplains of Lower Mike Horse Creek, Beartrap Creek, and Upper Blackfoot River. In January of 2009, per the Watershed Restoration Agreement (DEQ/EPA/USFS, 2008), the State hired engineering firms to complete design-level investigations of the wastes in the impoundment and to perform a detailed analysis of the Paymaster repository site, which was selected by the USFS in the Action Memorandum as the preferred repository location. These investigations raised serious concerns regarding the cost and suitability of the Paymaster repository site. Because of these concerns, a search for other suitable repository sites in and near the UBMC was initiated. In late 2009 and early 2010, through visual observation and site reconnaissance, Section 35 was identified as a potential repository and borrow site. In the summer of 2010, an investigation of Section 35 was conducted (DEQ-Terragraphics, 2010), which indicated multiple potential areas within Section 35 might be suitable for a repository.

In the summer of 2010 three monitoring wells and one piezometer were installed during an investigation of Section 35 (DEQ-Terragraphics, 2010) in the vicinity of Region 1 (see Figure 2). Analysis of the data collected in 2010 indicated that Region 1 could be a suitable repository site, but additional design-level data would be needed to support a protective repository design that would meet all applicable requirements (DEQ-Pioneer Technical Services, 2011b).

In the spring of 2011, DEQ tasked Pioneer Technical Services to complete an independent review of the process utilized to select a repository site, to identify issues with that process, and to prepare a repository siting study for the UBMC. Results of the review and siting study are presented in the Final Repository Siting Study (DEQ-Pioneer Technical Services, 2011a), which identified Section 35 as the preferred repository alternative for the UBMC cleanup. The study was released for public comment in September of 2011 and in July 2012, the USFS selected Section 35 as the preferred repository location for mine waste from the UBMC (USFS, Helena National Forest, 2012).

3.0 TEST PITTING

3.1 SAMPLING METHODS

Test pit sampling was performed at 13 test pit locations within Region 1 of Section 35 in accordance with Section 2.3 of the SAP (DEQ-Pioneer Technical Services, 2012a). Deviations from the SAP are discussed in Section 8.0.

Test pits were excavated between October 2, 2012 and October 5, 2012 by Streamworks Inc. using a Komatsu PC200 excavator. Test pits were observed and logged by Pioneer personnel. Figure 3 shows the locations of the test pit locations within Region 1 of Section 35 overlaid on a 2011 National Agriculture Imagery Program (NAIP) image of Section 35 (State of Montana, 2011).

Field data collection consisted of test pit location; date and time; weather conditions; soil profile/lithology descriptions, including Universal Soil Classification System (USCS) soil classification; sample numbers; sample depth intervals; personnel present; and presence of the groundwater during excavation. Field logs and test pit logs are provided in Appendix A.1. Digital photographs were collected from each test pit location. The test pit photo log is provided in Appendix B.1.

Bulk samples were collected from each stratigraphic layer identified per the SAP and at specific depths, as requested by the Field Sampling Leader. Each stratigraphic layer was carefully observed as it was exposed and visual soil classification and texture (according to American Society of Testing Materials [ASTM]) Test Method D-2487), moisture condition, gravel/cobble/boulder content, color, depth, the presence of bedrock, groundwater, organic material, and other notable features were recorded in the field logs. Disturbed bulk samples for geotechnical testing were collected in five-gallon buckets, and all other samples were collected and sealed in one-gallon Ziplock® freezer bags. Samples were given a unique sample number, as described in Section 3.1.2 of the SAP.

All samples were transported to the Pioneer Geotechnical Laboratory for compositing (if applicable), additional classification according to ASTM Test Method D-2488 (USCS classification), and preparation for testing.

After logging and sampling was completed, the test pits were backfilled with the existing soils. The backfill was tamped in place with the excavator bucket and the stripped topsoil was replaced on the surface prior to leaving each test pit location

3.2 TEST PIT LOGS AND FIELD LOGBOOKS

A field log book was maintained during field sampling. Appendix A.1 provides the test pit logs and copies of the field log book. The logs provide USCS soil classification, resource grade GPS location, total depth, and the presence of water (when applicable). Field log books and original field data sheets for this investigation are maintained on file at the Pioneer office in Helena, Montana and duplicated in Appendix A.

3.3 SELECTION OF SAMPLES FOR LABORATORY ANALYSIS

The primary purpose of the test pitting investigation was to identify physical (geotechnical) properties of the soils for repository and borrow area design. Sixty-one discrete bulk samples were chosen to represent the various material types identified by the geotechnical engineer.

Six composite bulk samples were created from the discrete bulk samples along several of the repository transects shown on Figure 3. The composite bulk samples were selected and created to simulate potential average soil properties of different phases of repository excavation and/or borrow area development. Samples used to create the composite samples and the composite sample numbers are provided in Table 1.

Six samples and one duplicate sample were selected and submitted for Target Analyte List (TAL) metals analysis to determine if the alluvium materials are suitable for use as clean backfill for reclamation at the UBMC. Table 2 summarizes the results of laboratory data provided in Appendix D. Deviations from the SAP are presented in Section 8.0.

3.4 SAMPLE ANALYSIS RESULTS

Discrete and composite bulk soil samples were analyzed in the Pioneer Technical Services geotechnical laboratories in Helena and Belgrade, Montana. Appendix C.1 provides the laboratory-reported geotechnical test results. Table 2 presents a summary of the test pit laboratory results. Table 3 presents a summary of the particle size distributions (material gradations). A Standard Proctor analysis was attempted on bulk sample from Test Pit S35TP-113, but the sample was too coarse-grained and no values were obtained.

The bagged analytical laboratory soil samples were sent to the Pioneer Technical Services geotechnical laboratory in Helena, Montana where they were screened through a number 10 mesh screen, re-bagged with appropriate identification, and sent to Energy Labs in Helena, Montana for laboratory analyses for agronomic properties, physical properties, ABA/SMP, and TAL metals. Appendix D provides the raw laboratory soil geochemical results, which include agronomic properties, physical properties, ABA/SMP, and TAL metals and the chain-of-custody forms that accompanied the samples that were sent to the lab. A summary of the geochemical laboratory results is also presented in Table 2.

The total metals results are all within their respective Screening Level (as defined in the footnotes of Table 2), with the exception of lead in samples S35-CS-01 and S35-CS-01 (Duplicate). These samples were composited using base course and topsoil from the surface of Test Pit S35TP-101 and topsoil from the surface of Test Pits S35TP-112 and S35TP-113. Total lead concentrations in these two samples range from 548 to 630 mg/kg, which exceed the Risk Screening Levels (RSLs) of 400 mg/kg (for Residential use) and are an order of magnitude higher than the lead levels in all other test pits. According to the Agency for Toxic Substances and Disease Registry, higher levels of lead are often found in surface soils found near roadways, due to the exhaust of leaded gasoline by passing vehicles. Because Test Pit S35TP-101 is located at the centerline of the old highway between Lincoln and Helena, it is hypothesized that the elevated lead levels in S35-CS-01 and S35-CS-01 (Duplicate) may be related to years of

deposition of leaded gasoline exhaust from vehicles. This theory could be verified by submitting a sample from the surface of S35TP-101 for total lead analysis; however, the sample location is outside of the proposed Region 1 repository and does not represent soil to be utilized during reclamation. Institutional controls currently in place prohibit residential development at the site, and the sample concentrations fall below applicable Industrial (800 mg/kg) and Recreational (3,920 mg/kg) RSLs.

3.5 QUALITY ASSURANCE, QUALITY CONTROL, AND DATA VALIDATION

QA/QC summary reports are provided with the raw laboratory soil geochemical results from Energy Labs in Appendix D. One duplicate sample was collected for TAL metals analysis. Table 2 provides the results for the duplicate sample, which was used in the data validation process. Per the QAPP and as stated in the SAP, field blanks and field duplicate samples were not collected for geotechnical samples collected during the investigation. Geotechnical testing was completed in Pioneer's accredited laboratory using standard test methods which provide adequate QA/QC measures for geotechnical testing and reporting.

The quality of the analytical data in this investigation in terms of accuracy, precision, representativeness, and completeness was evaluated based on protocol established in the QAPP. Data quality for the analytical samples is discussed in Section 7.0.

3.6 WATER LEVEL DATA

Single piezometers were installed in eight (8) of the test pits and two (2) nested piezometers sets were installed in two (2) of the test pits. Piezometers were installed if water or evidence suggesting water may be present was observed. Piezometer depths and screened intervals were determined by the Field Sampling Leader and DEQ Project Officer, when available, in order to target the specific soil units. Total depth, screen interval, and other pertinent information about the piezometers are provided in the field logs provided in Appendix A.1. Piezometer completion information is presented in Section 5.0 and summarized in Table 6.

3.7 SURVEY DATA

Appendix E provides the survey data for actual test pit locations surveyed by the DEQ-contracted surveyor (DJ&A). The survey data report the northing, easting, ground elevation, and the monitoring point elevation of the piezometer casings as constructed.

4.0 GEOTECHNICAL SOIL BORINGS AND MONITORING WELLS

4.1 SAMPLING METHODS

The geotechnical soil boring investigation involved drilling and the collection of soil and bedrock samples. The samples were collected using the methods stated in the SAP. Deviations from the SAP are discussed in Section 7.0.

A total of 20 soil borings were completed, field logged, and sampled during the investigation.

Soil boring locations were field identified and adjusted as necessary to accommodate equipment access. Figure 3 shows the locations of the soil boring locations within Region 1 of Section 35 overlaid on a 2011 NAIP image of Section 35 (State of Montana, 2011).

Field data collection consisted of soil boring location; date and time; weather conditions; soil profile/lithology descriptions, including USCS soil classification; sample numbers; sample depth intervals; personnel present; and associated organization. Notes also were made regarding the presence of water observed during the drilling.

Sampling was completed at either the prescribed intervals or at specific depths determined by the geotechnical engineer. The coarse-grained soils were sampled with split spoon samplers of varying size. It is not possible to obtain undisturbed samples of coarse-grained soils without special measures, so only disturbed samples suitable for classification purposes were obtained in the coarse-grained soils. Samples obtained by the grab, or bulk, method are similarly disturbed and suitable only for classification purposes. Fine-grained soils can be sampled with 2.8-inch thin-walled tubes or in brass liners installed into larger split spoon samplers. Thin-walled samplers are used where the soils are soft enough to push them into the undisturbed soil ahead of the bit using the hydraulic pressure of the drill. In locations where the finer-grained material was too stiff to sample with a thin-walled sampler, a 3-inch outside diameter split spoon with brass liners was used to obtain relatively undisturbed samples. Every attempt was made to sample fine-grained material with thin-walled samplers to minimize sample disturbance.

Each sample was carefully observed as it was recovered and soil classification, moisture condition, and the presence of organic and other notable features were recorded in the field logs. Disturbed samples were sealed in thick plastic bags and/or five-gallon buckets and transported to the Pioneer Technical Services Geotechnical Laboratory in Belgrade, Montana for testing and additional classification.

All soils were visually classified in accordance with ASTM Test Method D-2487 (USCS). Subsurface conditions interpreted from the field observations, drill performance, and water production from the hole during the drilling process was noted on the drilling logs.

The stratification lines shown on the borehole logs represent the approximate boundary between soil types as observed in the boreholes. The actual *insitu* transition may be either gradual or abrupt and typically changes within the limits of the investigation. Due to the depositional characteristics of natural soils, care should be taken in interpolating subsurface conditions beyond the location of the boreholes.

After sampling was finished, one or two piezometers or a single monitoring well was installed into each of the soil borings. Piezometer and monitoring well depths and screened intervals were constructed per the direction of the geotechnical engineer and the DEQ Project Officer, when available, to target the bedrock and specific soil units when possible. Figure 3 shows the locations of the soils borings, monitoring wells, and piezometers installed at Section 35.

After all data were collected and the boring logs completed, the soil boring data were used to develop five (5) east-west and three (3) north-south geologic cross sections of Region 1 (Figures

4-12). These data will be used to develop a three-dimensional geologic model of the repository area for use in repository and borrow area design and stability analyses. Preliminary interpretation of the data indicates that the repository could be constructed entirely in the glacial till/outwash materials.

4.2 SOIL BORING, PIEZOMETER AND MONITORING WELL LOGS

Appendix A.2 provides the soil boring logs. The logs provide soil boring location; date and time; soil profile/lithology descriptions, including USCS soil classification; sample numbers; sample depth intervals; piezometer and monitoring well installation records; preliminary water level readings; personnel present; and associated organization. Notes also were made regarding the presence of the groundwater observation during the drilling. Field log books and original field data sheets for this investigation are on file at the Pioneer offices in Helena, Montana.

4.3 SELECTION OF SAMPLES FOR LABORATORY ANALYSIS

All samples from the soil borings were collected as described above and returned to the Pioneer geotechnical laboratory located in Belgrade, Montana. Representative samples for the various geologic units at Section 35 were selected and prepared for laboratory testing according to the methods specified in the SAP.

4.4 SAMPLE ANALYSIS RESULTS

The selected soil samples were analyzed at the Pioneer geotechnical laboratory located in Belgrade, Montana. The laboratory performed geotechnical analyses on selected samples per applicable testing standards. The Section 35 Repository Design Investigation soil boring laboratory data and testing methods are summarized in Table 4. A summary of the particle size distributions is presented in Table 5. Appendix C.2 provides the laboratory geotechnical reports.

4.5 QUALITY ASSURANCE, QUALITY CONTROL, AND DATA VALIDATION

The quality of the analytical data, for the soil boring investigation, in terms of accuracy and precision, was evaluated based on protocol established in the QAPP (DEQ-Pioneer Technical Services, 2012b). Per the QAPP and as stated in the SAP, field blanks and field duplicate samples were not collected for geotechnical samples collected during the investigation. Geotechnical testing was completed in Pioneer's accredited laboratory using standard test methods which provide adequate QA/QC measures for geotechnical testing and reporting.

4.6 WATER LEVEL DATA

A total of 41 nested piezometers and/or monitoring wells were installed in soil borings as described in the SAP or as determined appropriate during the investigation. Piezometers were installed in each geologic formation to measure groundwater elevations throughout Section 35 and to assist with the planned pumping test.

Piezometer depths and screened intervals were determined by the Field Sampling Leader and the

DEQ Project Officer, when available, in order to target the specific stratigraphic units. Total depth, screen interval, and other pertinent information about the piezometers are provided in the logs provided in Appendix A.2. Table 6 presents piezometer completion information based on the surveyed locations and elevations.

4.7 SURVEY DATA

Appendix E presents the survey data for actual soil boring locations that were surveyed by the DEQ-contracted surveyor (DJ&A). The survey data report the northing, easting, ground elevation, and the monitoring point elevation of the monitoring wells and piezometer casings as constructed.

5.0 MONITORING WELL AND PIEZOMETER INSTALLATION

5.1 PIEZOMETER AND MONITORING WELL LOGS

Appendix A.2 provides the soil boring logs. The logs provide soil boring location; date and time; soil profile/lithology descriptions, including USCS soil classification; sample numbers; sample depth intervals; piezometer and monitoring well installation records; preliminary water level readings; personnel present; and associated organization. Notes also were made regarding the presence of water observed during the drilling.

Monitoring wells and piezometers were installed in each soil boring as indicated on the logs. Locations of the monitoring wells and piezometers are shown on Figure 3. Stratigraphy, screen information, and water elevations recorded in each piezometer during the investigation are shown on Figures 4 through 12. Table 6 summarizes all of the monitoring well and piezometer installation information.

5.2 WATER LEVEL DATA

After all new wells and piezometers were surveyed, the preliminary water level elevations measured during the soil boring investigation were corrected and added to logs provided in Appendix A.2. The geologic cross sections were updated to reflect elevations relative to the actual surveyed ground surface elevations at each soil boring.

Appendix F provides a table of all previously installed monitoring wells and piezometers at Section 35 including northing and easting, ground and measuring point elevations, total depth, and transducer elevations. Appendix F also presents graphs showing water fluctuation in the existing monitoring wells and piezometers from August 2010 to December 2012.

6.0 PUMPING TEST

A groundwater pumping test (aquifer test) was proposed in the SAP (DEQ-Pioneer 2012 a). The location of the proposed pumping well and monitoring wells are shown on the figures in the SAP.

During the soil boring investigation Pioneer determined that the proposed pumping well location would not produce enough water to complete an effective aquifer test. The investigation was suspended and preliminary geologic cross sections of Section 35 were created in an attempt to find a suitable alternate pumping well location. Pioneer discussed the options with Spectrum Engineering and DEQ, and all parties agreed to eliminate the pumping test from the fall 2012 field work.

Instead of the pumping test, water elevations will be monitored through installation of transducers in 22 of the piezometers installed at Section 35. These data will be collected though the spring of 2013. The need to conduct the pumping test will be reassessed based on the results of the spring 2013 water elevation monitoring. After the spring 2013 monitoring data are analyzed, if DEQ determines that a pumping test still is warranted, the pumping well location and test will be redesigned and completed in the late the spring or early summer of 2013, in accordance with the SAP (DEQ-Pioneer 2012a).

6.1 GROUNDWATER SAMPLING AND FIELD PARAMETER TESTING

Depth-to-water measurements were recorded from each new monitoring well and piezometer within Region 1 after installation according to Pioneer's SOP (PTS-SOP-GW-03), provided in Appendix B of the QAPP (DEQ-Pioneer Technical Services, 2012b), and Section 3 of the SAP (DEQ-Pioneer Technical Services, 2012a). New monitoring well and piezometer I.D.'s, elevations, and depth-to-groundwater measurements recorded on November 19, 2012 are summarized in Table 6.

Water quality parameters and groundwater samples have not been collected from the new Region 1 monitoring wells and piezometers as of the date of this report. Results of water sampling from the monitoring wells at Section 35 in July and August of 2010 (DEQ-Terragraphics, 2010), and subsequent monitoring by Portage (Portage Inc., 2012) indicate that none of the water samples collected from the wells at Section 35 exceeded human health standards for dissolved metals in Circular DEQ-7 (DEQ, 2012). Water quality samples proposed in the SAP were intended to determine if water discharged during the pumping test would exceed standards or require treatment and are not needed for this purpose unless the pumping test is conducted. Depending on the results of the spring groundwater elevation monitoring, the new wells may be sampled in the spring of 2013 in preparation for or in conjunction with the pumping test.

6.2 STAFF GAGES

New staff gages have not been installed in Nora Creek or the Blackfoot River as of the date of this report. The staff gages were to be installed and monitored during the pumping test. Depending on the results of the spring groundwater elevation monitoring, the staff gages may be installed in the spring of 2013 in preparation for or in conjunction with the pumping test.

7.0 DATA VALIDATION

The specific needs for data to be collected during the sampling and investigation work were examined to ensure that project objectives were achieved. The Data Quality Objectives (DQOs) of the investigation are summarized in Tables 1 and 2 of the QAPP for this investigation (DEQ-Pioneer Technical Services, 2012b). A summary of the data quality assurance/quality control (QA/QC) review for the 11 samples submitted to Energy Labs on December 19, 2012 and the 1 duplicate sample (S35-CS-01) submitted to Energy Labs on January 16, 2013 is provided in the Data Validation Report provided in Appendix G.

Because of method blank detections in the samples submitted on December 19, 2012, all detected silver results were qualified with a J+ (the result is an estimated quantity, but the result may be biased high). The barium result from the sample submitted on January 16, 2013 was qualified with a J+ based on matrix spike (MS) results. Potassium results from both submittals were qualified with a J+ based on MS and matrix spike duplicate (MSD) recoveries that were outside of the laboratory control limits. Antimony results from both sample submissions were qualified as UJ (the analyte was analyzed for, but not detected; the reported quantitation limit is approximate and may be inaccurate or imprecise) based on MS and MSD recoveries outside of the laboratory control limits. All mercury results were qualified as UJ; the receiving temperature of the samples was well above the temperature required in the EPA National Functional Guidelines for Inorganic Superfund Data Review (EPA, 2010); and all samples were extracted outside of the recommended holding times. The purpose of this investigation was to collect engineering design data and not to characterize the site for cleanup. As a result, impacts of sampling mercury out of the temperature and holding time range are considered to be negligible. No data were rejected. QC criteria for precision, accuracy, representativeness, and completeness were used to assess and qualify the data and are summarized in the following sections.

7.1 PRECISION

Precision is the amount of scatter or variance that occurs in repeated measurements of a particular analyte. Acceptance or rejection of precision measurements is based on the relative percent difference (RPD) of the laboratory and field duplicates. For example, perfect precision would be a 0% RPD between duplicate samples (both samples have the same analytical result). For total metals, acceptable precision would be a RPD of plus or minus 35% in solid samples and plus or minus 20% in water samples. Precision requirements are derived from the Contract Laboratory Program (CLP) Statement of Work (SOW) (EPA, 1992). For these investigations, precision was assessed only for the laboratory analysis of certain metals on the TAL. The procedures used to assess precision followed the DEQ guidance provided in Appendix A of the QAPP (DEQ-Pioneer Technical Services, 2012b). Precision was determined to be acceptable for all samples collected for TAL analysis.

7.2 ACCURACY

Accuracy is the ability of the analytical procedure to determine the actual or known quantity of a particular substance in a sample. The standard deviation (SD) of the laboratory matrix spike was

used to measure accuracy statements for inorganic data. Accuracy acceptance or rejection was based on the percent recovery (% R) of the laboratory matrix spike. Perfect recovery would be 100% (the analysis result is exactly the known concentration of the matrix spike). For total metals, an acceptable accuracy range would be 75% to 125% in solids and in water. Accuracy requirements for this project are derived from the CLP SOW (EPA, 1992). Accuracy was only assessed for the laboratory analysis of metals in the TAL. The procedures used to calculate accuracy followed the DEQ guidance provided in Appendix A of the QAPP (DEQ-Pioneer Technical Services, 2012b). Accuracy was determined to be acceptable for all samples collected for TAL analysis.

7.3 REPRESENTATIVENESS

Representativeness is a qualitative parameter that is addressed through proper design of the sampling program. The sampling program described in the SAP was designed to obtain a sufficient number of samples that adequately represent the range of conditions present in the medium being sampled and specified suitable sampling methods and procedures.

The laboratory results have been reviewed and qualitatively assessed by Pioneer and have been determined to be representative of the conditions at Section 35 and the purpose of this investigation.

7.4 COMPLETENESS

Completeness is assessed to determine if enough valid data have been collected (see Section 10.0 of the QAPP, DEQ-Pioneer Technical Services, 2012b) to meet the investigation needs. Completeness is assessed by comparing the number of valid sample results to the number of samples planned for the investigation. The completeness targets for these investigations is 90% or greater. A total of three (3) topsoil composite samples and four (4) base/cover soil and floodplain borrow composite samples were to be tested for metals in the TAL list. Four topsoil composite samples, including one duplicate, and three (3) base/cover soil and floodplain borrow composite samples were actually tested, resulting in 100% sample collection completeness for this investigation. In addition, no results were rejected due to data validation, resulting in 100% sample analysis completeness for this investigation.

7.5 COMPARABILITY

Comparability is assessed to determine if one set of data can be compared to another set of data by determining if an EPA-approved analysis method was used, if values and units are sufficient for the database, if specific sampling points can be established and documented, and if field collection methods were similar. Analysis methods and SOP's for this investigation are included in the QAPP (DEQ-Pioneer Technical Services, 2012b) and sampling locations were documented in the SAP (DEQ-Pioneer Technical Services, 2012a).

The laboratory results have been reviewed and qualitatively assessed by Pioneer and have been determined to be comparable of the conditions at Section 35 and the purpose of this investigation.

8.0 DEVIATIONS FROM THE SAMPLING AND ANALYSIS PLAN

Deviations from the SAP (DEQ-Pioneer Technical Services, 2012a) are as follows:

- The test pit side slopes were to be pushed back to a 1.5H:1V slope and one wall was to be prepared for evaluation and sampling as described in Section 2.3 of the SAP. Due to the consistent *insitu* strength of the soils, the Field Sampling Leader was able to enter all test pits to log and sample to a depth of 4 feet below the ground surface and side slopes did not have to be sloped. Samples were collected from the excavator bucket below 4 feet.
- As anticipated and described in the SAP, the proposed test pit and soil boring locations identified were adjusted as needed in the field based on accessibility and/or field conditions.
- Metals analysis was not conducted on some of the samples collected from the test pit investigation. The materials were sampled previously and Pioneer consulted with DEQ and determined that collection of certain samples as not necessary. The combination of the discrete material samples collected previously and the composite samples collected during this investigation provide enough data for design purposes.
- Piezometers were not proposed for the test pits in the SAP. Piezometers were installed in 10 of the 13 test pits as approved by DEQ.
- All new monitoring wells were developed as discussed in Section 2.5.6 of the SAP but will not be sampled unless the pumping test is conducted.
- A pumping well (PW-205O) was to be installed to conduct a pumping test, as described in Section 2.6 of the SAP. The pumping well was not installed for the reasons discussed in Section 6.0. The need for installing the pumping well will be reassessed after the spring 2013 groundwater elevation monitoring work is completed.
- Staff gages were to be installed in Nora Creek and the Blackfoot River, as discussed in Section 2.7 of the SAP. The staff gages were not installed for the reasons discussed in Section 6.0. The need for the installing the staff gages will be reassessed after the spring 2013 groundwater elevation monitoring work is completed.
- A pumping test was to be performed at Section 35, as discussed in Section 2.8 of the SAP. The pumping test was not completed for the reasons discussed in Section 6.0. The need for completing the pumping test will be reassessed after the spring 2013 groundwater elevation monitoring work is completed.
- Two glacial outwash samples were to be submitted for geochemical laboratory testing as shown in Table 2 of the SAP. No glacial outwash samples were collected or tested during the investigation.
- Four base/cover soil and floodplain borrow composite samples were to be submitted for geochemical laboratory testing as shown in Table 2 of the SAP. Only three samples were actually tested. Field duplicate samples were not to be collected for the soil sampling effort. However, one duplicate sample of topsoil was submitted for total metals analysis.
- Groundwater samples were to be collected from all new monitoring wells, as discussed in Sections 2.5.7 and 2.9 of the SAP. Pioneer discussed collection of groundwater analytical samples with DEQ and DEQ determined that the samples collected previously were sufficient and additional sampling was not warranted during this investigation. Therefore samples were not collected or analyzed for this investigation, but may be

collected prior to the pumping test to determine water discharge quality, if the test is conducted. The need for collecting the groundwater quality samples will be reassessed after the spring 2013 groundwater elevation monitoring work is completed.

- Subsurface data was to be presented in Strater ® logs. Subsurface data is instead presented on GInt® logs.

9.0 HEALTH AND SAFETY

All health and safety procedures were performed in accordance with the Site Specific Health and Safety Plan, which is included as Appendix B of the SAP (DEQ-Pioneer Technical Services, 2012a). Daily Tool Box Meeting Records were completed daily during execution of the field work and will be provided upon request.

No lost time accidents or near misses were recorded during this project.

A cell phone booster was used successfully at Section 35 to improve emergency communication with workers. Pioneer recommends that cell phone boosters be available for use during future design and construction phases of the project.

10.0 CONCLUSIONS AND RECOMMENDATIONS

The data collected during this investigation are suitable to support the repository design. Samples collected from the repository site indicate that the materials will be suitable for constructing the repository cap, and mine site reclamation.

Geotechnical samples and geotechnical drilling results indicate that the site is suitable to construct a repository.

Groundwater elevation data collected at the site indicate that the site should be suitable for siting the repository. Small but manageable quantities of water are present in the glacial materials at some locations as anticipated.

The pumping test was not completed because it was determined that the well location and zone of influence would not yield data relevant to the entire repository site. Instead, Pioneer installed 22 additional transducers and presented a plan for collecting additional spring groundwater water elevation data to support the design effort. After the spring groundwater elevation data are collected and analyzed, if interactions between the water in the overlying outwash and the underlying bedrock aquifer system exist, they can be better defined. The need for a pumping test will be revisited once the spring data are collected and analyzed.

In aggregate, the data collected during this investigation are sufficiently complete to proceed with a repository design.

11.0 REFERENCES

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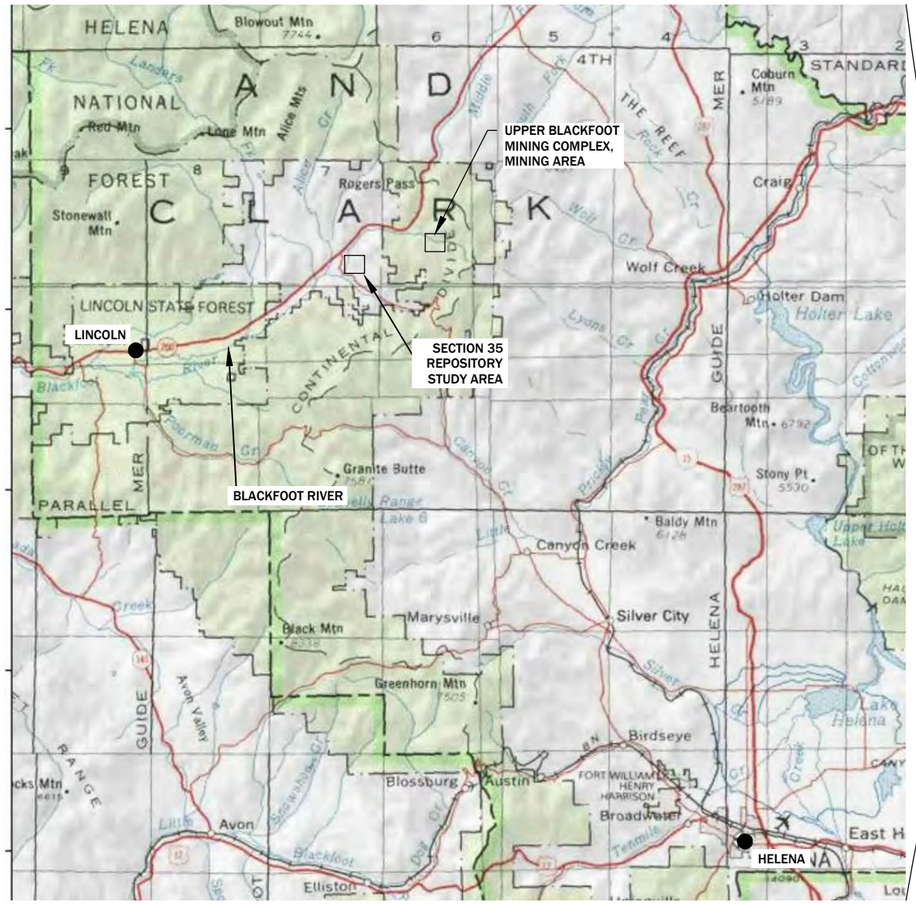

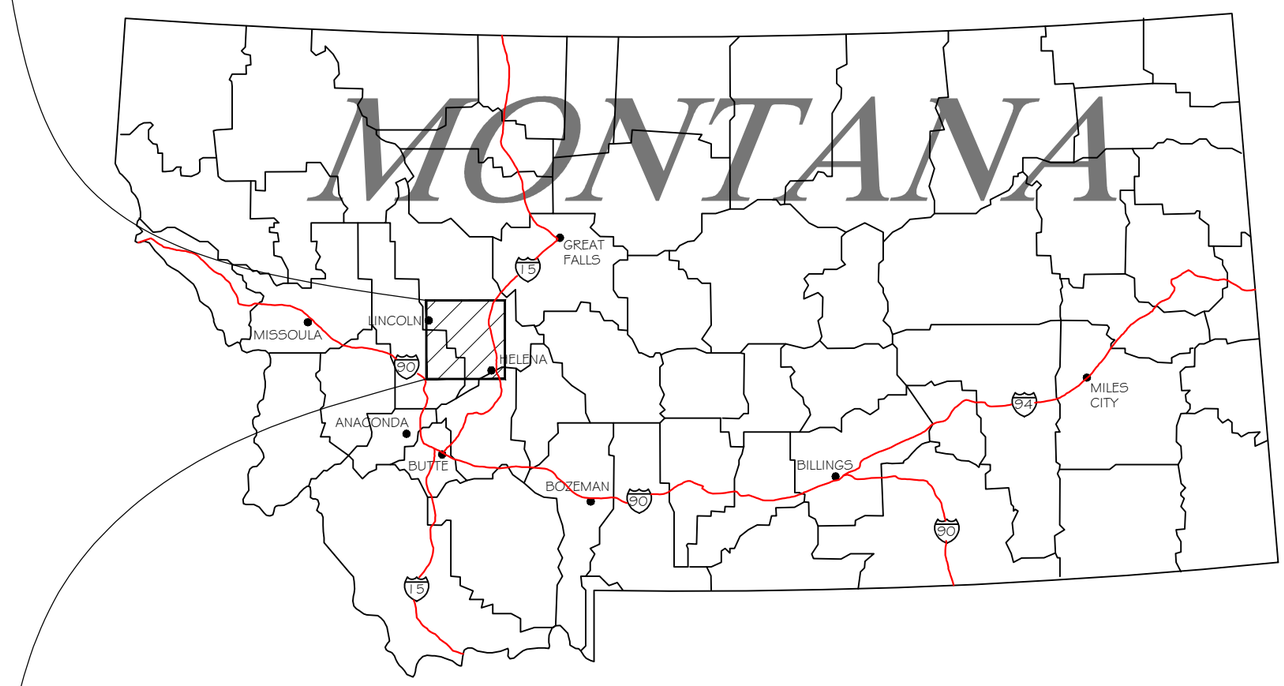

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		UNITS: N/A	HELENA, MONTANA 59601
		SOURCE: N/A	(406) 457-8252
		SCALE IN FEET 0 N/A	UPPER BLACKFOOT MINING COMPLEX SECTION 35 PROJECT LOCATION MAP
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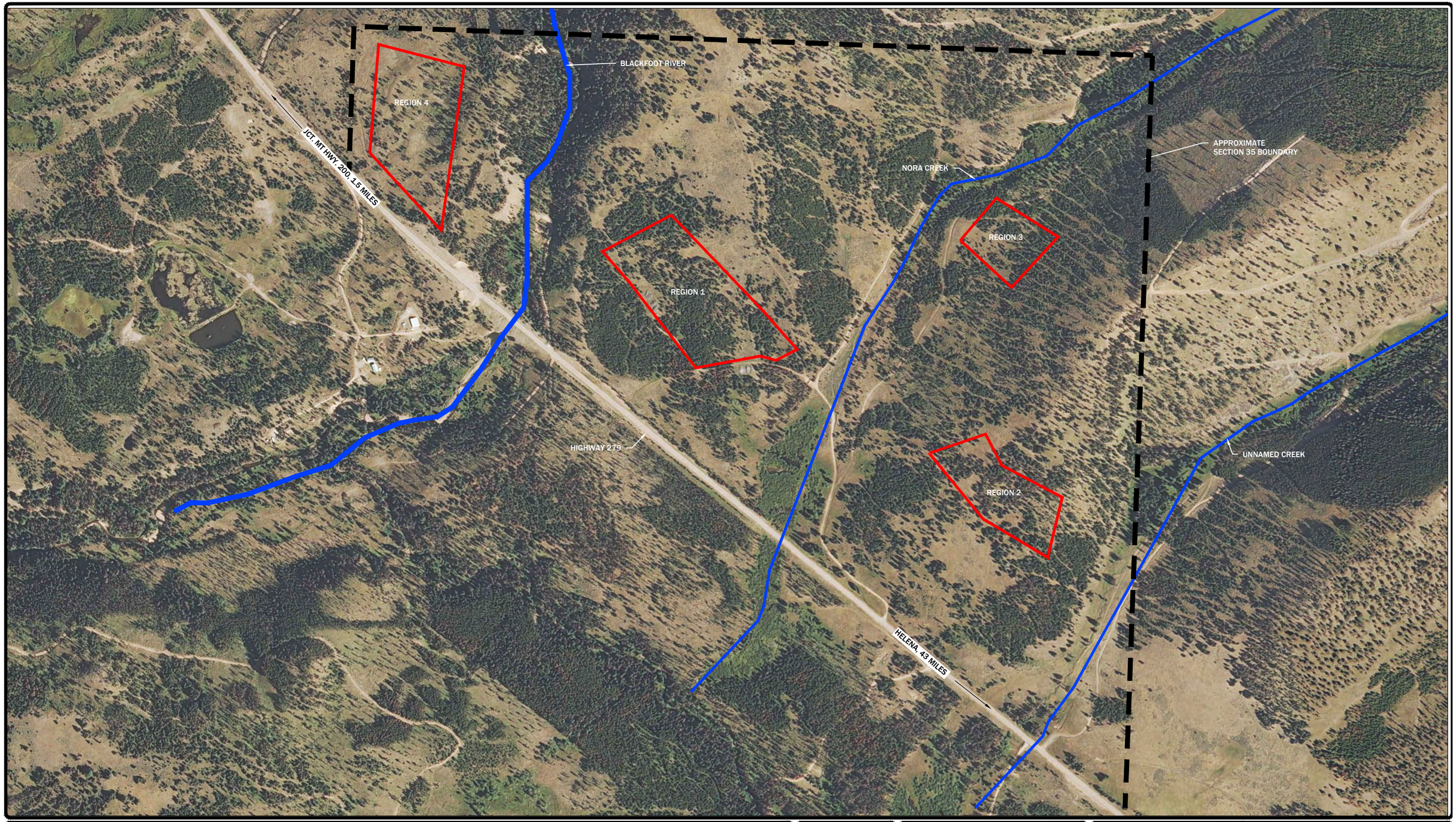

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FIGURE 2

PIONEER
TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MT 59601
(406) 457-8252

UPPER BLACKFOOT MINING COMPLEX SECTION 35 AND PROPOSED REPOSITORY LOCATIONS

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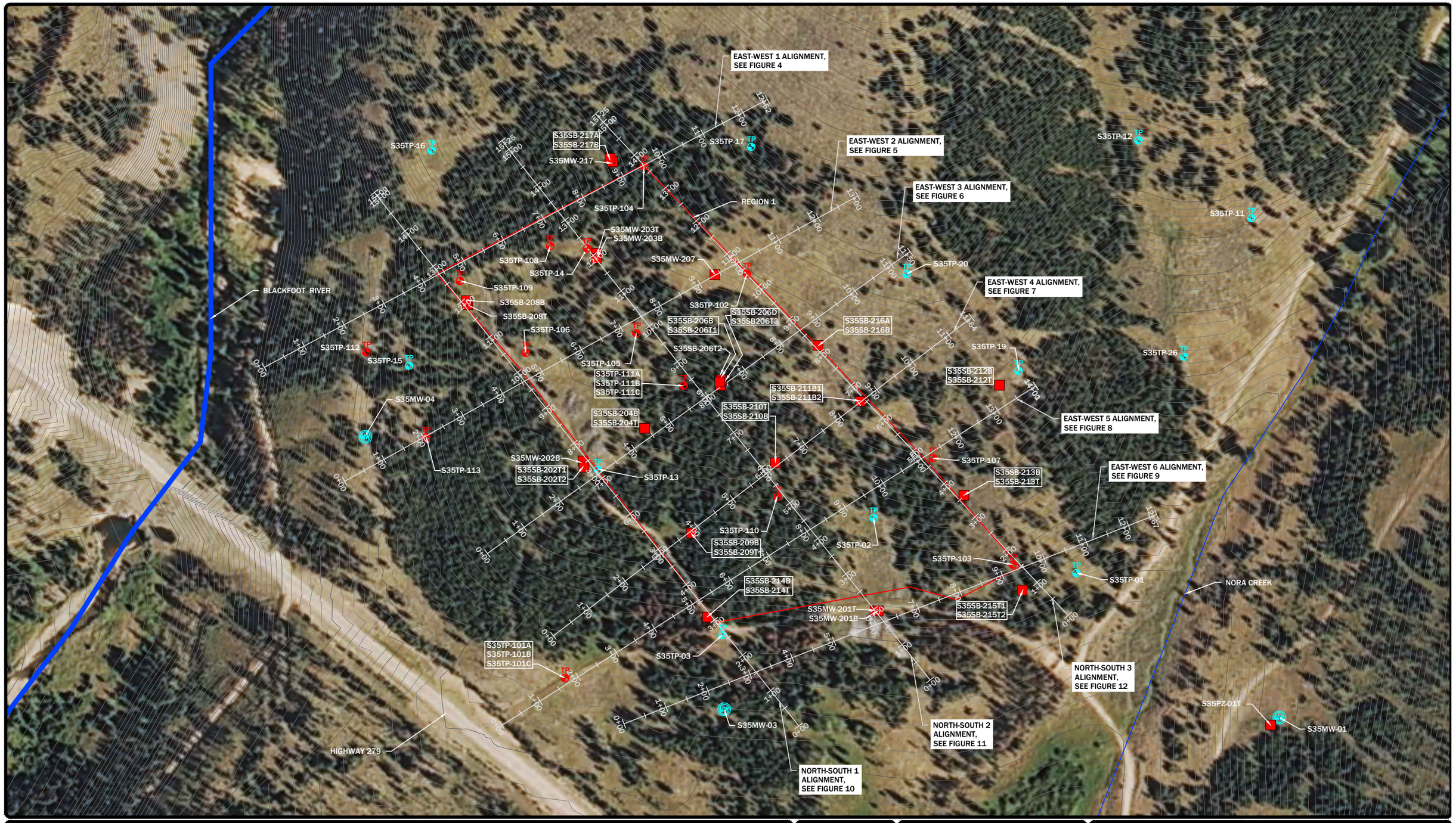

LEGEND

EXISTING

- EXISTING MONITORING WELL
- EXISTING TEST PIT

NEW

- NEW TEST PIT w/ PIEZOMETER
  NOTE: S35TP-104 DOES NOT HAVE A PIEZOMETER
- NEW SOIL BORING
- PROPOSED REPOSITORY REGION 1

S35MW-XXX = SOIL BORING WITH MONITORING WELL

S35SB-XXX = SOIL BORING WITH PIEZOMETER

S35XX-XXXX / S35XX-XXXX = MULTIPLE PIEZOMETERS IN ONE BOREHOLE/TEST PIT

N

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FIGURE 3

UPPER BLACKFOOT MINING COMPLEX SECTION 35 REGION 1 SITE MAP

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

DATE: 4/4/13

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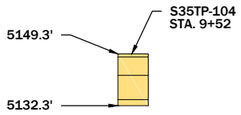

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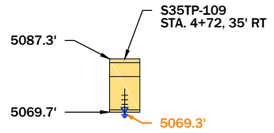

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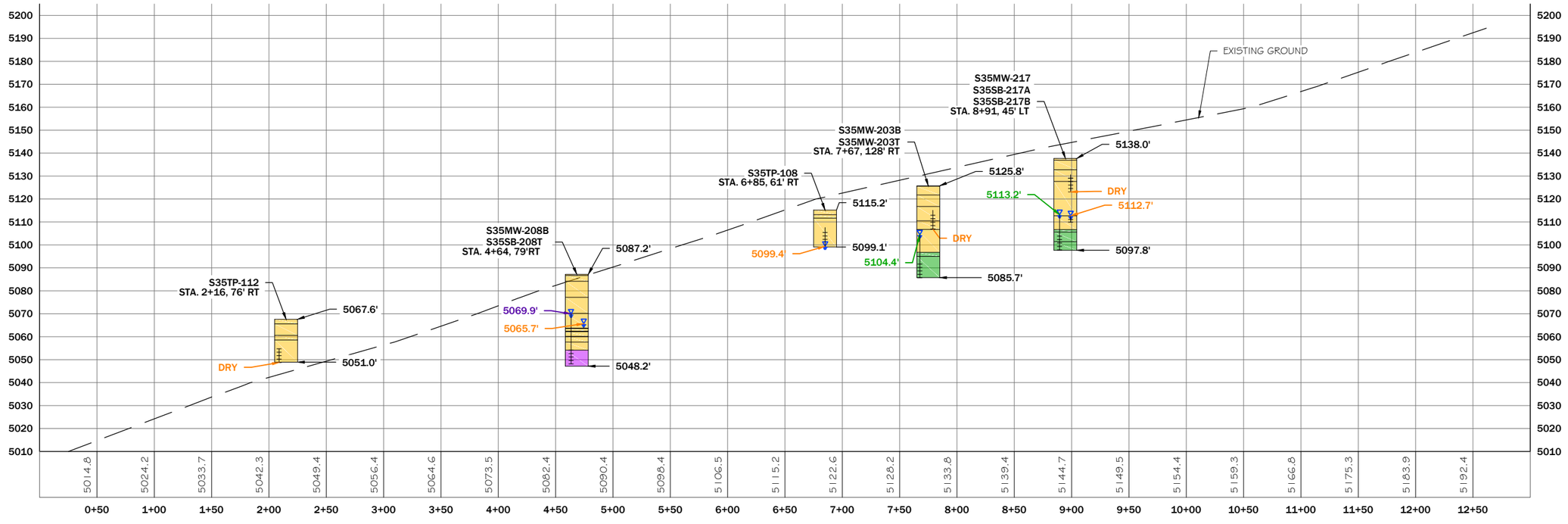

INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

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DATUM: NA
UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
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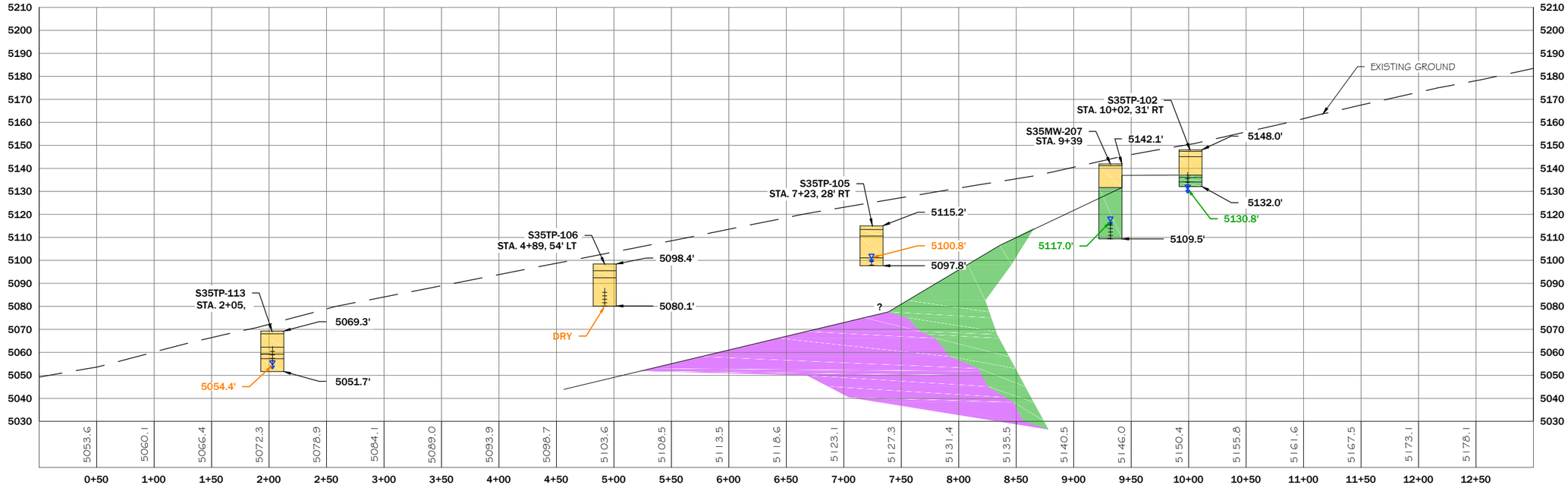
FIGURE 4

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

UPPER BLACKFOOT MINING COMPLEX SECTION 35 DESIGN INVESTIGATION EAST-WEST 1

DATE: 4/4/13



INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

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SOURCE: PIONEER

SCALE IN FEET
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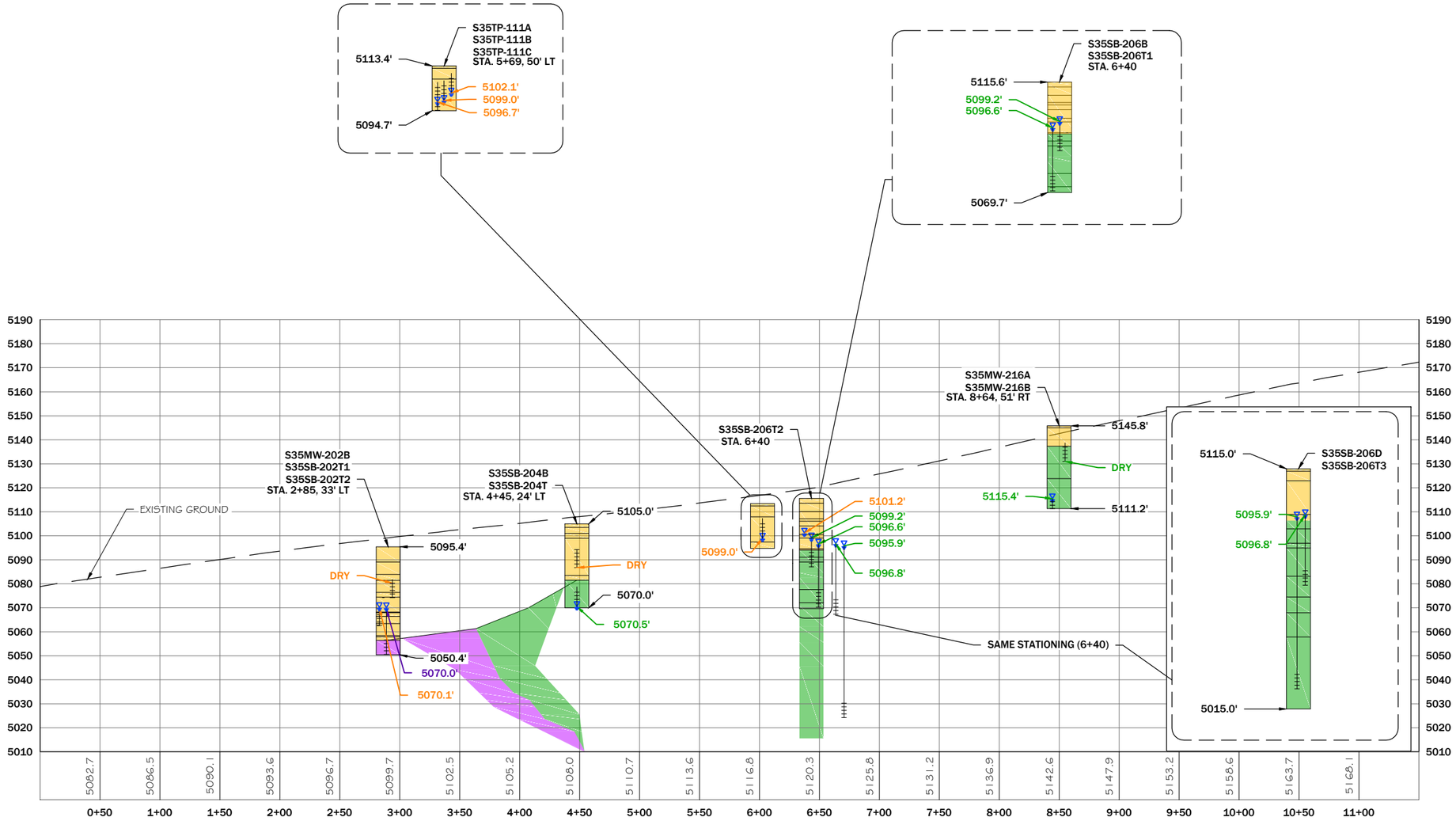
FIGURE 5

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

UPPER BLACKFOOT MINING COMPLEX SECTION 35 DESIGN INVESTIGATION EAST-WEST 2

DATE: 4/4/13



INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

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SCALE IN FEET
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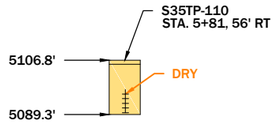
FIGURE 6

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

UPPER BLACKFOOT MINING COMPLEX SECTION 35 DESIGN INVESTIGATION EAST-WEST 3

DATE: 4/4/13



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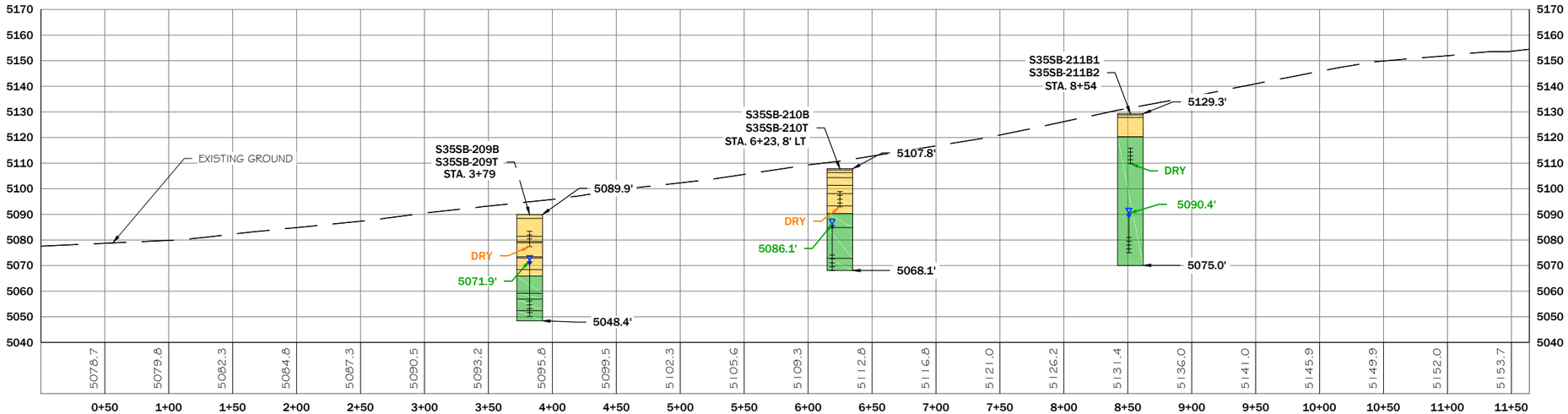

INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

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DATUM: NA
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SOURCE: PIONEER

SCALE IN FEET
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FIGURE 7

PIONEER TECHNICAL SERVICES, INC.
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HELENA, MONTANA 59601
(406) 457-8252

UPPER BLACKFOOT MINING COMPLEX SECTION 35 DESIGN INVESTIGATION EAST-WEST 4

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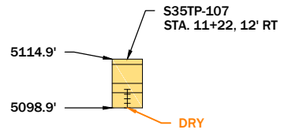

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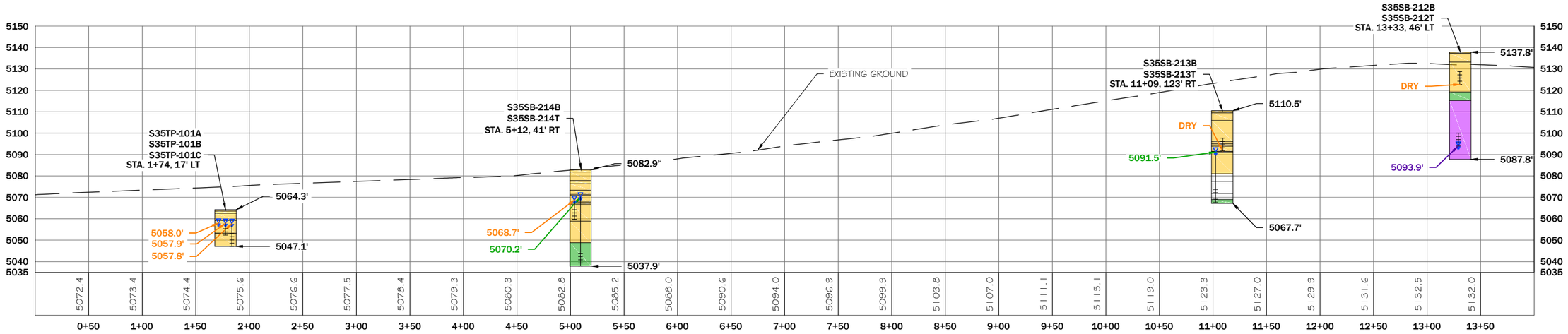

INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

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SCALE IN FEET
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DISPLAYED AS:
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DATUM: NA
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SOURCE: PIONEER

SCALE IN FEET
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FIGURE 8

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

UPPER BLACKFOOT MINING COMPLEX SECTION 35 DESIGN INVESTIGATION EAST-WEST 5

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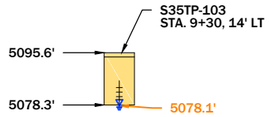

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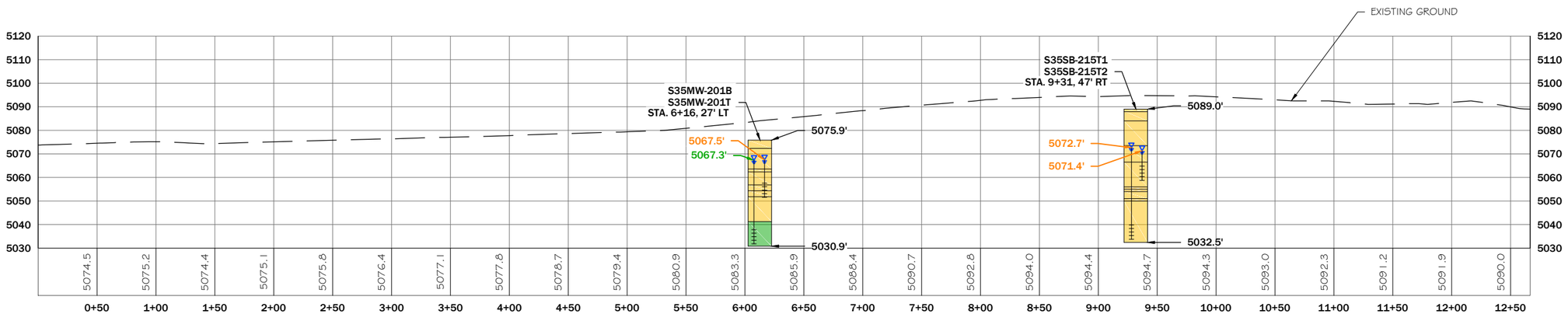

INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

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DISPLAYED AS:
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SOURCE: PIONEER

SCALE IN FEET
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FIGURE 9

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

UPPER BLACKFOOT MINING COMPLEX SECTION 35 DESIGN INVESTIGATION EAST-WEST 6

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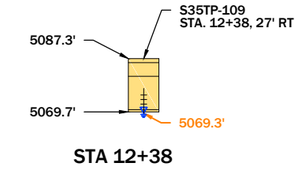

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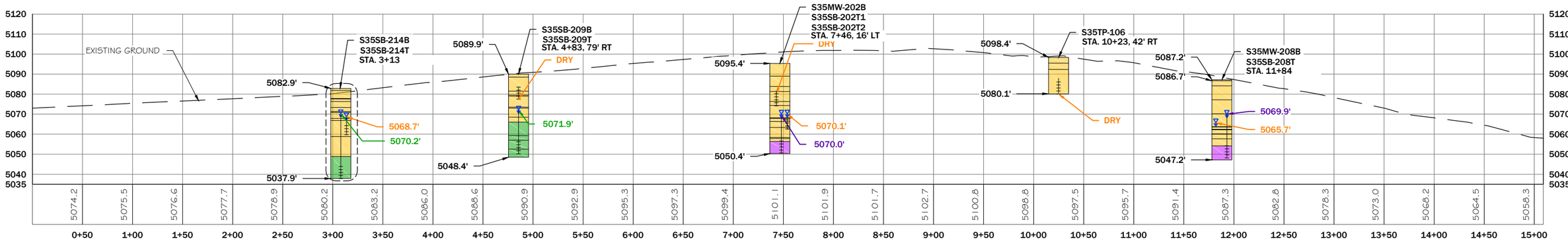

INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

TILL

ARGILLITE

TUFF

SCALE IN FEET
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DISPLAYED AS:
COORD SYS/ZONE: NA
DATUM: NA
UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
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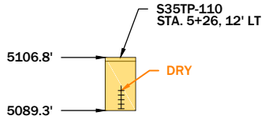
FIGURE 10

UPPER BLACKFOOT MINING COMPLEX
SECTION 35 DESIGN INVESTIGATION
NORTH-SOUTH 1

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

DATE: 4/4/13



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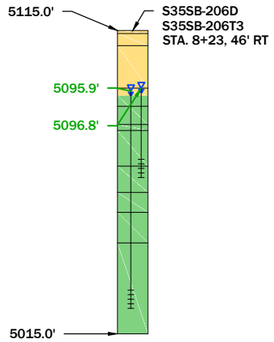

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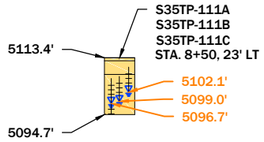

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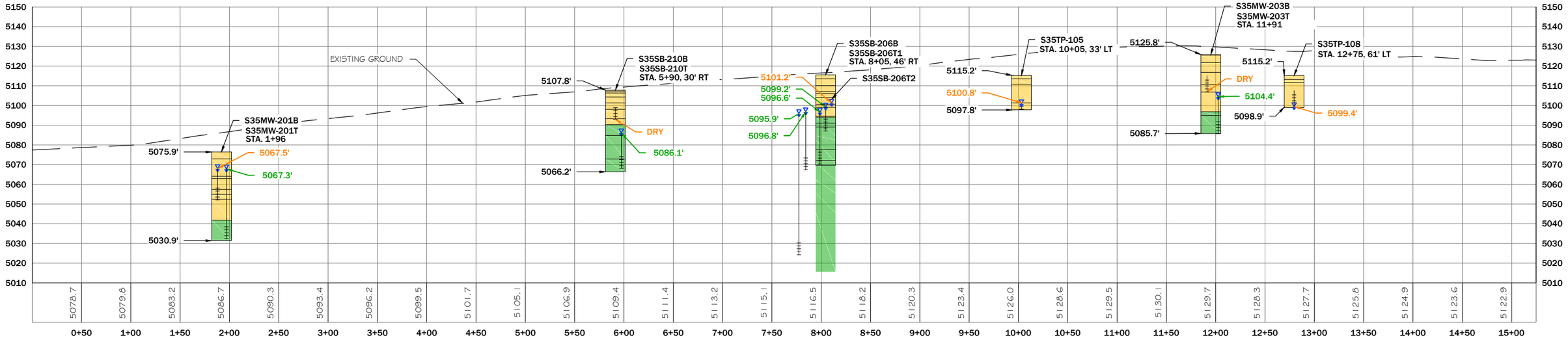

INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

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ARGILLITE

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SCALE IN FEET
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DISPLAYED AS:
COORD SYS/ZONE: NA
DATUM: NA
UNITS: FEET
SOURCE: PIONEER

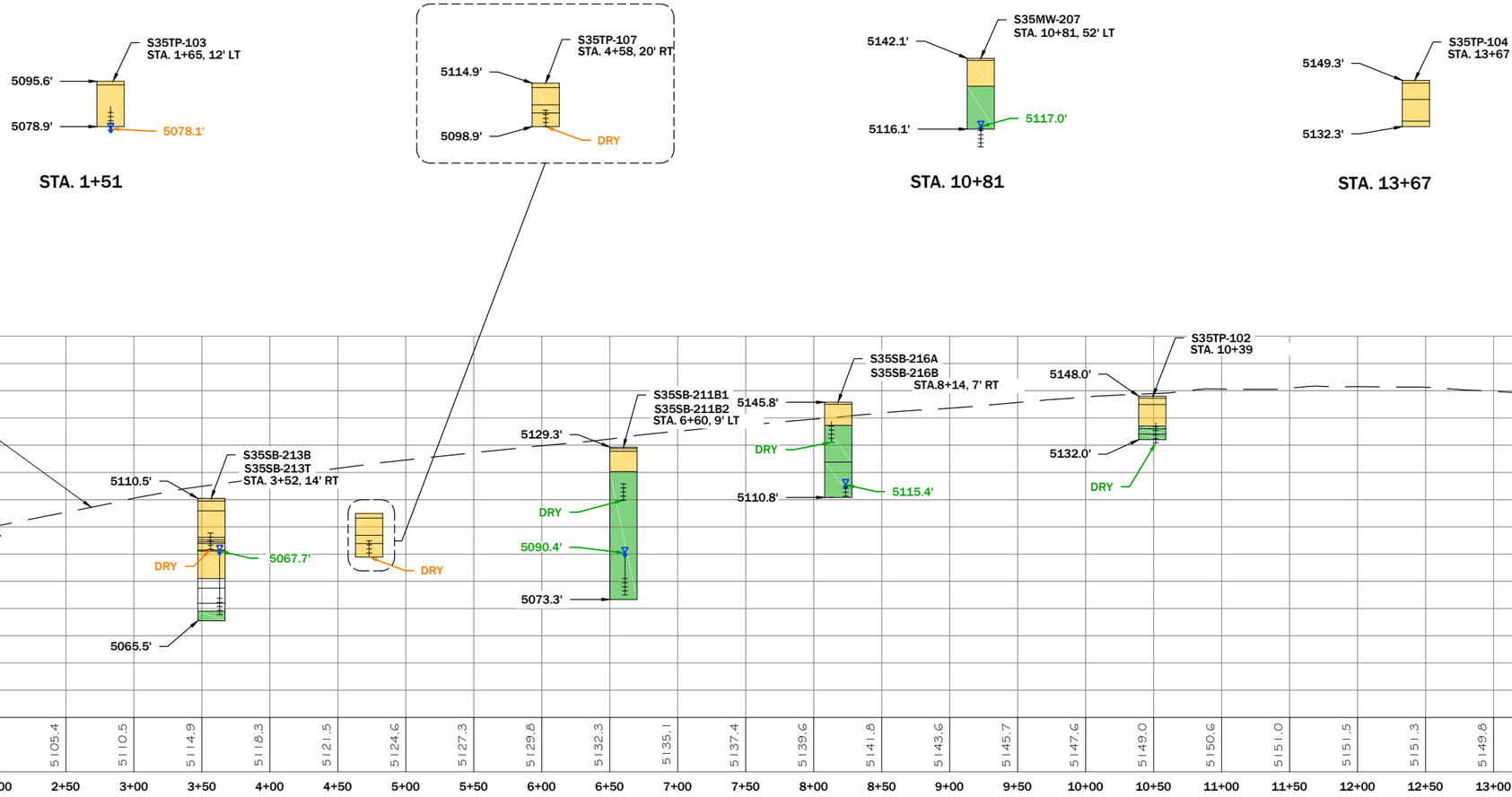
SCALE IN FEET
0 50 100

FIGURE 11

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

UPPER BLACKFOOT MINING COMPLEX SECTION 35 DESIGN INVESTIGATION NORTH SOUTH 2

DATE: 4/4/13



INDICATES MOST RECENT GROUNDWATER MEASURED 11-19-12

TILL

ARGILLITE

TUFF

SCALE IN FEET
50
100

DISPLAYED AS:
COORD SYS/ZONE: NA
DATUM: NA
UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
0 50 100

FIGURE 12

UPPER BLACKFOOT MINING COMPLEX
SECTION 35 DESIGN INVESTIGATION
NORTH SOUTH 3

PIONEER TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MONTANA 59601
(406) 457-8252

DATE: 4/4/13

Table 1
UMBC Section 35 Design Investigation
Test Pit Composite Sample Summary

Combined Sample Sample ID	Samples to Combine [1,2]
S35-BGT-01	TP-101 (2.5-3.5)
	TP-101 (8.2-9.2)
	TP-113 (1.3-3.5)
	TP-113 (16-17)
	TP-112 (2-4.5)
	TP-112 (15-16)
S35-BGT-02	TP-110 (4-5)
	TP-110 (9-10)
	TP-111 (1-4.7)
	TP-111 (10.5-11.5)
	TP-105 (3-9)
	TP-108 (8.5-9.5)
S35-BGT-03	TP-104 (1-4.5)
	TP-104 (7-10)
	TP-107 (1.7-5.2)
	TP-107 (9-10)
	TP-102 (0.7-3.7)
S35-CS-01; S35-CS-01 (Dup)	TP-101 (0-0.7)
	TP-101 (0.7-1.7)
	TP-113 (0-1.2)
	TP-112 (0-2)
S35-CS-02	TP-110 (0-1.3)
	TP-111 (0-1.0)
	TP-105 (0-1.7)
	TP-108 (0-2.1)
S35-CS-03	TP-107 (0-1.7)
	TP-102 (0-0.7)

NOTES:

1) Samples that originate from a larger bulk sample container reduced to the required size with a sample splitter.

2) Unused sample splits stored for future testing needs.

Table 2
UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Laboratory Data Summary

Sample ID	Lab ID	Sample Intervals (ft)	USCS Group Symbol	Sample Type [1]	Geotechnical Properties						
					Mechanical Sieve with Hydrometer Analysis (ASTM D422) [3]	Atterberg Limits (ASTM D4318)			Moisture Content (ASTM D2216) [8]	Specific Gravity -#10 Fraction (ASTM D854 or D6473)	Standard Proctor Max. Dry Unit Weight (ASTM D698)
					% Passing #200	PL	LL	PI	(wt %)		(pcf)
S35TP-104	H12120317-007	(7.0-10.0)	GC	B	38	15	26	11	10	2.68	
S35TP-106	H12120317-008	(8.4-9.4)	GC	B	20	14	23	9	8	2.67	
S35TP-107	H12120317-009	(9.0-10.0)	SM	B	14	NP	NV	NP	6	2.68	
S35TP-111	H12120317-010	(10.5-11.5)	GC	B	27	15	23	8	10	2.69	
S35TP-113	H12120317-011	(1.5-3.5)	GW	B	4.1	NP	NV	NP	3	2.66	NA [7]
S35-BGT-01	H12120317-001	Composite [2]			11				7	2.68	
S35-BGT-02	H12120317-002	Composite [2]			28				10	2.68	
S35-BGT-03	H12120317-003	Composite [2]			25				7	2.69	
S35-CS-01	H12120317-004	Composite [2]			39				8	2.65	
S35-CS-01 (Dup)	H13010211-001	Composite [2]									
S35-CS-02	H12120317-005	Composite [2]			47				15	2.53	
S35-CS-03	H12120317-006	Composite [2]			41				11	2.57	

NOTES:
1) B = Bulk/Grab Sample.
2) Refer to Table 1 for composite sample components.
3) See Table 3 and Appendix C.1 of DSR for complete gradation results.
4) RSL = Nov 2012 Regional Screening Levels for chemical contaminants at Superfund Sites (DEQ).
April 2009 Regional Screening Levels referenced for Total Chromium.
5) AL = DEQ Action level for Arsenic in surface soil (DEQ Remediatoin Division 2005).
6) Complete fertilizer recommendations provided in Appendix D of DSR.
7) Material too coarse to run proctor. No value obtained.
8) See Appendix C.1 of DSR for a complete list of Moisture Content results.
= Soil concentration exceeds the Regional Screening Level.

Table 2
UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Laboratory Data Summary

Sample ID	Lab ID	Sample Intervals (ft)	USCS Group Symbol	Sample Type [1]	Agronomic Properties						
					Organic Matter Content (ASA #9, ASA 29-3)	pH, Saturated Paste (ASAM10-3.2)	Conductivity, Saturated Paste (ASAM10-3)	Sodium Adsorption Ratio (USDA20b)	Saturation Percentage (USDA27a)	Cation Exchange Capacity (USDA 60, 19 (EPA 6010B))	Fertilizer Recommendation Analysis (N/K/P) [6] (N-ASA#9 (33-8); K-ASA #9 (13-3); P-ASA#9 (24-5))
					(%)	(s.u.)	(mmhos/cm)	(unitless)	(%)	(meq/100g)	(lbs / acre)
S35TP-104	H12120317-007	(7.0-10.0)	GC	B	<0.2	7.6	0.3	0.2	33.2	11.6	
S35TP-106	H12120317-008	(8.4-9.4)	GC	B	<0.2	7.3	0.3	0.2	27.8	10.3	
S35TP-107	H12120317-009	(9.0-10.0)	SM	B	<0.2	7.9	0.2	0.1	19.5	4.89	
S35TP-111	H12120317-010	(10.5-11.5)	GC	B	<0.2	7.8	0.2	0.1	29.0	9.52	
S35TP-113	H12120317-011	(1.5-3.5)	GW	B	<0.2	6.8	0.4	0.1	24.6	3.33	
S35-BGT-01	H12120317-001	Composite [2]			<0.2	7.2	0.4	0.3	24.0	9.75	(35/50/30)[6]
S35-BGT-02	H12120317-002	Composite [2]			<0.2	7.1	0.3	0.2	29.8	11.3	(35/50/50)[6]
S35-BGT-03	H12120317-003	Composite [2]			0.3	6.8	0.5	0.2	32.4	14.2	(35/30/30)[6]
S35-CS-01	H12120317-004	Composite [2]			1.5	5.7	0.5	0.2	32.3	16.9	(35/30/0)[6]
S35-CS-01 (Dup)	H13010211-001	Composite [2]									
S35-CS-02	H12120317-005	Composite [2]			2.8	5.7	0.3	0.2	38.8	23.0	(35/0/0)[6]
S35-CS-03	H12120317-006	Composite [2]			4.1	5.7	0.2	0.1	45.5	27.0	(35/0/0)[6]

NOTES:
1) B = Bulk/Grab Sample.
2) Refer to Table 1 for composite sample components.
3) See Table 3 and Appendix C.1 of DSR for complete gradation results.
4) RSL = Nov 2012 Regional Screening Levels for chemical contaminants at Superfund Sites (DEQ).
April 2009 Regional Screening Levels referenced for Total Chromium.
5) AL = DEQ Action level for Arsenic in surface soil (DEQ Remediatoin Division 2005).
6) Complete fertilizer recommendations provided in Appendix D of DSR.
7) Material too coarse to run proctor. No value obtained.
8) See Appendix C.1 of DSR for a complete list of Moisture Content results.
= Soil concentration exceeds the Regional Screening Level.

Table 2
UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Laboratory Data Summary

Sample ID	Lab ID	Sample Intervals (ft)	USCS Group Symbol	Sample Type [1]	Physical Properties			
					Hydrometer (%Sand, Silt, Clay) (ASA #9 Part 1, Method 15-5)	USDA Texture (ASA #9, Part 1, Method 15-5)	Permanent Wilting Point (SSSA pt. 4)	Field Capacity (SSSA pt. 4)
					(%)	Classification	(-15 bar wt%)	(-1/3 bar wt%)
S35TP-104	H12120317-007	(7.0-10.0)	GC	B	(43,34,23)	Loam	9.6	19
S35TP-106	H12120317-008	(8.4-9.4)	GC	B	(59,23,18)	Sandy Loam	7.5	17
S35TP-107	H12120317-009	(9.0-10.0)	SM	B	(76,19,5)	Loamy Sand	2.9	10
S35TP-111	H12120317-010	(10.5-11.5)	GC	B	(52,30,18)	Sandy Loam	7.3	17
S35TP-113	H12120317-011	(1.5-3.5)	GW	B	(80,10,10)	Sandy Loam	4.7	8.6
S35-BGT-01	H12120317-001	Composite [2]			(61,22,16)	Sandy loam	6.2	15
S35-BGT-02	H12120317-002	Composite [2]			(51,30,19)	Loam	7.9	18
S35-BGT-03	H12120317-003	Composite [2]			(54,31,14)	Sandy Loam	9.0	19
S35-CS-01	H12120317-004	Composite [2]			(39,43,18)	Loam	9.4	21
S35-CS-01 (Dup)	H13010211-001	Composite [2]						
S35-CS-02	H12120317-005	Composite [2]			(42,43,14)	Loam	11.0	26
S35-CS-03	H12120317-006	Composite [2]			(42,42,17)	Loam	12.0	29

NOTES:
1) B = Bulk/Grab Sample.
2) Refer to Table 1 for composite sample components.
3) See Table 3 and Appendix C.1 of DSR for complete gradation results.
4) RSL = Nov 2012 Regional Screening Levels for chemical contaminants at Superfund Sites (DEQ).
April 2009 Regional Screening Levels referenced for Total Chromium.
5) AL = DEQ Action level for Arsenic in surface soil (DEQ Remediatoin Division 2005).
6) Complete fertilizer recommendations provided in Appendix D of DSR.
7) Material too coarse to run proctor. No value obtained.
8) See Appendix C.1 of DSR for a complete list of Moisture Content results.
= Soil concentration exceeds the Regional Screening Level.

Table 2
UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Laboratory Data Summary

Sample ID	Lab ID	Sample Intervals (ft)	USCS Group Symbol	Sample Type [1]	ABA/SMP						
					Sulfur, Total (Modified Sobek, USDA 60, Method 23c)	Neutralization Potential (Modified Sobek, USDA 60, Method 23c)	Acid Potential (Modified Sobek, USDA 60, Method 23c)	Acid/Base Potential (Modified Sobek, USDA 60, Method 23c)	Total Exchangeable Acidity (TEA) (ASA#9 (9-4))	SMP Buffering Capacity (ASA#9 (12-3))	Lime Requirement, SMP Buffer (ASA#9 (12-3))
					(%)	(tons/1000)	(tons/1000)	(tons/1000)	(meq/100g)	(pH s.u.)	tons/1000
S35TP-104	H12120317-007	(7.0-10.0)	GC	B	<0.01	23	<0.3	23	0.95	7.6	<1
S35TP-106	H12120317-008	(8.4-9.4)	GC	B	<0.01	7	<0.3	7	1.5	7.6	<1
S35TP-107	H12120317-009	(9.0-10.0)	SM	B	<0.01	26	<0.3	26	1.1	7.6	<1
S35TP-111	H12120317-010	(10.5-11.5)	GC	B	<0.01	22	<0.3	22	0	7.6	<1
S35TP-113	H12120317-011	(1.5-3.5)	GW	B	<0.01	6	<0.3	7	2.9	7.5	<1
S35-BGT-01	H12120317-001	Composite [2]			<0.01	13	<0.3	13	0.95	7.6	<1
S35-BGT-02	H12120317-002	Composite [2]			<0.01	10	<0.3	10	1.4	7.6	<1
S35-BGT-03	H12120317-003	Composite [2]			<0.01	14	<0.3	14	2.8	7.4	<1
S35-CS-01	H12120317-004	Composite [2]			<0.01	9	<0.3	9	6.2	6.8	<1
S35-CS-01 (Dup)	H13010211-001	Composite [2]									
S35-CS-02	H12120317-005	Composite [2]			<0.01	8	<0.3	9	9.8	6.4	4.0
S35-CS-03	H12120317-006	Composite [2]			<0.01	10	<0.3	10	12	6.2	5.0

NOTES:
1) B = Bulk/Grab Sample.
2) Refer to Table 1 for composite sample components.
3) See Table 3 and Appendix C.1 of DSR for complete gradation results.
4) RSL = Nov 2012 Regional Screening Levels for chemical contaminants at Superfund Sites (DEQ).
April 2009 Regional Screening Levels referenced for Total Chromium.
5) AL = DEQ Action level for Arsenic in surface soil (DEQ Remediatoin Division 2005).
6) Complete fertilizer recommendations provided in Appendix D of DSR.
7) Material too coarse to run proctor. No value obtained.
8) See Appendix C.1 of DSR for a complete list of Moisture Content results.
= Soil concentration exceeds the Regional Screening Level.

Table 2
UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Laboratory Data Summary

Sample ID	Lab ID	Sample Intervals (ft)	USCS Group Symbol	Sample Type [1]	TAL Metals						
					Total Aluminum (EPA 6010/6020 prep 3050B) RSL[4] = 77,000 mg/kg	Total Antimony (EPA 6010/6020 prep 3050B) RSL[4] = 31 mg/kg	Total Arsenic (EPA 6010/6020 prep 3050B) AL[5] = 40 mg/kg	Total Barium (EPA 6010/6020 prep 3050B) RSL[4] = 15,000 mg/kg	Total Cadmium (EPA 6010/6020 prep 3050B) RSL[4] = 70 mg/kg	Total Chromium (EPA 6010/6020 prep 3050B) RSL[4] = 280 mg/kg	Total Copper (EPA 6010/6020 prep 3050B) RSL[4] = 3,100 mg/kg
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
S35TP-104	H12120317-007	(7.0-10.0)	GC	B	9,530	< 1	7	216	< 1	20	17
S35TP-106	H12120317-008	(8.4-9.4)	GC	B	9,620	< 1	5	146	<1	12	22
S35TP-107	H12120317-009	(9.0-10.0)	SM	B	4,970	< 1	3	232	<1	7	13
S35TP-111	H12120317-010	(10.5-11.5)	GC	B	8,540	< 1	5	192	<1	12	14
S35TP-113	H12120317-011	(1.5-3.5)	GW	B	7,900	< 1	6	132	<1	12	15
S35-BGT-01	H12120317-001	Composite [2]			8,380	< 1	7	166	<1	14	17
S35-BGT-02	H12120317-002	Composite [2]			10,100	< 1	6	195	<1	13	18
S35-BGT-03	H12120317-003	Composite [2]			11,800	< 1	7	191	<1	16	15
S35-CS-01	H12120317-004	Composite [2]			16,300	< 1	21	254	1	19	113
S35-CS-01 (Dup)	H13010211-001	Composite [2]			16,300	<1	21	269	<1	21	106
S35-CS-02	H12120317-005	Composite [2]			16,400	< 1	6	315	<1	16	18
S35-CS-03	H12120317-006	Composite [2]			18,100	< 1	6	326	<1	17	18

NOTES:
1) B = Bulk/Grab Sample.
2) Refer to Table 1 for composite sample components.
3) See Table 3 and Appendix C.1 of DSR for complete gradation results.
4) RSL = Nov 2012 Regional Screening Levels for chemical contaminants at Superfund Sites (DEQ).
April 2009 Regional Screening Levels referenced for Total Chromium.
5) AL = DEQ Action level for Arsenic in surface soil (DEQ Remediatoin Division 2005).
6) Complete fertilizer recommendations provided in Appendix D of DSR.
7) Material too coarse to run proctor. No value obtained.
8) See Appendix C.1 of DSR for a complete list of Moisture Content results.
= Soil concentration exceeds the Regional Screening Level.

Table 2
UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Laboratory Data Summary

Sample ID	Lab ID	Sample Intervals (ft)	USCS Group Symbol	Sample Type [1]	TAL Metals						
					Total Iron (EPA 6010/6020 prep 3050B) RSL[4] = 55,000 mg/kg	Total Lead (EPA 6010/6020 prep 3050B) RSL[4] = 400 mg/kg	Total Manganese (EPA 6010/6020 prep 3050B) RSL[4] = 1,800 mg/kg	Total Mercury (EPA SW7471A) RSL[4] = 10 mg/kg	Total Nickel (EPA 6010/6020 prep 3050B) RSL[4] = 1,500 mg/kg	Total Silver (EPA 6010/6020 prep 3050B) RSL[4] = 390 mg/kg	Total Zinc (EPA 6010/6020 prep 3050B) RSL[4] = 23,000 mg/kg
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
S35TP-104	H12120317-007	(7.0-10.0)	GC	B	13,400	10	341	< 0.50	17	< 1	39
S35TP-106	H12120317-008	(8.4-9.4)	GC	B	13,200	20	328	< 0.50	13	< 1	42
S35TP-107	H12120317-009	(9.0-10.0)	SM	B	9,420	7	293	< 0.50	8	3	26
S35TP-111	H12120317-010	(10.5-11.5)	GC	B	11,600	10	308	< 0.50	11	< 1	35
S35TP-113	H12120317-011	(1.5-3.5)	GW	B	15,100	10	283	< 0.50	13	< 1	42
S35-BGT-01	H12120317-001	Composite [2]			13,600	12	350	< 0.50	14	< 1	43
S35-BGT-02	H12120317-002	Composite [2]			13,500	11	400	< 0.50	15	< 1	41
S35-BGT-03	H12120317-003	Composite [2]			14,500	11	335	< 0.50	15	< 1	39
S35-CS-01	H12120317-004	Composite [2]			16,000	548	603	< 0.50	14	1	273
S35-CS-01 (Dup)	H13010211-001	Composite [2]			16,300	630	718	<0.50	14	2	267
S35-CS-02	H12120317-005	Composite [2]			14,600	12	531	< 0.50	14	< 1	62
S35-CS-03	H12120317-006	Composite [2]			14,600	11	399	< 0.50	13	< 1	61

NOTES:
1) B = Bulk/Grab Sample.
2) Refer to Table 1 for composite sample components.
3) See Table 3 and Appendix C.1 of DSR for complete gradation results.
4) RSL = Nov 2012 Regional Screening Levels for chemical contaminants at Superfund Sites (DEQ).
April 2009 Regional Screening Levels referenced for Total Chromium.
5) AL = DEQ Action level for Arsenic in surface soil (DEQ Remediatoin Division 2005).
6) Complete fertilizer recommendations provided in Appendix D of DSR.
7) Material too coarse to run proctor. No value obtained.
8) See Appendix C.1 of DSR for a complete list of Moisture Content results.
= Soil concentration exceeds the Regional Screening Level.

Table 3
UBMC Section 35 Design Investigation
Test Pit Laboratory Gradation Test Data Summary

Sample I.D.	Sample Depth (ft)	Sample Type[1]	ASTM D2488 General Material Description	ASTM D2488 USCS Classification Based on Lab Testing	Particle Size Distribution ASTM D422				
					Passing 3" (%) Passing	Passing #4 (%) Passing	Passing #10 (%) Passing	Passing #20 (%) Passing	Passing 0.005 mm (%) Finer
S35TP-104	(7.0-10.0)	B	clayey gravel with sand	GC	100	68	61	38	18.0
S35TP-106	(8.4-9.4)	B	clayey gravel with sand	GC	100	58	44	20	9.0
S35TP-107	(9.0-10.0)	B	silty sand with gravel	SM	100	61	46	14	3.0
S35TP-111	(10.5-11.5)	B	clayey gravel with sand	GC	100	59	50	27	12.0
S35TP-113	(1.5-3.5)	B	well-graded gravel with sand	GW	100	46	20	4.1	2.0
S35-BGT-01	Composite [2]				100	43	25	11	5.0
S35-BGT-02	Composite [2]				100	66	51	28	13.0
S35-BGT-03	Composite [2]				100	61	46	25	9.0
S35-CS-01	Composite [2]				100	66	61	39	15.0
S35-CS-02	Composite [2]				100	86	76	47	18.0
S35-CS-03	Composite [2]				100	73	65	41	16.0

NOTES:

1) B = Bulk/Grab Sample

2) Refer to Table 1 for composite sample components.

Table 4
UBMC Section 35 Design Ivestigation
Data Summary Report
Soil Boring Laboratory Data Summary

Sample ID	Sample Intervals (ft)	USCS Group Symbol	Sample Type [1]	Mechanical Sieve with Hydrometer Analysis [2] (ASTM D422)	Atterberg Limits (ASTM D4318)			Moisture Content (ASTM D2216) [3]	Specific Gravity (ASTM D854 or D6473)	Consolidation Testing (ASTM D2435) [4]	Permeability - Back Pressure TX/Pbp by constant head (ASTM D5084) [4]	CU Triaxial - Saturated with Pore Water Pressure (ASTM D4767) [4]	CU Triaxial - Saturated with Porewater Pressure - Staged (ASTM D4767) [4]
					PL	LL	PI	(%)			cm/sec		
S35MW-203B	(20.0-20.8)		ST	x	14	30	16		2.65		5.1E-08		x
S35SB-206B	(15.0-15.5)	SC	BL	x	16	36	20				1.6E-08	x	
S35SB-206B	(15.5-16.0)		BL									x	
S35SB-206B	(16.0-16.5)		BL						2.60			x	
S35SB-206B	(35.0-36.5)		SS	x	21	48	27	15					
S35MW-208B	(20.0-20.7)		ST	x	14	29	15	10					
S35SB-211B	(9.0-9.5)	CL	ST	x	12	41	29		2.70		2.6E-06		x
S35SB-213B	(40.0-40.8)		ST	x	15	39	24		2.67	x	3.2E-08		x
S35MW-217	(25.0-25.9)	GC	ST	x	13	26	13		2.62	x			

NOTES:

1) B: Bulk/Grab Sample, BL: 2.5" California Brass Liners, SS: 2" or 3" Dia. Split Spoon, ST: 3" Dia. Shelby Tube.
2) See Table 5 and Appendix C.2 of DSR for complete gradation results.
3) See Appendix C.2 of DSR for a complete list of Moisture Content results.
4) See Appendix C.2 of DSR for complete test results.

Table 5
UBMC Section 35 Design Investigation
Soil Boring Laboratory Gradation Data Summary

Sample I.D.	Sample Depth (ft)	Sample Type[(1)]	ASTM D2488 General Material Description	ASTM D2488 USCS Classification Based on Lab Testing	Particle Size Distribution ASTM D422				
					Passing 3" (%) Passing	Passing #4 (%) Passing	Passing #10 (%) Passing	Passing #200 (%) Passing	Passing 0.005 mm (%) Finer
S35SB-203B	(20.0-20.8)	ST	clayey gravel with sand	GC	100	61	48	31	17
S35SB-206B	(15.0-16.5)	BL	clayey sand with gravel	SC	100	80	65	41	23
S35SB-206B	(35.0-36.5)	SS	sandy lean clay	CL	100	94	84	51	29
S35SB-208B	(20.0-20.7)	ST	clayey sand with gravel	SC	100	58	51	31	16
S35SB-211B	(9.0-9.5)	ST	sandy lean clay	CL	100	99	92	62	28
S35SB-213B	(40.0-40.8)	ST	clayey sand with gravel	SC	100	71	60	40	25
S35MW-217	(25.0-25.9)	ST	clayey gravel with sand	GC	100	63	50	28	13

NOTES:

1) B: Bulk/Grab Sample, BL: 2.5" California Brass Liner, SS: 2" or 3" Dia. Split Spoon, ST: 3" Dia Shelby Tube.

Table 6
UBMC Section 35 Design Investigation
Monitoring Well and Piezometer Installation Summary

Monitoring Well or Piezometer ID	Logged By	Completion Date	Total Depth (ft bgs)[1]	Total PVC Depth (ft)[1]	Depth to Water (ft)[2]	Water Level Date	Northing SP-N83 (IF)	Easting SP-N83 (IF)	Top of PVC Casing Elevation NAVD88 (ft)	Ground Elevation NAVD88 (ft)	Bottom of Screen Interval Elevation NAVD88 (ft)	Screen Interval (ft bgs)[1]	Filter Pack Interval (ft bgs)[1]	Depth of Transducer (ft)[2]	Transducer Elevation NAVD88 (ft)	PVC Casing Diameter (in)	Stickup (ft ags)[3]
S35MW-201T	M. Browne	11/1/2012	44.00	24.15	11.65	11/19/2012	1020346.98	1233668.82	5079.19	5075.78	5051.63	19.2-24.2	19.2-24.2	25.14	5054.05	2	3.41
S35MW-201B	M. Browne	11/1/2012	44.00	44.00	12.18	11/19/2012	1020347.09	1233675.78	5079.51	5075.91	5031.91	39-44	37-44	45.20	5034.31	2	3.60
S35SB-202T1	J. Riedel	10/12/2012	33.89	22.18	Dry	11/19/2012	1020667.81	1233022.44	5097.85	5096.39	5074.22	17.2-22.2	17.2-22.2	N/A	N/A	1	1.45
S35SB-202T2	J. Riedel	10/12/2012	33.89	33.89	27.67	11/19/2012	1020667.87	1233022.24	5097.75	5096.46	5062.58	28.9-33.9	28.9-33.9	32.75	5065.00	1	1.28
S35MW-202B	J. Riedel	10/11/2012	45.00	44.77	29.47	11/19/2012	1020673.87	1233018.56	5099.51	5095.36	5050.59	39.8-44.8	39.8-44.8	46.50	5053.01	2	4.15
S35MW-203T	M. Browne	10/30/2012	20.00	19.04	Dry	11/19/2012	1021133.63	1233052.98	5127.68	5125.92	5106.88	14-19	13-19	N/A	N/A	2	1.76
S35MW-203B	M. Browne	10/29/2012	40.11	40.11	23.26	11/19/2012	1021128.63	1233054.20	5127.63	5125.77	5085.66	35.1-40.1	34.1-40.1	N/A	N/A	2	1.86
S35SB-204T	J. Riedel	10/14/2012	35.00	18.20	Dry	11/19/2012	1020752.06	1233159.21	5106.89	5104.99	5086.79	13.2-18.2	13.2-18.2	N/A	N/A	1	1.90
S35SB-204B	J. Riedel	10/14/2012	35.00	34.24	38.20	11/19/2012	1020751.97	1233159.49	5108.68	5104.95	5070.71	29.2-34.2	29.2-34.2	N/A	N/A	1	3.73
S35SB-206T2	J. Riedel	10/13/2012	15.00	14.42	18.29	11/19/2012	1020850.12	1233325.83	5119.51	5115.64	5101.22	9.4-14.4	9.4-14.4	18.00	5101.51	1	3.87
S35SB-206T1	J. Riedel	10/12/2012	46.50	28.70	19.15	11/19/2012	1020855.89	1233324.07	5118.32	5115.81	5087.12	23.7-28.7	23.7-28.7	28.78	5089.54	1	2.50
S35SB-206T3	J. Riedel	10/26/2012	100.00	47.88	20.63	11/19/2012	1020846.06	1233327.18	5117.45	5115.33	5067.45	42.9-47.9	42.9-47.9	48.60	5068.85	1	2.12
S35SB-206B	J. Riedel	10/12/2012	45.93	45.93	21.30	11/19/2012	1020856.05	1233324.21	5117.90	5116.23	5070.30	40.9-45.9	40.9-45.9	45.19	5072.71	1	1.67
S35SB-206D	J. Riedel	10/26/2012	100.00	90.70	23.05	11/19/2012	1020845.93	1233326.88	5118.93	5115.03	5024.33	85.7-90.7	85.7-90.7	92.60	5026.33	1	3.90
S35MW-207	M. Browne	10/30/2012	35.25	32.59	29.08	11/19/2012	1021091.32	1233314.60	5146.03	5142.09	5109.50	27.6-32.6	25.6-32.6	N/A	N/A	2	3.94
S35SB-208T	J. Riedel	10/29/2012	23.68	23.68	23.01	11/19/2012	1021024.30	1232767.37	5088.73	5087.41	5063.73	18.7-23.7	18.7-23.7	23.20	5065.53	1	1.32
S35SB-208B	J. Riedel	10/26/2012	40.00	39.00	18.99	11/19/2012	1021028.79	1232765.25	5088.84	5087.19	5048.19	34-39	34-39	38.24	5050.60	2	1.65
S35SB-209T	J. Riedel	10/14/2012	41.50	12.39	Dry	11/19/2012	1020519.00	1233262.02	5092.62	5089.83	5077.45	8.4-12.4	8.4-12.4	14.70	5077.92	1	2.78
S35SB-209B	J. Riedel	10/14/2012	41.50	39.71	20.10	11/19/2012	1020518.87	1233261.81	5091.98	5089.89	5050.18	34.7-39.7	34.7-39.7	39.38	5052.60	1	2.09
S35SB-210T	J. Riedel	10/16/2012	40.00	14.83	Dry	11/19/2012	1020675.30	1233448.27	5111.62	5107.75	5092.92	9.8-14.8	7.8-14.8	N/A	N/A	1	3.87
S35SB-210B	J. Riedel	10/16/2012	44.50	39.64	23.52	11/19/2012	1020675.56	1233448.29	5109.61	5107.75	5068.11	34.6-39.6	34.6-39.6	N/A	N/A	1	1.86
S35SB-211B1	J. Riedel	10/17/2012	55.00	54.28	43.00	11/19/2012	1020810.84	1233635.64	5133.44	5129.26	5074.99	49.3-54.3	44.3-54.3	N/A	N/A	1	4.17
S35SB-211B2	J. Riedel	10/17/2012	55.00	19.53	Dry	11/19/2012	1020811.15	1233635.25	5131.05	5129.33	5109.80	14.5-19.5	14.5-19.5	N/A	N/A	1	1.72
S35SB-212T	J. Riedel	11/7/2012	50.00	15.07	Dry	11/19/2012	1020846.28	1233943.54	5139.81	5137.91	5122.84	10.1-15.1	5.1-15.1	N/A	N/A	1	1.90
S35SB-212B	J. Riedel	11/7/2012	50.00	48.13	45.73	11/19/2012	1020846.10	1233943.38	5139.64	5137.78	5089.64	43.1-48.1	20.1-48.1	N/A	N/A	1	1.87
S35SB-213T	J. Riedel	11/5/2012	49.25	18.88	Dry	11/19/2012	1020602.32	1233865.24	5112.28	5110.53	5091.66	13.9-18.9	13.9-18.9	N/A	N/A	1	1.74
S35SB-213B	J. Riedel	11/5/2012	49.25	42.84	20.61	11/19/2012	1020602.44	1233865.37	5112.14	5110.54	5067.70	37.8-42.8	33.8-42.8	N/A	N/A	1	1.60
S35SB-214T	J. Riedel	10/16/2012	45.50	23.42	16.34	11/19/2012	1020332.96	1233297.30	5085.00	5083.26	5059.85	18.4-23.4	18.4-23.4	22.73	5062.27	1	1.73
S35SB-214B	J. Riedel	10/16/2012	45.50	45.00	16.12	11/19/2012	1020332.86	1233296.90	5086.31	5082.86	5037.86	40-45	40-45	46.03	5040.28	1	3.45
S35SB-215T1	J. Riedel	11/6/2012	56.50	55.17	18.11	11/19/2012	1020393.32	1233994.32	5090.82	5088.99	5033.82	50.2-55.2	50.2-55.2	54.60	5036.22	1	1.83
S35SB-215T2	J. Riedel	11/6/2012	56.50	30.22	19.85	11/19/2012	1020393.46	1233994.48	5091.24	5089.01	5058.79	25.2-30.2	25.2-30.2	30.03	5061.21	1	2.23
S35SB-216A	M. Browne	11/2/2012	35.00	34.71	32.19	11/19/2012	1020935.19	1233542.51	5147.57	5145.88	5111.17	24.7-34.7	22.7-34.7	36.13	5111.44	1	1.69
S35SB-216B	M. Browne	11/2/2012	35.00	14.87	Dry	11/19/2012	1020935.23	1233542.73	5149.30	5145.84	5130.97	9.9-14.9	7.9-14.9	18.04	5131.26	1	3.46
S35SB-217B	M. Browne	10/31/2012	30.00	14.63	Dry	11/19/2012	1021345.75	1233083.35	5141.50	5137.70	5123.07	9.6-14.6	7.6-14.6	18.18	5123.32	1	3.80
S35SB-217A	M. Browne	10/31/2012	30.00	27.86	26.70	11/19/2012	1021345.90	1233083.25	5139.43	5137.73	5109.87	22.9-27.9	21.9-27.9	29.29	5110.14	1	1.70
S35MW-217	M. Browne	10/31/2012	40.13	40.13	28.74	11/19/2012	1021341.61	1233088.22	5141.90	5137.95	5097.82	35.1-40.1	35.1-40.1	39.66	5102.24	2	3.95
S35PZ-01T	J. Riedel	11/8/2012	15.53	15.53	17.18	11/19/2012	1020093.22	1234545.24	5097.17	5095.31	5079.78	10.5-15.5	5.5-15.5	N/A	N/A	1	1.86

Table 6
UBMC Section 35 Design Investigation
Monitoring Well and Piezometer Installation Summary

Monitoring Well or Piezometer ID	Logged By	Completion Date	Total Depth (ft bgs)[1]	Total PVC Depth (ft)[1]	Depth to Water (ft)[2]	Water Level Date	Northing SP-N83 (IF)	Easting SP-N83 (IF)	Top of PVC Casing Elevation NAVD88 (ft)	Ground Elevation NAVD88 (ft)	Bottom of Screen Interval Elevation NAVD88 (ft)	Screen Interval (ft bgs)[1]	Filter Pack Interval (ft bgs)[1]	Depth of Transducer (ft)[2]	Transducer Elevation NAVD88 (ft)	PVC Casing Diameter (in)	Stickup (ft ags)[3]
S35TP-101A	M. Browne/N. Jaynes	10/5/2012	17.70	17.66	9.96	11/19/2012	1020197.25	1232982.21	5067.78	5064.51	5046.85	12.7-17.7	N/A	N/A	N/A	1.5	3.27
S35TP-101B	M. Browne/N. Jaynes	10/5/2012	17.70	11.92	9.67	11/19/2012	1020197.43	1232982.18	5067.53	5064.35	5052.43	6.9-11.9	N/A	N/A	N/A	1.5	3.18
S35TP-101C	M. Browne/N. Jaynes	10/5/2012	17.70	6.43	9.05	11/19/2012	1020197.38	1232982.34	5067.00	5064.33	5057.90	1.4-6.4	N/A	N/A	N/A	1.5	2.67
S35TP-102	M. Browne/N. Jaynes	10/2/2012	17.10	17.10	Dry	11/19/2012	1021092.77	1233385.12	5150.50	5147.96	5130.85	12.1-17.1	N/A	N/A	N/A	1.5	2.55
S35TP-103	M. Browne/N. Jaynes	10/5/2012	17.70	17.32	Dry	11/20/2012	1020449.00	1233972.74	5099.61	5095.58	5078.25	12.3-17.3	N/A	N/A	N/A	1.5	4.04
S35TP-104[4]	M. Browne/N. Jaynes	10/2/2012	17.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S35TP-105	M. Browne/N. Jaynes	10/3/2012	17.50	17.13	18.51	11/19/2012	1020960.61	1233139.08	5119.31	5115.23	5098.11	12.1-17.1	N/A	N/A	N/A	1.5	4.07
S35TP-106	M. Browne/N. Jaynes	10/4/2012	18.22	18.22	Dry	11/19/2012	1020918.15	1232895.44	5102.10	5098.36	5080.14	8.2-18.2	N/A	N/A	N/A	1.5	3.74
S35TP-107	M. Browne/N. Jaynes	10/3/2012	16.00	15.51	Dry	11/19/2012	1020683.38	1233796.13	5119.52	5114.92	5099.42	5.5-15.5	N/A	N/A	N/A	1.5	4.59
S35TP-108	M. Browne/N. Jaynes	10/2/2012	16.30	16.30	19.51	11/19/2012	1021154.66	1232949.19	5118.88	5115.16	5098.86	6.3-16.3	N/A	N/A	N/A	1.5	3.72
S35TP-109	M. Browne/N. Jaynes	10/4/2012	18.04	18.04	21.95	11/19/2012	1021077.35	1232749.80	5091.28	5087.32	5069.28	13-18	N/A	N/A	N/A	1.5	3.96
S35TP-110	M. Browne/N. Jaynes	10/5/2012	18.11	18.11	Dry	11/19/2012	1020634.95	1233451.93	5110.57	5106.81	5088.70	13.1-18.1	N/A	N/A	N/A	1.5	3.76
S35TP-111A	M. Browne/N. Jaynes	10/3/2012	19.37	19.37	20.95	11/19/2012	1020844.10	1233244.89	5117.67	5113.82	5094.46	14.4-19.4	N/A	N/A	N/A	1.5	3.84
S35TP-111B	M. Browne/N. Jaynes	10/3/2012	19.37	14.80	18.34	11/19/2012	1020844.23	1233244.67	5117.31	5113.62	5098.81	9.8-14.8	N/A	N/A	N/A	1.5	3.70
S35TP-111C	M. Browne/N. Jaynes	10/3/2012	19.37	11.52	14.96	11/19/2012	1020844.09	1233244.71	5117.07	5113.43	5101.91	6.5-11.5	N/A	N/A	N/A	1.5	3.64
S35TP-112	M. Browne/N. Jaynes	10/4/2012	16.59	16.59	Dry	11/19/2012	1020918.91	1232542.35	5071.85	5067.59	5051.00	11.6-16.6	N/A	N/A	N/A	1.5	4.26
S35TP-113	M. Browne/N. Jaynes	10/4/2012	17.00	15.18	19.87	11/19/2012	1020729.63	1232675.00	5074.25	5069.27	5054.09	5.2-15.2	N/A	N/A	N/A	1.5	4.98

Notes:

1) bgs = Below ground surface

2) Measured from top of PVC casing (marked "M.P.")

3) ags = Above ground surface

4) No survey shot taken

5) N/A = No data collected

= Water level pressure transducer installed in February 2013

APPENDIX A

LOGS AND FIELD LOG BOOKS

Note to Users:

Data and information contained in the field notes and logs may differ from the final interpretations presented on the final test pit logs, soil borings, and/or cross sections. Data, soil classifications, and other information recorded on the field notes are the best estimate of the field personnel at the time of completing the test pit or soil boring. These data may be revised based on subsequent laboratory analysis, additional survey, and/or data interpretation performed after the field logs were recorded.

APPENDIX A.1

LOGS AND FIELD LOG BOOKS - TEST PIT LOGS

Drill Hole No. S35TP-101

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/5/12 - 10/5/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION: 5064.51 ft	HOLE DIAMETER:
BOREHOLE LOCATION: N 1020197.24, E 1232982.39 (MT St. Pl. NAD83)	HAMMER TYPE:

This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0			X	13324		Moist, Dark reddish brown [5YR 2.5/2], CLAYEY GRAVEL with Sand, GC, subangular, low to medium plasticity, BASE COARSE, 1 1/2-in minus, gravels have rust surface staining.					6.0	
		1			X	13325		Moist, Dark brown, SILTY SAND, SM, no to low plasticity, very stiff, trace dead roots and burned wood debris, potentially a topsoil layer prior to old highway road construction, TOPSOIL.					12.0	
		2						Moist, Reddish brown [5YR 5/4], SANDY CLAY with Gravel, CL, subrounded, medium plasticity, at 3 ft depth gravels are generally 1-in minus.						
		3			X	13326							12.0	
		4												
		5						Moist to wet, Reddish brown [5YR 5/4], CLAYEY SAND with Gravel, SC, subrounded, medium plasticity.						Side caving in at 5', soil wet but no water flowing into Test Pit
▼		6												Water level on 11-19-12 TP-101A=6.7' TP-101B=6.5' TP-101C=6.4'
		7												
		8												
		9			X	13327		Moist to wet, Pink [5YR 7/3], SILT, ML, low plasticity.					16.0	
		10						Moist to wet, Reddish brown [2.5YR 5/4], CLAYEY SAND with Gravel, SC, subangular to subrounded, medium plasticity.						
		11												Water content decreases below 11.0'
		12												
		13												Installed 3 nested piezometers all 1.5" Diameter TP-101A installed to 17.7', screened 12.7'-17.7' TP-101B installed to 11.9', screened 6.9-11.9' TP-101C installed to 6.4', screened 1.4'-6.4'
		14												
		15												
		16												
		17			X	13328							14.0	
		18						BOH = 17.7 ft.						
		19												
		20												

PIONEER TECHNICAL SERVICES, INC.

CLIENT: Montana Department of Environmental Quality	
ADDRESS: P.O. Box 200901 Helena, Montana 59620-0901	
PHONE NUMBER:	

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35TP-102	PAGE 1 of 1
DATE STARTED / FINISHED: 10/2/12 - 10/2/12	DRILLER: Stream Works, Inc.	
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200	
GROUND SURFACE ELEVATION: 5147.96 ft	HOLE DIAMETER:	
BOREHOLE LOCATION: N 1021092.52, E 1233384.95 (MT St. Pl. NAD83)	HAMMER TYPE:	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0			X	13330		This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.					8.0	
		0			X			Dry, Dark brown, SANDY CLAY with Gravel, CL, subangular to subrounded, low plasticity, organics (grass roots), estimated 30% Gravel, maximum particle size is 8-in., TOPSOIL.						
		1			X			Dry, Brown [7.5YR 4/2], CLAYEY GRAVEL with Sand, GC, subangular to subrounded, low plasticity, estimated 40% Gravel, pockets of higher gravel content.						
		2			X	13331								
		3			X			Moist, Brown [7.5YR 4/2], CLAYEY SAND with Gravel, SC, subangular to subrounded, low to medium plasticity, estimated 15% Gravel, 5% Cobble, and 5% Boulder, maximum particle size is 32-in.						
		4			X									
		5			X									
		6			X									
		7			X									
		8			X									Water Level on 11-19-12= DRY
		9			X	13332							15.0	
		10			X									
		11						Moist, Dark gray with purple, LEAN CLAY, CL, medium plasticity, WEATHERED ARGILLITE, Iron staining in fissures, trace pyrite, pockets of fine grained silty sand, crumbles with finger pressure.						
		12						Moist, Very dark grayish brown [10YR 3/2], CLAYEY SAND with Gravel, SC, low to medium plasticity, WEATHERED PYROCLASTIC/ARGROMERLATE, fine grain particles that crumble with finger pressure, visible pyrite, multiple colors (red, light gray, dark gray, purple).						
		13			X	13333							23.0	Installed 1.5" diameter PVC to 17.1' Screened 12.1-17.1'
		14						Moist, Dark grayish brown [10Y 4/2], POORLY GRADED GRAVEL with SILT AND SAND, GP, subangular, non-plastic, WEATHERED SANDSTONE, breaks with finger pressure, Fe Staining.						
		15			X	13334							20.0	
		16												
		17						BOH = 17.1 ft.						
		18												
		19												
		20												

PIONEER TECHNICAL SERVICES, INC.

CLIENT: Montana Department of Environmental Quality
ADDRESS: P.O. Box 200901 Helena, Montana 59620-0901
PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

Drill Hole No. S35TP-103

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/5/12 - 10/5/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION: 5095.58 ft	HOLE DIAMETER:
BOREHOLE LOCATION: N 1020448.79, E 1233973.53 (MT St. Pl. NAD83)	HAMMER TYPE:

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DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
0						Dry, Dark brown, SANDY SILT with Gravel, ML, subangular, no to low plasticity, organics (roots), soil color is very dark brown when moisture is added, TOPSOIL.						
1			X	13335							6.0	
2						Dry to moist, Light brown, CLAYEY SAND with Gravel, SC, subrounded, medium plasticity, trace cobbles, maximum particle size is 5-in, particles are mixed.						
3						Moist, Dark reddish brown [5YR 3/2] Dark yellowish brown [10YR 3/6], CLAYEY SAND with Gravel, SC, subangular to subrounded, medium plasticity, trace cobbles, particles are mixed. At 5 ft depth estimated 5% Cobbles, 30% Gravels.						
4												
5			X	13336							8.0	
6												Moisture content increases with depth.
7												
8												Water level on 11-19-12= DRY
9			X	13337							10.0	
10												Installed 1.5" diameter PVC to 17.3'
11												
12												Screened 12.3-17.3'
13												
14												
15												
16			X	13338							11.0	
17												
18						BOH = 17.7 ft.						
19												
20												

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PHONE NUMBER:	

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35TP-104

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/2/12 - 10/2/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION: Not surveyed	HAMMER TYPE:

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0			X	13339		Dry, Dark brown, SANDY CLAY, CL, organics (roots), TOPSOIL.					8.0	Piezometer not installed in Test Pit
		1			X			Dry, Dark reddish brown [5YR 3/2], CLAYEY SAND with Gravel, SC, angular to subangular, low to medium plasticity, trace subrounded boulders and cobbles, maximum particle size is 10-in., organics (roots) to 3 ft depth.						
		2			X									
		3			X	13340								
		4			X									
		5			X									Groundwater not encountered while excavating
		6			X									
		7			X			Moist, Dark red [10R 3/6], CLAYEY GRAVEL with Sand, GC, subrounded, low to medium plasticity, estimated 5% Cobbles and 20% Gravels.						
		8			X									
		9			X	13341			26	15			10.0	
		10			X									
		11												
		12												
		13												
		14												
		15			X			Moist, Dark red [10R 3/6], CLAYEY SAND with Gravel, SC, subangular to subrounded, medium to high plasticity, trace cobbles and boulders.						
		16			X	13342							13.0	
		17			X			BOH = 17.0 ft.						
		18												
		19												
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35TP-105

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/3/12 - 10/3/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION: 5115.23 ft	HOLE DIAMETER:
BOREHOLE LOCATION: N 1020960.51, E 1233140.29 (MT St. Pl. NAD83)	HAMMER TYPE:

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1			X	13343		Dry, Dark brown, SANDY CLAY with Gravel, CL, subangular, organics (roots), estimated 30% Gravel, TOPSOIL.					6.0	Hard digging from 0 to 4.5 ft.
		2						Dry, Dark red [10R 3/6] Light brown, CLAYEY GRAVEL with Sand, GC, subangular to subrounded, low to medium plasticity, with Cobbles and Boulders, at 3 ft depth estimated 10% Boulders & Cobbles and 30% Gravel, poorly graded.						
		3			X	13344							8.0	
		4												
		5						Moist, Dark red [10R 3/6], CLAYEY SAND with Gravel, SC, subangular to subrounded, medium plasticity, At 8 ft depth estimated 10% Cobble and 30% Gravel. Multiple seams of wet, brown, Gravelly SAND with Silt observed transversing the test pit between 14 and 14.5' and between 16.5' and bottom of hole.						
		6												Moisture content increases with depth. Easier digging with depth.
		7												
		8			X	13345							9.0	
		9												
		10												
		11												
		12												
		13												
		14												Groundwater observed dripping out of the seams of gravelly sand between 14' and 14.5' and between 16.5' and bottom of hole. Moisture wicks to the surface of the gravelly sand when tapped. Water Level on 11-19-12=14.4'
		15												
		16												
		17			X	13347							12.0	Installed 1.5" PVC to 17.1' Screened 12.1'-17.1'
					X	13346							19.0	
		18						BOH = 17.5 ft.						
		19												
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35TP-106	PAGE 1 of 1
DATE STARTED / FINISHED: 10/4/12 - 10/4/12	DRILLER: Stream Works, Inc.	
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200	
GROUND SURFACE ELEVATION: 5098.36 ft	HOLE DIAMETER:	
BOREHOLE LOCATION: N 1020917.82, E 1232895.37 (MT St. Pl. NAD83)	HAMMER TYPE:	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1				13348		Dry, Brown, SILTY SAND with Gravel, SM, subangular, low plasticity, organics (roots), color changes to dark brown with moisture, TOPSOIL.					7.0	No groundwater observed while excavating
		3						Dry, Dark reddish brown [5YR 3/2], SILTY GRAVEL with Sand, GM, subangular, low plasticity, with Boulders and Cobbles, estimated 10% Boulder, 10% Cobble, and 30% Gravel.						
		4				13349								
		6						Moist, Dark red [10R 3/6], CLAYEY GRAVEL with Sand, GC, subangular, medium to high plasticity, with Boulders and Cobbles, estimated 5% Boulder, 10% Cobble, 20% Gravel, maximum particle size is 24-in.						Groundwater level on 11-19-12= Dry
		9				13350			23	14			10.0	
		14												Installed 1.5" PVC to 18.2' Screened 7.75'-17.75'
		18				13351		BOH = 18.2 ft.					10.0	

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35TP-107

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/3/12 - 10/3/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION: 5114.92 ft	HOLE DIAMETER:
BOREHOLE LOCATION: N 1020684.26, E 1233795.92 (MT St. Pl. NAD83)	HAMMER TYPE:

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1			X	13352		Dry, Dark brown, SANDY CLAY with Gravel, CL, angular, low plasticity, organics (roots), TOPSOIL.					8.0	
		2			X			Moist, Dark yellowish brown [10YR 3/4], CLAYEY SAND with Gravel, SC, angular to subangular, low to medium plasticity, with Boulders and Cobbles, estimated 5% Boulder, 5% Cobble, 20% Gravel, maximum particle size is 10-in.						
		3			X	13353							11.0	
		4			X									
		5			X									
		6												
		7												
		8						Moist, Brown, SILTY SAND with Gravel, SM, subangular to subrounded, non-plastic, with Cobbles, estimated 10% Cobble and 30% Gravel.						Water level on 11-19-12= DRY
		9			X	13354							6.0	
		10			X									
		11						Moist, Dark red [2.5YR 3/6], CLAYEY SAND with Gravel, SC, angular to subangular, low to medium plasticity, with Boulders and Cobbles, estimated 5% Boulder, 5% Cobble, 20% Gravel, maximum particle size is 18-in., moisture increases with depth.						
		12												
		13												Installed 1.5" PVC to 15.5' Screened 5.5-15.5'
		14												
		15			X	13355							11.0	
		16			X			BOH = 16.0 ft.						
		17												
		18												
		19												
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35TP-108 PAGE 1 of 1
DATE STARTED / FINISHED: 10/2/12 - 10/2/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION: 5115.16 ft	HOLE DIAMETER:
BOREHOLE LOCATION: N 1021154.01, E 1232949.66 (MT St. Pl. NAD83)	HAMMER TYPE:

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1				13356		This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered. Dry, Dark brown, CLAY with Sand, CL, low plasticity, organics (roots), color changes to black when wetted, TOPSOIL.					14.0	Groundwater table not observed while excavating
		2						Dry, Light brown, SILTY SAND with Gravel, SM, angular to subangular.						
		3				13357								
		4						Dry to moist, Dark reddish brown [5YR 3/2] Red [10R 4/6], CLAYEY SAND with Gravel, SC, subangular, medium to high plasticity, occasional Argillite rock particles are purplish in color, Iron surface staining notes on Argillite at 15 ft depth, maximum particle size is 18-in., estimate 5% Boulders, 10% Cobbles, and 20% Gravel.						
		5												
		6												
		7												
		8												
		9				13358								
		10												Soil is almost wet at 10 ft depth.
		11												
		12												
		13												
		14												Groundwater level on 11-19-12= 15.8'
		15				13359							18.0	Installed 1.5" diameter PVC to 16.3' Screened 6.3-16.3'
▼		16						BOH = 16.3 ft.						
		17												
		18												
		19												
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35TP-109	PAGE 1 of 1
DATE STARTED / FINISHED: 10/4/12 - 10/4/12	DRILLER: Stream Works, Inc.	
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200	
GROUND SURFACE ELEVATION: 5087.32 ft	HOLE DIAMETER:	
BOREHOLE LOCATION: N 1021077.17, E 1232750.18 (MT St. Pl. NAD83)	HAMMER TYPE:	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1			X	13361		Dry, Brown [7.5YR 4/2], SILTY SAND with Gravel, SM, angular to subangular, low plasticity, organics (roots), TOPSOIL.					5.0	Groundwater table not observed while excavating
		2						Dry, Light brown, SILTY SAND with Gravel, SM, subangular, no to low plasticity, at 3 ft depth estimated 10% Cobble, 30% Gravel, 40% Sand, and 20% fines.						
		3												Hard digging entire test pit depth
		4			X	13362							9.0	
		5						Moist, Dark red [10R 3/6] Dusky red [10R 3/4], CLAYEY GRAVEL with Sand, GC, subangular to subrounded, medium to high plasticity, estimated 10% Cobble, 30% Gravel, maximum particle size is 8-in.						
		6												
		7												
		8			X	13363							12.0	
		9												
		10												
		11												
		12												
		13												
		14												
		15												Installed 1.5" PVC to 18.0' Screened 13-18'
		16												Groundwater level on 11-19-12= 18.0'
		17			X	13364							11.0	
▼		18						BOH = 18.0 ft.						
		19												
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

Drill Hole No. S35TP-110

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/5/12 - 10/5/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION: 5106.81 ft	HOLE DIAMETER:
BOREHOLE LOCATION: N 1020634.70, E 1233452.38 (MT St. Pl. NAD83)	HAMMER TYPE:

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
								This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		1			X	13365		Dry, Dark brown, SILTY SAND with Gravel, SM, subangular, low plasticity, organics (roots), TOPSOIL.					8.0	No groundwater encountered while excavating
		2						Dry to moist, Dark red [10R 3/6], CLAYEY SAND with Gravel, SC, subangular to subrounded, medium plasticity, homogeneous, at 5 ft depth estimated 10% Cobble, 20% Gravel, and 5% Boulder. At 9 ft depth, pockets of Lean Clay.						
		3												
		4			X	13366							7.0	
		5												
		6												
		7												
		8												
		9			X	13367							8.0	
		10												
		11												
		12												Installed 1.5" PVC to 18.1'
		13												Screened 13.1-18.1'
		14												
		15												
		16												
		17			X	13368							13.0	
		18						BOH =18.1 ft.						Groundwater level on 11-19-12=DRY
		19												
		20												

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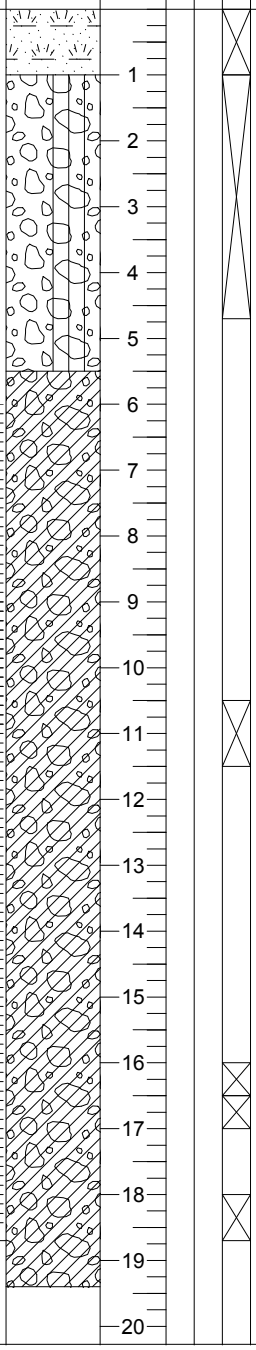
DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35TP-111

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/3/12 - 10/3/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION: 5113.82 ft	HOLE DIAMETER:
BOREHOLE LOCATION: N 1020844.58, E 1233244.80 (MT St. Pl. NAD83)	HAMMER TYPE:



DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
0			X	13369		Dry, Dark brown, CLAYEY SAND with Gravel, SC, subangular to subrounded, medium plasticity, organics (grass roots), estimated 30% gravel, maximum particle size is 5-in., TOPSOIL.					32.0	Three nested piezometers installed in test pit. Piezometer A screened from 14.4 to 19.4 ft, Piezometer B screened from 9.8 to 14.8 ft, Piezometer C screened from 6.5 to 11.5 ft. Piezometers backfilled with soil excavated from test pit.
1			X			Moist, Dusky red [10R 3/4], SILTY GRAVEL with Sand, GP-GM, subangular, low plasticity, with Boulders and Cobbles, estimated 5% Boulder, 10% Cobble, and 30% Gravel, maximum particle is 18-in.						
2			X									
3			X	13370							7.0	
4			X									
5			X									
6						Moist, Reddish brown, CLAYEY GRAVEL with Sand, GC, subangular to subrounded, medium plasticity, with Boulders and Cobbles, estimated 10% Cobble, 20% Gravel. Wet, brown, Gravel and Sand observed between 16 and 17.0'.						
7												
8												
9												
10												
11			X	13371			23	15			10.0	Groundwater level on 11-12-19 TP-111A=17.1' TP-111B=14.6' TP-111C=11.3'
12												
13												
14												
15												
16			X	13372							14.0	Groundwater slowly flowing into test pit from 16 and 17 ft depth through sand and gravel
17			X	13373							12.0	
18			X									
19			X	13374							15.0	
20						BOH = 19.4 ft.						

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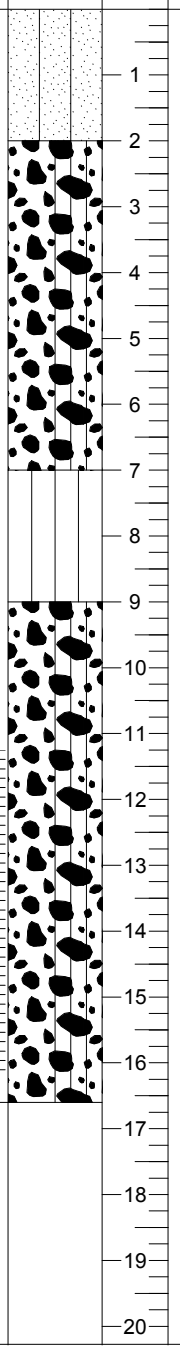
DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35TP-112

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/4/12 - 10/4/12	DRILLER: Stream Works, Inc.
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200
GROUND SURFACE ELEVATION: 5067.59 ft	HOLE DIAMETER:
BOREHOLE LOCATION: N 1020918.47, E 1232542.59 (MT St. Pl. NAD83)	HAMMER TYPE:



DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
0-2						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered. Dry, Light brown, SILTY SAND with Gravel, SM, subangular, low plasticity, organics (grass roots), TOPSOIL.					9.0	
2-7						Dry to moist, Dark brown [10YR 3/3], WELL GRADED GRAVEL with Silt and Sand, GW-GM, subrounded, rock particles generally laying flat, at 4 ft depth estimated 15% Cobble, 50% Gravel, and 35% Sand, maximum particle size is 8-in.					4.0	
7-9						Moist, Reddish brown, SANDY SILT, ML, low plasticity.					25.0	Easy digging from 7 to 9 ft.
9-16.6						Moist to wet, Dark brown [10YR 3/3], WELL GRADED GRAVEL with Silt and Sand, GW-GM, subrounded, estimated 10% Boulder, 30% Cobble, 40% Gravel and 20% Sand with maximum particle size of 30-in. Wet, reddish brown, Sandy Clay, CL, observed at 16.0'.					6.0 13.0	Installed 1.5" PVC to 16.6' Screened 11.6'-16.6' Groundwater level on 11-19-12= DRY Groundwater at 16' while excavating Could not visually observe the Sandy Clay on the test pit walls or bottom.
16.6						BOH = 16.6 ft.						

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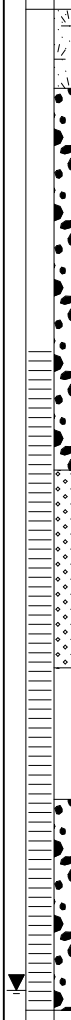
DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35TP-113	PAGE 1 of 1
DATE STARTED / FINISHED: 10/4/12 - 10/4/12	DRILLER: Stream Works, Inc.	
LOGGED BY: M. Browne / N. Jaynes	DRILL TYPE: Komatsu PC200	
GROUND SURFACE ELEVATION: 5069.27 ft	HOLE DIAMETER:	
BOREHOLE LOCATION: N 1020730.25, E 1232675.16 (MT St. Pl. NAD83)	HAMMER TYPE:	



DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	MOISTURE (%)	REMARKS / TESTING
						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.		
1			X	13380		Dry, Light brown, SILTY SAND with Gravel, SM, subangular, low plasticity, organic (roots), estimated 20% Gravels.	6.0	
2			X			Dry to moist, Brown, WELL GRADED GRAVEL with Sand, GW, subrounded, with Cobbles, particles are generally flat and laying in horizontal position. At 4 ft depth estimated 5% Cobble and max particle size 6-in..		
3			X	13381			3.0	
4								
5								
6								
7						Moist, Brown, WELL GRADED SAND, SW, non-plastic, particles are generally fine to medium grained, occasional pockets of poorly graded, fine grain sand.		
8			X	13382			16.0	
9								
10			X			Moist to wet, Reddish brown, SANDY SILT, ML, low plasticity, occasional seams of varied Lean CLAY.		
11			X	13383			26.0	Observed groundwater dripping into test pit near 11 ft depth, sidewall of test pit caved in and water drip could no longer be noted
12			X			Wet, Brown, WELL GRADED GRAVEL with Clay and Sand, GW-GC, subrounded, at 14 ft depth estimated 10% Boulder, 30% Cobbles and a maximum particle size of 16-in.		
13			X					
14			X					Installed 1.5" PVC to 15.2' Screened 5.2-15.2'
15			X	13384			12.0	Groundwater level on 11-19-12= 14.9'
16						BOH = 15.2 ft.		
17								
18								
19								
20								

LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)

PIONEER TECHNICAL SERVICES, INC.

CLIENT: Montana Department of Environmental Quality
ADDRESS: P.O. Box 200901 Helena, Montana 59620-0901
PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

S35 7A-104

Test Pit No.

PAGE 1 OF 2

PROJECT NAME: UBMC	
DATE STARTED/FINISHED: 10/2/12	OPERATOR: STREAM WORKS
TIME STARTED/FINISHED: ~11:00 /	EXCAVATOR TYPE: KOMATSU PC 200 LC
LOGGED BY: MR ASSISTED BY: NT & PR	
COORDINATES:(State Plane) Northing: Easting:	

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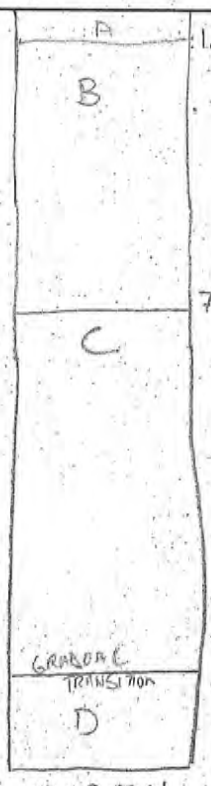
DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	UNDISTURBED	BULK	RECOVERY (%)
0					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					

MATERIAL DESCRIPTION



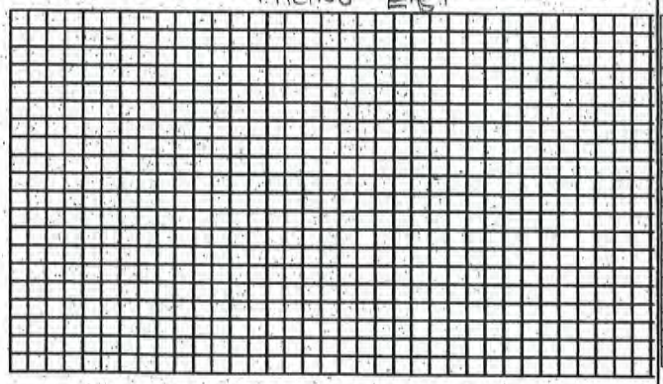
A) TOP SOIL
SANDY, SILTY CLAY (CL); DRY; DARK BROWN; LOTS OF GRASS ROOTS;

B) CLAYEY SAND W/ GRAVEL (SC); DRY; PALE BROWN; LOW PL MINUS 40 FRACTION IS LEAN CLAY; (0.9' MAX) TRACE SUB ROUNDED BOULDERS / COBBLES; GRAVELS ARE ANGULAR & SUBANG. TRACE ROOTS TO 3'

C) SILTY SAND (SM) W/ GRAVEL & OCCASIONAL COBBLES; DAMP; REDDISH BROWN; LOW PL APPROX 20% GRAVELS (SUBROUNDED) COBBLES & GRAVELS ARE (1' MAX) & SUBROUNDED ~5% TOTAL VOLUME

D) ~~CLAYEY SAND~~ CLAYEY SAND (SC) W/ GRAVEL; MOIST; MED PLASTIC, REDDISH BROWN; TRACE COBBLES & BOULDERS; SUBANGULAR

FACING EAST



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Test Pit No. TP-104

Weather:

Temperature: 60's **Snow depth:** ✓ **Wind** WINDY **Cloud Cover:** P. CLOUDY / MOSTLY OVERCAST

Notes:

Piezo Stickup @ M.P. (ft/tenths): _____ **Diameter:** _____ **Material** _____

Screen Interval: _____ **M.P to Water:** _____ **Depth to Water:** _____

Depth to Bottom of Test Pit: 17.0

Initial pH _____ **Depth at Reading** _____ **Time at Reading** _____

Stabilized water pH _____ **Depth at Reading** _____ **Time at Reading** _____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	1.0	S35TP-104	BAG(2)	11:35	CL	D. BROWN		
1	4.5	"	BUCK(2)		SC	PALE BROWN		
7	10	"	"	12:15	SM	R. BROWN		
15	17	"	BUCK(1)		SC	"		

Notes:

IN POCKET OF SMALL, LIVE PINE TREES. HEALTHY GRASSES

DENSITY OR CONSISTENCY		N-VALUE	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE
		5-10	► LOOSE
		11-29	► MEDIUM DENSE
		30-49	► DENSE
		>50	► VERY DENSE

	N-VALUE	q_u (tsf)	
FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
	3-4	0.25-0.50	► SOFT
	5-8	0.50-1.0	► MEDIUM
	9-15	1.0-2.0	► STIFF
	16-30	2.0-4.0	► VERY STI
	>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

S35 TP-108

Test Pit No.

PAGE 1 OF 2

PROJECT NAME: UBMC	
DATE STARTED/FINISHED: 10/2/12	OPERATOR: SW
TIME STARTED/FINISHED:	EXCAVATOR TYPE: PC 200LC
LOGGED BY: MB ASSISTED BY: NJ	
COORDINATES:(State Plane) Northing: Easting:	

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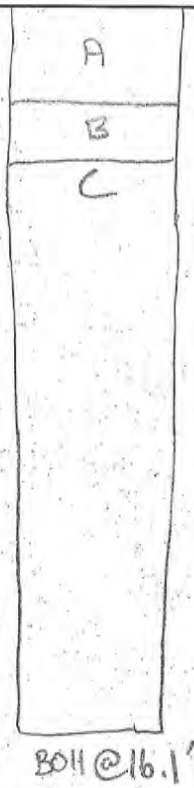
DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					



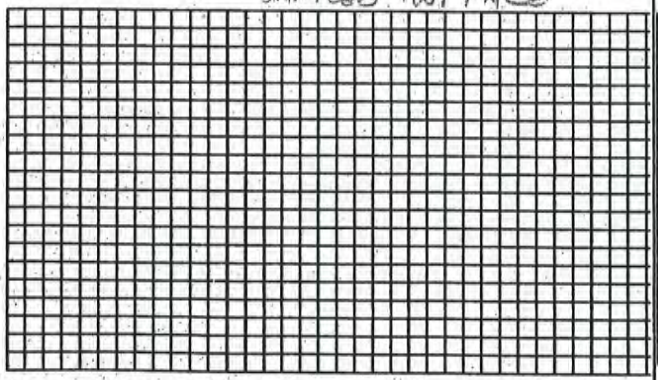
MATERIAL DESCRIPTION

A) TOPSOIL — BLK WHEN WETTED
D. BROWN; DRY; GRASS ROOTS
SILTY CLAY W/ SAND; LOW PL;

B) SILTY SAND W/ GRAVEL; DRY; LIGHT BROWN; (BONY)
~~SMALL~~ GRAVELS (~~FINE~~) ARE ANG. TO SUB ANG

C) CLAYEY SAND (SC) W/ GRAVELS & COBBELS; ~~DRY~~; MED PL; BROWN W/ RED TINGE
GRAVELS ARE SUB ANG TO ANG
ARGILLITE ROCKS ARE PURPLISH IN COLOR; DRY TO MOIST, ALMOST WET @ 10'
OCCASIONAL ANGULAR BOULDERS (18")
~10% COBBEL
IRON STAINING NOTED IN ARGILLITE NOTED @ 15'

SAMPLED W. FACE



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Page 2 of 2

Test Pit No. S357A-108

Weather: _____

Temperature: 60's | Snow depth: / | Wind WINDY | Cloud Cover: CLEAR

Notes: _____

Piezo Stickup @ M.P. (ft/tenths): _____ | Diameter: 1½ | Material SCH 80 PVC

Screen Interval: 10' @ BOTTOM | M.P to Water: _____ | Depth to Water: NOT OBSERVED

Depth to Bottom of Test Pit: 16.1

Initial pH _____ | Depth at Reading _____ | Time at Reading _____

Stabilized water pH _____ | Depth at Reading _____ | Time at Reading _____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	2.1	S35 TP-108	BAG (2)	13:35	TS	BROWN		
2.1	4.7	"	8 BUCKET(2)	13:45	SC	R. BROWN		
8.5	9.5	"	"	14:00	"	"		
16.	17	"	"	14:20	"	"		

Notes:

HEALTHY GRASS & TREE SURROUNDING TP

DENSITY OR CONSISTENCY		N-VALUE				N-VALUE	q_u (tsf)	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE		FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
		5-10	► LOOSE			3-4	0.25-0.50	► SOFT
		11-29	► MEDIUM DENSE			5-8	0.50-1.0	► MEDIUM
		30-49	► DENSE			9-15	1.0-2.0	► STIFF
		>50	► VERY DENSE			16-30	2.0-4.0	► VERY STI
						>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

Test Pit No. S35TP-102 PAGE 1 OF 2

PROJECT NAME: CRMC	
DATE STARTED/FINISHED: 10/2/12	OPERATOR: S.W.
TIME STARTED/FINISHED: 15:15	EXCAVATOR TYPE: PC200LC
LOGGED BY: MB ASSISTED BY: NJ	
COORIDINATES:(State Plane) Northing: Easting:	

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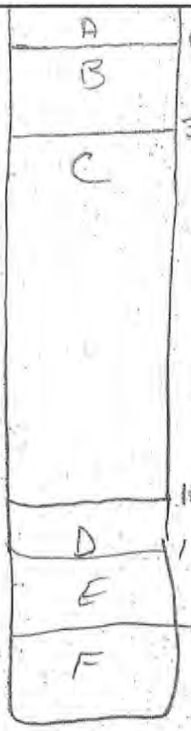
DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	UNDISTURBED	BULK	RECOVERY (%)
0					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					

MATERIAL DESCRIPTION



A) TOPSOIL; SANDY CLAY W/ SOME COBBELS; GRAVELLY DARK BROWN; DRY; LOW PL; ORGANIC GRASS ROOTS GRAVELS ARE SUBROUNDED & SUBANG. (~30% GRAVEL) (8" MAX COBBEL)

B) SILTY SAND; DRY; LIGHT BROWN; LOW PL; GRAVELLY SUBROUND & SUBANG; ~40% GRAVEL & COBBEL; POCKETS OF HIGHER ROCK %;

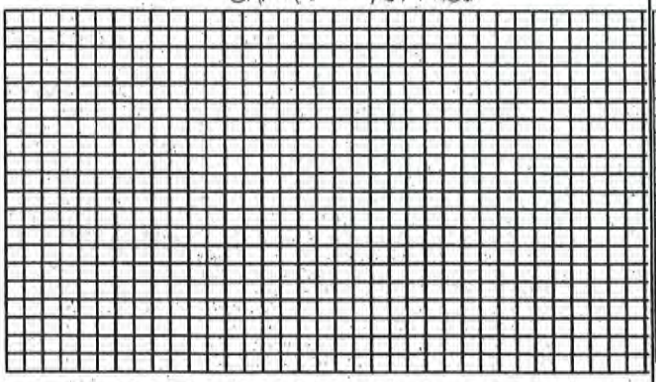
C) CLAYEY SAND(SC) W/ GRAVEL; DAMP @ 3'; M. PLASTIC; GRAVELS SUBROUND & SUBANG; TRACE (~~18~~ 24 ~ 32") SUBROUNDED COBBELS; ~15% GRAVEL 5% COBBEL 5% BOULDER

D) WEATHERED ARGILLYTE; MOIST; DARK GRAY W/ PURPLISH TING; IRON STAINING OBSERVED IN FISSURES; BREAKS DOWN W/ FINGER PRESSURE TO A MEDIUM PLASTIC CLAY; TRACE PYRITE FLAKES. POCKETS OF F. GRAIN SILTY SAND

E) PYROCLYSTIC? AGROMERATE; MOIST; D. BROWN - RUSTY BROWN RED - LT GRAY - DARK GRAY - PURPLE; FINE GRAIN PARTICLES CRUMBLE W/ FINGER PRESSURE; PYRITE FLAKES; LOW PL

F) SANDSTONE; GRAY; F. GRAIN; BREAKS W/ FINGER PRESSURE; NP; FE STAINING

SAMPLE NJ. FACE



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	**OTHER**
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Page 2 of 2

Test Pit No. 535TP-102

Weather: _____

Temperature: 70 | Snow depth: / | Wind WINDY | Cloud Cover: CLEAR

Notes:

Piezo Stickup @ M.P. (ft/tenths): 2.35 | Diameter: 1"h | Material PVC

Screen Interval: 5' @ BOTTOM | M.P to Water: _____ | Depth to Water: _____

Depth to Bottom of Test Pit: 16'

Initial pH _____ | Depth at Reading _____ | Time at Reading _____

Stabilized water pH _____ | Depth at Reading _____ | Time at Reading _____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	0.7	535TP-102	BAG(1)	151.30	TS	D. BROWN		
0.7	3.7	"	BUC(1)	15:45	SC	R. BROWN		
9.0	10.0	"	"	16:00	"	"		
13.0	13.5	"	BUC(1)	16:15				
15.	16.0	"	"	16:45				

Notes:

IN MEADOW W/ GRASS & SAGE BRUSH.
SURROUNDED BY SMALL (~30') TREES
↑ PINE

DENSITY OR CONSISTENCY		N-VALUE	
COARSE GRAINED DEPOSITS	0-4	►	VERY LOOSE
	5-10	►	LOOSE
	11-29	►	MEDIUM DENSE
	30-49	►	DENSE
	>50	►	VERY DENSE

	N-VALUE	q_u (tsf)	
FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
	3-4	0.25-0.50	► SOFT
	5-8	0.50-1.0	► MEDIUM
	9-15	1.0-2.0	► STIFF
	16-30	2.0-4.0	► VERY STI
	>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

S35 TP-105

Test Pit No. 105 PAGE 1 OF 2

PROJECT NAME: UBMC	
DATE STARTED/FINISHED: 10/3/12	OPERATOR: S.W.
TIME STARTED/FINISHED: 11:00	EXCAVATOR TYPE:
LOGGED BY: MB ASSISTED BY: NT	
COORIDINATES:(State Plane) Northing: Easting:	

DEPTH (FT) | SAMPLE NO. DEPTH | SAMPLES: DRIVE, UNDISTURBED, BULK | RECOVERY (%)

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MATERIAL DESCRIPTION

TOPSOIL

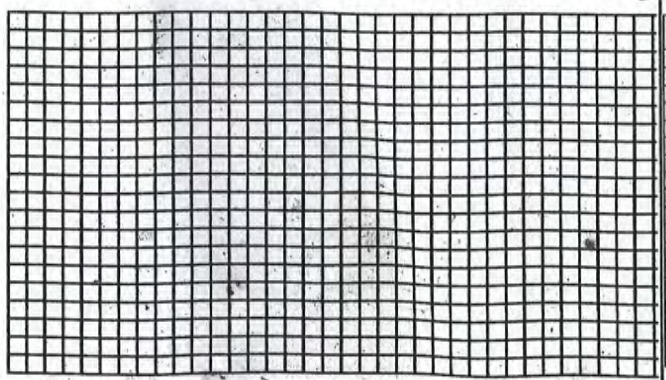
A) SANDY CLAY W/ GRAVEL; DRY; HARD DIGGING; DARK BROWN; ORGANIC GRASS ROOTS
~30% GRAVELS -> SUB ANGULAR

B) POORLY GRADED, GRAVELLY SAND W/ CLAY, COBBLES, + BOULDERS; LT BROWN; DRY @ 3FT DEPTH; SUB ANG TO SUB ROUNDED; HARD DIGGING; LOW PL
~10% BOULDERS & COBBLES MINUS 40
~30% GRAVEL

C) CLAYEY SAND (SC) W/ GRAVEL & COBBLES; BROWN W/ RED TING; MED PL; GRAVELS SUB ANG & SUB ROUND; MOIST
@8' ~30% GRAVEL, 10% COBBLE

D) SEAMS OF GRAVELLY SAND W/ SILT; BROWN; WET WATER DRAWS TO SURFACE WHEN TAPPING W/ FINGER; WATER VISUALLY DRIP OUT OF SIDE OF TP.
FIRST NOTED @ 14'; OCCASIONALLY NOTED TO BOTTOM DEPTH

GRAVELS ARE 1½" MINUS, SUB ANG.



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

EASIER DIGGING W/ DEPTH
MOISTURE ↑ W/ DEPTH

Page 2 of 3

Test Pit No. S357P-105

Weather: _____

Temperature: 30's Snow depth: 4" Wind CALM Cloud Cover: CLOUDY

Notes:

Piezo Stickup @ M.P. (ft/tenths): 3.95 CUT TO Diameter: 1½ Material PVC

(2x10' BLANKS, 15' SCREEN, & CAP)

Screen Interval: BOTTOM 5 M.P to Water: _____ Depth to Water: _____

Depth to Bottom of Test Pit: 17.5

Initial pH _____ Depth at Reading _____ Time at Reading _____

Stabilized water pH _____ Depth at Reading _____ Time at Reading _____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	1.7	S357P-105	BAG(3)	11:35	TS	D. BROWN		
3	4	"	BUC(2)	11:50	SP	LT. BROWN		
8	9	"	"	12:00	SC	R BROWN		
17	17.5	"	BAG(2)	12:30	SP	BROWN		
16.5	17.0		BAG(1)	12:45	SC	R. BROWN		

Notes:

TRICKLE OF WATER FLOW INTO TP START @ 14'

SITY OR SISTENCY

	N-VALUE	
COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE
	5-10	► LOOSE
	11-29	► MEDIUM DENSE
	30-49	► DENSE
	>50	► VERY DENSE

	N-VALUE	q_u (tsf)	
FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
	3-4	0.25-0.50	► SOFT
	5-8	0.50-1.0	► MEDIUM
	9-15	1.0-2.0	► STIFF
	16-30	2.0-4.0	► VERY STI
	>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thum
Very Hard	Thumbnail will not indent soil

S35TP-107

Test Pit No. 107 PAGE 1 OF 2

PROJECT NAME: UBMC	
DATE STARTED/FINISHED: 10/3/12	OPERATOR: SW
TIME STARTED/FINISHED: 8:41 /	EXCAVATOR TYPE: PC 200 LC
LOGGED BY: MB ASSISTED BY: NT	
COORDINATES:(State Plane) Northing: Easting:	

DEPTH (FT) | SAMPLE NO. DEPTH | SAMPLES: DRIVE, UNDISTURBED, BULK | RECOVERY (%)

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MATERIAL DESCRIPTION

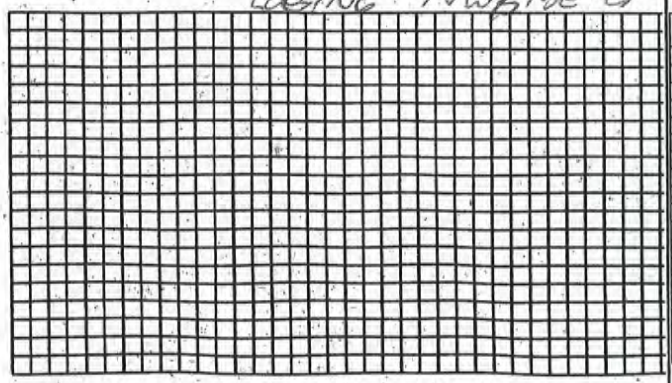
A) TOPSOIL
DRY; DARK BROWN; SANDY CLAY W/ GRAVEL & TRACE COBBLES; LOW PL; ORGANIC GRASS ROOTS; GRAVEL & COBBLES ARE ANGULAR

B) CLAYEY SAND (SC); DAMP; LT. BROWN W/ RED TING; ANGULAR ~~TO SUB ANG~~ TO SUB ROUNDED WITH GRAVEL & SOME BOULDERS 10% MAX; 5% COBBLE; 20% GRAVEL LOW TO MED PL. & COBBLE

C) POORLY GRADED GRAVELLY SAND (SP) W/ SOME SILT, MOIST; BROWN; NON PLASTIC; SUB-ANG - SUB ROUND ~30% GRAVEL ~10% COBBLES

B) MOISTURE INCREASES W/ DEPTH. TRACE BOULDERS W/ MAX 18" Ø

LOOKING NW SIDE OF TP



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Test Pit No. SSPTP-07

Weather: SNOW

Temperature: 30's **Snow depth:** 4" **Wind** CALM **Cloud Cover:** CLOUDY & SNOWING

Notes:

Piezo Stickup @ M.P. (ft/tenths): 4.6 **Diameter:** 1 1/2 **Material** PVC

Screen Interval: BOTTOM 10' **M.P to Water:** **Depth to Water:** NA

Depth to Bottom of Test Pit: 16'

Initial pH **Depth at Reading** **Time at Reading**

Stabilized water pH **Depth at Reading** **Time at Reading**

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	1.7	SSPTP-07	BAG(S)	9:10	SS	D. BROWN		
1.7	5.2	"	BAG(S)	9:15	SC	R. BROWN		
9	10	"	"	9:25	SP	LT BROWN		
15	16	"	"	10:00	SC	R. BROWN		

Notes:

MEDIUM DIGGING HARDNESS

DENSITY OR CONSISTENCY		N-VALUE			N-VALUE	q_u (tsf)	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE	FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
		5-10	► LOOSE		3-4	0.25-0.50	► SOFT
		11-29	► MEDIUM DENSE		5-8	0.50-1.0	► MEDIUM
		30-49	► DENSE		9-15	1.0-2.0	► STIFF
		>50	► VERY DENSE		16-30	2.0-4.0	► VERY STI
					>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

S35TP-111

Test Pit No. 111

PAGE 1 OF 2

PROJECT NAME: UBMC	
DATE STARTED/FINISHED: 10/3/12	OPERATOR: SW
TIME STARTED/FINISHED: 13:15	EXCAVATOR TYPE: 200
LOGGED BY: TB MB ASSISTED BY: MS	
COORIDINATES:(State Plane) Northing: Easting:	

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DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)

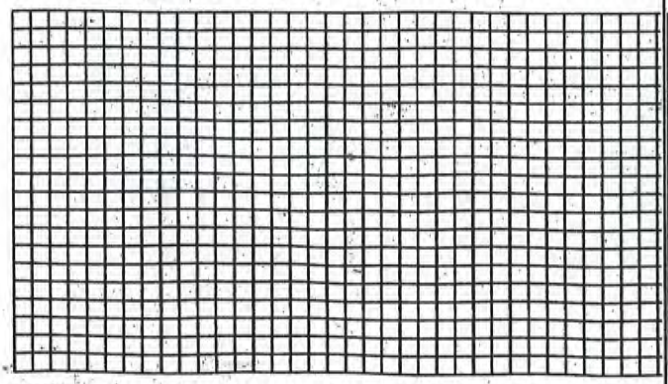
MATERIAL DESCRIPTION

A) TOPSOIL
GRAVELLY, CLAYEY SAND (SC); DRY; D. BROWN;
~30% GRAVEL, SUB ANG & SUB ROUND;
5" MAX PARTICLE; ORGANIC GRASS ROOTS
MED PL;

B) POORLY GRADED GRAVELLY SAND W/ SILT & COBBLES & BOULDERS; ~~DRY~~ DAMP @3'; LT BROWN;
SUB ANG & ROUND TO 4 LARGEST PARTICLE IS ~~8"~~; LOW PL;
@4' MAX 18" PARTICLE; ~5% BOULDER ~10% COBBLE; ~30% GRAVEL

C) CLAYEY SAND W/ GRAVEL & COBBLES; MOIST; M. PL; @10' ~10% COBBLE & BOULDER ~20% GRAVEL → SUB ANG & SUB ROUND
BROWN W/ RED HUE;

D) POORLY GRADED GRAVEL W/ SAND & TRACE TOPSOIL CLAY; SUB ROUNDED; PRIMARILY ~~X~~ MAFICS, WET; BROWN/GRAY MATRIX; WATER 1½" FLOWING THROUGH LAYER
MAX PARTICLE IS 5".



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Page _____ of _____

Test Pit No. S33 TP-111

Weather: _____

Temperature: 30's **Snow depth:** 4" **Wind** _____ **Cloud Cover:** _____

Notes: _____

Piezo Stickup @ M.P. (ft/tenths): _____ **Diameter:** _____ **Material** _____

Screen Interval: _____ **M.P to Water:** _____ **Depth to Water:** _____

Depth to Bottom of Test Pit: 18.7

Initial pH _____ **Depth at Reading** _____ **Time at Reading** _____

Stabilized water pH _____ **Depth at Reading** _____ **Time at Reading** _____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	1	S33 TP-111	BAG(1)	13:45				
10.5	11.5	"	BUC(1)	14:10				
16.5	17.0	"	BAG(1)	14:30				
18.0	18.7	"	"	14:50	GP			
16.0	16.5	"		14:20	SC			
1	4.7	"	BUC(1)	13:50				

Notes:

	Bottom	PIPE	CUT/ADD	STICKUP
A	18.7	20' RISER 5' SCREEN 0.3 TIP	-1.8	3.95'
B	14.7	10' " 5' " "	+3.3	3.77
C	11.0	10' 5' " "	0	3.5

DENSITY OR CONSISTENCY

	N-VALUE	
COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE
	5-10	► LOOSE
	11-29	► MEDIUM DENSE
	30-49	► DENSE
	>50	► VERY DENSE

	N-VALUE	q_u (tsf)	
FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
	3-4	0.25-0.50	► SOFT
	5-8	0.50-1.0	► MEDIUM
	9-15	1.0-2.0	► STIFF
	16-30	2.0-4.0	► VERY STI
	>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

Test Pit No. 106

PAGE 1 OF 2

PROJECT NAME: IBMC	
DATE STARTED/FINISHED: WW 10/4/17	OPERATOR: SW
TIME STARTED/FINISHED: 14:15 /	EXCAVATOR TYPE: PC200 LC
LOGGED BY: ASSISTED BY:	
COORDINATES:(State Plane) Northing: MB Easting: NJ	

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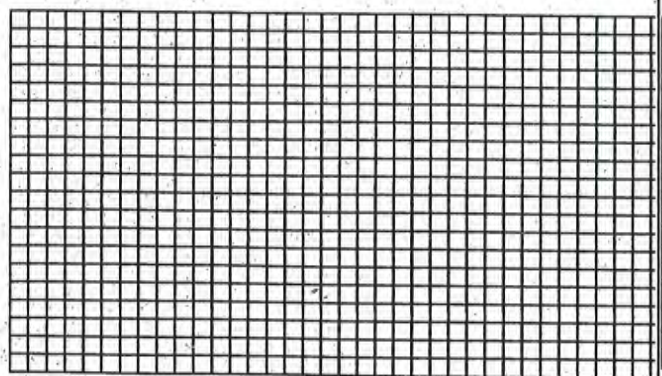
DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	UNDISTURBED	BULK	RECOVERY (%)
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					

MATERIAL DESCRIPTION

A) TOPSOIL
SILTY SAND W/ SOME SUBANG GRAVEL; DRY; BROWN (TURNS DARK BROWN W/ MOISTURE); ORGANIC GRASS ROOTS; LOW PL

B) SILTY SAND (COBBLE & BOULDERS); DRY; 14" MAX; GRAVELLY
LT BROWN; SUBANGULAR; SLIGHTLY PLASTIC;
HARD DIGGING
@ 4' ~30% GRAVEL 10% COBBLE 10% BOULDERS

C) CLAYEY SAND W/ GRAVEL, COBBLES, & BOULDERS; MOIST; BROWN W/ RED HUE; SUBANGULAR PARTICLES; LARGEST PARTICLE ~24"; ~5% BOULDER, ~10% COBBLE, ~20% GRAVEL
MED PL
EAS MEDIUM DIGGING HARDNESS



Classification			
USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Page _____ of _____

Test Pit No. 106

Weather: LIGHT SNOW

Temperature: 30 Snow depth: 3" Wind CALM Cloud Cover: OVERCAST

Notes:

Piezo Stickup @ M.P. (ft/tenths): 2.15 Diameter: 1½" Material PVC

Screen Interval: 10' (0.3' CAP) M.P to Water: _____ Depth to Water: _____

Depth to Bottom of Test Pit: 18.2

Initial pH _____ Depth at Reading _____ Time at Reading _____

Stabilized water pH _____ Depth at Reading _____ Time at Reading _____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	2.9		BAG(2)	14:30	TS	D. BROWN		
3.6	4.6		BAG(2)	14:30	SM	LT. BROWN		
8.4	9.4		"	15:05	SC	R. BROWN		
17.2	18.2		"	15:55	"	"		

Notes:

- POTENTIALLY TP LOCATED ON OLD SLASH PILE
- NO GW OBSERVED
- TECH STUDENTS ON SITE

DENSITY OR CONSISTENCY		N-VALUE			N-VALUE	q_u (tsf)	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE	FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
		5-10	► LOOSE		3-4	0.25-0.50	► SOFT
		11-29	► MEDIUM DENSE		5-8	0.50-1.0	► MEDIUM
		30-49	► DENSE		9-15	1.0-2.0	► STIFF
		>50	► VERY DENSE		16-30	2.0-4.0	► VERY STI
					>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

Test Pit No. 109 PAGE 1 OF 2

PROJECT NAME: UBMC	
DATE STARTED/FINISHED: 10/4/12	OPERATOR:
TIME STARTED/FINISHED: 12:30 / 14:15	EXCAVATOR TYPE: PC 200 LC
LOGGED BY: MB ASSISTED BY: LA	
COORDINATES:(State Plane) Northing: Easting:	

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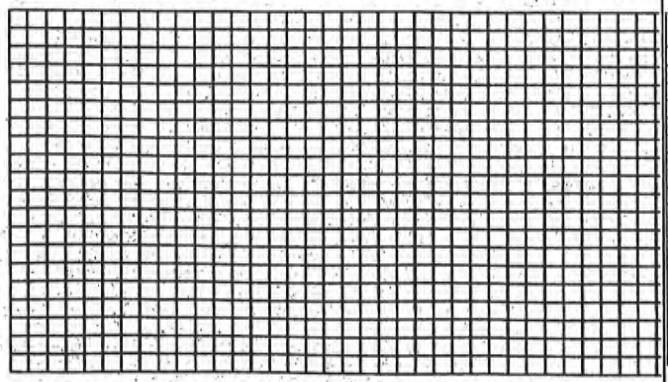
DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)
0–20					

MATERIAL DESCRIPTION

A) TOPSOIL
SILTY SAND W/ ANGULAR GRAVEL; DRY; BROWN; PRIMARILY 1" MINUS; LOW PL; ORGANIC GRASS ROOTS;

B) SILTY, ~~X~~ GRAVELLY SAND W/ SOME COBBLES; 6" MAX @ 3'; DRY; ~~BROWN W/ RED MUD~~ LT BROWN; GRAVELS ARE SUB ANG; SLIGHT PL
@ 3' ≈ 10% COBBEL, 30% GRAVEL, 40% SAND, 20% SILT & COARSE

C) CLAYEY SAND W/ GRAVEL; MOIST; BROWN W/ RED MUD; MED PL; SUB ANG & SUB ROUNDED, ≈ 30% GRAVEL MAX PARTICLE 8" TRACES
≈ 10% COBBEL
MOIST ENTIRE DEPTH BUT DIDN'T APPEAR TO CHANGE W/ DEPTH
HARD DIGGING ENTIRE DEPTH



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	**OTHER**
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Page 2 of 2

Test Pit No. 109

Weather: LIGHT SNOW

Temperature: 30's | Snow depth: 3" | Wind CALM | Cloud Cover: OVERCAST

Notes:

Piezo Stickup @ M.P. (ft/tenths): 4.15 | Diameter: 1½ | Material PVC

Screen Interval: 5" | M.P to Water: | Depth to Water:

Depth to Bottom of Test Pit: 17.6

Initial pH | Depth at Reading | Time at Reading

Stabilized water pH | Depth at Reading | Time at Reading

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	1.3	SBSTP-109	BAG(2)	12:45	TS	D. BROWN		
3.6	4.6		BK 2	12:55		LT BROWN		
7.3	8.3		"	13:10	SC	R. BROWN		
16.6	17.6		"	13:30	"	"		

Notes:

NO GW OBSERVED

DENSITY OR CONSISTENCY		N-VALUE	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE
		5-10	► LOOSE
		11-29	► MEDIUM DENSE
		30-49	► DENSE
		>50	► VERY DENSE

	N-VALUE	q_u (tsf)	
FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
	3-4	0.25-0.50	► SOFT
	5-8	0.50-1.0	► MEDIUM
	9-15	1.0-2.0	► STIFF
	16-30	2.0-4.0	► VERY STI
	>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

S35 TP-112

PROJECT NAME: UBMC 16
DATE STARTED/FINISHED: 10/9/12
TIME STARTED/FINISHED: 10/12/12 10:19 / 12:00
LOGGED BY: MB ASSISTED BY: NJ
COORDINATES:(State Plane) Northing: Easting:

Test Pit No. 112 PAGE 1 OF 2

OPERATOR: SW
EXCAVATOR TYPE: PC 200 LC

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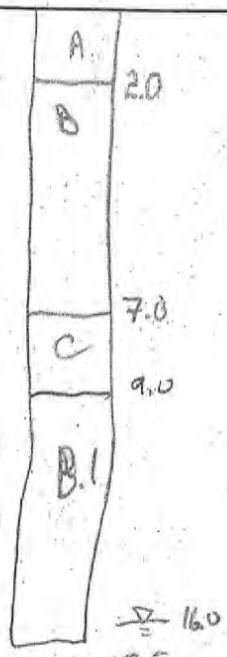
DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)



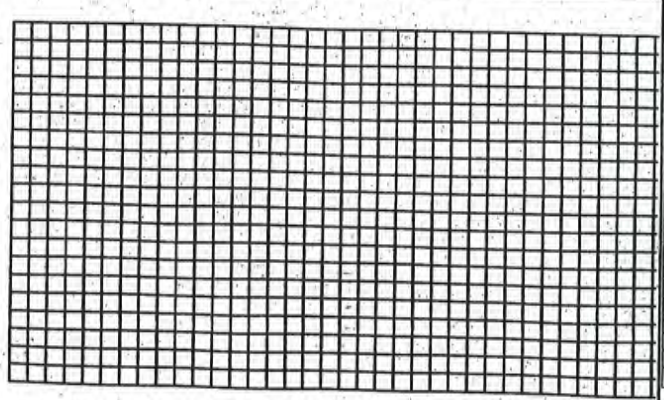
MATERIAL DESCRIPTION

A) TOPSOIL
SILTY SAND W/ SUBANGULAR GRAVELS; DRY; LT BROWN; ORGANIC GRASS ROOTS; LOW PL

B) SANDY GRAVEL; WELL GRADED; PARTICLES GENERALLY SUBROUNDED & LAYING FLAT; BROWN MATRIX; DRY @ 2' DAMP @ 4.5'; @ 9' 15% COBBLE MAX PARTICLE ~ 8"
50% GRAVEL
35% SAND

C) SANDY SILT (ML); REDDISH BROWN; MOIST; LOW PL; SOFT DIGGING

B.1) SAME AS B) BUT BONYIER
~10% BOULDER MAX 30"
~30% COBBLE
~40% GRAVEL 20% SAND/FINES
BOTTOM SCOOP WAS WET (@ 16'
DID NOT OBSERVE WATER FLOWING INTO TP.
NOTE SOME SANDY CLAY ON TEETH OF EXCAVATOR, LIKELY FROM BOTTOM. DID NOT VISUALLY SEE ANY CLAY IN BOTTOM TP



Classification			
USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Test Pit No. 112

Weather: _____

Temperature: 30s Snow depth: 3" Wind CALM Cloud Cover: CLOUDY / OVERCAST

Notes: _____

Piezo Stickup @ M.P. (ft/tenths): 1.85' Diameter: 1½ Material PVC

Screen Interval: 5' (0.5' slot) M.P to Water: _____ Depth to Water: _____

Depth to Bottom of Test Pit: _____

Initial pH _____ Depth at Reading _____ Time at Reading _____

Stabilized water pH _____ Depth at Reading _____ Time at Reading _____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	2.0	SBS TP-112	BAG (2)	10:15	TS	BROWN		
2.0	4.5		BAG (3)	10:25	GRAV	BROWN		
6.8	8.8		BAG (2)	10:35	ML			
16	16.5		BAG (1)	11:15	CL			
15	16		BUCK (2)	11:00	GRAV			

Notes:

NO GW OBSERVED

DENSITY OR CONSISTENCY		N-VALUE	
COARSE GRAINED DEPOSITS		0-4	► VERY LOOSE
		5-10	► LOOSE
		11-29	► MEDIUM DENSE
		30-49	► DENSE
		>50	► VERY DENSE

	N-VALUE	q_u (tsf)	
FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
	3-4	0.25-0.50	► SOFT
	5-8	0.50-1.0	► MEDIUM
	9-15	1.0-2.0	► STIFF
	16-30	2.0-4.0	► VERY STI
	>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

S35 TP-113

Test Pit No. 113 PAGE 1 OF 2

PROJECT NAME: UBMC	
DATE STARTED/FINISHED: 10/4/12	OPERATOR: STEVAN W
TIME STARTED/FINISHED: 8:15 / 10:00	EXCAVATOR TYPE: 200 EX
LOGGED BY: MB ASSISTED BY: NJ	
COORDINATES:(State Plane) Northing: Easting:	

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DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	MATERIAL DESCRIPTION
0–2						A) TOPSOIL SILTY SAND W/ SUBANGULAR GRAVEL; DRY; LT BROWN; TRACE ORGANIC GRASS ROOTS; LOW PL; ~20% GRAVELS W/ SOME COBBLE
2–6						B) SANDY GRAVEL; DAMP; BROWN MATRIX; PRIMARILY 1½" MINUS SUBROUNDED [TRACE SUB ANGULAR PARTICLES @ 4' MAX PARTICLE ~6"; ~5% COBBLE HORIZONTALLY DEPOSITED MOISTURE CONTENT INCREASES ~5.5'
6–8						C
8–10						E @ 5-7' 5% BOULDER (14" MAX) FLAT PARTICLES SUBROUNDED 15% COBBLE
10–12						D
12–14						C) WELL GRADED SAND (SW); MOIST; BROWN; f. to m. GRAIN; NP ↳ POCKETS OF f. GRAIN SP.
14–16						B
16–18						D) SANDY SILT (ML); WET; BROWN; LOW PL; REDDISH OCCASIONAL SEAMS OF VARVED CLAY (CL); MPL
18–20						B @ 14' MAX PARTICLE ~16" SUBROUNDED 10% BOULDER 30% COBBLE 60% GRAVEL & SAND WET

A 1.2
B 7.0
C 8.0
E 10.0
D 12.0
B
BOH @ 17.0

NOTED WATER DRIP DURING EXCAVATION; SIDE WALL CAVED IN & COULD NO LONGER SEE DRIP

Classification			
USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Page 2 of 2

Test Pit No. 113

Weather:

Temperature: 30 Snow depth: 3" Wind CALM Cloud Cover: OVERCAST

Notes:

Piezo Stickup @ M.P. (ft/tenths): 5.2 Diameter: 1 1/2 Material PVC

Screen Interval: 0.3' CAP; 10' SCREEN; 10' RISER M.P to Water: Depth to Water:

Depth to Bottom of Test Pit:

Initial pH Depth at Reading Time at Reading

Stabilized water pH Depth at Reading Time at Reading

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID
0	1.2	SBSTP-113	BAG(1)	825	TS	LT BROWN		
1.5	3.5		BUC(1)	8:35	GP	BROWN		
~~6.0~~	~~7.0~~		~~BUC(1)~~	~~8:45~~	~~SW~~	~~BROWN~~		
8.0	9.0		BAG(1)	8:50	SW	BROWN		
10:0	12:0		BAG(1)	9:15	M	DK BROWN		
16	17		BUC(1)	9:20	GRAVEL	BROWN		

Notes:

DENSITY OR CONSISTENCY		N-VALUE			N-VALUE	q_u (tsf)	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE	FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
		5-10	► LOOSE		3-4	0.25-0.50	► SOFT
		11-29	► MEDIUM DENSE		5-8	0.50-1.0	► MEDIUM
		30-49	► DENSE		9-15	1.0-2.0	► STIFF
		>50	► VERY DENSE		16-30	2.0-4.0	► VERY STI
					>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

S35TP-101

Test Pit No. 101 PAGE 1 OF 2

PROJECT NAME: SECTION 35 VENTC	
DATE STARTED/FINISHED: 10/5/12	OPERATOR: SW
TIME STARTED/FINISHED: 9:15 / 11:00	EXCAVATOR TYPE: PC 200
LOGGED BY: MB ASSISTED BY:	
COORIDINATES:(State Plane) Northing: Easting:	

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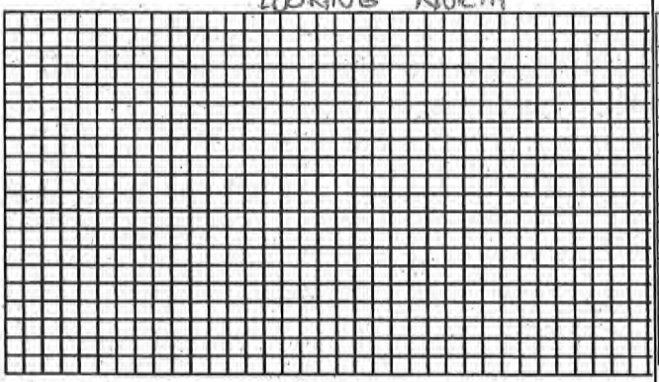
DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	MATERIAL DESCRIPTION
0						A) BASECOURSE (TEST PIT LOCATED ALONG ALIGNMENT OLD FLETCHER HIGHWAY)
2						1½" CRUSHED GRAVEL W/ SILTY SAND, BROWN; DAMP; GRAVELS HAVE RUST STAINING ON FACE.
4						B) SILTY SAND; DAMP; DARK BROWN; V. STIFF; TRACE ORGANIC ROOTS (DEAD); TRACE BURNED WOOD DEBRIS; SLIGHT PL; LIKELY A TOPSOIL LAYER PRIOR TO ROAD
6						
8						C) CLAYEY SAND W/ GRAVEL; MOIST; MED PL; SANDY CLAY
10						@ 8' GRAVEL GENERALLY 1" MINUS & SUBROUNDED, BROWN W/ RED HUE. → ZONES OF SANDY CLAY
12						11.7 TO 5' SANDY CLAY LS/ TRACE GRAVEL
14						BELOW 5' CLAYEY SAND W/ GRAVEL & SOME COBBLES
16						WET @ 5' → SIDE WALLS CAVING IN, SOIL IS WET VISIBLE SEEP/ WET SURFACE BUT NO WATER FLOWING INTO TP.
18						- WATER CONTENT DECREASES BELOW 11'
20						

A 0.7
B 1.7
C MOIST
6-11' WET
C MOIST
17.2

LOOKING NORTH



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

D) SILT (ML); MOIST; BROWN W/ RED HUE; LOW PL; DID NOT OBSERVE ON TP SIDEWALLS BUT NOTED IN BUCKET

Test Pit No. 101

Weather: _____

Temperature: 30 **Snow depth:** 2" **Wind** CALM **Cloud Cover:** CLEAR

Notes: _____

Piezo Stickup @ M.P. (ft/tenths): _____ **Diameter:** 1 1/2 **Material** PVC

3 NESTED PIEZOS

Screen Interval: 5' SCREEN 0.3' CAP EACH ONE HAS **M.P to Water:** _____ **Depth to Water:** _____

Depth to Bottom of Test Pit: 17.2

Initial pH _____ **Depth at Reading** _____ **Time at Reading** _____

Stabilized water pH _____ **Depth at Reading** _____ **Time at Reading** _____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID

Notes:

IN OLD ROAD BED

A IS ON BOTTOM

B IS 5.5' UP FROM A

C IS 5.5' UP FROM B

STICKUP

A 3.04

B 2.78

C 2.25

DENSITY OR CONSISTENCY		N-VALUE	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE
		5-10	► LOOSE
		11-29	► MEDIUM DENSE
		30-49	► DENSE
		>50	► VERY DENSE

	N-VALUE	q_u (tsf)	
FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
	3-4	0.25-0.50	► SOFT
	5-8	0.50-1.0	► MEDIUM
	9-15	1.0-2.0	► STIFF
	16-30	2.0-4.0	► VERY STI
	>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

Test Pit No. 103 PAGE 1 OF 2

PROJECT NAME: Sec 35 CBMC	
DATE STARTED/FINISHED: 10/5/12	OPERATOR: SW
TIME STARTED/FINISHED: 11:15	EXCAVATOR TYPE: PC 200 LC
LOGGED BY: MR ASSISTED BY: NS	
COORIDINATES:(State Plane) Northing: Easting:	

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DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)

MATERIAL DESCRIPTION

V. DAMP W/ MOISTURE

A

1.4'

COLOR TRANSITION

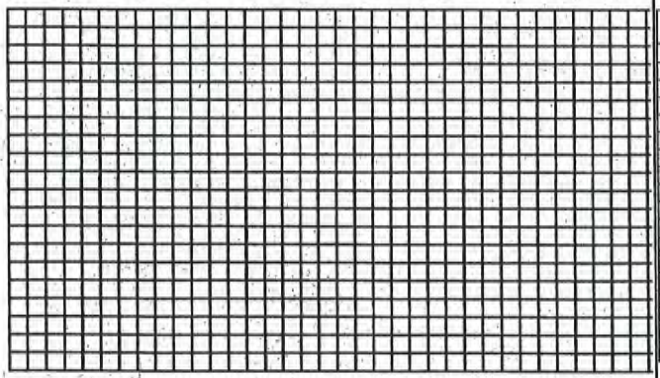
B

A) TOPSOIL SANDY SILT ~~SILTY SAND~~ W/ SUB ANGULAR GRAVELS; DARK BROWN; DRY; TRACE ORGANIC ROOTS; SLIGHT PL

B) CLAYEY SAND W/ GRAVEL & TRACE COBBLES
MINUS 40 PARTICLES ARE MED PL;
LARGEST PARTICLE FROM 0-5' IS 5"; PARTICLES GENERALLY SUB ROUNDED & JUMBLED;
FROM @ 1.4 TO 3.1 LT BROWN, BELOW 3.1 IS BROWN W/ RED HUE.
@ 4' ~ 5% COBBEL, ~20% GRAVEL
MOISTURE % INCREASED TO DAMP @ 8' (DAMP)
INCREASES TO MOIST @ BOTTOM
↳ ~12 to 13' ~~4~~ 18 % SAND % INCREASE CLAY CONTENT
LARGEST PARTICLE ~10"
SIMILAR GRAVEL & COBBLE % ENTIRE DEPTH

OVERALL VERY CONSISTENT THROUGHOUT ENTIRE DEPTH

BOH @ 16.7'



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	OTHER
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Page 2 of 2

Test Pit No. 103

Weather: _____

Temperature:_____ Snow depth:_____ Wind_____ Cloud Cover:_____

Notes:

Piezo Stickup @ M.P. (ft/tenths): 3.85 Diameter: 1 1/2 Material PVC

Screen Interval: BOTTOM 5' (3' CAP M.P to Water:_____ Depth to Water:_____

Depth to Bottom of Test Pit: 16.7

Initial pH_____ Depth at Reading_____ Time at Reading _____

Stabilized water pH_____ Depth at Reading_____ Time at Reading_____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID

Notes:

DENSITY OR CONSISTENCY		N-VALUE				N-VALUE	q_u (tsf)	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE		FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
		5-10	► LOOSE			3-4	0.25-0.50	► SOFT
		11-29	► MEDIUM DENSE			5-8	0.50-1.0	► MEDIUM
		30-49	► DENSE			9-15	1.0-2.0	► STIFF
		>50	► VERY DENSE			16-30	2.0-4.0	► VERY STI
						>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

Test Pit No. 110 PAGE 1 OF 2

PROJECT NAME: UBMC SEC 35	
DATE STARTED/FINISHED: 10/5/12	OPERATOR:
TIME STARTED/FINISHED: 13:30 /	EXCAVATOR TYPE: PC 1 C200 PC
LOGGED BY: MB ASSISTED BY: NJ	
COORIDINATES:(State Plane) Northing: Easting:	

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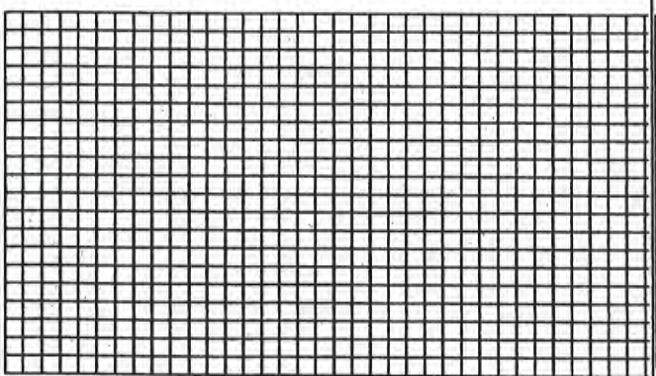
DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	MATERIAL DESCRIPTION
0–2						A) TOPSOIL SILTY SAND W/ SUBANGULAR GRAVEL & COBBLES, TRACE ORGANIC GRASS ROOTS, LT. BROWN, DRY, LOW PL.
2–18						B) CLAYEY SAND W/ GRAVEL, COBBLES, & TRACE BOULDER; GRAVELS GENERALLY SUB ROUNDED; LT BROWN TO REDDISH BROWN @ 3.5', DRY TO DAMP @ 5', MAX PARTICLE ~~12"~~ 24", ~10% COBBEL, ~20% GRAVEL, 5% BOULDER, LOW TO MED PL; ~9' POCKETS OR ISOLATED ZONES WHICH HAVE HIGH CL % (CLEAN CLAY W/ FINE SAND & TRACE GRAVEL. BOULDERS & COBBLES ARE SUB ANGULAR. OVERALL VERY CONSITANT THROUGHOUT DEPTH
18–20						BOH 17.5



Classification

USCS	USCS	USCS	USCS
GW	Well graded gravel, fine to course gravel	SC	Clayey sand
GP	Poorly graded gravel	SC-SM	Silty, clayey sand
GW-GM	Well graded gravel with silt	CL	Clay
GW-GC	Well graded gravel with clay or silty clay	CL-ML	Silty Clay
GP-GM	Poorly graded gravel with silt	ML	Silt
GP-GC	Poorly graded gravel with clay or silty clay	OL	Organic silt, organic clay
GM	Silty gravel	CH	Clay of high plasticity, fat clay
GC	Clayey gravel	MH	Silt of high plasticity, elastic silt
GC-GM	Silty, clayey gravel	OH	Organic clay, organic silt
SW	Well graded sand, fine to course sand	OTHER	**OTHER**
SP	Poorly graded sand	CT	Concentrated tailings -
SW-SM	Well graded sand with silt	BLK	Black Mn/Fe coated
SW-SC	Poorly graded sand with clay or silty clay	MT	Mixed tailings/ alluvium
SP-SM	Poorly graded sand with silt	NA	Native, undisturbed above water table
SP-SC	Poorly graded sand with clay or silty clay	NB	Native, undisturbed below water table
SM	Silty sand	Pt	Peat
		W	Water starts flowing into pit

Page _____ of _____

Test Pit No. MD

Weather: _____

Temperature:_____ Snow depth:_____ Wind_____ Cloud Cover:_____

Notes:

Piezo Stickup @ M.P. (ft/tenths):4.4 Diameter:_____ Material_____

Screen Interval:5' screen M.P to Water:_____ Depth to Water:_____

Depth to Bottom of Test Pit:_____

Initial pH_____ Depth at Reading_____ Time at Reading _____

Stabilized water pH_____ Depth at Reading_____ Time at Reading_____

Soil Samples

From	To	Sample ID	Type	Time (Military)	USC	Color	Comment	Photo ID

Notes:

DENSITY OR CONSISTENCY		N-VALUE				N-VALUE	q_u (tsf)	
	COARSE GRAINED DEPOSITS	0-4	► VERY LOOSE		FINE GRAINED DEPOSITS	0-2	<0.25	► VERY SO
		5-10	► LOOSE			3-4	0.25-0.50	► SOFT
		11-29	► MEDIUM DENSE			5-8	0.50-1.0	► MEDIUM
		30-49	► DENSE			9-15	1.0-2.0	► STIFF
		>50	► VERY DENSE			16-30	2.0-4.0	► VERY STI
						>30	>4.0	► HARD

Criteria for Describing Consistency (Fine grain)

Very Soft	Thumb will penetrate the soil more than 1" (25mm)
Soft	Thumb will penetrate soil about 1" (25mm)
Firm	Thumb will indent soil about ¼" (5mm)
Hard	Thumb will not indent soil, but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

APPENDIX A.2

LOGS AND FIELD LOG BOOKS - SOIL BORING LOGS

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35MW-201B/T	PAGE 1 of 3
DATE STARTED / FINISHED: 11/1/12 - 11/1/12	DRILLER: Axis Drilling	
LOGGED BY: M. Browne	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5075.91 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020346.93, E1233675.89 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
								This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		1					94	Moist, Black [10YR 2/1] Dark yellowish brown [10YR 3/6], ORGANIC SANDY SILT WITH GRAVEL, OL, low plasticity, no reaction to HCl, some roots.					11.0	
		2					39	Moist, Very dark brown [7.5YR 2.5/2], ORGANIC CLAY, OL, low to medium plasticity.					11.6	
		3												
		4						Moist to wet, Reddish brown [5YR 4/4], CLAY with Gravel, CL, medium plasticity, gravel content decreasing with depth, becoming wet t 11.0'.						
		5												
		6					83				19		11.1	
		7					67				6		17.3	
▼		8												Water level on 11-19-12 MW-201B=8.6' SB-201T=8.2'
		9												
		10					80							Bottom 1" crumbled on liner
		11					61				23		14.4	
		12						Moist, Reddish brown [5YR 4/4], SAND, SP, non-plastic.						
		13						Wet, Reddish brown [5YR 4/4], CLAYEY SAND with Gravel, SC, medium plasticity, contains layers of poorly graded sand.						
		14												
		15												
		16					78				26		11.3	Attempted 24" Shelby prior to SPTs. End crumpled (pushed 2") no recovery
		17					72				19		7.8	
		18						Wet, GRAVEL, GP, gravels and cobbles noted from cuttings.						
		19						Wet, Reddish brown [2.5YR 4/4], CLAYEY SAND with Gravel, SC, low plasticity.						Driller reports water sealed off at 19.0'
		20												

PIONEER TECHNICAL SERVICES, INC.

CLIENT: Montana Department of Environmental Quality
ADDRESS: P.O. Box 200901 Helena, Montana 59620-0901
PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35MW-201B/T

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21					72	Wet, Reddish brown [2.5YR 4/4], CLAYEY SAND with Gravel, SC, low plasticity. *(Continued)*			100+		6.9	
		22					17	Wet, Reddish brown [5YR 4/4], SILTY SAND with Gravel, SM, low plasticity.			29		23.5	
		23												
		24						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, low to medium plasticity, very stiff, Weathered Tuff, Secondary Gravelly Clay with Sand (CL), Argillite gravels within Tuff are subangular, purple in color.						
		25												
		26					100				33		11.8	
		27					72				23		11.4	
		28												
		29												
		30												
		31					100				15		15.7	
		32												
		33												
		34												
		35						Wet, Reddish brown [5YR 4/4], CLAYEY GRAVEL, GC, low plasticity, Weathered Tuff.						on a rock no SPT
		36												
		37												
		38												
		39												too hard for SPT
		40												Piezometer: 2" Sch 40 PVC 0-37' Bentonite 0-39' Riser
		41												37-44' 10-20 Sand

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PIONEER TECHNICAL SERVICES, INC.

CLIENT: Montana Department of Environmental Quality

ADDRESS: P.O. Box 200901
Helena, Montana 59620-0901

PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35MW-201B/T

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43						Wet, Reddish brown [5YR 4/4], CLAYEY GRAVEL, GC, low plasticity, Weathered Tuff. *(Continued)*						39-44' 0.010 Screen Total Depth= 44.0'
		44												
		45												
		46												
		47												
		48												
		49												
		50												
		51												
		52												
		53												
		54												
		55												
		56												
		57												
		58												
		59												
		60												
		61												
		62												
		63												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35MW-202B	PAGE 1 of 3
DATE STARTED / FINISHED: 10/11/12 - 10/11/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5095.36 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1233018.43, E1020673.72 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1				SS#1	78	Dry, Very dark brown [7.5YR 2.5/2], ORGANIC SILT, OL, low plasticity, very stiff.			100+		9.4	
		2				SS#2	39	Dry, Dark brown [7.5YR 3/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, very stiff.			61		5.5	
		3						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, very stiff, Argillite gravels.						
		4												
		5												
		6				SS#3	89				53		8.9	
		7						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, very stiff to hard, gravels rounded.						
		8				SS#4	39				26		10.5	
		9				SS#5	67	Moist to wet, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, very stiff to hard, Argillite cobble/gravel in spoon at 9.0',very thin lense of sand at 11', interbedded with gravel at 15.5', shattered argillite in spoon from 19-19.5'.			46		11.4	
		10												
		11				SS#6	100				24		14.6	
		12				SS#7	78				18		10.4	
		13												
		14												
		15												
		16				SS#8	100				19		10.7	Visible water at 15.5'
		17				SS#9					41		10.6	dust and chips from 17.5-17.75'
		18												
		19												
		20						Wet, Reddish brown [5YR 4/4], SILTY GRAVEL with Sand, GM, low plasticity.						

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35MW-202B

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
								This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
						SS#10	83	Wet, Reddish brown [5YR 4/4], SILTY GRAVEL with Sand, GM, low plasticity. *(Continued)*			12		9.6	spoon moist on outside
		21					92	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.			21		14.0	
		22				SS#11							12.4	
		23												
		24												
▼		25						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, firm.						Water level on 11-19-12
		26				SS#12	100				15		12.1	MW-202B=25.3'
		27				SS#13	67				16		12.7	outside of spoon is wet
							67						9.0	
		28												cuttings are chips and dust with clay at 29'
		29						Boulder.						
		30				SS#14	0				100+			Split spoon on boulder
		31												
		32						Moist to wet, Reddish brown [5YR 4/4], CLAYEY GRAVEL with Sand, GC, medium plasticity, medium dense.						
		33				B#1								
		34												
		35												
		36				SS#15	100				15			
		37						Cobble.						rock chips at 37'
		38						Moist to wet, Dark reddish brown [5YR 3/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, medium dense.						
		39						Saturated, Dark reddish brown [5YR 3/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, medium dense.						blowing dust at 39-40', some 1/2" chips, argillite, grayish purple
		40												
		41				SS#16	83				24		21.1	

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35MW-202B

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43						Saturated, Dark reddish brown [5YR 3/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, medium dense. *(Continued)*						
		44												
		45												Total Depth= 45.0'
		46												Piezometer MW-202B
		47												2" Sch 40 PVC
		48												Stick-up 3.9'
		49												0-40' Riser
		50												40-45' 0.010 Screen
		51												Annulus
		52												0-40' Bentonite Chips 3/8"
		53												40-45' 10-20 Sand
		54												
		55												
		56												
		57												
		58												
		59												
		60												
		61												
		62												
		63												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-202T
DATE STARTED / FINISHED: 10/12/12 - 10/12/12	DRILLER: Axis Drilling
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5096.39 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1020667.66, E1233022.45 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1–20				B#1		This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		10						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						
		15				B#2		Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						

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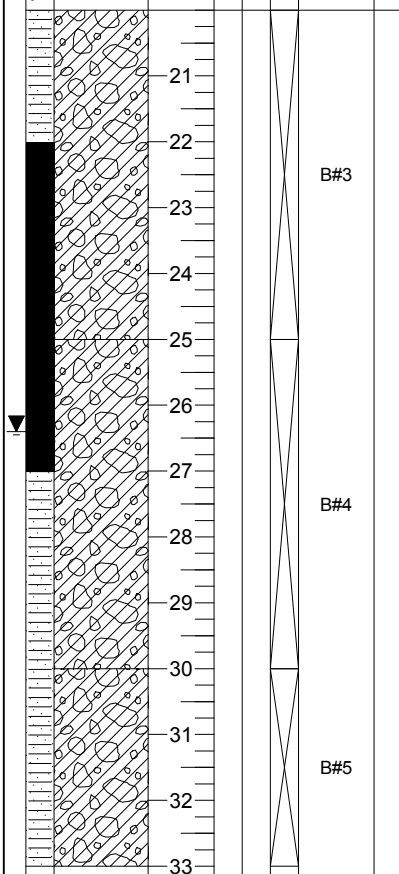
DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-202T



DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
21						Moist, Reddish brown [5YR 5/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						
22				B#3								
23												
24												
25						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						
26												Water level on 11-19-12 SB-202T1=DRY SB-202T2=26.4'
27				B#4								Total Depth= 33'
28												Piezometer SB-202T1
29												1" Sch 40 PVC
30						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						Stick-up 1.4'
31				B#5								0-17' Riser
32												17-22' 0.010" Screen
33						Installed 1" diameter piezometer to 33'.						Piezometer SB-202T2
34												1" Sch 40 PVC
35												Stick-up 1.3'
36												0-27' Riser
37												27-33' 0.010" Screen
38												Annulus
39												0-17' Bentonite Chips 3/8"
40												17-22' 10-20 Sand
41												22-27' Bentonite Chips 3/8"
												27-33' 10-20 Sand

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35MW-203B	PAGE 1 of 2
DATE STARTED / FINISHED: 10/29/12 - 10/29/12	DRILLER: Axis Drilling	
LOGGED BY: M. Browne	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5125.77 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1233054.10, E1021128.57 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0	X			SS#1	83	Moist, Black [10YR 2/1], ORGANIC SILT, OL, no reaction to HCl, grass roots in upper 3".					25.7	
		1	X				92	Moist, Dark brown [7.5YR 3/3], SANDY CLAY with Gravel, CL, medium plasticity, no reaction to HCl.					4.0	
		2	X			SS#2	72	Moist, Dark reddish brown [5YR 3/4], CLAYEY GRAVEL with Sand, GC, medium plasticity, no reaction to HCl, gravels are subangular.					5.0	Gravel content higher from 1.5-3.0'
		3												
		4						Moist, Dark brown [7.5YR 3/3], SILTY GRAVEL with Sand, GM, non-plastic, gravels and cobbles are subangular.						
		5	X											
		6				SS#3					55		2.4	
		7	X			SS#4	53				37		4.9	
		8												
		9						Moist, Dark reddish brown [5YR 3/4], CLAYEY GRAVEL with Sand, GC, medium plasticity.						
		10	X											
		11				SS#5					36		10.5	
		12	X			SS#6					28			
		13												
		14												
		15	X					Moist, Reddish brown [5YR 4/3], CLAYEY SAND with Gravel, SC, low plasticity.						
		16				SS#7	100				40		6.1	
		17	X			SS#8	61				21		5.6	
		18												
		19						Moist, Brown [7.5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, no reaction to HCl, 25.25'-25.5' higher gravel content, gravels are subangular.						Driller reports that bottom 1" of run is clay layer
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35MW-203B

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21				ST#1	100	Moist, Brown [7.5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, no reaction to HCl, 25.25'-25.5' higher gravel content, gravels are subangular. *(Continued)*	30	16		132.5	11.3	Bottom 1" of Shelby tube is crumpled, pp=1.25 tsf in top
▼		22				SS#9	100				12		11.8	Water level on 11-19-12 MW-203B=21.4'
		23												
		24												
		25						Wet, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, gravel subangular.						
		26				SS#10	72				19		13.0	
		27				SS#11	22				16		16.1	
		28												
	Y Y Y Y Y	29						Wet, Very dark gray [5YR 3/1], GRAVELLY CLAY, CL, weathered Tuff, greenish in color only apparent in seams.						
	Y Y Y Y Y	30				SS#12					100+		12.1	Hard drilling stopped due to high blow counts
	Y Y Y Y Y	31						Saturated, Dark brown [7.5YR 3/2], SILTY GRAVEL with Sand, GM, Weather Tuff.						
	Y Y Y Y Y	32												3/8" rock fragments in cuttings
	Y Y Y Y Y	33												
	Y Y Y Y Y	34												
	Y Y Y Y Y	35												
	Y Y Y Y Y	36												
	Y Y Y Y Y	37												Total Depth= 40.0'
	Y Y Y Y Y	38												Piezometer MW-203B
	Y Y Y Y Y	39												1" Sch 40 PVC Stick-up 1.5' 0-35' Riser 35-40' 0.010" Screen Annulus 0-34' Bentonite Chips 3/8" 34-40' 10-20 Sand
	Y Y Y Y Y	40												
		41												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35MW-203T	PAGE 1 of 1
DATE STARTED / FINISHED: 10/30/12 - 10/30/12	DRILLER: Axis Drilling	
LOGGED BY: M. Browne	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5125.92 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1021133.42, E1233052.94 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		2												
		3												
		4												
		5												
		6												
		7												
		8												
		9												
		10						Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL.						
		11												
		12												
		13												
		14												
		15						Moist, Dark brown [7.5YR 3/4], CLAYEY SAND with Gravel, SC.						Water level on 11-19-12
		16												Piezometer MW-203T MW-203T=Dry 1" Sch 40 PVC Stick-up 1.4'
		17												0-15' Riser
		18												15-20' 0.010" Screen
		19												Annulus 0-14' Bentonite Chips 3/8" 14-20' 10-20 Sand
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35SB-204B

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/14/12 - 10/14/12	DRILLER: Axis Drilling
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5104.95 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1020751.92, E1233159.35 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
			X			SS#1	83	Dry, Black [10YR 2/1], ORGANIC CLAY, OL, low to medium plasticity, contains organics, twigs, roots.					8.3	
		1	X			SS#2	83	Dry, Dark reddish brown [5YR 3/2], GRAVELLY CLAY with Sand, CL, low to medium plasticity.					7.1	
		2	X			SS#3	78	Dry, Dark brown [7.5YR 3/2], CLAYEY GRAVEL with Sand, GC, low to medium plasticity.					6.9	
		3												
		4						Dry, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, low to medium plasticity.						
		5	X											
		6	X			SS#4	100				100+		6.7	
		7	X					Dry, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, low to medium plasticity, stiff.						
						SS#5	56				31		11.1	
		8	X					Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, stiff.						
		9												
		10	X											
		11	X			SS#6	100				33		12.1	
		12	X					Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, stiff.						
						SS#7	72				26		11.8	
		13			X			Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, stiff.						
		14			X	B#1								
		15	X											
		16	X			SS#8	100				19			Rock stuck in bit, no recovery
		17	X			SS#9	0				8			Water Level 11-19-12
		18			X									SB-204T = Dry
		19			X	B#2								
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-204B

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DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
21				SS#10	100	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.			27			3 brass liners from 20-21.5'
22				SS#11					20		11.8	
23												
24				B#3		Moist, Dark grayish brown [10YR 4/2], LEAN CLAY, CL, medium plasticity, weathered Tuff , andesite, secondary secrite, limonite, hematite on fracture faces, maybe chlorite also.						cuttings color change to yellowish gray at 23.5'
25						Moist, Dark grayish brown [10YR 4/2], SILT with Gravel, ML, low plasticity, weathered Tuff.						
26									100+		24.0	
27						Moist, Dark grayish brown [10YR 4/2], CLAYEY GRAVEL with Sand, GC, medium plasticity, weathered Tuff.						
28				B#4								
29												
30						Moist, Dark grayish brown [10YR 4/2], LEAN CLAY, CL, medium plasticity, weathered Tuff.			100+		17.8	Refusal, no recovery from 3" split spoon, switched to 2" sampler in same spot, 50/4", sampler very hard to retrieve
31						Moist, Dark grayish brown [10YR 4/2], SANDY CLAY, CL, low to medium plasticity, weathered Tuff.						
32												Water Level 11-19-12
33												SB-204 = 34.5'
34												Total Depth= 35.0'
35						.						Piezometer SB-204B
36												1" Sch 40 PVC
37												Stick-up 3.8'
38												0-30' Riser
39												30-35' 0.010" Screen
40												Piezometer SB-204T
41												1" Sch 40 PVC
												Stick-up 1.9'
												0-13' Riser
												13-18' 0.010" Screen
												Annulus
												0-13' Bentonite Chips 3/8"
												13-18' 10-20 Sand
												18-30' Bentonite Chips 3/8"
												30-35' 10-20 Sand

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-206B	PAGE 1 of 3
DATE STARTED / FINISHED: 10/12/12 - 10/12/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5116.23 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020856.02, E1233324.44 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

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DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
0				SS#1	83	Dry, Black [10YR 2/1], ORGANIC CLAY, OL, low plasticity, contains twigs, roots, pine needles.					8.6	
1				SS#2	83						8.0	
2				SS#3	56	Dry, Dark brown [7.5YR 3/2], CLAYEY GRAVEL with Sand, GC, medium plasticity.					4.5	
3						Moist, Reddish brown [5YR 5/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						
4												
5				SS#4	88	Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.			100+		7.7	
6				SS#5	89	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.			100+		8.3	
7				SS#6	44				20		6.1	
8												
9						Boulder.						
10						Moist, Reddish brown [2.5YR 5/4], CLAYEY GRAVEL with Sand, GC, medium plasticity, dense.						outside of spoon is damp
11				SS#7	22				52		11.8	
12						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, very stiff.						
13				SS#8	100				29		11.7	
14												
15						Moist, CLAYEY SAND with Gravel, SC, medium plasticity, very stiff.						3 brass liners
16				SS#9	100		36	16	33	109.1	13.9	Water level on 11-19-12
17						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, very stiff.						SB-206T1=16.6'
18				SS#10	89				20		12.8	
19						Moist, Dark reddish gray [5YR 4/2], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.						Water level on 11-19-12 SB-206B=19.6'
20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-206B

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21				SS#11	100	Moist, Dark reddish gray [5YR 4/2], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff. *(Continued)*			22		13.8	
		22				SS#12	44	Wet, Very dark gray [5YR 3/1], CLAYEY GRAVEL with Sand, GC, medium to high plasticity, gravels are weathered Tuff.			18		19.1	
		23												
		24						Saturated, Dark reddish brown [5YR 2.5/2], SANDY SILT with Gravel, SM, low plasticity, weathered Tuff.						
		25												
		26				SS#13	100				22		18.8	
		27						Saturated, Very dark gray [5YR 3/1], SANDY SILT, SM, low plasticity, rock is limonite, weathered feldspars, fine grained parent rock.						
		28				SS#14	89				17		28.7	
		29				B#1		Saturated, Very dark gray [5YR 3/1], SANDY CLAY with Gravel, CL, low to medium plasticity, gravels are weathered feldspars.						hard drilling at 29'
		30												
		31				SS#15	39	Saturated, Dark gray [5YR 4/1], SANDY CLAY, CL, medium plasticity, weathered Tuff, small quartz feldspar, horndblend, limonite secondary.			31		25.3	
		32												
		33												
		34												
		35												water on return
		36				SS#16	100		48	21	49		15.5	
		37												
		38												blowing dust, solid drilling at 38'
		39				B#2							13.1	
		40												
		41				SS#17	100	Saturated, Dark gray [5YR 4/1], CLAYEY GRAVEL with Sand, GC, medium plasticity, very stiff, Argillite within Tuff.			100+		19.9	50/5" Refusal, maybe weathered volcanics with country rock argillite

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-206B

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43			X	B#3		Saturated, Very dark gray [5YR 3/1], CLAYEY GRAVEL with Sand, GC, medium plasticity, very stiff, multicolored with multiple rock types, weatheredTuff, argillite, diorite, dendrite, argillite with magnesium oxide. *(Continued)*						Hard drilling. Cuttings red/purple argillite chips, some white feldspar? trace green olivine?
		44												
		45	X											50/4.5" Refusal
		46	X			SS#18	100				100+		11.7	Piezometer SB-206B 1" Sch 40 PVC Stick-up 1.6' 0-40' Riser 40-45' 0.010" Screen Piezometer SB-206T1 1" Sch 40 PVC Stick-up 2.1' 0-25' Riser 25-30' 0.010" Screen Annulus 0-25' Bentonite Chips 3/8" 25-30' 10-20 Sand 30-40' Bentonite Chips 3/8" 40-45' 10-20 Sand
		47												
		48												
		49												
		50												
		51												
		52												
		53												
		54												
		55												
		56												
		57												
		58												
		59												
		60												
		61												
		62												
		63												

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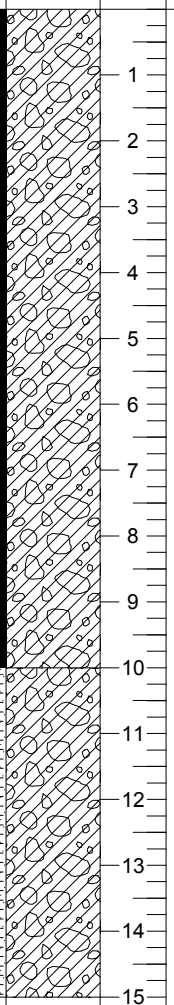
DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-206T	PAGE 1 of 1
DATE STARTED / FINISHED: 10/13/12 - 10/13/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5115.64 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020855.69, E1233324.12 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	



DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
0						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC.						Blowing dust some chips
5				B#2								Cuttings have less dust and an increase in moisture
10				B#3		Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC.						
14												Water Level 11-19-12
15												SB-206T2 = 14.4'
												Total Depth = 15.0'
												Piezometer SB-206T2
												1" Sch 40 PVC
												Stick-up 3.4'
												0-10' Riser
												10-15' 0.010" Screen
												Annulus
												0-10' Bentonite Chips 3/8"
												10-15' 10-20 Sand

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-206D	PAGE 1 of 5
DATE STARTED / FINISHED: 10/24/12 - 10/26/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5115.03 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020845.92, E1233326.98 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		1						Moist to wet, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, low to medium plasticity.						cuttings are dry
		2												
		3												
		4												
		5												
		6												
		7				B#1								
		8												
		9												
		10						Moist to wet, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, low to medium plasticity.						
		11												
		12				B#2								
		13												
		14												
		15												
		16												
		17				B#3								Water Level 11-19-12
		18												SB-206D = 19.2'
		19												SB-206T3 = 18.5'
		19						Wet, Very dark gray [5YR 3/1], LEAN CLAY, CL, medium plasticity, Tuff cuttings, with chips of Argillite.						Intermittent Color change to gray at 19'
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-206D

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21						Wet, Very dark gray [5YR 3/1], LEAN CLAY, CL, medium plasticity, Tuff cuttings, with chips of Argillite. *(Continued)*						
		22				B#4								
		23												
		24												
		25												
		26												
		27				B#5								
		28												
		29												
		30												produced some water less than 0.1 gpm
		31												Lost water at 31', becoming higher plasticity clay, sticking to drill stem
		32												
		33						Wet, Very dark gray [5YR 3/1], CLAYEY SAND, SC, low to medium plasticity.						Chips harder at 33'
		34												
		35												Very little return, cuttings are chips of Argillite mixed with Clay
		36												
		37												
		38				B#6								
		39												Cuttings dusty at 39'
		40												
		41				B#7								

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-206D

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43				B#7		Wet, Very dark gray [5YR 3/1], CLAYEY SAND, SC, low to medium plasticity. *(Continued)*						
		44												Chips of Argillite in Tuff, cuttings with gravel/grayish purple
		45						Wet to Saturated, Dark brown [7.5YR 3/2], SANDY CLAY with Gravel, CL, medium to high plasticity.						Switch to open hole hammer.
		46												
		47				B#8								Possible sign of bentonite (greenish clay chips)
		48												
		49												
		50												Small amount of water on bit return
		51												
		52												
		53						Wet to Saturated, Dark reddish brown [5YR 3/2], CLAYEY GRAVEL with Sand, GC, medium plasticity, Chips are argillite and less weathered Tuff, less altered, coming as chips not globs of clay.						
		54												
		55												Switch back to casing advance, too clayey to clean open hole
		56												
		57				B#9								
		58												
		59												
		60												Switch back to open hole hammer
		61												
		62				B#10								
		63												more water, less than 0.1 gpm

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-206D

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		64				B#10		This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered. Wet to Saturated, Dark reddish brown [5YR 3/2], CLAYEY GRAVEL with Sand, GC, medium plasticity, Chips are argillite and less weathered Tuff, less altered, coming as chips not globs of clay. *(Continued)*						
		65						Saturated, Dark brown [7.5YR 3/2], GRAVEL with Clay and Sand, GP-GC, low plasticity, Some chips are hard Argillite, some chips are weathered clays, weathered Tuff.						water misting from hole
		66												
		67												
		68				B#11								
		69												
		70												producing more water
		71												
		72												No more than 2-3 gpm, one large chip of Argillite, one large chip of black volcanic w/epidote approx 1" in size
		73				B#12								
		74												
		75												
		76												
		77												
		78				B#13								
		79												
		80												
		81												
		82												
		83				B#14								
		84												Biotite, Argillite, and weathered Tuff chips
		85												
						B#15								

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-206D

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		86						Saturated, Dark brown [7.5YR 3/2], GRAVEL with Clay and Sand, GP-GC, low plasticity, Some chips are hard Argillite, some chips are weathered clays, weathered Tuff. *(Continued)*						producing less than 3 gpm, still in Tuff although less weatherd, Cutting are Argillite and Tuff chips
		87												
		88				B#15								
		89												
		90												
		91												
		92												
		93				B#16								producing less than 3 gpm, still in Tuff although less weatherd, Cutting are Argillite and Tuff chips
		94												
		95												
		96												
		97												
		98												Low water production. Less than 3 gpm. Tuff and Argillite.
		99												Total Depth=100.0'
		100												Piezometer SB-206D
		101												1" Sch 40 PVC
		102												Stick-up 3.2'
		103												0-85' Riser
		104												85-90' 0.010" Screen
		105												Piezometer SB-206T3
		106												1" Sch 40 PVC
		107												Stick-up 1.8'
														0-43' Riser
														43-48' 0.010" Screen
														Annulus
														0-43' Bentonite Chips 3/8"
														43-48' 10-20 Sand
														48-85' Bentonite Chips 3/8"
														85-90' 10-20 Sand

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35MW-207	PAGE 1 of 2
DATE STARTED / FINISHED: 10/30/12 - 10/30/12	DRILLER: Axis Drilling	
LOGGED BY: M. Browne	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5142.09 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1021091.10, E1233314.65 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		0					78	Moist, Black [10YR 2/1], ORGANIC SANDY SILT, OL.					12.8	
		1						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, gravels are subangular.						
		2					44						3.6	
		3												
		4												
		5												
		6					83				41		7.6	
		7					89				24		12.5	
		8												
		9												
		10						Moist, Dark brown [7.5YR 3/2], CLAYEY SAND with Gravel, SC, Weathered Tuff, greenish gray with rust staining and some purple.						
		11									100+		9.0	Sampler stuck at 10.5'
		12					33				100+		13.2	
		13												
		14												
		15									100+		13.9	
		16												
		17												
		18												
		19												Boulder from 19-20.5'
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35MW-207

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21–41						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
							83	Moist, Dark brown [7.5YR 3/2], CLAYEY SAND with Gravel, SC, Weathered Tuff, greenish gray with rust staining and some purple. *(Continued)*			100+			Water Level 11-19-12 SB-207 = 25.1'
							100	Wet, Very dark brown [7.5YR 2.5/2], SANDY CLAY, CL, low to medium plasticity, no reaction to HCl, Weathered Tuff, breaks down to sandy clay.					31.2	bouncing on rock 10 blows for 1st 2 inches
							100						19.8	Total Depth=35.25' Piezometer SB-207 2" Sch 40 PVC Stick-up 3.7' 0-28' Riser 28-33' 0.010" Screen Annulus 0-28' Bentonite Chips 3/8" 28-33' 10-20 Sand

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PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35MW-208B

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/26/12 - 10/26/12	DRILLER: Axis Drilling
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5087.19 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1021028.74, E1232765.17 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0						.						
		1						Dry, CLAYEY SAND with Gravel, SC.						
		2												
		3						Wet, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.						
		4												
		5												spoon with water on outside
		6				SS#1	100				36		9.6	
		7				SS#2	100				34		11.3	
		8						Moist to wet, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.						
		9												
		10				ST#1	100							
		11				SS#3	100				19		11.8	
		12												
		13												
		14				B#1							10.1	
		15				ST#2	100							
		16				SS#4					16		12.0	
▼		17						Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, stiff.						Water Level 11-19-12
		18												SB-208B = 17.3'
		19				B#2								
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35MW-208B

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21				ST#3	69	Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, stiff. *(Continued)*	29	14				
		22				SS#5	89				15		11.6	
		23												
		24				B#3								
		25						Boulder.						
		26						Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, stiff.						Blowing dust at 24.9, boulder quartzite cuttings at 25'
		27						Boulder.						
		28				B#4		Saturated, Dark reddish brown [5YR 3/2], GRAVEL with Clay and Sand, GP-GC, angular Argillite gravels.						
		29												
		30												
		31				SS#6	89				26		12.0	
		32				SS#7	50				25		17.1	2" heave on top of SS#7
		33						Saturated, Very dark gray [5YR 3/1], Argillite, filled veins with quartz.						Water to 16' in casing on bit return, producing approximately 4 gal/min, cuttings are Argillite chips
		34				B#5								
		35												
		36												
		37												Hard drilling, angular hard chips
		38				B#6								Total Depth=40.0'
		39												Piezometer SB-208B 1" Sch 40 PVC Stick-up 1.4' 0-34' Riser 34-39' 0.010" Screen Annulus 0-34' Bentonite Chips 3/8" 34-39' 10-20 Sand
		40												
		41												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-208T	PAGE 1 of 2
DATE STARTED / FINISHED: 10/29/12 - 10/29/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5087.41 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1021024.21, E1232767.34 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0–5				B#1		Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						Cuttings are moist, but blowing a lot of dust
		5–10				B#2		Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, SC, medium plasticity.						White dust with cuttings, likely cobbles
		10–20				B#3		Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-208T

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity. *(Continued)*						Water Level 11-19-12 SB-208T = 21.7'
▼		22												
		23												Total Depth= 23.0'
		24												
		25												Piezometer SB-208T 1" Sch 40 PVC Stick-up 1.4' 0-18' Riser 18-23' 0.010" Screen Annulus 0-18' Bentonite Chips 3/8" 18-23' 0.010" Screen 18-23' 10-20 Sand
		26												
		27												
		28												
		29												
		30												
		31												
		32												
		33												
		34												
		35												
		36												
		37												
		38												
		39												
		40												
		41												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-209B	PAGE 1 of 2
DATE STARTED / FINISHED: 10/14/12 - 10/14/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5089.89 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020518.90, E1233261.87 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
								This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		1				SS#1	100	Dry, Black [10YR 2/1], ORGANIC SILT with GRAVEL, OL, medium plasticity, stiff.					9.5	
		2				SS#2	61	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, low to medium plasticity, stiff.					7.8	
		3												
		4												
		5												
		6				SS#3	78				38		13.7	
		7						Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, SC, low plasticity.						
		8				SS#4	100				37		11.2	
		9												
		10				SS#5	100				33		5.2	
		11				SS#6	100	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, stiff.			33		12.2	Water Level 11-19-12
		12				SS#7	100	Wet, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.			39		9.5	SB-209T = Dry
		13												
		14												
		15						Moist, Reddish brown [5YR 4/3], Organic Clay with Gravel, CL, medium plasticity, stiff.						
		16				SS#8	100				28		11.2	
		17				SS#9	100				17		11.1	
						SS#10	100				17		10.4	
						SS#9	100	Saturated, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, stiff.			17		11.1	
▼		18												Water Level 11-19-12 SB-209B = 18'
		19												
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-209B

DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
21				SS#11		Saturated, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, stiff. *(Continued)*			23		11.9	
22				SS#12	56	Saturated, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, SC, low to medium plasticity, stiff.			16		18.9	
23												
24						Saturated, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, stiff.						
25												
26				SS#13	100				23		11.1	
27				SS#14	100				17		13.3	
28												
29												
30				SS#15					19		13.1	Piezometer SB-209B 1" Sch 40 PVC
31				SS#16		Saturated, Dark gray [5YR 4/1], CLAYEY GRAVEL with Sand, GC, low plasticity, very stiff.			19		18.5	Stick-up 1.6' 0-35' Riser
32												35-40' 0.010 Screen
33				B#3		Saturated, Light gray [2.5Y 7/1] multicolored, LEAN CLAY, CL, low plasticity, very stiff.						Piezometer SB-209T 1" Sch 40 PVC Stick-up 2.4' 0-8' Riser
34												
35												8-12' 0.010 Screen
36				SS#17					18		31.2	Annulus 0-8' Bentonite Chips 3/8"
37												8-12' 10-20 Sand
38						Saturated, Light gray [2.5Y 7/1] multicolored, LEAN CLAY, CL, medium plasticity, stiff.						12-35' Bentonite Chips 3/8" 35-40' 10-20 Sand
39												
40												
41				SS#18					12		33.3	

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

Drill Hole No. S35SB-210B/T

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/16/12 - 10/16/12	DRILLER: Axis Drilling
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5107.75 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1020675.56, E1233448.48 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
						SS#1	100	Dry, Black [10YR 2/1], ORGANIC SILT, OL, low plasticity.					30.6	
		1				SS#2	100	Dry, Dark reddish brown [5YR 2.5/2], SILTY GRAVEL with Sand, GM, low plasticity, medium dense.					4.9	
		2						Dry, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, low to medium plasticity, medium dense.						
		3				SS#3	100						4.2	
		4						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, very stiff.						
		5												
		6				SS#4	100				38		9.3	
		7						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.						
		8				SS#5	28				37		10.5	
		9				ST#1	100							
		10						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.						
		11				SS#6	67				34		12.4	
		12												
		13												
		14												
		15						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.						Water Level 11-19-12
		16				SS#7					32		11.9	SB-210T = Dry
		17				SS#8					26		14.9	
		18				SS#9		Moist, Very dark gray [5YR 3/1], SANDY CLAY, CL, low plasticity, no reaction to HCl, multicolored, weathered Tuff, hematite, limonite, biotite.			26		21.4	
		19												
		20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-210B/T

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21	X			SS#10		Moist, Very dark gray [5YR 3/1], SILTY GRAVEL with Sand, GM, weathered Tuff with pieces of argillite intermixed, multicolored.			15		12.1	Water Level 11-19-12
▼		22	X			SS#11	100	Moist, Very dark gray [5YR 3/1], SANDY SILT, ML, low plasticity, stiff, weathered Tuff with purple Argillite.			20		13.6	SB-210B = 21.7'
		23	X					Moist, Very dark gray [5YR 3/1], CLAYEY SAND with Gravel, SC, medium plasticity, stiff, weathered Tuff with purple Argillite.						
		24												
		25	X											
		26	X			SS#12	100				20		13.5	
		27			X			Saturated, Very dark gray [5YR 3/1], CLAYEY SAND with Gravel, SC, low to medium plasticity, multicolored, biotite, limonite, hematite, weathered Tuff.						No Argillite in cuttings
		28			X	B#1							18.4	
		29			X									
		30	X		X									water from casing upon bit return
		31	X		X	SS#13	100				29		20.1	
		32			X									
		33			X	B#2								Drilling rock, Argillite chips and weathered volcanics
		34			X									
		35	X					Saturated, Gray [7.5YR 5/1], LEAN CLAY, CL, medium plasticity, multicolored, weathered Tuff.						
		36	X			SS#14	100				21		23.1	
		37			X			Saturated, Brown [10YR 4/3], SILTY GRAVEL with Sand, GM, low plasticity, weathered Tuff with pieces of argillite intermixed, multicolored.						Harder drilling at 37', more water
		38			X	B#3								
		39			X									Open hole drilling, volcanic and argillite cuttings Heave in hole at 39', drill through heave to 41.5'
		40	X		X									
		41	X		X	SS#15	28	Saturated, Very dark grayish brown [10YR 3/2], CLAYEY GRAVEL with Sand, GC, low to medium plasticity, weathered Tuff with pieces of argillite intermixed, multicolored.			34		16.9	

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-210B/T

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43						Saturated, Very dark grayish brown [10YR 3/2], CLAYEY GRAVEL with Sand, GC, low to medium plasticity, weathered Tuff with pieces of argillite intermixed, multicolored. *(Continued)*						
		44												
		45												Piezometer SB-210B Total Depth = 44.5' Heave in Hole from 39-44.5' 1" Sch 40 PVC Stick-up 1.7' 0-35' Riser 35-40' 0.010 Screen Piezometer SB-210T 1" Sch 40 PVC Total Depth=40', Heave in hole from 39-40.0' Stick-up 3.7' 0-10' Riser 10-15' 0.010 Screen Annulus 0-8' Bentonite Chips 3/8" 8-15' 10-20 Sand 15-35' Bentonite Chips 3/8" 35-40' 10-20 Sand
		46												
		47												
		48												
		49												
		50												
		51												
		52												
		53												
		54												
		55												
		56												
		57												
		58												
		59												
		60												
		61												
		62												
		63												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-211B	PAGE 1 of 3
DATE STARTED / FINISHED: 10/17/12 - 10/17/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5129.26 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020811.18, E1233635.42 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1				SS#1	100	This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered. Dry to moist, Black [10YR 2/1], ORGANIC SILT with Sand, OL, low plasticity, with roots, and pine needles.					10.9	
		2						Dry, Reddish brown [2.5YR 4/4], GRAVEL with Sand, GP, low plasticity.						
						SS#2		Dry, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, stiff.						very dusty cuttings
		3												
		4												
		5												
		6				SS#3	56				38		8.6	
		7												
		8												
		9				ST#1	100	Dry, Very dark gray [7.5Y 3/1], CLAYEY GRAVEL with Sand, GC, medium plasticity, very stiff, weathered Tuff, multicolored.	41	29		108.8	16.7	
		10				SS#4	39				28		14.9	
		11												volcanics cuttings
		12												
		13				B#1								
		14												
		15						Dry, Very dark gray [7.5Y 3/1], SANDY CLAY, CL, medium plasticity, very stiff, weathered Tuff.						
		16				SS#5	83				25		16.0	
		17												
		18												
		19												Water Level 11-19-12
		20												SB-211B2 = Dry

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-211B

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21				SS#6	83	Dry, Very dark gray [7.5Y 3/1], SANDY CLAY, CL, medium plasticity, very stiff, weathered Tuff. *(Continued)*			25		14.9	starting bouncing after 12"
		22												hard drilling, blowing dust
		23												
		24				B#2								
		25												
		26												
		27				B#3								
		28												
		29												
		30												
		31												
		32				B#4								
		33												
		34												
		35						Dry, Very dark gray [7.5Y 3/1], SILTY SAND with Gravel, SM, low plasticity, weathered Tuff.						mixed Argillite chips and weathered Tuff, dry, more argillite below 39', more dust below 39'
		36												
		37												
		38				B#5								Water Level 11-19-12
		39												SB-211B1 = 38.8'
		40												
		41				B#6								Water encountered at 41.0' on 10-17-12

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-211B

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43				B#6		Dry, Very dark gray [7.5Y 3/1], SILTY SAND with Gravel, SM, low plasticity, weathered Tuff. *(Continued)*						cuttings Argillite chips, hard to stiff drilling
		44												
		45												small amount of water from hole
		46												Argillite chips, hard to stiff drilling
		47				B#7								
		48												
		49												
		50												Small amount of water from hole upon bit return, some chips dacite, some argillite
		51												
		52												
		53				B#8								
		54												
		55												Total Depth= 55.0'
		56												Piezometer SB-211B1
		57												1" Sch 40 PVC
		58												Stick-up 4.1'
		59												0-50' Riser
		60												50-55' 0.010" Screen
		61												Piezometer SB-206B2
		62												1" Sch 40 PVC
		63												Stick-up 1.5'
														0-15' Riser
														15-20' 0.010" Screen
														Annulus
														0-15' Bentonite Chips 3/8"
														15-20' 10-20 Sand
														20-45' Bentonite Chips 3/8"
														45-55' 10-20 Sand

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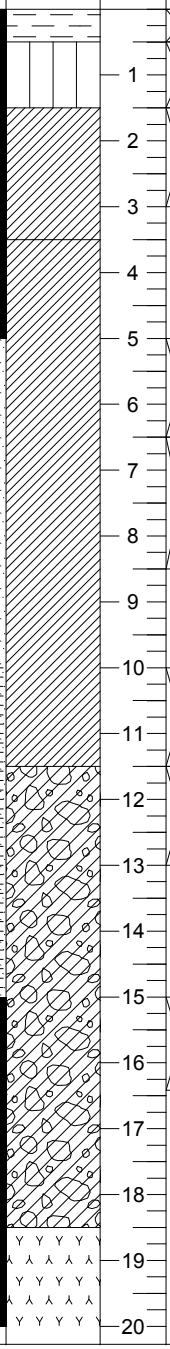
DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-212B	PAGE 1 of 3
DATE STARTED / FINISHED: 11/7/12 - 11/7/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5137.78 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020846.07, E1233943.38 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	



DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
0	X			SS#1	93	Dry, Black [10YR 2/1], ORGANIC SILT, OL, low plasticity.					19.2	
1	X			SS#2	94	Dry, Dark reddish brown [5YR 3/2], GRAVELLY SILT with Sand, ML, low plasticity.					3.9	
2	X			SS#3	33	Dry, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, low to medium plasticity, stiff.					5.9	Dusty Cuttings
3												
4						Dry to moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, low to medium plasticity, very stiff.						
5	X			SS#4	100				38		9.1	
6												
7	X			SS#5	50				35		5.4	
8												
9			X	B#1								
10	X											
11				SS#6	100				33		11.2	
12	X					Moist to wet, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, low to medium plasticity, dense.						Rocky during drilling
13	X			SS#7	100				39		10.2	
14			X	B#2								approximate 1.0' diameter boulder from 13.5-14.5'
15												Water Level 11-19-12
16	X			SS#8	100				28		9.3	SB-212T = Dry
17												50/5", stopped at 20 for 3"
18												Switch to open hole hammer
19						Moist, Brown [7.5YR 5/4], CLAYEY GRAVEL with Sand, GC, low plasticity, dense, Weathered Tuff.						
20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-212B

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21				SS#9	100	Moist, Brown [7.5YR 5/4], CLAYEY GRAVEL with Sand, GC, low plasticity, dense, Weathered Tuff. *(Continued)*			16		5.7	Maybe weathered Tuff
		22												
		23				B#4		Moist to wet, Brown [7.5YR 5/4], Fractured Argillite.						
		24				B#5								Hole collapsed, blow out
		25												
		26												
		27				B#6								Caved material in spoon (B#5)
		28												Hard, fractured Argillite
		29												
		30												
		31												
		32				B#7								
		33												
		34												
		35												
		36												
		37				B#8								
		38												
		39												
		40												
		41				B#9								

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-212B

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43				B#9		Moist to wet, Brown [7.5YR 5/4], Fractured Argillite. *(Continued)*						Water Level 11-19-12 SB-212B = 43.9'
		44												
		45												More competent Argillite
		46												
		47				B#10								
		48												
		49												
		50												Total Depth= 50.0'
		51												Piezometer SB-212B 1" Sch 40 PVC Stick-up 1.5' 0-43' Riser 43-48' 0.010" Screen
		52												
		53												
		54												Piezometer SB-212T 1" Sch 40 PVC Stick-up 1.7' 0-10' Riser 10-15' 0.010" Screen
		55												
		56												
		57												Annulus 0-5' Bentonite Chips 3/8" 5-15' 10-20 Sand 15-20' Bentonite Chips 3/8" 20-48' 10-20 Sand
		58												
		59												
		60												
		61												
		62												
		63												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35SB-213B

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 11/5/12 - 11/5/12	DRILLER: Axis Drilling
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5110.54 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1020602.46, E1233865.26 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto

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DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
0				SS#1	100	Moist, Black [10YR 2/1], ORGANIC SILT with GRAVEL, OL.					19.6	
1				SS#2	100	Dry, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, low to medium plasticity, stiff.					7.2	
2				SS#3	61						6.2	
3												
4												cuttings are dusty
5						Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity.						pp= 2.5 tsf
6				SS#4	78				55		6.6	
7						Moist, Reddish brown [5YR 4/3], CLAYEY SAND with Gravel, SC, medium plasticity, stiff, 0.25" sand lense at 7.75'.						
8				SS#5	78				23		11.7	
9												
10				ST#1	93	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.			17			
11				SS#6	78						11.5	
12												
13				B#1		Moist to wet, Reddish brown [5YR 4/3], CLAYEY SAND with Gravel, SC, medium plasticity, stiff, interbedded with medium plasticity sandy clay with gravel.						
14												
15						Moist to wet, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						
16				SS#7	89	Moist to wet, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, stiff.			15		10.6	2" diameter cobble in spoon
17				SS#8	83				31		10.0	outside of spoon is wet, pp=3.2 and 3.0 tsf
18												Water Level 11-19-12
19				B#2		Boulder.						SB-213B = 19.0'
20						Moist, Reddish brown [5YR 4/4], CLAYEY GRAVEL with Sand, GC.						SB-213T = Dry

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-213B

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
								This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		21				SS#9	0	Moist, Reddish brown [5YR 4/4], CLAYEY GRAVEL with Sand, GC. *(Continued)*			17			dusty cuttings, cobble/boulder at 19', put on open hole hammer 50/5" no recovery
		22												large boulders, open hole, cuttings come up 1" diameter with reddish lean clay stuck to it
		23												
		24												
		25												
		26												cuttings are bits of clay, sand, with chips up to 1.5" diameter.
		27				B#3								
		28												Driller states it will be difficult to get casing through, should consider open hole the rest
		29												
		30						Moist, Dark yellowish brown [10YR 4/4], SANDY CLAY with Gravel, CL, Limonite secondary soil.						6" of heave/collapse
		31				SS#10	100				100+		9.9	Doesn't appear to be weathered rock, looks like till, matrix is clayey soil, granules of volcanics, Argillite
		32												
		33				B#4		Moist, Dark brown [7.5YR 3/2], CLAY with Gravel, CL.						
		34												
		35												
		36				SS#11	75				23		13.0	
		37												
		38												
		39						Saturated, Dark yellowish brown [10YR 3/4], CLAY with Gravel, CL, organics, gravels to 1/2" diameter.						cuttings sticking to rods, high plasticity
		40				ST#2	100		39	15		111.9	19.6	
		41				SS#12	100				19		12.8	clays are limonite, purple and

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-213B

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43						Moist, Reddish gray [5YR 5/2], CLAY with Gravel, CL, weathered Tuff, with argillite chips, possible bentonite chips in sample. *(Continued)*						greenish white, weathered Tuff with Argillite chips Minor amount of chips on the return, casing clogged with clay form above
		44												
		45												
		46		X		ST#3								
		47		X										
		48	X			SS#13	100				25		12.2	Sample ST#3 and SS#13, likely collected materials stuck to inside of casing.
		49												
		50												Total Depth=49.3'
		51												Piezometer SB-213B 1" Sch 40 PVC Stick-up 1.5' 0-38' Riser 38-43' 0.010" Screen
		52												
		53												Piezometer SB-213T 1" Sch 40 PVC Stick-up 1.7' 0-14' Riser 14-19' 0.010" Screen
		54												
		55												
		56												Annulus 0-14' Bentonite Chips 3/8" 14-19' 10-20 Sand 19-34' Bentonite Chips 3/8" 34-43' 10-20 Sand
		57												
		58												
		59												
		60												
		61												
		62												
		63												

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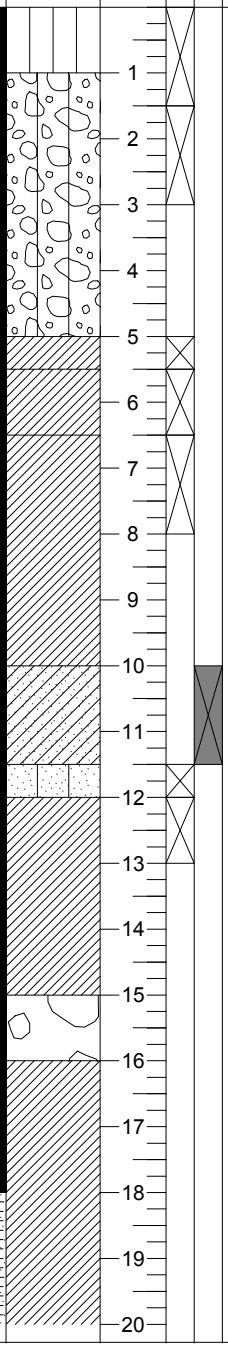
DRILL HOLE LOG COMBINED REPOSITORY.GPJ 3/4/13

Drill Hole No. S35SB-214B

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/15/12 - 10/16/12	DRILLER: Axis Drilling
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5082.86 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1020332.83, E1233297.12 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto



DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
1	X			SS#1	100	Dry, Dark brown [7.5YR 3/2], GRAVELLY SILT with Sand, ML, low plasticity, firm.					7.1	
2	X			SS#2	100	Dry, Brown [7.5YR 4/3], SILTY GRAVEL with Sand, GM, low plasticity.					4.7	
3	X											
4	X											
5	X			SS#3	100	Moist, Dark brown [7.5YR 3/2], SANDY CLAY with Gravel, CL, medium plasticity.			41		12.4	
6	X			SS#4	100	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.			41		11.7	
7	X			SS#5	100	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY, CL, medium plasticity, stiff.			33		11.3	
8	X											
9	X											
10		X				Moist, CLAYEY SAND with Gravel, SC, low to medium plasticity, stiff.						
11		X		SS#6	100				40			
12	X			SS#7	56	Moist, Reddish brown [5YR 4/3], SILTY SAND with Gravel, SM, low plasticity.			19		10.6	
13	X			SS#8	56	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity.			19		11.0	Water Level 11-19-12 SB-214B = 12.7' SB-214T = 14.6'
14												
15						Boulder, Quartzite.						Boulder, sampler refusal
16						Moist to wet, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff.						
17												
18												
19												
20												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-214B

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		21				SS#9	100	Moist to wet, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, stiff. *(Continued)*			20		10.7	
		22				SS#10	100				12		10.4	
		23												
		24						Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, stiff.						
		25												
		26				SS#11	100				23		10.8	
		27												clayey sand cuttings, driller reports clayey, slow advance
		28												
		29												
		30												No recovery, sandy clay on outside of spoon
		31				SS#12	0				26			
		32												Water from casing when air turned back on
		33												
		34						Wet, Gray [7.5YR 6/1], SANDY SILT with Gravel, ML, low plasticity, weathered Trachyte.						
		35				SS#13	100				37		22.4	
		36												
		37						Wet to Saturated, Brown [10YR 4/3], SILTY GRAVEL with Sand, GM, non-plastic, Cuttings are fine grained, white, alkaline feldspars, dark minerals hornblende and biotite.						5-10 gpm water at 37'
		38												
		39												
		40				SS#14	100				100+		30.3	
		41												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-214B

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43						Wet to Saturated, Brown [10YR 4/3], SILTY GRAVEL with Sand, GM, non-plastic, Cuttings are fine grained, white, alkaline feldspars, dark minerals hornblende and biotite. *(Continued)*						
		44												
		45												
		46												Total Depth= 45.5'
		47												
		48												Piezometer SB-214B 1" Sch 40 PVC Stick-up 3.0' 0-40.5' Riser 40.5-45.5' 0.010" Screen
		49												
		50												
		51												Piezometer SB-214T 1" Sch 40 PVC Stick-up 1.7' 0-18' Riser 18-23' 0.010" Screen
		52												
		53												
		54												Annulus 0-18' Bentonite Chips 3/8" 18-23' 10-20 Sand 23-40.5' Bentonite Chips 3/8" 40.5-45.5' 10-20 Sand
		55												
		56												
		57												
		58												
		59												
		60												
		61												
		62												
		63												

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35SB-215T	PAGE 1 of 3
DATE STARTED / FINISHED: 11/6/12 - 11/6/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5088.99 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020393.31, E1233994.42 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0				SS#1	89	Moist, Very dark brown [7.5YR 2.5/2], CLAYEY GRAVEL with Sand, GC, some roots.					23.0	
		1				SS#2	89						6.0	
		2						Dry, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, low to medium plasticity, stiff.						
		3				SS#3	94						6.2	
		4												
		5						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, very stiff.						Spoon very difficult to retrieve
		6				SS#4	89				63		9.3	
		7												
		8				B#1								Drilled cobbles for entire run, fines low plasticity
		9												
		10												
		11												
		12				B#2								
		13												
		14												
		15												
		16				SS#5	28	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, low to medium plasticity.			16		9.8	Water Level 11-19-12 SB-215T1 = 16.3' SB-215T2 = 17.6'
		17												
		18				B#3								
		19												
		20												

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CLIENT: Montana Department of Environmental Quality
ADDRESS: P.O. Box 200901 Helena, Montana 59620-0901
PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-215T

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
								This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		21				SS#6	100	Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, low to medium plasticity. *(Continued)*			12		11.1	Spoon is wet. pp= 2.5 tsf
		22												
		23				B#4		Saturated, Reddish brown [5YR 4/4], CLAYEY GRAVEL with Sand, GC, low to medium plasticity, stiff.						Rock at 22.5'
		24												
		25												Rocky to 25'
		26				SS#17	33				28		15.5	
		27												Rock in end of sampler
		28				B#5								
		29												
		30												Saturated spoon, trace organics in spoon
		31				SS#8	6				13			
		32												
		33				B#6		Boulder.						1.0' boulder, quartzite from 33-34'
		34						Wet, Reddish brown [5YR 4/4], CLAYEY GRAVEL with Sand, GC, low to medium plasticity.						
		35						Wet to Saturated, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, low to medium plasticity, stiff.						
		36				SS#9	44				15		12.3	
		37												
		38				B#7		Boulder.						
		39						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, low to medium plasticity, stiff.						
		40												pp=2.0 tsf and 1.5 tsf
		41				SS#10	67				19		12.0	
						B#8								

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DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-215T

This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		43				B#8		Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, low to medium plasticity, stiff. *(Continued)*						Drilling cobbles and clay
		44												
		45												
		46				SS#11	67				19		8.2	
		47												
		48												
		49												
		50												
		51				SS#12	67				16		12.0	
		52												
		53												
		54												
		55						Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity, stiff.						pp=3.5 tsf, 3.5tsf, 3.0 tsf
		56				SS#13	67				17		12.9	
		57												Total Depth=56.5'
		58												Piezometer SB-215T1 1" Sch 40 PVC Stick-up 1.5' 0-50.5' Riser 50.5-55.5' 0.010" Screen
		59												Piezometer SB-215T2 1" Sch 40 PVC Stick-up 1.8' 0-25.5' Riser 25.5-30.5' 0.010" Screen Annulus 0-25.5' Bentonite Chips 3/8" 25.5-30.5' 10-20 Sand 30.5-50.5' Bentonite Chips 3/8" 50.5-55.5' 10-20 Sand
		60												
		61												
		62												
		63												

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ADDRESS: P.O. Box 200901
Helena, Montana 59620-0901

PHONE NUMBER:

Drill Hole No. S35SB-216B

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 11/2/12 - 11/2/12	DRILLER: Axis Drilling
LOGGED BY: M. Browne	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5145.84 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1020935.25, E1233542.80 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		0						Moist, Black [10YR 2/1], ORGANIC SILT, OL, with trace subangular gravel, oganic roots.						
		1					100	Moist, Very dark brown [7.5YR 2.5/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, no reaction to HCl, gravels are subrounded.					9.0	
		2					22							
		3												Gravel/Cobble fragments in spoon
		4												
		5												
		6					83				56		12.0	
		7												Top 6" sluff in hole
		8					17				49		6.0	
		9						Moist, Dark brown [7.5YR 3/2], CLAYEY SAND, SC, low plasticity, Weathered Tuff w/frequent zones of rusty yellow, purple, breaks down to a fine grain clayey sand.						
		10												
		11					89				100+		16.0	
		12					94				100+		16.0	
		13												
		14												Harder Drilling, larger rock fragments
		15												Water Level 11-19-12
		16					78				29		14.0	SB-216B = Dry
		17												
		18												
		19												
		20												

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Helena, Montana 59620-0901

PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-216B

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21					100	Moist, Dark brown [7.5YR 3/2], CLAYEY SAND, SC, low plasticity, Weathered Tuff w/frequent zones of rusty yellow, purple, breaks down to a fine grain clayey sand. *(Continued)*			27		11.0	
		22												
		23												
		24												
		25												Too hard for SPT, switching to open hole hammer
		26												
		27												
		28												
		29												
▼		30												Water Level 11-19-12
		31												SB-216A = 30.5'
		32												
		33												Total Depth= 35.0'
		34												Piezometer SB-216A
		35												1" Sch 40 PVC
		36												Stick-up 1.5'
		37												0-30' Riser
		38												30-35' 0.010" Screen
		39												Piezometer SB-216B
		40												1" Sch 40 PVC
		41												Stick-up 1.7'
														0-10' Riser
														10-15' 0.010" Screen
														Annulus
														0-8' Bentonite Chips 3/8"
														8-15' 10-20 Sand
														15-23' Bentonite Chips 3/8"
														23-35' 10-20 Sand

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PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35SB-217A/B

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/31/12 - 10/31/12	DRILLER: Axis Drilling
LOGGED BY: M. Browne	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5137.73 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1021345.73, E1233083.26 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1–20						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						Materials from Soil Boring were not logged, refer to S35MW-217 suburface information Water Level 11-19-12 SB-217B = Dry SB-217A = 25.0'

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PHONE NUMBER:	

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35SB-217A/B

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
		22												Piezometer SB-217B
		23												1" Sch 40 PVC
		24												Stick-up 1.7'
▼		25												0-10' Riser
		26												10-15' 0.010" Screen
		27												
		28												
		29												Piezometer SB-217A
		30												1" Sch 40 PVC
		31												Stick-up 3.8'
		32												0-23' Riser
		33												23-28' 0.010" Screen
		34												Annulus 0-8' Bentonite Chips 3/8"
		35												8-15' 10-20 Sand 15-22' Bentonite Chips 3/8"
		36												22-28' 10-20 Sand 28-30' Bentonite Chips 3/8"
		37												
		38												
		39												
		40												
		41												

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PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

Drill Hole No. S35MW-217

PROJECT NAME: Section 35 Repository Design Investigation	
DATE STARTED / FINISHED: 10/31/12 - 10/31/12	DRILLER: Axis Drilling
LOGGED BY: M. Browne	DRILL TYPE: Davey-Kent
GROUND SURFACE ELEVATION: 5137.95 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX
BOREHOLE LOCATION: N1021341.29, E1233088.18 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto

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WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		1					100	Moist, Very dark grayish brown [10YR 3/2], ORGANIC SANDY SILT WITH GRAVEL, OL, contains organics, tree roots.					8.1	
		2					17	Moist, Dark reddish gray [5YR 4/2], SANDY CLAY with Gravel, CL.					8.0	
		3						Moist, Dark brown [7.5YR 3/2], SANDY CLAY with Gravel, CL, Argillite gravels are angular, with rust on stain on surface, has structure when broke apart, yellow inclusions, some gravels are purple in color.						
		4												
		5												
		6											8.0	
		7					0				19			
		8												
		9												
		10						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, gravels are subrounded.						
		11									25		13.9	
		12					72				16		13.0	
		13												
		14												
		15					100							Water Level 11-19-12 SB-217B = Dry
		16					11				20			16-21' higher rock content
		17												
		18												
		19												
		20												

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ADDRESS: P.O. Box 200901 Helena, Montana 59620-0901	
PHONE NUMBER:	

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation

Drill Hole No. S35MW-217

WELL LOG	GRAPHIC LOG	DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
		21						Moist, Reddish brown [5YR 4/3], GRAVELLY CLAY with Sand, CL, medium plasticity, gravels are subrounded. *(Continued)*						No SPT, driller reports on top of rock at 21.5'
		22												
		23												
		24												
▼		25		■			100	Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity, stiff, no structure compared to soils above.	26	13				Bottom 1/2" of Shelby crumpled. pp= 0.25, 0.5, and 0.75 tsf Water Level 11-19-12 SB-217 = 24.8'
		26					72				10		12.1	Bottom of run on rock at 30'
		27												Piezometer SB-217
		28												1" Sch 40 PVC
		29												Stick-up 3.7' 0-35' Riser 35-40' 0.010" Screen
		30												Annulus
		31					72				10		14.9	0-35' Bentonite Chips 3/8" 35-40' 10-20 Sand
		32						Moist, Dark yellowish brown [10YR 3/4], SANDY CLAY, CL, medium to high plasticity, Tuff, some subangular gravel fragments.						
		33						Moist to wet, Very dark gray [7.5Y 3/1], SANDY CLAY with Gravel, CL, Tuff, breaks down to Sandy Clay, some angular gravel fragments.						
		34												
		35												
		36					61				100+		30.6	
		37						Wet, Dark gray [7.5YR 4/1], GRAVEL with Sand, GP, Tuff, drill cuttings are rock fragments.						
		38												
		39												Driller reports too rocky for SPT at 40.0'
		40												Total Depth= 40.0'
		41												

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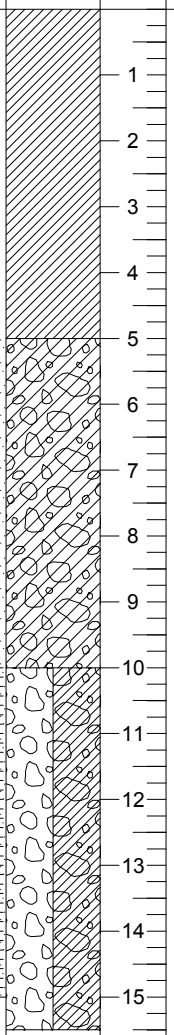
Helena, Montana 59620-0901

PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: Section 35 Repository Design Investigation	Drill Hole No. S35PZ-01T	PAGE 1 of 1
DATE STARTED / FINISHED: 11/8/12 - 11/8/12	DRILLER: Axis Drilling	
LOGGED BY: J. Riedel	DRILL TYPE: Davey-Kent	
GROUND SURFACE ELEVATION: 5095.31 (U.S. Feet) NAV88	HOLE DIAMETER: 4.5" ODEX	
BOREHOLE LOCATION: N1020093.20, E1234544.98 (MT St. Pl. NAD83)	HAMMER TYPE: 140 lb auto	



DEPTH (FT)	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	RECOVERY (%)	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	CORRECTED SPT	DRY DENSITY (pcf)	MOISTURE (%)	REMARKS / TESTING
1						This log is part of a report prepared by Pioneer Technical, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplication of actual conditions encountered.						
2				B#1		Moist, Reddish brown [5YR 4/3], SANDY CLAY with Gravel, CL, medium plasticity.						
3												
4												
5						Moist, Reddish brown [5YR 4/3], CLAYEY GRAVEL with Sand, GC, medium plasticity.						
6												
7				B#2								
8												
9												
10						Moist, Dark reddish gray [5YR 4/2], GRAVEL with Clay and Sand, GP-GC, fines medium plasticity.						Water Level 11-19-12
11												PZ-01T = Dry
12				B#3								
13												
14												
15												
16												Total Depth =15.5'
17												Piezometer PZ-01T
18												1" Sch 40 PVC
19												Stick-up 1.8'
20												0-10' Riser
												10.5-15.5' 0.010" Screen
												Annulus
												0-5' Bentonite Chips 3/8"
												5.5-15.5' 10-20 Sand

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ADDRESS: P.O. Box 200901 Helena, Montana 59620-0901
PHONE NUMBER:

DRILL HOLE LOG COMBINED REPOSITORY.GPJ 2/27/13

PROJECT NAME: MH Section 35

DATE STARTED/FINISHED: 10-11-12

LOGGED BY: JR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. MW202

PAGE 1 OF 3

DRILLER: Axis

DRILL TYPE: Davey Kent

HOLE DIAMETER: 4 1/2 ODEX

HAMMER TYPE: 140 lb Auto

This log is part of a report prepared by Piedmont Engineering, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
1	CL	Dry, reddish brown, lean clay w/ gravel (CL), roots, medium stiff	1	SS#1 2"	6, 16, 18			14/18	10:30 AM
2		Dry reddish white, lean clay w/ gravel stiff, med plas	2	SS#2 1"	6, 10, 15			7/18	
3			3						
4			4						Cuttings, reddish/wh. CL lean clay w/ gravel chips, mostly (CL), very dusty cuttings
5		moist reddish brown clay w/ gravel (CL), Argillite gravels, med plas	5	SS#3 2"	10, 18, 16			16/18	11:00
6			6						Shelly from DEQ Arrives onsite.
7	SC	Moist reddish brown, clayey sand w/ gravel (SC), stiff, rounded gravels, med plas	7	SS#4 1"	7, 7, 10			7/18	
8		Moist reddish brown clayey sand w/ gravel (SC), stiff, Cobble/boulder at 9', broken in spoon, argillite	8						
9			9	SS#5 2"	13, 16, 28			12/18	
10		Moist reddish brown clayey sand w/ gravel (SC) stiff.	10	SS#6 2"	8, 11, 12			18/18	11:50
11	SC	very thin layer of sand at 11'	11						
12	CL	Moist reddish brown lean clay w/ sand and gravel (CL), stiff.	12	SS#7 1"	5, 6, 12			14/18	
13			13						
14	SC		14						clayey cuttings, sample saved
15		Moist/wet reddish brown clay sand (SC), stiff, interbedded w/ SP w/ gravel at 15.5'. Visible water at 15.5'	15	SS#8 2"	7, 11, 12			18/18	12:25
16			16						
17		1" thin, med plas clays	17	SS#9 1"	18, 16, 32				no water on spoon
18	Cobble	Moist reddish brown clay sand w/ gravel (SC) very med plast stiff. Last 6" shattered argillite	18						dust and chips at 17.5 - 17.75 back into SC w/ gravel at 17.75
19			19						
20	SP	wet reddish brown sandy w/ clay and gravel medium, low plast (SP)	20	SS#10 2"	10, 7, 8			16/18	Spoon is moist on outside
21			21						

PIONEER TECHNICAL SERVICES, INC.

1215 APPLES WAY
BELGRADE, MONTANA 59714
(406)-388-8578

CLIENT:

ADDRESS:

PHONE NUMBER:

PROJECT NAME: Section 35
DATE STARTED/FINISHED: 10-11-12
LOGGED BY: JR.
GROUND SURFACE ELEVATION:
BOREHOLE LOCATION:

Drill Hole No. SB-202 PAGE 2 OF 3

DRILLER: Axis
DRILL TYPE:
HOLE DIAMETER: 4 1/2
HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NO. DEPTH	DRIVE	UNDISTURBED	BULK	RECOVERY (%)	REMARKS
21–22	SC	Moist reddish brown clayey sand w/gravel (SC), med plastic, stiff.	SS#11 1'	9 / 12 / 14			10/18	
25		Moist reddish brown clayey sand w/gravel (SC), med plastic medium stiffness, amorphis.	SS#12 2"	8 / 9 / 13			18/18	1:30
27	SC / SP / CL	Moist reddish brown lean clay w/sand interbedded w/ sand w/clay and gravel (SP), med plastic fines – wet	SS#13	9 / 14 / 11			12/18	wet spoon
29	Boulder							Cuttings are chips and dust, w/ clay at 29'
30			SS#14					2:25 → refusal
33	CL							SC cuttings
35		Moist/wet reddish brown lean clay w/ sand and gravel (CL) med plas medium stiffness	SS #15 2"	15 / 18 / 21	X / X / X		18/18	3:20 Outside of spoon is wet; 3 Brass Liners
37	Cobble							Rock chips at 37
38	CL							Cuttings color change to gray/purple clayey sand
40		Saturated gray purple clayey gravel w/ sand (GC) low plastic fines. medium dense.	SS #16 1'	13 / 13 / 17			15/18	Blowing dust at 39-40, some 1/2" chips argillite, gray/purple 4:10 Water on turning Air on, lots

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PROJECT NAME: Section 35

Drill Hole No. SB-202 PAGE 3 OF 3

DATE STARTED/FINISHED:

DRILLER:

LOGGED BY:

DRILL TYPE:

GROUND SURFACE ELEVATION:

HOLE DIAMETER:

BOREHOLE LOCATION:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
43		
44		
45		End for day, start 8:15 am to Build piezo
46		Screen 45-40
47		Sand 45-40
48		blank 40-0
49		bentonite 40-0
50		5 bags bent
51		3 bags sand
52		end hole 45'
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		
63		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
43						5-10 gal/min return water
44						fairly solid at 42'
45						Drill string at 38' in morning. Turn on air, water out of casing.
46						
47						
48						
49						
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						

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PROJECT NAME: Section 35	Drill Hole No. SB-202 PAGE 1 OF 2
DATE STARTED/FINISHED: 10-~~11~~ 12-12	DRILLER: Axis T/O
LOGGED BY: JR	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
1–9		Run to town
10–14	SC	Moist Reddish brown clayey sand w/gravel SC, med plast.
15–19		Moist reddish brown clayey sand w/ gravel (SC), med plast
20–21		Moist reddish brown clayey sand w/gravel (SC) med plast

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
10	B#1				10:15	
15	B#2				11:07	
20	B#3				11:21	

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PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10-12-12

LOGGED BY:

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. SB-202T PAGE 2 OF 2

DRILLER:

DRILL TYPE:

HOLE DIAMETER:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
25	SC	Moist Reddish brown, clayey Sand w/ gravel (SC) med plast.
30		moist reddish brown, clayey sand w/ gravel (SC) med plast
33		End hole at 33' install nest pzeos

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
25						11:36
27	B#4					
30						12:00 Rockier drilling
31	B#4					
33						12:21 1" Pzo 33-27 Screen 33-27 Sand ~~27-0~~ 27-0 Blank 27-22 Bentonite 22-17 Sand 17-0 Bentonite

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PHONE NUMBER:

PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10-12-12

LOGGED BY: JR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. SB-206

PAGE 1 OF 3

DRILLER: Axis

DRILL TYPE: Davey Kent

HOLE DIAMETER: 4 1/2

HAMMER TYPE: 140 Auto

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
0	OL	Dry dark brown organic silt (OL) twigs, roots, pine needles	0	SS#1	6			15/18	overhole at 3:00pm start drill 3:25
1	OL	Dry lite brown organic silt (OL) roots. Low plasticity	1	2" SS#2	6				
2			2		10				
3	S	Dry Pink tan sand w Silt and gravel	3	SS#3 1"	7				
4			4		13				
5			5	SS#4	20				
6		Moist brownish red clayey sand (SC) stiff, low/med plast	6	SS#5 2"	16			16/18	
7	SC	moist reddish brown clay sand with silt w/gravel (sc), stiff, med plas.	7	SS#6 1'	17			8/18	
8			8		9				
9	Boulder		9		8				
10	GC	Moist reddish brown clayey gravel w/sand (GC), very stiff. med plasticity fines	10	SS#7 2"	7			4/18	4:00 outside of spoon damp
11			11		15				
12	SC	Moist reddish brown clayey sand w/gravel (SC), very stiff. med plast.	12	SS#8 1"	20			18/18	
13			13		12				4:24
14			14		11				
15	CL	Moist reddish brown lean clay w/sand and gravel, very stiff, med plast	15	SS#9 2"	20				3 Brass liners
16			16		9				
17	SC	Moist reddish brown clayey sand w/gravel (SC), med plast. very stiff	17	SS#10 1'	15				
18			18		17				
19			19		13				
20		Moist reddish brown lean clay w/ sand and gravel m.p. very stiff	20	SS#11 2"	16				5:00
21			21		13				

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Drill Hole No. SB 206 PAGE 2 OF 3

PROJECT NAME: Section 35	DRILLER:
DATE STARTED/FINISHED: 10-12-12	DRILL TYPE:
LOGGED BY: JR	HOLE DIAMETER:
GROUND SURFACE ELEVATION:	HAMMER TYPE:
BOREHOLE LOCATION:	

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22		Wet gray/purple clay w/ sand and gravel, medium plas. weathered rock. is clayey portion
23	CH	
24		wet gray/purple clay w/ sand and gravel, mod plas. weathered bedrock
25	GC	Saturated, purple, gray, red gravelly w/ sand and clay (Clayey gravel w/ sand
26		GC med plast. stiff. weathered rock
27	CH	Saturated purple/white (salt and pepper) clay w/ sand and gravel, muscovite, weathered feldspars. fine grained tuff rock.
28		
29		
30		saturated purple/gray, salt & pepper clay w/ sand and gravel. weathered feldspars
31		
32		
33		
34		
35		Saturated purple, white (salt & pepper) clay w/ sand, weathered volcanics, small qtz, feldspar, hornblend, muscovite secondary
36		
37		
38		
39	Argillit	
40		Saturated purple gray gravel w/ clay, argillite, angular, very stiff
41		
42		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
22	SS#12 1"	20 6 16 12			18/18	water +1.5 feet from 20', start drilling again 10-13-12
23	SS#13				18/ (2)	
24						
25	SS#13 2"	14 18 19			18/18	
26						
27	SS#14 1"	6 12 7 12			16/18	
28						
29	B#1					Hand drilling at 29'
30	SS#15 1"	11 16 19			7/18	
31						
32						
33						
34						
35	SS#16 1"	15 28 34			18/18	water on return
36						
37						
38	B#2					Blowing dust Hand drilling at 38'
39						
40	SS#17 1"	45 50			50/5"	Refusal
41						may be weathered volcanics with country rock argillite
42						

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PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10-03-17

LOGGED BY: JR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. SB-206 PAGE 3 OF 3

DRILLER: Aaris

DRILL TYPE:

HOLE DIAMETER:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
43	Aug	Saturated, olive green
44	vol	pink, red, purple, purple black
45		clayey sandy w/ gravel,
46		weathered rock.
47		piece of multiple rock types
48		argillite, diorite green argillite with MgO dendrite
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		
63		

40-45 Screen, Sand

30-40 Bent

25-30 Screen

15-25 Bent

10-15 Screen

0-10 Bent.

end of hole 45

last sample to HSA

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
43	B#3					Hard drilling
44						Cuttings, red/purple argillite
45	SS#18	18				chips. Some white feldspar?
46	1"	50				chips, trace green olivine?
47						50/4½" Refusal
48						
49						
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						

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PROJECT NAME: Section 35	Drill Hole No. 206T PAGE 1 OF 1
DATE STARTED/FINISHED: 10-13-12	DRILLER:
LOGGED BY: JR	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
1			1						Blowing dust, some chips.
2	SC		2						
3			3						
4			4						
5		moist, reddish brown clayey sand w/ gravel.	5				X		
6			6						Cuttings
7			7	B#2					less dust from return, increase moisture
8			8						
9			9						
10		Piez moist reddish brown clayey sand w/ gravel	10						
11			11						
12			12	B#3					
13			13						
14			14						
15		end hole	15						
16			16						
17		Piezo	17						
18		15-10 Sand/Screen	18						
19		10-0 Bentonite	19						
20			20						
21			21						

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PROJECT NAME: Section 35	Drill Hole No. MW-204 PAGE 1 OF 2
DATE STARTED/FINISHED: 10-14-12	DRILLER: Axis
LOGGED BY: JR	DRILL TYPE: D.K.
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 9 1/2
BOREHOLE LOCATION:	HAMMER TYPE: 140 Auto

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
0	OL	top soil, Dry brown organic silt (OL) root, twigs.	0	SS#1	4			15/18	Start drill 7:45 AM
1	OL	Dry light brown organic silt (OL) (w/ trace gravel.	1	SS#2	6				
2	SC	Dry reddish white clayey sand w/ gravel (SC). low plast. very stiff.	2	SS#3 1"	10				
3			3		16			4/18	
4	SM		4		13				Blowing lots of dust
5		Dry, reddish white Silt sand w/ gravel	5		10				hand survey from across the street stopped by. ask if we were drilling across the river. said I don't know. Jack McInnis
6	(SM)	low to non plastic. very stiff	6	SS#4 2"	22			18/18	
7	SC	Dry reddish white clayey sand w/ gravel (SC) low/med plast. stiff.	7	SS#5 1"	10			14/18	
8			8		9				
9			9		14				cuttings less dusty
10		MOIST reddish brown clayey sandy gravel (SC) textured plast stiff.	10	SS#6 1"	13			10/18	
11			11		12				
12		Moist reddish brown clayey sand w/ gravel & gravel plast. stiff	12	SS#7 1"	10			13/18	
13			13		12				
14			14	BT#1	16		X		
15		Moist reddish brown clayey sand w/ gravel stiff, med plas.	15	SS#8 2"	9			9/18	1-12" BL ← Brass Liners 1-6" BL ← Brass Liners
16			16		12				
17			17	SS#9 1"	13			0/18	rock stuck in bit, no recovery
18			18		5				
19			19	BT#2	6		X		Cutting show clayey sand w/ gravel.
20		Moist reddish brown clayey sand w/ gravel, stiff, med plas.	20	SS#10	12			18/18	Brass Liners 3x
21			21		21				21-21.5 Form bit
					23				

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PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10-14-12 → 10-15-12

LOGGED BY: JR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. MW-204

PAGE 2 OF 2

DRILLER: Apex

DRILL TYPE:

HOLE DIAMETER:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22	CL	Moist reddish brown lean clay w/ sand and gravel, stiff, med plast
23		
24		
25	Volcanic	Moist, gray, yellow, rust, green clay. Weathered volcanics, andesite. Secondary sericite, limonite, hematite. Weathered hematite on fracture faces. maybe chlorite also
26		
27		
28		
29		
30	Vol	Moist purple, tan clayey sand Secondary minerals, limonite MnO_2, chlorite, maybe altered argillite/maybe altered volcanics clays are platey when fractured.
31		
32		
33		
34		
35		end hole
36		35-30 Screen
37		30-18 bent
38		18-13 Screen
39		13-0 bent.
40		
41		
42		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22	SS#11 1"	9 21 14				
23						Cuttings color change to yellowish gray at 23.5
24						
25	SS#12 24	24 35 40				11:20
26						
27						
28	BS#4					1" Sampler
29						
30	SS#13 3"	50/3"				50/5 Refusal No recovery from 2" sampler try 1" in same spot
31		50/4"				50/4" second run. Sampler very hard to retrieve
32						
33	BS#5					
34						
35		12				12 blows/2" Stop as to not get sampler stuck.
36						
37						
38						
39						
40						
41						
42						

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PHONE NUMBER:

PROJECT NAME: Section 35	Drill Hole No. SB209 PAGE 1 OF 2
DATE STARTED/FINISHED: 10-14-12	DRILLER: Axis
LOGGED BY: JR	DRILL TYPE: ODEX
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 4½
BOREHOLE LOCATION:	HAMMER TYPE: 140 Auto

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
0	OL	Organics	0	SS#1	8			18/18	3:15 PM
1	OL	Dry pinkish gray fine, organic silt (OL) med plast. stiff.	1	2"	12				
2	SC	Moist reddish brown clayey sand w/ gravel, stiff, low to med plas.	2	SS#2	12			14/18	
3			3	1"	17				
4			4		8				dusty cuttings
5		moist, reddish brown, clayey sand w/ gravel - stiff, med plast.	5	SS#3	11				
6			6	2"	11			14/18	
7		moist reddish brown clayey sand w/ gravel stiff, med plast	7	SS#4	13				
8			8	1"	8			18/18	
9	SP	moist pinkish brown sand w/ gravel.	9		14				Rocks + cuttings
10		moist reddish brown lean clay w/ sand	10	SS#5	14				4:00
11	CL	and gravel stiff, med plast	11	2"	15			18/18	
12	SC	wet reddish brown clayey sand w/ gravel, stiff med/low plast. (SC)	12	SS#6	17				
13			13	SS#7	10			18/18	
14			14	1"	14				
15		moist Reddish brown clayey sand w/ gravel stiff med plast.	15	SS#8	9				4:30 -
16			16	2"	16			18/18	
17	SP CL	moist reddish brown lean clay w/ sand and gravel, stiff. med plast	17	SS#9 SS#10	20				SS#10 16.75-17.0
18			18		9				SS#9 16.5-16.75+ 17.0-18.00
19			19		11			18/18	
20		saturated reddish brown lean clay w/ sand and gravel stiff, med plasticity	20		13				▽ 10-15-12 water in hole morning
21			21	SS#11	7 14 21				

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PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10-14- 10-15-12

LOGGED BY:

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. SB-209

PAGE 2 OF 2

DRILLER:

DRILL TYPE:

HOLE DIAMETER:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22	SC	Saturated reddish brown clayey sand w/ gravel, medium stiff low to med plasticity
25	CL	Saturated reddish brown lean clay w/ sand and gravel med plast.
27		Saturated reddish brown lean clay w/ sand and gravel stiff, med plast.
31	Volcanics	Moist pink grey clayey gravel w/ sand (GC) very stiff, low plastic.
32	GC	
33	CL	
35		Saturated yellow, purple, white sandy clay (CH), weathered volcanics, limonite, hematite sericite, ~~host~~, maybe epidote.
38	CH	
40		saturated, yellow, green, pink black white, orange grey fat clay, weathered volcanics, hydrothermal.
42	Bentonite	maybe bentonite

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22	SS#12	8, 13, 12			10/18	
24						~~Sandy Clay~~ clayey sand cuttings
25	SS# 13 2"	14, 18, 20			12/18	
27	SS# 14	8, 13, 16			18/18	
30	SS# 15	11, 25				
31	2" SS#	15, 25				
32	B#3					Cuttings yellowish grey clayey sand
35	SS# 17 1'	7, 10, 12				
37						40-35 Sand Screen 35-12 bent 12-8 screen 8-0 bent
40	SS# 18	5, 6, 9				
42						

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PHONE NUMBER:

PROJECT NAME: Section 35	Drill Hole No. SB-214 PAGE 1 OF 2
DATE STARTED/FINISHED: 10-15-12	DRILLER: Axis
LOGGED BY: SR	DRILL TYPE: Dover Kent
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 4 1/2
BOREHOLE LOCATION:	HAMMER TYPE: 140 Auto

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
0	OL	Dry tan/gray organic silt (OL) medium stiff low plast
2		Dry whitish red clayey sand w/ gravel and very stiff, low plast.
5	GW	
5		Moist reddish brown clayey sand w/ gravel, med plasticity
6	SC	
7	CL	Moist/wet reddish brown lean clay w/ gravel and sand, stiff med plasticity
10	SC	Moist/wet clayey sand w/ gravel (SC) stiff, med/low plast.
12	SP	Moist reddish brown sand w/ clay and gravel (SP). Moist reddish
12	CL	brown, lean clay w/ sand and gravel (CL)
15	granite boulder	
20		Moist wet lean clay w/ sand and gravel. Stiff med plast

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
1	SS#1 2"	9 9 10			18/18	
2	SS#2 1"	12 15 15			18/18	
5	SS#3 2"	8 10			18/18	2:25
6	SS#4	16				
7	SS#5 1"	6 10 14			18/18	
10	SS#6 2"	11 15 24			18/18	
12	SS#7	3			10/18	
13	SS#8 1"	9 11				
15		50				X Boulder, refusal. change hammer, advance 1" thru boulder. Re attach casing advance hammer.
20	SS#9 2"	19 17 16				4:30

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PROJECT NAME: Section 35		Drill Hole No. SB214	PAGE 2 OF 2
DATE STARTED/FINISHED: 10-15 → 10-16-12		DRILLER:	
LOGGED BY:		DRILL TYPE:	
GROUND SURFACE ELEVATION:		HOLE DIAMETER:	
BOREHOLE LOCATION:		HAMMER TYPE:	

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22	Q	moist wet leanclay w/sand. med plast medium.
23		
24	SC	
25		moist reddish brown clay sand w/gravel stiff med plast
26		
27		
28		
29		
30	SC	
31		
32		
33		
34	Trachyte/ andesite	
35		wet greenish white, yellow, dark purple black clayey sand w/gravel (SC) weathered volcanics.
36		
37		
38		Piezo 45.5-40.5 Screen/sand 40.5-23 Bent 23-18 Screen Sand 18-0 bent
39		
40		
41		
42		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
22	SS#10 1"	5 9 11				1.5 ft of water in casing in morning
23						Stop for day 5:00 Heavy Rain
24						
25	SS#11	16			15/18	
26	1"	18 20				
27						Clayey sand cuttings drill stabs clogging, slow advance
28						
29						
30	SS#12	10			0/18	No recovery clayey sand on outside of spoon
31	1"	12 20				water from casing - when air turned back on.
32						
33						
34						Color change to light tan at 34'
35	SS#13	18				work casing, water from casing
36	2"	50				50/5½" Refusal
37						
38						Lots of water 5-10 gals/min
39						
40	SS#14	20				50 blows/2"
41	1"					Advance to 45' Auger to/trachyte end hole, Auger to/lots of water
42						

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PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10-16-12

LOGGED BY: JR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. 210 (SB-210)

PAGE 1 OF 2

DRILLER: Axis

DRILL TYPE: Dreyent CODEX

HOLE DIAMETER: 4 1/2

HAMMER TYPE: 140 Auto

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NO. DEPTH	DRIVE	UNDISTURBED	BULK	RECOVERY (%)	REMARKS
0–0.5	OL	Organic silt (OL)	SS#1 2"	3, 10			10/18	
0.5–1.5	SM	~~tan~~ Dry tan ~~silt w/sand~~ silty sand (SM)	SS#2	21, 16				
1.5–3.5		Dry pinkish white poorly graded sand w/ clay and gravel. (SP-SC) medium dense	1" SS#3	19, 13			18/18	
3.5–6.5	SC	Moist reddish brown clayey sand w/ gravel (SC) med plast. very stiff	SS#4 2"	11, 18, 22			18/18	
6.5–9.5	CL	moist reddish brown lean clay w/ sand and gravel stiff, med/low plast	SS#5 1"	15, 11, 6			5/18	
		Moist reddish brown lean clay w/ sand and gravel (CL) stiff med plast	ST#1		X		~~[illegible]~~	9/7 3/4
9.5–14.5	SC	moist clayey sand w/ gravel stiff med plast.	SS#6 1"	6, 9, 11			12/18	
15–17.5	CL	moist reddish brown lean clay w/ sand and gravel. (CL) stiff, med. plast	SS#7 2"	9, 41, 13				← Cobble in 2nd run
			SS#8 4"	4, 8				
17.5–	weathered rock	Moist purple gray, rust, yellow green clay w/ sand. weathered rock, hematite limonite, biotite no reaction to HCL	SS#9	12				
		moist black, purple gray, rust yellow weathered rock with firm pieces of argillite entrained	SS#10 2"	22, 41, 50				50/5

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PHONE NUMBER:

PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10- 10-

LOGGED BY: JR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. SB-210

PAGE 2 OF 2

DRILLER:

DRILL TYPE:

HOLE DIAMETER:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22	Vol / Arg / Vol	moist, clayey sand w/gravel. Inter bedded w/ purple Argillite, clayey sand is stiff, mod moist
25	arg / vol / arg	moist, clay sand w/gravel. weathered bedrock volcanics inter bedded w/ purple hard argillite, clayey sand is stiff, mod plast
27	volcanic	
30		Saturated, yellow, red, rust very wheat, biotite limonite hematite, weathered volcanics No argillite
33	arg / vol	
35		Saturated yellow red, rust, grey white, biotite limonite, hematite weathered volcanics clayey sand.
37		Build Piezo
38		44.5 - 43.0 seal
39		43.0 - 39.5 Sand, screen
40		Saturated yellow, red, rust, grey hematite, biotite, limonite, clay sand w/ gravel.
42		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22	SS#11 1'	10 / 19 / 27			18/18	
25	SS#12 1'	20 / 18 / 24			18/18	
28	Bit 1					no argillite in cuttings
30	SS#13 1'	10 / 22 / 30			18/18	water in spoon. water from casing upon bit return
33	Bit 2					Drilling rock, argillite chips and weathered volcanics
35	SS#14 1'	10 / 12 / 32			18/18	
37	Bit 3					Harder drilling @ 37, more water
38						Open hole drill Volcanic and argillite cuttings
40	SS# 15 1'	14 / 18 / 22			5/18	heave in hole, at 39' drive through heave to 41.5'
42						

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PROJECT NAME: Section 35	Drill Hole No. SB-211	PAGE 1 OF 3
DATE STARTED/FINISHED: 10-17-12	DRILLER: Axis	
LOGGED BY: JR	DRILL TYPE: ODEX	
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 4 1/2	
BOREHOLE LOCATION:	HAMMER TYPE: 130 Auto	

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
0	OL	Dry to moist organic silt w/ roots, needles	SS#1	9			12/18	Start drilling 1:30
1	SM	Pinkish white silty fine sand (SM)	2"	7				
2		Dry, low plast	SS#2	3			11/18	
3			1"	3				
4	SC			8				very dusty cuttings
5		Dry Pinkish with Clayey Sand w/gravel (SC)	SS#3	13				
6		med/low plast, Stiff.	2"	14				
7				17				Can't find hole, drip 1" Spoon
8								
9	Volcanics	Dry yellow, purple, green clay sand w/gravel. Weathered volcanics, low plast fines, very Stiff, but excavatable	SS#1		X		6/6	
10			SS#4	10			7/18	6" Push Shelby Tube
11			1"	15				
12				16				Volcanics cuttings
13								
14								
15				15				
16				50				50/5.5"
17				50				
18								open hole
19								started bouncing after 12"
20		Dry black, green, yellow clayey sand (SC) weathered volcanics. very stiff		24				50/4"
21				40				
				50				

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PROJECT NAME: Section 35	Drill Hole No. SB-21 PAGE 2 OF 3
DATE STARTED/FINISHED:	DRILLER:
LOGGED BY:	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22		Volcanics, dry
23		
24		
25		Weathered volcanics dry
26		
27		
28		
29		
30		
31	Vol	
32		
33		
34		
35		
36		
37	Vol	
38		
39		
40		
41		
42		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22						Hard drilling blowing dust
23	B#2					
24						
25						Dry grey yellow cuttings
26						
27	B#3					
28						
29						
30						
31	B#4					
32						
33						
34						
35						Mixed Argillite chips and volcanics
36						dry more argillite
37	B#5					below 39'
38						more dust below 39 also
39						
40						
41	B#6					
42						

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PROJECT NAME: Section 35		Drill Hole No. SB-211	PAGE 3 OF 3
DATE STARTED/FINISHED: 10-18-12		DRILLER: Axis	
LOGGED BY: JR		DRILL TYPE:	
GROUND SURFACE ELEVATION:		HOLE DIAMETER:	
BOREHOLE LOCATION:		HAMMER TYPE:	

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
43		This log is part of a report prepared by Piedmont Engineering, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	43	BH/P					Cuttings show argillite chips and gray ~~[illegible]~~ Hard stiff drilling
44			44						
45			45						~~Water~~ from hole, small amounts
46			46	BH7					Gray silt w/sand and argillite chips ~~A++~~ Hard stiff drilling
47			47						
48			48						
49			49						
50			50						A little water from hole upon bit return
51			51						Some chips are dacite
52			52	BH8					Some are argillite
53			53						
54			54						
55			55						Stop for day
56			56						
57			57						Build well 10-18-12 Water at 41' bgs
58			58						
59			59						Piezo 56-46 sand 56-57 screen
60			60						46-20 bent, blank
61			61						20-15 Sand screen
62			62						15-0 bent
63			63						

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PROJECT NAME: Section 35	Drill Hole No. 206D PAGE 1 OF 5
DATE STARTED/FINISHED: 10-24-12 / 10-26	DRILLER: AXIS
LOGGED BY: JR	DRILL TYPE: DK
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 4½
BOREHOLE LOCATION:	HAMMER TYPE: 140 Auto

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
1	OL		1						need to fix hammer, grind down weld.
2	SC		2						
3			3						
4			4						Cuttings are dry
5			5						
6	SC		6						
7			7	B#1					moist Cuttings: clayey sand w/ gravel
8			8						
9			9						
10			10						
11			11						Cutting moist clayey sand w/ gravel
12			12						
13			13	B#2					
14			14						
15			15						353
16			16						
17			17						
18			18						
19	Volcanics		19	#3					Color change, intermittent
20			20						415
21			21						

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PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10-24-12 / 10-26

LOGGED BY: SR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. SB-206D

DRILLER: AXIS

DRILL TYPE: D.C

HOLE DIAMETER:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22–42	Vol SC; Vol Clt; Vol Chips Clt	

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22	B#4					Cuttings, Clay w/ sand volcanics cuttings, w/ chips of argillite also
25						4:35 Clay w/ sand weathered volcanics, w/ argillite chips
28	B#5					
30						4:50 water from hole on bit return Produced some water, <0.1 gpm
31						Lost water at 31 becoming very clayey, fat clay. Sticking to drill stem, Harder chips at 33' Start again at 7:30
35						35: very little return cuttings, chips of argillite inter mixed w/ clay
37	B#6					Drying abit at 39', dusty cuttings
40						
42						

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PROJECT NAME: Section 35	Drill Hole No.	PAGE 3 OF 5	
DATE STARTED/FINISHED: 10-24 / 10-26	DRILLER:		
LOGGED BY:	DRILL TYPE:		
GROUND SURFACE ELEVATION:	HOLE DIAMETER:		
BOREHOLE LOCATION:	HAMMER TYPE:		

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
43	Vol		43	B#7					Blowing grey dust. Chips of argillitic/in volcanics Cuttings moist/dry clayey sand with gravel, grayish purple. Begin open hole. Cuttings: clayey saturated/ wet clayey sand. Some sign of bentonite (greenish clay chips)
44			44						
45	Clt Vol		45						
46			46						
47			47	B#8					
48			48						
49			49						
50			50						small amount of water on bit return
51			51						
52			52						Very clayey, very little cuttings.
53			53						
54	Vol less weathered	Chips becoming dusty at 55'	54						- Water entering hole, little bit too clayey to clear open hole
55			55						Switch Bobs to casing advancer
56			56						
57			57	B#9					Hard drilling at 54'
58		Cutting getting even more dusty.	58						Chips are argillite and less weathered volcanics, less altered, coming as chips not globs of clay. Chips are still clayey though
59			59						
60			60						Try open hole.
61			61	B#10					Water rose to 57' during switch
62			62						
63			63						→ more water less than 0.1 gal/min

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CLIENT:
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PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10/24/12-26-12

LOGGED BY: JR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. 7667 PAGE 4 OF 5

DRILLER: AXIS

DRILL TYPE: OK

HOLE DIAMETER: 4 1/2

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
64	Vol	
65		
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		
80		
81		
82		
83		
84		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
64						clay sand w/ gravel, saturated grey
65						Misting water from hole
66						Saturated grey clayey sand w/ gravel, Argillite chips some chips are hard, some chips are weathered clays
67	B#1					
68						
69						
70						Producing more water no more than 2-3 gal/min One long chip of argillite One large chip of black volcanic w/ epidote. 2" in size. (Chips)
71						
72	B#2					
73						
74						
75						Saturated, mucher weathered volcanics, still some clay Slight darker colored cutting.
76						
77						
78	B#3					
79						
80						
81						
82	B#4					- Slightly redder colored cuttings, bits of clay basalt, argillite and volcanic chips
83						
84						

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PHONE NUMBER:

PROJECT NAME: Section 35	Drill Hole No. 206D PAGE 5 OF 5
DATE STARTED/FINISHED: 10-24/10 - 26-12	DRILLER: Axis
LOGGED BY: JR	DRILL TYPE: DK
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 4 1/2
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
0			0						
1			1						producing ~13 gal/min still in volcanics. volcanics are much less weathered proportion of clay pieces is much smaller saturated clay gravel, chips of argillite and volcanics.
2			2						
3			3	B#15					
4			4						
5			5						
6			6						
7			7						
8			8	B#16					producing ~<3gal/min still in volcanics, volcanics are less weathered, still some clay though. chips are gravel of argillite and volcanics
9			9						
10			10						
11			11						
12			12						
13			13						Low water production, ~< 3gal/min. Volcanics and argillite. Chips are volcanics and argillite
14			14						
15			15						
16		End hole	16						
17			17						
18			18						
19			19						
20			20						
21			21						

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PROJECT NAME: Section 35

DATE STARTED/FINISHED: 10-29-12

LOGGED BY: JR

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. 208T PAGE 1 OF ~~X~~1

DRILLER: AXIS

DRILL TYPE: D12.

HOLE DIAMETER: 4 1/2

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
0		~~Moist~~ Reddish brown sandy clay w/ gravel, CL med plast
2	CL	
5		Moist Reddish brown sandy clay w/ gravel (CL), med plast
10		Moist Reddish brown sandy clay w/ gravel (CL) med plast
20		End Hole at 23'

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
0						Cuttings are moist, but blowing lots of dust.
3	BH1					
5						white dust w/ cuttings likely cobbles
7	BH2					
10						
13	BH3					
15						

Piezo
23-18 screen
23-18 sand
18-0 blank
18-0 Bent.

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PROJECT NAME: Section 35	Drill Hole No. SB-208 PAGE 1 OF 2
DATE STARTED/FINISHED: 10-26-12	DRILLER: AXIS
LOGGED BY: JR	DRILL TYPE: DK
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 4 1/2
BOREHOLE LOCATION:	HAMMER TYPE: Auto 140

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
0	OL		0						Cuttings are dusty clay sand w/ gravel. 12:30
1	SC		1						
2			2						
3	CL		3						
4			4						
5		reddish brown Wet/Saturated lean clay w/ gravel (CL) medium, med plast	5	SS#1 2"	10			18/18	Spoon w/ water on outside
6			6		11				
7		wet/saturated reddish brown sandy lean clay w/ gravel, med plast, med stiff	7	SS#2 1"	12				
8			8		5			18/18	Spoon w/ water on outside
9			9		6				
10		Wet/Saturated reddish brown sandy lean clay w/ gravel, med plasticity medium.	10	SS#1	19			10/10	
11			11	SS#3 1'	5			18/18	
12			12		7				
13			13		12				
14			14	BAG1					lean clay w/ gravel cuttings
15		moist reddish brown, sandy lean clay w/ gravel, med plast, medium stiff	15	SS#2				4/4	
16			16	SS#4 1"	8				
17			17		10				
18			18	BAG2	11				End 5th day / Start 10-29-12
19			19						Cutting: Sandy clay w/ gravel
20		moist reddish brown sandy lean clay w/ gravel (CL), med plast, med stiff	20	SS#2				4'6"/6'2"	
21			21						

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CLIENT:
ADDRESS:
PHONE NUMBER:

PROJECT NAME: 10-29-12 Section 35

DATE STARTED/FINISHED:

LOGGED BY: JR, MB

GROUND SURFACE ELEVATION:

BOREHOLE LOCATION:

Drill Hole No. 203

PAGE 2 OF 2

DRILLER: AXIS

DRILL TYPE:

HOLE DIAMETER:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22	CL	Moist, reddish brown sandy clay w/ gravel (CL), stiff, med plast.
25	Boulder	
27	Cobble	
30	GP-GC Argillite gravels	Saturated poorly sorted graded gravel w/ clay (GP-GC) Angular, Argillite
		Saturated poorly graded gravel w/ clay, Angular, Argillite
33	Argillite	Argillite, fractures have, filled veins w/ qtz.
40		End of hole
		Piezo Screen 40-35
		Sand 40-35
		Bent/Blank 35-0

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
22	SS#5 1'	9 10 12			16/18	SS#5 (20.7-22.3)
24	B#3					Cuttings: reddish brown sandy clay w/ gravel.
25						blowing dust at 24.9 boulder, qtz vein cuttings out of boulder at 25'
27	B#4					Intermixed clay and cobbles, clay sounding hammer, to blowing dust.
30						Cuttings, Sandy clay w/ gravel.
31	SS#6 2'	22 31			16/12	
32	SS#7 1'	6 12 18			9/10"	2" HEAVE ON TOP SOIL
33						
34	B#5					Water to 16' in casing on bit return producing ~4 gal/min
35						cuttings: Argillite chips
36						Poorly graded gravel w/ Sand Black, saturated.
37	B#6					Hard drilling, Angular Hard chips
38						cuttings: Black, gray Sand w/ gravel.
40						
42						

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PROJECT NAME: UBMC	Drill Hole No. 203B PAGE 1 OF 2		
DATE STARTED/FINISHED: 10/29/12	DRILLER: AXIS		
LOGGED BY: MB	DRILL TYPE: DAVEY KENT		
GROUND SURFACE ELEVATION:	HOLE DIAMETER:		
BOREHOLE LOCATION:	HAMMER TYPE: OBEY		

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
0	TOPSOIL	TOPSOIL; SANDY LEAN CLAY; MOIST; V. DARK BROWN; NO HCL; MED PL; GRASS ROOTS IN TOP 3"
1	SC	
2		CLAYEY SAND (SC) W/ SUB ANG GRAVEL; DAMP; REDDISH BROWN; MINUS #40 IS MP; NO HCL
3		
4	?	? ? ?
5		WELL GRADED SAND W/ SUB ANG GRAVEL; MOIST; BROWN; NP & COBBLES
6	SW	
7		
8		
9	?	? ? ?
10		SANDY LEAN CLAY W/ GRAVEL; MOIST; REDDISH BROWN; MED PL
11	CL	
12		
13		
14		
15		WELL GRADED SAND W/ CLAY & GRAVELS; MOIST; REDDISH BROWN; SUB ANG PARTICLES; SLIGHT TO NO PL
16	SW	
17		
18		
19		SANDY LEAN CLAY (CL) W/ GRAVEL; MOIST; REDDISH BROWN; MED PL;
20		
21		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
1	SPT 1 2½	X			16/18"	9-14-27
2	SPT 2 1'½	X			13/18"	20-25-19 HIGHER GRAVEL % FROM 1.5 - 3.0'
3						
4						
5	SPT 3 2½"	11 10 17				
6						
7	SPT 4 1'½	11 19 8			9½/18	9½" REC,
8						
9						
10	SPT 5 2½	28 17 18				
11						
12	SPT 6 1'½	7 10 12				
13						
14						
15	SPT 7 2½	20 26 25			18/18	8:16;60
16						
17	SPT 8 1½	14 17 12			11/18	
18						
19				X		DRILLER NOTES BOTTOM 1' OF RUN IS CLAYEY
20						8:21;15
21	12" Shelby 1		X		10/11	8:58:30 BOTTOM 1" CRUMPLED POCKET PEN AVE = 1.25 TSF

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PROJECT NAME: SFL 35	Drill Hole No. 203 B PAGE 2 OF 2
DATE STARTED/FINISHED: MB	DRILLER:
LOGGED BY:	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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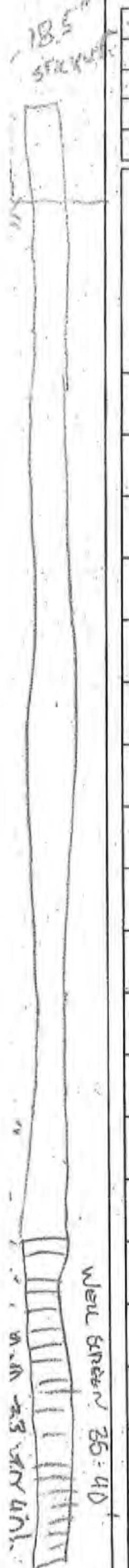
DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
21–22	CL	SANDY LEAN CLAY W/ GRAVEL (cont.) MOIST; REDDISH BROWN; MED PL. NO HCL	21–22	SPT 9 1½	3 8 10	-		18/18	[illegible] 2.25, 5, 5, 10
23–24			23–24				X		
25–26		25.25 TO 25.5 HIGHER SUB ANG GRAVEL CONTENT; SAMPLE IS WET	25–26	SPT 10 2½"	11 14 17			13/18	9:08:30 9:44:15
27		MOIST BELOW GRAVEL LAYER	27	SPT 11 1½	9 8 19			4/18	
28–29		GRAVELLY CLAY; WET; REDDISH BROWN; MED PL; SUB ANG.	28–29	~~S1~~	~~24/ 17/3"~~		~~X~~		
29–30		GRAVELLY CLAY W/ VOLCANICS VOLCANICS GREENISH IN COLOR, ONLY APPARENT IN SEAMS	30	SPT 12 1½	24/6" 17/2"				HARD, STOPPED SPT DUE TO HIGH BL
31–35	ARGILITE	ARGILITE; REDDISH BROWN; DAMP HARD DRILLING	31–35				CUTTINGS		ROCK FRAGMENTS ~3/8" FLYING
35–40		WET REDDISH BROWN	35–40				CUTTINGS		NO SPT 10:44:30 FLYING ROCK FRAGMENTS
40		BOH @ 40'	40						
41–42			41–42						



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PROJECT NAME:	Drill Hole No. 203 T PAGE 1 OF 1
DATE STARTED/FINISHED: 10/30/17	DRILLER:
LOGGED BY:	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

1½' STICKUP

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
1			1						ABOUT 5' NORTH OF MW 203B
2			2						BURNED THROUGH W/O SAMPLING
3			3						
4			4						
5			5						
6			6						
7	BENTONITE TO TOA (7–14')		7						DID NOT OBSERVE CUTTINGS; GETTING BENTONITE (to 10')
8			8						
9			9						
10		REDDISH BROWN; MOIST; SANDY CLAY	10				X		CUTTINGS (10–15')
11			11						
12			12						
13			13						
14	SAND 20 – 14'		14						
15		SOME REDDISH BROWN; MOIST SANDY CLAY & SOME SANDY GRAVEL	15				X		CUTTINGS (15–20')
16			16						
17			17						
18	SCREEN 15-20'		18						
19			19						
20		BOH @ 20'	20						
21			21						

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S35 SB-207

PROJECT NAME: UMBC SEC 35 | Drill Hole No. S35SB-207 PAGE 1 OF ___

DATE STARTED/FINISHED: 10/30/12 14:00 / | DRILLER: AMS

LOGGED BY: MR | DRILL TYPE:

GROUND SURFACE ELEVATION: | HOLE DIAMETER:

BOREHOLE LOCATION: | HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	DRILL RATE	REMARKS
0		TOPSOIL; V. DARK BROWN; MOIST; SANDY SILT W/ ORGANICS	0	SPT 2½"	2, 9, 17			14/18		14:50:40
1		GRAVELLY CLAY; MOIST; REDDISH BROWN; MED PL; GRAVELS ARE SUB ANG	1							
2			2	SPT 1½"	17, 18, 23			8/18"		
3			3							
4			4	BULK			X			GRAVEL IN SPT TIP
5			5							14:19:35 / 14:20
6			6	SPT 2½"	12, 13, 13			15/18		14:35:05
7			7	SPT 1½"	5, 9, 9			16/18		
8			8							— DUSTY CUTTINGS
9			9							
10			10							14:42:50
11		VOLCANICS HIGHLY WEATHERED ROCK GREENISH GRAY W/ RUST STAINING SOME PURPLE DAMP ↳ BREAKS DOWN TO SILTY SAND & CL	11	SPT 2½"	21, 44, 50/5"					15:15:30 — SAMPLER STUCK
12			12	SPT 1½"	15, 24			6/12		— DUSTY CUTTINGS DAMP, BROWN
13			13							
14			14							
15			15	1½ SPT	23					15:43:00
16			16							DUSTY CUTTINGS
17			17							
18			18							
19			19							~10 MIN TO GO THROUGH ROCK
20			20							16:05 / 16:06:40 — 1½' BOULDER 19 - 20.5
21			21							

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PROJECT NAME: SEC 35	Drill Hole No. 207 PAGE 2 OF 2
DATE STARTED/FINISHED: FINISH 10/21 ~ 10:15	DRILLER:
LOGGED BY: MB	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	DRIVE	UNDISTURBED	BULK	RECOVERY (%)	REMARKS
22		VOLCANICS CON'T GRAYISH MATRIX SAMPLE BREAKS DOWN TO G	22						
23			23						
24			24						
25		"	25	1½ SPT	16 22			10/12"	16:25:20 7:46:00 → STOP FOR DAY ON 8/30/12 → RESUME AUGERING ON 8/31/12 → DRILLER NOTED A LITTLE BIT OF WATER COLLECTED IN HOLE OVERNIGHT
26			26						
27			27						
28			28						
29			29						
30		WET BREAKS DOWN TO SANDY CLAY RUSTY YELLOW / BROWN MATRIX NO HCL	30	1½" SPT	18 33/2½"			9/9	~8:00 8:39:30 → BOUNCING ON ROCK ~10 BLOWS FOR 1ST 2" → NO INDICATION OF ROCK IN SPT ∴ VOLCANICS DRILL CUTTINGS THROUGHOUT SAMPLER
31			31						
32			32						
33			33						
34			34						
35		" WET / HARD BOH @ 35.25	35	1½ SPT				3/3	8:57:30 30/3"
36			36						
37			37						
38		BUILD WELL 2" PVC SLOTTED FROM 35-30 SAND 35 - 28 BENTONITE 0-28 → PULLED UP 26" WHEN TRIPPIN OUT	38						
39			39						
40			40						
41			41						
42			42						

ADDED PVC TO ... (STICK UP 44")

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CLIENT:
ADDRESS:
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S35 SB - 217

PROJECT NAME:	Drill Hole No. 217 PAGE 1 OF ___
DATE STARTED/FINISHED:	DRILLER:
LOGGED BY:	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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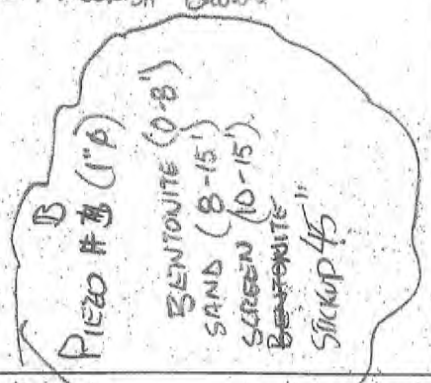
DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
0		TOPSOIL; DAMP; DARK BROWN; ORGANIC SANDY SILT W/ GRAVEL; GRASS ROOTS							
1		SANDY CLAY W/ GRAVEL; DAMP;	1	2½" SPT	9 14 19			18/18"	10:20:25
2			2	1½" SPT	11 14 16			3/18"	
3			3						
4		TO COMPLETELY	4	CUTTING			X		
5		HIGHLY WEATHERED ARGILITE	5						11:05:05
6		SANDY CLAY W/ ANGULAR GRAVEL	6	2½" SPT					
7		GRAVEL HAS RUST STAIN ON SURFACE HAS STRUCTURE & INCLUSIONS (YELLOW) WHEN BROKE APART	7	1½ SPT	7 7 7			0/18	*
8			8						
9		SOME GRAVEL PURPLISH IN COLOR;	9						
10			10						11:29:00 11:53:15
11		GRAVELLY CLAY W/ SAND; BROWN; MOIST; MED PL; SUB ROUNDED	11	2½" SPT	9 13 11				SAME STRUCTURE AS BUT HIGHER W% & COMPLETLY WEATHERED.
12			12	1½ SPT	5 7 10			13/18	
13			13						
14			14						
15		MOIST; REDDISH BROWN	15	SHELBY		X		9"	11:58:35 12:24:05 — TUBE BENT OBLONG MOST OF LENGTH
16			16	SPT 1½"	13 13 13			2/18"	
17			17						HIGH ROCK CONTENT
18			18						
19			19						
20			20	NO SAMPLE					→ STOPPED SPT DRILLER STATED HE WAS ON TOP OF ROCK
21			21						



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PROJECT NAME:	Drill Hole No. 217 PAGE 2 OF 2
DATE STARTED/FINISHED:	DRILLER:
LOGGED BY:	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

23" STICKUP

BENTONITE (15-22')
SAND (22-23')
SCREEN (23-28')
BENTONITE (28-30') PLUG

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22		DRILL CUTTINGS ARE @ GRAVELLY CLAY w/ SAND, REDDISH BROWN MOIST						ROCK? DRILLER NOTES OUT OF ROCK @ 21.5'
23								
24								
25	TILL	GRAVELLY CLAY; MOIST, REDDISH BROWN; MED PL (ROLLS TO 1/16" W/O ADDING H_2O) STIFF	SHELBY 2		X		9"	BOTTOM 1/2" CRUMPLED
26								13:20:00
27			1½" SPT	3 5 8			13/18	POCKET PEN = 0.25, 0.5 & 0.75
28		↳ NO STRUCTURE TO SOIL AS NOTED AT HIGHER DEPTHS.						
29		↳ 1½ SUBROUNDED PURPLISH GRAVEL STUCK IN SPT TIP						BOTTOM OF IRON ON ROCK
30								~15:30
31	VOLC	VOLCANICS MOIST; GRAY TO BROWNISH YELLOW, DARK	1½ SPT	4 50/5"			13/18	13:52:15 0.25=PP 1.5=PP
32								→ CUTTINGS CHANGE TO GRAY FROM BROWN
33	VOLC	MED TO HIGH PL; SOME SUB ANG GRAVEL FRAGMENTS.						
34		VOLCANICS MOIST TO WET; DARK GRAY BRAKES DOWN TO SANDY CLAY MED PL; SOME ANG. GRAVEL FRAGMENTS						
35			1½ SPT	8 14 4/1"			11/13	2:41:35
36								
37	VOLC	DRILL CUTTINGS ARE ROCK FRAGMENTS (WET & D. GRAY) & HARD VOLCANIC ROCK						
38								—
39								
40		BOH @ 40'						14:51:00 — DRILLED TO ROCK FOR SPT.
41		SCREEN 35-40', SAND 33-40', BENT. 0-33', STICKUP 44"						
42								

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MW-201B

Drill Hole No.

PAGE 1 OF ___

PROJECT NAME: SR 35	
DATE STARTED/FINISHED: 11/1/12	DRILLER: AXIS
LOGGED BY: MAB	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
0	TOP SOIL	TOP SOIL; SANDY SILT W/ SOME GRAVELS; LOW PL; DARK BROWN W/ TRACE YELLOW INCLUSIONS; DAMP; SOME ORGANIC ROOTS; NO HCL
4		? ? ? ?
5	TILL	SANDY CLAY (CL) W/ GRAVEL; MOIST; REDDISH BROWN; MED PL;
7		GRAVEL CONTENT DECREASES
10		
11		WET
12		12.25
13		CLAYEY, F. GRAIN SAND; MED PL; NO REACTION; WET; REDDISH BROWN W/ GRAVEL
14		OCCASIONAL LAYERS OF POORLY GRADED SAND
17		17.5
18		GRAVELS & COBBLES (WET) ↳ NOTED FROM CUTTINGS
19		19.0
20		CLAYEY, SANDY, GRAVEL; WET; REDDISH BROWN; LOW PL
21		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
1	2½ SPT	7 8 11			17/18	10:31:50
2	1½ SPT	8 10 15			7/18	
4	CUTTINGS					
5						10:40:00
6	2½ SPT W/ LINERS	6 6 6			15/18	10:56:55 ← RECOVERED 2 BASS LINERS W/ SAMPLE
7	SPT 1½	2 2 2			12/18	
10						11:01:30
10	SHELBY 2		X		8/10	BOTTOM 1" CRUMPLED ON LINER 10:24:30
12	1½ SPT	4 6 13			11/18	
13						ATTEMPTED 24" SHELBY PRIOR TO SPT's. END CRUMPLED (PUSHED 2") - NO RECOVERY
15						12:09:30
16	2½ SPT	9 13 12			14/18	
17	1½" SPT	5 8 12			13 AV 18	
19						LYLE STATED WATER SEALED OFF @ 19'
20						
21	2½ SPT	18 42 50			13/18	12:51:30

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TMW LOCATED BETWEEN ACCESS ROADS & ELM HILL

MW - 201 B

Drill Hole No.

PAGE 2 OF ___

PROJECT NAME: UBMC SEC 35	
DATE STARTED/FINISHED: 11/1/12	DRILLER: AXIS
LOGGED BY: MB	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22		SILTY SAND W/ GRAVEL; F. GRAIN; WET; REDDISH BROWN;
24	?	? ? ? ?
25	ARGILITE	HIGHLY WEATHERED ARGILITE HAS STRUCTURE WHEN SECONDARY → GRAVELLY CLAY W/ SAND. REDDISH BROWN; MOIST GRAVELS ARE SUB ANGULAR PURPLE VERY STIFF
30		VERY STIFF
35		BEDROCK
42		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22	1½ SPT	10 9 14			3/18	2½ SPT (SEE PG 1)
24						~13:05 BROWN
25	2½ SPT	13 16 27			18/18	~13:41
27	1½ SPT	9 13 19			13/18	27-28' LYLE NOTES CLAY
30	1½" SPT	6 9 13			18/18	14:25 SPOON IS WET BOT SAMPLE IS ONLY MOIST WHEN BROKE → MAY NEED TO BAIL PIEZ BEFORE READING
35						14:46 → DOWN A ROCK 14:58 NO SPT
40						15:19 → TO HARD FOR SPT 15:21
42						

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MW - 2015

Drill Hole No.

PAGE 3 OF ___

PROJECT NAME:	
DATE STARTED/FINISHED:	DRILLER:
LOGGED BY:	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
43		BEDROCK CONT	43						
44			44						
45		BOH @ APX 44'	45						
46			46						
47			47						
48		2" PVC PIEZO	48						
49		5' SCREEN FROM 39' TO 44'	49						
50		7' SAND FROM 37' TO 44'	50						
51		BENTONITE TO SURFACE	51						
52			52						
53			53						
54			54						
55			55						
56			56						
57			57						
58			58						
59			59						
60			60						
61			61						
62			62						
63			63						

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S35 SB-216

PROJECT NAME: VBMC SEC 35 | Drill Hole No. | PAGE 1 OF ___

DATE STARTED/FINISHED: 11/2/12 | DRILLER: AXIS

LOGGED BY: MB | DRILL TYPE: D-K

GROUND SURFACE ELEVATION: | HOLE DIAMETER:

BOREHOLE LOCATION: | HAMMER TYPE: STANLEY

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
0.75	TOP SOIL	TOP SOIL (SANDY SILT W/ TRACE SUBANG GRAVEL) V DARK BROWN; MOIST; ORGANIC ROOTS	2½ SPT			X	18/18	11:55:50
1	GC	GRAVELLY CLAY W/ SAND (GC); DAMP; MED PL; BROWN; GRAVELS ARE SUBROUNDED; NO HCL	1½ SPT	18 17 16			4/18	→ POUND GRAVEL/COBBLE FRAGMENTS IN SPOON
5						X		W/ LINERS
6			2½ SPT	14 16 20			15/18	12:20:50 BRASS LINER
7			1½ SPT	11 15 19			3/18	→ TOP OF SLUFF IN HOLE
9		VOLCANIC BEDROCK; MOIST; PRIMARILY DARK BROWNISH GRAY W/ FREQUENT ~~ORANGE~~ ZONES OF RUSTY YELLOW; PURPLE				X		W/ LINERS 12:24:30
11		↳ BREAKS DOWN TO A FINE GRAIN GRAVEY SAND LOW PL	2½ SPT	16 81 50/5½			14/18	12:53:30 GOOD BRASS TUBE SAMPLES
12			1½ SPT	15 26 50/4		½"	17/18	
14						X		→ HARDER DRILLING LARGER ROCK FRAGMENTS
15								13:03:35
16			1½ SPT	12 16 22			14/18	13:25:30
19						X		13:33:20
20		LIGHT GREENISH GRAY W/ PURPLE DAMP	1½ SPT	15 21 23			18/18	13:37:15

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PROJECT NAME:	Drill Hole No. 216 PAGE 2 OF 2
DATE STARTED/FINISHED:	DRILLER:
LOGGED BY:	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22		VERY HARD; DUSTY CUTTINGS						~20 MIN FOR RUN
23								
24								
25								TO HARD FOR SPT LYCE SWITCHING TO OPEN HOLE HAMMER
26		"						
27								
28								
29								
30		"						NO SPT
31								
32								
33								
34								
35		BOH @ 35'						
36		SB-216A						
37		PIEZO #1 SCREEN 25-35' SAND 23-35' STICKUP 19"						
38		BOT 36.40						
39		SB-216B						
40		PIEZO #2 SCREEN 10-15 SAND 8-15						
41		BOT @ 18.03 STICKUP 41"						
42								

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MW-201T 11/2/12

↳ NOT LOGGED, WENT TO TREATMENT PLANT TO GET SUPPLIES WHILE LYLE DRILLED.

↳ "8' WEST OF MW-201B

↳ 2" PVC MONITORING WELL

DRILLED 24'

SCREEN 14 - 24'

SAND 12 - 24'

BENT 0 - 12'

STICKUP = 39" = MP

GW = 12.88" FROM MP

Drill Hole No. 213

PAGE 1 OF 3

PROJECT NAME: Section 35	DRILLER: Axis
DATE STARTED/FINISHED: 11-5-12	DRILL TYPE: D.K.
LOGGED BY: JR	HOLE DIAMETER:
GROUND SURFACE ELEVATION:	HAMMER TYPE: 140 Auto
BOREHOLE LOCATION:	

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
0	OL	moist dark brown silt SOIL	3" SS#1	2 1			18/18	
1			SS#2	21				
2			2" SS#3	15 15 15			11/18	
3	SM	Dry w/ trace pink silty sandy gravel (SM) low plast Stiff.						
4								Cuttings are dusty
5	CL	Moist reddish brown lean clay w/ gravel Stiff. Med plast	SS#4 3"	15 17 14			14/18	T.P. H.1 P.P 3.5
6								
7		moist reddish brown lean clay w/ sand and gravel. Stiff. med plast Small sand lense at 7.75', ~ 1/2" wide	SS#5 2"	7 9 12			14/18	P.P. 2.5 P.P 2.5
8								
9								
10		moist reddish brown lean clay w/ gravel, stiff, med plast	ST#1				7/7.5	
11		moist reddish brown lean clay w/ gravel (CL). Stiff med. plast.	SS#6 2"	7 8 10			14/18	
12								
13			B#1				1	
14								
15	SC	moist to wet reddish brown clay sand w/ gravel. very stiff med plast - Interbedded w/ CL	SS#7 3"	18 17 26			16/18	Cobble in spoon ø2"
16	CL	moist/wet reddish brown Lean clay w/ sand and gravel med plast. Stiff	SS#8 2"	12 15 14			15/18	outside of Spoon is wet - P.P. 3.2 P.P. 3.0
17	SC							
18	CL							
19	boulder		B#2					Dusty cuttings Cobble/boulder at 19' put on open hole hammer.
20			3" SS#9	50			0/18	50/0" No Recovery
21								

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PROJECT NAME: Sochin 35	Drill Hole No. SB-213 PAGE 2 OF 3
DATE STARTED/FINISHED: 11-5-12	DRILLER: AXIS
LOGGED BY: JR	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NO. DEPTH	DRIVE	UNDISTURBED	BULK	RECOVERY (%)	REMARKS
21–22	GC							
22–24								Large boulders. open hole. Cuttings come up 1" dia w/ reddish lean clay stuck to it.
25–26		moist reddish brown clayey gravel w/ sand. (GC)						Cuttings are bits of clay sand, and lean clay w/ chips up to 1½" dia
27			B#3			X		
28–29								Drill states it will be difficult to get casing thru. should consider open hole the rest.
30	CL	Moist yellowish brown lean clay w/ gravel. limonite secondary soil. Similar to 208 just before bedrock	SS#10 2"	7, 10, 12, 18				6" of heave/collapse. Doesn't appear to be weathered rock, looks like fill, matrix is clay soil granules of volcanics argillite
33			B#4			X	1	Cutting change to Purple/brown Volcanics at 33'
35–37	CL	moist purplish brown, lean clay w/ gravel	SS#11 2"	7, 10, 11, 14				11-6-12 water at ~20' in morning
38–39	CH							Cuttings are sticking to rods high plasticity
40–41		Saturated yellowish brown fat clay w/ gravel, organics! medium. gravels are ~½ dia	ST#2		X		8/8	
41.5			SS#11 [?]	14, 15				clays are limonitic, purple and greenish white, weather ash flow w/ argillite chips
42	VOL	Moist purple/gray gravel w/ clay (GC) weather volcanics w/ argillite chips maybe bentonite chips on sample	SS#12	19				

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PROJECT NAME: Section 35	Drill Hole No. SB-213 PAGE 3 OF 3
DATE STARTED/FINISHED: 10-5-12	DRILLER: AXIS
LOGGED BY: JR	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
42–45	VOL		42–45						minor amount of chips on return. casing clogged with fat clay from above chips are weathered vol.
45		End hole 45'	45						
45–47			45–47	ST# 3					Cutting from hole in ST# 3. had to push sample thru clogged casing. to stick to blow out w/air
47–48.5			47–48.5	SS# 13 2"	12 13 43				last 6" stiff.
49–52			49–52						Piezo 46-41 Screen 46-37 Sand - may be mixed w/clay 37-34.5 bentonite
53			53						
54			54						
55			55						
56			56						
57			57						
58			58						
59			59						
60			60						
61			61						
62			62						
63			63						

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PROJECT NAME: Section 35	Drill Hole No. SB-215 PAGE 1 OF 3
DATE STARTED/FINISHED: 11-6-12	DRILLER: Axis
LOGGED BY: JP	DRILL TYPE: DK.
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 4 1/2
BOREHOLE LOCATION:	HAMMER TYPE: Auto 140

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
0	OL	Organic Soil, moist, roots
1	SC	pinkish red dry sandy clay (SC) w/ gravel
2		
3		Dry pinkish red clayey sand (SC) w/ gravel stiff, med/Low plast.
4		
5	GP/GC	moist reddish brown poorly graded gravel w/ clay. Very Stiff med plastic clay
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		Moist reddish brown clayey sand w/ gravel (SC) medium, Low plast
16	SC	
17		
18		
19		
20		moist/wet reddish brown clayey sand (SC) medium, Low plast
21		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
0	SS#1	3				
1	3'	11			16/18	
	SS#2	19				
2		12				
	SS#3	13			17/18	
3	2'	12				Dusty Cuttings.
4		7				
5	SS#4	11			16/18	Spoon very hard to retrieve
6	3'	21				
7		19				
8	B#1					Cuttings moist reddish brown poorly graded gravel w/ clay or clayey gravel - drilled cobbles for entire run. low plastic fines
9						
10						
11						Dusty.
12	B#2					Cuttings moist reddish brown poorly graded gravel w/ clay.
13						
14						
15	SS#5	22			5/18	
16		50				
17						
18	B#3					
19						
20	SS#6			5		Spoon is wet PP 2.5 PP 2.5 PP 2.0
21				6		
				8		

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PROJECT NAME: Section 35	Drill Hole No. SB-215 PAGE 2 OF 3
DATE STARTED/FINISHED: 11-6-12	DRILLER: AXS
LOGGED BY: SB	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
22	GC	
23		
24		
25		Saturated Reddish brown clayey gravel w/sand stiff. med/low plast
26		
27		
28		
29		
30		Saturated.
31		
32		
33	boulder	
34	GC	
35		Wet/saturated reddish brown lean clay w/ gravel CL
36	CL	
37		
38		
39		
40	GC	moist reddish brown lean clay w/sand stiff, med/low plast
41		
42		

11-7-12 ▽

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22						
23	B#4					Rock at 22.5 Rock to 25'
24						
25		14				on boulder no sample Wet spoon
26	SS#7 3"	19 19			6/18	Back in bit Cuttings: moist reddish brown clayey gravel w/sand.
27						
28	B#5					
29						
30	SS#8	7				
31	2"	9 11			1/18	Saturated spoon trace organics in spoon mist of water on bit retrieval
32						
33	B#6					1' boulder, qtzite 33-34
34						Cutting: moist reddish brown clayey gravel
35	SS#9	5				
36	2"	11 13			8/18	Stop for day 4:50 water at 33' in morning
37						
38	B#7					
39						Cuttings: moist reddish brown clayey gravel.
40	SS#10	6				P.P. = 2.0
41	3"	11 12				P.P. = 1.5
42						

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PROJECT NAME: Section 35	Drill Hole No. 93-215 PAGE 3 OF 3
DATE STARTED/FINISHED: 11-6-12	DRILLER: Axis
LOGGED BY: JR	DRILL TYPE: D.K. ODEX
GROUND SURFACE ELEVATION:	HOLE DIAMETER: 4 1/2
BOREHOLE LOCATION:	HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION
43	GC	
44		
45		Moist reddish brown clayey gravel GC Very stiff. med plast.
46		
47		
48		
49		
50	GC	Moist reddish brown clayey gravel GC. Very Stiff, med/low plast
51		
52		
53		
54		
55	GC	moist reddish brown clayey gravel w/sand stiff med plast.
56		End Hole
57		
58		
59		
60		
61		
62		
63		

DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
43	BS#8					Cuttings clayey gravel moist reddish brown. drilling cobbles and CL
44						
45						
46	SS#7 3"	8 16 34			12/18	Tried S.L. to good too much gravel
47						drilling grav
48						
49						
50	SS#8 3"	13 20 23				Want to get bulk and sand from UD
51						
52						
53						
54						
55	SS#9 2"	6 10 13				P.P. 3.5 P.P. 3.5 P.P. 3.0 End hole
56						
57						
58						
59						
60						
61						
62						
63						

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Drill Hole No. SB-212 PAGE 1 OF 3

PROJECT NAME: Section 35	DRILLER: Axis
DATE STARTED/FINISHED: 11-7-12	DRILL TYPE:
LOGGED BY: JR	HOLE DIAMETER:
GROUND SURFACE ELEVATION:	HAMMER TYPE:
BOREHOLE LOCATION:	

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES DRIVE	SAMPLES UNDISTURBED	SAMPLES BULK	RECOVERY (%)	REMARKS
0	QL	Dry Pinkish white clayey sand (SC)	0	SS#1	5			7/18	
1	SC		1	SS#2 3'	12 16				
2		Dry pinkish white clayey sand (SC) ~~stiff~~ stiff. Low plast.	2	SS#3 2"	10 12 14			6/18	Rock
3			3						
4	GC		4						Dusty
5		Dry, pinkish white clayey gravel GC. very stiff low plast fines.	5	SS#4	17				Sandslike rock
6			6	3'	27			8/18	
7		Dry pinkish white clayey gravel w/sand (GC) very stiff, low plastic fines.	7	SS#5	8				
8			8	2'	27 21 15			12/24	
9			9	BH#1					
10		Moist reddish brown clayey gravel w/ sand. very stiff, med plast.	10	SS#6	10				
11			11	3'	12 23			18/18	
12		moist/wet brown/red clayey clayey gravel w/sand very stiff. low/ med plastic fines.	12	SS#7 2"	11 12 18				Rocks during drive
13			13						
14			14	BH#2					Cuttings clayey gravel boulder w/1.0' dia at 13.5-14.5
15		Moist reddish brown clayey gravel w/sand. very stiff, med/low plast	15	SS#8	12				
16			16	3"	8 50/5				~ 50/5 Stopped at 20 for 3"
17			17						
18			18						Open Hole
19	Vol		19						
20		Moist purple gray clayey gravel stiff. low plast.	20	SS#9 2"	14 17				Maybe tuffs.
21			21						

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PROJECT NAME: Section 35		Drill Hole No. SB-212	PAGE 2 OF 3
DATE STARTED/FINISHED: 11-7-12		DRILLER: AXIS	
LOGGED BY: JR		DRILL TYPE: ODEX	
GROUND SURFACE ELEVATION:		HOLE DIAMETER:	
BOREHOLE LOCATION:		HAMMER TYPE:	

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
22	Vol		22						Cutting gravels w/ clay purple
23	Arg.		23	B#4					
24			24	B#5					Hole collapsed.
25		dry, yellow tans fractured argillit	25						blow out, too big to blow fry pound
26			26						B#5 (Carried material up from
27			27						
28			28	B#6					Hard, fractured argillite
29			29						
30		Dry yellow tan gravel, fractured argillite.	30						
31			31						
32			32						
33			33	B#7					
34			34						
35			35						
36			36						Dusty cuttings
37			37						
38			38	B#8					
39			39						
40			40						
41			41						
42			42						

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PROJECT NAME: Section 35

Drill Hole No. 212

DATE STARTED/FINISHED:

DRILLER:

LOGGED BY:

DRILL TYPE:

GROUND SURFACE ELEVATION:

HOLE DIAMETER:

BOREHOLE LOCATION:

HAMMER TYPE:

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DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
43–63		More competent angulat End Hole 50' Screen 50-45 Sand 50-22 Bent 22-15 Screen 15-10 Sand 15-5 Bent 5-0	43–63	B#9 B#10					

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ADDRESS:

PHONE NUMBER:

PROJECT NAME: Schon 35	Drill Hole No. PZ-01T PAGE 1 OF 1
DATE STARTED/FINISHED: 11-8-12	DRILLER: Axis
LOGGED BY: JR	DRILL TYPE:
GROUND SURFACE ELEVATION:	HOLE DIAMETER:
BOREHOLE LOCATION:	HAMMER TYPE:

DEPTH (FT)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (FT)	SAMPLE NO. DEPTH	SAMPLES: DRIVE	SAMPLES: UNDISTURBED	SAMPLES: BULK	RECOVERY (%)	REMARKS
1–21		This log is part of a report prepared by Piedmont Engineering, Inc. for this project and should be read with the report. This summary applies only at the location of the boring and at the time of the drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	1–21	B#1 3 B#2 8 B#3 12					

TILL

Screen 15-10
Blank 10-0
Sand 15-[illegible]5
Bentonite

PIONEER TECHNICAL SERVICES, INC.
1215 APPLES WAY
BELGRADE, MONTANA 59714
(406) 388-8578

CLIENT:
ADDRESS:
PHONE NUMBER:

APPENDIX B

PHOTO DOCUMENTATION

APPENDIX B.1

PHOTO DOCUMENTATION - TEST PIT PHOTOS

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 1 | Date - October 5, 2012

Description - S35TP-101. Looking Northeast | Project - Section 35 Repository Design Investigation

Picture # - 2 | Date - October 5, 2012

Description - S35TP-101. Final Excavated Depth at 17.2' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 3 | Date - October 2, 2012

Description - S35TP-102. Looking West | Project - Section 35 Repository Design Investigation

Picture # - 4 | Date - October 2, 2012

Description - S35TP-102. Final Excavated Depth at 16' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 5 | Date - October 2, 2012

Description - S35TP-102. Glacial Till Excavated from 0' to 11' | Project - Section 35 Repository Design Investigation

Picture # - 6 | Date - October 2, 2012

Description - S35TP-102. Tuff Bedrock Excavated at 13.5' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 7	Date - October 5, 2012
Description - S35TP-103. Looking Northwest	Project - Section 35 Repository Design Investigation

Picture # - 8	Date - October 5, 2012
Description - S35TP-103. Glacial Till from 0' to 5'	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 9 | Date - October 5, 2012

Description - S35TP-103. Final Excavated Depth at 16.7' | Project - Section 35 Repository Design Investigation

Picture # - 10 | Date - October 5, 2012

Description - S35TP-103. Glacial Till Excavated from 0' to 16.7' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 11	Date - October 2, 2012
Description - S35TP-104. Looking Northeast	Project - Section 35 Repository Design Investigation

Picture # - 12	Date - October 2, 2012
Description - S35TP-104. Glacial Till From 0' to 4.5'	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 13 | Date - October 2, 2012

Description - S35TP-104. Final Excavated Depth at 17' | Project - Section 35 Repository Design Investigation

Picture # - 14 | Date - October 2, 2012

Description - S35TP-104. Glacial Till Excavated from 0' to 17' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 15 | Date - October 3, 2012

Description - S35TP-105. Glacial Till from 0' to 4' | Project - Section 35 Repository Design Investigation

Picture # - 16 | Date - October 3, 2012

Description - S35TP-105. Final Excavated Depth at 17.5' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 17
Description - S35TP-105. Glacial Till Excavated from 0' to 16.5'

Date - October 3, 2012
Project - Section 35 Repository Design Investigation

Picture # - 18
Description - S35TP-105. Pockets of Wet Gravelly Sand Excavated from 16.5' to 17.5'

Date - October 3, 2012
Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 19 | Date - October 4, 2012

Description - S35TP-106. Looking Southeast | Project - Section 35 Repository Design Investigation

Picture # - 20 | Date - October 4, 2012

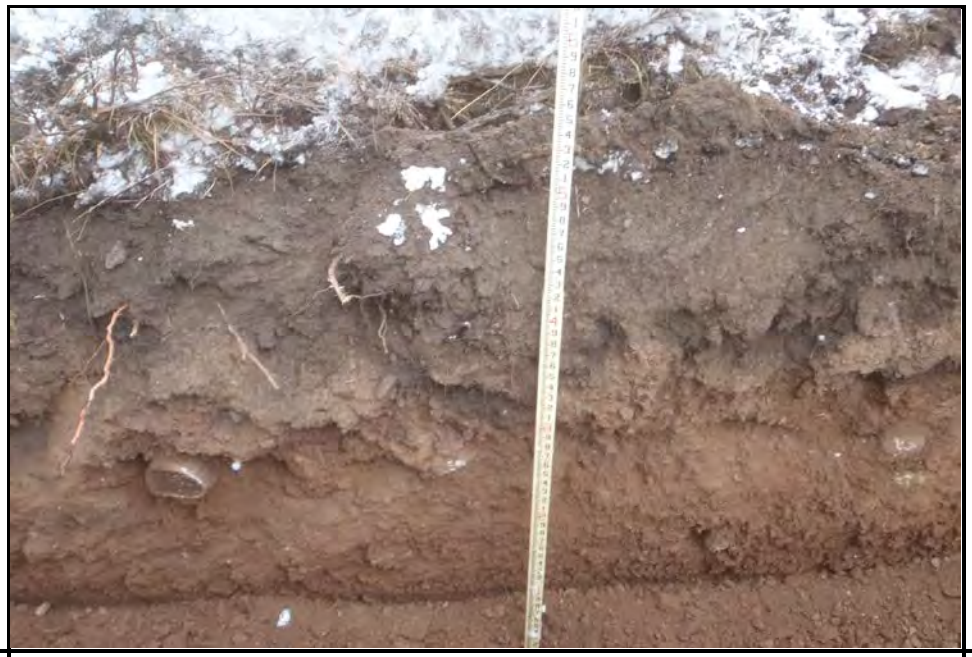
Description - S35TP-106. Final Excavated Depth at 18.2' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 21 | Date - October 3, 2012

Description - S35TP-107. Looking South | Project - Section 35 Repository Design Investigation



Picture # - 22 | Date - October 3, 2012

Description - S35TP-107. Glacial Till from 0' to 5' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 23 | Date - October 3, 2012

Description - S35TP-107. Final Excavated Depth at 16' | Project - Section 35 Repository Design Investigation

Picture # - 24 | Date - October 3, 2012

Description - S35TP-107. Looking South After Backfilling | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 25	Date - October 2, 2012
Description - S35TP-108. Glacial Till from 0' to 16.1'	Project - Section 35 Repository Design Investigation

Picture # - 26	Date - October 2, 2012
Description - S35TP-108. Final Excavated Depth at 16.1'	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 27
Description - S35TP-108. Interbedded Cobbles and Boulders from 0' to 16.1'

Date - October 2, 2012
Project - Section 35 Repository Design Investigation

Picture # - 28
Description - S35TP-108. Iron Staining on Interbedded Cobble at 15'

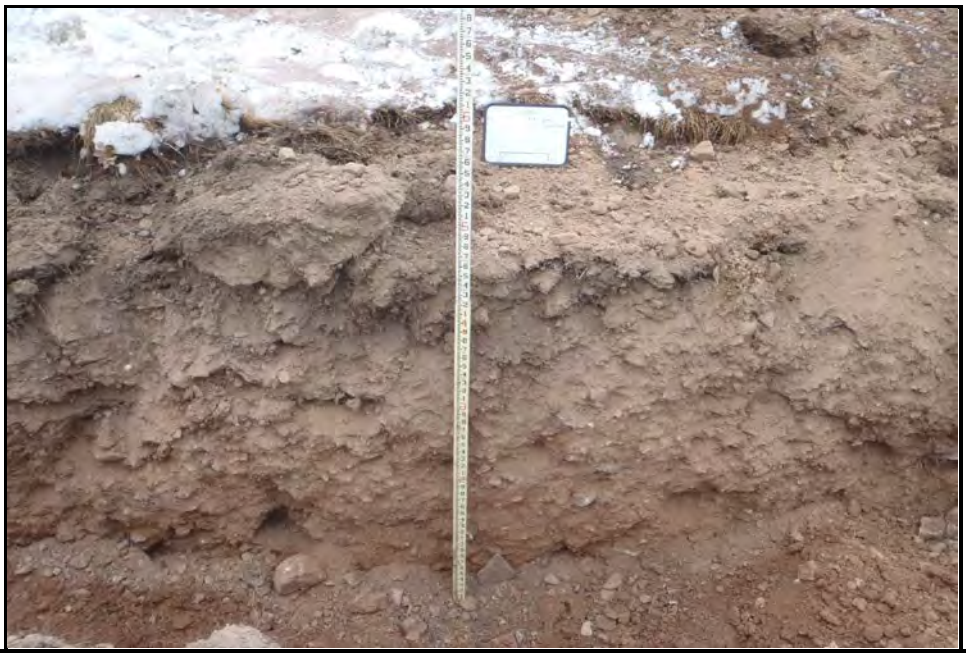
Date - October 2, 2012
Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 29 | Date - October 4, 2012

Description - S35TP-109. Looking West | Project - Section 35 Repository Design Investigation



Picture # - 30 | Date - October 4, 2012

Description - S35TP-109. Glacial Till from 0' to 5.5' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 31 | Date - October 4, 2012

Description - S35TP-109. Final Excavated Depth at 17.6' | Project - Section 35 Repository Design Investigation

Picture # - 32 | Date - October 4, 2012

Description - S35TP-109. Excavated Glacial Till from 0' to 17.6' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 33 | Date - October 5, 2012

Description - S35TP-110. Glacial Till from 0' to 4.5' | Project - Section 35 Repository Design Investigation

Picture # - 34 | Date - October 5, 2012

Description - S35TP-110. Final Excavated Depth at 17.5' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 35 | Date - October 3, 2012

Description - S35TP-111. Looking Northeast | Project - Section 35 Repository Design Investigation

Picture # - 36 | Date - October 3, 2012

Description - S35TP-111. Excavation from 0' to 16' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 37
Description - S35TP-111. Final Excavation Depth at 18.7'. Water Flowing out of Sand and Gravel Layer from 16' to 17'

Date - October 3, 2012
Project - Section 35 Repository Design Investigation

Picture # - 38
Description - S35TP-111. Excavated Wet Sand and Gravel from 16' to 17'

Date - October 3, 2012
Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 39 | Date - October 4, 2012

Description - S35TP-112. Looking East | Project - Section 35 Repository Design Investigation

Picture # - 40 | Date - October 4, 2012

Description - S35TP-112. Sand and Gravel from 2' to 4.5' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 41	Date - October 4, 2012
Description - S35TP-112. Final Excavated Depth at 16.5'	Project - Section 35 Repository Design Investigation

Picture # - 42	Date - October 4, 2012
Description - S35TP-112. Excavated Sand and Gravel from 0' to 16.5'	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 43 | Date - October 4, 2012

Description - S35TP-112. Silt Layer from 7' to 9' | Project - Section 35 Repository Design Investigation

Picture # - 44 | Date - October 4, 2012

Description - S35TP-113. Looking East | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 45 | Date - October 4, 2012

Description - S35TP-113. Sand and Gravel from 1.2' to 4' | Project - Section 35 Repository Design Investigation

Picture # - 46 | Date - October 4, 2012

Description - S35TP-113. Final Excavated Depth at 17' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Test Pit Photo Summary

Picture # - 47 | Date - October 4, 2012

Description - S35TP-113. Sand from 7' to 10' | Project - Section 35 Repository Design Investigation

Picture # - 48 | Date - October 4, 2012

Description - S35TP-113. Wet Sand and Gravel from 16.5' to 17' | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

APPENDIX B.2

PHOTO DOCUMENTATION - SOIL BORING PHOTOS

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 1	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

Picture # - 2	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 3	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

Picture # - 4	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 5	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

Picture # - 6	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 7	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

Picture # - 8	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 9	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

Picture # - 10	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 11	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

Picture # - 12	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 13	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

Picture # - 14	Date - October 29, 2012
Description - S35MW-201B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 15	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

Picture # - 16	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 17	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

Picture # - 18	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 19	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

Picture # - 20	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 21	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

Picture # - 22	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 23	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

Picture # - 24	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 25	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

Picture # - 26	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 27	Date - October 29, 2012
Description - S35MW-203B	Project - Section 35 Repository Design Investigation

Picture # - 28	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 29	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

Picture # - 30	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 31	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

Picture # - 32	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 33	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

Picture # - 34	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 35	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

Picture # - 36	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

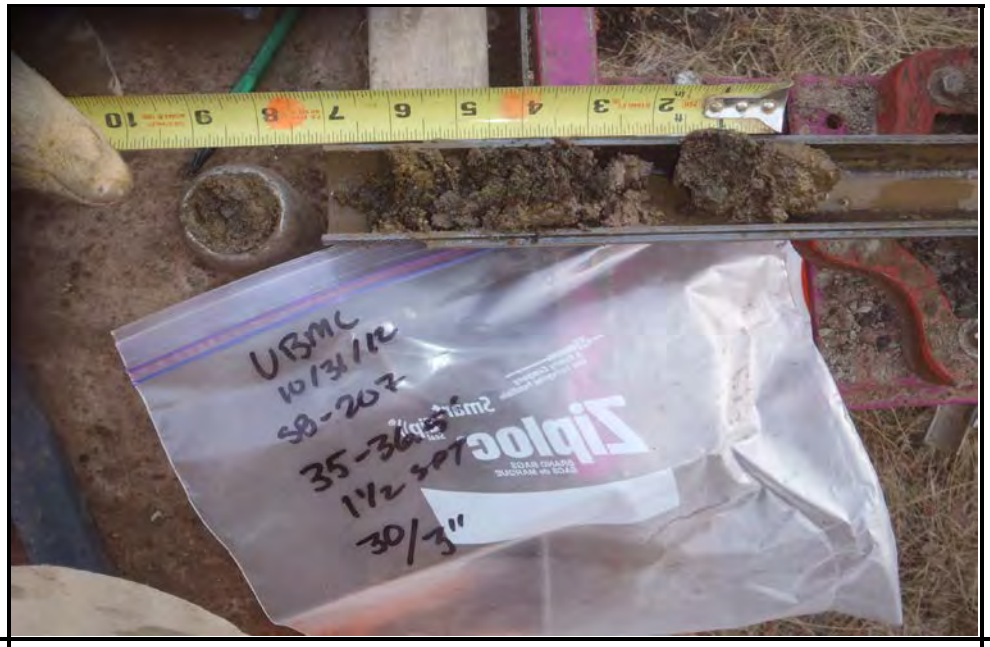
Picture # - 37	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

Picture # - 38	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 39	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation



Picture # - 40	Date - October 29, 2012
Description - S35SB-207	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 41	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

Picture # - 42	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 43	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

Picture # - 44	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 45	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

Picture # - 46	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 47	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

Picture # - 48	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 49	Date - October 29, 2012
Description - S35SB-216	Project - Section 35 Repository Design Investigation

Picture # - 50	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 51	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

Picture # - 52	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 53	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

Picture # - 54	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 55	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

Picture # - 56	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 57	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

Picture # - 58	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 59	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

Picture # - 60	Date - October 29, 2012
Description - S35SB-217	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 61 | Date - October 29, 2012

Description - S35SB-217 | Project - Section 35 Repository Design Investigation

Picture # - 62 | Date - October 29, 2012

Description - S35SB-206D soil boring location | Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 63	Date - October 29, 2012
Description - S35SB-206D, Depth 72' bgs	Project - Section 35 Repository Design Investigation

Picture # - 64	Date - October 29, 2012
Description - S35SB-206D, Depth 72' bgs	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

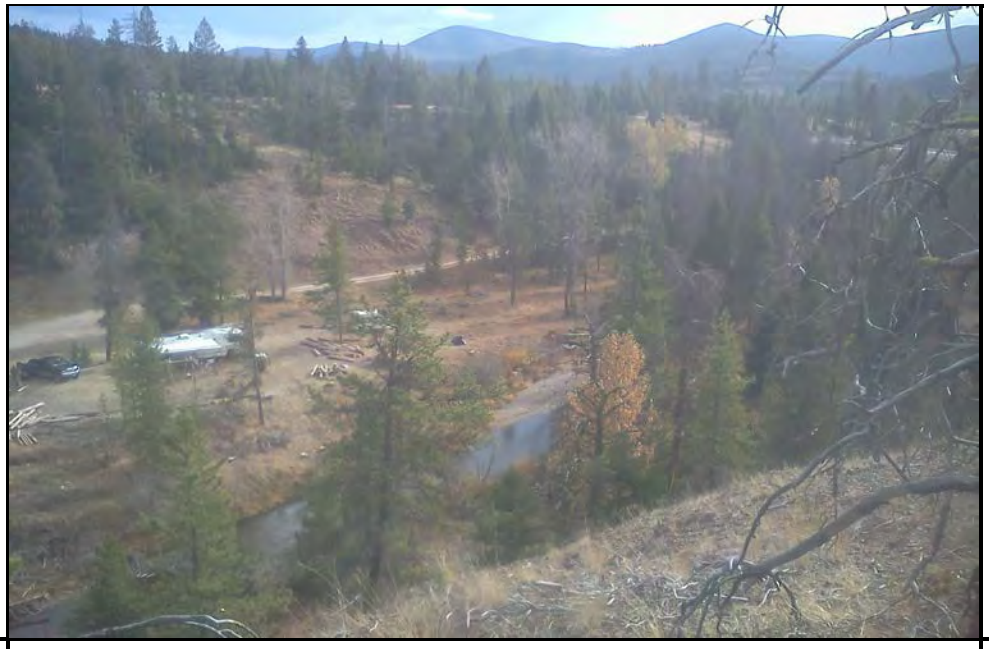
Picture # - 65	Date - October 29, 2012
Description -View of site from Northwest, across Blackfoot River	Project - Section 35 Repository Design Investigation

Picture # - 66	Date - October 29, 2012
Description - View of site from Northwest, across Blackfoot River	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 67	Date - October 29, 2012
Description -View of site from Northwest, across Blackfoot River	Project - Section 35 Repository Design Investigation



Picture # - 68	Date - October 29, 2012
Description - View of Site from Northwest, across Blackfoot River	Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

UBMC Section 35 Design Investigation
Data Summary Report
Soil Boring Photo Summary

Picture # - 69
Description - Tuff unit, exposed northwest of site along Blackfoot River cutbank

Date - October 29, 2012
Project - Section 35 Repository Design Investigation

Picture # - 70
Description - Tuff unit, exposed northwest of site along Blackfoot River cutbank

Date - October 29, 2012
Project - Section 35 Repository Design Investigation

PIONEER TECHNICAL SERVICES, INC.

APPENDIX C

GEOTECHNICAL LABORATORY DATA

APPENDIX C.1

GEOTECHNICAL LABORATORY DATA - TEST PIT GEOTECHNICAL DATA

PIONEER TECHNICAL SERVICES, INC.
201 East Broadway, Suite C
Helena, Montana 59601
Phone (406)457-8252 Fax (406)442-1158
www.pioneer-technical.com

Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation **Project Number:** 10180

Lab No:	13324	13325	13326	13327	13328	13329	13330	13332	13333	13335
BH or Loc:	S35TP-101	S35TP-101	S35TP-101	S35TP-101	S35TP-101	S35TP-101	S35TP-102	S35TP-102	S35TP-102	S35TP-103
Depth:	0.0-0.7	0.7-1.7	2.5-3.5	8.2-9.2	17.0-17.2	8.2-9.2	0.0-0.7	9.0-10.0	13.0-13.5	0.0-1.4
Date Tested:										
Wet Wt, & Pan (g):	2599.4	290.5	1897.1	1867.4	933.5	1606.5	294.0	1553.4	1760.3	260.1
Dry Wt, & Pan (g):	2471.4	263.4	1719.8	1635.4	842.7	1374.5	274.8	1401.3	1502.0	246.0
Loss of Moisture	128.0	27.1	177.3	232.0	90.8	232.0	19.2	152.1	258.3	14.2
Wt. of Pan (g):	193.0	32.4	196.1	193.6	182.7	195.2	34.0	381.7	391.0	25.0
Wt. of Dry Soil (g):	2278.4	231.0	1523.7	1441.8	660.0	1179.3	240.8	1019.6	1111.0	220.9
M. Content (%):	**6**	**12**	**12**	**16**	**14**	**20**	**8**	**15**	**23**	**6**

Lab No:	13336	13337	13338	13342	13344	13345	13350	13351	13353	13354
BH or Loc:	S35TP-103	S35TP-103	S35TP-103	S35TP-104	S35TP-105	S35TP-105	S35TP-106	S35TP-106	S35TP-107	S35TP-107
Depth:	4.5-5.5	8.5-9.5	16.7-17.7	15.0-17.0	3.0-4.0	8.0-9.0	8.4-9.4	17.2-18.2	1.7-5.2	9.0-10.0
Date Tested:										
Wet Wt, & Pan (g):	2619.0	2619.6	2744.1	2705.3	2084.7	1526.0	1043.9	1658.6	2434.8	3088.2
Dry Wt, & Pan (g):	2461.7	2417.7	2515.8	2432.2	1964.6	1428.8	982.6	1516.5	2200.8	2925.5
Loss of Moisture	157.3	201.9	228.3	273.1	120.1	97.2	61.3	142.1	234.0	162.7
Wt. of Pan (g):	381.7	377.0	388.8	391.3	383.3	392.0	188.5	34.9	34.8	34.9
Wt. of Dry Soil (g):	2080.0	2040.7	2127.0	2040.9	1581.3	1036.8	794.1	1481.6	2166.0	2890.6
M. Content (%):	**8**	**10**	**11**	**13**	**8**	**9**	**8**	**10**	**11**	**6**

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201 East Broadway, Suite C
Helena, Montana 59601
Phone (406)457-8252 Fax (406)442-1158
www.pioneer-technical.com

Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation **Project Number:** 10180

Lab No:	**13355**	**13362**	**13364**	**13366**	**13367**	**13368**	**13370**	**13376**	**13377**	**13379**
BH or Loc:	S35TP-107	S35TP-109	S35TP-109	S35TP-110	S35TP-110	S35TP-110	S35TP-111	S35TP-112	S35TP-112	S35TP-112
Depth:	15.0-16.0	3.6-4.6	16.6-17.6	4.0-5.0	9.0-10.0	16.5-17.5	1.0-4.7	2.0-4.5	6.8-8.8	15.0-16.0
Date Tested:										
Wet Wt, & Pan (g):	1793.8	1883.2	2219.3	2224.6	2920.0	1815.3	1811.2	1997.3	313.6	3285.0
Dry Wt, & Pan (g):	1621.8	1745.3	2017.7	2094.9	2722.8	1626.6	1708.6	1936.6	256.0	3111.5
Loss of Moisture	172.0	137.9	201.6	129.7	197.2	188.7	102.6	60.7	57.6	173.5
Wt. of Pan (g):	35.2	195.8	189.9	192.9	192.0	197.0	188.5	306.7	27.9	391.0
Wt. of Dry Soil (g):	1586.6	1549.5	1827.8	1902.0	2530.8	1429.6	1520.1	1629.9	228.1	2720.5
M. Content (%):	**11**	**9**	**11**	**7**	**8**	**13**	**7**	**4**	**25**	**6**

Lab No:	**13384**	**13334**	**13341**	**13363**	**13350**	**13371**	**13381**	**13339**	**13343**	**13347**
BH or Loc:	S35TP-113	S35TP-102	S35TP-104	S35TP-109	S35TP-106	S35TP-111	S35TP-113	S35TP-104	S35TP-105	S35TP-105
Depth:	16.0-17.0	15.0-16.0	7.0-10.0	7.3-8.3	8.4-9.4	10.5-11.5	1.5-3.5	0.0-1.0	0.0-1.7	16.5-17.0
Date Tested:										
Wet Wt, & Pan (g):	2543.5	978.3	812.9	762.0	1043.9	819.3	881.9	186.8	288.9	154.7
Dry Wt, & Pan (g):	2313.5	879.8	756.0	702.5	952.6	763.1	861.8	175.4	274.6	140.3
Loss of Moisture	230.0	98.5	56.9	59.5	91.3	56.2	20.1	11.4	14.3	14.4
Wt. of Pan (g):	384.2	376.9	189.5	191.4	188.5	196.2	197.9	34.1	34.1	22.9
Wt. of Dry Soil (g):	1929.3	502.9	566.5	511.1	764.1	566.9	663.9	141.2	240.5	117.4
M. Content (%):	**12**	**20**	**10**	**12**	**12**	**10**	**3**	**8**	**6**	**12**

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Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation **Project Number:** 10180

Lab No:	13346	13348	13352	13356	13360	13361	13365	13369	13372	13373
BH or Loc:	S35TP-105	S35TP-106	S35TP-107	S35TP-108	S35TP-108	S35TP-109	S35TP-110	S35TP-111	S35TP-111	S35TP-111
Depth:	17.0-17.5	0.0-2.9	0.0-1.7	0.0-2.1	16.0-17.0	0.0-1.3	0.0-1.3	0.0-1.0	16.5-17.0	18.0-18.7
Date Tested:										
Wet Wt, & Pan (g):	324.6	278.5	283.2	248.5	168.6	143.0	202.5	325.7	174.7	336.6
Dry Wt, & Pan (g):	278.7	263.0	265.5	221.8	145.0	137.8	190.0	252.5	158.1	296.6
Loss of Moisture	45.9	15.5	17.7	26.7	23.6	5.3	12.5	73.2	16.6	40.0
Wt. of Pan (g):	33.8	24.7	33.6	25.0	14.6	27.1	27.0	24.7	24.6	26.6
Wt. of Dry Soil (g):	244.8	238.2	231.9	196.8	130.4	110.7	163.0	227.8	133.5	270.0
M. Content (%):	**19**	**7**	**8**	**14**	**18**	**5**	**8**	**32**	**12**	**15**

Lab No:	13374	13375	13378	13380	13382	13383				
BH or Loc:	S35TP-111	S35TP-112	S35TP-112	S35TP-113	S35TP-113	S35TP-113				
Depth:	16.0-16.5	0.0-2.0	16.0-16.5	0.0-1.2	8.0-9.0	10.0-12.0				
Date Tested:										
Wet Wt, & Pan (g):	251.9	156.3	144.8	179.4	345.9	337.2				
Dry Wt, & Pan (g):	224.4	145.5	130.1	170.3	302.1	273.6				
Loss of Moisture	27.6	10.8	14.6	9.0	43.8	63.5				
Wt. of Pan (g):	27.6	23.1	13.4	24.9	33.9	32.6				
Wt. of Dry Soil (g):	196.8	122.4	116.7	145.5	268.2	241.1				
M. Content (%):	**14**	**9**	**13**	**6**	**16**	**26**				

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Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation **Project Number:** 10180

Composite Sample Moisture Contents:

	S35CS-02	S35CS-03	S35CS-01	S35BGT-02		S35BGT-03		S35BGT-01		
Lab No:	13365, 13369, 13343, 13356	13339, 13352, 13330	13375, 13324, 13325, 13380	13366, 13367, 13370, 13371, 13344, 13358		13340, 13341, 13353, 13354, 13331		13326, 13327, 13381, 13384		
Wet Wt, & Pan (g):	624.4	837.6	1012.4	645.0		1087.6		1342.7		
Dry Wt, & Pan (g):	569.7	772.7	961.2	604.7		1028.1		1267.0		
Loss of Moisture	54.7	64.9	51.2	40.3		59.5		75.7		
Wt. of Pan (g):	193.2	195.5	304.1	196.2		193.0		197.6		
Wt. of Dry Soil (g):	376.5	577.2	657.1	408.5		835.1		1069.4		
M. Content (%):	**15**	**11**	**8**	**10**		**7**		**7**		

PIONEER TECHNICAL SERVICES, INC.

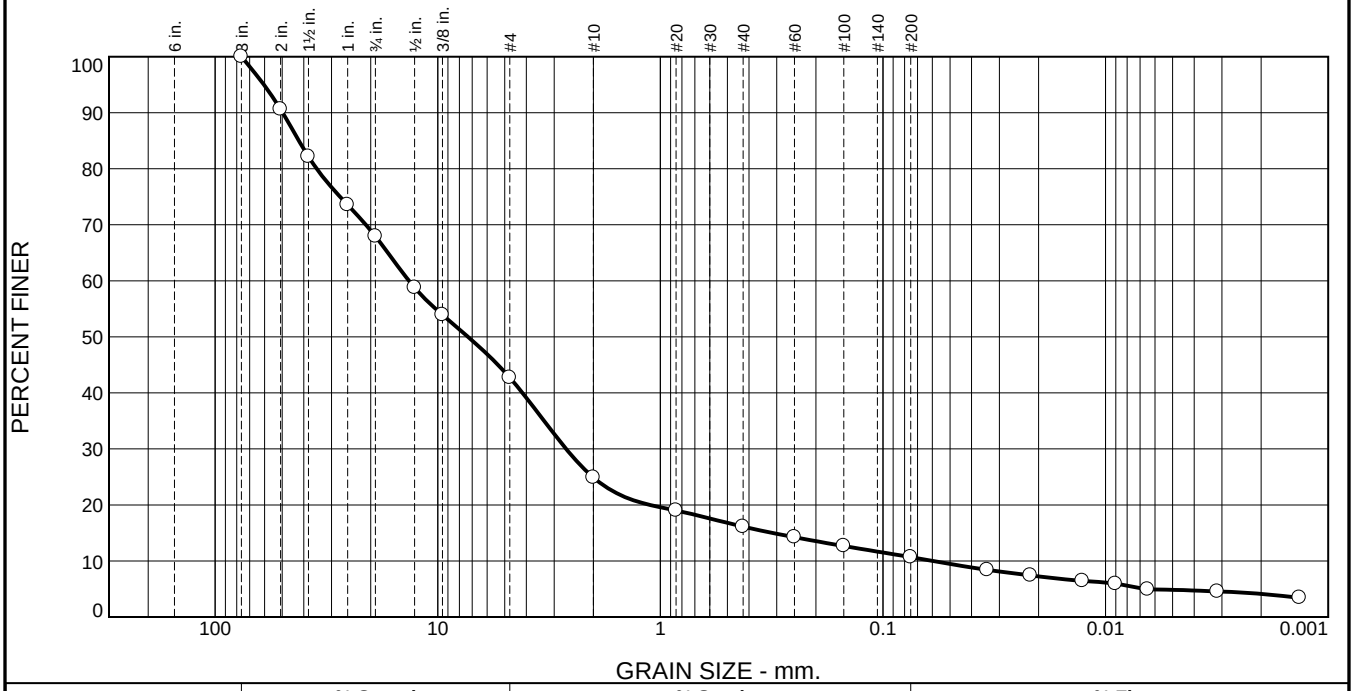
Specific Gravity of Soils

Specific Gravity of (-) #10 Fraction

Project	UBMC Section 35 Design Investigation
Client:	Montana DEQ
Date:	1/14/2013
Tested By:	LS

Sample I.D.	Depth (ft)	Specific Gravity
S35-BGT-01 Composite	Various	2.68
S35-BGT-02 Composite	Various	2.68
S35-BGT-03 Composite	Various	2.69
S35-CS-01 Composite	Various	2.65
S35-CS-02 Composite	Various	2.53
S35-CS-03 Composite	Various	2.57

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	32	25	18	9	5	6	5

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	91		
1.5	82		
1	74		
.75	68		
.5	59		
.375	54		
#4	43		
#10	25		
#20	19		
#40	16		
#60	14		
#100	13		
#200	11		
0.0340 mm.	8.4		
0.0218 mm.	7.4		
0.0127 mm.	6.5		
0.0090 mm.	6.0		
0.0065 mm.	4.9		
0.0031 mm.	4.5		
0.0013 mm.	3.4		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 49.7123 D_{85}= 42.0769 D_{60}= 13.4676
D_{50}= 7.3113 D_{30}= 2.6500 D_{15}= 0.3124
D_{10}= 0.0595 C_u= 226.50 C_c= 8.77

Remarks

Date Received: **Date Tested:**

Tested By:

Checked By:

Title:

Location: S35BGT-01 (Composite: 13326, 13327, 13381, 13384, 13376, 13379) **Date Sampled:**

Pioneer Technical Services, Inc.

1215 Apple's Way - Belgrade, MT 59714

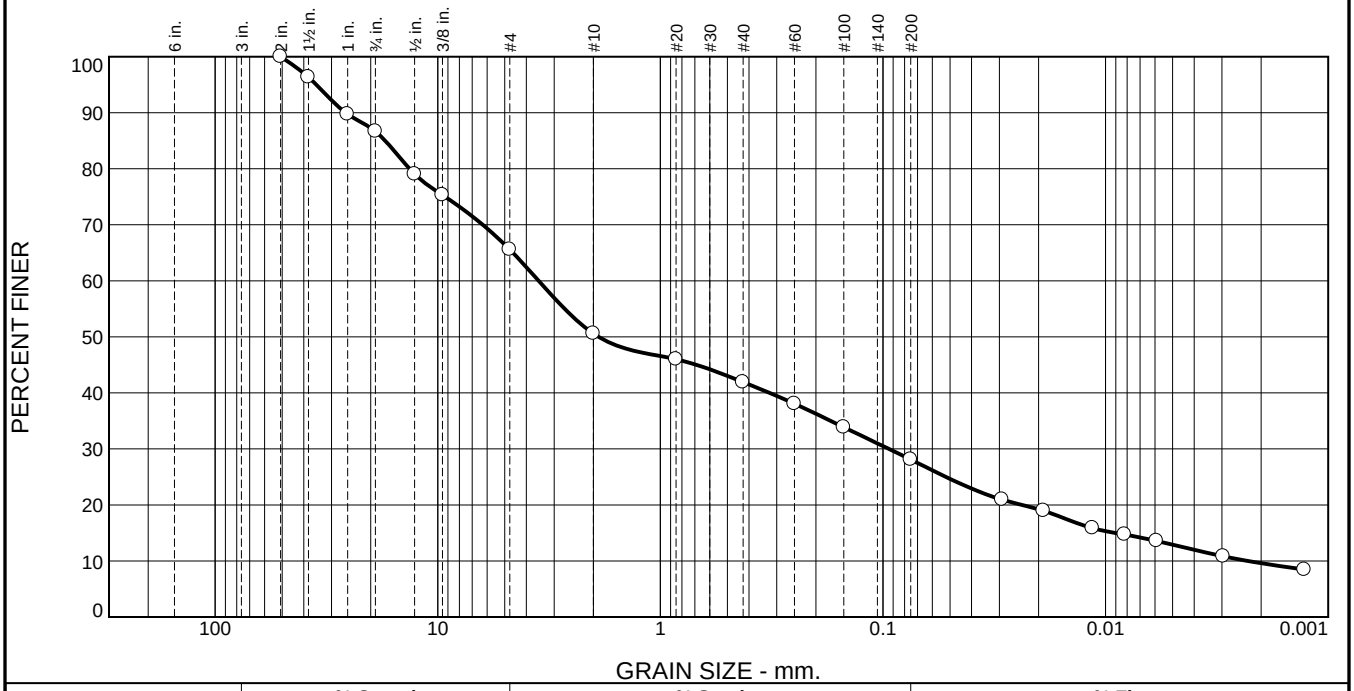
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	13	21	15	9	14	15	13

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100		
1.5	96		
1	90		
.75	87		
.5	79		
.375	75		
#4	66		
#10	51		
#20	46		
#40	42		
#60	38		
#100	34		
#200	28		
0.0292 mm.	21		
0.0190 mm.	19		
0.0114 mm.	16		
0.0082 mm.	15		
0.0059 mm.	14		
0.0030 mm.	11		
0.0013 mm.	8.5		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 25.9611 D_{85}= 17.2113 D_{60}= 3.5219
D_{50}= 1.8940 D_{30}= 0.0940 D_{15}= 0.0090
D_{10}= 0.0023 C_u= 1539.92 C_c= 1.10

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Location: S35BGT-02 (Composite: 13366, 13367, 13370, 13371, 13344, 13358) **Date Sampled:**

Pioneer Technical Services, Inc.

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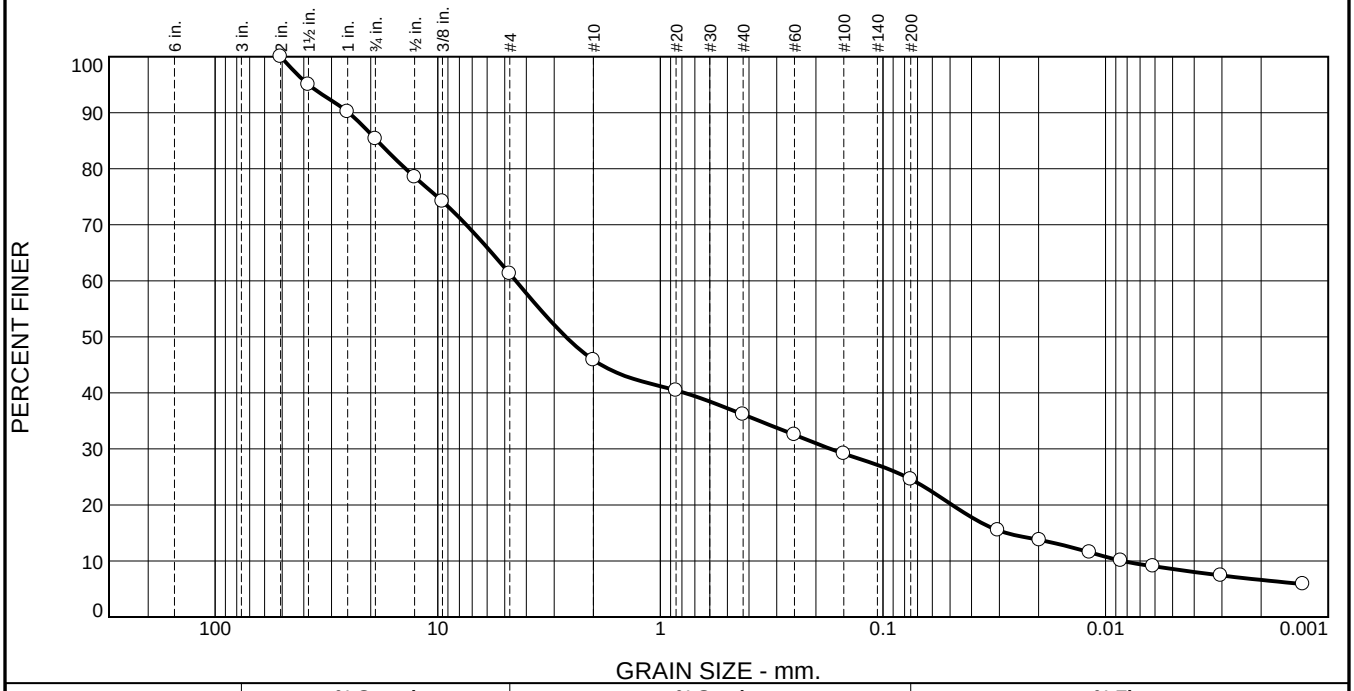
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	15	24	15	10	11	16	9

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100		
1.5	95		
1	90		
.75	85		
.5	79		
.375	74		
#4	61		
#10	46		
#20	40		
#40	36		
#60	33		
#100	29		
#200	25		
0.0304 mm.	15		
0.0198 mm.	14		
0.0118 mm.	12		
0.0085 mm.	10		
0.0061 mm.	9.1		
0.0030 mm.	7.4		
0.0013 mm.	5.9		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 25.1126 D_{85}= 18.6968 D_{60}= 4.4631
D_{50}= 2.6566 D_{30}= 0.1719 D_{15}= 0.0279
D_{10}= 0.0084 C_u= 530.98 C_c= 0.79

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Location: S35BGT-03 (Composite: 13331, 13340, 13341, 13353, 13354) **Date Sampled:**

Pioneer Technical Services, Inc.

1215 Apple's Way - Belgrade, MT 59714

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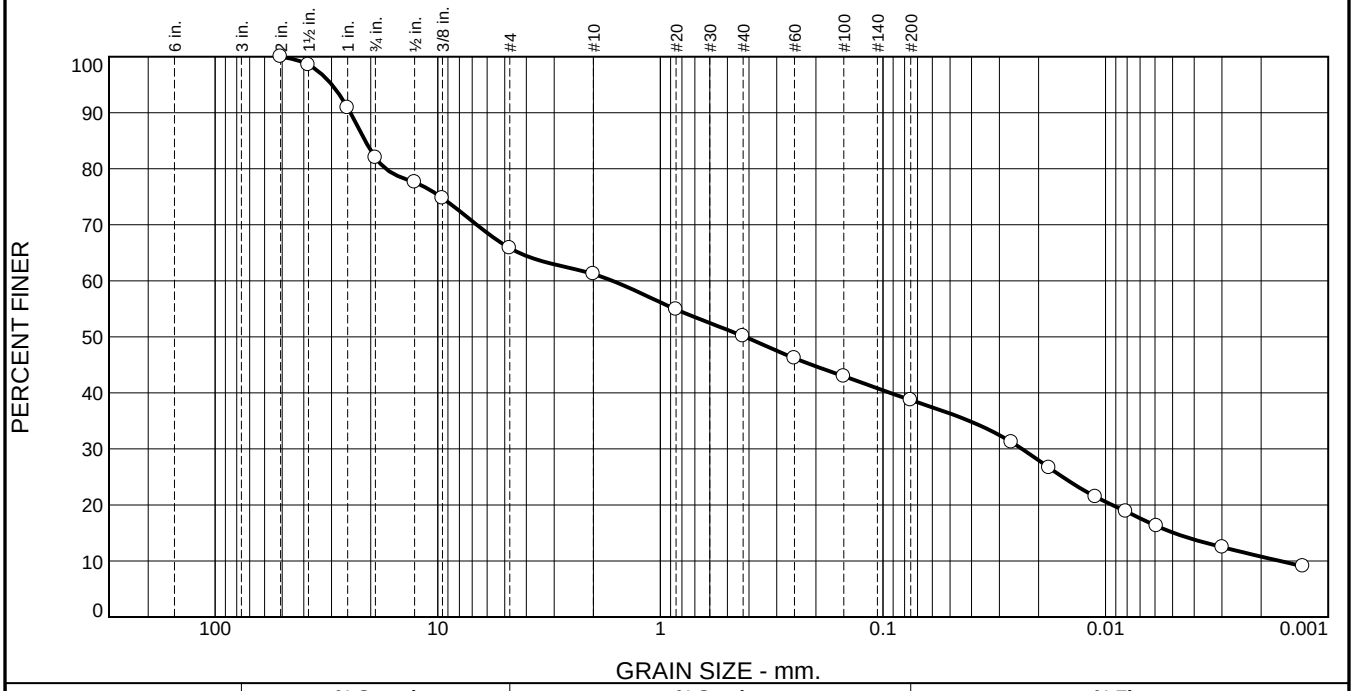
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	18	16	5	11	11	24	15

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100		
1.5	99		
1	91		
.75	82		
.5	78		
.375	75		
#4	66		
#10	61		
#20	55		
#40	50		
#60	46		
#100	43		
#200	39		
0.0264 mm.	31		
0.0179 mm.	27		
0.0111 mm.	21		
0.0081 mm.	19		
0.0059 mm.	16		
0.0030 mm.	12		
0.0013 mm.	9.1		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 24.6757 D_{85}= 21.1931 D_{60}= 1.6396
D_{50}= 0.4176 D_{30}= 0.0237 D_{15}= 0.0049
D_{10}= 0.0016 C_u= 996.71 C_c= 0.21

Remarks

Date Received: **Date Tested:**

Tested By:

Checked By:

Title:

Location: S35CS-01 (Composite: 13324, 13325, 13380, 13375) **Date Sampled:**

Pioneer Technical Services, Inc.
1215 Apple's Way - Belgrade, MT 59714
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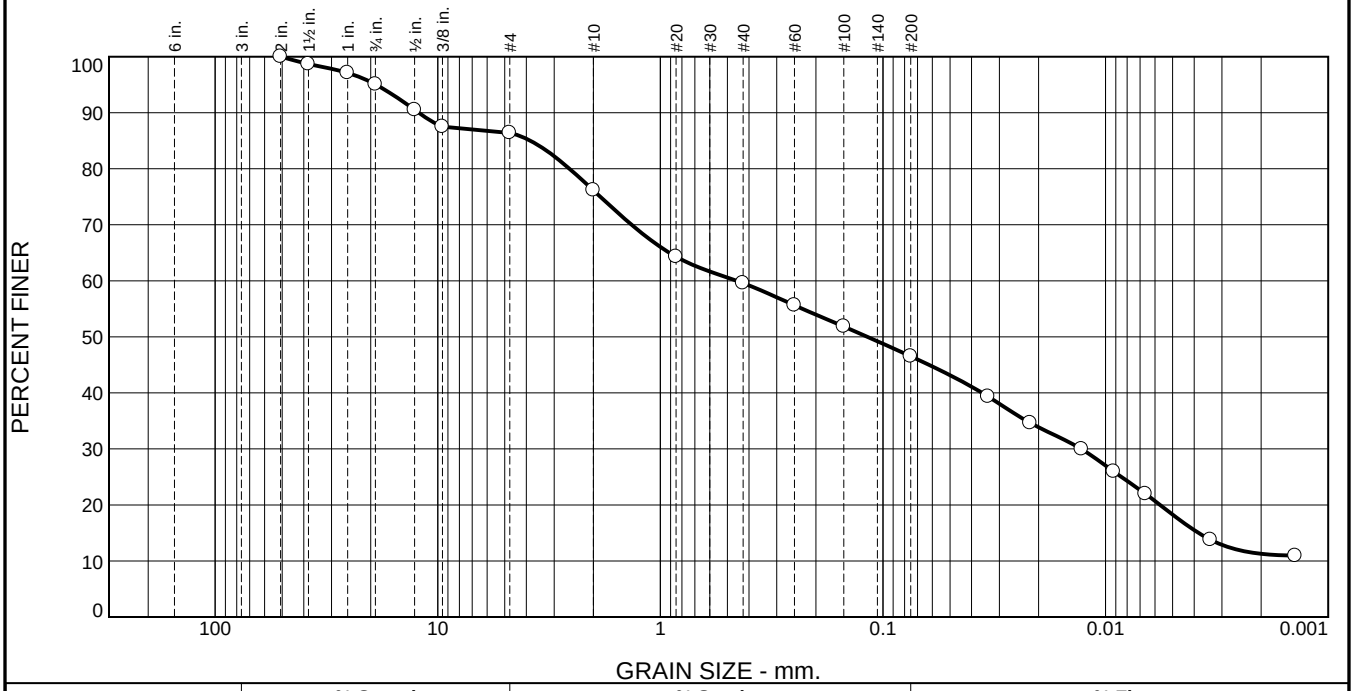
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	5	9	10	16	13	29	18

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100		
1.5	99		
1	97		
.75	95		
.5	91		
.375	87		
#4	86		
#10	76		
#20	64		
#40	60		
#60	56		
#100	52		
#200	47		
0.0338 mm.	39		
0.0218 mm.	35		
0.0128 mm.	30		
0.0092 mm.	26		
0.0066 mm.	22		
0.0034 mm.	14		
0.0014 mm.	11		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 12.1748 D_{85}= 3.8345 D_{60}= 0.4536
D_{50}= 0.1174 D_{30}= 0.0129 D_{15}= 0.0038
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Location: S35CS-02 (Composite: 13365, 13369, 13343, 13356) **Date Sampled:**

Pioneer Technical Services, Inc.

1215 Apple's Way - Belgrade, MT 59714

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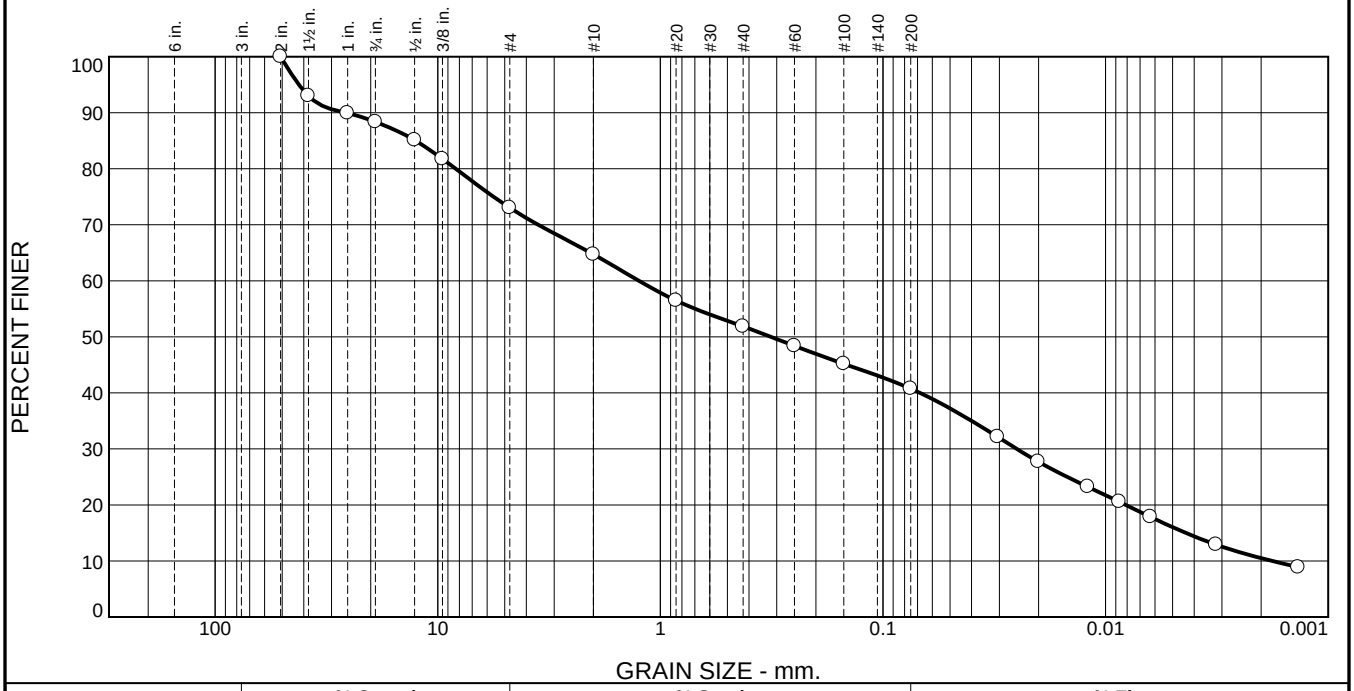
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	12	15	8	13	11	25	16

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100		
1.5	93		
1	90		
.75	88		
.5	85		
.375	82		
#4	73		
#10	65		
#20	56		
#40	52		
#60	48		
#100	45		
#200	41		
0.0306 mm.	32		
0.0201 mm.	28		
0.0120 mm.	23		
0.0087 mm.	21		
0.0063 mm.	18		
0.0032 mm.	13		
0.0014 mm.	8.9		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 25.7595 D_{85}= 12.5687 D_{60}= 1.2483
D_{50}= 0.3187 D_{30}= 0.0251 D_{15}= 0.0044
D_{10}= 0.0018 C_u= 700.83 C_c= 0.28

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Location: S35CS-03 (Composite: 13339, 13352, 13330)

Date Sampled:

Pioneer Technical Services, Inc.

1215 Apple's Way - Belgrade, MT 59714

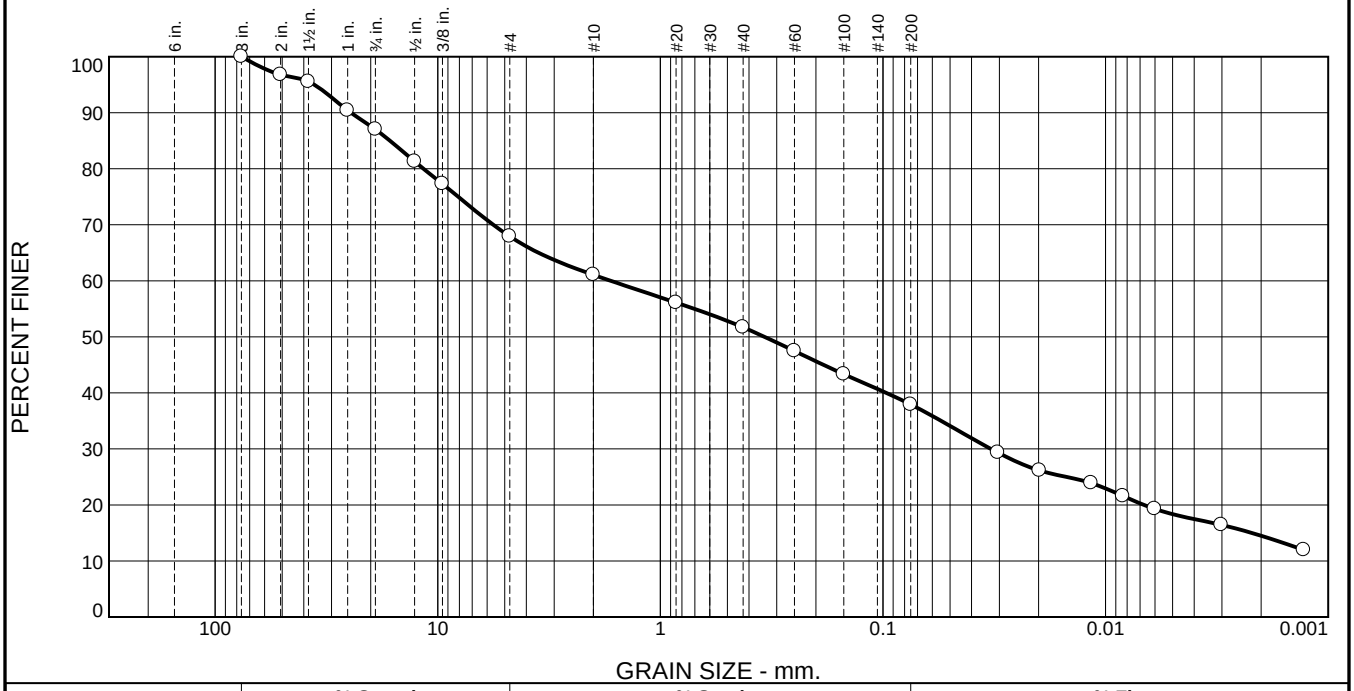
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	13	19	7	9	14	20	18

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	97		
1.5	96		
1	90		
.75	87		
.5	81		
.375	77		
#4	68		
#10	61		
#20	56		
#40	52		
#60	47		
#100	43		
#200	38		
0.0305 mm.	29		
0.0198 mm.	26		
0.0116 mm.	24		
0.0084 mm.	22		
0.0060 mm.	19		
0.0030 mm.	16		
0.0013 mm.	12		

* (no specification provided)

Material Description

clayey gravel with sand

Atterberg Limits (ASTM D 4318)

PL= 15 **LL=** 26 **PI=** 11

Classification

USCS (D 2487)= GC **AASHTO (M 145)=** A-6(1)

Coefficients

D_{90}= 24.5812 D_{85}= 16.3902 D_{60}= 1.6698
D_{50}= 0.3404 D_{30}= 0.0327 D_{15}= 0.0022
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Location: S35TP-104
Sample Number: 13341 **Depth:** 7-10'

Date Sampled:

Pioneer Technical Services, Inc.

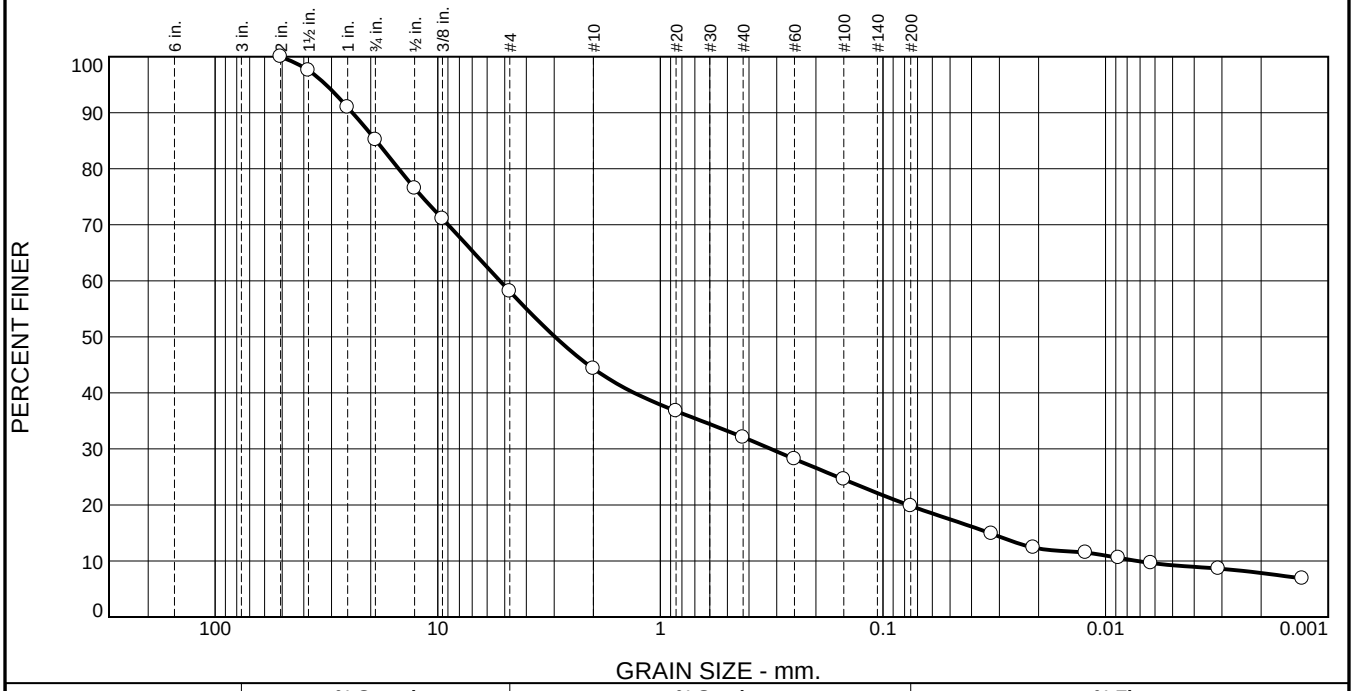
1215 Apple's Way - Belgrade, MT 59714

Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	15	27	14	12	12	11	9

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100		
1.5	98		
1	91		
.75	85		
.5	77		
.375	71		
#4	58		
#10	44		
#20	37		
#40	32		
#60	28		
#100	25		
#200	20		
0.0325 mm.	15		
0.0211 mm.	12		
0.0123 mm.	11		
0.0088 mm.	11		
0.0063 mm.	9.6		
0.0031 mm.	8.6		
0.0013 mm.	6.9		

* (no specification provided)

Material Description

clayey gravel with sand

Atterberg Limits (ASTM D 4318)

PL= 14 **LL=** 23 **PI=** 9

Classification

USCS (D 2487)= GC **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 24.1633 D_{85}= 18.8922 D_{60}= 5.2606
D_{50}= 2.9741 D_{30}= 0.3192 D_{15}= 0.0332
D_{10}= 0.0072 C_u= 728.14 C_c= 2.68

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

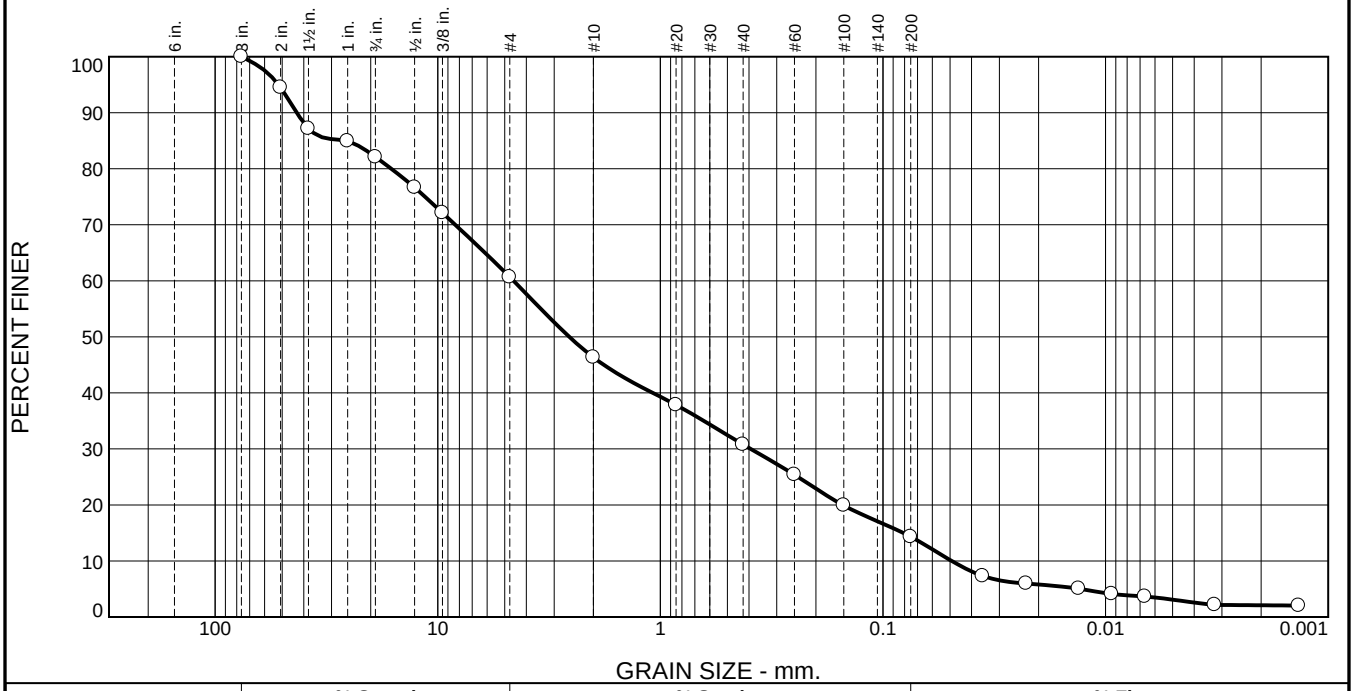
Location: S35TP-106
Sample Number: 13350 **Depth:** 8.4-9.4' **Date Sampled:**

Pioneer Technical Services, Inc.
1215 Apple's Way - Belgrade, MT 59714
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	18	21	15	15	17	11	3

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	94		
1.5	87		
1	85		
.75	82		
.5	77		
.375	72		
#4	61		
#10	46		
#20	38		
#40	31		
#60	25		
#100	20		
#200	14		
0.0356 mm.	7.3		
0.0227 mm.	6.0		
0.0132 mm.	5.1		
0.0094 mm.	4.1		
0.0067 mm.	3.7		
0.0032 mm.	2.2		
0.0014 mm.	2.0		

* (no specification provided)

Material Description

silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 43.0002 D_{85}= 25.9447 D_{60}= 4.5687
D_{50}= 2.5638 D_{30}= 0.3928 D_{15}= 0.0810
D_{10}= 0.0491 C_u= 93.03 C_c= 0.69

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Location: S35TP-107
Sample Number: 13354 **Depth:** 9-10'

Date Sampled:

Pioneer Technical Services, Inc.

1215 Apple's Way - Belgrade, MT 59714

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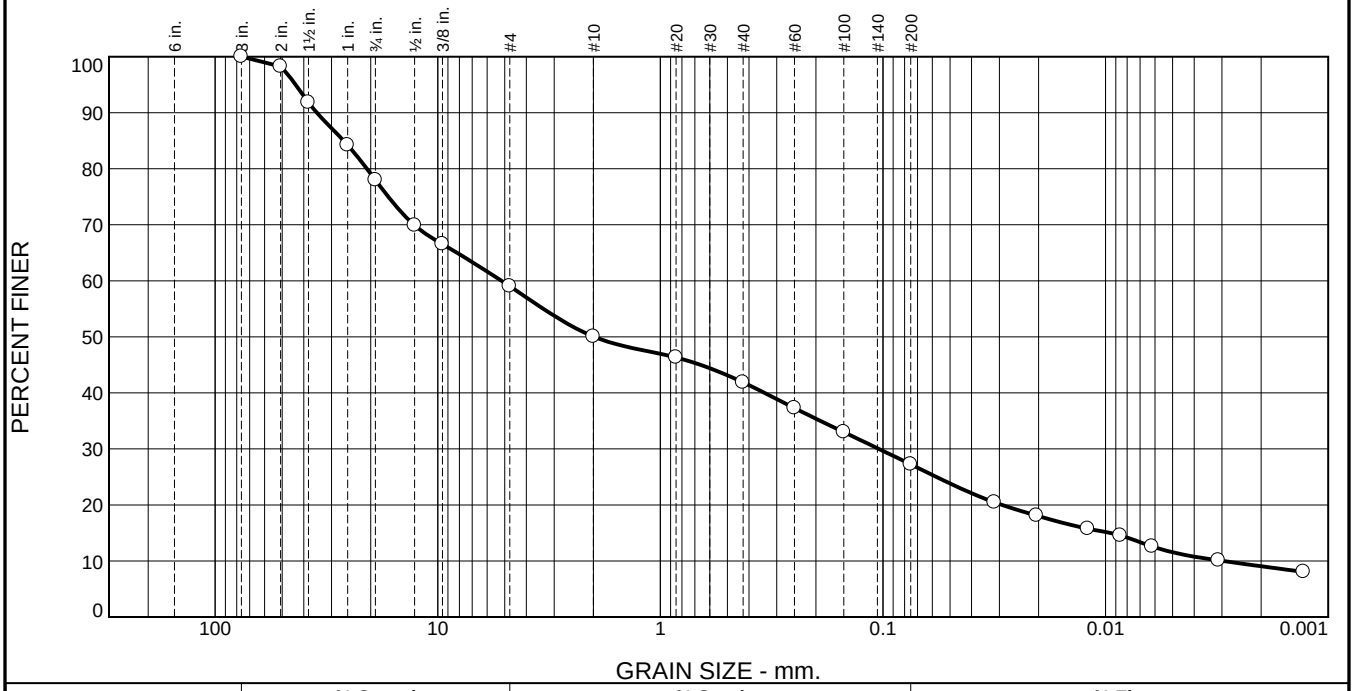
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	22	19	9	8	15	15	12

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	98		
1.5	92		
1	84		
.75	78		
.5	70		
.375	67		
#4	59		
#10	50		
#20	46		
#40	42		
#60	37		
#100	33		
#200	27		
0.0316 mm.	20		
0.0204 mm.	18		
0.0120 mm.	16		
0.0086 mm.	15		
0.0062 mm.	13		
0.0031 mm.	10		
0.0013 mm.	8.1		

* (no specification provided)

Material Description

clayey gravel with sand

Atterberg Limits (ASTM D 4318)

PL= 15 **LL=** 23 **PI=** 8

Classification

USCS (D 2487)= GC **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 34.9288 D_{85}= 26.4592 D_{60}= 5.1690
D_{50}= 1.9820 D_{30}= 0.1043 D_{15}= 0.0095
D_{10}= 0.0030 C_u= 1740.01 C_c= 0.71

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Location: S35TP-111
Sample Number: 13371 **Depth:** 10.5-11.5 **Date Sampled:**

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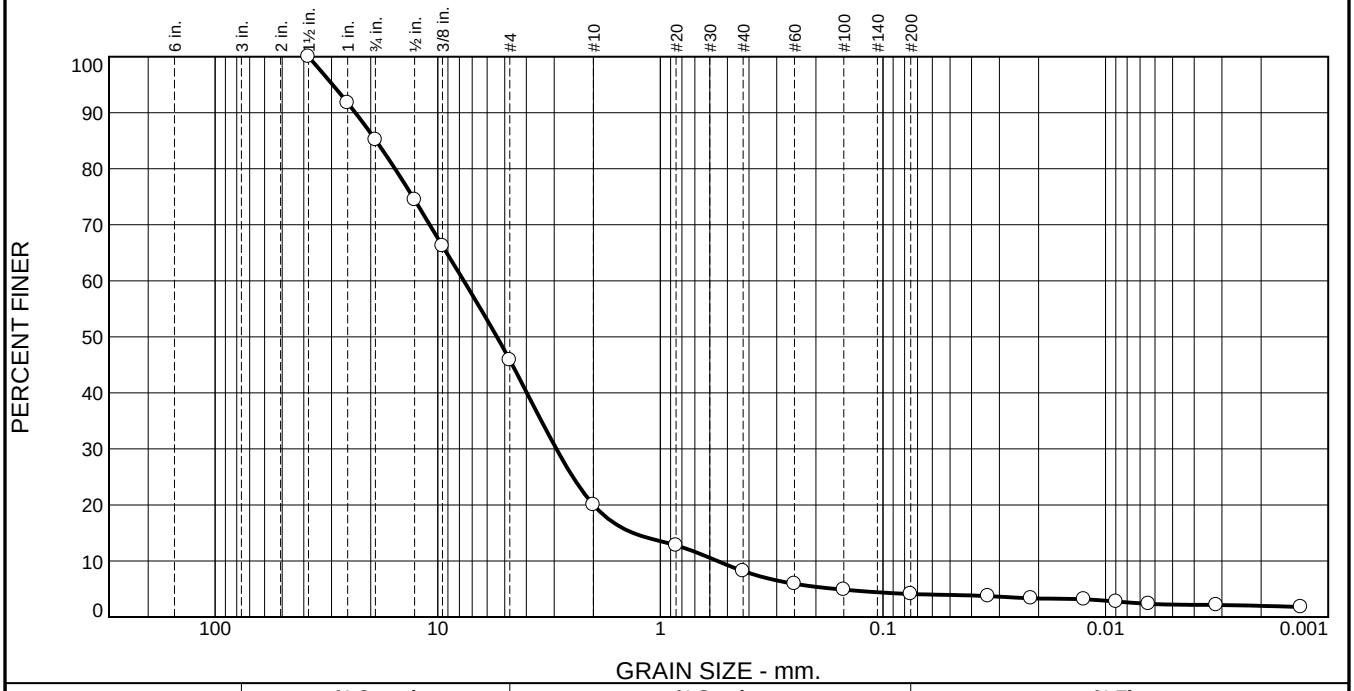
1215 Apple's Way - Belgrade, MT 59714
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	15	39	26	12	4	2	2

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100		
1	92		
.75	85		
.5	74		
.375	66		
#4	46		
#10	20		
#20	13		
#40	8		
#60	6		
#100	5		
#200	4.1		
0.0338 mm.	3.7		
0.0216 mm.	3.3		
0.0125 mm.	3.2		
0.0090 mm.	2.8		
0.0064 mm.	2.4		
0.0032 mm.	2.2		
0.0013 mm.	1.8		

* (no specification provided)

Material Description

well-graded gravel with sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GW **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 23.4397 D_{85}= 18.9234 D_{60}= 7.6422
D_{50}= 5.4224 D_{30}= 2.9321 D_{15}= 1.3257
D_{10}= 0.5542 C_u= 13.79 C_c= 2.03

Remarks

Date Received: **Date Tested:**

Tested By:

Checked By:

Title:

Location: S35TP-113
Sample Number: 13381 **Depth:** 1.5-3.5 **Date Sampled:**

Pioneer Technical Services, Inc.
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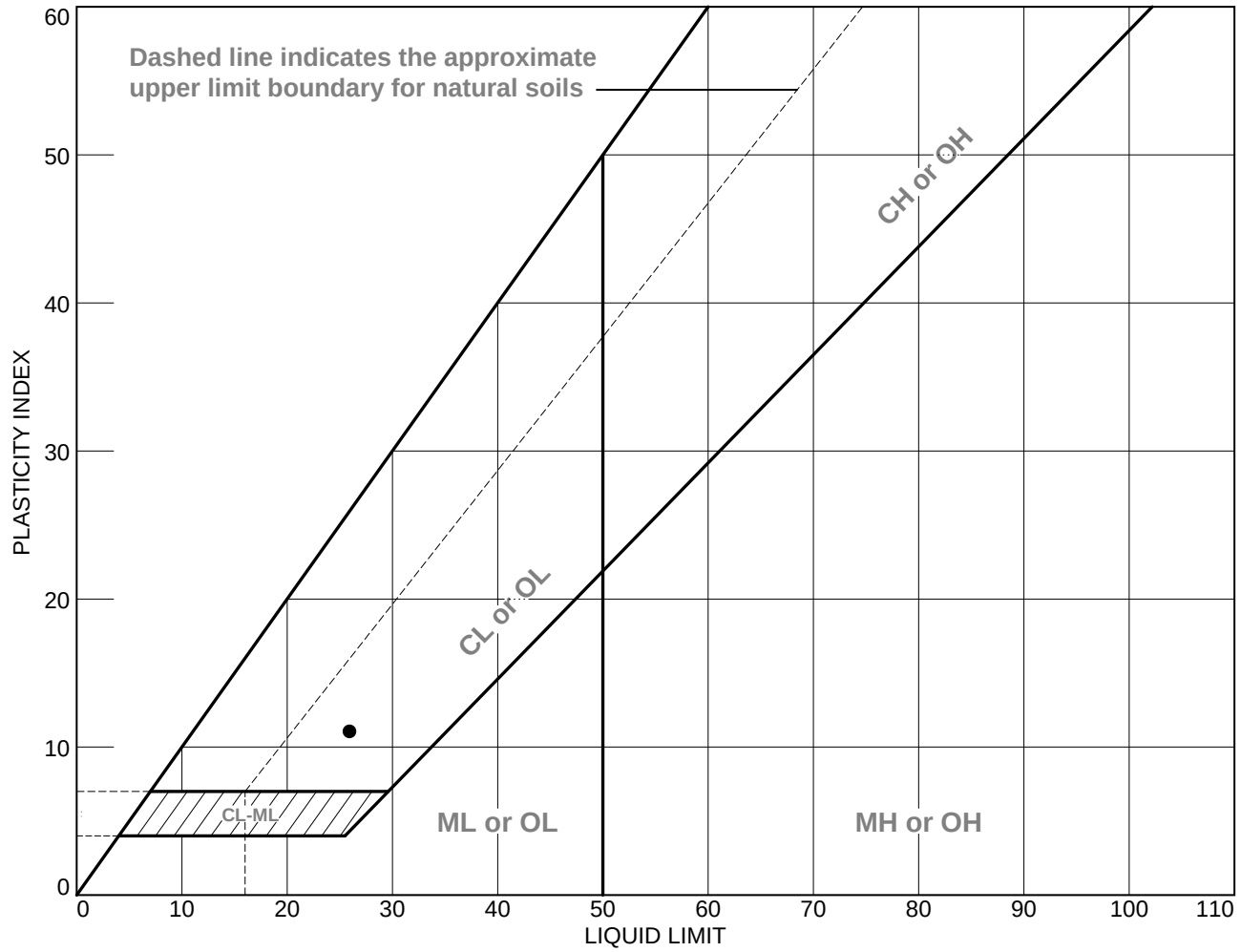
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35TP-104	13341	7-10'		15	26	11	GC

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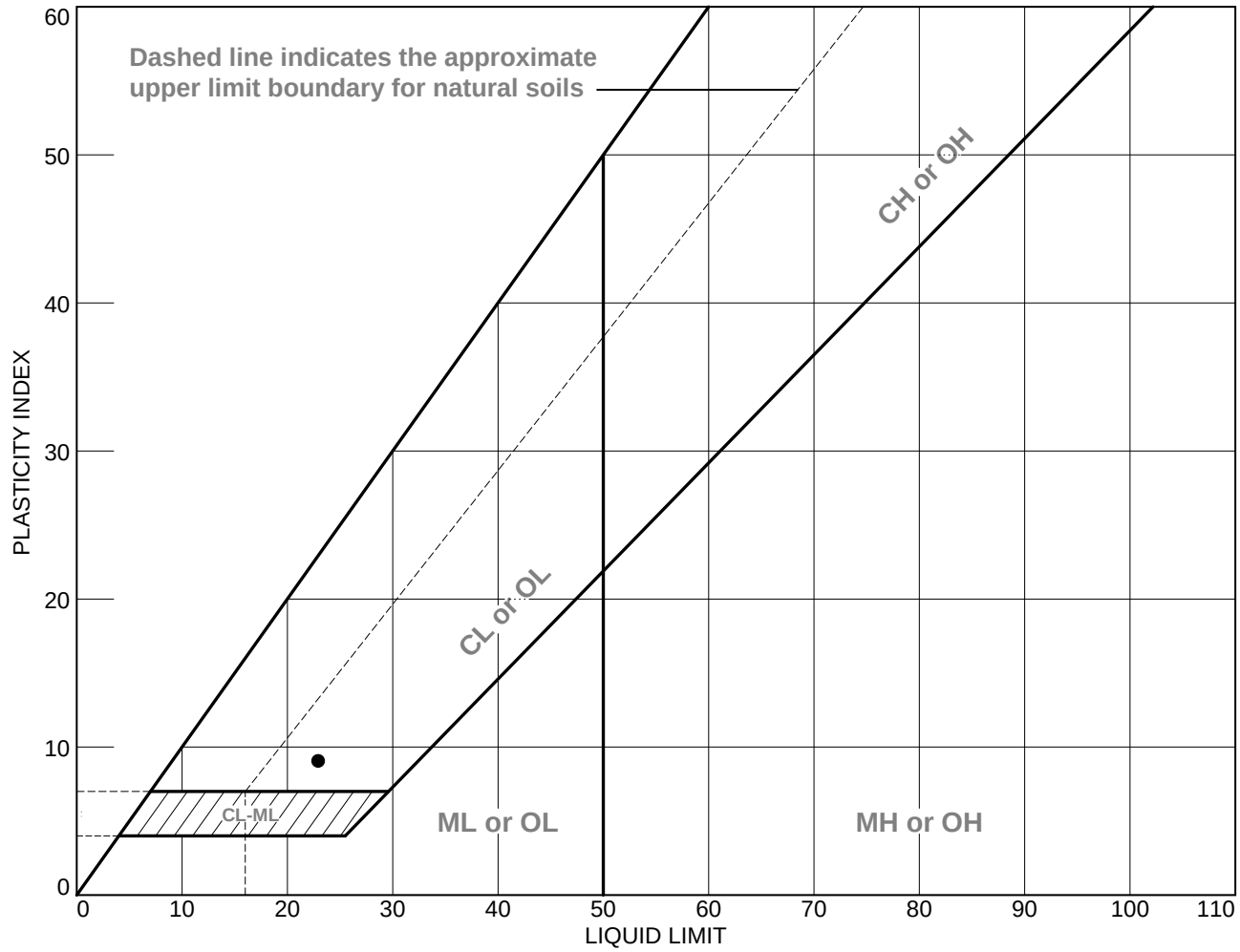
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35TP-106	13350	8.4-9.4'		14	23	9	GC

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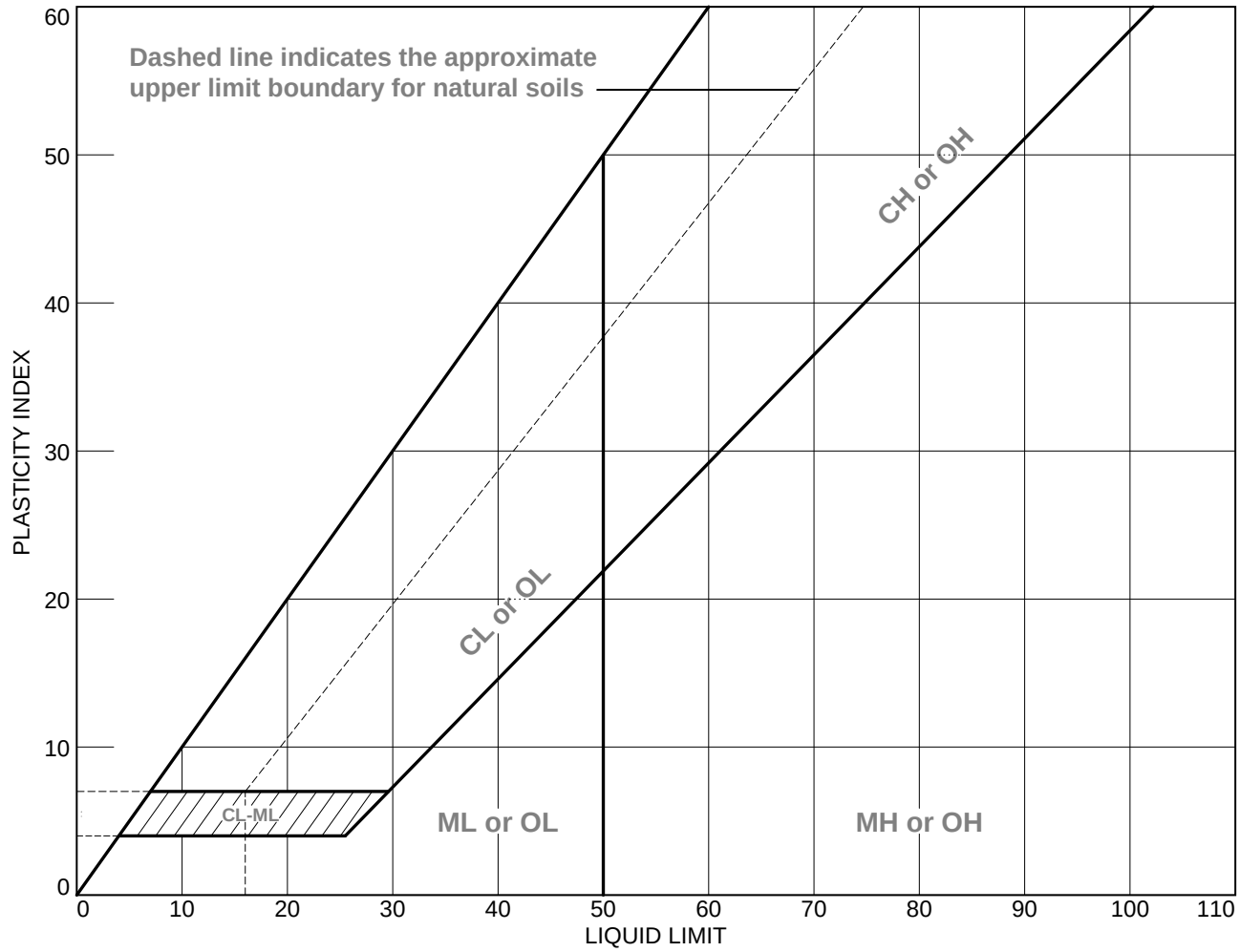
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35TP-107	13354	9-10'		NP	NV	NP	SM

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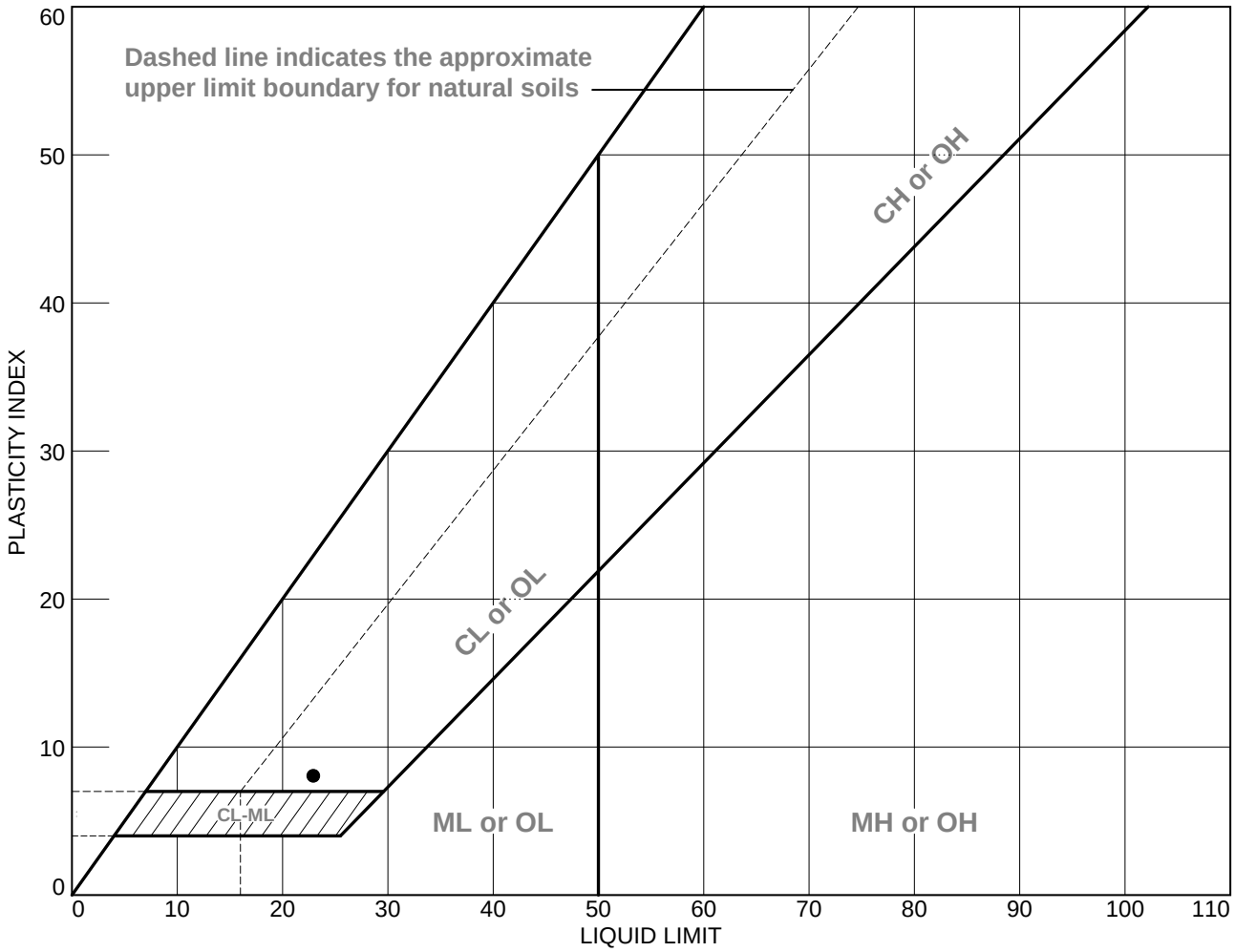
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35TP-111	13371	10.5-11.5		15	23	8	GC

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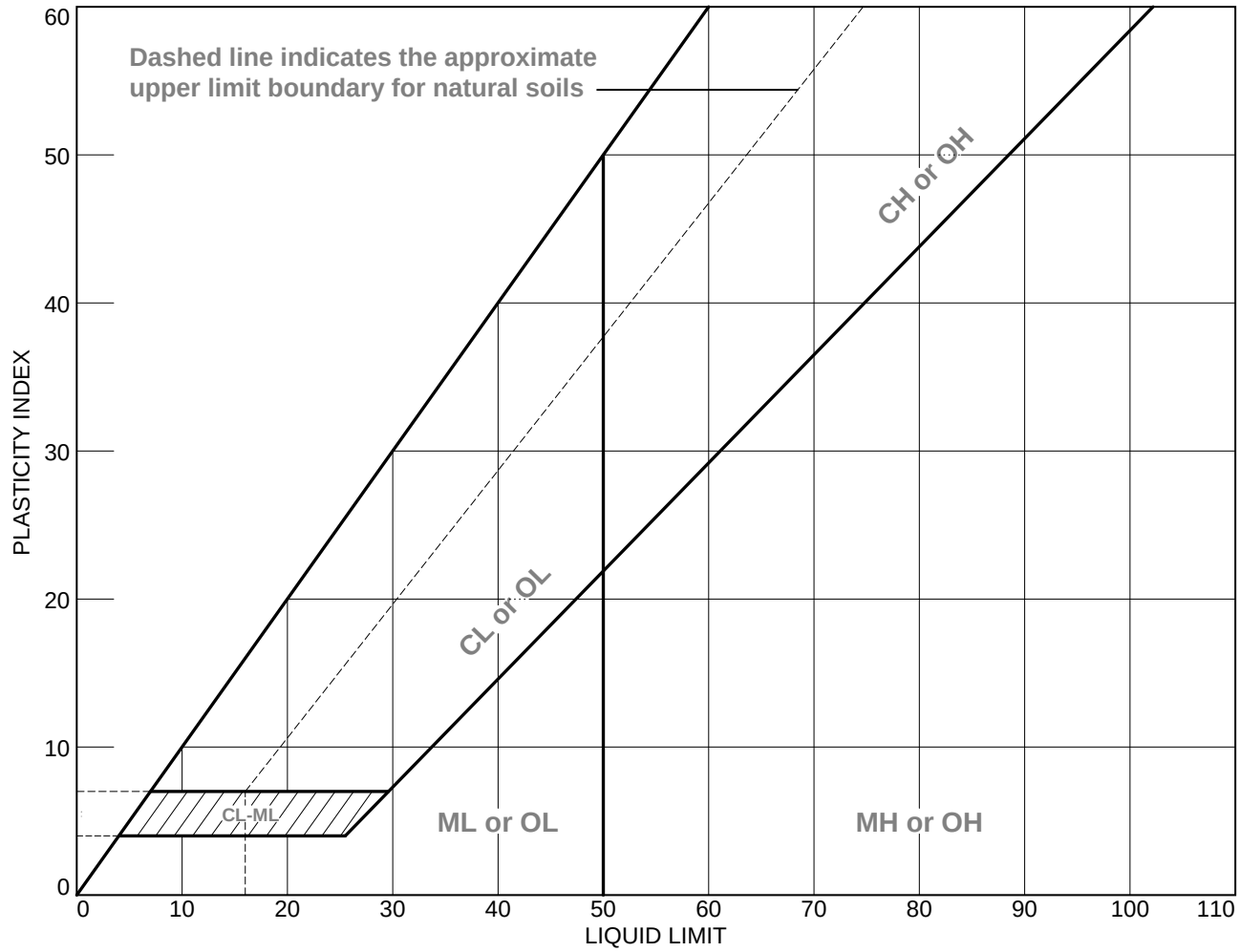
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35TP-113	13381	1.5-3.5		NP	NV	NP	GW

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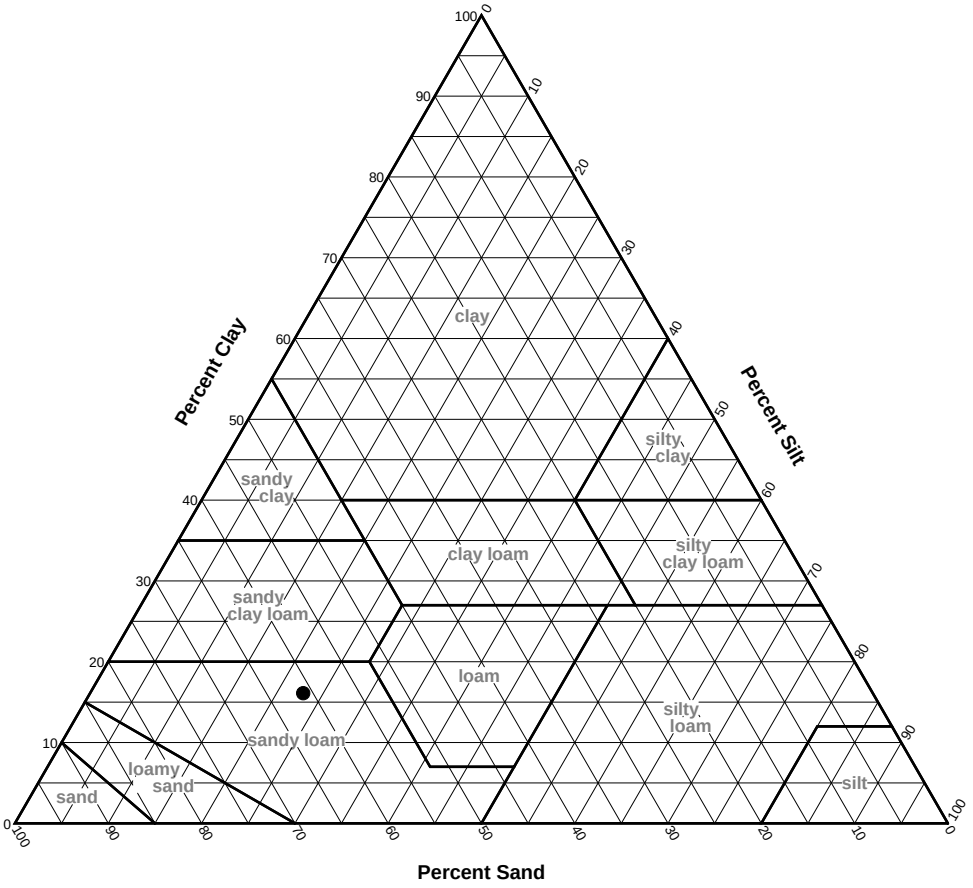
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA

	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35BGT-01			61	22	16	Sandy loam

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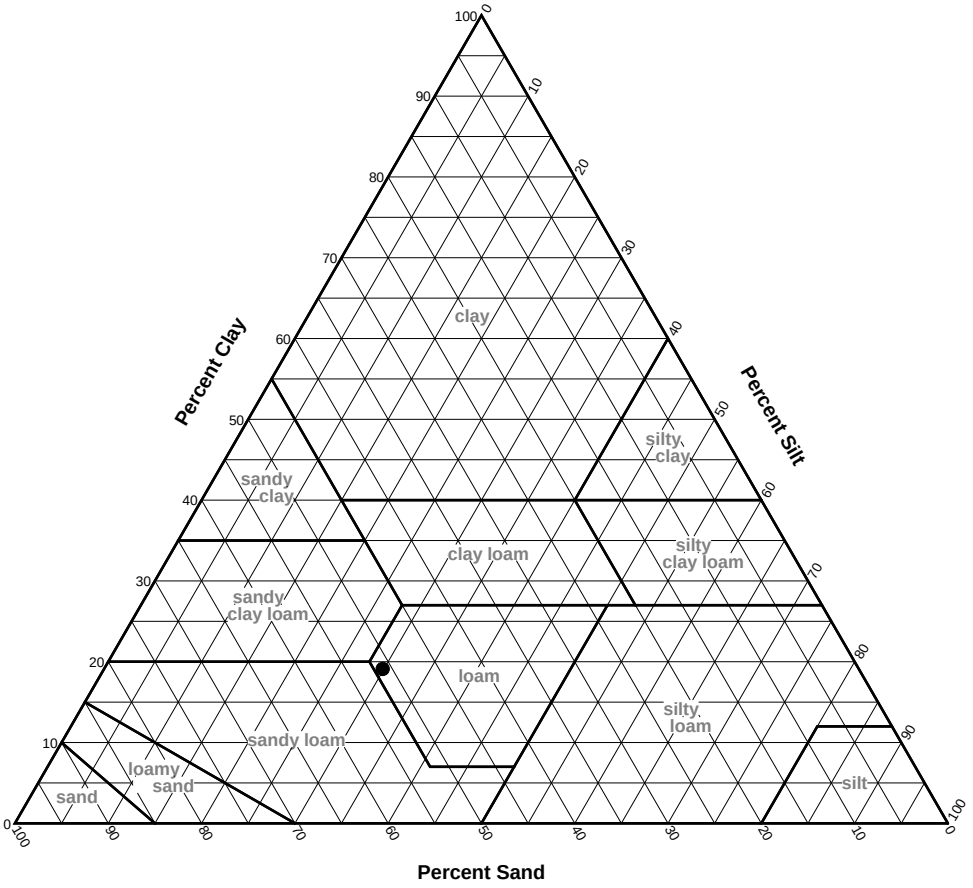
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35BGT-02			51	30	19	Loam

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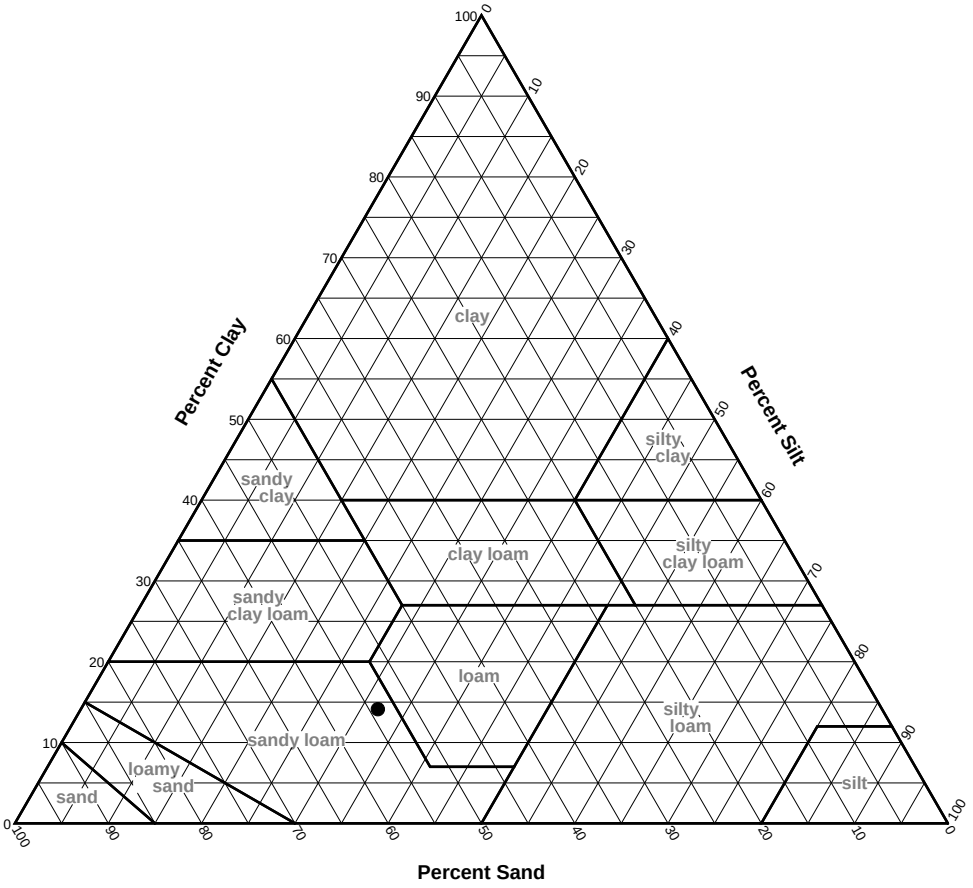
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation
Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35BGT-03			54	31	14	Sandy loam

Pioneer Technical Services, Inc.

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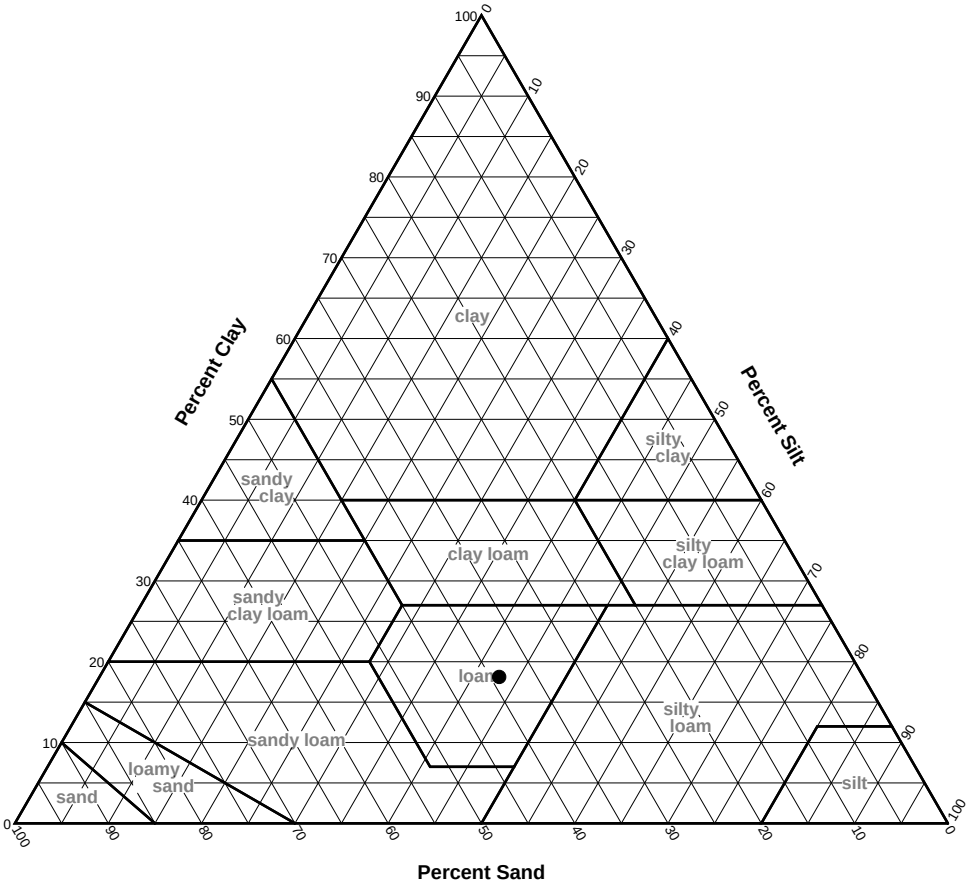
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35CS-01			39	43	18	Loam

Pioneer Technical Services, Inc.

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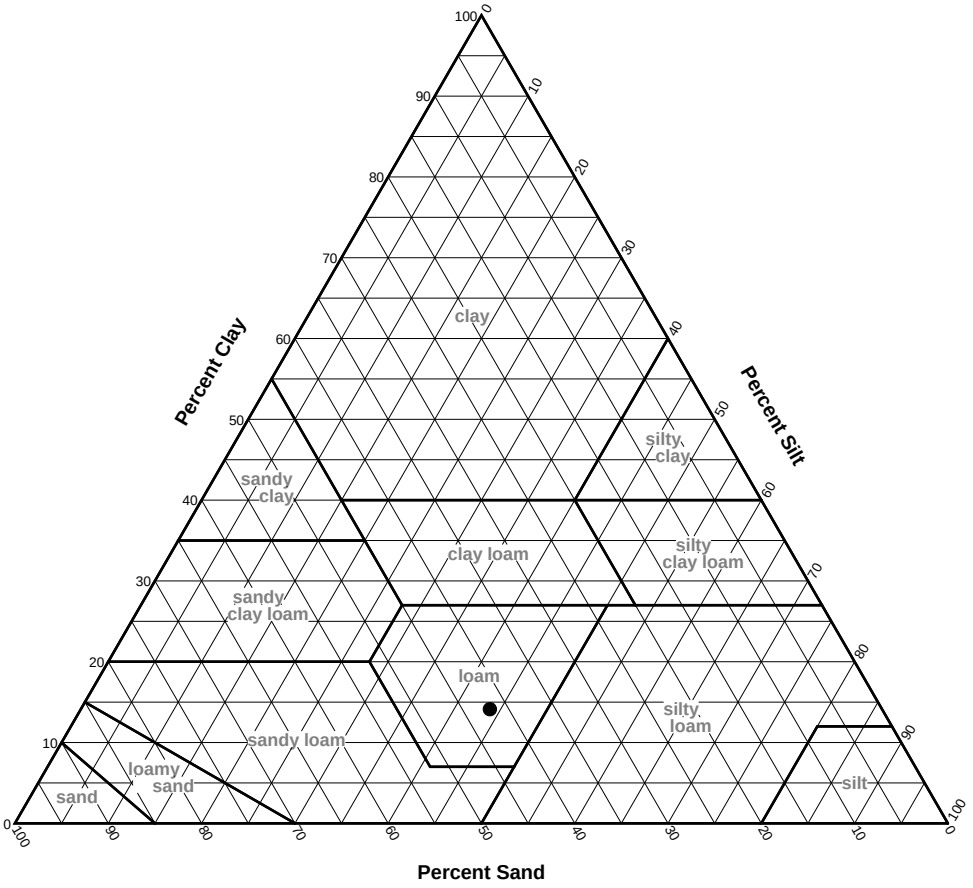
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35CS-02			42	43	14	Loam

Pioneer Technical Services, Inc.

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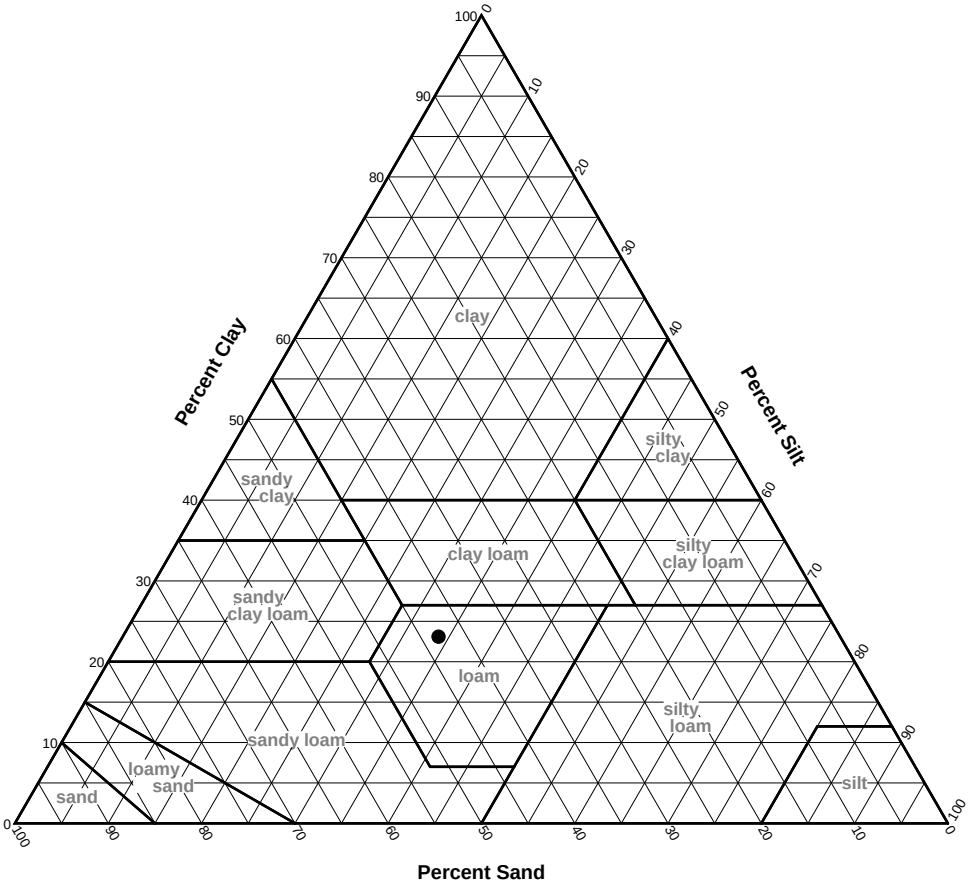
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35TP-104	13341	7-10'	43	34	23	Loam

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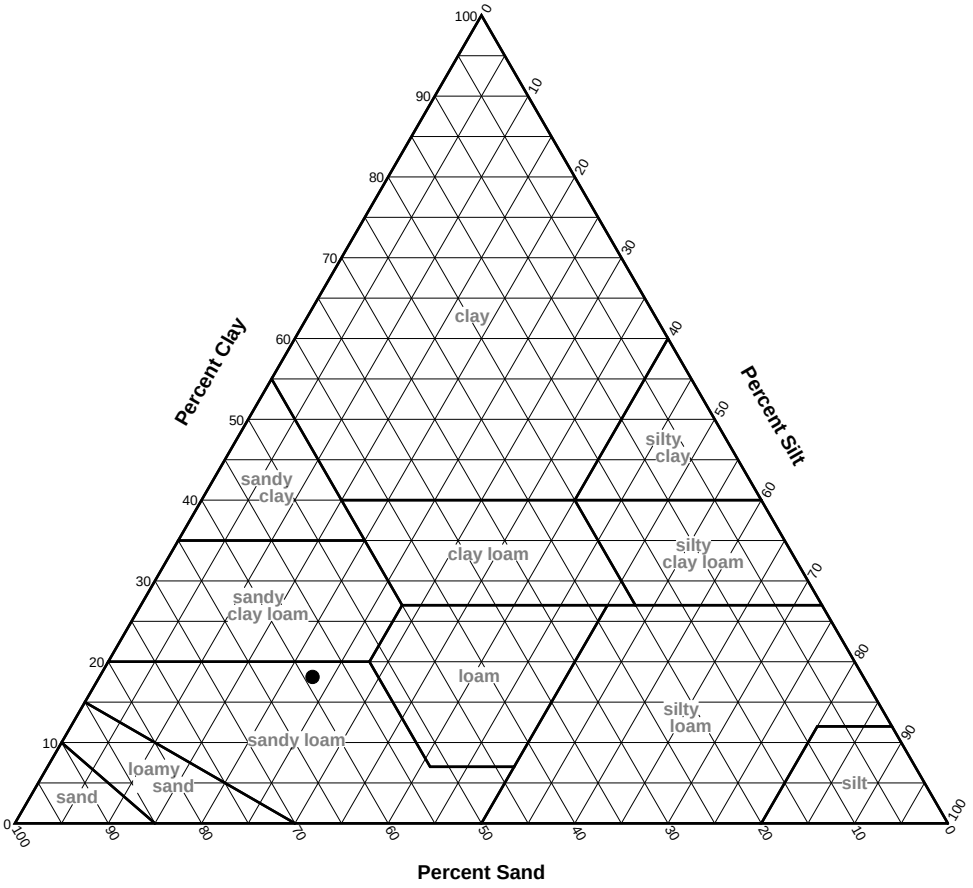
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation
Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35TP-106	13350	8.4-9.4'	59	23	18	Sandy loam

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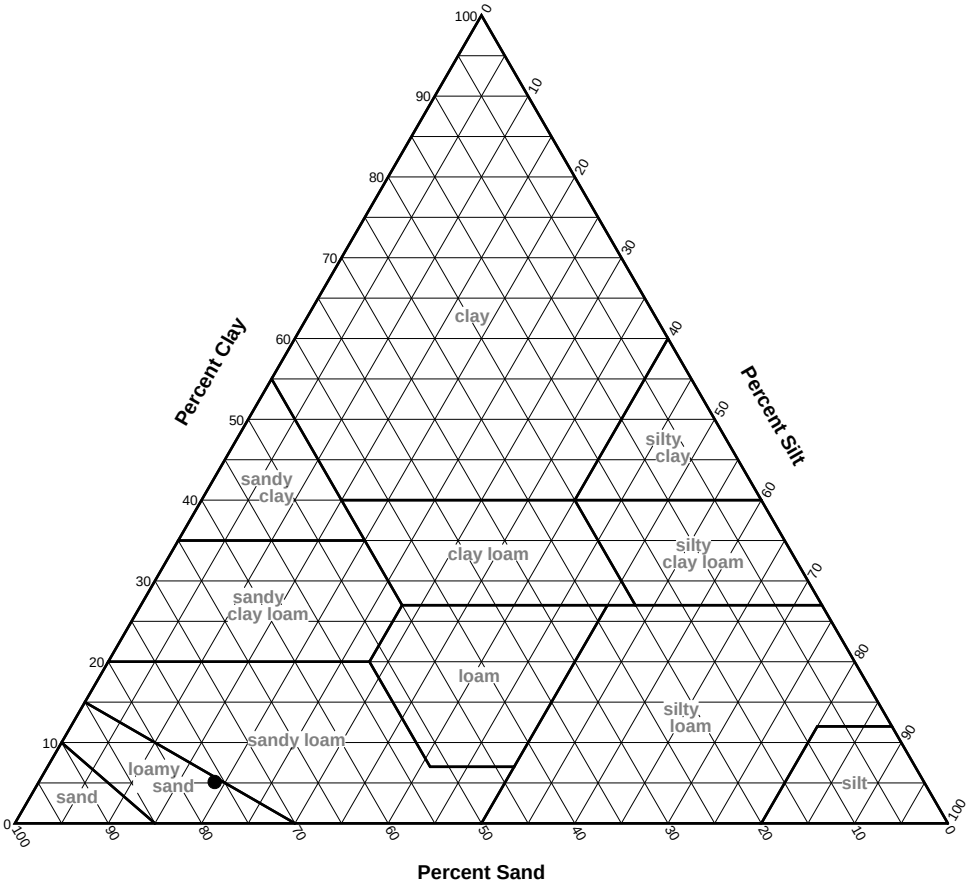
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation
Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35TP-107	13354	9-10'	76	19	5	Loamy sand

Pioneer Technical Services, Inc.

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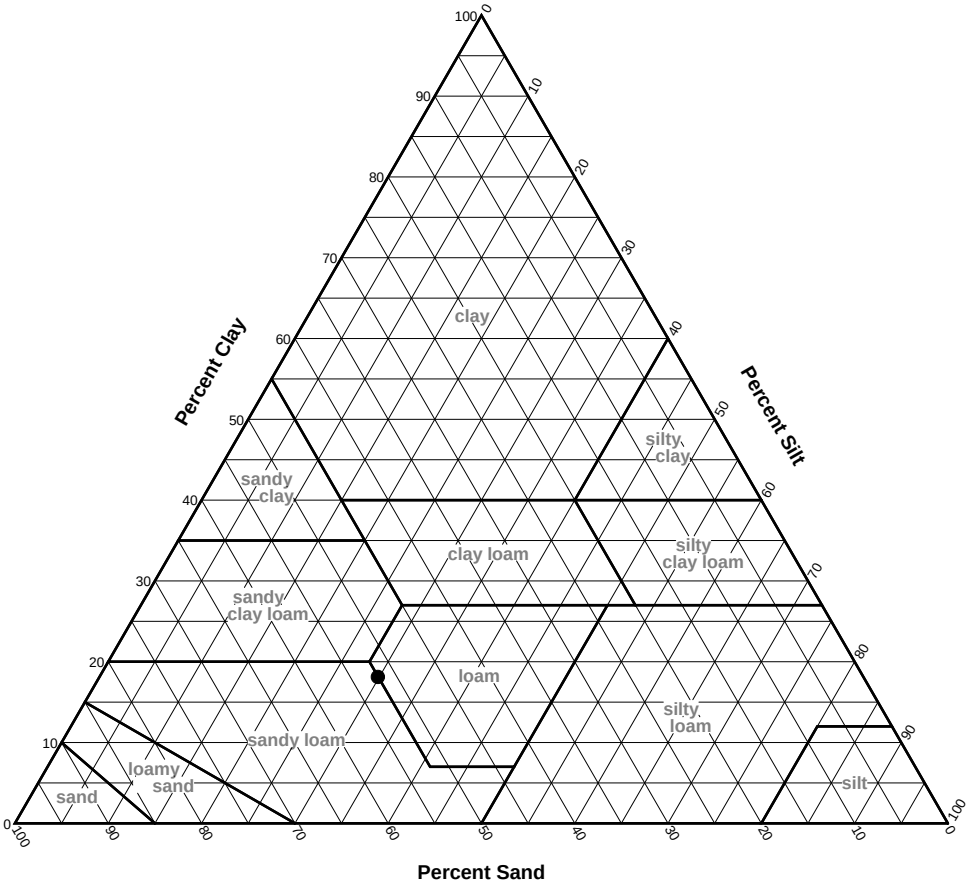
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

USDA Soil Classification

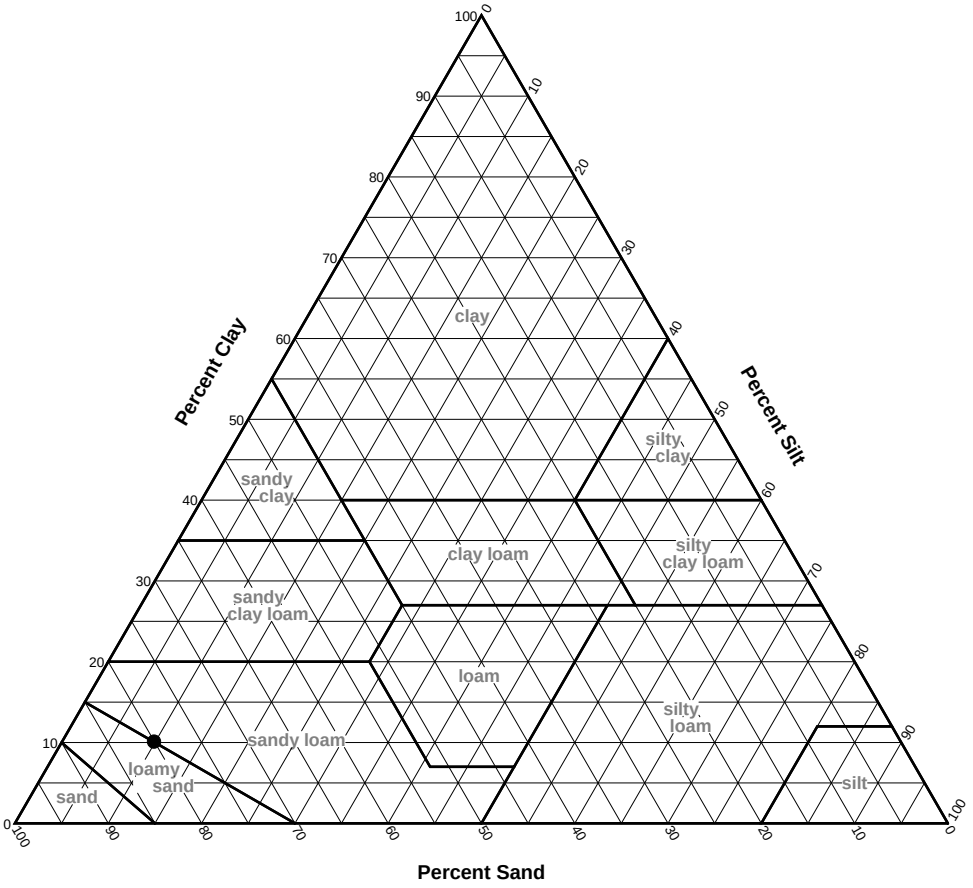


SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35TP-111	13371	10.5-11.5	52	30	18	Sandy loam

Pioneer Technical Services, Inc.
1215 Apple's Way - Belgrade, MT 59714
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation
Project No.: 10180 **Figure**

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	S35TP-113	13381	1.5-3.5	80	10	10	Sandy loam

Pioneer Technical Services, Inc.
1215 Apple's Way - Belgrade, MT 59714
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation
Project No.: 10180 **Figure**

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Visual Class			SEE ATTACHED	Comments: Material Description	Normal Turnaround	RUSH Turnaround	Pioneer Lab No.
	1. S35 TP-101 (0-0.7')			SOIL	X				X					X		13324
	2. S35 TP-101 (0.7-1.7')			SOIL										X		13325
	3. S35 TP-101 (2.5-3.5')			SOIL	X				X					X		13326
	4. S35 TP-101 (8.2-9.2')			SOIL	X				X					X		13327
	5. S35 TP-101 (17-17.2')			SOIL	X				X					X		13328
	6. S35 TP-101 (8.2- 9.2')			SOIL	X				X					X		13329

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
				JHD	10/8/12 3:00
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Visual Class			SEE ATTACHED	Comments: Material Description	Normal Turnaround	RUSH Turnaround	Pioneer Lab No.
	1. S35 TP-102 (0-0.7')			SOIL										X		13330
	2. S35 TP-102 (0.7-3.7')			SOIL					X					X		13331
	3. S35 TP-102 (9.0-10.0')			SOIL	X				X					X		13332
	4. S35 TP-102 (13-13.5')			SOIL	X				X					X		13333
	5. S35 TP-102 (15-16')			SOIL					X					X		13334
	6. S35 TP-103 (0-1.4')			SOIL										X		13335

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
				RAD	10/8/12 3:00
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer	Visual Class		SEE ATTACHED	Material Description	Normal Turnaround	RUSH Turnaround	Pioneer Lab No.
	1. S35 TP-103 (4.5-5.5')			SOIL	X					X				X		13336
	2. S35 TP-103 (8.5-9.5')			SOIL	X					X				X		13337
	3. S35 TP-103 (16.7-17.7')			SOIL	X					X				X		13338
	4. S35 TP-104 (0-1.0')			SOIL										X		13339
	5. S35 TP-104 (1-4.5')			SOIL						X				X		13340
	6. S35 TP-104 (7-10')			SOIL		X	X		X					X		13341

Comments:

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
				[signature]	10/8/12 3:00
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Visual Class			SEE ATTACHED	Comments: Material Description	Normal Tunraround	RUSH Turnaround	Pioneer Lab No.
	1. S35 TP-104 (15-17')			SOIL	X				X					X		13342
	2. S35 TP-105 (0-1.7')			SOIL										X		13343
	3. S35 TP-105 (3-4')			SOIL	X				X					X		13344
	4. S35 TP-105 (8-9')			SOIL	X				X					X		13345
	5. S35 TP-105 (17-17.5')			SOIL										X		13346
	6. S35 TP-105 (16.5-17.0')			SOIL										X		13347

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

Received by: [signature]

Date/Time: 10/8/12 3:00

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer	Visual Class		SEE ATTACHED	Comments: Material Description	Normal Tunraround	RUSH Turnaround	Pioneer Lab No.
	1. S35 TP-106 (0-2.9')			SOIL										X		13348
	2. S35 TP-106 (3.6-4.6')			SOIL						X				X		13349
	3. S35 TP-106 (8.4-9.4')			SOIL	X	X	X		X					X		13350
	4. S35 TP-106 (17.2-18.2')			SOIL	X					X				X		13351
	5.															
	6.															

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
				RAD	10/8/12 3:00
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer	Visual Class		SEE ATTACHED	Comments: Material Description	Normal Tunraround	RUSH Turnaround	Pioneer Lab No.
	1. S35TP - 107 0-1.7'			soil										X		13352
	2 S35TP – 107 1.7-5.2'			soil	X					X				X		13353
	3 S35TP – 107 9.0-10.0'			soil	X	X	X		X					X		13354
	4 S35TP – 107 15-16'			soil	X					X				X		13355
	5 S35TP-108 0-2.1'			soil										X		13356
	6 S35TP-108 2.1-4.7'			soil						X				X		13357

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
				LAD	10/8/12 3:00
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer	Visual Class		SEE ATTACHED	Comments: Material Description	Normal Turnaround	RUSH Turnaround	Pioneer Lab No.
	1 S35TP-108 8.5-9.5'			soil						X				X		13358
	2 S35TP-108 15-16'			soil						X				X		13359
	3 S35TP-108 15-16' (saturated)			soil										X		13360
	4 S35TP-109 0-1.3'			soil										X		13361
	5 S35TP-109 3.6-4.6'			soil	X					X				X		13362
	6 S35TP-109 7.3-8.3'			soil	X					X				X		13363

Custody Record MUST be Signed					
	Relinquished by:	Date/Time:	Shipped by:	Received by: LAD	Date/Time: 10/8/12 300
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer	Visual Class		SEE ATTACHED	Comments: Material Description	Normal Turnaround	RUSH Turnaround	Pioneer Lab No.
	1 S35TP-109 16.6-17.6'			soil	x					x				x		13364
	2 S35TP-110 0-1.3'			soil										x		13365
	3 S35TP-110 4-5'			soil	x					x				x		13366
	4 S35TP-110 9-10'			soil	x					x				x		13367
	5 S35TP-110 16.5-17.5'			soil	x					x				x		13368
	6 S35TP-111 0-1'			soil										x		13369

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
				RMD	10/8/12 300
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer	Visual Class		SEE ATTACHED	Comments: Material Description	Normal Turnaround	RUSH Turnaround	Pioneer Lab No.
	1 S35TP-111 1-4.7'			Soil	x					x						13370
	2 S35TP-111 10.5-11.5'			Soil	x	x	x		x							13371
	3 S35TP-111 16.5-17.0'			Soil												13372
	4 S35TP-111 18.0-18.7'			Soil												13373
	5 S35TP-111 16.0-16.5'			Soil												13374
	6 S35TP-112 0-2'			Soil												13375

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
					10/8/12 300
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer	Visual Class		SEE ATTACHED	Material Description	Normal Turnaround	RUSH Turnaround	Pioneer Lab No.
	1 S35TP-112 2-4.5'			Soil	X					X				X		13376
	2 S35TP-112 9.8-8.8'			Soil										X		13377
	3 S35TP-112 16-16.5'			Soil										X		13378
	4 S35TP-112 15-16'			Soil	X					X				X		13379
	5 S35TP-113 1-1.2'			Soil										X		13380
	6 S35TP-113 1.5-3.5'			Soil	X	X	X	X	X					X		13381

Comments:

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
				RAD	10/8/12 300
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer	Visual Class		SEE ATTACHED	Comments: Material Description	Normal Turnaround	RUSH Turnaround	Pioneer Lab No.
	1 S35TP-113 8-9'			Soil										x		13382
	2 S35TP-113 10-12'			Soil										x		13383
	3 S35TP-113 16-17'			Soil	x					x				x		13384

Custody Record MUST be Signed	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:
				LAD	10/8/12 300
	Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

PIONEER TECHNICAL SERVICES, INC.

Chain of Custody

Company Name: Pioneer Technical Services	Project Name: UBMC Repository	
Report Mail Address:	Project Contact Name, Phone, Fax, Email:	
Invoice Address:	Invoice Contact and Phone:	Purchase Order:

Client ID	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Sample Type	Moisture Content	Atterberg Limits	Gradation	Proctor (STD, MOD)	Hydrometer			SEE ATTACHED	Comments: Material Description	Normal Tunraround	RUSH Turnaround	Pioneer Lab No.
	1 S35-BGT-01: 13326, 13327, 13381, 13384, 13376, 13379			Soil	x				X							**
	2 S35-BGT-02: 13366, 13367, 13370, 13371, 13344, 13358			Soil	x				X							**
	3 S35-BGT-03: 13340, 13341, 13353, 13354, 13331			Soil	x				X							**
	4 S35-CS-01: 13324, 13325, 13380, 13375			Soil	x				X							**
	5 S35-CS-01: 13365, 13369, 13343, 13356			Soil	x				X							**
	6 S35-CS-01: 13339, 13352, 13330			Soil	x				X							**

Custody Record MUST be Signed				
Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time: 10/8/12 300
Relinquished by:	Date/Time:	Shipped by:	Received by:	Date/Time:

**All samples are composite samples of listed sample numbers.

APPENDIX C.2

GEOTECHNICAL LABORATORY DATA - SOIL BORING GEOTECHNICAL DATA

PIONEER TECHNICAL SERVICES, INC.
201 East Broadway, Suite C
Helena, Montana 59601
Phone (406)457-8252 Fax (406)442-1158
www.pioneer-technical.com

Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35MW-201B	S35MW-201B	S35MW-201B	S35MW-201B	S35MW-201B	S35MW-201B	S35MW-201B	S35MW-201B	S35MW-201B	S35MW-201B
Depth:	0.0-1.5	1.5-3.0	5.0-6.5	6.5-8.0	10.8-12.3	15.0-16.5	16.5-18.0	20.0-21.5	21.5-23.0	25.0-26.5
Date Tested:										
Wet Wt, & Pan (g):	196.8	96.6	112.2	200.2	134.7	345.0	128.1	299.1	108.2	253.6
Dry Wt, & Pan (g):	180.0	88.3	102.5	174.7	119.7	313.3	120.0	281.4	89.8	230.4
Loss of Moisture	16.8	8.4	9.6	25.5	15.0	31.7	8.1	17.6	18.4	23.3
Wt. of Pan (g):	27.1	16.0	15.8	26.9	15.9	33.8	16.0	27.4	11.7	32.6
Wt. of Dry Soil (g):	152.9	72.3	86.8	147.8	103.8	279.5	104.0	254.1	78.1	197.8
M. Content (%):	**11**	**12**	**11**	**17**	**14**	**11**	**8**	**7**	**24**	**12**

Lab No:										
BH or Loc:	S35MW-201B	S35MW-201B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B
Depth:	26.5-28.0	30.0-31.5	0.0-1.5	1.5-3.0	5.0-6.5	6.5-8.0	8.5-9.5	10.0-11.5	11.5-13.0	15.0-16.5
Date Tested:										
Wet Wt, & Pan (g):	210.0	115.8	263.2	110.7	258.0	70.0	232.5	182.3	81.1	231.8
Dry Wt, & Pan (g):	191.1	102.1	243.4	105.6	239.7	64.8	212.2	162.7	75.0	212.7
Loss of Moisture	18.9	13.7	19.7	5.0	18.3	5.2	20.4	19.7	6.1	19.2
Wt. of Pan (g):	24.9	14.5	33.7	14.5	33.4	15.8	34.0	27.7	15.9	33.8
Wt. of Dry Soil (g):	166.2	87.6	209.7	91.1	206.3	49.0	178.2	134.9	59.1	178.9
M. Content (%):	**11**	**16**	**9**	**6**	**9**	**11**	**11**	**15**	**10**	**11**

PIONEER TECHNICAL SERVICES, INC.
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www.pioneer-technical.com

Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-202B	S35MW-203B	S35MW-203B
Depth:	16.5-18.0	20.0-21.0	21.0-21.5	21.5-23.0	25.0-26.5	26.5-27.25	27.25-27.5	40.0-41.5	0.0-0.5	0.5-1.5
Date Tested:										
Wet Wt, & Pan (g):	91.5	318.4	171.0	85.3	197.4	74.1	68.3	94.9	67.5	102.0
Dry Wt, & Pan (g):	84.3	292.7	153.1	77.7	179.5	67.5	64.0	81.1	56.1	98.6
Loss of Moisture	7.3	25.7	18.0	7.7	17.8	6.6	4.3	13.8	11.4	3.3
Wt. of Pan (g):	15.6	25.1	24.5	15.8	32.6	16.1	16.0	15.7	11.7	15.8
Wt. of Dry Soil (g):	68.7	267.6	128.5	61.9	147.0	51.4	48.0	65.4	44.4	82.9
M. Content (%):	**11**	**10**	**14**	**12**	**12**	**13**	**9**	**21**	**26**	**4**

Lab No:										
BH or Loc:	S35MW-203B	S35MW-203B	S35MW-203B	S35MW-203B	S35MW-203B	S35MW-203B	S35MW-203B	S35MW-203B	S35MW-203B	S35MW-203B
Depth:	1.5-3.0	5.0-6.5	6.5-8.0	10.0-11.5	15.0-16.5	16.5-18.0	20.8-22.3	25.0-26.5	26.5-28.0	30.0-30.75
Date Tested:										
Wet Wt, & Pan (g):	104.3	129.3	78.2	237.5	120.0	89.2	274.4	276.3	89.3	92.4
Dry Wt, & Pan (g):	100.1	126.6	75.1	217.2	114.0	85.3	248.1	247.5	79.1	80.3
Loss of Moisture	4.2	2.7	3.1	20.2	6.0	3.9	26.4	28.9	10.2	12.1
Wt. of Pan (g):	16.0	16.1	12.2	25.0	16.3	15.9	25.1	25.0	15.8	15.9
Wt. of Dry Soil (g):	84.0	110.6	63.0	192.3	97.7	69.5	223.0	222.4	63.3	64.4
M. Content (%):	**5**	**2**	**5**	**11**	**6**	**6**	**12**	**13**	**16**	**19**

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Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35SB-204B	S35SB-204B	S35SB-204B	S35SB-204B	S35SB-204B	S35SB-204B	S35SB-204B	S35SB-204B	S35SB-204B	S35SB-204B
Depth:	0.0-0.75	0.75-1.5	1.5-3.0	5.0-6.5	6.5-8.0	10.0-11.5	11.5-13.0	21.5-23.0	25.0-26.5	30.0-30.5
Date Tested:										
Wet Wt, & Pan (g):	119.4	97.0	98.9	239.3	74.6	182.3	78.2	75.2	325.1	184.0
Dry Wt, & Pan (g):	112.0	91.7	93.5	225.8	68.6	165.3	71.7	68.7	268.8	159.7
Loss of Moisture	7.4	5.4	5.4	13.5	6.0	17.0	6.5	6.5	56.3	24.3
Wt. of Pan (g):	23.0	16.1	15.5	24.7	14.5	25.1	16.4	14.1	33.9	23.2
Wt. of Dry Soil (g):	89.0	75.6	78.0	201.1	54.1	140.2	55.3	54.6	234.9	136.5
M. Content (%):	**8**	**7**	**7**	**7**	**11**	**12**	**12**	**12**	**24**	**18**

Lab No:										
BH or Loc:	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B
Depth:	0.0-0.5	0.5-1.5	1.5-3.0	5.0-5.5	5.5-6.5	6.5-8.0	10.0-11.5	11.5-13.0	16.5-18.0	20.0-21.5
Date Tested:										
Wet Wt, & Pan (g):	83.6	186.3	103.5	273.4	238.4	97.9	96.0	94.3	88.6	190.9
Dry Wt, & Pan (g):	78.3	174.4	99.8	256.3	221.8	93.2	87.5	86.1	80.4	171.7
Loss of Moisture	5.4	11.9	3.8	17.1	16.6	4.7	8.4	8.2	8.3	19.2
Wt. of Pan (g):	15.9	25.0	16.1	34.0	23.2	15.7	15.8	16.1	15.8	32.2
Wt. of Dry Soil (g):	62.4	149.4	83.7	222.2	198.7	77.5	71.7	70.0	64.6	139.4
M. Content (%):	**9**	**8**	**4**	**8**	**8**	**6**	**12**	**12**	**13**	**14**

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Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35SB-206B	S35MW-207	S35MW-207	S35MW-207
Depth:	21.5-23.0	25.0-26.5	26.5-28.0	30.0-31.5	35.0-36.5	40.0-41.5	45.0-45.9	0.0-1.5	1.5-3.0	5.0-6.5
Date Tested:										
Wet Wt, & Pan (g):	203.0	281.1	106.8	88.6	89.1	103.1	102.2	169.2	110.6	298.4
Dry Wt, & Pan (g):	175.9	240.5	86.3	73.9	79.2	88.6	93.2	152.6	107.3	279.7
Loss of Moisture	27.1	40.5	20.6	14.7	9.8	14.5	9.1	16.6	3.3	18.7
Wt. of Pan (g):	34.1	24.7	14.5	15.8	15.6	15.6	15.6	22.9	15.9	32.6
Wt. of Dry Soil (g):	141.8	215.9	71.8	58.1	63.7	72.9	77.6	129.7	91.4	247.1
M. Content (%):	**19**	**19**	**29**	**25**	**15**	**20**	**12**	**13**	**4**	**8**

Lab No:										
BH or Loc:	S35MW-207	S35MW-207	S35MW-207	S35MW-207	S35MW-207	S35MW-207	S35SB-208B	S35SB-208B	S35SB-208B	S35SB-208B
Depth:	6.5-8.0	10.0-11.5	11.5-13.0	15.0-15.5	30.0-31.0	35.0-35.25	5.0-6.5	6.5-8.0	10.8-12.3	15.3-16.8
Date Tested:										
Wet Wt, & Pan (g):	263.2	311.6	99.2	96.0	101.6	91.5	214.9	187.7	91.6	145.9
Dry Wt, & Pan (g):	236.7	288.3	89.4	86.2	81.2	80.6	198.6	171.1	83.7	132.7
Loss of Moisture	26.5	23.4	9.8	9.8	20.4	11.0	16.3	16.7	8.0	13.2
Wt. of Pan (g):	25.0	27.4	15.6	15.8	15.8	25.1	27.6	23.1	15.7	23.0
Wt. of Dry Soil (g):	211.7	260.9	73.8	70.4	65.4	55.5	171.0	148.0	68.0	109.8
M. Content (%):	**13**	**9**	**13**	**14**	**31**	**20**	**10**	**11**	**12**	**12**

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www.pioneer-technical.com

Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35SB-208B	S35SB-208B	S35SB-208B	S35SB-208B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B
Depth:	20.0-20.7	20.7-22.3	30.0-31.5	31.5-33.0	0.0-1.5	1.5-3.0	5.0-6.5	6.5-8.0	10.0-10.5	10.5-11.5
Date Tested:										
Wet Wt, & Pan (g):	118.4	105.7	267.7	89.3	232.5	146.0	208.9	101.8	323.0	241.1
Dry Wt, & Pan (g):	110.0	96.3	241.7	78.6	214.5	137.1	187.0	93.2	308.8	218.7
Loss of Moisture	8.4	9.3	26.0	10.7	18.0	8.9	21.8	8.6	14.2	22.4
Wt. of Pan (g):	27.9	15.8	25.0	16.0	25.0	23.0	27.4	16.1	34.0	34.0
Wt. of Dry Soil (g):	82.1	80.5	216.8	62.6	189.6	114.1	159.6	77.2	274.8	184.7
M. Content (%):	**10**	**12**	**12**	**17**	**10**	**8**	**14**	**11**	**5**	**12**

Lab No:										
BH or Loc:	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B	S35SB-209B
Depth:	11.5-13.0	15.0-16.5	16.5-16.75,	16.75-17.0	20.0-21.5	21.5-23.0	25.0-26.5	26.5-28.0	30.0-30.75	30.75-31.5
Date Tested:			17.0-18.0							
Wet Wt, & Pan (g):	101.7	289.0	91.3	112.4	231.1	149.4	290.3	225.0	192.0	137.7
Dry Wt, & Pan (g):	94.3	263.3	83.8	104.4	209.1	128.0	264.7	202.5	172.7	119.8
Loss of Moisture	7.4	25.7	7.5	8.0	22.0	21.4	25.5	22.5	19.3	17.9
Wt. of Pan (g):	16.1	32.6	16.1	27.9	24.7	14.5	33.9	32.6	25.0	22.9
Wt. of Dry Soil (g):	78.2	230.7	67.7	76.6	184.5	113.5	230.9	170.0	147.7	96.8
M. Content (%):	**9**	**11**	**11**	**10**	**12**	**19**	**11**	**13**	**13**	**19**

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Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35SB-209B	S35SB-209B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B
Depth:	35.0-36.5	40.0-41.5	0.0-0.75	0.75-1.5	1.5-3.0	5.0-6.5	6.5-8.0	9.75-11.25	15.0-16.5	16.5-17.5
Wet Wt, & Pan (g):	79.6	151.7	69.9	203.0	90.8	209.7	79.4	105.2	183.2	82.9
Dry Wt, & Pan (g):	64.5	120.0	57.3	194.8	87.7	194.2	73.2	95.3	166.4	74.2
Loss of Moisture	15.0	31.7	12.6	8.2	3.1	15.5	6.2	9.9	16.9	8.7
Wt. of Pan (g):	16.4	24.7	16.0	27.1	14.1	27.9	14.5	15.1	25.0	15.8
Wt. of Dry Soil (g):	48.2	95.3	41.3	167.7	73.7	166.4	58.7	80.2	141.4	58.4
M. Content (%):	**31**	**33**	**31**	**5**	**4**	**9**	**11**	**12**	**12**	**15**

Lab No:										
BH or Loc:	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-210B	S35SB-211B	S35SB-211B	S35SB-211B
Depth:	17.5-18.0	20.0-21.5	21.5-23.0	25.0-26.5	30.0-31.5	35.0-36.5	40.0-41.5	0.0-1.5	5.0-6.5	9.5-11.0
Date Tested:										
Wet Wt, & Pan (g):	67.7	250.0	267.8	166.0	211.2	180.9	168.1	217.8	263.5	113.3
Dry Wt, & Pan (g):	58.6	225.8	239.8	149.5	180.0	152.1	148.7	198.9	245.3	99.8
Loss of Moisture	9.1	24.2	27.9	16.6	31.2	28.8	19.4	19.0	18.2	13.5
Wt. of Pan (g):	15.9	25.6	33.7	27.1	24.9	27.6	33.8	25.0	34.1	8.8
Wt. of Dry Soil (g):	42.6	200.2	206.1	122.4	155.1	124.5	114.9	173.9	211.2	91.0
M. Content (%):	**21**	**12**	**14**	**14**	**20**	**23**	**17**	**11**	**9**	**15**

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Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35SB-211B	S35SB-211B	S35SB-212B	S35SB-212B	S35SB-212B	S35SB-212B	S35SB-212B	S35SB-212B	S35SB-212B	S35SB-212B
Depth:	15.0-16.5	20.0-21.5	0.0-0.5	0.5-1.5	1.5-3.0	5.0-6.5	6.5-8.0	10.0-11.5	11.5-13.0	15.0-16.5
Wet Wt, & Pan (g):	144.5	111.3	80.6	361.3	104.0	285.4	263.2	251.5	217.8	222.2
Dry Wt, & Pan (g):	127.2	98.6	70.2	349.2	99.1	263.7	251.1	228.7	199.8	205.2
Loss of Moisture	17.4	12.7	10.4	12.2	4.9	21.6	12.1	22.8	17.9	17.0
Wt. of Pan (g):	18.8	13.5	16.2	33.8	16.1	25.1	27.3	24.9	24.7	23.1
Wt. of Dry Soil (g):	108.3	85.1	54.0	315.4	83.1	238.6	223.8	203.8	175.2	182.1
M. Content (%):	**16**	**15**	**19**	**4**	**6**	**9**	**5**	**11**	**10**	**9**

Lab No:										
BH or Loc:	S35SB-212B	S35SB-213B	S35SB-213B	S35SB-213B	S35SB-213B	S35SB-213B	S35SB-213B	S35SB-213B	S35SB-213B	S35SB-213B
Depth:	20.0-21.5	0.0-1.0	1.0-1.5	1.5-3.0	5.0-6.5	6.5-8.0	10.8-12.3	15.0-16.5	16.5-18.0	30.0-31.5
Date Tested:										
Wet Wt, & Pan (g):	116.2	88.2	112.7	94.9	330.8	238.1	217.9	286.3	293.9	280.0
Dry Wt, & Pan (g):	110.8	76.4	106.2	90.3	312.3	215.8	198.8	260.2	270.2	257.8
Loss of Moisture	5.4	11.8	6.5	4.6	18.5	22.3	19.1	26.1	23.7	22.1
Wt. of Pan (g):	16.0	16.4	15.7	16.0	33.7	24.9	32.4	14.4	33.3	34.0
Wt. of Dry Soil (g):	94.8	60.0	90.6	74.3	278.6	190.9	166.4	245.8	236.9	223.8
M. Content (%):	**6**	**20**	**7**	**6**	**7**	**12**	**11**	**11**	**10**	**10**

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Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35SB-213B	S35SB-213B	S35SB-213B	S35SB-214B	S35SB-214B	S35SB-214B	S35SB-214B	S35SB-214B	S35SB-214B	S35SB-214B
Depth:	35.0-37.0	40.8-42.3	46.75-48.25	0.0-1.5	1.5-3.0	5.0-5.5	5.5-6.5	6.5-8.0	11.5-12.0	12.0-13.0
Wet Wt, & Pan (g):	276.3	206.3	259.9	263.6	154.4	164.4	200.3	232.6	84.7	66.1
Dry Wt, & Pan (g):	247.5	186.1	234.6	248.3	149.0	149.0	182.2	211.5	78.1	60.8
Loss of Moisture	28.9	20.2	25.3	15.2	5.4	15.4	18.1	21.0	6.6	5.3
Wt. of Pan (g):	25.0	28.0	26.7	32.2	33.8	24.8	27.0	25.1	15.8	12.2
Wt. of Dry Soil (g):	222.4	158.1	207.9	216.1	115.2	124.2	155.2	186.4	62.3	48.6
M. Content (%):	**13**	**13**	**12**	**7**	**5**	**12**	**12**	**11**	**11**	**11**

Lab No:										
BH or Loc:	S35SB-214B	S35SB-214B	S35SB-214B	S35SB-214B	S35SB-214B	S35SB-215T	S35SB-215T	S35SB-215T	S35SB-215T	S35SB-215T
Depth:	20.0-21.5	21.5-23.0	25.0-26.5	35.0-36.0	40.0-40.25	0.0-0.75	0.75-1.5	1.5-3.0	5.0-6.5	15.0-16.5
Date Tested:										
Wet Wt, & Pan (g):	326.2	203.4	116.4	109.4	81.3	88.5	109.3	306.2	236.1	95.9
Dry Wt, & Pan (g):	297.7	186.7	106.7	92.3	66.0	75.1	104.4	290.4	218.3	89.2
Loss of Moisture	28.5	16.8	9.8	17.1	15.3	13.4	4.9	15.8	17.8	6.7
Wt. of Pan (g):	32.4	24.6	15.9	16.0	15.6	16.1	20.4	33.9	27.4	20.7
Wt. of Dry Soil (g):	265.3	162.1	90.8	76.3	50.4	59.0	84.0	256.5	190.9	68.5
M. Content (%):	**11**	**10**	**11**	**22**	**30**	**23**	**6**	**6**	**9**	**10**

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Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:										
BH or Loc:	S35SB-215T	S35SB-215T	S35SB-215T	S35SB-215T	S35SB-215T	S35SB-215T	S35SB-215T	S35SB-216B	S35SB-216B	S35SB-216B
Depth:	20.0-21.5	25.0-26.5	35.0-36.5	40.0-41.5	45.0-46.5	50.0-51.5	55.0-56.5	0.0-1.5	5.0-6.5	6.5-8.0
Wet Wt, & Pan (g):	111.2	93.3	139.2	301.7	261.6	277.5	223.7	284.1	278.8	115.7
Dry Wt, & Pan (g):	101.5	82.5	125.5	272.4	243.8	250.7	201.3	263.3	251.8	110.0
Loss of Moisture	9.8	10.9	13.7	29.3	17.8	26.7	22.4	20.8	27.0	5.7
Wt. of Pan (g):	13.5	12.2	14.5	33.8	25.1	27.0	27.9	24.9	25.0	16.1
Wt. of Dry Soil (g):	88.0	70.2	111.0	238.6	218.7	223.7	173.4	238.4	226.8	94.0
M. Content (%):	**11**	**15**	**12**	**12**	**8**	**12**	**13**	**9**	**12**	**6**

Lab No:										
BH or Loc:	S35SB-216B	S35SB-216B	S35SB-216B	S35SB-216B	S35MW-217	S35MW-217	S35MW-217	S35MW-217	S35MW-217	S35MW-217
Depth:	10.0-11.5	11.5-13.0	15.0-16.5	20.0-21.5	0.0-1.5	1.5-3.0	5.0-6.5	10.0-11.5	11.5-13.0	25.9-27.4
Date Tested:										
Wet Wt, & Pan (g):	227.2	185.5	229.4	221.3	85.6	113.4	248.1	218.4	252.4	264.0
Dry Wt, & Pan (g):	199.6	163.7	205.5	201.6	80.4	106.0	231.0	194.7	226.4	238.4
Loss of Moisture	27.5	21.8	23.9	19.7	5.2	7.4	17.1	23.7	26.0	25.5
Wt. of Pan (g):	25.6	23.1	27.8	24.6	16.3	13.4	26.7	24.7	27.1	27.9
Wt. of Dry Soil (g):	174.0	140.6	177.7	177.0	64.2	92.6	204.4	170.0	199.3	210.5
M. Content (%):	**16**	**16**	**13**	**11**	**8**	**8**	**8**	**14**	**13**	**12**

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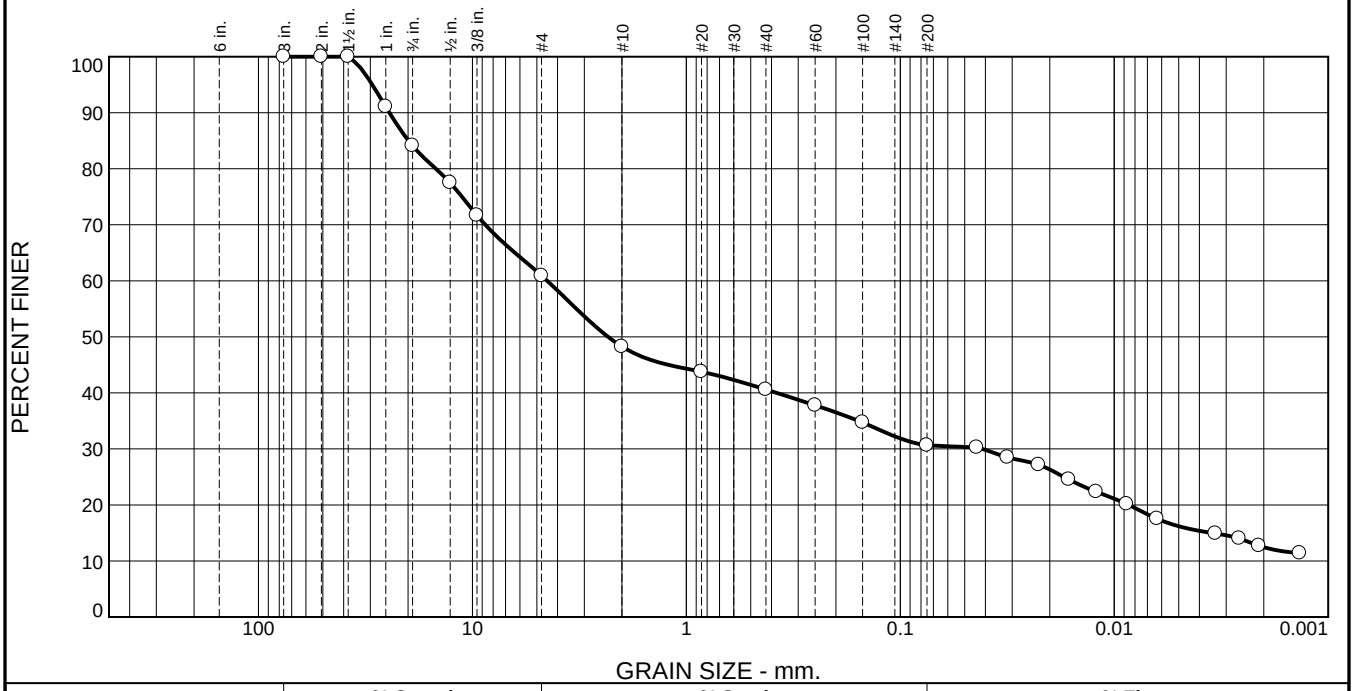
Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: UBMC Section 35 Design Investigation, Soil Boreholes **Project Number:** 10180

Lab No:			
BH or Loc:	S35MW-217	S35MW-217	
Depth:	30.0-31.5	35.0-36.5	
Date Tested:			
Wet Wt, & Pan (g):	126.5	210.7	
Dry Wt, & Pan (g):	111.8	169.2	
Loss of Moisture	14.7	41.5	
Wt. of Pan (g):	13.4	33.6	
Wt. of Dry Soil (g):	98.4	135.5	
M. Content (%):	**15**	**31**	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	16	23	13	7	10	15	16

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	100		
1.5	100		
1	91		
.75	84		
.5	77		
.375	72		
#4	61		
#10	48		
#20	44		
#40	41		
#60	38		
#100	35		
#200	31		
0.0438 mm.	30		
0.0315 mm.	28		
0.0226 mm.	27		
0.0163 mm.	25		
0.0121 mm.	22		
0.0087 mm.	20		
0.0063 mm.	18		
0.0034 mm.	15		
0.0026 mm.	14		
0.0021 mm.	13		
0.0014 mm.	11		

* (no specification provided)

Material Description

clayey gravel with sand

Atterberg Limits (ASTM D 4318)

PL= 14 **LL=** 30 **PI=** 16

Classification

USCS (D 2487)= GC **AASHTO (M 145)=** A-2-6(1)

Coefficients

D_{90}= 24.4296 D_{85}= 19.9054 D_{60}= 4.4705
D_{50}= 2.3234 D_{30}= 0.0414 D_{15}= 0.0035
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Source of Sample: S35MW-203B **Depth:** 20-20.8' **Date Sampled:**

Pioneer Technical Services, Inc.

1215 Apple's Way - Belgrade, MT 59714

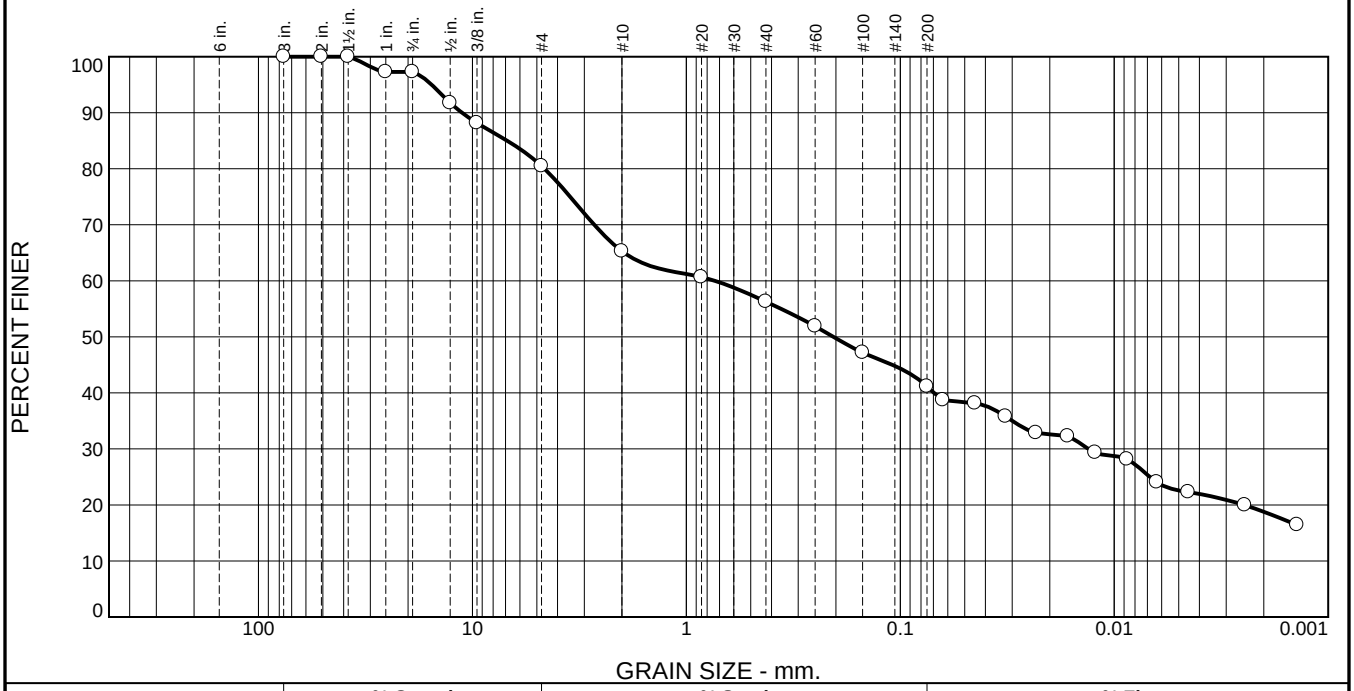
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	3	17	15	9	15	18	23

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	100		
1.5	100		
1	97		
.75	97		
.5	92		
.375	88		
#4	80		
#10	65		
#20	61		
#40	56		
#60	52		
#100	47		
#200	41		
0.0631 mm.	39		
0.0448 mm.	38		
0.0322 mm.	36		
0.0232 mm.	33		
0.0165 mm.	32		
0.0123 mm.	29		
0.0087 mm.	28		
0.0063 mm.	24		
0.0045 mm.	22		
0.0025 mm.	20		
0.0014 mm.	16		

* (no specification provided)

Material Description

clayey sand with gravel

Atterberg Limits (ASTM D 4318)

PL= 16 **LL=** 36 **PI=** 20

Classification

USCS (D 2487)= SC **AASHTO (M 145)=** A-6(4)

Coefficients

D_{90}= 11.1947 D_{85}= 6.8838 D_{60}= 0.7366
D_{50}= 0.2054 D_{30}= 0.0132 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: LS

Checked By:

Title:

Source of Sample: S35SB-206B **Depth:** 15-16.5' **Date Sampled:**

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1215 Apple's Way - Belgrade, MT 59714
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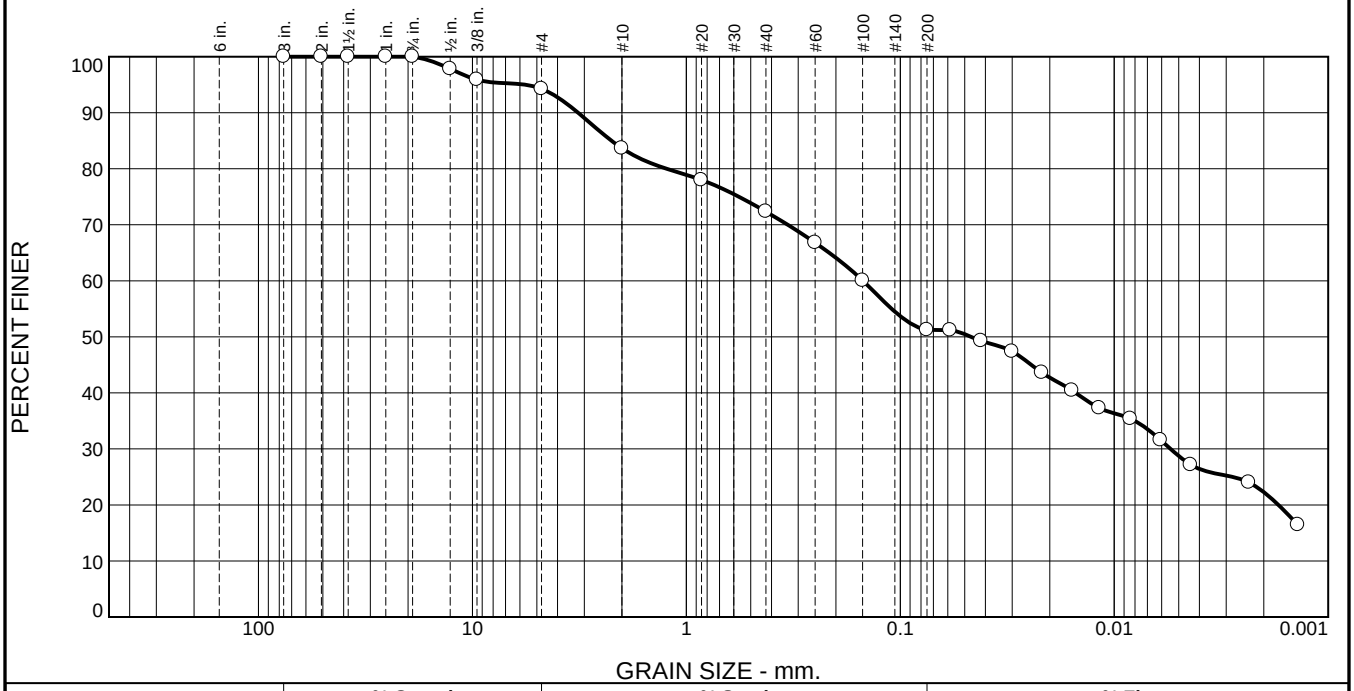
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	6	10	12	21	22	29

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	100		
1.5	100		
1	100		
.75	100		
.5	98		
.375	96		
#4	94		
#10	84		
#20	78		
#40	72		
#60	67		
#100	60		
#200	51		
0.0584 mm.	51		
0.0419 mm.	49		
0.0300 mm.	47		
0.0218 mm.	44		
0.0158 mm.	40		
0.0117 mm.	37		
0.0084 mm.	35		
0.0061 mm.	32		
0.0044 mm.	27		
0.0023 mm.	24		
0.0014 mm.	16		

* (no specification provided)

Material Description

sandy lean clay

Atterberg Limits (ASTM D 4318)

PL= 21 **LL=** 48 **PI=** 27

Classification

USCS (D 2487)= CL **AASHTO (M 145)=** A-7-6(10)

Coefficients

D_{90}= 3.2075 D_{85}= 2.2393 D_{60}= 0.1495
D_{50}= 0.0466 D_{30}= 0.0055 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Source of Sample: S35SB-206B **Depth:** 35-36.5 **Date Sampled:**

Pioneer Technical Services, Inc.

1215 Apple's Way - Belgrade, MT 59714

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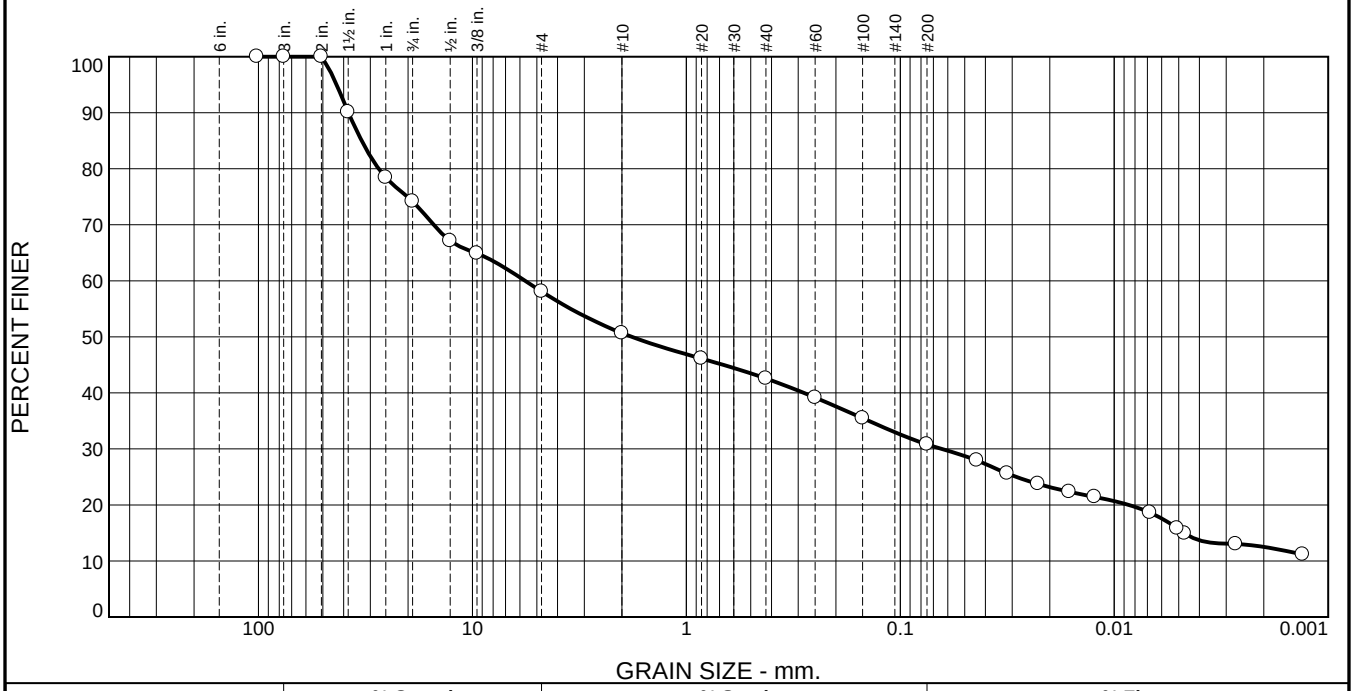
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	26	16	7	8	12	15	16

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
4	100		
3	100		
2	100		
1.5	90		
1	78		
3/4	74		
1/2	67		
3/8	65		
#4	58		
#10	51		
#20	46		
#40	43		
#60	39		
#100	35		
#200	31		
0.0439 mm.	28		
0.0316 mm.	26		
0.0227 mm.	24		
0.0162 mm.	22		
0.0124 mm.	21		
0.0068 mm.	19		
0.0051 mm.	16		
0.0047 mm.	15		
0.0027 mm.	13		
0.0013 mm.	11		

* (no specification provided)

Material Description

clayey gravel with sand

Atterberg Limits (ASTM D 4318)

PL= 14 **LL=** 29 **PI=** 15

Classification

USCS (D 2487)= GC **AASHTO (M 145)=** A-2-6(1)

Coefficients

D_{90}= 37.9812 D_{85}= 32.9426 D_{60}= 5.6684
D_{50}= 1.7985 D_{30}= 0.0642 D_{15}= 0.0047
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: NG/BG

Checked By: NG

Title:

Source of Sample: S35SB-208B **Depth:** 20-20.7' **Date Sampled:**

Pioneer Technical Services, Inc.

1215 Apple's Way - Belgrade, MT 59714

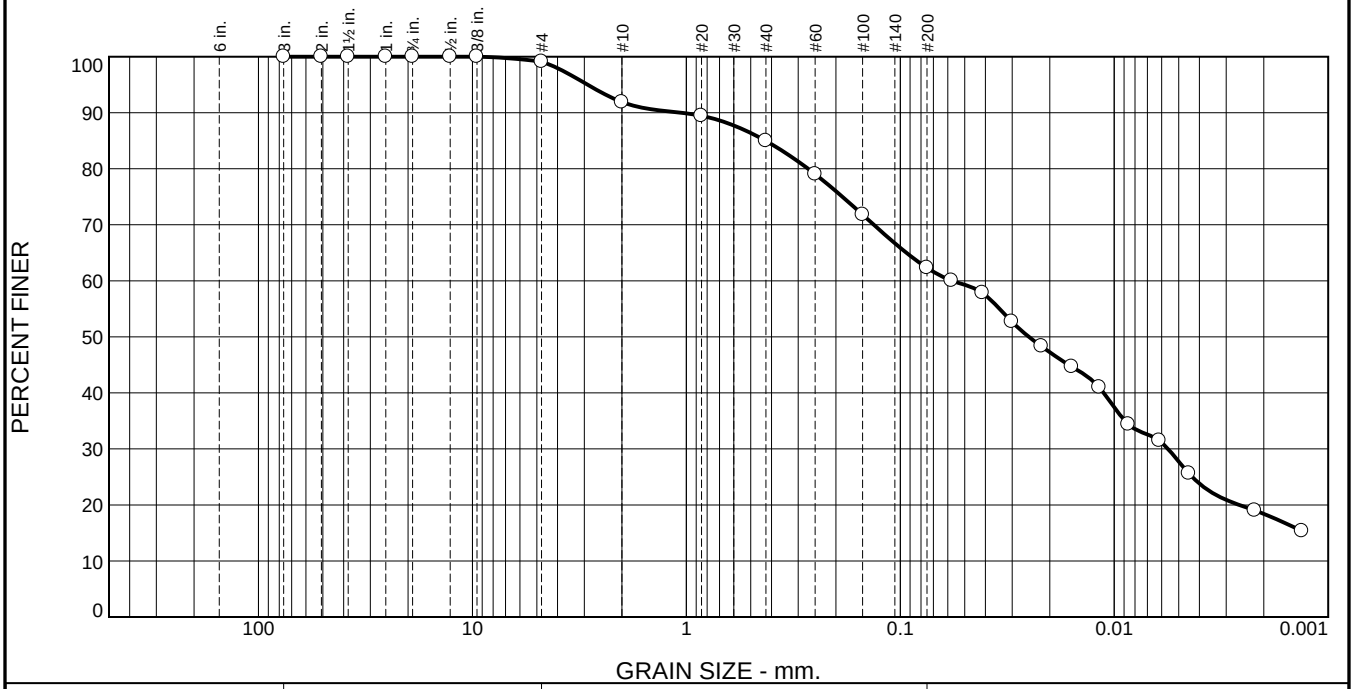
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	7	7	23	34	28

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	100		
1.5	100		
1	100		
.75	100		
.5	100		
.375	100		
#4	99		
#10	92		
#20	89		
#40	85		
#60	79		
#100	72		
#200	62		
0.0576 mm.	60		
0.0413 mm.	58		
0.0302 mm.	53		
0.0219 mm.	48		
0.0158 mm.	45		
0.0118 mm.	41		
0.0086 mm.	34		
0.0062 mm.	31		
0.0045 mm.	26		
0.0022 mm.	19		
0.0013 mm.	15		

* (no specification provided)

Material Description

sandy lean clay

Atterberg Limits (ASTM D 4318)

PL= 12 **LL=** 41 **PI=** 29

Classification

USCS (D 2487)= CL **AASHTO (M 145)=** A-7-6(14)

Coefficients

D_{90}= 1.0604 D_{85}= 0.4264 D_{60}= 0.0573
D_{50}= 0.0250 D_{30}= 0.0056 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Source of Sample: S35SB-211B **Depth:** 9-9.5' **Date Sampled:**

Pioneer Technical Services, Inc.

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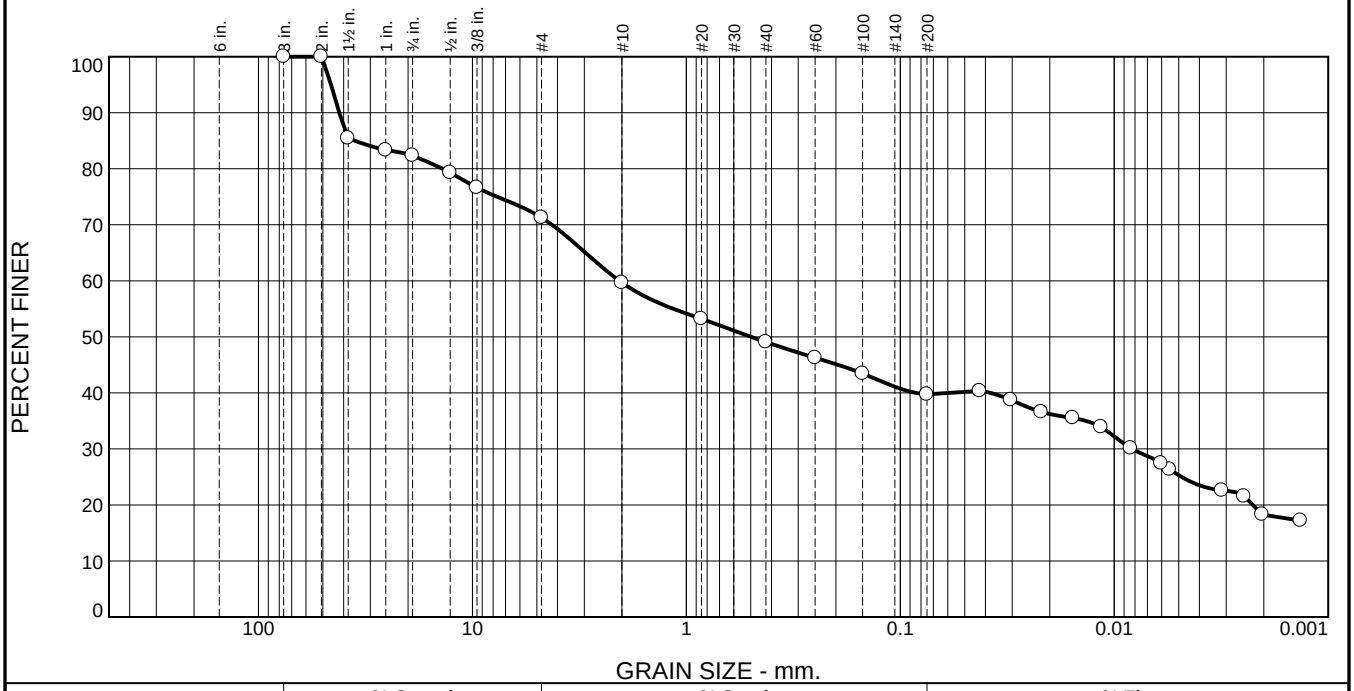
Ph. 406-388-8578 - Fax 406-388-8579

Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	18	11	11	11	9	15	25

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	100		
1.5	85		
1	83		
.75	82		
.5	79		
.375	77		
#4	71		
#10	60		
#20	53		
#40	49		
#60	46		
#100	43		
#200	40		
0.0425 mm.	40		
0.0304 mm.	39		
0.0219 mm.	37		
0.0156 mm.	36		
0.0115 mm.	34		
0.0084 mm.	30		
0.0060 mm.	27		
0.0055 mm.	26		
0.0031 mm.	23		
0.0025 mm.	22		
0.0020 mm.	18		
0.0013 mm.	17		

* (no specification provided)

Material Description

clayey sand with gravel

Atterberg Limits (ASTM D 4318)

PL= 15 **LL=** 39 **PI=** 24

Classification

USCS (D 2487)= SC **AASHTO (M 145)=** A-6(4)

Coefficients

D_{90}= 41.9225 D_{85}= 35.5060 D_{60}= 2.0557
D_{50}= 0.4986 D_{30}= 0.0083 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: _____

Checked By: _____

Title: _____

Source of Sample: S35SB-213B **Depth:** 40-40.8' **Date Sampled:**

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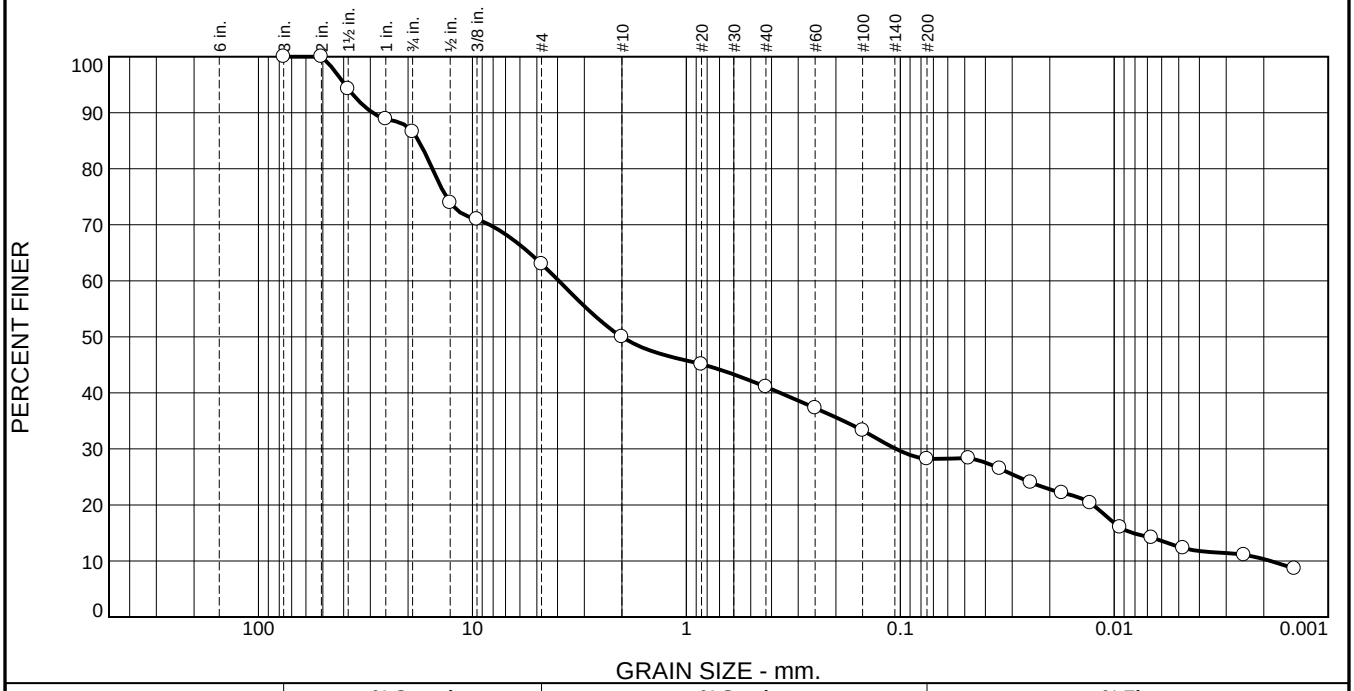
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	13	24	13	9	13	15	13

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100		
2	100		
1.5	94		
1	89		
.75	87		
.5	74		
.375	71		
#4	63		
#10	50		
#20	45		
#40	41		
#60	37		
#100	33		
#200	28		
0.0480 mm.	28		
0.0343 mm.	26		
0.0246 mm.	24		
0.0176 mm.	22		
0.0129 mm.	20		
0.0094 mm.	16		
0.0067 mm.	14		
0.0048 mm.	12		
0.0025 mm.	11		
0.0014 mm.	8.6		

* (no specification provided)

Material Description

clayey gravel with sand

Atterberg Limits (ASTM D 4318)

PL= 13 **LL=** 26 **PI=** 13

Classification

USCS (D 2487)= GC **AASHTO (M 145)=** A-2-6(0)

Coefficients

D_{90}= 29.2726 D_{85}= 17.8472 D_{60}= 3.9480
D_{50}= 2.0032 D_{30}= 0.1047 D_{15}= 0.0082
D_{10}= 0.0019 C_u= 2123.57 C_c= 1.49

Remarks

Date Received: **Date Tested:**

Tested By:

Checked By:

Title:

Source of Sample: S35MW-217 **Depth:** 25-25.9' **Date Sampled:**

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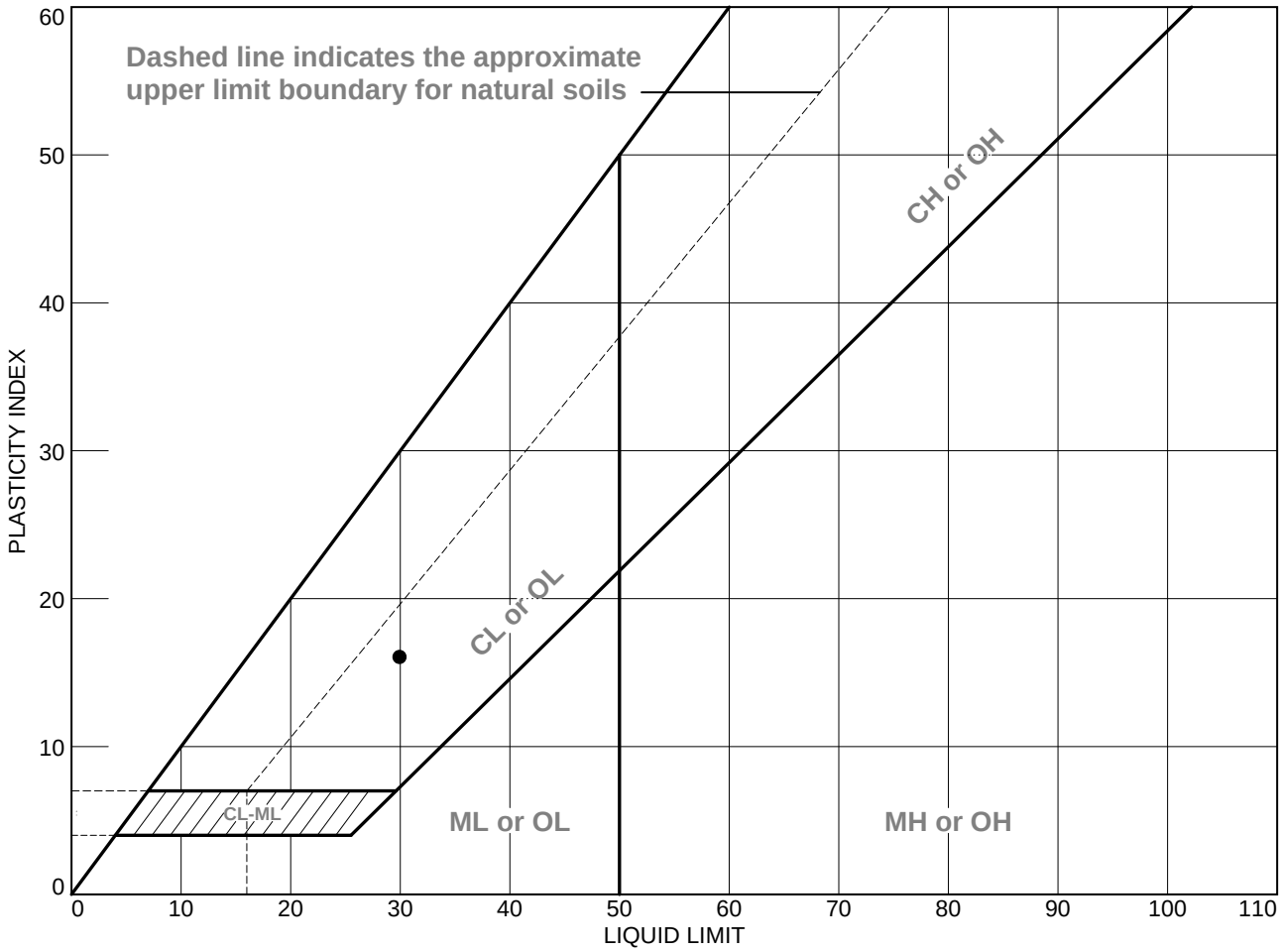
Client: Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Project No: 10180 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35MW-203B		20-20.8'		14	30	16	GC

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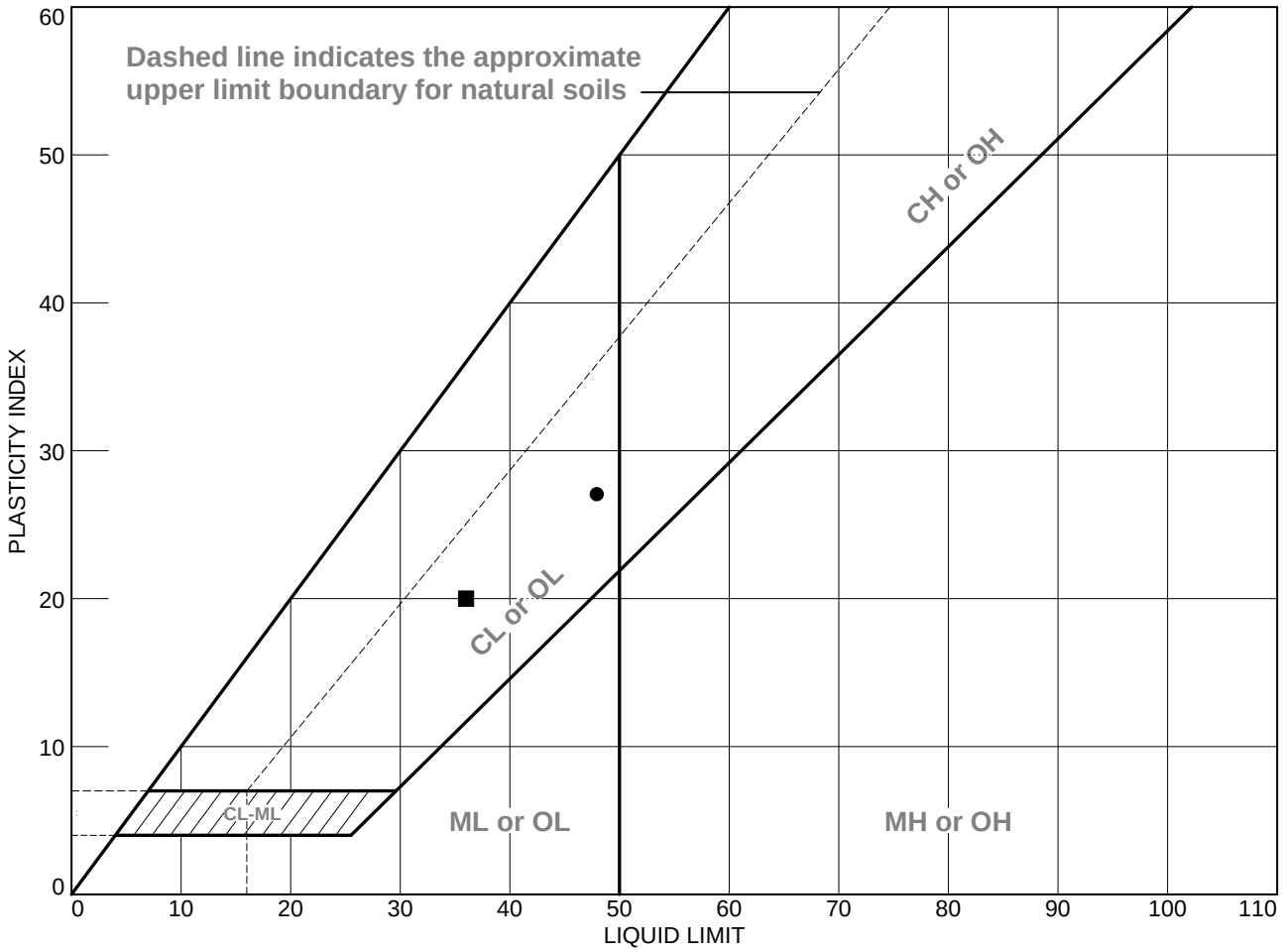
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

Tested By: LS

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35SB-206B		35-36.5		21	48	27	CL
■	S35SB-206B		15-16.5'		16	36	20	SC

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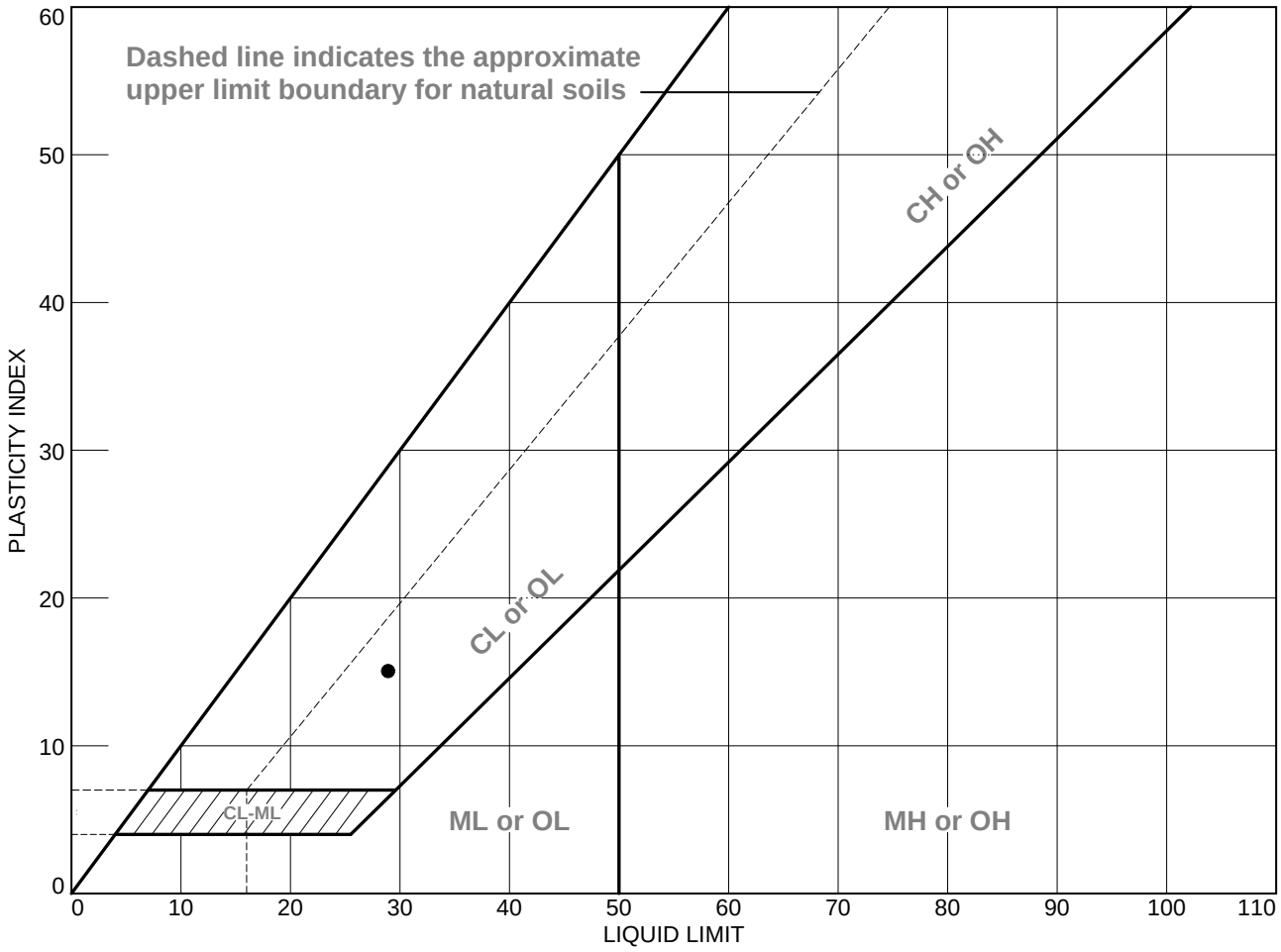
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

Tested By: LS

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35SB-208B		20-20.7'		14	29	15	GC

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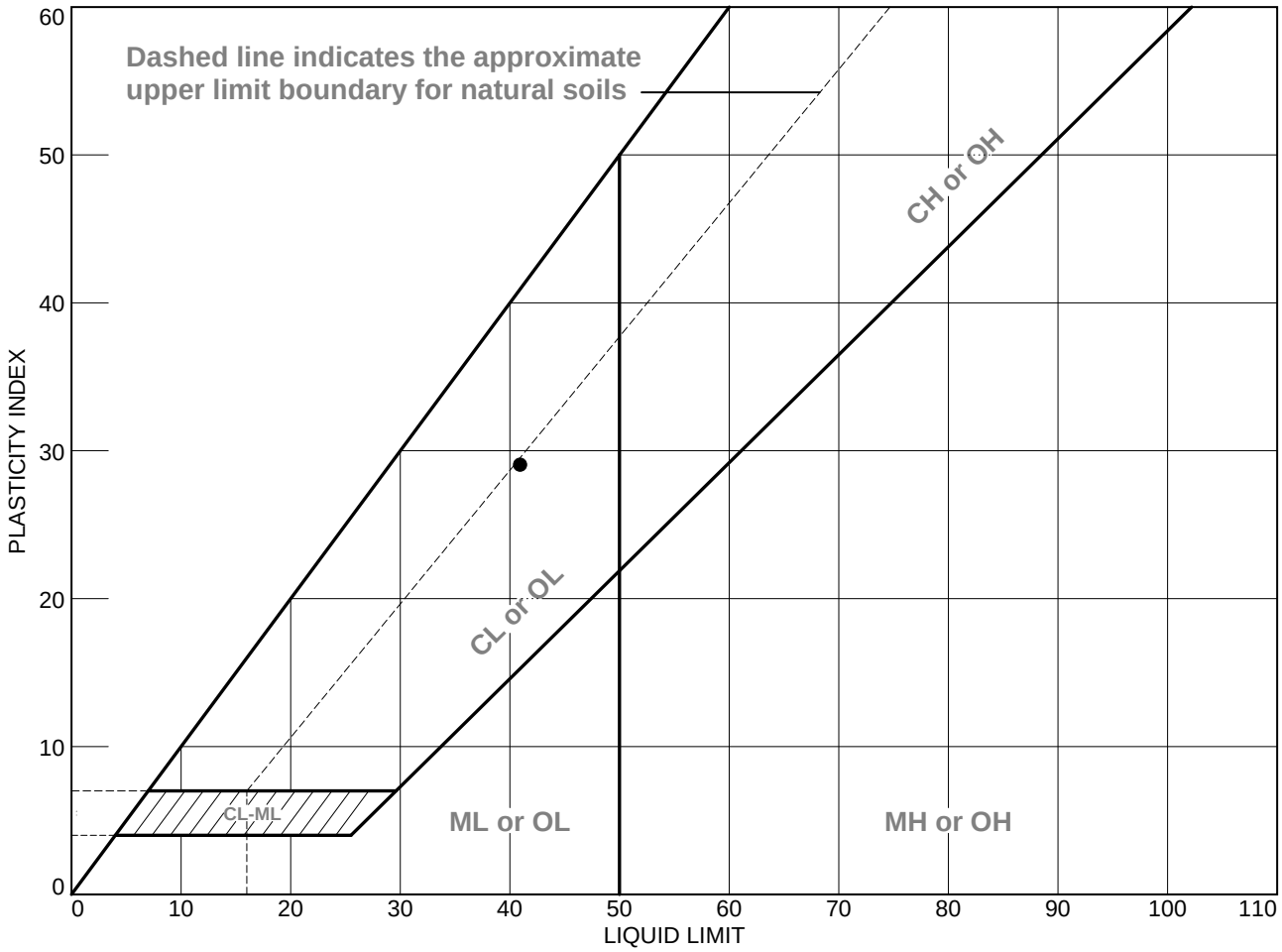
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

Tested By: LS

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35SB-211B		9-9.5'		12	41	29	CL

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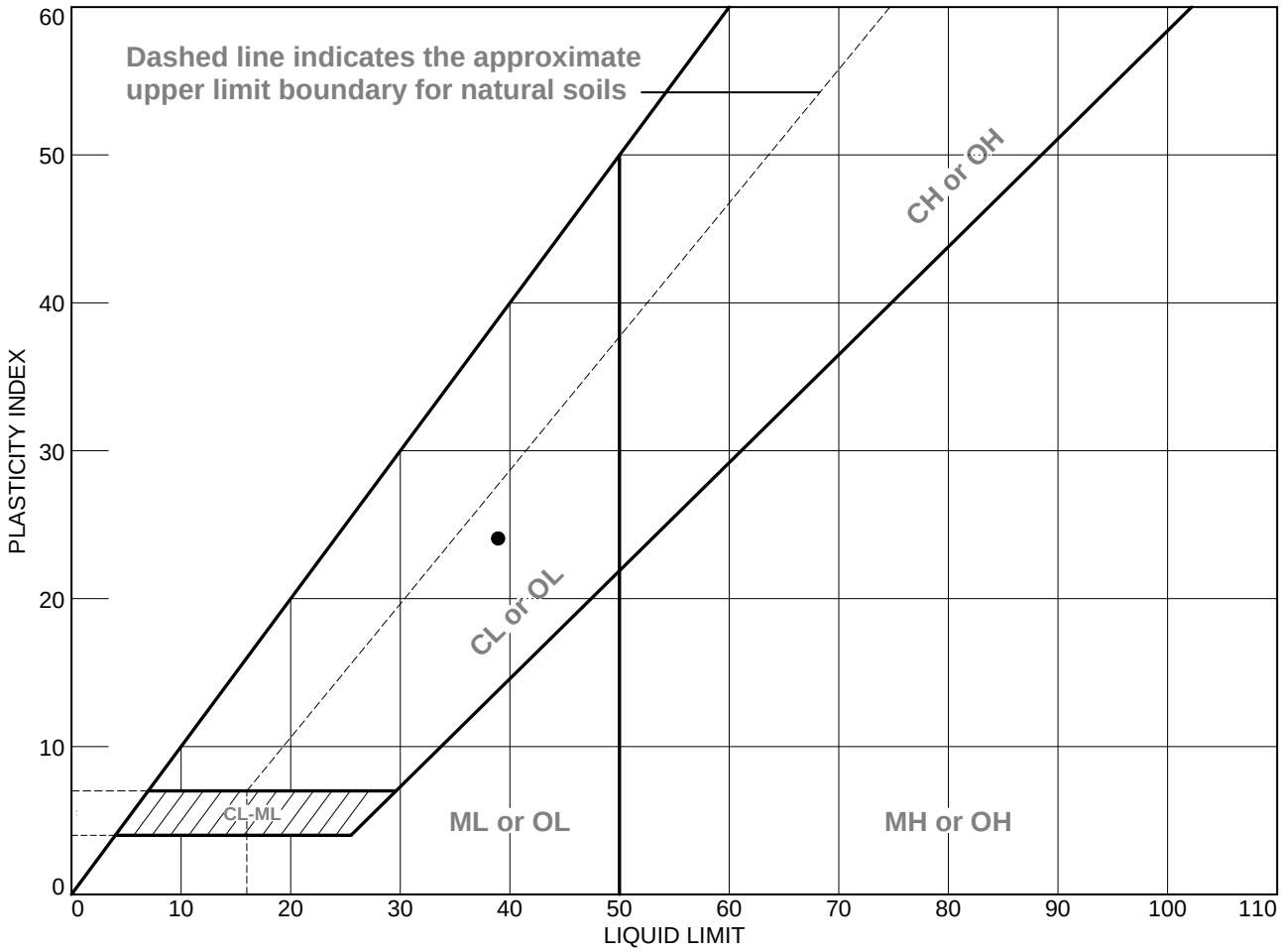
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

Tested By: LS

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35SB-213B		40-40.8'		15	39	24	SC

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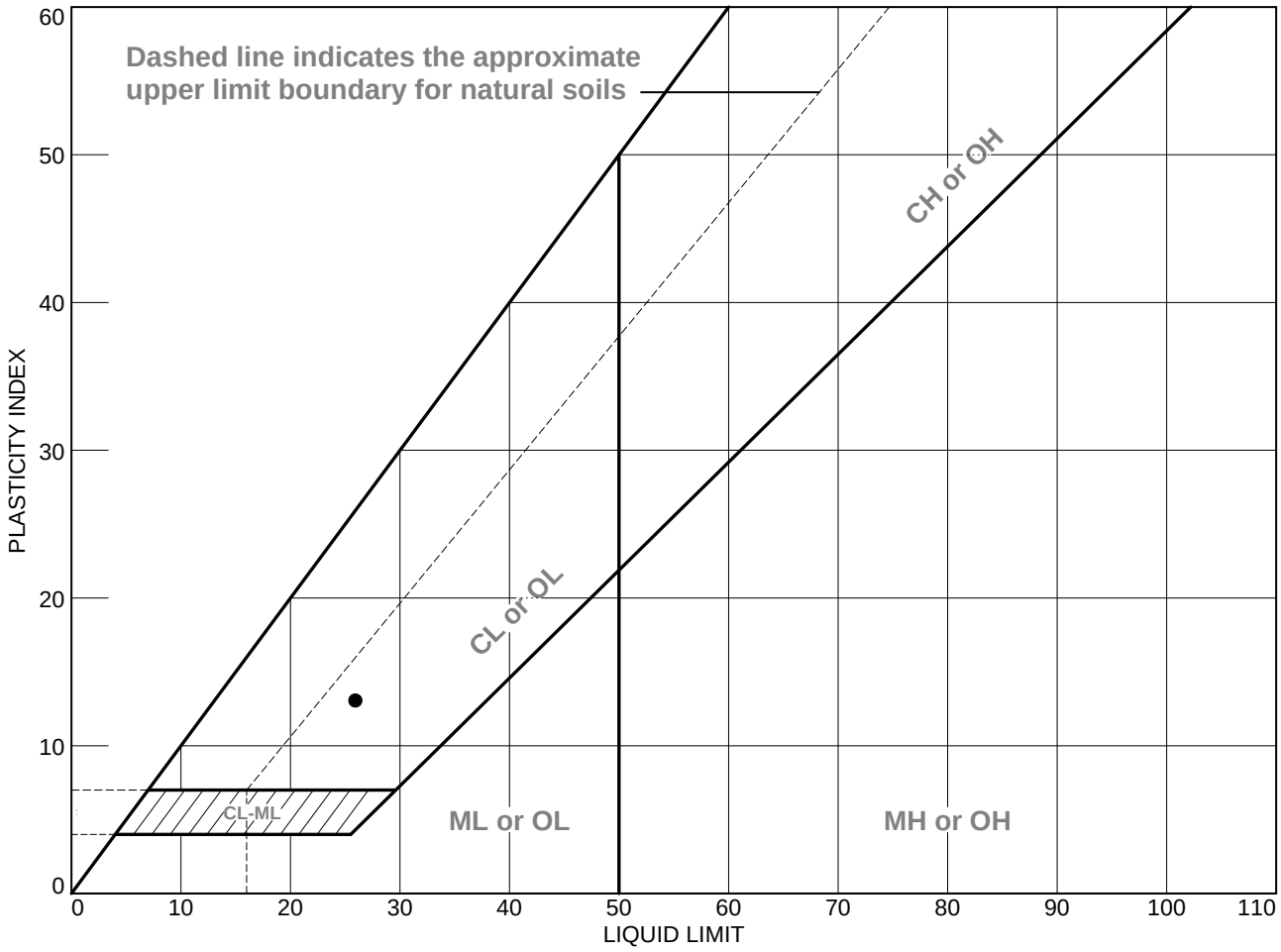
Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

Tested By: LS

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	S35MW-217		25-25.9'		13	26	13	GC

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Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation

Project No.: 10180 **Figure**

Tested By: LS

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Specific Gravity of (-) #10 Fraction

Project: **UBMC Section 35 Design Investigation** **Client:** **Montana DEQ**
Sample ID: **S35MW-203B** **Date:** **1/14/2013**
Tested by: LS

Depth of sample ID	20-20.8'					
Volume of flask	250ml					
Method of air removal	vacuum					
Weight of the flask + water + soil	394.73					
Temperature, ^{o}C	17					
Weight of the flask + water	365.25					
Evaporation dish #						
Weight of evaporation dish	112.58					
Weight of evaporation dish + dry soil	159.91					
Weight of dry soil	47.33					
alpha	1.0006					
Weight of the water	17.85					
Specific Gravity	2.65					

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Specific Gravity of (-) #10 Fraction

Project: **UBMC Section 35 Design Investigation** **Client:** **Montana DEQ**
Sample ID: **S35SB-206B** **Date:** **12/21/2012**
Tested by: NG

Depth of sample ID	16-16.5'					
Volume of flask	250ml					
Method of air removal	vacuum					
Weight of the flask + water + soil	392.4					
Temperature, ^{o}C	18					
Weight of the flask + water	362.82					
Evaporation dish #						
Weight of evaporation dish	111					
Weight of evaporation dish + dry soil	159.11					
Weight of dry soil	48.11					
alpha	1.0004					
Weight of the water	18.53					
Specific Gravity	2.60					

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Specific Gravity of (-) #10 Fraction

Project: **UBMC Section 35 Design Investigation** **Client:** **Montana DEQ**
Sample ID: **S35SB-211B** **Date:** **1/3/2013**
Tested by: **LS**

Depth of sample ID	9-9.5					
Volume of flask	250ml					
Method of air removal	vacuum					
Weight of the flask + water + soil	383.82					
Temperature, ^{o}C	16					
Weight of the flask + water	362.87					
Evaporation dish #						
Weight of evaporation dish	110.5					
Weight of evaporation dish + dry soil	143.82					
Weight of dry soil	33.32					
alpha	1.0007					
Weight of the water	12.37					
Specific Gravity	2.70					

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Specific Gravity of (-) #10 Fraction

Project: **UBMC Section 35 Design Investigation** **Client:** **Montana DEQ**
Sample ID: **S35SB-213B** **Date:** **1/14/2013**
Tested by: LS

Depth of sample ID	40-40.8					
Volume of flask	250ml					
Method of air removal	vacuum					
Weight of the flask + water + soil	394.95					
Temperature, ^{o}C	17					
Weight of the flask + water	362.85					
Evaporation dish #						
Weight of evaporation dish	110.79					
Weight of evaporation dish + dry soil	162.15					
Weight of dry soil	51.36					
alpha	1.0006					
Weight of the water	19.26					
Specific Gravity	2.67					

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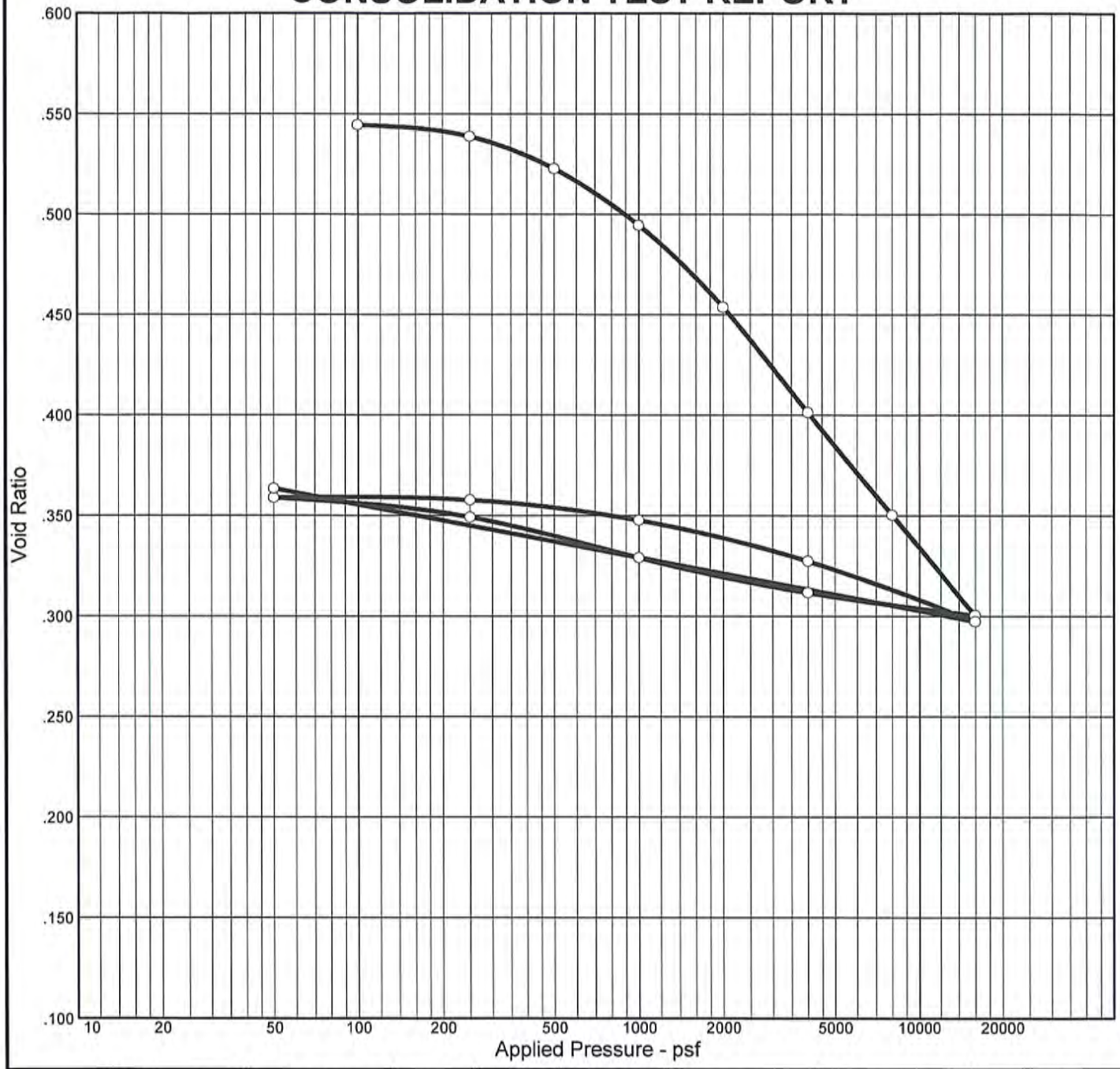
Specific Gravity of (-) #10 Fraction

Project: UBMC Section 35 Design Investigation
Client: Montana DEQ
Sample ID: S35MW-217
Date: 12/21/2012
Tested by: LS

Depth of sample ID	25-25.9					
Volume of flask	250ml					
Method of air removal	vacuum					
Weight of the flask + water + soil	396.27					
Temperature, ^{o}C	18					
Weight of the flask + water	365.22					
Evaporation dish #						
Weight of evaporation dish	111.56					
Weight of evaporation dish + dry soil	161.79					
Weight of dry soil	50.23					
alpha	1.0004					
Weight of the water	19.18					
Specific Gravity	2.62					

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
99.5 %	20.3 %	107.9	39	24	2.67	SC	A-6(4)	0.545

MATERIAL DESCRIPTION

clayey sand with gravel

Project No. 10180 **Client:** Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Source: S35SB-213B **Elev./Depth:** 40-40.8'

Remarks:

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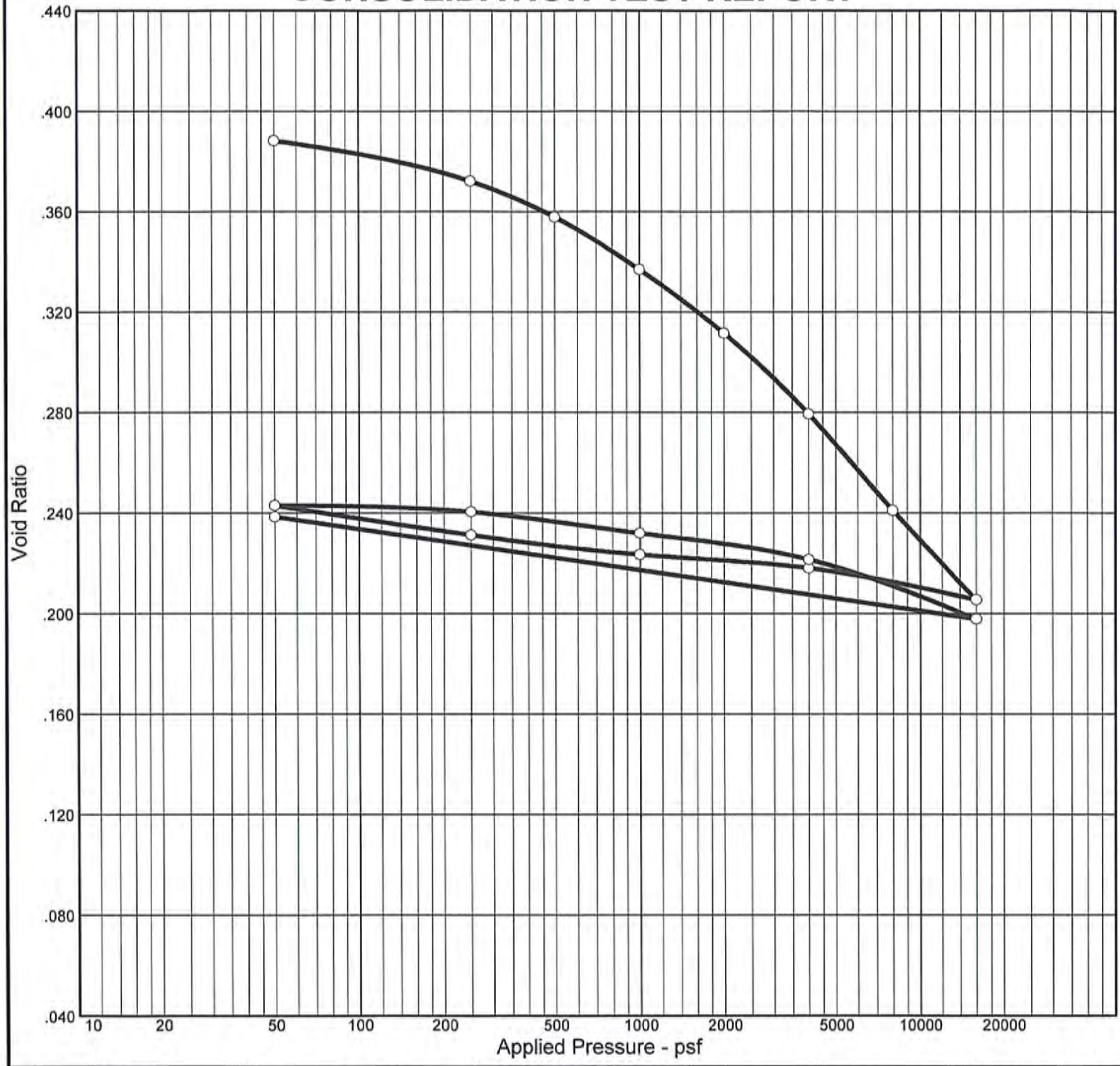
Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
88.2 %	13.1 %	117.8	26	13	2.62	GC	A-2-6(0)	0.389

MATERIAL DESCRIPTION

clayey gravel with sand

Project No. 10180 **Client:** Montana Department of Environmental Quality

Project: UBMC Section 35 Design Investigation

Source: S35MW-217 **Elev./Depth:** 25-25.9'

Remarks:

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Figure

HYDRAULIC CONDUCTIVITY FOR FLEXIBLE-WALLED TEST SAMPLES
FALLING HEAD APPARATUS, ASTM D5084

Client:	DEQ						**Project:**	Section 35 Repository				
Sample Description:	SB-203B 20-20.8'											
Test Specimen												
Dry Density (pcf):		132.5										
% Max. ASTM D-698:												
Specimen Length (cm):		16.055										
Specimen Diameter (cm):		7.112										
				Testing Equipment								
				Height Inlet Above Floor (cm):								
				Height Outlet Above Bench (cm):		21.9						
				Area of Standpipe (cm^2):		0.912						

Increment Number	Initial Reading Influent (cm^3)	Inital Reading Effluent (cm^3)	Final Reading Influent (cm^3)	Final Reading Effluent (cm^3)	Time Increment (min.)	Applied Pressure Differential (psi)	Initial Head (cm)	Final Head (cm)	Average Hydraulic Gradient (cm/cm)	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity at 20 C (cm/sec)
1	0.5	45.1	3.3	42.4	1418	2.9	252.75	246.72	15.56	5.2E-08	5.4E-08
2	3.3	424.4	8.4	37.1	3071	2.9	665.40	235.33	28.05	1.0E-06	1.1E-06
5	8.4	37.1	10.5	34.9	1425	2.9	235.33	230.61	14.51	4.4E-08	4.5E-08
6	10.5	34.9	12.95	32.5	1429	2.9	230.61	225.30	14.20	5.0E-08	5.2E-08
9	12.95	32.5	14.75	30.7	1069	2.9	225.30	221.35	13.91	5.1E-08	5.2E-08
10	14.75	30.7	17.5	27.8	1845	2.9	221.35	215.16	13.59	4.7E-08	4.8E-08
11	17.5	19.5	27.8	25.8	1266	2.9	206.06	201.68	12.70	5.2E-08	5.2E-08
12											
13											
14											
15											
16											
17											
18											
19											
20	Average Hydraulic Conductivity of Last Four Test Increments =							**5.1E-08**	**cm/sec**		
21											
23											
24											
25											

k = (aL/At) ln (h1/h2)

Water Content Before Test		Water Content After Test	
Tare #		Tare #	
Wet Soil + Tare (grams)	1526.10	Wet Soil + Tare (grams)	1509.60
Dry Soil + Tare (grams)	1371.40	Dry Soil + Tare (grams)	1371.40
Tare Weight (grams)	0.00	Tare Weight (grams)	0.00
Water Content (%)	11.28	Water Content (%)	10.08
Source	Specimen	Source	Specimen

HYDRAULIC CONDUCTIVITY FOR FLEXIBLE-WALLED TEST SAMPLES
FALLING HEAD APPARATUS, ASTM D5084

Client:	Montana DEQ						**Project:**	UBMC Section 35 Design Investigation				
Sample Description:	S35SB-206B 15-15.5'											
Test Specimen												
Dry Density (pcf):		109.8										
% Max. ASTM D-698:												
Specimen Length (cm):		15.24										
Specimen Diameter (cm):		6.173										
				Testing Equipment								
				Height Inlet Above Floor (cm):								
				Height Outlet Above Bench (cm):		21.9						
				Area of Standpipe (cm^2):		0.899						

Increment Number	Initial Reading Influent (cm^3)	Inital Reading Effluent (cm^3)	Final Reading Influent (cm^3)	Final Reading Effluent (cm^3)	Time Increment (min.)	Applied Pressure Differential (psi)	Initial Head (cm)	Final Head (cm)	Average Hydraulic Gradient (cm/cm)	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity at 20 C (cm/sec)
1	0.5	24.2	1.2	23.6	1438	2.8	222.82	221.39	14.57	1.7E-08	1.7E-08
2	1.2	23.6	2	23	1445	2.6	207.33	205.80	13.55	2.0E-08	1.9E-08
5	2.05	22.9	4	21.6	3985	2.8	219.69	216.13	14.30	1.6E-08	1.6E-08
6	4	21.6	4.6	21.2	1328	2.7	209.10	208.00	13.68	1.5E-08	1.5E-08
9	4.6	21.2	5.2	20.7	1425	2.7	208.00	206.80	13.61	1.6E-08	1.5E-08
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20	Average Hydraulic Conductivity of Last Four Test Increments =							**1.6E-08**	**cm/sec**		
21											
23											
24											
25											
k = (aL/At) ln (h1/h2)											

Water Content Before Test	
Tare #	
Wet Soil + Tare (grams)	920.30
Dry Soil + Tare (grams)	801.95
Tare Weight (grams)	0.00
Water Content (%)	14.76
Source	Specimen

Water Content After Test	
Tare #	
Wet Soil + Tare (grams)	398.80
Dry Soil + Tare (grams)	357.50
Tare Weight (grams)	111.53
Water Content (%)	16.79
Source	Specimen

HYDRAULIC CONDUCTIVITY FOR FLEXIBLE-WALLED TEST SAMPLES
FALLING HEAD APPARATUS, ASTM D5084

Client: Montana DEQ — **Project:** UBMC Section 35 Design Investigation

Sample Description: SB-211 9-9.5' Panel #4

Test Specimen

Dry Density (pcf):	108.8
% Max. ASTM D-698:	
Specimen Length (cm):	15.24
Specimen Diameter (cm):	7.11

Testing Equipment

Height Inlet Above Floor (cm):	
Height Outlet Above Bench (cm):	21.9
Area of Standpipe (cm^2):	0.912

Increment Number	Initial Reading Influent (cm^3)	Inital Reading Effluent (cm^3)	Final Reading Influent (cm^3)	Final Reading Effluent (cm^3)	Time Increment (min.)	Applied Pressure Differential (psi)	Initial Head (cm)	Final Head (cm)	Average Hydraulic Gradient (cm/cm)	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity at 20 C (cm/sec)
1	1.3	45.9	23.2	24.4	170	3.1	266.81	219.25	15.95	3.4E-06	3.5E-06
2	23.2	24.4	38.9	8.7	194	3.0	212.22	177.80	12.80	2.7E-06	2.7E-06
5	0.5	45.6	7.7	38.3	68	3.0	260.33	244.44	16.56	2.7E-06	2.8E-06
6	9.3	37	27.5	18.7	215	3.0	241.26	201.26	14.52	2.5E-06	2.5E-06
9	27.5	18.7	40	6.2	183	3.0	201.26	173.86	12.31	2.3E-06	2.4E-06
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20	Average Hydraulic Conductivity of Last Four Test Increments =							**2.6E-06**	**cm/sec**		
21											
22											
23											
24											
25											

$k = (aL/At) \ln (h1/h2)$

Water Content Before Test	
Tare #	
Wet Soil + Tare	1230.60
Dry Soil + Tare	1054.90
Tare Weight	0.00
Water Content	16.66
Source	Specimen

Water Content After Test	
Tare #	
Wet Soil + Tare	1261.60
Dry Soil + Tare	1054.90
Tare Weight	0.00
Water Content	19.59
Source	Specimen

HYDRAULIC CONDUCTIVITY FOR FLEXIBLE-WALLED TEST SAMPLES
FALLING HEAD APPARATUS, ASTM D5084

Client: Montana DEQ
Project: UMBC Section 35 Design Investigation
Sample Description: S35SB-213B 40-40.8'

Test Specimen

Dry Density (pcf):	111.9
% Max. ASTM D-698:	
Specimen Length (cm):	13.97
Specimen Diameter (cm):	7.112

Testing Equipment

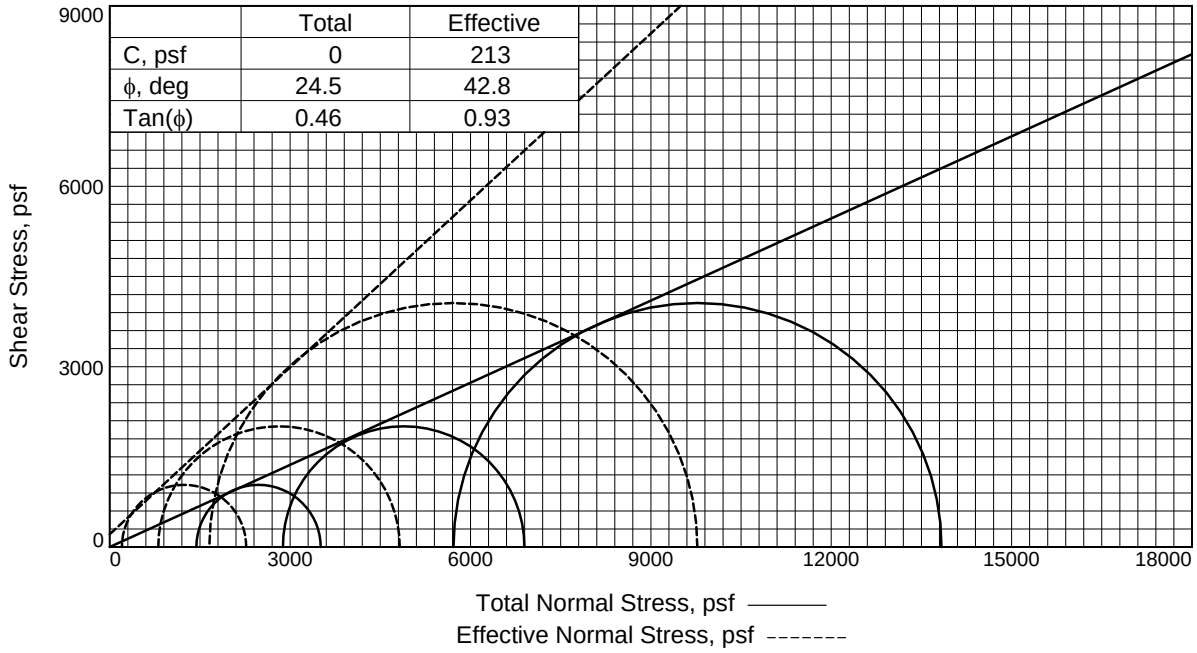
Height Inlet Above Floor (cm):	
Height Outlet Above Bench (cm):	21.9
Area of Standpipe (cm^2):	0.912

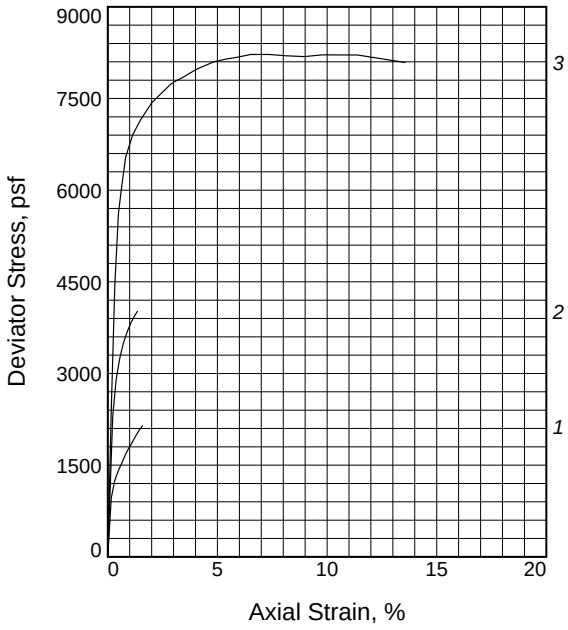
Increment Number	Initial Reading Influent (cm^3)	Inital Reading Effluent (cm^3)	Final Reading Influent (cm^3)	Final Reading Effluent (cm^3)	Time Increment (min.)	Applied Pressure Differential (psi)	Initial Head (cm)	Final Head (cm)	Average Hydraulic Gradient (cm/cm)	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity at 20 C (cm/sec)
1	0.2	41	4.5	36.9	2992	3.1	262.65	253.44	18.47	3.2E-08	3.2E-08
2	4.5	36.9	6.5	35	1420	3.1	253.44	249.17	17.99	3.2E-08	3.3E-08
5	6.5	35	8.5	33.1	1427	3.1	249.17	244.89	17.68	3.2E-08	3.4E-08
6	8.5	33.1	9.85	31.7	1073	3.1	244.89	241.88	17.42	3.1E-08	3.2E-08
9	9.85	31.7	12.2	29.4	1816	3.1	241.88	236.78	17.13	3.1E-08	3.2E-08
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20	Average Hydraulic Conductivity of Last Four Test Increments =							**3.2E-08**	**cm/sec**		
21											
23											
24											
25											

$k = (aL/At) \ln (h1/h2)$

Water Content Before Test	
Tare #	
Wet Soil + Tare (grams)	1189.50
Dry Soil + Tare (grams)	994.76
Tare Weight (grams)	0.00
Water Content (%)	19.58
Source	Specimen

Water Content After Test	
Tare #	
Wet Soil + Tare (grams)	1138.30
Dry Soil + Tare (grams)	994.76
Tare Weight (grams)	0.00
Water Content (%)	14.43
Source	Specimen





Sample No.		1	2	3
Initial	Water Content, %	11.3	11.3	11.3
	Dry Density, pcf	134.2	134.2	134.2
	Saturation, %	128.6	128.6	128.6
	Void Ratio	0.2325	0.2325	0.2325
	Diameter, in.	2.80	2.80	2.80
	Height, in.	6.32	6.32	6.32
At Test	Water Content, %	10.1	10.1	10.1
	Dry Density, pcf	134.2	134.2	134.2
	Saturation, %	114.9	114.9	114.9
	Void Ratio	0.2325	0.2325	0.2325
	Diameter, in.	2.80	2.82	2.84
	Height, in.	6.32	6.22	6.14
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		71.50	72.50	73.30
Cell Pressure, psi		81.50	92.50	113.00
Fail. Stress, psf		2068	4017	8117
Total Pore Pr., psf		11534	12514	14616
Ult. Stress, psf		2145	4017	8221
Total Pore Pr., psf		11534	12514	14501
$\bar{\sigma}_1$ Failure, psf		2269	4823	9773
$\bar{\sigma}_3$ Failure, psf		202	806	1656

Type of Test:
CU with Pore Pressures

Sample Type: Staged

Description: clayey gravel with sand

LL= 30 **PL=** 14 **PI=** 16

Specific Gravity= 2.65

Remarks:

Figure _____

Client: Montana Department of Environmental Quality

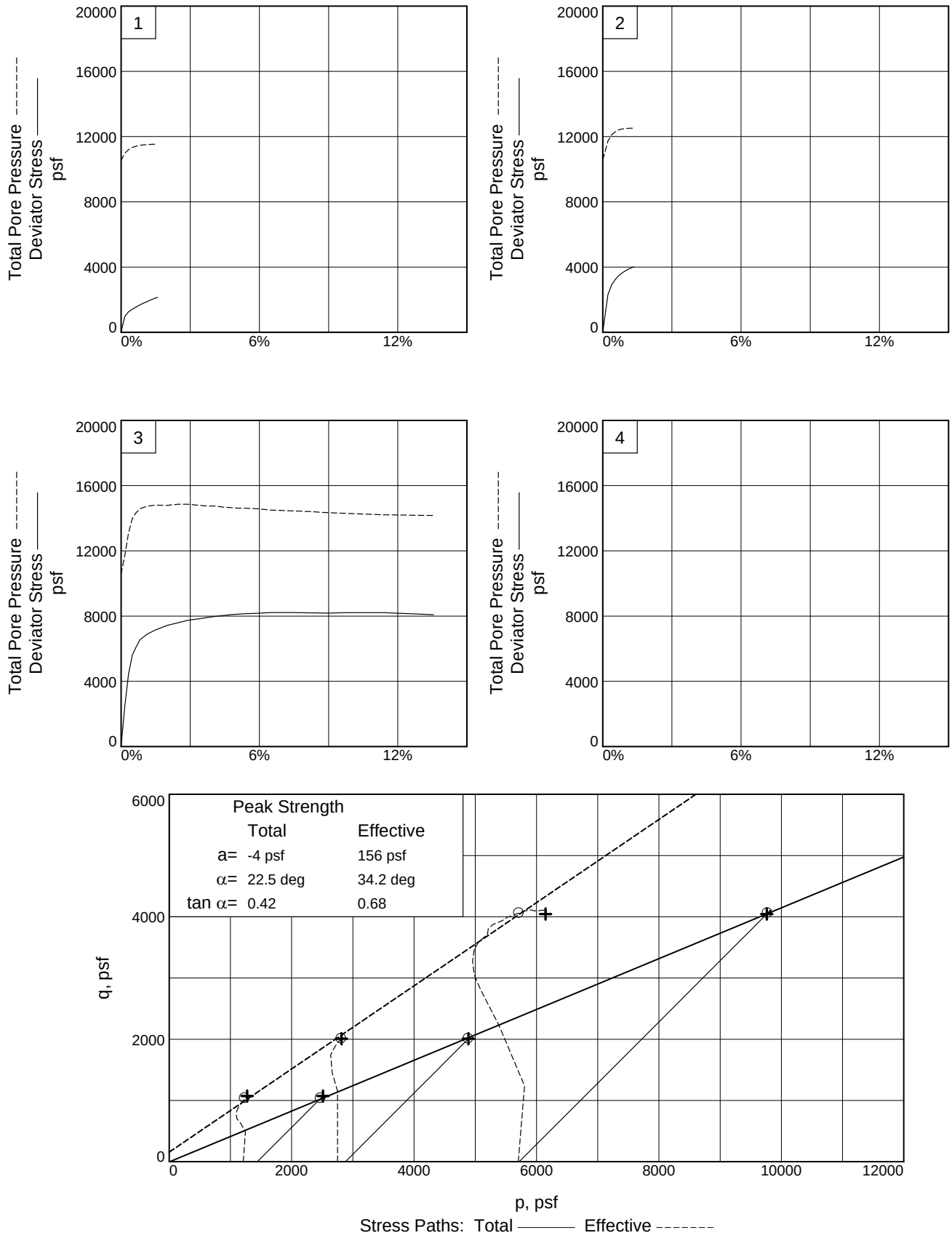
Project: UBMC Section 35 Design Investigation

Source of Sample: S35MW-203B **Depth:** 20-20.8'

Proj. No.: 10180 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Pioneer Technical Services, Inc.
1215 Apple's Way - Belgrade, MT 59714



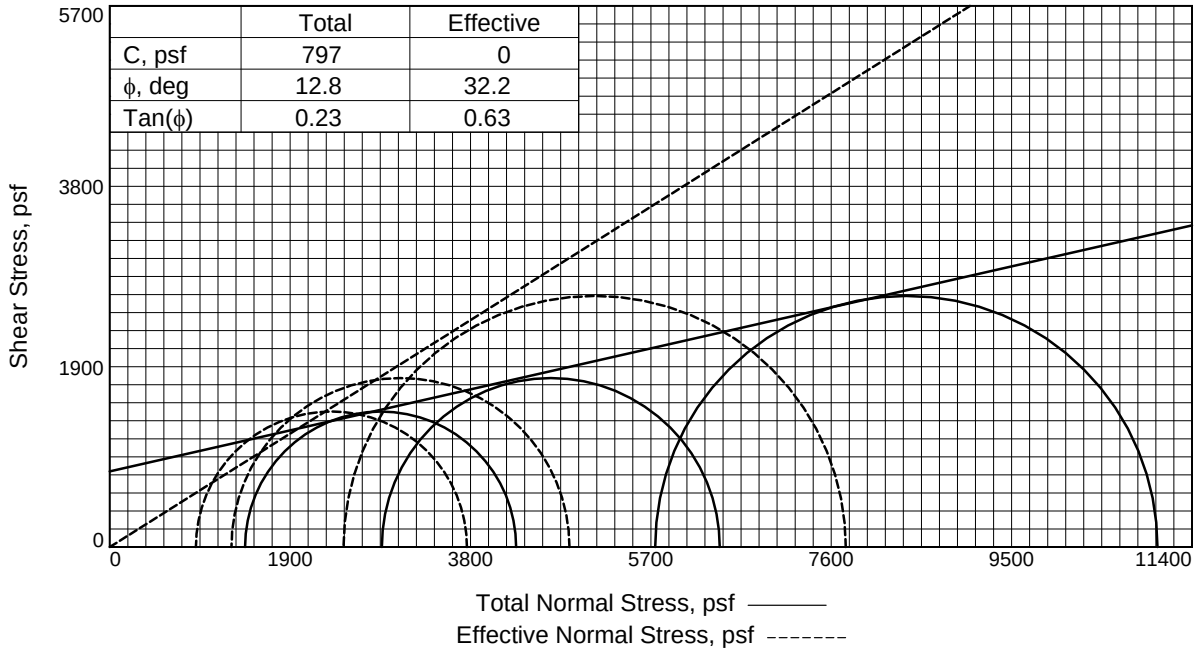
Client: Montana Department of Environmental Quality

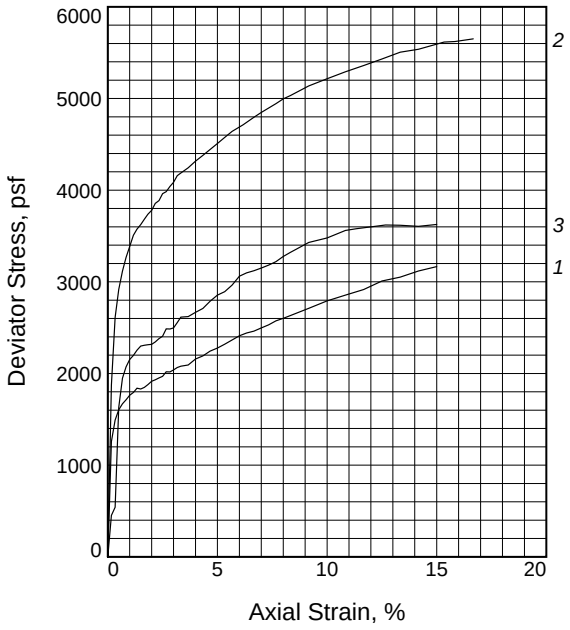
Project: UBMC Section 35 Design Investigation

Source of Sample: S35MW-203B **Depth:** 20-20.8'

Project No.: 10180 **Figure** _____

Pioneer Technical Services, Inc.





Sample No.		1	2	3
Initial	Water Content, %	13.3	13.0	14.8
	Dry Density, pcf	113.5	104.0	109.8
	Saturation, %	79.0	59.5	79.0
	Void Ratio	0.4406	0.5734	0.4897
	Diameter, in.	2.42	2.54	2.43
	Height, in.	6.00	6.00	6.00
At Test	Water Content, %	16.3	14.2	16.8
	Dry Density, pcf	113.5	104.0	109.8
	Saturation, %	96.7	64.8	89.8
	Void Ratio	0.4406	0.5734	0.4897
	Diameter, in.	2.42	2.54	2.43
	Height, in.	6.00	6.00	6.00
Strain rate, in./min.		0.01	0.01	0.01
Back Pressure, psi		69.60	70.30	94.70
Cell Pressure, psi		79.50	110.20	114.60
Fail. Stress, psf		2855	5291	3560
Total Pore Pr., psf		10541	13406	15221
Ult. Stress, psf		3167	5616	3626
Total Pore Pr., psf		10382	13118	15106
$\bar{\sigma}_1$ Failure, psf		3762	7753	4842
$\bar{\sigma}_3$ Failure, psf		907	2462	1282

Type of Test:
CU with Pore Pressures

Sample Type:

Description: clayey sand with gravel

LL= 36 **PL=** 16 **PI=** 20

Specific Gravity= 2.62

Remarks:

Figure _____

Client: Montana Department of Environmental Quality

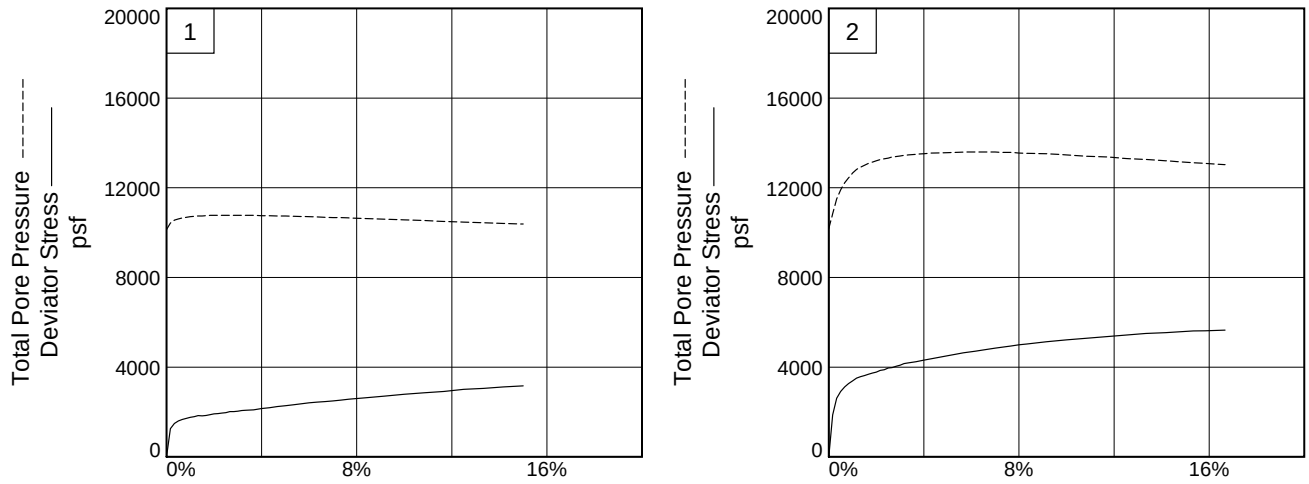
Project: UBMC Section 35 Design Investigation

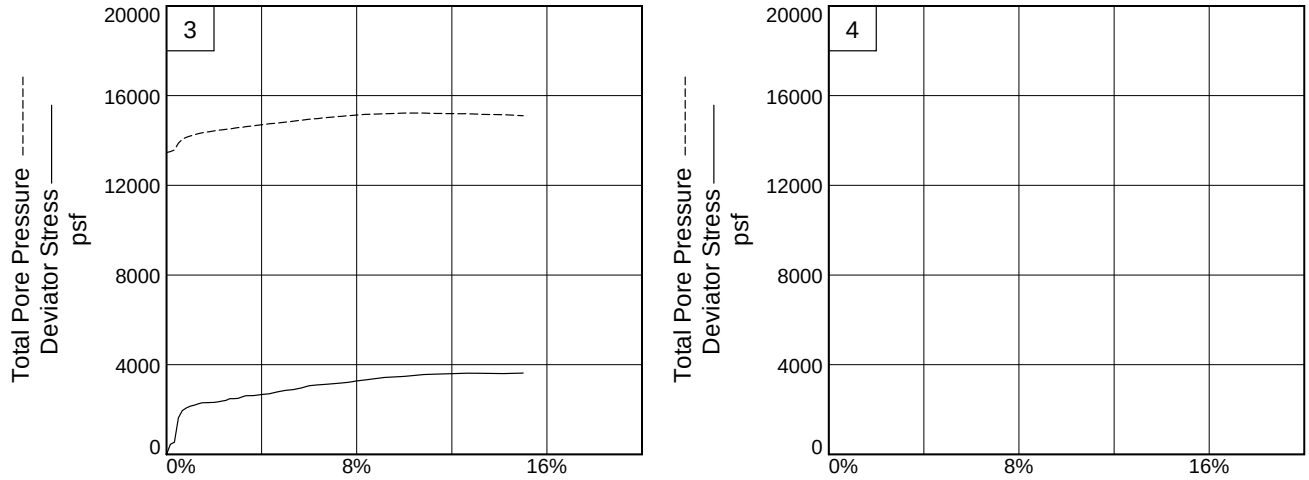
Source of Sample: S35SB-206B **Depth:** 15-16.5'

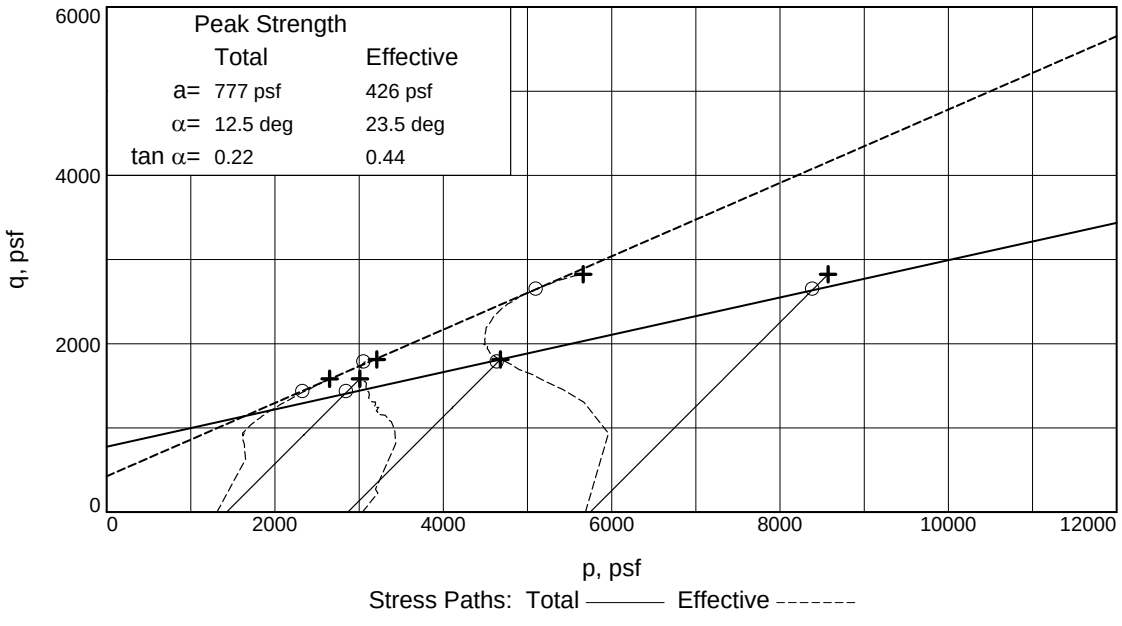
Proj. No.: 10180 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Pioneer Technical Services, Inc.
1215 Apple's Way - Belgrade, MT 59714

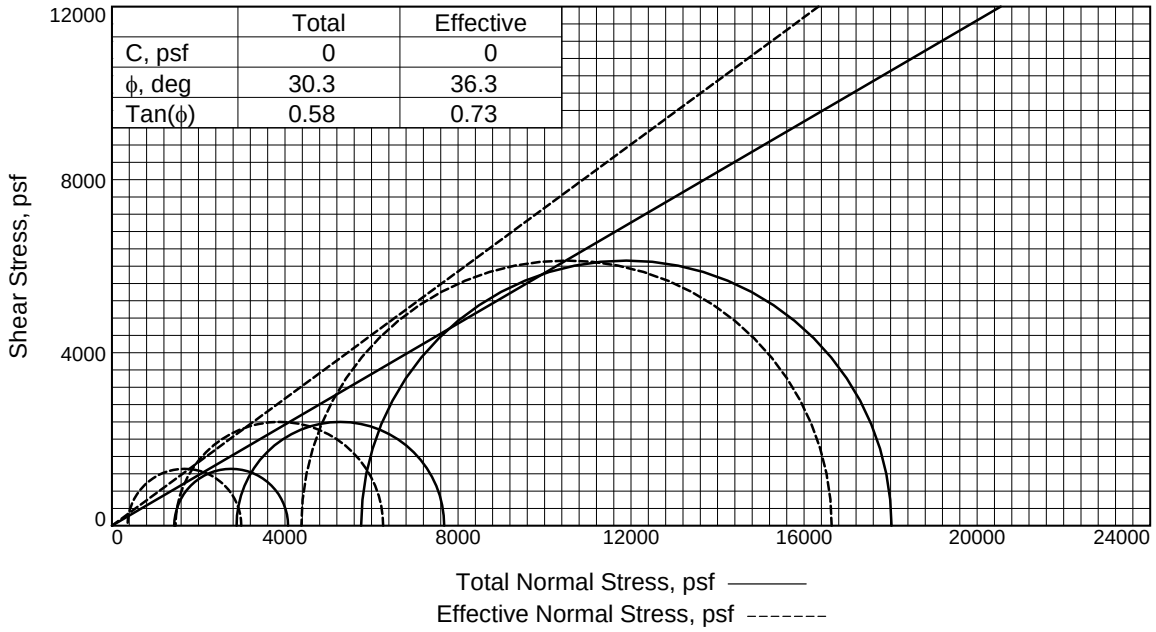


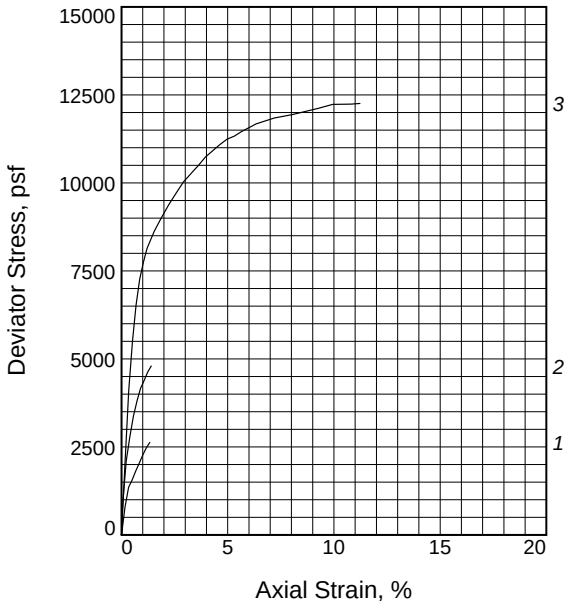




Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation
Source of Sample: S35SB-206B **Depth:** 15-16.5'
Project No.: 10180 **Figure** _____

Pioneer Technical Services, Inc.





Sample No.		1	2	3
Initial	Water Content, %	16.7	16.7	16.7
	Dry Density, pcf	108.8	108.8	108.8
	Saturation, %	81.8	81.8	81.8
	Void Ratio	0.5496	0.5496	0.5496
	Diameter, in.	2.80	2.80	2.80
	Height, in.	6.00	6.00	6.00
At Test	Water Content, %	19.6	19.6	19.6
	Dry Density, pcf	108.8	108.8	108.8
	Saturation, %	96.3	96.3	96.3
	Void Ratio	0.5496	0.5496	0.5496
	Diameter, in.	2.80	2.82	2.84
	Height, in.	6.00	5.92	5.84
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		69.60	72.30	72.30
Cell Pressure, psi		79.60	92.30	112.30
Fail. Stress, psf		2630	4800	12260
Total Pore Pr., psf		11102	11822	11794
Ult. Stress, psf		2630	4800	12260
Total Pore Pr., psf		11102	11822	11794
$\bar{\sigma}_1$ Failure, psf		2990	6269	16638
$\bar{\sigma}_3$ Failure, psf		360	1469	4378

Type of Test:
CU with Pore Pressures
Sample Type: Staged
Description: sandy lean clay

LL= 41 **PL=** 12 **PI=** 29
Specific Gravity= 2.7
Remarks:

Figure _____

Client: Montana Department of Environmental Quality

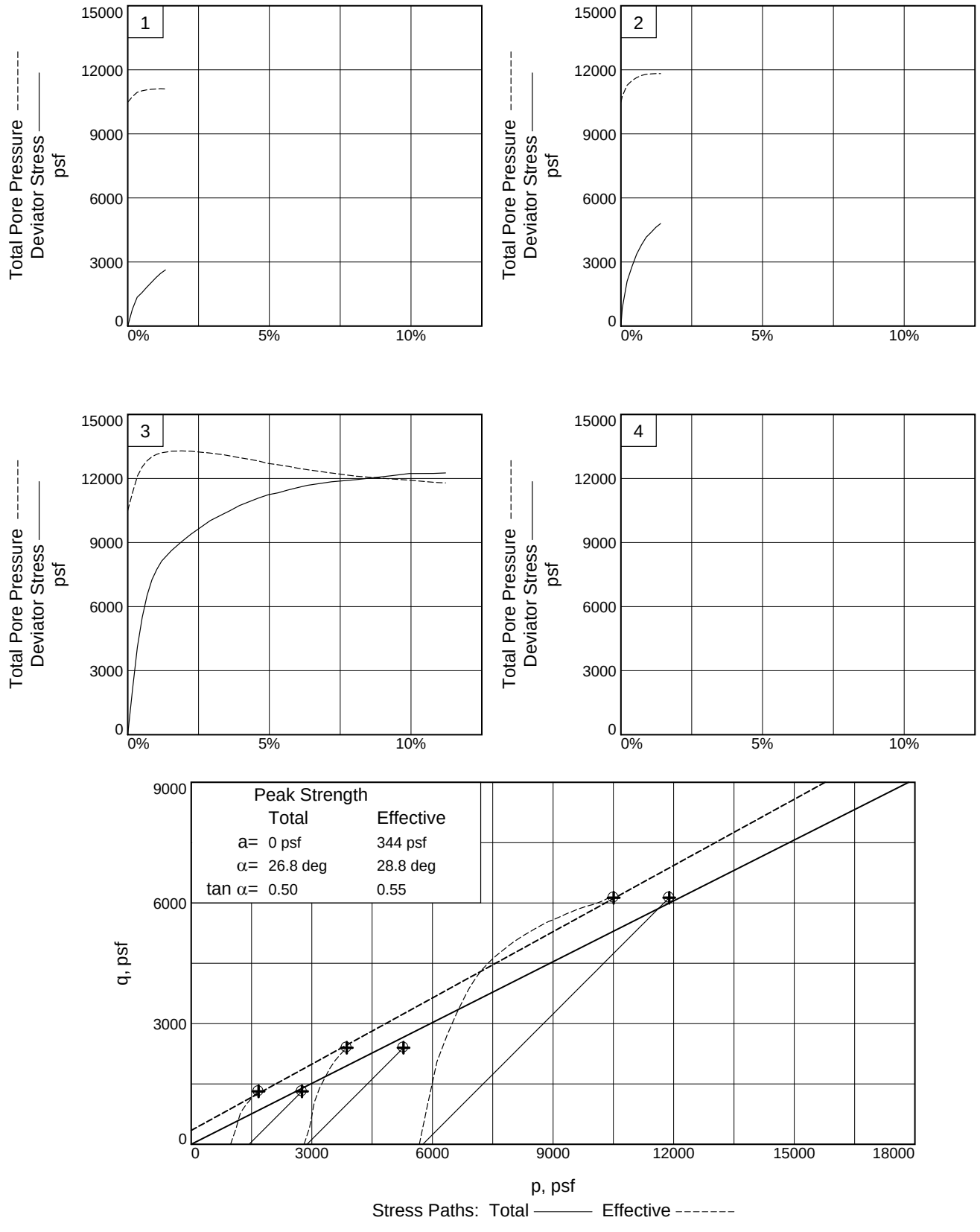
Project: UBMC Section 35 Design Investigation

Source of Sample: S35SB-211B **Depth:** 9-9.5'

Proj. No.: 10180 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Pioneer Technical Services, Inc.
1215 Apple's Way - Belgrade, MT 59714

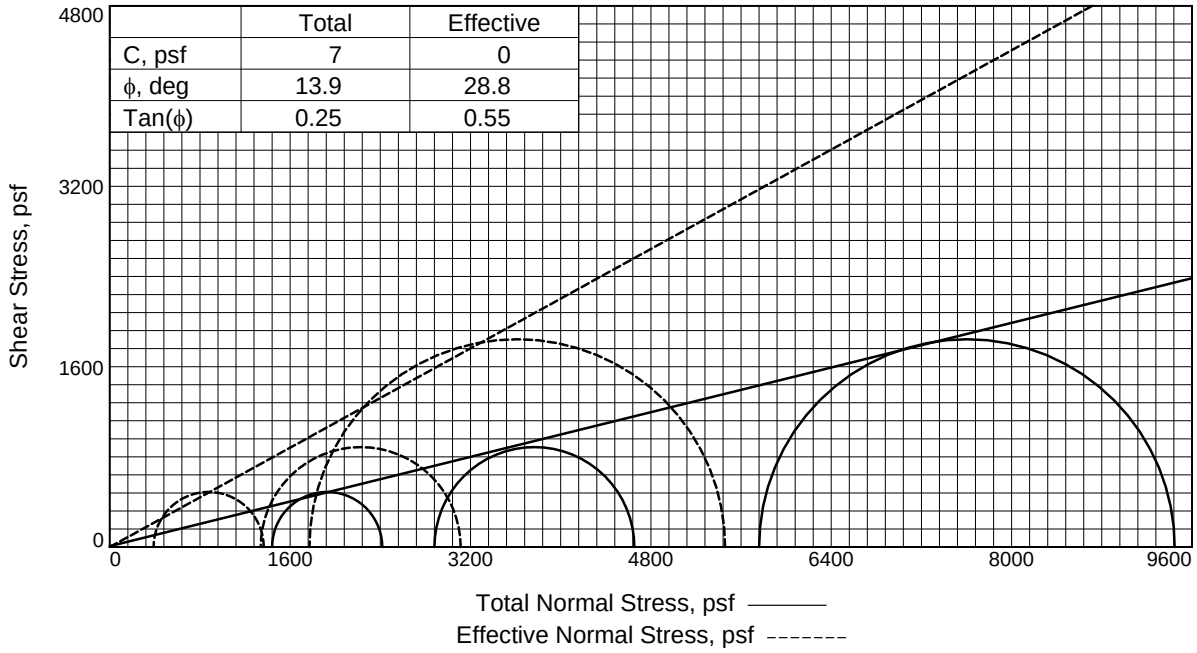
Tested By: NKG

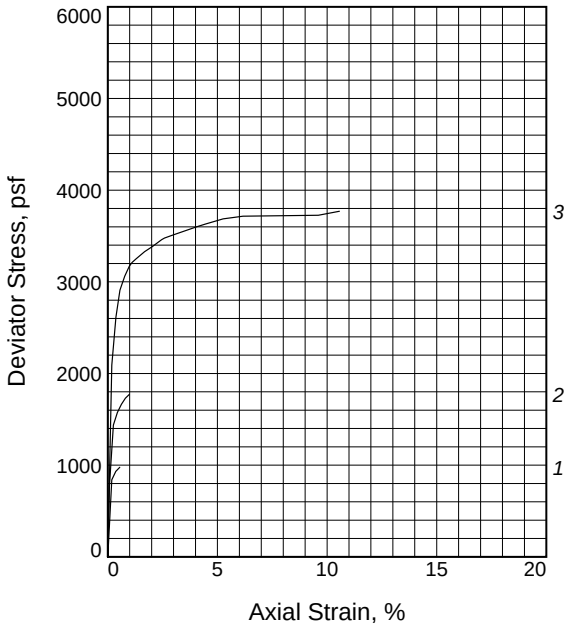


Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation
Source of Sample: S35SB-211B **Depth:** 9-9.5'
Project No.: 10180 **Figure** _____

Pioneer Technical Services, Inc.

Tested By: NKG





Sample No.		1	2	3
Initial	Water Content, %	19.6	19.6	19.6
	Dry Density, pcf	111.9	111.9	111.9
	Saturation, %	106.8	106.8	106.8
	Void Ratio	0.4896	0.4896	0.4896
	Diameter, in.	2.80	2.80	2.80
	Height, in.	5.50	5.50	5.50
At Test	Water Content, %	14.4	14.4	14.4
	Dry Density, pcf	111.9	111.9	111.9
	Saturation, %	78.7	78.7	78.7
	Void Ratio	0.4896	0.4896	0.4896
	Diameter, in.	2.80	2.81	2.82
	Height, in.	5.50	5.47	5.42
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		70.40	73.20	72.90
Cell Pressure, psi		80.40	93.20	112.90
Fail. Stress, psf		977	1773	3687
Total Pore Pr., psf		11189	12082	14486
Ult. Stress, psf		977	1773	3769
Total Pore Pr., psf		11189	12082	14544
$\bar{\sigma}_1$ Failure, psf		1366	3112	5458
$\bar{\sigma}_3$ Failure, psf		389	1339	1771

Type of Test:
CU with Pore Pressures

Sample Type:

Description: clayey sand with gravel

LL= 39 **PL=** 15 **PI=** 24

Specific Gravity= 2.67

Remarks:

Figure _____

Client: Montana Department of Environmental Quality

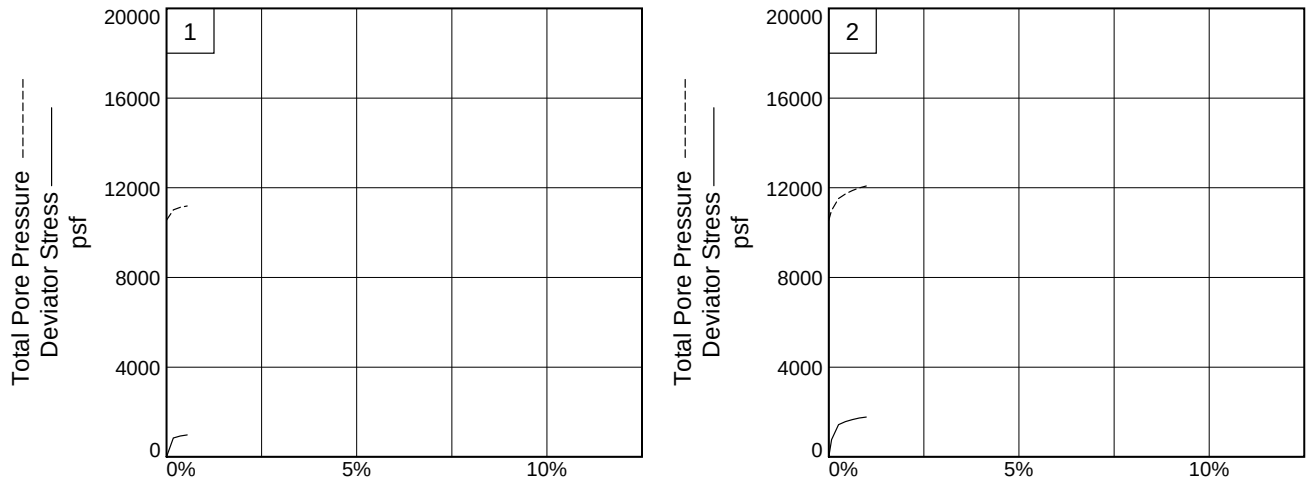
Project: UBMC Section 35 Design Investigation

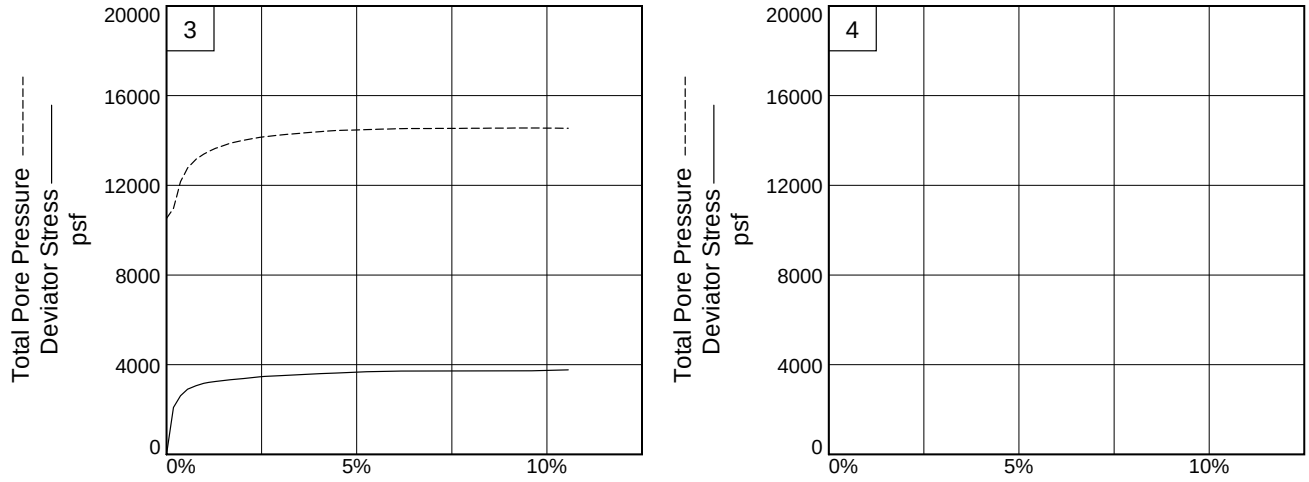
Source of Sample: S35SB-213B **Depth:** 40-40.8'

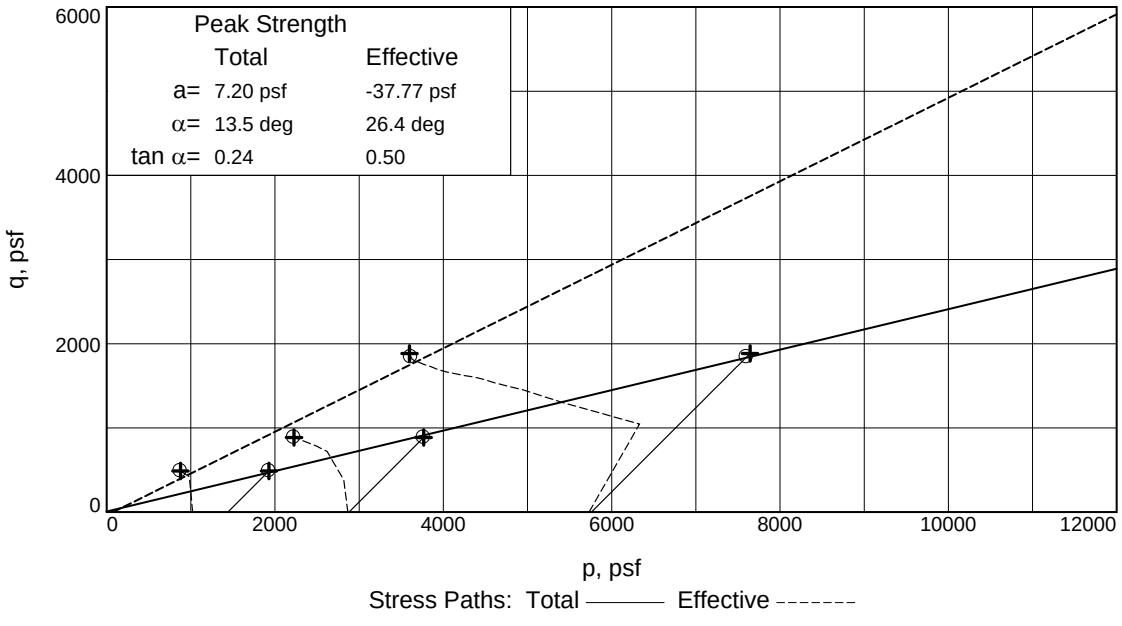
Proj. No.: 10180 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Pioneer Technical Services, Inc.
1215 Apple's Way - Belgrade, MT 59714







Client: Montana Department of Environmental Quality
Project: UBMC Section 35 Design Investigation
Source of Sample: S35SB-213B **Depth:** 40-40.8'
Project No.: 10180 **Figure** _____

Pioneer Technical Services, Inc.

APPENDIX D

LABORATORY ANALYTICAL DATA

ANALYTICAL SUMMARY REPORT

January 15, 2013

MT DEQ-Site Response
PO Box 200901
Helena, MT 59620-0901

Workorder No.: H12120317 Quote ID: H813 - Mike Horse Repository

Project Name: UBMC Repository

Energy Laboratories Inc Helena MT received the following 11 samples for MT DEQ-Site Response on 12/19/2012 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H12120317-001	S35-BGT-01	12/18/12 12:00	12/19/12	Soil	Metals by ICP/ICPMS, Total Cation Exchange Capacity Cations, NHO4Ac Extractable Cations, Saturated Paste Acid/Base Potential Total Acidity Conductivity, Saturated Paste Extract Mercury in Solid By CVAA Fertilizer Recommendation Anions by Ion Chromatography Lime Requirement, SMP Buffer Nitrate as N, CaCL2 Extract Organic Carbon/Matter Walkely Black pH, Saturated Paste Phosphorus-Olsen Digestion, Total Metals CaCl2 Hot Water Soil Extraction CEC NH4AC Soil Extraction Digestion, Mercury by CVAA Lime Percentage NaHCO3 Soil Extract NH4AC Soil Extraction Total Organic Matter Prep Saturated Paste Extraction Sodium Adsorption Ratio Saturation Percentage Sulfur Forms Soil Preparation
H12120317-002	S35-BGT-02	12/18/12 12:05	12/19/12	Soil	Same As Above
H12120317-003	S35-BGT-03	12/18/12 12:10	12/19/12	Soil	Same As Above
H12120317-004	S35-CS-01	12/18/12 12:15	12/19/12	Soil	Same As Above
H12120317-005	S35-CS-02	12/18/12 12:20	12/19/12	Soil	Same As Above
H12120317-006	S35-CS-03	12/18/12 12:25	12/19/12	Soil	Same As Above
H12120317-007	13341: TP104 (7-10')	12/18/12 12:30	12/19/12	Soil	Same As Above
H12120317-008	13350: TP106 (8.4-9.4')	12/18/12 12:35	12/19/12	Soil	Same As Above
H12120317-009	13354: TP107 (9-10')	12/18/12 12:40	12/19/12	Soil	Same As Above
H12120317-010	13371: TP111 (10.5-11.5)	12/18/12 12:45	12/19/12	Soil	Same As Above
H12120317-011	13381: TP113 (1.5-3.5)	12/18/12 12:50	12/19/12	Soil	Same As Above

ANALYTICAL SUMMARY REPORT

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

CLIENT: MT DEQ-Site Response
Project: UBMC Repository
Sample Delivery Group: H12120317

Report Date: 01/15/13

CASE NARRATIVE

Tests associated with analyst identified as ELI-CS were subcontracted to Energy Laboratories, 415 Graham Rd., College Station, TX, EPA Number TX01520.

TO: MT DEQ - Site Response
ADDRESS:

LAB NO.: H12120317-001-011
DATE: 1/14/13

UBMC Repository
FERTILIZER RECOMMENDATIONS
Fertilizer Suggested in Actual Pounds per Acre

FIELD	S35-BGT: 01	S35-BGT: 02	S35-BGT: 03	S35-CS: 01	S35-CS: 02	S35-CS: 03
CROP	Grass	Grass	Grass	Grass	Grass	Grass
PROJECTED YIELD	1T	1T	1T	1T	1T	1T
Nitrogen						
Total	35	35	35	35	35	35
Preplant						
Topdress						
Phosphrus (P_2O_5)						
Broadcast	30	50	30	0	0	0
Banded						
Potassium (K_2O)						
Broadcast	50	50	30	30	0	0
Banded						
Sulphur (S)						
Zinc (Zn)						
Iron (Fe)						
Copper (Cu)						
Lime	0	0	0	0	4	5
Compost	10T	10T	10T	5T	0T	0T

COMMENTS:
For soils with < 2% organic matter, compost at 5-10 tons per acre would help with grass establishment and growth while providing a slow release nitrogen. Those with compost recommended have < 2% O.M.

PREPARED BY: Neal Fehringer, Certified Professional Agronomist, C.C.A., (406) 860-3647.

TO: MT DEQ - Site Response
ADDRESS:

LAB NO.: H12120317-001-011
DATE: 1/14/13

UBMC Repository
FERTILIZER RECOMMENDATIONS
Fertilizer Suggested in Actual Pounds per Acre

FIELD	S35-BGT: 01	S35-BGT: 02	S35-BGT: 03	S35-CS: 01	S35-CS: 02	S35-CS: 03
CROP	Grass	Grass	Grass	Grass	Grass	Grass
PROJECTED YIELD	1T	1T	1T	1T	1T	1T
Nitrogen						
Total	35	35	35	35	35	35
Preplant						
Topdress						
Phosphrus (P_2O_5)						
Broadcast	30	50	30	0	0	0
Banded						
Potassium (K_2O)						
Broadcast	50	50	30	30	0	0
Banded						
Sulphur (S)						
Zinc (Zn)						
Iron (Fe)						
Copper (Cu)						
Lime	0	0	0	0	4	5
Compost	10T	10T	10T	5T	0T	0T

COMMENTS:
For soils with < 2% organic matter, compost at 5-10 tons per acre would help with grass establishment and growth while providing a slow release nitrogen. Those with compost recommended have < 2% O.M.

PREPARED BY: Neal Fehringer, Certified Professional Agronomist, C.C.A., (406) 860-3647.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Project: UBMC Repository
Workorder: H12120317

Report Date: 01/15/13
Date Received: 12/19/12

		Analysis		TEA Exch Acidity	pH, SMP Buffer	Lime Requireme	Percent Sat	pH-SatPst	COND	Ca-SatPst	Mg-SatPst	Na-SatPst	SAR	SO4-SatPst
		Units		meq/100g	s_u_	Tons/1000T	%	s_u_	mmhos/cm	meq/l	meq/l	meq/l	unitless	meq/L
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
H12120317-001	S35-BGT-01	0	0	0.95	7.6	< 1	24.0	7.2	0.4	2.83	0.94	0.36	0.3	0.9
H12120317-002	S35-BGT-02	0	0	1.4	7.6	< 1	29.8	7.1	0.3	2.45	0.66	0.20	0.2	< 0.4
H12120317-003	S35-BGT-03	0	0	2.8	7.4	< 1	32.4	6.8	0.5	4.11	1.21	0.27	0.2	< 0.4
H12120317-004	S35-CS-01	0	0	6.2	6.8	< 1	32.3	5.7	0.5	3.28	1.32	0.30	0.2	4.1
H12120317-005	S35-CS-02	0	0	9.8	6.4	4	38.8	5.7	0.3	2.41	0.81	0.20	0.2	0.4
H12120317-006	S35-CS-03	0	0	12	6.2	5	45.5	5.7	0.2	1.65	0.53	0.12	0.1	< 0.4
H12120317-007	13341: TP104 (7-10')	0	0	0.95	7.6	< 1	33.2	7.6	0.3	1.76	0.48	0.22	0.2	< 0.4
H12120317-008	13350: TP106 (8.4-9.4')	0	0	1.5	7.6	< 1	27.8	7.3	0.3	2.24	0.75	0.28	0.2	0.5
H12120317-009	13354: TP107 (9-10')	0	0	1.1	7.6	< 1	19.5	7.9	0.2	1.53	0.52	0.14	0.1	< 0.4
H12120317-010	13371: TP111 (10.5-11.5)	0	0	0.0	7.6	< 1	29.0	7.8	0.2	1.65	0.42	0.14	0.1	< 0.4
H12120317-011	13381: TP113 (1.5-3.5)	0	0	2.9	7.5	< 1	24.6	6.8	0.4	3.04	0.79	0.20	0.1	< 0.4

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Project: UBMC Repository
Workorder: H12120317

Report Date: 01/15/13
Date Received: 12/19/12

		Analysis		K, available	CEC	OM-WB	Neut Potential	Acid Potential	Acid/Base Potential	Sulfur, Total	Olsen Phos-Olsen	NO3	Ag-T	Al-T
		Units		mg/kg	meq/100g	%	t/kt	t/kt	t/kt	%	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
H12120317-001	S35-BGT-01	0	0	81	9.75	< 0.2	13	< 0.3	13	< 0.01	5	< 1	< 1	8380
H12120317-002	S35-BGT-02	0	0	83	11.3	< 0.2	10	< 0.3	10	< 0.01	2	< 1	< 1	10100
H12120317-003	S35-BGT-03	0	0	132	14.2	0.3	14	< 0.3	14	< 0.01	5	< 1	< 1	11800
H12120317-004	S35-CS-01	0	0	154	16.9	1.5	9	< 0.3	9	< 0.01	18	1	1	16300
H12120317-005	S35-CS-02	0	0	223	23.0	2.8	8	< 0.3	9	< 0.01	37	< 1	< 1	16400
H12120317-006	S35-CS-03	0	0	283	27.0	4.1	10	< 0.3	10	< 0.01	18	< 1	< 1	18100
H12120317-007	13341: TP104 (7-10')	0	0	109	11.6	< 0.2	23	< 0.3	23	< 0.01	2	< 1	< 1	9530
H12120317-008	13350: TP106 (8.4-9.4')	0	0	93	10.3	< 0.2	7	< 0.3	7	< 0.01	2	< 1	< 1	9620
H12120317-009	13354: TP107 (9-10')	0	0	41	4.89	< 0.2	26	< 0.3	26	< 0.01	1	< 1	3	4970
H12120317-010	13371: TP111 (10.5-11.5)	0	0	82	9.52	< 0.2	22	< 0.3	22	< 0.01	2	< 1	< 1	8540
H12120317-011	13381: TP113 (1.5-3.5)	0	0	48	3.33	< 0.2	6	< 0.3	7	< 0.01	6	< 1	< 1	7900

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Project: UBMC Repository
Workorder: H12120317

Report Date: 01/15/13
Date Received: 12/19/12

		Analysis		As-T	Ba-T	Be-T	Ca-T	Cd-T	Co-T	Cr-T	Cu-T	Fe-T	K-T	Mg-T
		Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
H12120317-001	S35-BGT-01	0	0	7	166	< 1	4240	< 1	6	14	17	13600	1590	4490
H12120317-002	S35-BGT-02	0	0	6	195	< 1	3070	< 1	7	13	18	13500	2080	4440
H12120317-003	S35-BGT-03	0	0	7	191	< 1	3820	< 1	6	16	15	14500	2030	4090
H12120317-004	S35-CS-01	0	0	21	254	< 1	2300	1	6	19	113	16000	2280	3570
H12120317-005	S35-CS-02	0	0	6	315	< 1	2610	< 1	6	16	18	14600	2370	3520
H12120317-006	S35-CS-03	0	0	6	326	< 1	2950	< 1	5	17	18	14600	2970	3390
H12120317-007	13341: TP104 (7-10')	0	0	7	216	< 1	6830	< 1	7	20	17	13400	2050	4740
H12120317-008	13350: TP106 (8.4-9.4')	0	0	5	146	< 1	2240	< 1	6	12	22	13200	1870	3630
H12120317-009	13354: TP107 (9-10')	0	0	3	232	< 1	6850	< 1	5	7	13	9420	1120	4420
H12120317-010	13371: TP111 (10.5-11.5)	0	0	5	192	< 1	6650	< 1	6	12	14	11600	1760	4330
H12120317-011	13381: TP113 (1.5-3.5)	0	0	6	132	< 1	1850	< 1	7	12	15	15100	1380	3880

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Project: UBMC Repository
Workorder: H12120317

Report Date: 01/15/13
Date Received: 12/19/12

		Analysis		Mn-T	Na-T	Ni-T	Pb-T	Sb-T	Se-T	Tl-T	V-T	Zn-T	Hg, Total	1/3 Bar Moisture
		Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	wt%
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
H12120317-001	S35-BGT-01	0	0	350	52	14	12	< 1	< 1	< 1	13	43	< 0.50	15
H12120317-002	S35-BGT-02	0	0	400	51	15	11	< 1	< 1	< 1	11	41	< 0.50	18
H12120317-003	S35-BGT-03	0	0	335	65	15	11	< 1	< 1	< 1	14	39	< 0.50	19
H12120317-004	S35-CS-01	0	0	603	68	14	548	< 1	< 1	< 1	21	273	< 0.50	21
H12120317-005	S35-CS-02	0	0	531	60	14	12	< 1	< 1	< 1	16	62	< 0.50	26
H12120317-006	S35-CS-03	0	0	399	68	13	11	< 1	< 1	< 1	16	61	< 0.50	29
H12120317-007	13341: TP104 (7-10')	0	0	341	76	17	10	< 1	< 1	< 1	14	39	< 0.50	19
H12120317-008	13350: TP106 (8.4-9.4')	0	0	328	54	13	20	< 1	< 1	< 1	11	42	< 0.50	17
H12120317-009	13354: TP107 (9-10')	0	0	293	36	8	7	< 1	< 1	< 1	10	26	< 0.50	10
H12120317-010	13371: TP111 (10.5-11.5)	0	0	308	58	11	10	< 1	< 1	< 1	11	35	< 0.50	17
H12120317-011	13381: TP113 (1.5-3.5)	0	0	283	53	13	10	< 1	< 1	< 1	14	42	< 0.50	8.6

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Project: UBMC Repository
Workorder: H12120317

Report Date: 01/15/13
Date Received: 12/19/12

		Analysis		15 Bar Moisture
		Units		wt%
Sample ID	Client Sample ID	Up	Low	Results
H12120317-001	S35-BGT-01	0	0	6.2
H12120317-002	S35-BGT-02	0	0	7.9
H12120317-003	S35-BGT-03	0	0	9.0
H12120317-004	S35-CS-01	0	0	9.4
H12120317-005	S35-CS-02	0	0	11
H12120317-006	S35-CS-03	0	0	12
H12120317-007	13341: TP104 (7-10')	0	0	9.6
H12120317-008	13350: TP106 (8.4-9.4')	0	0	7.5
H12120317-009	13354: TP107 (9-10')	0	0	2.9
H12120317-010	13371: TP111 (10.5-11.5)	0	0	7.3
H12120317-011	13381: TP113 (1.5-3.5)	0	0	4.7

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA12-3										Batch: R85449
Sample ID: LCS-19107		Laboratory Control Sample				Run: SOIL PH METER_121228A				12/28/13 13:00
pH, SMP Buffer		7.56	s.u.	0.10	100	70	130			
Sample ID: H12120317-010ADUP	2	Sample Duplicate				Run: SOIL PH METER_121228A				12/28/12 13:00
pH, SMP Buffer		7.63	s.u.	0.10						
Lime Requirement, SMP buffer		ND	Tons/1000T	1.0					30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA24-5									Analytical Run: FIA202-HE_130104A	
Sample ID: ICV		Initial Calibration Verification Standard							01/04/13 09:12	
Phosphorus, Olsen		5.0	mg/kg	1.0	100	90	110			
Sample ID: ICB		Initial Calibration Blank, Instrument Blank							01/04/13 09:16	
Phosphorus, Olsen		0.023	mg/kg	1.0		0	0			
Method: ASA24-5									Batch: 19156	
Sample ID: MB-19156		Method Blank				Run: FIA202-HE_130104A			01/04/13 09:18	
Phosphorus, Olsen		1.0	mg/kg	0.08						
Sample ID: LCS-19156		Laboratory Control Sample				Run: FIA202-HE_130104A			01/04/13 09:19	
Phosphorus, Olsen		46	mg/kg	1.0	102	70	130			
Sample ID: H12120317-001AMS		Sample Matrix Spike				Run: FIA202-HE_130104A			01/04/13 09:21	
Phosphorus, Olsen		53	mg/kg	1.0	96	80	120			
Sample ID: H12120317-001AMSD		Sample Matrix Spike Duplicate				Run: FIA202-HE_130104A			01/04/13 09:22	
Phosphorus, Olsen		53	mg/kg	1.0	96	80	120	0.3	20	
Sample ID: H12120317-010Adup		Sample Duplicate				Run: FIA202-HE_130104A			01/04/13 09:35	
Phosphorus, Olsen		1.9	mg/kg	1.0				8.1	30	
Sample ID: H12120317-011AMS		Sample Matrix Spike				Run: FIA202-HE_130104A			01/04/13 09:37	
Phosphorus, Olsen		53	mg/kg	1.0	94	80	120			
Sample ID: H12120317-011AMSD		Sample Matrix Spike Duplicate				Run: FIA202-HE_130104A			01/04/13 09:38	
Phosphorus, Olsen		54	mg/kg	1.0	96	80	120	2.0	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA29-3										Batch: 19110
Sample ID: LCS-19110121231121		Laboratory Control Sample				Run: MISC SOILS_130102F				12/31/12 12:11
Organic Matter		1.29	%	0.17	87	70	130			
Sample ID: H12120317-010ADUP		Sample Duplicate				Run: MISC SOILS_130102F				12/31/12 12:11
Organic Matter		ND	%	0.17						
Sample ID: H12120317-010ADUP		Sample Duplicate				Run: MISC SOILS_130102F				12/31/12 12:11
Organic Matter		ND	%	0.020					30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA33-8									Analytical Run: FIA203-HE_130102B	
Sample ID: ICV		Initial Calibration Verification Standard							01/02/13 11:53	
Nitrate as N, KCL Extract		1.1	mg/kg	1.0	106	90	110			
Sample ID: CCV		Continuing Calibration Verification Standard							01/02/13 11:55	
Nitrate as N, KCL Extract		0.50	mg/kg	1.0	100	90	110			
Sample ID: ICB		Initial Calibration Blank, Instrument Blank							01/02/13 11:57	
Nitrate as N, KCL Extract		-0.0069	mg/kg	1.0		0	0			
Sample ID: CCV		Continuing Calibration Verification Standard							01/02/13 12:17	
Nitrate as N, KCL Extract		0.50	mg/kg	1.0	100	90	110			
Method: ASA33-8									Batch: 19112	
Sample ID: MB-19112		Method Blank				Run: FIA203-HE_130102B			01/02/13 12:00	
Nitrate as N, KCL Extract		ND	mg/kg	0.1						
Sample ID: LCS-19112		Laboratory Control Sample				Run: FIA203-HE_130102B			01/02/13 12:01	
Nitrate as N, KCL Extract		5.0	mg/kg	2.0	96	70	130			
Sample ID: H12120317-001AMS		Sample Matrix Spike				Run: FIA203-HE_130102B			01/02/13 12:04	
Nitrate as N, KCL Extract		2.3	mg/kg	1.0	95	80	120			
Sample ID: H12120317-001AMSD		Sample Matrix Spike Duplicate				Run: FIA203-HE_130102B			01/02/13 12:05	
Nitrate as N, KCL Extract		2.3	mg/kg	1.0	94	80	120	0.1	30	
Sample ID: H12120317-010Adup		Sample Duplicate				Run: FIA203-HE_130102B			01/02/13 12:19	
Nitrate as N, KCL Extract		0.15	mg/kg	1.0					30	
Sample ID: H12120317-011AMS		Sample Matrix Spike				Run: FIA203-HE_130102B			01/02/13 12:22	
Nitrate as N, KCL Extract		1.9	mg/kg	1.0	95	80	120			
Sample ID: H12120317-011AMSD		Sample Matrix Spike Duplicate				Run: FIA203-HE_130102B			01/02/13 12:23	
Nitrate as N, KCL Extract		1.9	mg/kg	1.0	95	80	120	0.2	30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA9-4										Batch: T_R48932
Sample ID: MBLK1301110833		Method Blank				Run: SUB-T48932				01/11/13 08:33
Exchangeable Acidity-TEA		ND	meq/100g	0.1						
Sample ID: H12120317-005A		Sample Duplicate				Run: SUB-T48932				01/11/13 08:33
Exchangeable Acidity-TEA		10	meq/100g	0.10				6.4	10	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASAM10-3									Analytical Run: SOIL EC_121231A	
Sample ID: CCV_1_121228_1		Continuing Calibration Verification Standard							12/28/12 10:44	
Conductivity, sat. paste		1.44	mmhos/cm	0.10	102	90	110			
Sample ID: CCV1_1_121228_1		Continuing Calibration Verification Standard							12/28/12 10:44	
Conductivity, sat. paste		5.09	mmhos/cm	0.10	102	90	110			
Sample ID: ICV_1_121228_1		Initial Calibration Verification Standard							12/28/12 10:44	
Conductivity, sat. paste		18.8	mmhos/cm	0.10	94	90	110			
Sample ID: CCV_3_121228_1		Continuing Calibration Verification Standard							12/28/12 10:47	
Conductivity, sat. paste		1.42	mmhos/cm	0.10	100	90	110			
Method: ASAM10-3									Batch: 121228_1_COND-S-PASTE	
Sample ID: LCS-19107		Laboratory Control Sample				Run: SOIL EC_121231A			12/28/12 10:44	
Conductivity, sat. paste		4.71	mmhos/cm	0.10	100	80	120			
Sample ID: H12120317-010ADUP		Sample Duplicate				Run: SOIL EC_121231A			12/28/12 10:46	
Conductivity, sat. paste		0.212	mmhos/cm	0.10				4.6	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASAM10-3.2									Analytical Run: SOIL PH METER_121231A	
Sample ID: CCV_1_121228_1		Continuing Calibration Verification Standard							12/28/12 10:50	
pH, sat. paste		7.01	s.u.	0.10	100	95	105			
Sample ID: CCV1_1_121228_1		Continuing Calibration Verification Standard							12/28/12 10:50	
pH, sat. paste		4.01	s.u.	0.10	100	95	105			
Sample ID: ICV_1_121228_1		Initial Calibration Verification Standard							12/28/12 10:50	
pH, sat. paste		10.0	s.u.	0.10	100	98	102			
Sample ID: CCV_3_121228_1		Continuing Calibration Verification Standard							12/28/12 10:51	
pH, sat. paste		6.97	s.u.	0.10	100	95	105			
Method: ASAM10-3.2									Batch: 19107	
Sample ID: LCS-19107		Laboratory Control Sample				Run: SOIL PH METER_121231A			12/28/12 10:50	
pH, sat. paste		7.56	s.u.	0.10	100	90	110			
Sample ID: H12120317-010ADUP		Sample Duplicate				Run: SOIL PH METER_121231A			12/28/12 10:51	
pH, sat. paste		7.74	s.u.	0.10				0.1	30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Analytical Run: ICP2-HE_121231C	
Sample ID: ICV	17	Initial Calibration Verification Standard							12/31/12 11:27	
Aluminum		4.08	mg/L	0.10	102	90	110			
Barium		0.802	mg/L	0.10	100	90	110			
Beryllium		0.411	mg/L	0.0010	103	90	110			
Cadmium		0.396	mg/L	0.0010	99	90	110			
Calcium		40.6	mg/L	1.0	101	90	110			
Chromium		0.846	mg/L	0.010	106	90	110			
Cobalt		0.807	mg/L	0.010	101	90	110			
Copper		0.817	mg/L	0.010	102	90	110			
Iron		4.03	mg/L	0.030	101	90	110			
Magnesium		40.3	mg/L	1.0	101	90	110			
Manganese		3.99	mg/L	0.010	100	90	110			
Nickel		0.833	mg/L	0.010	104	90	110			
Potassium		40.5	mg/L	1.0	101	90	110			
Silver		0.386	mg/L	0.0054	97	90	110			
Sodium		40.8	mg/L	1.0	102	90	110			
Vanadium		0.807	mg/L	0.10	101	90	110			
Zinc		0.805	mg/L	0.010	101	90	110			
Sample ID: ICSA	17	Interference Check Sample A							12/31/12 11:42	
Aluminum		528	mg/L	0.10	106	80	120			
Barium		0.000490	mg/L	0.10		0	0			
Beryllium		-2.00E-05	mg/L	0.0010		0	0			
Cadmium		0.00215	mg/L	0.0010		0	0			
Calcium		483	mg/L	1.0	97	80	120			
Chromium		0.00644	mg/L	0.012		0	0			
Cobalt		0.00239	mg/L	0.010		0	0			
Copper		0.000170	mg/L	0.010		0	0			
Iron		189	mg/L	0.030	94	80	120			
Magnesium		508	mg/L	1.0	102	80	120			
Manganese		0.00483	mg/L	0.010		0	0			
Nickel		0.00659	mg/L	0.010		0	0			
Potassium		-0.000960	mg/L	1.0		0	0			
Silver		0.0408	mg/L	0.0054		0	0			
Sodium		0.00909	mg/L	1.0		0	0			
Vanadium		-0.00144	mg/L	0.10		0	0			
Zinc		0.0155	mg/L	0.010		0	0			
Sample ID: ICSAB	17	Interference Check Sample AB							12/31/12 11:45	
Aluminum		522	mg/L	0.10	104	80	120			
Barium		0.495	mg/L	0.10	99	80	120			
Beryllium		0.494	mg/L	0.0010	99	80	120			
Cadmium		0.901	mg/L	0.0010	90	80	120			
Calcium		472	mg/L	1.0	94	80	120			
Chromium		0.507	mg/L	0.012	101	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response **Report Date:** 01/15/13

Project: UBMC Repository **Work Order:** H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Analytical Run: ICP2-HE_121231C	
Sample ID: ICSAB	17	Interference Check Sample AB							12/31/12 11:45	
Cobalt		0.453	mg/L	0.010	91	80	120			
Copper		0.506	mg/L	0.010	101	80	120			
Iron		186	mg/L	0.030	93	80	120			
Magnesium		501	mg/L	1.0	100	80	120			
Manganese		0.475	mg/L	0.010	95	80	120			
Nickel		0.942	mg/L	0.010	94	80	120			
Potassium		22.2	mg/L	1.0	111	80	120			
Silver		1.01	mg/L	0.0054	101	80	120			
Sodium		22.4	mg/L	1.0	112	80	120			
Vanadium		0.475	mg/L	0.10	95	80	120			
Zinc		0.977	mg/L	0.010	98	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response **Report Date:** 01/15/13

Project: UBMC Repository **Work Order:** H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E300.0									Analytical Run: IC102-H_130103A	
Sample ID: ICV010313-12		Initial Calibration Verification Standard							01/03/13 15:26	
Sulfate		390	mg/L	1.0	97	90	110			
Sample ID: CCV010313-44		Continuing Calibration Verification Standard							01/03/13 22:22	
Sulfate		410	mg/L	1.0	102	90	110			
Sample ID: CCV010313-57		Continuing Calibration Verification Standard							01/04/13 01:05	
Sulfate		410	mg/L	1.0	103	90	110			
Method: E300.0									Batch: 19107	
Sample ID: MB-19107		Method Blank				Run: IC102-H_130103A			01/03/13 21:56	
Sulfate, sat. paste		ND	meq/L	0.0005						
Sample ID: H12120317-009AMS		Sample Matrix Spike				Run: IC102-H_130103A			01/04/13 00:40	
Sulfate, sat. paste		97.7	meq/L	0.47	117	90	110			S
Sample ID: H12120317-009AMSD		Sample Matrix Spike Duplicate				Run: IC102-H_130103A			01/04/13 00:53	
Sulfate, sat. paste		97.4	meq/L	0.47	117	90	110			S
Sample ID: H12120317-011AMS		Sample Matrix Spike				Run: IC102-H_130103A			01/04/13 02:08	
Sulfate, sat. paste		97.9	meq/L	0.47	117	90	110			S
Sample ID: H12120317-011AMSD		Sample Matrix Spike Duplicate				Run: IC102-H_130103A			01/04/13 02:21	
Sulfate, sat. paste		97.4	meq/L	0.47	117	90	110			S
Method: E300.0									Batch: 19107	
Sample ID: LCS-19107		Laboratory Control Sample				Run: IC102-H_130104A			01/04/13 15:16	
Sulfate, sat. paste		61.5	meq/L	0.42	130	70	130			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: Sobek Modified										Batch: R85411
Sample ID: H12120317-010A		Sample Duplicate				Run: LECO632_121231A				12/31/12 09:01
Sulfur, Total		ND	%	0.010					30	
Method: Sobek Modified										Batch: 19108
Sample ID: LCS-19108		Laboratory Control Sample				Run: MAN-TECH_121228A				12/28/12 09:01
Neutralization Potential		70	t/kt		98	70	130			
Sample ID: H12120317-010ADUP		Sample Duplicate				Run: MAN-TECH_121228A				12/28/12 10:39
Neutralization Potential		22	t/kt					0.3	20	
Method: Sobek Modified										Batch: 19143
Sample ID: LCS-19143		Laboratory Control Sample				Run: MAN-TECH_121231A				12/31/12 08:15
Neutralization Potential		69	t/kt		96	70	130			
Sample ID: H12120317-007ADUP		Sample Duplicate				Run: MAN-TECH_121231A				12/31/12 08:34
Neutralization Potential		23	t/kt					0.3	20	
Method: Sobek Modified										Batch: 19108
Sample ID: H12120317-010ADUP	2	Sample Duplicate				Run: MISC SOILS_121231A				12/27/12 07:58
Acid Potential		ND	t/kt	0.31					20	
Acid/Base Potential		22	t/kt					0.2	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response **Report Date:** 01/15/13

Project: UBMC Repository **Work Order:** H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SSSA pt4										Batch: R85556
Sample ID: LCS-19107	2	Laboratory Control Sample				Run: MISC SOILS_121231C				12/31/12 13:57
1/3 Bar Moisture		27	wt%	0.10	98	70	130			
15 Bar Moisture		15	wt%	0.10	86	70	130			
Sample ID: H12120317-010ADUP	2	Sample Duplicate				Run: MISC SOILS_121231C				12/31/12 13:57
1/3 Bar Moisture		17	wt%	0.10				1.1	20	
15 Bar Moisture		7.4	wt%	0.10				1.4	20	

Qualifiers:

RL - Analyte reporting limit.

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QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 19111
Sample ID: MB-19111	2	Method Blank				Run: ICP1-HE_121227A				12/27/12 18:55
Potassium, Available		0.8	mg/kg	0.02						
Potassium, Extractable		0.002	meq/100g	5E-05						
Sample ID: LCS-19111	2	Laboratory Control Sample				Run: ICP1-HE_121227A				12/27/12 18:58
Potassium, Available		182	mg/kg	1.00	101	70	130			
Potassium, Extractable		0.466	meq/100g	0.0026	102	70	130			
Sample ID: H12120317-001AMS2	2	Sample Matrix Spike				Run: ICP1-HE_121227A				12/27/12 19:07
Potassium, Available		1050	mg/kg	2.8	97	75	125			
Potassium, Extractable		2.69	meq/100g	0.0073	97	75	125			
Sample ID: H12120317-001AMSD	2	Sample Matrix Spike Duplicate				Run: ICP1-HE_121227A				12/27/12 19:10
Potassium, Available		1010	mg/kg	2.8	93	75	125	4.1	20	
Potassium, Extractable		2.58	meq/100g	0.0073	93	75	125	4.1	20	
Sample ID: H12120317-010Adup	2	Sample Duplicate				Run: ICP1-HE_121227A				12/27/12 19:47
Potassium, Available		83.9	mg/kg	1.00				2.0	30	
Potassium, Extractable		0.215	meq/100g	0.0026				2.0	30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 19104
Sample ID: MB-19104	17	Method Blank				Run: ICP2-HE_121231C				12/31/12 13:11
Aluminum		ND	mg/kg	0.3						
Barium		0.02	mg/kg	0.02						
Beryllium		ND	mg/kg	0.004						
Cadmium		ND	mg/kg	0.01						
Calcium		3	mg/kg	3						
Chromium		ND	mg/kg	0.7						
Cobalt		ND	mg/kg	0.1						
Copper		ND	mg/kg	0.2						
Iron		4	mg/kg	0.7						
Magnesium		ND	mg/kg	1.0						
Manganese		0.05	mg/kg	0.04						
Nickel		ND	mg/kg	0.08						
Potassium		3	mg/kg	1						
Silver		0.2	mg/kg	0.2						
Sodium		2	mg/kg	0.7						
Vanadium		ND	mg/kg	0.10						
Zinc		0.2	mg/kg	0.1						
Sample ID: LFB-19104	17	Laboratory Fortified Blank				Run: ICP2-HE_121231C				12/31/12 13:15
Aluminum		250	mg/kg	5.0	100	80	120			
Barium		50.4	mg/kg	1.0	101	80	120			
Beryllium		25.2	mg/kg	1.0	101	80	120			
Cadmium		23.2	mg/kg	1.0	93	80	120			
Calcium		2390	mg/kg	5.0	96	80	120			
Chromium		50.6	mg/kg	1.0	101	80	120			
Cobalt		46.7	mg/kg	1.0	93	80	120			
Copper		49.5	mg/kg	1.0	99	80	120			
Iron		242	mg/kg	5.0	96	80	120			
Magnesium		2370	mg/kg	5.0	95	80	120			
Manganese		239	mg/kg	1.0	96	80	120			
Nickel		48.1	mg/kg	1.0	96	80	120			
Potassium		2530	mg/kg	5.0	101	80	120			
Silver		23.2	mg/kg	1.0	92	80	120			
Sodium		2580	mg/kg	5.0	103	80	120			
Vanadium		48.5	mg/kg	1.0	97	80	120			
Zinc		47.4	mg/kg	1.0	94	80	120			
Sample ID: LCS-19104	17	Laboratory Control Sample				Run: ICP2-HE_121231C				12/31/12 13:19
Aluminum		12600	mg/kg	5.0	87	50.7	131.3			
Barium		565	mg/kg	1.0	93	80.6	112.2			
Beryllium		45.6	mg/kg	1.0	90	76.3	108.6			
Cadmium		120	mg/kg	1.0	89	73	105.1			
Calcium		10500	mg/kg	5.0	85	78.2	111.9			
Chromium		73.0	mg/kg	1.0	97	72.8	109.1			

Qualifiers:

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ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B									Batch: 19104	
Sample ID: LCS-19104	17	Laboratory Control Sample				Run: ICP2-HE_121231C			12/31/12 13:19	
Cobalt		49.1	mg/kg	1.0	86	73.3	103.7			
Copper		255	mg/kg	1.0	92	77.5	109.6			
Iron		18600	mg/kg	5.0	82	39.6	138.3			
Magnesium		3020	mg/kg	5.0	93	73.2	115.6			
Manganese		361	mg/kg	1.0	99	80.8	115.7			
Nickel		54.9	mg/kg	1.0	91	72.3	103.4			
Potassium		2090	mg/kg	18	99	75	127.8			
Silver		62.6	mg/kg	1.0	91	67.8	112.8			
Sodium		197	mg/kg	5.0	96	70.9	123.3			
Vanadium		59.5	mg/kg	1.0	82	66.6	107.3			
Zinc		192	mg/kg	1.0	91	74.2	109.9			
Sample ID: H12120317-011AMS	16	Sample Matrix Spike				Run: ICP2-HE_121231C			12/31/12 14:18	
Aluminum		12300	mg/kg	5.0		75	125			A
Barium		186	mg/kg	1.0	110	75	125			
Beryllium		24.5	mg/kg	1.0	97	75	125			
Cadmium		22.6	mg/kg	1.0	91	75	125			
Calcium		4180	mg/kg	5.0	94	75	125			
Chromium		66.3	mg/kg	1.0	111	75	125			
Copper		59.8	mg/kg	1.0	90	75	125			
Iron		13900	mg/kg	5.0		75	125			A
Magnesium		6150	mg/kg	5.0	92	75	125			
Manganese		510	mg/kg	1.0	92	75	125			
Nickel		63.4	mg/kg	1.0	102	75	125			
Potassium		5040	mg/kg	18	148	75	125			S
Silver		24.5	mg/kg	1.0	81	75	125			
Sodium		2600	mg/kg	5.0	103	75	125			
Vanadium		61.2	mg/kg	1.0	94	75	125			
Zinc		94.2	mg/kg	1.0	105	75	125			
Sample ID: H12120317-011AMSD	16	Sample Matrix Spike Duplicate				Run: ICP2-HE_121231C			12/31/12 14:22	
Aluminum		12100	mg/kg	5.0		75	125	1.7	20	A
Barium		186	mg/kg	1.0	110	75	125	0.0	20	
Beryllium		24.9	mg/kg	1.0	99	75	125	1.4	20	
Cadmium		23.1	mg/kg	1.0	93	75	125	2.2	20	
Calcium		4290	mg/kg	5.0	99	75	125	2.6	20	
Chromium		67.0	mg/kg	1.0	112	75	125	1.0	20	
Copper		61.3	mg/kg	1.0	93	75	125	2.5	20	
Iron		14200	mg/kg	5.0		75	125	2.6	20	A
Magnesium		6410	mg/kg	5.0	102	75	125	4.2	20	
Manganese		538	mg/kg	1.0	103	75	125	5.4	20	
Nickel		60.9	mg/kg	1.0	97	75	125	4.0	20	
Potassium		4830	mg/kg	18	139	75	125	4.2	20	S
Silver		26.0	mg/kg	1.0	87	75	125	5.8	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 19104
Sample ID: H12120317-011AMSD	16	Sample Matrix Spike Duplicate				Run: ICP2-HE_121231C				12/31/12 14:22
Sodium		2640	mg/kg	5.0	105	75	125	1.5	20	
Vanadium		62.2	mg/kg	1.0	96	75	125	1.6	20	
Zinc		89.7	mg/kg	1.0	96	75	125	4.8	20	
Method: SW6010B										Batch: 19107
Sample ID: MB-19107	6	Method Blank				Run: ICP2-HE_121231C				12/31/12 14:25
Calcium		0.04	mg/L	0.02						
Magnesium		ND	mg/L	0.007						
Sodium		ND	mg/L	0.02						
Calcium, sat. paste		0.002	meq/L	0.001						
Magnesium, sat. paste		ND	meq/L	0.0006						
Sodium, sat. paste		ND	meq/L	0.0008						
Sample ID: LCS-19107	6	Laboratory Control Sample				Run: ICP2-HE_121231C				12/31/12 14:37
Calcium		492	mg/L	1.0	118	70	130			
Magnesium		199	mg/L	1.0	115	70	130			
Sodium		484	mg/L	1.0	113	70	130			
Calcium, sat. paste		24.6	meq/L	0.050	118	70	130			
Magnesium, sat. paste		16.4	meq/L	0.082	115	70	130			
Sodium, sat. paste		21.0	meq/L	0.044	113	70	130			
Sample ID: H12120317-006AMS2	6	Sample Matrix Spike				Run: ICP2-HE_121231C				12/31/12 15:07
Calcium		125	mg/L	1.0	91	75	125			
Magnesium		100	mg/L	1.0	94	75	125			
Sodium		104	mg/L	1.0	101	75	125			
Calcium, sat. paste		6.22	meq/L	0.050	91	75	125			
Magnesium, sat. paste		8.23	meq/L	0.082	94	75	125			
Sodium, sat. paste		4.53	meq/L	0.044	101	75	125			
Sample ID: H12120317-006AMSD	6	Sample Matrix Spike Duplicate				Run: ICP2-HE_121231C				12/31/12 15:10
Calcium		126	mg/L	1.0	93	75	125	1.0	20	
Magnesium		101	mg/L	1.0	95	75	125	1.2	20	
Sodium		103	mg/L	1.0	101	75	125	0.7	20	
Calcium, sat. paste		6.28	meq/L	0.050	93	75	125	1.0	20	
Magnesium, sat. paste		8.33	meq/L	0.082	95	75	125	1.2	20	
Sodium, sat. paste		4.50	meq/L	0.044	101	75	125	0.7	20	
Sample ID: H12120317-010Adup	6	Sample Duplicate				Run: ICP2-HE_121231C				12/31/12 16:03
Calcium		33.7	mg/L	1.0				1.5	30	
Magnesium		5.18	mg/L	1.0				2.7	30	
Sodium		3.45	mg/L	1.0				9.6	30	
Calcium, sat. paste		1.68	meq/L	0.050				1.5	30	
Magnesium, sat. paste		0.427	meq/L	0.082				2.7	30	
Sodium, sat. paste		0.150	meq/L	0.044				9.6	30	
Method: SW6010B										Batch: 19113

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 19113
Sample ID: MB-19113	2	Method Blank				Run: ICP2-HE_121231C				12/31/12 16:18
Sodium		0.7	mg/kg	0.09						
Cation Exchange Capacity		0.06	meq/100g	0.008						
Sample ID: LCS-19113	2	Laboratory Control Sample				Run: ICP2-HE_121231C				12/31/12 16:22
Sodium		262	mg/kg	1.0	109	70	130			
Cation Exchange Capacity		22.8	meq/100g	0.087	109	70	130			
Sample ID: H12120317-001AMS2	2	Sample Matrix Spike				Run: ICP2-HE_121231C				12/31/12 16:41
Sodium		361	mg/kg	1.0	99	75	125			
Cation Exchange Capacity		31.4	meq/100g	0.087	99	75	125			
Sample ID: H12120317-001AMSD	2	Sample Matrix Spike Duplicate				Run: ICP2-HE_121231C				12/31/12 16:45
Sodium		366	mg/kg	1.0	102	75	125	1.5	20	
Cation Exchange Capacity		31.9	meq/100g	0.087	102	75	125	1.5	20	
Sample ID: H12120317-010Adup	2	Sample Duplicate				Run: ICP2-HE_121231C				12/31/12 17:30
Sodium		109	mg/kg	1.0				0.1	30	
Cation Exchange Capacity		9.51	meq/100g	0.087				0.1	30	

Qualifiers:

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QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 19104
Sample ID: H12120317-011AMS	17	Sample Matrix Spike				Run: ICP2-HE_130102B				01/02/13 16:53
Aluminum		12400	mg/kg	5.0		75	125			A
Barium		183	mg/kg	1.0	106	75	125			
Beryllium		24.4	mg/kg	1.0	97	75	125			
Cadmium		23.4	mg/kg	1.0	94	75	125			
Calcium		4460	mg/kg	5.0	100	75	125			
Chromium		66.7	mg/kg	1.0	105	75	125			
Cobalt		54.2	mg/kg	1.0	97	75	125			
Copper		59.9	mg/kg	1.0	90	75	125			
Iron		14600	mg/kg	5.0		75	125			A
Magnesium		6440	mg/kg	5.0	93	75	125			
Manganese		535	mg/kg	1.0	96	75	125			
Nickel		64.9	mg/kg	1.0	102	75	125			
Potassium		5030	mg/kg	18	146	75	125			S
Silver		27.9	mg/kg	1.0	84	75	125			
Sodium		2530	mg/kg	5.0	100	75	125			
Vanadium		63.3	mg/kg	1.0	97	75	125			
Zinc		97.2	mg/kg	1.0	102	75	125			
Sample ID: H12120317-011AMSD	17	Sample Matrix Spike Duplicate				Run: ICP2-HE_130102B				01/02/13 16:56
Aluminum		12100	mg/kg	5.0		75	125	2.0	20	A
Barium		184	mg/kg	1.0	107	75	125	0.5	20	
Beryllium		24.8	mg/kg	1.0	98	75	125	1.4	20	
Cadmium		23.1	mg/kg	1.0	94	75	125	1.0	20	
Calcium		4550	mg/kg	5.0	104	75	125	2.0	20	
Chromium		66.0	mg/kg	1.0	104	75	125	1.1	20	
Cobalt		52.8	mg/kg	1.0	94	75	125	2.6	20	
Copper		61.5	mg/kg	1.0	93	75	125	2.7	20	
Iron		14900	mg/kg	5.0		75	125	1.9	20	A
Magnesium		6630	mg/kg	5.0	101	75	125	3.0	20	
Manganese		562	mg/kg	1.0	107	75	125	5.0	20	
Nickel		60.5	mg/kg	1.0	93	75	125	7.0	20	
Potassium		4780	mg/kg	18	136	75	125	5.2	20	S
Silver		28.4	mg/kg	1.0	85	75	125	1.5	20	
Sodium		2540	mg/kg	5.0	101	75	125	0.6	20	
Vanadium		63.6	mg/kg	1.0	98	75	125	0.5	20	
Zinc		90.8	mg/kg	1.0	89	75	125	6.8	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Analytical Run: ICPMS204-B_121228B	
Sample ID: ICV STD	7	Initial Calibration Verification Standard							12/28/12 14:05	
Antimony		0.0512	mg/L	0.0010	102	90	110			
Arsenic		0.0510	mg/L	0.0010	102	90	110			
Cobalt		0.0514	mg/L	0.0010	103	90	110			
Lead		0.0506	mg/L	0.0010	101	90	110			
Selenium		0.0523	mg/L	0.0010	105	90	110			
Silver		0.0252	mg/L	0.0010	101	90	110			
Thallium		0.0510	mg/L	0.0010	102	90	110			
Method: SW6020									Batch: 19104	
Sample ID: MB-19104	7	Method Blank				Run: ICPMS204-B_121228B			12/28/12 15:10	
Antimony		0.03	mg/kg	0.002						
Arsenic		0.02	mg/kg	0.006						
Cobalt		ND	mg/kg	0.003						
Lead		0.008	mg/kg	0.003						
Selenium		0.04	mg/kg	0.007						
Silver		0.3	mg/kg	0.02						
Thallium		ND	mg/kg	0.002						
Sample ID: LCS TEST	7	Laboratory Control Sample				Run: ICPMS204-B_121228B			12/28/12 15:15	
Antimony		56.9	mg/kg	1.0	46	2.2	92.9			
Arsenic		316	mg/kg	1.0	93	72.3	106.4			
Cobalt		55.5	mg/kg	1.0	98	73.3	103.7			
Lead		196	mg/kg	1.0	106	75.9	108.6			
Selenium		202	mg/kg	1.0	104	72.5	112.2			
Silver		71.3	mg/kg	1.0	104	67.8	112.8			
Thallium		90.3	mg/kg	1.0	100	71.7	109.5			
Sample ID: LFB-19104	7	Laboratory Fortified Blank				Run: ICPMS204-B_121228B			12/28/12 15:24	
Antimony		53.4	mg/kg	1.0	107	80	120			
Arsenic		50.8	mg/kg	1.0	102	80	120			
Cobalt		49.1	mg/kg	1.0	98	80	120			
Lead		51.6	mg/kg	1.0	103	80	120			
Selenium		52.8	mg/kg	1.0	106	80	120			
Silver		27.4	mg/kg	1.0	108	80	120			
Thallium		50.0	mg/kg	1.0	100	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response **Report Date:** 01/15/13

Project: UBMC Repository **Work Order:** H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020										Batch: 19104
Sample ID: H12120317-011AMS	7	Sample Matrix Spike				Run: ICPMS204-B_130102A			01/02/13 12:08	
Antimony		23.7	mg/kg	1.0	48	75	125			S
Arsenic		55.9	mg/kg	1.0	101	75	125			
Cobalt		57.7	mg/kg	1.0	102	75	125			
Lead		63.0	mg/kg	1.0	107	75	125			
Selenium		50.9	mg/kg	1.0	103	75	125			
Silver		26.2	mg/kg	1.0	106	75	125			
Thallium		50.1	mg/kg	1.0	101	75	125			
Sample ID: H12120317-011AMSD	7	Sample Matrix Spike Duplicate				Run: ICPMS204-B_130102A			01/02/13 12:13	
Antimony		22.0	mg/kg	1.0	44	75	125	7.8	20	S
Arsenic		57.1	mg/kg	1.0	104	75	125	2.1	20	
Cobalt		55.4	mg/kg	1.0	97	75	125	4.0	20	
Lead		62.7	mg/kg	1.0	106	75	125	0.5	20	
Selenium		53.5	mg/kg	1.0	108	75	125	4.9	20	
Silver		26.2	mg/kg	1.0	106	75	125	0.2	20	
Thallium		49.5	mg/kg	1.0	100	75	125	1.3	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW7471A									Analytical Run: HGCV201-H_121228A	
Sample ID: ICV		Initial Calibration Verification Standard							12/28/12 11:18	
Mercury		0.0010	mg/kg	0.50	101	90	110			
Sample ID: CCV		Continuing Calibration Verification Standard							12/28/12 11:20	
Mercury		0.0024	mg/kg	0.50	97	90	110			
Sample ID: CCV		Continuing Calibration Verification Standard							12/28/12 12:11	
Mercury		0.0026	mg/kg	0.50	104	90	110			
Method: SW7471A									Batch: 19106	
Sample ID: MB-19106		Method Blank				Run: HGCV201-H_121228A			12/28/12 11:25	
Mercury		0.002	mg/kg	0.0004						
Sample ID: LCS-19106		Laboratory Control Sample				Run: HGCV201-H_121228A			12/28/12 11:27	
Mercury		4.6	mg/kg	0.50	91	80	120			
Sample ID: H12120317-004AMS		Sample Matrix Spike				Run: HGCV201-H_121228A			12/28/12 11:39	
Mercury		1.1	mg/kg	0.50	108	80	120			
Sample ID: H12120317-004AMSD		Sample Matrix Spike Duplicate				Run: HGCV201-H_121228A			12/28/12 11:42	
Mercury		1.1	mg/kg	0.50	109	80	120	1.0	20	
Sample ID: H12120317-004ADIL		Serial Dilution				Run: HGCV201-H_121228A			12/28/12 11:44	
Mercury		0.043	mg/kg	0.50		0	0		20	
Sample ID: H12120319-001AMS		Sample Matrix Spike				Run: HGCV201-H_121228A			12/28/12 12:21	
Mercury		1.00	mg/kg	0.50	100	80	120			
Sample ID: H12120319-001AMSD		Sample Matrix Spike Duplicate				Run: HGCV201-H_121228A			12/28/12 12:23	
Mercury		1.0	mg/kg	0.50	104	80	120	3.6	20	
Sample ID: H12120319-001ADIL		Serial Dilution				Run: HGCV201-H_121228A			12/28/12 12:25	
Mercury		0.014	mg/kg	0.50		0	0		20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: USDA20b										Batch: R85555
Sample ID: H12120317-010ADUP	Sample Duplicate					Run: MISC SOILS_130107B				01/07/13 13:53
Sodium Adsorption Ratio (SAR)		0.150	unitless	0.10				6.9	30	
Sample ID: LCS-19107	Laboratory Control Sample					Run: MISC SOILS_130107B				01/07/13 13:53
Sodium Adsorption Ratio (SAR)		4.65	unitless	0.10	105	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Site Response
Report Date: 01/15/13
Project: UBMC Repository
Work Order: H12120317

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: USDA27a										Batch: 19107
Sample ID: LCS-19107		Laboratory Control Sample				Run: MISC SOILS_121231B				12/28/12 10:53
Saturation		47.3	%	0.10	100	80	120			
Sample ID: H12120317-010ADUP		Sample Duplicate				Run: MISC SOILS_121231B				12/28/12 10:54
Saturation		29.2	%	0.10				0.7	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

Standard Reporting Procedures

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Workorder Receipt Checklist

MT DEQ-Site Response H12120317

Login completed by: Wanda Johnson
Date Received: 12/19/2012
Reviewed by: BL2000\jhager
Received by: wjj
Reviewed Date: 12/21/2012
Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☐	No ☑	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	18.4°C No Ice		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Contact and Corrective Action Comments:

No date or time on sample bags. Wj 12/19/12 Do not analyze for Texture, this will be done at Pioneer. Wj 12/20/12

Chain of Custody and Analytical Request Record

PLEASE PRINT- Provide as much information as possible.

Company Name: MT DEQ – Site response	Project Name, PWS, Permit, Etc.: VBMC Repository (Section 35)	Sample Origin State: MT	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: PO BOX 200901 HELENA, MT 59620-0901	Contact Name: SHELLI HAALAND Phone/Fax: 406-431-1401	Email:	Sampler: (Please Print) LAURI DUENSING 406-439-1360
Invoice Address: PO BOX 200901 HELENA, MT 59620-0901	Invoice Contact & Phone: SHELLI HAALAND	Purchase Order:	Quote/Bottle Order: H813

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ A2LA
☐ GSA ☐ EDD/EDT (Electronic Data)
☐ POTW/WWTP Format: _____
☐ State: _____ ☐ LEVEL IV
☐ Other: _____ ☐ NELAC

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Organic matter, pH, conducivity ✓	Sodium adsorption rate, saturation % ✓	Cation exchange capacity ✓	fertilizer recommendation ✓	Usda texture, wilting point, field capacity	Sulfur fractions/neutralization potential	Exchangeable acidity, smp ✓ buffering capacity	Total metals & mercury ✓			SEE ATTACHED	Normal Turnaround (TAT)
1 S35-BGT-01	12-18-12	12:00	SOIL	x	x	x	x	x	x	x	x				x
2 S35-BGT-02	12-18-12	12:05	SOIL	x	x	x	x	x	x	x	x				x
3 S35-BGT-03	12-18-12	12:10	SOIL	x	x	x	x	x	x	x	x				x
4 S35-CS-01	12-18-12	12:15	SOIL	x	x	x	x	x	x	x	x				x
5 S35-CS-02	12-18-12	12:20	SOIL	x	x	x	x	x	x	x	x				x
6 S35-CS-03	12-18-12	12:25	SOIL	x	x	x	x	x	x	x	x				x
7															
8															
9															
10															

RUSH

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:
All samples air dried at 60 degrees C and sieved over 10

Shipped by: hand del
Cooler ID(s): Box
Receipt Temp: 15.4 °C
On Ice: Yes (No)
Custody Seal Intact Y N
Signature Match Y N

LABORATORY USE ONLY
H12120317-001
cooler

Custody Record MUST be Signed

Relinquished by (print): Lauri Duensing	Date/Time: 12/19/12 1500	Signature: LAD	Received by (print): / Date/Time: / Signature:
Relinquished by (print):	Date/Time:	Signature:	Received by (print): / Date/Time: / Signature:
Sample Disposal: Return to Client: _____	Lab Disposal: _____		Received by Laboratory: Wanda Jom Date/Time: 12-19-12 15:26 Signature:

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

Chain of Custody and Analytical Request Record

PLEASE PRINT- Provide as much information as possible.

Company Name: MT DEQ – Site response	Project Name, PWS, Permit, Etc.: LBMC Repository (Section 35)	Sample Origin State: MT	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: PO BOX 200901 HELENA, MT 59620-0901	Contact Name: SHELLI HAALAND Phone/Fax: 406-431-1401	Email:	Sampler: (Please Print) LAURI DUENSING 406-439-1360
Invoice Address: PO BOX 200901 HELENA, MT 59620-0901	Invoice Contact & Phone: SHELLI HAALAND	Purchase Order:	Quote/Bottle Order: H813

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ A2LA
☐ GSA ☐ EDD/EDT (Electronic Data)
☐ POTW/WWTP Format: _____
☐ State: _____ ☐ LEVEL IV
☐ Other: _____ ☐ NELAC

Number of Containers
Sample Type: A Air W Water S Soils/Solids V Vegetation B Bioassay O Other

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Organic matter, pH, conducvity	Sodium adsorption rate, saturation %	Cation exchange capacity, fertilizer recommendation	Usda texture, wilting point, field capacity	Sulfur fractions/neutralization potential	Exchangeable acidity, smp buffering capacity	Total metals & mercury			SEE ATTACHED	Normal Turnaround (TAT)
1 13341: TP104 (7-10')	12-18-12	12:30	SOIL	x	x	x	x	x	x	x				x
2 13350 TP106 (8.4-9.4')	12-18-12	12:35	SOIL	x	x	x	x	x	x	x				x
3 13354: TP107(9-10')	12-18-12	12:40	SOIL	x	x	x	x	x	x	x				x
4 13371: TP111 (10.5-11.5)	12-18-12	12:45	SOIL	x	x	x	x	x	x	x				x
5 13381: TP113 (1.5-3.5)	12-18-12	12:50	SOIL	x	x	x	x	x	x	x				x
6.														
7														
8														
9														
10														

RUSH

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:
All samples air dried at 60 degrees C and sieved over 10

Shipped by: Laddel
Cooler ID(s): Box
Receipt Temp: 18.4 °C
On Ice: Yes No
Custody Seal Y N
Intact Y N
Signature Match Y N

#12120317-02

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by (print): Lauri Duensing Date/Time: 12/19/12 1528 Signature:
Relinquished by (print): Date/Time: Signature:

Received by (print): Date/Time: Signature:
Received by (print): Date/Time: Signature:
Received by Laboratory: Wanda Johnson Date/Time: 12-19-12 15:28 Signature:

Sample Disposal: Return to Client: _____ Lab Disposal: _____

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

ANALYTICAL SUMMARY REPORT

January 17, 2013

Pioneer Technical Services
63 1/2 W Broadway
Butte, MT 59701

Workorder No.: H13010211 Quote ID: H813 - Mike Horse Repository

Project Name: UBMC

Energy Laboratories Inc Helena MT received the following 1 sample for Pioneer Technical Services on 1/16/2013 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H13010211-001	S35-BGT-990	01/16/13 8:00	01/16/13	Soil	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Digestion, Total Metals Digestion, Mercury by CVAA

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Pioneer Technical Services
Project: UBMC
Workorder: H13010211

Report Date: 01/17/13
Date Received: 01/16/13

		Analysis		Ag-T	Al-T	As-T	Ba-T	Be-T	Ca-T	Cd-T	Co-T	Cr-T	Cu-T	Fe-T
		Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
H13010211-001	S35-BGT-990	0	0	2	16300	21	269	< 1	2300	< 1	7	21	106	16300

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Pioneer Technical Services
Project: UBMC
Workorder: H13010211

Report Date: 01/17/13
Date Received: 01/16/13

		Analysis		K-T	Mg-T	Mn-T	Na-T	Ni-T	Pb-T	Sb-T	Se-T	Tl-T	V-T	Zn-T
		Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
H13010211-001	S35-BGT-990	0	0	2070	3680	718	72	14	630	< 1	< 1	< 1	19	267

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Pioneer Technical Services
Project: UBMC
Workorder: H13010211

Report Date: 01/17/13
Date Received: 01/16/13

		Analysis		Hg, Total
		Units		mg/kg
Sample ID	Client Sample ID	Up	Low	Results
H13010211-001	S35-BGT-990	0	0	< 0.50

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Pioneer Technical Services **Report Date:** 01/17/13

Project: UBMC **Work Order:** H13010211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Analytical Run: ICP2-HE_130117B	
Sample ID: ICV	18	Initial Calibration Verification Standard							01/17/13 09:30	
Aluminum		4.12	mg/L	0.10	103	90	110			
Arsenic		0.808	mg/L	0.0092	101	90	110			
Barium		0.810	mg/L	0.10	101	90	110			
Beryllium		0.413	mg/L	0.0010	103	90	110			
Cadmium		0.400	mg/L	0.0010	100	90	110			
Calcium		40.9	mg/L	1.0	102	90	110			
Chromium		0.797	mg/L	0.010	100	90	110			
Cobalt		0.793	mg/L	0.010	99	90	110			
Copper		0.812	mg/L	0.010	101	90	110			
Iron		4.02	mg/L	0.030	100	90	110			
Lead		0.796	mg/L	0.013	99	90	110			
Magnesium		40.2	mg/L	1.0	101	90	110			
Manganese		4.04	mg/L	0.010	101	90	110			
Nickel		0.785	mg/L	0.010	98	90	110			
Potassium		38.3	mg/L	1.0	96	90	110			
Sodium		38.6	mg/L	1.0	96	90	110			
Vanadium		0.808	mg/L	0.10	101	90	110			
Zinc		0.811	mg/L	0.010	101	90	110			
Sample ID: ICSA	18	Interference Check Sample A							01/17/13 09:45	
Aluminum		519	mg/L	0.10	104	80	120			
Arsenic		0.00487	mg/L	0.0092		0	0			
Barium		0.000620	mg/L	0.10		0	0			
Beryllium		-1.00E-05	mg/L	0.0010		0	0			
Cadmium		-0.00307	mg/L	0.0010		0	0			
Calcium		473	mg/L	1.0	95	80	120			
Chromium		0.00852	mg/L	0.010		0	0			
Cobalt		-0.00573	mg/L	0.010		0	0			
Copper		-0.00157	mg/L	0.010		0	0			
Iron		186	mg/L	0.030	93	80	120			
Lead		0.0300	mg/L	0.013		0	0			
Magnesium		496	mg/L	1.0	99	80	120			
Manganese		0.00952	mg/L	0.010		0	0			
Nickel		0.00671	mg/L	0.010		0	0			
Potassium		-0.0366	mg/L	1.0		0	0			
Sodium		0.0454	mg/L	1.0		0	0			
Vanadium		0.00414	mg/L	0.10		0	0			
Zinc		0.0122	mg/L	0.010		0	0			
Sample ID: ICSAB	18	Interference Check Sample AB							01/17/13 09:49	
Aluminum		520	mg/L	0.10	104	80	120			
Arsenic		1.10	mg/L	0.0092	110	80	120			
Barium		0.498	mg/L	0.10	100	80	120			
Beryllium		0.494	mg/L	0.0010	99	80	120			
Cadmium		0.919	mg/L	0.0010	92	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Pioneer Technical Services **Report Date:** 01/17/13

Project: UBMC **Work Order:** H13010211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.7**									Analytical Run: ICP2-HE_130117B	
Sample ID: **ICSAB**	18	Interference Check Sample AB							01/17/13 09:49	
Calcium		473	mg/L	1.0	95	80	120			
Chromium		0.481	mg/L	0.010	96	80	120			
Cobalt		0.466	mg/L	0.010	93	80	120			
Copper		0.508	mg/L	0.010	102	80	120			
Iron		186	mg/L	0.030	93	80	120			
Lead		0.926	mg/L	0.013	93	80	120			
Magnesium		495	mg/L	1.0	99	80	120			
Manganese		0.488	mg/L	0.010	98	80	120			
Nickel		0.902	mg/L	0.010	90	80	120			
Potassium		20.3	mg/L	1.0	102	80	120			
Sodium		20.6	mg/L	1.0	103	80	120			
Vanadium		0.480	mg/L	0.10	96	80	120			
Zinc		0.996	mg/L	0.010	100	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Pioneer Technical Services **Report Date:** 01/17/13

Project: UBMC **Work Order:** H13010211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 19286
Sample ID: MB-19286	18	Method Blank				Run: ICP2-HE_130117B				01/17/13 10:38
Aluminum		ND	mg/kg	0.3						
Arsenic		ND	mg/kg	0.4						
Barium		0.04	mg/kg	0.02						
Beryllium		ND	mg/kg	0.004						
Cadmium		ND	mg/kg	0.01						
Calcium		3	mg/kg	3						
Chromium		0.1	mg/kg	0.07						
Cobalt		ND	mg/kg	0.1						
Copper		ND	mg/kg	0.2						
Iron		0.9	mg/kg	0.7						
Lead		ND	mg/kg	1						
Magnesium		ND	mg/kg	1.0						
Manganese		0.07	mg/kg	0.04						
Nickel		ND	mg/kg	0.08						
Potassium		ND	mg/kg	1						
Sodium		4	mg/kg	0.7						
Vanadium		ND	mg/kg	0.10						
Zinc		ND	mg/kg	0.1						
Sample ID: LFB-19286	18	Laboratory Fortified Blank				Run: ICP2-HE_130117B				01/17/13 10:42
Aluminum		258	mg/kg	5.0	103	80	120			
Arsenic		49.1	mg/kg	1.0	98	80	120			
Barium		52.6	mg/kg	1.0	105	80	120			
Beryllium		25.9	mg/kg	1.0	104	80	120			
Cadmium		24.1	mg/kg	1.0	97	80	120			
Calcium		2540	mg/kg	5.0	101	80	120			
Chromium		50.2	mg/kg	1.0	100	80	120			
Cobalt		50.0	mg/kg	1.0	100	80	120			
Copper		51.8	mg/kg	1.0	104	80	120			
Iron		250	mg/kg	5.0	100	80	120			
Lead		47.5	mg/kg	1.0	95	80	120			
Magnesium		2410	mg/kg	5.0	97	80	120			
Manganese		255	mg/kg	1.0	102	80	120			
Nickel		47.8	mg/kg	1.0	96	80	120			
Potassium		2390	mg/kg	5.0	95	80	120			
Sodium		2430	mg/kg	5.0	97	80	120			
Vanadium		50.3	mg/kg	1.0	101	80	120			
Zinc		49.2	mg/kg	1.0	98	80	120			
Sample ID: LCS-19286	18	Laboratory Control Sample				Run: ICP2-HE_130117B				01/17/13 10:45
Aluminum		13100	mg/kg	5.0	90	50.7	131.3			
Arsenic		297	mg/kg	1.5	87	72.3	106.4			
Barium		595	mg/kg	1.0	98	80.6	112.2			
Beryllium		47.3	mg/kg	1.0	94	76.3	108.6			
Cadmium		126	mg/kg	1.0	93	73	105.1			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Pioneer Technical Services **Report Date:** 01/17/13

Project: UBMC **Work Order:** H13010211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 19286
Sample ID: LCS-19286	18	Laboratory Control Sample				Run: ICP2-HE_130117B				01/17/13 10:45
Calcium		11200	mg/kg	5.0	90	78.2	111.9			
Chromium		76.8	mg/kg	1.0	102	72.8	109.1			
Cobalt		54.1	mg/kg	1.0	95	73.3	103.7			
Copper		270	mg/kg	1.0	98	77.5	109.6			
Iron		20100	mg/kg	5.0	88	39.6	138.3			
Lead		194	mg/kg	3.1	105	75.9	108.6			
Magnesium		3070	mg/kg	5.0	94	73.2	115.6			
Manganese		391	mg/kg	1.0	107	80.8	115.7			
Nickel		55.0	mg/kg	1.0	91	72.3	103.4			
Potassium		1990	mg/kg	18	95	75	127.8			
Sodium		185	mg/kg	5.0	89	70.9	123.3			
Vanadium		62.8	mg/kg	1.0	87	66.6	107.3			
Zinc		203	mg/kg	1.0	96	74.2	109.9			
Sample ID: H13010197-001AMS	18	Sample Matrix Spike				Run: ICP2-HE_130117B				01/17/13 11:00
Aluminum		13100	mg/kg	5.0		75	125			A
Arsenic		385	mg/kg	1.5		75	125			A
Barium		204	mg/kg	1.0	137	75	125			S
Beryllium		23.8	mg/kg	1.0	95	75	125			
Cadmium		24.4	mg/kg	1.0	89	75	125			
Calcium		23600	mg/kg	5.0		75	125			A
Chromium		62.9	mg/kg	1.0	94	75	125			
Cobalt		49.5	mg/kg	1.0	93	75	125			
Copper		111	mg/kg	1.0	100	75	125			
Iron		15600	mg/kg	5.0		75	125			A
Lead		418	mg/kg	3.1		75	125			A
Magnesium		9050	mg/kg	5.0	97	75	125			
Manganese		15900	mg/kg	1.0		75	125			A
Nickel		51.3	mg/kg	1.0	89	75	125			
Potassium		6500	mg/kg	18	135	75	125			S
Sodium		2620	mg/kg	5.0	99	75	125			
Vanadium		45.3	mg/kg	1.0	91	75	125			
Zinc		560	mg/kg	1.0		75	125			A
Sample ID: H13010197-001AMSD	18	Sample Matrix Spike Duplicate				Run: ICP2-HE_130117B				01/17/13 11:11
Aluminum		12400	mg/kg	5.0		75	125	5.5	20	A
Arsenic		435	mg/kg	1.5		75	125	12	20	A
Barium		198	mg/kg	1.0	126	75	125	2.7	20	S
Beryllium		24.5	mg/kg	1.0	98	75	125	2.8	20	
Cadmium		25.5	mg/kg	1.0	94	75	125	4.3	20	
Calcium		22600	mg/kg	5.0		75	125	4.6	20	A
Chromium		63.8	mg/kg	1.0	96	75	125	1.4	20	
Cobalt		51.0	mg/kg	1.0	96	75	125	3.0	20	
Copper		111	mg/kg	1.0	101	75	125	0.3	20	
Iron		15000	mg/kg	5.0		75	125	4.3	20	A

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Pioneer Technical Services **Report Date:** 01/17/13

Project: UBMC **Work Order:** H13010211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **SW6010B**									Batch: 19286	
Sample ID: **H13010197-001AMSD**	18	Sample Matrix Spike Duplicate			Run: ICP2-HE_130117B				01/17/13 11:11	
Lead		451	mg/kg	3.1		75	125	7.6	20	A
Magnesium		9280	mg/kg	5.0	107	75	125	2.5	20	
Manganese		17200	mg/kg	1.0		75	125	7.6	20	A
Nickel		52.7	mg/kg	1.0	92	75	125	2.8	20	
Potassium		6350	mg/kg	18	129	75	125	2.2	20	S
Sodium		2620	mg/kg	5.0	99	75	125	0.2	20	
Vanadium		45.0	mg/kg	1.0	91	75	125	0.7	20	
Zinc		594	mg/kg	1.0		75	125	6.0	20	A

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Pioneer Technical Services **Report Date:** 01/17/13

Project: UBMC **Work Order:** H13010211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020								Analytical Run: ICPMS204-B_130117B		
Sample ID: ICV STD	4	Initial Calibration Verification Standard							01/17/13 10:41	
Antimony		0.0592	mg/L	0.0010	99	90	110			
Selenium		0.0596	mg/L	0.0010	99	90	110			
Silver		0.0287	mg/L	0.0010	96	90	110			
Thallium		0.0593	mg/L	0.0010	99	90	110			
Method: SW6020									Batch: 19286	
Sample ID: MB-19286	4	Method Blank				Run: ICPMS204-B_130117B			01/17/13 13:45	
Antimony		0.03	mg/kg	0.002						
Selenium		0.03	mg/kg	0.007						
Silver		0.03	mg/kg	0.02						
Thallium		0.007	mg/kg	0.002						
Sample ID: LCS-19286	4	Laboratory Control Sample				Run: ICPMS204-B_130117B			01/17/13 13:50	
Antimony		58.2	mg/kg	1.0	47	2.2	92.9			
Selenium		196	mg/kg	1.0	101	72.5	112.2			
Silver		71.2	mg/kg	1.0	104	67.8	112.8			
Thallium		92.1	mg/kg	1.0	102	71.7	109.5			
Sample ID: LFB-19286	4	Laboratory Fortified Blank				Run: ICPMS204-B_130117B			01/17/13 13:54	
Antimony		51.2	mg/kg	1.0	102	80	120			
Selenium		51.8	mg/kg	1.0	104	80	120			
Silver		25.9	mg/kg	1.0	103	80	120			
Thallium		51.3	mg/kg	1.0	103	80	120			
Sample ID: H13010197-001AMS	4	Sample Matrix Spike				Run: ICPMS204-B_130117B			01/17/13 14:17	
Antimony		20.0	mg/kg	1.0	35	75	125			S
Selenium		49.2	mg/kg	1.0	99	75	125			
Silver		31.9	mg/kg	1.0	111	75	125			
Thallium		49.6	mg/kg	1.0	99	75	125			
Sample ID: H13010197-001AMSD	4	Sample Matrix Spike Duplicate				Run: ICPMS204-B_130117B			01/17/13 14:21	
Antimony		20.6	mg/kg	1.0	36	75	125	2.5	20	S
Selenium		49.0	mg/kg	1.0	98	75	125	0.6	20	
Silver		31.7	mg/kg	1.0	111	75	125	0.4	20	
Thallium		50.2	mg/kg	1.0	101	75	125	1.3	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Pioneer Technical Services **Report Date:** 01/17/13

Project: UBMC **Work Order:** H13010211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW7471A									Analytical Run: HGCV201-H_130116B	
Sample ID: ICV		Initial Calibration Verification Standard							01/16/13 14:52	
Mercury		0.00100	mg/kg	0.50	100	90	110			
New Calibration. SBK										
Sample ID: CCV		Continuing Calibration Verification Standard							01/16/13 14:55	
Mercury		0.0025	mg/kg	0.50	98	90	110			
Method: SW7471A									Batch: 19288	
Sample ID: MB-19288		Method Blank				Run: HGCV201-H_130116B			01/16/13 14:59	
Mercury		0.002	mg/kg	0.0009						
Sample ID: LCS-19288		Laboratory Control Sample				Run: HGCV201-H_130116B			01/16/13 15:02	
Mercury		4.5	mg/kg	0.50	92	80	120			
Sample ID: H13010211-001AMS		Sample Matrix Spike				Run: HGCV201-H_130116B			01/16/13 15:06	
Mercury		1.1	mg/kg	0.50	101	80	120			
Sample ID: H13010211-001AMSD		Sample Matrix Spike Duplicate				Run: HGCV201-H_130116B			01/16/13 15:09	
Mercury		0.93	mg/kg	0.50	89	80	120	13	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

Standard Reporting Procedures

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Workorder Receipt Checklist

Pioneer Technical Services H13010211

Login completed by: Tracy L. Lorash
Date Received: 1/16/2013
Reviewed by: BL2000\sdull
Received by: TLL
Reviewed Date: 1/17/2013
Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	14.5°C No Ice - From Field		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Contact and Corrective Action Comments:

None

Chain of Custody and Analytical Request Record

PLEASE PRINT- Provide as much information as possible.

Company Name: Pioneer Technical Services	Project Name, PWS, Permit, Etc. UBMC	Sample Origin State: MT	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: 1101 S. Montana Butte, MT 59701	Contact Name: Nick Jaynes Phone/Fax: (406) 782-5177	Email: njaynes@pioneer-technical.com	Sampler: (Please Print) LAURI DUENSING 406-439-1360
Invoice Address: 1101 S. Montana Butte, MT 59701	Invoice Contact & Phone: Amanda Booth	Purchase Order:	Quote/Bottle Order: H813

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ A2LA
☐ GSA ☐ EDD/EDT (Electronic Data)
☐ POTW/WWTP Format: _____
☐ State: _____ ☐ LEVEL IV
☐ Other: _____ ☐ NELAC

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Total metals & mercury									SEE ATTACHED	Normal Turnaround (TAT)	RUSH
1 S35-BGT-990	1/16/13	0800	SOIL	x											X
2															
3															
4															
5															
6.															
7															
8															
9															
10															

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments: sample air dried at 60 degrees C and sieved over 10

Need results by Friday 1-18

Shipped by: Hand
Cooler ID(s): None
Receipt Temp 14.5 °C
On Ice: Yes (No)
Custody Seal Y (N)
Intact Y N
Signature Match Y N

LABORATORY USE ONLY H13010211

Custody Record MUST be Signed

Relinquished by (print): Lauri Duensing	Date/Time: 1/16/13 9:30	Signature:	Received by (print):	Date/Time:	Signature:
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Sample Disposal: Return to Client: _____ Lab Disposal: _____			Received by Laboratory: Tracy Lovas	Date/Time: 1/16/13 9:30	Signature: Tracy Lovas

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

APPENDIX E

SURVEY DATA

UBMC Section 35 Design Investigation

Data Summary Report

Survey Data

Size and Description	Piezometer ID	DJA Point Number	MONTANA STATE PLANE NAD83 (S.I. Feet) Top of PVC Pipe		NAV88 (U.S. Feet) Top of PVC Elevation from GPS	MONTANA STATE PLANE (NAD83) (S.I. Feet) Ground Shot PVC Pipe		NAVD88 (U.S. Feet) Ground Elevation From GPS	PVC Pipe Angle from Plumb Nearest Degree	Piezometer Height Above Ground (Feet)
			NORTHING	EASTING		NORTHING	EASTING			
2" PVC	MW-201B	22032	1020347.09	1233675.78	5079.51	1020346.93	1233675.89	5075.91	3	3.60
2" PVC	MW-201T	22034	1020346.98	1233668.82	5079.19	1020347.03	1233669.02	5075.78	3	3.41
2" PVC	MW-202B	22048	1020673.87	1233018.56	5099.51	1020673.72	1233018.43	5095.36	3	4.15
1' PVC	SB-202T1	22045	1020667.81	1233022.44	5097.85	1020667.66	1233022.45	5096.39	6	1.45
1' PVC	SB-202T2	22046	1020667.87	1233022.24	5097.75	1020667.69	1233022.25	5096.46	8	1.28
2" PVC	MW-203B	22089	1021128.63	1233054.20	5127.63	1021128.57	1233054.10	5125.77	4	1.86
2" PVC	MW-203T	22088	1021133.63	1233052.98	5127.68	1021133.42	1233052.94	5125.92	7	1.76
1' PVC	SB-204B	22052	1020751.97	1233159.49	5108.68	1020751.92	1233159.35	5104.95	2	3.73
1' PVC	SB-204T	22051	1020752.06	1233159.21	5106.89	1020751.88	1233159.24	5104.99	5	1.90
1" PVC	SB-206B	22116	1020856.05	1233324.21	5117.90	1020856.02	1233324.44	5116.23	8	1.67
1" PVC	SB-206D	22112	1020845.93	1233326.88	5118.93	1020845.92	1233326.98	5115.03	1	3.90
1" PVC	SB-206T1	22115	1020855.89	1233324.07	5118.32	1020855.69	1233324.12	5115.81	5	2.50
1" PVC	SB-206T2	22114	1020850.12	1233325.83	5119.51	1020850.06	1233325.88	5115.64	1	3.87
1" PVC	SB-206T3	22113	1020846.06	1233327.18	5117.45	1020846.24	1233327.18	5115.33	5	2.12
2" PVC	MW-207	22085	1021091.32	1233314.60	5146.03	1021091.10	1233314.65	5142.09	3	3.94
2" PVC	MW-208B	22058	1021028.79	1232765.25	5088.84	1021028.74	1232765.17	5087.19	3	1.65
1" PVC	SB-208T	22057	1021024.30	1232767.37	5088.73	1021024.21	1232767.34	5087.41	4	1.32
1' PVC	SB-209B	22041	1020518.87	1233261.81	5091.98	1020518.90	1233261.87	5089.89	2	2.09
1' PVC	SB-209T	22042	1020519.00	1233262.02	5092.62	1020518.96	1233261.95	5089.83	2	2.78
1" PVC	SB-210B	22067	1020675.56	1233448.29	5109.61	1020675.56	1233448.48	5107.75	6	1.86
1" PVC	SB-210T	22066	1020675.30	1233448.27	5111.62	1020675.25	1233448.26	5107.75	1	3.87
1" PVC	SB-211B1	22076	1020810.84	1233635.64	5133.44	1020811.18	1233635.42	5129.26	5	4.17
1" PVC	SB-211B2	22077	1020811.15	1233635.25	5131.05	1020811.31	1233635.24	5129.33	5	1.72
1' PVC	SB-212B	22029	1020846.10	1233943.38	5139.64	1020846.07	1233943.38	5137.78	1	1.87
1' PVC	SB-212T	22030	1020846.28	1233943.54	5139.81	1020846.17	1233943.64	5137.91	4	1.90

UBMC Section 35 Design Investigation

Data Summary Report

Survey Data

Size and Description	Piezometer ID	DJA Point Number	MONTANA STATE PLANE NAD83 (S.I. Feet) Top of PVC Pipe		NAV88 (U.S. Feet) Top of PVC Elevation from GPS	MONTANA STATE PLANE (NAD83) (S.I. Feet) Ground Shot PVC Pipe		NAVD88 (U.S. Feet) Ground Elevation From GPS	PVC Pipe Angle from Plumb Nearest Degree	Piezometer Height Above Ground (Feet)
			NORTHING	EASTING		NORTHING	EASTING			
1" PVC	SB-213B	22072	1020602.44	1233865.37	5112.14	1020602.46	1233865.26	5110.54	4	1.60
1" PVC	SB-213T	22073	1020602.32	1233865.24	5112.28	1020602.37	1233865.19	5110.53	2	1.74
1' PVC	SB-214B	22038	1020332.86	1233296.90	5086.31	1020332.83	1233297.12	5082.86	4	3.45
1' PVC	SB-214T	22037	1020332.96	1233297.30	5085.00	1020332.86	1233297.26	5083.26	4	1.73
1' PVC	SB-215T1	22019	1020393.32	1233994.32	5090.82	1020393.31	1233994.42	5088.99	3	1.83
1' PVC	SB-215T2	22020	1020393.46	1233994.48	5091.24	1020393.37	1233994.62	5089.01	4	2.23
1" PVC	SB-216B	22080	1020935.23	1233542.73	5149.30	1020935.25	1233542.80	5145.84	1	3.46
1" PVC	SB-216A	22081	1020935.19	1233542.51	5147.57	1020935.15	1233542.61	5145.88	4	1.69
2" PVC	MW-217	22095	1021341.61	1233088.22	5141.90	1021341.29	1233088.18	5137.95	5	3.95
1" PVC	SB-217A	22097	1021345.90	1233083.25	5139.43	1021345.73	1233083.26	5137.73	6	1.70
1" PVC	SB-217B	22096	1021345.75	1233083.35	5141.50	1021345.65	1233083.44	5137.70	2	3.80
1.5" PVC	TP-101A	22120	1020197.25	1232982.21	5067.78	1020197.24	1232982.39	5064.51	3	3.27
1.5" PVC	TP-101B	22121	1020197.43	1232982.18	5067.53	1020197.58	1232982.08	5064.35	3	3.18
1.5" PVC	TP-101C	22122	1020197.38	1232982.34	5067.00	1020197.42	1232982.48	5064.33	3	2.67
1.5" PVC	TP-102	22083	1021092.77	1233385.12	5150.50	1021092.52	1233384.95	5147.96	7	2.55
1.5" PVC	TP-103	22023	1020449.00	1233972.74	5099.61	1020448.79	1233973.53	5095.58	11	4.04
*	TP-104									
1.5" PVC	TP-105	22100	1020960.61	1233139.08	5119.31	1020960.51	1233140.29	5115.23	17	4.07
1.5" PVC	TP-106	22054	1020918.15	1232895.44	5102.10	1020917.82	1232895.37	5098.36	5	3.74
1.5" PVC	TP-107	22069	1020683.38	1233796.13	5119.52	1020684.26	1233795.92	5114.92	11	4.59
1.5" PVC	TP-108	22091	1021154.66	1232949.19	5118.88	1021154.01	1232949.66	5115.16	12	3.72
1.5" PVC	TP-109	22060	1021077.35	1232749.80	5091.28	1021077.17	1232750.18	5087.32	6	3.96
1.5" PVC	TP-110	22063	1020634.95	1233451.93	5110.57	1020634.70	1233452.38	5106.81	8	3.76
1.5" PVC	TP-111A	22104	1020844.10	1233244.89	5117.67	1020844.58	1233244.80	5113.82	7	3.84
1.5" PVC	TP-111B	22105	1020844.23	1233244.67	5117.31	1020844.65	1233244.51	5113.62	7	3.70

UBMC Section 35 Design Investigation

Data Summary Report
Survey Data

Size and Description	Piezometer ID	DJA Point Number	MONTANA STATE PLANE NAD83 (S.I. Feet) Top of PVC Pipe		NAV88 (U.S. Feet) Top of PVC Elevation from GPS	MONTANA STATE PLANE (NAD83) (S.I. Feet) Ground Shot PVC Pipe		NAVD88 (U.S. Feet) Ground Elevation From GPS	PVC Pipe Angle from Plumb Nearest Degree	Piezometer Height Above Ground (Feet)
			NORTHING	EASTING		NORTHING	EASTING			
1.5" PVC	TP-111C	22106	1020844.09	1233244.71	5117.07	1020844.32	1233244.32	5113.43	7	3.64
1.5" PVC	TP-112	22126	1020918.91	1232542.35	5071.85	1020918.47	1232542.59	5067.59	7	4.26
1.5" PVC	TP-113	22124	1020729.63	1232675.00	5074.25	1020730.25	1232675.16	5069.27	7	4.98
1" PVC	PZ-01T	22017	1020093.22	1234545.24	5097.17	1020093.20	1234544.98	5095.31	8	1.86

* A lathe was found for TP-104, but no piezometer pipe. No survey shot taken.

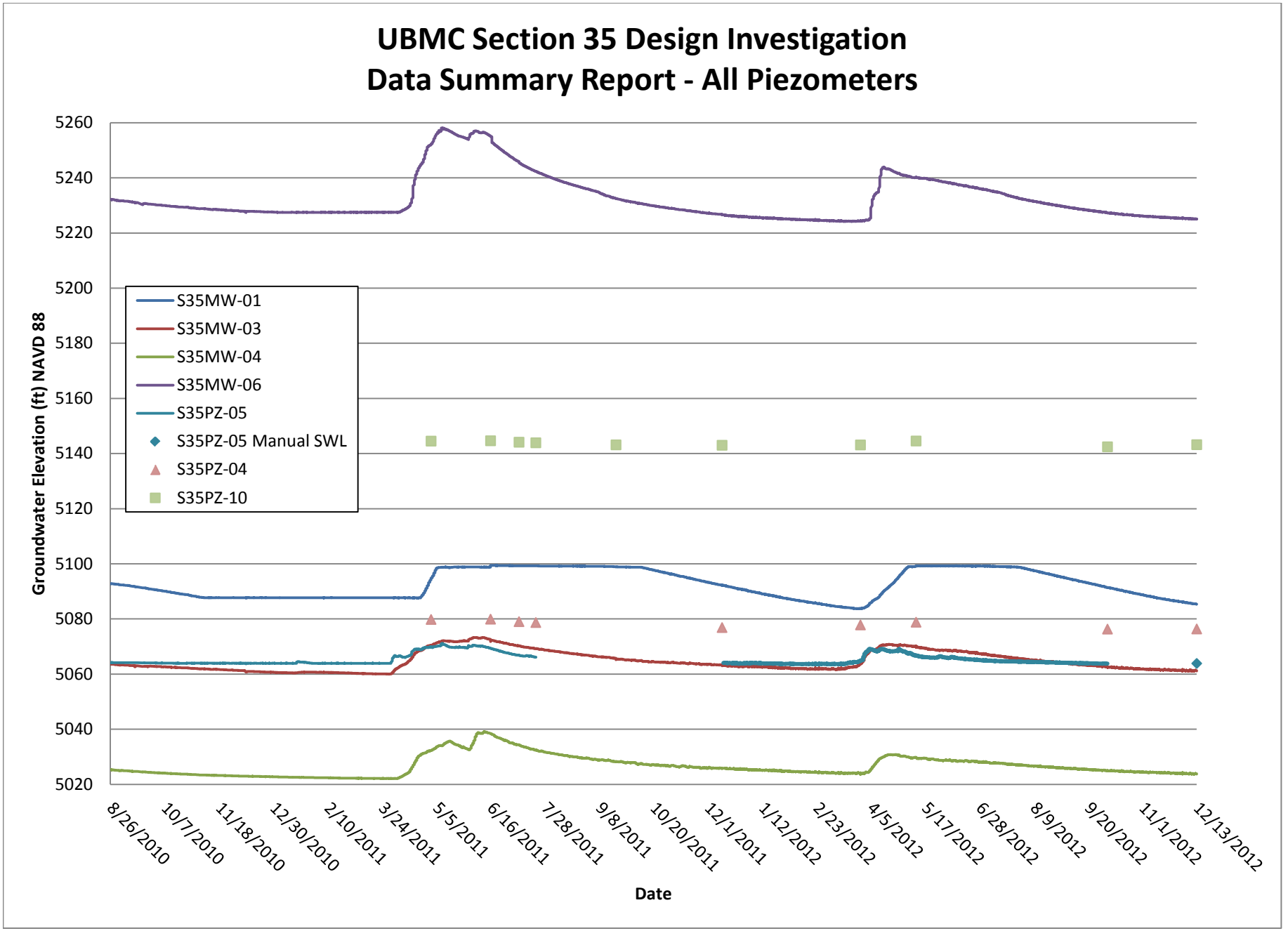
APPENDIX F

WATER LEVEL DATA

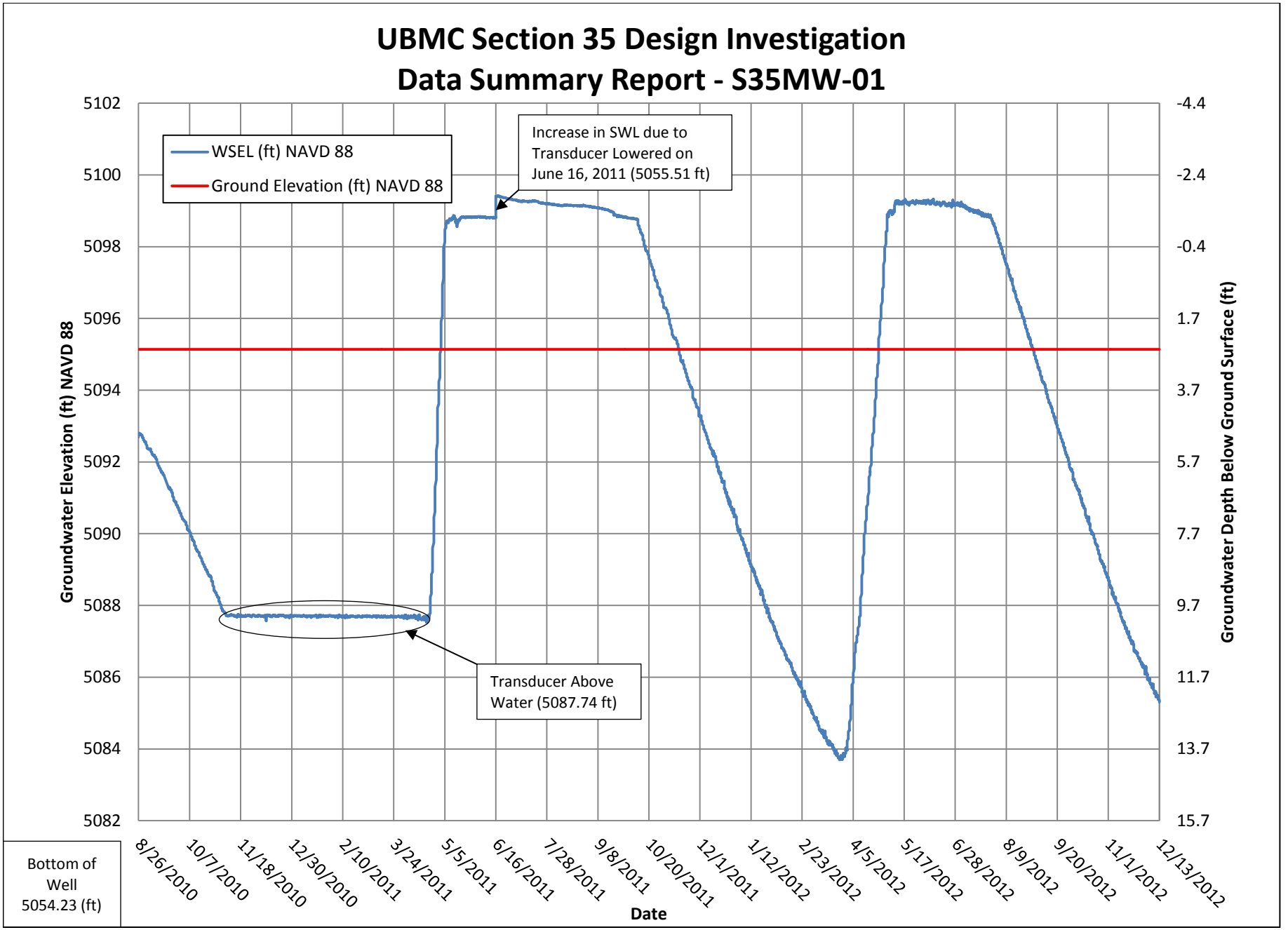
UBMC Section 35 Design Investigation
Data Summary Report
Existing Monitoring Wells and Piezometers

Monitoring Point ID	Montana State Plane (NAD83) (S.I. Feet)		NAVD88 (US Feet)	Stickup (feet)	MP_Elev (ft) NAVD88	Transducer_Depth Before June 16, 2011 (ft)[1]	Tranducer_Elev (ft) NAVD88 Before June 16, 2011	Transducer_Depth After June 16, 2011 (ft)[1]	Tranducer_Elev (ft) NAV88 After June 16, 2011	Well Depth (ft)[2]
	Northing	Easting	Elevation							
S35MW-01	1020113.00	1234563.00	5095.14	2.82	5097.96	10.22	5087.74	42.45	5055.51	43.40
S35MW-03	1020131.00	1233334.00	5074.08	2.53	5076.61	18.19	5058.42	41.80	5034.81	42.00
S35MW-04	1020735.00	1232540.00	5062.77	1.90	5064.67	42.90	5021.77	42.80	5021.87	43.10
S35MW-06	1021996.00	1233463.00	5261.05	2.20	5263.25	35.72	5227.53	67.45	5195.80	68.00
S35PZ-04	1020296.00	1233331.00	5082.00	2.02	5084.02	NA	no transducer	NA	no transducer	9.90
S35PZ-05	1019657.72	1234289.90	5073.35	2.25	5075.60	11.55	5064.05	11.85	5063.75	12.00
S35PZ-10	1021829.86	1235024.25	5151.00	2.78	5153.78	NA	no transducer	NA	no transducer	14.90

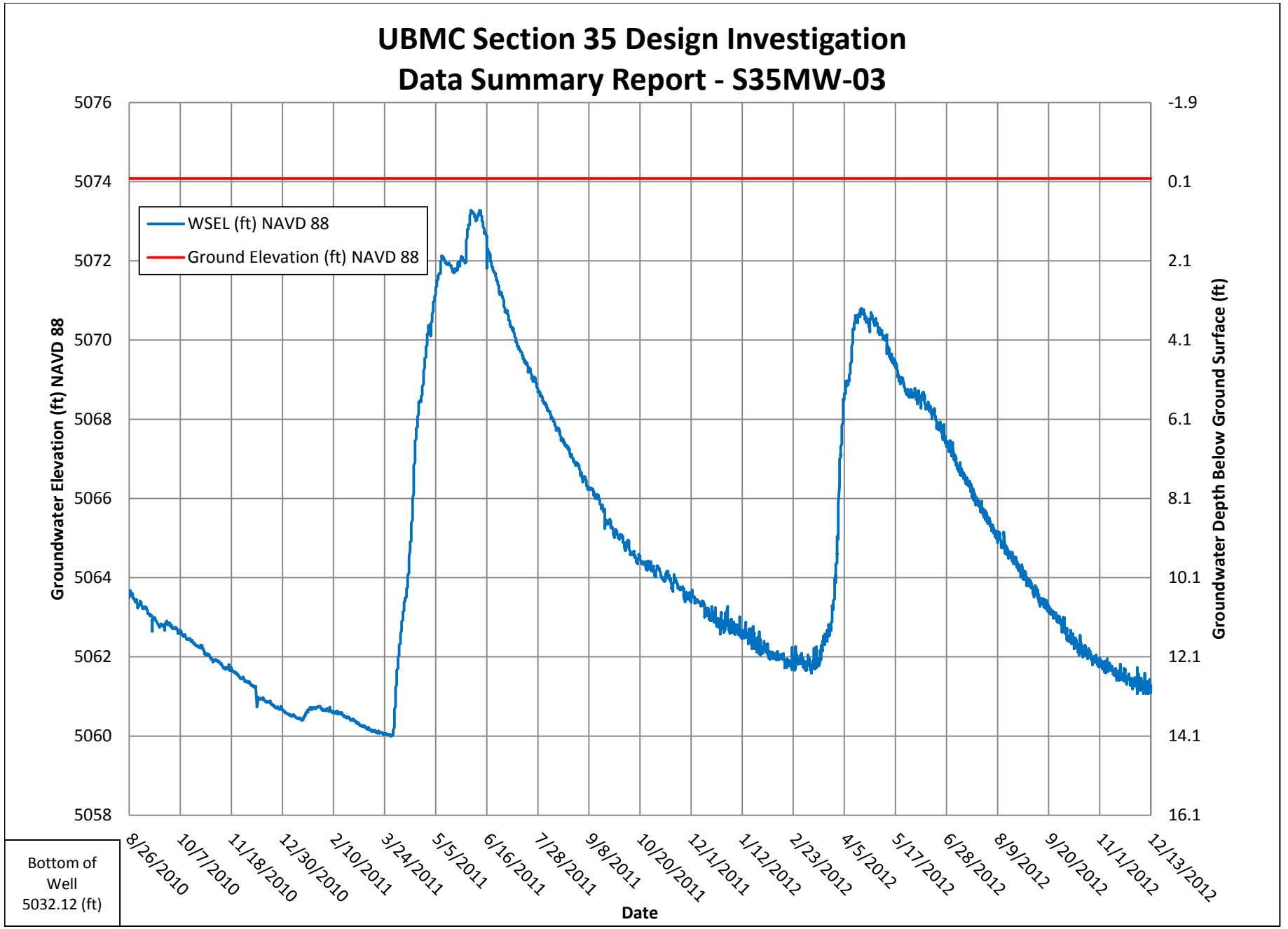
Notes: 1) Measured from top of PVC casing
2) Measured below ground surface


UBMC Section 35 Design Investigation
Data Summary Report - All Piezometers
Groundwater Elevation (ft) NAVD 88
5260
5240
5220
5200
5180
5160
5140
5120
5100
5080
5060
5040
5020
S35MW-01
S35MW-03
S35MW-04
S35MW-06
S35PZ-05
S35PZ-05 Manual SWL
S35PZ-04
S35PZ-10
8/26/2010
10/7/2010
11/18/2010
12/30/2010
2/10/2011
3/24/2011
5/5/2011
6/16/2011
7/28/2011
9/8/2011
10/20/2011
12/1/2011
1/12/2012
2/23/2012
4/5/2012
5/17/2012
6/28/2012
8/9/2012
9/20/2012
11/1/2012
12/13/2012
Date

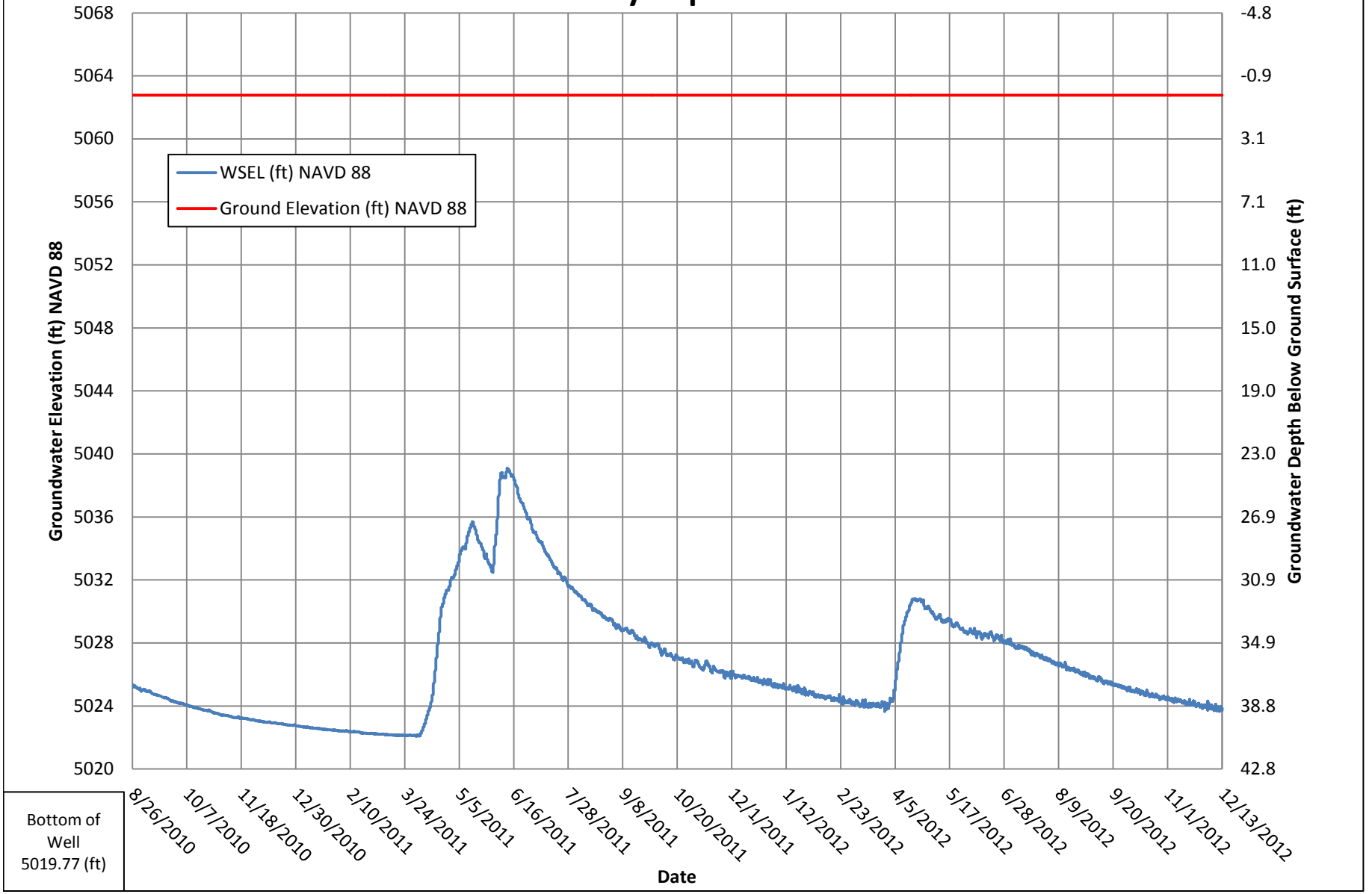
UBMC Section 35 Design Investigation
Data Summary Report - S35MW-01

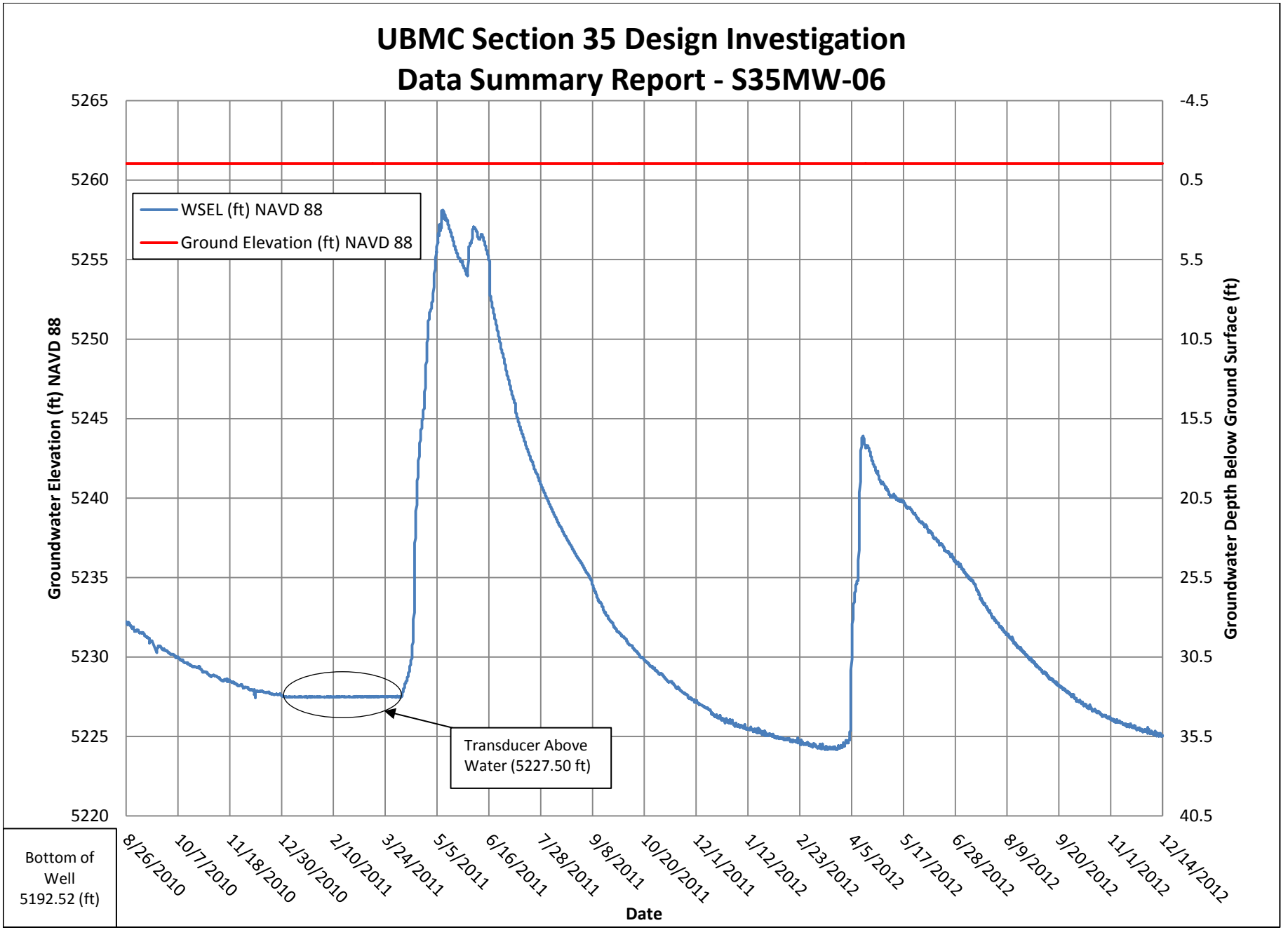


Bottom of Well 5054.23 (ft)

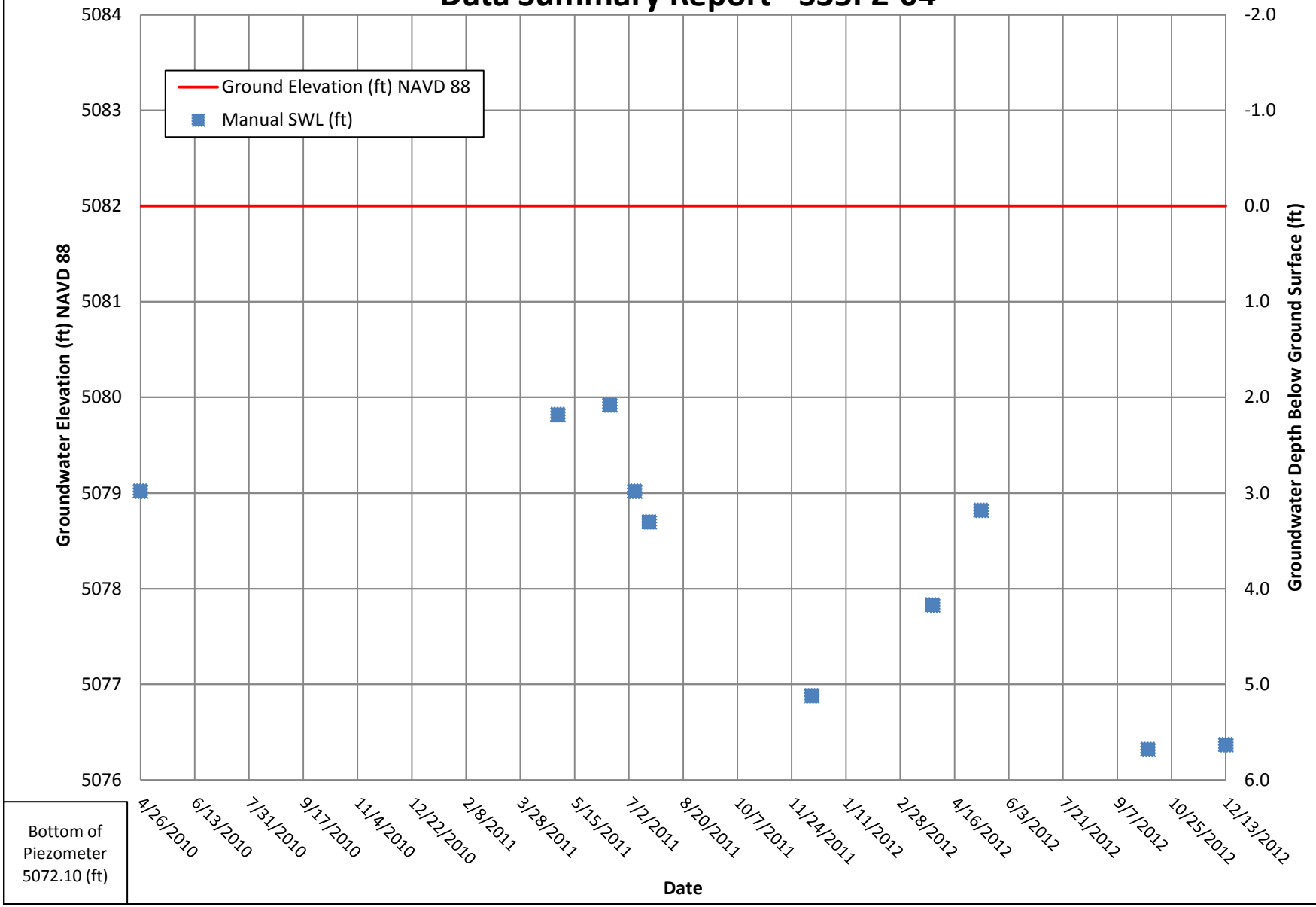

UBMC Section 35 Design Investigation
Data Summary Report - S35MW-03
WSEL (ft) NAVD 88
Ground Elevation (ft) NAVD 88
Groundwater Elevation (ft) NAVD 88
Groundwater Depth Below Ground Surface (ft)
Date
5076
5074
5072
5070
5068
5066
5064
5062
5060
5058
-1.9
0.1
2.1
4.1
6.1
8.1
10.1
12.1
14.1
16.1
8/26/2010
10/7/2010
11/18/2010
12/30/2010
2/10/2011
3/24/2011
5/5/2011
6/16/2011
7/28/2011
9/8/2011
10/20/2011
12/1/2011
1/12/2012
2/23/2012
4/5/2012
5/17/2012
6/28/2012
8/9/2012
9/20/2012
11/1/2012
12/13/2012
Bottom of Well 5032.12 (ft)

UBMC Section 35 Design Investigation
Data Summary Report - S35MW-04



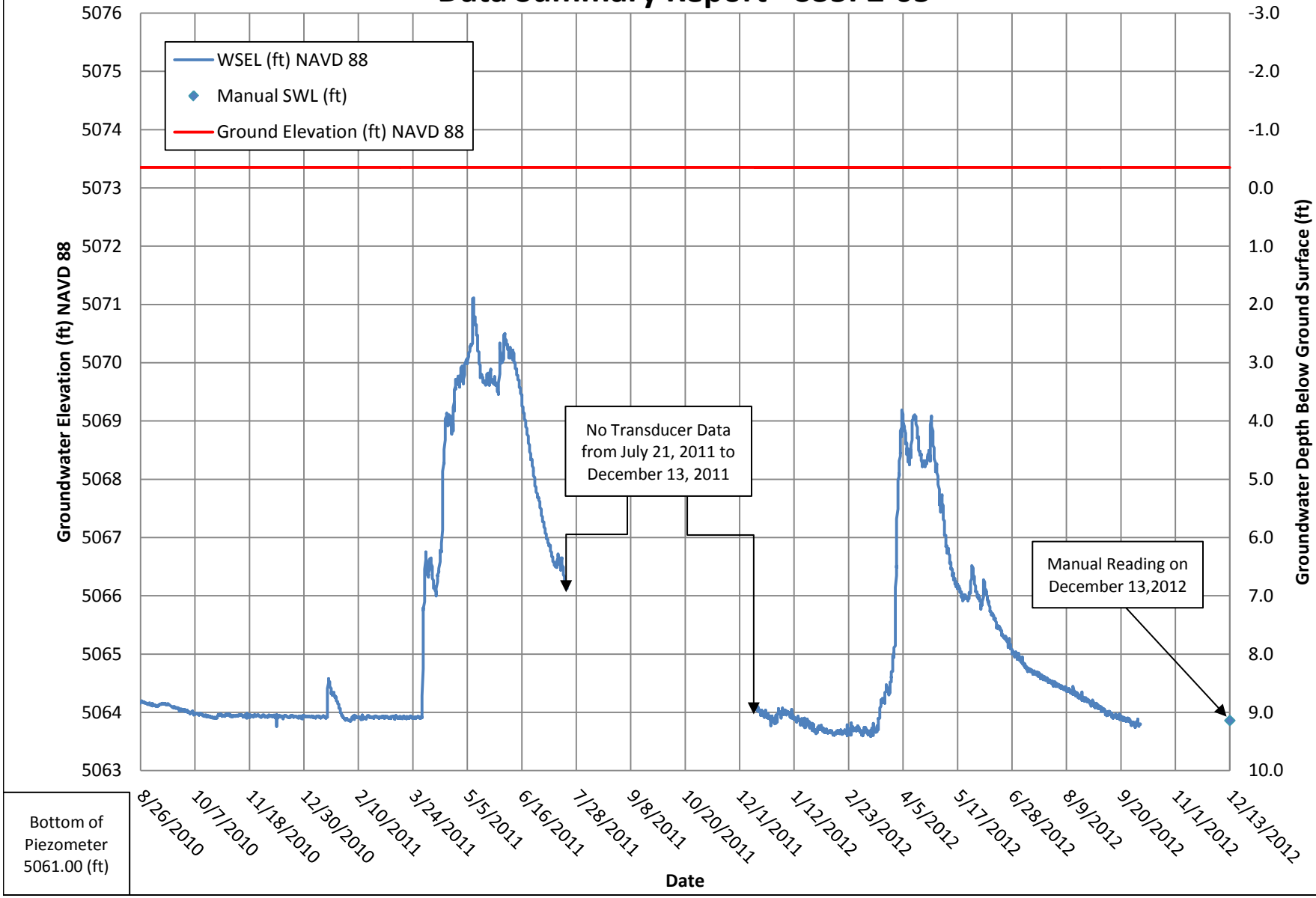

UBMC Section 35 Design Investigation
Data Summary Report - S35MW-06
WSEL (ft) NAVD 88
Ground Elevation (ft) NAVD 88
Groundwater Elevation (ft) NAVD 88
Groundwater Depth Below Ground Surface (ft)
5265
5260
5255
5250
5245
5240
5235
5230
5225
5220
-4.5
0.5
5.5
10.5
15.5
20.5
25.5
30.5
35.5
40.5
Transducer Above Water (5227.50 ft)
Bottom of Well 5192.52 (ft)
8/26/2010
10/7/2010
11/18/2010
12/30/2010
2/10/2011
3/24/2011
5/5/2011
6/16/2011
7/28/2011
9/8/2011
10/20/2011
12/1/2011
1/12/2012
2/23/2012
4/5/2012
5/17/2012
6/28/2012
8/9/2012
9/20/2012
11/1/2012
12/14/2012
Date

UBMC Section 35 Design Investigation
Data Summary Report - S35PZ-04

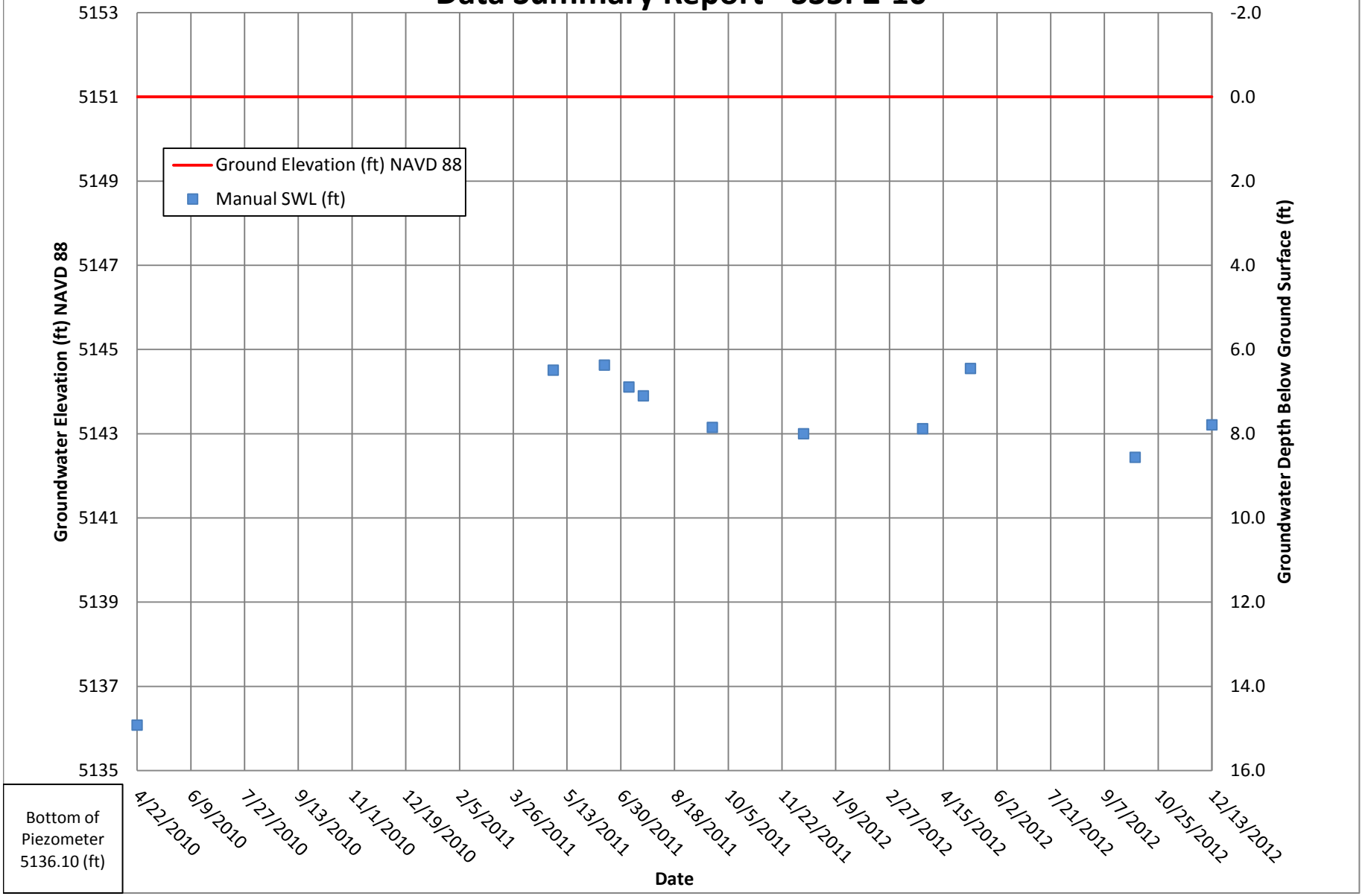


Bottom of Piezometer 5072.10 (ft)

UBMC Section 35 Design Investigation
Data Summary Report - S35PZ-05



UBMC Section 35 Design Investigation
Data Summary Report - S35PZ-10



APPENDIX G

DATA VALIDATION REPORT

DATA VALIDATION REPORT
UPPER BLACKFOOT MINING COMPLEX SECTION 35 DESIGN INVESTIGATION

Sample collection and analysis were consistent with the *Final UBMC Flood Plain Sampling and Analysis Plan* and the *Final Quality Assurance Project Plan* (QAPP) *for the Upper Blackfoot Mining Complex Design Investigation, approved July, 2012 (*DEQ-Pioneer Technical Services, 2012). Tables G-1, G-2, and G-3 provide a listing of the samples collected during the pilot project, the laboratory information including lab name, lab ID number, date sampled, the sample matrix, the analytical method, reporting units, the data qualifiers associated with each sample, and the type and number of laboratory QA/QC samples. Table G-4 presents the field duplicate sample collected and the relative percent difference (RPD). In the following sections, the QA/QC information presented in these tables is discussed by matrix type and sampling event.

Soil samples were collected by Pioneer in early October, composited into 11 samples based on physical characteristics and hand delivered to Energy Laboratories, Inc. (Energy) in Helena, Montana on December 19, 2012. The temperature of the samples upon receipt by the laboratory was recorded at 18.4ºC which is above the accepted temperature range of 4ºC (±2ºC) in the *EPA National Functional Guidelines for Inorganic Superfund Data Review* (EPA, 2010). The Chain of Custody records from field to laboratory was complete and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Mercury has a 28 day holding time and this sample was extracted several months after collection. The purpose of the Section 35 investigation was to provide a baseline screening and not to characterize the site for cleanup. As a result, the impact of sampling mercury outside of the temperature and holding time is considered to be negligible. It appears from the analytical report that all the other analytes were extracted and analyzed within the appropriate holding times.

In addition, an archived portion of sample S35-CS-01was split by Pioneer personnel on January 16, 2013 to create a duplicate to evaluate matrix variability. The sample was hand delivered on January 16, 2013 to Energy in Helena, Montana. The temperature of the samples upon receipt by the laboratory was recorded at 14.5ºC which is above the accepted temperature range of 4ºC (±2ºC) in the *EPA National Functional Guidelines for Inorganic Superfund Data Review* (EPA, 2010). The Chain of Custody records from field to laboratory was complete and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Mercury has a 28 day holding time and this sample was extracted several months after collection. As discussed above, this investigation was not for cleanup screening purposes and therefore, the impacts of sampling mercury out of the temperature and holding time range is considered to be negligible. It appears from the analytical report that all the other analytes were extracted and analyzed within the appropriate holding times.

Analytical results with laboratory analytical results are presented in Table 2 of the DSR, and the analytical reports are attached in Appendix D of the DSR. Table G-1 in Appendix G of the DSR presents the field sample number, the associated lab sample number, the analysis performed, the analytical method, the reporting units, and any laboratory data qualifiers associated with the analysis and the assigned data validation qualifiers. A description of the data qualifiers used in the table is included on the table as well as on Attachment 1 in this Data Validation. Data validation was completed on January 18, 2013 by Julie Flammang of Pioneer.

Table G-2 in Appendix G of the DSR presents a summary of the Laboratory Quality Control/Quality Assurance Samples that the laboratory ran for each sample batch and analysis. Included on the table is the analysis, the type and quantity of QA/QC samples and a description of the result if it was out of the laboratory control limits. As shown on Table G-2 the number of laboratory QA/QC samples met the requirements defined in the *EPA National Functional Guidelines for Inorganic Superfund Data Review* (EPA, 2010) QAPP.

Table G-3 presents a summary of laboratory QA/QC results that were outside of the laboratory control limits, and the resulting data qualifications. Because of method blank detections in the samples submitted on December 19, 2012, all detected silver results were qualified with a J+ (the result is an estimated quantity, but the result may be biased high). The barium result from the sample submitted on January 16, 2013 was qualified with a J+ based on matrix spike (MS) results. Potassium results from both submittals were qualified with a J+ based on matrix spike (MS) and matrix spike duplicate (MSD) recoveries that were outside of the laboratory control limits. Antimony results from both sample submissions were qualified as UJ (the analyte was analyzed for, but not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise) based on MS and MSD recoveries outside of the laboratory control limits. All mercury results were qualified as UJ; the receiving temperature of the samples was well above the temperature required in the *EPA National Functional Guidelines for Inorganic Superfund Data Review* (EPA, 2010) and all samples were extracted outside of the recommended holding times.

No field duplicates or field blanks were collected as none were required in the SAP or QAPP. One duplicate was generated by Pioneer on January 16, 2013 from an archived sample to evaluate matrix variability. Table G-4 presents the duplicate sample and the relative percent difference (RPD). Silver had and RPD outside the +/- 35% precision criteria with a value of 67%. Both results (natural and duplicate) were near the reporting limit. The variability may be indicative of the heterogeneity of natural soil conditions or may reflect the difficulties of precision near the reporting limit. No qualifications have been assigned based on duplicate precision. All remaining field duplicate results were within the +/- 35% acceptance criteria.

Analytical methods and reporting limits as defined in the SAP and QAPP were met by the laboratory.

No additional samples were flagged due to the data validation and the results are accepted with the qualifications indicated. No data was rejected.

REFERENCES

DEQ-Pioneer Technical Services, 2012. Final Quality Assurance Project Plan for the Upper Blackfoot Mining Complex Design Investigation, July 13, 2012.

EPA, 2010. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, OSWER 9240.1-51, USEPA-540-R-10-011, January 2010.

TABLE G-1
Laboratory and Analytical Information By Sample Number for Soil Samples
UBMC Section 35 Design Investigation

Laboratory	Work Order Number	Laboratory ID	Field Sample ID	Date Sampled	Matrix	Analysis	Analytical Method	Reporting Units	Laboratory Qualifiers	Data Validation Qualifiers/Reason
Energy	H 12120317	H12120317-001	S35-BGT-01	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		
Energy	H 12120317	H12120317-002	S35-BGT-02	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		

TABLE G-1
Laboratory and Analytical Information By Sample Number for Soil Samples
UBMC Section 35 Design Investigation

Laboratory	Work Order Number	Laboratory ID	Field Sample ID	Date Sampled	Matrix	Analysis	Analytical Method	Reporting Units	Laboratory Qualifiers	Data Validation Qualifiers/Reason
Energy	H 12120317	H12120317-003	S35-BGT-03	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		
Energy	H 12120317	H12120317-004	S35-CS-01	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		U, Method Blank
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		

TABLE G-1
Laboratory and Analytical Information By Sample Number for Soil Samples
UBMC Section 35 Design Investigation

Laboratory	Work Order Number	Laboratory ID	Field Sample ID	Date Sampled	Matrix	Analysis	Analytical Method	Reporting Units	Laboratory Qualifiers	Data Validation Qualifiers/Reason
Energy	H 12120317	H12120317-005	S35-CS-02	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		
Energy	H 12120317	H12120317-006	S35-CS-03	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		

TABLE G-1
Laboratory and Analytical Information By Sample Number for Soil Samples
UBMC Section 35 Design Investigation

Laboratory	Work Order Number	Laboratory ID	Field Sample ID	Date Sampled	Matrix	Analysis	Analytical Method	Reporting Units	Laboratory Qualifiers	Data Validation Qualifiers/Reason
Energy	H 12120317	H12120317-007	13341:TP104 (7-10')	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		
Energy	H 12120317	H12120317-008	13350:TP106 (8.4-9.4')	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		

TABLE G-1
Laboratory and Analytical Information By Sample Number for Soil Samples
UBMC Section 35 Design Investigation

Laboratory	Work Order Number	Laboratory ID	Field Sample ID	Date Sampled	Matrix	Analysis	Analytical Method	Reporting Units	Laboratory Qualifiers	Data Validation Qualifiers/Reason
Energy	H 12120317	H12120317-009	13354:TP107 (9-10')	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		J+, Method Blank
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		
Energy	H 12120317	H12120317-010	13371: TP111 (10.5-11.5')	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, MB and temp
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		

TABLE G-1
Laboratory and Analytical Information By Sample Number for Soil Samples
UBMC Section 35 Design Investigation

Laboratory	Work Order Number	Laboratory ID	Field Sample ID	Date Sampled	Matrix	Analysis	Analytical Method	Reporting Units	Laboratory Qualifiers	Data Validation Qualifiers/Reason
Energy	H 12120317	H12120317-011	13381: TP113 (1.5-3.5')	12/18/2012	Soil	Exchange Acidity, TEA	ASA9-4	meq/100g		
				12/18/2012	Soil	pH, SMP Buffer	ASA12-3	s.u.		
				12/18/2012	Soil	Lime Requirements	ASA12-3	Tons/1000T		
				12/18/2012	Soil	Percent Saturation	USDA27a	%		
				12/18/2012	Soil	Saturated Paste, pH	ASAM10-3.2	s.u.		
				12/18/2012	Soil	Conductivity	ASAM 10-3	mmhos/cm		
				12/18/2012	Soil	Calcium - Saturated paste	SW6010B	meq/l		
				12/18/2012	Soil	Magnesium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium - Saturated Paste	SW6010B	meq/L		
				12/18/2012	Soil	Sodium Adsorption Ratio	USDA20b	unitless		
				12/18/2012	Soil	Available Potassium	SW6010B	mg/kg		
				12/18/2012	Soil	CEC NH4AC	SW6010B	meq/100g		
				12/18/2012	Soil	Organic Carbon/Matter Walkely Black	ASA29-3	%		
				12/18/2012	Soil	Neutralization Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Acid/Base Potential	Sobek Modified	t/kt		
				12/18/2012	Soil	Total Sulfur	Sobek Modified	%		
				12/18/2012	Soil	Olsen Phosphorus	ASA24-5	mg/kg		
				12/18/2012	Soil	Nitrate as N	ASA33-8	mg/kg		
				12/18/2012	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Arsenic, Total	SW6020	mg/kg		
				12/18/2012	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				12/18/2012	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				12/18/2012	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Lead, Total	SW6020	mg/kg		
				12/18/2012	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				12/18/2012	Soil	Selenium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Thallium, Total	SW6020	mg/kg		
				12/18/2012	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				12/18/2012	Soil	Mercury, Total	SW7471A	mg/kg		UJ, Temp, Holding Time
				12/18/2012	Soil	1/3 Bar Moisture	SSSA-pt4	wt%		
				12/18/2012	Soil	15 Bar Moisture	SSSA-pt4	wt%		
Energy	H13010211	H13010211-001	S35-BGT-990	1/16/2013	Soil	Silver, Total	E200.7, SW6010B, SW6020	mg/kg		
				1/16/2013	Soil	Aluminum, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Arsenic, Total	SW6020	mg/kg		
				1/16/2013	Soil	Barium, Toatal	E200.7, SW6010B	mg/kg		J+, MS
				1/16/2013	Soil	Berrylium, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Calcium, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Cadmium, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Cobalt, Total	E200.7, SW6010B, SW6020	mg/kg		
				1/16/2013	Soil	Chromium, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Copper, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Iron, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Potassium, Total	E200.7, SW6010B	mg/kg		J+, MS
				1/16/2013	Soil	Magnesium, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Manganese, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Sodium, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Nickel, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Lead, Total	SW6020	mg/kg		
				1/16/2013	Soil	Antimony, Total	SW6020	mg/kg		UJ, MS
				1/16/2013	Soil	Selenium, Total	SW6020	mg/kg		
				1/16/2013	Soil	Thallium, Total	SW6020	mg/kg		
				1/16/2013	Soil	Vanadium, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Zinc, Total	E200.7, SW6010B	mg/kg		
				1/16/2013	Soil	Mercury, Total	SW7471A	mg/kg		UJ, Temp, Holding Time

UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise
J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+ - The result is an estimated quantity, but the result may be biased high
MS-Sample Matrix Spike
MSD-Sample Matrix Spike Duplicate
RL - Reporting Limit

TABLE G-2
Summary of Laboratory QA/QC Samples and Results Out of Range
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Result*
H12120317	12/18/2012	Exchange Acidity, TEA	ASA9-4	Method Blank	1	
				Sample Duplicate	1	
H12120317	12/18/2012	pH, SMP Buffer	ASA12-3	LCS	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Lime Requirements	ASA12-3	Sample Duplicate	1	
H12120317	12/18/2012	Percent Saturation	USDA27a	LCS	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Saturated Paste, pH	ASAM10-3.2	CCV	3	
				ICV	1	
				LCS	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Conductivity	ASAM 10-3	CCV	1	
				ICV	1	
				LCS	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Calcium - Saturated paste	SW6010B	Method Blank	1	Detected at 0.002, RL is 0.001, No qualification required, all results greater than 10X the blank result
				LCS	1	
				MS	1	
				MSD	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Magnesium - Saturated Paste	SW6010B	MB	1	
				LCS	1	
				MS	1	
				MSD	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Sodium - Saturated Paste	SW6010B	MB	1	
				LCS	1	
				MS	1	
				MSD	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Sodium Adsorption Ratio	USDA20b	Sample Duplicate	1	
				LCS	1	
H12120317	12/18/2012	Available Potassium	SW6010B	MB	1	Detected at 0.8, RL is 0.02, No qualification required, all results geater than 10X the blank result
				LCS	1	
				MS	1	
				MSD	1	
				Sample Duplicate	1	
H12120317	12/18/2012	CEC	SW6010B	MB	1	Detected at 0.06, RL is 0.008, No qualification required, all results greater than 10X the blank result
				LCS	1	
				MS	1	
				MSD	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Sodium	SW6010B	MB	1	Detected at 0.7, Rl is 0.09, No qualification required, all results greater than 10X the blank result
				LCS	1	
				MS	1	
				MSD	1	
				Sample Duplicate	1	
H12120317	12/18/2012	Organic Carbon/Matter Walkely Black	ASA29-3	LCS	1	
				Sample Duplicate	2	
H12120317	12/18/2012	Neutralization Potential	Sobek Modified	LCS	2	
H12120317	12/18/2012	Acid Potential	Sobek Modified	Sample Duplicate	1	
H12120317	12/18/2012	Acid/Base Potential	Sobek Modified	Sample Duplicate	1	
H12120317	12/18/2012	Total Sulfur	Sobek Modified	Sample Duplicate	1	
H12120317	12/18/2012	Olsen Phosphorus	ASA24-5	ICV	1	

TABLE G-2
Summary of Laboratory QA/QC Samples and Results Out of Range
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Result*
				ICB	1	
				MS	2	
				MSD	2	
				Sample Duplicate	1	
H12120317	12/18/2012	Nitrate as N	ASA33-8	ICV	1	
				CCV	2	
				ICB	1	
				MD	1	
				LCS	1	
				MS	2	
				MSD	2	
				Sample Duplicate	1	
H12120317	12/18/2012	Silver, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at RL - 0.2, H12120317-009=J+ qualification, result was greater than the CRQL but less than 10X the blank result, H12120317-004- Report with a U
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
			SW6020	ICV	1	
				Method Blank	1	Detected at 0.3, RL is 0.02, both samples, J+ qualification, result was greater than the CRQL but less than 10X the blank result
				LCS	1	
				Laboratory Fortified Blank	1	
H12120317	12/18/2012	Aluminum, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	In both samples the analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	2	In both samples the analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, RPD - 1.7, 2.0, data shall be reported unflagged
H12120317	12/18/2012	Arsenic, Total	SW6020	ICV	1	
				Method Blank	1	Detected at 0.02, RL-.006, No qulaification required, all results greater than 10X the blank resul
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	
				MSD	1	
H12120317	12/18/2012	Barium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at RL - 0.02, No qualification required, all results greater than 10X the blank resul
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	

TABLE G-2
Summary of Laboratory QA/QC Samples and Results Out of Range
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Result*
H12120317	12/18/2012	Berrylium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
H12120317	12/18/2012	Calcium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	2	Detected at RL - 3, Detected at 0.04, reporting limit - 0.02, No qualification required, all results greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	2	
				MS	3	
				MSD	3	
				Sample Duplicate	1	
H12120317	12/18/2012	Cadmium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
H12120317	12/18/2012	Cobalt, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
			SW6020	ICV	1	
				Method Blank	1	
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	
				MSD	1	
H12120317	12/18/2012	Chromium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
H12120317	12/18/2012	Copper, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
H12120317	12/18/2012	Iron, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 4, RL is 0.7, No qualification required, all results greater than 10X the resul
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	In both samples the analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	2	In both samples the analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, RPD - 2.6, 1.9, data shall be reported unflagged

TABLE G-2
Summary of Laboratory QA/QC Samples and Results Out of Range
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Result*
H12120317	12/18/2012	Potassium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 3, RL is 1, no qualification required, all results greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	% Rec - 148, 146, Spike recoveries outside of advisory limits, qaulify detected results as J+, non-detects require no qualification
				MSD	2	% Rec - 148, 136, Spike recoveries outside of advisory limits; RPD - 4.2, 5.2, qualify detected results as J+, non-detects require no qualification.
H12120317	12/18/2012	Magnesium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	2	
				Laboratory Fortified Blank	1	
				LCS	2	
				MS	3	
				MSD	2	
				Sample Duplicate	1	
H12120317	12/18/2012	Manganese, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 0.05, RL is 0.04, no qualification required, all results greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
H12120317	12/18/2012	Sodium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	2	Detected at 2, RL is 0.7, No qualification required, all results greater than 10x the blank
				Laboratory Fortified Blank	1	
				LCS	2	
				MS	3	
				MSD	3	
				Sample Duplicate	1	
H12120317	12/18/2012	Nickel, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 0.05, RL is 0.04, no qualification required, all results greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
H12120317	12/18/2012	Lead, Total	SW6020	ICV	1	
				Method Blank	1	Detected at 0.008, RL is 0.003, no qualification required, all results greater than 10X the blank result
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	
				MSD	1	
H12120317	12/18/2012	Antimony, Total	SW6020	ICV	1	
				Method Blank	1	Detected at 0.03, RL is 0.002, no qualification required, all results were non-detect
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	% Rec - 48, Spike recovery outside of advisory limits, all results were non-detect, qualify as U.
				MSD	1	% Rec - 44, RPD - 7.8, Spike recovery outside of advisory limits, all reuslts were non-detect, qualify as UJ
H12120317	12/18/2012	Selenium, Total	SW6020	ICV	1	
				Method Blank	1	Detected at 0.04, RL is 0.007, no qualification required, all results were not-detect
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	
				MSD	1	

TABLE G-2
Summary of Laboratory QA/QC Samples and Results Out of Range
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Result*
H12120317	12/18/2012	Thallium, Total	SW6020	ICV	1	
				Method Blank	1	
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	
				MSD	1	
H12120317	12/18/2012	Vanadium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
H12120317	12/18/2012	Zinc, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 0.2, RL is 0.1, no qualification required, all results greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	2	
				MSD	2	
H12120317	12/18/2012	Mercury, Total	SW7471A	ICV	1	
				CCV	2	
				Method Blank	1	Detected at 0.002, RL is 0.0004, no qualification required, all results not-detect
				LCS	1	
				MS	1	
				MSD	1	
H12120317	12/18/2012	1/3 Bar Moisture	SSSA-pt4	LCS	1	
				Sample Duplicate	1	
H12120317	12/18/2012	15 Bar Moisture	SSSA-pt4	LCS	1	
				Sample Duplicate	1	
H13010211	1/16/2013	Silver, Total	SW6020	ICV	1	
				Method Blank	1	Detected at 0.03, RL is 0.02, no qualification required, result is greater than 10X the blank result
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Aluminum, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
H13010211	1/16/2013	Arsenic, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged

TABLE G-2
Summary of Laboratory QA/QC Samples and Results Out of Range
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Result*
H13010211	1/16/2013	Barium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 0.04, RL is 0.02, no qualification required, result is greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	% Rec - 137, Spike recovery outside of advisory limits, qualify detected results as J+
				MSD	1	% Rec - 126, RPD - 2.7, Spike recovery outside of advisory limits, qualify detected results as J+
H13010211	1/16/2013	Berrylium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Calcium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at RL of 3, no qualification required, result is greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
H13010211	1/16/2013	Cadmium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Cobalt, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Chromium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 0.1, RL is 0.07, no qualification required, result is greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Copper, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Iron, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 0.9, RL is 0.7. no qualification required, result is greater than 10X the blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged

TABLE G-2
Summary of Laboratory QA/QC Samples and Results Out of Range
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Result*
H13010211	1/16/2013	Potassium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	% Rec - 135, Spike recoveries outside of advisory limits, qualify detected results as J+
				MSD	1	% Rec - 129, Spike recoveries outside of advisory limits; RPD - 2.2, qualify detected results as J+
H13010211	1/16/2013	Magnesium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Manganese, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 0.07, RL is 0.04, no qualification required, result is greater than 10X the blank
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
H13010211	1/16/2013	Sodium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	Detected at 4, RL is 0.7, no qualification required, result is greater than 10X blank result
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Nickel, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Lead, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
H13010211	1/16/2013	Antimony, Total	SW6020	ICV	1	
				Method Blank	1	Detected at 0.03, RL is 0.002, no qualification required, result was non-detect
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	% Rec - 35, Spike recoveries outside of advisory limits, non-detect result qualified as U.
				MSD	1	% Rec - 36, Spike recoveries outside of advisory limits, RPD - 2.5, non-detect result qualified as UJ
H13010211	1/16/2013	Selenium, Total	SW6020	ICV	1	
				Method Blank	1	Detected at 0.03, RL is 0.007, no qualification required, result was non-detect
				LCS	1	
				Laboratory Fortified Blank	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Thallium, Total	SW6020	ICV	1	
				Method Blank	1	
				LCS	1	

TABLE G-2
Summary of Laboratory QA/QC Samples and Results Out of Range
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Result*
				Laboratory Fortified Blank	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Vanadium, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	
				MSD	1	
H13010211	1/16/2013	Zinc, Total	E200.7	ICV	1	
			SW6010B	Method Blank	1	
				Laboratory Fortified Blank	1	
				LCS	1	
				MS	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
				MSD	1	The analyte level was greater than 4X the spike level. In accordance with the method % recovery is not calculated, data shall be reported unflagged
H13010211	1/16/2013	Mercury, Total	SW7471A	ICV	1	
				CCV	1	
				Method Blank	1	Detected at 0.002, RL is 0.0009, no qualification required, result was non-detec
				LCS	1	
				MS	1	1
				MSD	1	1

* - If the cell is blank, results were within the laboratory control limits
ICV- Initial Calibration verification Standard
CCV- Continuing Calibration verification Standard
LBF-Laboratory Fortified Blank
LCS - Laboratory Control Sample
MS-Sample Matrix Spike
MSD-Sample Matrix Spike Duplicate
RL - Reporting Limit
RPD - Relative Percent Difference
ND - Not Detected

TABLE G-3
Summary of Laboratory QA/QC Results and Resulting Qualifications
UBMC Section 35 Design Investigation

Work Order Number	Date Sampled	Analysis	Analytical Method	Type of QA/QC	# of Samples	Analytical Result	RL or Acceptable Range	Qualification Results
H12120317	12/18/2012	Calcium - Saturated paste	SW6010B	Method Blank	1	0.002	0.001	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Calcium	SW6010B	Method Blank	1	0.04	0.02	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Available Potassium	SW6010B	Method Blank	1	0.8	0.02	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Sodium	SW6010B	Method Blank	1	0.7	0.09	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Cation Exchange Capacity	SW6010B	Method Blank	1	0.06	0.008	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Silver	SW6010B, SW6020	Method Blank	2	0.02 and 0.03	0.02	S35-CS-01 and 13354:TP107 (9-10') qualified with J+
H12120317	12/18/2012	Total Arsenic	SW6020	Method Blank	1	0.02	0.006	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Barium	SW6010B	Method Blank	1	0.02	0.02	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Iron	SW6010B	Method Blank	1	4	0.07	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Potassium	SW6010B	Method Blank	1	3	1	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Potassium	SW6010B	MS	2	148%	75-125%	All results qualified with J+
H12120317	12/18/2012	Total Manganese	SW6010B	Method Blank	1	0.05	0.04	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Sodium	SW6010B	Method Blank	2	ND and detected at 2	0.7	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Nickel	SW6010B	Method Blank	1	0.05	0.04	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Lead	SW6020	Method Blank	1	0.008	0.003	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Antimony	SW6020	Method Blank	1	0.03	0.002	All results are non detect, no qualification necessary
H12120317	12/18/2012	Total Antimony	SW6020	MS	1	48%	75-125%	All results qualified with UJ
H12120317	12/18/2012	Total Selenium	SW6010B	Method Blank	1	0.04	0.007	All results are non detect, no qualification necessary
H12120317	12/18/2012	Total Zinc	SW6010B	Method Blank	1	0.2	0.1	All results greater than 10X detection, no qualification necessary
H12120317	12/18/2012	Total Mercury	SW7471A	Method Blank	1	0.002	0.0004	All results are non detect, no qualification necessary
H12120317	12/18/2012	Total Mercury	Holding Time			approx 69 days	28 days	Receiving temperature was above accepted range, all results qualified with UJ
H12120317	12/18/2012	Total Mercury	Temperature			18.4°C	4°C ± 2°C	Receiving temperature was above accepted range, all results qualified with UJ
H13010211	12/18/2012	Total Barium	SW6010B	Method Blank	1	0.04	0.02	Result is greater than 10X detection, no qualification necessary
H13010211	12/18/2012	Total Barium	SW6010B	MS	1	137%	75-125%	Result qualified with J+
H13010211	12/18/2012	Calcium	SW6010B	Method Blank	1	3	3	Result is greater than 10X detection, no qualification necessary
H13010211	12/18/2012	Total Chromium	SW6010B	Method Blank	1	0.1	0.07	Result is greater than 10X detection, no qualification necessary
H13010211	12/18/2012	Total Iron	SW6010B	Method Blank	1	0.9	0.7	Result is greater than 10X detection, no qualification necessary
H13010211	12/18/2012	Total Potassium	SW6010B	MS	1	135	75-125%	Result qualified with J+
H13010211	12/18/2012	Total Manganese	SW6010B	Method Blank	1	0.07	0.04	Result is greater than 10X detection, no qualification necessary
H13010211	12/18/2012	Total Sodium	SW6010B	Method Blank	1	4	0.7	Result is greater than 10X detection, no qualification necessary
H13010211	12/18/2012	Total Antimony	SW6020	Method Blank	1	0.03	0.002	Result are non detect, no qualification necessary
H13010211	12/18/2012	Total Antimony	SW6020	MS	1	35%	75-125%	Result qualified with UJ
H13010211	12/18/2012	Total Selenium	SW6020	Method Blank	1	0.03	0.007	Result are non detect, no qualification necessary
H13010211	12/18/2012	Total Mercury	SW7471A	Method Blank	1	0.002	0.0009	Result are non detect, no qualification necessary
H13010211	12/18/2012	Total Mercury	Holding Time			approx 97 days	28 days	Receiving temperature was above accepted range, result qualified with UJ
H13010211	12/18/2012	Total Mercury	Temperature			14.5°C	4°C ± 2°C	Receiving temperature was above accepted range, result qualified with UJ

MS-Sample Matrix Spike
MSD-Sample Matrix Spike Duplicate
RL - Reporting Limit
UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise
J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+ - The result is an estimated quantity, but the result may be biased high
ND - Not detected

TABLE G-4
DUPLICATE SAMPLE COMPARISON
UBMC Section 35 Design Investigation

		S35-CS-01	S35-BG-990	RPD
Sample Type		Natural	Duplicate	
Sample Generation Date		12/18/2012	1/16/2013	
Silver, Total		1	2	67
Aluminum, Total		16300	16300	0
Arsenic, Total		21	21	0
Barium, Toatal		254	269	6
Berrylium, Total		<1	<1	NCU
Calcium, Total		2300	2300	0
Cadmium, Total		1	<1	NC1
Cobalt, Total		6	7	15
Chromium, Total		19	21	10
Copper, Total		113	103	9
Iron, Total		16000	16300	2
Potassium, Total		2280	2070	10
Magnesium, Total		3570	3680	3
Manganese, Total		603	718	17
Sodium, Total		68	72	6
Nickel, Total		14	14	0
Lead, Total		548	630	14
Antimony, Total		<1	<1	NCU
Selenium, Total		<1	<1	NCU
Thallium, Total		<1	<1	NCU
Vanadium, Total		21	19	10
Zinc, Total		274	267	3
		<0.50	<0.50	NCU

RPD - Relitive Percent Difference

NCU - Not Calculated because both of the samples were reported at below detection

NC1 - Not Calculated because one of the samples was below detection

< - result is less than reporting limit

ATTACHMENT 1

Data Qualifier Flags – Energy Labs

RL – analyte reporting limit

QCL – quality control limit

S – spike recovery outside of advisory limits

ND – Not detected at the reporting limit

R – RPD exceeds advisory limit

A – The analyte level was greater than 4 times the spike livel. In accordance with the method % recovery is not calculated.

Data Validation Flags

U - The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method.

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met, or the concentration of the analyte was below the CRQL).

J+ - The result is an estimated quantity, but the result may be biased high.

J- - The result is an estimated quantity, but the result may be biased low.

UJ - The analyte was not detected at a level greater than or equal to the adjusted CRQL. However, the reported adjusted CRQL is approximate and may be inaccurate or imprecise.

R - The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.