PIONEER
TECHNICAL SERVICES, INC.

January 29, 2014

Tom Henderson
Montana Department of Environmental Quality
Mine Waste Clean Up Bureau
P.O. Box 200901
Helena, MT 59620-0901

Re: **Final Repository Materials Analytical Results Report for the McLaren Tailings Abandoned Mine Site**

Dear Tom:

Please find four hard copies of the Final Repository Materials Analytical Results Report for the McLaren Tailings Abandoned Mine Site. Each copy of the report has a CD with a PDF version of the report. I have also included a CD bearing the electronic copies of the report in Microsoft Word, Excel, Auto Cad, and PDF formats. If you have any questions, please contact me at 497-8041 or 490-0807

Sincerely,

Joseph S McElroy

Joseph S. McElroy P.E.
Project Manager

Enclosure

cc: John Koerth, MDEQ
Marty Bennett, Pioneer Technical Services, Inc.

Final Repository Material Analytical Results for the McLaren Tailings Abandoned Mine Site Cooke City, Montana

January 29, 2014

Prepared for:
Mr. Tom Henderson
Montana Department of Environmental Quality
Abandoned Mines Section
P.O. Box 200901
Helena, Montana 59620

Pioneer Technical Services, Inc.
P.O. Box 3445 Butte, MT 59701 406 782-5177

TABLE OF CONTENTS

Page

1 INTRODUCTION 1

1.1 Purpose 1

1.2 Site Information 1

1.2.1 Site Location and Topography 1

1.2.2 Background 1

1.3 Mining History 1

1.4 Geology 3

1.5 McLaren Mine Geology 3

1.6 Current Conditions 3

2 PREVIOUS INVESTIGATIONS 4

2.1 Mineralogy 4

2.2 Process Testing Granada 1985 4

2.3 Process Testing Barrick 2008 5

3 2013 METALLURGICAL INVESTIGATION 5

4 WORK DEVIATIONS 6

5 VOLUME ESTIMATES 6

5.1 Calculation Methods and Assumptions 6

5.2 Results 7

6 REFERENCES 8

List of Figures

Figure 1-1. Site Location Map McLaren Tailings Site
Figure 1-2. McLaren Tailings Mining Claim Locations
Figure 1-3. McLaren Repository Cap Detail
Figure 3-1. Repository Assay Sample Locations and Profile
Figure 3-2. Repository Assay Sample Depths Station 1+00 to 1+75
Figure 3-3. Repository Assay Sample Depths Station 2+00 to 2+75
Figure 3-4. Repository Assay Sample Depths Station 3+00 to 3+75
Figure 3-5. Repository Assay Sample Depths Station 4+00 to 4+75
Figure 3-6. Repository Assay Sample Depths Station 5+00 to 5+75
Figure 3-7. Repository Assay Sample Depths Station 6+00 to 6+50
Figure 3-8. Repository Assay Sample Depth Volume Tables

List of Tables

Table 1-1. Mining Claim and Mineral Survey Number
Table 2-1. Barrick Golden Sunlight Mine Bottle Roll Leach Test Results
Table 3-1. Repository Sample Collection Summary
Table 3-2. Summary of Borehole Composite Samples
Table 3-3. Repository Metallurgical Sample Results
Table 3-4. Repository Environmental Results
Table 3-5. Repository Engineering Results
Table 5-1. Estimated Volume Calculations for Gold, Silver, and Copper in the McLaren Tailings

List of Appendices

Appendix A Final Potential Economic Recovery Report (2008)
Appendix B Final Sampling and Analysis Plan (SAP) for the McLaren Tailings Abandoned Mine Reclamation Project Repository Characterization Cooke City, Montana, (DEQ/Pioneer 2013)
Appendix C Field Sampling Documentation
Appendix C-1 Log Book
Appendix C-2 Photographs
Appendix D Laboratory Data Reports
Appendix D-1 ALS Geochemistry –Metallurgical
Appendix D-2 Energy Laboratory – Environmental
Appendix D-3 Pioneer Geotechnical Laboratory - Engineering
Appendix E Securities and Exchange Commission Industry Guide 7

Revision Summary

Revision No.	Author	Description	Date
Rev 1	Pioneer	Submitted to Client for Review	January 7, 2014
Rev 2	Pioneer	Final Submitted to Client	January 29, 2014

1 INTRODUCTION

1.1 Purpose

The purpose of this report is to present metallurgical data collected in August 2013 from the stabilized tailings at the McLaren Tailings Abandoned Mine Site prior to placing the final cap system on the repository. This metallurgical investigation, along with the previously collected metallurgical data, will be available to characterize the concentrations and amounts of select economic metals in the constructed mine waste repository. The Montana Department of Environmental Quality (DEQ) Abandoned Mines Section directed this investigation to minimize the potential of damage to the repository cap resulting from future efforts to assess precious metals content of the repository. A summary of previous investigations and results is included in Appendix A in the *Final Potential Economic Recovery Fact Sheet for the McLaren Tailings Site, Cooke City, Montana*, prepared by the Montana DEQ Mine Waste Cleanup Bureau (MWCB) and Pioneer Technical Services, Inc. (Pioneer) (DEQ/Pioneer, 2008).

1.2 Site Information

1.2.1 Site Location and Topography

The McLaren Tailings Abandoned Mine Site is located within the New World Mining District in Park County in south central Montana. It is bounded on the south by the Montana-Wyoming state line, on the west by Yellowstone National Park, and on the north and east by the Absaroka-Beartooth Wilderness area boundary. The area is characteristic of high alpine regions of the northern Rocky Mountains with elevations ranging from approximately 7,000 feet above mean sea level (amsl) to over 10,000 feet amsl. The tailings impoundment and waste rock sits at approximately 7,600 feet amsl.

The general location of the McLaren Tailings Abandoned Mine Site is approximately one quarter of a mile east of Cooke City, in Park County, Montana. The site is situated at the headwaters of Soda Butte Creek in Section 25 of Township 19 South, Range 14 East of the Montana Principal Meridian (See Figure 1-1). The communities of Cooke City and Silver Gate, Montana, are the only population centers near the McLaren Tailings Abandoned Mine Site.

1.2.2 Background

The Montana DEQ and the Montana Board of Environmental Review are the owners of the McLaren Tailings Abandoned Mine Site. Figure 1-2 shows the patented mill sites and placer claims that encompass the area where the tailings and waste rock are located. The mining claims and mineral survey numbers are listed in Table 1-1.

1.3 Mining History

Placer gold was discovered on upper Soda Butte Creek in 1869 and the first lode claims were staked the following year. At the time of discovery, the New World Mining District was part of

the Crow Indian Reservation and mining was conducted under trespass on Indian lands. Consequently, sponsors were reluctant to invest in the area until after 1882 when the reservation boundaries were reduced. Once legal titles to mining property could be obtained, attraction to the New World Mining District was renewed and hundreds of claims were staked throughout the area. Development of mines and prospects was limited due to the high cost of mule-back freight, and interest in the district languished when attempts to build a railroad into Cooke City, Montana, failed (GCM Services Inc., 1985).

Smelters were constructed in the New World Mining District in an attempt to counteract high transportation expenses. In 1889, the Montana State Mine Inspector documented three smelting facilities in the New World Mining District (Swallow, 1889). One of these smelters was a portable furnace located north of Cooke City, Montana, along Miller Creek. Another was the Great Republic Smelter, the ruins of which can be found below Cooke City on Woody Creek. The exact location of the third smelter, the 20-ton per day plant of the Eastern Montana Mining and Smelting Company, is unknown. Though the exact location of this early smelter is not recorded, there is speculation that it was located on Soda Butte Creek in the vicinity of the McLaren Tailings Abandoned Mine Site.

In 1933, the McLaren Gold Mines Company discovered the McLaren deposit on Henderson Mountain. The McLaren mine ore consisted of limestone and shale replaced by auriferous pyrite with some copper mineralization. The ore was mined on a non-selective basis using open cut methods. In 1934, a flotation mill was constructed on the Copper Glance mill site near Cooke City, Montana, and a tailings impoundment was constructed on the adjoining Horseshoe and Greeley placer (Hart, 1935). The McLaren Mill produced a gold and copper concentrate that was shipped to Anaconda, Montana, for smelting. Extensive exploration work at the mine in 1937 and 1938 resulted in the discovery of additional reserves and the mill was remodeled to increase capacity. During the operation of the mill, Soda Butte Creek's channel was filled with tailings and the stream was pushed into a ditch and culvert that ran along the south side of the impoundment (Johnson, 1949) (GLO, 1946). The McLaren Mill operated until 1953 when excess stripping ratios at the mine made the operation unprofitable (Goddard, 1953).

During operation of the McLaren Mill, tailings disposal was problematic as overflow from the tailings impoundment flowed downstream into Yellowstone National Park. Inspections by Park Rangers documented a regular pattern of leaks and breaks in the earthen dike surrounding the tailings impoundment. While the daily operation of the mill tended to give a milky appearance to Soda Butte Creek, the frequent breaks and washouts of the impoundment had more serious consequences (Johnson, 1949). A Park Ranger inspecting a breach in the impoundment dike in June 1950 documented repairs made to the impoundment but noted that similar breaks in the dam occurred each spring and more breaks could be anticipated with continued operation of the mill (Johnson, 1950).

Closure of the mill in 1953 did not end the concern about downstream environmental impacts resulting from the McLaren tailings. By the late 1960s, Soda Butte Creek was considered the most polluted stream entering Yellowstone National Park. Investigations into the cause of the pollution showed that ferrous iron precipitates and heavy silt loads from the tailings were

adversely affecting the fish-producing capacity of Soda Butte Creek within the Park (DOI-BSFW, 1969). In 1969, Bear Creek Mining, the site owner and a Kennecott Corporation subsidiary, rehabilitated the site by covering the eroding tailings with soil, demolished the buildings at the site, and excavated a new channel for Soda Butte Creek along the north side of the tailings impoundment (DOI-BSFW, 1970). Since completion of the initial reclamation work at the McLaren Tailings Abandoned Mine Site by Bear Creek Mining, State and Federal agencies have continued to study the site.

1.4 Geology

The McLaren Tailings Abandoned Mine Site is located in the Beartooth Mountains; a mountainous region subject to extensive uplift and thrust faulting that exposes Precambrian crystalline rocks (Foose et al., 1961). The site is located in a valley that is drained by Soda Butte Creek, which is an east-to-west flowing stream that runs through the site and eventually through Yellowstone National Park, five miles downstream. The valley is steep sided and has morphological and lithological characteristics typical of glaciated landscapes.

The McLaren Tailings Abandoned Mine Site is characterized by three general geologic units:

1. Precambrian and Tertiary age intrusive rocks that comprise the bedrock base.
2. Pleistocene age sediments consisting of alluvial sands and gravels, lacustrine silts and sands, fine to coarse textured glacial tills, and variable slope debris deposits.
3. Holocene age sediments and fill deposits resulting from the mining activity. These fills include mine tailings sediments, dam embankments or soil cap fills, and mine waste rock or stockpile ore deposits.

1.5 McLaren Mine Geology

The McLaren Mine provided feed stock to the McLaren Mill from the time it was built in 1934 until its closure in 1953. The mine is located on the southwestern side of Fisher Mountain where the Park shale and Meagher limestone are believed to be in contact with a felsitic breccia (Montana Bureau of Mines and Geology [MBMG], 1975). The majority of the intrusive rocks within the mined area are altered by hydrothermal solutions. Altered limestone in the main wall of the mine is cut by both dikes and sills of felsite and perhaps dacite or andesite. These intrusive features are offset by thin, sulfide-filled fault zones. Sulfide minerals seen at the surface of the McLaren Mine are concentrated in the zones of propylitic alteration, which consists primarily of chlorite but also contains minor areas of epidote and calcite enrichment. Magnetite and pyrite are always present in varying amounts. Pyritic replacement bodies appear to be restricted to the carbonate layers in the Park shale with pervasive, disseminated sulfide mineral present in the altered shale (MBMG, 1975).

1.6 Current Conditions

The McLaren tailings repository is located in the west portion of the site and encompasses 5.1 acres. Excavation of the tailings began in 2010 and was completed during the 2013 construction

season. Total volume of tailings contained in the repository is 232,000 compacted cubic yards (cy). To stabilize/dehydrate the tailings, 3 to 5 percent of quick lime (CaO) by weight was incorporated into the tailings. The tailings were then compacted to 95 percent of the Standard Proctor maximum dry density (ASTM D 698/AASHTO T-99) and then capped with geosynthetic materials. Excavation and stabilization of the tailings and compaction in the repository were documented in annual Construction Completion Reports (DEQ/Pioneer, 2011; DEQ/Pioneer, 2012; DEQ/Pioneer, 2013). A 3-foot-thick layer of soil will be placed over the geosynthetic liner system during the 2014 construction season and seeded. Figure 1-3 depicts the typical final layering of the repository.

2 PREVIOUS INVESTIGATIONS

A summary of previous investigations and results is provided in the *Final Potential Economic Recovery Fact Sheet for the McLaren Tailings Site, Cooke City, Montana* (DEQ/Pioneer, 2008). Several sampling programs designed to evaluate the mineral potential of the tailings have been completed since 1965. The first, by Bear Creek Mining, was composed of 47 auger holes. The Granada Exploration Company (Granada) completed a feasibility study on reprocessing the tailings in 1988. Granada excavated 8 backhoe test pits and collected 47 samples for gold and silver assays as well as acid-soluble copper analyses. A 500-pound composite sample for metallurgical tests was also collected and analyzed (Granada, 1987 and 1988).

As part of this feasibility study, Granada "recalculated" the findings using past sampling results completed by Kennecott and MBMG and their own results to determine a weighted average grade for gold, silver, and percent of copper on which to base the economic viability of reprocessing the tailings materials, as listed in the *McLaren Gold-Silver Tailings Project Feasibility Study* (Granada, 1988).

2.1 Mineralogy

Based on a study by Granada, native gold is present in the tailings up to 40 microns in diameter and also locked in silicate gangue, chalcopyrite, and pyrite fragments. Associated with the gold are dominant pyrite along with lesser amounts of chalcopyrite, sphalerite, pyrrhotite, bornite, enargite, arsenopyrite, chalcocite, and covellite. There is an oxide suite of magnetite, hematite, and goethite, some of which are a result of oxidation.

2.2 Process Testing Granada 1985

Granada also submitted sample materials to Kerley Industries, Inc. (Kerley) in Sahuarita, Arizona. Kerley completed cyanidation testing on the tailings sample with an average assay value of 0.097 ounces per ton (oz/ton) of gold. Gold recoveries were reported as 84.7 percent and cyanide consumptions were reported at 1.02 pounds per ton (lb/ton) when leaching at 0.1 percent sodium cyanide (NaCN) solutions strength. Sample washing increased the gold recovery rate to 91.8 percent, but did not reduce NaCN consumption. Lime consumption was 27.2 and

35.4 lb/ton, respectively (Huch, 1985). Granada also measured in-place dry density (by volume of undisturbed sample, excavated, dried, and weighed) at 17 cubic feet per ton.

2.3 Process Testing Barrick 2008

Barrick Golden Sunlight Mine, at the request of DEQ, completed a bottle roll leach test of the tailings at the mine laboratory located near Whitehall, Montana, as part of the initial site investigation completed in 2008.

Golden Sunlight completed the cyanidation testing on the tailings samples with an average assay value of 0.106 oz/ton of gold. Gold recoveries were reported as an average of 72.9 percent and average cyanide consumption of 3.69 lb/ton was reported with a calculated lime consumption of 103.2 lb/ton. Table 2-1 presents the summary of the test results.

3 2013 METALLURGICAL INVESTIGATION

The 2013 McLaren metallurgical investigation included the collection of core samples from 12 boreholes, totaling 410 feet of core material providing 51 discrete metallurgical samples as detailed in *The Final Sampling and Analysis Plan (SAP) for the McLaren Tailings Abandoned Mine Reclamation Project Repository Characterization Cooke City, Montana*, (DEQ/Pioneer, 2013) in Appendix B. Borehole sample locations of the 2013 investigation are shown on Figure 3-1. Table 3-1 and Table 3-2 summarize each sample collected during the investigation, and Table 3-2, Table 3-3, and Table 3-4 present the analytical results for each type of analysis. Appendix C contains the field log notes and photographs of the borehole samples.

The core samples were collected using a 66DT Geoprobe® equipped with a DT22 Soil Sampling System. The DT22 Soil Sampling System is designed to collect continuous soil samples. Three types of samples were obtained from each core: metallurgical, environmental, and engineering.

The metallurgical samples were the primary focus of the investigation, which characterized the metallurgical content of the tailings, primarily gold, silver, and copper. At each borehole, continuous soil samples were collected from ground surface to the bottom of the repository. The metallurgical samples were obtained by compositing tailings/mine wastes materials obtained every 8 feet of borehole core (i.e., 0 to 8 feet, 8 feet to 16 feet, etc.) to the bottom of the repository. A minimum of 1 kilogram of tailings/mine wastes from each sample interval was placed in a 1-gallon Ziploc® bag for laboratory analysis.

The field crew weighed each sample to ensure there was adequate sample quantity for analysis, and documented the weights of each sample in the field log book (provided in Appendix C). The remaining soil from the core was composited in 5-gallon buckets to use in the environmental and engineering samples.

The environmental samples characterized the pH, organic matter content, and the metal concentrations for antimony (Sb), aluminum (Al), arsenic (As), barium (Ba), cadmium (Cd),

cobalt (Co), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), and zinc (Zn). Table 3-4 lists the results. The engineering samples were collected to determine the particle size gradation, in-place/natural moisture, and density of the compacted tailings/mine wastes in the repository. Table 3-5 lists the test results from these analyses.

Laboratory analysis was provided by the following companies (the results are included in Appendix D):

- Metallurgical – ALS Geochemistry located in Elko, Nevada.
- Environmental – Energy Laboratory located in Helena, Montana.
- Engineering – Pioneer Geotechnical Laboratory located in Helena, Montana.

4 WORK DEVIATIONS

During the completion of borehole #1, refusal occurred at 8 feet below ground surface. At outlined in the SAP (provided in Appendix B), the borehole was moved laterally to the north and south, where refusal was still encountered at approximately the same depth. The Pioneer Project Manager instructed the drilling crew to move 40 feet to the south at the same elevation and redrill. Because of the distance from the original borehole, this borehole was labeled as Borehole #12. The borehole was completed to native soils.

After the sampling investigation finished on August 9, 2013, an additional 3,000 cy of tailings and sludge from the sediment detention pond was placed in the repository. Additional side slopes and top surface grading tasks were completed prior to installing the geosynthetic liner system; therefore, the current repository surface may vary from the surveyed elevations of the boreholes presented in Table 3-1.

5 VOLUME ESTIMATES

The volume of tailings used in this report is based on the final repository survey completed on September 26, 2013, after final regrading had been completed. The sample moisture of the compacted, lime-amended tailings ranged from 14.3 to 16.1 percent (Table 3-5). The calculated tons contained within the repository includes the in-place moisture content/natural moisture of the materials. Figure 3-2 through Figure 3-7 show the repository assay sample depth stations from station 1+00 to Station 6+50. Figure 3-8 provides the volume of tailings in cubic yards by profile station and sampling interval.

5.1 Calculation Methods and Assumptions

The following calculations and assumptions were used to calculate the potential total quantity of precious metals within the repository (summarized in Table 5-1). Note: The list below uses the following acronyms: cubic yards (cy), pounds per square foot (psf), pounds (lb), ounces (oz) cubic foot (ft^3), parts per million (ppm), milligrams/kilograms (mg/kg).

- Volume of tailing was determined using AutoCAD Civil 3-D for each distinct sampling interval and reported in cubic yards.
- A total of 232,000 cy (357,048 tons) of tailings is contained in the repository, containing 14 to 16 percent moisture. From the results presented in Table 3-5, an average moisture content of 15.3% was deducted from the tonnage.
- Gold and silver results are reported in troy ounces per short ton (2,000 lb).
- Estimated tonnage of each sampling interval was calculated using an average maximum dry density of 114.7 psf (see Table 3-5) (i.e., 114.0 psf *27(ft^3/1 cy) * 232,000 cy/2000 lb/1 ton).
- Conversion to troy oz/ton from ppm = concentration (ppm)*0.0292.
  1 ppm = 0.0292 troy oz/short ton.
- Conversion to pounds per ton copper from ppm = concentration (ppm) * 0.002
  1 mg/kg = 0.002 lb/short ton.
  (i.e., a copper concentration of 2,410 ppm * 0.002 lb/short ton = 4.82 lb/short ton).
- The estimated quantities presented in Table 5-1 summarize potential metal quantities contained in the repository material and *do not imply any particular metallurgical recovery.*
- Price of Gold on January 28, 2014 = $1,252.70/troy oz.
  Price of Silver on January 28, 2014 = $19.54/troy oz.
  Price of Copper on January 28, 2014 = $3.268/lb.

5.2 Results

Table 5-1 summarizes the potential gold, silver, and copper quantities calculated using maximum, average, and minimum reported values (oz/ton) and lb/ton, respectively. The amount of gold contained within the tailings ranges from a maximum of 35,159 troy oz to a minimum of 16,965 troy oz with an average of 25,291 troy oz. Silver ranges from a maximum of 106,831 ounces to a low of 80,122 ounces with an average of 93,845 ounces present in the tailings. Copper values ranged from a maximum of 1,897,372 lbs to a minimum of 1,202,873 lbs with an average of 1,561,047 lbs.

The economic values are based on the metal quoted prices on January 28, 2014. The McLaren repository metallurgical investigation was conducted to characterize the concentrations and amounts of select precious metals in the constructed mine waste repository. This investigation was not designed to meet the requirements of the *United States Securities And Exchange Commission Industry Guide 7: Description of Property by Issuers Engaged or to be Engaged in Significant Mining Operations*. A copy of Industry Guide 7 is provided in Appendix E.

6 REFERENCES

AASHTO T-99. Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

ASTM Standard D698, 2012. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3)). www.astm.org.

DEQ/Pioneer, 2013. Final Sampling and Analysis Plan (SAP) for the McLaren Tailings Abandoned Mine Reclamation Project Repository Characterization, Cooke City, Montana. July 31, 2013.

DEQ/Pioneer, 2013. Final 2012 Construction Completion Report for the McLaren Tailings Abandoned Mine Site. April 2013.

DEQ/Pioneer, 2012. Final Construction Completion Report for the McLaren Tailings Abandoned Mine Site. April 30, 2012.

DEQ/Pioneer, 2011. Final Construction Completion Report for the McLaren Tailings Abandoned Mine Site. February 18, 2011.

DEQ/Pioneer, 2008. Final Potential Economic Recovery Fact Sheet for the McLaren Tailings Site, Cooke City, Montana. September 2, 2008.

DOI-BSFW, 1970. Annual Project Report-Fishery Management Profram, Yellowstone National Park. Calendar year 1969. YNP Archives, Mammoth, Wyoming.

DOI-BSFW, 1969. Annual Project Report-Fishery Management Profram, Yellowstone National Park. Calendar year 1969. YNP Archives, Mammoth, Wyoming.

Foose, R.M., Wise D. U., and Garbarini, 1961. Structural Geology of the Beartooth Mountains; Montana and Wyoming Geological Society of American Bulletin, Vol. 72, pg. 1143-1172.

GCM Services Inc., 1985. Cultural Resource Inventory and Evaluation of the McLaren Mill Site, Cooke City, Montana. Prepared for Montana Department of State Lands, Abandoned Mine Reclamation Bureau.

GLO, 1946. Mineral Survey Plat No., 10815 Idabelle Lode and Idabelle Mill Site. Surveyed October 11, 1946 Author C. Ryder, Mineral Surveyor, Bureau of Land Management.

Goddard, Charles C. 1953. Memorandum Concerning the McLaren Gold Mining Company Near Cooke City, Park County, Montana. Anaconda Geologic Collection, Western Heritage Center, Laramie, Wyoming. File 28118.16.

Granada, 1988. McLaren Gold-Silver Tailings Project Feasibility Study. Granada Exploration Corporation. July 31, 1988.

Granada, 1987. News release to Shareholders, Granada Exploration Corporation. November, 1987.

Hart, L. H., 1935. Reconnaissance Summary of the McLaren Mine Near Cooke City, Park County, Montana. Anaconda Geologic Collection, Western Heritage Center, Laramie, Wyoming. File 28118.19.

Huch, 1985. Progress Report No. 2 on the Testings of your samples of Gold Tailing, our Lot No., R. O. Huch, Kerly Mining Products, Inc. December 1985.

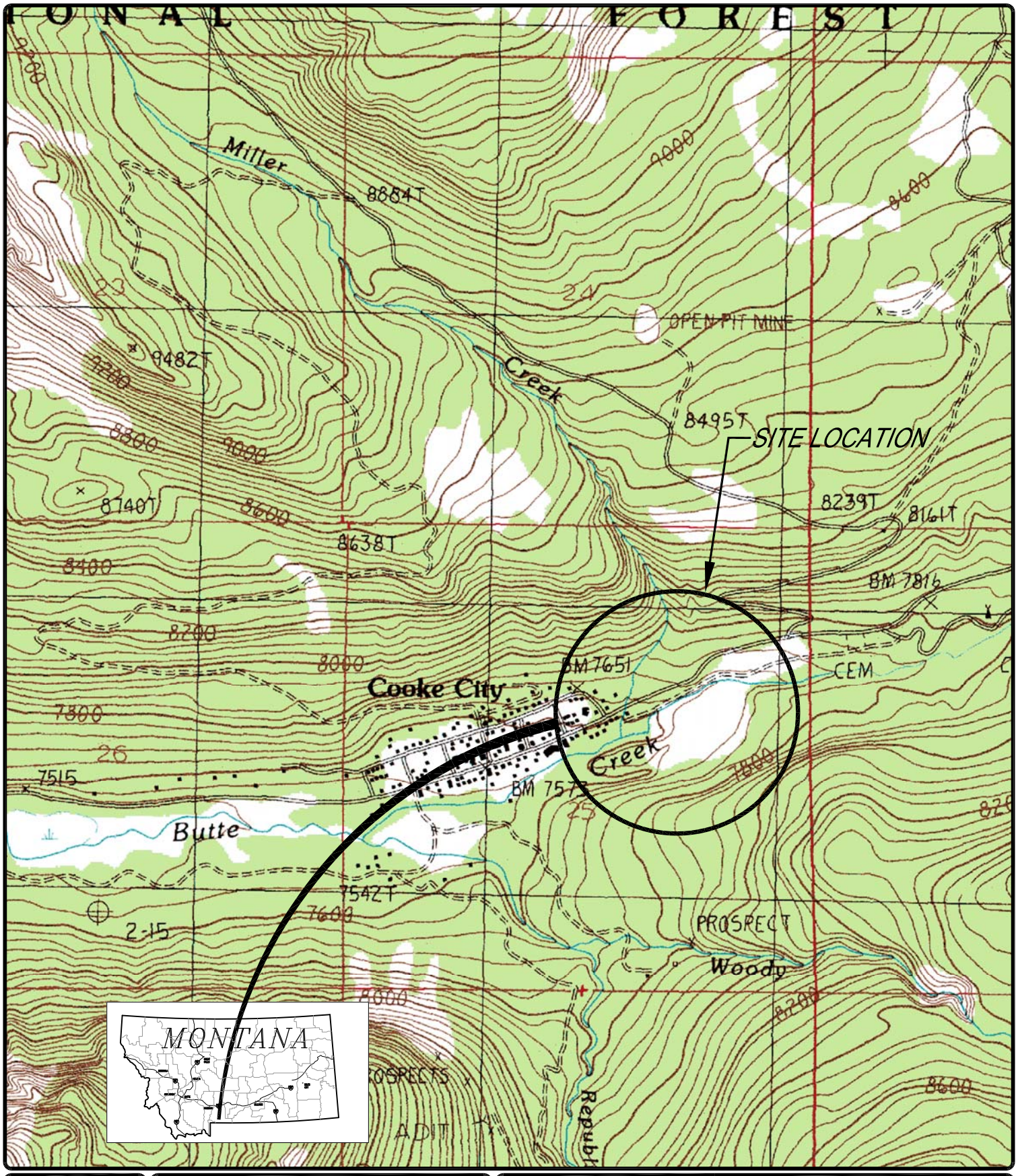
Johnson, Merritt S., 1950. Memorandum for the Chief Ranger. Re: Pollution of Soda Butte Creek. YNP Archives File 650-05. YNP, Mammoth, Wyoming. June 27, 1950.

Johnson, Merritt S., 1949. Memorandum for the Chief Ranger. Re: Pollution of Soda Butte Creek. YNP Archives File 650-05. YNP, Mammoth, Wyoming. June 16, 1949.

MBMG, 1975. Acid Mine Drainage Control - Feasibility Study Cooke City, Montana. Prepared by the Montana Bureau of Mines and Geology. December, 1975.

Swallow, G. C. 1889. Reports of Inspector of Mines for Montana for the Six Months Ending November 30, 1889. Journal Publishing Company, Helena, Montana.

Figures



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SOURCE: 7.5 QUAD

SCALE IN FEET
0 750 1500

FIGURE 1-1

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MT 59701
(406) 782-517

SITE LOCATION MAP
MCLAREN TAILINGS SITE

DATE: 11/4/13

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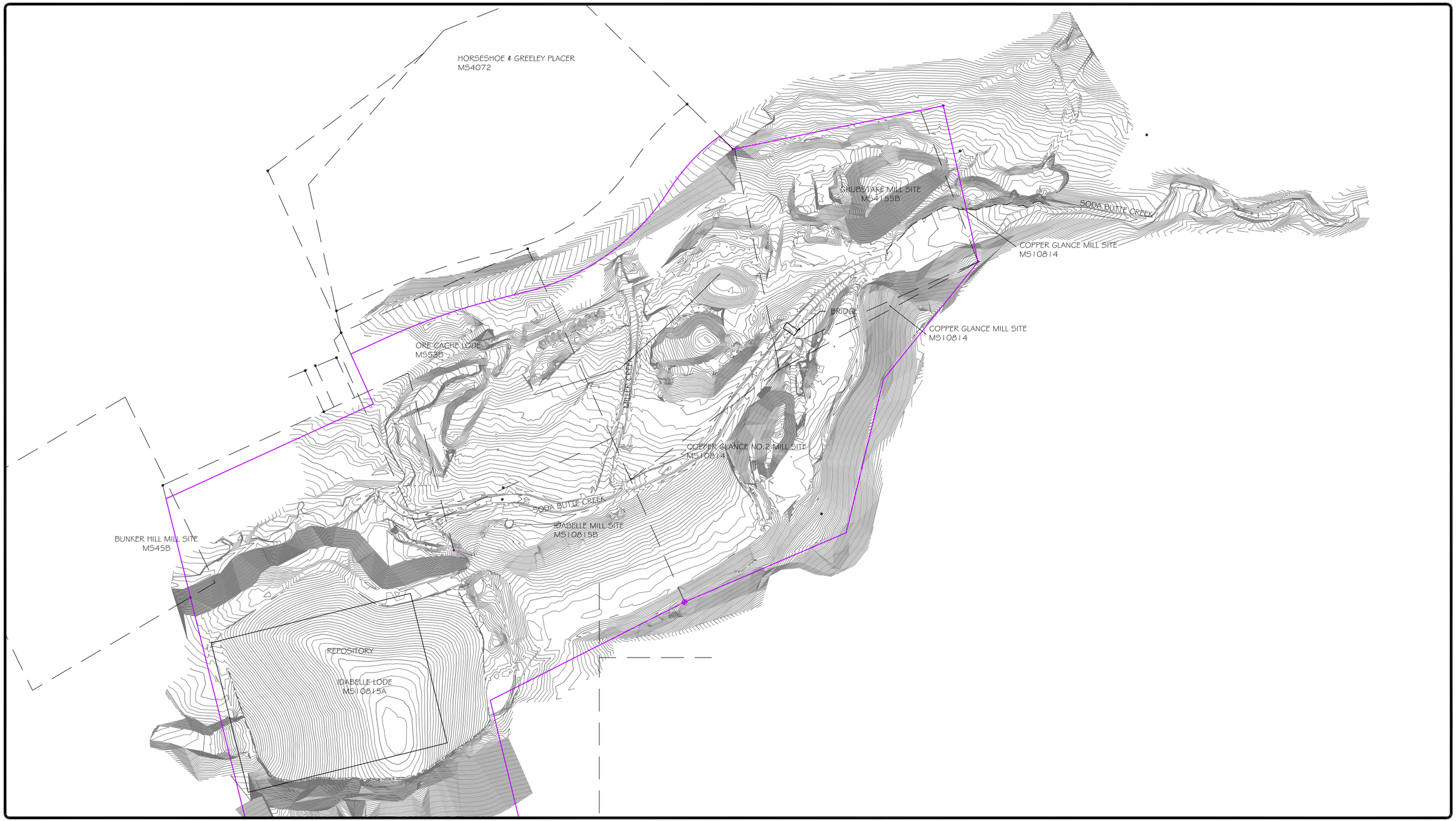

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UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
0 100 200

FIGURE 1-2

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

MCLAREN TAILINGS MINING CLAIM LOCATIONS

DATE: 11/4/13

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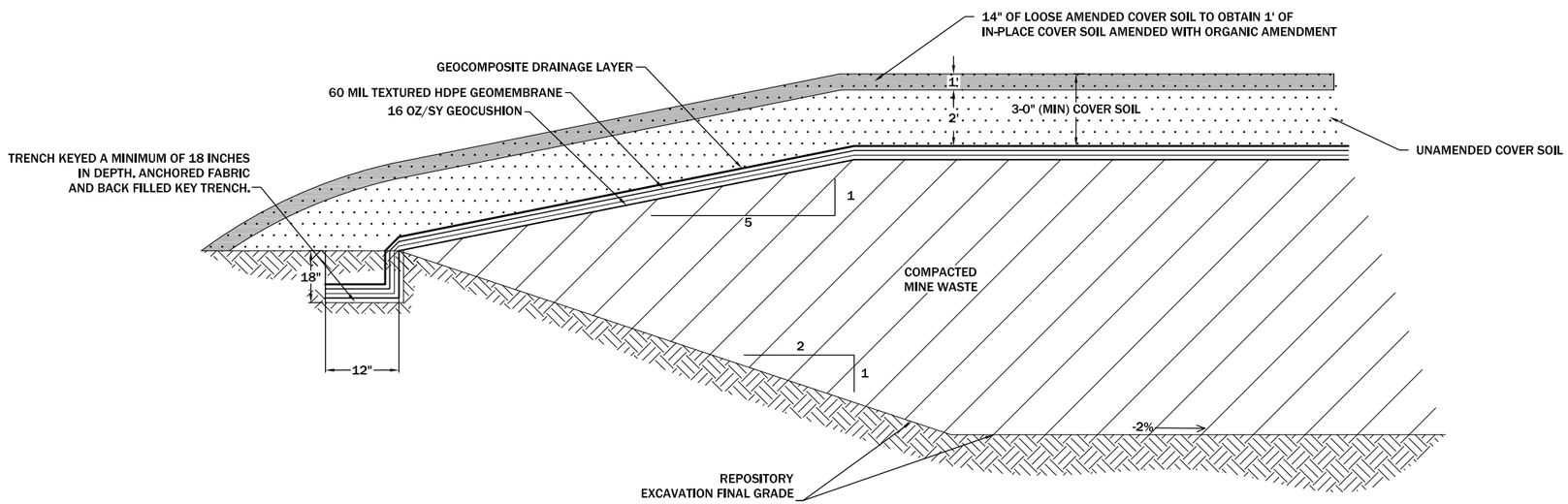

TYPICAL FINAL REPOSITORY LAYERING DETAIL

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DATUM:
UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
0 100 200

FIGURE 1-3

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

MCLAREN
REPOSITORY
CAP
DETAIL

DATE: 11/4/13

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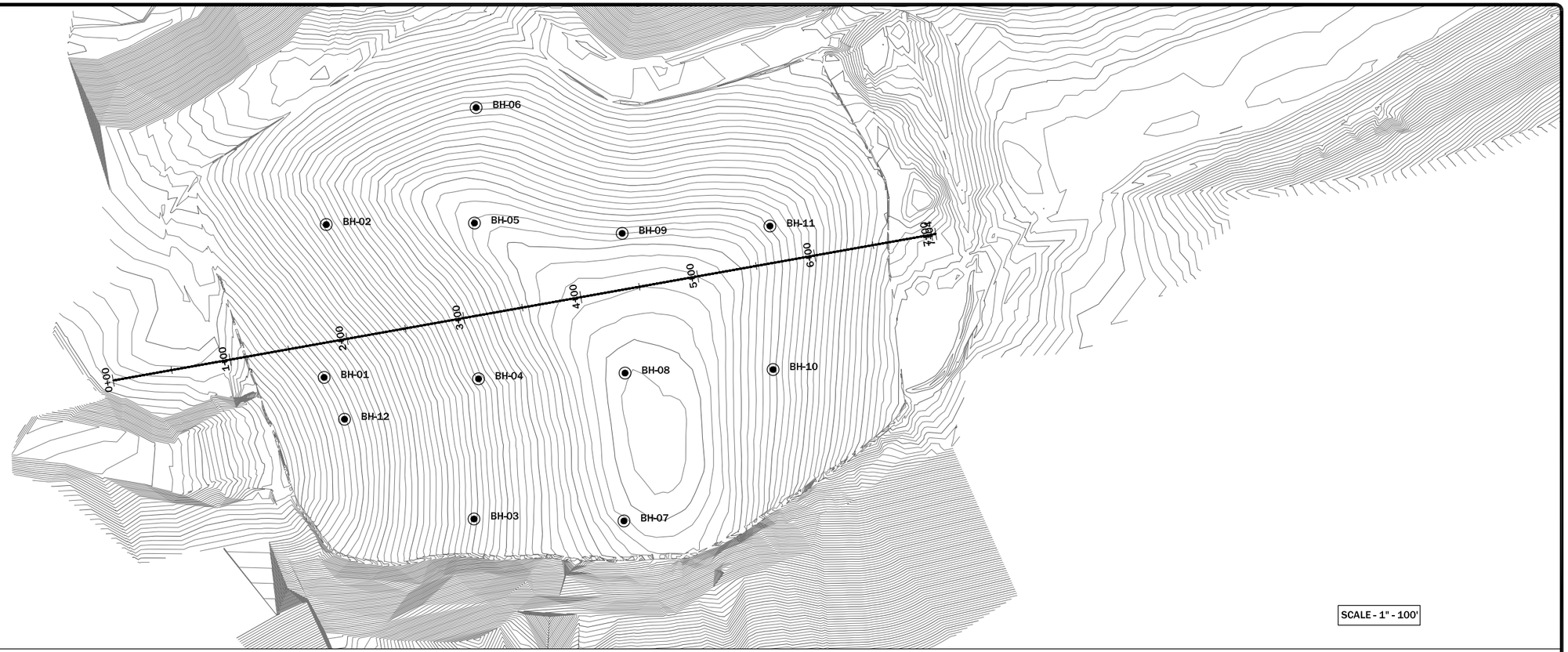

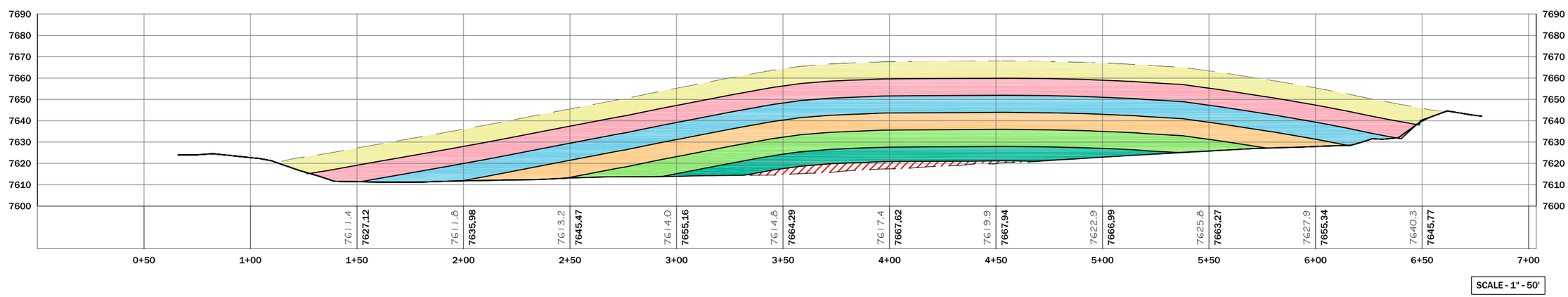

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SOURCE: PIONEER

SCALE IN FEET
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FIGURE 3-1

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

REPOSITORY ASSAY SAMPLE LOCATIONS AND PROFILE

DATE: 8/21/13

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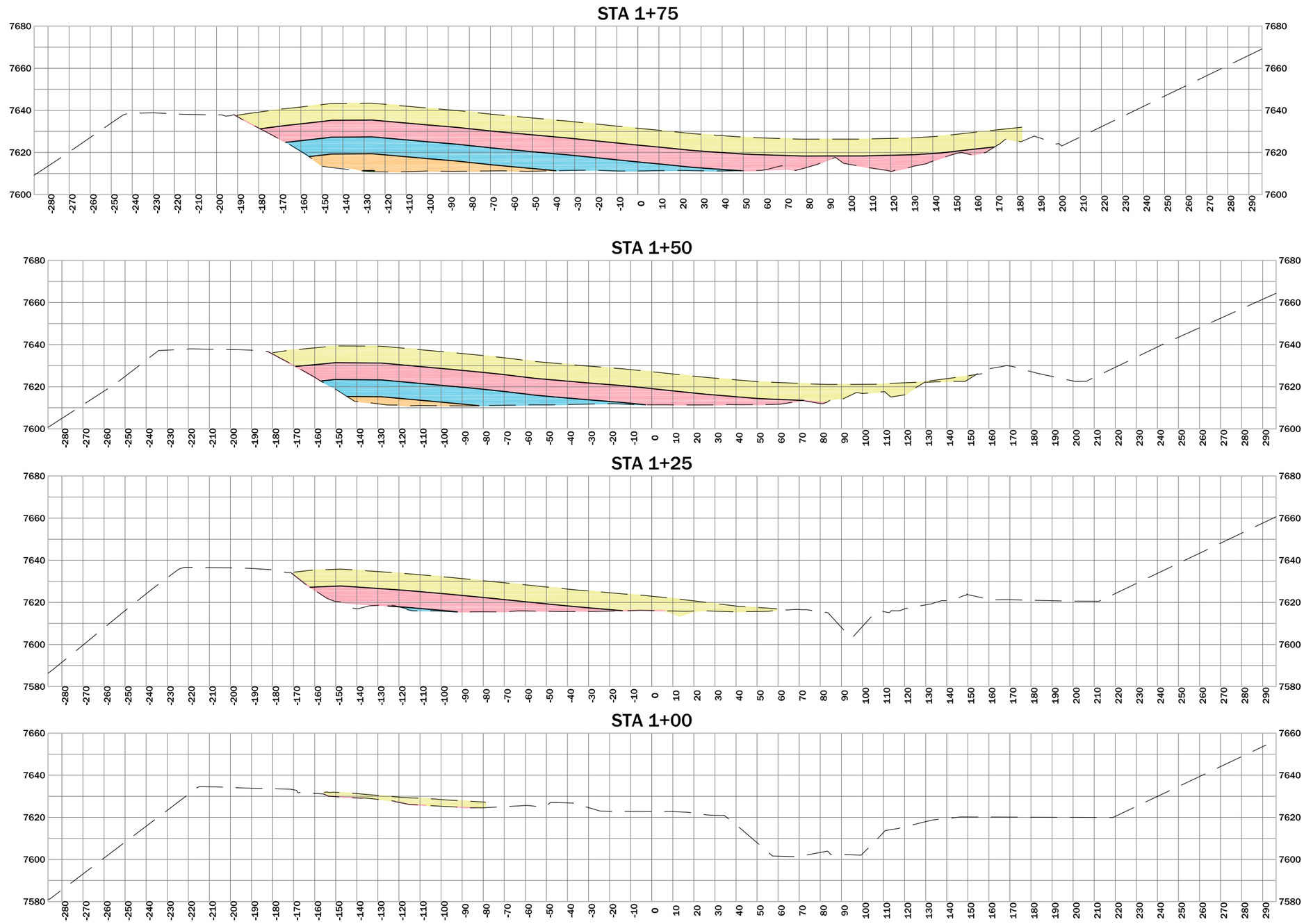


LEGEND

- 0-8 FEET
- 8-16 FEET
- 16-24 FEET
- 24-32 FEET
- 34-40 FEET
- 40-46.75 FEET

DISPLAYED AS:

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

SCALE IN FEET
0 25 50

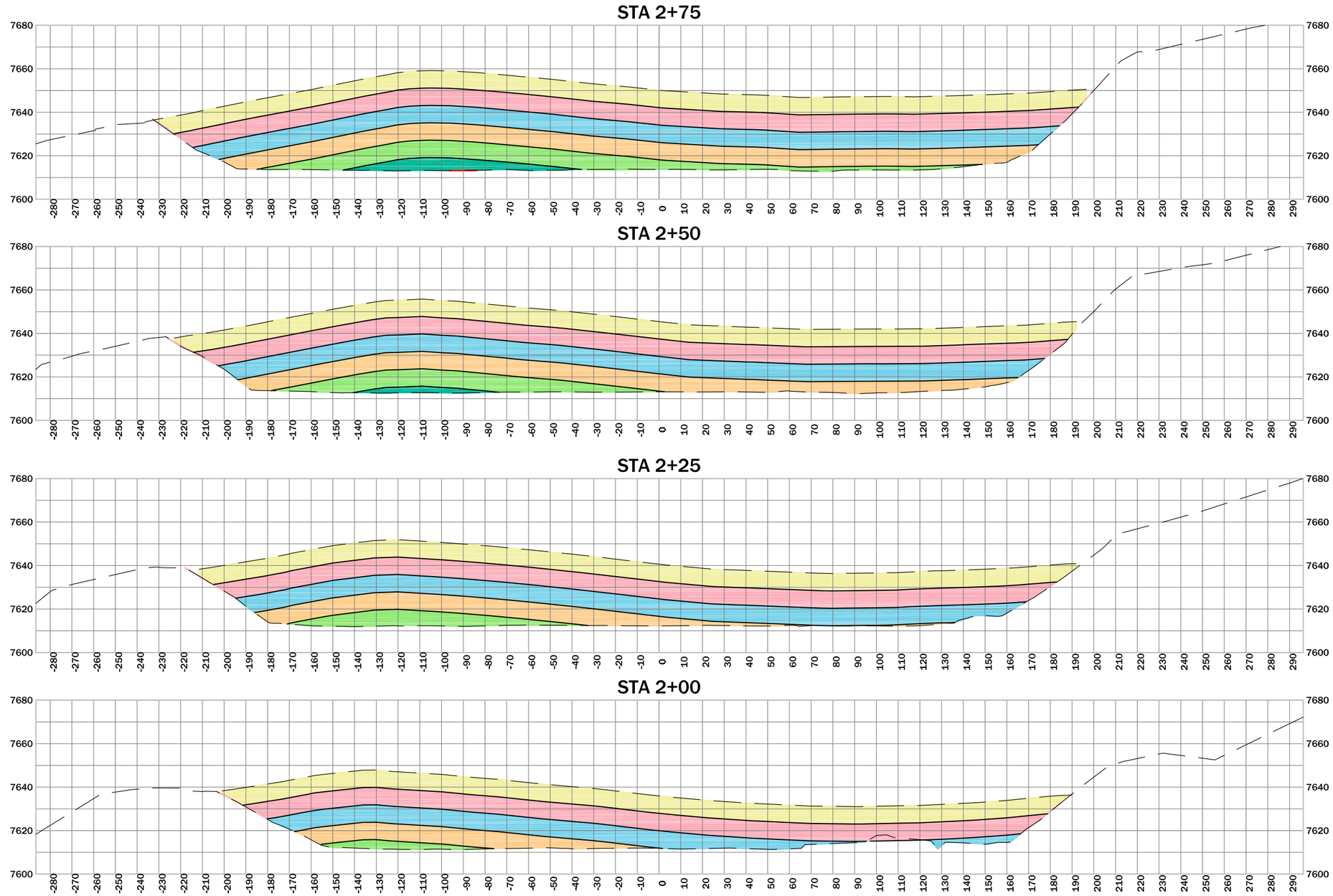
FIGURE 3-2

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

REPOSITORY ASSAY SAMPLE DEPTHS STATION 1+00 TO 1+75

DATE: 11/4/13

12/19/2013 12:26:08 PM P:\DEQ\MCLAREN\2013\DWG\REPOSITORY REPORT\MCL-REP-FG-XSF-001-13.DWG



LEGEND

- 0-8 FEET
- 8-16 FEET
- 16-24 FEET
- 24-32 FEET
- 34-40 FEET
- 40-46.75 FEET

DISPLAYED AS:

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

SCALE IN FEET
0 25 50

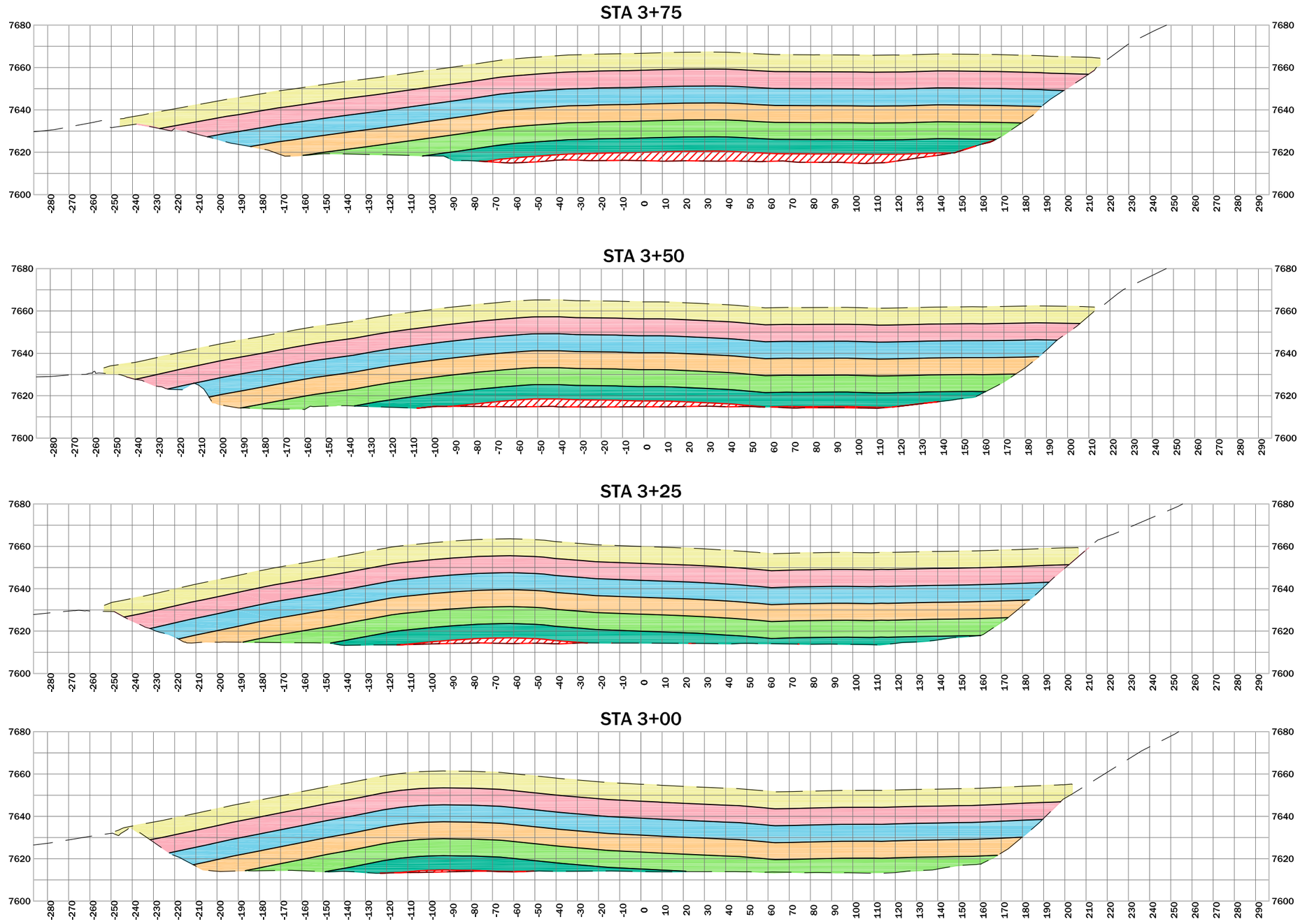
FIGURE 3-3

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

REPOSITORY ASSAY SAMPLE DEPTHS STATION 2+00 TO 2+75

DATE: 11/4/13

12/19/2013 12:26:27 PM P:\DEQ\MCLAREN\2013\DWG\REPOSITORY REPORT\MCL-REP-FG-XSF-001-13.DWG



LEGEND

- 0-8 FEET
- 8-16 FEET
- 16-24 FEET
- 24-32 FEET
- 34-40 FEET
- 40-46.75 FEET
- NO DATA

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

SCALE IN FEET
0 25 50

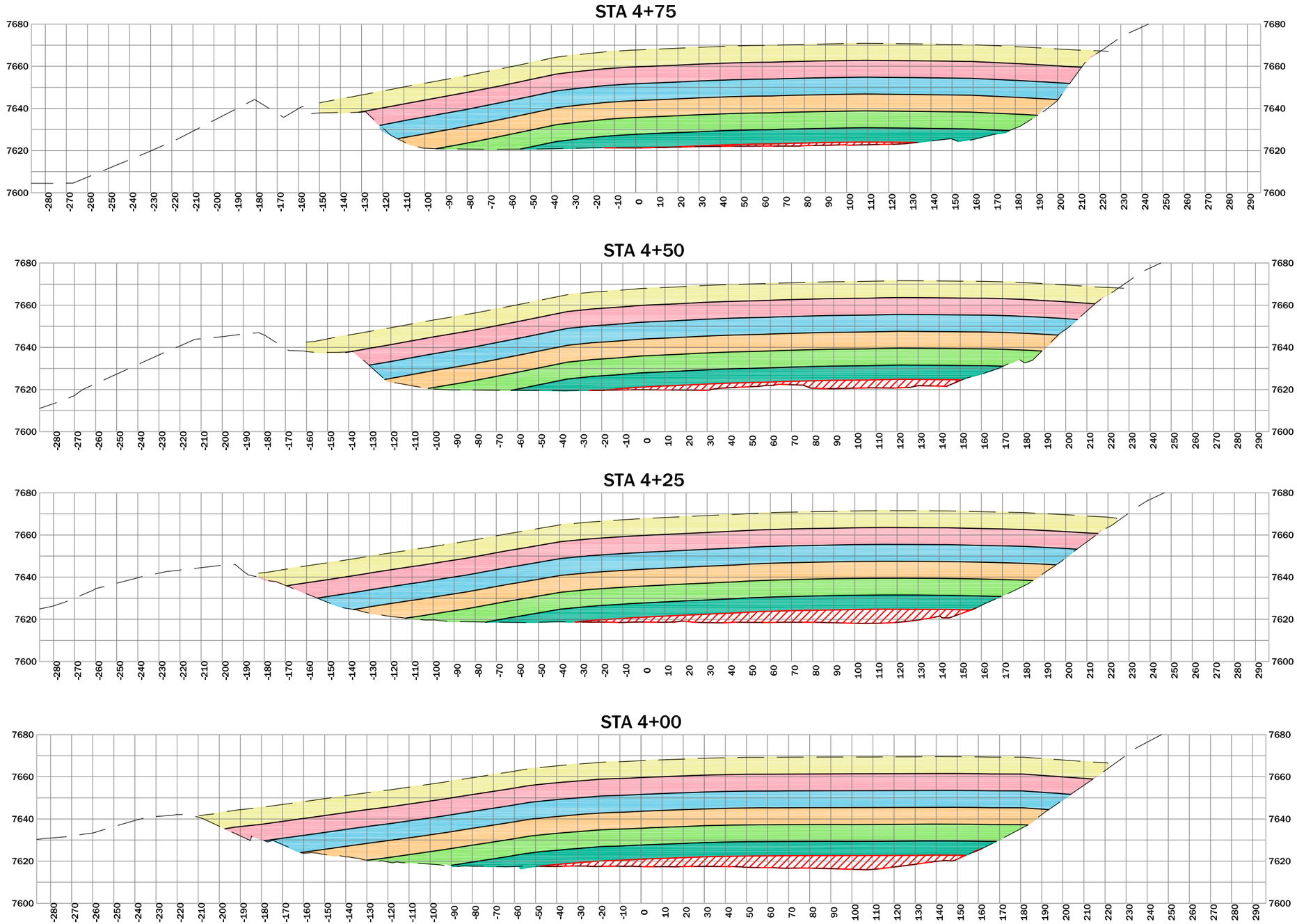
FIGURE 3-4

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

REPOSITORY ASSAY SAMPLE DEPTHS STATION 3+00 TO 3+75

DATE: 11/4/13

12/19/2013 12:26:49 PM P:\DEQ\MCLAREN\2013\DWG\REPOSITORY REPORT\MCL-REP-FG-XSF-001-13.DWG



LEGEND

- 0-8 FEET
- 8-16 FEET
- 16-24 FEET
- 24-32 FEET
- 34-40 FEET
- 40-46.75 FEET
- NO DATA

DISPLAYED AS:

COORD SYS/ZONE: NA

DATUM: NA

UNITS: FEET

SOURCE: PIONEER

SCALE IN FEET

0 25 50

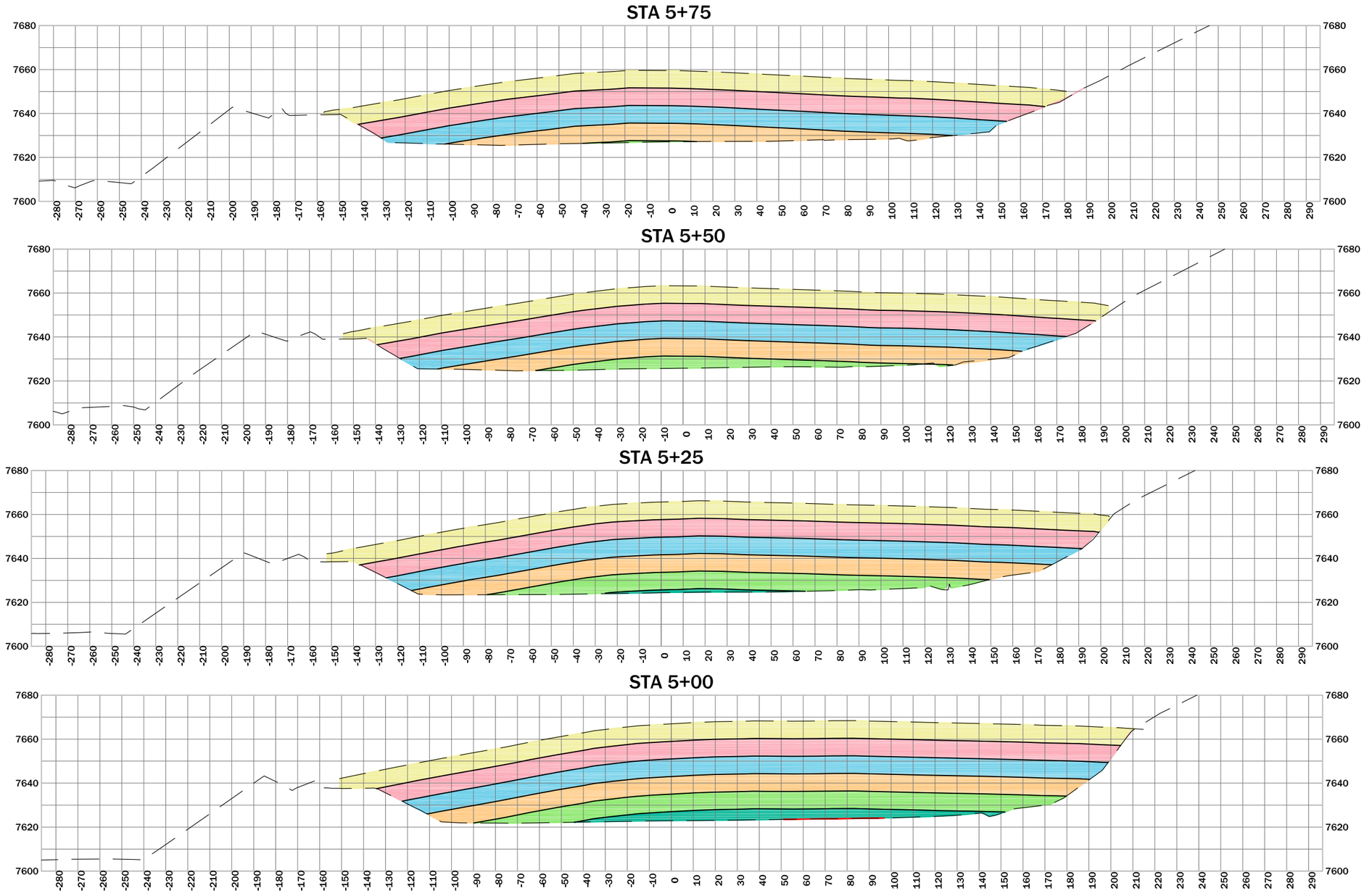
FIGURE 3-5

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

REPOSITORY ASSAY SAMPLE DEPTHS STATION 4+00 TO 4+75

DATE: 11/4/13

12/19/2013 12:27:05 PM P:\DEQ\MCLAREN\2013\DWG\REPOSITORY REPORT\MCL-REP-FG-XSF-001-13.DWG



LEGEND

- 0-8 FEET
- 8-16 FEET
- 16-24 FEET
- 24-32 FEET
- 34-40 FEET
- 40-46.75 FEET

DISPLAYED AS:

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

SCALE IN FEET
0 25 50

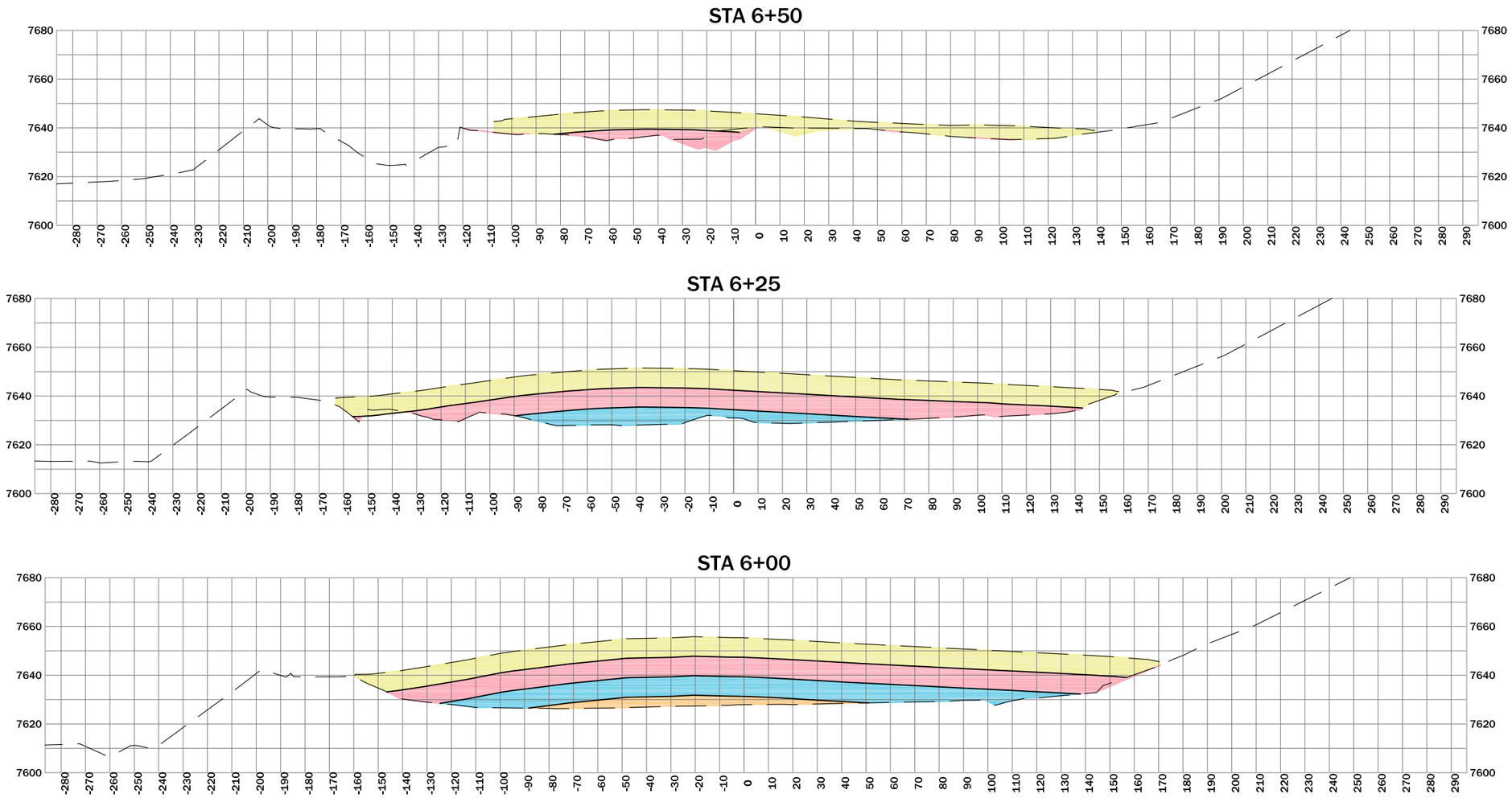
FIGURE 3-6

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

REPOSITORY ASSAY SAMPLE DEPTHS STATION 5+00 TO 5+75

DATE: 11/4/13

12/19/2013 12:27:24 PM P:\DEQ\MCLAREN\2013\DWG\REPOSITORY REPORT\MCL-REP-FG-XSF-001-13.DWG



LEGEND

- 0-8 FEET
- 8-16 FEET
- 16-24 FEET
- 24-32 FEET
- 34-40 FEET
- 40-46.75 FEET

DISPLAYED AS:

COORD SYS/ZONE: NA

DATUM: NA

UNITS: FEET

SOURCE: PIONEER

SCALE IN FEET

0 25 50

FIGURE 3-7

PIONEER TECHNICAL SERVICES, INC.

1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

REPOSITORY ASSAY SAMPLE DEPTHS STATION 6+00 TO 6+50

DATE: 11/4/13

12/19/2013 12:27:46 PM P:\DEQ\MCLAREN\2013\DWG\REPOSITORY REPORT\MCL-REP-FG-XSF-001-13.DWG

Total Volume Table (0-8 Foot)			
Station	FIll Area	FIll Volume	Cumulative Fill Vol
0+75.00	0.00	0.00	0.00
1+00.00	193.73	89.69	89.69
1+25.00	1568.12	815.67	905.36
1+50.00	2323.84	1801.83	2707.19
1+75.00	2915.08	2425.42	5132.61
2+00.00	3046.22	2759.86	7892.47
2+25.00	3185.94	2885.26	10777.74
2+50.00	3282.89	2994.83	13772.57
2+75.00	3386.25	3087.57	16860.13
3+00.00	3521.66	3198.11	20058.24
3+25.00	3639.87	3315.52	23373.76
3+50.00	3675.39	3386.69	26760.46
3+75.00	3626.97	3380.72	30141.18
4+00.00	3384.25	3245.94	33387.11
4+25.00	3183.52	3040.64	36427.75
4+50.00	3004.57	2864.86	39292.61
4+75.00	2892.82	2730.28	42022.88
5+00.00	2835.16	2651.85	44674.73
5+25.00	2789.46	2603.99	47278.72
5+50.00	2713.43	2547.63	49826.36
5+75.00	2611.43	2465.21	52291.57
6+00.00	2552.86	2390.87	54682.44
6+25.00	2493.96	2336.49	57018.93
6+50.00	1441.75	1822.09	58841.02
6+75.00	0.00	667.48	59508.50
7+00.00	0.00	0.00	59508.50

Total Volume Table (8-16 Foot)			
Station	Fill Area	Fill Volume	Cumulative Fill Vol
0+75.00	0.00	0.00	0.00
1+00.00	2.39	1.11	1.11
1+25.00	819.02	380.28	381.39
1+50.00	1612.42	1125.66	1507.05
1+75.00	2342.95	1831.19	3338.24
2+00.00	2871.47	2414.08	5752.32
2+25.00	3006.75	2721.40	8473.72
2+50.00	3136.39	2844.05	11317.77
2+75.00	3261.35	2961.92	14279.69
3+00.00	3365.37	3067.92	17347.61
3+25.00	3480.33	3169.31	20516.92
3+50.00	3460.75	3213.46	23730.38
3+75.00	3360.44	3157.96	26888.34
4+00.00	3187.67	3031.53	29919.87
4+25.00	2978.95	2854.92	32774.79
4+50.00	2750.63	2652.59	35427.38
4+75.00	2667.31	2508.31	37935.69
5+00.00	2638.10	2456.21	40391.89
5+25.00	2609.53	2429.46	42821.35
5+50.00	2525.27	2377.22	45198.57
5+75.00	2395.87	2278.31	47476.88
6+00.00	2305.93	2176.76	49653.64
6+25.00	1866.54	1931.70	51585.35
6+50.00	313.17	1009.12	52594.47
6+75.00	0.00	144.98	52739.45
7+00.00	0.00	0.00	52739.45

Total Volume Table (16-24 Foot)			
Station	Fill Area	Fill Volume	Cumulative Fill Vol
0+75.00	0.00	0.00	0.00
1+00.00	0.00	0.00	0.00
1+25.00	17.91	8.29	8.29
1+50.00	828.78	391.98	400.27
1+75.00	1311.11	990.69	1390.96
2+00.00	1904.94	1488.91	2879.87
2+25.00	2774.20	2166.27	5046.14
2+50.00	2953.80	2651.85	7697.99
2+75.00	3103.38	2804.25	10502.24
3+00.00	3213.12	2924.30	13426.54
3+25.00	3301.15	3015.86	16442.41
3+50.00	3198.42	3009.06	19451.47
3+75.00	3111.05	2921.05	22372.52
4+00.00	2938.39	2800.67	25173.19
4+25.00	2781.56	2648.12	27821.31
4+50.00	2621.81	2501.56	30322.87
4+75.00	2567.54	2402.48	32725.35
5+00.00	2495.49	2343.99	35069.34
5+25.00	2430.86	2280.72	37350.06
5+50.00	2298.08	2189.33	39539.39
5+75.00	2115.61	2043.38	41582.77
6+00.00	1693.04	1763.27	43346.03
6+25.00	686.32	1101.55	44447.59
6+50.00	0.00	317.74	44765.33
6+75.00	0.00	0.00	44765.33
7+00.00	0.00	0.00	44765.33

Total Volume Table (24-32 Foot)			
Station	Fill Area	Fill Volume	Cumulative Fill Vol
0+75.00	0.00	0.00	0.00
1+00.00	0.00	0.00	0.00
1+25.00	0.00	0.00	0.00
1+50.00	136.62	63.25	63.25
1+75.00	554.09	319.78	383.02
2+00.00	993.74	716.59	1099.62
2+25.00	1537.42	1171.84	2271.45
2+50.00	2364.33	1806.37	4077.82
2+75.00	2900.74	2437.53	6515.35
3+00.00	3017.90	2740.11	9255.46
3+25.00	3072.84	2819.79	12075.25
3+50.00	3048.75	2834.07	14909.32
3+75.00	2872.42	2741.28	17650.60
4+00.00	2661.28	2561.90	20212.50
4+25.00	2532.00	2404.29	22616.79
4+50.00	2450.33	2306.64	24923.43
4+75.00	2404.22	2247.48	27170.90
5+00.00	2310.68	2182.82	29353.72
5+25.00	2132.07	2056.83	31410.55
5+50.00	1855.66	1846.17	33256.72
5+75.00	1247.85	1436.81	34693.53
6+00.00	386.20	756.50	35450.04
6+25.00	0.00	178.80	35628.83
6+50.00	0.00	0.00	35628.83
6+75.00	0.00	0.00	35628.83
7+00.00	0.00	0.00	35628.83

Total Volume Table (32-40 Foot)			
Station	Fill Area	Fill Volume	Cumulative Fill Vol
0+75.00	0.00	0.00	0.00
1+00.00	0.00	0.00	0.00
1+25.00	0.00	0.00	0.00
1+50.00	0.00	0.00	0.00
1+75.00	2.15	1.00	1.00
2+00.00	204.07	95.47	96.47
2+25.00	621.29	382.11	478.58
2+50.00	1011.35	755.85	1234.43
2+75.00	1571.07	1195.56	2429.99
3+00.00	2413.88	1844.89	4274.88
3+25.00	2681.16	2358.82	6633.70
3+50.00	2689.51	2486.42	9120.11
3+75.00	2410.35	2361.04	11481.16
4+00.00	2283.37	2173.02	13654.18
4+25.00	2175.57	2064.33	15718.50
4+50.00	2118.07	1987.80	17706.30
4+75.00	2072.31	1939.99	19646.29
5+00.00	1889.14	1834.00	21480.30
5+25.00	1416.71	1530.48	23010.78
5+50.00	591.38	929.67	23940.45
5+75.00	22.19	284.06	24224.51
6+00.00	0.00	10.27	24234.78
6+25.00	0.00	0.00	24234.78
6+50.00	0.00	0.00	24234.78
6+75.00	0.00	0.00	24234.78
7+00.00	0.00	0.00	24234.78

Total Volume Table (40-46.75 Foot)			
Station	Fill Area	Fill Volume	Cumulative Fill Vol
0+75.00	0.00	0.00	0.00
1+00.00	0.00	0.00	0.00
1+25.00	0.00	0.00	0.00
1+50.00	0.00	0.00	0.00
1+75.00	0.00	0.00	0.00
2+00.00	0.00	0.00	0.00
2+25.00	0.00	0.00	0.00
2+50.00	128.94	59.69	59.69
2+75.00	395.00	242.57	302.26
3+00.00	692.74	503.58	805.84
3+25.00	1394.14	966.15	1771.99
3+50.00	1782.88	1470.84	3242.83
3+75.00	1657.66	1592.84	4835.67
4+00.00	1576.36	1497.23	6332.91
4+25.00	1469.78	1410.25	7743.16
4+50.00	1396.82	1327.13	9070.29
4+75.00	1306.37	1251.48	10321.77
5+00.00	687.81	923.23	11245.00
5+25.00	90.89	360.51	11605.51
5+50.00	0.00	42.08	11647.58
5+75.00	0.00	0.00	11647.58
6+00.00	0.00	0.00	11647.58
6+25.00	0.00	0.00	11647.58
6+50.00	0.00	0.00	11647.58
6+75.00	0.00	0.00	11647.58
7+00.00	0.00	0.00	11647.58

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

SCALE IN FEET
0 25 50

FIGURE 3-8

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

REPOSITORY ASSAY SAMPLE DEPTH VOLUME TABLES

DATE: 11/4/13

Tables

TABLE 1-1
MINING CLAIM AND MINERAL SURVEY NUMBER

Name of Claim	Mineral Survey Number
Ore Cache	MS 538
Idabelle	MS 10815 A
Idabelle	MS 10815 B
Copper Glance	MS 10814
Copper Glance No. 2	MS 10814B

TABLE 2-1
McLAREN TAILINGS ABANDONED MINE SITE
BARRICK GOLDEN SUNLIGHT MINE
BOTTLE ROLL LEACH TEST RESULTS 2008

	Composite	1A	1B	2A	2B	3A	Average
	Head Assay	0.125	0.117	0.111	0.091	0.118	0.112
Calculated Head Assay	1	0.117	0.109	0.083	0.099	0.126	
	2	0.119	0.106	0.086	0.094	0.126	
	Average	0.118	0.108	0.084	0.097	0.126	0.106
Calculated Gold Recovery	1	81.1%	70.6%	76.0%	65.8%	72.2%	
	2	79.0%	70.8%	75.5%	66.0%	72.1%	
	Average	80.1%	70.7%	75.7%	65.9%	72.1%	72.9%
NaCN Consumption, lbs/ton	1	3.08	4.23	2.34	6.28	2.55	
	2	3.03	3.97	2.10	6.94	2.42	
	Average	3.05	4.10	2.22	6.61	2.49	3.69
Lime Consumption, lbs/ton	1	102.4	100.8	100.8	111.2	106.2	
	2	100.5	98.9	99.5	104.9	107.1	
	Average	101.4	99.8	100.2	108.1	106.6	103.2
pH After Initial NaCN Addition	1	12.2	12.4	12.3	12.5	12.4	
	2	12.1	12.5	12.3	12.4	12.4	
	Average	12.1	12.4	12.3	12.4	12.4	12.3

Note: No lime additions were necessary during bottle roll tests. Lime consumption data shown are based on 5% lime addition before samples were delivered to Golden Sunlight.

NaCN - Sodium Cyanid

TABLE 3-1

McLAREN TAILINGS ABANDONED MINE SITE

REPOSITORY SAMPLE COLLECTION SUMMARY

AUGUST 2013

Borehole	Sample Interval (feet)	Metallurigal Sample ID	Environmental Sample ID	Engineering Sample ID
McL-BH1	0-8	McL-BH1M-0-8	MCL-Env-G2-080813	MCL-E-G2-080813
Northing: 280807.18				
Easting: 1857709.806				
Elevation: 7629.23				
McL-BH2	0-8	McL-BH2M-0-8-080513	MCL-Env-G1-080813	MCL-E-G1-080813
Northing: 280935.849	8-16	McL-BH2M-8-16-080513	MCL-Env-G1-080813	MCL-E-G1-080813
Easting: 1857711.62	16-24	McL-BH2M-16-24-080513	MCL-Env-G1-080813	MCL-E-G1-080813
Elevation: 7647.68	24-32	McL-BH2M-24-32-080513	MCL-Env-G1-080813	MCL-E-G1-080813
	32-36.5	McL-BH2M-32-36.5-080513	MCL-Env-G1-080813	MCL-E-G1-080813
McL-BH3	0-8	McL-BH3M-0-8-080613	MCL-Env-G2-080813	MCL-E-G2-080813
Northing: 280687.961	8-16	McL-BH3M-8-16-080613	MCL-Env-G2-080813	MCL-E-G2-080813
Easting: 1857836.035	16-24	McL-BH3M-16-24-080613	MCL-Env-G2-080813	MCL-E-G2-080813
Elevation: 7651.29	24-30.5	McL-BH3M-24-30.5-808613	MCL-Env-G2-080813	MCL-E-G2-080813
McL-BH4	0-8	McL-BH4M-0-8-080613	MCL-Env-G2-080813	MCL-E-G2-080813
Northing: 280805.97	8-16	McL-BH4M-8-16-080613	MCL-Env-G2-080813	MCL-E-G2-080813
Easting: 1857839.859	16-24	McL-BH4M-16-24-080613	MCL-Env-G2-080813	MCL-E-G2-080813
Elevation: 7656.16	24-32	McL-BH4M-24-32-080613	MCL-Env-G2-080813	MCL-E-G2-080813
	32-43.1	McL-BH4M-32-43.1-080613	MCL-Env-G2-080813	MCL-E-G2-080813
McL-BH5	0-8	McL-BH5M-0-8-080713	MCL-Env-G1-080813	MCL-E-G1-080813
Northing: 280937.1	8-16	McL-BH5M-8-16-080713	MCL-Env-G1-080813	MCL-E-G1-080813
Easting: 1857836.418	16-24	McL-BH5M-16-24-080713	MCL-Env-G1-080813	MCL-E-G1-080813
Elevation: 7658.57	24-32	McL-BH5M-24-32-080713	MCL-Env-G1-080813	MCL-E-G1-080813
	32-40	McL-BH5M-32-40-080713	MCL-Env-G1-080813	MCL-E-G1-080813
	40-44.75	McL-BH5M-40-44.75-080713	MCL-Env-G1-080813	MCL-E-G1-080813
McL-BH6	0-8	McL-BH6M-0-8-080713	MCL-Env-G1-080813	MCL-E-G1-080813
Northing: 281034.332	8-16	McL-BH6M-8-16-080713	MCL-Env-G1-080813	MCL-E-G1-080813
Easting: 1857837.809	16-24	McL-BH6M-16-24-080713	MCL-Env-G1-080813	MCL-E-G1-080813
Elevation: 7650.84	24-32	McL-BH6M-24-32-080713	MCL-Env-G1-080813	MCL-E-G1-080813
	32-36.9	McL-BH6M-32-36.9-080713	MCL-Env-G1-080813	MCL-E-G1-080813

TABLE 3-1
McLAREN TAILINGS ABANDONED MINE SITE
REPOSITORY SAMPLE COLLECTION SUMMARY
AUGUST 2013

Borehole	Sample Interval (feet)	Metallurigal Sample ID	Environmental Sample ID	Engineering Sample ID
McL-BH7	0-8	McL-BH7M-0-8-080613	MCL-Env-G4-080813	MCL-E-G4-080813
Northing: 280686.307	8-16	McL-BH7M-8-16-080613	MCL-Env-G4-080813	MCL-E-G4-080813
Easting: 1857962.288	16-24	McL-BH7M-16-24-080613	MCL-Env-G4-080813	MCL-E-G4-080813
Elevation: 7666.84	24-34.3	McL-BH7M-24-34.3-080613	MCL-Env-G4-080813	MCL-E-G4-080813
McL-BH8	0-8	McL-BH8M-0-8-080713	MCL-Env-G4-080813	MCL-E-G4-080813
Northing: 280810.826	8-16	McL-BH8M-8-16-080713	MCL-Env-G4-080813	MCL-E-G4-080813
Easting: 1857963.214	16-24	McL-BH8M-16-24-080713	MCL-Env-G4-080813	MCL-E-G4-080813
Elevation: 7665.56	24-32	McL-BH8M-24-32-080713	MCL-Env-G4-080813	MCL-E-G4-080813
	32-40	McL-BH8M-32-40-080713	MCL-Env-G4-080813	MCL-E-G4-080813
	40-46.75	McL-BH8M-40-46.75-080713	MCL-Env-G4-080813	MCL-E-G4-080813
McL-BH9	0-8	McL-BH9M-0-8-080713	MCL-Env-G3-080813	MCL-E-G3-080813
Northing: 280928.452	8-16	McL-BH9M-8-16-080713	MCL-Env-G3-080813	MCL-E-G3-080813
Easting: 1857960.843	16-24	McL-BH9M-16-24-080713	MCL-Env-G3-080813	MCL-E-G3-080813
Elevation: 7660.95	24-32	McL-BH9M-24-32-080813	MCL-Env-G3-080813	MCL-E-G3-080813
	32-42	McL-BH9M-32-42-080813	MCL-Env-G3-080813	MCL-E-G3-080813
McL-BH10	0-8	McL-BH10M-0-8-080813	MCL-Env-G3-080813	MCL-E-G3-080813
Northing: 280813.811	8-16	McL-BH10M-8-16-080813	MCL-Env-G3-080813	MCL-E-G3-080813
Easting: 1858087.917	16-24	McL-BH10M-16-24-080813	MCL-Env-G3-080813	MCL-E-G3-080813
Elevation: 7660.45	24-34	McL-BH10M-24-34-080813	MCL-Env-G3-080813	MCL-E-G3-080813
McL-BH11	0-8	McL-BH11M-0-8-080513	MCL-Env-G3-080813	MCL-E-G3-080813
Northing: 280934.638	8-16	McL-BH11M-8-16-080513	MCL-Env-G3-080813	MCL-E-G3-080813
Easting: 1858085.261	16-24	McL-BH11M-16-24-080513	MCL-Env-G3-080813	MCL-E-G3-080813
Elevation: 7659.18	24-32.5	McL-BH11M-24-32.5-080513	MCL-Env-G3-080813	MCL-E-G3-080813
McL-BH12	0-8	McL-BH12M-0-8-080813	MCL-Env-G2-080813	MCL-E-G2-080813
Northing: 280771.942	8-18.4	McL-BH12M-8-18.4-080813	MCL-Env-G2-080813	MCL-E-G2-080813
Easting: 1857726.992				
Elevation: 7629.47				

Elevation as measured above mean sea level on August 28, 2013

TABLE 3-2
Summary of Bolehole Composite Samples

Environmental/Engineering Samples	Borehole Groups
ENV-G1/E-G1	2 , 5, 6
ENV-G2/E-G2	1, 3, 4, 12
ENV-G3/E-G3	9, 10, 11
ENV-G4/E-G4	7, 8

TABLE 3-3
McLAREN TAILINGS ABANDONED MINE SITE
REPOSITORY METALLURGICAL RESULTS
AUGUST 2013

Analytical Method	Au-AA23	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61
Element	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	K	La	Mg	Mn	Mo
Unit of Measurement	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%	ppm	%	ppm	ppm
Borehole																			
McL-BH1M-0-8-080513	2.86	11.5	3.62	28	80	1.8	36	5.09	0.8	20	48	2,410	21.2	30	1.32	20	1.28	344	2
McL-BH2M-0-8-080513	3.74	10.6	3.63	33	80	1.9	25	4.75	<0.5	16	42	2,590	20.9	30	1.26	20	1.19	414	2
McL-BH2M-8-16-080513	2.12	9.5	3.55	38	80	1.8	22	5.63	0.8	16	43	2,200	20.4	30	1.25	20	1.35	471	2
McL-BH2M-16-24-080513	2.25	8.9	3.7	24	90	1.6	21	6.16	0.9	19	44	2,690	18.75	30	1.27	20	1.55	503	2
McL-BH2M-24-32-080513	3.1	10.2	3.16	32	70	1.7	19	3.66	0.8	33	33	3,350	25.8	30	1.09	20	0.96	399	1
McL-BH2M-32-36.5-080513	2.63	12.2	3.7	34	70	1.7	28	4.94	0.9	21	39	3,840	21.4	30	1.28	20	1.22	540	3
McL-BH3M-0-8-080613	2.53	9.2	3.28	28	70	1.8	21	5.96	0.8	20	40	2,820	21.8	20	1.08	20	1.3	373	1
McL-BH3M-8-16-080613	2.47	11.2	3.88	33	70	2	24	4.96	0.7	15	44	2,400	20.4	30	1.42	30	1.25	505	3
McL-BH3M-16-24-080613	3.44	9.9	3.31	31	100	1.7	20	4	<0.5	19	38	2,750	21.9	30	1.19	20	0.96	393	2
McL-BH3M-24-30.5-808613	3.35	10.7	3.25	32	70	2	28	3.35	<0.5	15	44	2,240	23.8	30	1.18	20	1.13	351	2
McL-BH4M-0-8-080613	2.26	10.7	3.61	33	80	1.9	22	5.24	0.6	12	47	2,260	19.55	30	1.34	20	1.28	415	2
McL-BH4M-8-16-080613	3.47	10.5	2.89	47	70	2.7	32	4.26	0.7	19	35	2,250	26.1	30	1.07	20	1	383	2
McL-BH4M-16-24-080613	2.87	9.2	3.15	30	60	1.7	20	4.46	0.7	21	38	2,860	22.7	30	1.12	20	1.13	446	1
McL-BH4M-24-32-080613	2.86	10.1	3.01	40	70	2.1	25	4.38	0.6	18	36	2,480	24.8	30	1.11	20	1.04	291	1
McL-BH4M-32-43.1-080613	2.57	9.8	3.54	26	70	1.7	20	5.65	0.7	18	43	2,340	20.8	30	1.22	20	1.47	500	2
McL-BH5M-0-8-080713	3.55	12.9	3.51	37	110	2.6	29	3.81	<0.5	11	44	2,180	22.9	30	1.36	20	1.18	398	1
McL-BH5M-8-16-080713	2.35	9.2	3.69	33	80	2	22	4.21	0.7	15	43	2,570	21.8	30	1.34	20	1.29	430	1
McL-BH5M-16-24-080713	2.37	9.4	3.7	37	90	1.8	23	4.44	0.5	15	45	2,750	21.2	30	1.34	20	1.22	491	2
McL-BH5M-24-32-080713	2.63	9.3	3.48	35	70	1.9	23	4.96	0.8	16	45	2,600	21.8	30	1.23	20	1.38	434	1
McL-BH5M-32-40-080713	2.86	11	3.5	29	110	1.7	25	4.23	0.7	26	37	3,530	23.8	30	1.23	20	1.12	463	2
McL-BH5M-40-44.75-080713	2.62	11.1	3.58	39	90	1.7	24	4.49	0.9	19	36	3,470	21.2	30	1.22	20	1.05	459	2
McL-BH6M-0-8-080713	2.57	12.7	3.79	33	190	2.3	27	5.18	0.9	14	51	1,800	21.6	30	1.39	30	1.31	420	2
McL-BH6M-8-16-080713	3.52	9.9	3.87	30	160	1.8	20	4.21	0.9	16	44	2,780	21.7	30	1.32	30	1.31	494	3
McL-BH6M-16-24-080713	1.44	8.8	4.28	33	240	1.5	19	7.6	0.9	16	59	1,910	15.75	30	1.37	30	1.93	482	3
McL-BH6M-24-32-080713	1.815	10.8	4.43	28	230	1.7	19	5.95	1.1	15	53	2,710	18.55	30	1.48	30	1.83	614	3
McL-BH6M-32-36.9-080713	2.08	12.9	4.23	34	210	1.9	27	4.99	1.3	15	44	3,500	20.8	40	1.43	30	1.67	610	4
McL-BH7M-0-8-080613	2.09	11.8	3.93	35	90	2	27	5.63	0.5	12	58	1,725	18.5	30	1.44	20	1.36	385	1
McL-BH7M-8-16-080613	2.46	8.9	3.71	29	80	2	20	4.55	0.7	17	49	2,600	21.5	30	1.27	20	1.35	475	3
McL-BH7M-16-24-080613	3.1	11.6	3.51	34	70	2.4	26	5.07	0.7	12	43	2,110	21.3	30	1.36	20	1.26	432	1
McL-BH7M-24-34.3-080613	4.38	9.6	3.04	32	80	1.9	26	3.39	<0.5	18	35	3,230	25.2	30	1.08	20	0.96	437	2

TABLE 3-3
McLAREN TAILINGS ABANDONED MINE SITE
REPOSITORY METALLURGICAL RESULTS
AUGUST 2013

Analytical Method	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61
Element	Na	Ni	P	Pb	S	Sb	Sc	Sr	Th	Ti	Tl	U	V	W	Zn
Unit of Measurement	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
Borehole															
McL-BH1M-0-8-080513	0.41	16	560	90	>10.0	<5	5	173	<20	0.16	<10	<10	37	120	122
McL-BH2M-0-8-080513	0.54	15	560	68	>10.0	<5	5	163	<20	0.14	<10	<10	35	80	113
McL-BH2M-8-16-080513	0.36	16	550	74	>10.0	<5	5	164	<20	0.15	<10	<10	37	90	138
McL-BH2M-16-24-080513	0.38	17	540	69	>10.0	<5	5	173	<20	0.15	<10	10	36	90	133
McL-BH2M-24-32-080513	0.25	16	470	71	>10.0	<5	4	112	<20	0.13	<10	<10	29	150	109
McL-BH2M-32-36.5-080513	0.26	14	580	119	>10.0	<5	5	130	<20	0.15	<10	<10	34	110	148
McL-BH3M-0-8-080613	0.4	17	480	74	>10.0	<5	5	176	<20	0.14	<10	<10	34	110	131
McL-BH3M-8-16-080613	0.38	18	580	90	9.7	<5	5	158	<20	0.15	<10	<10	38	90	146
McL-BH3M-16-24-080613	0.32	16	500	72	>10.0	<5	5	132	<20	0.13	<10	<10	32	90	113
McL-BH3M-24-30.5-808613	0.34	17	500	85	>10.0	23	5	138	<20	0.14	<10	<10	35	110	116
McL-BH4M-0-8-080613	0.34	16	530	79	9.24	<5	5	153	<20	0.15	<10	<10	36	100	134
McL-BH4M-8-16-080613	0.26	14	440	75	>10.0	<5	4	120	<20	0.12	10	<10	30	110	124
McL-BH4M-16-24-080613	0.3	16	490	66	>10.0	<5	5	135	<20	0.13	<10	<10	31	110	121
McL-BH4M-24-32-080613	0.25	12	430	65	>10.0	<5	4	120	<20	0.13	<10	<10	30	130	104
McL-BH4M-32-43.1-080613	0.36	21	550	74	>10.0	<5	5	169	<20	0.15	<10	<10	36	110	127
McL-BH5M-0-8-080713	0.38	15	490	75	8.22	<5	5	154	<20	0.15	<10	<10	36	110	122
McL-BH5M-8-16-080713	0.38	15	500	79	>10.0	<5	5	161	<20	0.15	<10	<10	36	90	123
McL-BH5M-16-24-080713	0.32	19	580	81	>10.0	<5	5	136	<20	0.15	<10	<10	36	90	138
McL-BH5M-24-32-080713	0.36	16	500	69	>10.0	<5	5	159	<20	0.14	<10	<10	36	90	130
McL-BH5M-32-40-080713	0.25	15	530	83	>10.0	<5	5	118	<20	0.14	<10	<10	32	130	132
McL-BH5M-40-44.75-080713	0.22	13	580	88	>10.0	<5	5	117	<20	0.14	<10	<10	32	120	140
McL-BH6M-0-8-080713	0.43	16	550	98	9.6	10	6	189	<20	0.16	<10	10	40	120	124
McL-BH6M-8-16-080713	0.54	15	590	76	>10.0	7	5	167	<20	0.15	<10	<10	36	90	140
McL-BH6M-16-24-080713	0.58	19	620	70	7.5	<5	7	261	<20	0.18	<10	<10	46	90	114
McL-BH6M-24-32-080713	0.48	19	640	96	9.77	8	7	198	<20	0.18	<10	10	43	90	150
McL-BH6M-32-36.9-080713	0.28	15	630	108	>10.0	9	6	133	<20	0.17	<10	<10	37	110	161
McL-BH7M-0-8-080613	0.57	17	570	79	6.77	<5	6	220	<20	0.17	<10	<10	43	110	120
McL-BH7M-8-16-080613	0.45	19	500	68	>10.0	<5	5	178	<20	0.15	<10	<10	36	100	129
McL-BH7M-16-24-080613	0.35	16	550	84	9.19	<5	5	150	<20	0.15	<10	<10	36	100	131
McL-BH7M-24-34.3-080613	0.27	16	460	81	>10.0	<5	4	109	<20	0.12	<10	<10	30	80	131

TABLE 3-3
McLAREN TAILINGS ABANDONED MINE SITE
REPOSITORY METALLURGICAL RESULTS
AUGUST 2013

Analytical Method	Au-AA23	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61
Element	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	K	La	Mg	Mn	Mo
Unit of Measurement	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%	ppm	%	ppm	ppm
Borehole																			
McL-BH8M-0-8-080713	2.47	11.6	4.09	41	210	2.3	21	4.91	1	10	52	2,020	21	30	1.41	30	1.34	408	2
McL-BH8M-8-16-080713	2.8	10.7	3.63	36	160	2	23	5.74	1	15	43	2,790	22.5	30	1.24	30	1.41	503	2
McL-BH8M-16-24-080713	3.32	12.7	3.83	36	170	2.4	27	5.02	1.1	13	43	2,470	23.1	30	1.37	30	1.27	481	4
McL-BH8M-24-32-080713	3.86	10.4	3.12	37	150	1.9	20	3.89	0.9	23	34	3,060	27.9	30	1.08	20	1.11	412	3
McL-BH8M-32-40-080713	3.73	12.1	2.85	50	160	2.1	26	4.45	1.1	22	35	2,340	27.8	30	1.03	30	0.97	251	2
McL-BH8M-40-46.75-080713	2.92	10.9	3.54	46	170	1.9	23	6.94	0.9	17	43	2,300	22.2	30	1.2	30	1.42	450	3
McL-BH9M-0-8-080713	2.62	12.3	4.1	39	180	2.5	26	4.19	1	16	52	2,000	23.7	30	1.49	30	1.34	406	2
McL-BH9M-8-16-080713	2.82	11	3.71	49	210	2.4	29	4.61	1.1	14	45	2,670	24.6	30	1.35	30	1.22	418	3
McL-BH9M-16-24-080713	2.92	10.6	4.16	39	140	2	19	4.46	1.2	15	52	2,640	21.7	30	1.41	30	1.18	505	4
McL-BH9M-24-32-080813	4.05	10.8	2.92	39	180	2	18	3.45	0.7	21	35	3,020	27.9	30	1.02	20	0.88	309	3
McL-BH9M-32-42-080813	4.2	12.6	2.82	49	170	2.3	24	3.13	1.3	23	33	2,990	30	30	1.04	20	0.97	298	2
McL-BH10M-0-8-080813	2.4	9.4	3.93	38	150	2.1	23	5.2	0.8	16	52	2,510	22.8	30	1.34	30	1.42	468	2
McL-BH10M-8-16-080813	3.06	11	3.83	37	170	2.1	18	5.46	1.2	18	46	2,590	22.8	30	1.32	30	1.29	421	3
McL-BH10M-16-24-080813	2.98	12.9	3.63	34	150	1.9	22	5.59	1	17	41	3,150	23.6	30	1.27	30	1.27	470	3
McL-BH10M-24-34-080813	3.31	10.6	3.08	35	180	1.9	23	3.81	1.2	31	38	2,700	28.7	30	1.08	20	1.09	361	2
McL-BH11M-0-8-080513	2.33	10.7	4.25	36	240	2.1	22	4.94	1	14	54	2,330	20.3	30	1.52	30	1.51	460	2
McL-BH11M-8-16-080513	2.82	11.1	3.59	45	210	2.4	22	4.98	0.8	11	38	2,420	23.5	30	1.28	30	1.21	435	3
McL-BH11M-16-24-080513	4.52	10.3	2.86	39	180	2	16	2.94	1.1	21	30	4,020	30.1	30	0.99	20	0.94	448	2
McL-BH11M-24-32.5-080513	2.54	12.1	3.79	42	210	2	20	4.56	1.2	20	58	1,990	21.8	30	1.34	30	1.2	363	4
McL-BH12M-0-8-080813	4.11	11.2	3.77	36	210	2	24	4.64	1.3	17	43	2,230	21.4	30	1.29	30	1.05	349	4
McL-BH12M-8-18.4-080813	3.2	11.1	3.42	40	200	2	23	4.88	1.5	21	43	2,550	24.1	30	1.19	20	1.3	400	2

TABLE 3-3
McLAREN TAILINGS ABANDONED MINE SITE
REPOSITORY METALLURGICAL RESULTS
AUGUST 2013

Analytical Method	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61	ME-ICP61
Element	Na	Ni	P	Pb	S	Sb	Sc	Sr	Th	Ti	Tl	U	V	W	Zn
Unit of Measurement	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
Borehole															
McL-BH8M-0-8-080713	0.49	18	600	91	8.83	<5	6	200	<20	0.17	<10	<10	43	90	121
McL-BH8M-8-16-080713	0.34	16	540	95	>10.0	9	5	163	<20	0.15	<10	10	37	100	133
McL-BH8M-16-24-080713	0.35	13	570	94	>10.0	9	5	158	<20	0.15	<10	10	38	110	152
McL-BH8M-24-32-080713	0.24	13	490	71	>10.0	8	4	120	<20	0.12	<10	10	30	120	117
McL-BH8M-32-40-080713	0.24	13	420	62	>10.0	11	4	120	<20	0.12	<10	10	29	160	96
McL-BH8M-40-46.75-080713	0.36	11	550	84	>10.0	7	5	177	<20	0.15	<10	10	37	100	133
McL-BH9M-0-8-080713	0.44	13	580	91	9.97	6	6	179	<20	0.17	<10	10	40	120	129
McL-BH9M-8-16-080713	0.33	13	580	86	>10.0	12	5	158	<20	0.15	<10	10	38	120	146
McL-BH9M-16-24-080713	0.43	20	640	90	>10.0	10	6	166	<20	0.17	<10	10	42	90	147
McL-BH9M-24-32-080813	0.23	12	450	62	>10.0	6	4	106	<20	0.11	<10	10	28	130	109
McL-BH9M-32-42-080813	0.19	10	430	70	>10.0	10	4	96	<20	0.12	<10	10	27	140	106
McL-BH10M-0-8-080813	0.47	17	570	82	>10.0	10	6	202	<20	0.15	<10	10	40	90	122
McL-BH10M-8-16-080813	0.44	14	600	98	>10.0	9	5	189	<20	0.16	<10	10	38	130	146
McL-BH10M-16-24-080813	0.3	13	550	86	>10.0	9	5	148	<20	0.15	<10	10	35	120	135
McL-BH10M-24-34-080813	0.3	14	460	70	>10.0	20	4	132	<20	0.13	<10	10	31	140	114
McL-BH11M-0-8-080513	0.47	20	600	91	10	7	6	201	<20	0.17	<10	<10	42	90	138
McL-BH11M-8-16-080513	0.31	15	540	88	>10.0	15	5	146	<20	0.15	<10	<10	34	110	128
McL-BH11M-16-24-080513	0.21	15	420	74	>10.0	11	4	99	<20	0.11	<10	10	27	110	118
McL-BH11M-24-32.5-080513	0.45	16	610	102	9.9	13	5	178	<20	0.16	<10	10	40	110	127
McL-BH12M-0-8-080813	0.47	13	570	74	>10.0	17	5	166	<20	0.15	<10	<10	34	100	105
McL-BH12M-8-18.4-080813	0.34	16	510	68	>10.0	7	5	158	<20	0.14	<10	10	35	100	108

TABLE 3-4
McLAREN TAILINGS ABANDONED MINE SITE
REPOSITORY ENVIRONMENTAL RESULTS
AUGUST 2013

Sample ID	Composite of Boreholes	pH s.u.	Organic Matter (LOI) %	Al mg/Kg	As mg/Kg	Ba mg/Kg	Cd mg/Kg	Co mg/Kg	Cr mg/Kg	Cu mg/Kg	Fe mg/Kg	Mn mg/Kg	Ni mg/Kg	Pb mg/Kg	Sb mg/Kg	Zn mg/Kg	Hg mg/Kg
MCL-ENV-G1-080813	2, 5 and 6	11.0	1.6	10,000	23	77	<1	12	25	1,980	147,000	354	14	65	<1	100	<0.5
MCL-Env-G2-080813	1, 3, 4 and 12	11.5	1.4	9,720	22	71	<1	13	27	1,690	144,000	282	16	60	<1	92	<0.5
MCL-Env-G3-080813	9, 10 and 11	11.4	1.4	10,500	26	77	<1	12	28	1,840	161,000	312	15	61	<1	107	<0.5
MCL-Env-G4-080813	7 and 8	12.1	1.3	10,200	24	75	<1	10	27	1,760	147,000	319	15	70	<1	95	<0.5

s.u - standard units
LOI - Loss on Ignition
mg/Kg - milligram per kilogram
Al -Aluminmum, As - Arsenic, Ba - Barium, Cd - Cadmium, Co - Colbalt, Cr - Chromium
Cu - Copper, Fe - Iron, Mn - Maganese, Ni -Nickle, Pb - Lead, Sb Antimony
Zn - Zinc, Hg - Mercury

TABLE 3-5
McLAREN TAILINGS ABANDONED MINE SITE
REPOSITORY ENGINEERING RESULTS
AUGUST 2013

Sample ID	Composite of Boreholes	Material Description	Liquid Limit	Plastic Limit	Plastic Index	%> 3/8 in.	%<#40	%<#200	In-Place/ Natural Moisture Content (%)	Maximum Dry Density pcf	Optimum Moisture Percent
MCL-E-G1-080813	2, 5 and 6	Tailings; Silty sand with gravel	NV	NP	NP	10	61	42	16.1	113.7	19.8
MCL-E-G2-080813	1, 3, 4 and 12	Tailings; Gravelly silt with sand	NV	NP	NP	10	72	60	15.8	113.2	19.8
MCL-E-G3-080813	9, 10 and 11	Tailings; Silty sand with gravel	NV	NP	NP	13	59	36	14.3	117.7	18.1
MCL-E-G4-080813	7 and 8	Tailings; Silty sand with gravel	NV	NP	NP	14	59	37	15.0	114.3	18.7

NV = Non-Viscous
NP = Non-Plastic
pcf =pounds cubic foot

Table 5-1
VOLUME CALCULATIONS FOR GOLD AND SILVER IN McLAREN TAILINGS

Tailings Volume Calculations

Average Maxiumum Dry Density (pcf)	Average Tailings in-situ Moisture Percent
114.7	15.3%

Au Value January 28, 2014
$1,252.70 per troy ounce

Gold

Depth Interval (ft)	Concentration Gold Troy oz/ton High	Average	Low	Cubic Yards of Tailings	Wet Tons of Tailings	Dry Tons of Tailings	Calculated amount of Au present in tailings (Troy oz) High	Average	Low	Calculated Value of Au present in tailings ($U.S.) High	Average	Low
0-8	0.119	0.081	0.061	59,508	92,145	78,047	9,302.4	6,324.2	4,730.4	$ 11,653,136.89	$ 7,922,337.39	$ 5,925,804.41
8-16	0.102	0.082	0.061	52,739	81,664	69,169	7,060.8	5,669.4	4,252.5	$ 8,845,048.66	$ 7,102,080.65	$ 5,327,131.58
16-24	0.131	0.085	0.042	44,765	69,316	58,711	7,695.8	4,973.3	2,451.8	$ 9,640,569.63	$ 6,230,111.48	$ 3,071,331.92
24-32	0.127	0.092	0.052	35,628	55,168	46,727	5,935.3	4,321.4	2,452.7	$ 7,435,175.54	$ 5,413,418.90	$ 3,072,526.88
32-40	0.122	0.087	0.060	24,234	37,525	31,784	3,871.3	2,775.9	1,917.2	$ 4,849,534.64	$ 3,477,424.25	$ 2,401,674.30
40-46.75	0.085	0.080	0.076	11,647	18,035	15,275	1,293.5	1,227.1	1,160.6	$ 1,620,401.36	$ 1,537,161.56	$ 1,453,921.77
46.75 - 53.75		No Data		3,479	5,387	4,563	-	-	-	$ -	$ -	$ -
				232,000	**359,240.4**	**304,277**	**35,159**	**25,291**	**16,965**	**$ 44,043,866.72**	**$ 31,682,534.23**	**$ 21,252,390.84**

Tailings Volume Calculations

Ag Value January 28, 2014
$19.54 per Troy ounce

Silver

Depth Interval (ft)	Concentration Silver Troy oz/ton High	Average	Low	Cubic Yards of Tailings	Wet Tons of Tailings	Dry Tons of Tailings	Calculated amount of Ag present in tailings (Troy oz) High	Average	Low	Calculated Value of Ag present in tailings ($U.S.) High	Average	Low
0-8	0.374	0.325	0.267	59,508	92,145	78,047	29,197.4	25,387.4	20,822.9	$ 570,516.51	$ 496,069.27	$ 406,879.99
8-16	0.325	0.301	0.258	52,739	81,664	69,169	22,466.1	20,806.7	17,852.6	$ 438,988.42	$ 406,563.14	$ 348,839.01
16-24	0.374	0.302	0.255	44,765	69,316	58,711	21,963.8	17,758.3	14,983.0	$ 429,172.07	$ 346,997.26	$ 292,768.55
24-32	0.351	0.303	0.270	35,628	55,168	46,727	16,396.7	14,174.3	12,602.4	$ 320,390.75	$ 276,965.89	$ 246,250.74
32-40	0.374	0.341	0.284	24,234	37,525	31,784	11,890.3	10,845.7	9,033.0	$ 232,336.78	$ 211,924.76	$ 176,503.91
40-46.75	0.322	0.319	0.316	11,647	18,035	15,275	4,917.2	4,872.9	4,828.6	$ 96,081.60	$ 95,216.00	$ 94,350.40
46.75 - 53.75		No Data		3,479	5,387	4,563	-	-	-	$ -	$ -	$ -
				232,000.0	**359,240**	**304,277**	**106,831**	**93,845**	**80,122**	**$ 2,087,486.13**	**$ 1,833,736.32**	**$ 1,565,592.60**

Table 5-1
VOLUME CALCULATIONS FOR COPPER IN McLAREN TAILINGS

Tailings Volume Calculations	Median Maxiumum Dry Density (pcf)	Average Tailings in-situ Moisture Percent	**Cu Value January 28, 2014**
	114.7	15.3%	**$3.268** per pound

Copper

	Concentration Copper Pounds/ton						Calculated amount of Cu present in tailings (Pounds)			Calculated Value of Cu present in tailings ($U.S.)		
Depth Interval (ft)	High	Average	Low	Cubic Yards of Tailings	Wet Tons of Tailings	Dry Tons of Tailings	High	Average	Low	High	Average	Low
0-8	4.82	4.48	3.45	59,508	92,145	78,047	376,186.3	349,585.3	269,262.0	$ 1,229,376.87	$ 1,142,444.79	$ 879,948.17
8-16	5.58	5.06	4.40	52,739	81,664	69,169	385,963.9	349,870.2	304,344.3	$ 1,261,330.03	$ 1,143,375.74	$ 994,597.15
16-24	8.04	5.47	3.82	44,765	69,316	58,711	472,036.1	321,149.0	224,275.9	$ 1,542,614.05	$ 1,049,514.78	$ 732,933.54
24-32	6.70	5.48	3.98	35,628	55,168	46,727	313,073.9	255,879.5	185,975.2	$ 1,023,125.46	$ 836,214.18	$ 607,767.06
32-40	7.68	6.18	4.68	24,234	37,525	31,784	244,099.5	196,423.8	148,748.1	$ 797,717.22	$ 641,913.08	$ 486,108.93
40-46.75	6.94	5.77	4.60	11,647	18,035	15,275	106,011.8	88,139.5	70,267.2	$ 346,446.51	$ 288,039.82	$ 229,633.13
46.75 - 53.75		No Data		3,479	5,387	4,563	-	-	-	$ -	$ -	$ -
				232,000	**359,240**	**304,277**	**1,897,372**	**1,561,047**	**1,202,873**	**$ 6,200,610.13**	**$ 5,101,502.39**	**$ 3,930,988.00**

Appendix A

Final Potential Economic Recovery Report (2008)

FINAL
POTENTIAL ECONOMIC RECOVERY FACT SHEET FOR THE McLAREN TAILINGS ABANDONED MINE SITE COOKE CITY, MONTANA

Prepared for:

Mr. Tom Henderson
Montana Department of Environmental Quality
Abandoned Mines Section
P.O. Box 200901
Helena, Montana 59620

Prepared by:

Pioneer Technical Services, Inc.
P.O. Box 3445
Butte, Montana 59702

September 2, 2008

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1
- 1.1 Purpose 1
  - 1.1.1 Background 1
- 1.2 Site Information 1
  - 1.2.1 Site Location and Topography 1
  - 1.2.2 Site Description/Ownership 2
- 1.3 Transportation 2
  - 1.3.1 Highway – Acceptable Route 2
  - 1.3.2 Railroad 3

2.0 SITE BACKGROUND 3
- 2.1 McLaren Mine Geology 3

3.0 MINING/MILLING SOURCE AREAS 4
- 3.1 MINE Dump 4
- 3.2 Tailings Impoundment 7

4.0 ECONOMIC CONSIDERATIONS 7
- 4.1 Investigations Completed 7
- 4.2 Mineralogy 11
- 4.3 Process Testing 11

5.0 ASSUMPTIONS - VOLUME ESTIMATES 11

6.0 REFERENCES 15

LIST OF FIGURES

Figure 1-1 Site Location Map, McLaren Tailings Site
Figure 1-2 McLaren Tailings Site Map Site, Cooke City, MT
Figure 1-3 McLaren Tailings Mill Site Claim Map
Figure 1-4 Acceptable Haul Route McLaren Tailings Site
Figure 1-5 Railhead Locations and Routes
Figure 1-6 Potential Mineral Processing Facilities
Figure 4-1 Bear creek Auger Holes, McLaren Tailings Site (1965)
Figure 4-2 MBMG Drill Holes, McLaren Tailings Site (1975)
Figure 4-3 Granada Test Holes McLaren Tailings Site (1987)

LIST OF TABLES

Page

Table 1-1 Mining Claim and Mineral Survey Number 2
Table 3-1 Physical Properties, McLaren Tailings Site Samples, September, 2000 and September, 2001 5
Table 3-2 McLaren Tailings Site Total Metals in Waste Rock and Tailings Results, August, 1993, September, 2000 and September, 2001 6
Table 4-1 Tailings Tonnage and Metal Values, McLaren Mill Site (Data provided by Bear Creek Mining Company, 1965) 8
Table 4-2 Chemical Analyses of Montana Bureau of Mines and Geology Drill Holes, McLaren Mill Site, 1975 9
Table 4-3 Granada Test Hole Analytical Results (1987) 10
Table 4-4 Granada Exploration Feasibility Study Calculated Weighted Averages 11
Table 5-1 Volume Calculations for Gold and Silver in McLaren Tailings 13

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this fact sheet is to assess the potential for economic recovery of precious metals through off-site reprocessing of mining wastes (tailings and mine dump materials/unprocessed ore) currently located at the McLaren Tailings Abandoned Mine Site near Cooke City, Montana. This fact sheet summarizes the known site information, site access, transportation infrastructure, and available metallurgical data.

1.1.1 Background

The Montana Department of Environmental Quality (DEQ) and the Montana Board of Environmental Review are the owners of the McLaren Tailings Abandoned Mine Site. The DEQ's Abandoned Mine Reclamation Program is planning to reclaim the McLaren Tailings Abandoned Mine Site to mitigate the impact to the environment and potential impacts to human health associated with mine wastes present at the site. Reclamation activities are anticipated to be initiated in 2009. The DEQ's Abandoned Mine Reclamation Program is evaluating the potential for processing the mine dumps and tailings to recover their mineral values as a possible reclamation alternative to reduce costs of reclamation of the site. The DEQ is searching for an interested private sector partner capable of handling transportation of the material away from the site as well as processing the materials. Several studies conducted at the site in the past have indicated that there is a potential for economic recovery of gold, silver, and copper from the mine dumps and tailings at the site. This fact sheet presents a summary of the available literature regarding site background and mineral values in the mine dumps and tailings.

1.2 SITE INFORMATION

1.2.1 Site Location and Topography

The McLaren Tailings Abandoned Mine Site is located within the New World Mining District in Park County in south-central Montana. It is bounded on the south by the Montana-Wyoming state line, on the west by Yellowstone National Park, and on the north and east by the Absaroka-Beartooth Wilderness area boundary. The area is characteristic of high alpine regions of the northern Rocky Mountains with elevations that range from approximately 7,000 feet above mean sea level (amsl) to over 10,000 feet amsl with the tailings impoundment and waste rock situated at approximately 7,600 feet amsl.

The general location of the McLaren Tailings Abandoned Mine Site is approximately one quarter of a mile east of Cooke City, in Park County, Montana. The site is situated at the headwaters of Soda Butte Creek in Section 25 of Township 19 South, Range 14 East of the Montana Principal Meridian (Figure 1-1).

The communities of Cooke City and Silver Gate, Montana, are the only population centers near the McLaren Tailings Abandoned Mine Site.

1.2.2 Site Description/Ownership

The DEQ and Montana Board of Environmental Review are the owners of the McLaren Tailings Abandoned Mine Site. The site is comprised of approximately 5 acres of mine dumps and unprocessed ore with an estimated volume of 56,200 cubic yards (cy) and 12 acres containing approximately 182,000 cy (DEQ/Pioneer, 2002) of tailings. The patented mill sites and placer claims that encompass the area where the tailings and waste rock are located are shown on Figures 1-2 and 1-3. The mining claim and mineral survey number is presented in Table 1-1.

TABLE 1-1
MINING CLAIM AND MINERAL SURVEY NUMBER

Name of Claim	Mineral Survey Number
Ore Cache	MS 538
Idabelle	MS 10815 A
Idabelle	MS 10815 B
Copper Glance	MS 10814
Copper Glance No. 2	MS 10814B

1.3 TRANSPORTATION

1.3.1 Highway – Acceptable Route

The site is accessed by traveling approximately one quarter of a mile east of Cooke City, Montana. The site is adjacent to, and accessed directly from U.S. Highway 212. The main body of tailings is located less than 500 feet south of U.S. Highway 212.

The access to McLaren tailings for commercial hauling is restricted in several of the following ways:

1. Commercial hauling through Yellowstone National Park is prohibited.

2. Beartooth Highway was designed by Civilian Conservation Corps (CCC) during the depression as a tourist highway and consists of a narrow two-lane switchback road at altitudes exceeding 10,900 feet at its highest point. The DEQ does not consider either of these routes as acceptable for hauling the mineralized material.

3. U.S. Highway 212 east of Cooke City to Wyoming State Route 296 is not plowed during the winter months. Consequently transportation is limited to late spring summer and fall.

The acceptable route to transport material from Cooke City begins with U.S. Highway 212 in Cooke City. U.S. Highway 212 joins Wyoming State Route 296 and should be followed until Wyoming State Route 296 connects with Wyoming State Route 120 for access to points north and south (see Figure 1-4).

1.3.2 Railroad

Railroad serving the area in Montana and Wyoming include Burlington Northern and Santa Fe (BNSF) Railway and Montana Rail Link. These railroads should be contracted for information regarding availability and cost of service to transport mineral material. Figure 1-5 shows the location of railheads in proximity to the McLaren Tailings Abandoned Mine Site.

1.3.3 Potential Processing Facilities

Potential mineral processing facilities that may be capable of extracting mineral from the McLaren Tailings Abandoned Mine Site located within the western U.S. and Canada has been identified and is shown on Figure 1-6. This is not an all inclusive list and other facilities capable of extracting minerals from the McLaren Tailings Abandoned Mine Site may exist. These facilities should be contacted for information regarding the processing of the mineral material.

2.0 SITE BACKGROUND

In 1933, the McLaren Gold Mines Company discovered the McLaren deposit on Henderson Mountain. The McLaren Mine ore consisted of limestone and shale replaced by auriferous pyrite with some copper mineralization. The ore was mined on a non-selective basis using open cut methods. In 1934, a flotation mill was constructed on the Copper Glance Mill Site near Cooke City and a tailings impoundment was constructed on the adjoining Horseshoe and Greeley Placer (Hart, 1935). The McLaren Mill produced a gold and copper concentrate that was shipped to Anaconda, Montana, for smelting. Extensive exploration work at the mine in 1937 and 1938 resulted in the discovery of additional reserves and the mill was remodeled to increase capacity. The McLaren Mill operated until 1953 when excess stripping ratios at the mine made the operation unprofitable (Goddard, 1953).

In 1969, Bear Creek Mining, the then site owner, rehabilitated the site by covering the eroding tailings with soil, demolished the buildings at the site, and excavated a new channel for Soda Butte Creek along the north side of the tailings impoundment (DOI-BSFW, 1970).

2.1 McLAREN MINE GEOLOGY

The McLaren Mine provided feed stock to the McLaren Mill from the time it was built in 1934 until its closure in 1953. The mine is located on the southwestern side of Fisher Mountain where the Park Shale and Meagher Limestone are believed to be in contact with a felsitic breccia (MBMG, 1975). The majority of the intrusive rocks within the mined area are altered by hydrothermal solutions. Altered limestone in the main wall of the mine is cut by both dikes and sills of felsite and perhaps dacite or andesite. These intrusive features are off set by thin sulfide-filled fault zones. Sulfide minerals seen at the surface of the McLaren Mine are concentrated in the zones of propylitic alteration, which consisted primarily of chlorite but also contained minor areas of epidote and calcite enrichment. Magnetite and pyrite are always present in varying

amounts. Pyritic replacement bodies appear to be restricted to the carbonate layers in the Park Shale with pervasive disseminated sulfide mineral present in the altered shale (MBMG, 1975).

3.0 MINING/MILLING SOURCE AREAS

3.1 MINE DUMP

It is reported that the McLaren Gold Mines Company stockpiled ore on the far east end of the McLaren Mill property (DEQ/Pioneer, 2002), near where the Daisy Creek Road crosses the U.S. Highway 212. A mine dump lies at the surface of the northeast end of the McLaren Tailings Abandoned Mine Site. Upon closure of the site, the mill located near the west end of the mine dump, was demolished and the mine dump was leveled during closure activities.

The mine dump encompasses approximately 5 acres with an estimated volume of 56,200 cy. The mine dump material is described as sandy clay in texture (DEQ/Pioneer, 2002). The breakdown of texture is described in Table 3-1.

TABLE 3-1
PHYSICAL PROPERTIES - McLAREN TAILINGS ABANDONED MINE SITE SAMPLES
September 2000 and September 2001

SAMPLE NO.	USDA TEXTURE	SOIL DESC.	RAPID HYDROMETER COARSE (%)	SAND (%)	SILT (%)	CLAY (%)	MAX DRY DENSITY (pcf)	SP. GRAVITY
							NR	NR
McLaren-WR1-2	Sandy Clay		28.6	62.0	2.0	36.0	NR	NR
McLaren-WR1-3	Sandy Clay		28.3	60.0	3.0	37.0	NR	NR
^MT-TP-A1	NR	Sandy Silt	NR	NR	NR	NR	117.50	3.23
^MT-TP-B1	NR	Silty Sand	NR	NR	NR	NR	135.70	3.38
^MT-TP-C1	NR	Sandy Silt	NR	NR	NR	NR	120.30	3.20
^MT-TP-D1	NR	Sandy Silt	NR	NR	NR	NR	122.50	3.29

^2000 Data

NR - Not Reported or Requested

WR - Waste Rock
TP - Tailings Material

pcf -pounds per cubic foot

SP. Gravity - Specific Gravity

Extensive iron staining on the surface is evident, and iron pyrite deposits are visible over most of the area. Concentrations of the following metals are significantly elevated above background in the mine dump: cadmium, copper, iron, and silver (Table 3-2).

TABLE 3-2
McLAREN TAILINGS SITE TOTAL METALS in WASTE ROCK AND TAILINGS RESULTS
August 1993, September 2000, and September 2001

SAMPLE NO.	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)
* 34-004-WR-1	6.18 UJ	45.3 J	101	1.99	5.13	17.5 J	846	105000	208	191	0.099	8.87	NR	80.1
McLaren-WR1-1	6.00	49.3	136	6.30	NR	19.9	1930	139000	144	199	0.110	5.80	24.2	76.3
McLaren-WR1-2	4.40 U	30.6	154	3.80	NR	33.8	937	104000	166	403	0.050	18.80	12.7	110
McLaren-WR1-3	4.60 U	50.1	51.5	15.80	NR	16.6	7600	267000	130	183	0.100	8.10	30.7	79.5
*34-004-TP-1	7.16 UJ	26.3 J	73.8	2.58	12.8	17.5 J	1700	107000	69	217	0.105	10.40	NR	81.9
*34-004-TP-2	6.71 UJ	41.6 J	69.3	3.00	6.79	21.6 J	3680	163000	104	576	0.179	14.40	NR	162
McLaren-TP1-1	6.40	6.7 U	92.2	0.88 U	NR	16.7	21.4	12500	15.4	293	0.020 U	14.40	0.86	31.7
McLaren-TP1-2	4.50 U	38.9	122.0	10.50	NR	16.2	1240	182000	97.6	102	0.190	4.20	18.0	48.7

U - Not Detected
J - Estimated Quantity
NR - Not Requested
WR - Waste Rock
TP - Tailings Pile
* - 1993 AMRB Hazardous Materials Inventory Analytical Results
mg/kg: milligram per kilogram

3.2 TAILINGS IMPOUNDMENT

The tailings impoundment covers an area of approximately 12 acres with an estimated volume of approximately 182,000 cy. The tailings consist of phyllosilicates (clays), tectosilicates (predominantly feldspars and quartz), sulfides (mostly pyrite), iron oxides (magnetite, goethite, and ferric hydroxide), and calcium salts (gypsum and calcite). Most of the material is coarser than 325 mesh (44 microns). The tailings exhibit fines contents ranging from 60 to 95 percent.

Overlying the tailings is a soil cap fill comprised of silty sands, gravels, and cobbles. The soil cover is classified as gravelly sandy loam in texture according to the U.S. Department of Agriculture (USDA) textural classification system. Utilizing the topographic map of the McLaren tailings and 1989 and 2001 data from the borings, the volume of cover soil overlying the tailings impoundment is approximately 57,000 cy (including the volume of the dam embankment).

4.0 ECONOMIC CONSIDERATIONS

4.1 INVESTIGATIONS COMPLETED

Several sampling programs designed to evaluate the mineral potential of the tailings have been completed since 1965. The first, by Bear Creek Mining, was composed of 47 auger holes. Results of the analysis are presented in Table 4-1 and a copy of their borehole locations are shown on Figure 4-1.

4.2 MINERAL ROYALTY

McLaren tailings are subject to a 10 percent net smelter return royalty held by:

Kentroy, Inc.
P.O. Box 11248
Salt Lake City, UT 84147

TABLE 4-1
TAILINGS TONNAGE AND METAL VALUES, McLAREN MILL SITE
(Data provided by Bear Creek Mining Company, 1965)

Hole No.	Depth (feet)	Tonnage (20 ft³/ton)	Silver (oz)	Gold (oz)	Copper (%)
A-10	3.7	577	0.20	0.155	0.44
B-9	0.8	1382	0.34	0.165	0.15
B-10	10.5	2625	0.57	0.130	0.39
B-11	2.0	501	0.49	0.090	0.15
B-12	7.2	1843	0.77	0.115	0.1
B-13	8.9	2122	0.24	0.080	0.39
C-9	1.5	398	0.31	0.170	0.34
C-10	5.6	1400	1.21	0.130	0.48
C-11	13.9	3475	0.32	0.200	0.29
C-12	13.7	3425	0.56	0.125	0.29
C-13	10.5	2625	0.47	0.110	0.24
C-14	15.3	4192	0.32	0.120	0.34
C-15	12.2	2840	0.40	0.070	0.34
D-8	2.3	633	0.22	0.125	0.24
D-9	1.9	475	0.20	0.080	0.24
D-10	7.9	1975	0.40	0.070	0.29
D-11	3.1	475	0.10	0.160	0.15
D-12	11.6	2900	0.41	0.155	0.48
D-13	14.4	3600	0.33	0.090	0.29
D-14	14.2	3550	0.35	0.100	0.24
D-15	17.1	1555	0.43	0.110	0.39
E-6	1.0	84	0.32	0.080	0.29
E-7	7.2	1802	0.26	0.140	0.39
E-8	10.7	2675	0.28	0.120	0.44
E-9	8.9	2225	0.29	0.170	0.48
E-10	8.1	2025	0.30	0.120	0.39
E-11	17.1	4275	0.43	0.100	0.29
E-12	9.9	2475	0.30	0.100	0.34
E-13	15.3	3825	0.10	0.110	0.39
E-14	11.6	2900	0.10	0.110	0.39
E-15	15.3	3500	0.11	0.095	0.39
F-6	3.1	310	0.32	0.080	0.29
F-7	18.4	6395	0.26	0.100	0.39
F-8	22.1	8071	0.11	0.110	0.34
F-9	18.2	5132	0.18	0.100	0.34
F-10	8.1	2025	0.18	0.090	0.39
F-11	17.0	4726	0.33	0.115	0.39
F-12	9.2	2558	0.26	0.120	0.34
F-13	16.7	4175	0.34	0.080	0.39
F-14	13.1	3505	0.50	0.100	0.39
F-15	18.6	4650	0.32	0.080	0.34
F-16	18.0	6926	0.34	0.080	0.44
G-10	14.1	11562	0.36	0.080	0.39
G-13	17.7	12376	0.32	0.100	0.39
G-15	31.7 (?)	22786	0.35	0.092	0.39
H-9	16.5	17166	0.30	0.085	0.44
H-14	21.0	21142	0.30	0.100	0.58

In 1975, the MBMG sampled 9 boreholes for analysis by atomic absorption. Results from the MBMG investigation are presented in Table 4-2 and borehole locations are shown on Figure 4-2.

TABLE 4-2
CHEMICAL ANALYSES OF MONTANA BUREAU OF MINES AND GEOLOGY DRILL HOLES
MCLAREN MILL SITE
1975

Drill Hole Number	Gold (oz/ton)	Silver (oz/ton)	Copper (wt %)	Lead (wt %)	Zinc (wt %)	SiO_2 (wt %)	Sulfur (wt %)	Iron (wt %)	Al_2O_3 (wt %)
22	0.050	0.18	0.349	0.150	0.100	28.22	14.14	26.96	21.84
23	0.100	0.16	0.336	0.200	0.075	33.20	11.07	22.82	27.54
25	0.070	1.42	0.246	0.175	0.012	29.36	11.24	24.60	20.90
28	0.090	0.26	0.362	0.125	0.075	26.12	14.56	27.94	20.42
29	0.120	0.24	0.384	0.100	0.100	28.22	13.49	25.19	20.01
30	0.280	0.32	0.297	0.150	0.025	28.42	14.32	27.35	20.45
31	0.070	0.05	0.181	0.075	0.025	34.14	3.38	22.82	20.24
33	0.015	0.24	0.336	0.150	0.025	28.46	11.57	25.19	20.31
34	0.180	0.34	0.427	0.125	0.037	29.46	12.91	24.50	22.00

oz/ton - ounce per ton
wt% – weight percent

The Granada Exploration Company (Granada) completed a feasibility study on reprocessing the tailings in 1988. Granada excavated 8 backhoe test pits and collected 47 samples for gold and silver assays as well as acid-soluble copper analyses. Results from the Granada investigation are presented in Table 4-3 and test pit locations are shown on Figure 4-3. A 500-pound composite sample for metallurgical tests was also collected and analyzed (Granada, 1987 and 1988).

TABLE 4-3
GRANADA TEST HOLE ANALYTICAL RESULTS (1987)

Sample Description	Sample Depth (feet)	Thickness (feet)	Wet Weight by Hole (lbs)	Silver (ounces per ton)	Gold (ounces per ton)
GNA-1-1	4.00	1.50	47.5	0.51	0.062
GNA-1-2	5.50	1.50		0.57	0.094
GNA-1-3	7.00	1.50		0.67	0.060
GNA-1-4	8.50	1.50		0.44	0.074
GNA-1-5	10.00	1.50		0.44	0.092
GNA-1-6	11.50	1.50		0.35	0.126
GNA-2-1	4.00	1.50	52.5	0.67	0.092
GNA-2-2	5.50	1.50		0.45	0.060
GNA-2-3	7.00	1.50		0.4	0.080
GNA-2-4	8.50	1.50		0.41	0.062
GNA-2-5	10.50	2.00		0.39	0.088
GNA-2-6	12.50	2.00		0.36	0.128
GNA-3-1	3.50	1.50	74.0	0.44	0.090
GNA-3-2	5.00	1.50		0.34	0.102
GNA-3-3	6.50	1.50		0.47	0.104
GNA-3-4	8.00	1.50		0.54	0.094
GNA-3-5	10.00	2.00		0.32	0.064
GNA-3-6	12.25	2.25		0.29	0.094
GNA-4-1	2.75	1.50	71.0	0.39	0.122
GNA-4-2	4.25	1.50		0.32	0.070
GNA-4-3	5.75	1.50		0.36	0.080
GNA-4-4	7.00	1.25		0.41	0.104
GNA-4-5	9.00	2.00		0.32	0.090
GNA-4-6	11.00	2.00		0.36	0.112
GNA-5-1	5.00	2.00	60.0	0.42	0.100
GNA-5-2	7.00	2.00		0.34	0.100
GNA-5-3	9.00	2.00		0.47	0.166
GNA-5-4	10.50	1.50		0.29	0.084
GNA-5-5	12.00	1.50		0.32	0.066
GNA-6-1	3.00	1.75	70.5	0.38	0.135
GNA-6-2	5.00	2.00		0.36	0.118
GNA-6-3	7.00	2.00		0.32	0.106
GNA-6-4	9.00	2.00		0.31	0.108
GNA-6-5	11.00	2.00		0.34	0.070
GNA-6-6	12.50	1.50		0.71	0.060
GNA-7-1	3.00	1.50	88.0	0.41	0.130
GNA-7-2	4.50	1.50		0.39	0.132
GNA-7-3	6.50	2.00		0.73	0.120
GNA-7-4	8.50	2.00		0.73	0.060
GNA-7-5	10.50	2.00		0.93	0.042
GNA-7-6	12.50	2.00		0.63	0.086
GNA-8-1	3.00	2.00	91.5	0.36	0.198
GNA-8-2	5.00	2.00		0.34	0.114
GNA-8-3	7.00	2.00		0.28	0.076
GNA-8-4	9.00	2.00		0.25	0.080
GNA-8-5	11.00	2.00		0.32	0.070
GNA-8-6	13.00	2.00		0.61	0.080

As presented in the *McLaren Gold-Silver Tailings Project Feasibility Study* (Granada, 1988), the calculated weighted averages of metal concentrations of the above 3 systematic sampling

programs are summarized in Table 4-4. As part of the Granada feasibility report, Granada "recalculated" the past sampling results completed by Kennecott, MBMG and their own results to determine a weighted average grade for gold, silver and copper on which to base the economic viability of reprocessing the tailings materials.

TABLE 4-4
GRANADA EXPLORATION FEASIBILITY STUDY
CALCULATED WEIGHTED AVERAGES

Study	Gold (oz/ton)	Silver (oz/ton)	Copper (%)
Kennecott	0.103	0.324	0.39
MBMG	0.106	0.357	0.313
Granada	0.096	0.44	NR
Recalculated Weighted Average Grade (Granada)	0.099	0.329	NR

oz/ton – Troy ounce per ton
NR – Not reported
% - percent

4.2 MINERALOGY

Based on a study by Granada, native gold is present in the tailings up to 40 microns in diameter and also locked in silicate gangue, chalcopyrite, and pyrite fragments. Associated with the gold are dominant pyrite along with lesser amounts of chalcopyrite, sphalerite, pyrrhotite, bornite, enargite, arsenopyrite, chalcocite, and covellite. There is an oxide suite of magnetite, hematite, and goethite, some of which are a result of oxidation.

4.3 PROCESS TESTING

Granada also submitted sample materials to Kerley Industries, Inc. (Kerley) in Sahuarita, Arizona. Kerley completed cyanidation testing on the tailings sample with an average assay value of 0.097 ounces per ton (oz/ton) of gold. Gold recoveries were reported as 84.7 percent and cyanide consumptions were reported at 1.02 pounds per ton when leaching at 0.1 percent NaCN solutions strength. Sample washing increasing the gold recovery rate to 91.8 percent, but did not reduce NaCN consumption. Lime consumption was 27.2 and 35.4 pounds per ton, respectively (Huch, 1985). Granada also measured in-place dry density (by volume of undisturbed sample, excavated, dried, and weighed) at 17 cubic feet per ton.

5.0 ASSUMPTIONS - VOLUME ESTIMATES

The following assumptions were used for calculating the potential total quantity of minerals within the mine dumps and tailings currently located at the McLaren Tailings Abandoned Mine Site (as summarized in Table 5-1):

- DEQ/Pioneer estimated a total of 182, 000 cy of tailings and 56,200 cy of mine dump material at the site;
- Gold and silver results from the three previous studies are reported in troy ounces per ton;
- Pounds per cubic foot value used for the mine dump was based on the reported tailings results for sandy silt even though the mine dump was generally described as a sandy clay;
- Estimated tonnage was calculated using maximum dry density (psf)*27(ft^3/1cy)*182,000cy/2000 lb/1ton;
- Weighted averages of gold, silver, and copper that were calculated by the respective companies are correctly reported; and
- Conversion to oz/ton from parts per million (ppm) - concentration (ppm)/31.03 (constant).

The estimated quantities represent the total potential quantity contained in the mineral material at the McLaren Tailings Abandoned Mine Site and do not imply any particular metallurgical recovery.

Table 5-1 summarizes the potential gold and silver quantities calculated using both the high and low reported values (oz/ton), and maximum dry density values of 117.5 and 135.7 pounds per cubic foot. The economic values are based on the metal quoted price on August 12, 2008.

Table 5-1
VOLUME CALCULATIONS FOR GOLD AND SILVER IN McLAREN TAILINGS

Tailings Volume Calculations — **182,000 cubic yards** — **Au Value August 12, 2008 $814.60**

Gold

		Maxiumum Dry Density (pcf)	Weighted Average Au Value from reports Troy oz./ton	Tons of Tailings	Calculated amount of Au present in tailings (Troy oz)	Calculated Value of Au present in tailings ($U.S.)
Kennecott						
	Low	117.5	0.103	288,698	29,736	$ 24,222,817.30
	High	135.7	0.103	333,415	34,342	$ 27,974,777.09
MBMG						
	Low	117.5	0.106	288,698	30,602	$ 24,928,336.25
	High	135.7	0.106	333,415	35,342	$ 28,789,576.42
Granada						
	Low	117.5	0.096	288,698	27,715	$ 22,576,606.42
	High	135.7	0.096	333,415	32,008	$ 26,073,578.64
Recalculated Weighted Average (Granada)						
	Low	117.5	0.099	288,698	28,581	$ 23,282,125.37
	High	135.7	0.099	333,415	33,008	$ 26,888,377.98

Tailings Volume Calculations — **182,000 cubic yards** — **Ag Value August 12, 2008 $14.49**

Silver

		Maxiumum Dry Density (lb/ft^3)	Weighted Average Au Value from reports Troy oz./ton	Tons of Tailings	Calculated amount of Ag present in tailings (Troy oz)	Calculated Value of Ag present in tailings ($U.S.)
Kennecott						
	Low	117.5	0.324	288,698	93,538	$ 1,355,365.48
	High	135.7	0.324	333,415	108,026	$ 1,565,302.94
MBMG						
	Low	117.5	0.357	288,698	103,065	$ 1,493,411.96
	High	135.7	0.357	333,415	119,029	$ 1,724,731.94
Granada						
	Low	117.5	0.44	288,698	127,027	$ 1,840,619.78
	High	135.7	0.44	333,415	146,703	$ 2,125,720.04
Recalculated Weighted Average (Granada)						
	Low	117.5	0.329	288,698	94,981	$ 1,376,281.61
	High	135.7	0.329	333,415	109,694	$ 1,589,458.85

Table 5-1
VOLUME CALCULATIONS FOR GOLD AND SILVER IN McLAREN TAILINGS

Mine Dump Volume Calculations		**56,200 cubic yards**			**Ag Value August 12, 2008 $14.49**
Silver					
	Maxiumum Dry Density (lb/ft^3)	Calculated Ag Value (Troy oz./ton)	Tons of Mine Dump Material	Calculated amount of Ag present in tailings (Troy oz)	Calculated Value of Ag present in tailings ($U.S.)
PTS -24.2 ppm					
low	117.5	0.780	89,147	69,535	$ 1,007,560.05
high	135.7	0.780	102,956	80,305	$ 1,163,624.67
PTS - 12.7 ppm					
low	117.5	0.409	89,147	36,461	$ 528,323.15
high	135.7	0.409	102,956	42,109	$ 610,157.04
PTS-30.7					
low	117.5	0.989	89,147	88,167	$ 1,277,534.47
high	135.7	0.989	102,956	101,823	$ 1,475,416.41

oz/ton - ounce per ton
PTS - Pioneer Technical Services, Inc Data
Calculation for converting cubic yards (cy) to tons:
Short Ton = Max Dry Density(lb/ft^3)* 27 ft^3/1cy) * 182,000 cy of tailings / 2000 lbs/1ton (short ton weight)

Conversion to oz/ton from parts per million (ppm) = concentration (ppm)/31.03 (constant)

Assumption 1: Used MDEQ/Pioneer 2002 volume estimate of 182, 000 cy of tailings at site and 56,200 cy of mine dump materials.
Assumption 2: The gold and silver results from the 3 previous studies were reported in troy ounces per ton.
Assumption 3: The pounds per cubic foot value used for the mine dump materials was based on the reported tailings results for sandy silt even though the mine dump materials were described as sandy clay.
Assumption 4: The weighted averages of Au, Ag, and Cu were calculated by the respective companies are correctly reported.
Assumption 5: The estimated quantities represent the total potential minerial quantity contained in the McLaren Tailings and mine dump materials, and do not imply any particular metallurical recovery.

6.0 REFERENCES

DEQ/Pioneer, 2002. Draft Final Expanded Engineering Evaluation/Cost Analysis for The McLaren Tailings Site, Cooke City, Montana. May 2002.

DOI-BSFW, 1970. Annual Project Report-Fishery Management Profram, Yellowstone National Park. Calendar year 1969. YNP Archives, Mammoth, Wyoming.

Goddard, Charles C. 1953. Memorandum Concerning the McLaren Gold Mining Company Near Cooke City, Park County, Montana. Anaconda Geologic Collection, Western Heritage Center, Laramie, Wyoming. File 28118.16.

Granada, 1987. News release to Shareholders, Granada Exploration Corporation. November, 1987.

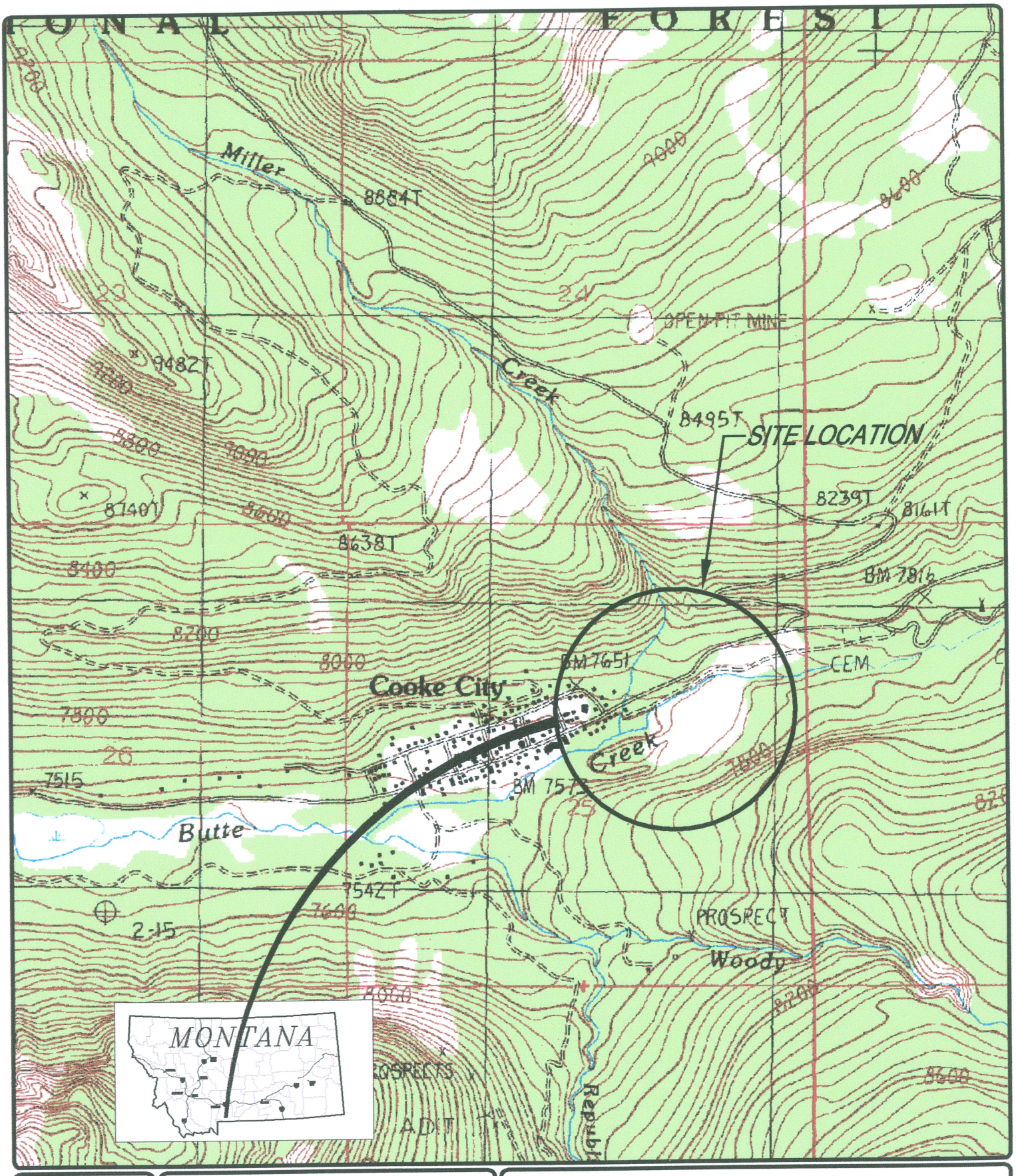
Granada, 1988. McLaren Gold-Silver Tailings Project Feasibility Study. Granada Exploration Corporation. July 31, 1988.

Hart, L.H., 1935. Reconnaissance Summary of the McLaren Mine Near Cooke City, Park County, Montana. Anaconda Geologic Collection, Western Heritage Center, Laramie, Wyoming. File 28118.19.

Huch, 1985. Progress Report No. 2 on the Testings of your samples of Gold Tailing, our Lot No. , R.O. Huch, Kerly Mining Products, Inc. December 1985

MBMG, 1975. Acid Mine Drainage Control - Feasibility Study Cooke City, Montana. Prepared by the Montana Bureau of Mines and Geology. December, 1975.

FIGURES



PROJECTION: NAD83
ZONE:
DATUM:
UNITS: FEET
SOURCE: COOKE CITY, MT-WY 7.5 QUADRANGLE

SCALE IN FEET
0 750 1500

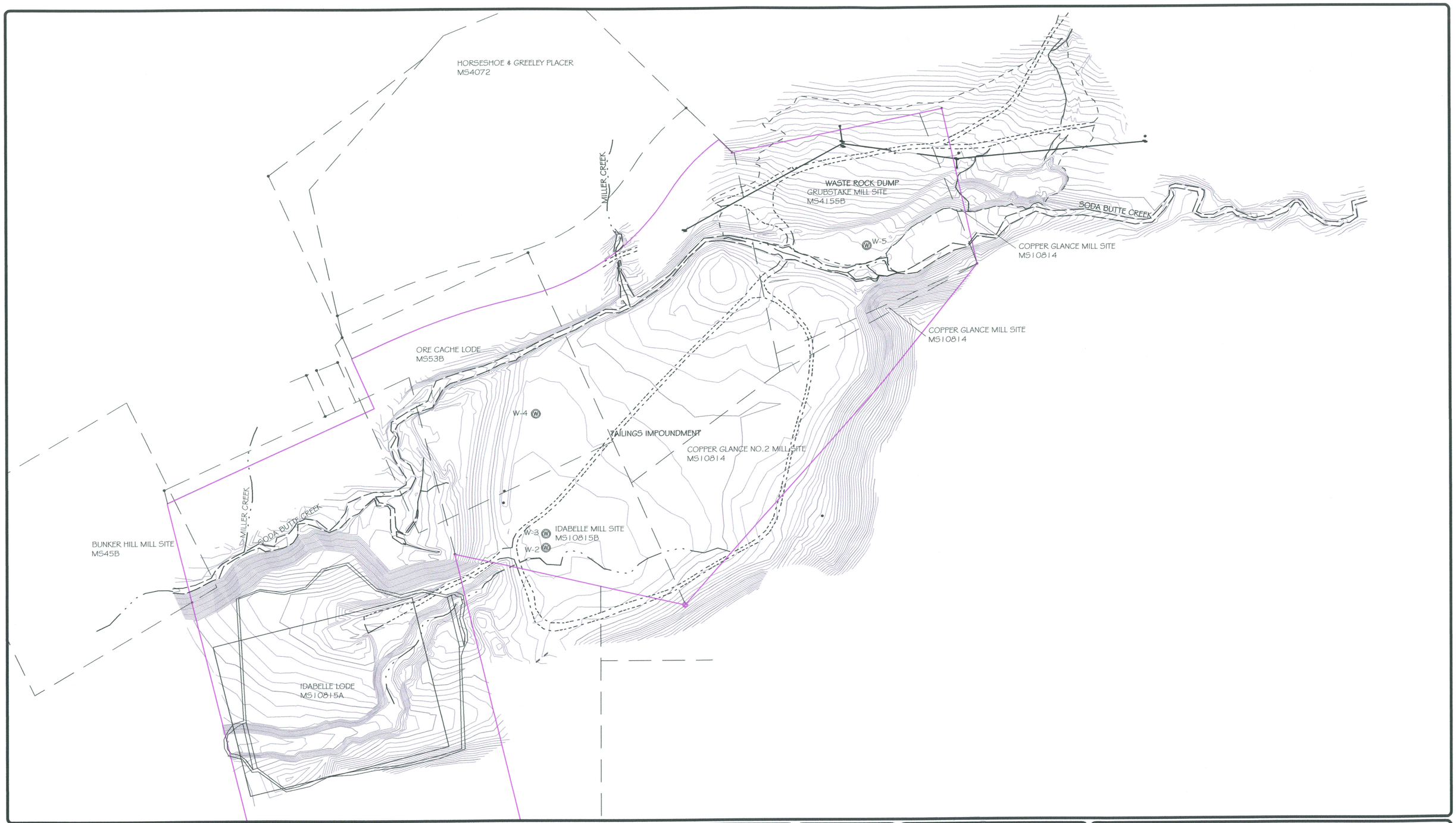
FIGURE 1-1

SITE LOCATION MAP
McLAREN TAILINGS SITE

PIONEER TECHNICAL SERVICES, INC.
Butte, Helena, Anaconda

DATE: 8/26/2008

\\SRVW2K\DATAL$\DEQ\MCLAREN\2008\economic potential fact sheet\mc-epfs-101.dwg\MC-F100-08



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PROJECTION:
ZONE:
DATUM:
UNITS:
SOURCE:

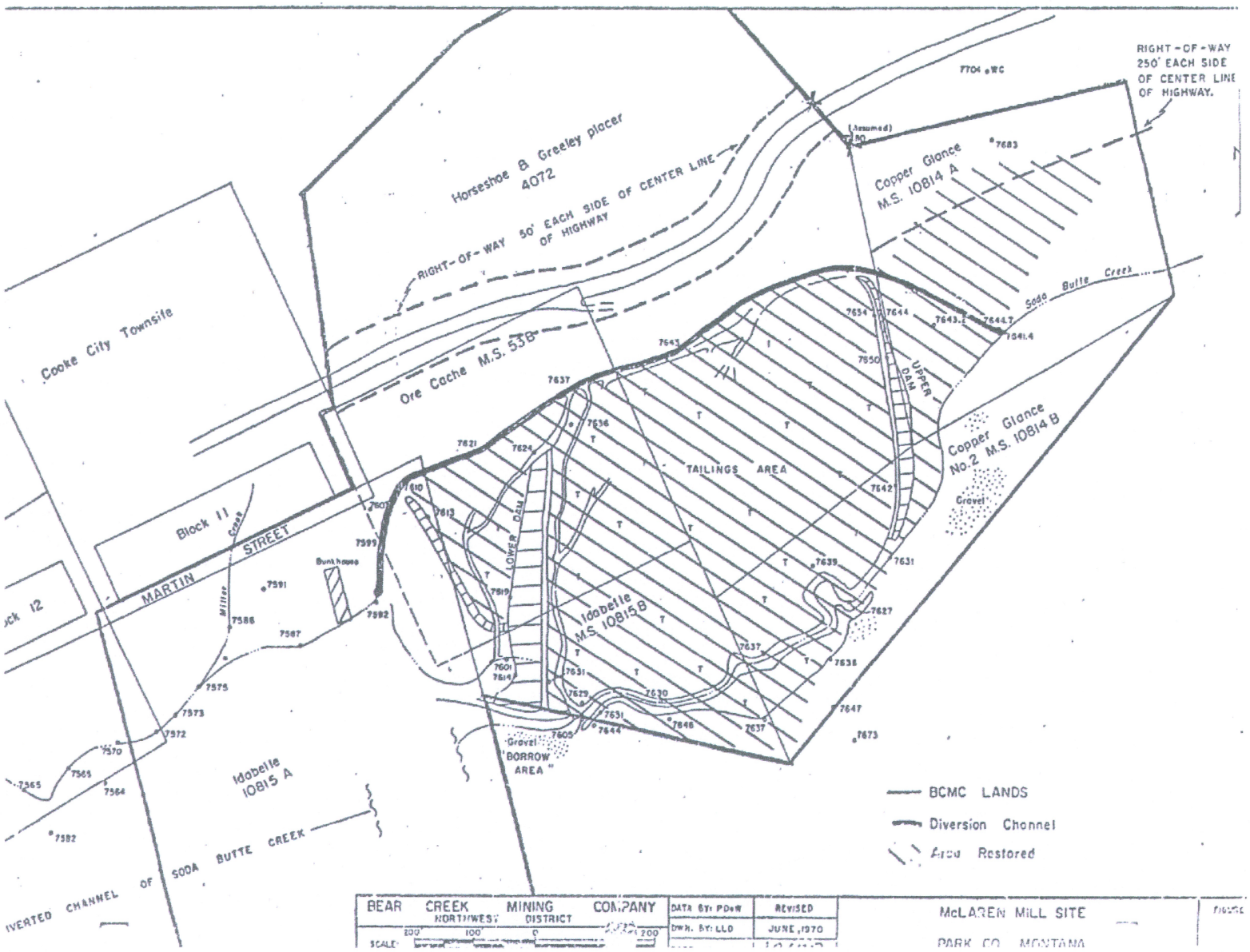
SCALE IN FEET
0 100 200

FIGURE 1-2 McLAREN TAILINGS SITE MAP COOKE CITY, MT

PIONEER TECHNICAL SERVICES, INC.
Butte, Helena, Anaconda

DATE: 8/26/2008

\\SRVW2K\DATAL$\DEQ\MCLAREN\2008\economic potential fact sheet\MC-epfs-102.dwg-08



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ZONE: NA
DATUM: NA
UNITS: NA
SOURCE: "GRANADA, 1988"

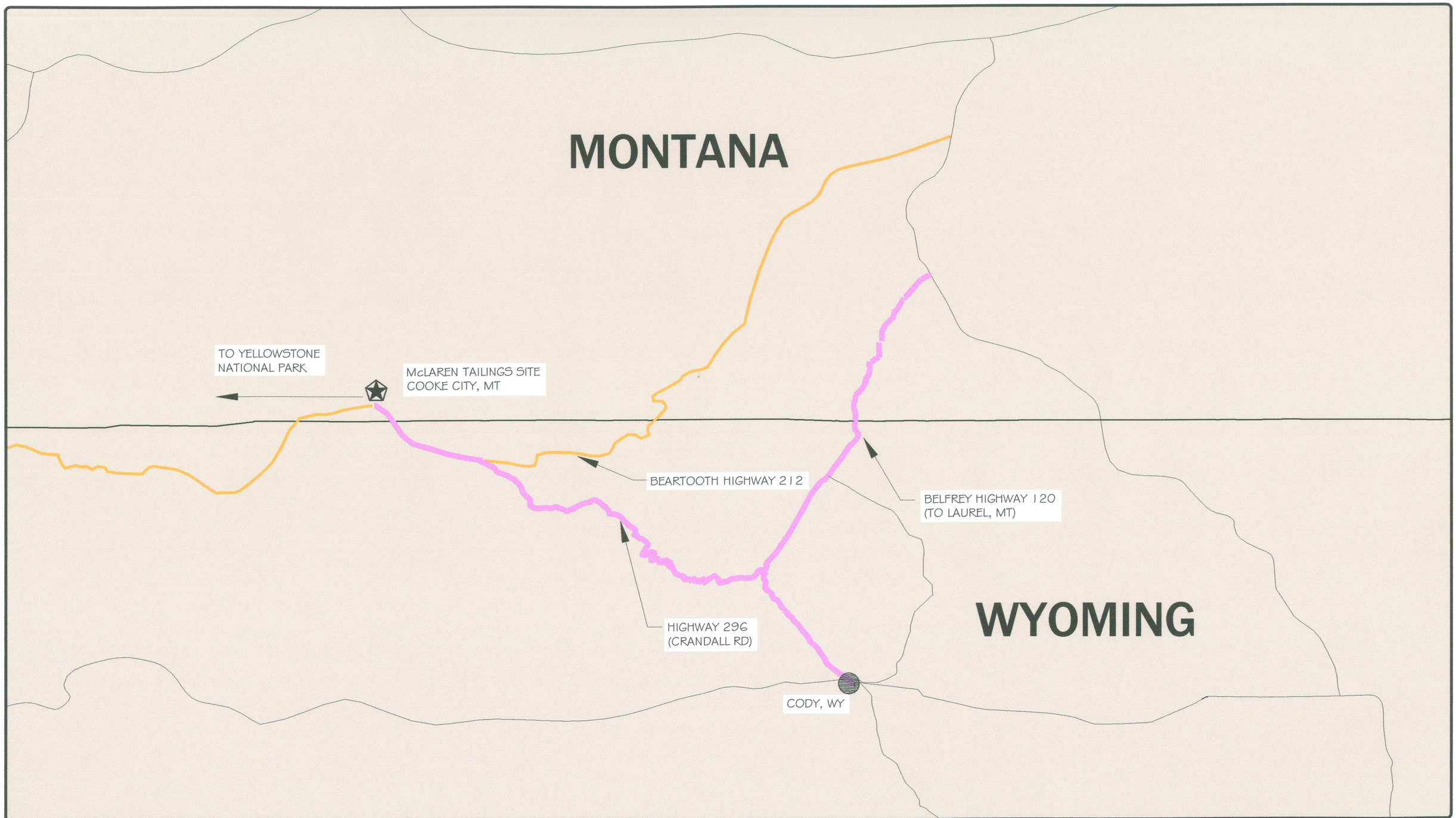
SCALE IN FEET
0 N.T.S.

FIGURE 1-3 McLAREN TAILINGS MILL SITE CLAIM MAP

PIONEER TECHNICAL SERVICES, INC.
Butte, Helena, Anaconda

DATE: 8/26/2008

MC-EPFS-110.DWF



LEGEND
ACCEPTABLE HAUL ROUTES
OTHER HIGHWAYS

N

PROJECTION: GEOGRAPHIC
ZONE:
DATUM: NAD 83
UNITS: DECIMAL DEGREES
SOURCE: NATIONAL ATLAS DATA

SCALE IN FEET
0 N.T.S.

FIGURE 1-4 ACCEPTABLE HAUL ROUTE McLAREN TAILINGS SITE

PIONEER TECHNICAL SERVICES, INC.
Butte, Helena, Anaconda

DATE: 8/26/2008

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BRITISH COLUMBIA

ALBERTA

TRAIL, B.C.

SEATTLE

SPOKANE

Washington

Montana

BUTTE

BOZEMAN

BILLINGS

SHERIDAN

CODY

Oregon

Idaho

Wyoming

SALTLAKE CITY

Utah

Colorado

Nevada

California

LEGEND

BURLINGTON NORTHERN AND SANTA FE RALIWAY CO.

UNION PACIFIC RAILROAD CO.

MONTANA WESTERN RAILWAY CO.

MONTANA RAIL LINK

OTHER RAILROADS

N

PROJECTION: GEOGRAPHIC

ZONE:

DATUM: NAD 83

UNITS: DECIMAL DEGREES

SOURCE: NATIONAL ATLAS DATA

SCALE IN FEET

0 N.T.S.

FIGURE 1-5 RAILHEAD LOCATIONS AND ROUTES

PIONEER TECHNICAL SERVICES, INC.

Butte, Helena, Anaconda

DATE 8/26/2008

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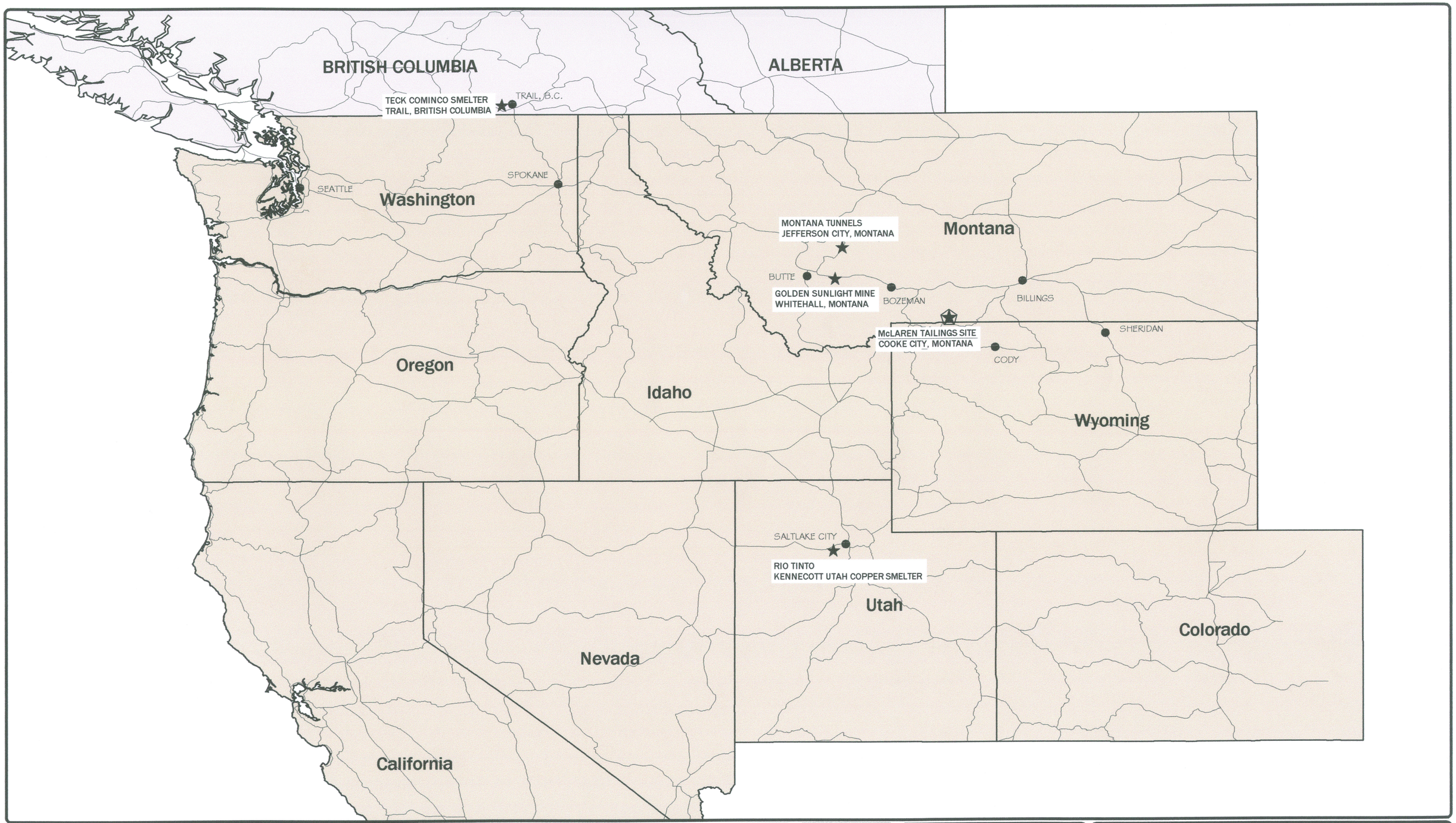

NOTE:
THIS IS NOT AN ALL INCLUSIVE LIST AND OTHER FACILITIES CAPABLE OF EXTRACTING MINERALS FROM THE McLAREN TAILINGS SITE MAY EXIST. THESE FACILITIES SHOULD BE CONTACTED FOR INFORMATION REGARDING THE PROCESSING OF THE MINERAL MATERIAL.

N

PROJECTION: GEOGRAPHIC
ZONE:
DATUM: NAD 83
UNITS: DECIMAL DEGREES
SOURCE: NATIONAL ATLAS DATA

SCALE IN FEET
0 N.T.S.

FIGURE 1-6 POTENTIAL MINERAL PROCESSING FACILITIES

PIONEER TECHNICAL SERVICES, INC.
Butte, Helena, Anaconda

DATE: 8/26/2008

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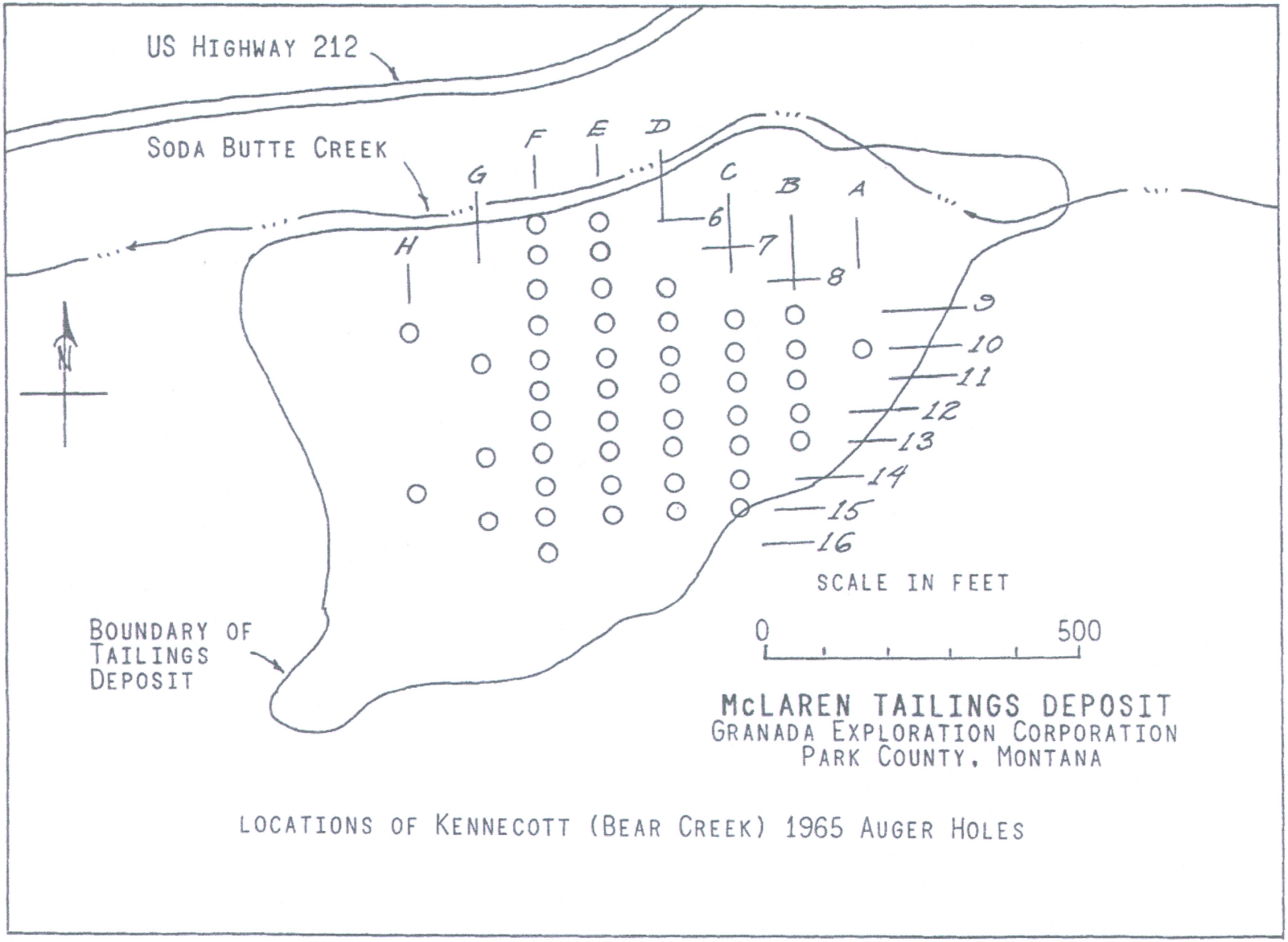


PROJECTION: NA
ZONE: NA
DATUM: NA
UNITS: NA
SOURCE: "GRANADA, 1988"

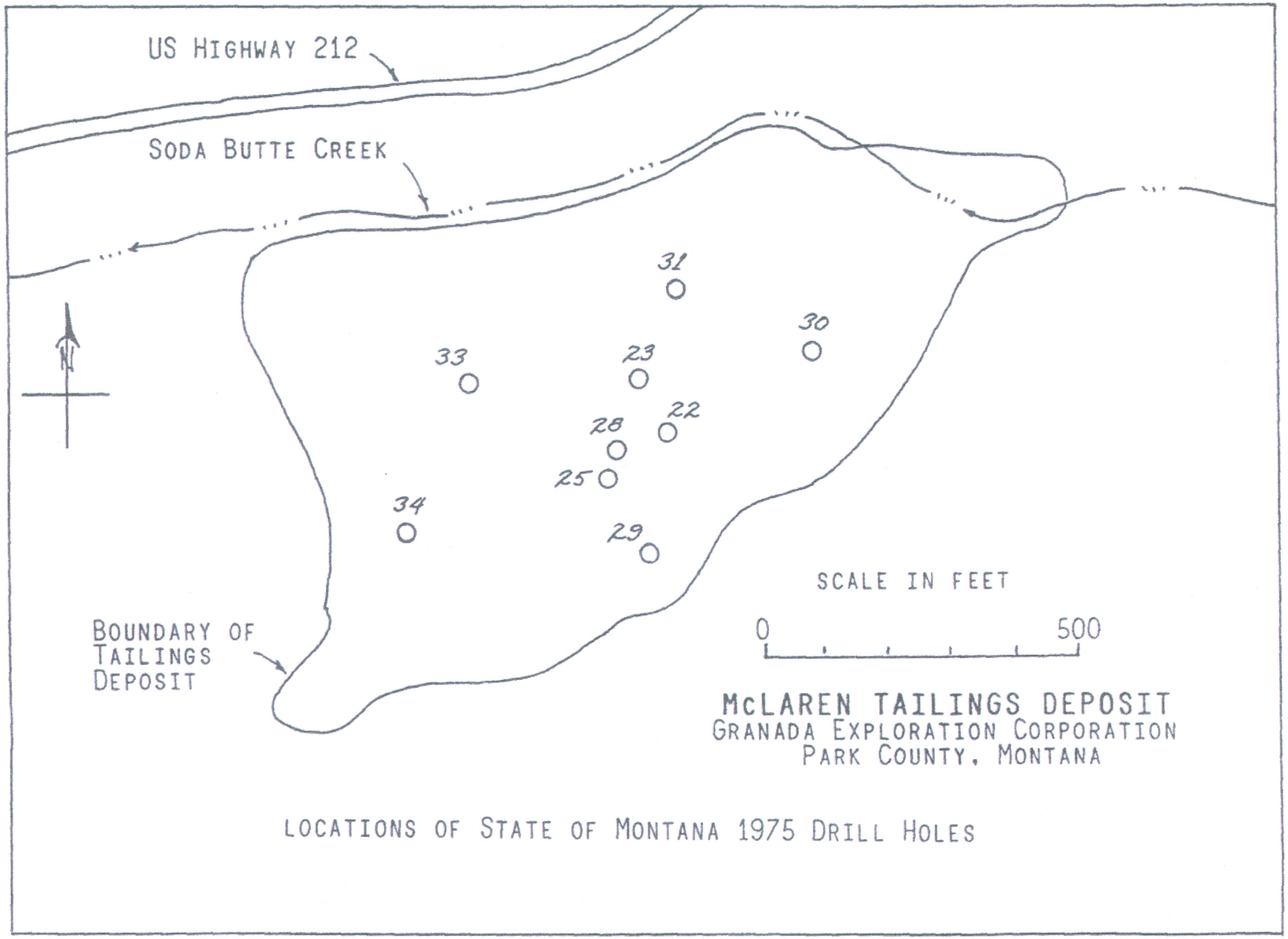
SCALE IN FEET
0 N.T.S.

FIGURE 4-1 BEARCREEK AUGER HOLES McLAREN TAILINGS SITE (1965)

PIONEER TECHNICAL SERVICES, INC.
Butte, Helena, Anaconda

DATE: 8/26/2008

MC-EPFS-112.DWF



PROJECTION: NA
ZONE: NA
DATUM: NA
UNITS: NA
SOURCE: "GRANADA, 1988"

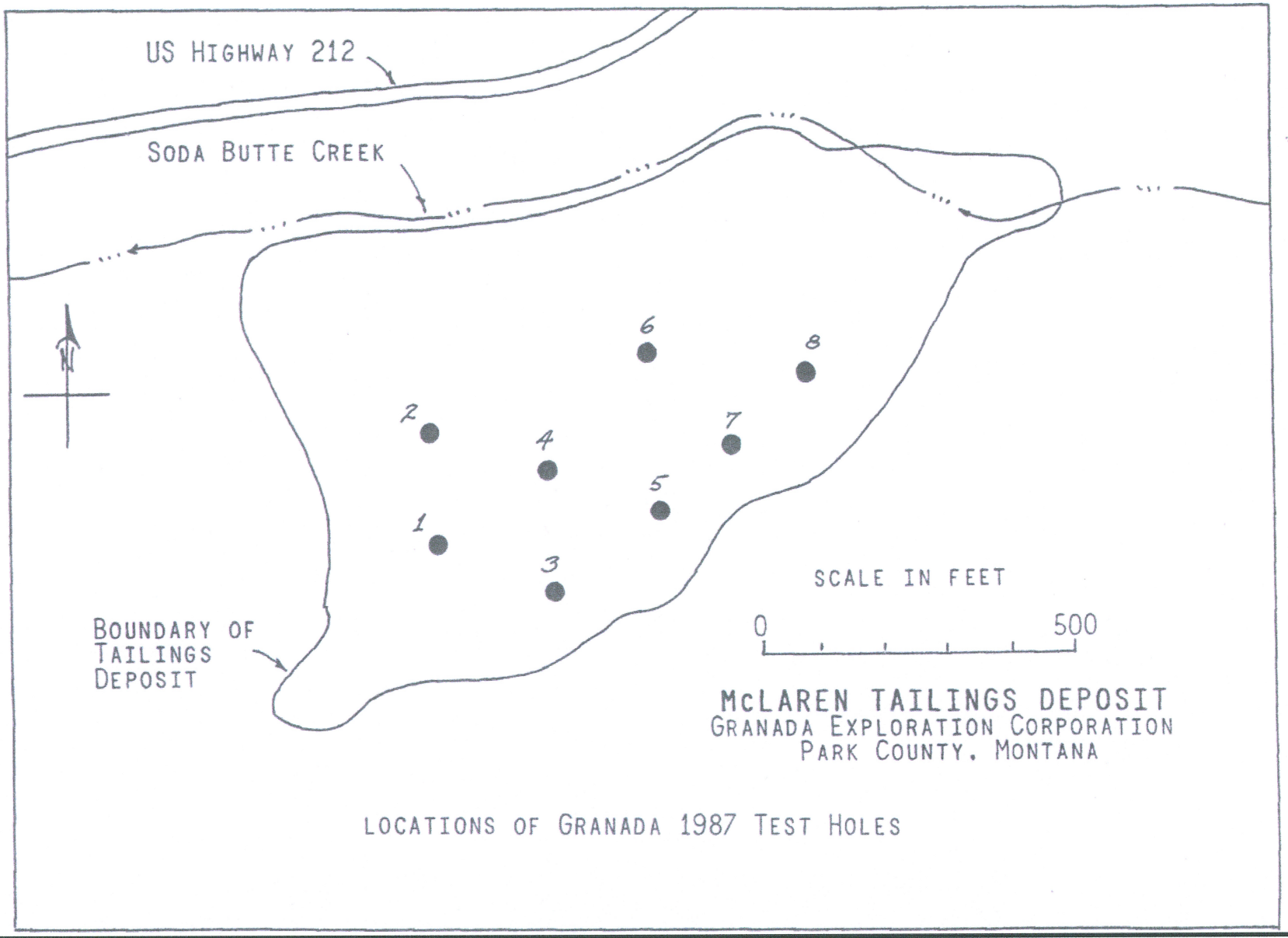
SCALE IN FEET
0 N.T.S.

FIGURE 4-2 MBMG DRILL HOLES McLAREN TAILINGS SITE (1975)

PIONEER TECHNICAL SERVICES, INC.
Butte, Helena, Anaconda

DATE: 8/26/2008

MC-EPFS-114.DWF



PROJECTION: NA
ZONE: NA
DATUM: NA
UNITS: NA
SOURCE: "GRANADA, 1988"

SCALE IN FEET
0 N.T.S.

FIGURE 4-3 GRANADA TEST HOLES McLAREN TAILINGS SITE (1987)

PIONEER TECHNICAL SERVICES, INC.
Butte, Helena, Anaconda

DATE: 8/26/2008

MC-EPFS-115.DWF

Appendix B

Final Sampling and Analysis Plan (SAP) for the McLaren Tailings Abandoned Mine Reclamation Project Repository Characterization Cooke City, Montana

PIONEER
TECHNICAL SERVICES, INC.

August 2, 2013

Tom Henderson
Montana Department of Environmental Quality
Mine Waste Clean Up Bureau
P.O. Box 200901
Helena, MT 59620-0901

Re: **Final Repository Materials Characterization Sampling Analysis Plan for the McLaren Tailings Abandoned Mine Site**

Dear Tom:

Please find enclosed 2 hard copies of the Final Repository Materials Characterization Sampling Analysis Plan (SAP) for the McLaren Tailings Abandoned Mine Site. Also included in the SAP is CD with a complete PDF file of the SAP. Also enclosed is one CD containing the working files for the SAP. If you have any questions, please contact me at 497-8041 or 490-0807

Sincerely,

Joseph S. McElroy P.E.
Project Manager

Enclosure

cc: John Koerth, MDEQ
Marty Bennett, Pioneer Technical Services, Inc.

FINAL
SAMPLING AND ANALYSIS PLAN (SAP)
FOR THE
McLAREN TAILINGS ABANDONED MINE
RECLAMATION PROJECT
REPOSITORY CHARACTERIZATION
COOKE CITY, MONTANA

Prepared for:

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TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1
1.1 PROJECT DESCRIPTION 1
1.1.1 Project Location 1
1.1.2 Project History 1
1.1.3 Current Conditions 1

2.0 SCOPE OF PROJECT 2
2.1 Description of Activities 2
2.1.1 Tailings Sampling 3

3.0 SAMPLING PROTOCOL 5
3.1 FIELD PROCEDURES 5
3.1.1 Equipment Decontamination 5
3.1.2 Sample Designation and Labeling 6
3.1.3 Sample Handling 6
3.1.4 Documentation 6
3.1.5 Photographs 7
3.1.6 Field Activities Oversight 7
3.1.7 Decontamination 7
3.1.8 Post-Sampling Activities 7

4.0 PROJECT MANAGEMENT/PERSONNEL 8

5.0 SCHEDULE 8

6.0 RECORDS AND REPORTS 9

7.0 REFERENCES 9

LIST OF FIGURES

Figure 1 McLaren Tailings Site Location Map, Cooke City, Montana
Figure 2 McLaren Tailings Site Map, Cooke City, Montana
Figure 3 McLaren Tailings Site Repository Investigation Borehole Locations

LIST OF TABLES

Page

Table 1 McLaren Tailings Abandoned Mine Site Proposed Samples 5

LIST OF APPENDICES

Appendix A Pioneer's Standard Operating Procedures (SOPs)
Appendix B Quality Assurance Project Plan
Appendix C ALS Submittal Form

1.0 INTRODUCTION

All work identified in this Sampling and Analysis Plan (SAP) will be undertaken by Pioneer Technical Services, Inc. (Pioneer) with Montana Department of Environmental Quality (DEQ) (Agency) oversight pursuant to the May 7, 2013, Task Order Number 82, Contract No. 407038, issued by the DEQ/Mine Waste Cleanup Bureau (DEQ/MWCB). This SAP presents the sampling approach for the McLaren Tailings Repository Materials Characterization (RMC).

Data collected during this characterization will provide additional metallurgical information on the precious metals contained in the stabilized tailings located in the on-site engineered repository. A summary of previous investigations and results are provided in the *Final Potential Economic Recovery Fact Sheet for the McLaren Tailings Site, Cooke City, Montana* (DEQ/MWCB-Pioneer, 2008).

1.1 PROJECT DESCRIPTION

1.1.1 Project Location

The McLaren Tailings Abandoned Mine Site Reclamation Project is located in Park County in Section 25 of Township 9 South, Range 14 East of the Montana Principal Meridian. The site is accessed by traveling one quarter of a mile east of Cooke City, Montana, along Montana Highway 212 and turning south onto a dirt road that exits the highway. The site is located less than 500 feet south of the highway and encompasses an area of roughly 20 acres (see Figures 1 and 2).

1.1.2 Project History

The purpose of this reclamation project is to limit human and environmental exposure to the contaminants of concern, reduce the mobility and migration of these contaminants and mitigate impacts to the local surface water and groundwater. The reclamation project plan involves removing saturated tailings materials from designated areas and stabilizing/dehydrating the tailings by adding quicklime and placing and compacting in an on-site repository

The repository will be capped with geosynthetic materials including a textured 60-mil high density polyethylene (HDPE) geomembrane liner and cover soil. The repository cap will then be fertilized, seeded, and mulched.

Reclamation of the McLaren Tailings Abandoned Mine Site began on June 1, 2010 and is expected to be completed in the fall of 2014.

1.1.3 Current Conditions

The McLaren tailings repository is located in the west portion of the site and encompasses 5.1 acres. Total volume of tailings contained in the repository is 236,000 compacted cubic yards. In order to stabilize/dehydrate the tailings, 3 to 5% of quick lime (by weight) was incorporated into

the tailings. The tailings were then compacted to 95% of the Standard Proctor maximum dry density (ASTM D 698/AASHTO T-99).

2.0 SCOPE OF PROJECT

The scope of this SAP is to gather additional metallurgical data for the stabilized tailings prior to placing the final cap system on the repository. This additional metallurgical information, along with the previously collected metallurgical data will be provided to any interested party looking to potentially reprocess the tailings. By completing this investigation prior to final capping of the repository, the final cap system will not be compromised in the future by parties interested in the potential removal and processing of the stabilized tailings currently being placed in the on-site repository.

For this investigation all sampling will start at ground surface and continuous samples will be obtained from the ground surface to the bottom of the repository. If refusal is encountered in the soil boring, the boring will be abandoned and the sample location moved to a new location adjacent to the abandoned soil boring. Sampling at the new location will begin at the last sample interval of the abandoned soil boring.

The principal technique used for collecting this additional metallurgical data will be a 66DT Geoprobe® equipped with a DT22 Soil Sampling System. The DT22 Soil Sampling System is designed to collect continuous soil samples. The Geoprobe® will advance a 2.25-inch outer rod with a 1.25-inch inner rod and solid drive tip to the desired top of the sample interval. Upon achieving the desired sample interval, the inner rod will be removed and the 4-foot sampler equipped with a polyvinyl chloride (PVC) liner will be placed down the outer rod and driven ahead of the outer rod to collect a 48-inch continuous soil sample. Once the sample has been collected the inner rod and sample is removed from the outer rod. Each PVC liner sleeve will be opened lengthwise and composite samples will be collected. After retrieving the sample the drive tip will be installed on the inner rod and placed down the outer rod and the outer and inner rod advanced to the next sample interval. This process is repeated over the entire sampling intervals of the boring. The following information will be recorded from each borehole interval:

- Time;
- Borehole interval sampled;
- Length of recovered material;
- Amount of sluffed material at the top of PVC sleeve; and
- Any samples collected for submission to an analytical laboratory.

2.1 DESCRIPTION OF ACTIVITIES

This SAP outlines the site characterization tasks necessary to complete the RMC at the McLaren Tailings Abandoned Mine Site. In general, these tasks include:

- Installing 11 boreholes in the final surface of the repository, for a total borehole length of approximately 400 linear feet;
- Boreholes will be completed through the entire depth of placed tailings;

- Boreholes will be completed through the entire depth of placed tailings;
- Collecting continuous soil sample cores;
- Backfill completed boreholes with bentonite crumbles and
- Sampling and analyzing the tailings to determine metallurgical and engineering characteristics of the tailings.

Borehole locations with depths of each are shown on Figures 3. In the event that the borehole cannot be completed to native underlying soils, the borehole will be moved approximately 5 to 10 feet and re-drilled. No additional sample will be collected in this new borehole until the depth of refusal is reached in the original borehole, at that point, continuous samples will be collected again. Exact locations and sample numbers may vary slightly in the field based on site conditions. After the completion of each borehole, the borehole will be backfilled to the top of the hole with bentonite crumbles or chips.

The field team leader will direct the collection of all samples for laboratory analyses using the logic detailed in the following subsections. Pioneer's Standard Operating Procedures (SOPs) detail the methods and procedures (Appendix A) that will be used to conduct the RMC and collect the representative samples identified in the following.

2.1.1 Tailings Sampling

There are three types of samples that will be obtained from the repository during the RMC. The three types of tailings samples to be collected are metallurgical, environmental, and engineering.

Metallurgical Samples

The metallurgical samples will be the primary focus of the RMC and will focus on the metallurgical content of the tailings, primarily gold, silver and copper. At each borehole continuous soil samples will be collected from ground surface to the bottom of the repository. The field crew will obtain the metallurgical samples by compositing tailings/mine wastes materials obtained every 8 feet of borehole core (i.e., 0 to 8 feet, 8 feet to 16 feet, etc.) to the bottom of the repository. A minimum of 1 kilogram or 3 pounds of tailings/mine wastes from each sample interval will be placed in a 1-gallon Ziploc® bags for laboratory analysis. The field crew will weigh the sample to ensure there is adequate sample quantity. Weights will be documented in the field logs. The remaining will be composited in a 5-gallon bucket for use in the environmental and engineering samples discussed below. Based on approximately 400 linear feet of soil borings, there will be 50 metallurgical samples collected and sent to the laboratory for analysis. As outlined in Table 1, metallurgical samples will be sent to ALS Geochemistry in Elko, Nevada.

Environmental Samples

Environmental samples will be collected as part of the RMC. The environmental samples will focus on the pH, Organic Matter Content, and the metal concentrations for Antimony (Sb), Aluminum (Al), Arsenic (As), Barium (Ba), Cadmium (Cd), Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), and Zinc (Zn).

As discussed above the field crew will place the remaining tailings/mine waste materials from each boring into a 5-gallon bucket. The remaining tailings/mine waste materials from a group of 3 boreholes will be composited into one 5-gallon bucket for the environmental and engineering samples. The following borehole will be grouped together for the environmental and engineering samples.

Environmental/Engineering Samples	Borehole Groups
ENV-G1/E-G1	2 , 5, 6
ENV-G2/E-G2	1, 3, 4
ENV-G3/E-G3	9, 10, 11
ENV-G4/E-G4	7, 8

The field crew will obtain a minimum of one quart size Ziploc® bag from the composited sample for the environmental sample. A total of 4 environmental samples will be collected during the RMC. As outlined in Table 1, the environmental samples will be placed on ice and shipped to Energy Laboratories in Helena, Montana, for analysis.

Engineering Samples

Engineering samples will be collected and focus on gradation and density of the tailings/mine wastes located in the repository. The remaining tailings/mine waste materials from the group of 3 boreholes, as outlined above, will be composited into one 5-gallon bucket for the environmental and engineering samples. The field crew will obtain a minimum of one 5-gallon bucket from the composited sample for the engineering sample. A total of 4 engineering samples will be collected during the RMC. As outlined in Table 1, the engineering sample will be shipped to Pioneer's Laboratory located in Helena, Montana, for analysis.

If insufficient quantities of tailings/mine waste sample cannot be obtained for the environmental and engineering samples then a separate borehole will be completed to obtain the required samples. The location of the additional boreholes will be determined by the DEQ and Pioneer's field project manager.

Samples will be collected using Pioneer's SOPs that are provided in Appendix A.

TABLE 1
SUMMARY OF PROPOSED SAMPLES

LABORATORY SAMPLE NUMBER	LABORATORY	ANALYSIS TYPE	SPECIFIC LABORATORY ANALYSIS	SAMPLE SIZE
Metallurgical	ALS			
McL-BH1M-0-8-071613		Au	Fire Assay and AAS	1-gallon Ziploc® bag Minimum of 1Kg or 3 lbs.
McL-BH1M-0-8-071613		Ag and Cu	Four acid/ICP-AES	
Environmental	Energy Labs			
McL- ENV-G1 - 071613		Environmental	pH, and organic matter content, Total Metals (Sb, Al, As, Ba, Cd, Co, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn)	Minimum of a 1-quart Ziploc® bag
Engineering	Pioneer			
McL- E-G1 -071613		Engineering	Proctor (density) and gradation	One 5-gallon bucket

Au-gold, Ag-Silver, Cu-Copper

3.0 SAMPLING PROTOCOL

3.1 FIELD PROCEDURES

All field activities including sampling and analytical methods, quality assurance/quality control (QA/QC) procedures, equipment and personnel decontamination, sample designation and handling, and documentation will follow Pioneer's SOPs presented in Appendix A.

3.1.1 Equipment Decontamination

Disposable equipment intended for one-time use and personal protective equipment (PPE) materials will not be decontaminated but will be packaged for appropriate disposal as a solid waste in the local landfill. Any other equipment used will also be decontaminated before leaving the site to prevent off-site transport of contaminants.

3.1.2 Sample Designation and Labeling

A sample number system will be used to uniquely identify the project site, the specific sample location and depth interval. The following is an example of the sample numbering system:

Sample Number:	**McL-BH1M-0-8-071613**
Site:	McL - McLaren Tailings Site
Location:	BH1 - Sample Location (corresponds with Borehole ID No.). All sample locations will be surveyed and plotted on a map.
Group:	G1- correspond to the group of boreholes utilized to composite the samples. Modification to the borehole groups will be documented in the field logbook.
Analysis:	M – Metallurgical ENV- Environmental E - Engineering
Depth Interval:	Depth interval (0 to 8-foot depth).
Date:	071613 - sample collected on July 16, 2013.

All sample locations and depths for each composite will be described in the field logbook and surveyed. The field logbook will also include the subsample locations plotted on the site sketch. All samples will be labeled in the field with documentation of the date and time of sample collection, the sample number, analyses requested, and the sampler's initials. A permanent marker will be used for labeling.

3.1.3 Sample Handling

Chain of custody records will be kept with the samples and custody seals will be placed on the sample storage containers. In addition, the field crew will complete the required submittal form for analysis at ALS. The ALS submittal form can be found in Appendix C.

3.1.4 Documentation

All field sampling activities and non-sampling data collection will be recorded in a bound site logbook. The field team leader is responsible for recording information including weather conditions, field crew members, visitors to the site, samples collected, date and time of sample collection, procedures used, any field data collected, and any deviations from this SAP. Individual field team members may be responsible for required documentation based upon specific tasks assigned by the field project manager in the field.

3.1.5 Photographs

Field sampling activities will be documented with photographs. The following information will be documented in the field logbook for each photograph taken:

- Time, date, and location; and
- Direction that the photograph was taken and description of the subject photographed.

3.1.6 Field Activities Oversight

Any deviations from this SAP will be brought to the attention of DEQ oversight personnel, or if first determined by oversight personnel, Pioneer will be immediately notified. Reasons for such deviations will be recorded in the field logbook, along with corrective actions to be implemented, if required. If DEQ oversight personnel request a deviation from the SAP, the deviation, and the reasons for the deviation will be noted and then signed by the Agency personnel.

3.1.7 Decontamination

The Geoprobe® will arrive at the site decontaminated. The Geoprobe® personnel will provide their own decontamination equipment and will decontaminate the equipment between sample locations. The Geoprobe® and drill rig will be decontaminated prior to leaving the McLaren Tailings Abandoned Mine Site. Decontamination fluids will be disposed of to the ground surface. Gross contamination will be removed from the Geoprobe® with a shovel prior to leaving the site.

Disposable equipment intended for one-time use and PPE materials will not be decontaminated but will be packaged for appropriate disposal as a solid waste in the local landfill. All personnel must undergo decontamination procedures when leaving a contaminated area, for their own protection. Personnel decontamination includes routine practices as well as emergency decontamination; all procedures will follow U.S. Environmental Protection Agency (EPA) protocols. All measures will be taken to prevent the spread of potentially contaminated materials to clean areas.

3.1.8 Post-Sampling Activities

All samples will be either hand delivered or shipped via United Parcel Service (UPS) to each appropriate laboratory with chain of custody. Samples will be shipped in appropriate containers that will prevent detrimental effects to the sample.

4.0 PROJECT MANAGEMENT/PERSONNEL

DEQ/MWCB Project Officer – Mr. Tom Henderson

The DEQ/MWCB Project Officer will ensure the terms of the contract, insofar as the field activities and the associated personnel and their responsibilities in performing the field activities, are carried out satisfactorily.

Field Project Manager – Marty Bennett, Pioneer

The field project manager is responsible for the overall implementation of the SAP. This includes communicating the requirements to all personnel, supervising fieldwork, and making appropriate changes to the SAP. All access agreements and permits needed to complete field activities will be in the possession of the field project manager prior to commencing field activities.

Geoprobe Driller – Ken Manchester/Matt Williams, Pioneer

The driller operates and completes each borehole as specified and manages all aspects of the Geoprobe® and materials.

Health and Safety Officer – Tara Schleeman, Pioneer

The Health and Safety Officer will ensure that work crews comply with all site/contractor and Pioneer corporate health and safety requirements.

Sampler/Field Health and Safety Officer – Julie Flammang

The sampler ensures that the SAP has been established and is followed to implement field activities. The sampler is responsible for field activities, documentation in the logbook, equipment, problem solving, and decision making in the field. The Field Health and Safety Officer conducts daily tailgate safety meetings and ensures that work crews comply with all site/contractor and Pioneer corporate health and safety requirements.

Field Sampler – Jerika Allick

The field sampler assists in field activities including sampling, monitoring and decontaminating procedures and ensures that these activities are documented in the field logbook.

5.0 SCHEDULE

Work is scheduled to begin in late summer of 2013 and will proceed until completion (approximately 5 days), weather conditions permitting. The actual schedule will be determined with consultation with Knife River and their excavation and hauling activities.

6.0 RECORDS AND REPORTS

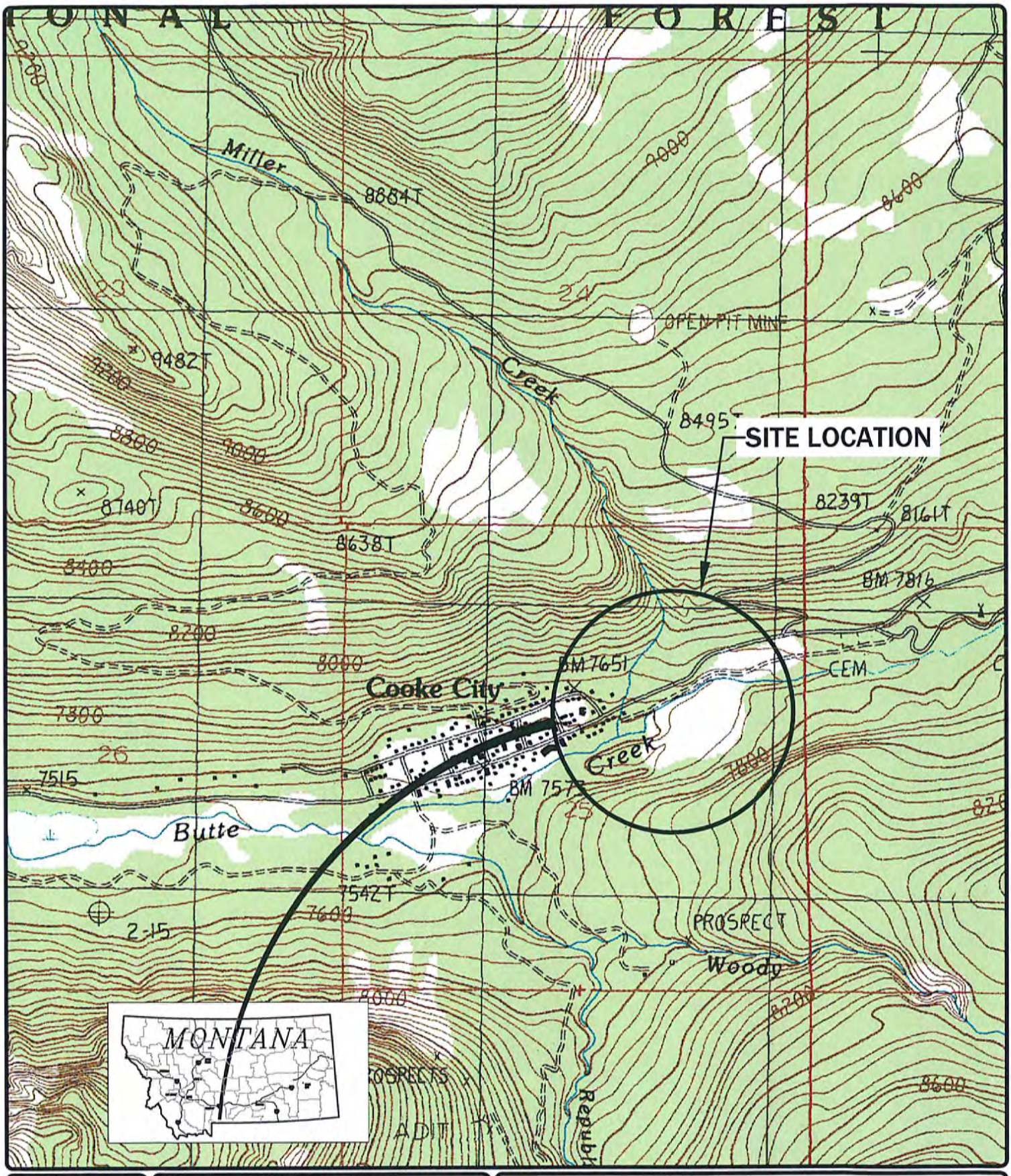
Using the data results collected during the RMC, a Data Summary Report (DSR) will be developed and submitted to DEQ.

7.0 REFERENCES

DEQ/MWCB-Pioneer, 2008. Final Potential Economic Recovery Fact Sheet for the McLaren Tailings Site, Cooke City, Montana. September 2008.

DEQ/MWCB-Pioneer, 2010. McLaren Tailings Abandoned Mine Site Reclamation Project, Cooke City, Montana. Final Bid Package. October 2009.

FIGURES



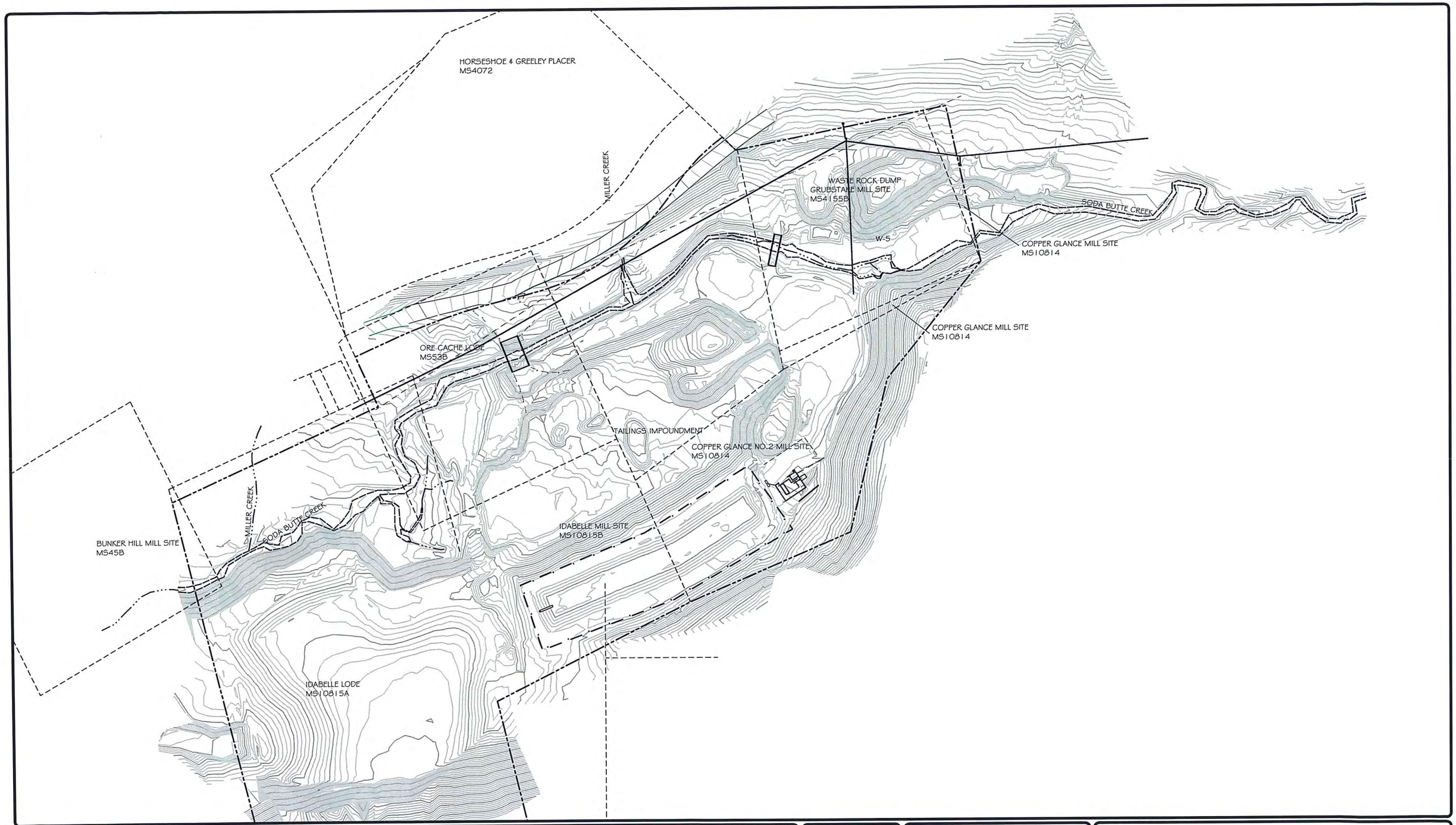
PROJECTION: TRANSVERSE MERCATOR
ZONE: MONTANA
DATUM: MSP NAD83
UNITS: FEET
SOURCE: COOKE CITY, MT-WY 7.5 QUADRANGLE

SCALE IN FEET
0 750 1500

FIGURE 1 SITE LOCATION MAP

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

DATE: 7/30/13



N

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD83
UNITS: FEET
SOURCE: PIONEER

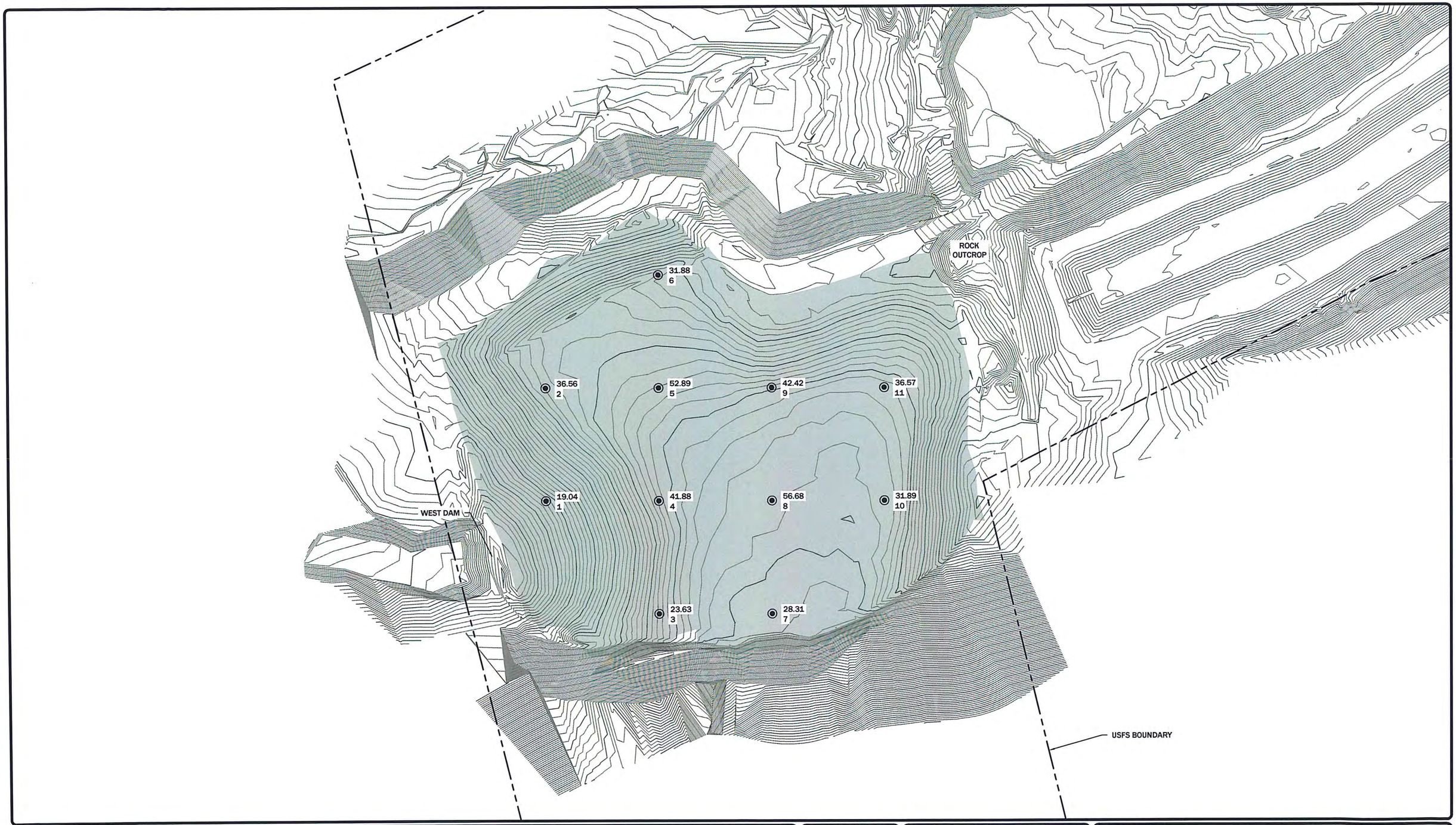
SCALE IN FEET
0 100 200

FIGURE 2

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

MCLAREN TAILINGS
ABANDONED
MINE SITE 2013
ASSAY

DATE: 7/30/13



N

DISPLAYED AS:

COORD SYS/ZONE: MSP

DATUM: NAD83

UNITS: FEET

SOURCE: PIONEER

SCALE IN FEET

0 100 200

FIGURE 3

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

MCLAREN TAILINGS
ABANDONED
MINE SITE 2013
ASSAY
SAMPLE LOCATIONS

DATE: 7/30/13

APPENDIX A

PIONEER'S STANDARD OPERATING PROCEDURES (SOPs)

PTS-SOP-SA-01

STANDARD OPERATING PROCEDURE
SOIL AND WATER SAMPLE PACKAGING AND SHIPPING

1. Water samples will be preserved, if required, according to PTS-SOP-SA-02 and PTS-SOP-SA-02B.

2. Based on the analytes requested (low level mercury, low level chromium, etc.) it may be necessary to place each filled sample containers in separate ziplock bags to prevent cross contamination, keep the container clean, dry, and isolated, and protect the sample label. In most cases, all sample containers collected from a specific sample location are placed in a large ziplock bag and shipped together. Samples will then be placed in a cooler which has been lined with a plastic bag. The samples will be surrounded with non-contaminating packaging materials to reduce movement and absorb any leakage. Ice will be double bagged and placed in the cooler. The plastic bag will then be sealed to contain the samples, packing material and ice.

3. The Field Team Leader or their designated representative will double check the chain of custody (COC) forms to assure those samples recorded on the COC form are in the cooler. The Field Team Leader or the designated representative will then sign the chain-of-custody form to relinquish custody.

4. One copy of the signed COC form will remain with the Field Team Leader. A photocopy may be made of the completed form if there are no carbon copies available. The paper work will then be placed in a sealed ziplock bag and taped to the inside of the cooler lid. If the shipping cooler contains more samples than can be analyzed in one analytical batch, the laboratory may request that the samples in the cooler be bagged for separate analytical batches. This may be necessary so that the appropriate Quality Control/Quality Assurance samples are included in each analytical batch. In this case separate COC forms will be filled out for each batch and included in the in the appropriate bags. The COC forms for each batch will be placed in a sealed ziplock bag and included at the top of the bag so that they are clearly visible to laboratory personnel when they open the bags.

5. The cooler will be labeled with the appropriate shipping labels (NOS, flammable liquids, flammable solids, this side up, fragile, etc.).

6. The cooler will then be closed and the appropriate shipping label (overnight shipping from Federal Express, UPS or the United States Postal Service or equivalent) will be affixed to the lid..

7. The Field Team Leader or the designated representative will sign chain-of-

custody seals and place the signed seals over the opening edge of the cooler.

8. Tape will then be placed over the custody seals and around the cooler.

9. The cooler(s) will then be transported to a secure storage, to the shipping agent, or directly to the laboratory.

Note: Bagging of samples and lining of coolers will not be necessary if samplers transport samples directly to the laboratory.

PTS-SOP-SA-04

STANDARD OPERATING PROCEDURE
CHAIN OF CUSTODY FORMS FOR ENVIRONMENTAL SAMPLES

This SOP establishes the requirements for documenting and maintaining environmental sample chain of custody from point of origin to receipt of sample at the analytical laboratory. This procedure shall apply to all types of air, soil, water, sediment, biological, and/or core samples collected in environmental investigations by Pioneer Technical Services, Inc. (Pioneer). It is applicable from the time of sample acquisition until custody of the sample is transferred to an analytical laboratory.

Chain of custody is an unbroken trail of accountability that ensures the physical security of samples, data and records. Custody refers to the physical responsibility for sample integrity, handling, and/or transportation. Custody responsibilities are effectively met if the samples are:

- in the responsible individual's physical possession;
- in the responsible individual's visual range after having taken possession;
- secured by the responsible individual so that no tampering can occur; or
- secured or locked by the responsible individual in an area in which access is restricted to authorized personnel only.

RESPONSIBILITIES

PROJECT MANAGER:

1. The Project Manager is responsible for overall management of environmental sampling activities, designating sampling responsibilities to qualified personnel, and reviewing any changes to the sampling plan.

FIELD TEAM LEADER:

1. The Project Manager may act as the Field Team Leader or may choose to appoint a Field Team Leader.
2. The Field Team Leader is responsible for general supervision of field sampling activities and ensuring proper storage/transportation of samples from the field to the analytical laboratory. Chain of Custody forms will be reviewed for accuracy and completeness to preserve sample integrity from collection to receipt by an analytical lab by the Field Team Leader. The review of Chain of Custody forms may be delegated to qualified personnel. The Field Team Leader is responsible for sample custody until the sample has been properly relinquished as documented on the chain of custody form.

FIELD SAMPLER

1. The Field Sampler is responsible for sample acquisition in compliance with technical procedures, initiating the Chain of Custody, and checking sample integrity and documentation prior to transfer.

2. Field samplers are also responsible for initial transfer of samples consisting of physical transfer of samples directly to the internal laboratory or transferred to a shipping carrier, (i.e., United Parcel Service or Federal Express) for delivery.

LABORATORY TECHNICIAN

1. The receiving Laboratory Technician is responsible for inspection of transferred samples to ensure proper labeling and satisfactory sample condition.
2. Unacceptable samples will be identified and segregated. The Laboratory Project Manager will be notified.
3. The Laboratory Technician will review the Chain of Custody for completeness and file as part of the project's permanent record.

EQUIPMENT AND MATERIALS

- Seals and Labels;
- Chain of Custody forms and chain of custody seals (provided by contracted laboratory); and
- Packing and shipping materials as necessary.

1. All samples shall be collected and handled in accordance with PTS-SOP-SA-01 and PTS-SOP-SA-02, or methods described in the sampling and analysis plan or work plan.. Samples will be transported in insulated coolers with ice ('blue ice' is acceptable) as necessary to maintain temperature at 4° C+/- 2°C until receipt by the analytical laboratory.

2. The Field Team Leader or designated Field Sampler shall initiate the Chain of Custody form for the initial transfer of samples.

3. A Chain of Custody form will be completed and accompany every sample. The form includes the following information:

- Project code;
- Project name;
- Samplers signature;
- Sample identification;
- Date sampled;
- Time sampled;
- Analysis requested;
- Remarks;
- Relinquishing signature, data, and time; and
- Receiving signature, date, and time.

4. The Field Sampler relinquishing custody and the responsible individual accepting custody shall sign, date, and note the time of transfer on the Chain of Custody form. (If the transporter is not an employee of Pioneer, the Field Sampler may identify the carrier and reference the bill of lading number in lieu of the transporter's signature.)

5. One copy of the Chain of Custody form shall be filed as a temporary record of sample transfer by the Field Sampler. The original form shall accompany the samples and shall be returned to Pioneer as part of the contracted laboratory Quality Assurance/Quality Control (QA/QC) requirements. The original form will be filed as part of the project's permanent records.

6. The Project Manager (or designee) shall track the Chain of Custody to ensure timely receipt of samples by an analytical laboratory.

PTS-SOP-SA-05

STANDARD OPERATING PROCEDURE
PROJECT DOCUMENTATION

This SOP establishes the requirements for documenting and maintaining field logbooks and photographs. These procedures shall apply to all types of air, soil, water, sediment, biological, and/or core samples collected in environmental investigation by Pioneer Technical Services, Inc. (Pioneer). These procedures apply from the time field work begins until site activities are completed.

LOGBOOKS

A designated field logbook will be used for each field project. If requested by the Project Manager a separate field logbook will be used for each field task within a larger project. Each logbook will be labeled with the project name, dates that it covers and logbook number. This information will be written with a waterproof marker such as a Sharpie© The logbooks will be bound and have consecutively numbered pages.

The information recorded in these logbooks shall be written in ink. Begin a new page for each days notes. Write on every line of the logbook. If a blank space is necessary for clarity, such as a change of subject, skip one line before beginning the new subject. Do not skip any pages or parts of pages unless a day's activity ends in the middle of a page. Draw a diagonal line on any blank spaces of four lines or more to prevent unauthorized entries. The author will initial and date entries at the end of each day. All corrections will consist of a single line-out deletion in ink, followed by the author's initials and the date. Information not related to the project should not be entered in the logbook. The language used in the logbook should be factual and objective.

These bound logbooks shall include the following entries:

1. A description of the field task.
2. Time and date fieldwork started.
3. Location and/or a description of the work areas, including sketches if needed, any maps or references needed to identify locations, and sketches of construction activities. If the location has been documented in the logbook during prior visits only changes in conditions should be noted.
4. Names and company affiliations of field personnel.
5. Name, company affiliation or address, and phone number of any field contacts or official site visitors
6. Meteorological conditions at the beginning of fieldwork and any ensuing changes in these conditions.
7. Details of the fieldwork performed and reference to field data sheets if used.
8. Deviation from the task-specific Sampling and Analysis Plan (SAP), Work Plan (WP) or Standard Operating Procedures (SOP).
9. All field measurements made.
10. Any field laboratory analytical results.
11. Personnel and equipment decontamination procedures, if appropriate.

For any field sampling work the following entries should be made:

1. Sample location and number.
2. Sample type and amount collected.
3. Date and time of sample collection.
1. Type of sample preservation.
4. Split samples taken by other parties. Note the type of sample, sample location, time/date, name of person for whom the split was collected, that person's company, and any other pertinent information.
5. Sampling method, particularly any deviations from the SOP.
6. Documentation or reference of preparation procedures for reagents or supplies that will become an integral part of the sample if available. This information may not be available for water or soil sampling bottles that come preserved from the laboratory or for preservatives provided by the laboratory. Bottle blanks will need to be used to evaluate the provided reagents.
7. The laboratory where the samples will be sent.

No bound field logbooks will be destroyed or thrown away even if they are illegible or contain inaccuracies that require a replacement document

PHOTOGRAPHS

Photographs will be taken of field activities using a digital camera. Photographs should include a scale in the picture when practical. Telephoto or wide-angle shots will not be used, since they cannot be used in enforcement meetings. The following items shall be recorded in the bound field logbook or on a field data sheet for each photograph taken:

1. The photographer's name, the date, the time of the photograph, and the general direction faced.
2. A brief description of the subject and the fieldwork portrayed in the picture.
3. Sequential number of the photograph.

An electronic copy and/or a hard copy of the photographs shall be placed in task files in the field office after each day of field activities.. Any supporting documentation from the bound field logbooks or field data sheets shall be photocopied and placed in the task files to accompany the photographs once the field activities are complete.

PTS-SOP-S-01

STANDARD OPERATING PROCEDURE
SURFACE SOIL SAMPLING

A surface sample is defined as a mineral soil sample collected from immediately beneath the vegetative mat. It generally includes some interval from the upper six inches of soil. Surface sampling under biased conditions may be selected after considering factors such as type of contaminant, length of time the area has been contaminated, the type of soil and the past use of the area.

GRAB SAMPLE:

Sample collection devices include stainless steel scoops or trowels, disposable Teflon trowels or for inorganic contaminants disposable plastic scoops. The following procedure is designed to be used to collect a surface soil sample from the 0-2 inch horizon. These procedures may be modified in the field based on field and site conditions after appropriate annotations have been made in the field log book. These procedures are **not to** be used when sampling for volatile organic compounds. The procedure for collecting volatile organic samples is included in Section 3 of this SOP.

1. Locate the site as directed in the appropriate sampling and analysis plan (SAP).

2. Complete a site walk through and determine any site specific hazards associated with the sampling area. Discuss with sampling crew and note in the field logbook. During the site walk through note possible locations for underground utilities. As an example identify where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. Determine if an underground sprinkling system is present. If sample locations have not been assigned in the SAP, note the probable locations of underground utilities and try to avoid those areas when choosing sample locations. If sample locations are identified in the SAP use the appropriate survey method to locate.

3. Dig a 6 to 12-inch square pit to a depth of approximately 6 inches. The size and depth of the sample pit required would depend on the amount of material needed for sample analysis and the interval to be sampled. If a sod mat is present, it shall be separated from the mineral soil surface with the chosen sampling tool. The removed sod mat shall be shaken and scraped over the sample collection bowl to dislodge any mineral soil particles. All dislodged particles shall be placed in the sample. If the surface material is coarse-grained material free of intermixed materials (i.e., graveled driveway) the sample will be collected from the layer below the protective barrier. However, if the graveled driveway, alley or lot contains soil/dust material on the surface the sample will be collected from the appropriate interval. If the sample area is unvegetated the sample material will be collected from the designated interval inches below ground surface.

4. Measure the interval to be sampled (0-2 inches or 0-6 inches) with a stainless steel tape measure or a ruler and mark the appropriate interval.

5. Scrape the walls of the sample pit within the marked interval with a decontaminated stainless steel trowel or scoop, a Teflon scoop, or a disposable plastic scoop to expose a clean surface.

6. Once the wall of the test pit has been cleaned, collect the sample by scraping the appropriate interval on the cleaned face of the pit with the sampling tool and placing the material in a decontaminated stainless steel bowl, or a new cleaned foil pan.

7. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining material in the bowl with the sampling tool..

8. Transfer the soil sample directly into the appropriate sample container according to PTS-SOP-SA-01 and store in a cooler at 4°C or less.

9. Record appropriate information about the sample collection in the field logbook.

10. Decontaminate sampling tools according to procedures outlined in PTS-SOP-DE-02.

COMPOSITE SAMPLING

In many situations a composite sample is more appropriate for sample collection than a grab sample. Several types of composite samples can be collected. A biased composite sample can be collected by the sampler identifying specific spots within the sample area that appear to be contaminated or not contaminated and digging sample pits in those locations. Composite samples can also be collected randomly as defined in a SAP.

Sub samples are often collected in a five-point (star) pattern. At each point, a subsample of a predetermined depth is collected. The diagonal distance between points is commonly ten feet depending on the area of soil homogeneity. Sub samples can also be collected in a three-point (triangular) pattern. At each point, a subsample of predetermined depth is collected. The diagonal distance between the points is commonly ten feet depending on the area of soil homogeneity. The precise method for compositing the sample will be discussed in the SAP. Each subsample test hole will be prepared and sampled in the manner discussed above under Grab Samples.

1. Composite samples will consist of discrete aliquots of equal amounts of soil from each subsample location. The soil aliquots will be collected into a stainless steel bowl and thoroughly mixed. During the homogenization process, large particles (greater than 0.5 inch in diameter) will be discarded. After mixing, the sample will be placed in a one quart plastic bag, labeled, stored in a cooler with ice and maintained at 4 degrees Celsius (°C) until delivered to the laboratory. Any remaining sample material will be returned to

the sample holes. A sufficient quantity of soil will be collected in each sample container to provide for analysis with additional soil left over to be archived. An alternative method of compositing soil subsamples is with a large disposable plastic or canvas sheet. The subsamples are mixed in the center of the sheet. Each corner is pulled up and toward the diagonally opposite corner. This process is done from each corner. After the soil is mixed, it is again spread out on the cloth into a relatively flat pile. The pile is quartered. A small scoop is used to collect small samples from each quarter until the desired amount of soil is acquired. Note: High concentrations of organic chemicals in soils can react with the plastic sheet. The sampler may also "eyeball" an equal amount of sample material from each hole into a resealable plastic bag (i.e. Ziploc®). The sample material would be thoroughly mixed between each subsample pit and prior to placing in the appropriate sample containers.

2. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining material in the bowl with the sampling tool.

3. Transfer the soil sample directly into the appropriate sample container according to PTS-SOP-SA-01 and store in a cooler at 4°C or less.

4. Record appropriate information about the sample collection in the field logbook.

5. Decontaminate sampling tools according to procedures outlined in PTS-SOP-DE-02.

VOLATILE ORGANIC SAMPLING

1. Locate the site as directed in the appropriate sampling and analysis plan (SAP).

2. Do a site walk through and determine any site specific hazards associated with the sampling area. Discuss with sampling crew and note in the field logbook. During the site walk through note possible locations for underground utilities. As an example identify where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. If sample locations have not been assigned in the SAP, note the probable locations of underground utilities and try to avoid those areas when choosing sample locations. If sample locations are identified in the SAP use the appropriate survey method to locate.

3. Dig a 6 to 12-inch square pit to a depth of approximately 6 inches. The size and depth of the sample pit required would depend on the amount of material needed for sample analysis and the interval being sampled. If a sod mat is present, it shall be separated from the mineral soil surface with the chosen sampling tool. The removed sod mat shall be shaken and scraped over the sample collection bottle to dislodge any mineral soil particles. All dislodged particles shall be placed in the sample. If the surface material is coarse-grained material free of intermixed materials (i.e., graveled driveway) the sample will be collected from the appropriate layer below the protective barrier. However, if the graveled driveway, alley or lot contains soil/dust material on the surface the sample will

be collected from the appropriate interval. If the sample area is unvegetated the sample material will be collected from appropriate depth below ground surface.

4. Measure the interval to be sampled (0-2 inches or 0-6 inches) with a stainless steel tape measure or a ruler and mark the appropriate interval.

5. Scrape the walls of the sample pit within the marked interval with a decontaminated stainless steel trowel or scoop, a Teflon scoop, or a disposable plastic scoop to expose a clean surface.

6. After the face of the test pit has been cleaned either immediately place the sampling container into the sample pit and collect the sample by scraping the appropriate interval of mineral soil directly into the sample container, material should be packed in as tightly as feasible and the sampler should try to avoid getting large particles in the jar. The sampling container should be filled to the top with little to no headspace and the lid placed on the container as soon as the jar is full. The sample should be placed immediately in a cooler at 4°C or less.

7. Record appropriate information about the sample collection in the field logbook.

8. Decontaminate sampling tools according to procedures outlined in PTS-SOP-DE-02.

PTS-SOP-S-02

STANDARD OPERATING PROCEDURE
SUBSURFACE SOIL SAMPLING

A subsurface sample is defined as a mineral soil sample collected from 6 inches to 25 feet below ground surface. The need for biased sampling of subsurface soils should be evaluated by considering factors such as the precipitation, the type of soil and the length of time the site has been contaminated. If precipitation has moved contaminants into lower soil horizons, subsurface sampling may be appropriate.

Composite or grab samples can be collected during subsurface sampling similar to those techniques described in the surface sampling SOP (PTS-SOP-S-01).

SHALLOW SUBSURFACE SAMPLING

Several techniques can be used to collect samples from 6 inches to four or five feet below ground surface (bgs). A shovel and pry bar can be used to collect samples from 6 inches to 2 feet bgs. A hand auger may be used to collect subsurface samples up to four or five feet in depth. Because the auger is twisted into the soil the soil's cohesive structure and stratigraphic character are destroyed. An in situ soil recovery auger may also be used to collect subsurface samples up to five feet. The auger accommodates a liner and provides fast cutting of the soil with very little soil disturbance. In particularly rocky or hard soils a back hoe may be needed to excavate even shallow test pits. It is important to evaluate site conditions prior to choosing a subsurface sampling method. Each method of sampling will be discussed below.

Hand Dug Test Pits

1. Locate the site as directed in the appropriate sampling and analysis plan (SAP).

2. Conduct a site walk through and determine any site specific hazards associated with the sampling area. Discuss these with the sampling crew and note in the field logbook. During the site walk through note possible locations for underground utilities. For example identify where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. If sample locations have not been assigned in the SAP, note the probable locations of underground utilities and try to avoid those areas when choosing sample locations. If sample locations are identified in the SAP use the appropriate survey method to locate.

3. Dig a 6 to 12-inch square pit to the depth specified in the SAP plus an additional 3 to 4 inches.

4. Measure the interval to be sampled with a stainless steel tape measure or a ruler and mark the appropriate interval.

5. Scrape the walls of the sample pit within the marked interval with a decontaminated stainless steel trowel or scoop, a Teflon scoop, or a disposable plastic scoop to expose a clean surface.

6. Place a stainless steel bowl or a clean decontaminated disposable foil pan adjacent to or in the sample pit and collect the sample by scraping the appropriate interval on the cleaned face of the pit with the sampling tool. If more than one interval is to be collected from the hole, collect the bottom or deepest interval first. If sampling for volatile organic compounds, the soil must be placed directly into the sample container with no head space and placed into a cooler with ice immediately.

7. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining material in the bowl with the sampling tool.

8. Transfer the soil sample directly into the appropriate sample container according to PTS-SOP-SA-01 and store in a cooler at 4°C or less.

9. Record appropriate information about the sample and collection in the field logbook.

10. Decontaminate sampling tools according to procedures outlined in PTS-SOP-DE-02

Hand Auger Sampling

1. Locate the site as directed in the appropriate sampling and analysis plan (SAP).

2. Conduct a site walk through and determine any site specific hazards associated with the sampling area. Discuss with the sampling crew and note in the field logbook. During the site walk through note possible locations for underground utilities. For example identify where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. If sample locations have not been assigned in the SAP, note the probable locations of underground utilities and try to avoid those areas when choosing sample locations. If sample locations are identified in the SAP use the appropriate survey method to locate. Note the locations of overhead lines and overhead hazards and avoid those areas if possible.

3. Place a large piece of plastic of canvas adjacent to the sample location. Choose the appropriate auger head for the soil type at the sample site (i.e., sand, mud, normal). Measure the auger head to determine the advancement depth for each full auger. Place the auger at the sample location and begin turning, when the head is full remove the auger

from the hole and empty the head onto the plastic. Measure the hole depth to determine the number of auger heads needed to reach the sample interval. Keep augering and emptying the soil onto the plastic sheet until the top of the sampling interval is reached. The soil can be placed on the sheet in the order of removal for a general soil profile.

4. Place a stainless steel bowl or a clean decontaminated disposable foil pan near the sample pit (preferably on a clean portion of the plastic or canvas sheet) and collect the sample by emptying the auger head into the bowl or pan. Continue augering and emptying the auger head into the sampling container throughout the entire sampling interval. If sampling for volatile organic compounds, the soil must be placed directly into the sample container with no head space and placed into a cooler with ice immediately.

5. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining material in the bowl with the sampling tool.

6. Transfer the soil sample directly into the appropriate sample container according to PTS-SOP-SA-01 and store in a cooler at 4°C or less.

7. Record appropriate information about the sample and collection in the field logbook.

8. Decontaminate sampling tools according to procedures outlined in PTS-SOP-DE-02.

In-Situ Soil Recovery Auger

A power auger mounted on a truck or trailer is the most common of the In-Situ Soil Recovery Augers and can be used to sample up to 25 feet or more in depth. There are also several types of hand augers with liner tubes that can be used for sampling up to 5 feet depending on soil type.

1. Prior to site entry have a utility locate performed.

2. Locate the site as directed in the appropriate sampling and analysis plan (SAP).

3. Walk through the site and determine any site specific hazards associated with the sampling area. Discuss these with the sampling crew and note in the field logbook. During the site walk through note possible locations for underground utilities, for example identify where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. If sample locations have not been assigned in the SAP, note the probable locations of underground utilities and try to avoid those areas when choosing sample locations. If sample locations are identified in the SAP use the appropriate survey method to locate.

4. Actual augering or drilling of the sampling holes will be conducted following the subcontractors SOP's and safety protocols.

5. As the plastic, Teflon or stainless steel liner is removed from the drill or auger rod, make sure that the "top" of the liner, which represents the upper intervals is identified. If entire auger is being submitted for analysis seal both ends and mark the liner with the appropriate sample number and information. Place in a cooler and store at 4°C or less. If individual sample containers need to be collected or a composite sample over several intervals is to be collected place the liner on a work surface (portable table or plastic tarp on the ground). Cut the liner tube along its length. Label the top and bottom of the liner with the appropriate depths, index cards or pieces of paper placed at the top and bottom are acceptable. Photograph the core. Measure the amount of material present in the liner and if specified in the site specific sampling plan log the core.

6. Place a stainless steel bowl or a clean decontaminated disposable foil pan near the liner. Using a decontaminated stainless steel trowel or scoop, a Teflon scoop, or a disposable plastic scoop remove the appropriate interval from the liner and put it in the bowl/pan. If sampling for volatile organic compounds, place the soil directly into the appropriate sampling container, fill the container so that there is no head space, seal and place in a cooler with ice immediately.

7. For all other analytes remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining material in the bowl with the sampling tool.

8. Transfer the soil sample directly into the appropriate sample container according to PTS-SOP-SA-01 and store in a cooler at 4°C or less.

9. Record appropriate information about the sample and collection in the field logbook.

10. Decontaminate sampling tools according to procedures outlined in PTS-SOP-DE-02.

PTS-SOP-SA-01

STANDARD OPERATING PROCEDURE
SOIL AND WATER SAMPLE PACKAGING AND SHIPPING

1. WATER SAMPLE PRESERVATION precedes if the sample to be packed is water and preservation is required.

2. Each of the filled sample containers will be placed in separate ziplock bags to keep it clean, dry, isolated, and to protect the sample label. Samples will then be placed in a cooler which has been lined with a plastic bag. The samples will be surrounded with vermiculite to reduce movement and absorb any leakage. The garbage bag will then be tied to contain the vermiculite.

3. The Project Manager will double check the paper work (chain-of-custody form, etc.) to assure those samples recorded on the associated paper work are in the cooler. The Project Manager and the sampler will then sign the chain-of-custody form to relinquish custody.

4. The paper work will then be placed in a sealed ziplock bag and taped to the inside of the cooler lid.

5. The cooler will be labeled with the appropriate shipping labels (NOS, flammable liquids, flammable solids, this side up, fragile, etc.).

6. The cooler will then be closed and an address label will be affixed to the lid (a Federal Express label will also be affixed, if used, at this time).

7. The cooler will then be closed and chain-of-custody seals will be placed over the opening.

8. Tape will then be placed over the custody seals and around the cooler.

9. The cooler(s) will then be transported to a secure storage, to the shipping agent, or directly to the laboratory.

Note: Bagging of samples and lining of coolers will not be necessary if samplers transport samples directly to the laboratory.

Geoprobe Direct Push Machine Inspection Form: (sonic rig n/a)

Company Name: Location: Date of Inspection:

Equipment Information				Crew Information	Job Information
Unit Number	Current Hours	Next Service Hour	Unit Serial #	Supervisor:	Job Name:
Inspector:		Geoprobe Model #			

ENGINE COMPARTMENT	Y	N	NA	Comments
Engine oil level ADD |----------| FULL				
Engine coolant level ADD |----------| FULL				
Hyd. oil level (site glass) BTM |----------| TOP				
Hyd. drain plug cap in place				
Hyd. fill cap installed				
Radiator cleanliness				
Master disconnect secure, clean, functioning				
Battery clean and secure				
Fuse and relay box clean, secure, closed				
Belt in good condition and proper tension				
Air filter cover secure, orientated correctly				
Fuel cap installed				
Hydraulic oil cooler clean				
Hyd lines overall condition and free of leaks				
Wiring secure, condition, frays, corrosion, etc				
MACHINE CHASSIS				
Tracks' condition and correct tension				
Grease chassis as reqd				
Inspect Hyd cylinders for leaks				
Hyd lines overall condition and free of leaks				
Hyd manifolds for security, leaks, damage				
Emergency Stops condition & operation				
Fire Extinguisher				
Strobe light operation				
Wiring secure, condition, corrosion, etc				
Check for loose or missing fasteners				
Frame for damage, cracks, etc				
REMOTE SYSTEMS				
Wireless TX condition, batteries, operation				
Wireless RX security, condition, operation				
Tether Remote – cable, box, condition				
Remote E-stop functionality				

CONTROL PANEL	Y	N	NA	Comments
Cleanliness				
MD3 display condition & messages				
Alarm / Warning light operation				
Manual levers in neutral and secure				
Rocker switches, condition, operation				
Aux flow controls				
Gauges working				
Enable switch operation and condition				
Overlay condition and readability				
Hydraulics free of leaks and secure				
Electrical harness security & condition				
FOOT				
Slides adjusted, secure, lubricated				
Hydraulics free of leaks and secure				
Check for loose or missing fasteners				
GH Hammer charged, secure, condition				
Pull latch security and condition				
Electrical harness security & condition				
E- stop pull cable adjustment, operation				
MACHINE ACCESSORIES				
Moyno Pump or other				
Drop Hammer secure, hyd hoses, lubricated				
Wire Rope condition, secure, lay on drum				
Winch mast shives secured rotating freely				
Mast cylinder upper roll pin installed				
Winch drum backing plate / tensioner				
Winch safety hook condition, & operation				
Extruder installation correct and secure				
Pressure washer instl correct and secure				
Racks, Trays, & etc instl correct & secure				
Safety cage, condition, operation				

MACHINE DISCREPANCIES	SAFETY CRITICAL (Y/N)	CORRECTIVE ACTION

FIELD / UNIT NOTES

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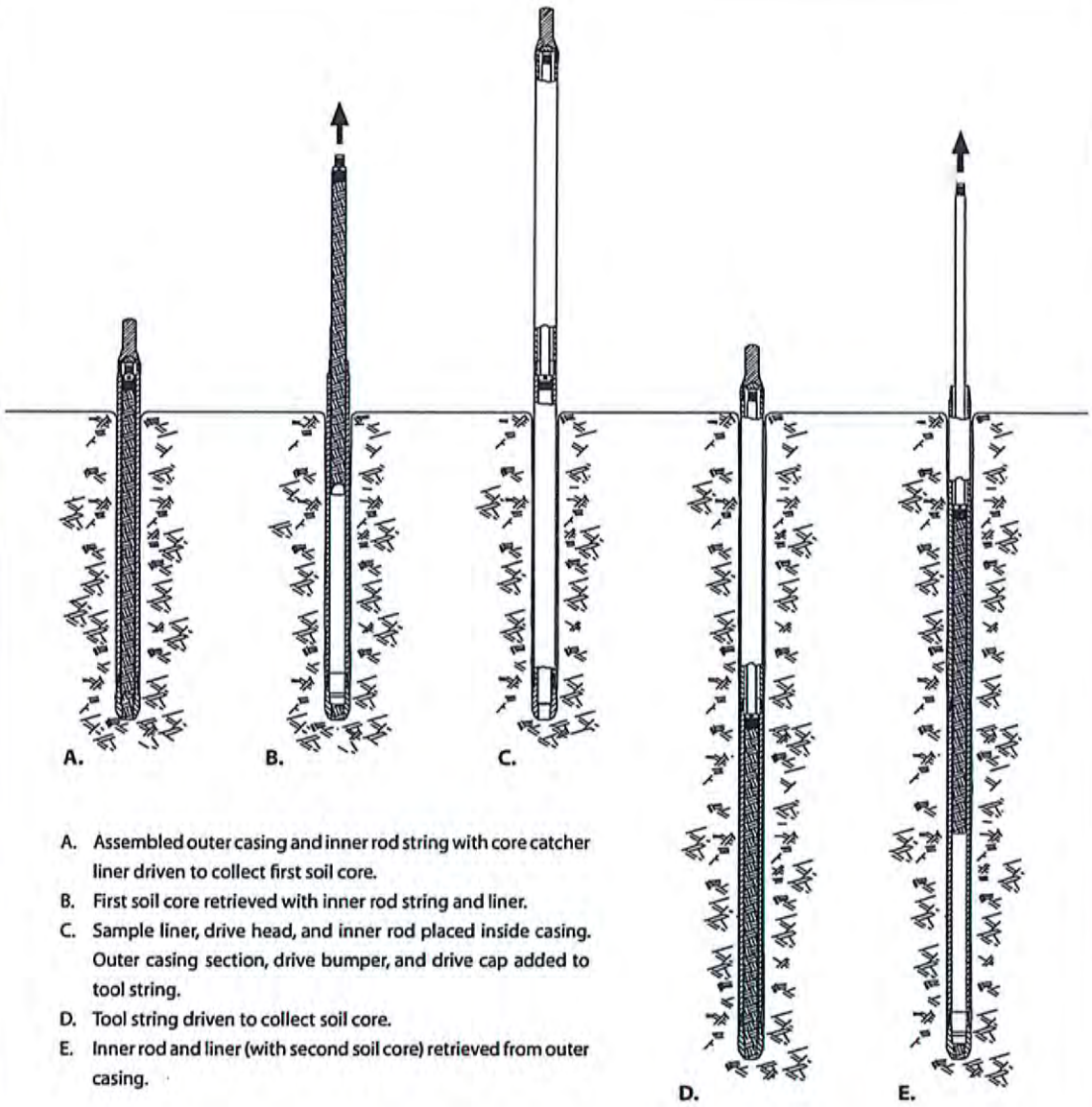
GEOPROBE® DT22 DUAL TUBE SOIL SAMPLING SYSTEM

CONTINUOUS CORE SOIL SAMPLER

STANDARD OPERATING PROCEDURE

Technical Bulletin No. MK3140

PREPARED: November, 2006
REVISED: January, 2011



A. Assembled outer casing and inner rod string with core catcher liner driven to collect first soil core.
B. First soil core retrieved with inner rod string and liner.
C. Sample liner, drive head, and inner rod placed inside casing. Outer casing section, drive bumper, and drive cap added to tool string.
D. Tool string driven to collect soil core.
E. Inner rod and liner (with second soil core) retrieved from outer casing.

OPERATION OF THE DUAL TUBE 22 SOIL SAMPLING SYSTEM

Geoprobe Systems®

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Geoprobe® Prepacked Screens are manufactured under U.S. Patent No. 7,735,553B2.

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1.0 OBJECTIVE

The objective of this procedure is to collect a representative soil sample at depth through an enclosed casing and recover it for visual inspection and/or chemical analysis.

2.0 BACKGROUND

2.1 Definitions

Geoprobe®: A brand name of high quality, hydraulically-powered machines that utilize both static force and percussion to advance sampling and logging tools into the subsurface. The Geoprobe® brand name refers to both machines and tools manufactured by Geoprobe Systems®, Salina, Kansas. Geoprobe® tools are used to perform soil core and soil gas sampling, groundwater sampling, soil conductivity and contaminant logging, grouting, and materials injection.
** Geoprobe® and Geoprobe Systems® are registered trademarks of Kejr Engineering, Inc., Salina, Kansas*

Dual Tube 22 Soil Sampling System: A direct push system for collecting continuous core samples of unconsolidated materials from within a sealed casing of Geoprobe® 2.25-inch (57 mm) outside diameter (OD) probe rods. Samples are collected and retrieved within a liner that is threaded onto the leading end of a string of Geoprobe® 1.25-inch (32 mm) OD Light-Weight Center Rods and inserted to the bottom of the outer casing. Collected samples measure up to approximately 980 ml in volume in the form of a 1.125-inch x 60-inch (29 mm x 1524 mm) core.

Liner: A 1.375-inch (35 mm) OD thin-walled, PVC tube that is inserted into the outer casing on the leading end of the inner rod string for the purpose of containing and retrieving core samples. Liners are available in two configurations; a simple open tube or a tube with a core catcher permanently attached to the leading end. Nominal liner lengths include 36 inches, 1 meter, 48 inches, and 60 inches.
***Nominal liner length identifies the length of tools with which the liner is used (see Page 8). The actual end-to-end lengths of the various DT22 liners will differ from the specified nominal lengths.*

Core Catcher: A dome-shaped device positioned at the leading end of a liner to prevent loss of collected soil during retrieval of the liner and soil core. Flexible fingers at the top of the core catcher are pushed outward by soil entering the liner during advancement of the tool string. As the filled liner is subsequently retrieved, the fingers of the core catcher move back inward, effectively closing off the end of the liner and limiting soil loss. The core catcher designed for the DT22 system is made of PVC material and is permanently fused to the liner.

2.2 Discussion

Dual tube sampling gets its name from the fact that two sets of probe rods are used to retrieve continuous soil core samples from the subsurface. One set of rods is driven into the ground as an outer casing (Fig. 2.1). These rods receive the driving force from the hammer and provide a sealed casing through which soil samples may be recovered. The second, smaller set of rods are placed inside the outer casing with a sample liner attached to the leading end of the rod string (Fig. 2.1). These smaller rods hold the liner in place as the outer casing is driven to fill the liner with soil. The inner rods are then retracted to retrieve the full liner.

Standard Geoprobe® 2.25-inch OD probe rods provide the outer casing for the DT22 Dual Tube Soil Sampling System. A cutting shoe is threaded into the leading end of the rod string. When driven into the subsurface, the cutting shoe shears a 1.125-inch OD soil core which is collected inside the casing in a clear plastic liner.

The second set of rods in the DT22 system are Geoprobe® 1.25-inch OD Light-Weight Center rods. A sample liner is attached to the end of these smaller rods and then inserted into the casing. The 1.25-inch rods hold the liner tight against the cutting shoe as the outer casing is driven to collect the soil core. Once filled with soil, the liner is removed from the bottom of the outer casing by lifting out the 1.25-inch rods.

The outer, 2.25-inch probe rods provide a cased hole through which to sample. The main advantage of sampling through a cased hole is that there is no side slough to contend with. In addition, the outer casing effectively seals the probe hole when sampling through perched water tables. These factors mean that sample cross-contamination is eliminated. The DT22 sampling system is therefore ideal for continuous coring in both saturated and unsaturated zones.

Solid Drive Tip

A DT22 Discrete Point 1.25 pin (22956) can be placed on the leading end of the 1.25 inner rod string in place of a sample liner (Fig. 2.2). When installed in the outer casing, the drive tip firmly seats within the cutting shoe and effectively seals the tool string as it is driven into the subsurface. This enables the operator to advance the outer casing to the bottom of a pre-cored hole or through undisturbed soil to reach the top of the sampling interval.

Grouting

The DT22 system allows bottom-up grouting through the primary tool string. This means that a cement or bentonite grout mix can be pumped through the outer casing as it is withdrawn from the ground. This is in contrast to most other soil samplers which require driving a second set of tools back down the probe hole in order to deliver the grout mix.

Monitoring Well Installation

An expendable cutting shoe enables the operator to install a Geoprobe® Prepacked Screen Monitoring Well through the outer casing of the DT22 Dual Tube System. After the collection of continuous soil cores to the desired depth, prepacked screens can be inserted to the bottom of the outer casing on the leading end of a PVC riser string. The well is finished, complete with grout barrier, bentonite well seal, and a high-solids bentonite slurry/neat cement grout, during retrieval of the outer casing.

SP22 Groundwater Sampler

The Screen Point 22 (SP22) Groundwater Sampler can be used in conjunction with the DT22 Dual Tube System to perform soil sampling, groundwater sampling, and slug testing at multiple depth intervals in one probe push.

With the SP22 sampler, a stainless steel or PVC screen is lowered to the bottom of the DT22 outer casing on the leading end of a string of either 1.25-inch OD light-weight center rods or 0.75-inch schedule 40 flush-thread PVC riser. The outer casing is then retracted while the SP22 screen is held in place with the 1.25-inch rods or PVC riser. This exposes the screen to the formation for groundwater sampling or slug testing. When sampling or testing is complete, the SP22 screen is removed with the inner rod or riser string and DT22 sampling may continue.

For specific information on using the SP22 sampler, refer to *Geoprobe® Screen Point 22 Groundwater Sampler - Standard Operating Procedure* (Geoprobe® Technical Bulletin No. MK3173).

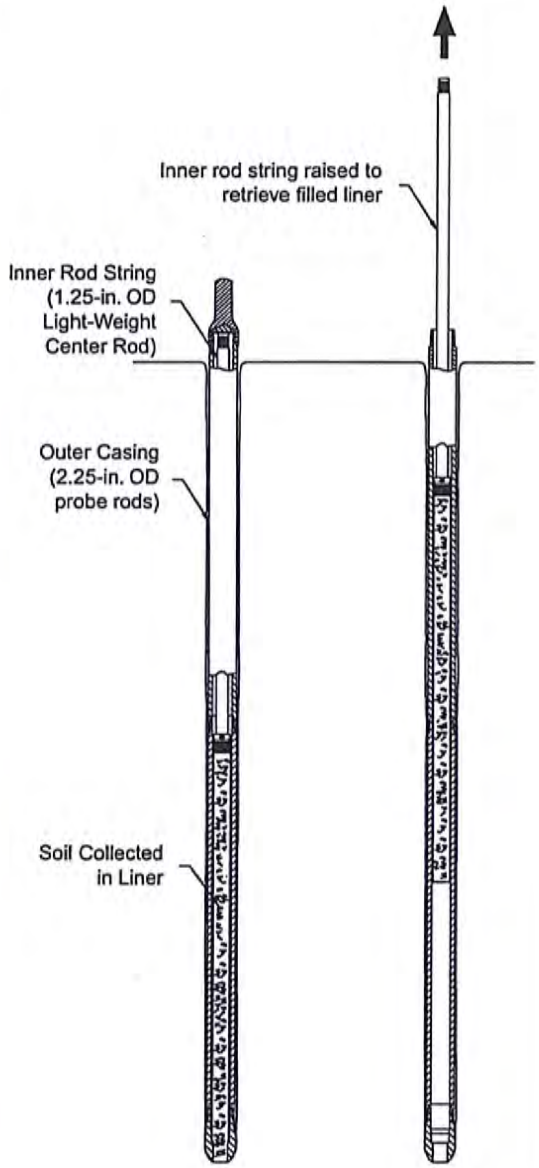

FIGURE 2.1
Outer Casing Driven With Liner

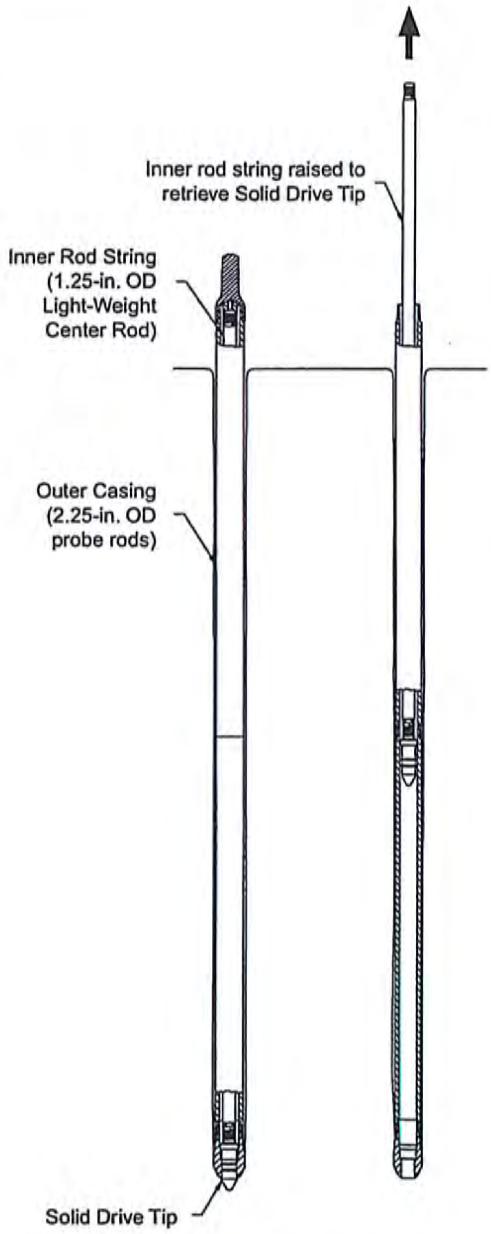

FIGURE 2.2
Outer Casing Driven With Solid Drive Tip

3.0 REQUIRED EQUIPMENT

The following equipment is used to recover samples with the Geoprobe® Dual Tube 22 Soil Sampling and probing systems. Refer to Figure 3.1 for parts identification.

DUAL TUBE 22 SAMPLER PARTS	QUANTITY	PART NUMBER
DT22 Drive Bumper	-10-	DT4010
DT22 Drive Head Cushion Assembly	-1-	42236
DT22 Drive Cushion Assist Handle	-1-	45425
DT22 Threadless Drive Cap, for 1.25-inch rods	-1-	22955
DT22 Liner Drive Head Assembly, for 1.25-inch rods	-1-	DT4052
DT22 Thread Cutting Drive Head Assembly, for 1.25-inch rods	-1-	41675
Rebuild Kit for DT22 Liner Drive Head	-1-	DT4051K
DT22 Solid Drive Tip, for 1.25-inch rods	-1-	22956
O-rings for Solid Drive Tip, Pkg. of 25	variable	DT4070R
DT22 Liner, 60-inch, Box of 50*	variable	DT4061K
DT22 Liner, 48-inch, Box of 50*	variable	DT4048K
DT22 Liner, 1-meter, Box of 50*	variable	DT4039K
DT22 Liner, 36-inch, Box of 50*	variable	DT4036K
DT22 Liner with Core Catcher, 60-inch, Box of 50*	variable	DT4161K
DT22 Liner with Core Catcher, 48-inch, Box of 50*	variable	DT4148K
DT22 Liner with Core Catcher, 1-meter, Box of 50*	variable	DT4139K
DT22 Liner with Core Catcher, 36-inch, Box of 50*	variable	DT4136K
DT22 Liner Cutter	-1-	28751
DT22 Vinyl End Caps, Pkg. of 100 (50 pair)	variable	DT4026K
Universal Liner Holder	-1-	22734
DT22 Cutting Shoe, Standard	-1-	25341
DT22 Expendable Cutting Shoe Holder	-1-	29402
DT22 Expendable Cutting Shoe, 2.375-inch OD	variable	DT4045
O-rings for Expendable Cutting Shoe, Pkg. of 50	variable	DT4045R

CENTER RODS AND CENTER ROD ACCESSORIES	QUANTITY	PART NUMBER
Light-Weight Center Rod, 1.25-inch OD x 60 inches*	variable	27600
Light-Weight Center Rod, 1.25-inch OD x 48 inches*	variable	21900
Light-Weight Center Rod, 1.25-inch OD x 36 inches*	variable	43012
Light-Weight Center Rod, 1.25-inch OD x 1 meter*	variable	32318
Leaf Puller Assembly, for 1.25-inch rods	-1-	31499
Adjustable Rod Clamp	-1-	27216

PROBE RODS AND PROBE ROD ACCESSORIES	QUANTITY	PART NUMBER
Probe Rod, 2.25-inch OD x 60 inches*	variable	25301
Probe Rod, 2.25-inch OD x 48 inches*	variable	25300
Probe Rod, 2.25-inch OD x 1 meter*	variable	25352
Probe Rod, 2.25-inch OD x 36 inches*	variable	33245
O-rings for 2.25-inch rods, Pkg. of 25	variable	AT2100R
GH60 Threadless Drive Cap, for 2.25-inch rods**	-1-	31530
GH60 Threaded Drive Cap, for 2.25-inch rods**	-1-	25363
GH40 Threadless Drive Cap, for 2.25-inch rods	-1-	31405
GH40 Threaded Drive Cap, for 2.25-inch rods	-1-	25362
Pull Cap, for 2.25-inch rods	-1-	33622
Rod Grip Pull System, for GH40 Hammer and 2.25-inch rods	-1-	29461
Rod Grip Pull Handle, for GH60 Hammer and 2.25-inch rods	-1-	29385

* Match length of rods to desired liner length. Use 60-inch rods with 60-inch liners, 48-inch rods with 48-inch liners, etc.

** The considerable percussive force of the GH60 Hydraulic Hammer may result in reduced tool life for components such as the DT22 Drive Bumper and rod string as compared to operation with the GH40 Hydraulic Hammer.

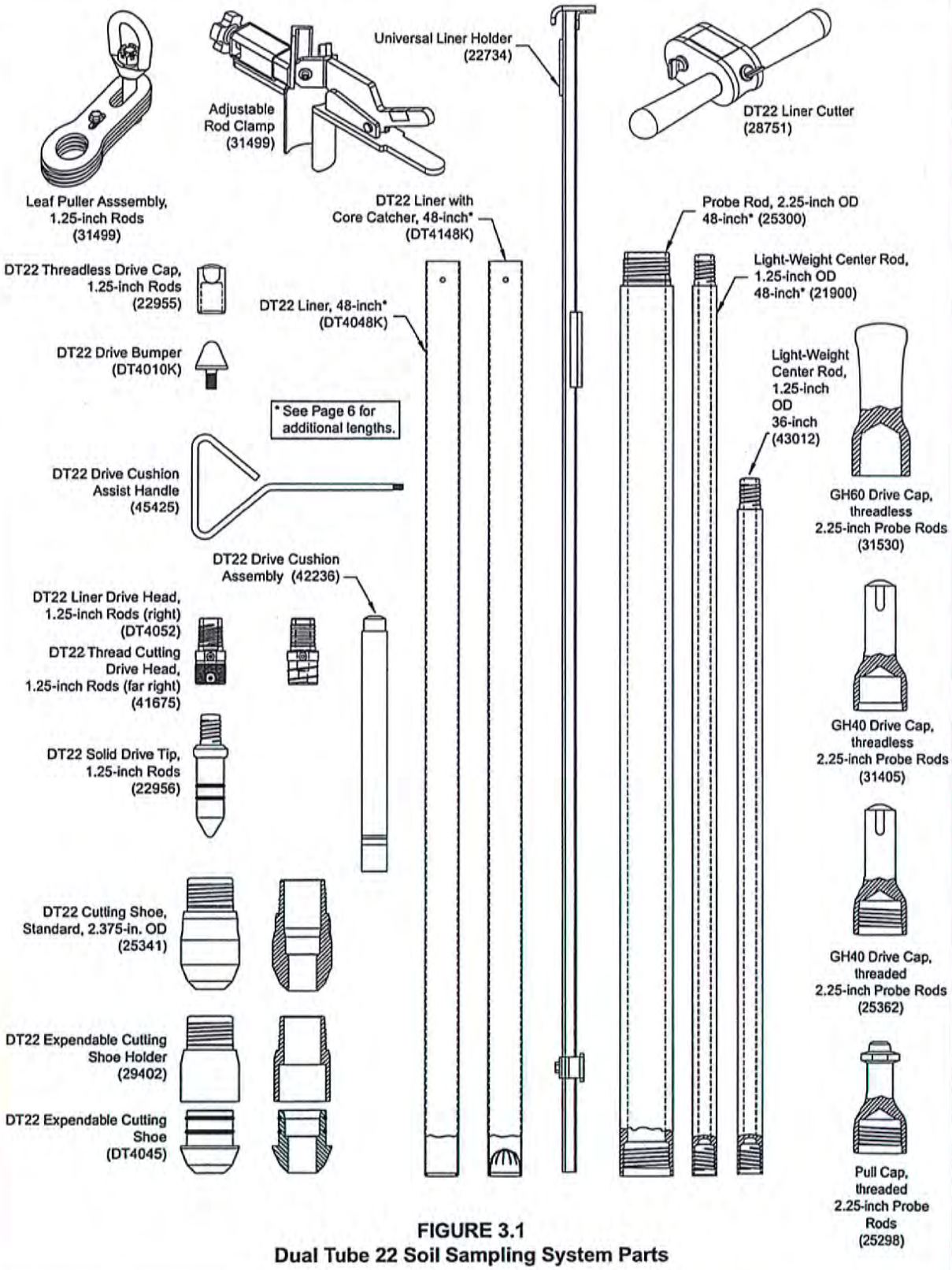

FIGURE 3.1
Dual Tube 22 Soil Sampling System Parts

3.1 Tool Options

Three major components of the DT22 Soil Sampling System are probe rods, sample liners, and cutting shoes. These items are manufactured in a variety of sizes to fit the specific needs of the operator. This section identifies the specific tool options available for use with the DT22 Dual Tube System.

Probe Rods

Geoprobe® 1.25-inch (32 mm) OD Light-Weight Center Rods and 2.25-inch (57 mm) OD probe rods are required to operate the DT22 Soil Sampling System. Both rod sets (1.25-inch and 2.25-inch) must be of the same length.

Sample Liners

Sample liners are made of a heavy-duty clear plastic for convenient inspection of the soil sample. Lengths of 36, 48, 60 inches, and 1 meter are available with an OD of 1.375 inches (35 mm).

Sample liners with integral core catchers are available in lengths of 36, 48, 60 inches, and 1 meter. Utilize the core catcher liners when sampling flowing sands, noncohesive soils, extremely dry soils, or any other materials that fall from the liner during retrieval. DT22 core catcher liners are used with the same equipment as open sample liners. No special tooling or adapters are required.

Cutting Shoes

The standard DT22 Cutting Shoe is available for use with the DT22 Dual Tube System (Fig. 3.2). The DT22 sampling system may also employ an expendable cutting shoe. In this arrangement, a DT22 Expendable Cutting Shoe Holder (29402) is threaded into the leading end of the outer casing. A DT22 Expendable Cutting Shoe (DT4045) is then inserted into the holder. Upon completion of soil sampling, the outer casing is withdrawn slightly. The expendable cutting shoe detaches from the holder, leaving an open casing through which a prepacked screen monitoring well may be installed. Dimensions for the expendable cutting shoe are the same as the standard cutting shoe (ID = 1.125 in. (29 mm) and OD = 2.375 in. (60 mm)).

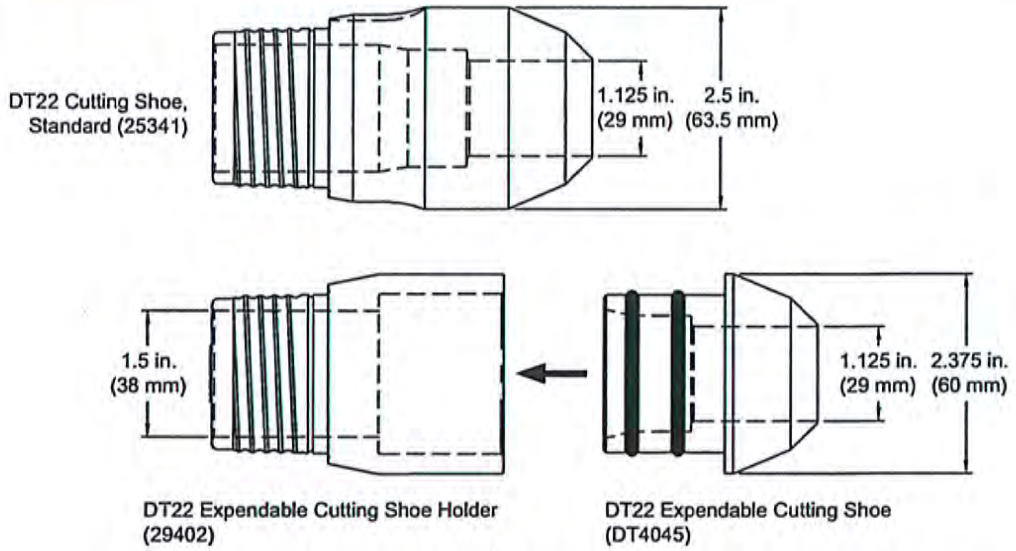

FIGURE 3.2
Cutting Shoe Options for the DT22 Dual Tube Soil Sampling System

4.0 OPERATION

4.1 Decontamination

Before and after each use, thoroughly clean all parts of the sampling system according to project requirements. Parts should also be inspected for wear or damage. During sampling, a clean new liner is used for each soil core.

4.2 Operational Overview

The DT22 Soil Sampling System is designed to collect continuous soil cores. Sampling may begin either from ground surface or a predetermined depth below ground. Once sampling begins, consecutive soil cores must be removed as the outer casing is advanced to greater depths.

When sampling is to begin at the ground surface, the first soil core should be collected using a core catcher liner to maximize sample recovery (Fig. 4.1-A). This is especially true when the first core is composed of dry, loose soil. Upon removal of the first liner and soil core (Fig. 4.1-B), a new liner is inserted to the bottom of the outer casing on the end of an inner rod. A section of outer casing is added to the tool string (Fig. 4.1-C) and the entire tool string is driven to fill the liner with soil (Fig. 4.1-D). The filled liner is removed from the outer casing to retrieve the second soil core (Fig. 4.1-E). A new liner is then inserted to the bottom of the outer casing and the process is repeated over the entire sampling interval.

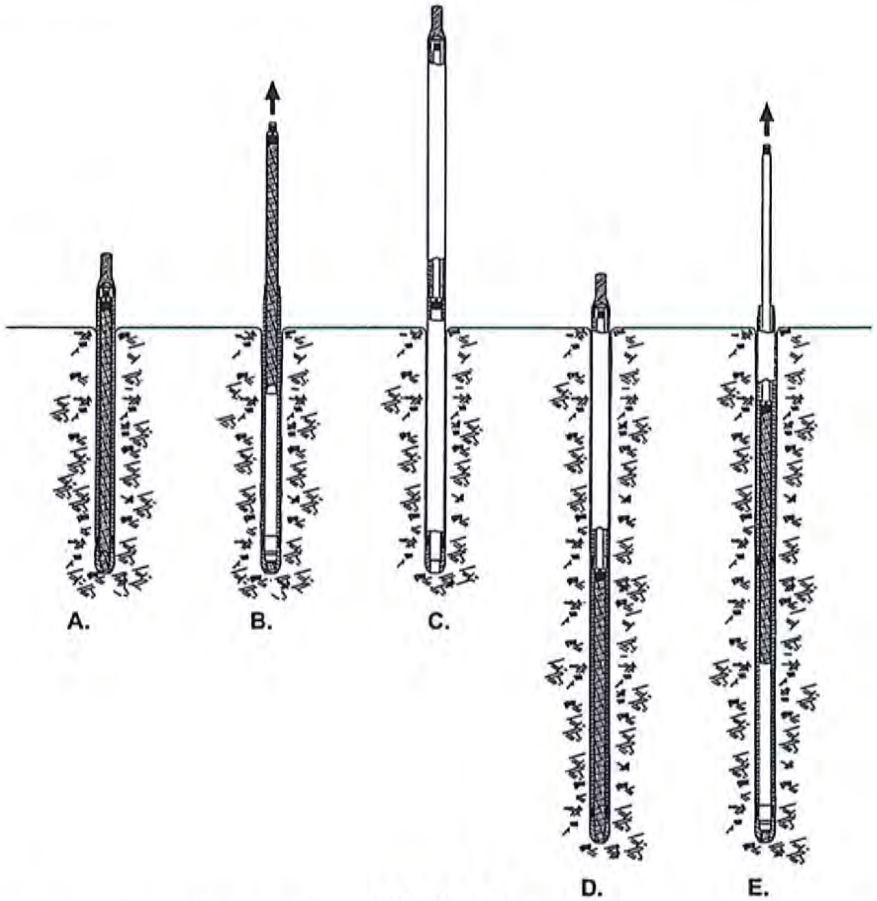

FIGURE 4.1
Continuous Core Sampling From Ground Surface with Dual Tube 22 System

When the sampling interval begins at some depth below ground surface, a DT22 Solid Drive Tip is installed in the outer casing and the entire assembly is driven from ground surface directly through undisturbed soil (Fig. 4.2-A). This enables the operator to reach the top of the sampling interval without stopping to remove unwanted soil cores. Once the interval is reached, the solid drive tip is removed (Fig 4.2-B) and sampling continues as described in the preceding paragraphs (Fig. 4.2-C, Fig. 4.2-D, and Fig. 4.2-E).

Specific instructions for the assembly and operation of the DT22 Dual Tube Soil Sampling System are given in the following sections.

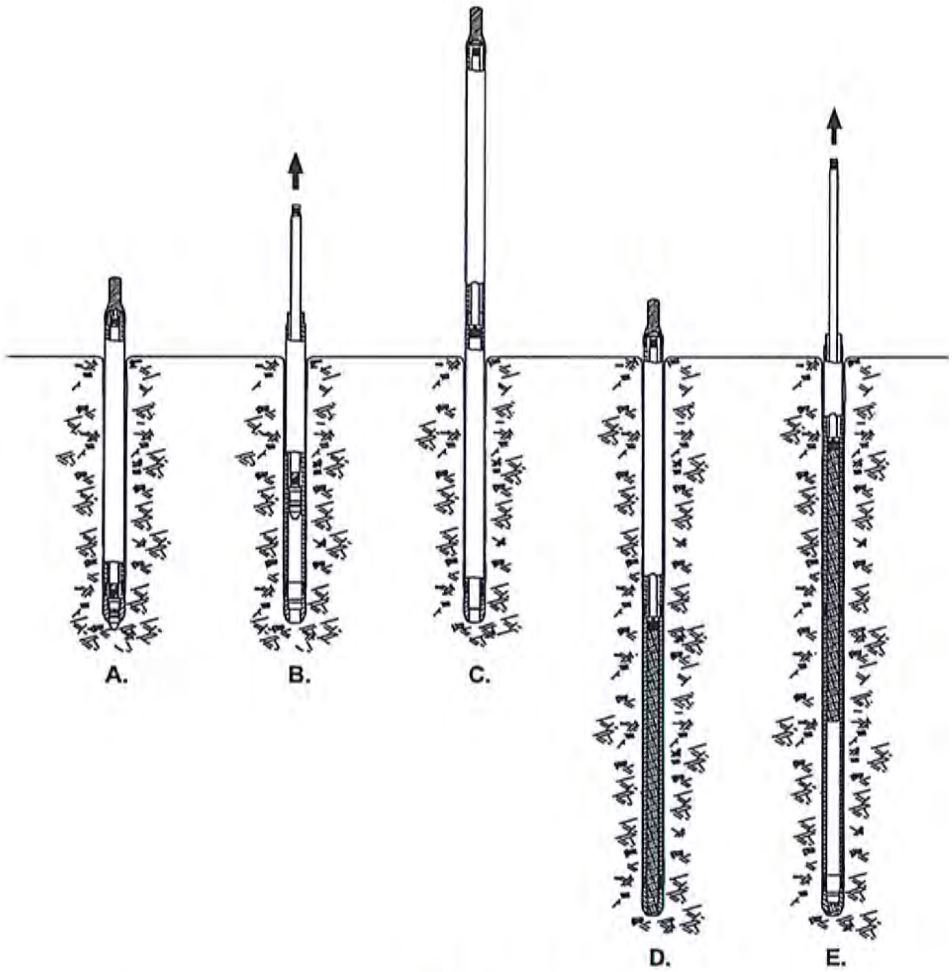

FIGURE 4.2
Outer Casing Driven Through Undisturbed Soil to Begin Sampling with DT22 System

4.3 Assembling and Driving the Outer Casing Using a DT22 Solid Drive Tip

If soil sampling is to begin at some depth below ground surface, the outer casing of the DT22 Dual Tube System can be driven to the top of the sampling interval with a DT22 Solid Drive Tip installed in the leading end. The solid drive tip seals the outer casing as it is driven to depth. Once the desired sampling interval is reached, the solid drive tip is removed to allow collection of the first soil core. This section describes assembling and driving the outer casing using the DT22 Solid Drive Tip.

1. When using a DT22 Standard Cutting Shoe (25341) install an O-ring (AT2100R) at the base of the threads as shown in Figure 4.3. If using an expendable cutting shoe, install an AT2100R O-ring on the DT22 Expendable Cutting Shoe Holder (29402) and two DT4045R O-Rings on the DT22 Expendable Cutting Shoe (DT4045) (Fig. 4.3).

2. Thread the DT22 Cutting Shoe or DT22 Expendable Point Holder into the leading end of a 2.25-inch OD Probe Rod (25300). Completely tighten the cutting shoe or cutting shoe holder using a pipe wrench.

3. Install an O-ring (DT4070R) in both grooves of the DT22 Solid Drive Point (22956) (Fig.4.4).

4. Thread the solid drive point into the female end of a 1.25-inch OD Light-Weight Center Rod of the same length as the 2.25-inch probe rod (outer casing).

5. Lubricate the O-rings on the solid drive point with a small amount of deionized water. Insert the point and probe rod into the outer casing until the point partially extends from the bottom of the cutting shoe.

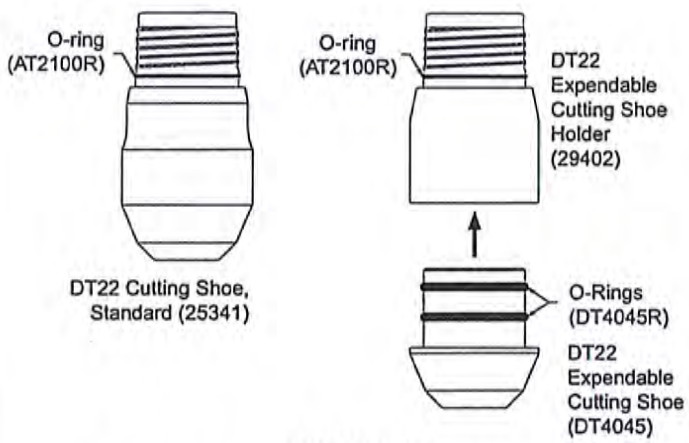

FIGURE 4.3
DT22 Cutting Shoes Utilize O-ring Seals

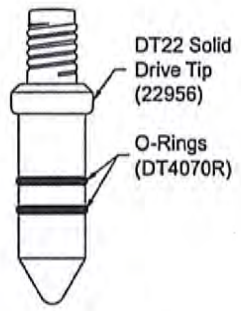

FIGURE 4.4
Solid Drive Point Utilizes Two O-Rings

6. Place a DT22 Threadless Drive Cap (22955) on top of the inner rod (Fig. 4.5). This drive cap is threadless for quick installation/removal, yet still provides protection for the probe rod threads.

7. Install a GH40 Threadless Drive Cap (31405) or GH60 Threadless Drive Cap (31530) on the 2.25-inch probe rod (outer casing) as shown in Figure 4.5.

   Certain soil conditions may allow the outer casing to advance slightly ahead of the inner rod string when using a threadless drive cap on the outer casing. The result is poor sample recovery and alignment problems when adding rods to the tool string. Utilizing a threaded drive cap on the 2.25-inch probe rods may solve this issue. The GH40 Series (25362) and GH60 Series (25363) threaded drive caps secure the inner rod string of the DT22 system during percussion so that the outer casing and inner rod string are advanced as one assembly.

   NOTE: Do not allow the threaded drive cap to unthread while driving the tool string. Failure to keep the drive cap tight during percussion will fuse the drive cap to the outer casing and permanently damage the threads of both the drive cap and top probe rod.

8. Place the assembled outer casing section under the direct push machine for driving. Position the casing directly under the hammer with the cutting shoe centered between the toes of the probe foot.

9. Lower the hydraulic hammer onto the drive cap and advance the outer casing into the subsurface.

10. Raise the hydraulic hammer and remove the drive cap from the outer casing and the threadless drive cap from the inner rod string.

11. Place an O-ring (AT2100R) on the outer casing section that extends from the ground (Fig. 4.6).

12. Thread a 1.25-inch Light-Weight Center Rod onto the inner rod string. Place a 2.25-inch probe rod over the inner rods and thread it onto the outer casing (Fig. 4.7). Completely tighten the outer casing using a pipe wrench.

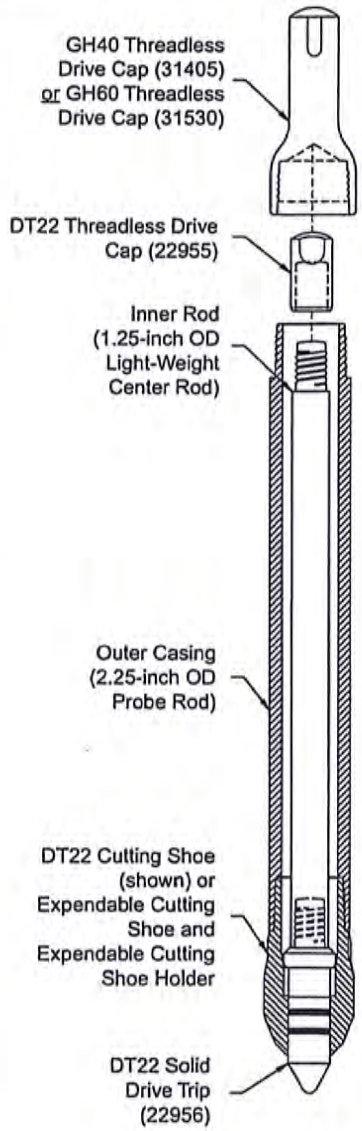

FIGURE 4.5
Outer Casing with Solid Drive Tip

13. Place the threadless drive cap on top of the inner rod. Thread the 2.25-inch drive cap over the threadless drive cap and onto the outer casing.

14. Lower the hydraulic hammer onto the drive cap and advance the outer casing into the subsurface.

    Repeat Steps 10-13 until the leading end of the outer casing is at the top of the proposed sampling interval. Continue with Step 15 to remove the DT22 Solid Drive Point for sampling.

15. Raise the hydraulic hammer and retract the probe derrick to provide access to the top of the tool string.

16. Unthread the 2.25-inch drive cap and remove the threadless drive cap from the inner rods.

17. Thread a 1.25-inch OD Light-Weight Center Rod onto the inner rod string. Lift and remove the inner rods from the outer casing. The DT22 Solid Drive Point is removed from the leading end of the casing with the inner rods.

    The outer casing is now ready for sampling.

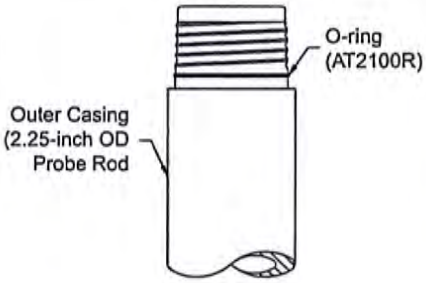

FIGURE 4.6
Outer Casing Joints are Sealed with O-Rings

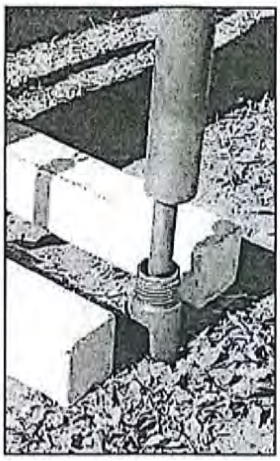

Figure 4.7. Thread a 2.25-inch probe rod onto the outer casing string.

4.4 Liner Drive Head Assembly

There are two liner drive heads for the DT22 System - the DT4052 DT22 Liner Drive Head (Fig. 4.8) and the 41675 DT22 Thread Cutting Drive Head (Fig. 4.9). The main function of both liners drive heads is to connect a liner to the leading end of the inner rod string. This enables the inner rods to hold the liner tight against the cutting shoe to fill the liner with soil as the outer casing is driven. The inner rods are then used to retrieve the liner and soil core from within the outer casing.

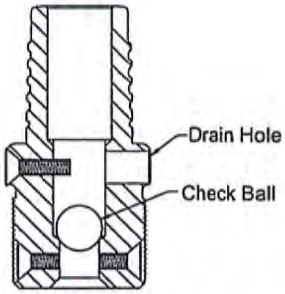

FIGURE 4.8
DT22 Liner Drive Head Features (DT4052 shown)

The liner drive head assembly includes an internal check ball to improve sample recovery (Fig. 4.8) Vacuum is created below the filled liner as it is lifted from the bottom of the outer casing. Because the inner rod string and liner drive head are hollow, atmospheric air can travel through the rods creating a positive pressure differential above the soil core during retrieval. The check ball seals the liner drive head to eliminate air flow into the liner which could otherwise push the soil sample out of the liner. The check ball also allows air to escape through the liner drive head and inner rod string when lowering a new liner down the outer casing and as soil enters the liner during sampling.

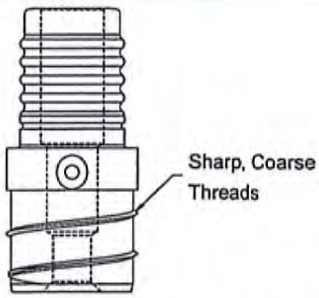

FIGURE 4.9
DT22 Thread Cutting Drive Head (41675)

Saturated conditions can also challenge sample recovery. Water enters the outer casing either from the saturated formation or is deliberately poured from the ground surface to keep flowing sands out of the casing. As with air in unsaturated formations, the check ball lets water pass through the liner drive head as a new liner is lowered to the bottom of the casing and during sampling as the liner is filled with soil. The check ball then seals the drive head during retrieval so that water draining from the inner rods does not wash the sample out the bottom of the liner. A drain hole located on the side of the liner drive head (Fig. 4.8) allows water to exit the inner rods and travel harmlessly along the outside of the liner.

The DT4052 is the primary liner drive head for the DT22 system. The 41675 DT22 Thread Cutting Drive Head has the advantage of quicker assembly/disassembly due to the fact that the liner is simply twisted onto/off of the sharp, coarse threads on the end of the drive head (Fig. 4.9). But this is at the cost of reduced holding force on the liner. Because of this, the 41675 liner drive head should be limited to shallow depths and mild sampling conditions.

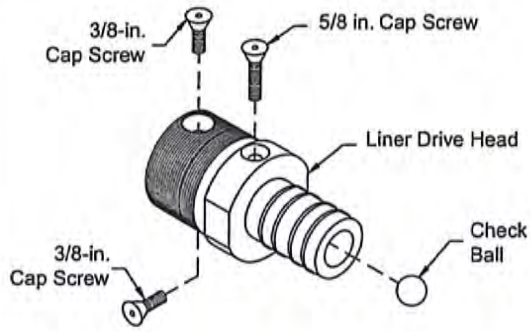

FIGURE 4.10
DT4052 Liner Drive Head Components

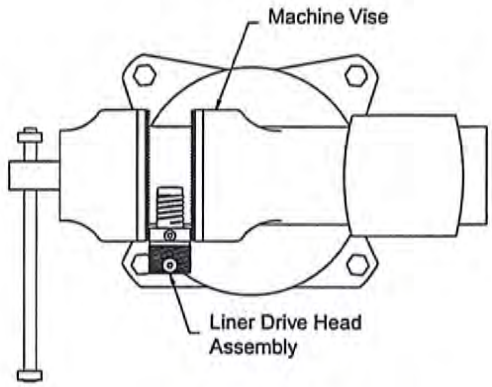

FIGURE 4.11
Place Liner Drive Head in Vise

The DT4052 Liner Drive Head Assembly is made up of five parts as shown in Figure 4.10. The two 3/8-inch flat head socket cap screws are used to attach liners to the liner drive head. The longer 5/8-inch flat head socket cap screw holds the stainless steel check ball within the liner drive head. To disassemble the liner drive head for cleaning, simply unthread the 5/8-inch cap screw and remove the check ball.

Instructions for attaching a liner to the DT22 Liner Drive Head Assembly (DT4052) are given below.

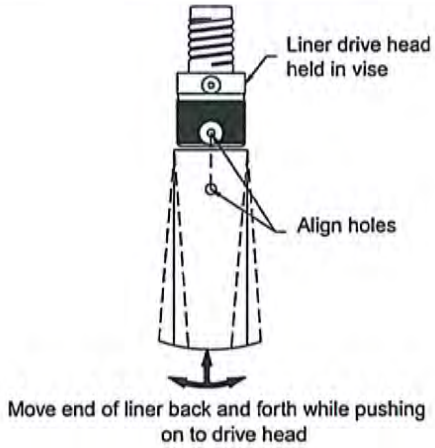

FIGURE 4.12
Push Liner Onto Liner Drive Head

1. Visually inspect the liner drive head assembly to ensure that the check ball moves freely within the drive head and the drain hole is unobstructed.

2. Place the liner drive head assembly in a machine vise so that either one of the 3/8-inch caps screws is on top as shown in Figure 4.11.

   NOTE: Only one 3/8-inch cap screw is used to attach a liner to the liner drive head assembly. Two 3/8-inch cap screws are included on the drive head to provide a backup in case one incurs thread damage. Either cap screw may be used to attach the liner.

3. Remove the 3/8-inch cap screw using a 3/32-inch hex key.

4. Place the open end of a DT22 Liner against the bottom of the liner drive head. Align the hole in the liner with the hole in the liner drive head as shown in Figure 4.12. Wiggle the free end of the liner back-and-forth while pushing the liner onto the drive head (Fig. 4.12).

5. Thread the 3/8-inch cap screw through the liner and back into the liner drive head (Fig. 4.13). Tighten the cap screw with the 3/32-inch hex key.

   The DT22 Liner is now attached to the DT22 Liner Drive Head Assembly (Fig. 4.14).

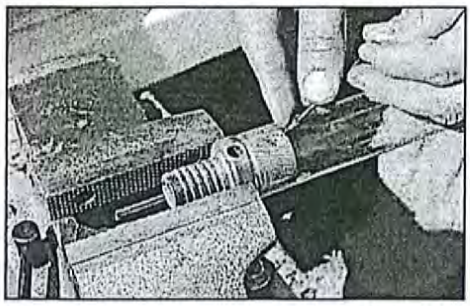

Figure 4.13. Thread cap screw into liner drive head to secure liner.

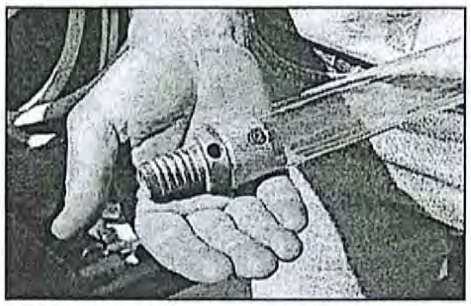

Figure 4.14. Liner attached to liner drive head and ready for sampling.

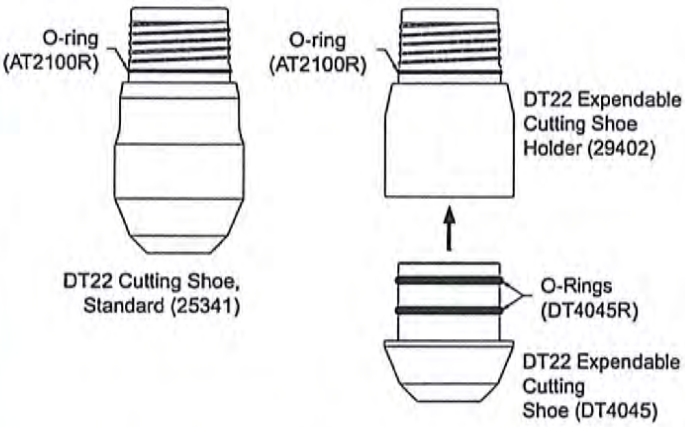

FIGURE 4.15
DT22 Cutting Shoes Utilize O-ring Seals

Figure 4.16. Place probe rod (outer casing) in a vise and tighten the cutting shoe with a pipe wrench.

4.5 Soil Core Collection

This section describes collection of continuous soil core samples from within the sealed outer casing of the DT22 Dual Tube Soil Sampling System. The procedure is written for a sampling series that begins at the ground surface. If sampling is to begin after driving the outer casing through undisturbed soil using a DT22 Solid Drive Tip, skip ahead to Step 13 of this section.

1. Install an O-ring (AT2100R) at the base of the threads on the Standard Cutting Shoe (25341) as shown in Figure 4.15. If using an expendable cutting shoe, install an AT2100R O-ring on the expendable cutting shoe holder and two DT4045R O-Rings on the expendable cutting shoe (Fig. 4.15).

2. Thread the DT22 Cutting Shoe or DT22 Expendable Point Holder into the leading end of a 2.25-inch OD Probe Rod (25300). Completely tighten the cutting shoe or cutting shoe holder using a machine vise and pipe wrench as shown in Figure 4.16.

3. Attach a DT22 Liner Drive Head Assembly (DT4052) of DT22 Thread Cutting Drive Head (41675) to a new liner, as described in Section 4.4. A core catcher liner is recommended for when the first soil core begins at ground surface as this configuration will provide maximum sample recovery.

4. Insert the liner and drive head into the 2.25-inch OD probe rod such that the core catcher contacts the cutting shoe as shown in Figure 4.17.

5. Place a DT22 Drive Bumper (DT4010) on top of the liner drive head (Figure 4.17).

6. Install a GH40 Threadless Drive Cap (31405) or GH60 Threadless Drive Cap (31530) onto the 2.25-inch probe rod (outer casing) as shown in Figure 4.17.

   NOTE: See Step 7 of Section 4.3 for additional drive cap options.

7. Place the assembled outer casing section under the direct push machine for driving. Position the casing directly under the hydraulic hammer with the cutting shoe centered between the toes of the probe foot.

8. Lower the hydraulic hammer onto the drive cap and advance the outer casing into the subsurface using continuous percussion.

9. Raise the hydraulic hammer and move the probe assembly back to provide access to the top of the tool string.

10. Remove the drive cap and drive bumper.

11. Thread a 1.25-inch Light-Weight Center Rod onto the liner drive head. Rotate the probe rod and liner assembly two or three revolutions to shear the soil core at the bottom of the liner. Lift the probe rod and filled liner from the outer casing to retrieve the first soil core.

12. Remove the filled liner from the liner drive head as described in Section 4.6. Prepare the soil core for subsampling or storage as specified by the project plan.

13. Place an O-ring (AT2100R) in the groove just below the male threads on the top section of the outer casing (Fig. 4.18).

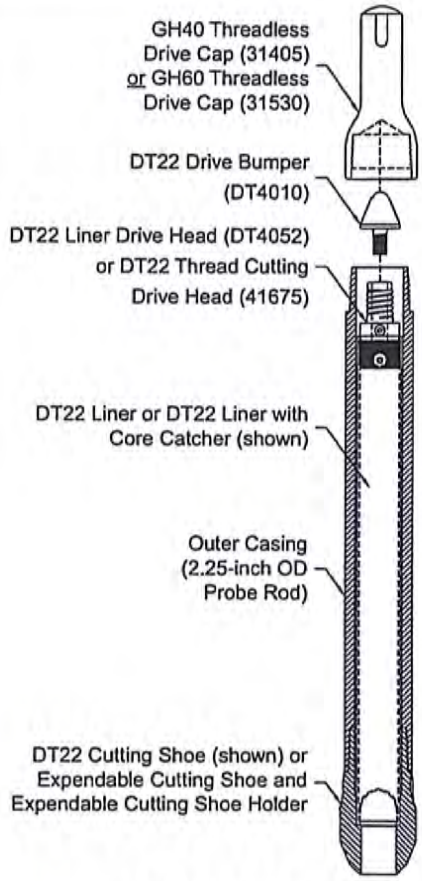

FIGURE 4.17
Outer Casing with DT22 Liner

14. Thread a 1.25-inch Light-Weight Center Rod onto an assembled DT22 Liner Drive Head (or DT22 Thread Cutting Drive Head) and DT22 Liner (Fig. 4.19).

15. Insert the liner and probe rod into the outer casing (Fig. 4.20). The inner rod will extend past the top of the outer casing if only one section of casing was previously driven into the ground. If the casing was driven to a greater depth, continue adding 1.25-inch Light-Weight Center Rods until the last rod extends from the casing.

16. Place a 2.25-inch probe rod over the inner rods and thread it onto the outer casing (Fig. 4.21). Completely tighten the outer casing using a pipe wrench.

17. Place a DT22 Drive Cushion Assembly on top of the inner rod as shown in Figure 4.22.

18. Install a drive cap (31405 or 31530) onto the 2.25-inch probe rod (Fig. 4.22).

19. Lower the hydraulic hammer onto the drive cap and advance the outer casing one liner length into the subsurface to collect the first soil core. Apply hammer percussion to the tool string as this helps move soil through the cutting shoe and into the liner for increased sample recovery.

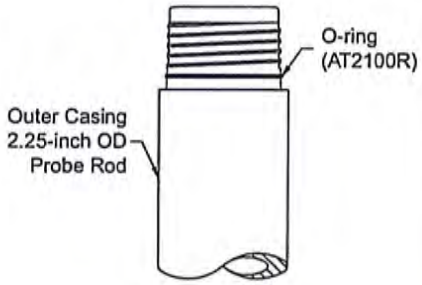

FIGURE 4.18
Outer Casing Joints are Sealed with O-Rings

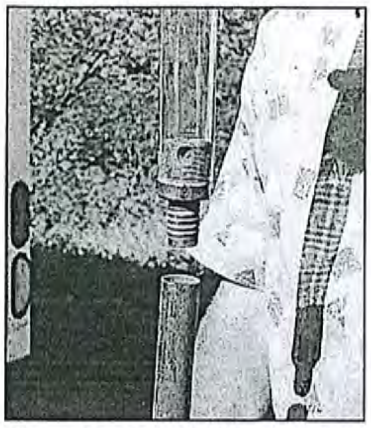

Figure 4.19. Thread liner and liner drive head into 1.25-inch Light-Weight Center Rod.

Figure 4.20. Lower liner to bottom of outer casing on leading end of inner rods.

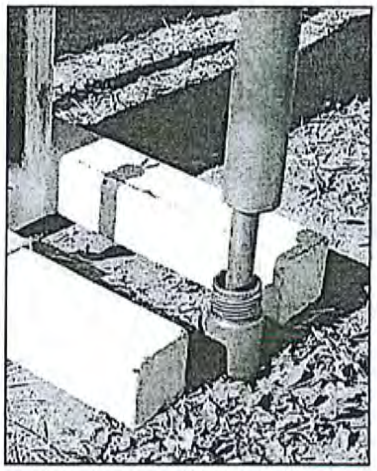

Figure 4.21. Place a 2.25-inch probe rod over the 1.25-inch inner rod and thread it onto the outer casing string.

Figure 4.22. Place a DT22 Drive Cushion Assembly on top of the inner rods and a drive cap onto the outer casing.

Figure 4.23. Thread a 1.25-inch Light-Weight Center Rod onto inner rod string to retrieve filled liner.

20. Raise the hydraulic hammer and retract the probe derrick to provide access to the top of the tool string.

21. Unthread the drive cap and remove the DT22 Drive Cushion Assembly.

22. Thread a 1.25-inch Light-Weight Center Rod onto the inner rod (Fig. 4.23). Rotate the inner rods two or three revolutions to shear the soil core at the bottom of the liner. Raise the inner rods to retrieve the filled liner.

23. Remove the filled liner from the liner drive head as described in Section 4.6.

(Repeat Steps 13-23 to collect consecutive soil core samples.)

4.6 Removing the DT22 Liner Drive Head (DT4052) from a Filled DT22 Liner

The liner drive head remains attached to the filled liner after retrieval from the outer casing (Fig. 4.24). In order to decontaminate the drive head for further sampling, it must first be removed from the filled liner. The DT22 Thread Cutting Drive Head (41675) is removed by simply placing the drive head in a vise and manually unthreading the liner. The process is slightly more involved for the DT22 Liner Drive Head (DT4045), but is easily accomplished using a machine vise and sharp utility knife as described below.

Place the liner drive head in the machine vise such that the 3/8-inch cap screw threaded through the liner is positioned on top. Remove the cap screw with a 3/32-inch hex key.

Using a utility knife, score a line from the top of the liner to the bottom of the drive head (Fig. 4.25). Move the free end of the liner side-to-side until the top of the liner splits and releases from the drive head (Fig. 4.26). The soil core may now be prepared for storage or analysis according to project guidelines.

Figure 4.24. Liner drive head remains attached to filled liner after retrieval from outer casing.

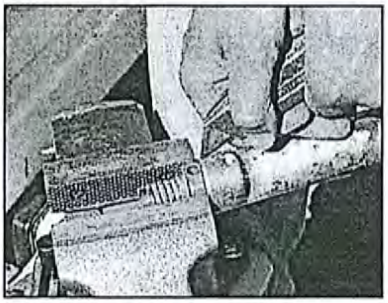

Figure 4.25. Score a line from top of liner to base of liner drive head using a utility knife.

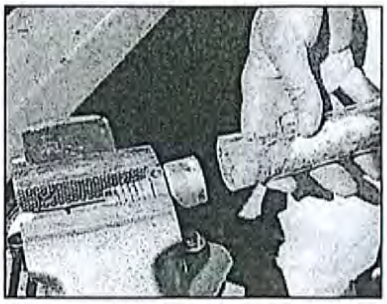

Figure 4.26. Move free end of liner back-and-forth to split liner and free it from the liner drive head.

Cutting the Liner Open

The DT22 Liner Cutter (28751) is a light-weight cutter that safely and efficiently slices an approximately 1.125-inch wide strip the entire length of a filled polymer liner. Two hooked cutting blades, one mounted on each side of the cutter as show in Figure 4.27, make a lengthwise opening in the liner for easy access and viewing of the sample material. The cutter features guards (covers) for each blade to maximize operator safety. However, care should always be used when operating this device.

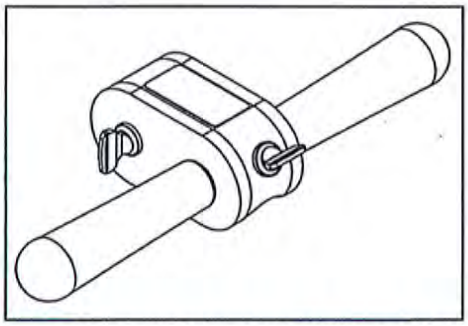

Figure 4.27. The DT22 Liner Cutter (28751) safely removes an approximately 1.125-inch wide strip the entire length of a filled polymer liner.

Suggested Equipment

- DT22 Liner Cutter (28751)
- Universal Liner Holder (22734)
- Filled polymer DT22 Liner

Safety

- Always grasp the cutter by the handles to avoid accidental contact with the cutter blades.
- Apply slight downward pressure on the cutter while drawing it down the length of the liner. This will help maintain contact with the liner and avoid having the cutter unexpectedly slip off of the liner.
- Wear leather gloves while operating the liner cutter.

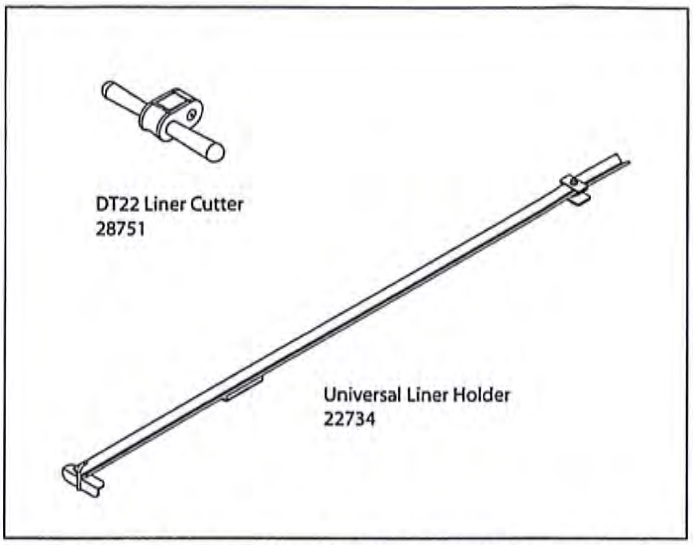

Figure 4.28: A universal liner holder is used to secure the liner when operating the liner cutter.

- Utilize a Universal Liner Holder to secure the liner for cutting. Never attempt to hold the liner by hand while cutting.
- Replace dull or damaged blades immediately. Do not operate the cutter with dull or damaged blades.

Operation

1. Place the universal liner holder on a solid surface such as a sturdy work table.
2. Install the liner in the liner holder. Adjust the stop on the liner holder to secure the liner tightly to the holder.
3. Grasping the cutter by the handles, place the cutter on the liner beginning at the end of the holder which has the bent rod. Ensure that the cutter blades are positioned over the end of the liner to initiate the cut.
4. With slight downward pressure on the cutter, draw the cutter slowly and smoothly along the liner as shown in Figure 4.29. It will not take a great deal of force to cut the liner. If excessive force is required, the cutter blades may be dull and require replacement.
5. When the cutter has been drawn the entire length of the liner, the cut section of liner may be removed to access the sample material.

⚠ CAUTION

Cutting Hazard!
Always grasp the cutter by the handles.

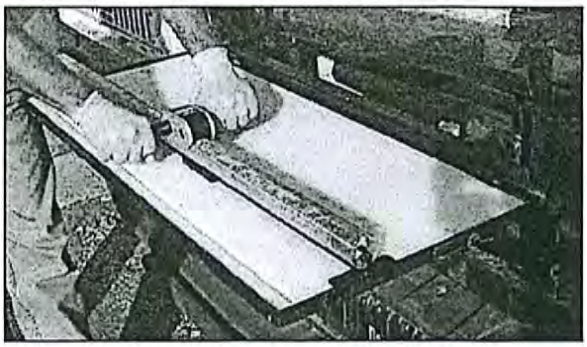

Figure 4.29. Secure the liner with the universal liner holder for cutting. Always place the liner holder on a solid surface such as the work table shown here.

4.8 Dual Tube Soil Sampling Tips

Saturated sands are the most difficult formations to sample with the DT22 system. Saturated conditions place positive pressure on the soil outside of the outer casing. When sampling in noncohesive formations (e.g. sands) below the water table, it may be necessary to add water to the outer casing to prevent formation heave. Adding water to the probe rods puts a positive head on the system and may keep formation material from flowing into the rods as the liner and soil sample are retracted. If a small amount of formation material is still drawn into the outer casing as the soil core is retrieved, the material may be displaced by slightly raising the outer casing while lowering the next new liner to depth. Water must be maintained within the outer casing during this process to overcome the hydraulic head imparted by the formation fluid.

DT22 core catcher liners will provide the best sample recovery in saturated noncohesive formations.

DT22 core catcher liners will help considerably with sample recovery in noncohesive soils and other materials that do not fill the liner diameter. Core catcher liners are not recommended for cohesive or expansive soils as the core catchers may actually inhibit soil movement into the liner.

Some formation materials may extrude during sampling and cause problems due to overfilled liners. If such conditions are encountered, try using a shorter sample interval such as driving the tool string 36 inches when using a 48-inch liner. This can help avoid overfilling the liners and may improve sample recovery.

4.9 Outer Casing Retrieval

The outer casing of the DT22 Dual Tube System may be retrieved in one of three ways:

1. Casing pulled then probe hole sealed from ground surface with granular bentonite.

   The outer casing may be pulled from the ground with the probe machine and a Pull Cap (25298) or a Rod Grip Pull System (for GH40 Hammers [29461] or for GH60 Hammers [29385]) if the probe hole is to be sealed with granular bentonite from the ground surface (Fig. 4.30). This method is used for shallow probe holes in stable formations only. Such conditions allow the entire probe hole to be sealed with granular bentonite.

2. Casing pulled with probe hole sealed from bottom-up during retrieval.

   Bottom-up grouting should be performed during casing retrieval in unstable formations where side slough is probable. Such conditions create void spaces in the probe hole if granular bentonite is installed from the ground surface.

   A Geoprobe® Grout System is used to deliver a sealing material (high-solids bentonite slurry or neat cement grout) to the bottom of the outer casing through flexible tubing. The grout mix is pumped through the tubing to seal the void remaining as the outer casing is retrieved (Fig. 4.31). This is an advantage of the DT22 Dual Tube System as other soil samplers require a second set of tools to deliver grout to the bottom of the probe hole. Contact Geoprobe Systems® for more information on bottom-up grouting.

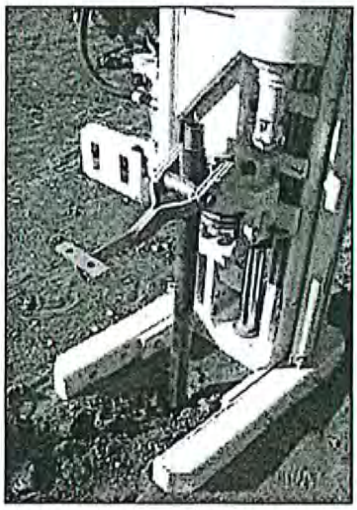

Figure 4.30 Outer casing may be retrieved with a pull cap or rod grip pull system if the probe hole is sealed with granular bentonite.

Figure 4.31. A grout machine and flexible tubing allow bottom-up grouting as the outer casing is retrieved.

3. Casing pulled with Geoprobe® Prepacked Screen Well installed during retrieval.

The final option is to install a 1.4-inch OD Geoprobe® Prepacked Screen Monitoring Well in the probe hole during retrieval of the outer casing. A DT22 Expendable Cutting Shoe Holder (29402) and a DT22 Expendable Cutting Shoe (DT4045) allow the operator to collect continuous soil cores as the outer casing is driven to depth. When sampling is complete, the outer rods are raised and the expendable cutting shoe is removed from the leading rod. This leaves an open casing through which a set of prepacked screens is lowered on the leading end of a PVC riser string (Fig. 4.32). The well is finished, complete with grout barrier, bentonite well seal, and a high-solids bentonite slurry/neat cement grout, during retrieval of the outer casing.

Refer to *Geoprobe® 0.5-in. x 1.4-in. OD and 0.75-in. x 1.4-in. OD Prepacked Screen Monitoring Wells Standard Operating Procedure* (Geoprobe® Technical Bulletin No. 962000) for specific information on well installation.

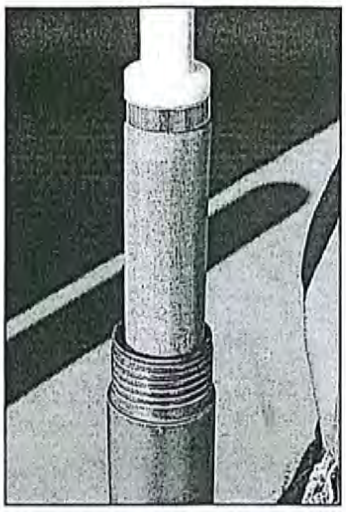

Figure 4.32. Geoprobe® prepacked screens may be installed through the outer casing when an expendable cutting shoe is used.

5.0 REFERENCES

Geoprobe Systems®, *Geoprobe® 0.5-in. x 1.4-in. OD and 0.75-in. x 1.4-in. OD Prepacked Screen Monitoring Wells - Standard Operating Procedure.* Technical Bulletin No. 962000, 2010.

Geoprobe Systems®, *Geoprobe® Screen Point 22 Groundwater Sampler - Standard Operating Procedure.* Technical Bulletin No. MK3173, 2010

Geoprobe Systems®, *Geoprobe Systems® Tools Catalog,* Vol. 6, 2003.

Equipment and tool specifications, including weights, dimensions, materials, and operating specifications included in this brochure are subject to change without notice. Where specifications are critical to your application, please consult Geoprobe® Systems.

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PTS-SOP-DE-02

STANDARD OPERATING PROCEDURE
EQUIPMENT DECONTAMINATION

All equipment leaving the contaminated area of a site must be decontaminated. Decontamination methods include removal of contaminants through physical, chemical or a combination of both methods. Decontamination procedures are to be performed in the same level of protection used in the contaminated area of a site. In some cases, decontamination personnel may be sufficiently protected by wearing one level lower protection. The information for site specific equipment decontamination and personnel protection levels as detailed in the sampling and analysis or work plan should be followed.

The following decontamination procedures are for typical uncontrolled hazardous waste sites, for a specific or unusual contaminant such as dioxins, see the site-specific Health and Safety Plan. Decontamination procedures should be used in conjunction with methods to prevent contamination of sampling and monitoring equipment. One time use equipment should be used if practical, and disposed of in accordance with the site-specific Health and Safety Plan

INORGANIC CONTAMINANTS - HEAVY METALS:

1. Remove gross contamination with a tap water rinse. If available, use pressurized or gravity flow tap water, if not a 5 gallon bucket of tap water and a stiff brush may be used.

2. Wash equipment in a solution of soap (no phosphate) and tap water with a stiff brush.

3. Triple rinse the equipment with tap water.

4. Triple rinse the equipment with de-ionized or distilled water.

5. If specified in the site Sampling or Work Plan, rinse the equipment with a mixture of 10:1 nitric acid in distilled water (10 parts water to 1 part nitric acid). In many cases, the tap water and de-ionized water rinses will be sufficient.

6. If a nitric rinse is used, rinse the equipment again with distilled water.

7. Place equipment on plastic sheeting or foil to air dry.

8. Wrap equipment in foil or plastic wrap to transport or store.

ORGANIC CONTAMINANTS:

1. Remove gross contamination physically with a disposable paper towel or if available with a tap water rinse using pressurized or gravity flow. If water is not available on site the equipment can be rinsed using a five gallon bucket of tap water and a stiff brush

2. Wash equipment in a solution of soap (no phosphate) and tap water with a stiff brush.

3. Triple rinse the equipment in tap water.

4. Triple rinse the equipment with de-ionized water.

5. Rinse the equipment with methanol (if appropriate, see site Sampling Plan or Work Plan to determine appropriate chemical rinses). If testing for dioxins, a hexane triple rinse will be included as part of the decontamination.

EQUIPMENT USED FOR DECONTAMINATION:

1. Triple rinse equipment (brushes, buckets, tubs) used in the decontamination process with water, preferably pressurized.

2. Agitate the equipment used in the decontamination process in the soap/tap water solution. (The tub which holds the solution will only have the water rinse.)

3. Triple rinse equipment with tap water.

4. Place equipment in appropriate areas, so they are used only for decontamination purposes (label if necessary).

DISPOSAL OF DECONTAMINATION SOLUTIONS:

1. Proper disposal of the soap/tap water solution, the tap water rinse, and the de-ionized water rinse is to a proper waste water container.

2. Proper disposal of the solvent rinse is to a proper organic solvent waste container.

3. When contaminants have been identified, either in the solutions or elsewhere on the site, solutions should be disposed of appropriately as discussed in the site specific Health and Safety plan. If they are hazardous (characteristic, listed, etc.) dispose of them as such.

4. WHEN USING OTHER THAN THE ABOVE MENTIONED SOLUTIONS, BE SURE TO CHECK WITH THE HEALTH AND SAFETY OFFICER AND THE

PROJECT MANAGER. SOME SOLVENTS MUST BE EVAPORATED.

EFFECTIVENESS OF DECONTAMINATION:

1. Effectiveness of the decontamination procedures will be measured using field equipment rinsate blanks (see the site-specific Quality Assurance Project Plan).

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

FINAL
QUALITY ASSURANCE PROJECT PLAN
FOR THE
McLAREN TAILINGS ABANDONED MINE
RECLAMATION PROJECT
COOKE CITY, MONTANA

Prepared for:

Mr. Tom Henderson
Montana Department of Environmental Quality
Mine Waste Cleanup Bureau
P.O. Box 200901
Helena, Montana 59620

Prepared by:

Pioneer Technical Services, Inc.
P.O. Box 3445
Butte, Montana 59702

July 30, 2013

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1

2.0 PROJECT LOCATION 1

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES 1

4.0 DATA QUALITY OBJECTIVES (DQOS) 2

5.0 QUALITY ASSURANCE OBJECTIVES 5
- 5.1 PRECISION 5
- 5.2 ACCURACY 5
- 5.3 REPRESENTATIVENESS 5
- 5.4 COMPLETENESS 5
- 5.5 COMPARABILITY 6

6.0 SAMPLING PROCEDURES 6
- 6.1 FIELD LOGBOOK 6
- 6.2 SAMPLE CONTROL, DOCUMENTATION, AND SHIPPING 6

7.0 SAMPLE CUSTODY 7
- 7.1 CHAIN OF CUSTODY 7
- 7.2 CHAIN OF CUSTODY FORM 7
- 7.3 SAMPLE LABELS 7
- 7.4 CUSTODY SEALS 7
- 7.5 LABORATORY CUSTODY 8

8.0 EQUIPMENT OPERATION, MAINTENANCE, CALIBRATION, AND STANDARDIZATION 8

9.0 ANALYTICAL PROCEDURES 8

10.0 DATA REDUCTION, VALIDATION, DATA EVALUATION, AND REPORTING 8
- 10.1 DATA REDUCTION 8
- 10.2 DATA VALIDATION 9
- 10.3 DATA EVALUATION 10
- 10.4 DATA REPORTING 10

11.0 CORRECTIVE ACTION PROCEDURES 10

12.0 AUDIT PROCEDURES 11

13.0 REFERENCES 12

LIST OF TABLES

Page

Table 1 Summary of Data Quality Objectives 4
Table 2 Precision, Accuracy, and Completeness Requirements 5
Table 3 Result Qualifiers 9
Table 4 Data Qualifiers 10

LIST OF ATTACHMENTS

Attachment 1 Procedures for Calculating Accuracy and Precision

1.0 INTRODUCTION

This document has been prepared for the Montana Department of Environmental Quality Mine Waste Cleanup Bureau (DEQ/MWCB) pursuant to the May 7, 2013, Task Order Number 82, Contract No. 407038, issued by the DEQ/DEQ/MWCB.

This Quality Assurance Project Plan (QAPP) describes quality assurance (QA) for the McLaren Tailings Repository Materials Characterization (RMC). Information collected during this characterization will provide additional metallurgical information on the potential precious metals contained in the stabilized tailings located in the on-site engineered repository. This QAPP is a supporting document (Appendix B) for the Sampling and Analysis Plan (SAP).

Quality assurance is defined as the integrated program for ensuring reliable monitoring and measuring data. The QA program requires the generation of a site or project-specific QAPP.

This QAPP contains 13 sections including: Introduction, Project Location, Project Organization and Responsibility, Data Quality Objectives (DQOs), Quality Assurance Objectives, Sampling Procedures, Sample Custody, Equipment Operation, Analytical Procedures, Data Reduction, Corrective Action Procedures, Audit Procedures, and References.

2.0 PROJECT LOCATION

The McLaren Tailings Abandoned Mine Site is an abandoned hardrock mine site listed on the DEQ/MWCB Abandoned Hardrock Mines Priority Sites List. The general location of the McLaren Tailings Abandoned Mine Site is approximately ¼ mile east of Cooke City, in Park County, Montana. The site is situated at the headwaters of Soda Butte Creek in Section 25 of Township 19 South, Range 14 East of the Montana Principal Meridian as shown on Figure 1 provided in Appendix A of the Reclamation Work Plan.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

<u>DEQ/MWCB Project Officer</u> – Mr. Tom Henderson

The DEQ/MWCB Project Officer will ensure the terms of the contract, insofar as the field activities and the associated personnel and their responsibilities in the performance of the field activities, are carried out satisfactorily. All access agreements needed to complete field activities will be obtained by DEQ/MWCB prior to commencing field activities.

<u>Field Project Manager</u> – Marty Bennett, Pioneer

The Field Project Manager is responsible for the overall implementation of the SAP. This includes communicating the requirements to all personnel, supervising fieldwork, and making appropriate changes to the SAP. All access agreements and permits needed to complete field activities will be in the possession of the Field Project Manager prior to commencing field

activities.

Health and Safety Officer – Tara Schleeman, Pioneer

The Health and Safety Officer will ensure that work crews comply with all contractor site and Pioneer corporate health and safety requirements.

Sampler/Field Health and Safety Officer – Julie Flammang

The Sampler ensures that the SAP has been established and is followed to implement field activities. The Sampler is responsible for field activities, documentation in the logbook, equipment, problem solving, and decision making in the field. The Field Health and Safety Officer ensures that work crews comply with all contractor site and Pioneer corporate health and safety requirements.

Field Sampler – Jerika Allick

The Field Sampler assists in field activities including sampling, monitoring and decontamination procedures and ensures that these activities are documented in the field logbook.

4.0 DATA QUALITY OBJECTIVES (DQOS)

Data Quality Objectives are qualitative and quantitative statements that specify the quality of the data required to support remediation activities. For the investigation at the McLaren Tailings Abandoned Mine Site, DQOs were developed using the process outlined in *Data Quality Objectives for Remedial Response Activities, Development Process* (EPA, 1987).

Table 1 present DQOs for the project. Included in Table 1 is the measurement, location of that measurement, analysis method, sample media, and analytical support level.

The analytical support levels are the analytical options available to support data collection activities. There are five general levels that are distinguished by the types of technology, documentation use, and degree of sophistication. The five general levels are as follows:

- Level I - Field Screening. This level is characterized by the use of portable instruments that can provide real-time data to assist in optimizing sampling point locations and for health and safety support.

- Level II - Field Analysis. This level is characterized by the use of portable analytical instruments that can be used on-site or in mobile laboratories stationed near the site.

- Level III - Laboratory Analysis Using Methods other than U. S. Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) Routine Analytical Service (RAS) methods. This level is used primarily in support of engineering studies using standard EPA approved procedures. Some procedures may be equivalent to CLP RAS without the CLP requirements for documentation.

- Level IV - EPA CLP RAS. This level is characterized by rigorous QA protocols and documentation and provides qualitative and quantitative analytical data.

- Level V – Non-Standard Methods. Analyses that may require method modification and/or development. Analyses performed by the EPA CLP under a Unique Laboratory Services Analysis (ULSA) request are considered Level V.

TABLE 1
SUMMARY OF DATA QUALITY OBJECTIVES

MEASUREMENT	LOCATION	ANALYSIS METHOD	ANALYTICAL SUPPORT LEVEL	DETECTION RANGE (ppm)	DATA USE
Metallurgical					
Gold (Au)	Lab	Fire Assay and AAS	III	0.005 to 10	EC
Silver (Ag)	Lab	Four acid/ICP-AES Multi-element	III	Au 0.5 to 100	EC
Copper (Cu)	Lab	Four acid/ICP-AES Multi-element	III	Cu 1 to 10,000	EC
Environmental					
Soil pH	Lab	USDA Handbook #18	N/A	2 to 10 s.u.	MP
Organic Matter Content	Lab	ASA #9, Part 2 (90) pgs. 1371-1372	III	0.1 to 10	MP
Total Metals (Sb, Al, As, Ba, Cd, Co, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn)	Lab	CLP SOW	IV	Varies	SC, EC
Engineering					
Proctor (density)	Lab	Methods D698 ASTM	N/A	N/A	MP
Particle Size	Lab	Method D6913 ASTM	III	3/4-inch to #200	MP

Analysis Method
ASA #9 - American Society of Agronomy, Methods of Soil Analysis (ASA, 1965)

ASTM - American Society for Testing and Materials (ASTM, 1985)

USDA – U.S. Department of Agriculture

s.u. - standard units
EC - Economic Recovery
SC – Site Characterization

MP - Metallurgical Properties
ppm – parts per million

5.0 QUALITY ASSURANCE OBJECTIVES

The ability of data to meet DQOs is evaluated with a precision, accuracy, representativeness, completeness, and comparability (PARCC) statement. A PARCC statement is generated during data evaluation (after data have been validated).

5.1 PRECISION

Precision is the amount of scatter or variance that occurs in repeated measurements of a particular analyte. Precision acceptance and rejection is based on the relative percent difference (RPD) of the laboratory and field duplicates. For example, perfect precision would be a 0% RPD and for total metals acceptable precision would be a RPD of plus or minus 35% in solids. Precision requirements are derived from the CLP Statement of Work (SOW) (EPA, 1992). Precision will only be assessed for the laboratory analysis of certain metals in the Target Analyte List (TAL); the procedures for calculating precision are presented in Attachment 1. The range of acceptable RPDs for precision is presented in Table 2.

TABLE 2
PRECISION, ACCURACY AND COMPLETENESS REQUIREMENTS

	PRECISION	ACCURACY	COMPLETENESS
Media	Solid	Solid	
Metal	35%	75% to 125%	90%

5.2 ACCURACY

Accuracy is measured as 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 will be used to generate overall accuracy statements for inorganic data. Accuracy acceptance or rejection is based on the percent recovery (% R) of the laboratory matrix spike. For example, perfect recovery would be 100% and an acceptable range for total metals would be 75% to 125% in solids. Accuracy requirements are derived from the CLP SOW (EPA, 1992). Accuracy will only be assessed for the laboratory analysis of certain metals in the TAL; the procedures for calculating accuracy are presented in Attachment 1. The range of acceptable RPDs for accuracy is presented in Table 2.

5.3 REPRESENTATIVENESS

The objective in addressing representativeness is to assess whether information obtained during the investigation accurately represents the site conditions.

5.4 COMPLETENESS

The objective in addressing completeness is to assess whether enough data have been collected and enough data are valid (see Section 10.0) to meet the investigation needs. Completeness is assessed by comparing the number of valid sample results to the number of samples collected.

The completeness targets for this investigation are presented in Table 2.

5.5 COMPARABILITY

The objective in addressing comparability is to assess whether one set of data can be compared to another set of data. Comparability is assessed 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. Specifications for laboratory methods are available in this SAP.

6.0 SAMPLING PROCEDURES

The quality of data collected in a metallurgical investigation depends on the quality of the sampling activities. Detailed procedures for sample collection and handling are specified and documented in the SAP and corresponding Pioneer Technical Services, Inc. (Pioneer's) Standard Operating Procedures (SOPs) (Appendix A of the SAP). Procedures presented in the SAP are in accordance with EPA-accepted procedures.

6.1 FIELD LOGBOOK

The field logbook is the written record of all data, observations, field equipment calibrations, samples, and chain of custody. All entries will be in waterproof ink, and any mistakes will be lined out with a single line and initialed by the person making the correction. At a minimum the entry will include the following:

- Purpose of sampling;
- Location and description of sampling point;
- Identification of sampling crew;
- Type, number, and volume of sample;
- Date and time of sampling;
- Date and time of shipping;
- Weather;
- Field measurements; and
- Deviations from SOPs.

6.2 SAMPLE CONTROL, DOCUMENTATION, AND SHIPPING

Pioneer's SOPs for sample handling, shipping, and related matters are in the SAP (Appendix A). Samples will be packaged and shipped according to the U.S. Department of Transportation (DOT) and EPA regulations. The purpose of these procedures is to maintain the integrity of all samples during collection, transportation, analysis, and reporting.

7.0 SAMPLE CUSTODY

7.1 CHAIN OF CUSTODY

A required part of any sampling and analytical program is the integrity of the sample from collection to data reporting. This includes the ability to trace the possession and handling of samples from the time of collection through analysis and final disposition. This documentation of the sample's history is referred to as chain of custody. A sample is considered to be under a person's custody if it is in a person's physical possession, in view of the person after taking possession, or secured by that person so that no one can tamper with the sample.

The components of the field chain of custody (chain of custody form, labels, and custody seals) and laboratory chain of custody (chain of custody record, sample log-in/log-out, sample storage records, and disposal records) are described in this section.

7.2 CHAIN OF CUSTODY FORM

A chain of custody form will be completed and accompany every sample. The form includes the following information:

- Project code;
- Project name;
- Samplers signature;
- Sample identification;
- Date sampled;
- Time sampled;
- Analysis requested;
- Remarks;
- Relinquishing signature, data, and time; and
- Receiving signature, date, and time.

7.3 SAMPLE LABELS

Sample labels are necessary to prevent misidentification of samples. Self-adhesive labels are used and include the following information:

- Sample identification;
- Sampler's initials;
- Analysis requested;
- Sampling date; and
- Sampling time.

7.4 CUSTODY SEALS

Custody seals are used to detect unauthorized tampering with samples following sample collection up to the time of analysis. Custody seals will be applied to the shipping containers

when the samples are not in the sampler's custody.

7.5 LABORATORY CUSTODY

Laboratory custody will conform to procedures established for the CLP. These procedures include the following:

- Designation of sample custodian;
- Correct completion of the chain of custody form, recording of sample identification numbers, and documentation of sample condition upon receipt;
- Laboratory sample tracking and documentation procedures; and
- Secure sample storage.

The sample will be delivered to the laboratory for analysis in order to perform requested analyses within the specified allowable holding times. The sample will be delivered to the person in the laboratory who is authorized to receive samples (laboratory sample custodian).

8.0 EQUIPMENT OPERATION, MAINTENANCE, CALIBRATION, AND STANDARDIZATION

All field and laboratory equipment will be operated, maintained, calibrated, and standardized in according to the EPA and manufacturer's recommended procedures. Pioneer's SOPs in the SAP (Appendix A) contain the field equipment operation, maintenance, calibration, and standardization procedures. The analytical methods contain the laboratory equipment operation, maintenance, calibration, and standardization procedures.

9.0 ANALYTICAL PROCEDURES

Methods to be employed are presented in Table 1. Laboratory analysis of samples collected during the course of this study will be performed by laboratories that have established protocols and QA procedures that meet or exceed EPA guidelines. The EPA-approved methods will be used for all applicable parameters.

10.0 DATA REDUCTION, VALIDATION, DATA EVALUATION, AND REPORTING

10.1 DATA REDUCTION

Data reduction is performed on the data in the laboratory. Similar Quality Control (QC) samples are grouped together and the recoveries are calculated and reported. Data reduction is performed using EPA applicable procedures and methods.

10.2 DATA VALIDATION

Data validation is performed on the laboratory data in the laboratory and in the office after data reduction is complete. The laboratory validates data by reporting concentrations with "result qualifiers" (inorganics), if necessary. Table 3 presents result qualifiers that may be used; result qualifiers are derived from the CLP SOW (EPA, 1992).

TABLE 3
RESULT QUALIFIERS

1) C (Concentration) qualifier -- Enter "B" if the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). If the analyte was analyzed for but not detected, a "U" must be entered.

2) Q (Qualifier)
   - E - The reported value is estimated because of the presence of interference.
   - S - The reported value was determined by the Method of Standard Additions (MSA).
   - W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.
   - * - Duplicate analysis not within control limits.
   - + - Correlation coefficient for the MSA is less than 0.995.

Entering "S" "W" or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field for an analyte.

3) M (Method) qualifier -- Enter:
   - "AA" for Atomic Adsorption
     "P" for Inductive Coupled Plasma.
   - "A" for Flame AA.
   - "F" for Furnace AA.
   - "CV" for Manual Cold Vapor AA.
   - "AV" for Automated Cold Vapor AA.
   - "AS" for Semi-Automated Spectrophotometric.
   - "C" for Manual Spectrophotometric.
   - "T" for Titrimetric.
   - "NR" if the analyte is not required to be analyzed.

The office validates data by reporting concentrations with "data qualifiers" (inorganics). Table 4 presents data qualifiers that may be used; data qualifiers are derived from the *Functional Guidelines for Evaluating Inorganics Analysis* (EPA, 1988).

TABLE 4
DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J - The associated value is an estimated quantity.
R - The data are unusable. (Note: Analyte may or may not be present.)
UJ - The material was analyzed for, but not detected. The associated value is an estimate and may not be accurate or precise.

Knowing the limitations of the data assists the data user when making interpretations. Data with limitations are usable for evaluation as long as the limitations are considered. Data are divided into three levels after data validation has been completed. The three levels include: enforcement quality (unrestricted use), screening quality (restricted use), and unusable. These data levels are related to the analytical support levels described in Section 4.0.

10.3 DATA EVALUATION

Data evaluation is performed in the office after data validation is complete. Data evaluation is the generation of the PARCC statement (see Section 5.0) that assesses the data meeting the DQOs.

10.4 DATA REPORTING

Data reporting begins with transferring the validated analytical results and field measurements to the computerized database. Pioneer will be using Microsoft Access or Microsoft Excel software for transferring data to the DEQ/MWCB. Data reporting continues with a printout of the analytical results and field measurements database and the interpretation of the analytical results and field measurements. The QC Summary Results, validation summaries, and computerized database will be presented to the DEQ/MWCB at the completion of the project.

11.0 CORRECTIVE ACTION PROCEDURES

Field equipment malfunctions will be identified immediately and corrected by the Field Team Leader. Field QC samples outside of the control limits presented in Table 3 will be handled in the data validation process by assigning data or result qualifiers. Laboratory equipment malfunctions are handled by the chemist according to the EPA analytical method specifications. Laboratory QC samples (calibration samples, method blanks, matrix spike samples, laboratory control samples, and laboratory duplicates) will be handled according to the EPA analytical method specifications.

12.0 AUDIT PROCEDURES

An internal audit of all field procedures will be performed by the QA Officer prior to any fieldwork. The internal audit will include a review of procedures selected for the sampling program, a review of the QA/QC samples required, and a review of training requirements. The laboratory is required to have written procedures addressing internal QA/QC.

An external audit of all field procedures will be performed at the discretion of the DEQ/MWCB Project Officer. External audit reports with recommended corrective action will be submitted by the DEQ/MWCB Project Officer to the QA Officer and Field Project Officer.

13.0 REFERENCES

ASA, 1965. Methods of Soil Analysis. American Society of Agronomy.

ASTM, 1985. American Society of Testing Materials.

EPA, 1987. Data Quality Objectives for Remedial Response Activities. Volume 1 - Development Process. U.S. Environmental Protection Agency, March 1987.

EPA, 1988. Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analysis. U.S. Environmental Protection Agency, July 1, 1988.

EPA, 1992. Contract Laboratory Program, Statement of Work. Inorganic Analysis, Multi-Media, Multi-Concentration. U.S. Environmental Protection Agency, March 1992.

ATTACHMENT 1

PROCEDURES FOR CALCULATING ACCURACY AND PRECISION

PROCEDURES FOR CALCULATING ACCURACY

1. Calculate the percent recovery of the laboratory matrix spike:

$$\% \text{ Recovery of Spike} = \frac{SSR - SR}{SA} \times 100$$

Where:

SSR = Spiked Sample Results;
SR = Sample Results; and,
SA = Spike Added.

Perfect accuracy would be 100 percent recovery.

2. Calculate the standard deviation of all pairs.

$$SD = \left[\frac{\sum_{i=1}^{n} (Recovery_i - Recovery_{avg.})^2}{n-1} \right]^{1/2}$$

Where:

$Recovery_i$ = individual recoveries;
$Recovery_{avg.}$ = average recovery; and
n = number of values.

3. To validate recovery data, the individual recoveries are compared with the average recovery value to identify individual values that lie outside the range of reasonableness. Chauvenet's criterion is used to identify individual recovery values that lie outside the range. To use Chauvenet's criterion, the screening variable is computed for recovery values that are suspected of lying outside the range of reasonableness.

$$\text{Screening Variable} = (Recovery_i - Recovery_{avg.}) / SD.$$

The calculated screening variable is then compared to the maximum allowable value (found in Table A-1, Chauvenet's Criterion) for the appropriate number of recovery determinations. The suspect recovery value is set aside (set aside values are called outliers) if the calculated screening variable equals or exceeds the maximum allowable value.

TABLE A-1

CHAUVENET'S CRITERION FOR REJECTING A SUSPECTED VALUE[a]

Number of Samples n	Maximum Allowable Values for $(Recovery_i - Recovery_{avg.}) / SD$[b]
3	1.901
4	1.983
5	2.015
6	2.111
7	2.164
8	2.195
9	2.214
10	2.228
11	2.279
12	2.318
13	2.348
14	2.373
15	2.393
16	2.409
17	2.424
18	2.435
19	2.445
20	2.454
21	2.462
22	2.469
23	2.475
24	2.480
25	2.485
26	2.502
27	2.517
28	2.530
29	2.543
30	2.555
40	2.634

[a] Based on t distribution rather than the traditional (normal) distribution.

[b] Individual Recovery = $Recovery_i$
Average Recovery = $Recovery_{avg.}$
If outliers are identified using Chauvenet's criterion, a new average recovery and a new standard

deviation are recalculated using the remaining good value, and Chauvenet's criterion is reapplied. This procedure is repeated until all surviving recovery values pass Chauvenet's criterion. (Usually one application and one recalculation are enough.) The final average recovery and final standard deviation are calculated from the surviving recovery values. The final average recovery value is used to eliminate any bias from the laboratory data.

4. The range of uncertainty (R) in the recovery is then calculated.

$$\text{þ}R = \text{þ}\ tSD/(n)^{1/2}$$

Where:

R = range of uncertainty expressed as a percent;
t = value of the t distribution for the selected confidence level (90 percent) and (n-1) degrees of freedom (Table A-2);
n = number of samples; and
SD = standard deviation.

The range of uncertainty is used in conjunction with the average recovery to determine if bias adjustments are required.

5. The completeness of accuracy data is that percentage of the total number of samples that remained after outliers are identified and set aside with Chauvenet's criterion.

TABLE A-2
DISTRIBUTION OF t

Number of Sample	Degrees of Freedom	90% Complementary Probability
2	1	6.314
3	2	2.920
4	3	2.353
5	4	2.132
6	5	2.015
7	6	1.943
8	7	1.895
9	8	1.860
10	9	1.833
11	10	1.812
12	11	1.796
13	12	1.782
14	13	1.771
15	14	1.761
16	15	1.753
17	16	1.746
18	17	1.740
19	18	1.734
20	19	1.729
21	20	1.725
22	21	1.721
23	22	1.717
24	23	1.714
25	24	1.711
26	25	1.708
27	26	1.706
28	27	1.703
29	28	1.701
30	29	1.699
31	30	1.697
41	40	1.684
61	60	1.671
121	120	1.645

PROCEDURES FOR CALCULATING PRECISION

1. Calculate the relative percent difference (RPD) of each replicate pair:

$$RPD = \frac{s - D}{(SD)/2} \times 100$$

Where:

RPD = relative percent difference;
S = first sample value (original); and
D = second sample value duplicate.

Perfect precision would result in 0 percent RPD.

2. Any RPD value exceeding the control limit of ± 20 percent (water) or ± 35 percent (soil) for inorganics or the control limits in the QAPjP for organics is evaluated as an outlier using the Dixon Q method.

Dixon Test for Outlying Observations

This procedure has an advantage in that an estimate of the standard deviation is not needed to use it. The procedure is:

a. Rank the RPD data in order of increasing numerical value.
b. Decide which RPD value is suspect (usually the highest number).
c. Select the risk for a false rejection (Table A-3).
d. Compute one of the following ratios (statistics):

n	Ratio	If X_n is suspect
$3 \leq n \leq 7$	10	$(X_n - X_{n-1}) / (X_n - X_1)$
$8 \leq n \leq 10$	11	$(X_n - X_{n-1}) / (X_n - X_2)$
$11 \leq n \leq 13$	21	$(X_n - X_{n-2}) / (X_n - X_3)$
$14 \leq n \leq 25$	22	$(X_n - X_{n-2}) / (X_n - X_4)$

e. Compare the ratio (statistic) calculated with the values in Table A-3. If the calculated ratio is greater than the tabulated value, rejection may be made with the tabulated risk.

f. Suspected outliers failing the Dixon test are rejected in an iterative process and are not used in the following precision QA statement calculations.

TABLE A-3

VALUES FOR USE IN THE DIXON TEST FOR OUTLIERS

Number of Statistic	Observations, n	10% Risk of False Rejection
t 10		
	3	.886
	4	.679
	5	.557
	6	.482
	7	.434
t 11		
	8	.479
	9	.441
	10	.409
t 21		
	11	.517
	12	.490
	13	.467
t 22		
	14	.492
	15	.472
	16	.454
	17	.438
	18	.424
	19	.412
	20	.401

Original reference: W.J. Dixon, "Processing Data Outliers," Biometrics, B10MA, 9(No.1): 74-89 (March 1953).

3. Calculate the relative standard deviation (RSD) of each replicate pair.

$RSD_{each\ pair}$ = SD each pair/Mean

4. Calculate the RSD for all the pairs.

$$RSD_{overall} = \left[\frac{\sum_{i=1}^{n} (RSD_{each^2})}{n - 1_{pair}} \right]^{1/2}$$

5. Calculate precision as a percent.

$$Precision\ (\%) = \left[\frac{t_{(n-1)} \times RSD_{overall}}{(n-1)^{1/2}} \right] x\ 100$$

Where t is the value from the 90 percent probability level (Table A-2).

6. The completeness of precision data is that percentage of the total number of RPD values that remained after outliers are identified and set aside with Dixon's Q ratio.

APPENDIX C

ALS SUBMITTAL FORM

ALS minerals

Sample Submittal Form

Company Name: _____
Submitted by: _____
Telephone: _____
Courier/Waybill: _____
Containers: _____
Date Shipped: _____
PO Number: _____

Internal Use Only

Date Received: _____
Client Code: _____
Workorder No: _____
Quote: _____
Template: _____

Standard Project: _____
Commodity: _____ ☐ Ore ☐ Trace
Special Instructions: _____
Sample Type: ☐ Rock ☐ Pulp ☐ Percussion ☐ Soil ☐ Sediment ☐ Drill Core Other _____

Results to
Name: _____
Email: _____
Address: _____
City: _____ State: _____
Country: _____ Zip: _____

☐ Invoice
☐ Certificate
☐ QC Certificate
☐ Data File
☐ Webtrieve Only

Copy to
Name: _____
Email: _____

☐ Webtrieve Only
☐ Certificate
☐ Data File

Copy to
Name: _____
Email: _____

☐ Webtrieve Only
☐ Certificate
☐ Data File

Sample Return

Pulps	Rejects
☐ Return after analysis	☐ Return after analysis
☐ Return after 90 days	☐ Return after 45 days
☐ Discard	☐ Discard
☐ Paid Storage	☐ Paid Storage

Failure to indicate pulp & reject instructions will result in disposal without notice

Return Address: _____

Attention: _____

Authorized By:
Name: _____
(Please Print)
Signature: _____

Samples ID's		Quantity	Sample Preparation Required (Prep Code)	Analytical (Elements or Method Code)	Check here for Rush Premium Service
Start No.	Finish No.				
					CONTACT THE LAB TO CONFIRM AVAILABILITY
	Total Samples				

Print Reset Form

Appendix C

Field Log Book and Photographs

Appendix C-1

Log Book

No. 350NF Numbered Field—Fab

ISBN 978-1-932149-51-7

McLAREN REPOSITORY
INVESTIGATION 2013

AUGUST 5, 2013

TO

Rite in the Rain®
ALL-WEATHER
FIELD BOOK
№ 350NF

AUGUST 12, 2013

8/5/13

Geoprobe Sampling of Repository

0700 Arrive @ McLaren Site
for pre-entry brief & Knife River
Safety mtg

- K. Manchester
- M. Williams
- T. Decker
- M. Williams
- J. Flammang
- J. Allika
- M. Bennett

} PTS

Sunny, Calm, 30°-70°F,

0730 Arrive @ Repository

K. Manchester
M. Williams } Geoprobe Crew
T. Decker

J. Flammang
J. Allick } Sampling Crew

Sampling Under:
Final SAP for the McLaren Tailings
Abandoned Mine Reclamation Project
Repository Characterization, Cooke City, MT
July 30, 2013

8/5/13

Discussed hazards of ~~tate~~ 5 8/5/13 lime that is present in Repository

755 - Begin probing @ $\boxed{\text{Hole \#11}}$
800 - Refusal @ one foot moved over & reprobed
820 - 0-8' arrived
Cut 0-4', 48" → 48"
photo #1 - 825 - core 0-4'
put core in disposible aluminum pan, broke up big pieces -
Cut 4-8' 48" → 48"
photo # 829 - core 4'-8'
added core to disposible aluminum pan, mixed w/ disposible plastic scoop containing 0-4

0833 Collected MCL-BH11-M-0-8-080513
- 1 gallon ziplock bag for Ag, Au, Cu, Fire Assay composited 0-8'
Wt - 6.5 lbs

Remainder of material put in 5 gallon bucket for Env & Eng analysis

8/5/13

0845 - 8-12' arrived 48" → 48"
No apparent stuff
Photo #3-0847 - 8-12'
put core in disposible Al pan, broke up big pieces

0900 12'-15' arrived recovery 48" for 36" of probe
No apparent stuff
photo #4-0904- 12-15'
put core in disposile Al pan, broke up big pieces

0910 15-18 arrived recovery 48" for 36"
No apparent stuff
photo # 5-912- 15'-18'
put 1 foot of core in 8-16' pan
put 2 feet of core in 16-24' pan~

0915 Collect McL-BHIIM-8-16-080513
1-1 gallon ziplock for fire assay Ag, Au, Cu
Composite of core from 8-16'
core was placed in disposible Al pan mixed w/ disposible scoop ~ placed in bags
wt - 6.5 lbs

8/5/13

0920 18'-21' arrived Recovery 36" for 36"
No apparent stuff
photo #6-925- 18'-21'
put core in disposible Al pan, broke up clumps - pan contained 16'-18' already

0940 21'-24' arrived Recovered 39" for 36"
No apparent stuff
photo #7 942 21'-24'
put core in pan w/ 16'-21'

0950 Collect McL-BHIIM-16-24-080513
1-1 gallon ziplock for fire assay
Composite of core from 16'-24'
core was placed in disposible Al pan mixed w/ disposible scoop ~ placed in bag
wt - 6.5 lbs

0953 24-24.5' 6" recovery on 6"
No apparent stuff
photo #6- 0953 - 24-24.5'
core was placed in disposible Al pan ~ clumps broken up

8/5/13

0-24.5' was drilled using 3" plastic tubing - switching to 2" core from here down due to difficulty in drilling -

1022 24.3-27.3 arrived 37" ~~for~~ 36"
Approx 1.2" of sluff mostly rock
photo #9 - Picture of melted tube
photo #10 - 1024 - 24.3-27.3'
placed core in disposible aluminum pan w/ 24"-24.6" -

K. Manchester said geoprobe had refusal @ about 24.5' but pushed hard through to 27.3 - melted plastic tubing - Pulled rods & will redrill adjacent to it to 27.3' and then will begin collecting @ that point w/ 2" rod -

1100 Arrive w 27.3-30.3 recovery was 43" for 36"
2" tubing - No apparant sluff
photo 11 - 27.3'-30.3' @ 1104
placed core in disposible aluminum pan w/ 24-27.3 -

8/5/13

1125 - Arrive w/ 30.3-32.5'
Recovery 43" for 28"
photo #12 - 1126 - 30.3'-32.5'
put core in al pan containing 24-30.3'
mixed material together thoughrly

1132 Collect McL-BH11-M-24-32.5-080513
1-1 gal ziplock bag for Fire Assay
Ag, Au, Cu
Composite sample of 24-32.5' core
Core was placed in disposible Al pan
mixed w/ disposible scoop & placed in bag
Wt. - 4 lbs

1135 Begin collecting - McL ~~BF~~ E-G3-080513 JB 8/6/13
1-1 5 gallon bucket for proctor & gradation
1-1 qt ziplock for pH, OMC & TM -
(Sb, Al, As, Ba, Ca, Co, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn)
- 1 5 gallon bucket was marked into 3rds & 4 1/3'
An equal number of scoops was taken from the 4 intervals sampled
1 large scoop added to 1 gallon ziplock bag for TM analysis from each composite pan - 0-8, 8-16, 16-24, 24-32.5

8/5/11

from BH-11 → 0-8', 8-16', 16-24', 24'-32.5'
and placed into bucket to the 1/3 line
Lid was placed on bucket & taped in
place. Remaining boreholes 9 & 10
will be added when they are drilled-
Test Hole BH11 was 0-32.5'. No Natl soil @ bottom
BH-11 was refilled w/bentonite chips
& leftover soil

1200 Arrive @ Hole #2

photo #13 - Geoprobe @ BH-2 looking N
photo #14 - Geoprobe @ BH-2 looking S

Windy, 74, partly Cloudy

0-4 stuck in tube @ this time

1325 4-8' arrived 48" recovered from 48"
No Apparent Stuff
photo # 15 - 1335 - 4-8'
put core in disposible Al pan marked 0-4
broke up core-
Geoprobe personnel decided to chill

8/5/11

in 2 foot intervals because melting
the plastic tubes @ bottom

1340 8-10' arrived 48" from 24"
No apparent stuff
photo #16 - 1340 - 8'-10'
put core in disposible Al pan marked 8'-16'
broke up core

1342 - 10-12' arrived 36" from 24"
No apparent stuff
1342 - photo #17 - 10-12'
put core in Al pan marked 8-16' broke
up core

1345 - 12-14' arrived 47" from 24"
No apparent stuff
1345 - photo #18 - 12-14'
put core in Al pan marked - 8-16, broke
up core

1348 14-16' arrived 46" from 24"
No apparent stuff
1348 - photo #19 - 14-16'

8/5/13 Hole 2 cont

put core in Al pan marked 8'-16', broke up core.

1355 Collect mcL-BH02M-080513 ~~0846~~ 8/5/13

mcL-BH02m-8-16-080513

1-1 gallon ziplock for fire assay Ag, Au, Cu Composite of core from 8'-16'. Soils were placed in disposible Al pan mixed w/ disposible scoop & placed in bag

Wt - 5 lbs

1358 16-18' arrive; recovery 48" for 24"

No apparent stuff

1359 Photo #20 - Core from 16-18'

Placed core in disposible Al pan marked 16-24', broke up core

1402 18-20' arrive, recovery 32" for 24"

No apparent stuff

1403 Photo #21 - Core from 18'-20'

Placed core in Al pan marked ~~18-2~~ 8/5/13 16-24', broke up core

1404 20-22' arrive, recovery from 38" for 24"

8/5/13 Hole 2 cont

No apparent stuff

1404 Photo 22" - Core from 20'-22'

Placed core in Al pan marked 16'-18'

broke up core

1405 - 22-24' arrive, recovery 37" for 24"

No apparent stuff

1405 - Photo #23 - Core from 22-24

Placed core in Al pan marked 16-18' broke up core

1412 Collect mcL-BH02M-1624-080513 8/5/13

1-1 gallon ziplock for fire assay Ag, Au, Cu Composite of core from 16'-24'. Soils were placed in disposible Al pan & mixed thoroughly w/ disposible scoop, Material was then placed in bag

Wt - 5 lbs

1416 - 24'-26' arrive, recovery 43" for 24"

No apparent stuff

1416 Photo #24 - Core from 24-26

Placed core in disposible Al pan, broke up core - Pan marked 24'-32'

1418 26-28' arrive, recovery 33" for 24"
No apparent stuff
1418 - Photo # 25 - Core from 26-28'
place core in Al pan marked 24-32'
broke up core

1425 28-30' arrive, recovery 30" for 24"
No apparent stuff
1428 - Photo # 26 - Core from 28-30'
place core in Al pan marked 24-32,
broke up core

1427 30-32 arrive, recovery 43" for 24"
No apparent stuff
1430 - Photo # 27 - Core from 30-32"
place core in pan (Al) marked 24-32
broke up core

1433 - Collect McL-BH02-2432-080513 (5/8/13)
1-1 gallon ziplock for Ag Au, Cu
Weight - 5 lbs
Composite of core from 24-32'
core from these intervals placed in
disposible Al pan and mixed w/ disposible
scoop. Material placed in bag

1435 - 32-34' Arrive, recovery 36" for 24"
No apparent stuff
1437 Photo # 28 - Core from 32-34'
Place core in disposible Al pan marked
32-36.5', broke up core

1438 - 34-36.5' Arrive, recovery 48" for 30"
No apparent stuff
1439 Photo # 29 - Core from 34-36.5'
Place core in Al pan marked - 32-36.5
broke up core

1444 Collect McL-BH2M-~~3436~~ 32-36.5-080513 (5/8/13)
1-1 gallon ziplock for fire assay Ag, Au, Cu
Weight - 3.5 lbs
Composite of ~~34~~ 5/8/13 32-36.5'
of material. Material placed in disposible
Al pan, mixed thoroughly w/ disposible
plastic scoop & placed in bag

1445 - 0-4' Arrive, Recovery 32" for 48"
No apparent stuff
1448 Photo # 30 - Core from 0-4'
Place core in Al pan marked 0-8',
broke up core

1453 Collect - MCL-BH2-M-0-8-080513
1-1 gallon ziplock for fire assay, Au, Ag, Cu
Weight 3.25 lbs
Composite of core from 0'-8', Placed core in disposible Al pan mixed thoroughly w/disposible plastic scoop & placed in bag

1500 Begin collecting MCL-ENV-GI-080513
1-5 gallon bucket for proctor, gradation
1-1 qt ziplock for TM (see list p.7, pH & OMC
A 5 gallon bucket was marked into 1/3's (4 1/3"). An equal # of scoops were taken from 0-8 8-16, 16-24, & 24-32 composite pans, 1/2 as many scoops were added from the 32-36.5 pans & from 0-8 all remaining material was added - about 3 scoops less than 8-16, 16-24, 24-32 because of the lack of volume -
Lid was placed on bucket & taped in place - Remaining boreholes - 5 & 6 will be added when bored.

Test Hole BH-2 probed from 0-36.5
No Nat'l Soil @ base

~~1520 0-2' 5/8/13~~
1510 Move to Hole #1
Cloudy, 70's windy, some thunder

1520 0'-2' Arrive, recovery 17" for 24"
No Apparent stuff
1522 - Photo #31 - 5/8/13 0'-2' of core
Core was placed in disposible Al pan marked 0'-8', broke up core

1523 - 2'-4' arrive, recovery 27" for 24"
No apparent stuff
1525 - Photo #32 - 2'-4' of core
Core was placed in disposible Al pan marked 0-8' broke up core

1545 - 4'-6' core stuck in pipe

1620 - 6-8' core arrives, recovery 43" - 24"
No apparent stuff
1621 - Photo #33 - Core - 6-8'
Core was placed in Al pan marked 0-8
broke up core

8/5/13 BH-1 Cont

1624 - 8'-10' Arrive, Recovery 23" for 24"
No apparent stuff
1625 - Photo #34 - 8'-10' of core 8/5/13
Core was placed in disposable Al pan marked 8'-16', core was broke up

1653 M. Williams showed up they switched to 3" because they were having so much trouble getting down & didn't want to do 2-2" bores

1655 0-2' 3" core arrives, 25.5" for 24"
No apparent stuff
1658 Photo #35 - 0-2' 3" core
core was added to Al pan marked 0-8'
core was broke up

1659 - 2-4' 3" core arrives 23" for 24"
No apparent stuff
1701 - Photo #36 - 2-4' 3" core
core was added to Al pan marked 0-8'
core was broke up

1702 4-6' 3" core arrives. 35" for 24"

8/5/13

No Apparent stuff
1703 - Photo #37 - 4-6' 3" core
Core was added to Al pan marked 0-8', core was broke up

1705 6-8' of 3" core arrives, recovery 24.5" for 24"
No Apparent stuff
1706 photo #38 - 6-8' of 3" core BH-1
core was added to Al pan marked 0-8', core was broke up

1710 Collect MCL-BH1-M-~~8-1~~ 8-8-080513 8/5/13

1-1 gal ziplock bag for fire assay Ag, Au, Cu
weight - 5.5 lbs
Composite of core from 0-8 feet
Cores were placed in a disposible Al pan & mixed thoroughly w/ disposible plastic scoop then placed in bag

1714 8'-10' 3" core Arrives, Rec - 40" for 24"
No apparent stuff
1716 Photo #39 - 8-10' 3" core BH-1
core was placed in disposible Al pan marked 8-16', broke core up
Auger refusal on geoprobe @ 10.5'
1751 - Off-site for day

8/6/13 Geoprobe Sampling of Repository
0700 - Arrive @ McLaren Site
for Knife River Safety Mtg
Safety Mtg:
K. Manchester
J. Flammang
J. Allick
T. Becker
M. Williams
M. Bennett
} PTS
Subject: Eye Contact

0715 Arrive @ repository
J. Flammang
J. Allick } PTS sampling
M. Williams
K. Manchester
T. Becker } Geoprobe

~~1745~~ Moved from original BH-1 location (refusal @ 10.5') to new location 10' S
began probing
1800 Auger Refusal - Will leave for later in the week
1808 Moving to BH-3
1830 J. Flammang & J. Allick off-site to office

8/6/13
905 J. Flammang & J. Allick back on site
0-10' of core from BH-4 @ station
BH-4 - 2" Core throughout
900 Process BH-4 0-2' recov 18" from 24"
No sluff
919 Photo #40 (white camera) 0-2 core for BH-4
Core was placed in disposible Al pan
marked 0-8'. Broke core up

920 Process 2'-4' core recov - 24" from 24"
No apparent sluff
920 Photo #41 - BH-4, 2'-4' core
Core was put in Al pan marked 0-8
Broke core up

922 Process 4'-6' core recov 33" for 24"
1" of dark ~~sluff~~ material on top may be sluff
922 Photo #42 - BH-4, 4-6' core
Core was put in Al pan marked 0-8
Broke core up

924 Process 6'-8' recov - 26" from 24"
No apparent sluff, rock on top
924 Photo #43 - BH-4, 6-8' core

8/6/13

BH-4 6-8' cont.

Core placed in pan marked 0-8, broke core up.

932 - Collect mcl-BH4m-0-8-080613

1-1 Gallon ziplock for fire assay Ag, Au, Cu

Composite of core 0-8'

0-2, 2-4, 4-6, 6-8' cores placed in disposible Al pan, mixed thoroughly w/ disposible plastic scoop & placed in bag

Weight - 6.0 lbs -

950 Auger Refusal @ 12' in BH-4

move location 5' to South - 4A -

Began collecting @ 8' w/ 2" pipe

1055 Core for BH-4A arrives

8-10, 10-12, 12-16, 16-18, 18-20

1056 Process 8-10' BH-4A recovery 23" for 24"

No Apparant stuff

1059 Photo #44 - core from 8-10' from BH4A

Core placed in disposible Al pan marked 8-16, broke core up

11-scoops everything - 3

17 scoops of 0-24, 11 scoops of 24-30.5

8/6/13

1101 BH4A core 10-12', recovery 46 for 24

No apparant stuff but large rock @ top

1101 Photo # 45 - BH4A - 10-12' core

Placed core in Al pan marked 8-16

broke up core

1103 BH4A core 12-14', recovery 48" for 24"

No apparant stuff

1103 Photo #46 - BH4A - 12-14' core

Placed core in Al pan marked 8-16

broke up core

1105 - BH4A core 14-16', recovery 40" for 24"

No apparent stuff

1105 Photo #47 - BH4A - 14-16' core

Placed core in Al pan marked 8-16'

broke up core

1111 Collect mcl-BH4m-8-16-080613

1-1 gallon ziplock bag for fire assay

Ag, Au, Cu

Weight - 5 lbs

Composite of core 8-16'

8-10, 10-12, 12-14, 14-16 cores placed

8/6/13
BH4 cont.
in disposible Al pan mixed w/ disposible plastic scoop a portion placed in bag

1117 BH4A 16'-18' core processed
Recovery 40" for 24"
No apparent stuff
1118 - Photo #48 - BH4 16-18' core
Core placed in disposible Al pan marked 16'-24", core was broke up

1119 Processed BH4A 18-20' core, recov - 37" for 24"
No apparent stuff
1119 Photo #49 - BH4 18'-20' core
Core placed in disposible Al pan marked 16'-24', core was broke up

1121 Processed BH4A 20'-22' core, Recov - 43" for 24"
No apparent stuff
1121 - photo #50 - BH4 20-22 core
Core placed in disposible Al pan marked 16-24', core was broke up

8/6/13
1123 Process BH4A - 22-24' core, Recov 46" for 24"
No apparent stuff
1124 - Photo #51 - BH4 core 22-24'
Core was placed in Al pan marked 16-24', core was broke up

1131 Collect MCL-BH4M-8/6/13-16-24-080613
~1 gallon ziplock bag for fire assay Ag, Au, Cu
Weight - 5 lbs
Composite over 16'-24' core
16-18', 18-20', 20-22', 22'-24' sections of core placed in disposible Al pan marked 16-24', mixed thoroughly w/ disposible plastic scoop a portion placed in ziplock bag

1136 Process BH4A 24-26' core, recov - 48" for 24"
No apparent stuff
1137 Photo #52 - BH4 - 24-26' core
Core was placed in disposible Al pan marked 24-32', core was broke up

1140 - Process BH4A 26-28' core, recovery 40" for 24"
No apparent stuff

8/6/13 BH4-cont

1141 Photo #53 - BH4 Core 26'-28'
Core was placed in Al pan marked 24-32'
core was broke up

1143 Process BH4A-28'-30' core, Recov 44" for 24"
No apparent stuff
1144 Photo #54 - BH4 - 28-30' core
Core was placed in Al pan marked ~~28-30'~~ 8/6/13
24-32'; core was broke up

1145 Process BH4A-30-32' core, Recov 38" for 24"
No apparent stuff
1146 Photo #55 - BH4 - 30-32' core
Core was placed in Al pan marked 24-32', core was broke up.

1152 Collect MCL-BH4M-24-32-080613
1 - 1 gallon ziplock bag for fire assay Ag, Au, Pb
Weight - 5 lbs, Composite of 24-32' core
Composite of core sections 24-26, 26-28, 28-30
30-32. Core was placed in
disposible Al pan marked 24-32'
& mixed thoroughly w/ disposible
scoop. Portion of material then placed

8/6/13

in 1 gallon ziplock bag

1158 Process BH4A-32-34' core, Recovery
41" for 24"
No apparent stuff
1158 - Photo #56 - BH4, 32-34' core
core was placed in disposible Al pan
marked 32-40', core was broke up

1200 Process BH4A-34-36' core, Recovery
41" for 24"
No apparent stuff
1200 - Photo #57 - BH4, 34-36' core
core was placed in disposible Al pan
marked 32'-40' - broke core up

1201 Process BH4A-36-38' core, Recovery
48" for 24"
No apparent stuff
1201 Photo #58 - BH4, 36-38 core
core was placed in Al pan, marked
32-40', broke core up

1203 Press BH4A-38-40' core, Recovery

BH4 cont 8/6/13

46" for 24"

No apparent stuff

1203 Photo #59 - BH4 - Core ~~32-40'~~ 8/6/13 38-40'

Core was placed in Al pan marked 32-40

core was broke up

1205 Process BH4A - 40-42', Recovery - 42" for 24"

No apparent stuff

1205 Photo #60 - BH4 Core 40-42'

Core was placed in Al pan marked 32-40

core was broke up

1207 Process BH4A - 42-44', Recovery was 36" for 24".

Core was examined and it was determined that Nat'l Ground began @ approx 43.1 feet. Tan ~~sandy~~ 8/6/13 silty sand to sand present @ that interval. Above that interval for approx 4" was a brick red clayey silt w/gravel. That was included in the composite sample (brick red material) 43.1 to 44' was underlying soil

8/6/13

1210 Photo #62 - Underlying soil @ BH-4A

Tailings from 0-43.1' in this location. Borehole 2 probed 0-44'

1224 Collect MCL-BH4M-32-43.1-080613

1-1 gallon ziplock bag for fire assay Au, Ag, Cu

Weight was 6 lbs

Composite sample representing 32-43.1'

Cores from 32-34, 34-36, 36-38, 38-40, 40-42 & 42-43.1 were placed in pan marked 32-40 (disposible Al) & mixed thoroughly w/disposible plastic scoop. Portion of material was placed in ziplock bags

* Deviation to SAP - more than 8' included in MCL-BH4M-32-43.1-080613 Not enough material to make a 40-43.1 ~~interval~~ sample

1235 Begin collecting:
MCL-ENV-G2-080613
1 1 qt ziplock bag composed of a composite of BH-1, BH-3, BH-4 - 5 scoops of ~~compost~~ material from BH-4 0-43.1' were placed in a 1 gallon bag for compositing - Equal amounts from each composite sample 0-8, 8-16, 16-24, 24-32, 32-43.1

1235 Begin collecting
MCL-ENG-G2-080613
1 5 gallon bucket, composed of a Composite of BH-1, BH-3, BH-4 - 1/3 of the bucket was filled w/equal amounts of material from BH-4 cores 0-8, 8-16, 16-24, 24-32, 32-43.1 1/3 bucket was approx 4'1/3" - a line was drawn on bucket ^ an equal # of scoops from each composite was added. Lid was then placed on bucket until addition of other boreholes -

8/6/13

1245 - Begin Processing Core from BH-3 Breezy, P. Cloudy 70s
2" core throughout
1245 Process BH-3, 0'-2' recovery 26" for 24"
No stuff top of hole
1245 - Photo #63 - BH-3, 0-2' core
Core was placed in a disposible Al pan marked 0-8', core was broken up

1250 Process BH-3, 2-4' core, recovery 32" for 24"
No stuff - rock was on top
1252 - Photo #64 - BH-3, 2-4' core
Core was placed in Al pan marked 0-8' core was broken up

1253 - Process BH-3, 4-6' core, recovery 31" for 24"
No apparent stuff
1255 - Photo #65 - 4-6' core
Core was placed in Al pan marked 0-8', core was broken up

8/6/13 BH-3 cont

1257 - Process BH-3, 6-8' core, recovery 29" for 24"
No apparent sluff
1259 - Photo #66 - BH-3, 6-8' core
Core was placed in a Al pan marked 0-8', core was broken up

1300 Collect mcL-BH3m-0-8-080613
1-1 Gal ziplock bag for fire assay Au, Ag, Cu
Weight 3.5 lbs
Composite of material from 0-8'
Cores from 0-2, 2-4, 4-6, 6-8 were placed in a disposible Al pan mixed thoroughly with disposible plastic scoop. A portion was placed in ziplock bag

1308 Process BH-3, 8-10' core
Recovery 48" for 24"
No apparent sluff
1310 Photo # 67 - BH-3, 8-10' core
core was placed in a disposible Al pan marked 8-16', core was broken up

8/6/13

1311 - Process BH-3, 10-12' Core
~~No~~ 8/6/13 Recovery 36" for 24"
No apparent sluff
1313 - Photo # 68 - BH-3, 10-12' core
core was placed in an Al pan marked ~~10-12'~~ 8/6/13 8'-16', core was broken up

1314 Process BH-3, 12-14' core
Recovery 36" for 24"
Appears to be 1" of sluff - Removed
1315 - Photo #69 - BH-3, 12-14' core
core was placed in an Al pan marked 8-16' ~~12-14'~~ 8/6/13, core was broken up

1317 Process BH-3, 14-16' core
Recovery 43" to 24" No apparent sluff
1318 Photo #70 - BH-3, 14-16' core
core was placed in an Al pan marked 8-16', core was backed up

1325 - Collect mcL-BH3m-8-16-080613
1-1 gal ziplock bag for fire assay Ag, Au, Cu
Weight - 5 lbs
Composite of material from 8'-16'

8/6/13 BH-3 cont

cores from 8-10', 10-12', 12-14', 14-16' were placed in a disposible Al pan & mixed w/a disposible plastic scoop. A portion of this was put in ziplock bag

1330 Process BH-3, 16-18' Core
Recovery 41" for 24" No apparent stuff
1330 Photo #71-BH-3, 16-18' core
core was placed in an Al pan marked 16-24', core was broken up

1331 Process BH-3, 18-20' Core
Recovery 29" for 24" No apparent stuff
1332 Photo #72-BH-3, 18-20' core
core was placed in an Al pan marked 16-24', core was broken up

1333 Process BH-3, 20-22' core
Recovery 20" for 24" No apparent stuff
1334 Photo #73-BH-3, 20-22' core
core was placed in an Al pan marked 16-24', core was broken up

1335 Process BH-3, 22-24' core

Recovery 26" for 24" No apparent stuff
1336 Photo #74-BH3, 22-24' core
core was placed in an Al pan, marked 16-24', core was broken up

1341 Collect MCL-BH3M-16-24-080613
1-1 gal ziplock bag for fire assay Ag, Au, Zn
Weight 3.5 lbs
Composite of core from 16-24'
Cores from 16-18', 18-20', 20-22', 22-24' were placed in a disposible Aluminum pan & mixed thoroughly w/disposible plastic scoop. A portion was then placed in a ziplock bag

1343 Process BH-3, 24-26' core
Recovery 29-~~24~~ 8/6/13 for 24"
1344 Photo #75-BH-3, 24-26' core
core was placed in an Al pan marked 24-32', core was broken up
No apparent stuff
1345 Process BH-3, 26-28' core
Recovery 16" for 24" No apparent stuff
1346 Photo #76-BH3, 26-28' core

8/6/13 BH-3 cont

core was placed in an Al pan marked 24'-30', core was broken up

1347 Process BH-3 28'-30' core
Recovery 27" for 24" No apparent stuff

1348 Photo #77-BH3, 28-30' core

core was placed in an Al pan, marked 24'-32', core was broken up

1349 Process BH 3, 30-32'
Recovery 16" for 24" No apparent stuff

Examining the core only 1/4 of it appeared to be tailings - Red clayey silt w/gravel from 30-30.5" rest appeared to be natural soil - brown sand to silty sand

1350 Photo #78 - BH3, 30-32' core (cards on core say 28-30 by mistake)

core from 30-30.5' was placed in Al pan marked 24-32', core was broken up. Core from 30.5-32 was discarded

Hole BH-3 was probed from 0-32'

8/6/13 BH-3 cont

Tailing were from 0-30.5'

1353 Collect MCL-BH3M-24-30.5-080612
1-1 gal ziplock bag for fire assay Ag, Au, Pb
Weight 3.0 lbs

Composite of core from 24-30.5'
Core from 24-26', 26-28', 28-30', 30-30.5' placed in a disposible Al pan, mixed thoroughly w/disposible plastic scoop
A portion was then placed in ziplock bag

1400 Continue collecting MCL-ENV- ~~0806~~
1-1 qt ziplock bag for Fm, PH, OCM -
5 scoops of material from 0-30.5 were placed in a gallon zip lock bag to mix w/ material from BH-1 & BH-4
Equal amounts from each composite interval were added - 0-8', 8-16', 16-24 & 24-30.5'.

1400 Continue collecting MCL-ENG- ~~0806~~
1-5 gal bucket for proctor & grad
17 scoops each ~~makes~~ composite BH-3 0-8, 8-16 & 16-24 were placed

8/16/13 BH-3 cont

in the 5 gallon bucket containing BH-4. In addition 11 scoops of 24-30.5' were added. There was not enough material to add the 8th scoops to make it equal to other additions (0-8, 8-16, 16-24). A line was drawn on bucket 4'1/3" above the material from BH-4, which equals a 1/3 of the bucket. The bucket was filled to that line & then the lid was placed on it to await the addition of BH-1 material

1400 Geoprobe moves to BH-7
2" core throughout
sunny, windy 70's

1413 - Process BH-7, 0'-2' core
Recovery 26" for 24" No apparent stuff

1414 Photo #79 - BH-7, 0-2' core
core was placed in an disposible aluminum pan marked 0'-8', core was broken up

1416 Process BH-7, 2-4' core
Recovery 31" for 24" No apparent stuff

1417 - Photo #80 - BH-7, 2-4' core

8/6/13 BH-7 cont

core was placed in Al pan marked 0-8'
core was broken up

1419 - Process 4-6' core from BH-7
Recovery 41/24 for 24" 41/24

1420 Photo #81 - BH-7, 4-6' core
core was placed in Al pan marked 0-8'
core was broken up - No apparent stuff

1421 - Process 6-8' core from BH-7
Recovery 30' for 24" No apparent stuff

1423 - Photo #82 - BH-7, 6-8' core
Core was placed in Al pan marked 0-8
core was broken up

1425 Collect MCL-BH7M-0-8-080613
1-1 gal ziplock bag for fire assay Au, Ag, Cu
Weight - 3.5 lbs
Composite of 0-8' core from BH-7
0-2', 2-4', 4-6', 6-8' core was placed in a disposible Al pan, it was thoroughly mixed w/disposible scoop and a portion was placed in ziplock bag

8/6/13 BH-7

1434 Process 8'-10' core from BH-7
No apparent stuff
Recovery 35" for 24"
1435 Photo # 83 BH-7, 8-10' core
core was placed in a disposible aluminum pan marked 8-16', core was broken up

1440 Process 10'-12' core from BH-7
Recovery 29" for 24"
No apparent stuff
1441 Photo # 84- BH-7, 10'-12' core
core was placed in an Al pan marked ~~8~~ 10-12'
Core was broken up

1442 Process 12-14' core from BH-7
Recovery 17" for 24"
No apparent stuff
1443 - Photo # 85- BH-7, 12'-14' core
core was placed in an Al pan marked 8-16',
core was broken up

1444 Process 14'-16' from BH-7
Recovery 7.5" from 24"

8/6/13

No apparent stuff
1446 Photo #86- BH-7, 14'-16'
core was placed in al pan marked 8'-16'
than core was broken up.

~~1503 Called MCL BH7 M-8-16-080613~~ F 8/6/13
~~I got ziplock bag for fire assay, Au, Ag, Cu~~

Not enough material was collected to meet sampling requirements for the 8-16' composite. an additional hole will be probed & core from 8'-16' will be collected & added to pan once this BH-7 is completed

1448 Process 16'-18' core from BH-7
Recovery 32" for 24"
No apparent stuff
1449 - Photo #87, BH-7, 16'-18' core
core was placed in a disposible Al pan marked 16'-24', core was broken up

1450 Process 18'-20' core from BH-7
Recovery 33" from 24"

8/6/13 BH-7 cont 18-20'

No apparent stuff

1451 - Photo #88 - BH-7, 18'-20' core

core was placed in an Al pan marked 16'-24', core was broken up

1453 Process 20'-22' from BH-7

Recovery 37" for 24".

No apparent stuff

1454 Photo #89 - BH-7, 20-22' Core

core was placed in an Al pan marked 16-24', core was broken up

1456 Process 22'-24' core from BH-7

Recovery 34" for 24"

No apparent stuff

1457 Photo #90 - BH-7 - 22'-24' core

core was placed in an Al pan marked 16'-24', core was broken up

1503 Collect MCL-BH7M-16-24-080613

1-1 gal ziplock bag for fire assay Au, Ag, Cu

Weight - 3.5 lbs

Composite of 16'-24' core

Cores from 16'-18', 18'-20', 20'-22', 22'-24'

8/6/13

were placed in a disposible aluminum pan & mixed thoroughly w/a disposible plastic scoop. A portion was placed in the gallon ziplock bag

1505 - Process 24'-26' core from BH-7

Recovery 38" for 24"

No apparent stuff

1506 - Photo #91 - BH-7, 24'-26' core

core was placed in a disposible aluminum pan, marked 24-32', core was broken up

1508 - Process 26'-28' core from BH-7

Recovery 39" for 24"

No apparent stuff

1509 - Photo #92 - BH-7, 26'-28' core

core was placed in a disposible al pan marked 24-32, core was broken up

1509 K. Manchester off-site for diesel for geoprobe

1511 Process 28'-30' core from BH-7

Recovery 39" for 24"

8/6/13 BH-7 cont.

No apparent stuff

1512 Photo #93 - BH-7, 28'-30' core

core was placed in an Al pan marked 24'-32', core was broken up

1514 Process 30'-32' core for BH-7

Recovery 22" for 24"

No apparent stuff

1515 Photo #94 - BH-7, 30'-32' core

core was placed in an Al pan marked 24'-32', core was broken up

Core was moist to damp

1517 Process 32'-34' core for BH-7

Recovery 27" for 24"

No apparent stuff

1518 Photo #95 BH-7, 32'-34' core

core was placed in an Al pan, marked 24'-32', core was broken up

1521 Process 34-36 core for BH-7

Recovery 18" for 24"

No apparent stuff

1522 Photo #96 - BH-7, 34'-36' core

8/6/13

At 33.8' core contained red clay silt w/ lime & gravel. This has been seen just above Nat'l ground in previous holes. Red silt ran from 33'8" to 34.3'. ~~Natur soil~~ 8/6/13 Natural soil appears to start @ 34.3' - med brown sand to silty sand -

34-34.3' was placed in Al pan marked 24'-32', core was broken up - remainder of core was discarded

1527 Collect MC-BH7M-24-34.3-080613

1-1 gallon ziplock bag for fire assay Ag, Au, Cu

Weight - 4.5 lbs

Composite of core from 24-34.3'

Cores from 24-26, 26-28, 28-32, 32-34.3 were placed in a disposible Al pan and mixed w/ a disposible plastic scoop. A portion was placed in ziplock bag.

* Deviation to SAP - more than 8' included in composite - not enough material to make an additional sample (32'-34.3')

8/6/13 BH-7 cont
K. Manchester off-site for week

Began probing for additional footage for 8'-16' composite. Had refusal in several holes

1640 Begin processing 8-10' core from BH-7B
Recovery 32" for 24"
No apparent stuff
1641 Photo #97 - BH-7B, 8'-10' core
core was placed in the Al pan marked 8'-16', core was broke up & incorporated w/ BH-7 8'-16' cores

1642 Processed 10'-12' core from BH-7B
Recovery 26" for 24"
No apparent stuff
1642 Photo #98 - BH-7B, 10'-12' core
core was placed in the Al pan marked 8-16' containing the BH-7 core from 8-16', core was broke up

1644 Processed 12'-14' core from BH-7B
Recovery 40" for 24"

8/6/13
No apparent stuff
1645 - Photo #99 - BH-7B, Core 12'-14'
core was placed in the Al pan marked 8'-16' containing the 8'-16' BH-7 core, core was broke up

1648 - Processed 14'-16' core from BH-7B
Recovery 29" to 24 inches
No apparent stuff
1649 - Photo #100 - 14'-16' core, BH-7B
core was placed in Al pan marked 8-16' containing the material from the 8'-16' interval in BH-7

1653 Collect MCL-BH7M-8-16-080613
1-1 gallon ziplock bag for fire assay Ag, Au, Cu
Weight - 6 lbs
Composite of core from 8'-16' from BH-7 & BH-7B
Cores from 8'-10', 10-12', 12-16', 16-18' from both BH-7 & BH-7B (8 cores) were placed in a disposible Al pan & mixed w/disposible plastic scoop. A portion was then placed in ziplock bag

8/6/13

1700 Begin collecting MCL-ENV-64-~~08013~~ 8/7/13
- 1-1 qt ziplock bag for TM, OCM & pH -
2 small scoops from each composite interval 0-8', 8-16', 16-24' & 24-34.3' from BH-7 were placed in a 1 gallon ziplock bag for later compositing w/ BH-8

1700 Begin collecting MCL-ENV-64-~~08010~~ 8/7/13
1-5 gallon bucket for proctor degradation
An equal amount from each composite interval from BH-7, 0-8, 8-16, 16-24, 24-34.3 were placed in bucket, Enough material was placed in bucket to fill approximately 4½ to 5" of bucket. BH-8-(10-60") will be added to remainder of bucket to complete sample (1/3 + 2/3).

1730- All off site for day

8/7/13 Geoprobe Sampling of Repository

0700- Arrive @ McLaren Site for Knife River Safety mtg
J. Flammang
J. Allick
T. Decker
M. Williams
M. Bennett
} PTS } Sampling Geoprobe
Sunny, calm, 40's
0710 M. Williams, T. Decker to BH-8 to begin geoprobing
J. Flammang, J. Allick off-site to get fuel for geoprobe.

0730 J. Flammang, J. Allick back on-site

754 Process 0-2' core for BH-8
Recovery - 27" for 24"
Top - No sluff
755 Photo #101 - BH-8, 0-2' core
core was placed in disposible Al pan marked 0-8', core was broken up

8/7/13

756 Process 2'-4' core from BH-8
Recovery 20" for 24"
Rocks @ surface, No stuff
757 Photo # 102 - 2'-4' core, BH-8
core was placed in disposible Al pan marked 0-8, core was broken up

758 Process 4'-6' core from BH-8
Recovery 40" for 24" No apparent stuff
759 Photo #103 - BH-8, 4'-6' core
core was placed in Al pan marked 0-8
broke core up

801 Process 6'-8' core from BH-8
Recovery 41" for 24" No apparent stuff
803 Photo #104 - BH-8, 6-8' core
core was placed in Al pan marked 0-8', broke core up

805 Collect MCL-BH8M-0-8-080713
1-1 gal ziplock bag for fire assay Ag, Au, Cu
Weight 3.5 lbs
Composite of core from 0'-8'
0-2', 2-4', 4'-6', 6'-8' core was placed

8/7/13

in a disposible Al pan marked 0'-8' & mixed thoroughly w/disposible plastic scoop. A portion was then placed in ziplock bag

Safety Topic - Loader moving large timbers near our sampling location be aware of loader & ops - when present - backing up near our location - Stop work when he is backing up

808 Process 8-10' core from BH-8
Recovery 45" for 24"
No apparent stuff
809 Photo # 105 - BH-8, 8-10' core
core placed in disposible Al pan marked 8'-16', core broke up

811 Process 10-12' core from BH-8
Recovery 47" for 24"
No apparent stuff
812 Photo #106 - BH-8, 10-12' core
core placed in Al pan marked 8-16'
core broke up

8/7/13 BH-8 cont

816 Process BH-8, 12-14' Core
Recovery 32" for 24"
No apparent stuff
817 Photo # 107 - BH-8, 12'-14' Core
core was placed in Al pan marked
8'-16', core was broke up

818 Process BH-8, 14'-16' core
Recovery 23" for 24"
trace of stuff on top
819 Photo # ~~18~~ 8/7/13 108 - BH-8, 14'-16' core
core was placed in Al pan marked
8-16', core was broke up

822 Collect MCL-BH8M-8-16-080713
1-1 L Ziplock bag for fire assay Au, Ag, Cu
Weight ~6.0 lbs
Composite of 8'-16' core from BH-8
Core from 8-10, 10-12, 12-14, 14-16 was placed
in a disposible Al pan mixed thoroughly with
a disposible plastic scoop and a portion
was placed in qal ziplock bag

8/7/13

825 Process BH-8, 16-18' core
Recovery 43" for 24"
trace of stuff @ surface - not included in comp
826 Photo # 109 - 16'-18' core, BH-8
core was placed in disposible Al pan
marked #8 16-24', core was broke up

828 Process BH-8, 18-20' core
Recovery 36" for 24"
No apparent stuff
829 Photo # 110 - 18'-20' core, BH-8
core was placed in disposible Al pan
marked #8 16'-24', core was broke up

840 Process BH-8, 20'-22' core
Recovery 33" for 24"
No apparent stuff
841 Photo # 111 - ~~TOS~~ 8/7/13 20'-22' core, BH-8
core was placed in disposible Al pan
marked #8 16-24, core was broke up

843 Process BH-8, 22'-24' core
Recovery 48" for 24"

8/7/13 BH-8 cont

No apparent stuff

844 Photo #112 - BH-8, 22'-24' core

core was placed in Al pan marked #8-16-24'

core was broke up

847 Collect MCL-BH8M-16-24-080713

1-1 gal ziplock bag for fire assay Ag, Au, Cu

Weight - 6.0 lbs

Composite of core from 16'-24'

Core from 16-18, 18-20, 20-22, 22-24 was placed in a disposible Al pan mixed thoroughly w/disposible plastic scoop & a portion was placed in ziplock bag

849 Process BH-8 24'-26' core

Recovery 47" for 24"

No apparent stuff

850 Photo # 113, Core 24'-26' from BH-8

core was placed in disposible Al pan marked #8 24-32, core was broke up

853 Process BH-8, 26-28' core

Recovery 37" for 24"

No apparent stuff

8/7/13

854 Photo # 114 - BH-8, 26-28' Core

core was placed in Al pan marked #8 24-32

core was broke up

858 Process BH-8, 28'-30' core

Recovery 21" for 24"

No apparent stuff

859 Photo #115 - BH8, 28'-30' Core

core was placed in Al pan marked #8 24-32

core was broke up

900 Process BH-8, 30'-32' core

Recovery 39" to 24"

No apparent stuff

901 Photo #116, BH-8, 30-32' Core

core was placed in Al pan marked # 8 24-32

core was broke up

909 Collect MCL-BH8M-24-32-080713

1-1 gal ziplock bag for fire assay Ag, Au, Cu

Weight - 4.5 lbs

Composite of core from 24-32'

Core from 24-26, 26-28, 28-30, 30-32 was placed in disposible Al pan and mixed

8/7/13 - BH-8 cont

thoroughly w/disposible plastic scoop. A portion was placed in gallon ziplock bag

914 Process BH-8 32-34' core
Recovery 48" for 24"
Approx 1" of stuff removed from top

915 Photo #118 (119 taken of 46-48) BH-8, 32'-34'
core was placed in disposible Al pan marked #8 32-40, core was broke up

920 Process BH-8 34'-36' core
Recovery 48" for 24"
No apparent stuff

921 Photo #119 - BH-8, 34'-36' core
core was placed in disposible Al pan marked #8 32-40, core was broken up

927 Process BH-8, 36'-38' core
Recovery 42" for 24"
No apparent stuff

928 Photo #120 - BH-8, 36-38' Core
core was placed in Al pan marked #8 32-40
core was broke up

8/7/13

930 Process BH-8, 38-40' core
Recovery 29" for 24"
No apparent stuff

931 Photo #121 - BH-8 38-40' core
core was placed in Al pan marked #8 32-40
core was broken up

933 Collect MCL-BH8M-32-40-080713
1-1 gal ziplock bag for fire assay Ag, Au, Cu
Weight - 7+ lbs
Composite of core from 32'-40'
Core from 32-34', 34-36', 36-38', & 38'-40' was placed in disposible Al pan and mixed w/ disposible plastic scoop. A portion was placed in ~~an Al pan~~ 8/7/13 the ziplock bag

937 Process BH-8, 40'-42' core
Recovery 48" for 24"
No apparent stuff

938, Photo #122 - BH-8, 40'-42' core
core was placed in a disposible Al pan marked #8 40'-48', core was broken up

939 Process BH-8, 42'-44"

8/7/13 BH-8 cont
Recovery 42" for 24"
No apparent stuff
940 Photo # 123 - BH-8, 42-44' core
core was placed in pan marked #8 40-48,
core was broken up

941 Process BH-8, 44'-46' core
Recovery 48" for 24"
No apparent stuff
942 Photo # 124 - BH-8, Core from 44'-46'
core was placed in Al pan marked #8 40-48', core
was broken up

905 Process BH-8, 46-~~48~~ 47' core 8/7/13
Recovery was 24.5/for 12"
Native Grd was encountered @ approx
46.75', Med brown sand to silty sand
w/small gravel -
906 Photo # 117 - BH-8, 46'-47' core
core from 46-46.75 was placed in Al
pan marked #8 40-48', remaining core was
discarded, core in pan was broken up

8/7/13

948 Collect MCL-BH8m-40-46.75-080713
1-1 gal ziplock bag for fire assay Ag, Au, Cu
weight 3.5 lbs
Composite of core from 40-46.75'
core from 40-42', 42'-44', 44'-46', 46'-46.75'
was placed in a disposible Al pan & mixed
thoroughly w/ disposible plastic scoop
A portion was placed in a ziplock bag

950 Continue collecting MCL-ENV-64 ~~[illegible]~~ 8/7/13
1-1 gal ziplock for TPH, PH, ORP
1 large scope from each composite
from BH-8, 0-8, 8-16, 16-24, 24-32, 32-40 &
40-46.75 were placed in the 1 gallon
ziplock bag already containing material
from BH-7 & placed on ice

955 Continue collecting MCL-ENV-64
1 5 gallon bucket for proctor & gradation
An equal amount of ~~soil~~ material from
each composite interval for BH-8 was
added to bucket already containing BH-7.
Enough material was placed in bucket
to fill approximately 2/3 of the bucket

8/7/13 BH-8 cont

BH-8 was supposed to be about 60' deep
BH-7 was 34.3' deep - ~~based~~ JF 8/7/13 on
that information. JF 8/7/13 The 5 gallon bucket
was divided into 1/3 & 2/3 portions
BH-7 (1/3), BH-8 (2/3) and filled accordingly -
BH-8 was not as deep as originally planned.

955 Collect MCL-E-64-080713
1-5 Gallon bucket for proctor & gradation
Composite of BH-8 (2/3 content) & BH-7
(1/3 content)
See above for collection details -
Bucket was sealed & marked

1000 Move to BH-5
Sunny, 60's, Calm

1020 Process BH-5, 0'-2' Core
Recovery 24.5/24'
No stuff as its the top
1020 Photo #125, BH-5, 0'-2' Core
Core was placed in disposible Al pan marked
#5 0-8', core was broken up

8/7/13

1022 - Process BH-5, 2'-4' core
Recovery 30" for 24"
No apparent stuff
1022 Photo# 126 - BH-5, 2'-4' core
core was placed in Al pan marked #5, ~~2-4'~~ 0-8' JF
core was broken up

1024 Process BH-5, 4'-6' core
Recovery 40" for 24"
No apparent stuff
1025 Photo# 127 - BH-5, 4'-6' core
Core was placed in Al pan marked #5, ~~4-6'~~ 0-8' JF
core was broken up

1026 - Process BH-5, 6'-8' core
Recovery 28.5" for 24"
No apparent stuff
1028 Photo # 128 - BH-5, 6'-8' core
core was placed in Al pan marked #5 ~~6-8'~~ 0-8' JF
core was broken up

1029 Process BH-5, 8'-10' core
Recovery 36.5 for 24"
No apparent stuff

8/7/13 BH-5 cont.

1030 Photo #129 - BH-5, 8'-10' core
core was placed in ~~Al~~ disposible Aluminum pan marked #5 8'-16', core was broken up

1033 Process BH-5, 10'-12' core
Recovery 34.5" for 24"
No apparent sluff

1034 Photo #130 - BH-5, 8'-10' core
core was placed in Al pan marked #5 8'-16'
core was broken up

1035 Process BH-5, 12'-14' core
Recovery 35" for 24"
No apparent sluff

1036 Photo #131 - BH-5, 12-14' core
core was placed in Al pan marked #5 8'-16'
core was broken up

1038 Process BH-5, 14-16' core
Recovery 35" for 24"
Trace amount of sluff removed

1039 Photo #132, BH-5, 14'-16' core
core was placed in Al pan marked #5 8-16
core was broken up

8/7/13 BH-5 cont.

Auger refusal @ 16', moved geoprobe over ~~to~~ 5' slightly & started new hole - will collect the new material & add to the other composite pans

1040 move to BH-5B

1045 Process BH-5B, 0'-2'
Recovery 25.5 for 24"
No sluff as the top

1046 Photo # 133, BH-5B, 0-2' core
core was placed in pan w/ material from BH-5, pan marked #5 0-8, core broken up

1047 Process BH-5B 2-4'
Recovery 28.5" for 24"
Large rock @ top of tube

1048 Photo # 134 - BH-5B, 2-4' core
core was placed in pan w/ material from BH-5
pan is marked #5, 0-8, core broken up

1049 Process BH-5B, 4'-6'
Recovery 38.5" for 24"
No apparent sluff

1050 Photo #135 - BH-5B, 4-6' core

8/7/13 BH-5B cont

1051 Process BH-5B, 6'-8'
Recovery 22" for 24"
No apparent sluff

1052 Photo #136 - BH-5B, 6'-8' core
core was placed in pan w/material from BH-5, pan marked #5 0'-8', core broken up

~~1057 Process BH-5B, 8-10' JF 8/7/13~~

1054 Collect MCL-BH5M-0-8-080713 JF
1-1 gal ziplock bag for fire assay Au, Ag, Cu
Weight - 6.0 lbs
Composite of core from 0'-8'
Core from BH-5, 0-2, 2-4, 4-6, 6-8 and core from BH-5B 0-2, 2-4, 4-6, 6-8 were placed in a disposible Al pan, mixed thoroughly w/disposible plastic scoop and a portion placed in the ziplock bag

1057 Process BH-5B, 8'-10' core
Recovery 36" for 24"
No apparent sluff

1058 Photo # 137 - BH-5B, Core from 8'-10'
core was placed in the disposible Al pan

8/7/13

containing material from BH-5 - 8-10, 10-12, 12-14, 14-16, pan marked #5 8-16, core was broken up

1100 Process BH-5B, 10-12 core
Recovery 33" for 24"
No apparent sluff but large rock on top

1101 Photo # 138, BH-5B core from 10-12'
core placed in pan containing core from BH-5 8-16', pan marked #5 8-16', broke core up

1102 Process BH-5B, 12'-14' core
Recovery 41" for 24"
No apparent sluff

1103 Photo #139, BH-5B core from 12-14'
core placed in pan containing core from BH-5 8'-16', pan is marked #5 8-16, broke core up

1105 Process BH-5B, 14'-16' core
Recovery 37.5" for 24"
trace of sluff @ top - Removed
Core pt JF 1106, Photo # 140, BH-5B, 14'-16' core

8/7/13 BH-5B cont

core was placed in Al pan w/core from BH-5 8-16', pan marked #5 8-16, broke up core

1109 Collect MCL-BH5M-8-16-080713
1-1 gallon ziplock bag for fire Assay Au, Ag, Cu
Weight - 7.0 lbs
Composite of core from 8-16'
core from BH-5, 8-10, 10-12, 12-14, 14-16 and core from BH-5B, 8-10, 10-12, 12-14, 14-16 were placed in a disposible Al pan, mixed thoroughly w/disposible plastic scoop and a portion placed in the zip lock bag

1113 Process BH-5B, 16-18' core
Recovery 37" for 24"
No apparent stuff

1114 Photo #141 - BH-5B, 16-18' core
Core was placed in a disposible Al pan marked #5-16-24, broke core up

1117 - Process BH-5B, 18-20' core
Recovery 37" for 24"

8/7/13

No apparent stuff

1118, Photo #142, BH-5B, core from 18-20'
core was placed in Al pan marked #5-16-24, broke core up

1128 Process BH-5B, 20-22' core
Recovery 39 for 24"
No apparent stuff

1129 Photo # 143 - BH-5B, 20-22' core
core was placed in Al pan marked #5 16-24, broke core up

1131 Process BH-5B, 22-24' core
Recovery 38" for 24"
No apparent stuff

1133 Photo #144 - BH-5B, 22-24' core
core placed in Al pan marked #5 16-24 broke up

1136 Collect MCL-BH5M-16-24-080713
1-1 gal ziplock bag for fire assay for Cu, Au, Ag
Weight - ~~7.1 lbs~~ 8/7/13 6.0 lbs
Composite of core from 16-24'
core from 16-18', 18-20', 20-22', 22-24' from BH-5B was placed in disposible Al pan, mixed thoroughly w/disposible

8/7/13 BH-5b

plastic scoop & a portion was placed in a 1gallon ziplock bag

1144 Process BH-5B, 24-26' core
Recovery 48" for 24"
No apparent stuff.
1145 Photo #145 - BH-5B, 24'-26' core
core was placed in a disposible Al pan marked #5, 24'-32', core was broke up

1147 Process BH-5B - 26'-28' core
Recovery 35.5" for 24"
No apparent stuff
1148 Photo #146 - BH-5B, 26'-28' core
core was placed in an Al pan marked #5, 24-32', core was broke up

1149 Process BH-5B-28-30' core
Recovery 48" for 24"
No apparent stuff
1150 Photo #147 - BH-5B, 28'-30' core
core was placed in an Al pan marked #5, 24-32', core was broke up

8/7/13 BH-5B

1152 Process BH-5B, 30'-32' core
Recovery 35.5" for 24"
No apparent stuff
1153, Photo #148 - Core 30'-32' from BH-5B
core was placed in Al pan marked #5-30' 24-32, core was broken up

1155 Collect mcL-BH5M-24-32-080713
1-1gal ziplock bag for fire assay Au, Ag, Cu
Weight 7.0+ lbs
Composite of core from 24'-32'
Core from 24-26', 26'-28', 28'-30', 30'-32' from BH-5 was placed in a disposible Al pan mixed w/a disposible plastic scoop. A portion was put in a ziplock bag.

1158 Process BH-5B, 32'-34' core
Recovery 46" for 24"
1159 Photo #149 - BH-5B, ~~30-32'~~ 32-34' core
core was placed in disposible Al pan marked #5, 32'-40', core was broken up

8/7/13 BH-5B cont

1201 Process BH-5B, 34'-36' core
Recovery 39.5" for 24"
No Apparent sluff
1202 Photo #150 - 34'-36' core from BH-5B
core was placed in Al pan marked #5 32'-40'
core was broken up

1204 Process BH-5B, 36'-38' core
Recovery 46" for 24"
No apparent sluff
1205 Photo #151 - 36'-38' core from BH-5B
core was placed in Al pan marked #5 32'-40'
core was broken up

1207 Process BH-5B - 38'-40' core
Recovery 41.5" for 24"
No apparent sluff
1208 Photo #152 - 38'-40' core from BH-5B
core was placed in Al pan marked #5 - 38'-40'
core was broken up

1211 Collect MCL-BH5M-32'-40'-080713
1 1 gal ziplock bag for fire Assay Ag, Au, Pt

8/7/13 BH-5B
Weight - 7.0+ lbs
Composite of core from 32'-40'
Core from 34'-36', 36'-38', 38'-40', 30'-32'
from BH-5B were placed in disposible Al pan
mixed thoroughly w/disposible plastic scoop
& then a portion was placed in ziplock bag

1214 Process BH-5B, 40'-42' core
Recovery 48" for 24"
1215 Photo #153, BH-5B, 40'-42' core
No apparent sluff
core was placed in Al pan marked ~~40-42~~
#5 40-48', core was broken up

1216 Process BH-5B, 42'-44' core
Recovery 33" for 24"
No apparent sluff
1217 Photo #154, BH-5B, 42'-44' core
core was placed in Al pan marked #5
40'-48', core was broke up

1220 Process BH-5B, 44'-46' core
Recovery 38" for 24"
No apparent sluff

8/7/13 BH-5B

1221 Photo # 155 - Core from 44'-46', BH-5B
Core contained part tailings, part Nat'l Grd
Native soil was encountered at approx
44.75' in the core, Native soil lt med brown
sandy silt / silty sand to sand w/gravel -
Core from 44-44.75 was placed in pan
marked #5 40'-48', core was broke up
Remaining core (Native Ground) was
discarded on the repository.

1223 Collect MCL-BH5-40-44.75-080713
1-1 gal ziplock bag for fire assay Au, Ag, Cu
Weight 5.0 lbs
Composite of core from BH-5B, 40'-44.75'
core from 40'-42', 42'-44 & 44'-44.75' were
placed in disposible Al pan marked #5
40-48, mixed thoroughly w/a disposible
plastic scoop and a portion was placed
in a 1 gal ziplock bag -

1223 Continue Collecting MCL-ENV-G1 -
1-1 qt ziplock for TM, OMC & pH -
Added 1 large scoop from each composite

8/7/13

pan from BH-5/BH-5B, 0-8, 8-16, 16-24,
24-32, 32-40 and 1/2 scoop from
40'-44.75' composite to the bag
containing, similar material from BH-2.
Need addition of BH-6 material to
finish sample

1223 Continue collecting MCL-E-G1
1-5 gal bucket for proctor & gradation
An equal amount of material from each
composite interval for BH-5 (0-8, 8-16, 16-24
24-32, 32-40) and 1/2 of that amount
for composite interval was added to
the bucket already containing BH-2.
Enough material was placed in bucket
to fill approx 1/3 of the bucket - The
amount needed was marked on
the bucket prior to filling - approx 4'/3"
was added. Lid was taped on bucket
to await ~~of~~ addition of BH-6

1300-1320 J. Allick, J. Flammang off-site
1320 Move to BH-6

8/7/13 BH-6

1348 Process 0'-2' core from BH-6
3" tubing Recovery 22.5" for 24"
Top of hole so no slough

1348 Photo # 156 - BH-6, Core from 0'-2'
core was placed in a disposible Aluminum pan marked #6, 0-8', core was broke up

1351 Process 2'-4' core from BH-6
3" tube, Recovery 29" for 24"
No apparent slough

1352 Photo # 157, BH-6 core from 2'-4'
core was placed in a disposible Al pan marked #6-0-8', core was broke up

1354 Process BH-6, core from 4'-6'
3" tube, Recovered 36.5" for 24"
No apparent slough

Photo # 158, BH-6 core from 4'-6'.
core was placed in a Al pan marked #6 0-8, core was broken up.

1354 Process BH-6, core from 6'-8'
3" tube, Recovery 26" for 24"
No apparent slough

8/7/13

1400 Photo #159 - Core from 6'-8' in BH-6
core was placed in Al pan marked #6, 0-8, core was broke

1404 Collect Md-BH6M-0-8-080713
1-1 gal. ziplock bag for fire assay Ag, Au, Cu
Weight - 7.0 lbs
Composite of 0-8' from BH-6
0'-2', 2'-4', ~~6-8,~~ 8/7/13 4'-6', 6'-8' cores from BH-6 were placed in a disposible Al pan & mixed w/a disposible plastic scoop. A portion was placed in a ziplock bag

1407 Process BH-6, 8'-10'
switched to 2" tube, tube was melted @ bottom from encountering rock
Recovery - 26" for 24"
No apparent slough

1408 Photo #160 - Core from 8'-10', BH-6
core was placed in a disposible Al pan marked #6, ~~8-8'~~ 8-16', core was broke up

1411 Process BH-6, 10'-12'
2" tube, Recovery 37" for 24"

8/7/13 BH-6 cont
trace of sluff on surface
1412 Photo # 161, - BH-6 core from 10'-12'
core was placed in a Al pan marked #6
8-16; core was broke up

1413 Process BH-6, 12'-14'
2" tube, Recovery 43" for 24"
No apparent sluff except a 1" rock @ top
1414 Photo #162 - BH-6 core from 12'-14'
core was placed in a Al pan marked #6-8-16
core was broke up

1427 Process BH-6, 14'-16'
2" tube, Recovery 35" for 24"
No apparent sluff
1428 Photo #163, BH-6, core from 14'-16'
core was placed in a Al pan marked #6-8-16'
core was broke up

1431 Collect MCL-BH6M-8-16-080713
1-1 gal ziplock bag for fire assay Ag, Au, Cu
Weight - 5.5 lbs
Composite of core from 8-16'
core from 8-10, 10-12, 12-14, 14-16

8/7/13
from BH-6 was placed in a disposible
Al pan and mixed w/disposible plastic
scoop. A portion was placed in ziplock bag

1434 Process BH-6, 16'-18' core
2" tube, Recovery 30" for 24"
No apparent sluff
1435, Photo #164, BH-6, 16'-18' core
core was placed in a disposible Al pan
marked 16-24', core was broke up

1436 Process BH-6, 18'-20' core
2" tube Recovery 33" for 24"
No apparent sluff
1437, Photo #165, BH-6, 18-20' core
core was placed in an Al pan, marked #6,
16-24', core was broke up

1439 Process BH-6, 20'-22' core
2" tube, Recovery 43.5" for 24"
core was placed in an Al pan, marked #6
20-22 16'-24', core was broke up
1440, Photo #166 - BH-6, 20'-22' core

8/7/13 BH-6 cont

1443 Process, BH-6 22'-24' core
Ø2" tube, Recovery 42.5" for 24"
No Apparant stuff
1444 Photo #167 - BH-6 core from 22'-24'
core was placed in Al pan marked
#6 16-24, core was broke up

1449 Collect MCL-BH6M-16-24-080713
1-1 gal ziplock bag for Fire Assay Ag, Au & Cu
Weight - 5.5 lbs
Composite of core from 16'-24 from BH-6
core from 16-18, 18-20, 20-22, 22-24 from
BH-6 was placed in a desposible Al pan
marked #6 16-24. Core was broken up
thoroughly mixed using a disposible
plastic scoop. A portion was placed in
the gallon ziplock bag

1452 Process BH-6, 24'-26' core
2" tube, Recovery 37.5" for 24"
No apparent stuff
1453 Photo #168 - Core from BH-6, 24'-26'
core was placed in a disposible Al pan

marked BH-6, 24'-32', core was broken up

1455 Process BH-6 core from 26'-28'
2" core, Recovery 26" for 24"
No apparant stuff
1456 - Photo #169 - BH-6, Core from 26'-28'
core was placed in an Al pan marked
#6 24-32 and broken up

1457 - Process core from BH-6 28'-30'
2" tube Recovery 24.5" for 24"
No apparent stuff
1458 Photo #170 - BH-6 core from 28-30'
core was placed in an Al pan marked #6
24-32 & broken up

1500 Process core from BH-6, 30'-32'
2" tube, Recovery 28" for 24"
No apparent stuff
1501 - Photo #171 - BH-6 core from 30'-32'
Core was placed in a Al pan marked
#6 24-32 and broken up

8/7/13 BH-6

1505 Collect MCL-BH6M-24-32-080713
1-1 gal zip lock bag for fire assay Au, Ag & Cu
Weight - 3.5 lbs
Composite of core from BH-6 24' to 32'
core from 24-26', 26'-28', 28'-30', & 30'-32'
was placed in a disposible Al pan &
mixed thoroughly using a disposible
plastic scoop. A portion was placed in
a gallon ziplock bag

1508 Process BH-6 core from 32'-34'
2" tube, Recovery 45" for 24"
No apparent stuff
1509, Photo #172 - BH-6, Core from 32'-34'
core was placed in Al pan marked 32-40
#6, core was broken up

1511 Process BH-6, core from 34'-36'
2" tube, Recovery 34" for 24"
No apparent stuff
1512, Photo #173 - BH-6, Core from 34'-36'
core was placed in Al pan marked #6,
32-40, core was broken up

8/7/13 BH-6

1513 Process BH-6, core from 36'-37'
2" tube, Recovery 16.5" for 12"
Natural Ground was estimated
@ 34'. Natural Ground was intersected
@ 36.9'. Rocks & tan sand -
Core ~~was added to pan~~ 8/7/13
from 36'-36.9' was added to pan
marked #6, 32-40', & broken up -

1518 ~~Pro~~ 8/7/13 Collect MCL-BH6M-32-36.9
-080713
1-1 gal ziplock bag for fire assay Au, Ag, Cu
Weight - 3.5 lbs
Composite of core 32-36.9', BH-6
core from 32-34, 34-36, 36-36.9 was
placed in disposible Al pan, mixed
thoroughly w/ disposible plastic scoop
and a portion placed in a Al pan

1520 - Continue collecting ~~MCL-ENV-1~~ 8/7/13
MCL-ENV-61
1-1 qt ziplock for TM, OMC, pH
Added 1 large scoop ~~& 1/2 scz~~ 8/7

8/7/13 BH-6, BH-9

from each composite pan, 0'-8', 8'-16', 16'-24', 24'-32' and 1/2 scoop from composite pan 32'-36.9' to the gallon bag containing composite material from BH-5 & BH-2

1525 Continue collecting MCL-E-61 1-5 gallon bucket for proctor & gradation. An equal amount of material from composite pans 0-8, 8-16, 16-24, & 24-32 and 1/2 of that amount for pan 32-36.9 were added to composite material already in 5 gallon bucket from BH-5 & BH-2. Approximately 4 1/3" (1/3 bucket) was added. Lid was taped back on to await processing

1530 Move to BH-9

Windy, Sunny 70°F

1540 Process BH-9, Core from 0'-2' 3" tube, Recovery 23" for 24"

Top - No sluff

1540 - Photo #174, BH-9, 0'-2' core

8/7/13 BH-9

core was placed in disposible Al pan marked #9-0-8, & broken up

1545 Process BH-9, core from 2'-4' 3" tube, Recovery 26" for 24"

No apparent sluff

1546, Photo #175, BH-9, 2'-4' core core was placed in Al pan marked #9, 0'-8' & broken up

1549 Process BH-9, core from 4'-6' 3" tube, Recovery 28.5" for 24"

No apparent sluff

1550, Photo #176, BH-9, 4'-6' core core was placed in Al pan marked #9, 0-8' & broken up

1553 Process BH-9, core from 6'-8' 3" tube, Recovery 20" for 24"

No apparent sluff

1554 Photo #177, BH-9, 6'-8' core core was placed in Al pan marked #9, 0-8' & broken up

1556 Called MCL-BH9m-0-8-080713 1-1 gal ziplock bag for fire assay Au, Ag, Cu

8/7/13 BH-9

Weight 7.0 lbs

Composite from 0'-8', BH-9 core from 0'-2', 2'-4', 4'-6', 6'-8' from BH-9 was placed in a disposible Al pan mixed thoroughly w/ disposible plastic scoop and a portion placed in 1 gallon ziplock

1604 Process BH-9, core from 8'-10' 3" tube, Recovery 32.5" for 24"
No apparent stuff

1605 8/7/13 Photo # 178, BH-9, core from 8'-10' core was placed in a disposible Al pan marked #9, 8'-16', core was broken up

1608 Process BH-9, 10'-12' 3" tube, Recovery 24" for 24"
No apparent stuff

1609, Photo #179- BH-9, core from 10'-12' core was placed in a disposible Al pan marked #9, 8-16', core was broken up

1610 Process BH-9, 12'-14' 3" holes, Recovery 34" for 24"
No apparent stuff

8/7/13 BH9

1611 Photo #180- BH-9 core from 12'-14' core was placed in Al pan marked #9, 8-16', core was broken up

1614 Process BH-9, 14' 8/7/13 to 16' core 3" core, Recovery 30.5" for 24"
No apparent stuff

1615, Photo #181- BH-9 core from 14'-16' core was placed in Al pan marked #9; 8-16', core was broken up

1619 Collect MCL-BH9M-8-16-080713
1-1 gallon ziplock for fire assay Au, Ag, Cu
Weight 7.0 lbs
Composite of core from 8'-16', BH-9 core from 8'-10', 10'-12', 12'-14' & 14'-16' from BH-9 was placed in a disposible Al pan mixed thoroughly w/ disposible plastic scoop & a portion placed in ziplock bag

1624 Process BH-9, 16'-18' core 3" Tube- Recovery 30.5 for 24"
No Apparent stuff

1625, Photo #182- BH-9, 16'-18' core

8/7/13 BH-9

core was placed in disposible Al pan marked #9 16'-24', core was broken up

~~A problem~~ Auger refusal developed w/ drilling 3" core deeper, switched to 2" to maintain equal aliquots of material the 16'-18' interval was mixed thoroughly & 1/2 the material was removed so ~~that~~ it would more closely resemble the amount from a 2" tube

1644 Process BH-9, 18'-20' core 2"+3" core, Recovery 8" for 24"
Tubes were melted @ bottom
No apparent stuff

1645 Photo #183, both 3"+2" tubes from 18'-20'
Both cores were included in composite, both cores placed in Al pan marked 16'-24', core was broken up

1647 Process BH-9, core from 20'-22' 3" core, Recovery 48" for 24"
No apparent stuff

BH-9

1648, Photo #184 - BH-9, 20'-22' core core was placed in pan marked #9 16'-24', core was broken up

1653, Photo #185 - BH-9, 22'-24' core 3" core Recovery 31" for 24"
No apparent stuff

1654, Photo #185 - BH-9, 22'-24' core core was placed in pan marked #9 16-24, core was broken up

1659 Collect MCL-BH9m-16-24-080713 080713
1-1 gal ziplock bag for fire assay Au, Ag, Cu
Weight: 5.75 lbs
Composite of BH-9 core from 16'-24' core ~~was~~ from BH-9 16'-18', 18'-20' (2"+3"), 20'-22', 22'-24' were placed in a disposible Al pan, mixed thoroughly w/ disposible plastic scoop and then a portion of composite was placed in a ziplock bag

1650 Completed geoprobing for day
1730 - Off-site for day
J, TD, JA, MW, MB

8/8/13 Finish Geoprobing & Sampling

0700 Arrive @ McLaren Site for Knife River Safety Mtg

M. Williams
T. Decker
J. McElroy
M. Bennett
J. Flammang
J. Allick

} Geoprobe PTS
} samplers

Topics: Visitors watch out for from DEQ, stay hydrated

Sunny, partly cloudy, 40's

0730 Begin geoprobing @ BH-9 (resume @ 24-26' depth.

752 Process BH-9, core from 24'-26'
3" Tube, Recovery - 36.5" for 24"
No apparent sluff
753 Photo # 187- BH-9, 24-26' core
core was placed in disposible Al pan marked # 9, 24-32, core was broke up

8/8/13

758 Process core from BH-9 26-28'
2" tube, Recovery 40" for 24"
No apparent sluff
759 Photo # 187- BH-9-core 26-28'
core was placed in Al pan marked #9 24'-32', core was broke up

800 Auger refusal begin boring an additional hole - Auger refusal in this hole prior to sampling interval
921 Begin probing another hole @ BH-9 to get to 28', then will start coring

938 Process BH-9B core 28-30'
2" core No apparent sluff
Recovery 40" for 24"
939 Photo #188- BH-9B, 28'-30'
core was placed in pan marked #9 24-32 w/core from BH-9 24'-26' & 26'-28', core was broken up

943 Process BH-9B core ~~32-34~~ 8/8/13
2" core Recovery 38.5" for 24"
No apparent sluff

8/8/13 ~~9~~ BH-9B con

0944- Photo #189- BH-9B, core from ~~30-32~~ core was placed in Al pan marked #9 ~~30-32~~ 8/8/13 24-32', core was broken up

948 Called MCL-BH-9-24-32-080813
1-1 gal ziplock for Fire Assay Ag, Au, Cu
Weight- 6.0 lbs
Composite of core from 24'-32'
Core from BH-9, 24'-26', 26'-28' and core from BH-9B,- 28'-30' & 30'-32' were placed in a disposible Al pan mixed w/a disposible plastic scoop.
A portion was placed in a ziplock bag

954 Process BH-9B, Core from 32'-34'
2" core Recovery- 38" for 24"
No apparent stuff

955 Photo #190- BH-9B, core from 32'-34' core was placed in Al pan marked #9, 32'-40', core was broken up

959 Process BH-9B, core from 34'-36'
2" core, Recovery 37.5" for 24"
No apparent stuff

8/8/13

1000- Photo #191 - BH-9B, 34'-36' core was placed in Al pan marked BH-9B, ~~34'~~ 8/8/13 32'-40', core was broken up

1002- Process core 36'-38', BH-9B
2" core, Recovery 37" for 24"
No apparent stuff

1003 Photo #192- BH-9B, 36'-38' core was placed in Al pan marked ~~BH-9B~~ 8/8/13 32'-40', core was broken up

1005 Process core ~~9~~ 8/8/13 BH-9B, 38'-40'
2" core, Recovery 34" for 24"
No apparent stuff

1006, Photo #193- BH-9B, 38'-40' core was placed in Al pan marked ~~BH~~ 8/8/13, #9, ~~38'-40'~~ 8/8/13 32'-40', core was broken up-
Footage in photo #193 are mixed up

1024 Process BH-9B, core from 40'-42'
2" core, Recovery 38" for 24"
No apparent stuff

1025, Photo #194, BH-9B, 40'-42'

8/8/13 - BH-9B 40'-42' cont.
core was placed in Al pan marked 32'-40', core was broken up
~~This additional core was added~~ F
Estimated Nat'l Ground was 42'-42', ~~Nat'l Grd was encountered~~ @ F8/8/13
Lime was present @ 41.5', 41.5'-42.0 appeared to be a mix of Nat'l grd and tails - The entire core was added to the composite

1025 Process BH-9B, 42'-44'
2" ~~tube~~, Recovery - 22" for 24"
2" of sluff @ top
1026, Photo #195 - BH-9B, 42'-44'
Core appears to be all natural soils and was not added to pan - Discarded -

1029 Collect MCL-BH9-32-42-080813
1-1 gal ziplock bag for Fire Assay - Ag, Au, Zn
Weight - 7.0 lbs
Composite of core from 32' to 42'
core from BH-9B, 32'-34', 34'-36', 36'-38', 38'-40', 40-42' was placed in a

8/8/13
disposible Al pan, mixed w/a disposible plastic scoop & a portion was placed in ziplock bag

1040 Continue Collecting MCL-Env-G3
1-1 qt ziplock bag for TOM, OCM, pH
Added 1 large scoop from each composite pan from BH-9/BH-9B - 0-8', 8'-16', 16'-24', 24-32', 32'-42'. Material was added to ziplock containing material from BH-11. Need addition of BH-10 to finish sample

1045 Continue Collecting - MCL-E-G3
1-5 gal bucket for proctor & gradation
An equal amount of material from the composite pans from BH-9/BH-9B 0-8', 8'-16', 16'-24', 24-32', 32'-42' was placed in the bucket already containing BH-11. Enough material was placed in the bucket to fill 1/3 of it. The amount ~~was~~ F8/8/13 needed was marked on the bucket prior to adding material. Approximately 4 1/3" was added. Lid was taped on waiting for addition of BH-10

8/8/13

~~1050~~ 1040 Move to BH-10

1056 Process core BH-10, 0'-4'
2" ~~core~~ tube, Recovery 48" for 48"
Top - No stuff
1057, Photo #196 - BH-10, 0'-4'
Core was placed in disposible Al pan
marked #10, 0'-8', core was broken up

1113 Process core BH-10, 4'-6'
2" core, Recovery 48" for 24"
trace of stuff on top - Not included
1114, Photo #197 - BH-10, 4'-6'
core was placed in disposible Al pan
marked #10, 0-8', core was broken up

1129 Process core BH-10, 6'-8'
2" core, Recovery 32" for 24"
One rock @ top of tube, stuff?
1130 Photo #198 - BH-10, 6-8'
core was placed in disposible Al pan
marked #10 - 0'-8', core was broken up

1132 Collect MCL-BH10m-0-8-080813

8/8/13

1-1 gallon ziplock for fire assay Ag, Au, Cu
Composite of core from BH-10, 0'-8'
Weight 5.75 lbs
core from BH-10, 0'-4', 4'-6', 6'-8' was placed in a disposible Al pan, mixed thoroughly w/a disposible plastic scoop and a portion was placed in ziplock bag

1135 Process BH-10, core from 8'-10'
2" tube, Recovery 38" for 24"
No apparent stuff
1136 Photo #199 - BH-10, 8'-10' core
core from 8-10' was placed in a disposible Al pan marked #10, 8'-16'
core was broken up

1138 Process BH-10 core from 10'-12'
2" tube, Recovery 35" for 24"
No apparent stuff
1139, Photo #200 - BH-10, 10'-12'
core from 10'-12' was placed in Al pan
marked #10, 8'-16', core was broken up

8/8/13 BH-10

1143 Process BH-10, core from 12'-14'
2" tube, Recovery 45" for 24"
No Apparent stuff
1144, Photo #201, BH-10, 12'-14' core
core was placed in a disposible Al
pan marked BH-10-8'-16', core was
broken up

1153 Process BH-10 core from 14'-16'
2" tube, Recovery 34" for 24"
No apparent stuff
1154, Photo #202, BH-10, 14'-16' core
core was placed in a disposible pan
marked BH-10-8'-16', core was broke up

1200 Collect MCL-BH10m-8-16-080813
1- 1 gallon ziplock for fire assay Au, Ag, Pu
Weight 6.75 lbs
Composite of core from 8'-16'
core was placed in a disposible Al
pan, core from BH-10, 8'-10', 10'-12'
12'-14', 14'-16', mixed thoroughly w/
disposible plastic scoop and a
portion was placed in ziplock bag

8/8/13 BH-10

1207 Process BH-10, 16'-18' core
2" core, Recovery 46" for 24"
No Apparent Stuff
1208, Photo #203, BH-10, 16'-18' core
core was placed in Al pan marked
#10, 16'-18', core was broken up

1213 Process BH-10, 18'-20' core
2" core, Recovery 23" for 24"
No apparent stuff
1214, Photo #204, BH-10, 18'-20' core
core was placed in Al pan, marked
#10, 18'-20', core was broken up

1231 Process BH-10, 20'-22' core
2" core, Recovery 18" for 24"
No apparent stuff
1233, Photo #205, BH-10, 18'-20 core
core was placed in Al pan, marked
#10, 20'-22', core was broken up

1256 Process BH-10, 22'-24' core
2" core, Recovery 41" for 24"
No apparent stuff

8/8/13 BH-10

1257, Photo #206, BH-10, ~~20'~~ 22'-24' core
core was placed in Al pan marked
#10, 16'-24', core was broken up

1303 Collect MCL-BH10M-16-24-080813
1-1 gallon ziplock bag for fire assay Ag, Au, Cu
Weight: 5.0 lbs
Composite of core from 16'-24'
Core from BH-10, 16'-18', 18'-20', 20'-22'
22'-24' was placed on ~~an~~ 8/8/13 disposible
Al pan, material was mixed thoroughly
w/ disposible plastic scoop. A portion
was placed in ziplock bag

1306 Process BH-10, 24'-26' core
2" core, Recovery 32.5" for 24"
No apparent stuff
1307, Photo #207, BH-10, 24'-26' core
core was placed in disposible Al pan
marked #10, 24'-26', core was broke up

1309 Process BH-10, 26'-28' core
2", Recovery 33" for 24"
No apparent stuff

8/8/13 BH-10

1310, Photo #208, BH-10, 26'-28' core
core was placed in Al pan, marked
#10, 26'-~~28'~~ 32', core was broken up

1314 Process BH-10, 28'-30' core
2" core, Recovery 31" for 24"
No apparent stuff
1315, Photo #209, BH-10, 28'-30'
core was placed in Al pan, marked #10
28'-30', core was broke up

1324 Process BH-10, 30'-32' core
2" core, Recovery 35" for 24"
No apparent stuff
1325, Photo #210 - BH-10, 30'-32' core
core was placed in Al pan marked
#10 30'-32', core was broken up

1327 Process BH-10, 32'-34' core
2" core, Recovery 41" for 24"
No apparent stuff
1328, Photo #211, BH-10, 32'-34' core
core was placed in Al pans marked
#10, 32'-34', core was broke up

8/8/13 BH-10

BH-10 was estimated to be 33' deep, and was to be added to composite pan ~~3~~ 24'-32'. The entire core appeared to be waste contained lime & tailings

1333 Process BH-10, 34'-36' core 2" core Recovery 28" for 24"
No apparent slurf

1334, Photo # 212, 34'-36' core core appeared to be all native soil med brown silty sand to sand w/ gravel - Core was not added to the composite

1337 Collect MCL-BH10M-34-34-080813
1-1 gallon ziplock for fire assay Au, Ag, Cu
Weight 7.0+ lbs
Composite of core from 24-34'
core from BH-10 from 24'-26', 26'-28', 28-30', 30-32', 32-34' was placed in a disposible Al pan, mixed thoroughly w/ disposible plastic scoop & a portion placed in gallon ziplock bag

8/8/13

1508 Finish collecting MCL-~~ENV~~ ENV-G3-080813 SF 8/8/13

1-1 qt ziplock bag for TM - Sb, Al, As Ba, Ca, Co, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH & Organic Matter Content
1 large scoop ~~was ac~~ SF 8/8/13 from each composite pan was added to SF 8/8/13 ziplock bag containing BH-9, & BH-11.
A scoop was added from BH-10, 0-8', 8'-16', 16-24', 24-34'. In the bag were 1 large scoop from BH-9, 0-8', 8-16', 16-24', 24-32' & 32-42' composite pans. Also 1 large scoop from composite pans 0-8, 8-16, 16-24, 24-32.5 from BH-11
The material in the gallon bag was mixed thoroughly & then transferred to marked quart bag -
Finish The ENV sample was stored on ice from collection to completion
1508 Collecting MCL-E-G3-080813
1-5 gal bucket for gradation & proctor
An equal number of scoops were

8/8/13

placed in the 5 gallon bucket already containg BH-11 (1/3 bucket - 4 1/3") and BH-9 (1/3 bucket - 4 1/3") from each composite pan from BH-10 - 0-8, 8-16, 16-24, 24-34'. 1/3 of the bucket was filled w/ the composite of BH-10 (4 1/3"). The amount needed was marked on bucket prior to filling. The bucket was not mixed and the lab was notified of that. lid was placed on the bucket & sealed. Bucket was labeled appropriately

1350 Move to BH-1 area to try and get core from 10'-19'. Core from 0'-10' was collected on 8/5/13. 0'-8' composite from BH-1 was bagged (ziplock) & remaining part of composite in pan was covered w/ clean foil pan & taped shut to await the remaining composite. BH-1, 8'-10' core was temporarily stored in a gallon ziplock bag for remaining core

8/8/13

Auger Refusal on 8/5/13 in several holes @ BH-1 location @ approx 10'.

8/8/13 - Several more holes drilled in BH-1 location w/ auger refusal in all holes moving progressively away. 20' was reached in hole far enough away from original BH-1 location that it was identified as BH-12

1543 Process BH-12, 0'-2'
2" core Recovery 42" for 48"
Top of hole no sluff

1544, Photo #213, BH-12, 0'-2' core
core was placed in disposible Al pan, marked #12-0'-8', core was broke up

1545 Process BH-12, 2'-4'
2" core Recovery 31.5" for 24"
No apparent ~~sluff~~ 8/8/13 sluff

1546, Photo #214, BH-12, 2'-4' core
core was placed in disposible Al pan, marked #12, 0'-8', core was broke up

8/8/13 BH-12

1554 Process BH-12, 4'-6' core
2" core 39" for 24" Recovery
No apparent stuff
1555, Photo #215, BH-12, 4'-6' core
core was placed in Al pan, marked #12,
0'-8', core was broken up

1601 Process BH-12, 6'-8' core
2" core, 42" for 24" Recovery
No apparent stuff
1602 Photo #216, BH-12, 6'-8' core
core was placed in Al pan, marked #12
0'-8', core was broken up

1605 Collect MCL-BH12M-0-8-080813
1-1 gallon ziplock bag for fire assay AuAgPt
Weight - 5.0 lbs
Composite of core 0'-8'
Core from 0'-2', 2'-4', 4'-6' from BH-12
was placed in disposible Al pan, mixed
thoroughly w/disposible plastic scoop
Then a portion was placed in ziplock
bag

8/8/13 BH-12

1603 Process BH-12, 8'-10' core
2" core, Recovery 46" for 24"
No apparent stuff
1604, Photo #217 - BH-12, 8'-10' core
core was placed in Al pan (disposible)
marked BH-12, 8'-16', core was broken up

1607 Process BH-12, 10'-12' core
2" core, Recovery 34" for 24"
No apparent stuff
1608, Photo #218 - BH-12, 10'-12' core
core was placed in Al pan marked BH-12
8'-16', core was broken up

1610 Process BH-12, 12'-14' core
2" core, Recovery 48" for 24"
No apparent stuff
1611, Photo #219 - BH-12, ~~10'~~ 8/8/13 12'-14' core
core was placed in Al pan marked BH-12
8'-16' core was broken up

1617 Process BH-12, 14'-16' core
2" core Recovery 39" for 24"
No apparent stuff

8/8/13 BH-12

1618, Photo #220, BH-12, 14'-16' core

Base of tailing estimated @ ≈ 19'
additional core will be added to 8'-16'
pan unless ≥ 4' of core & no nat'l ground

1420 Process BH-12, 16'-18' core
2" core, Recovery 26" for 24"
No apparent stuff
1421, Photo #221 - BH-12, 16-18' core
core was placed in Al pan marked
BH-12, 8'-16', core was broken up

1621 Process BH-12, 18'-20' core
2" core Recovery 26" for 24"
No apparent stuff
1622, Photo #222 - BH-12, 18-20' core
18.4' appeared to be bottom of tailing
Native soils below that
core from 18'-18.4' was placed in
Al pan marked BH-12, 8'-16', core was
broken up

8/8/13

1623 - Collect mcl-BH12m-8-18.4-080813
1-1 gallon ziplock bag for fire assay Au, Cu, Ag
Weight 7.0 lbs
Composite of core from 8'-18.4'
core from BH-12, 8'-10', 10'-12', 12'-14',
14'-16', 16'-18' & 18-18.4' was placed
in disposible Al pan marked 8'-16',
mixed thoroughly w/ disposible plastic
scoop and a portion was placed
in ziplock bag -

Finished probing & moved geoprobe
to get decomned @ 1540 - used
pressure washer to clean trucks &
geoprobe up by water treatment
plant -

1613
~~1623~~ - Finish collecting mcl-E-G2-080813
~~1-1 gt ziplock bag for~~ & 8/8/13
1-5 gallon bucket for proctor gradation
10 scoops of BH-12, 0-8 composite
was placed in 5 gallon bucket
already containing ~~composite~~ material

8/8/13

from BH-3, 0'-8', 8-16', 16-24', & 24'-30.5'
and from BH-4, 0'-8', 8'-16', 16-24',
24'-32', 32'-43.1'.
Added to the bucket for BH-12
10 scoops of BH-12, 0'-8' (all material left)
30 scoops of BH-12, 8-18.5'
20 scoops of BH-1, 0'-8'-(to represent
area in proctor & gradation)
Approx. 1/3 of bucket filled w/ BH-12/BH-1
(4 1/3")
Bucket consists of - 1/3 BH-3
1/3 BH-4
1/3 BH-12/BH-1
Bucket was sealed & appropriate label
placed on it-

1613 - Finish collecting MCL-ENV-62-080813
1-1 qt ziplock bag for TM - Sb, Al, As, Ba, Cd
Co, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn), Organic
Matter Content & pH -
1 large scoop from BH-12 0-8' composite
1 1/2 scoops from BH-12 8'-18.4' composite
was added to gallon ziplock bag
containing material from BH-3 & BH-4

8/8/13

material was mixed thoroughly
and then it was put in appropriately
labeled ziplock bag. Sample was
returned to cooler w/ ice
Prepared earlier in the day

0817 - Finished collecting MCL-Env-64-
080813
1-1 qt ziplock bag for TM - Sb, Al, As, Ba, Cd
Co, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn) Organic
Matter Content, PH
1 large scoop from composites ~~in~~
BH-7 Composites intervals, 0-8, 8-16,
16-24, 24-34.3 & BH-8 composite
intervals 0-8, 8-16, 16-24, 24-32,
32-40 & 40-46.75 were placed in
a gallon ziplock bag, The material
was mixed thoroughly & placed in
an appropriately labelled qt
ziplock bag & then returned to
cooler w/ ice

0817 - Finished collecting MCL-E-64-080813
1-5 gallon bucket for proctor & gradation

8/8/13

2/3 of the bucket was filled with material from BH-8 composite intervals - 0-8, 8-16, 16-24, 24-32, 32-40 & 40-46.75. 1/3 of the bucket was filled w/material from BH-7, ~~of~~ composite intervals - 0-8, 8-16, 16-24, 24-34.3

Bucket was sealed & appropriately marked - Bucket was not mixed prior to sealing - note was placed on it to notify lab.

821 Finish processing MCL-ENV-G1-080813

1-1 qt ziplock bag for Mn-5b, Al, As, Ba, Cd, Co, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, Organic Matter Content, pH

~~An~~ Material from BH-2, 1 scoop each from composite intervals 0-8, 8-16, 16-24, 24-32, & 1/2 scoop from 32-36.5 placed in 1 gallon ziplock bag - Material from BH-5/BH-5B - 1 large scoop from each composite interval - 0-8, 8-16, 16-24, 24-32, 32-40 & 1/2 scoop from 40-44.75 was added to the bag

8/8/13

In addition ~~material~~ 1 large scoop from BH-6 interval composites 0-8, 8-16, 16-24, 24-32 and 1/2 scoop from 32-36.9' were added to the bag. The material in the ziplock bag was mixed thoroughly & then placed in an appropriately labeled quart ziplock. ~~Bag~~ Sample was returned to cooler w/ice

821 Finish processing MCL-E-G1-080813

1-1 gallon bucket for proctor & gradation

1/3 of bucket was filled w/BH-2 material - ~~1 large~~ equal # of scoops from composite intervals 0-8, 8-16, 16-24, 24-32' and 1/2 the number of scoops from 32-36.5'

1/3 bucket was filled w/material from BH5/BH-5B. An equal number of scoops from 0-8, 8-16, 16-24, 24-32 & 32-40' composite intervals and 1/2 the number of scoops from 40-44.75'

1/3 bucket was filled w/BH-6

8/8/13

An equal ~~mumber~~ number of scoops from composite intervals 0-8, 8-16, 16-24, 24-32, ~~32-40~~ 32-36.9 were placed in bucket & 1/2 the number of scoops from 32-36.9 were added. Bucket was sealed and labeled appropriately. Bucket was not mixed after each addition and a note to the lab was put on the bucket to indicate that.

Off-site @ approx 1800 after deconning

8/9/13

0730 - Drive back to Butte

8/12/13 - ~~Sa~~ 8/10/13

Environmental ~~& Engineering~~ 8/10/13 Samples were hand delivered to Energy Labs in Helena Mt

Engineering samples were hand delivered to Pioneer Technical Material Testing Lab in Helena, Mt.

8/13/13

9 Boxes containing the fire assay samples were shipped ~~via~~ to ALS Minerals in Elko Nevada

8/13/13 - ALS Notified J. Flammary that samples arrived

Appendix C-2

Photographs

2013 McLaren Tailings Abandoned Mine Reclamation Project Photo Log

Folder	Folder summary	Photo	Caption
2013 0805McLaren	Geoprobe Sampling	2013_0805AA	Borehole #11: Interval 00ft-04ft
Photos from Jerika Allick		AB	Borehole #11: Interval 04ft-08ft
		AC	Borehole #11: Interval 08ft-12ft
		AD	Borehole #11: Interval 12ft-15ft
		AE	Borehole #11: Interval 15ft-18ft
		AF	Borehole #11: Interval 18ft-21ft
		AG	Borehole #11: Interval 21ft-24ft
		AH	Borehole #11: Interval 24ft-24.5ft
		AI	Melted Tube
		AJ	Borehole #11: Interval 24.5ft-27ft
		AK	Borehole #11: Interval 27ft-30ft
		AL	Borehole #11: Interval 30ft-32.5ft
		AM	Geoprobe at Borehole #2 Looking North
		AN	Geoprobe at Borehole #2 Looking South
		AO	Borehole #02: Interval 04ft-08ft
		AP	Borehole #02: Interval 08ft-10ft
		AQ	Borehole #02: Interval 10ft-12ft
		AR	Borehole #02: Interval 12ft-14ft
		AS	Borehole #02: Interval 14ft-16ft
		AT	Borehole #02: Interval 16ft-18ft
		AU	Borehole #02: Interval 18ft-20ft
		AV	Borehole #02: Interval 20ft-22ft
		AW	Borehole #02: Interval 22ft-24ft
		AX	Borehole #02: Interval 24ft-26ft
		AY	Borehole #02: Interval 26ft-28ft
		AZ	Borehole #02: Interval 28ft-30ft
		BA	Borehole #02: Interval 30ft-32ft
		BB	Borehole #02: Interval 32ft-34ft
		BC	Borehole #02: Interval 34ft-36.5ft
		BD	Borehole #02: Interval 00ft-04ft
		BE	Borehole #01a: Interval 00ft-02ft
		BF	Borehole #01a: Interval 02ft-04ft
		BG	Borehole #01a: Interval 06ft-08ft
		BH	Borehole #01a: Interval 08ft-10ft
		BI	Borehole #01b: Interval 00ft-02ft
		BJ	Borehole #01b: Interval 02ft-04ft
		BK	Borehole #01b: Interval 04ft-06ft
		BL	Borehole #01b: Interval 06ft-08ft
		BM	Borehole #01b: Interval 08ft-10ft

2013 McLaren Tailings Abandoned Mine Reclamation Project Photo Log

Folder	Folder summary	Photo	Caption
2013 0806McLaren Photos from Jerika Allick	Geoprobe Sampling	2013_0806AA	Borehole #04: Interval 00ft-02ft
		AB	Borehole #04: Interval 02ft-04ft
		AC	Borehole #04: Interval 04ft-06ft
		AD	Borehole #04: Interval 06ft-08ft
		AE	Borehole #04a: Interval 08ft-10ft
		AF	Borehole #04a: Interval 10ft-12ft
		AG	Borehole #04a: Interval 12ft-14ft
		AH	Borehole #04a: Interval 14ft-16ft
		AI	Borehole #04a: Interval 16ft-18ft
		AJ	Borehole #04a: Interval 18ft-20ft
		AK	Borehole #04a: Interval 20ft-22ft
		AL	Borehole #04a: Interval 22ft-24ft
		AM	Borehole #04a: Interval 24ft-26ft
		AN	Borehole #04a: Interval 26ft-28ft
		AO	Borehole #04a: Interval 28ft-30ft
		AP	Borehole #04a: Interval 30ft-32ft
		AQ	Borehole #04a: Interval 32ft-34ft
		AR	Borehole #04a: Interval 34ft-36ft
		AS	Borehole #04a: Interval 36ft-38ft
		AT	Borehole #04a: Interval 38ft-40ft
		AU	Borehole #04a: Interval 40ft-42ft
		AV	Borehole #04a: Interval 42ft-43.1ft
		AW	Borehole #04a: Interval 43.1ft-44ft
		AX	Borehole #03: Interval 00ft-02ft
		AY	Borehole #03: Interval 02ft-04ft
		AZ	Borehole #03: Interval 04ft-06ft
		BA	Borehole #03: Interval 06ft-08ft
		BB	Borehole #03: Interval 08ft-10ft
		BC	Borehole #03: Interval 10ft-12ft
		BD	Borehole #03: Interval 12ft-14ft
		BE	Borehole #03: Interval 14ft-16ft
		BF	Borehole #03: Interval 16ft-18ft
		BG	Borehole #03: Interval 18ft-20ft
		BH	Borehole #03: Interval 20ft-22ft
		BI	Borehole #03: Interval 22ft-24ft
		BJ	Borehole #03: Interval 24ft-26ft
		BK	Borehole #03: Interval 26ft-28ft
		BL	Borehole #03: Interval 28ft-30ft
		BM	Borehole #03: Interval 30ft-32ft (Labeled 28ft-30ft)
		BN	Borehole #07: Interval 00ft-02ft
		BO	Borehole #07: Interval 02ft-04ft
		BP	Borehole #07: Interval 04ft-06ft
		BQ	Borehole #07: Interval 06ft-08ft
		BR	Borehole #07: Interval 08ft-10ft
		BS	Borehole #07: Interval 10ft-12ft
		BT	Borehole #07: Interval 12ft-14ft
		BU	Borehole #07: Interval 14ft-16ft
		BV	Borehole #07: Interval 16ft-18ft
		BW	Borehole #07: Interval 18ft-20ft
		BX	Borehole #07: Interval 20ft-22ft
		BY	Borehole #07: Interval 22ft-24ft
		BZ	Borehole #07: Interval 24ft-26ft
		CA	Borehole #07: Interval 26ft-28ft
		CB	Borehole #07: Interval 28ft-30ft
		CC	Borehole #07: Interval 30ft-32ft
		CD	Borehole #07: Interval 32ft-34ft
		CE	Borehole #07: Interval 34ft-36ft
		CF	Borehole #07b: Interval 08ft-10ft
		CG	Borehole #07b: Interval 10ft-12ft
		CH	Borehole #07b: Interval 12ft-14ft
		CI	Borehole #07b: Interval 14ft-16ft

2013 McLaren Tailings Abandoned Mine Reclamation Project Photo Log

Folder	Folder summary	Photo	Caption
2013 0807McLaren	Geoprobe Sampling	2013_0807AA	Borehole #08: Interval 00ft-02ft
Photos from Jerika Allick		AB	Borehole #08: Interval 02ft-04ft
		AC	Borehole #08: Interval 04ft-06ft
		AD	Borehole #08: Interval 06ft-08ft
		AE	Borehole #08: Interval 08ft-10ft
		AF	Borehole #08: Interval 10ft-12ft
		AG	Borehole #08: Interval 12ft-14ft
		AH	Borehole #08: Interval 14ft-16ft
		AI	Borehole #08: Interval 16ft-18ft
		AJ	Borehole #08: Interval 18ft-20ft
		AK	Borehole #08: Interval 20ft-22ft
		AL	Borehole #08: Interval 22ft-24ft
		AM	Borehole #08: Interval 24ft-26ft
		AN	Borehole #08: Interval 26ft-28ft
		AO	Borehole #08: Interval 28ft-30ft
		AP	Borehole #08: Interval 30ft-32ft
		AQ	Borehole #08: Interval 46ft-46.75ft
		AR	Borehole #08: Interval 32ft-34ft
		AS	Borehole #08: Interval 34ft-36ft
		AT	Borehole #08: Interval 36ft-38ft
		AU	Borehole #08: Interval 38ft-40ft
		AV	Borehole #08: Interval 40ft-42ft
		AW	Borehole #08: Interval 42ft-44ft
		AX	Borehole #08: Interval 44ft-46ft
		AY	Borehole #05: Interval 00ft-02ft
		AZ	Borehole #05: Interval 02ft-04ft
		BA	Borehole #05: Interval 04ft-06ft
		BB	Borehole #05: Interval 06ft-08ft
		BC	Borehole #05: Interval 08ft-10ft
		BD	Borehole #05: Interval 10ft-12ft
		BE	Borehole #05: Interval 12ft-14ft
		BF	Borehole #05: Interval 14ft-16ft
		BG	Borehole #05b: Interval 00ft-02ft
		BH	Borehole #05b: Interval 02ft-04ft
		BI	Borehole #05b: Interval 04ft-06ft
		BJ	Borehole #05b: Interval 06ft-08ft
		BK	Borehole #05b: Interval 08ft-10ft
		BL	Borehole #05b: Interval 10ft-12ft
		BM	Borehole #05b: Interval 12ft-14ft
		BN	Borehole #05b: Interval 14ft-16ft
		BO	Borehole #05b: Interval 16ft-18ft
		BP	Borehole #05b: Interval 18ft-20ft
		BQ	Borehole #05b: Interval 20ft-22ft
		BR	Borehole #05b: Interval 22ft-24ft
		BS	Borehole #05b: Interval 24ft-26ft
		BT	Borehole #05b: Interval 26ft-28ft
		BU	Borehole #05b: Interval 28ft-30ft
		BV	Borehole #05b: Interval 30ft-32ft
		BW	Borehole #05b: Interval 32ft-34ft
		BX	Borehole #05b: Interval 34ft-36ft
		BY	Borehole #05b: Interval 36ft-38ft
		BZ	Borehole #05b: Interval 38ft-40ft
		CA	Borehole #05b: Interval 40ft-42ft
		CB	Borehole #05b: Interval 42ft-44ft
		CC	Borehole #05b: Interval 44ft-46ft
		CD	Borehole #06: Interval 00ft-02ft
		CE	Borehole #06: Interval 02ft-04ft
		CF	Borehole #06: Interval 04ft-06ft
		CG	Borehole #06: Interval 06ft-08ft
		CH	Borehole #06: Interval 08ft-10ft
		CI	Borehole #06: Interval 10ft-12ft
		CJ	Borehole #06: Interval 12ft-14ft
		CK	Borehole #06: Interval 14ft-16ft
		CL	Borehole #06: Interval 16ft-18ft
		CM	Borehole #06: Interval 18ft-20ft
		CN	Borehole #06: Interval 20ft-22ft
		CO	Borehole #06: Interval 22ft-24ft
		CP	Borehole #06: Interval 24ft-26ft
		CQ	Borehole #06: Interval 26ft-28ft
		CR	Borehole #06: Interval 28ft-30ft
		CS	Borehole #06: Interval 30ft-32ft
		CT	Borehole #06: Interval 32ft-34ft
		CU	Borehole #06: Interval 34ft-36ft
		CV	Borehole #09: Interval 00ft-02ft
		CW	Borehole #09: Interval 02ft-04ft
		CX	Borehole #09: Interval 04ft-06ft
		CY	Borehole #09: Interval 06ft-08ft
		CZ	Borehole #09: Interval 08ft-10ft
		DA	Borehole #09: Interval 10ft-12ft
		DB	Borehole #09: Interval 12ft-14ft
		DC	Borehole #09: Interval 14ft-16ft
		DD	Borehole #09: Interval 16ft-18ft
		DE	Borehole #09: Interval 18ft-20ft
		DF	Borehole #09: Interval 20ft-22ft
		DG	Borehole #09: Interval 22ft-24ft

2013 McLaren Tailings Abandoned Mine Reclamation Project Photo Log

Folder	Folder summary	Photo	Caption
2013 0808McLaren	Geoprobe Sampling	2013_0808AA	Borehole #09: Interval 24ft-26ft
Photos from Jerika Allick		AB	Borehole #09: Interval 26ft-28ft
		AC	Borehole #09b: Interval 28ft-30ft
		AD	Borehole #09b: Interval 30ft-32ft
		AE	Borehole #09b: Interval 32ft-34ft
		AF	Borehole #09b: Interval 34ft-36ft
		AG	Borehole #09b: Interval 36ft-38ft
		AH	Borehole #09b: Interval 38ft-40ft
		AI	Borehole #09b: Interval 40ft-42ft
		AJ	Borehole #09b: Interval 42ft-44ft
		AK	Borehole #10: Interval 00ft-04ft
		AL	Borehole #10: Interval 04ft-06ft
		AM	Borehole #10: Interval 06ft-08ft
		AN	Borehole #10: Interval 08ft-10ft
		AO	Borehole #10: Interval 10ft-12ft
		AP	Borehole #10: Interval 12ft-14ft
		AQ	Borehole #10: Interval 14ft-16ft
		AR	Borehole #10: Interval 16ft-18ft
		AS	Borehole #10: Interval 18ft-20ft
		AT	Borehole #10: Interval 20ft-22ft
		AU	Borehole #10: Interval 22ft-24ft
		AV	Borehole #10: Interval 24ft-26ft
		AW	Borehole #10: Interval 26ft-28ft
		AX	Borehole #10: Interval 28ft-30ft
		AY	Borehole #10: Interval 30ft-32ft
		AZ	Borehole #10: Interval 32ft-34ft
		BA	Borehole #10: Interval 34ft-36ft
		BB	Borehole #12: Interval 00ft-04ft
		BC	Borehole #12: Interval 04ft-06ft
		BD	Borehole #12: Interval 06ft-08ft
		BE	Borehole #12: Interval 08ft-10ft
		BF	Borehole #12: Interval 10ft-12ft
		BG	Borehole #12: Interval 12ft-14ft
		BH	Borehole #12: Interval 14ft-16ft
		BI	Borehole #12: Interval 16ft-18ft
		BJ	Borehole #12: Interval 18ft-20ft

Picture #: 2013_0805BA

Date: 8-5-13

Description: Borehole#02: Interval 30ft-32ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805BB

Date: 8-5-13

Description: Borehole#02: Interval 32ft-34ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805BC

Date: 8-5-13

Description: Borehole#02: Interval 34ft-36.5ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805BD

Date: 8-5-13

Description: Borehole#02: Interval 00ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BE

Date: 8-5-13

Description: Borehole#01a: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BF

Date: 8-5-13

Description: Borehole#01a: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BG

Date: 8-5-13

Description: Borehole#01a: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

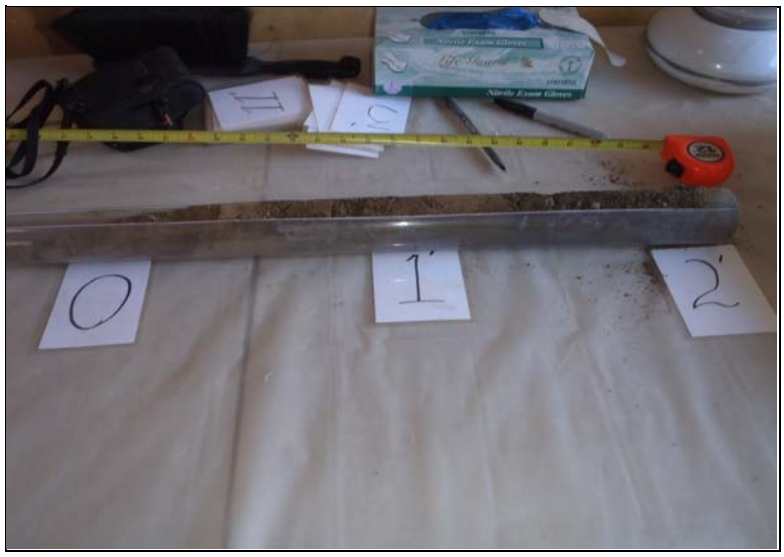
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BH

Date: 8-5-13

Description: Borehole#01a: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BI

Date: 8-5-13

Description: Borehole#01b: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BJ

Date: 8-5-13

Description: Borehole#01b: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BK

Date: 8-5-13

Description: Borehole#01b: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BL

Date: 8-5-13

Description: Borehole#01b: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805BM

Date: 8-5-13

Description: Borehole#01b: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AA

Date: 8-5-13

Description: Borehole #11: Interval 00ft-04ft

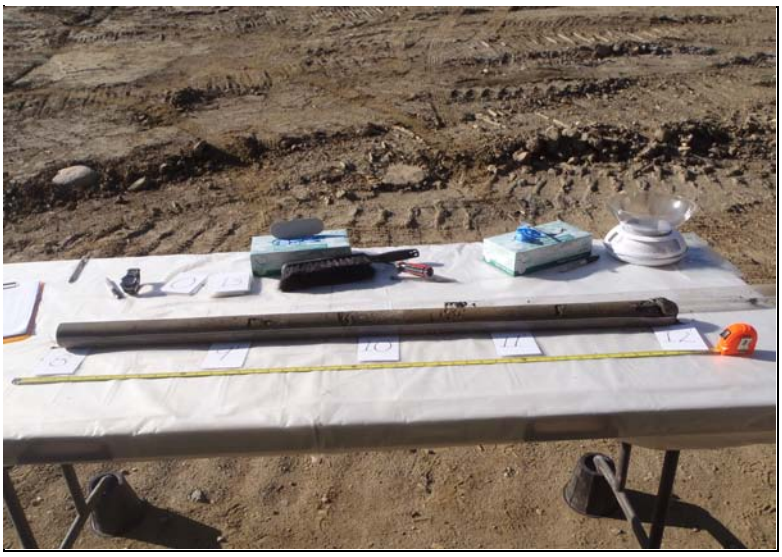
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AB

Date: 8-5-13

Description: Borehole #11: Interval 04ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

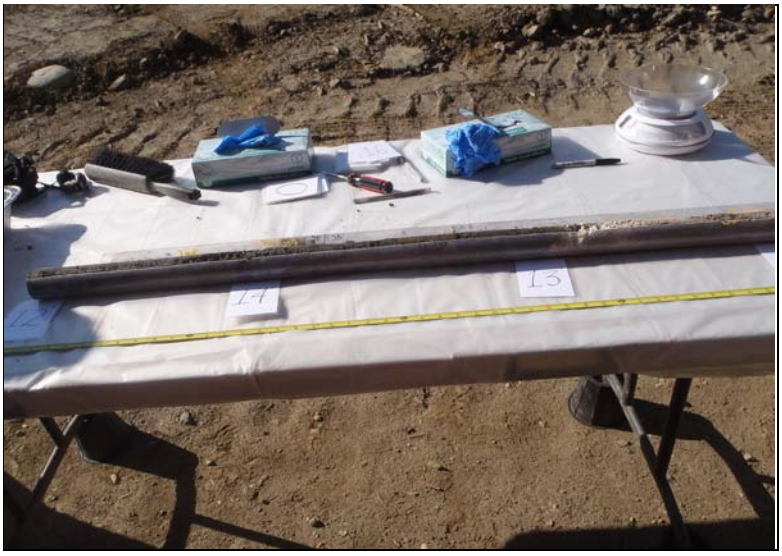


Picture #: 2013_0805AC

Date: 8-5-13

Description: Borehole #11: Interval 08ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0805AD

Date: 8-5-13

Description: Borehole #11: Interval 12ft-15ft

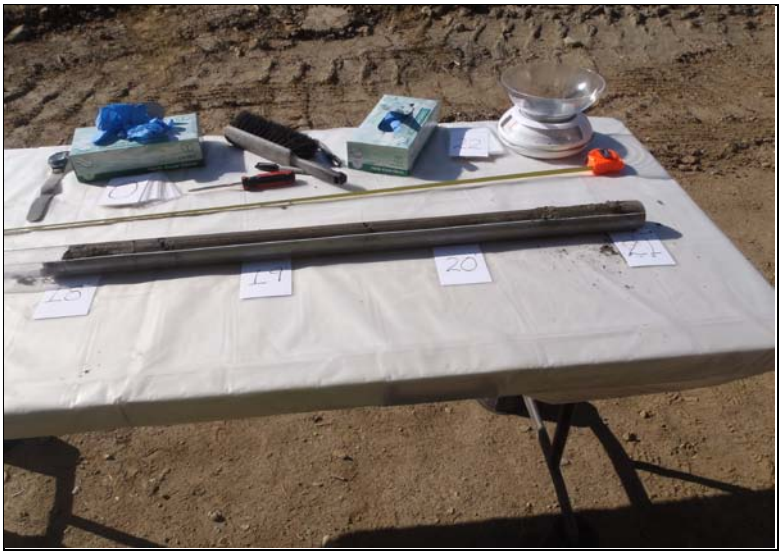
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AE

Date: 8-5-13

Description: Borehole #11: Interval 15ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0805AF

Date: 8-5-13

Description: Borehole #11: Interval 18ft-21ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AG

Date: 8-5-13

Description: Borehole #11: Interval 21ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AH

Date: 8-5-13

Description: Borehole #11: Interval 24ft-24.5ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AI

Date: 8-5-13

Description: Melted Tube

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AJ

Date: 8-5-13

Description: Borehole #11: Interval 24.5ft-27ft

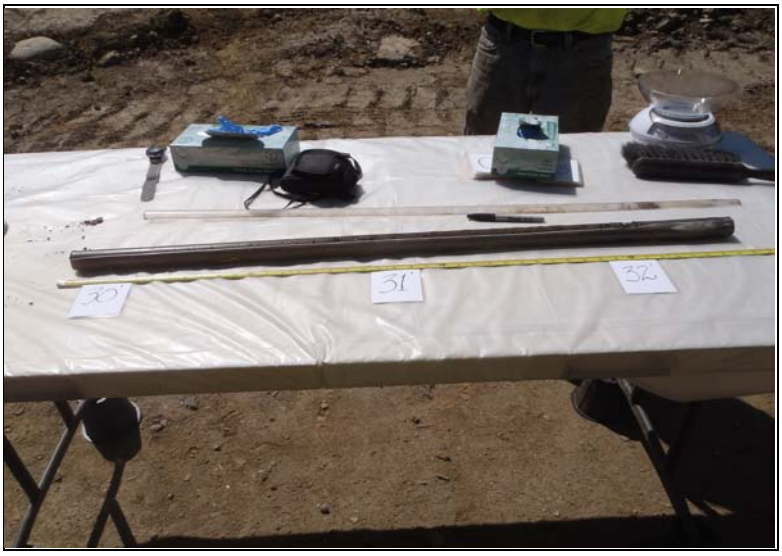
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AK

Date: 8-5-13

Description: Borehole #11: Interval 27ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0805AL

Date: 8-5-13

Description: Borehole #11: Interval 30ft-32.5ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AM

Date: 8-5-13

Description: Geoprobe at Borehole #2 Looking North

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AN

Date: 8-5-13

Description: Geoprobe at Borehole #2 Looking South

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AO

Date: 8-5-13

Description: Borehole #02: Interval 04ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AP

Date: 8-5-13

Description: Borehole #02: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AQ

Date: 8-5-13

Description: Borehole #02: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AR

Date: 8-5-13

Description: Borehole #02: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AS

Date: 8-5-13

Description: Borehole #02: Interval 14ft-16ft

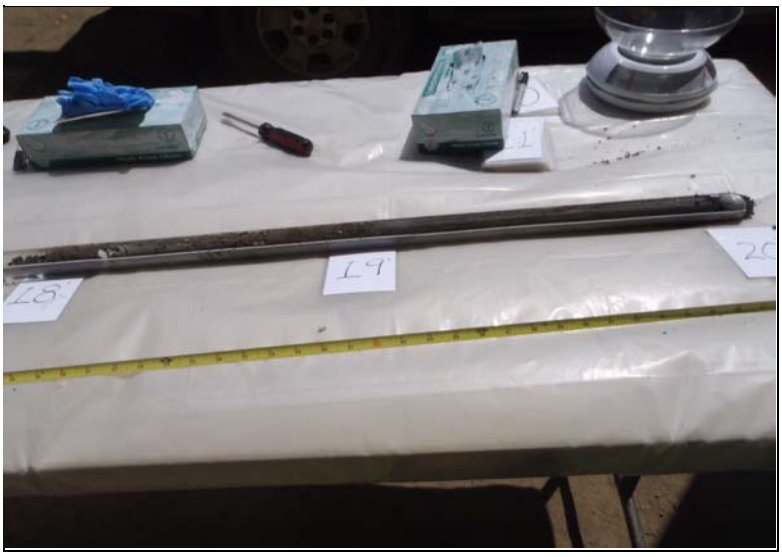
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0805AT

Date: 8-5-13

Description: Borehole #02: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AU

Date: 8-5-13

Description: Borehole #02: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AV

Date: 8-5-13

Description: Borehole #02: Interval 20ft-22ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AW

Date: 8-5-13

Description: Borehole #02: Interval 22ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AX

Date: 8-5-13

Description: Borehole #02: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AY

Date: 8-5-13

Description: Borehole #02: Interval 26ft-28ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0805AZ

Date: 8-5-13

Description: Borehole #02: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AA

Date: 10-6-13

Description: Borehole #04: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AB

Date: 10-6-13

Description: Borehole #04: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AC

Date: 10-6-13

Description: Borehole #04: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AD

Date: 10-6-13

Description: Borehole #04: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

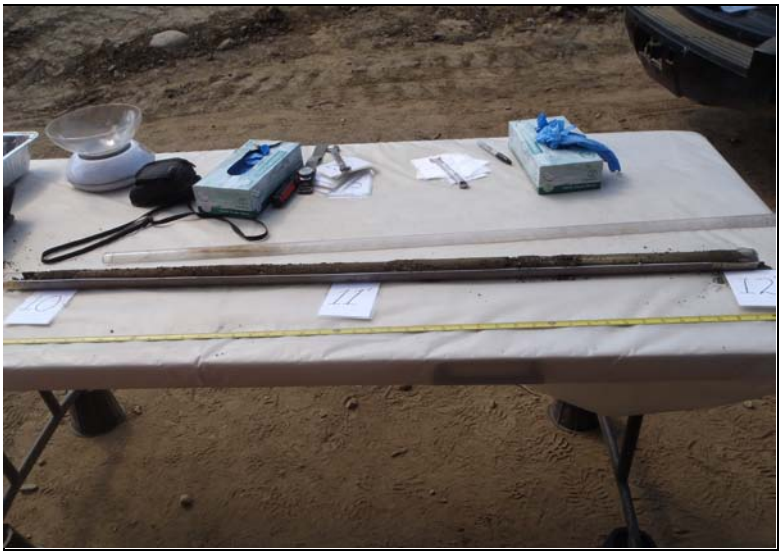
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AE

Date: 10-6-13

Description: Borehole #04a: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



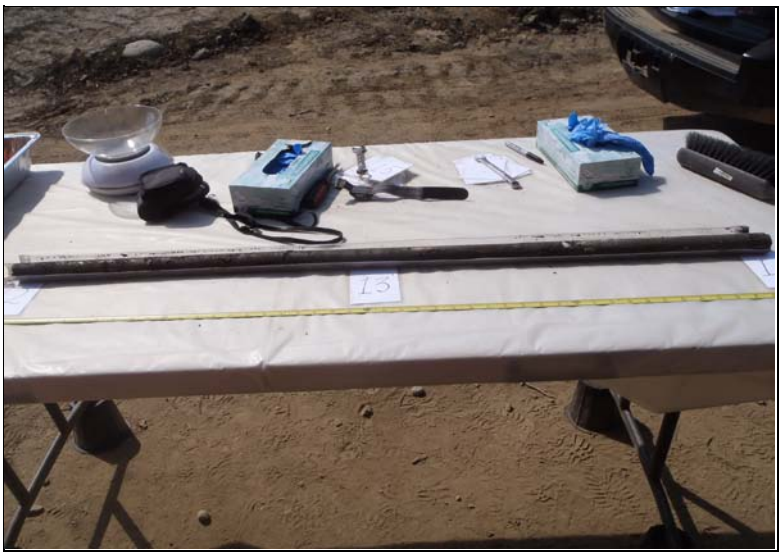
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AF

Date: 10-6-13

Description: Borehole #04a: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



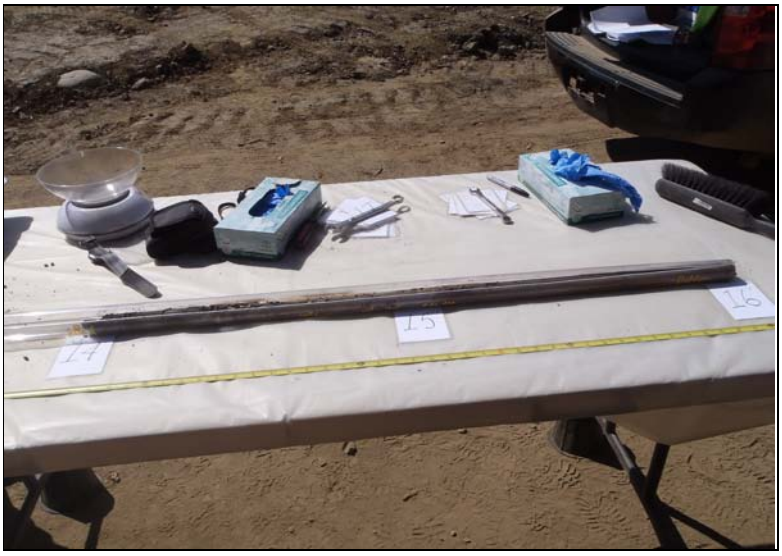
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AG

Date: 10-6-13

Description: Borehole #04a: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AH

Date: 10-6-13

Description: Borehole #04a: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AI

Date: 10-6-13

Description: Borehole #04a: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AJ

Date: 10-6-13

Description: Borehole #04a: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AK

Date: 10-6-13

Description: Borehole #04a: Interval 20ft-22ft

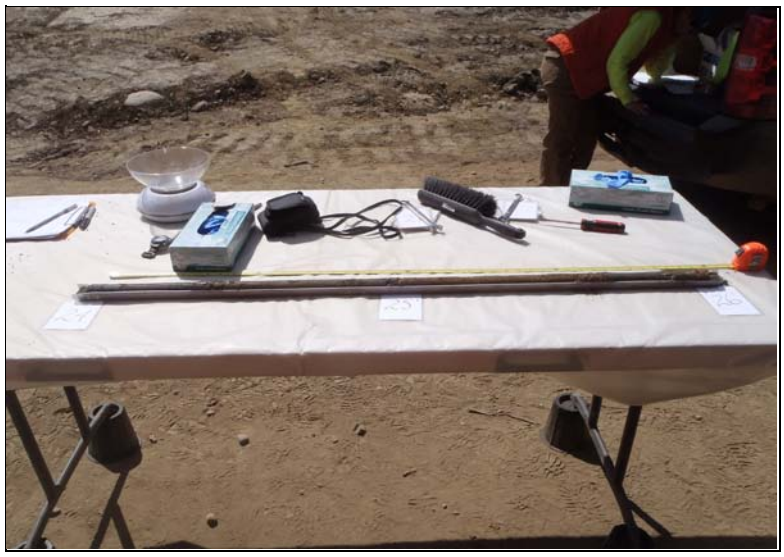
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AL

Date: 10-6-13

Description: Borehole #04a: Interval 22ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_1006AM

Date: 10-6-13

Description: Borehole #04a: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AN

Date: 10-6-13

Description: Borehole #04a: Interval 26ft-28ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AO

Date: 10-6-13

Description: Borehole #04a: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AP

Date: 10-6-13

Description: Borehole #04a: Interval 30ft-32ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AQ

Date: 10-6-13

Description: Borehole #04a: Interval 32ft-34ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_1006AR

Date: 10-6-13

Description: Borehole #04a: Interval 34ft-36ft

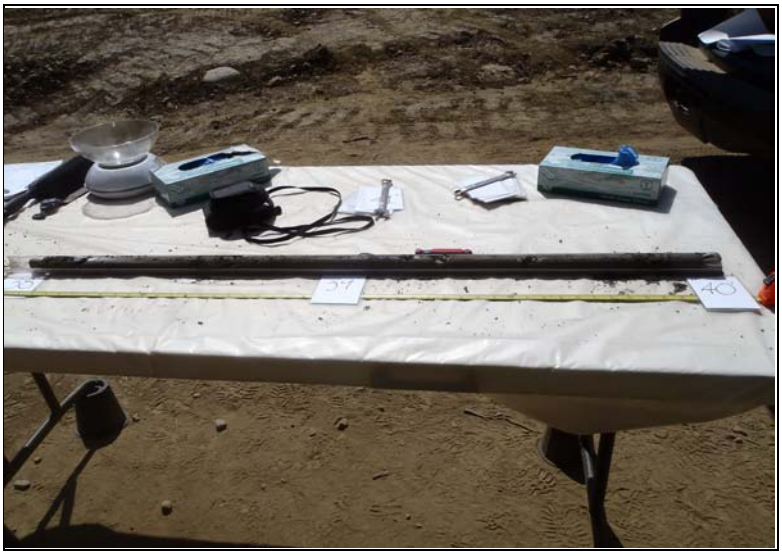
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AS

Date: 10-6-13

Description: Borehole #04a: Interval 36ft-38ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_1006AT

Date: 10-6-13

Description: Borehole #04a: Interval 38ft-40ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AU

Date: 10-6-13

Description: Borehole #04a: Interval 40ft-42ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AV

Date: 10-6-13

Description: Borehole #04a: Interval 42ft-43.1ft

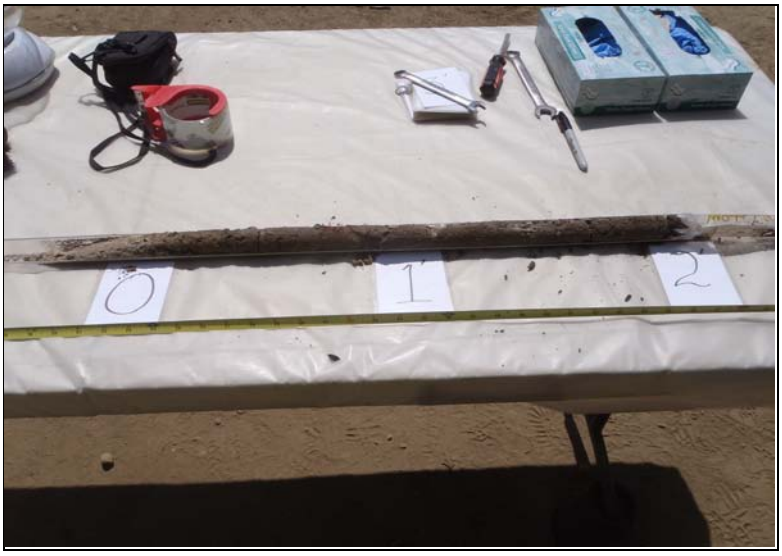
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AW

Date: 10-6-13

Description: Borehole #04a: Interval 43.1ft-44ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_1006AX

Date: 10-6-13

Description: Borehole #03: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AY

Date: 10-6-13

Description: Borehole #03: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_1006AZ

Date: 10-6-13

Description: Borehole #03: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BA

Date: 8-6-13

Description: Borehole #03: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BB

Date: 8-6-13

Description: Borehole #03: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806BC

Date: 8-6-13

Description: Borehole #03: Interval 10ft-12ft

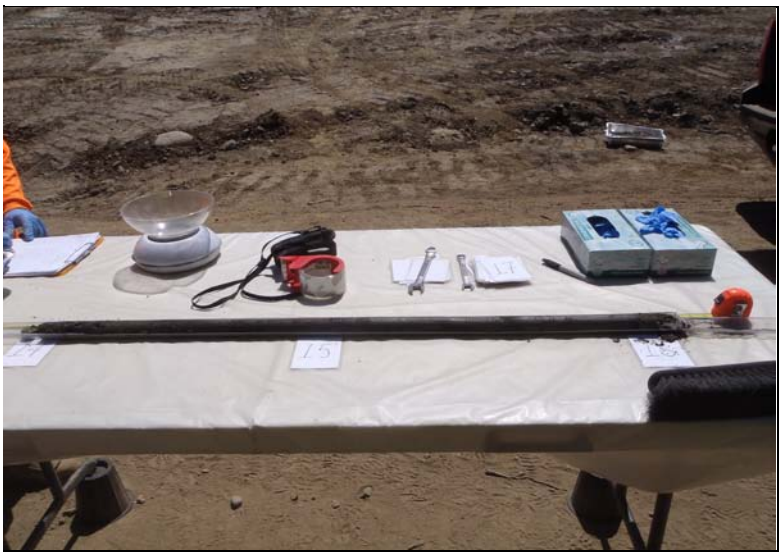
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806BD

Date: 8-6-13

Description: Borehole #03: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0806BE

Date: 8-6-13

Description: Borehole #03: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806BF

Date: 8-6-13

Description: Borehole #03: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806BG

Date: 8-6-13

Description: Borehole #03: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806BH

Date: 8-6-13

Description: Borehole #03: Interval 20ft-22ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BI

Date: 8-6-13

Description: Borehole #03: Interval 22ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BJ

Date: 8-6-13

Description: Borehole #03: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806BK

Date: 8-6-13

Description: Borehole #03: Interval 26ft-28ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806BL

Date: 8-6-13

Description: Borehole #03: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BM

Date: 8-6-13

Description: Borehole #03: Interval 30ft-32ft (Labeled 28ft-30ft)

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BN

Date: 8-6-13

Description: Borehole #07: Interval 00ft-02ft

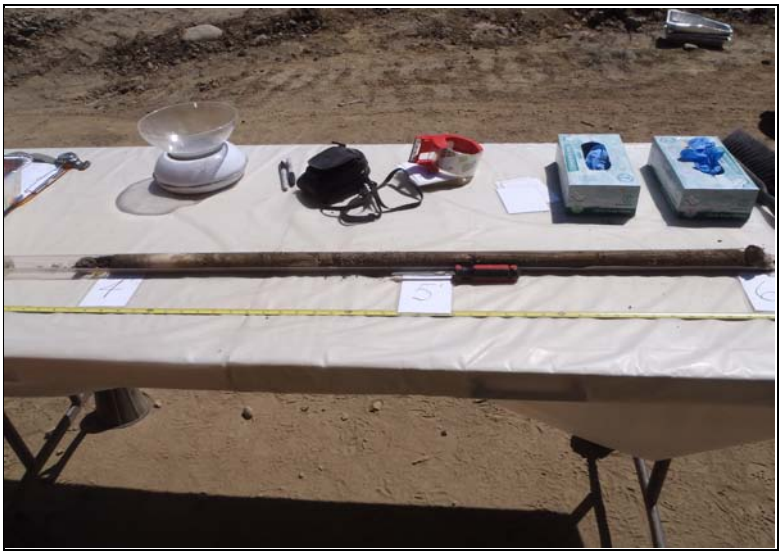
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806BO

Date: 8-6-13

Description: Borehole #07: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0806BP

Date: 8-6-13

Description: Borehole #07: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BQ

Date: 8-6-13

Description: Borehole #07: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BR

Date: 8-6-13

Description: Borehole #07: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BS

Date: 8-6-13

Description: Borehole #07: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BT

Date: 8-6-13

Description: Borehole #07: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BU

Date: 8-6-13

Description: Borehole #07: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BV

Date: 8-6-13

Description: Borehole #07: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BW

Date: 8-6-13

Description: Borehole #07: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BX

Date: 8-6-13

Description: Borehole #07: Interval 20ft-22ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BY

Date: 8-6-13

Description: Borehole #07: Interval 22ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

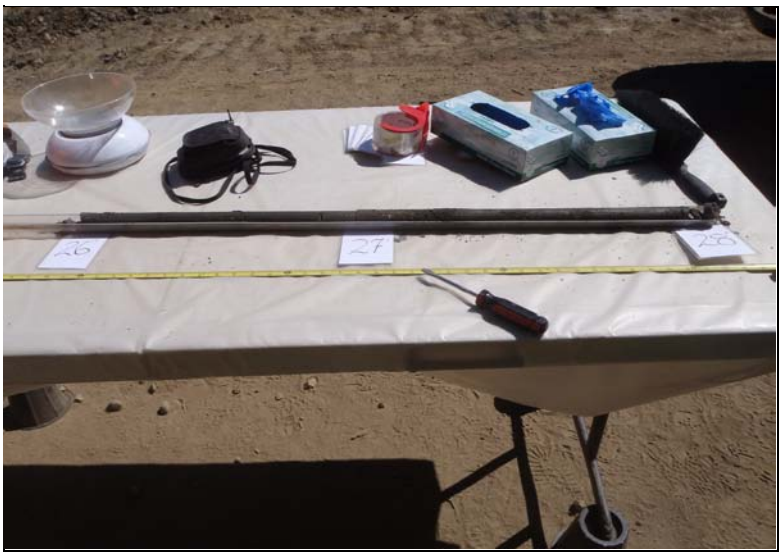
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806BZ

Date: 8-6-13

Description: Borehole #07: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806CA

Date: 8-6-13

Description: Borehole #07: Interval 26ft-28ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806CB

Date: 8-6-13

Description: Borehole #07: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806CC

Date: 8-6-13

Description: Borehole #07: Interval 30ft-32ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806CD

Date: 8-6-13

Description: Borehole #07: Interval 32ft-34ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806CE

Date: 8-6-13

Description: Borehole #07: Interval 34ft-36ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806CF

Date: 8-6-13

Description: Borehole #07b: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806CG

Date: 8-6-13

Description: Borehole #07b: Interval 10ft-12ft

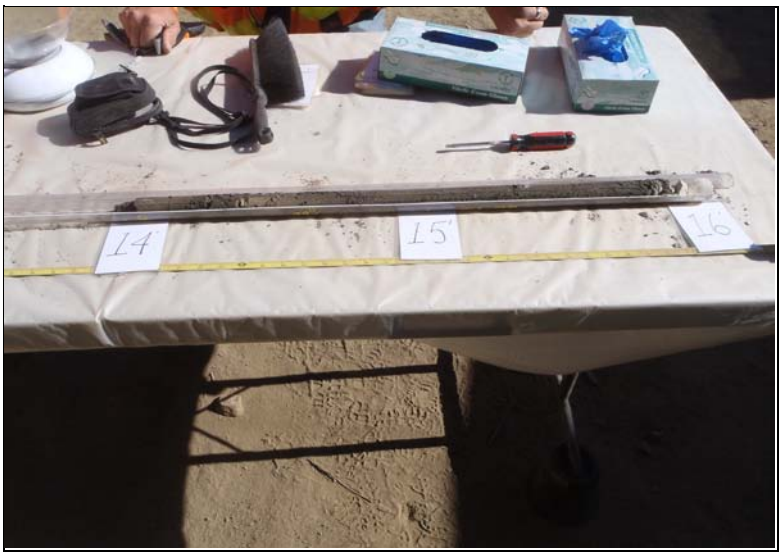
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0806CH

Date: 8-6-13

Description: Borehole #07b: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0806CI

Date: 8-6-13

Description: Borehole #07b: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AA

Date: 8-7-13

Description: Borehole #08: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

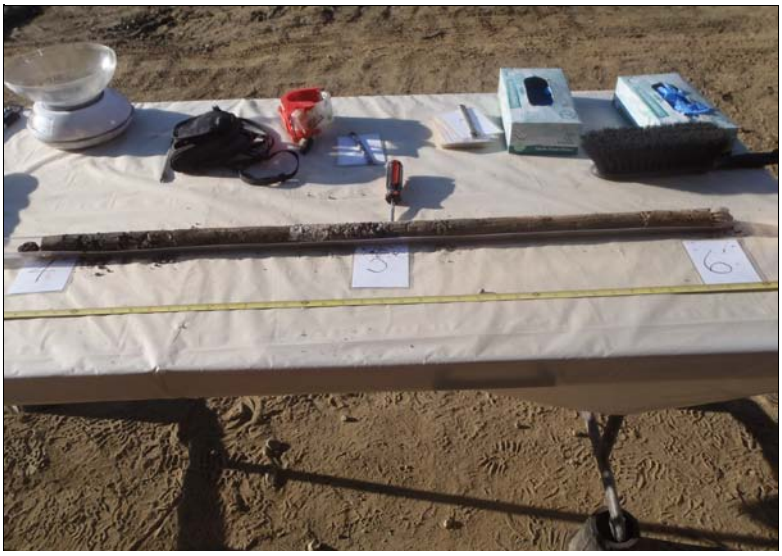
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AB

Date: 8-7-13

Description: Borehole #08: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

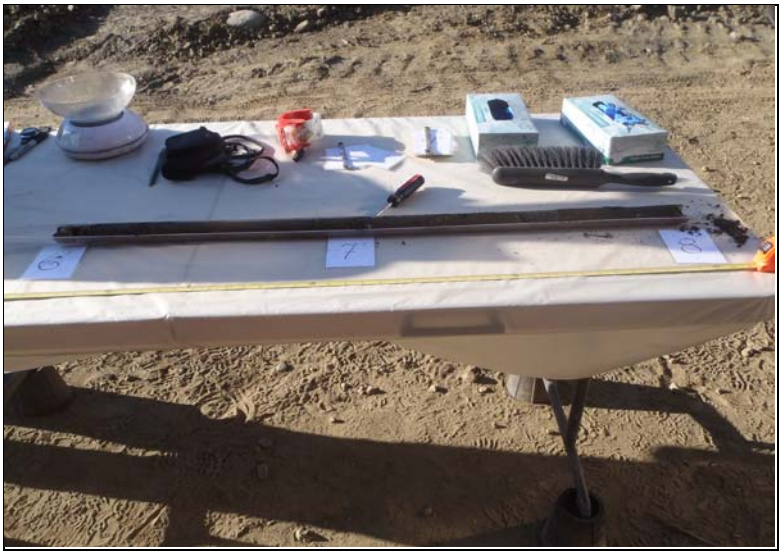


Picture #: 2013_0807AC

Date: 8-7-13

Description: Borehole #08: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

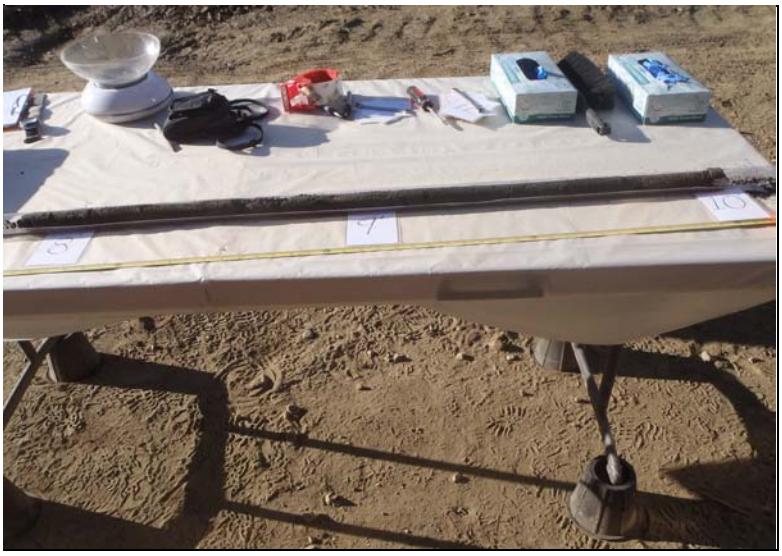


Picture #: 2013_0807AD

Date: 8-7-13

Description: Borehole #08: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

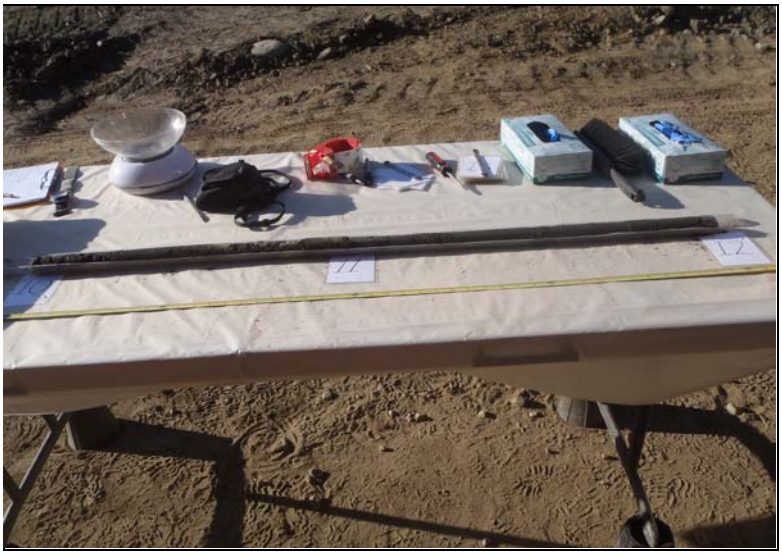


Picture #: 2013_0807AE

Date: 8-7-13

Description: Borehole #08: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

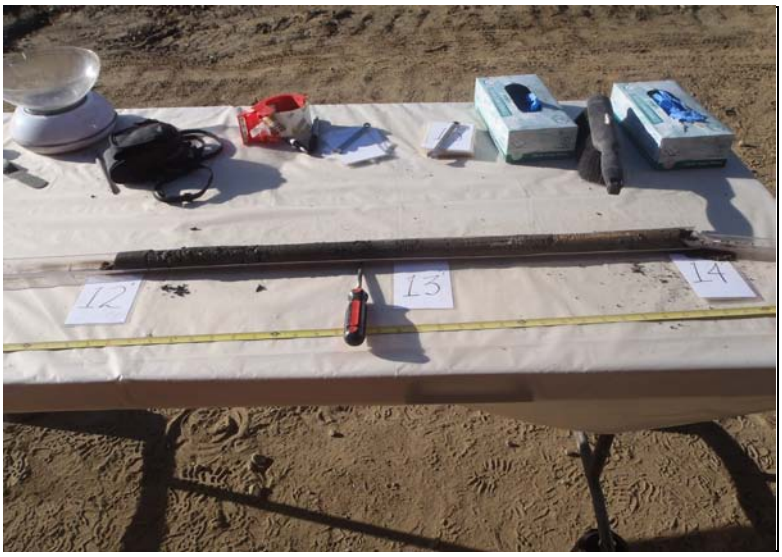


Picture #: 2013_0807AF

Date: 8-7-13

Description: Borehole #08: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AG

Date: 8-7-13

Description: Borehole #08: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

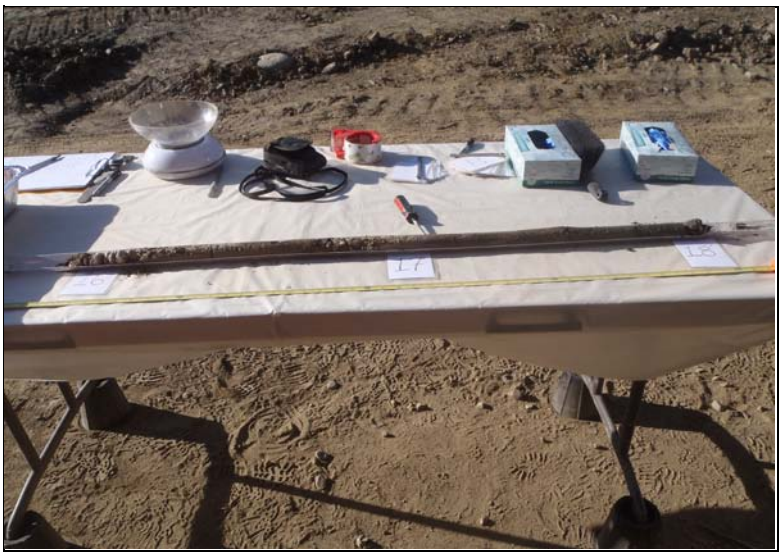
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AH

Date: 8-7-13

Description: Borehole #08: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



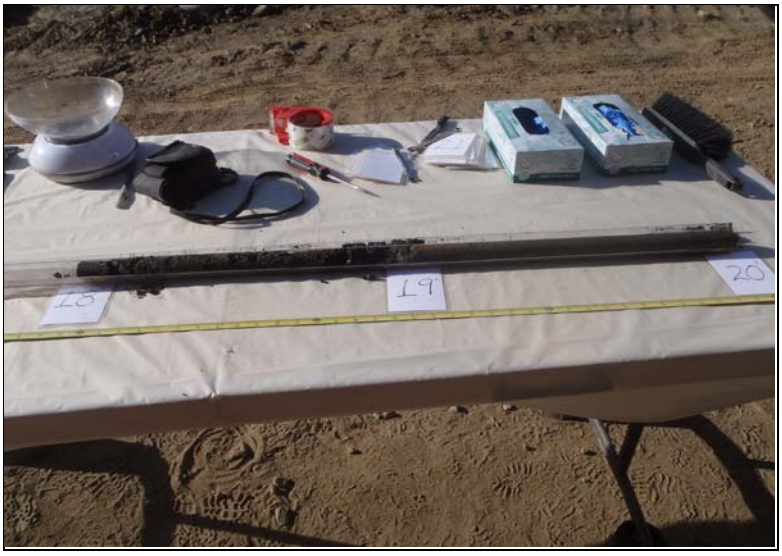
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AI

Date: 8-7-13

Description: Borehole #08: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



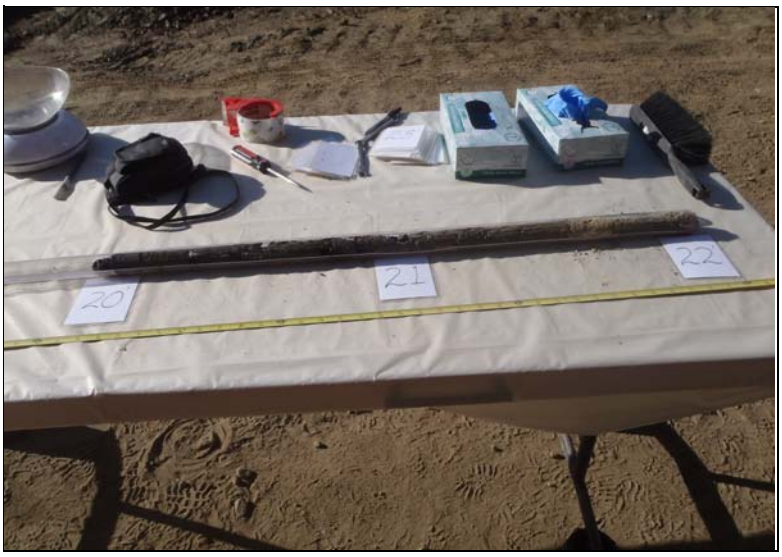
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AJ

Date: 8-7-13

Description: Borehole #08: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0807AK

Date: 8-7-13

Description: Borehole #08: Interval 20ft-22ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807AL

Date: 8-7-13

Description: Borehole #08: Interval 22ft-24ft

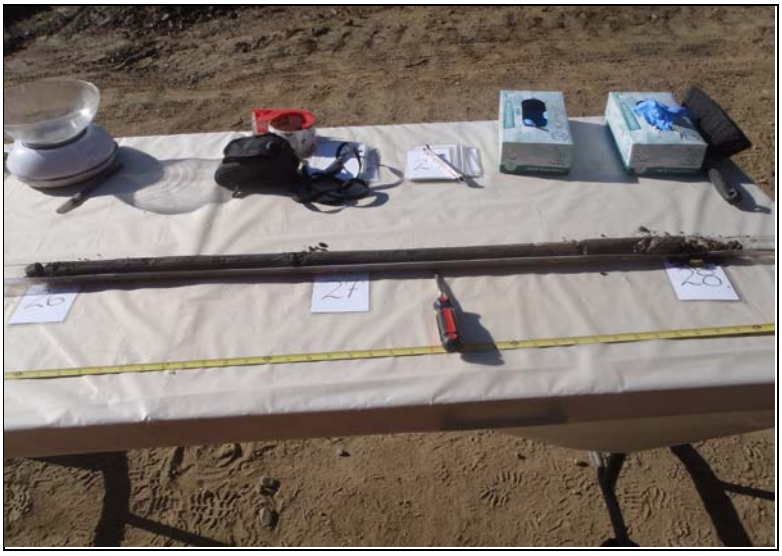
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807AM

Date: 8-7-13

Description: Borehole #08: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0807AN

Date: 8-7-13

Description: Borehole #08: Interval 26ft-28ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

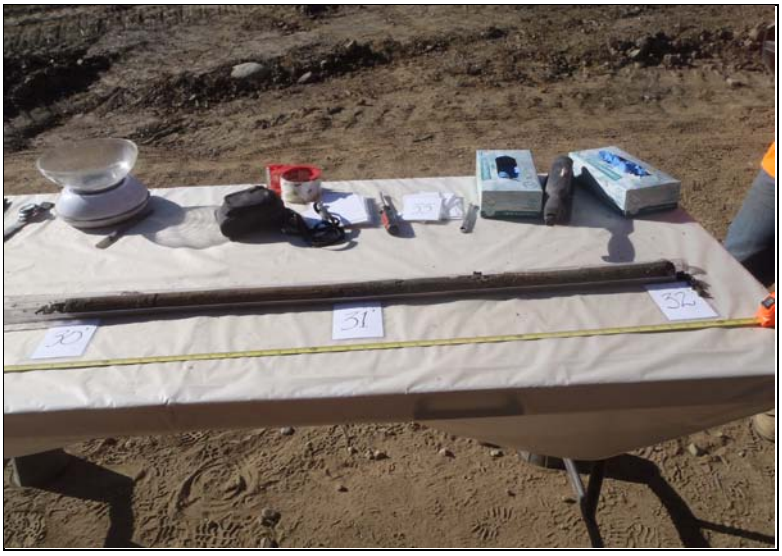
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AO

Date: 8-7-13

Description: Borehole #08: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AP

Date: 8-7-13

Description: Borehole #08: Interval 30ft-32ft

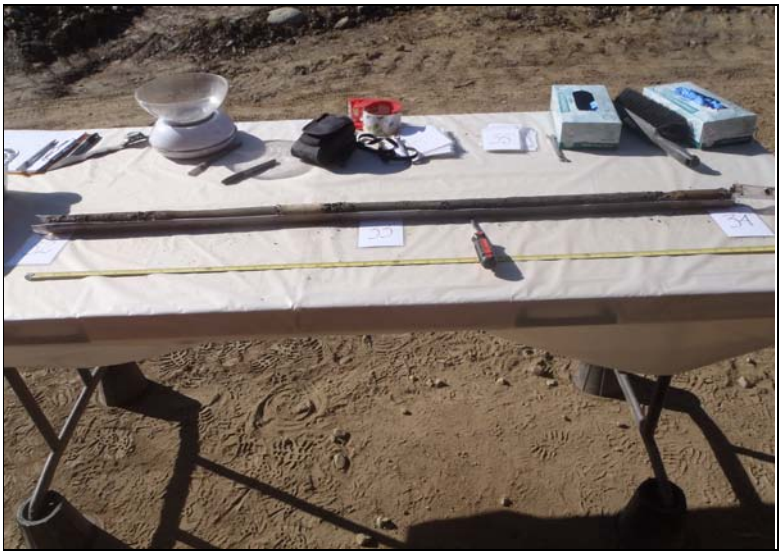
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807AQ

Date: 8-7-13

Description: Borehole #08: Interval 46ft-46.75ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0807AR

Date: 8-7-13

Description: Borehole #08: Interval 32ft-34ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807AS

Date: 8-7-13

Description: Borehole #08: Interval 34ft-36ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807AT

Date: 8-7-13

Description: Borehole #08: Interval 36ft-38ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

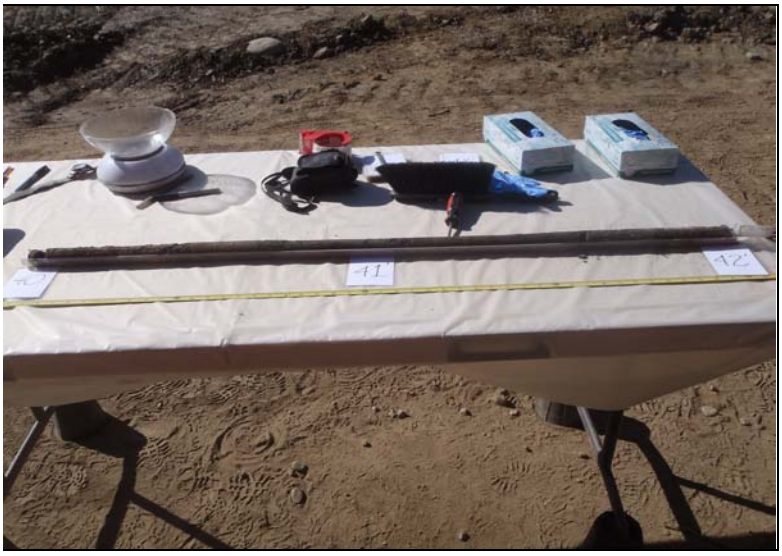
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AU

Date: 8-7-13

Description: Borehole #08: Interval 38ft-40ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



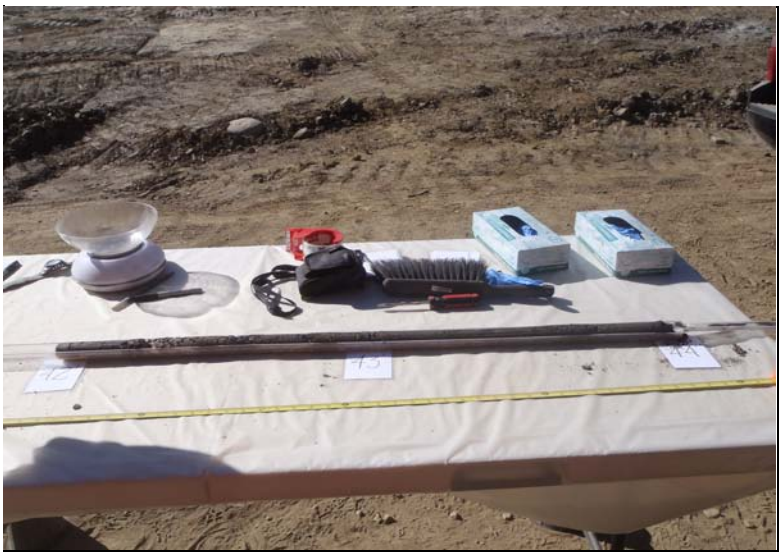
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AV

Date: 8-7-13

Description: Borehole #08: Interval 38ft-40ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

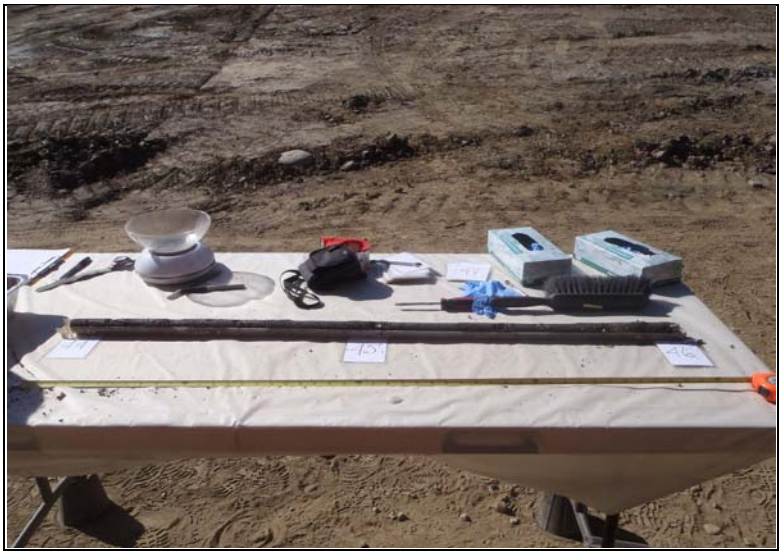


Picture #: 2013_0807AW

Date: 8-7-13

Description: Borehole #08: Interval 42ft-44ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0807AX

Date: 8-7-13

Description: Borehole #08: Interval 44ft-46ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AY

Date: 8-7-13

Description: Borehole #05: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807AZ

Date: 8-7-13

Description: Borehole #05: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BA

Date: 8-7-13

Description: Borehole #05: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BB

Date: 8-7-13

Description: Borehole #05: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BC

Date: 8-7-13

Description: Borehole #05: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BD

Date: 8-7-13

Description: Borehole #05: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BE

Date: 8-7-13

Description: Borehole #05: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BF

Date: 8-7-13

Description: Borehole #05: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BG

Date: 8-7-13

Description: Borehole #05b: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BH

Date: 8-7-13

Description: Borehole #05b: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BI

Date: 8-7-13

Description: Borehole #05b: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BJ

Date: 8-7-13

Description: Borehole #05b: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BK

Date: 8-7-13

Description: Borehole #05b: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BL

Date: 8-7-13

Description: Borehole #05b: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BM

Date: 8-7-13

Description: Borehole #05b: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807BN

Date: 8-7-13

Description: Borehole #05b: Interval 14ft-16ft

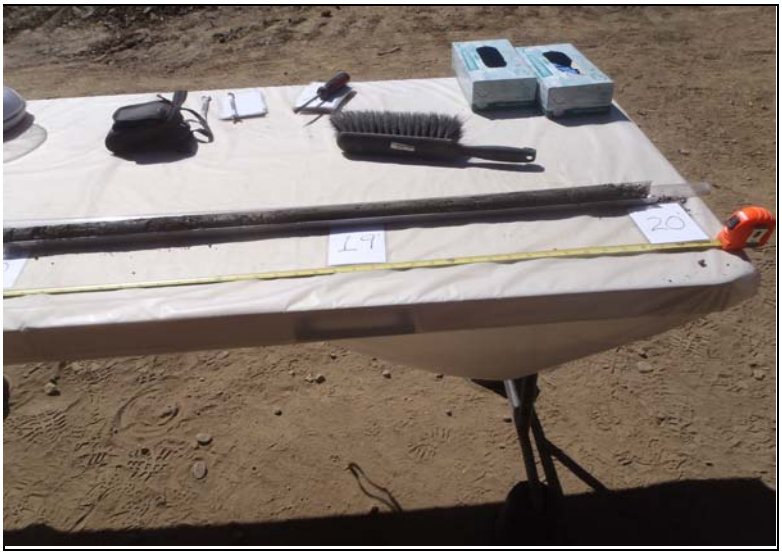
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BO

Date: 8-7-13

Description: Borehole #05b: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0807BP

Date: 8-7-13

Description: Borehole #05b: Interval 18ft-20ft

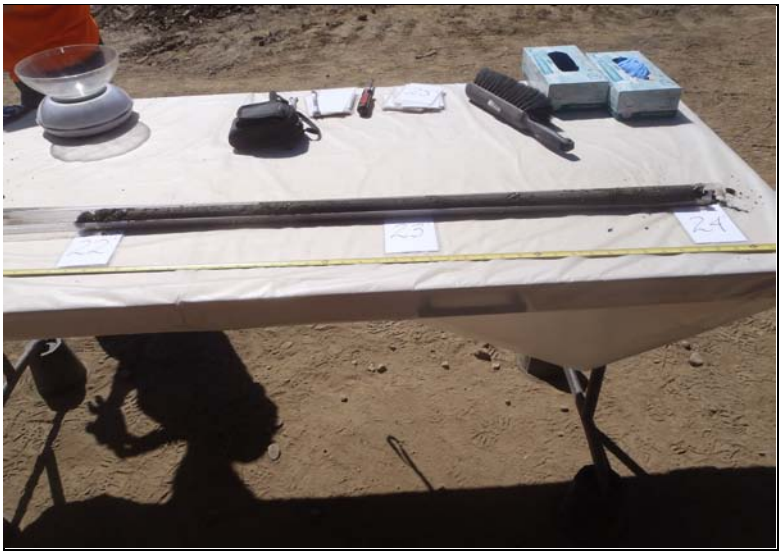
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BQ

Date: 8-7-13

Description: Borehole #05b: Interval 20ft-22ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0807BR

Date: 8-7-13

Description: Borehole #05b: Interval 22ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BS

Date: 8-7-13

Description: Borehole #05b: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BT

Date: 8-7-13

Description: Borehole #05b: Interval 26ft-28ft

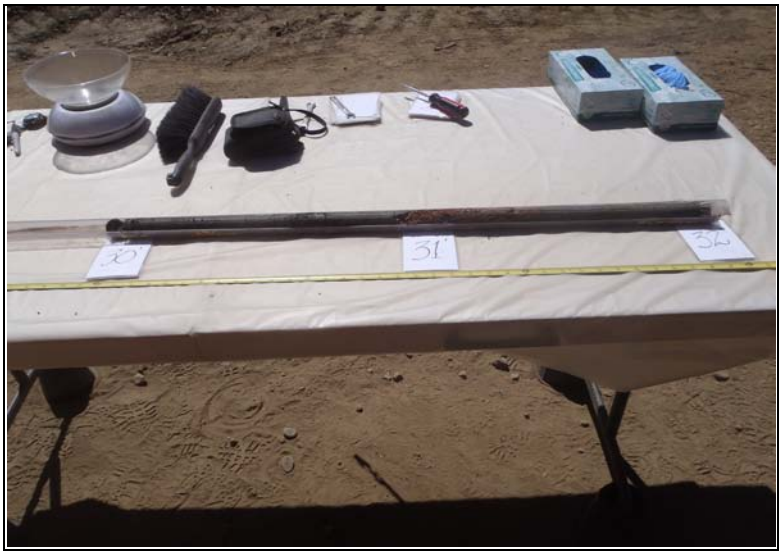
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BU

Date: 8-7-13

Description: Borehole #05b: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0807BV

Date: 8-7-13

Description: Borehole #05b: Interval 30ft-32ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BW

Date: 8-7-13

Description: Borehole #05b: Interval 30ft-32ft

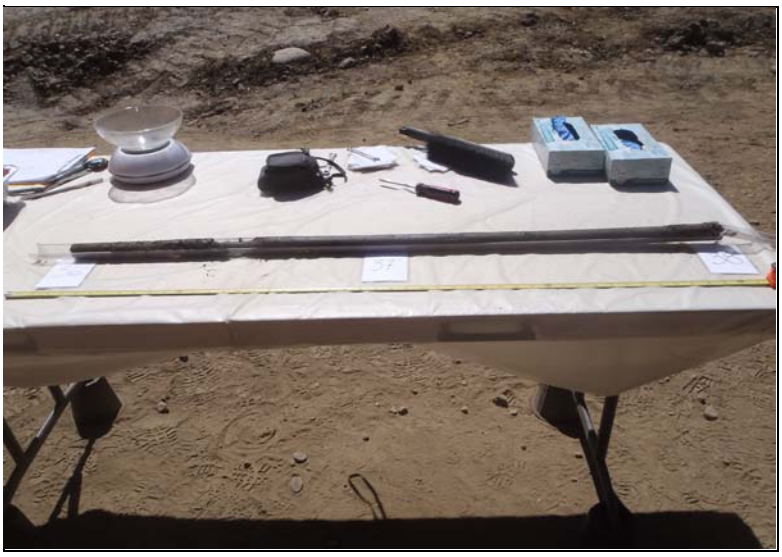
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BX

Date: 8-7-13

Description: Borehole #05b: Interval 34ft-36ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0807BY

Date: 8-7-13

Description: Borehole #05b: Interval 36ft-38ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807BZ

Date: 8-7-13

Description: Borehole #05b: Interval 38ft-40ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807CA

Date: 8-7-13

Description: Borehole #05b: Interval 40ft-42ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807CB

Date: 8-7-13

Description: Borehole #05b: Interval 42ft-44ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807CC

Date: 8-7-13

Description: Borehole #05b: Interval 44ft-46ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807CD

Date: 8-7-13

Description: Borehole #06: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807CE

Date: 8-7-13

Description: Borehole #06: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807CF

Date: 8-7-13

Description: Borehole #06: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CG

Date: 8-7-13

Description: Borehole #06: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CH

Date: 8-7-13

Description: Borehole #06: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807CI

Date: 8-7-13

Description: Borehole #06: Interval 10ft-12ft

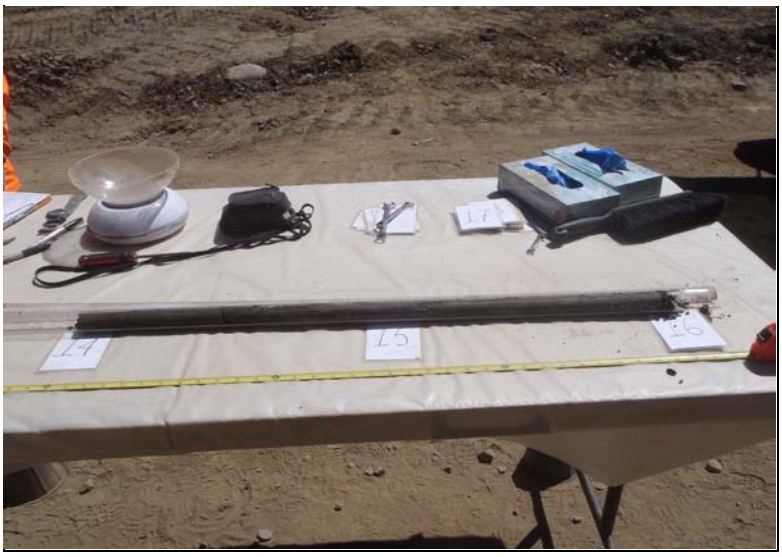
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807CJ

Date: 8-7-13

Description: Borehole #06: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CK

Date: 8-7-13

Description: Borehole #06: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CL

Date: 8-7-13

Description: Borehole #06: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

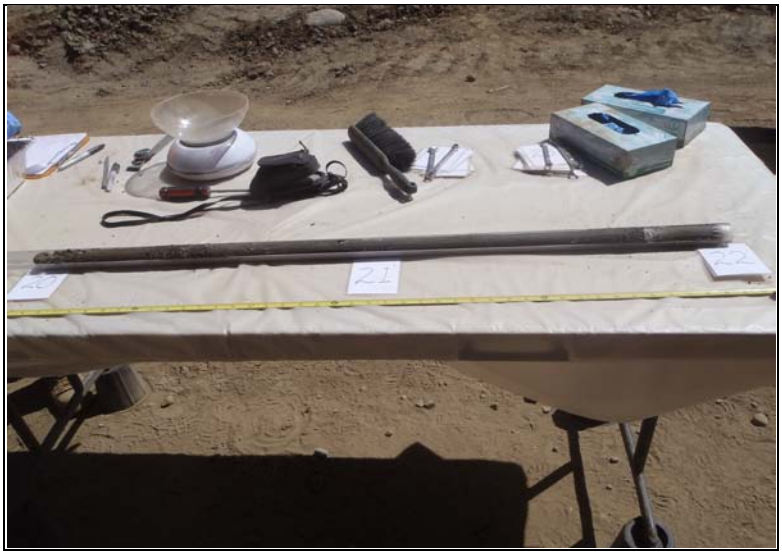
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CM

Date: 8-7-13

Description: Borehole #06: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CN

Date: 8-7-13

Description: Borehole #06: Interval 20ft-22ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CO

Date: 8-7-13

Description: Borehole #06: Interval 22ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CP

Date: 8-7-13

Description: Borehole #06: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CQ

Date: 8-7-13

Description: Borehole #06: Interval 26ft-28ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CR

Date: 8-7-13

Description: Borehole #06: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CS

Date: 8-7-13

Description: Borehole #06: Interval 30ft-32ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CT

Date:8-7-13

Description: Borehole #06: Interval 32ft-34ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CU

Date: 8-7-13

Description: Borehole #06: Interval 34ft-36ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CV

Date: 8-7-13

Description: Borehole #09: Interval 00ft-02ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CW

Date: 8-7-13

Description: Borehole #09: Interval 02ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CX

Date: 8-7-13

Description: Borehole #09: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

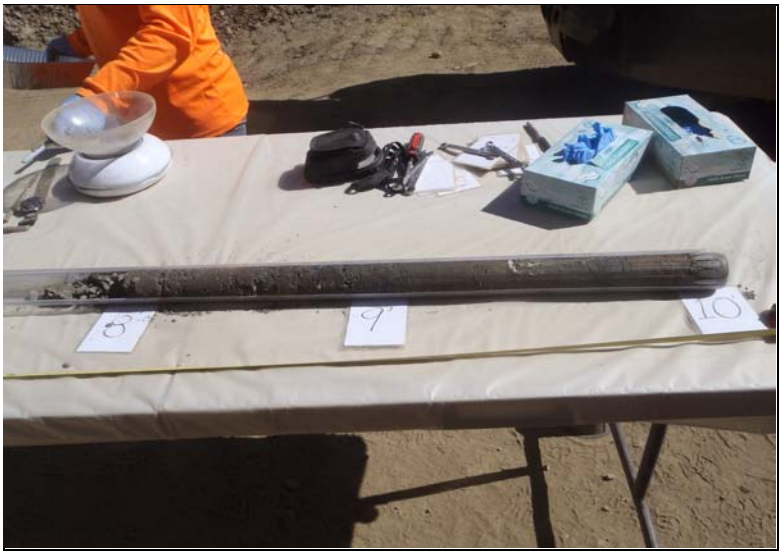
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CY

Date: 8-7-13

Description: Borehole #09: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807CZ

Date: 8-7-13

Description: Borehole #09: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807DA

Date: 8-7-13

Description: Borehole #09: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807DB

Date: 8-7-13

Description: Borehole #09: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807DC

Date: 8-7-13

Description: Borehole #09: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807DD

Date: 8-7-13

Description: Borehole #09: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807DE

Date: 8-7-13

Description: Borehole #09: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0807DF

Date: 8-7-13

Description: Borehole #09: Interval 20ft-22ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0807DG

Date: 8-7-13

Description: Borehole #09: Interval 22ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

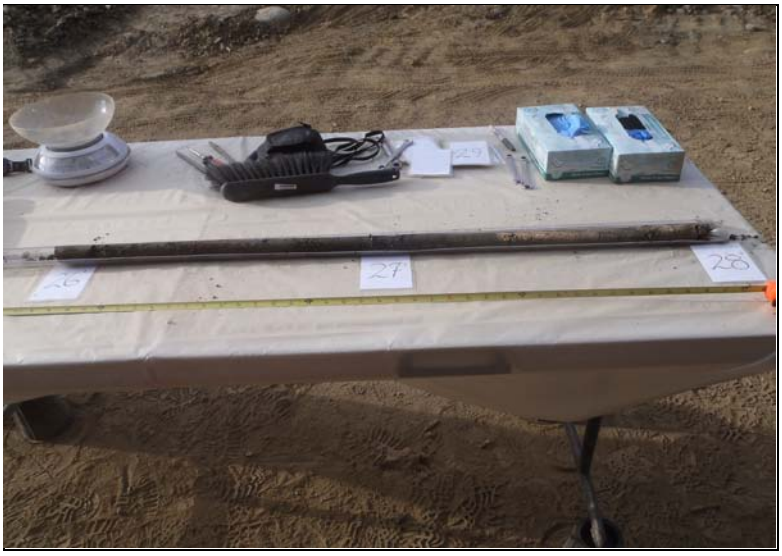
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AA

Date: 8-8-13

Description: Borehole #09: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



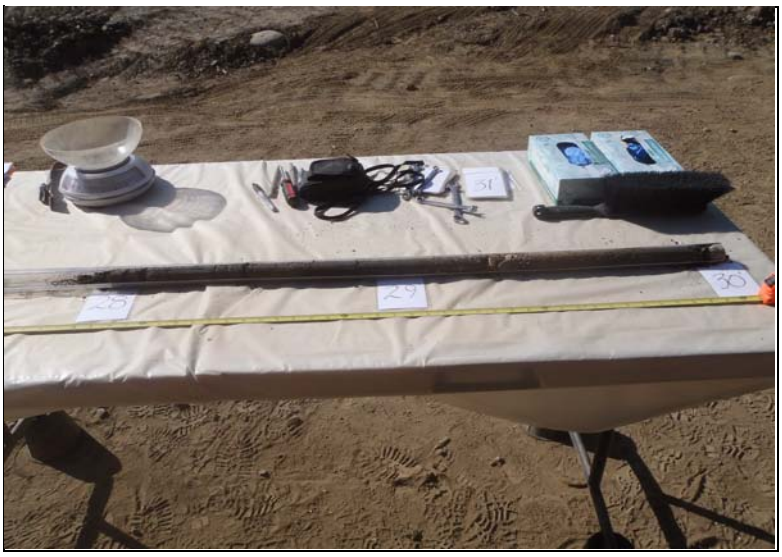
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AB

Date: 8-8-13

Description: Borehole #09: Interval 26ft-28ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



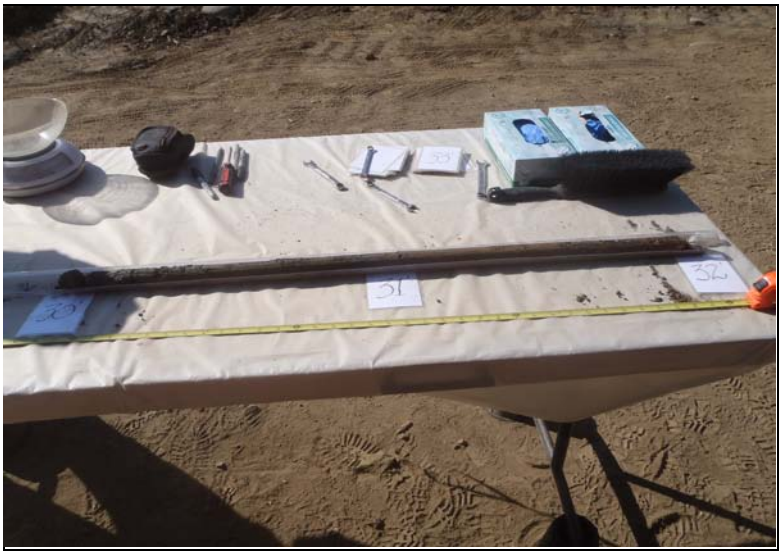
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AC

Date: 8-8-13

Description: Borehole #09b: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AD

Date: 8-8-13

Description: Borehole #09b: Interval 30ft-32ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AE

Date: 8-8-13

Description: Borehole #09b: Interval 32ft-34ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AF

Date: 8-8-13

Description: Borehole #09b: Interval 34ft-36ft

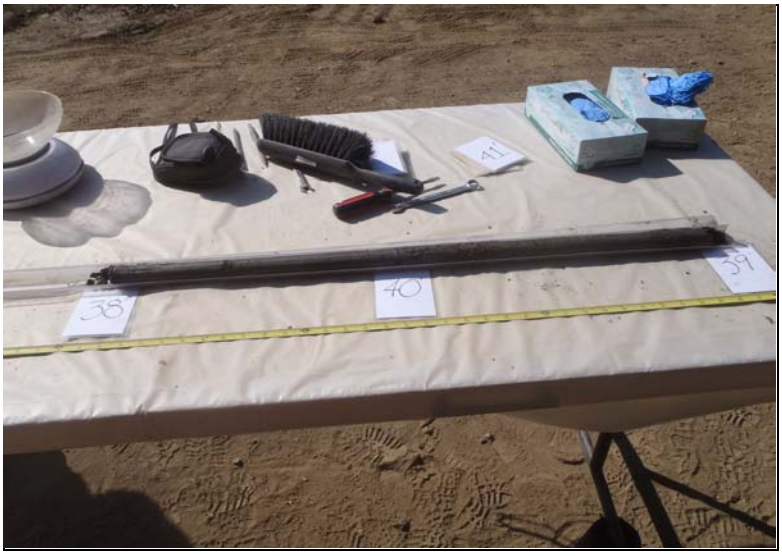
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AG

Date: 8-8-13

Description: Borehole #09b: Interval 36ft-38ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0808AH

Date: 8-8-13

Description: Borehole #09b: Interval 38ft-40ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AI

Date: 8-8-13

Description: Borehole #09b: Interval 40ft-42ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

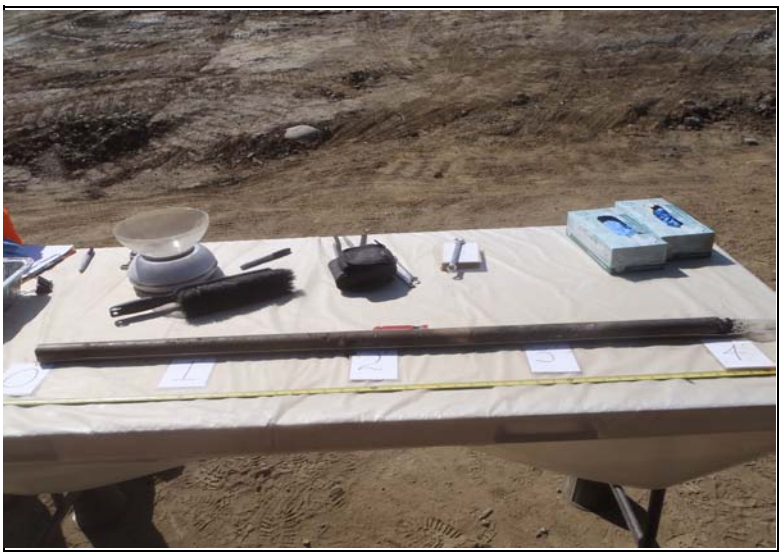
PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AJ

Date: 8-8-13

Description: Borehole #09b: Interval 42ft-44ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0808AK

Date: 8-8-13

Description: Borehole #10: Interval 00ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AL

Date: 8-8-13

Description: Borehole #10: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AM

Date: 8-8-13

Description: Borehole #10: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AN

Date: 8-8-13

Description: Borehole #10: Interval 08ft-10ft

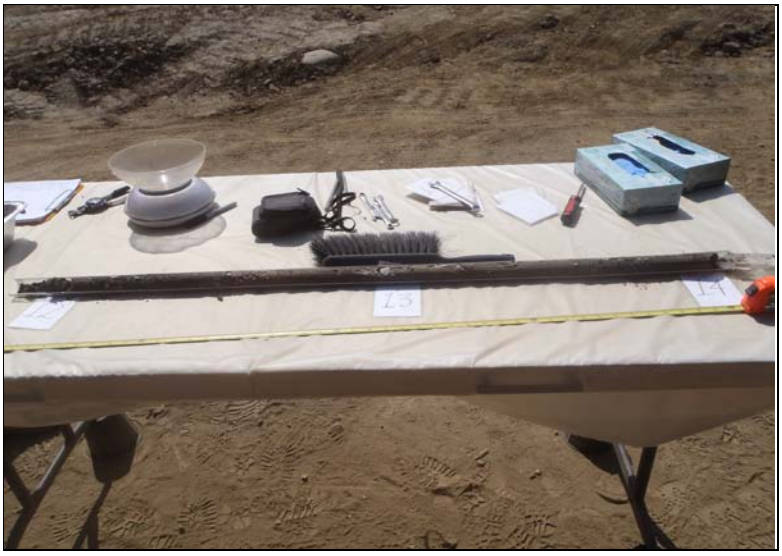
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AO

Date: 8-8-13

Description: Borehole #10: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



Picture #: 2013_0808AP

Date: 8-8-13

Description: Borehole #10: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AQ

Date: 8-8-13

Description: Borehole #10: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AR

Date: 8-8-13

Description: Borehole #10: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AS

Date: 8-8-13

Description: Borehole #10: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AT

Date: 8-8-13

Description: Borehole #10: Interval 20ft-22ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AU

Date: 8-8-13

Description: Borehole #10: Interval 22ft-24ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AV

Date: 8-8-13

Description: Borehole #10: Interval 24ft-26ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AW

Date: 8-8-13

Description: Borehole #10: Interval 26ft-28ft

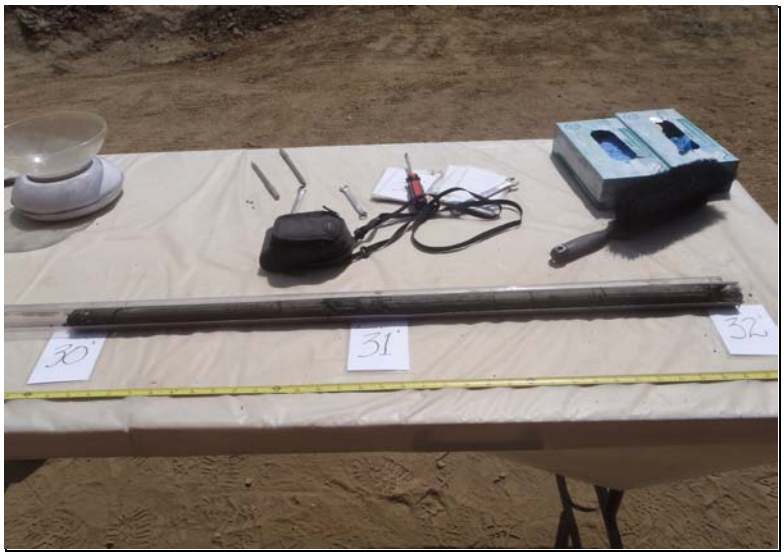
Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808AX

Date: 8-8-13

Description: Borehole #10: Interval 28ft-30ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project



PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AY

Date: 8-8-13

Description: Borehole #10: Interval 30ft-32ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808AZ

Date: 8-8-13

Description: Borehole #10: Interval 32ft-34ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808BA

Date: 8-8-13

Description: Borehole #10: Interval 34ft-36ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808BB

Date: 8-8-13

Description: Borehole #12: Interval 00ft-04ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808BC

Date: 8-8-13

Description: Borehole #12: Interval 04ft-06ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808BD

Date: 8-8-13

Description: Borehole #12: Interval 06ft-08ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808BE

Date: 8-8-13

Description: Borehole #12: Interval 08ft-10ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808BF

Date: 8-8-13

Description: Borehole #12: Interval 10ft-12ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808BG

Date: 8-8-13

Description: Borehole #12: Interval 12ft-14ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Picture #: 2013_0808BH

Date: 8-8-13

Description: Borehole #12: Interval 14ft-16ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808BI

Date: 8-8-13

Description: Borehole #12: Interval 16ft-18ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

PIONEER TECHNICAL SERVICES, INC.

Picture #: 2013_0808BJ

Date: 8-8-13

Description: Borehole #12: Interval 18ft-20ft

Project: McLaren Tailings Abandon Mine Site Reclamation Project

Appendix D

Laboratory Data Sheets

Appendix D-1

ALS Geochemistry–Metallurgical

ALS USA Inc.
4977 Energy Way
Reno NV 89502
Phone: 775 356 5395 Fax: 775 355 0179 www.alsglobal.com

To: PIONEER TECHNICAL SERVICES, INC
PO BOX 3445
BUTTE MT 59702

Finalized Date: 28- AUG- 2013
Account: PIOTEC

CERTIFICATE WN13146279

Project: McLaren Tailings Abandoned
P.O. No.:
This report is for 51 Soil samples submitted to our lab in Winnemucca, NV, USA on 14- AUG- 2013.
The following have access to data associated with this certificate:

MARTY BENNETT	TOM HENDERSON	JOE MCELROY

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
LOG- 22	Sample login - Rcd w/o BarCode
SCR- 41	Screen to - 180um and save both
DRY- 22	Drying - Maximum Temp 60C

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
ME- ICP61	33 element four acid ICP- AES	ICP- AES
Au- AA23	Au 30g FA- AA finish	AAS

The results of this assay were based solely upon the content of the sample submitted. Any decision to invest should be made only after the potential investment value of the claim 'or deposit has been determined based on the results of assays of multiple samples of geological materials collected by the prospective investor or by a qualified person selected by him/her and based on an evaluation of all engineering data which is available concerning any proposed project. Statement required by Nevada State Law NRS 519

To: PIONEER TECHNICAL SERVICES, INC
ATTN: JOE MCELROY
PO BOX 3445
BUTTE MT 59702

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:
Colin Ramshaw, Vancouver Laboratory Manager

ALS USA Inc.
4977 Energy Way
Reno NV 89502
Phone: 775 356 5395 Fax: 775 355 0179 www.alsglobal.com

To: PIONEER TECHNICAL SERVICES, INC
PO BOX 3445
BUTTE MT 59702

Finalized Date: 28- AUG- 2013
Account: PIOTEC

Project: McLaren Tailings Abandoned

CERTIFICATE OF ANALYSIS WN13146279

Sample Description / Method / Analyte / Units / LOR	WEI- 21 Recvd Wt. kg 0.02	Au- AA23 Au ppm 0.005	ME- ICP61 Ag ppm 0.5	ME- ICP61 Al % 0.01	ME- ICP61 As ppm 5	ME- ICP61 Ba ppm 10	ME- ICP61 Be ppm 0.5	ME- ICP61 Bi ppm 2	ME- ICP61 Ca % 0.01	ME- ICP61 Cd ppm 0.5	ME- ICP61 Co ppm 1	ME- ICP61 Cr ppm 1	ME- ICP61 Cu ppm 1	ME- ICP61 Fe % 0.01	ME- ICP61 Ga ppm 10
McL- BH1M- 0- 8- 080513	3.49	2.86	11.5	3.62	28	80	1.8	36	5.09	0.8	20	48	2410	21.2	30
McL- BH2M- 0- 8- 080513	1.48	3.74	10.6	3.63	33	80	1.9	25	4.75	<0.5	16	42	2590	20.9	30
McL- BH2M- 8- 16- 080513	2.22	2.12	9.5	3.55	38	80	1.8	22	5.63	0.8	16	43	2200	20.4	30
McL- BH2M- 16- 24- 080513	2.24	2.25	8.9	3.70	24	90	1.6	21	6.16	0.9	19	44	2690	18.75	30
McL- BH2M- 24- 32- 080513	2.20	3.10	10.2	3.16	32	70	1.7	19	3.66	0.8	33	33	3350	25.8	30
McL- BH2M- 32- 36.5- 080513	1.55	2.63	12.2	3.70	34	70	1.7	28	4.94	0.9	21	39	3840	21.4	30
McL- BH5M- 0- 8- 080713	2.60	3.55	12.9	3.51	37	110	2.6	29	3.81	<0.5	11	44	2180	22.9	30
McL- BH5M- 8- 16- 080713	3.04	2.35	9.2	3.69	33	80	2.0	22	4.21	0.7	15	43	2570	21.8	30
McL- BH5M- 16- 24- 080713	2.75	2.37	9.4	3.70	37	90	1.8	23	4.44	0.5	15	45	2750	21.2	30
McL- BH5M- 24- 32- 080713	3.27	2.63	9.3	3.48	35	70	1.9	23	4.96	0.8	16	45	2600	21.8	30
McL- BH5M- 32- 40- 080713	3.55	2.86	11.0	3.50	29	110	1.7	25	4.23	0.7	26	37	3530	23.8	30
McL- BH5M- 40- 44.75- 080713	2.23	2.62	11.1	3.58	39	90	1.7	24	4.49	0.9	19	36	3470	21.2	30
McL- BH4M- 0- 8- 080613	2.60	2.26	10.7	3.61	33	80	1.9	22	5.24	0.6	12	47	2260	19.55	30
McL- BH4M- 8- 16- 080613	2.18	3.47	10.5	2.89	47	70	2.7	32	4.26	0.7	19	35	2250	26.1	30
McL- BH4M- 16- 24- 080613	2.20	2.87	9.2	3.15	30	60	1.7	20	4.46	0.7	21	38	2860	22.7	30
McL- BH4M- 24- 32- 080613	2.20	2.86	10.1	3.01	40	70	2.1	25	4.38	0.6	18	36	2480	24.8	30
McL- BH4M- 32- 43.1- 080613	2.56	2.57	9.8	3.54	26	70	1.7	20	5.65	0.7	18	43	2340	20.8	30
McL- BH3M- 0- 8- 080613	1.55	2.53	9.2	3.28	28	70	1.8	21	5.96	0.8	20	40	2820	21.8	20
McL- BH3M- 8- 16- 080613	2.32	2.47	11.2	3.88	33	70	2.0	24	4.96	0.7	15	44	2400	20.4	30
McL- BH3M- 16- 24- 080613	1.53	3.44	9.9	3.31	31	100	1.7	20	4.00	<0.5	19	38	2750	21.9	30
McL- BH3M- 24- 30.5- 808613	1.34	3.35	10.7	3.25	32	70	2.0	28	3.35	<0.5	15	44	2240	23.8	30
McL- BH7M- 0- 8- 080613	1.50	2.09	11.8	3.93	35	90	2.0	27	5.63	0.5	12	58	1725	18.50	30
McL- BH7M- 8- 16- 080613	2.61	2.46	8.9	3.71	29	80	2.0	20	4.55	0.7	17	49	2600	21.5	30
McL- BH7M- 16- 24- 080613	1.64	3.10	11.6	3.51	34	70	2.4	26	5.07	0.7	12	43	2110	21.3	30
McL- BH7M- 24- 34.3- 080613	1.96	4.38	9.6	3.04	32	80	1.9	26	3.39	<0.5	18	35	3230	25.2	30
McL- BH11M- 0- 8- 080513	2.87	2.33	10.7	4.25	36	240	2.1	22	4.94	1.0	14	54	2330	20.3	30
McL- BH11M- 8- 16- 080513	2.64	2.82	11.1	3.59	45	210	2.4	22	4.98	0.8	11	38	2420	23.5	30
McL- BH11M- 16- 24- 080513	2.85	4.52	10.3	2.86	39	180	2.0	16	2.94	1.1	21	30	4020	30.1	30
McL- BH11M- 24- 32.5- 080513	1.79	2.54	12.1	3.79	42	210	2.0	20	4.56	1.2	20	58	1990	21.8	30
McL- BH12M- 0- 8- 080813	2.19	4.11	11.2	3.77	36	210	2.0	24	4.64	1.3	17	43	2230	21.4	30
McL- BH12M- 8- 18.4- 080813	3.06	3.20	11.1	3.42	40	200	2.0	23	4.88	1.5	21	43	2550	24.1	30
McL- BH6M- 0- 8- 080713	3.22	2.57	12.7	3.79	33	190	2.3	27	5.18	0.9	14	51	1800	21.6	30
McL- BH6M- 8- 16- 080713	2.39	3.52	9.9	3.87	30	160	1.8	20	4.21	0.9	16	44	2780	21.7	30
McL- BH6M- 16- 24- 080713	2.39	1.440	8.8	4.28	33	240	1.5	19	7.60	0.9	16	59	1910	15.75	30
McL- BH6M- 24- 32- 080713	1.62	1.815	10.8	4.43	28	230	1.7	19	5.95	1.1	15	53	2710	18.55	30
McL- BH6M- 32- 36.9- 080713	2.14	2.08	12.9	4.23	34	210	1.9	27	4.99	1.3	15	44	3500	20.8	40
McL- BH10M- 0- 8- 080813	2.51	2.40	9.4	3.93	38	150	2.1	23	5.20	0.8	16	52	2510	22.8	30
McL- BH10M- 8- 16- 080813	2.94	3.06	11.0	3.83	37	170	2.1	18	5.46	1.2	18	46	2590	22.8	30
McL- BH10M- 16- 24- 080813	2.22	2.98	12.9	3.63	34	150	1.9	22	5.59	1.0	17	41	3150	23.6	30
McL- BH10M- 24- 34- 080813	3.47	3.31	10.6	3.08	35	180	1.9	23	3.81	1.2	31	38	2700	28.7	30

***** See Appendix Page for comments regarding this certificate *****

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PO BOX 3445
BUTTE MT 59702

Finalized Date: 28- AUG- 2013
Account: PIOTEC

Project: McLaren Tailings Abandoned

CERTIFICATE OF ANALYSIS WN13146279

Sample Description / Method / Analyte / Units / LOR	ME- ICP61 K % 0.01	ME- ICP61 La ppm 10	ME- ICP61 Mg % 0.01	ME- ICP61 Mn ppm 5	ME- ICP61 Mo ppm 1	ME- ICP61 Na % 0.01	ME- ICP61 Ni ppm 1	ME- ICP61 P ppm 10	ME- ICP61 Pb ppm 2	ME- ICP61 S % 0.01	ME- ICP61 Sb ppm 5	ME- ICP61 Sc ppm 1	ME- ICP61 Sr ppm 1	ME- ICP61 Th ppm 20	ME- ICP61 Ti % 0.01
McL- BH1M- 0- 8- 080513	1.32	20	1.28	344	2	0.41	16	560	90	>10.0	<5	5	173	<20	0.16
McL- BH2M- 0- 8- 080513	1.26	20	1.19	414	2	0.54	15	560	68	>10.0	<5	5	163	<20	0.14
McL- BH2M- 8- 16- 080513	1.25	20	1.35	471	2	0.36	16	550	74	>10.0	<5	5	164	<20	0.15
McL- BH2M- 16- 24- 080513	1.27	20	1.55	503	2	0.38	17	540	69	>10.0	<5	5	173	<20	0.15
McL- BH2M- 24- 32- 080513	1.09	20	0.96	399	1	0.25	16	470	71	>10.0	<5	4	112	<20	0.13
McL- BH2M- 32- 36.5- 080513	1.28	20	1.22	540	3	0.26	14	580	119	>10.0	<5	5	130	<20	0.15
McL- BH5M- 0- 8- 080713	1.36	20	1.18	398	1	0.38	15	490	75	8.22	<5	5	154	<20	0.15
McL- BH5M- 8- 16- 080713	1.34	20	1.29	430	1	0.38	15	500	79	>10.0	<5	5	161	<20	0.15
McL- BH5M- 16- 24- 080713	1.34	20	1.22	491	2	0.32	19	580	81	>10.0	<5	5	136	<20	0.15
McL- BH5M- 24- 32- 080713	1.23	20	1.38	434	1	0.36	16	500	69	>10.0	<5	5	159	<20	0.14
McL- BH5M- 32- 40- 080713	1.23	20	1.12	463	2	0.25	15	530	83	>10.0	<5	5	118	<20	0.14
McL- BH5M- 40- 44.75- 080713	1.22	20	1.05	459	2	0.22	13	580	88	>10.0	<5	5	117	<20	0.14
McL- BH4M- 0- 8- 080613	1.34	20	1.28	415	2	0.34	16	530	79	9.24	<5	5	153	<20	0.15
McL- BH4M- 8- 16- 080613	1.07	20	1.00	383	2	0.26	14	440	75	>10.0	<5	4	120	<20	0.12
McL- BH4M- 16- 24- 080613	1.12	20	1.13	446	1	0.30	16	490	66	>10.0	<5	5	135	<20	0.13
McL- BH4M- 24- 32- 080613	1.11	20	1.04	291	1	0.25	12	430	65	>10.0	<5	4	120	<20	0.13
McL- BH4M- 32- 43.1- 080613	1.22	20	1.47	500	2	0.36	21	550	74	>10.0	<5	5	169	<20	0.15
McL- BH3M- 0- 8- 080613	1.08	20	1.30	373	1	0.40	17	480	74	>10.0	<5	5	176	<20	0.14
McL- BH3M- 8- 16- 080613	1.42	30	1.25	505	3	0.38	18	580	90	9.70	<5	5	158	<20	0.15
McL- BH3M- 16- 24- 080613	1.19	20	0.96	393	2	0.32	16	500	72	>10.0	<5	5	132	<20	0.13
McL- BH3M- 24- 30.5- 808613	1.18	20	1.13	351	2	0.34	17	500	85	>10.0	23	5	138	<20	0.14
McL- BH7M- 0- 8- 080613	1.44	20	1.36	385	1	0.57	17	570	79	6.77	<5	6	220	<20	0.17
McL- BH7M- 8- 16- 080613	1.27	20	1.35	475	3	0.45	19	500	68	>10.0	<5	5	178	<20	0.15
McL- BH7M- 16- 24- 080613	1.36	20	1.26	432	1	0.35	16	550	84	9.19	<5	5	150	<20	0.15
McL- BH7M- 24- 34.3- 080613	1.08	20	0.96	437	2	0.27	16	460	81	>10.0	<5	4	109	<20	0.12
McL- BH11M- 0- 8- 080513	1.52	30	1.51	460	2	0.47	20	600	91	10.0	7	6	201	<20	0.17
McL- BH11M- 8- 16- 080513	1.28	30	1.21	435	3	0.31	15	540	88	>10.0	15	5	146	<20	0.15
McL- BH11M- 16- 24- 080513	0.99	20	0.94	448	2	0.21	15	420	74	>10.0	11	4	99	<20	0.11
McL- BH11M- 24- 32.5- 080513	1.34	30	1.20	363	4	0.45	16	610	102	9.90	13	5	178	<20	0.16
McL- BH12M- 0- 8- 080813	1.29	30	1.05	349	4	0.47	13	570	74	>10.0	17	5	166	<20	0.15
McL- BH12M- 8- 18.4- 080813	1.19	20	1.30	400	2	0.34	16	510	68	>10.0	7	5	158	<20	0.14
McL- BH6M- 0- 8- 080713	1.39	30	1.31	420	2	0.43	16	550	98	9.60	10	6	189	<20	0.16
McL- BH6M- 8- 16- 080713	1.32	30	1.31	494	3	0.54	15	590	76	>10.0	7	5	167	<20	0.15
McL- BH6M- 16- 24- 080713	1.37	30	1.93	482	3	0.58	19	620	70	7.50	<5	7	261	<20	0.18
McL- BH6M- 24- 32- 080713	1.48	30	1.83	614	3	0.48	19	640	96	9.77	8	7	198	<20	0.18
McL- BH6M- 32- 36.9- 080713	1.43	30	1.67	610	4	0.28	15	630	108	>10.0	9	6	133	<20	0.17
McL- BH10M- 0- 8- 080813	1.34	30	1.42	468	2	0.47	17	570	82	>10.0	10	6	202	<20	0.15
McL- BH10M- 8- 16- 080813	1.32	30	1.29	421	3	0.44	14	600	98	>10.0	9	5	189	<20	0.16
McL- BH10M- 16- 24- 080813	1.27	30	1.27	470	3	0.30	13	550	86	>10.0	9	5	148	<20	0.15
McL- BH10M- 24- 34- 080813	1.08	20	1.09	361	2	0.30	14	460	70	>10.0	20	4	132	<20	0.13

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CERTIFICATE OF ANALYSIS WN13146279

Sample Description / Method / Analyte / Units / LOR	ME- ICP61 Tl ppm 10	ME- ICP61 U ppm 10	ME- ICP61 V ppm 1	ME- ICP61 W ppm 10	ME- ICP61 Zn ppm 2
McL- BH1M- 0- 8- 080513	<10	<10	37	120	122
McL- BH2M- 0- 8- 080513	<10	<10	35	80	113
McL- BH2M- 8- 16- 080513	<10	<10	37	90	138
McL- BH2M- 16- 24- 080513	<10	10	36	90	133
McL- BH2M- 24- 32- 080513	<10	<10	29	150	109
McL- BH2M- 32- 36.5- 080513	<10	<10	34	110	148
McL- BH5M- 0- 8- 080713	<10	<10	36	110	122
McL- BH5M- 8- 16- 080713	<10	<10	36	90	123
McL- BH5M- 16- 24- 080713	<10	<10	36	90	138
McL- BH5M- 24- 32- 080713	<10	<10	36	90	130
McL- BH5M- 32- 40- 080713	<10	<10	32	130	132
McL- BH5M- 40- 44.75- 080713	<10	<10	32	120	140
McL- BH4M- 0- 8- 080613	<10	<10	36	100	134
McL- BH4M- 8- 16- 080613	10	<10	30	110	124
McL- BH4M- 16- 24- 080613	<10	<10	31	110	121
McL- BH4M- 24- 32- 080613	<10	<10	30	130	104
McL- BH4M- 32- 43.1- 080613	<10	<10	36	110	127
McL- BH3M- 0- 8- 080613	<10	<10	34	110	131
McL- BH3M- 8- 16- 080613	<10	<10	38	90	146
McL- BH3M- 16- 24- 080613	<10	<10	32	90	113
McL- BH3M- 24- 30.5- 808613	<10	<10	35	110	116
McL- BH7M- 0- 8- 080613	<10	<10	43	110	120
McL- BH7M- 8- 16- 080613	<10	<10	36	100	129
McL- BH7M- 16- 24- 080613	<10	<10	36	100	131
McL- BH7M- 24- 34.3- 080613	<10	<10	30	80	131
McL- BH11M- 0- 8- 080513	<10	<10	42	90	138
McL- BH11M- 8- 16- 080513	<10	<10	34	110	128
McL- BH11M- 16- 24- 080513	<10	10	27	110	118
McL- BH11M- 24- 32.5- 080513	<10	10	40	110	127
McL- BH12M- 0- 8- 080813	<10	<10	34	100	105
McL- BH12M- 8- 18.4- 080813	<10	10	35	100	108
McL- BH6M- 0- 8- 080713	<10	10	40	120	124
McL- BH6M- 8- 16- 080713	<10	<10	36	90	140
McL- BH6M- 16- 24- 080713	<10	<10	46	90	114
McL- BH6M- 24- 32- 080713	<10	10	43	90	150
McL- BH6M- 32- 36.9- 080713	<10	<10	37	110	161
McL- BH10M- 0- 8- 080813	<10	10	40	90	122
McL- BH10M- 8- 16- 080813	<10	10	38	130	146
McL- BH10M- 16- 24- 080813	<10	10	35	120	135
McL- BH10M- 24- 34- 080813	<10	10	31	140	114

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CERTIFICATE OF ANALYSIS WN13146279

Sample Description	Method / Analyte / Units / LOR	WEI- 21 Recvd Wt. kg 0.02	Au- AA23 Au ppm 0.005	ME- ICP61 Ag ppm 0.5	ME- ICP61 Al % 0.01	ME- ICP61 As ppm 5	ME- ICP61 Ba ppm 10	ME- ICP61 Be ppm 0.5	ME- ICP61 Bi ppm 2	ME- ICP61 Ca % 0.01	ME- ICP61 Cd ppm 0.5	ME- ICP61 Co ppm 1	ME- ICP61 Cr ppm 1	ME- ICP61 Cu ppm 1	ME- ICP61 Fe % 0.01	ME- ICP61 Ga ppm 10
McL- BH9M- 0- 8- 080713		3.00	2.62	12.3	4.10	39	180	2.5	26	4.19	1.0	16	52	2000	23.7	30
McL- BH9M- 8- 16- 080713		3.07	2.82	11.0	3.71	49	210	2.4	29	4.61	1.1	14	45	2670	24.6	30
McL- BH9M- 16- 24- 080713		2.63	2.92	10.6	4.16	39	140	2.0	19	4.46	1.2	15	52	2640	21.7	30
McL- BH9M- 24- 32- 080813		2.67	4.05	10.8	2.92	39	180	2.0	18	3.45	0.7	21	35	3020	27.9	30
McL- BH9M- 32- 42- 080813		3.41	4.20	12.6	2.82	49	170	2.3	24	3.13	1.3	23	33	2990	30.0	30
McL- BH8M- 0- 8- 080713		1.54	2.47	11.6	4.09	41	210	2.3	21	4.91	1.0	10	52	2020	21.0	30
McL- BH8M- 8- 16- 080713		1.85	2.80	10.7	3.63	36	160	2.0	23	5.74	1.0	15	43	2790	22.5	30
McL- BH8M- 16- 24- 080713		2.69	3.32	12.7	3.83	36	170	2.4	27	5.02	1.1	13	43	2470	23.1	30
McL- BH8M- 24- 32- 080713		2.04	3.86	10.4	3.12	37	150	1.9	20	3.89	0.9	23	34	3060	27.9	30
McL- BH8M- 32- 40- 080713		3.13	3.73	12.1	2.85	50	160	2.1	26	4.45	1.1	22	35	2340	27.8	30
McL- BH8M- 40- 46.75- 080713		2.40	2.92	10.9	3.54	46	170	1.9	23	6.94	0.9	17	43	2300	22.2	30

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Sample Description	Method / Analyte / Units / LOR	ME- ICP61 K % 0.01	ME- ICP61 La ppm 10	ME- ICP61 Mg % 0.01	ME- ICP61 Mn ppm 5	ME- ICP61 Mo ppm 1	ME- ICP61 Na % 0.01	ME- ICP61 Ni ppm 1	ME- ICP61 P ppm 10	ME- ICP61 Pb ppm 2	ME- ICP61 S % 0.01	ME- ICP61 Sb ppm 5	ME- ICP61 Sc ppm 1	ME- ICP61 Sr ppm 1	ME- ICP61 Th ppm 20	ME- ICP61 Ti % 0.01
McL- BH9M- 0- 8- 080713		1.49	30	1.34	406	2	0.44	13	580	91	9.97	6	6	179	<20	0.17
McL- BH9M- 8- 16- 080713		1.35	30	1.22	418	3	0.33	13	580	86	>10.0	12	5	158	<20	0.15
McL- BH9M- 16- 24- 080713		1.41	30	1.18	505	4	0.43	20	640	90	>10.0	10	6	166	<20	0.17
McL- BH9M- 24- 32- 080813		1.02	20	0.88	309	3	0.23	12	450	62	>10.0	6	4	106	<20	0.11
McL- BH9M- 32- 42- 080813		1.04	20	0.97	298	2	0.19	10	430	70	>10.0	10	4	96	<20	0.12
McL- BH8M- 0- 8- 080713		1.41	30	1.34	408	2	0.49	18	600	91	8.83	<5	6	200	<20	0.17
McL- BH8M- 8- 16- 080713		1.24	30	1.41	503	2	0.34	16	540	95	>10.0	9	5	163	<20	0.15
McL- BH8M- 16- 24- 080713		1.37	30	1.27	481	4	0.35	13	570	94	>10.0	9	5	158	<20	0.15
McL- BH8M- 24- 32- 080713		1.08	20	1.11	412	3	0.24	13	490	71	>10.0	8	4	120	<20	0.12
McL- BH8M- 32- 40- 080713		1.03	30	0.97	251	2	0.24	13	420	62	>10.0	11	4	120	<20	0.12
McL- BH8M- 40- 46.75- 080713		1.20	30	1.42	450	3	0.36	11	550	84	>10.0	7	5	177	<20	0.15

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McL- BH9M- 0- 8- 080713		<10	10	40	120	129
McL- BH9M- 8- 16- 080713		<10	10	38	120	146
McL- BH9M- 16- 24- 080713		<10	10	42	90	147
McL- BH9M- 24- 32- 080813		<10	10	28	130	109
McL- BH9M- 32- 42- 080813		<10	10	27	140	106
McL- BH8M- 0- 8- 080713		<10	<10	43	90	121
McL- BH8M- 8- 16- 080713		<10	10	37	100	133
McL- BH8M- 16- 24- 080713		<10	10	38	110	152
McL- BH8M- 24- 32- 080713		<10	10	30	120	117
McL- BH8M- 32- 40- 080713		<10	10	29	160	96
McL- BH8M- 40- 46.75- 080713		<10	10	37	100	133

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CERTIFICATE COMMENTS

LABORATORY ADDRESSES

Processed at ALS Reno located at 4977 Energy Way, Reno, NV, USA.
Applies to Method: Au- AA23

Processed at ALS Winnemucca located at 3275 Fountain Way, Winnemucca, NV, USA.
Applies to Method: DRY- 22 LOG- 22 SCR- 41 WEI- 21

Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.
Applies to Method: ME- ICP61

Appendix D-2

Energy Laboratory–Environmental

ANALYTICAL SUMMARY REPORT

August 28, 2013

MT DEQ-Abandoned Mines
PO Box 200901
Helena, MT 59620-0901

Workorder No.: H13080211 Quote ID: H887

Project Name: McLaren Tailings Project

Energy Laboratories Inc Helena MT received the following 4 samples for MT DEQ-Abandoned Mines on 8/12/2013 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H13080211-001	MCL-ENV-G1-080813	08/08/13 8:21	08/12/13	Soil	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Organic Carbon/Matter Walkley-Black pH, Saturated Paste Digestion, Total Metals Digestion, Mercury by CVAA Total Organic Matter Prep Saturated Paste Extraction Soil Preparation
H13080211-002	MCL-Env-G2-080813	08/08/13 16:13	08/12/13	Soil	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Organic Carbon/Matter Walkley-Black pH, Saturated Paste Digestion, Total Metals Digestion, Mercury by CVAA Total Organic Matter Prep Saturated Paste Extraction
H13080211-003	MCL-Env-G3-080813	08/08/13 15:08	08/12/13	Soil	Same As Above
H13080211-004	MCL-Env-G4-080813	08/08/13 8:17	08/12/13	Soil	Same As Above

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: MT DEQ-Abandoned Mines
Project: McLaren Tailings Project
Lab ID: H13080211-001
Client Sample ID MCL-ENV-G1-080813

Report Date: 08/28/13
Collection Date: 08/08/13 08:21
DateReceived: 08/12/13
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
SATURATED PASTE							
pH, sat. paste	11.0	s.u.		0.1		ASAM10-3.2	08/23/13 09:07 / sah
CHEMICAL CHARACTERISTICS							
Organic Matter	1.6	%		0.2		ASA29-3	08/26/13 10:50 / sah
3050 EXTRACTABLE METALS							
Aluminum	10000	mg/kg		5		SW6010B	08/26/13 14:34 / sld
Antimony	ND	mg/kg		1		SW6020	08/26/13 23:23 / dck
Arsenic	23	mg/kg	D	8		SW6010B	08/26/13 14:34 / sld
Barium	77	mg/kg		1		SW6010B	08/26/13 14:34 / sld
Cadmium	ND	mg/kg		1		SW6020	08/26/13 23:23 / dck
Chromium	25	mg/kg	D	2		SW6010B	08/26/13 14:34 / sld
Cobalt	12	mg/kg		1		SW6020	08/26/13 23:23 / dck
Copper	1980	mg/kg	D	3		SW6010B	08/26/13 14:34 / sld
Iron	147000	mg/kg	D	20		SW6010B	08/26/13 18:45 / sld
Lead	65	mg/kg	D	10		SW6010B	08/26/13 14:34 / sld
Manganese	354	mg/kg		1		SW6010B	08/26/13 14:34 / sld
Nickel	14	mg/kg		1		SW6010B	08/26/13 14:34 / sld
Zinc	100	mg/kg		1		SW6010B	08/26/13 14:34 / sld
METALS, TOTAL							
Mercury	ND	mg/kg		0.50		SW7471A	08/23/13 11:35 / sbk

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: MT DEQ-Abandoned Mines
Project: McLaren Tailings Project
Lab ID: H13080211-002
Client Sample ID MCL-Env-G2-080813

Report Date: 08/28/13
Collection Date: 08/08/13 16:13
DateReceived: 08/12/13
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
SATURATED PASTE							
pH, sat. paste	11.5	s.u.		0.1		ASAM10-3.2	08/23/13 09:08 / sah
CHEMICAL CHARACTERISTICS							
Organic Matter	1.4	%		0.2		ASA29-3	08/26/13 10:50 / sah
3050 EXTRACTABLE METALS							
Aluminum	9720	mg/kg		5		SW6010B	08/26/13 14:38 / sld
Antimony	ND	mg/kg		1		SW6020	08/26/13 23:28 / dck
Arsenic	22	mg/kg	D	8		SW6010B	08/26/13 14:38 / sld
Barium	71	mg/kg		1		SW6010B	08/26/13 14:38 / sld
Cadmium	ND	mg/kg		1		SW6020	08/26/13 23:28 / dck
Chromium	27	mg/kg	D	2		SW6010B	08/26/13 14:38 / sld
Cobalt	13	mg/kg		1		SW6020	08/26/13 23:28 / dck
Copper	1690	mg/kg	D	3		SW6010B	08/26/13 14:38 / sld
Iron	144000	mg/kg	D	20		SW6010B	08/26/13 18:49 / sld
Lead	60	mg/kg	D	10		SW6010B	08/26/13 14:38 / sld
Manganese	282	mg/kg		1		SW6010B	08/26/13 14:38 / sld
Nickel	16	mg/kg		1		SW6010B	08/26/13 14:38 / sld
Zinc	92	mg/kg		1		SW6010B	08/26/13 14:38 / sld
METALS, TOTAL							
Mercury	ND	mg/kg		0.50		SW7471A	08/23/13 11:38 / sbk

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: MT DEQ-Abandoned Mines
Project: McLaren Tailings Project
Lab ID: H13080211-003
Client Sample ID MCL-Env-G3-080813

Report Date: 08/28/13
Collection Date: 08/08/13 15:08
DateReceived: 08/12/13
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
SATURATED PASTE							
pH, sat. paste	11.4	s.u.		0.1		ASAM10-3.2	08/23/13 09:09 / sah
CHEMICAL CHARACTERISTICS							
Organic Matter	1.4	%		0.2		ASA29-3	08/26/13 10:50 / sah
3050 EXTRACTABLE METALS							
Aluminum	10500	mg/kg		5		SW6010B	08/26/13 14:42 / sld
Antimony	ND	mg/kg		1		SW6020	08/26/13 23:33 / dck
Arsenic	26	mg/kg	D	8		SW6010B	08/26/13 14:42 / sld
Barium	77	mg/kg		1		SW6010B	08/26/13 14:42 / sld
Cadmium	ND	mg/kg		1		SW6020	08/26/13 23:33 / dck
Chromium	28	mg/kg	D	2		SW6010B	08/26/13 14:42 / sld
Cobalt	12	mg/kg		1		SW6020	08/26/13 23:33 / dck
Copper	1840	mg/kg	D	3		SW6010B	08/26/13 14:42 / sld
Iron	161000	mg/kg	D	20		SW6010B	08/26/13 18:53 / sld
Lead	61	mg/kg	D	10		SW6010B	08/26/13 14:42 / sld
Manganese	312	mg/kg		1		SW6010B	08/26/13 14:42 / sld
Nickel	15	mg/kg		1		SW6010B	08/26/13 14:42 / sld
Zinc	107	mg/kg		1		SW6010B	08/26/13 14:42 / sld
METALS, TOTAL							
Mercury	ND	mg/kg		0.50		SW7471A	08/23/13 11:40 / sbk

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: MT DEQ-Abandoned Mines
Project: McLaren Tailings Project
Lab ID: H13080211-004
Client Sample ID MCL-Env-G4-080813

Report Date: 08/28/13
Collection Date: 08/08/13 08:17
DateReceived: 08/12/13
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
SATURATED PASTE							
pH, sat. paste	12.1	s.u.		0.1		ASAM10-3.2	08/23/13 09:10 / sah
CHEMICAL CHARACTERISTICS							
Organic Matter	1.3	%		0.2		ASA29-3	08/26/13 10:50 / sah
3050 EXTRACTABLE METALS							
Aluminum	10200	mg/kg		5		SW6010B	08/26/13 14:46 / sld
Antimony	ND	mg/kg		1		SW6020	08/26/13 23:56 / dck
Arsenic	24	mg/kg	D	8		SW6010B	08/26/13 14:46 / sld
Barium	75	mg/kg		1		SW6010B	08/26/13 14:46 / sld
Cadmium	ND	mg/kg		1		SW6020	08/26/13 23:56 / dck
Chromium	27	mg/kg	D	2		SW6010B	08/26/13 14:46 / sld
Cobalt	10	mg/kg		1		SW6020	08/26/13 23:56 / dck
Copper	1760	mg/kg	D	3		SW6010B	08/26/13 14:46 / sld
Iron	147000	mg/kg	D	20		SW6010B	08/26/13 19:04 / sld
Lead	70	mg/kg	D	10		SW6010B	08/26/13 14:46 / sld
Manganese	319	mg/kg		1		SW6010B	08/26/13 14:46 / sld
Nickel	15	mg/kg		1		SW6010B	08/26/13 14:46 / sld
Zinc	95	mg/kg		1		SW6010B	08/26/13 14:46 / sld
METALS, TOTAL							
Mercury	ND	mg/kg		0.50		SW7471A	08/23/13 11:42 / sbk

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Abandoned Mines **Report Date:** 08/28/13

Project: McLaren Tailings Project **Work Order:** H13080211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA29-3										Batch: 21417
Sample ID: LCS-21417		Laboratory Control Sample				Run: MISC SOILS_130826B				08/26/13 10:50
Organic Matter		1.30	%	0.17	95	70	130			
Sample ID: H13080211-004ADUP		Sample Duplicate				Run: MISC SOILS_130826B				08/26/13 10:50
Organic Matter		1.34	%	0.17						

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Abandoned Mines **Report Date:** 08/28/13

Project: McLaren Tailings Project **Work Order:** H13080211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASAM10-3.2								Analytical Run: SOIL PH METER_130826A		
Sample ID: CCV_1_130822_1		Continuing Calibration Verification Standard								08/23/13 09:04
pH, sat. paste		6.98	s.u.	0.10	100	98.6	101.4			
Sample ID: CCV1_1_130822_1		Continuing Calibration Verification Standard								08/23/13 09:05
pH, sat. paste		4.00	s.u.	0.10	100	97.5	102.5			
Sample ID: ICV_1_130822_1		Initial Calibration Verification Standard								08/23/13 09:05
pH, sat. paste		9.98	s.u.	0.10	100	99	101			
Sample ID: ICV_1_130822_1		Initial Calibration Verification Standard								08/23/13 08:18
pH, sat. paste		9.97	s.u.	0.10	100	99	101			
Sample ID: ICV_1_130822_1		Initial Calibration Verification Standard								08/23/13 08:44
pH, sat. paste		9.98	s.u.	0.10	100	99	101			
Sample ID: ICV_1_130821_1		Initial Calibration Verification Standard								08/22/13 07:53
pH, sat. paste		9.99	s.u.	0.10	100	99	101			
Method: ASAM10-3.2										Batch: 21396
Sample ID: LCS-21396		Laboratory Control Sample				Run: SOIL PH METER_130826A				08/23/13 09:06
pH, sat. paste		7.63	s.u.	0.10	100	95	105			
Sample ID: H13080211-004ADUP		Sample Duplicate				Run: SOIL PH METER_130826A				08/23/13 09:11
pH, sat. paste		12.1	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-Abandoned Mines **Report Date:** 08/28/13

Project: McLaren Tailings Project **Work Order:** H13080211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Analytical Run: ICP2-HE_130826A	
Sample ID: ICV	10	Initial Calibration Verification Standard							08/26/13 09:04	
Aluminum		4.04	mg/L	0.10	101	90	110			
Arsenic		0.818	mg/L	0.012	102	90	110			
Barium		0.809	mg/L	0.10	101	90	110			
Chromium		0.778	mg/L	0.010	97	90	110			
Copper		0.796	mg/L	0.010	100	90	110			
Iron		3.91	mg/L	0.030	98	90	110			
Lead		0.812	mg/L	0.019	101	90	110			
Manganese		3.92	mg/L	0.010	98	90	110			
Nickel		0.768	mg/L	0.010	96	90	110			
Zinc		0.817	mg/L	0.010	102	90	110			
Sample ID: ICSA	10	Interference Check Sample A							08/26/13 09:18	
Aluminum		508	mg/L	0.10	102	80	120			
Arsenic		-0.00247	mg/L	0.012		0	0			
Barium		0.000210	mg/L	0.10		0	0			
Chromium		0.000940	mg/L	0.010		0	0			
Copper		0.00200	mg/L	0.010		0	0			
Iron		183	mg/L	0.030	92	80	120			
Lead		-0.00792	mg/L	0.019		0	0			
Manganese		0.00335	mg/L	0.010		0	0			
Nickel		0.00649	mg/L	0.010		0	0			
Zinc		0.0114	mg/L	0.010		0	0			
Sample ID: ICSAB	10	Interference Check Sample AB							08/26/13 09:22	
Aluminum		512	mg/L	0.10	102	80	120			
Arsenic		1.15	mg/L	0.012	115	80	120			
Barium		0.510	mg/L	0.10	102	80	120			
Chromium		0.469	mg/L	0.010	94	80	120			
Copper		0.502	mg/L	0.010	100	80	120			
Iron		185	mg/L	0.030	92	80	120			
Lead		0.915	mg/L	0.019	91	80	120			
Manganese		0.472	mg/L	0.010	94	80	120			
Nickel		0.897	mg/L	0.010	90	80	120			
Zinc		1.02	mg/L	0.010	102	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-Abandoned Mines **Report Date:** 08/28/13

Project: McLaren Tailings Project **Work Order:** H13080211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 21399
Sample ID: MB-21399	10	Method Blank				Run: ICP2-HE_130826A				08/26/13 14:12
Aluminum		0.9	mg/kg	0.5						
Arsenic		ND	mg/kg	0.8						
Barium		ND	mg/kg	0.02						
Chromium		ND	mg/kg	0.2						
Copper		ND	mg/kg	0.3						
Iron		2	mg/kg	0.4						
Lead		ND	mg/kg	1						
Manganese		ND	mg/kg	0.03						
Nickel		ND	mg/kg	0.10						
Zinc		0.1	mg/kg	0.1						
Sample ID: LFB-21399	10	Laboratory Fortified Blank				Run: ICP2-HE_130826A				08/26/13 14:16
Aluminum		258	mg/kg	5.0	103	80	120			
Arsenic		47.7	mg/kg	1.0	95	80	120			
Barium		52.5	mg/kg	1.0	105	80	120			
Chromium		50.2	mg/kg	1.0	100	80	120			
Copper		50.7	mg/kg	1.0	101	80	120			
Iron		253	mg/kg	5.0	100	80	120			
Lead		47.2	mg/kg	1.3	94	80	120			
Manganese		246	mg/kg	1.0	98	80	120			
Nickel		49.4	mg/kg	1.0	99	80	120			
Zinc		48.2	mg/kg	1.0	96	80	120			
Sample ID: LCS-21399	10	Laboratory Control Sample				Run: ICP2-HE_130826A				08/26/13 14:20
Aluminum		12600	mg/kg	5.0	88	50.7	131.3			
Arsenic		260	mg/kg	3.8	77	72.3	106.4			
Barium		558	mg/kg	1.0	93	80.6	112.2			
Chromium		65.4	mg/kg	1.0	88	72.8	109.1			
Copper		247	mg/kg	1.3	90	77.5	109.6			
Iron		18900	mg/kg	5.0	84	39.6	138.3			
Lead		164	mg/kg	6.2	90	75.9	108.6			
Manganese		372	mg/kg	1.0	103	80.8	115.7			
Nickel		52.0	mg/kg	1.0	87	72.3	103.4			
Zinc		181	mg/kg	1.0	87	74.2	109.9			
Sample ID: H13080211-004AMS	10	Sample Matrix Spike				Run: ICP2-HE_130826A				08/26/13 15:04
Aluminum		12100	mg/kg	5.0		75	125			A
Arsenic		68.3	mg/kg	7.6	91	75	125			
Barium		130	mg/kg	1.0	112	75	125			
Chromium		75.8	mg/kg	1.7	100	75	125			
Copper		1760	mg/kg	2.6		75	125			A
Iron		136000	mg/kg	5.0		75	125			A
Lead		112	mg/kg	12	85	75	125			
Manganese		563	mg/kg	1.0	100	75	125			
Nickel		61.8	mg/kg	1.0	95	75	125			

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.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: MT DEQ-Abandoned Mines **Report Date:** 08/28/13

Project: McLaren Tailings Project **Work Order:** H13080211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B										Batch: 21399
Sample ID: H13080211-004AMS	10	Sample Matrix Spike				Run: ICP2-HE_130826A			08/26/13 15:04	
Zinc		142	mg/kg	1.2	95	75	125			
Sample ID: H13080211-004AMSD	10	Sample Matrix Spike Duplicate				Run: ICP2-HE_130826A			08/26/13 15:08	
Aluminum		12900	mg/kg	5.0		75	125	6.4	20	A
Arsenic		69.3	mg/kg	7.6	93	75	125	1.4	20	
Barium		135	mg/kg	1.0	122	75	125	3.5	20	
Chromium		75.8	mg/kg	1.7	100	75	125	0.0	20	
Copper		1890	mg/kg	2.6		75	125	7.1	20	A
Iron		144000	mg/kg	5.0		75	125	5.6	20	A
Lead		110	mg/kg	12	81	75	125	1.6	20	
Manganese		565	mg/kg	1.0	101	75	125	0.5	20	
Nickel		62.5	mg/kg	1.0	96	75	125	1.2	20	
Zinc		146	mg/kg	1.2	103	75	125	2.7	20	
Sample ID: H13080211-004AMS	10	Sample Matrix Spike				Run: ICP2-HE_130826A			08/26/13 19:15	
Aluminum		12200	mg/kg	24		75	125			A
Arsenic		78.0	mg/kg	38	159	75	125			S
Barium		131	mg/kg	1.0	115	75	125			
Chromium		64.2	mg/kg	8.6	104	75	125			
Copper		1790	mg/kg	13		75	125			A
Iron		144000	mg/kg	19		75	125			A
Lead		126	mg/kg	62	84	75	125			
Manganese		584	mg/kg	1.5	104	75	125			
Nickel		61.9	mg/kg	4.8	93	75	125			
Zinc		152	mg/kg	5.8	97	75	125			
Sample ID: H13080211-004AMSD	10	Sample Matrix Spike Duplicate				Run: ICP2-HE_130826A			08/26/13 19:18	
Aluminum		12600	mg/kg	24		75	125	3.3	20	A
Arsenic		74.8	mg/kg	38	153	75	125	4.2	20	S
Barium		131	mg/kg	1.0	116	75	125	0.5	20	
Chromium		65.6	mg/kg	8.6	107	75	125	2.2	20	
Copper		1860	mg/kg	13		75	125	4.0	20	A
Iron		150000	mg/kg	19		75	125	3.6	20	A
Lead		117	mg/kg	62	66	75	125	7.2	20	S
Manganese		567	mg/kg	1.5	97	75	125	2.9	20	
Nickel		64.4	mg/kg	4.8	98	75	125	3.9	20	
Zinc		155	mg/kg	5.8	102	75	125	1.8	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-Abandoned Mines **Report Date:** 08/28/13

Project: McLaren Tailings Project **Work Order:** H13080211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Analytical Run: ICPMS204-B_130826C	
Sample ID: ICV STD	3	Initial Calibration Verification Standard							08/26/13 19:36	
Antimony		0.0624	mg/L	0.0010	104	90	110			
Cadmium		0.0324	mg/L	0.0010	108	90	110			
Cobalt		0.0628	mg/L	0.0010	105	90	110			
Sample ID: ICV STD	3	Initial Calibration Verification Standard							08/28/13 03:32	
Antimony		0.0601	mg/L	0.0010	100	90	110			
Cadmium		0.0312	mg/L	0.0010	104	90	110			
Cobalt		0.0617	mg/L	0.0010	103	90	110			
Method: SW6020										Batch: 21399
Sample ID: MB-21399	3	Method Blank				Run: ICPMS204-B_130826C			08/26/13 22:51	
Antimony		ND	mg/kg	0.08						
Cadmium		ND	mg/kg	0.07						
Cobalt		ND	mg/kg	0.03						
Sample ID: LCS-21399	3	Laboratory Control Sample				Run: ICPMS204-B_130826C			08/26/13 22:56	
Antimony		50.5	mg/kg	1.0	41	2.2	92.9			
Cadmium		126	mg/kg	1.0	94	73	105.1			
Cobalt		56.3	mg/kg	1.0	100	73.3	103.7			
Sample ID: LFB-21399	3	Laboratory Fortified Blank				Run: ICPMS204-B_130826C			08/26/13 23:00	
Antimony		54.0	mg/kg	1.0	108	80	120			
Cadmium		27.5	mg/kg	1.0	110	80	120			
Cobalt		51.5	mg/kg	1.0	103	80	120			
Sample ID: H13080211-004AMS	3	Sample Matrix Spike				Run: ICPMS204-B_130826C			08/27/13 00:05	
Antimony		9.91	mg/kg	1.0	20	75	125			S
Cadmium		26.6	mg/kg	1.0	106	75	125			
Cobalt		60.7	mg/kg	1.0	103	75	125			
Sample ID: H13080211-004AMSD	3	Sample Matrix Spike Duplicate				Run: ICPMS204-B_130826C			08/27/13 00:10	
Antimony		9.32	mg/kg	1.0	18	75	125	6.2	20	S
Cadmium		26.6	mg/kg	1.0	106	75	125	0.0	20	
Cobalt		61.6	mg/kg	1.0	105	75	125	1.5	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-Abandoned Mines **Report Date:** 08/28/13

Project: McLaren Tailings Project **Work Order:** H13080211

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW7471A									Analytical Run: HGCV201-H_130823B	
Sample ID: ICV		Initial Calibration Verification Standard							08/23/13 11:21	
Mercury		0.0011	mg/kg	0.50	106	90	110			
Sample ID: CCV		Continuing Calibration Verification Standard							08/23/13 11:23	
Mercury		0.0025	mg/kg	0.50	102	90	110			
Method: SW7471A									Batch: 21397	
Sample ID: MB-21397		Method Blank				Run: HGCV201-H_130823B			08/23/13 11:28	
Mercury		0.004	mg/kg	1E-05						
Sample ID: LCS-21397		Laboratory Control Sample				Run: HGCV201-H_130823B			08/23/13 11:30	
Mercury		5.0	mg/kg	0.50	101	80	120			
Sample ID: LFB-21397		Laboratory Fortified Blank				Run: HGCV201-H_130823B			08/23/13 11:33	
Mercury		1.1	mg/kg	0.50	112	80	120			
Sample ID: H13080211-004AMS		Sample Matrix Spike				Run: HGCV201-H_130823B			08/23/13 11:45	
Mercury		1.2	mg/kg	0.50	111	80	120			
Sample ID: H13080211-004AMSD		Sample Matrix Spike Duplicate				Run: HGCV201-H_130823B			08/23/13 11:47	
Mercury		1.2	mg/kg	0.50	106	80	120	3.7	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-Abandoned Mines H13080211

Login completed by: Tracy L. Lorash
Date Received: 8/12/2013
Reviewed by: BL2000\jweidemoyer
Received by: elm
Reviewed Date: 8/14/2013
Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all 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 in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	8.6°C On 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:

None

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page __ of __

PLEASE PRINT- Provide as much information as possible.

Company Name: Montana Department of Environmental Quality (MDEQ)	Project Name, PWS, Permit, Etc. McLaren Tailings Abandoned Mine Project	Sample Origin State: Montana	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: MDEQ, P.O. 200901, Helena, MT 59620-0901 / Pioneer Technical Services, P.O Box 3445, Butte, Montana 59702	Contact Name: Tom Henderson, Joe McElroy / Phone/Fax: 406-841-5052, 406-497-8041	Email: thenderson@mt.gov, jmcelroy@pioneer-technical.com	Sampler: (Please Print)
Invoice Address: MDEQ, P.O. 200901, Helena, MT 59620-0901 / Attention: Tom Henderson	Invoice Contact & Phone: MDEQ Tom Henderson 406-841-5052	Purchase Order:	Quote/Bottle Order:

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ GSA ☐ POTW/WWTP ☐ State: _____ ☐ Other: _____

☐ A2LA ☐ **EDD/EDT**(Electronic Data) **Format:**_____ ☐ LEVEL IV ☐ NELAC

RUSH: Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by: Hand

Cooler ID(s): Y

Receipt Temp 8.6 °C

On Ice: (Yes) No

Custody Seal Y N

Intact Y N

Signature Match Y (N)

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX (Number of Containers; Sample Type: A W S V B O; Air Water Soils/Solids Vegetation Bioassay Other)	pH	Organic Matter Content	Total Metals (Sb, Al, As, Ba, Cd, Co, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn)						SEE ATTACHED	Normal Turnaround (TAT)
1 McL-ENV-G1-080813	08-08-13	0821	S	✓	✓	✓							
2 McL-ENV-G2-080813	08-08-13	1613	S	✓	✓	✓							
3 McL-ENV-G3-080813	08-08-13	1508	S	✓	✓	✓							
4 McL-ENV-G4-080813	08-08-13	0817	S	✓	✓	✓							
5													
6													
7													
8													

LABORATORY USE ONLY: H13080211

Custody Record MUST be Signed

Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Julie Flammang	8/12/13 1100	Julie Flammang			
Keenan Gerhart	8/12/13 13:05	[signature]			

Received by Laboratory: Esther Merritt Date/Time: 8-12-13 13:05 Signature: Esther Merritt

Sample Disposal: Return to Client: _____ Lab Disposal: X

Appendix D-3

Pioneer Geotechnical Laboratory-Engineering

September 6, 2013

Mr. Tom Henderson
MDEQ
P.O. Box 200901
Helena, MT 59620-0901

RE: McLaren Tailings Abandoned Mine Project

Dear Mr. Henderson,

On August 12th, four samples from the McLaren Tailings Abandoned Mine project were delivered to our ASTM/AASHTO accredited materials testing laboratory. Table 1 contains the provided sample identification and corresponding assigned laboratory sample numbers. The testing request for the samples was:

- Sieve Analysis of Coarse and Fine Aggregate (ASTM C117, C136);
- Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318) [Atterberg Limits]; and
- Proctor Moisture/Density Relationships of Soils (ASTM D698).

Table 1 - Sample I.D. and Testing Request

Lab No.	Sample Identification	Sieve Analysis	Atterberg	Proctor
14446	McL-E-G1-080813	x	x	x
14447	McL-E-G2-080813	x	x	x
14448	McL-E-G3-080813	x	x	x
14449	McL-E-G4-080813	x	x	x

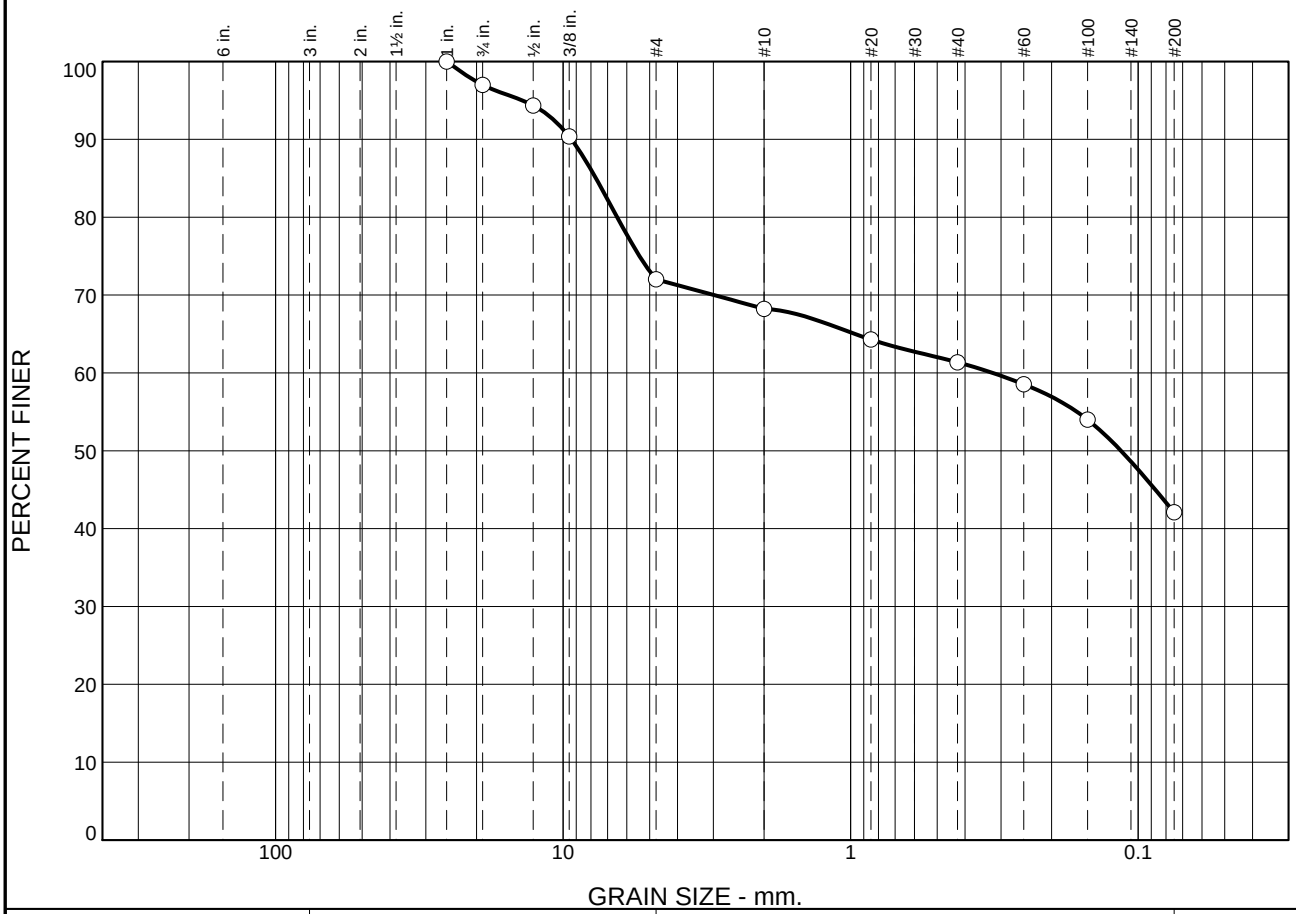
The grain-size distribution curves, Atterberg Limits chart, and the Proctor curves are included with this report. We thank you for using Pioneer Technical Services for your geotechnical and materials testing requirements. If you have any questions regarding these results, please contact Todd Lorenzen or Paul Bushnell at (406) 443-6053.

Sincerely,
PIONEER TECHNICAL SERVICES, INC.

Todd Lorenzen, P.E.
Senior Geotechnical Engineer

Paul Bushnell
Materials Testing Supervisor

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	3	25	4	7	19	42

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	97		
.5	94		
.375	90		
#4	72		
#10	68		
#20	64		
#40	61		
#60	59		
#100	54		
#200	42		

* (no specification provided)

Material Description

Tailings; Silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 9.3530 D_{85}= 7.6870 D_{60}= 0.3205
D_{50}= 0.1148 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

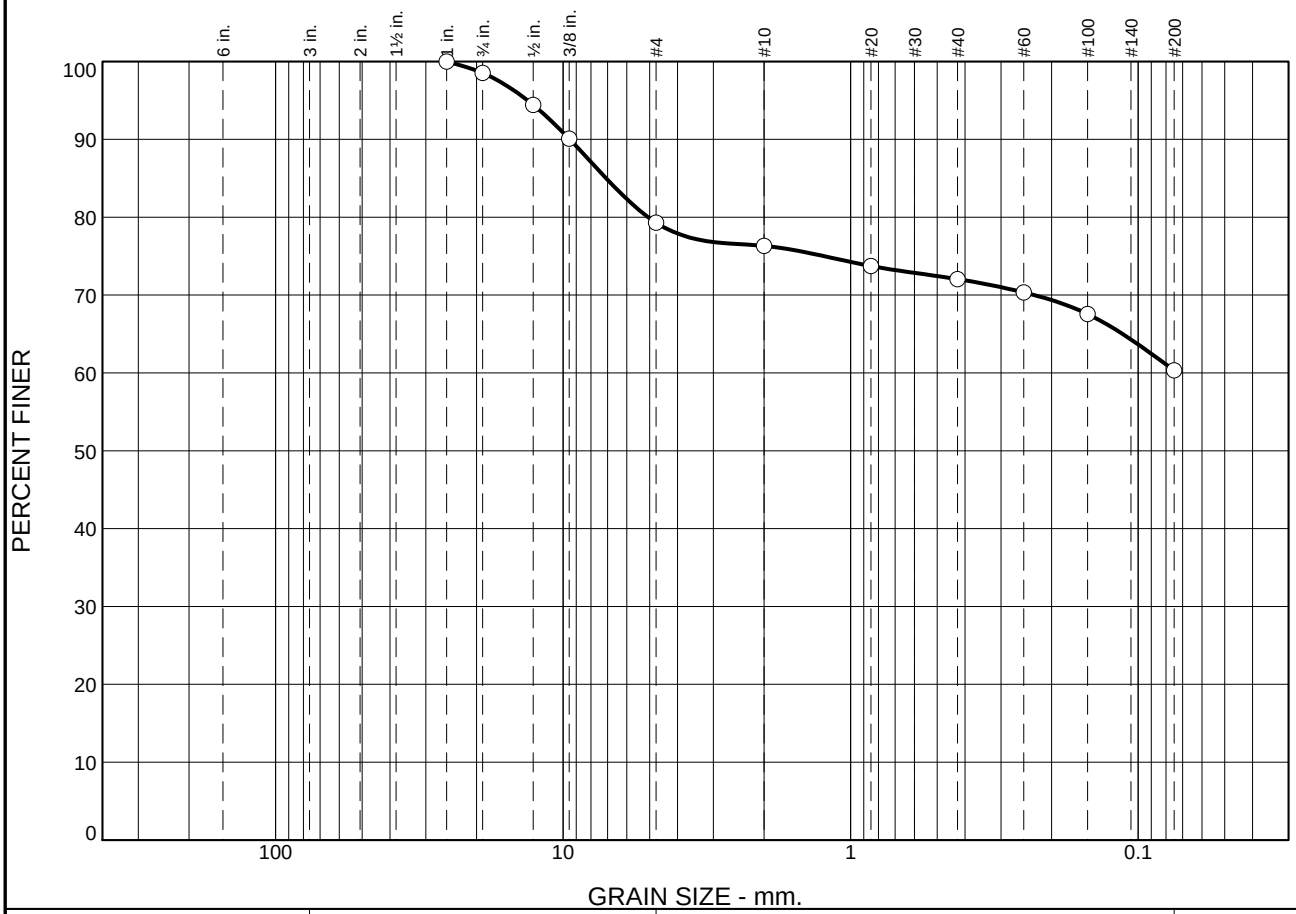
Location: MCL-E-G1-080813
Sample Number: 14446 **Date:**

PIONEER TECHNICAL SERVICES, INC.

Client: Montana DEQ
Project: McLaren Tailings Abandoned Mine Project

Project No: **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	1	20	3	4	12	60

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	99		
.5	94		
.375	90		
#4	79		
#10	76		
#20	74		
#40	72		
#60	70		
#100	68		
#200	60		

* (no specification provided)

Material Description

Tailings; Gravelly silt with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 9.4757 D_{85}= 7.0796 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

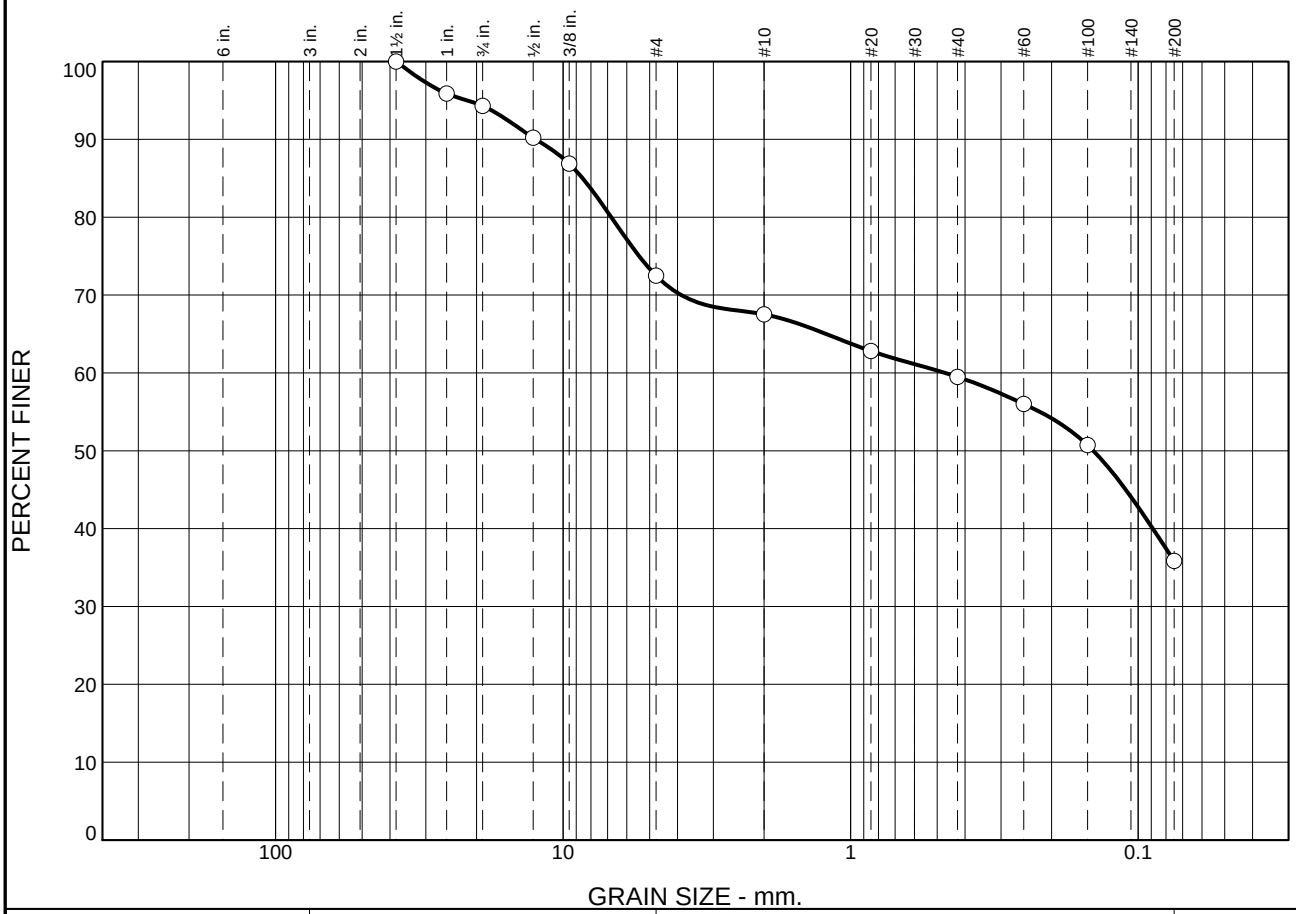
Location: MCL-E-G2-080813
Sample Number: 14447 **Date:**

PIONEER TECHNICAL SERVICES, INC.

Client: Montana DEQ
Project: McLaren Tailings Abandoned Mine Project

Project No: **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	6	22	4	9	23	36

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	96		
.75	94		
.5	90		
.375	87		
#4	72		
#10	68		
#20	63		
#40	59		
#60	56		
#100	51		
#200	36		

* (no specification provided)

Material Description

Tailings; Silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 12.4360 D_{85}= 8.5483 D_{60}= 0.4689
D_{50}= 0.1432 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

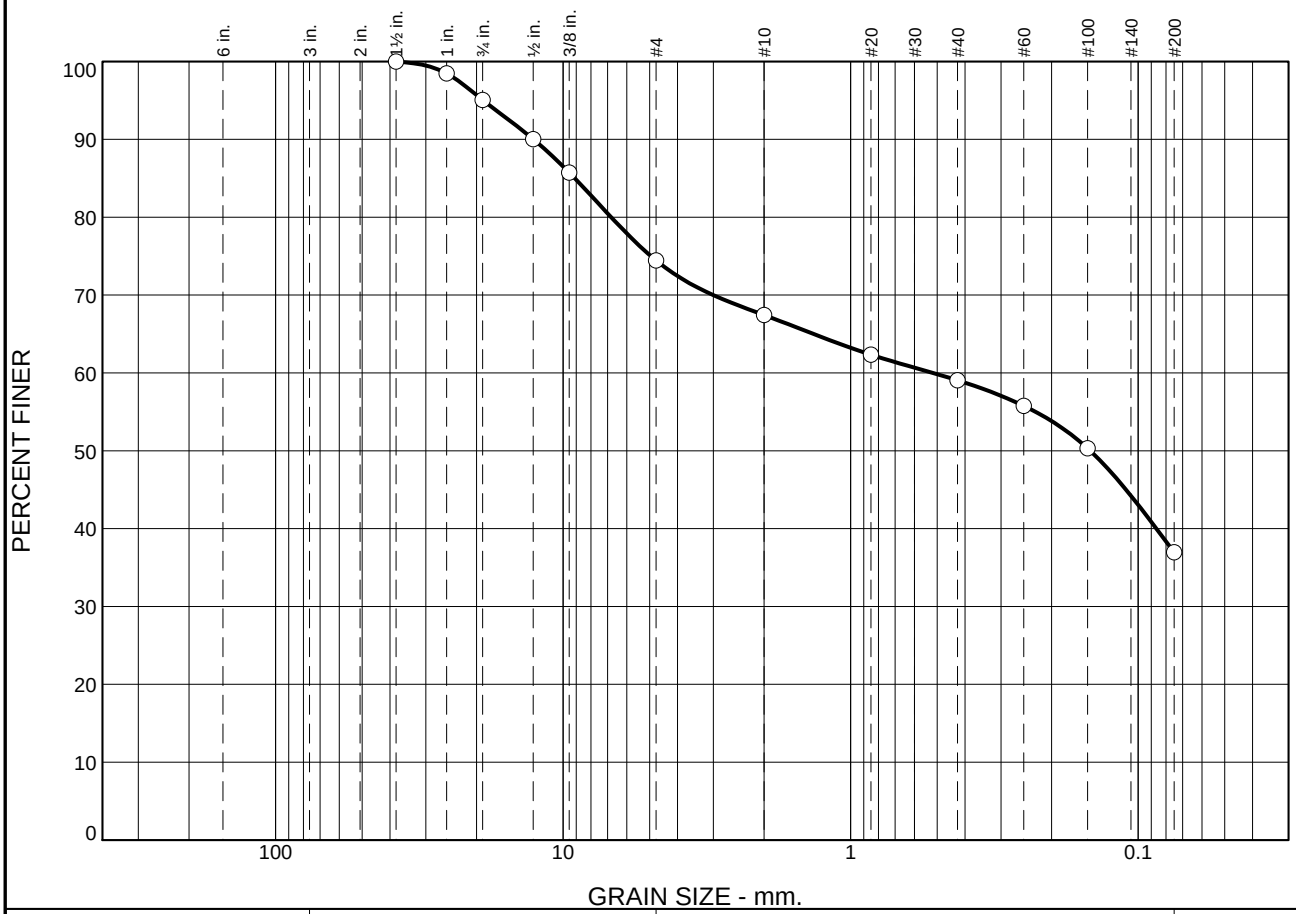
Location: MCL-E-G3-080813
Sample Number: 14448 **Date:**

PIONEER TECHNICAL SERVICES, INC.

Client: Montana DEQ
Project: McLaren Tailings Abandoned Mine Project

Project No: **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	5	21	7	8	22	37

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	98		
.75	95		
.5	90		
.375	86		
#4	74		
#10	67		
#20	62		
#40	59		
#60	56		
#100	50		
#200	37		

* (no specification provided)

Material Description

Tailings; Silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 12.6717 D_{85}= 9.1077 D_{60}= 0.5181
D_{50}= 0.1468 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

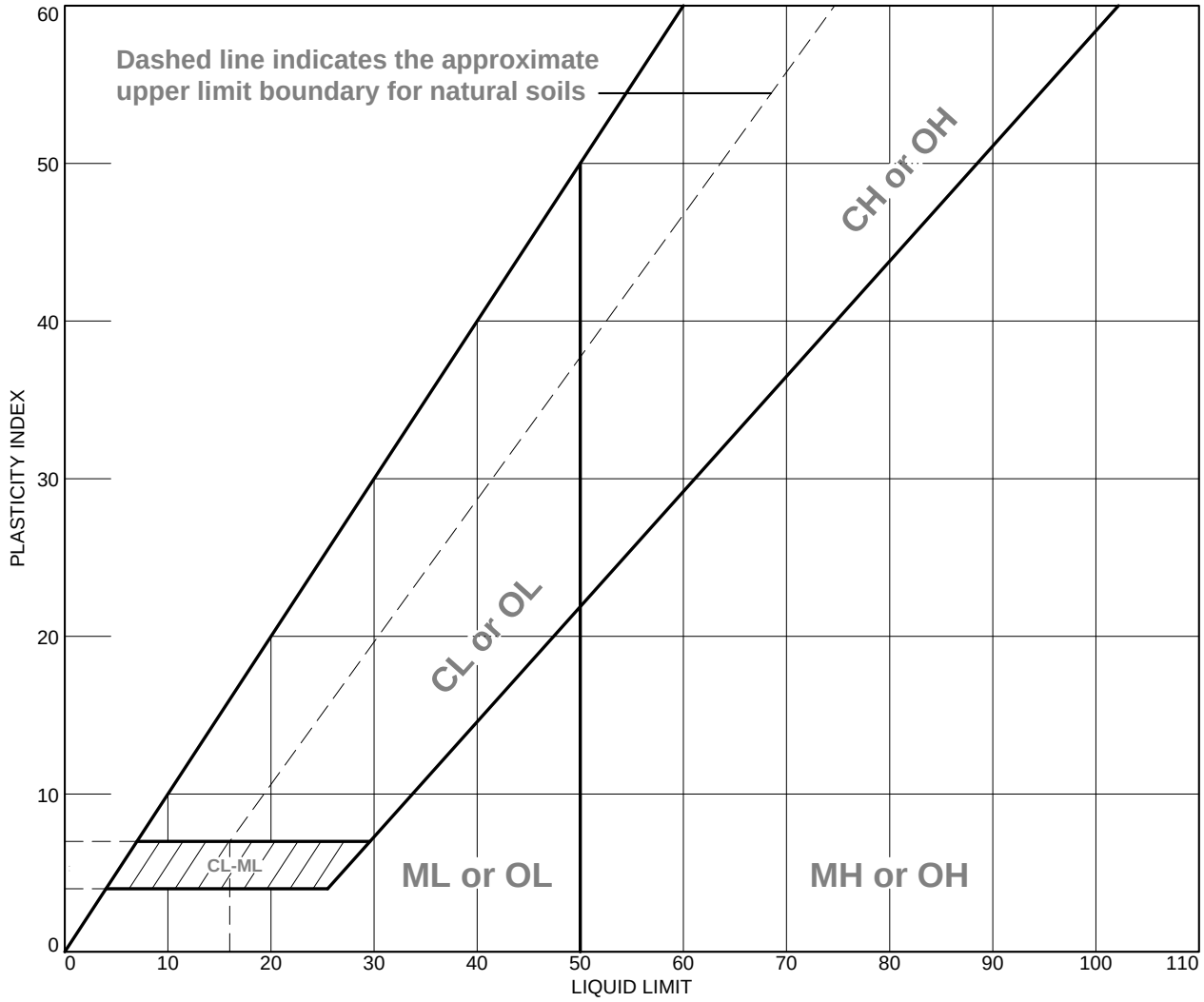
Location: MCL-E-G4-080813
Sample Number: 14449 **Date:**

PIONEER TECHNICAL SERVICES, INC.

Client: Montana DEQ
Project: McLaren Tailings Abandoned Mine Project

Project No: **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Tailings; Silty sand with gravel	NV	NP	NP	61	42	SM
■	Tailings; Gravelly silt with sand	NV	NP	NP	72	60	ML
▲	Tailings; Silty sand with gravel	NV	NP	NP	59	36	SM
◆	Tailings; Silty sand with gravel	NV	NP	NP	59	37	SM

Project No. **Client:** Montana DEQ

Project: McLaren Tailings Abandoned Mine Project

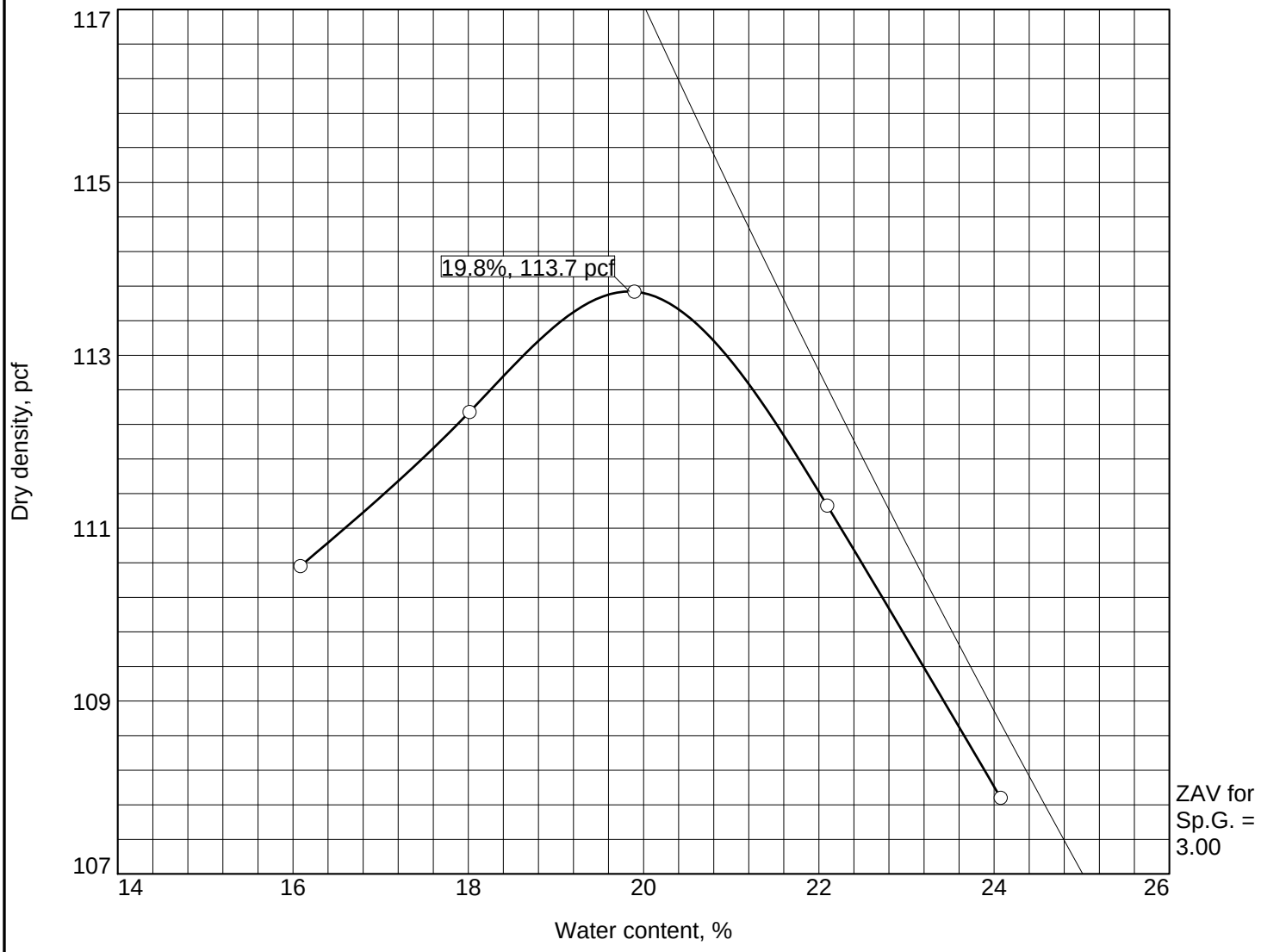
● **Location:** MCL-E-G1-080813 **Sample Number:** 14446
■ **Location:** MCL-E-G2-080813 **Sample Number:** 14447
▲ **Location:** MCL-E-G3-080813 **Sample Number:** 14448
◆ **Location:** MCL-E-G4-080813 **Sample Number:** 14449

Remarks:

PIONEER TECHNICAL SERVICES, INC.

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method B Standard
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SM	A-4(0)	16.1		NV	NP	10	42

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 113.7 pcf Optimum moisture = 19.8 %	Tailings; Silty sand with gravel

Project No. **Client:** Montana DEQ
Project: McLaren Tailings Abandoned Mine Project

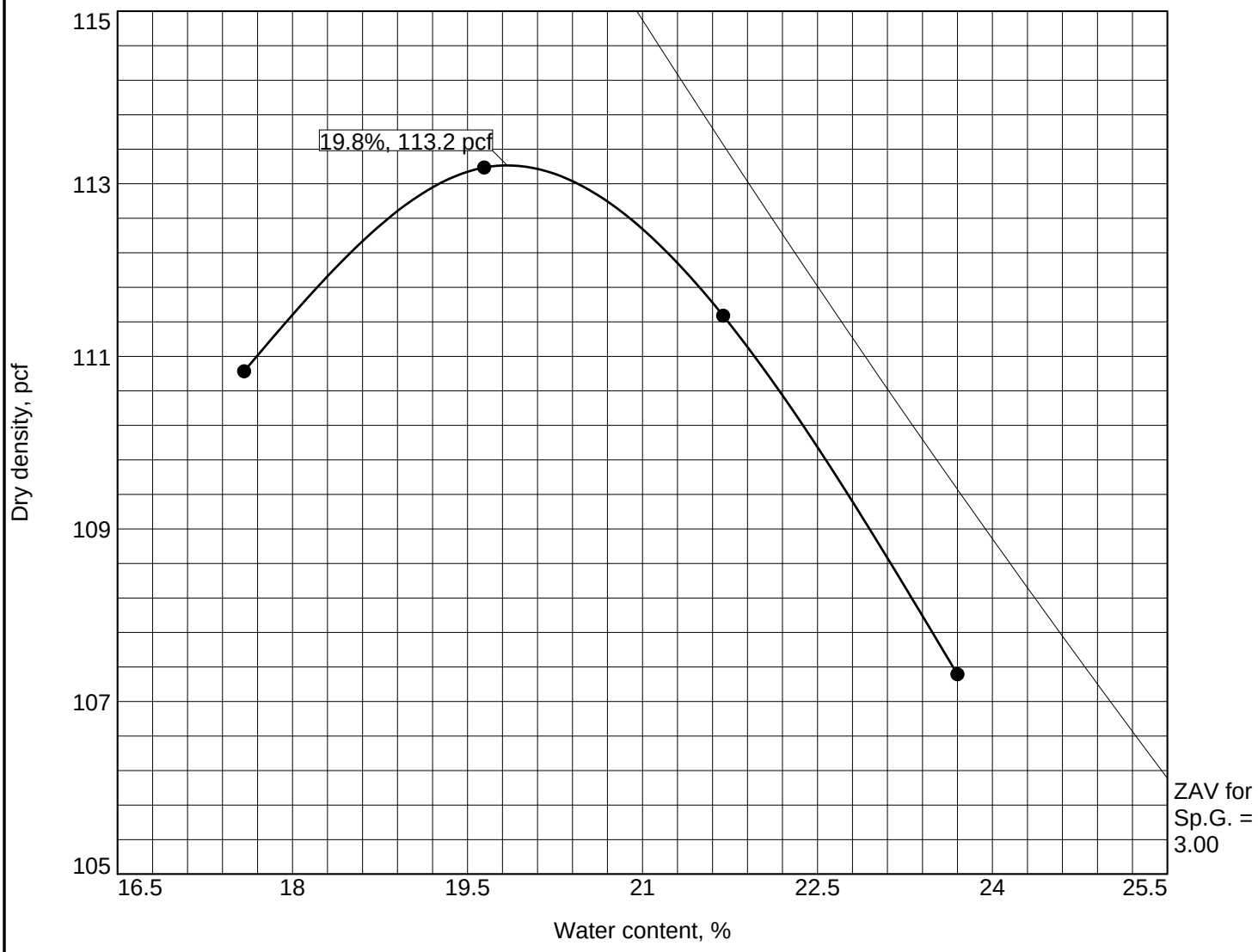
○ **Location:** MCL-E-G1-080813 **Sample Number:** 14446

Remarks:

PIONEER TECHNICAL SERVICES, INC.

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method B Standard
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	ML	A-4(0)	15.8		NV	NP	10	60

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 113.2 pcf Optimum moisture = 19.8 %	Tailings; Gravelly silt with sand

Project No. **Client:** Montana DEQ
Project: McLaren Tailings Abandoned Mine Project

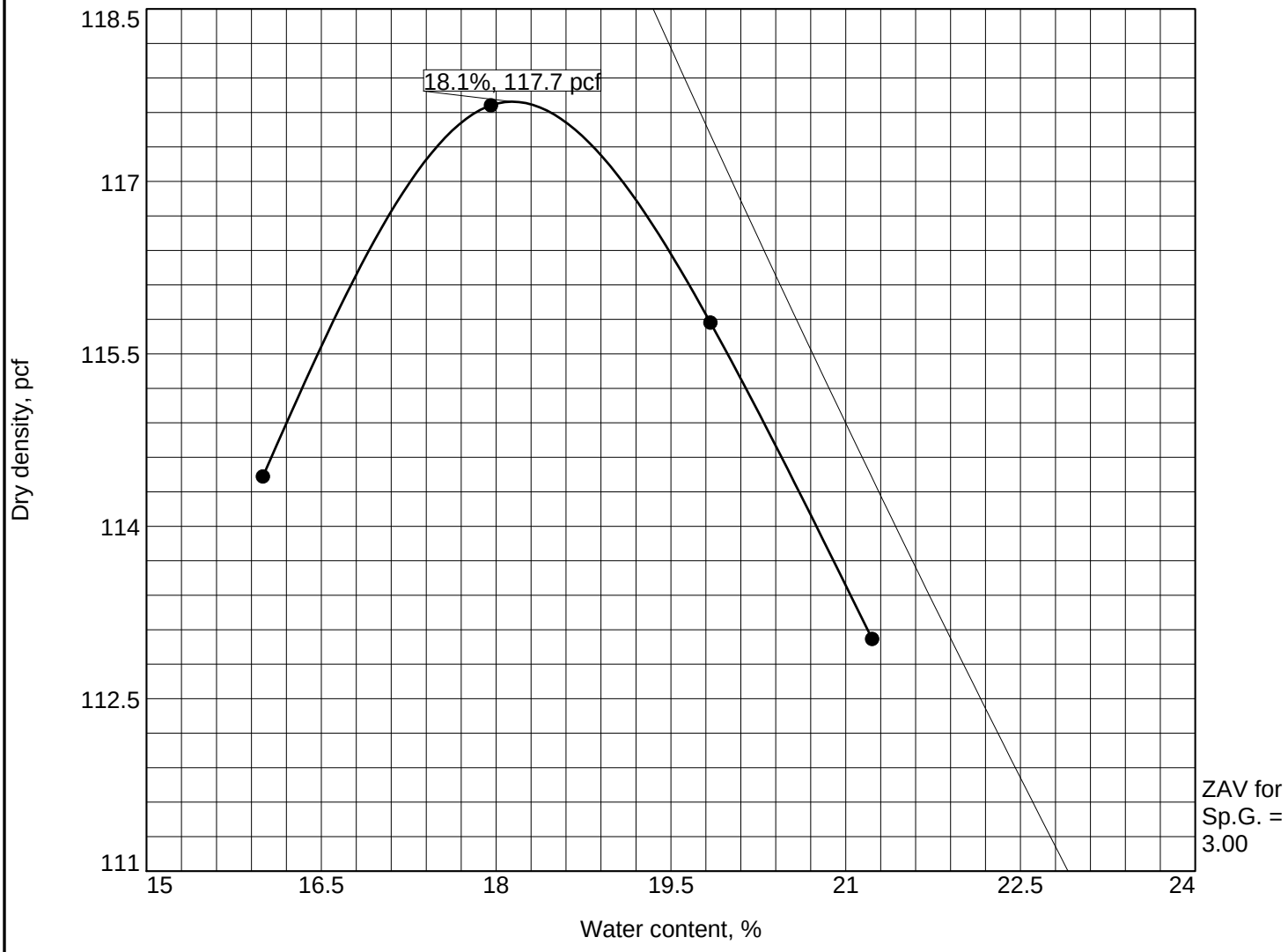
○ **Location:** MCL-E-G2-080813 **Sample Number:** 14447

Remarks:

PIONEER TECHNICAL SERVICES, INC.

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method B Standard
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SM	A-4(0)	14.3		NV	NP	13	36

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 117.7 pcf Optimum moisture = 18.1 %	Tailings; Silty sand with gravel

Project No. **Client:** Montana DEQ
Project: McLaren Tailings Abandoned Mine Project

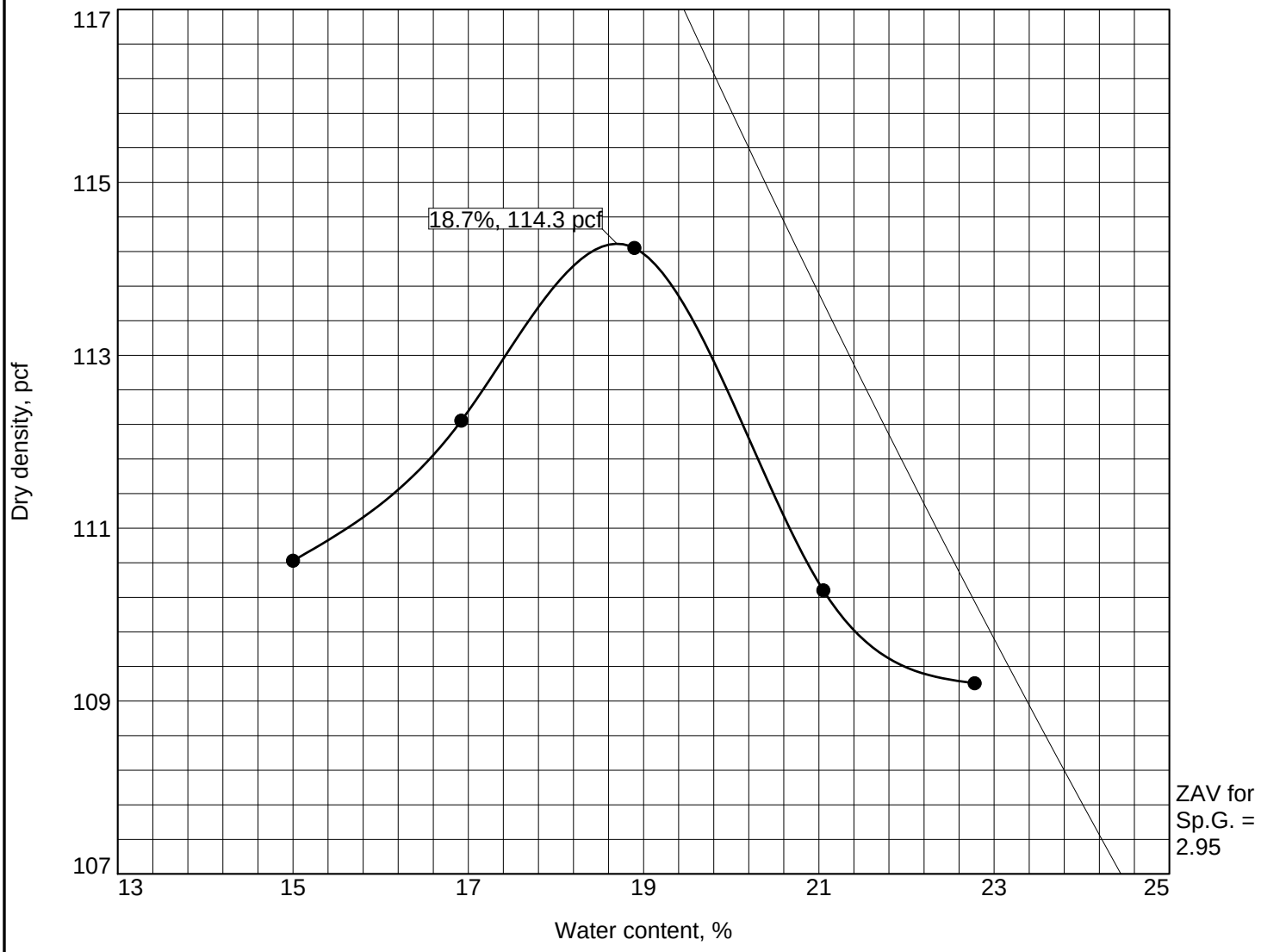
○ **Location:** MCL-E-G3-080813 **Sample Number:** 14448

Remarks:

PIONEER TECHNICAL SERVICES, INC.

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method B Standard
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SM	A-4(0)	15.0		NV	NP	14	37

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 114.3 pcf Optimum moisture = 18.7 %	Tailings; Silty sand with gravel

Project No. **Client:** Montana DEQ
Project: McLaren Tailings Abandoned Mine Project

○ **Location:** MCL-E-G4-080813 **Sample Number:** 14449

Remarks:

PIONEER TECHNICAL SERVICES, INC.

Figure

Appendix E

United States Securities and Exchange Commission
Industry Guide 7

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

INDUSTRY GUIDE 7:

Description of Property by Issuers Engaged or to be Engaged in Significant Mining Operations

Note: this Guide contains the Commission's basic mining disclosure policy. The definitions and disclosure instructions contained in this Guide apply to all public mining entities and their public disclosures pursuant to the rules of Regulation S-K. Questions regarding the application of these definitions and rules to specific situations should be asked of the Commission's mining engineers or geologists at either the Office of Engineering, Division of Corporation Finance, 202-272-3252, or the Branch of Geology, Central Regional Office, 303-844-1000.

(a) ***Definitions***. The following definitions apply to registrants engaged or to be engaged in significant mining operations:

(1) *Reserve*. That part of a mineral deposit which could be economically and legally extracted or produced at the time of the reserve determination.

Note: Reserves are customarily stated in terms of □ore□ when dealing with metalliferous minerals; when other materials such as coal, oil shale, tar, sands, limestone, etc. are involved, an appropriate term such as □recoverable coal□ may be substituted.

(2) *Proven (Measured) Reserves.* Reserves for which (a) quantity is computed from dimensions revealed in outcrops, trenches, workings or drill holes, grade and/or quality are computed from the results of detailed sampling and (b) the sites for inspection, sampling and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth and mineral content of reserves are well- established.

(3) *Probable (Indicated) Reserves.* Reserves for which quantity and grade and/or quality are computed from information similar to that used for proven (measured) reserves, but the sites for inspection, sampling, and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for proven (measured) reserves, is high enough to assume continuity between points of observation.

(4)(i) *Exploration Stage*□includes all issuers engaged in the search for mineral deposit

(reserves) which are not in either the development or production stage.

(ii) *Development Stage*□includes all issuers engaged in the preparation of an established commercially minable deposit (reserves) for its extraction which are not in the production stage.

(iii) *Production Stage*□includes all issuers engaged in the exploitation of a mineral deposit (reserve).

Instruction to *paragraph (a).*

1. Mining companies in the exploration stage should not refer to themselves as development stage companies in the financial statements, even though such companies should comply with FASB Statement No. 7, if applicable.

(b) ***Mining Operations Disclosure.*** Furnish the following information as to each of the mines, plants and other significant properties owned or operated, or presently intended to be owned or operated, by the registrant:

(1) The location and means of access to the property;

(2) A brief description of the title, claim, lease or option under which the registrant and its subsidiaries have or will have the right to hold or operate the property, indicating any conditions which the registrant must meet in order to obtain or retain the property. If held by leases or options, the expiration dates of such leases or options should be stated. Appropriate maps may be used to portray the locations of significant properties;

(3) A brief history of previous operations. including the names of previous operators, insofar as known;

(4)(i) A brief description of the present condition of the property, the work completed by the registrant on the property, the registrant□s proposed program of exploration and development, and the current state of exploration and/or development of the property. Mines should be identified as either open-pit or underground. If the property is without known reserves and the proposed program is exploratory in nature, a statement to that effect shall be made;

(ii) The age, details as to modernization and physical condition of the plant and equipment, including subsurface improvements and equipment. Further, the total cost for each property and its associated plant and equipment should be stated. The source of power utilized with respect to each property should also be disclosed.

(5) A brief description of the rock formations and mineralization of existing or potential economic significance on the property, including the identity of the principal metallic or other constituents insofar as known. If proven (measured) or probable (indicated) reserves have been established, state (i) the estimated tonnages and grades (or quality, where appropriate) of such classes of reserves, and (ii) the name of the person making the estimates and the nature of his relationship to the registrant.

Instructions to paragraph (b)(5).

1. It should be stated whether the reserve estimate is of in-place material or of recoverable material. Any inplace estimate should be qualified to show the anticipated losses resulting

from mining methods and beneficiation or preparation.

2. The summation of proven (measured) and probable (indicated) ore reserves is acceptable if the difference in degree of assurance between the two classes of reserves cannot be readily defined.

3. Estimates other than proved (measured) or probable (indicated) reserves, and any estimated values of such reserves shall not be disclosed unless such information is required to be disclosed by foreign or state law provided, however, that where such estimates previously have been provided to a person (or any of its affiliates) that is offering to acquire, merge, or consolidate with, the registrant or otherwise to acquire the registrant□s securities, such estimates may be included.

(6) If technical terms relating to geology, mining or related matters whose definition cannot readily be found in conventional dictionaries (as opposed to technical dictionaries or glossaries) are used, an appropriate glossary should be included in this report.

(7) Detailed geologic maps and reports, feasibility studies and other highly technical data should not be included in the report but should be, to the degree appropriate and necessary for the Commission□s understanding of the registrant□s presentation of business and property matters, furnished as supplemental information.

(c) Supplemental Information.

(1) If an estimate of proven (measured) or probable (indicated) reserves is set forth in the report, furnish:

(i) maps drawn to scale showing any mine workings and the outlines of the reserve blocks involved together with the pertinent sample-assay thereon.

(ii) all pertinent drill data and related maps.

(iii) the calculations whereby the basic sample-assay or drill data were translated into the estimates made of the grade and tonnage of reserves in each block and in the complete reserve estimate.

Instructions to paragraph (c)(i).

1. Maps and drawings submitted to the staff should include:

(a) A legend or explanation showing, by means of pattern or symbol, every pattern or symbol used on the map or drawing the use of the symbols used by the UPS. Geological

Survey is encouraged

(b) A graphical bar scale should be included; additional representations of scale such as □one inch equals one mile□ may be utilized provided the original scale of the map has not been altered;

(c) A north arrow on the maps;

(d) An index map showing where the property is situated in relationship to the state or province, etc., in which it was located

(e) A title of the map or drawing and the dare on which it was drawn

(f) In the event interpretive data is submitted in conjunction with any map, the identity of the geologist or engineer that prepared such data: and

(g) Any drawing should be simple enough or of sufficiently large scale to clearly show all features on the drawing.

(2) Furnish a complete copy of every material engineering, geological or metallurgical report concerning the registrant□s property, including governmental reports, which are known and available to the registrant. Every such report should include the name of its author and the date of its preparation, if known to the registrant.

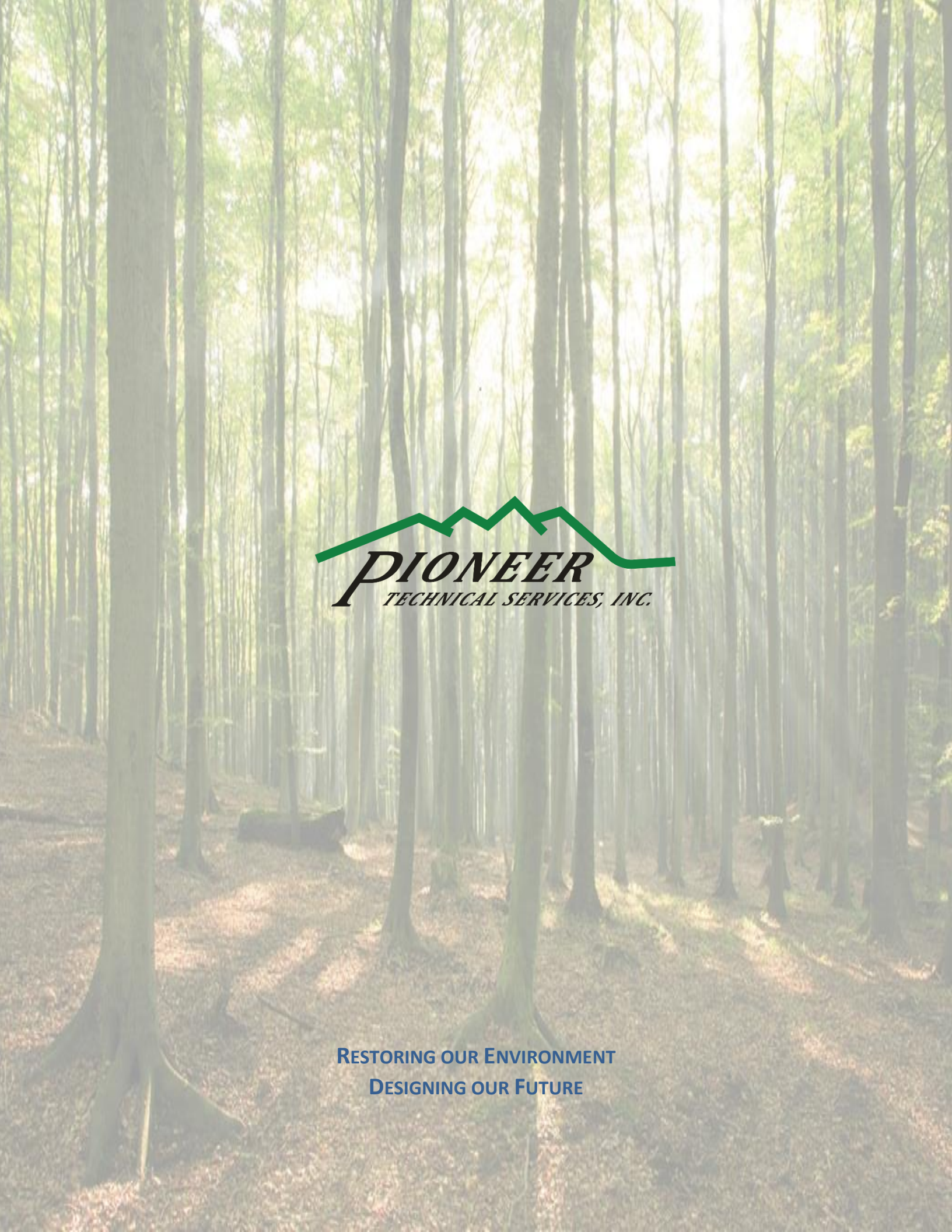
Instruction to paragraph (c)(2).

1. Any of the above-required reports as to which the staff has access need not be submitted. In this regard, issuers should consult with the staff prior to filing the report. Any reports not submitted should be identified in a list furnished to the staff. This list should also identify any known governmental reports concerning the registrant□s property.

(3) Furnish copies of all documents such as title documents, operating permits and easements needed to support representations made in the report.

[As adopted in Release No. FR-39, July 30, 1992, effective August 13. 1992, 57 *Federal Register* 36442.]

Note: the text of Industry Guide 7 is identical to the language found in Form S-18, Item 17A, which was adopted in 1981. Issuance of Guide 7 represents a relocation of the Commission□s mining disclosure policy rather than a change in that policy. One consequence of the issuance of Guide 7 is that the applicability of the foregoing policy to all mining companies is more explicit.



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