AMEC Environment & Infrastructure,
a Division of AMEC Americas Limited
Suite 600 – 4445 Lougheed Highway,
Burnaby, BC, Canada V5C 0E4
Tel +1 (604) 294-3811
Fax +1 (604) 294-4664
www.amec.com

Mount Nansen Remediation Project

2014 Site Investigation Report and Site Characterization Update

Submitted to:

Assessment and Abandoned Mines
Energy Mines and Resources
Whitehorse, YT

Submitted by:

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Executive Summary

Introduction, Project Scope and Report Objective

Mount Nansen has been the site of mining exploration activity and/or active mining since the 1940s. The most extensive stage of mining occurred between November 1996 and February 1999 in the Brown-McDade Open Pit. It involved construction of the existing tailings dam and deposition of approximately 240,000 m^3 of tailings within the tailings impoundment. A waste rock storage area was also created adjacent to the Brown-McDade Open Pit that currently contains about 360,000 m^3 of potentially acid generating (PAG) material and about 240,000 m^3 of non-acid generating (NAG) material. Earlier periods of mining contributed to smaller amounts of tailings, some of which are still present near the mill site, and localized zones of waste rock at the mill site and elsewhere on the site. Other site infrastructure includes the mill and camp facilities as well as various ancillary structures, power lines and pipelines. In 1999, mining was halted because it was no longer economical, and because sulphide ore was being mined in contravention of the water licence.

Since 1999, various investigations and assessments have been undertaken that have led to the development of a remediation plan for the site. This remediation plan is comprised of the following:

- Relocating the tailings and underlying affected soils from the existing tailings impoundment to the Open Pit;
- Removing the main tailings dam and downstream seepage dam;
- Relocating mineralized waste rock to the Open Pit;
- Backfilling the Open Pit so that the tailings are located above the groundwater table and a stable final surface and topography is provided;
- Developing a management method for the water currently in the Tailings Storage Facility and Open Pit;
- Covering the Open Pit area with an engineered low infiltration cover to substantially limit water contact within the tailings deposit;
- Understanding the hydrogeology of the backfilled pit so that seepage can be appropriately managed;
- Remediating the Mill Complex via:
  - building dismantling and/or demolition;
  - rail tanker removal;
  - PAG rock removal;
  - historic tailings removal;
  - hazardous waste removal;
  - historic settling ponds decommissioning;
  - landfill remediation (if found to be necessary);

  - watercourse restoration; and
  - the provision of compliant water quality.
- Remediating the camp area including demolishing existing buildings (except those required for maintenance following closure) and removing hazardous waste;
- Decommissioning all non-public roads, where not required for future monitoring;
- Removing existing infrastructure (power lines, pipelines, sediment ponds, ancillary buildings, etc.);
- Remediating hydrocarbon contaminated soils;
- Remediating exploration trenches and disturbed areas as appropriate;
- Decommissioning the Victoria Creek Wellhouse and existing artesian well;
- Reconstructing and reclaiming the Dome Creek channel and valley following removal of the Tailings Storage Facility; and
- Creating a remediated landscape that complements the natural topography and vegetation.

This document describes the scope, conduct and findings of the Site Investigation (SI) that was conducted in the summer of 2014 as part of the second phase of remedial design development (i.e. Phase 2). The update of the site characterization that is included in the report considers both data compiled by AMEC/AE during the 2014 SI and hydrological, ground and surface water quality assembled during the spring and summer of 2014 by others under separate contracts to AAM.

The Site Characterization update that is provided in this document supplements the 2013 Characterization Report (AMEC, 2014a) by expanding upon and/or modifying those previous characterizations influenced by 2014 data. The document does not replicate characterizations that have not been influenced by this data meaning that a full understanding of site conditions requires consideration of both this document and AMEC (2014a).

SI Program Objectives and Scope

The 30% design for the Mount Nansen Remediation Project (MNRP) (i.e. Phase 1) carried various uncertainties that were described in the Phase 1 characterization and design reports. It was recognized that some of these uncertainties could be cost effectively reduced through additional information gathered during a supplemental site investigation program. The investigation program developed to meet the objectives outlined above included the following components:

- Approximately 30 auger holes (herein referenced as boreholes - BH) to a maximum of 5 m drilled in the undisturbed/disturbed ground within approximately 4 m either side of the current disturbance limits as estimated in the general area;
- Two to three test pits to a maximum of 5 m in the landfill at the mill site;
- Sediment sampling in Dome Creek and in the area of blackened vegetation downstream of the Tailings Storage Facility;

- Reconnaissance of all work areas in consideration of the project design with a view towards construction considerations and project execution;
- Tailings, pit and seepage pond water sampling and laboratory analyses for water treatment plant process optimization;
- Reconnaissance of the trenches to confirm the reclamation classifications suggested in Phase 1;
- Downloading dataloggers (water level and temperature);
- Sampling of leachate bins;
- Geotechnical laboratory testing on samples collected, including moisture content, particle size analyses including fines content, and Atterberg limits (if applicable); and
- Geochemical testing on samples collected, consisting of metals analyses and some shake flask extraction tests.

Investigation Outcomes and Results

Drilling Program

The objective of drilling within the disturbed area limits was to determine the potential for ice-rich permafrost at the disturbed / undisturbed boundary of the Tailings Storage Facility. This affects the design of the tie-ins between the remediated area and the original ground and will also provide additional information regarding probable conditions under the fill material in the disturbed areas where thawing has yet to occur. While the objective for these holes was to target undisturbed terrain, local access conditions, or the likelihood of creating terrain disturbance, resulted in some holes being drilled in disturbed areas.

A total of 21 boreholes were completed around the Tailings Storage Facility, five at the Mill Complex and four at the camp area. Drilling at the Tailings Storage Facility was concentrated on the north facing (south side) slopes of the Tailings Storage Facility where permafrost is more likely to be located closer to the ground surface.

Disturbed Area Limits

The following presents some of the key observations that were made during the drilling program:

- Permafrost was noted at shallower depths along the north facing slopes (south side) of the Tailings Facility, with a depth typically on the order of 1 m to 3.5 m.
- The moisture content of the unfrozen soil ranged between 3% and 77%, with the higher values typically reflecting the presence of organics. Excluding the soil samples with organics content, the average moisture content of the unfrozen soil was on the order of 11%.
- The moisture content in the permafrost soils generally ranged between 14% and 145%, with the majority of the values within the 20% to 60% range. It is significant that the water contents of unfrozen (and likely thawed permafrost) samples are typically less than the frozen or

permafrost samples reflecting the “excess” water content of the permafrost. This water is drained out of the permafrost as it thaws, and can create settlement and terrain instability if not appropriately managed in design.

- The soils encountered at the disturbed / undisturbed boundaries of the Tailings Storage Facility generally consist of fine to medium grained sand and silt. Such soils are prone to water induced erosion, which has been noted in several locations along the south slopes adjacent to the Tailings Facility. This will need to be considered in the future during the design of the tie-in zones (including filter compatibility).
- Permafrost was not encountered at the camp and mill complex where the subsurface conditions are generally more favourable than in the Tailings Storage Facility, given that bedrock was encountered at relatively shallow depths.
- The extent of the historical landfill at the mill complex was found to be greater than initially anticipated.

Brown McDade Pit

- There are no changes to the Open Pit Site Characterization presented in the Phase 1 Site Characterization Report (AMEC, 2014a).

Waste Rock Areas

- There are no major changes to the Waste Rock Areas Site Characterization. However, field observations (iron staining, presence of sulphides and signs of oxidation) suggested that PAG rocks may be mixed with NAG rocks more extensively than was assumed in 2013. If the remediation design requires additional volumes of NAG rock for the construction works, significant effort may be required to separate NAG from PAG rock.

Tailings Storage Facility

The results from the borehole drilling and laboratory testing program completed around the Tailings Facility were in general agreement with the findings from the 2013 site investigation. The in situ soils along the margins of the Tailings Facility had fines content typically varying between about 5% and to 60%. The in situ soils sampled in 2013 under the tailings had fines content generally varying between 5% to 35%.

Based on the drilling information, there is shallow permafrost in the disturbed/undisturbed boundaries at the Tailings Storage Facility area, particularly on the south side of the Tailings Storage Facility where the slope is steeper (average depth on the south side is on the order of 1 m to 3.5 m). Permafrost soils in the disturbed/ undisturbed boundaries of the Tailings Storage Facility appear to have a higher silt content as well as amorphous organics (decayed plant and animals) that have a distinctive smell. Mosses and low lying shrubs are located on the south slopes, whereas evergreen and some aspen trees grow on the south facing (or north) slopes. In addition, dense willow grows in the Dome Creek valley upstream and downstream of the Tailings Facility.

The top vegetation layer in the undisturbed area consists of thick moss and shrubs. This layer not only provides considerable insulation to the ground in the summer, but also protects the underlying fine to medium grained sand with varying silt content (active layer) from deeper thawing. The active layer material is also subject to seasonal freeze-thaw cycles. The active layer in undisturbed terrain is vulnerable to surface disturbance, which results in thawing, subsequent settlement, focusing of runoff, and then the development of erosion channels in silty soils.

Dome Creek Valley

The objectives of the sediment and soil sampling program in the Dome Creek Valley were twofold:

- Identify the potential for past migration of tailings along Dome Creek; and
- Delineate the remediation extent upstream and downstream of the Tailings Storage Facility.

The above objectives included investigating areas of dead and/or blackened vegetation previously observed downstream of the Tailings Storage Facility. The SI program met these objectives by compiling the sediment and soil analytical data needed to characterize the limits of contamination and estimate the associated material volumes. The generation of these material volume estimates is part of the Phase 2 design scope.

The sampling and analysis program concluded that Dome Creek sediments are impacted along most of its length, but the impacts are highest immediately downstream of known sources. The areas of blackened and/or dead vegetation immediately downstream of the Tailings Storage Facility have significantly higher arsenic concentrations and potentially elevated copper concentrations (only seen in one of two samples). Further downstream of the TSF, the areas of blackened vegetation seem to be of lower concern.

Pond Waters

The purpose of the Pond Waters treatability testing program was to evaluate the previously proposed water treatment design completed during Phase 1. To achieve this, samples of the four contaminated water sources onsite were collected. To ensure representative water qualities for each of the sources, a detailed sampling protocol was provided to the onsite team responsible for the sample collection. These samples were shipped to AMEC’s water treatment laboratory in Pointe-Claire, Québec, where a series of water treatment tests were completed.

Based on the raw water quality, a set of 14 treatment tests were designed to confirm the treatment needs for each of the water sources. The approach was to evaluate the treatment requirements for each of the water sources separately without any prior blending. This method is considered conservative as blending will result in an improvement in the overall water quality, specifically for seepage pond and tailings porewater.

The testing provided the information necessary to size the reagent systems for lime, ferric sulphate, and flocculant. The testing also showed that CN can be treated, and it defined the required sulphuric acid dosages to reduce the final pH to 7.0 and mitigate ammonia toxicity.

The raw water concentrations of cyanide and ammonia in the collected samples were lower than the previous design basis. This suggests that proper raw water sequencing and blending of different site waters could remove the need to treat for these two contaminants. In this case, two of the planned reagents could be eliminated from the plant design: the peroxide and sulphuric acid. These are the two reagents which pose the greatest health and safety risks in the treatment plant. Eliminating these two reagents is expected to reduce the estimated water treatment plant costs by approximately 15%.

Groundwater

The primary objectives for the groundwater-related aspects of the 2014 site investigation were to increase the data for a refinement of the project baseline information, with respect to the seasonal variability in groundwater levels and groundwater chemistry. A secondary objective was to update, where applicable, the hydrogeological conceptual site model (AMEC, 2014b), according to the 2014 site investigation findings. Of the secondary objectives, the Brown McDade Pit pond levels and ground temperatures associated with the Pit are of particular relevance to the remediation design.

AMEC reviewed the recent 2014 groundwater monitoring and sampling results and the interpretation, described by Hemmera (2014). CCME Freshwater Aquatic Life guidelines were used as comparison water quality results in this report. Overall, the groundwater analytical results presented by Hemmera in 2014 are consistent with the results and conceptual model of the project site groundwater quality, as concluded by AMEC in 2013 (AMEC, 2014a). In 2014, acid rock drainage appears to be commencing at two locations in the tailings dam area (MW09-21 and MW09-22), with decreases in pH and alkalinity and increases in sulphate, compared to the results from 2009 to 2013 at these locations. Aside from these two groundwater monitoring locations, the 2014 results are generally consistent with the 2013 groundwater quality results.

Surface Water Hydrology and Water Quality

The purpose of the freshet program was to expand the surface water quality and flow data set for this seasonal period of transition. For the purposes of environmental assessment, YESAA guidelines require that seasonal variability be captured and the range of water quality characteristics be understood. The program addressed the following specific objectives:

- Measuring peak flow during the spring runoff period; and
- Combining water quality and stream flow monitoring data for loading calculations.

Freshet monitoring was conducted by EDI under contract to AAM. EDI also conducts monthly flow monitoring for the Mount Nansen site. The 2014 fresh monitoring was conducted on May 8 and 9. At all of the stations, and in all cases, the measured 2014 results fell within the range of previously measured flows. Therefore, the 2014 Data are consistent with previously collected data.

The 2014 surface water quality data included information collected on April 14-15, May 8-9, May 20-21 and June 24-26. The key elements of the water quality characterization included:

- Comparison to CCME guidelines and Mount Nansen Effluent Discharge Standards;

- Temporal variability; and
- Spatial variability.

Understanding these three characteristics of the water quality data is significant for meeting the YESAA guidelines as they relate to baseline and environmental assessment of the site. The above characteristics are also key to the evaluation and implementation of the remedial design for the site.

The following observations are based on a comparison of these 2014 water quality results to those from previous years:

- The primary parameters of concern are the same, namely Al, As, Cd, Cu, Fe and Zn;
- Temporal variability of exceedances at the stations in Dome, Victoria and Pony Creeks are very noticeable, with May 8-9, 2014 (freshet) period showing the most exceedances, followed by May 20-21, 2014, then June 24-16, 2014. April data were not considered because several stations could not be sampled;
- Dome Creek shows less seasonal change in the number of exceedances over the different sampling dates. Dome Creek also shows less spatial variance in parameter exceedances between stations;
- The Victoria Creek sampling station shows clear seasonal variations in the number of exceedances. What is particularly noticeable is that in June, only Al exceeded the guidelines at all of the Victoria Creek stations;
- Pony Creek also exhibits some seasonal variation, with most parameters exceeding guidelines during the freshet (May 8-9, 2014); and
- There is limited spatial variability in exceedances observed within the same creek or sampling area.

Mill Complex Landfill

The objective of the test pitting program was to assess the waste content and depth of the landfill area to better define the required scope of landfill remediation. The waste dump is located at the southeast side of the mill complex. Mechanical parts, metals, woods, plastic, glass and construction materials were noted at the exposed surface of the waste dump. Three tests pits were completed extending to a maximum depth of 5 metres, with soil samples collected from two of the pits. No waste material was identified in the first test pit and therefore no soil samples were collected. The waste material appears to have been historically dumped over the crest of the main road fill, then covered with road grading materials or unwanted fill. As a result, it is suspected that the extent of the landfill is larger than initially anticipated. No liner at the base of the landfill was noted during the test pitting program.

Waste Rock/Tailings

The main objective of the geochemical scope of work for waste rock and tailings was to improve the characterization of the waste rock and tailings drainage quality. This information will be used to refine the source terms for waste rock and tailings used in the Phase 2 water quality predictions. The kinetic testing conducted on non-PAG waste rock samples was intended to confirm source terms for non-PAG rock that is expected to be used as construction material or that will be left on surface following remediation activities. The leachate sampling from the field bins was undertaken to supplement the existing database for tailings seepage, waste rock and ore runoff water quality.

In general, sulphate and dissolved metal concentrations in the leachates collected from the unsaturated tailings field bin and ore field bin were comparable with leachates collected during previous sampling programs. Some exceptions were relatively high arsenic and iron concentrations measured in the leachate collected from the saturated tailings bin. Arsenic and iron concentrations were around three times higher than those in the leachates from previous sampling programs. The 2014 results will used to refine the tailings source terms for water quality modelling.

The waste rock field bin results suggest some changes in the concentrations of certain parameters for the waste rock source terms. However, the source terms for this rock are also influenced by the monitoring results for the seepage and runoff quality from the existing waste rock pile. Both the field bin leachate quality and the waste rock dump seepage quality data will be reviewed and used to update the source terms for the waste rock that will be relocated to the pit.

The source term for non-PAG rock that will be left at surface following remediation activities or used as construction material will be determined by the pending kinetic testing results (trickle leach column testing).

The previous tailings source terms were mainly determined by the results of humidity cell testing. The recent results from the tailings field bin leachate testing are unlikely to change the tailings source terms used in the water quality model.

The lab analysis results for the field ore bin leachate confirm there is no major change in the ore rock source terms used in the water quality model.

Exploration Trenches and Dome Creek

The SI program pertaining to reclamation had the following three specific objectives:

.1 Identify special habitat features in the Dome Creek Valley and TSF area to target placement of vegetation patches for reclamation;

.2 Improve the inventory and evaluation of exploration trenches selected for reclamation during Phase 1, based on refined rationales and the OIC boundary within an area not subject to a current mining claim; and

.3 Document the rationale for excluding trenches from selection for reclamation.

Vegetation cover and landscape features observed within the Dome Creek Valley are relatively uniform, without obvious special features that could be linked to specific vegetation patch placement. Dome Creek Valley is dominated by an alternating tall-shrub to low-shrub willow community, with a braided channel. Substrates are consistently sandy, and channel widths range from 0.3 m to 1 m wide. The reclamation prescription for vegetation patch placement recommended in Phase 1 (AMEC, 2014b) requires no additional updating; however, channel design should mimic a more braided morphology which observes the natural morphology currently exhibited in the valley.

The exploration trenches recommended for reclamation were identified based on the results of the attribute ranking. Trenches slated for reclamation generally ranked highest within the southern trench area due to their high visibility, ease of access, erosion evidence, sediment transport to Dome Creek, and their location within a wildlife corridor. In some cases, reclamation is not required for the entire length of the trench; only continuous portions that were judged to rank highly require reclamation at this time.

Background Samples

The objectives of the background soil sampling program were to:

- Enhance the historical background geochemical soil database for metal concentrations; and
- Provide a basis for comparison of impacted areas (predominantly in the Mill Complex) to undisturbed soils using the CSR soil standards.

Analyses for pH and metals were conducted on selected native soil samples collected from the geotechnical boreholes located in the Mill Complex and Camp Area and adjacent to the Tailings Storage Facility. The results of the current samples will be compiled during the Phase 2 design with the results from the previous exploration geochemistry and soil sampling programs for a thorough review of upper range limits of metal in the background soil.

General Site Reconnaissance

A general visual site reconnaissance was conducted by AMEC to assess the following areas of the site to better define the constructability assumptions for the remediation design.

Tailings Storage Facility

No additional information was noted in the Tailings Storage Facility area beyond what was presented in the Phase 1 Site Characterization Report (AMEC, 2014a).

Brown McDade Pit

In general, observations of the pit walls indicated that the exposed rock mass on the west side of the pit had a higher degree of weathering than the rock face on the east side of the pit. Only the northern pit pond contained water during the SI program and the southern pond was dry.

Waste Rock Area

In general, the rocks were highly weathered, red/yellow coloured and had visible sulphides. Field observations suggested that potentially acid generating (PAG) rock could be mixed more extensively with non- acid generating (NAG) rock than is currently estimated.

Mill Complex and Camp Area

There were no significant additions to the previous reconnaissance conducted in 2013 except:

- Previously, it was indicated that main mill level bench likely consists predominantly of waste rock/ore with landfill waste at the south end. Based on the 2014 test pit results and field observations, the extent of the landfill is assumed to extend further north on the main mill level bench. It may be thicker closer to the fill material crest.
- Previously assumed NAG volumes of the Mill Complex appeared to be a mixture of NAG and PAG based on visual observation of the rocks. As mentioned above, a significant effort may be required to separate NAG from PAG rocks, which may require further geochemical testing prior to remedial construction activities.

Dome Creek Valley

The extent of potential contamination of the Dome Creek Valley was visually assessed during the sedimentation sampling and general site reconnaissance. The potentially contaminated area consists of the flat area between the toes of the north and south sideslopes adjacent to the creek. In general, the Dome Creek wetted perimeter is considered to be soft to very soft and saturated. Initial assumptions for remediation of the Dome Creek below the Tailings Storage Facility involving heaving equipment may not be feasible.

Potential Borrow Areas

Two additional potential sand borrow areas were identified in the 2014 Site Investigation:

- Borrow Areas I and II are located upstream of the Tailings Storage Facility and may be used to supplement the existing sand borrow areas adjacent to the tailings.
- Borrow Area VI may contain appropriate fine grained material for a cover system; however, it is located on an external placer claim and procurement constraints and haul distances may make this borrow unfeasible.

Victoria Creek Wellhouse

AMEC and AAM representatives identified a 100 mm insulated pipe that was buried along the power line (consistent with the understanding that previous wellhouse decommissioning activity had addressed above grade features only). The power line to the Victoria Creek Wellhouse is accessible with an excavator for removal and reclamation purposes. Currently there are two wells at the Victoria Creek Wellhouse, one of which is sealed from the top.

1 Project Background and Scope

1.1 Introduction

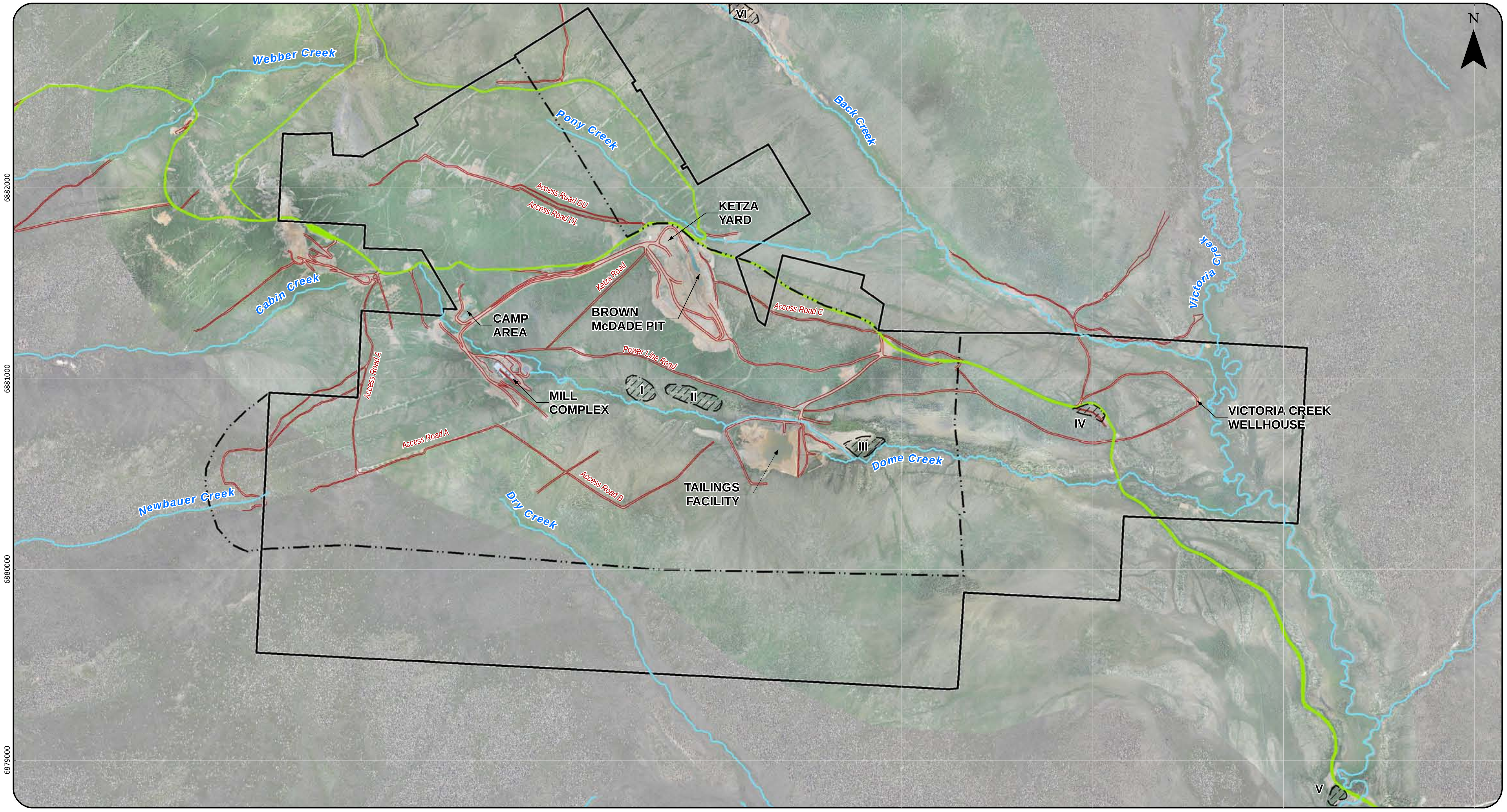
Mount Nansen has been the site of mining exploration activity and/or active mining since the 1940s. The most extensive stage of mining occurred between November 1996 and February 1999 in the Brown-McDade Open Pit. It involved construction of the existing tailings dam and deposition of approximately 240,000 m^3 of tailings within the tailings impoundment. A waste rock storage area was also created adjacent to the Brown-McDade Open Pit that currently contains about 360,000 m^3 of potentially acid generating (PAG) material and about 240,000 m^3 of non-acid generating (NAG) material. Earlier periods of mining contributed to smaller amounts of tailings, some of which are still present near the mill site, and localized zones of waste rock at the mill site and elsewhere on the site. Other site infrastructure includes the mill and camp facilities as well as various ancillary structures, power lines and pipelines. The general location and arrangement of these site features are shown on Figure 1.1-1.

In 1999, mining was halted because it was no longer economical, and because sulphide ore was being mined in contravention of the water licence. The company operating the Mount Nansen property was put into receivership in March 1999. The site is now managed by the Yukon Government through Assessment and Abandoned Mines (AAM). In support of site remediation, many studies and investigations have been carried out over the past decade to define the closure objectives and to explore various closure options. In 2012, the project partners selected a preferred remediation scheme based on a remediation alternatives study (LORAX, 2011). The first phase of remediation design (30%) was completed by AMEC and Associated Engineering (AE) in March 2014 and the development of the Yukon Environmental and Socio Economic Assessment Board (YESAB) project proposal has been initiated. Following final acceptance of Phase 1, the project will move into Phase 2, which entails completing a 60% design and cost estimate, preparing the YESAB project proposal document, and beginning the public consultation process.

1.2 Scope of Remediation

This remediation plan as described in the Phase 1 design report (AMEC, 2014b) is comprised of the following:

- Relocating the tailings and underlying affected soils from the existing tailings impoundment to the Open Pit;
- Removing the main tailings dam and downstream seepage dam;
- Relocating mineralized waste rock to the Open Pit;
- Backfilling the Open Pit so that the tailings are located above the groundwater table and a stable final surface and topography is provided;
- Developing a management method for the water currently in the Tailings Storage Facility and Open Pit;



Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012
Pleiades Satellite Imagery, 2013

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

- Order in Council Boundary
- Extent of Inactive Claim Areas
- Public Road
- Road
- Stream
- ▨ Potential Borrow Area

Energy, Mines and Resources
Assessment and Abandoned Mines

MOUNT NANSEN REMEDIATION PROJECT
Figure No. 1.1-1

2014 SITE INVESTIGATION REPORT

OVERVIEW

Scale 1:20,000
Metres
0 500 1,000
October 1, 2014

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- Covering the Open Pit area with an engineered low infiltration cover to substantially limit water contact within the tailings deposit;
- Understanding the hydrogeology of the backfilled pit so that seepage can be appropriately managed;
- Remediating the Mill Complex via:
  - building dismantling and/or demolition;
  - rail tanker removal;
  - PAG rock removal;
  - historic tailings removal;
  - hazardous waste removal;
  - historic settling ponds decommissioning;
  - landfill remediation (if found to be necessary);
  - watercourse restoration; and
  - the provision of compliant water quality.
- Remediating the camp area including demolishing existing buildings (except those required for maintenance following closure) and removing hazardous waste;
- Decommissioning all non-public roads, where not required for future monitoring;
- Removing existing infrastructure (power lines, pipelines, sediment ponds, ancillary buildings, etc.);
- Remediating hydrocarbon contaminated soils;
- Remediating exploration trenches and disturbed areas as appropriate;
- Decommissioning the Victoria Creek Wellhouse and existing artesian well;
- Reconstructing and reclaiming the Dome Creek channel and valley following removal of the Tailings Storage Facility; and
- Creating a remediated landscape that complements the natural topography and vegetation.

1.3 Project Development Status

1.3.1 Phase 1

In March of 2014, AMEC/AE completed the 30% Design Development phase (Phase 1). This phase was intended to:

- Characterize the technical feasibility of Option 4;
- Identify a base case design which could be further optimized and refined;
- Provide bracketed predictions of the likely performance of the base case design (e.g. predicted ranges of downstream water quality relative to CCME criteria);

- Provide a bracketed understanding of the risks associated with key project features and outcomes;
- Characterize the nature and scale of uncertainties related to predictions of performance and risk;
- Outline the basic elements of any Adaptive Management Plans (AMPs) that might be needed to manage risks and uncertainties; and
- Develop a project execution cost estimate with enough utility and reliability to support the next level of Partner decision making (generally equivalent to an AACE (Association for Advancement of Cost Engineering) Class 3 Estimate).

The work conducted to address these objectives was described in the following key Phase 1 deliverables:

- Site Investigation (SI) Data Report (AMEC, 2014): described the conduct of the 2013 site investigation completed to support Phase 1 design development activity and compiled all of the data generated by the program.
- Site Characterization Report (AMEC, 2014a): consolidated all of the information on the site and its characteristics into one description that was the primary input to Phase 1 design development activity. In short, the Site Characterization Report brought investigative work completed in the past together with the findings of the 2013 SI program completed by AMEC/AE.
- 30% Phase Design Report (AMEC, 2014b): described the development and validation of the Phase 1 Design Base Case prepared for Option 4 and presented the drawings produced during Phase 1.
- Cost Estimates (AMEC, 2014c): described the development of an AACE Class 3 cost estimate for the Phase 1 Design Base Case, as well as the construction schedule and assumptions upon which the estimate was based.

1.3.2 Phase 2

Broadly speaking, Phase 2 of the design development process is intended to:

- Refine and update the project Design Base Case established in Phase 1 via supplemental characterizations of key site conditions and additional assessments of remedial component performance, risks and uncertainties;
- Refine and update the description and development of the Adaptive Management Plans that are proposed as adjuncts to the Design Base Case;
- Progress the design to a level of definition that will support the preparation of draft tender packages during the next phase of design;
- Provide the project baseline and project description inputs needed for the YESAA Project Proposal; and

- Refine and update the project execution strategy, schedule and cost estimate (AACE Class 2) to a level of definition that supports advanced Project Partner decision processes and consultative efforts.

The detailed Scope of Work developed by AAM to meet these Phase 2 objectives was comprised of:

- Development of field investigation plans (freshet and summer), office support for the implementation of the freshet work and implementation of the summer field investigation;
- Submission of design drawings and technical specifications in report format at the 60% completion phase for review and comment by the Project Partners and at a level of detail sufficient for the development of an AACE Class 2 estimate. The 60% completion documents are intended to meet the Yukon Environmental and Socio-Economic Assessment (YESAA) Project Proposal (PP) and Water Licence application requirement by providing detailed construction schedules, details of remediation techniques, details on demolition of infrastructures, environmental effects and possible mitigation measures to facilitate environmental reviews and approvals necessary for construction of the proposed design;
- Provision of an AACE Class 2 estimate;
- Preparation of sections and associated appendices of the YESAA Project Proposal meeting the information requirements stipulated in YESAB's documents titled "*Proponent's Guide to Information Requirements for Executive Committee Project Proposal Submissions and Proponent's Guide*" and "*Water Information Requirements for Quartz Mining Project Proposals*", as well as the Yukon Water Board's document titled "*Type A and B Quartz Mining Undertakings – Information Package for Applicants*". Deliverables for the YESAA Project Proposal are to address YESAB's "Filling Requirements for an Executive Committee Screening";
- Participation in public consultation events undertaken in Carmacks to present the project; and
- Participation in various meetings and teleconferences throughout the phase to support project management activities and the communication of design developments and outcomes to the Project Partners.

2 Report Scope and Organization

This document describes the scope, conduct and findings of the Site Investigation (SI) that was conducted in the summer of 2014 as part of the Phase 2 MNRP scope of work. The update of the site characterization that is included in the report considers both data compiled by AMEC/AE during the 2014 SI and hydrological, ground and surface water quality assembled during the spring and summer of 2014 by others under separate contracts to AAM.

The Site Characterization update that is provided in this document supplements the 2013 Characterization Report (AMEC, 2014a) by expanding upon and/or modifying those previous characterizations influenced by 2014 data. The document does not replicate characterizations that have not been influenced by this data meaning that a full understanding of site conditions requires consideration of both this document and AMEC (2014a).

The contents of this 2014 SI Report and Site Characterization Update are organized as follows:

Section 1:	describes the project scope and current stage of project development
Section 3:	describes the scope and objectives of the 2014 SI program
Section 4:	describes the investigation methodologies applied to execute the SI program including the scopes of the associated laboratory programs
Section 5:	presents the findings and data of the SI program
Section 6:	describes those additions and/or refinements to the characterization of site conditions resulting from the 2014 SI findings and data
Appendix 3A:	provides a listing of 2014 testing locations
Appendix 3B:	provides the daily reports of field activity during the SI program
Appendix 3C:	provides photographs of SI program activity
Appendices 4A to 4C:	provide borehole and test pit logs and photographs imagery of the associated locations
Appendices 4D to 4G:	provide laboratory testing results from geotechnical, soil, sediment, geochemistry, and water treatability samples

3 2014 SI Program Overview

3.1 Previous Investigations

Mining has occurred at the Mount Nansen site in various forms since the 1940s with the most intensive period occurring in the late 1990s. A significant amount of monitoring and assessment work has been done at the site over the years, both before and especially after mining. As much as possible, the information available from these studies and particularly from previous investigation programs was reviewed by AMEC during development of the 2014 SI program. The previous investigations reviewed, and their influence on the 2014 SI program, are detailed or referenced in AMEC (2014, 2014a, 2013).

3.2 SI Program Objectives

The 30% design for the MNRP (i.e. Phase 1) carried various uncertainties that were described in the Phase 1 characterization and design reports. Some of these uncertainties will be addressed by additional assessment and/or design work during Phase 2, and some of these are inherent to the nature of the materials and work being done and cannot be cost effectively resolved prior to project execution. These would include:

- Effectiveness of the proposed tailings vacuum dewatering technique and associated impact on construction schedule;
- Exact locations and volumes of fine tailings within the impoundment; and
- Exact extent of permafrost throughout the site (albeit less uncertainty as more holes are drilled).

It was recognized that some of the uncertainties remaining at the conclusion of Phase 1 of the MNRP could be cost effectively reduced through additional information gathered during a supplemental site investigation program. These areas of uncertainty are summarized in Table 3.2-1.

Table 3.2-1: Information Needs Addressed by the 2014 Site Investigation Program

Information Need	Proposed Site Investigation
Potential for ice rich permafrost at disturbed / undisturbed boundary – this affects the design of the tie-ins and will also provide additional information regarding probable conditions under the fills in the disturbed areas where thawing has yet to occur.	Shallow boreholes (5 m, drilled with lightweight / hand portable equipment) around the Tailings Storage Facility, mill and camp areas, particularly concentrated on the north facing (south side) slopes. Some holes drilled in undisturbed terrain.
Background soil geochemistry to confirm sub-excavation depths and use of dam fill in reclaimed landscape.	Testing of the C Horizon soil samples obtained from boreholes described above to measure metals concentration and leachability. This will be supplemented by a statistical evaluation of historic data available for the project site and general area around Mount Nansen.
Undisturbed soil conditions.	Logging of soil horizons in the boreholes described above. This is not considered a critical information need because the upper soil horizons have been removed from the disturbed areas and no significant work or disturbance is planned in undisturbed areas.
Potential for past migration of tailings along Dome Creek / delineation of remediation extent downstream as well as upstream of Tailings Storage Facility.	Walk down the entire length of Dome Creek collecting shallow trowel samples at regular intervals with samples also gathered in areas where abnormal and/or concerning observations are made. This includes the area of blackened vegetation downstream of the Tailings Storage Facility. Samples will be subsequently tested for metals content.
Seasonal groundwater variations, particularly groundwater level minimums in open pit.	Datalogger download.
Increase ground temperature information dataset.	Datalogger download.
Increase groundwater quality dataset.	Sampling of all groundwater wells (to be completed by others).
Water treatment reagent and process requirements.	Sample tailings pond, seepage pond and pit pond water and complete laboratory testing.
Trench reclamation classification (i.e. requires reclamation or not).	Visual reconnaissance to assess existing conditions (erosion, runoff, ease of access and reclamation, etc.) and onsite determination of classification (in conjunction with AAM).
Construction and execution considerations with regards to material movement, excavation, placement, etc.	Site reconnaissance of all work areas in consideration of equipment access, logistics, benefit, etc. In particular, the historic tailings areas around the mill require assessment (including consideration of the mill ponds, landfill and valley areas).
Confirmation of treatment of existing landfill at mill site.	Test pits or trenches in landfill to assess waste content.
Add to database of tailings seepage / runoff water quality.	Sampling and lab testing of leachate bins.
Confirmation of source term for non-acid generating material to be used as construction material.	Kinetic testing on NAG waste rock material (samples gathered in 2013).
Increase surface water flow and quality dataset.	Freshet measurements and ongoing monthly monitoring by others.
Waste rock seepage occurrence and quality.	Freshet measurements and regular monitoring by others.
Observation of placer mining activity.	Regular monitoring to be completed by others.
Seepage into open pit from north side in particular or elsewhere as observed.	Regular monitoring to be completed by the site operator.

3.3 SI Scope of Work

The investigation program developed to meet the objectives outlined above included the following components:

- Approximately 30 auger holes (herein referenced as boreholes - BH) to a maximum of 5 m drilled in the undisturbed/disturbed ground within approximately 4 m either side of the current disturbance limits as estimated in the general area;
- Two to three test pits to a maximum of 5 m in the landfill at the mill site;
- Sediment sampling in Dome Creek and in the area of blackened vegetation downstream of the Tailings Storage Facility;
- Reconnaissance of all work areas in consideration of the project design with a view towards construction considerations and project execution;
- Tailings, pit and seepage pond water sampling and laboratory analyses for water treatment plant process optimization;
- Reconnaissance of the trenches to confirm the reclamation classifications suggested in Phase 1;
- Downloading dataloggers (water level and temperature);
- Sampling of leachate bins;
- Geotechnical laboratory testing on samples collected, including moisture content, particle size analyses including fines content, and Atterberg limits (if applicable); and
- Geochemical testing on samples collected, consisting of metals analyses and some shake flask extraction tests.

Details of the methods proposed for these components were outlined by discipline in Section 3.0 of the Execution Plan prepared in support of the 2014 SI Program (AMEC, 2014d).

3.4 Investigative Disciplines

The AMEC/AE investigative team was organized by technical discipline as follows:

- Geotechnical: materials relocation/management, physical integrity and stability of site structures and features;
- Water: movement and management of water and/or contaminants from source areas/ structures;
- Site Characterization: identification and characterization of hazardous materials and potential sources of soil and/or groundwater contamination, primarily related to former processing facilities and their ancillary structures;
- Infrastructure (Structures): dismantling/demolition (D&D) of structures and the disposition of D&D waste streams; and

- Infrastructure (Reclamation): surface restoration of disturbed and/or remediated lands and features.

The technical disciplines, as described above, are referenced at various junctures throughout this report.

3.5 Evolution of Investigative Program

The Investigation Program was conducted in general accordance with the Project Execution Plan (AMEC, 2014d). Minor changes were adopted to suit field conditions. The program was generally ahead of schedule and was completed in eight days, compared to the planned 11 days. The following summarizes the changes to the Execution Plan:

- Two additional boreholes (BH-T-14-20 and -21) were completed in the Tailings Storage Facility disturbed area to better characterize the in situ conditions.
- Two additional test pit (TP-M-14-03 and TP-T-14-01). Test pit TP-14-03 was completed in the Mill Complex to help determine the spatial extent of the landfill area. Test pit TP-T-14-01 was completed at a relatively flat area, which is assumed to have been constructed for construction laydown during the dam construction, at the north side of the spillway channel diversion to determine the extent of the waste rock at the flat area.
- The required volumes of tailings porewater samples could only be taken from two of the designated monitoring wells. A partial porewater sample was recovered from a third well with a limited yield. The remaining two designated monitoring wells did not yield sufficient volumes of porewater.

3.6 Summary of Investigations Completed

The following summarizes the investigations completed by AMEC/AE:

- Thirty shallow drill holes were located and completed in the following areas:
  - Twenty-one around the margins of the Tailings Storage Facility;
  - Five around the Mill Complex; and
  - Four around the Camp Area.
- Four test pits were completed, three at the Mill Complex landfill and one north of the spillway diversion channel;
- Sixty-three sediment samples were collect in Dome Creek;
- Five soil samples were collected from areas of blackened or dead vegetation in the Dome Creek Valley downstream of the Tailings Storage Facility;
- Ten groundwater data loggers were downloaded;
- Five groundwater monitoring wells were sampled;
- Three water bodies were sampled;

- Five samples were collected from the ore leachate bins;
- Forty-five exploration trenches were investigated; and
- Field reconnaissance was completed at the Tailings Storage Facility, Open Pit, Mill Complex, Camp Area, Dome Creek Valley, Victoria Creek Wellhouse and potential borrow areas.

The final location of the boreholes and test pits are summarized and presented in Appendix 3A.

In addition to the above activities, surface and groundwater monitoring was undertaken under separate contracts to AAM by EDI and Hemmera. The following activities were completed:

- Twenty-eight groundwater monitoring wells were sampled by Hemmera between June 26 and June 29, 2014 (Hemmera, 2014);
- Hydrometric monitoring at up to 14 sites (dependent on conditions) by EDI in April, May (two events) and June 2014;
- Water quality sampling at 22 regular sites by EDI in April, May (2 events) and June 2014; and
- Water quality sampling at six additional sites by EDI in May 2014 (2 events) to capture freshet conditions.

The results of these monitoring programs were referenced or summarized by AMEC/AE in the document and considered in the Site Characterization Update (Section 6). Note that additional ground and surface water monitoring was completed during the fall of 2014 (as part of the regularly scheduled program) that has not been included in the characterizations described in this document.

3.7 SI Program Schedule

Field activities for the 2014 SI Program were conducted over an eight day period in late July. The actual schedule of field activity completed during this period is detailed on Figure 3.7-1. The daily reports compiled during the SI Program field schedule are provided in Appendix 3B.

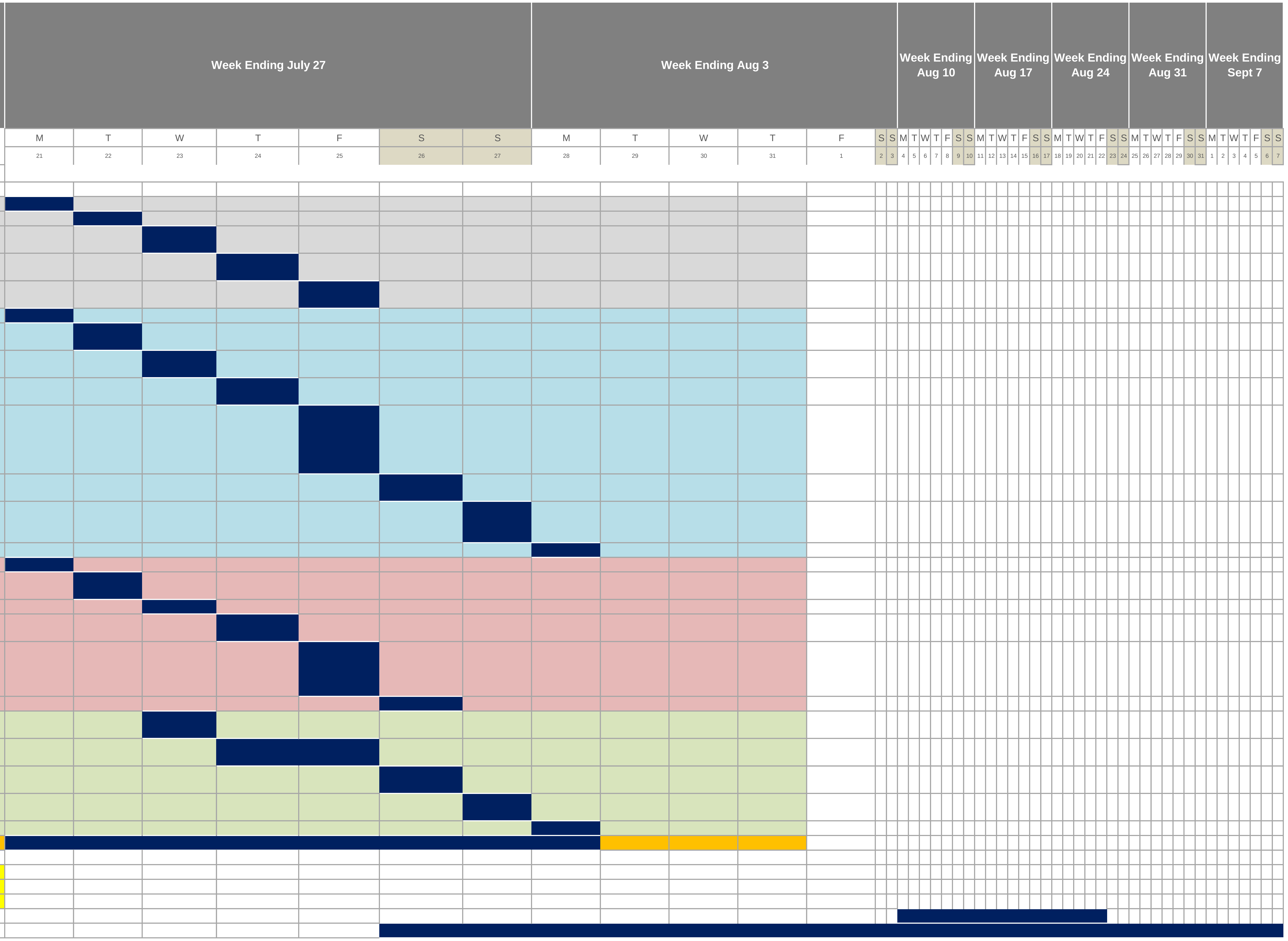
3.8 SI Program Photographs

Photographs illustrating activity under the various components of the SI program scope are provided in Appendix 3C.

Figure 3.7-1 Mount Nansen Remediation Project (MNRP) - Phase 2 TAR#2 SI Schedule

Last Update: **21-Jul-14** ***By: HY***

Component	Task	Activity	Start Date	End Date	Duration (Days)
Site Investigation					
Field Program					
	Nicole Jacques (AE)	Travel time/prep supply	21-Jul-14	21-Jul-14	1
		Download Data logger (AE/AAM)	22-Jul-14	22-Jul-14	1
		Sampled MW 09-04 and 09-03 at tailings area (2 AAM staff /1 AE) and sampling tailings pond on the boat.	23-Jul-14	23-Jul-14	1
		Sampling tailings seep water, seepage pond water and leachate bins (AE/AAM)	24-Jul-14	24-Jul-14	1
		Sampling of open pit pond water - Travel time/dropping off soil and water samples at Whitehors	25-Jul-14	25-Jul-14	1
	Hamid Yousefbeigi (AMEC)	Travel time/prep supply	21-Jul-14	21-Jul-14	1
		Dome Creek sedimen sampling downstream from Victoria Creek to 250m D/S of TSF (AMEC/AE/AAM)	22-Jul-14	22-Jul-14	1
		Trench reconnaissance (AMEC/AE/AAM) and laying out BH locations.	23-Jul-14	23-Jul-14	1
		Setting up Drillers and drilled two holes. Dome Creek sedimen sampling upstream of TSF (AMEC/AAM)	24-Jul-14	24-Jul-14	1
		Dome Creek sedimen sampling 250m D/S of TSF, going over some of the trenches with Carrie (AMEC/AE), shipping all samples to Whitehorse, completed taking photos of the pit walls to assist with pit stability analysis in the late afternoon.	25-Jul-14	25-Jul-14	1
		TSF site reconnaissance regarding construction execution and on site borrow potential (AMEC/AAM)	26-Jul-14	26-Jul-14	1
		General site reconnaissance regarding construction execution and on site borrow potential (AMEC/AAM) and landfill assessment test pitting (AMEC/AAM)	27-Jul-14	27-Jul-14	1
		Travel time	28-Jul-14	28-Jul-14	1
	Carrie Nadeau (AE)	Travel time/prep supply	21-Jul-14	21-Jul-14	1
		Dome Creek sedimen sampling downstream from Victoria Creek to 250m D/S of TSF (AMEC/AE/AAM)	22-Jul-14	22-Jul-14	1
		Trench reconnaissance (AMEC/AE/AAM)	23-Jul-14	23-Jul-14	1
		Trench reconnaissance and existing access roads on site (AE/AAM)	24-Jul-14	24-Jul-14	1
		Dome Creek sedimen sampling 250m D/S of TSF, going over some of the trenches with Hamid (AMEC/AE), travel time and dropping off water and soil samples	25-Jul-14	25-Jul-14	1
		Travel Time/drop off soil samples	26-Jul-14	26-Jul-14	1
	Daniel kennedy (AMEC) Jim Coates & Astrid Grawehr (Kryotek)	AMEC (Dan) and two drillers travel time, prep supply/ mobilization	23-Jul-14	23-Jul-14	1
		BH drilling soil & permafrost in immediate vicinity of TSF	24-Jul-14	25-Jul-14	2
		BH drilling soil & permafrost in immediate vicinity of Mill and Camp	26-Jul-14	26-Jul-14	1
		BH drilling soil & permafrost in immediate vicinity of TSF	27-Jul-14	27-Jul-14	1
		AMEC (Dan) and two drillers travel time, demobilization	28-Jul-14	28-Jul-14	1
	AAM Staff	Support During SI Program	21-Jul-14	28-Jul-14	8
Laboratory Testing					
		Kinetic rock resting	21-Jul-14		x
		Short term testing	21-Jul-14		x
		Water Quality Lab testing	21-Jul-14		x
		Geotechnical Lab testing	4-Aug-14	22-Aug-14	19
		Geochemical Lab testing	26-Jul-14	9-Sep-14	46



Lab testing dates are to be confirmed

4 Investigation Methodologies

4.1 Drilling

Thirty boreholes were completed around the Tailings Storage Facility disturbed area limits from July 24 to July 27, 2014. Dark Side Drilling, a Division of Kryotek Arctic Innovation Inc. was subcontracted via AMEC to conduct the drilling. The drilling was completed under AMEC’s direction and supervision. Two different types of solid stem auger drilling were used on this project. The selection of the appropriate method depended on the subsurface conditions encountered.

Solid stem flight augers mounted on a 6x6 Polaris Ranger were used for the majority of the drilling. The drilling rig was powered by a hydraulic motor mounted on the Ranger. The augers were 100 mm in diameter and had 1.52 metre (5 foot) rod lengths. The Ranger mounted rig was lightweight and portable, and was selected to minimize disturbance to the sensitive ground during drilling and rig movement.

In areas of difficult access or difficult drilling conditions, solid stem augers mounted on a portable tripod (Talon Drill) were used.

The drilling and sampling methodology was as follows:

- A tailgate safety meeting was held on a daily basis to discuss the anticipated hazards, Personal Protective Equipment (PPE) required and hazard mitigation procedures prior to drilling.
- Using the GPS coordinates presented in the Execution Plan, all boreholes were located and staked in the field using hand-held GPS equipment. This work was done one day prior to the start of the investigation program. Final borehole locations were determined based on field observations and the safety of the crew. In general, the borehole locations were laid out within approximately 4 m of the disturbed/undisturbed boundary. The as-built coordinates were taken via handheld GPS unit upon completion.
- An AMEC representative logged the soil samples from the auger flights based on the Modified Unified Soil Classification System (MUSCS). Details of the MUSCS and the borehole logs are presented in Appendix 4A. Aerial imagery of borehole locations is provided in Appendix 4B.
- A calibrated probe thermometer was used to measure the soil temperature to help identify permafrost.
- Representative soil samples were collected from the auger flights and placed in plastic bags for further laboratory testing. The name of the borehole and depth of the sample were labelled on the bag. Collected permafrost soil samples were weighed in the field using a digital scale with a resolution of 0.1 grams. The purpose of the field weight measurement was to record the initial weight of the sample, in case some of the melted water/ice in the sample leaked from the sample bag during transportation to the laboratory. Samples were packaged and shipped to the AMEC laboratory in Surrey, BC.
- Drilling continued until the termination depth was reached, or until refusal was met.

- The drill holes were backfilled to the ground surface using the drill cuttings.

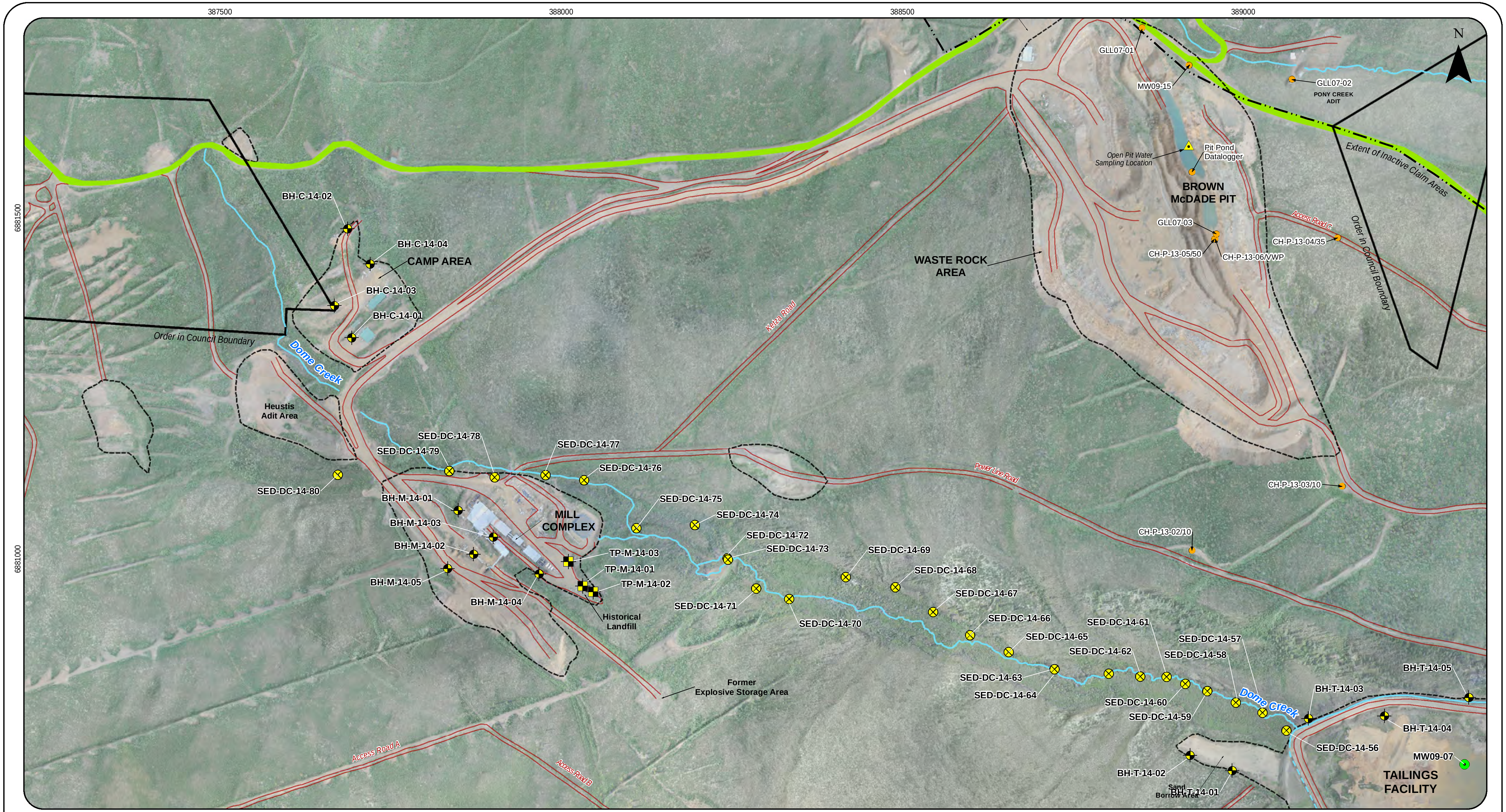
Borehole plan locations are shown on Figures 4.1-1 and 4.1-2 and borehole coordinates are included in summary table “2014 Site Investigation Locations” in Appendix 3A.

4.2 Test Pitting

Four test pits were completed, three in the landfill area at the mill site and one north of the spillway diversion channel on July 26, 2014. Test pit locations are shown on Figures 4.1-1 and 4.1-2. Denison Environmental Services (DES), contracted via AAM, carried out the test pitting program using their CASE CX210 hydraulic track excavator and operator. The test pitting program was completed under AMEC’s direction and supervision.

The test pit excavation and sampling methodology was as follows:

- A tailgate safety meeting was held to discuss the anticipated hazards, PPE required and hazard mitigation procedures.
- Test pits were visually located near the locations proposed in the execution plan. The coordinates of the actual test pit locations were taken with a handheld GPS unit.
- An AMEC representative logged the test pits while in constant communication (verbally and via hand signs) with the excavator operator for instructions/feedback.
- The operator directed the bucket straight down into the subsurface soil and brought the excavated materials to surface so they could be observed, logged, and sampled. If pit heights and/or sideslopes were within safety limits, the AMEC representative would enter the test pit for collecting, observing or logging the soil.
- The excavated material was then placed in a spoil pile adjacent to the test pit.
- Test pits were advanced until the operator was notified that a sample was to be retrieved.
- Collected soil samples were put in glass jars or durable plastic bags. All glass jars were filled with no headspace. Samples were placed in a cooler with ice packs and submitted to the ALS Environmental Laboratory in Whitehorse. The samples were collected in accordance with the Contaminated Sites Regulation (CSR) Protocol No. 3 (YG, 2002).
- Subsurface soils were logged per the modified unified soil classification system.
- The performance of the test pit was observed and recorded (i.e. degree and depth of sloughing, location and description of any water seepage).
- Representative photos were taken.
- Test pit depth, sample depth and depth of stratigraphic changes were measured by lowering a measuring tape down the test pit wall.
- The maximum depth of the test pit was determined by the maximum reach of the excavator, typically 4 m to 5 m depth depending on the horizontal reach of the test pit from the excavator.
- All test pits were backfilled upon completion, and graded to mimic the surrounding area.



Data Source:
Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

▬	Order in Council Boundary
– · · –	Extent of Inactive Claim Areas
🟩	Public Road
═	Road
▬	Stream
- - -	Diversion Channel
═	Contour (20 m)
═	Contour (5 m)

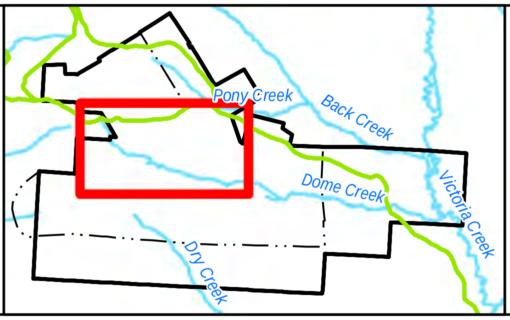
2014 Test Holes and Samples

⊕	Borehole
⊗	Sediment Sample
▣	Test Pit
▲	Water Sample (Bulk Water Treatment Tests)
●	Dataloggers

Existing Monitoring Wells Sampled (Bulk Water Treatment Tests)

⊙	Monitoring Wells

⬚ Distu



Energy, Mines and Resources
Assessment and Abandoned Mines

MOUNT NANSEN REMEDIATION PROJECT
Figure No. 4.1-1

2014 SITE INVESTIGATION REPORT
UPPER DOME CREEK
SOIL, SEDIMENT, WATER &
DATALOGGER SAMPLING LOCATIONS
Scale 1:5,500
Metres
0 110 220
January 16, 2015

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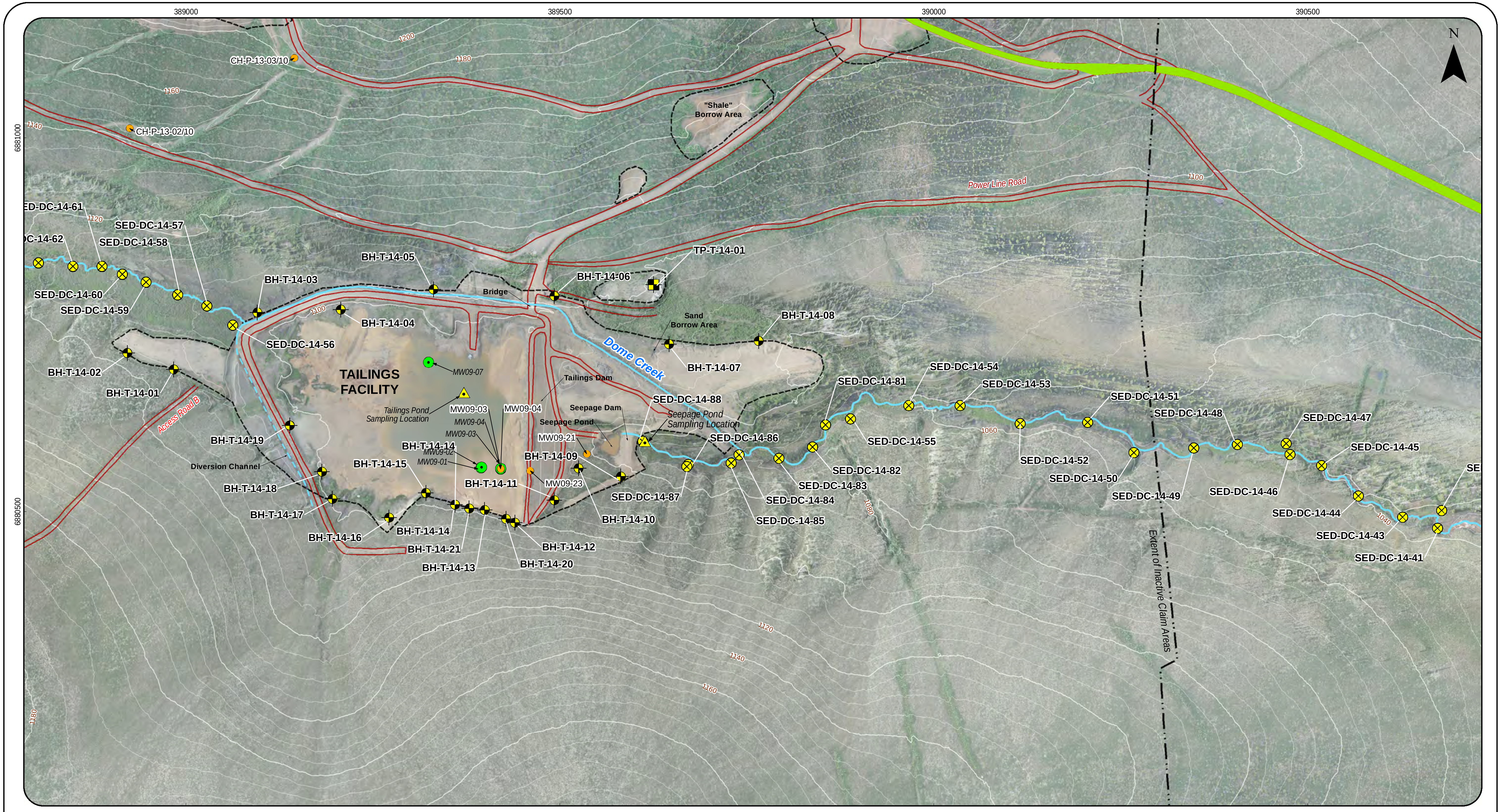


Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

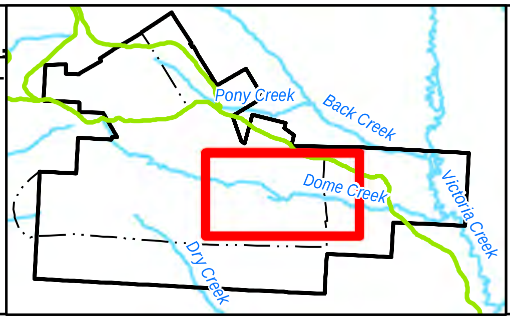
- Order in Council Boundary
- Extent of Inactive Claim Areas
- Public Road
- Road
- Stream
- Diversion Channel
- Contour (20 m)
- Contour (5 m)

2014 Test Holes and Samples

- Borehole
- Sediment Sample
- Test Pit
- Water Sample (Bulk Water Treatment Tests)
- Dataloggers

Existing Monitoring Wells Sampled (Bulk Water Treatment Tests)

- Monitoring Wells



MOUNT NANSEN REMEDIATION PROJECT
Figure No. 4.1-2

2014 SITE INVESTIGATION REPORT
MIDDLE DOME CREEK
SOIL, SEDIMENT, WATER &
DATALOGGER SAMPLING LOCATIONS
Scale 1:5,000
Metres
0 100 200
January 16, 2015

Energy, Mines and Resources
Assessment and Abandoned Mines

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Test pit TP-M-14-01 was excavated to 5 m with no waste material identified. No soil samples were collected from this location. Test pit TP-M-14-02 and TP-M-14-03 samples were collected from soils below the waste materials and sent for laboratory analysis. The test pit logs describing the conditions within each test pit are included in Appendix 4C.

4.3 Dome Creek Sediment Sampling

The sediment sampling program was conducted by individual AMEC and AE representatives, with the aid of an AAM staff member. Samples were collected at approximately 50 m regular intervals along Dome Creek starting from the confluence with Victoria Creek and working upstream. A total of 63 sediment samples were collected as follows:

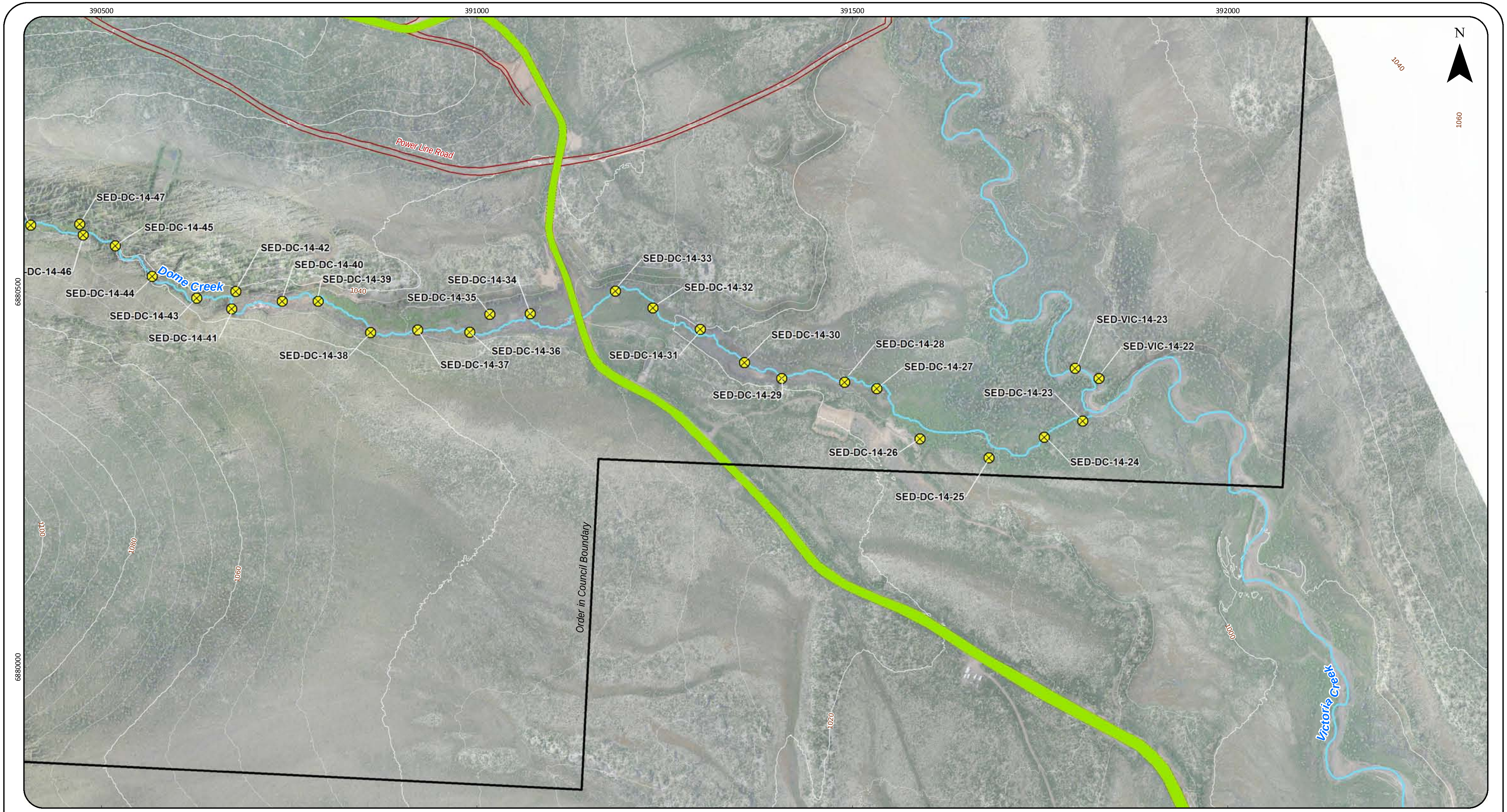
- Two samples from Victoria Creek just upstream of the confluence with Dome Creek;
- Eleven samples from Dome Creek between Victoria Creek and the road;
- Twenty-five samples from Dome Creek between the road and the TSF; and
- Twenty-five samples from Dome Creek between the TSF and Mill Complex.

Five soil samples were collected from areas of blackened or dead vegetation downstream of the TSF, based on visual observations. The locations of all samples are shown on Figures 4.1-1, 4.1-2 and 4.3-1.

A total of six duplicate samples were collected during the sediment sampling program. The AE representative also collected soil and vegetation samples from the areas of where blackened roots or dead patches of willow and shrub birch were observed. The coordinates of the individual sample locations were obtained using a hand held GPS unit. The sample locations were photographed and field observations were recorded.

The sediment and soil samples were collected using the following sampling procedures:

- Samples were collected from downstream to upstream.
- A new pair of disposable nitrile gloves was used to collect and handle sediments at each sampling location.
- The sample was collected with a scoop and consisted of a minimum of 200 g of fine-grained sediments (gravel or smaller) into a labelled durable plastic bag.
- The samples were double-bagged for additional protection during transportation.
- Field duplicate samples were collected for 10% of the sediment samples. The duplicate samples were collected by splitting the sediment sample into two separate bags.
- The samples were placed in 20 L buckets filled with ice packs during sample collection.
- The samples were transferred into a larger cooler filed with ice packs at the end of the shift.
- The samples were shipped to the laboratory within the 72 hour holding time requirement, specified by the laboratory.



Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012

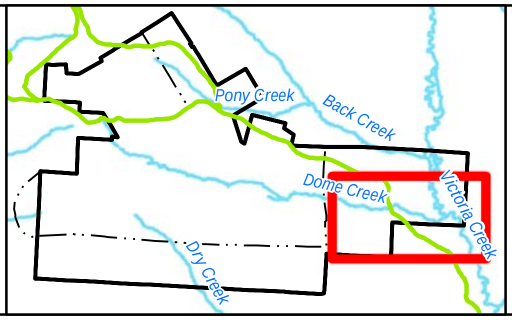
Datum: NAD 1983 CSRS UTM Zone 8N

Legend

— Order in Council Boundary
-·- Extent of Inactive Claim Areas
— Public Road
— Road
— Stream
-- Diversion Channel
═ Contour (20 m)
═ Contour (5 m)

2014 Test Holes and Samples

⊗ Sediment Sample



Associated Engineering GLOBAL PERSPECTIVE. LOCAL FOCUS.

amec

Yukon Energy, Mines and Resources Assessment and Abandoned Mines

MOUNT NANSEN REMEDIATION PROJECT
Figure No. 4.3-1

2014 SITE INVESTIGATION REPORT

LOWER DOME CREEK
SOIL AND SEDIMENT SAMPLING LOCATIONS

Scale 1:5,000
Metres
0 100 200

October 1, 2014

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The sediment and soil samples were labelled as “*SED-DC-14-XX*” where:

- *“SED”* indicated the type of sample, in this case sediment;
- *“DC”* indicated Dome Creek and “VIC” indicated Victoria Creek;
- *“14”* indicated the year when sample was collected; and
- *“XX”* indicated the sample number established from 2013 (the 2014 numbers started at 22).

Note that sample number 21 is missing. It was collected as an example and discarded in the field.

4.4 Water Sampling

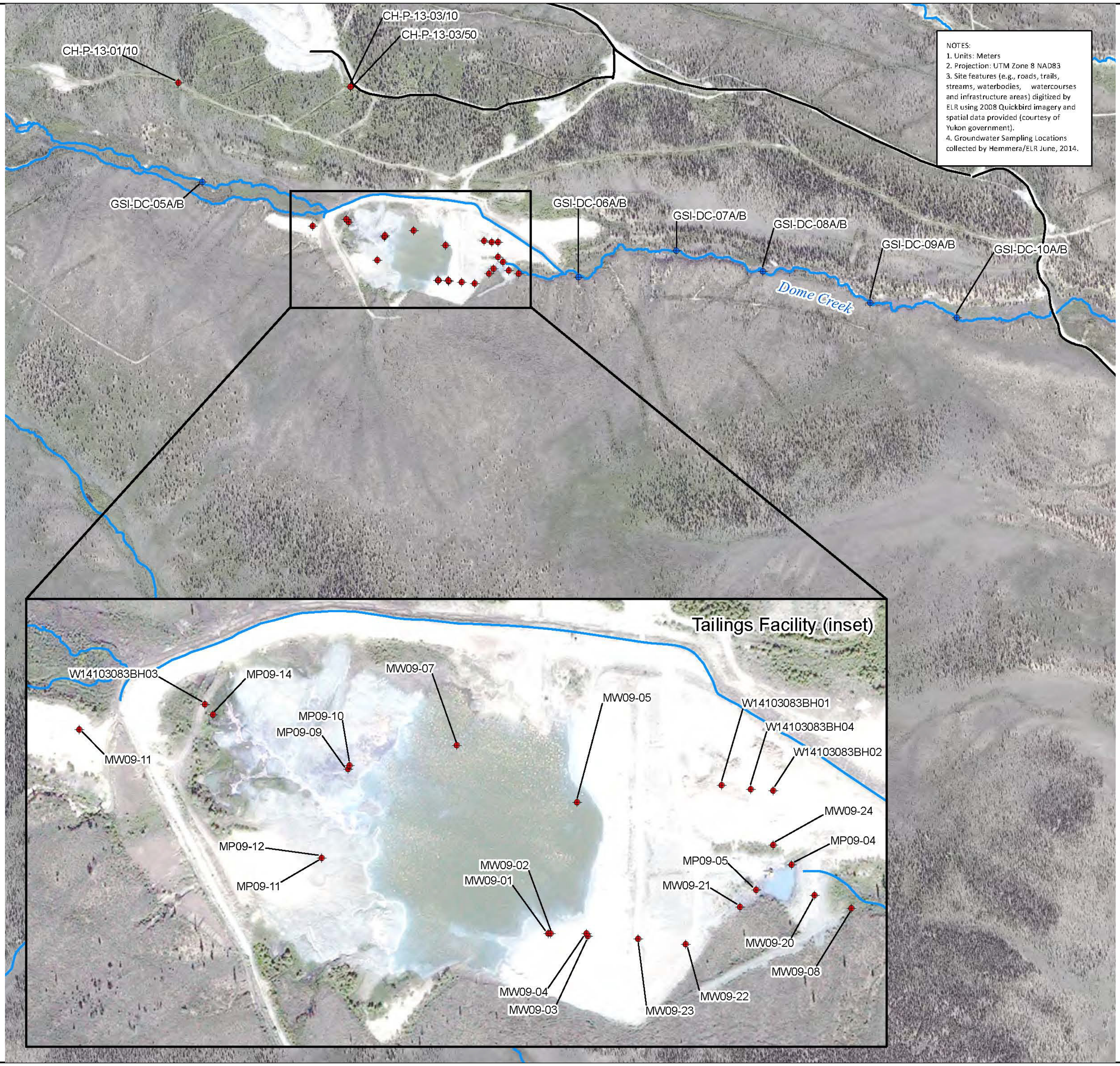
4.4.1 Groundwater Datalogger Downloads

Groundwater dataloggers were downloaded on July 22 and 25, 2014 by AE with the aid of an AAM representative. The datalogger locations are shown on Figures 4.1-1 and 4.1-2. The download procedures were outlined in the Project Execution Plan (AMEC, 2014d). All dataloggers were downloaded successfully, with the exception of one Solinst Levellogger that was frozen into place in groundwater well GLL07-01. This levellogger was retrieved at a later date. Going forward, AMEC has advised AAM that dataloggers should be downloaded on a quarterly basis.

4.4.2 Groundwater Monitoring Program

Groundwater monitoring was conducted by Hemmera Envirochem Inc. (Hemmera) and Ecological Logistics and Research Ltd. (ELR) between June 26 and June 29, 2014. The locations of the wells sampled are shown on Figures 4.4.2-1 and 4.4.2-2. The monitoring procedures are described in Hemmera (2014). Samples were submitted to the laboratory for analysis of general chemistry, ammonia, total inorganic carbon, sulphide, cyanide (total, free and WAD), thiocyanate, dissolved metals and dissolved mercury. Table 4.4.2-1 summarizes the samples collected at each well.

The sampling protocols used by Hemmera were consistent with industry standard protocols and included the purging of three well volumes of water using either Waterra foot-valves or a peristaltic pump. Field measurements were taken with standard instrumentation. The preservatives used, as listed in Table 2-2 of the Hemmera report, were the same as used by AMEC in 2013.



NOTES:
1. Units: Meters
2. Projection: UTM Zone 8 NAD83
3. Site features (e.g., roads, trails, streams, waterbodies, watercourses and infrastructure areas) digitized by ELR using 2008 Quickbird imagery and spatial data provided (courtesy of Yukon government).
4. Groundwater Sampling Locations collected by Hemmera/ELR June, 2014.

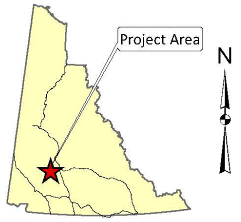
Data Source:
HEMMERA 2014

Datum: NAD 1983 UTM Zone 8N

Legend

Groundwater Sampling Locations

◆	Drive Point
◆	Monitoring Well
—	Watercourses



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MOUNT NANSEN REMEDIATION PROJECT
Figure No. 4.4.2-1

2014 SITE INVESTIGATION REPORT

GROUNDWATER SAMPLING LOCATIONS,
DOME CREEK AND TAILINGS
FACILITY (HEMMERA 2014)

Scale: 1:15,000

200 100 0 200
Meters

January 13, 2015

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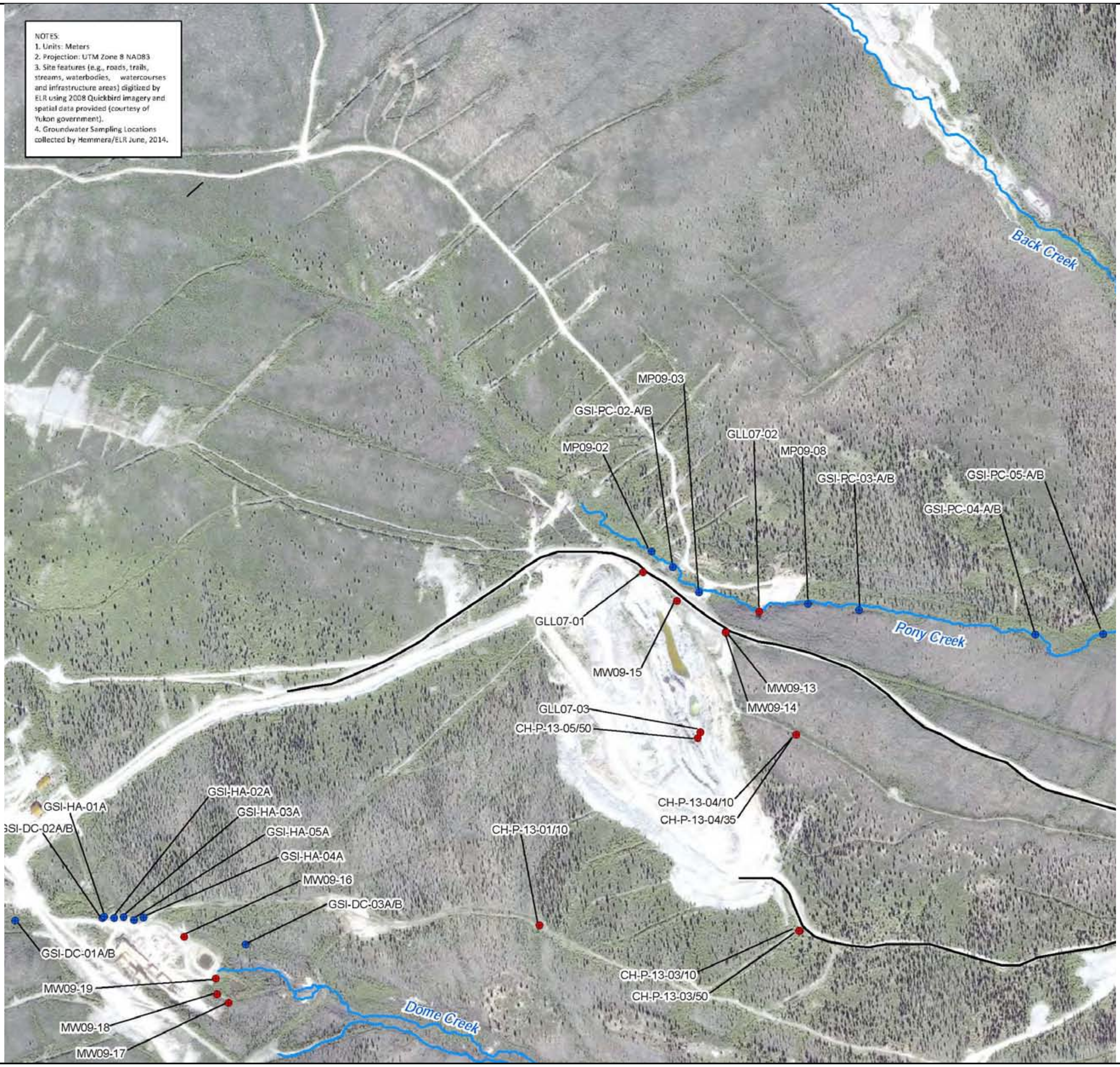


NOTES:
1. Units: Meters
2. Projection: UTM Zone 8 NAD83
3. Site features (e.g., roads, trails, streams, waterbodies, watercourses and infrastructure areas) digitized by ELR using 2008 Quickbird imagery and spatial data provided (courtesy of Yukon government).
4. Groundwater Sampling Locations collected by Hemmera/ELR June, 2014.

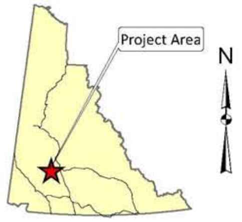
Data Source:
HEMMERA 2014

Datum: NAD 1983 UTM Zone 8N

Legend

Groundwater Sampling Locations

- ◆ Drive Point
- ◆ Monitoring Well
- — Watercourses



Energy, Mines and Resources
Assessment and Abandoned Mines

MOUNT NANSEN REMEDIATION PROJECT
Figure No. 4.4.2-2

2014 SITE INVESTIGATION REPORT

GROUNDWATER SAMPLING LOCATIONS,
MILL COMPLEX AND BROWN
MCDADE PIT (HEMMERA 2014)

Scale: 1:10,000

150 75 0 150

Meters

January 13, 2015

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Table 4.4.2-1: Summary of Samples Collected at Each Well Location (Hemmera, 2014)

Area	Well Name	UTM (Zone 08N)		Status[1]	Sample Collected	QA/QC Sample Collected
		Easting	Northing			
Dome Creek	GSI-DC-01B	387675	6881124	Insufficient Volume	-	-
	GSI-DC-02B	387839	6881129	Insufficient Volume	-	-
	GSI-DC-03B	388107	6881079	Insufficient Volume	-	-
	GSI-DC-05B	388725	6880836	Insufficient Volume	-	-
	GSI-DC-06B	389788	6880567	Good	✓	-
	GSI-DC-07B	390065	6880641	Good	✓	-
	GSI-DC-08-B	390311	6880583	Frozen	-	-
	GSI-DC-09-B	390614	6880494	Good	✓	-
	GSI-DC-10-B	390859	6880452	Good	✓	-
Mill Complex	GSI-HA-01A	387842	6881132	Insufficient Volume	-	-
	GSI-HA-02A	387861	6881129	Insufficient Volume	-	-
	GSI-HA-03A	387878	6881131	Insufficient Volume	-	-
	GSI-HA-04A	387916	65881130	Insufficient Volume	-	-
	GSI-HA-05A	387898	6881125	Insufficient Volume	-	-
	MW09-16	387992	6881094	Good	✓	Duplicate
	MW09-17	388075	6880970	Good	✓	-
	MW09-18	388054	6880986	Good	✓	-
	MW09-19	388051	6881016	Good	✓	-
Brown McDade Pit	CH-P-13-01/10	388657	6881116	Frozen	-	-
	CH-P-13-03/10	389145	6881105	Damaged[2]	-	-
	CH-P-13-03/50	389143	6881105	Good	✓	-
	CH-P-13-04/10	389138	6881472	Insufficient Volume	-	-
	CH-P-13-04/35	389138	6881472	Obstruction[2]	-	-
	CH-P-13-05/50	388954	6881466	Good	✓	Duplicate
	GLL07-01	388851	6881777	Frozen	-	-
	GLL07-02	389069	6881703	Dry	-	-
	GLL07-03	388959	6881477	Good	✓	-
	MP14-01	N/A	N/A	Not installed	-	-
	MW09-13	389006	6881665	Frozen	-	-
	MW09-14	389006	6881663	Frozen	-	-
	MW09-15	388915	6881723	Frozen	-	-
Pony Creek	GSI-PC-01-B	388720	6881918	Destroyed[2]	-	-
	GSI-PC-02-B	388907	6881786	Dry	-	-
	GSI-PC-03-B	389256	6881706	Insufficient Volume	-	-
Pony Creek	GSI-PC-04-B	389586	6881660	Insufficient Volume	-	-
	GSI-PC-05-B	389713	6881661	Dry	-	-
	MP09-01	N/A	N/A	Unable to Locate	-	-
	MP09-02	388867	6881816	Good	✓	-
	MP09-03	388956	6881739	Insufficient Volume	-	-
	MP09-08	389160	6881718	Good	✓	-

Area	Well Name	UTM (Zone 08N)		Status[1]	Sample Collected	QA/QC Sample Collected
		Easting	Northing			
Seepage Dam	W14103083BH01	389522	6880669	Frozen	-	-
	W14103083BH02	389561	6880665	Insufficient Volume	-	-
	W14103083BH04	389544	6880666	Frozen	-	-
Tailings Facility	MP09-04	389575	6880609	Good	✓	-
	MP09-05	389548	6880590	Good	✓	-
	MP09-09	389240	6880681	Good	✓	-
	MP09-10	389241	6880684	Good	✓	-
	MP09-11	389220	6880614	Good	✓	-
	MP09-12	389220	6880614	Good	✓	-
	MP09-14	389138	6880722	Insufficient Volume	-	-
	MW09-01	389391	6880557	Obstruction[2]	-	-
	MW09-02	389393	6880557	Good	✓	Duplicate
	MW09-03	389421	6880555	Good	✓	-
	MW09-04	389420	6880557	Good	✓	-
	MW09-05	389413	6880656	Unable to Access	-	-
	MW09-06	N/A	N/A	Unable to Locate[3]	-	-
	MW09-07	389322	6880699	Good	✓	-
	MW09-08	389620	6880576	Good	✓	Duplicate
	MW09-11	389037	6880711	Dry	-	-
	MW09-20	389592	6880586	Dry	-	-
	MW09-21	389536	6880577	Good	✓	-
	MW09-22	389495	6880549	Good	✓	-
	MW09-23	389459	6880553	Good	✓	-
	MW09-24	389561	6880624	Good	✓	-
	W14103083BH03	389132	6880730	Insufficient Volume	-	-

Notes:

[1] *Insufficient Volume as defined by AAM where less than two litres of water could be purged from the well, and where less than two litres of water was present after allowing the well to recharge.*

[2] *Further details concerning damaged, degraded, or obstructed wells are provided in Section 3.2.*

[3] *Well MW09-06 was noted as 'submerged' during 2013 (as described in the Scope of Work). Based on field observations, this is the likely reason for that well not being located during the spring 2014 program.*

4.4.3 Pond and Pore Water Sampling for Water Treatment

The following sources of water were sampled as part of the 2014 site investigation to advance the water treatment plant design and are shown on Figures 4.1-1 and 4.1-2:

- Tailings porewater;
- Tailings pond water;
- Tailings seepage pond water; and
- Pit pond water.

This task was completed by AE, with the aid of an AAM representative. Sampling procedures for those wells that could be sampled were as per the Execution Plan (AMEC, 2014d).

One 20 L bucket of the tailings porewater was collected from each of monitoring wells MW09-02, MW09-03 and MW09-04. Monitoring well MW09-01 was dry. Monitoring well MW09-07 produced insufficient water (i.e. 2 L after 1.5 hours of pumping) for analysis of all the parameters identified in Table 4.4.3-1. The 2 L volume was used for ammonia, cyanide and total and dissolved metals analysis. Monitoring well MW09-01 could not be sampled and MW09-07 had slow recovery during the June groundwater monitoring event too (Hemmera, 2014). This is not unusual with wells completed within tailings since tailings facilities tend to have very fine-grained areas due to the way the solids settle during deposition. Another explanation could be the relatively low tailings pond water elevation in 2014.

Two 20 L buckets were filled for each of the three surface water sources identified above to allow for sufficient volume to complete the water treatment laboratory tests. These bulk samples were not preserved; however, the following procedures were applied during their collection:

- Collection of bottom sediment was avoided;
- External effects that could compromise the sample (e.g. oil, petrol, or other reagents) were prevented;
- Cleanliness of pails (or other containers) was confirmed;
- Pails and lids were rinsed with sampled water (normally three rinses, while avoiding suspension of sediments);
- Snap-on lids (with tag removed) were used;
- Pails were filled as much as possible, to minimize reactions with oxygen; and
- Samples were kept cool during transport and storage.

To properly characterize each water source, small sample bottles were also filled for standard laboratory analyses of sulphur (or sulphate), ammonia, cyanide and total and dissolved metals. Table 4.4.3-1 is a summary table of the water samples which were collected for the water treatment scope. The sample collected from MW09-07 was tested for ammonia, cyanide and total and dissolved metals but not for sulphate or water treatment testing because the sample volume was insufficient for the complete analytical protocol.

Table 4.4.3-1: Summary of Water Samples Collected

Analysis	Bottle	Preservation	Pit Pond	Tailings Pond	Tailings Seepage Pond	Tailings Porewater				
						MW09-01	MW09-02	MW09-03	MW09-04	MW09-07
Water treatment	20 L pail	None	2	2	2	0	1	1	1	Partial
Total metals	125-250 mL plastic	1:3 Nitric Acid (HNO3)	1	1	1	0	1	1	1	1
Dissolved metals (field filtered)	100 mL plastic	1:3 Nitric Acid (HNO3)	1	1	1	0	1	1	1	1
Ammonia	250 mL glass or plastic	1:1 Sulphuric Acid (H2SO4)	1	1	1	0	1	1	1	1
Cyanide	145 mL plastic	6N NaOH	1	1	1	0	1	1	1	1
Sulphate	0.5-1.0 L plastic	None	1	1	1	0	1	1	1	0

Standard laboratory protocols and preservation techniques were followed. All small sample bottles were shipped to AGAT Laboratory. One 20 L bucket from each water source was shipped by an AE representative to the AMEC office in Montreal.

4.4.4 Leachate Bins

Leachate samples were collected from the unsaturated waste rock bin, unsaturated ore bin, unsaturated sand tailings bin, and also water columns from the saturated tailings+organic bin onsite. There was no visible water in the collection tank for the saturated waste rock bin and none that could be drained out of the tube leading to the tank. These bins are dependent on the material in the bin and meteoric water and only collect what drains through the bin material. For comparison, the unsaturated waste rock bin collection tank had 1.5 L of water, while the unsaturated sand tailings bin collection tank had as much as 17 L of water.

The leachate samples were submitted to ALS Environmental laboratory for water quality testing of physical parameters, anions and nutrients, total metals and dissolved metals. ALS Environmental is accredited by the Canadian Association for Laboratory Accreditation.

4.4.5 Surface Water Hydrology and Water Quality

Monthly flow monitoring and water quality sampling is conducted by EDI under contract to AAM. EDI also conducted an extra monitoring event on May 8 and 9 to capture freshet.

The following sample dates are included in this report for the ongoing EDI surface water hydrology monitoring and water quality sampling program:

- April 14-15, 2014;
- May 8-9, 2014;
- May 20-21, 2014; and
- June 23-25, 2014.

Hydrology monitoring stations and water quality sample locations are shown on Figure 4.4.5.1. All water quality samples were submitted to ALS Laboratory in Whitehorse. A summary of the hydrometric and water quality monitoring program completed at each station is presented in EDI (2014a) and reproduced (Table 4.4.5-1). Details of the sampling methodology and procedures are included in the Mount Nansen Water Resources Investigations Quarterly Report (Q1): April – June 2014 (EDI, 2014a). Results for the July and August sampling events were collected from monthly memos and will be reported in the Q2 report when it becomes available.

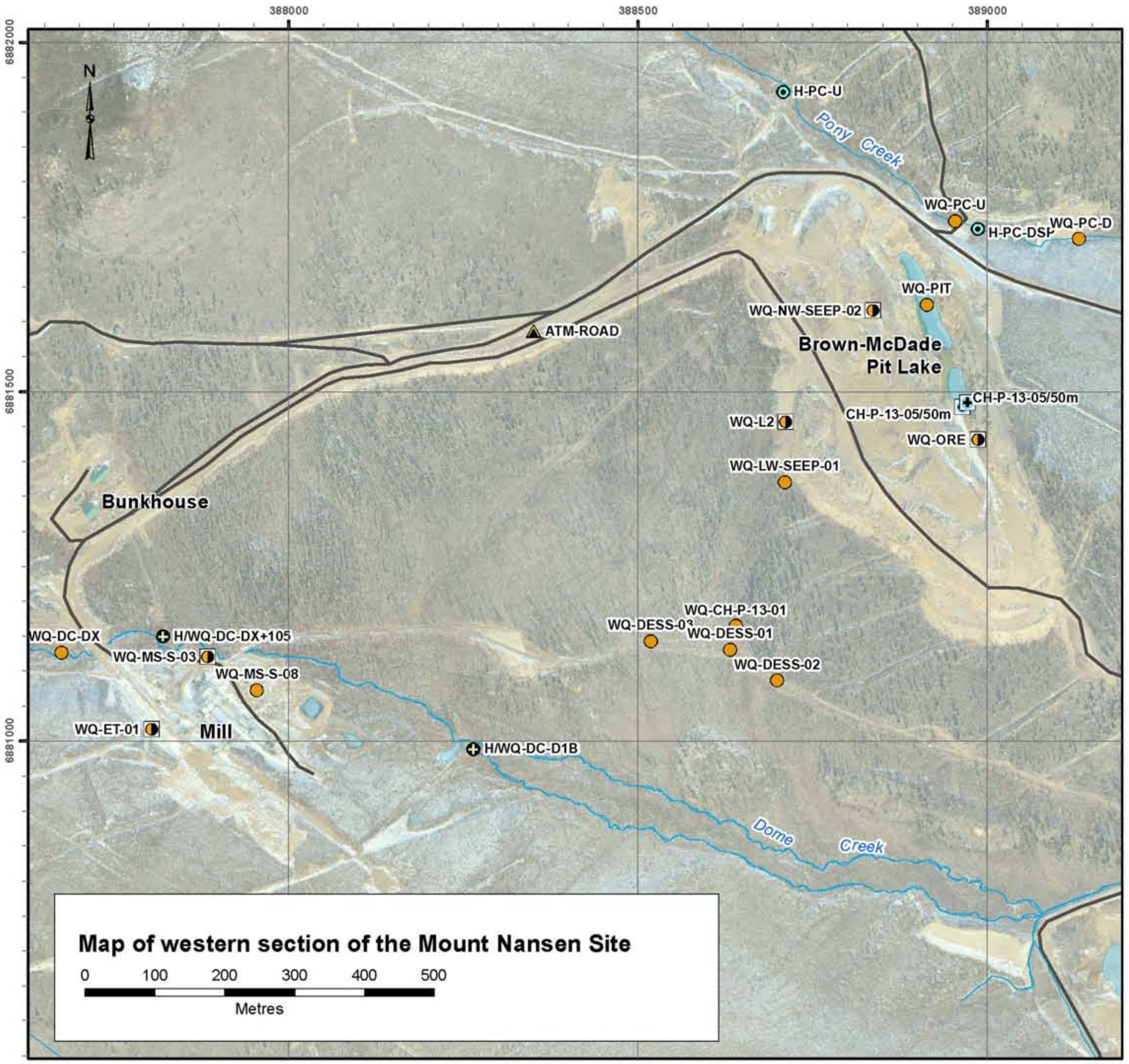
4.5 Exploration Trench and Dome Creek Inspections

4.5.1 Field Survey

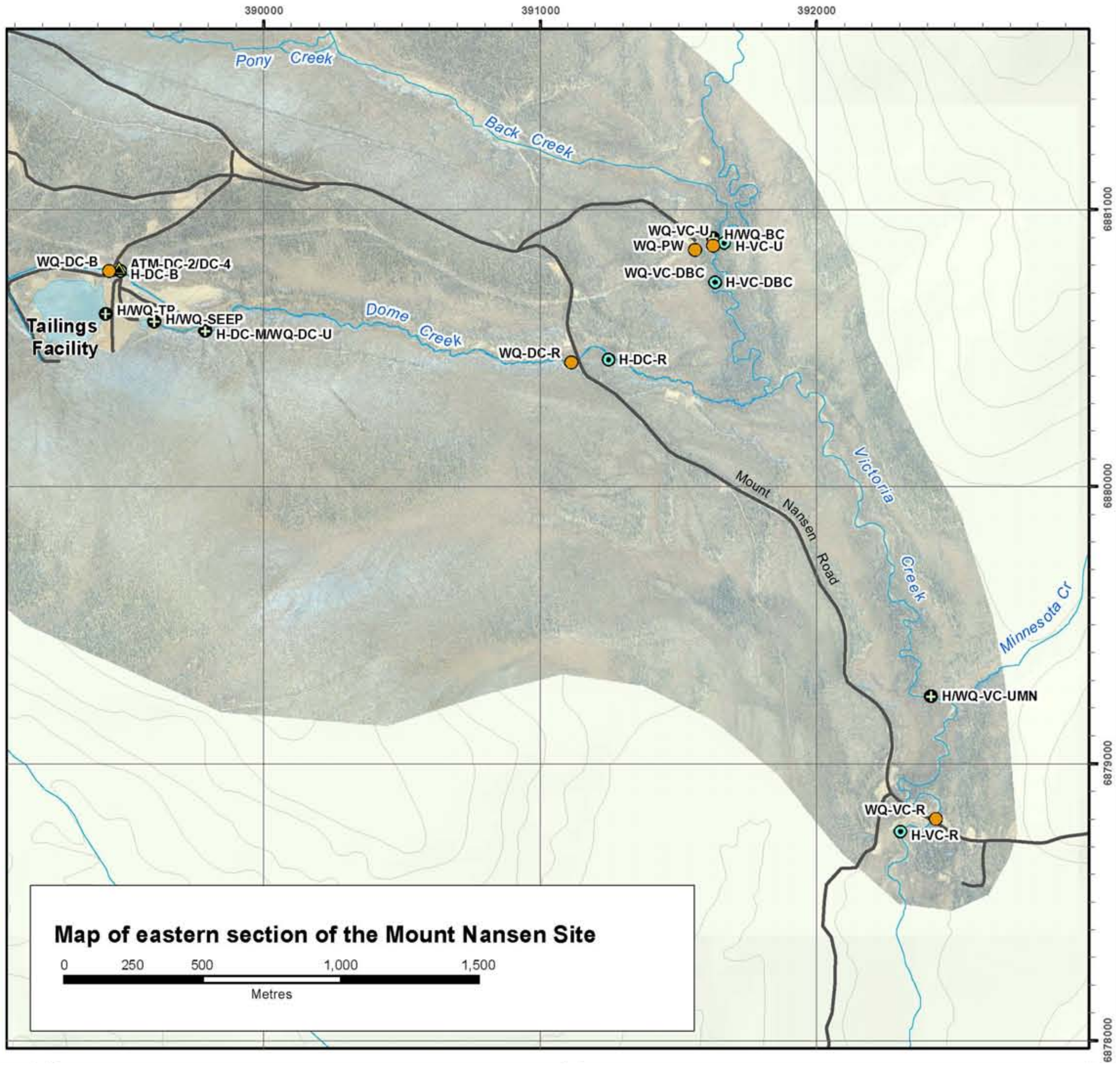
During the field survey, there were two areas of focus: Dome Creek and Dome Creek valley, and the exploration trenches. AE and AMEC field team members walked Dome Creek from the confluence with Victoria Creek up to the base of the Tailings Pond Dam. Waypoints were recorded at each sediment sampling site. Data collected included dominant vegetation species, general ecology and vegetation community type, wildlife observations, and special features relevant to reclamation such as uncommon riparian communities, wetland complexes, and changes in creek morphology.

Prior to the exploration trench survey, and for ease of identification in the field, the trenches were grouped based on location on the Mount Nansen site. Four groups were created (see Figure 4.5.1-1):

- South Trenches (ST, 13 trenches);
- Western Trenches (WT, 9 trenches);
- Northern Trenches (NT, 16 trenches); and
- Pit Trenches (PT, 6 trenches).



Map of western section of the Mount Nansen Site



Map of eastern section of the Mount Nansen Site

Notes:

1:50,000 and 1:250,000 Topographic Spatial Data provided by Geomatics - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Digital Elevation Model provided by Geomatics - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Watercourse, drainage areas and Mount Nansen Road layers digitized / modified by EDI (2011) using orthophotos provided by Yukon Government, Energy, Mines and Resources (2011).

Imagery provided by Yukon Government - Energy, Mines and Resources - Abandoned Mines Branch.

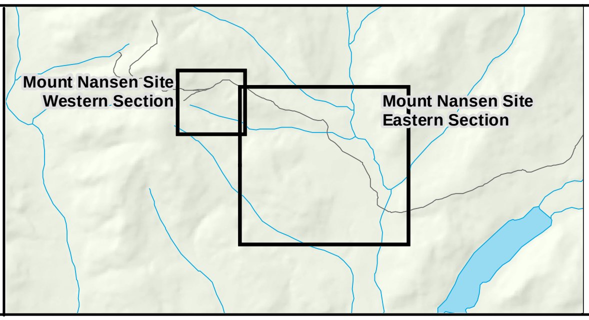
Project data displayed is site specific. Data collected by EDI Environmental Dynamics Inc. (2014) was obtained using Garmin GPS technology.

This document is not an official land survey and the spatial data presented is subject to change.

Legend

▲ Atmospheric Station (label ex: ATM-DC-2)
⊕ Hydrometric Station and Water Quality Site (label ex: H/WQ-VC-UMN)
⊙ Hydrometric Station (label ex: H-VC-R)
● Water Quality Site (label ex: WQ-PC-U)
⊞ Temporary Hydrometric Station
◑ Temporary Water Quality Site
— Unpaved Road/Access

Datum: NAD 1983 UTM Zone 8N



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MOUNT NANSEN REMEDIATION PROJECT
Figure No. 4.4.5-1

2014 SITE INVESTIGATION REPORT

HYDROMETRIC STATIONS AND
WATER QUALITY SITES (EDI 2014B)

January 13, 2015

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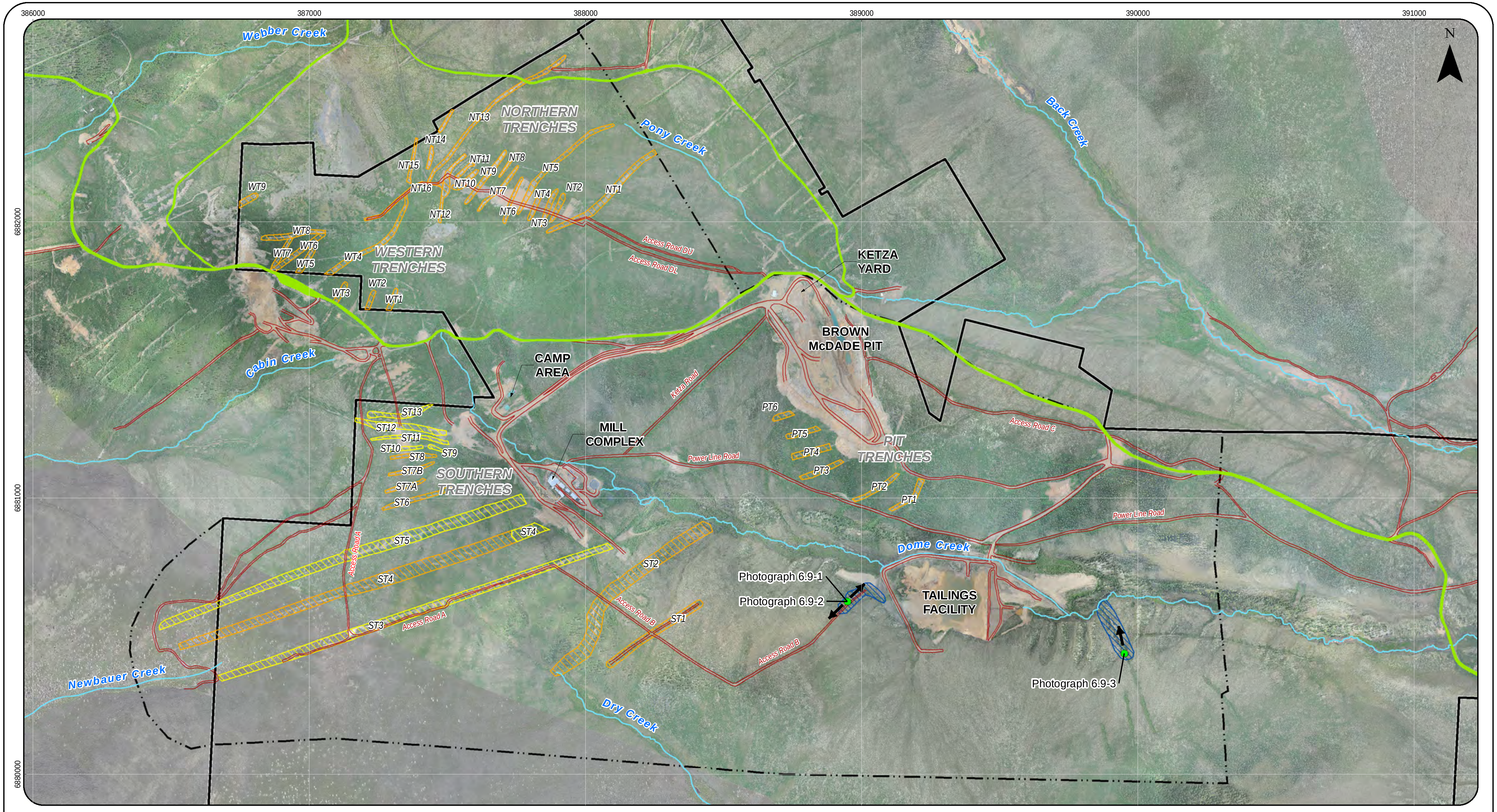
Table 4.4.5-1: 2014/2015 Hydrometric and Water Quality Stations as of April 2014 Reported by EDI (2014a)

Station/Site Name	Hydrology	Water Quality	Station/Site ID
Upper Pony Creek	Yes	Yes	H/WQ-PC-U
Pony Creek Downstream of Pit	Yes	Yes	H-PC-DSP/WQ-PC-D
Dome Creek at DX	-	Yes	WQ-DC-DX
Dome Creek at DX+105	Yes	Yes	H/WQ-DC-DX+105
Dome Creek at D1b	Yes	Yes	H/WQ-DC-D1b
Diversion Channel at Bridge	Yes	Yes	H/WQ-DC-B
Middle Dome Creek	Yes	Yes	H-DC-M/WQ-DC-U
Dome Creek at Road	Yes	Yes	H/WQ-DC-R
Seepage Pond Outflow	Yes	Yes	H/WQ-SEEP
Tailings Pond	Yes	Yes	H/WQ-TP
Brown-McDade Pit Lake	-	Yes	WQ-PIT-1,2,3
Mill Site Seep 08	-	Yes	WQ-MS-S-08
Back Creek	Yes	Yes	H/WQ-BC
Upper Victoria Creek	Yes	Yes	H/WQ-VC-U
Victoria Creek Downstream of Back Creek	Yes	Yes	H/WQ-VC-DBC
Victoria Creek Upstream of Minnesota Creek	Yes	Yes	H/WQ-VC-UMN
Victoria Creek at Road	Yes	Yes	H/WQ-VC-R
Pump House Well	-	Yes	WQ-PW
Dome East Slope Seep 01	-	Yes	WQ-DESS-01
Dome East Slope Seep 02	-	Yes	WQ-DESS-02
Dome East Slope Seep 03	-	Yes	WQ-DESS-03
CH-P-13-01	-	Yes	WQ-CH-P-13-01
Lower West Toe of Waste Rock Dump Seep 01*	-	Yes	WQ-LW-SEEP-01
Ore Ramp Seep*	-	Yes	WQ-ORE
Lysimeter 2*	-	Yes	WQ-L2
North West Toe of Waste Rock Dump Seep 01*	-	Yes	WQ-NW-SEEP-01
Mill Site Seep 03*	-	Yes	WQ-MS-S-03
Exploration Trench 1*	-	Yes	WQ-ET-1
Pit Groundwater Well GLL07-03*	Yes	-	GLL07-03
Pit Groundwater Well CH-P-13-05/50m*	Yes	-	CH-P-13-05/50m

**Additional freshet monitoring sites*



Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012
Pleiades Satellite Imagery, 2013

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

Order in Council Boundary	Photo Location (→ Photo Direction)
Extent of Inactive Claim Areas	▨ Trenches that require remediation
Public Road	▨ Trenches that do not require remediation
Road	▨ Non Exploration Trenches That Require Remediation
Stream	

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MOUNT NANSEN REMEDIATION PROJECT
Figure No. 4.5.1-1

2014 SITE INVESTIGATION REPORT

TRENCH RECLAMATION OVERVIEW

Scale 1:13,500
Metres
0 340 680

January 16, 2015

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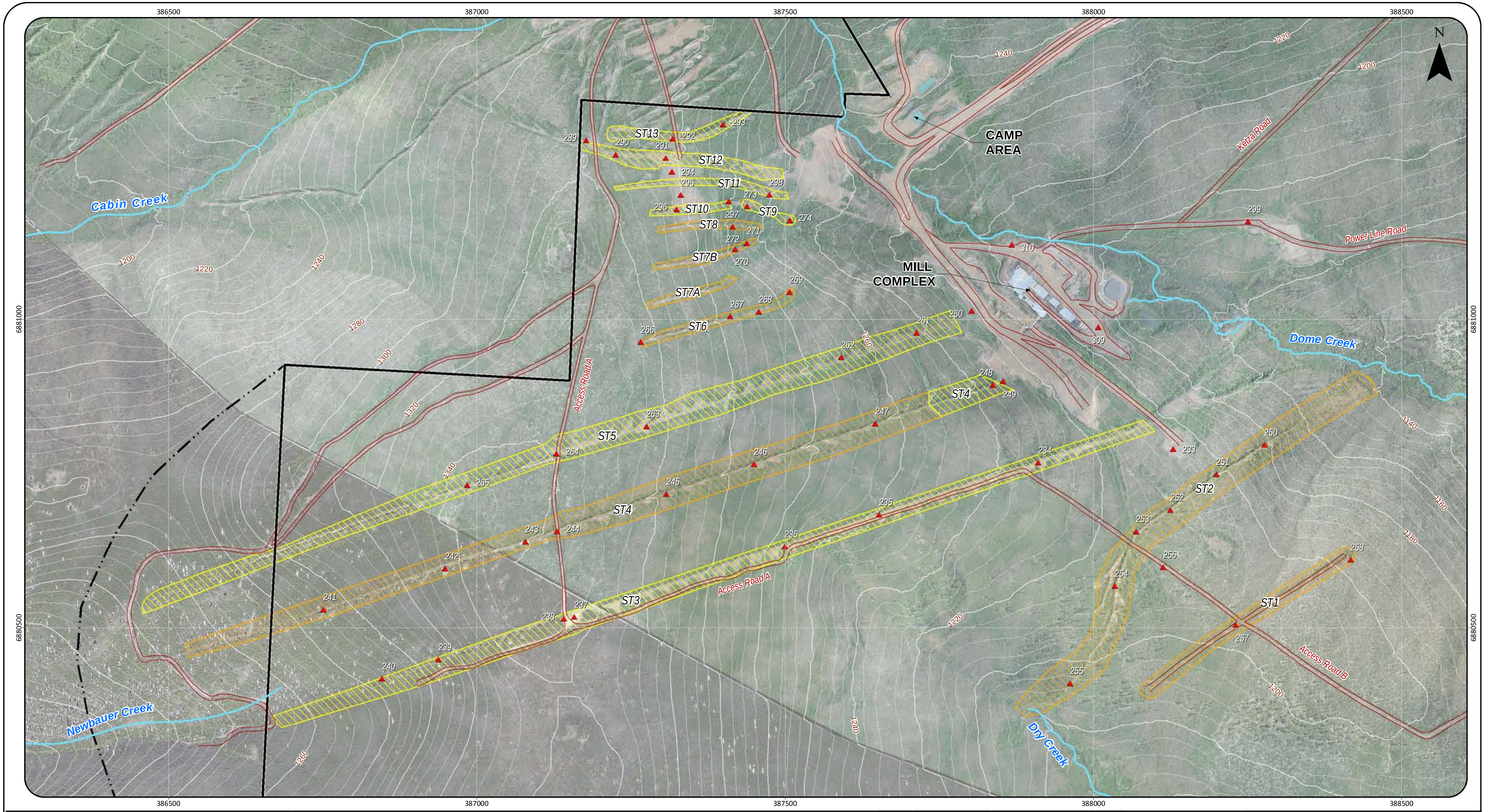
Each trench was assigned a number and corresponding location label (Figures 4.5.1-1 and 4.5.1-2). During the trench survey, each of the four locations was traversed on foot by AE and an AAM representative. Multiple waypoints and photos were taken along each surveyed trench at slope breaks and or signs of erosion. At each waypoint, the following attribute information was recorded:

- Date, trench label, surveyors;
- UTMs;
- Elevation;
- Slope (degrees);
- Aspect;
- Erosion sign;
- Ease of access;
- Wildlife movement barrier;
- Wildlife evidence;
- Vegetation cover;
- Aesthetics; and
- Additional comments.

In addition to the reclamation trench inspections conducted by AE, AMEC evaluated the trenches from an engineering perspective. Construction considerations such as site access, overall geotechnical stability and construction logistics were assessed. Photos and field notes were taken while AMEC accompanied AE staff.

4.5.2 Analysis Methods

Based on findings and conclusions during Phase 1, the supplemental field observations made during the 2014 SI program and feedback from AAM, the reclamation attributes of greatest concern were judged to be erosion and stability, ease of access, barriers to wildlife movement, human health and safety risks, and aesthetics. These attributes were referenced to determine the reclamation priority for each trench. Human health and safety is linked with erosion (on the premise that erosion potentially impacts surface water quality and may create physical hazards), and was not assessed independently. The attributes assessed were assigned a descriptive term, and each term was assigned a rank. Table 4.5.2-1 defines the descriptive terms for each attribute and their corresponding rankings (i.e. numbers in parentheses). Using this method, trenches were ranked for reclamation priority. Erosion (including human health and safety) and ease of access were weighted as most important by increasing the ranking by a factor of 2. Wildlife movement barriers and aesthetics were judged to be secondary and assigned a ranking factor of 1. Professional judgement was used to determine the final trench selection for reclamation, with specific attention paid to the ranking outcome and important wildlife corridors along the southern ridge of the valley (the southern trenches), as identified in Phase 1 (AMEC, 2014b).



Data Source:

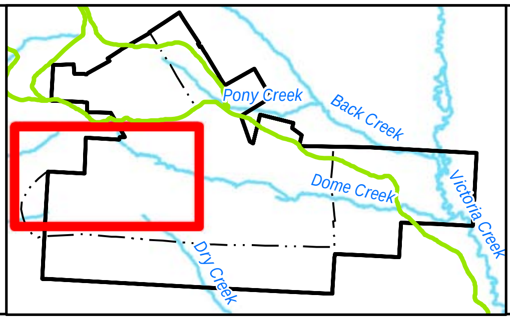
Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012
Pleiades Satellite Imagery, 2013

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

- Order in Council Boundary
- Extent of Inactive Claim Areas
- Public Road
- Road
- Stream
- ▲ Way Points
- ▨ Trenches that require remediation
- ▨ Trenches that do not require remediation



MOUNT NANSEN REMEDIATION PROJECT
Figure No. 4.5.1-2

2014 SITE INVESTIGATION REPORT

TRENCH RECLAMATION
DETAILS OF SOUTHERN TRENCHES

Scale 1:6,000
Metres
0 150 300

October 2, 2014

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Table 4.5.2-1: Attribute Term Definitions

Erosion	Access	Barrier To Wildlife Movement	Aesthetics[1]
Extreme - (8) Erosion connected into a water body, evidence of erosion >1 m deep	**Good – (4)** road access already established and currently in use	**Major – (3)** Between 3 and 5 m wide, ≥2 m deep impassible opening	**High visibility** – **(3)** Visible from Dome Creek Valley, and bare to sparse vegetation cover ≥2 m wide.
High – (6) Erosion connected into a water body, evidence of erosion <1 m but >0.5 m deep	**Fair – (2)** Previously accessed by a road; residual road surface still evident	**Moderate – (2)** Between 1 and 3 m wide, 1-<2 m deep impassible opening	**Moderate visibility (2) –** Visible from Dome Creek Valley or level with sparse or moderate vegetative cover <2 m wide, or aspect not facing Dome Creek Valley and sparse or bare vegetative cover
Moderate – (4) Evidence of erosion <0.5 m but >0.25 m deep	**Poor – (0)** no road access or residual road evident	**Minor – (1)** <1 m wide, 1-<2 m deep opening	**Low visibility (1)** – Aspect level or away from Dome Creek Valley, moderate vegetative cover, or dense vegetative cover, any aspect
Minor – (2) Erosion <0.25 m deep		**No – (0)** Level area or wide, gently sloped opening, or <1 m wide opening and <1 m deep	
None – (0) no erosion sign observed			

1 Vegetation cover (as per the BC Ministry of Environment Land Management Handbook 25: Describing Terrestrial Ecosystems in the Field, 2010) (BCMOE, 2010) is defined as:

- *Bare – 0-5%;*
- *Sparse – 6-15%;*
- *Moderate – 16-30%;*
- *Dense – 31-100%*

4.6 General Site Reconnaissance

An AMEC representative conducted a site reconnaissance of various areas of the site to assess construction issues, equipment access, and logistical issues and constraints. This information will be used by the materials management and infrastructure dismantling/demolition teams during Phase 2 design. The reconnaissance consisted of walking the site and taking photos and notes of the conditions on both site-wide and detailed scales. The areas of the site emphasized during the reconnaissance consisted of:

- The waste rock area to assess quantities and general material types;
- The Brown McDade Pit to provide high-level information on the conditions of exposed bedrock, which will be used to assess, at a conceptual level, additional pit slope stabilization measures required if liner placement or other open work is contemplated;
- The Mill Complex historical landfill and tailings disposal areas to assess the spatial extent;
- The camp area to assess the general site fill and materials;
- The Victoria Creek Wellhouse to assess the remediation of the civil structures required;
- The exploration trenches to assess geotechnical stability and constructability (if remediation is required);
- The roads and access roads to the trenches to assess requirements for constructability and logistics needed to minimize the construction footprint;
- The Tailings Storage Facility to assess the logistics and feasibility of tailings relocation;

- The Dome Creek Valley to assess the extent of remediation;
- Potential borrow sources; and
- Potential water treatment plant sites.

4.7 Laboratory Program

The laboratory testing program followed the site investigation program. Details of the laboratory methodologies for each discipline are included in the following subsections.

4.7.1 Geotechnical

Soil samples collected during the SI program were shipped to the AMEC laboratory in Surrey, BC, for geotechnical testing and further sample examination. Upon arrival at the laboratory, all soil samples were examined in detail to refine the descriptions completed in the field, and the borehole logs were edited accordingly. Samples were then selected for geotechnical and geochemical testing.

The geotechnical laboratory program consisted of testing soil samples according to the following ASTM standards:

- Moisture content tests (ASTM D 2216);
- Particle-size analysis tests (sieve) (ASTM D 6913);
- Organics content tests (ASTM D 2974 Method C); and
- Atterberg limit tests (ASTM D 4318).

The laboratory test results and “A Summary of 2014 Geotechnical Lab Results” are provided in Appendix 4D. Table 4.7.1-1 identifies the name and number of individual geotechnical index tests conducted in various regions of the site:

Table 4.7.1-1: Name and Number of Geotechnical Tests Completed in Various Regions

Sample Data			Laboratory Tests Completed			
Region	**Boreholes Completed**	**Samples Collected**	**Moisture Content**	**Sieve Analysis**	**Atterberg Limits**	**Organic Content**
Tailings Storage Facility	21	95	95	53	2	8
Mill Complex	5	9	9	4	0	0
Camp Area	4	12	10	3	0	0
Total:	30	116	114	60	2	8

Moisture content tests were conducted on all soil samples collected from the Tailings Storage Facility boreholes when the samples arrived at the AMEC laboratory. As noted in Section 4.1, samples collected from permafrost zones were weighed in the field to enable the determination of any water or ice loss during transportation to the laboratory. This precaution was required since such samples generally had greater water contents. The soil samples were weighed again in the laboratory (using the same scale used in the field), and the moisture content test was conducted. If the weight of the sample was found to be less in the laboratory than in the field, the difference was assumed to be due to lost water, and the moisture content was adjusted accordingly.

4.7.2 Mill Complex Landfill

Five soil samples were shipped to ALS Environmental Laboratory in Whitehorse on July 28, 2014. All samples were analyzed for pH, cyanide and metals. Three samples were also analyzed for volatile organic compounds (VOCs), hydrocarbons and polycyclic aromatic hydrocarbons (PAHs). No duplicate samples were collected during the landfill test pitting program. The ALS Environmental laboratory reports are included in Appendix 4E.

4.7.3 Geochemical and Background Soil Testing

Laboratory geochemical testing conducted for the 2014 Site Investigation program consisted of kinetic testing of waste rock samples, the metals analysis of soil samples from the drilling program and water testing of the field bin leachate samples.

4.7.3.1 Kinetic Testing of Waste Rock Samples

Representative samples for non-potentially acid generating (non-PAG) waste rock were selected for kinetic testing in order to determine a source term for future water quality prediction. The project design calls for non-PAG waste rock to be used as exposed construction material. PAG waste rock samples were not selected because the current design calls for all PAG waste rock to be encapsulated in the open pit. Since it will be mixed in the open pit with tailings, the tailings become the dominant material for producing source terms.

The non-PAG samples were selected from existing waste rock samples collected during the 2013 Site Investigation program that were stored at SGS Laboratory in Burnaby, BC. Three samples were selected that represented different ranges of arsenic and zinc contents, as shown in Table 4.7.3.1-1.

Table 4.7.3.1-1: Selected Waste Rock Samples for Kinetic Testing

No	Sample ID	As (mg/kg)^A	Zn (mg/kg)^A	Sulphide Sulphur (%)^A
1	TP-WA-13-10 ARD-02	310	556	0.19
2	TP-WA-13-11 ARD-02	1,160	1,760	<0.01
3	TP-WA-13-11 ARD-04	565	870	<0.01

Note: ^{A} *based on the 2013 geochemical testing results*

The trickle leach column test methodology was selected for the kinetic testing because the intent was to use get source terms based on site precipitation conditions to predict drainage quality from waste rock used on surface as construction material, especially in the TSF area. The trickle leach column is a laboratory test used to measure the impact of weathering and secondary mineral precipitation on drainage chemistry. The water to solid ratio for the trickle column testing is set close to the site precipitation conditions whenever possible. Alternatively, humidity cell tests, which are recommended to predict primary weathering rates under accelerated weathering conditions, are operated with fixed water volumes and are not adjustable to site precipitation conditions. Set up and analyses of the trickle leach columns were conducted according to the document Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials, MEND Report 1.20.1 (MEND, 2009).

The trickle leach columns were set up at the SGS Laboratory. The columns consist of a Plexiglas cylinder 20.5 cm high and 10.2 cm in diameter with a perforated bottom to allow drainage to flow into a collection vessel. Each column contains approximately 2.8 kg of waste rock sample except for one sample (TP-WA-13-10 ARD-02) which is around 3.0 kg. The waste rock samples were crushed to a nominal particle size of approximately 6 mm during the sample preparation. The waste rock samples were also pre-washed with deionized water prior to loading into the columns to remove any weathering products that may have accumulated during sample storage.

Trickle leach columns are operated on a repeating weekly cycle and were started the week of August 25. Approximately 300 mL of water is added to the top of the columns over a seven day period to simulate precipitation during the spring and summer months. The water is pumped intermittently at 50 mL per day for six days of the week. The leachate from the columns is collected weekly and analyzed for general parameters such as pH, conductivity, turbidity, hardness, alkalinity and sulphate, and dissolved metals. The volume of collected leachate is also measured. The trickle leach column testing was operated until the concentrations in the column leachates stabilized.

4.7.3.2 Metal Testing of Background Soil Samples

Geochemical testing was conducted on a selection of soil samples collected from the geotechnical boreholes for the purpose of background (or undisturbed soil) analysis. In total, 26 samples were selected from 12 boreholes located adjacent to the Tailings Storage Facility, the Camp Area and the Mill Complex as summarized in Table 4.7.3.2-1 and shown on Figures 4.1-1 and 4.1-2. The samples were submitted to ALS Environmental laboratory for pH and metals analysis. After reviewing the metal concentrations, six samples that had arsenic concentrations greater than ten times arsenic concentrations of average crustal abundance were selected for further leachable metal testing. Leachable metal testing on a subset of samples with high metal concentrations is conservative, since it provides the upper boundary for leachability. Duplicate soil samples were not submitted to the laboratory due to insufficient material availability (samples from augur flights are generally smaller in volume for the sample depth interval and needed to be split between geotechnical and background testing). The ALS analytical report is provided in Appendix 4E.

Table 4.7.2.3-1: Summary of Geochemical Laboratory Test Methods

Location	Number of Boreholes	Number of Samples	Number of Tests	
			Elemental Metals^A	Leachable Metals (Shake Flask Extraction)
Adjacent to Tailings Storage Facility	7	16	16	2
Mill Complex	1	2	2	1
Camp Area	4	8	8	3
Total	12	26	26	6

Note: ^{A} Elemental metals assessed by strong acid and aqua regia digestion method

Metal concentrations were analyzed in the laboratory using two different methods as outlined in Table 4.7.2.3.-2 below. The strong acid digestion method was required in order to compare soil concentrations to the Yukon CSR soil standards. The aqua regia digestion method was used so that metal concentrations could be compared to previous geochemical soil samples, including the exploration geochemistry programs. Since both the strong acid digestion and aqua regia digestion methods used in the previous sampling program, these two methods were used for the current SI program.

Table 4.7.2.3-2: Summary of Geochemical Laboratory Test Methods

Testing	Testing Method	Reference Testing Method
Metals in Soil	Strong acid digestion followed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	EPA 200.2/6020A
	Aqua regia digestion followed by ICP-MS	MEND (2009)
Leachable Metal	Shake Flask Extraction followed by ICP-MS.	MEND (2009)

4.7.3.3 Laboratory Testing of Field Bin Leachate Samples

Leachate samples were collected from the unsaturated waste rock bin, unsaturated ore bin, unsaturated sand tailings bin and also water columns from the saturated tailings+organic bin onsite. There was no visible water in the collection tank for the saturated waste rock bin and none that could be drained out of the tube leading to the tank. These bins are dependent on the material in the bin and meteoric water and only collect what drains through the bin material. For comparison, the unsaturated waste rock bin collection tank had 1.5 L of water, while the unsaturated sand tailings bin collection tank had as much as 17 L of water.

Leachate samples were submitted to ALS Environmental laboratory for water quality testing of physical parameters, anions and nutrients, total metals and dissolved metals. The ALS analytical report is provided in Appendix 4F.

4.7.4 Sediments

The first set of sediment samples collected on July 22 from downstream of the TSF were shipped to ALS Environmental Laboratory in Whitehorse on July 23, 2014. Samples, collected on July 24 and the morning of July 25 were shipped on the afternoon of July 25, 2014 to ALS Environmental in Whitehorse.

The soil and sediment samples were analyzed by ALS Environmental for pH, total cyanide and metals. The ALS Environmental analytical report is provided in Appendix 4E.

Six sediment samples were collected in duplicate to assess the magnitude and potential causes of variability between samples. The relative percent difference (RPD) of each parameter was calculated for each pair of QA/QC field duplicates. For concentrations greater than or equal to five times the method detection limit (MDL), the RPD should be less than or equal to 40%. For concentrations less than five times the MDL, the difference between two laboratory duplicate values should not be more than four times the detection limit.

All field duplicate samples met the QA/QC criteria except for SED-DC-70 and SED-DC-SED-70-DUP. In this case, chromium and uranium had RPD values of 46.3% and 60.0%, respectively. However, the original sample was retained in order to be conservative. The duplicate results and RPD calculations are included in Appendix 4E.

5 Detailed Scope and Investigation Results

5.1 Disturbed Area Limits

5.1.1 Objectives and Scope

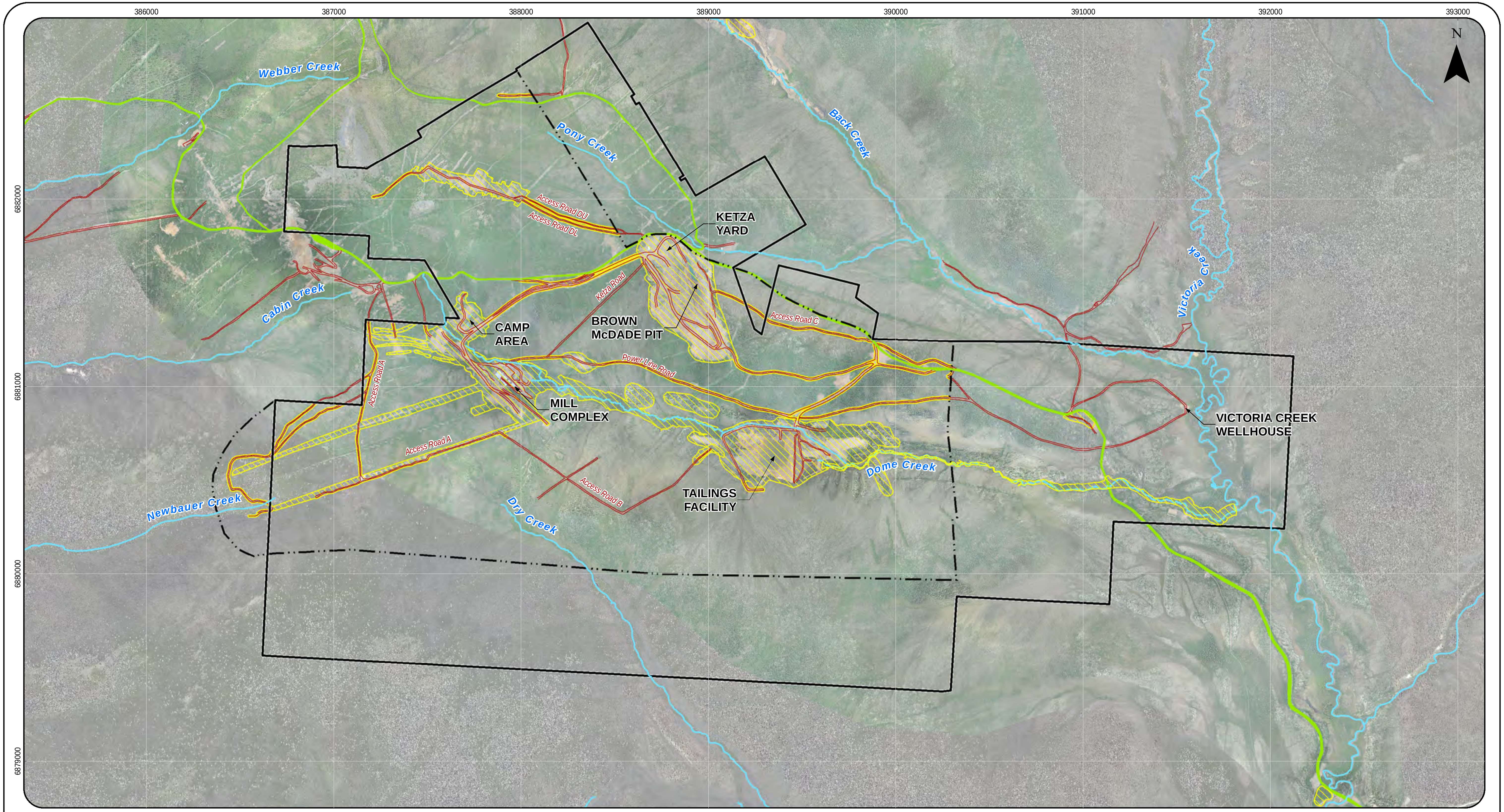
The objective of drilling within the disturbed area limits was to determine the potential for ice-rich permafrost at the disturbed / undisturbed boundary of the Tailings Storage Facility. This affects the design of the tie-ins between the remediated area and the original ground and will also provide additional information regarding probable conditions under the fill material in the disturbed areas where thawing has yet to occur. While the objective for these holes was to target undisturbed terrain, local access conditions, or the likelihood of creating terrain disturbance, resulted in some holes being drilled in disturbed areas.

A total of 21 boreholes were completed around the Tailings Storage Facility, five at the Mill Complex and four at the camp area. Drilling at the Tailings Storage Facility was concentrated on the north facing (south side) slopes of the Tailings Storage Facility where permafrost is more likely to be located closer to the ground surface. All boreholes were completed within the remediation area limits shown on Figure 5.1.1-1. Note that the remedial scope will also include decommissioning and removal of some comparatively minor ancillary infrastructure (e.g. power lines along road alignments) that may fall outside the limits indicated on Figure 5.1.1-1.

5.1.2 Results for the Tailings Storage Facility

Boreholes completed around the periphery of the Tailings Storage Facility typically reached the target depth of 15 feet (4.6 m). The exceptions to this were boreholes BH-T-14-03, -04, -09 to -13, -17 and -20, where refusal was met due to inferred bedrock or cobbles/boulders. Borehole logs along with aerial imagery of test hole locations are presented in Appendices 4A and 4B, respectively.

Particle size analyses indicate the majority of the soil consists of fine- to medium-grained sand with fines content ranging from 4% to 59%, with an average of 28%. Gravel content ranges from 0% to 27%, with an average of 4%. The gravel is typically angular to subangular with sizes ranging from 5 mm to 19 mm. The majority of the subsurface soils would be classified as poorly graded silty sand with traces of gravel. Based on field and laboratory descriptions and Atterberg Limits test results, the fines are generally non-plastic to low plastic. The moisture content of the unfrozen soil ranged from 3% to 77% (with an average of 17%), whereas the moisture content of the permafrost soils ranged from 17% to 145% (with an average of 41%). It should be noted that the percent moisture content is calculated based on the total water weight divided by the total dry solids weight and multiplied by 100. The results may exceed 100%.



Data Source:
Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012
Pleiades Satellite Imagery, 2013

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

- — Order in Council Boundary
- -·· Extent of Inactive Claim Areas
- — Public Road
- ═ Road
- — Stream
- ▨ Remediation Area

amec

Yukon
Energy, Mines and Resources
Assessment and Abandoned Mines

MOUNT NANSEN REMEDIATION PROJECT
Figure No. 5.1.1-1

2014 SITE INVESTIGATION REPORT

PLANNED EXTENT
OF REMEDIATION WORKS

Scale 1:20,000
Metres
0 500 1,000

January 16, 2015

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Various organic contents were found in the majority of soil samples. These samples were characterized by a distinctive smell of decaying organic matter and a black colour. The organic materials were mostly amorphous; however, some fibrous organics were also found. The fibrous organics were typically located in the upper layers of the soils, whereas the amorphous organics were typically located in the lower permafrost zones. The organic content, based on eight test results, ranged from 3.8% in BH-T-14-20 to 25.1% in BH-T-14-12 with an average of 14%. The organic content tests were conducted on samples from the upper 1 m to 2 m of the boreholes. Organic test results can be found in Appendix 4D.

Permafrost was encountered in 14 boreholes completed around the Tailings Storage Facility. As anticipated, the southern side of the disturbed/undisturbed boundary area had permafrost at a shallower depth, ranging from 0.8 m to 5 m depth, with an average depth on the order of 1 m to 3.5 m. The northern side of the facility had less permafrost, which was generally at a greater depth. Aerial imagery of the test hole locations shows the depths of permafrost encountered at the Tailings Storage Facility (Figure 5.1.2-1). The permafrost was typically weakly bonded with no excess ice. It is expected that the bonding would typically increase with depth. Most locations had no ice crystals visible, but some 10-20 mm thick ice lenses were noted in BH-T-14-13, -14, and -16. Permafrost was generally located in soils with a relatively high amount of silt. Groundwater or perched water was typically intersected within 3 m above the top of permafrost.

5.1.3 Results for the Mill Complex and Camp Area

All the boreholes in the Mill Complex and camp area were terminated in shallow bedrock. Drilling, using a solid stem auger, penetrated the weathered bedrock from 1.1 m to 4.5 m depth. The bedrock intersected was a meta-granitic rock and was highly weathered and fractured. Fill materials were encountered only in borehole BH-M-14-03. No permafrost soil or groundwater was encountered at the Mill Complex and Camp Area. Borehole locations are presented in Figure 4.1-1 and the soil logs are located in Appendix 4A.

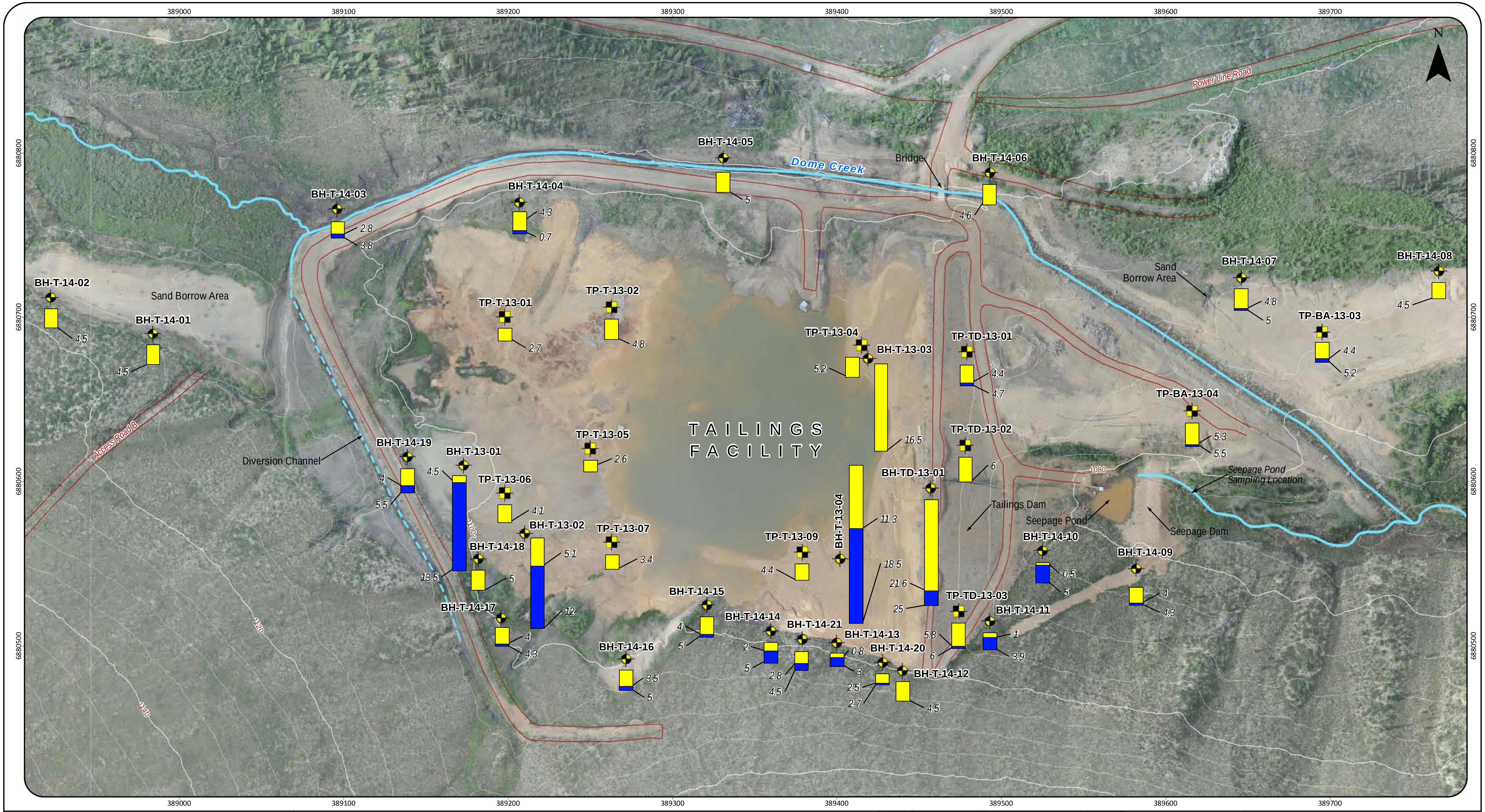
Particle size analyses indicated that the surficial weathered bedrock at the Mill Complex and Camp Area consisted of silty sand with traces of gravel. The silt content ranged from 25% to 50%, with an average of 38%. Typically, the amount of silt decreased and the percentage of gravel increased with depth, as the colour gradually changed from brown to grey. The gravel particles were subangular to angular and the silt was non-plastic.

5.2 Dome Creek Valley

5.2.1 Objectives and Scope

The objectives of the sediment and soil sampling program in the Dome Creek Valley were twofold:

- Identify the potential for past migration of tailings along Dome Creek; and
- Delineate the remediation extent upstream and downstream of the Tailings Storage Facility.



Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012
Pleiades Satellite Imagery, 2013

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

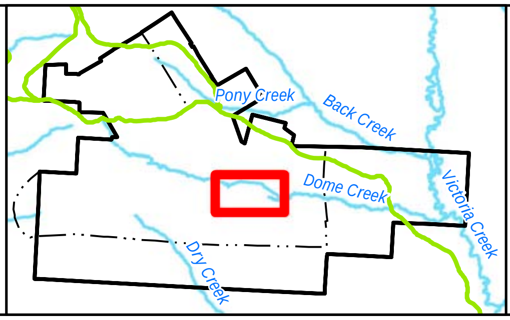
- -·· Extent of Inactive Claim Areas
- ━ Public Road
- ═ Road
- ━ Stream
- ╌ Diversion Channel
- ═ Contour (20 m)
- ═ Contour (5 m)

2014 Test Holes

- ⊕ Borehole
- ✚ Test Pit

Test Hole Depth and Permafrost Depth

- 🟨 Hole Depth
- 🟦 Permafrost



MOUNT NANSEN REMEDIATION PROJECT
Figure No. 5.1.2-1

2014 SITE INVESTIGATION REPORT

TEST HOLE DEPTH AND PERMAFROST DEPTH - TAILINGS FACILITY

Scale 1:2,250
Metres
0 50 100

October 1, 2014

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The above objectives included investigating areas of dead and/or blackened vegetation previously observed downstream of the Tailings Storage Facility.

5.2.1 Results

The analytical results for the sediment and soil samples are shown in Table 5.2.1-1 and are grouped by location. All results are compared to the Yukon Contaminated Sites Regulation (CSR) generic and matrix numerical standards for park land use.

The two samples from Victoria Creek exceeded the arsenic standard of 20 mg/kg with values of 27.0 mg/kg and 30.5 mg/kg. All other parameters were less than the applicable CSR PL standards.

The 11 sediment samples from Lower Dome Creek between Victoria Creek and the road all exceeded the arsenic standard, with concentrations ranging from 108 mg/kg at SED-DC-14-30 to 1,420 mg/kg at SED-DC-14-25. Sample SED-DC-14-33 (just downstream of the road) also had exceedances of the 20 mg/kg standard for antimony (31.9 mg/kg) and the 2.5 mg/kg standard for cadmium (3.96 mg/kg). Sample SED-DC-14-25 also had exceedances for antimony, cadmium, copper, lead and zinc.

All 25 sediment samples in the section of Dome Creek between the road and the TSF had arsenic concentrations greater than the standard of 20 mg/kg. Results ranged from 23.0 mg/kg at SED-DC-14-40 to 1,130 mg/kg at SED-DC-14-86. All other parameters were less than the applicable CSR PL standards.

For the section of Dome Creek between the TSF and Mill Complex, four of 25 samples had results less than the applicable CSR PL standards for all parameters (SED-DC-14-58, -63, -66 and -68). Eleven samples exceeded only the arsenic standard. Ten sediment samples had exceedances for two or more parameters. Antimony concentrations were greater than the CSR PL standard of 20 mg/kg in nine samples. The concentrations ranged from 29.4 mg/kg at SED-DC-14-74 and -79 to 146 mg/kg at SED-DC-14-77. Arsenic exceedances in the 21 samples ranged from 21.9 mg/kg at SED-DC-14-56 to 3,130 mg/kg at SED-DC-14-77. There were two slight exceedances of the barium standard of 500 mg/kg at SED-DC-14-71 (506 mg/kg) and SED-DC-14-76 (523 mg/kg). Cadmium concentrations exceeded the pH-dependent matrix numerical standard at four locations, with the lowest exceedance being 26.3 mg/kg in sample SED-DC-14-73. The highest cadmium exceedance was 191 mg/kg in sample SED-DC-14-77. Nine sediment samples exceeded the matrix numerical standard of 450 mg/kg, with concentrations ranging from 1,110 mg/kg at SED-DC-14-70 and -72 to 18,700 mg/kg at SED-DC-14-76.

Of the five soil samples from areas of blackened or dead vegetation, sample SED-DC-14-47 had concentrations less than the applicable CSR PL standards. Samples SED-DC-14-35, -42 and -85 each had one exceedance, with arsenic concentrations of 26.1 mg/kg, 48.2 mg/kg and 607 mg/kg, respectively. Sample SED-DC-14-87 had two exceedances, with an arsenic concentration of 157 mg/kg and a copper concentration of 499 mg/kg.

Table 5.2.1-1: Analytical Results for Sediment and Soil Samples

			Parameter	Moisture	pH	Total Cyanide (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Tin (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
			Yukon CSR Soils/Sediments (PL)	NA	NA	50	20	20	500	4	2-35	60	50	150	250-500	15	10	100	3	20	NA	50	NA	200	150-450
			Detection Limit	0.25	0.1	0.05-1.0	0.1	0.05	0.5	0.2	0.05	0.5	0.1	0.5	0.5	0.05	0.5	0.5	0.2	0.1	0.05	2	0.05	0.2	1
Sample Name	**Sample Date**	**Description**	**Matrix**																						
SED-VIC-14-22	22-Jul-2014	Victoria Cr just upstream of Dome Cr	Sediment	16.4	7.76	0.056	1.24	**27.0**	81.6	<0.20	0.380	5.98	3.68	9.84	14.9	<0.050	0.83	4.17	<0.20	<0.10	<0.050	<2.0	0.457	22.6	49.3
SED-VIC-14-23	22-Jul-2014	Victoria Cr just upstream of Dome Cr	Sediment	25.6	7.85	<0.050	1.30	**30.5**	99.1	<0.20	0.483	8.07	4.69	12.1	18.4	<0.050	0.95	5.13	<0.20	0.11	0.057	<2.0	0.633	27.3	62.2
SED-DC-14-23	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	29.5	7.75	-	3.05	**112**	99.0	<0.20	0.434	7.90	4.39	6.96	13.4	<0.050	<0.50	6.17	<0.20	0.19	0.057	<2.0	0.367	21.0	64.6
SED-DC-14-24	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	46.2	7.91	0.22	4.95	**187**	180	<0.20	0.823	12.4	6.46	10.5	20.5	<0.050	0.59	9.11	<0.20	0.40	0.070	<2.0	0.472	32.8	108
SED-DC-14-25	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	79.3	7.23	0.78	**137**	**1,420**	374	0.55	**5.78**	22.3	12.8	**291**	**792**	0.226	2.24	23.7	1.45	**20.3**	0.432	<2.0	5.39	50.4	409
SED-DC-14-26	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	45.9	7.69	<0.50	5.96	**212**	129	0.21	0.610	14.1	5.93	14.4	30.3	<0.050	<0.50	9.29	0.22	0.73	0.083	<2.0	0.667	35.3	89.9
SED-DC-14-27	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	54.8	7.77	<0.50	9.67	**817**	386	0.24	1.48	12.5	11.3	18.4	29.6	<0.050	1.16	10.8	0.47	0.56	0.123	<2.0	0.913	38.5	173
SED-DC-14-28	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	74.8	7.79	<1.0	9.41	**702**	231	0.30	1.49	14.8	6.93	22.2	37.7	<0.050	0.64	10.0	0.51	0.71	0.139	<2.0	0.820	36.8	142
SED-DC-14-29	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	42.4	7.93	<1.0	5.54	**326**	102	0.22	0.888	9.13	3.36	13.8	28.2	<0.050	<0.50	6.14	0.33	0.48	0.081	<2.0	0.523	22.7	81.4
SED-DC-14-30	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	18.7	7.90	<0.050	2.34	**108**	38.8	<0.20	0.176	4.55	2.03	4.45	11.3	<0.050	<0.50	3.66	<0.20	0.11	<0.050	<2.0	0.214	14.2	37.0
SED-DC-14-31	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	21.6	7.91	<0.050	5.48	**120**	40.9	<0.20	0.424	6.87	2.47	4.66	21.7	<0.050	<0.50	4.47	<0.20	0.22	0.052	<2.0	0.292	16.8	55.2
SED-DC-14-32	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	35.1	7.32	<1.0	5.65	**150**	65.2	<0.20	0.754	10.7	3.54	8.21	29.8	<0.050	<0.50	6.34	<0.20	0.43	0.078	<2.0	0.403	24.6	84.1
SED-DC-14-33	22-Jul-2014	Lower Dome Cr between Victoria Cr and Road	Sediment	72.9	7.13	<1.0	**31.9**	**1,220**	222	0.42	**3.96**	27.2	11.6	57.2	106	0.066	1.02	16.4	0.71	3.02	0.209	<2.0	1.85	85.5	364
SED-DC-14-34	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	43.2	7.83	<1.0	7.20	**189**	74.6	<0.20	1.03	12.9	3.96	9.19	38.9	<0.050	<0.50	6.66	<0.20	0.76	0.068	<2.0	0.471	31.9	93.7
SED-DC-14-36	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	21.1	6.29	<0.50	2.36	**51.5**	51.4	<0.20	0.375	9.04	2.52	5.02	11.8	<0.050	<0.50	4.93	<0.20	0.21	<0.050	<2.0	0.325	23.1	47.6
SED-DC-14-37	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	16.5	7.77	<0.050	1.62	**66.1**	28.7	<0.20	0.158	4.46	2.08	3.48	9.65	<0.050	<0.50	3.63	<0.20	<0.10	<0.050	<2.0	0.195	13.4	31.6
SED-DC-14-38	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	60.6	7.38	<1.0	5.48	**163**	132	0.35	0.884	20.2	6.45	27.2	29.5	0.051	0.58	13.0	0.51	0.45	0.125	<2.0	1.41	43.3	92.1
SED-DC-14-39	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	35.7	6.48	<1.0	3.19	**238**	85.3	0.20	0.434	12.3	4.09	12.4	13.0	<0.050	<0.50	7.87	0.23	0.17	0.081	<2.0	0.559	28.8	64.7
SED-DC-14-40	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	17.3	7.82	0.057	0.60	**23.0**	33.7	<0.20	0.084	5.90	2.17	3.91	3.57	<0.050	<0.50	4.14	<0.20	<0.10	<0.050	<2.0	0.221	15.2	23.5
SED-DC-14-41	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	25.0	7.57	<0.50	0.68	**25.2**	52.0	<0.20	0.131	14.9	3.55	5.53	4.37	<0.050	<0.50	5.84	<0.20	<0.10	<0.050	<2.0	0.404	48.6	34.3
SED-DC-14-43	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	25.0	7.98	<0.50	1.71	**34.3**	57.9	<0.20	0.146	11.9	3.61	5.87	5.53	<0.050	<0.50	6.34	<0.20	0.82	<0.050	<2.0	0.369	31.1	37.2
SED-DC-14-44	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	24.6	8.04	<1.0	0.98	**53.1**	59.1	<0.20	0.226	9.78	3.43	6.91	5.51	<0.050	<0.50	6.10	<0.20	<0.10	0.051	<2.0	0.319	25.0	41.9
SED-DC-14-45	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	45.7	7.80	<1.0	1.43	**80.5**	78.7	<0.20	0.304	11.1	3.86	8.05	7.23	<0.050	<0.50	6.87	<0.20	0.13	0.057	<2.0	0.379	26.1	51.4
SED-DC-14-46	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	25.1	8.12	<0.50	0.96	**50.8**	56.8	<0.20	0.199	8.92	3.27	5.60	5.27	<0.050	<0.50	5.41	<0.20	<0.10	<0.050	<2.0	0.283	21.4	39.5
SED-DC-14-48	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	17.4	7.97	<0.50	0.81	**34.7**	32.7	<0.20	0.093	4.07	1.92	4.60	8.18	<0.050	<0.50	3.43	<0.20	<0.10	<0.050	<2.0	0.203	12.0	24.3
SED-DC-14-49	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	20.7	7.88	<0.50	1.85	**47.1**	47.1	<0.20	0.174	10.4	3.28	6.31	9.94	<0.050	<0.50	6.43	<0.20	<0.10	<0.050	<2.0	0.344	29.8	41.6
SED-DC-14-50	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	16.1	7.99	<0.050	0.82	**36.3**	37.0	<0.20	0.157	9.58	2.83	5.60	5.10	<0.050	<0.50	4.76	<0.20	<0.10	<0.050	<2.0	0.287	34.3	31.2
SED-DC-14-51	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	27.1	7.47	<0.50	1.01	**40.7**	46.7	<0.20	0.191	9.46	2.85	6.09	6.87	<0.050	<0.50	5.50	<0.20	<0.10	<0.050	<2.0	0.297	28.4	36.2
SED-DC-14-52	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	21.7	8.13	0.066	1.71	**45.9**	43.9	<0.20	0.308	9.36	3.10	6.18	8.35	<0.050	<0.50	5.76	<0.20	0.22	<0.050	<2.0	0.264	21.9	48.0
SED-DC-14-53	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	22.3	8.21	0.088	1.30	**36.9**	49.0	<0.20	0.267	10.2	3.17	6.97	10.2	<0.050	<0.50	6.10	<0.20	0.19	<0.050	<2.0	0.278	28.8	42.0
SED-DC-14-54	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	28.9	8.07	<1.0	1.04	**36.6**	61.6	<0.20	0.204	12.4	3.59	7.46	8.35	<0.050	<0.50	7.12	<0.20	<0.10	0.058	<2.0	0.355	27.0	41.7
SED-DC-14-55	22-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	36.6	7.74	<1.0	1.57	**65.6**	69.7	<0.20	0.393	13.1	4.33	11.6	8.13	<0.050	<0.50	7.94	0.21	0.12	0.064	<2.0	0.460	32.9	58.9
SED.DC.14-81	25-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	31.8	7.73	<1.0	2.68	**36.5**	92.7	0.21	0.311	13.0	5.46	24.7	5.79	<0.050	<0.50	8.75	<0.20	0.26	0.089	<2.0	0.520	29.8	68.1
SED.DC.14-82	25-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	26.5	8.13	1.3	1.34	**46.6**	55.9	<0.20	0.190	10.0	3.27	7.47	7.57	<0.050	<0.50	6.46	<0.20	0.10	<0.050	<2.0	0.346	22.5	43.0
SED.DC.14-83	25-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	36.2	7.65	<1.0	2.43	**217**	87.2	<0.20	0.479	13.2	3.61	12.8	8.60	<0.050	<0.50	6.56	<0.20	0.18	0.069	<2.0	0.495	47.2	62.2
SED.DC.14-84	25-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	21.2	8.00	<0.50	0.65	**58.3**	50.1	<0.20	0.149	7.75	2.83	5.60	3.60	<0.050	<0.50	5.56	<0.20	<0.10	<0.050	<2.0	0.449	20.7	34.4
SED.DC.14-86	25-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	66.6	7.90	13.7	2.87	**1,130**	254	<0.20	4.51	6.36	4.47	35.5	6.71	<0.050	1.53	6.07	0.55	1.04	<0.050	<2.0	1.11	25.5	87.1
SED.DC.14-88	25-Jul-2014	Lower Dome Cr between Road and TSF	Sediment	82.3	7.62	19.5	1.68	**210**	80.3	<0.20	1.62	8.74	3.88	18.6	7.08	<0.050	0.83	7.54	0.25	0.28	0.061	<2.0	0.574	22.1	48.2
SED.DC.14-56	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	31.3	7.77	<1.0	0.69	**21.9**	57.4	<0.20	0.141	12.2	3.65	9.45	3.77	<0.050	<0.50	7.53	<0.20	<0.10	0.058	<2.0	0.390	25.4	41.4
SED.DC.14-57	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	21.4	7.47	<0.050	0.42	**25.1**	53.3	<0.20	0.089	10.9	3.27	05.7	3.00	<0.050	<0.50	6.14	<0.20	<0.10	<0.050	<2.0	0.338	28.8	25.1
SED.DC.14-58	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	21.9	7.87	<0.050	0.41	11.1	73.8	0.2	0.106	11.3	3.57	7.00	3.05	<0.050	<0.50	7.47	<0.20	<0.10	0.059	<2.0	0.308	25.1	28.2
SED.DC.14-59	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	37.4	7.94	<0.50	6.96	**185**	101.0	<0.20	1.01	12.9	5.26	10.1	23.70	<0.050	<0.50	8.83	0.33	0.73	0.140	<2.0	0.674	30.5	214
SED.DC.14-60	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	38.5	7.58	<1.0	1.89	**39.6**	69.1	<0.20	0.498	10.9	3.59	8.15	8.39	<0.050	<0.50	6.97	0.23	0.13	0.085	<2.0	0.524	25.5	86.2
SED.DC.14-61	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	68.0	7.31	<1.0	7.74	**147**	224	0.49	1.87	28.2	8.54	45.6	32.5	0.1	0.95	20.1	1.23	0.68	0.253	<2.0	2.24	62.8	257
SED.DC.14-62	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	25.8	7.72	<0.50	2.88	**41.9**	59.5	<0.20	0.440	9.28	3.56	5.18	9.67	<0.050	<0.50	6.05	<0.20	0.41	0.086	<2.0	0.369	20.9	81.2
SED.DC.14-63	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	22.9	7.81	<1.0	1.03	20.0	71.4	<0.20	0.200	11.5	4.02	6.6	4.55	<0.050	<0.50	7.63	<0.20	<0.10	0.095	<2.0	0.446	24.3	65.4
SED.DC.14-64	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	31.4	7.34	<1.0	1.15	**33.1**	48.7	<0.20	0.239	8.82	2.92	4.90	4.51	<0.050	<0.50	5.44	<0.20	<0.10	0.067	<2.0	0.429	20.1	55.2
SED.DC.14-65	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	33.5	7.69	<1.0	0.96	**27.5**	69.4	<0.20	0.118	8.98	3.37	5.72	3.95	<0.050	<0.50	6.11	<0.20	<0.10	0.063	<2.0	0.432	23.2	35.3
SED.DC.14-66	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	23.2	7.41	<0.050	0.56	13.9	53.8	<0.20	0.071	8.34	2.94	03.7	3.42	<0.050	<0.50	5.30	<0.20	<0.10	0.057	<2.0	0.345	21.4	28.3
SED.DC.14-67	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	52.3	6.86	<1.0	2.71	**63.2**	233	0.34	0.682	19.9	7.73	25.7	8.87	0.067	0.61	13.3	0.51	0.24	0.171	<2.0	2.02	45.9	82.7
SED.DC.14-68	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	22.6	7.54	<0.50	0.53	13.6	68.8	<0.20	0.120	11.2	3.93	06.8	3.05	<0.050	<0.50	7.64	<0.20	<0.10	0.062	<2.0	0.367	22.9	28.1
SED.DC.14-69	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	54.9	7.28	<1.0	2.37	**209**	212.0	0.24	0.381	13.9	9.57	18.3	7.77	<0.050	0.52	9.40	0.36	0.22	0.120	<2.0	1.04	39.9	88.3
SED.DC.14-70	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	39.8	7.82	<1.0	**62.3**	**1,340**	173.0	0.24	11.0	13.7	5.61	40.0	246	0.074	<0.50	8.16	0.60	4.26	0.291	<2.0	1.04	34.1	**1,110**
SED.DC.14-71	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	78.6	7.94	0.618	19.5	**2,670**	**506**	<0.20	3.26	4.45	9.10	7.28	47.5	<0.050	1.78	4.25	0.36	0.89	0.088	<2.0	0.799	15.9	400
SED.DC.14-72	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	45.5	7.84	<1.0	**58.7**	**789**	93.1	<0.20	11.1	9.93	4.44	34.1	257	0.062	<0.50	7.23	0.33	5.31	0.253	<2.0	0.572	24.8	**1,110**
SED.DC.14-73	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	51.2	7.98	7	**73.6**	**732**	213	0.29	**26.3**	12.8	10.5	42.8	262	0.103	0.71	14.3	0.48	6.78	0.570	<2.0	0.667	38.2	**3,050**
SED.DC.14-74	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	47.0	7.98	6.3	**29.4**	**522**	157	0.2	8.8	11.3	6.00	23.7	57.8	0.058	0.57	7.70	0.43	1.10	0.235	<2.0	0.540	32.9	**1,410**
SED.DC.14-75	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	48.8	8.07	0.192	**136**	**1,850**	196	0.23	**42.1**	8.07	10.4	83.9	370	0.06	2.06	11.0	0.55	8.65	0.525	<2.0	0.915	27.0	**3,670**
SED.DC.14-76	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	67.4	7.93	<1.0	**127**	**2,490**	**523**	0.62	**187**	17.3	46.8	96.6	377	0.174	2.37	46.5	0.93	6.31	2.01	<2.0	1.41	60.5	**18,700**
SED.DC.14-77	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	72.1	7.84	0.54	**146**	**3,130**	460	0.57	**191**	15.2	43.4	102	405	0.159	3.06	54.4	0.94	7.58	2.29	<2.0	1.47	53.4	**16,700**
SED.DC.14-78	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	25.1	7.98	0.466	**91.8**	**895**	173	0.39	12.5	8.18	10.5	69.7	378	0.054	0.99	7.91	0.35	7.45	0.402	<2.0	0.685	51.4	**1,240**
SED.DC.14-79	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	29.3	7.52	<1.0	**29.4**	**301**	114	0.29	13.0	12.1	9.27	27.9	61.9	0.062	0.83	10.7	0.24	1.11	0.446	<2.0	0.593	46.0	**1,140**
SED.DC.14-80	24-Jul-2014	Dome Cr between TSF and Mill Area	Sediment	23.3	7.40	<1.0	3.21	**65.8**	49.3	<0.20	0.152	6.28	4.05	7.51	9.98	<0.050	<0.50	3.73	<0.20	0.120	0.152	<2.0	0.339	29.0	43.1
SED-DC-14-35	22-Jul-2014	Soil between Road and TSF	Soil	18.8	8.08	<0.050	1.04	**26.1**	38.0	<0.20	0.171	7.32	2.73	4.48	5.39	<0.050	<0.50	4.88	<0.20	<0.10	<0.050	<2.0	0.306	18.0	28.8
SED-DC-14-42	22-Jul-2014	Soil between Road and TSF	Soil	28.2	6.94	<1.0	1.63	**48.2**	93.1	0.22	1.50	15.7	4.99	24.1	9.67	<0.050	<0.50	9.94	0.23	1.54	0.081	<2.0	0.597	36.6	155
SED-DC-14-47	22-Jul-2014	Soil between Road and TSF	Soil	19.9	5.71	<1.0	0.84	18.0	70.4	<0.20	0.968	12.8	3.96	23.2	5.60	<0.050	<0.50	9.25	<0.20	1.60	0.064	<2.0	0.474	26.8	147
SED.DC.14-85	25-Jul-2014	Soil between Road and TSF	Soil	57.5	7.61	7.06	11.50	**607**	253	<0.20	8.08	4.70	5.88	93.8	49.10	0.177	1.79	8.19	0.67	15.0	0.091	<2.0	1.26	19.5	108
SED.DC.14-87	25-Jul-2014	Soil between Road and TSF	Soil	21.0	5.55	1.1	15.80	**157**	107	<0.20	1.22	2.17	3.42	**499**	77.10	0.171	1.41	7.14	0.27	5.03	0.071	<2.0	1.48	4.61	99.6

Notes:

Bold and shaded exceeds CSR PL values

Strong acid digestion method was used on all samples

Yukon CSR - Yukon Contaminated Site Regulation, O.I.C. 2002/171, Generic and matrix numerical soil standards for park land use (PL)

Matrix standard used: the most stringent of groundwater flow to surface water used by freshwater aquatic live, human intake of contaminated soil or toxicity to soil invertebrates and plants was used.

5.3 Pond Waters

5.3.1 Objective and Scope

The purpose of the Pond Waters treatability testing program was to evaluate the previously proposed water treatment design completed as part of the "Mount Nansen Remediation Project 30% Design Phase" (AMEC, 2014b). To achieve this, samples of the four contaminated water sources onsite were collected. To ensure representative water qualities for each of the contaminated water sources, a detailed sampling protocol was provided to the onsite team responsible for the sample collection. These samples were shipped to AMEC's water treatment laboratory in Pointe-Claire, Québec, where a series of water treatment tests were completed.

5.3.1.1 Raw Water Quality

The raw water quality was analyzed both at the site and upon receipt at the AMEC laboratory to ensure that the quality had not been altered significantly during transport (Table 5.3.1.1-1). The water treatment tests were planned in response to the analytical results of the raw water quality for each of the different contaminated water sources. Due to the expected heterogeneity in the tailings porewater, samples were collected and sent for testing from three piezometers in the tailings pond: MW09-02, MW09-03, and MW09-04. Although water was collected from MW09-07, there was insufficient water to conduct bulk water treatment tests.

The raw water quality for the four water sources was better than the original estimates used for the 30% design phase. In Table 5.3.1.1-1, parameters of concern are highlighted in red. These include any constituent with concentrations exceeding the federal Metal Mining Effluent Regulations (MMER) discharge criteria for monthly average limits (Government of Canada, 2002). In addition, any iron concentrations exceeding 7 mg/L were highlighted because this would contribute to total suspended solids (TSS), and could result in exceedances for the TSS limit of 15 mg/L. Ammonia exceeding 10 mg/L is highlighted because this could result in toxicity to rainbow trout if the pH is alkaline. The interim treatment objective is to have all of the concentrations meet MMER limits because these are "end-of-pipe" discharge limits (note final validation and selection of all proposed treatment and/or remediation standards is part of the Phase 2 design scope). The MMER limits are graded upon the effect of toxicity so that Cu and Pb have lower limits than Ni and Zn. Although the MMER limits are normally applicable to operating sites, they have been used at other closed mine sites in Canada as appropriate discharge criteria (Government of Canada, 2012).

The Tailings Pond water does not exceed any of the objectives. The Pit Lake water quality only shows a Zn concentration equal to the limit (only for the sample taken onsite). Note that both the tailings and pit waters are expected to exceed MMER limits for TSS during tailings relocation.

Table 5.3.1.1-1: Raw Water Quality of Mount Nansen Samples

Parameter	Units	MMER Criteria	Pit Lake		Tailings Pond		Seep Pond		Porewater (02)		Porewater (03)		Porewater (04)	
Total Concentrations			Site	Lab	Site	Lab	Site	Lab	Site	Lab	Site	Lab	Site	Lab
pH	-	-	8.0	7.6	8.2	7.6	6.8	6.8	6.8	6.4	6.9	7.1	7.9	8.1
Total Ammonia	mg/L	-	<0.05	<0.05	<0.05	<0.05	4.84	4.98	**13.4**	**11.8**	1.70	1.74	6.27	6.49
Total Sulphur	mg/L	-		317	N/A	252	N/A	338	N/A	724	N/A	594	N/A	698
Total CN	mg/L	1	<0.005	0.02	0.01	0.02	**1.96**	0.61	**1.08**	0.76	0.12	0.10	0.09	0.09
Total Arsenic	mg/L	0.5	<0.025	<0.05	0.10	0.10	0.07	0.06	**21.7**	**17.3**	**0.81**	**0.84**	**3.53**	**3.63**
Total Cadmium	mg/L	-	<0.0125	<0.01	0.001	<0.01	0.001	<0.01	<0.0005	<0.01	0.001	<0.01	<0.0005	<0.01
Total Copper	mg/L	0.3	<0.025	<0.1	0.022	<0.1	0.006	<0.1	0.003	<0.1	0.004	<0.1	0.003	<0.1
Total Iron	mg/L	-	<1.75	<0.1	0.26	0.20	**9.42**	**7.50**	**47.50**	**34.10**	0.26	0.20	<0.07	<0.1
Total Lead	mg/L	0.2	<0.025	<0.05	0.006	0.025	<0.001	0.025	0.001	0.025	<0.001	0.025	0.003	0.025
Total Nickel	mg/L	0.5	<0.025	<0.01	0.003	<0.01	0.007	0.010	0.008	0.020	0.008	0.020	0.006	0.020
Total Zinc	mg/L	0.5	**0.50**	0.27	0.06	0.06	0.02	0.03	0.40	0.42	0.02	0.02	0.06	0.07
Dissolved Metals														
Dissolved Arsenic	mg/L	-	0.01	0.01	0.06	0.06	0.06	0.00	22.90	8.34	0.81	0.59	3.57	2.81
Dissolved Cadmium	mg/L	-	0.0023	0.0023	0.0005	0.0007	0.0005	<0.005	<0.005	<0.005	0.0014	0.0012	<0.005	<0.005
Dissolved Copper	mg/L	-	0.003	0.002	0.015	0.012	0.004	0.003	0.004	0.002	0.004	0.003	0.003	0.002
Dissolved Iron	mg/L	-	<0.07	<0.07	<0.07	<0.07	7.05	<0.07	49.40	19.20	0.24	0.11	<0.07	<0.07
Dissolved Lead	mg/L	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Nickel	mg/L	-	0.003	0.004	0.003	0.003	0.006	0.006	0.008	0.008	0.008	0.007	0.006	0.006
Dissolved Zinc	mg/L	-	0.33	0.25	0.03	0.04	0.01	0.03	0.38	0.35	0.01	0.02	0.04	0.05

Notes:

Bold red values indicate parameters greater than MMER criteria, Fe concentrations greater than 7 mg/L or ammonia concentrations greater than 10 mg/L.
See text for detailed explanation.
N/A - not analyzed

High CN concentrations were measured for the Seep Pond water and Tailings Porewater 02. The Tailings Porewater sample points 02 and 04 contain high As concentrations. For the purposes of the water treatability tests, a single Tailings Porewater blend was used; this was blended at a 50-50 ratio using the two most contaminated samples (02 and 04). In the tests described below, the term Tailings Porewater is used to represent this blend.

5.3.1.2 Laboratory Tests

Based on the raw water quality, a set of 14 treatment tests was designed to confirm the treatment needs for each of the water sources. The approach was to evaluate the treatment requirements for each of the water sources separately without any prior blending. This method is considered conservative as blending will result in an improvement in the overall water quality, specifically for Seepage Pond and Tailings Porewater.

The Tailings Pond and Pit Lake waters were neutralised with lime to a pH of 9.5, followed by flocculant addition and 1 hour settling for solid-liquid separation. This treated effluent was sampled and measured for TSS and turbidity. A final pH adjustment with sulphuric acid to a setpoint of 7.0 was completed to define the dosage in case this would be required to mitigate ammonia toxicity.

Similar procedures were applied to the Seep Pond and Tailings Porewater, with added steps for arsenic co-precipitation and cyanide oxidation. For cyanide, different ratios of peroxide addition were tested and the use of copper sulphate was attempted for use as a catalyst. For arsenic treatment, different Fe:As ratios were tested. The details of each test are given in Table 5.3.1.2-1.

After review of the initial test results, tests 13 and 14 were added to verify the effect of treating blends.

5.3.2 Treatability Test Results

A summary of the reagent consumption rates and test pH values is provided in Table 5.3.2-1. Three pH values are shown here: "Initial" is the pH of the raw water before the test is started, "Treated" is the pH of the water after one hour settling (representing what would be the clarifier overflow), and "Adjusted" is the final pH after acidification to mitigate ammonia toxicity, if needed. The reagent consumption rates of lime and acid are a function of the water and pH setpoint. These results can be used to design the final treatment plant. The peroxide, copper, and iron addition rates were set by the test parameters, as per Table 5.3.1.2-1.

Table 5.3.2-2 shows the analytical results from testing, including only the parameters which require treatment or which have levels close to the MMER limits. As mentioned previously, MMER were used as appropriate reference “end-of-pipe” discharge criteria for the water treatment plant. Each of the different water sources were successfully treated to compliant levels depending on the test conditions.

Table 5.3.1.2-1: Description of Treatment Tests Completed

Test No.	Water Source	Dosage	Reagent	Analysis Needed
1	Pit Lake	pH=9.5	Lime	ICP (incl. S), CN
		2 mg/L	Flocculant	
		pH=7	Sulfuric Acid	
2	Tailings Pond	pH=9.5	Lime	ICP (incl. S), CN
		2 mg/L	Flocculant	
		pH=7	Sulfuric Acid	
3	Seep Pond	pH=9.5	Lime	ICP (incl. S), CN
		2 mg/L	Flocculant	
		1:1 (molar ratio of H2O2:CN)	Peroxide	
		pH=7	Sulfuric Acid	
4	Seep Pond	pH=9.5	Lime	ICP (incl. S), CN
		2 mg/L	Flocculant	
		2:1 (molar ratio of H2O2:CN)	Peroxide	
		pH=7	Sulfuric Acid	
5	Seep Pond	pH=9.5	Lime	ICP (incl. S), CN
		2 mg/L	Flocculant	
		5:1 (molar ratio of H2O2:CN)	Peroxide	
		pH=7	Sulfuric Acid	
6	Seep Pond	pH=9.5	Lime	ICP (incl. S), CN
		2 mg/L	Flocculant	
		2:1 (molar ratio of H2O2:CN)	Peroxide	
		5 mg/L	Cu Catalyst	
		pH=7	Sulfuric Acid	
7	Seep Pond	pH=9.5	Lime	ICP (incl. S), CN
		2 mg/L	Flocculant	
		10:1 (molar ratio of H2O2:CN)	Peroxide	
		pH=7	Sulfuric Acid	
8	Tailings Porewater	none	Ferric Sulphate	ICP (incl. S), CN
		pH=9.5	Lime	
		2 mg/L	Flocculant	
		2:1 (molar ratio of H2O2:CN)	Peroxide	
		5 mg/L	Cu Catalyst	
		pH=7	Sulfuric Acid	
9	Tailings Porewater	5:1 (molar ratio Fe to As)	Ferric Sulphate	ICP (incl. S), CN
		pH=9.5	Lime	
		2 mg/L	Flocculant	
		2:1 (molar ratio of H2O2:CN)	Peroxide	
		5 mg/L	Cu Catalyst	
		pH=7	Sulfuric Acid	
10	Tailings Porewater	10:1 (molar ratio Fe to As)	Ferric Sulphate	ICP (incl. S), CN
		pH=9.5	Lime	
		2 mg/L	Flocculant	
		2:1 (molar ratio of H2O2:CN)	Peroxide	
		5 mg/L	Cu Catalyst	
		pH=7	Sulfuric Acid	
11	Tailings Porewater	5:1 (molar ratio Fe to As)	Ferric Sulphate	ICP (incl. S), CN
		pH=9.5	Lime	
		2 mg/L	Flocculant	
		5:1 (molar ratio of H2O2:CN)	Peroxide	
		pH=7	Sulfuric Acid	
12	Tailings Porewater	10:1 (molar ratio Fe to As)	Ferric Sulphate	ICP (incl. S), CN
		pH=9.5	Lime	
		2 mg/L	Flocculant	
		5:1 (molar ratio of H2O2:CN)	Peroxide	
		pH=7	Sulfuric Acid	
13	50-50 Blend Tailings Pond - Tailings Porewater	5:1 (molar ratio Fe to As)	Ferric Sulphate	ICP (incl. S), CN
		pH=9.5	Lime	
		2 mg/L	Flocculant	
14	50-50 Blend Pit Lake - Seep Pond	10:1 (molar ratio Fe to As)	Ferric Sulphate	ICP (incl. S), CN
		pH=9.5	Lime	
		2 mg/L	Flocculant	

Table 5.3.2-1: Summary of Reagent Consumption Rates

Test	Source Water	Initial pH	Treated pH	Adjusted pH	Lime added	H_2O_2	$CuSO_4$	$Fe_2(SO_4)_3$	H_2SO_4
					(g)	(mL)	(g)	(mL)	(mL)
1	Pit Lake	8.06	8.51	7.00	0.18	-	-	-	2.6
2	Tailings Pond	7.88	8.95	7.00	0.05	-	-	-	5.8
3	Seep Pond	6.92	8.60	7.02	0.35	0.04	-	-	4.5
4	Seep Pond	6.95	8.76	7.03	0.36	0.08	-	-	5.4
5	Seep Pond	7.10	8.98	7.04	0.33	0.20	-	-	7.5
6	Seep Pond	7.12	8.98	7.03	0.34	0.08	0.63	-	3.6
7	Seep Pond (10:1)	7.20	9.02	7.00	0.34	0.40	-	-	6.2
8	Tailings Porewater	6.96	9.01	7.05	0.14	0.05	-	-	4.8
9	Tailings Porewater	6.97	9.08	6.96	0.19	0.05	0.63	0.17	4.6
10	Tailings Porewater	7.17	9.05	6.96	0.32	0.05	0.63	0.34	3.6
11	Tailings Porewater	7.22	8.98	7.05	0.19	0.13	-	0.17	3.9
12	Tailings Porewater	6.99	8.92	7.00	0.31	0.13	-	0.34	2.8
13	50:50 Tailings Pond:Porewater	7.64	9.12	-	0.10	-	-	0.83	-
14	50-50 Pit Lake:Seep Pond	8.00	8.87	-	0.25	-	-	0.80	-

Table 5.3.2-2: Analytical Results of Treatability Testing

Test	Source Water	TSS (mg/L)	As (mg/L)		Cu (mg/L)		Fe (mg/L)		Zn (mg/L)		CN (mg/L)	NH_3 (mg/L)
			Total	Diss	Total	Diss	Total	Diss	Total	Diss	Total	Total
	MMER Limit	**15**	**0.5**		**0.3**		**-**		**0.5**		**1**	
1	Pit Lake	2.80	0.005	0.004	0.003	0.003	0.04	0.04	0.018	0.012	**-**	**-**
2	Tailings Pond	2.40	0.080	0.052	0.018	0.013	0.18	0.04	0.044	0.023	-	-
3	Seep Pond	5.20	0.006	0.004	0.005	0.005	0.14	0.04	0.014	0.025	0.88	-
4	Seep Pond	3.20	0.004	0.003	0.004	0.004	0.16	0.04	0.007	0.007	0.72	-
5	Seep Pond	5.20	0.001	0.003	0.002	0.006	0.04	0.04	0.007	0.047	**1.42**	**-**
6	Seep Pond	3.60	0.003	0.002	**0.560**	0.254	0.04	0.04	0.004	0.007	0.43	-
7	Seep Pond (10:1)	4.80	0.001	0.003	0.002	0.003	0.04	0.04	0.007	0.007	**1.34**	**-**
8	Tailings Porewater	2.40	**1.100**	**1.000**	0.000	0.100	0.10	0.05	0.010	0.010	0.38	-
9	Tailings Porewater	2.00	0.025	0.130	0.050	0.100	0.05	0.05	0.010	0.010	**1.27**	**-**
10	Tailings Porewater	1.60	0.050	0.025	0.050	0.050	0.10	0.05	0.010	0.010	0.40	-
11	Tailings Porewater	3.20	0.110	0.080	0.050	0.050	0.20	0.05	0.010	0.010	0.42	-
12	Tailings Porewater	3.20	0.040	0.027	0.003	0.003	0.13	0.04	0.004	0.006	0.39	-
13	50:50 Tailings Pond:Porewater	1.20	0.025	0.006	0.050	0.004	0.05	0.04	0.010	0.004	0.142	4.2
14	50-50 Pit Lake:Seep Pond	2.00	0.001	0.001	0.003	0.003	0.15	0.04	0.004	0.005	0.011	2.2

Notes:

Bold red values indicate parameters greater than MMER criteria, Fe concentrations greater than 7 mg/L or ammonia concentrations greater than 10 mg/L. See text for detailed explanation.

CN posed the greatest challenge with regards to final effluent quality as three out of the 10 tests requiring CN treatment were unsuccessful. High CN-bearing effluent occurred at various peroxide addition ratios, as well as when a catalyst was added (CuSO4). The catalyst should be avoided if possible as an exceedance of the Cu limit occurred during Test #6 resulting from catalyst addition. Despite some of the tests being successful at removing CN, the inconsistency of the test conditions producing low CN effluent makes this contaminant a challenge for treatment. Another option for managing high CN levels is to blend existing waters prior to treatment. This would reduce the CN concentration in the influent water and could eliminate the need to treat specifically for CN. This was explored in Tests #13 and #14.

Arsenic co-precipitation was successful in all treatment tests including the addition of ferric sulphate. In Test #8, the only one where the As concentration was high, no ferric sulphate was added. This indicates that this Fe addition is required in order to achieve compliant effluent when Tailings Porewater is treated. A 5 to 1 molar ratio (Fe to As) is sufficient for As removal.

The results for tests 13 and 14 show that when waters are blended, there is no need to treat specifically for CN, therefore allowing the possibility to eliminate peroxide addition. In both Test 13 and Test 14, the CN was well below the MMER limit. In addition, these tests were not pH adjusted with sulphuric acid; this is considered acceptable as the final ammonia levels are less than 5 mg/L in these blended waters.

The opportunity of treating blended waters should be pursued during sequencing as it can allow for removal of two reagents from the water treatment plant. By maintaining low CN concentrations, peroxide is not needed. In addition, with ammonia concentrations of less than 10 mg/L, sulphuric acid is not considered necessary.

5.4 Groundwater

5.4.1 Objectives

The primary objectives for the groundwater-related aspects of the 2014 site investigation were to increase the data for a refinement of the project baseline information, with respect to the seasonal variability in groundwater levels and groundwater chemistry. A secondary objective was to update, where applicable, the hydrogeological conceptual site model (AMEC, 2014b), according to the 2014 site investigation findings. Of the secondary objectives, the Brown McDade Pit pond levels and ground temperatures associated with the Pit are of particular relevance to the remediation design.

5.4.2 Groundwater Level Instrumentation and Data Objectives

Pre-2013 water level and temperature instrumentation was installed inside the Brown McDade Pit to record the Pit pond level and groundwater level within the fractured bedrock Pit floor, adjacent to the pond (GLL07-03). This instrumentation utilized a corehole that was extended to an elevation equivalent to the deepest portion of the Pit pond (El. 1074 m). Other pre-2013 instrumentation records groundwater levels in two monitoring wells constructed north of the Pit, adjacent to the public road. Of these monitoring wells external to the Pit, one has experienced intermittently freezing conditions (MW09-15) and the other has experienced permanently freezing conditions (GLL07-01).

In 2013, additional water level and temperature instrumentation was installed in bedrock forming the Brown McDade Pit floor and bedrock to the east and south, to assess potential pathways for groundwater leaving the Pit area. This instrumentation included thermistor devices capable of an operating temperature range extending down to -20°C.

A summary of all instrumentation currently installed for recording Pit pond level, fractured bedrock groundwater levels (piezometric elevation) and temperature, is provided in Table 5.4.2-1, Summary of Groundwater/Hydrogeologic Datalogger Installations. This table summarizes the locations, types, configurations, data period and graphical output reference for each of the dataloggers downloaded in July 2014. Two types of datalogger are currently in service: Levelloggers (Solinst) and vibrating wire piezometers (RST Instruments). One Barologger (Solinst) is located within the Brown McDade Pit, dedicated to recording atmospheric pressure for a project-wide barometric pressure. Note that loggers for GLL07-01, MW09-15, MW09-21 and MW09-23 appear to have run out of memory prior to the download event in July. All dataloggers were reset by AAM late in 2014 and will be downloaded in 2015 to confirm they are in working order.

A number of the vibrating wire datalogger devices have malfunctioning temperature or frequency channels. However, enough are functioning to provide the information required to assess hydrogeological conditions. The lowest ground temperatures experienced by the project to-date are approximately -1.0°C. This ‘warm’ permafrost appears to be enabling bedrock fracture water and ice to co-exist. It is also possible that ice formation pressure may have influenced the results, presented in the following sub-sections.

Each Levellogger is a self-contained, water pressure and temperature recording device that is downloaded individually and the data processed with a barometric compensation from the Barologger. The vibrating wire piezometers comprise water pressure and thermistor sensor units connected to surface data loggers housed within the surface casing, using dedicated signal cables, downloaded as a group according to the number of connected sensor devices. In 2013, the vibrating wire piezometers were installed in two configurations, comprising strings of five sensors at two locations (Brown McDade Pit floor/east wall and Pit (south-west) exterior) and single sensors attached to the exterior of one-inch monitoring wells, within the sand pack, at three locations (Brown McDade Pit floor and Pit (east and south) exterior). The five-sensor strings were installed within cement-bentonite grout, with a semi-permeable formulation, enabling each sensor to respond primarily to the adjacent corehole wall pore pressure and temperature.

Table 5.4.2-1: Summary of Groundwater/Hydrogeologic Datalogger Installations

Mine Element Monitored	Datalogger Identification and Installation Type	Datalogger Sensor Details	Datalogger Data Period	Graph Figures
Brown McDade Pit, interior, pond.	Pit Pond - free water Levellogger.	Pond water suspended.	4/Aug/'10 to 22/Jul/'14.	Figure 5.4.3-1 - piezometric elevation and temperature.
Brown McDade Pit, exterior, north-west.	GLL07-01 - free water Levellogger.	Monitoring well suspended.	2/Sep/'09 to 27/Mar/'14.	Figure 5.4.3-1 - piezometric elevation showing frozen conditions.
Brown McDade Pit, interior, gives project-wide barometric reference.	GLL07-03 - free air Barologger.	Air suspended.	11/Aug/'10 to 22/Jul/'14.	Not graphed separately.
Brown McDade Pit, interior, pit floor.	GLL07-03 - free water Levellogger.	Monitoring well suspended.	11/Aug/'10 to 22/Jul/'14.	Figure 5.4.3-1 - piezometric elevation.
Brown McDade Pit, exterior, northeast.	MW09-15 - free water Levellogger.	Monitoring well suspended.	11/Aug/'10 to 10/Feb/'14.	Figure 5.4.3-1 - piezometric elevation showing freeze-thaw conditions.
Brown McDade Pit, exterior, southwest.	CH-P-13-02 - grouted-in RST vibrating wire.	10 m (El. 1139.1 m) 20 m (El. 1128.7 m) 30 m (El. 1118.3 m) 40 m (El. 1108.6 m) 50 m (El. 1097.9 m).	04/Oct/'13 to 22/Jul/'14.	Figure 5.4.3-2a - piezometric elevation (50 m malfunction after Nov 2013); and Figure 5.4.3-2b - thermistor temperature.
Brown McDade Pit, exterior, south.	CH-P-13-03 - sand pack RST vibrating wire.	50 m (El. 1134.3 m).	14/Nov/'13 to 22/Jul/'14.	Figure 5.4.3-3 - piezometric elevation. Non-valid thermistor temperature.
Brown McDade Pit, exterior, east.	CH-P-13-04 - sand pack RST vibrating wire.	35 m (El. 1190.6 m).	31/Oct/'13 to 22/Jul/'14.	Figure 5.4.3-4 - thermistor temperature. Non-valid piezometric elevation.
Brown McDade Pit, interior, pit floor.	CH-P-13-05 - sand pack RST vibrating wire.	50 m (El. 1135.6 m).	15/Nov/'13 to 22/Jul/'14.	Figure 5.4.3-5 - thermistor temperature non-valid starting 11/Mar/'14. Non-valid piezometric elevation.
Brown McDade Pit, interior, pit floor and east wall.	CH-P-13-06 - grouted-in RST vibrating wire. Inclined at 45 °.	10 m (El. 1170.7 m) 20 m (El. 1164.3 m) 30 m (El. 1156.6 m) 40 m (El. 1150.1 m) 50 m (El. 1143.4 m).	05/Oct/'13 to 22/Jul/'14.	Figure 5.4.3-6a - piezometric elevation and Figure 5.4.3-6b - thermistor temperature.
TSF, interior tailings, shallow zone.	MW09-03 – free water Levellogger.	Monitoring well suspended.	17/Oct/'11 to 2/Jun/'12 17/Sep/'13 to 22/Jul/'14.	Figure 5.4.3-7 - piezometric elevation.
TSF, interior tailings, deeper zone.	MW09-04 – free water Levellogger.	Monitoring well suspended.	17/Oct/'11 to 2/Jun/'12 17/Sep/'13 to 23/Jul/'14.	Figure 5.4.3-7 - piezometric elevation.
TSF, exterior, dam east face.	MW09-21 – free water Levellogger.	Monitoring well suspended.	17/Oct/'11 to 15/Oct/'12.	Figure 5.4.3-7 - piezometric elevation.
TSF, exterior, dam crest.	MW09-23 – free water Levellogger.	Monitoring well suspended.	17/Oct/'11 to 15/Oct/'12.	Figure 5.4.3-7 - piezometric elevation.

5.4.3 Groundwater Datalogger Results

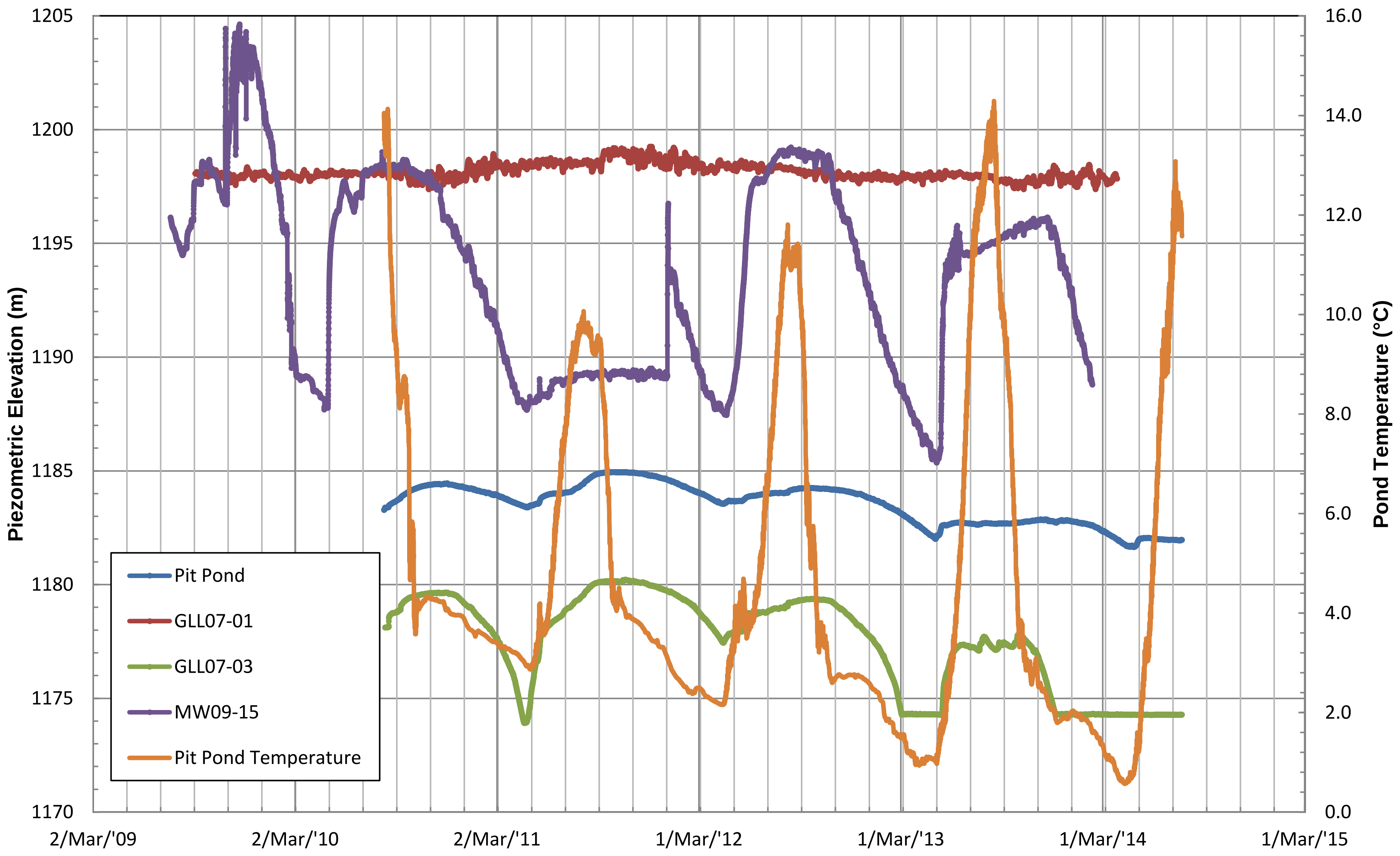
The downloaded data obtained in July 2014 were grouped according to mine element location, namely the Brown McDade Pit and the Tailings Storage Facility, as shown in Table 5.4.2-1. The individual outputs from these dataloggers are shown as time-series graphs, Figures 5.4.3-1 to 5.4.3-7, inclusive. A summary of each of these seven figures is provided in the following paragraphs.

Figure 5.4.3-1 shows Levellogger-derived data for the Brown McDade Pit pond elevation and pond water temperature, together with bedrock groundwater elevations from three bedrock monitoring wells, including: the pit floor (GLL07-03), the north of the high wall (GLL07-01) and northeast of the high wall (MW09-15). Coinciding with the Pit pond datalogger download event, the pond water elevation was also surveyed, relative to a geodetic benchmark (Underhill UU1981).

Figure 5.4.3-1 shows a vertical hydraulic gradient between the Pit pond and adjacent monitoring well constructed into the Pit floor (GLL07-03), with a 1.8 m long open-hole intake section. Other than two instances of the water level falling below the level of the shallow Pit floor datalogger (flat portions of piezometric elevation for GLL07-03), a downward vertical gradient is consistently present without significant seasonal change or reversal. This is displayed by the piezometric elevation for GLL07-03 mirroring the Pit pond elevation in an approximate manner. This observation supports the conclusion of a continuously draining Pit pond, year round, for the period of datalogger record. The other two monitoring wells, in and near the north high wall of the Brown McDade Pit, are influenced by active layer development (MW09-15) and permanently frozen conditions (GLL07-01). By active layer development, it is meant that freezing ground induces pressure build-up and thawing ground induces pressure dissipation, as seen by the peaks over the winter in 2009 and 2011. The sharp rise in piezometric elevation for MW09-15 in March/April of each year is indicative of spring snowmelt. Data for GLL07-01 is shown on Figure 5.4.3-1 for completeness.

The Pit pond temperature as shown on Figure 5.4.3-1 remains above 0°C throughout the year, as it is measured approximately 11 m below the water surface. The datalogger is installed at elevation 1179.3935 masl and the depth below water will fluctuate with water levels.

Overall, an upper bound bedrock piezometric elevation on the order of 1,198 m appears to be applicable to these two wells, which were constructed with the deepest screen elevations at elevations 1,191.6 m (GLL07-01) and 1,170.4 m (MW09-15). The latter appears to show some synchronicity and partially mimics the Pit pond suggesting a degree of hydraulic connectivity exists within the bedrock. If valid, bedrock groundwater movement would be from the north towards the Pit pond.



CLIENT:

Yukon
Government

AMEC Environment & Infrastructure
5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6
PHONE 780-436-2152, FAX 780-435-8425

amec

DWN BY: PRM

CHK'D BY: PRM

DATUM: -

PROJECTION: -

SCALE: NTS

PROJECT:

MOUNT NANSEN REMEDIATION

TITLE:

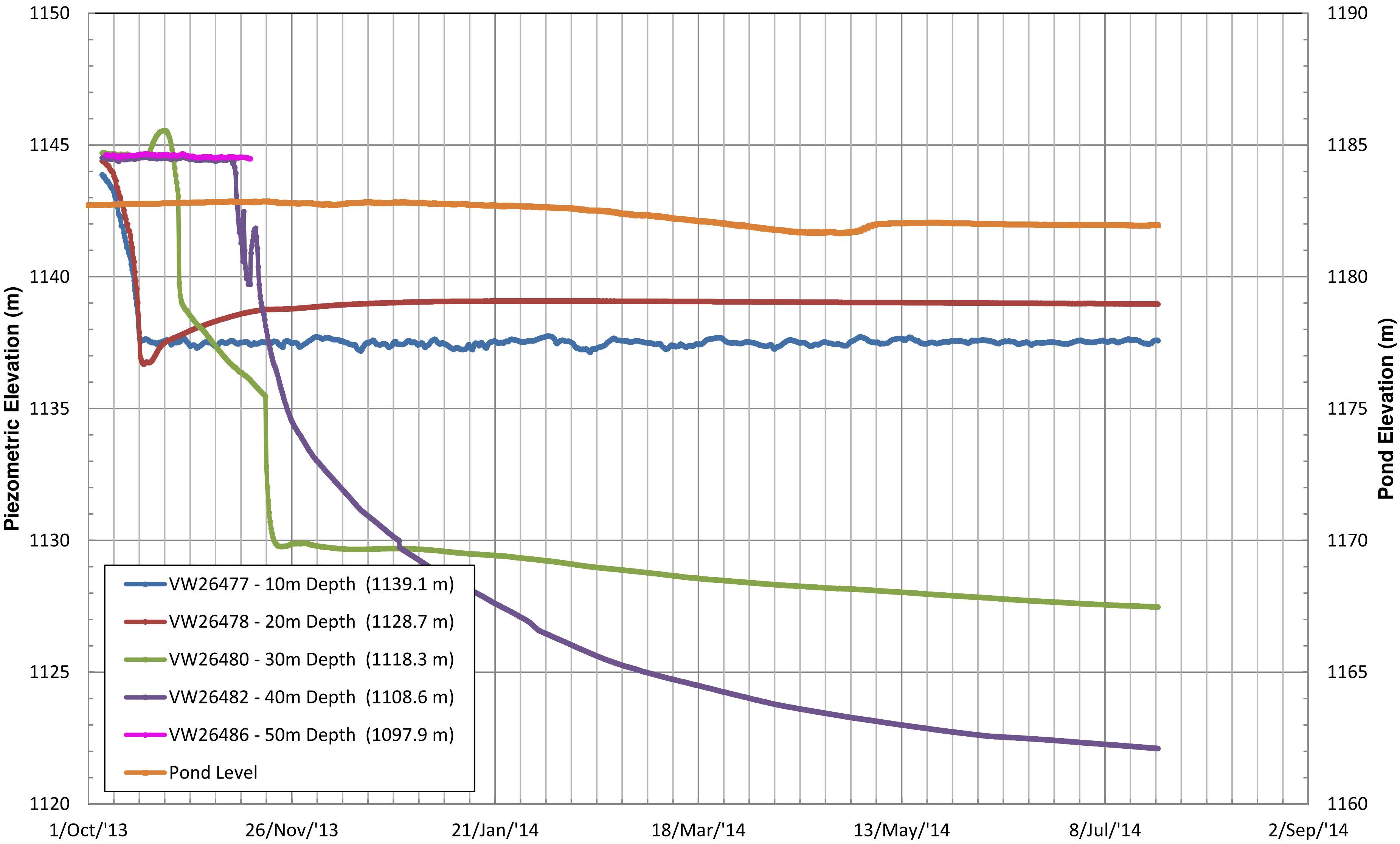
BROWN McDADE PIT POND AND AREA
PIEZOMETRIC ELEVATIONS
AND PIT POND TEMPERATURE

DATE: SEP 2014

PROJECT No.: VM00605J

REV. No.: A

FIGURE No.: 5.4.3-1



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5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6
PHONE 780-436-2152, FAX 780-435-8425

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DWN BY: DMcL

CHK'D BY: PRM

DATUM: -

PROJECTION: -

SCALE: NTS

PROJECT:

MOUNT NANSEN REMEDIATION

TITLE:

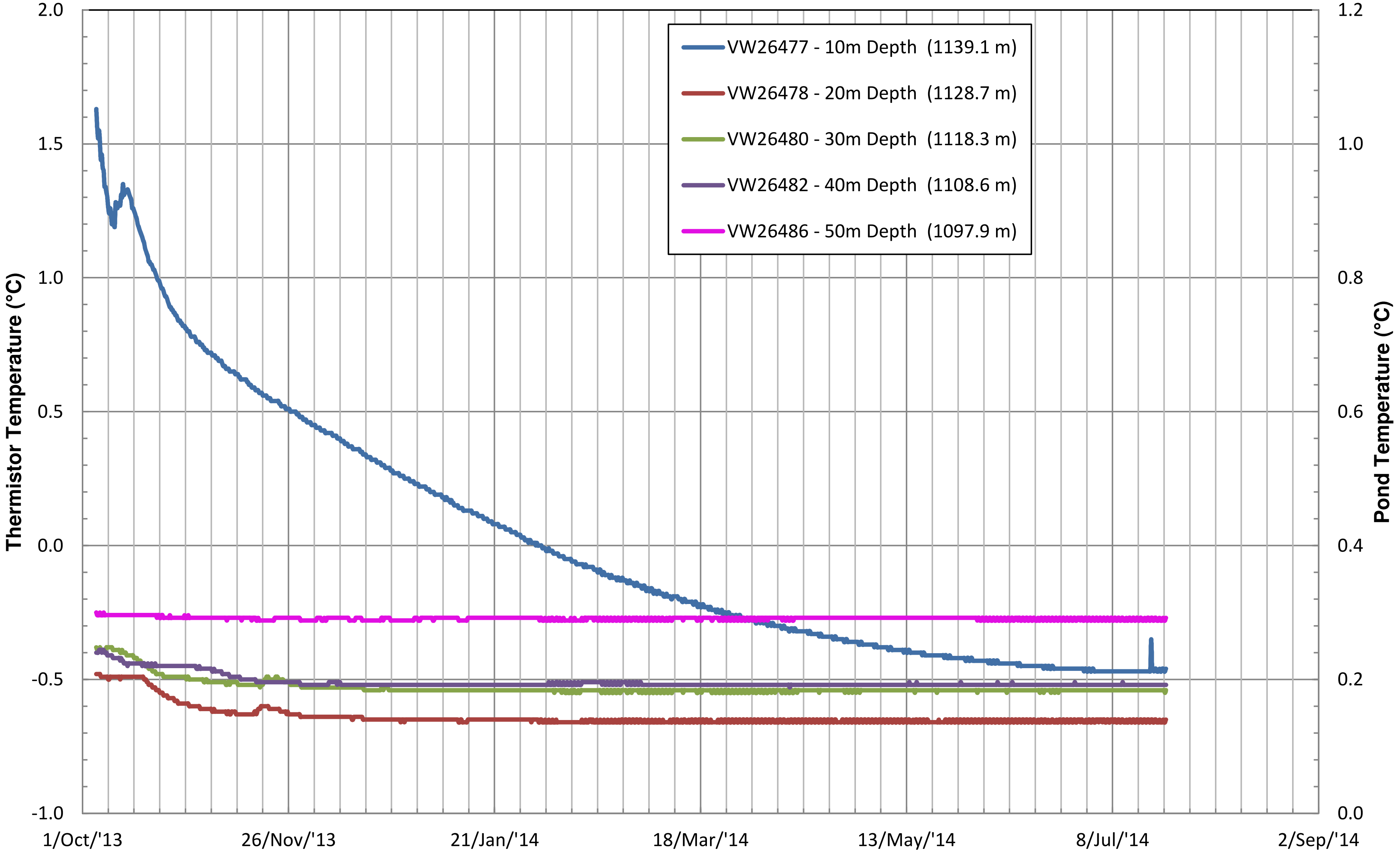
PIEZOMETRIC ELEVATIONS AT CH-P-13-02

DATE: JAN 2015

PROJECT No.: VM00605J

REV. No.: A

FIGURE No.: 5.4.3-2A



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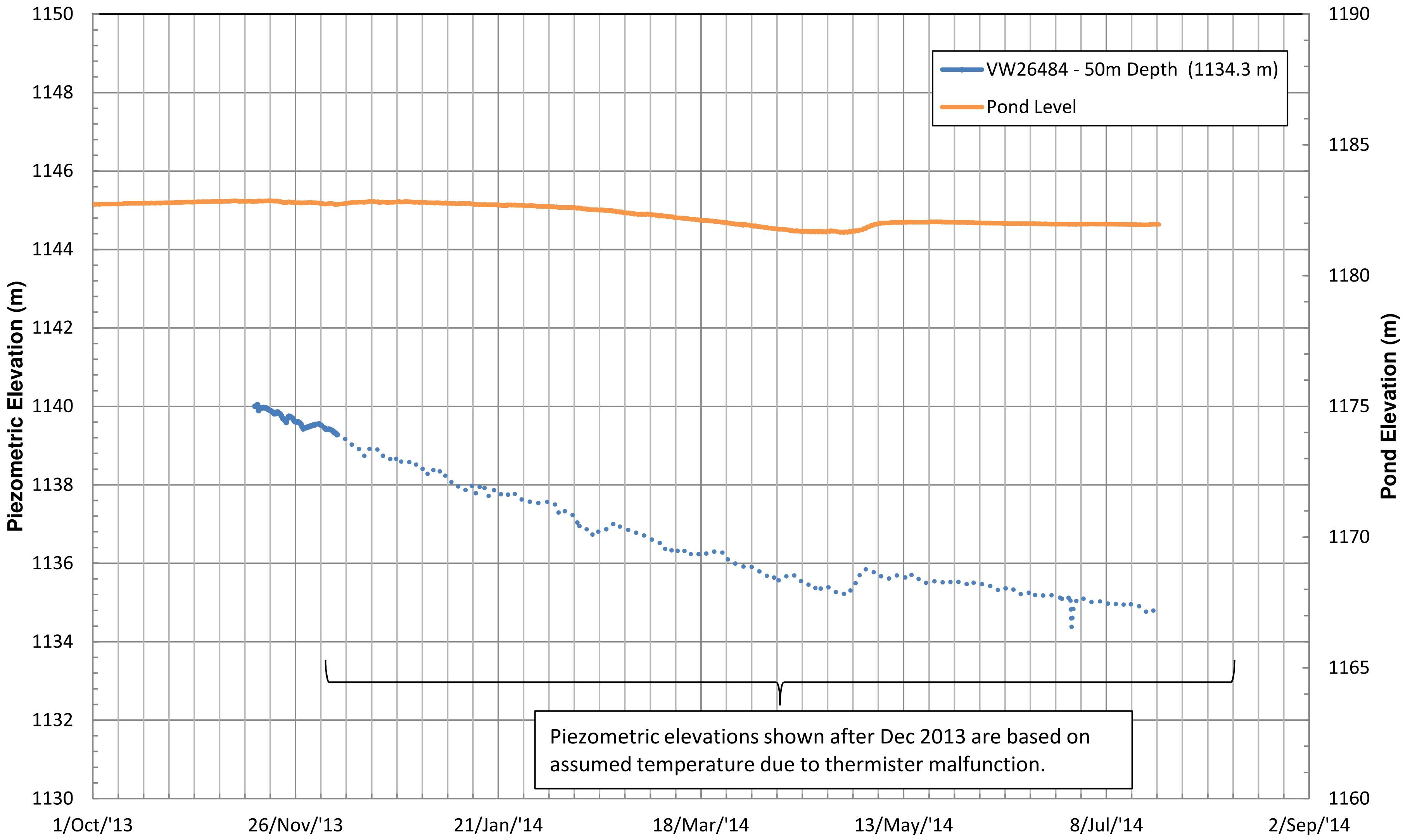
amec

DWN BY: DMcL
CHK'D BY: PRM
DATUM: -
PROJECTION: -
SCALE: NTS

PROJECT:
MOUNT NANSEN REMEDIATION

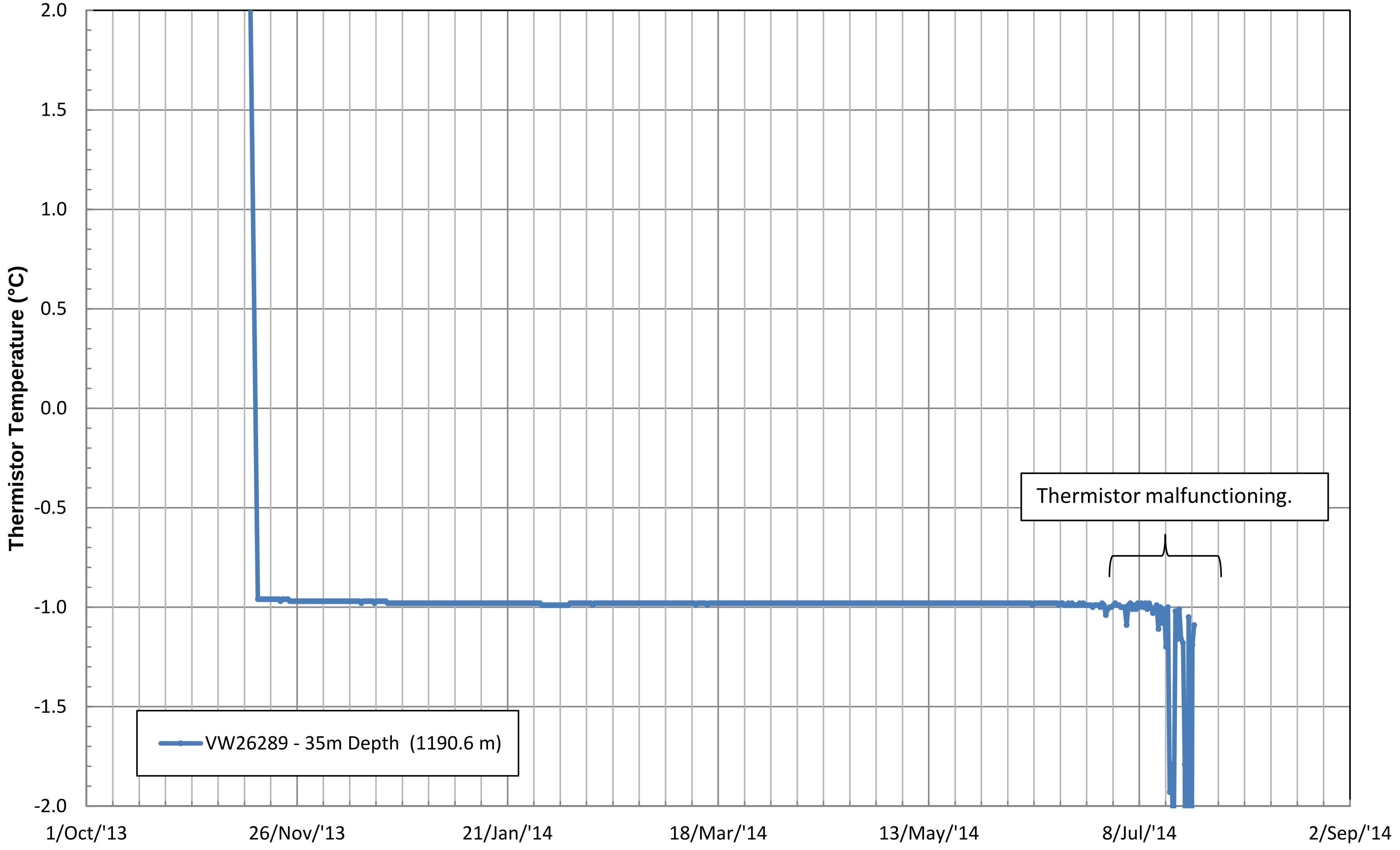
TITLE:
TEMPERATURE AT CH-P-13-02

DATE: SEP 2014
PROJECT No.: VM00605J
REV. No.: A
FIGURE No.: 5.4.3-2B



Piezometric elevations shown after Dec 2013 are based on assumed temperature due to thermister malfunction.

CLIENT. Yukon Government	DWN BY. DMcL	PROJECT. MOUNT NANSEN REMEDIATION	DATE. SEP 2014
	CHK'D BY: PRM		PROJECT No.: VM00605J
	DATUM: -	TITLE: PIEZOMETRIC ELEVATIONS AT CH-P-13-03	REV No.: A
AMEC Environment & Infrastructure 5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6 PHONE 780-436-2152, FAX 780-435-8425	PROJECTION: -		
	SCALE: NTS		FIGURE No.: 5.4.3-3



CLIENT: Yukon Government	DWN BY: DMcL CHK'D BY: PRM DATUM: - PROJECTION: - SCALE: NTS	PROJECT: MOUNT NANSEN REMEDIATION TITLE: TEMPERATURES AT CH-P-13-04	DATE: SEP 2014 PROJECT No.: VM00605J REV. No.: A FIGURE No.: 5.4.3-4

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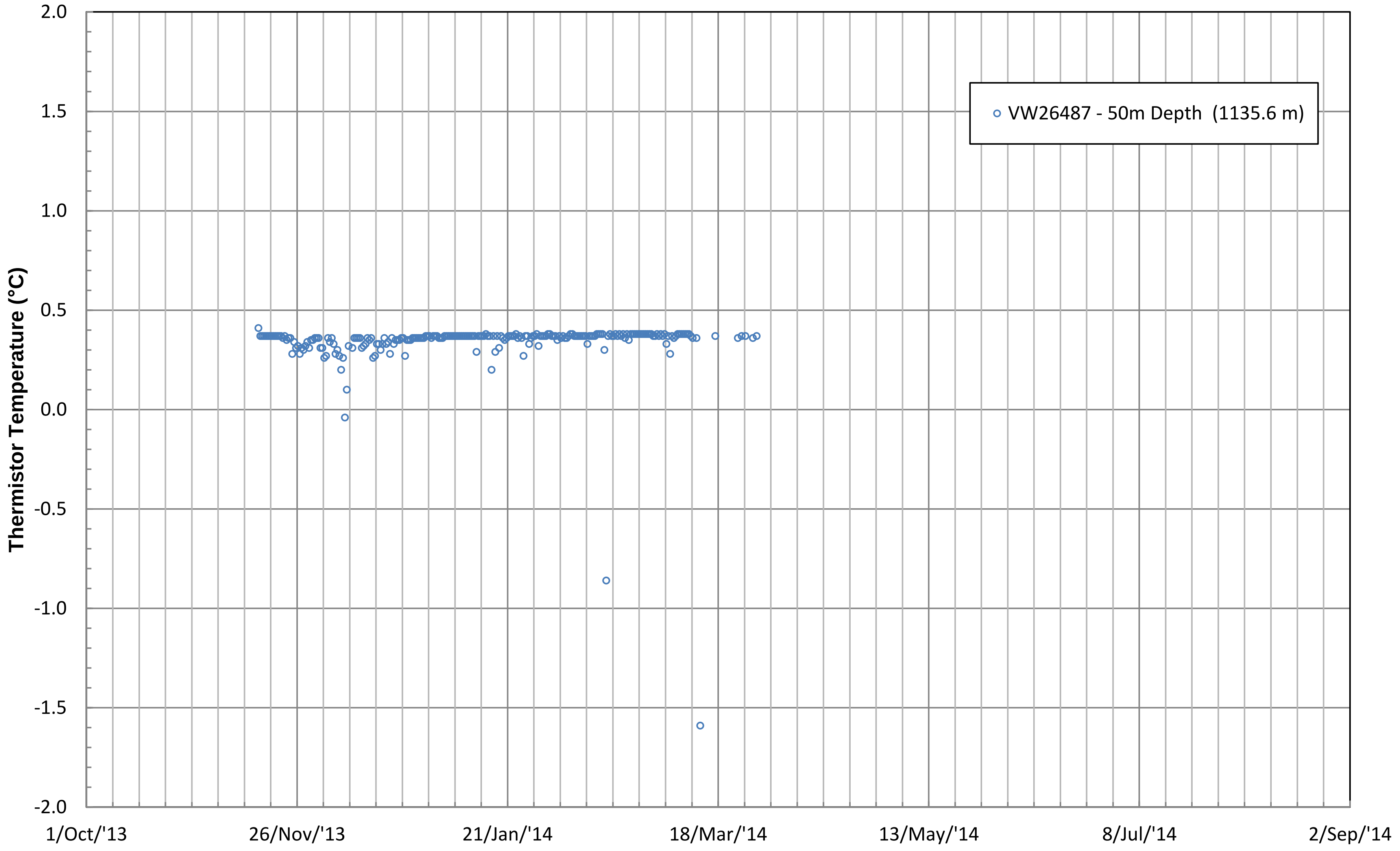

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DATUM: -
PROJECTION: -
SCALE: NTS

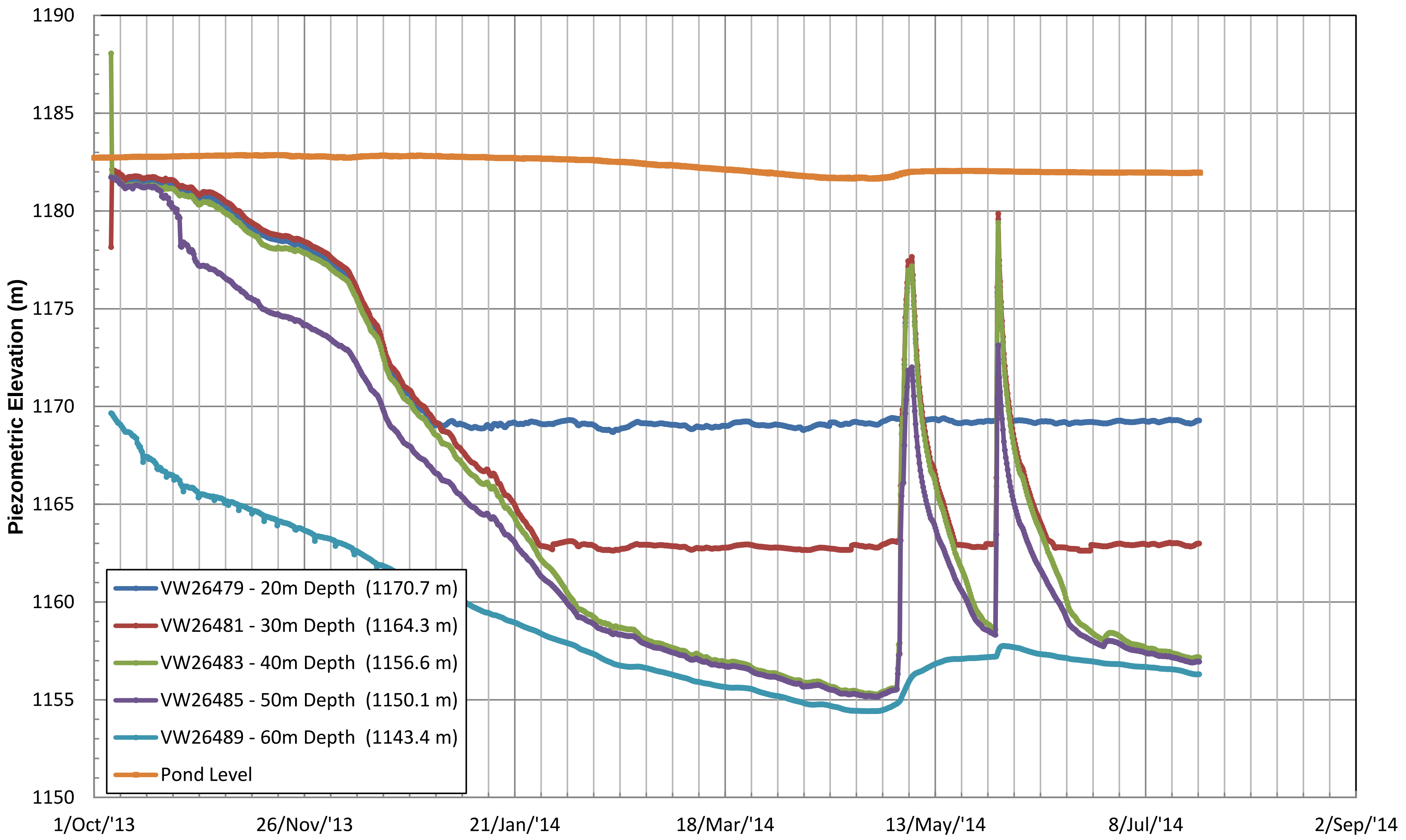
PROJECT:

MOUNT NANSEN REMEDIATION

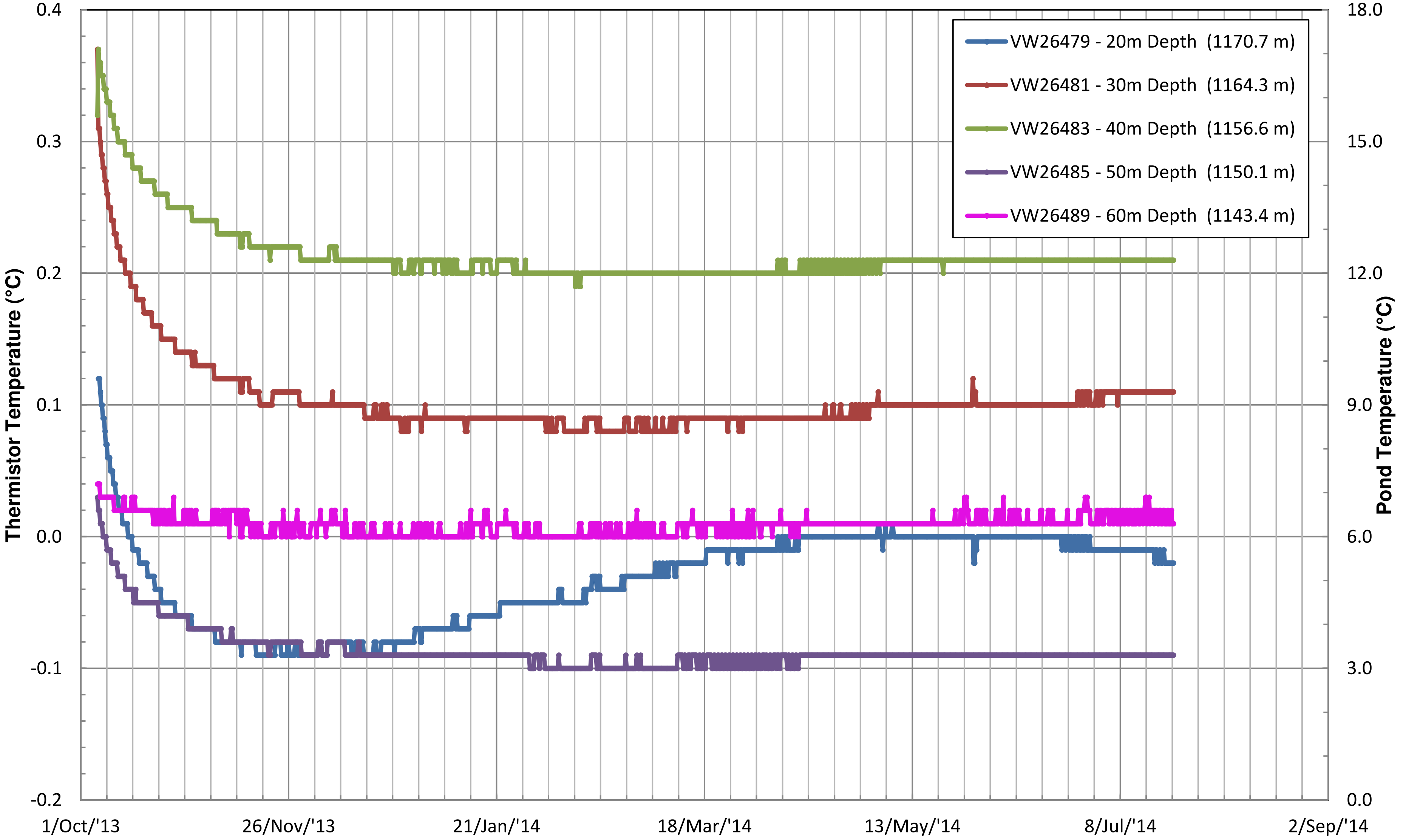
TITLE:

TEMPERATURES AT CH-P-13-05

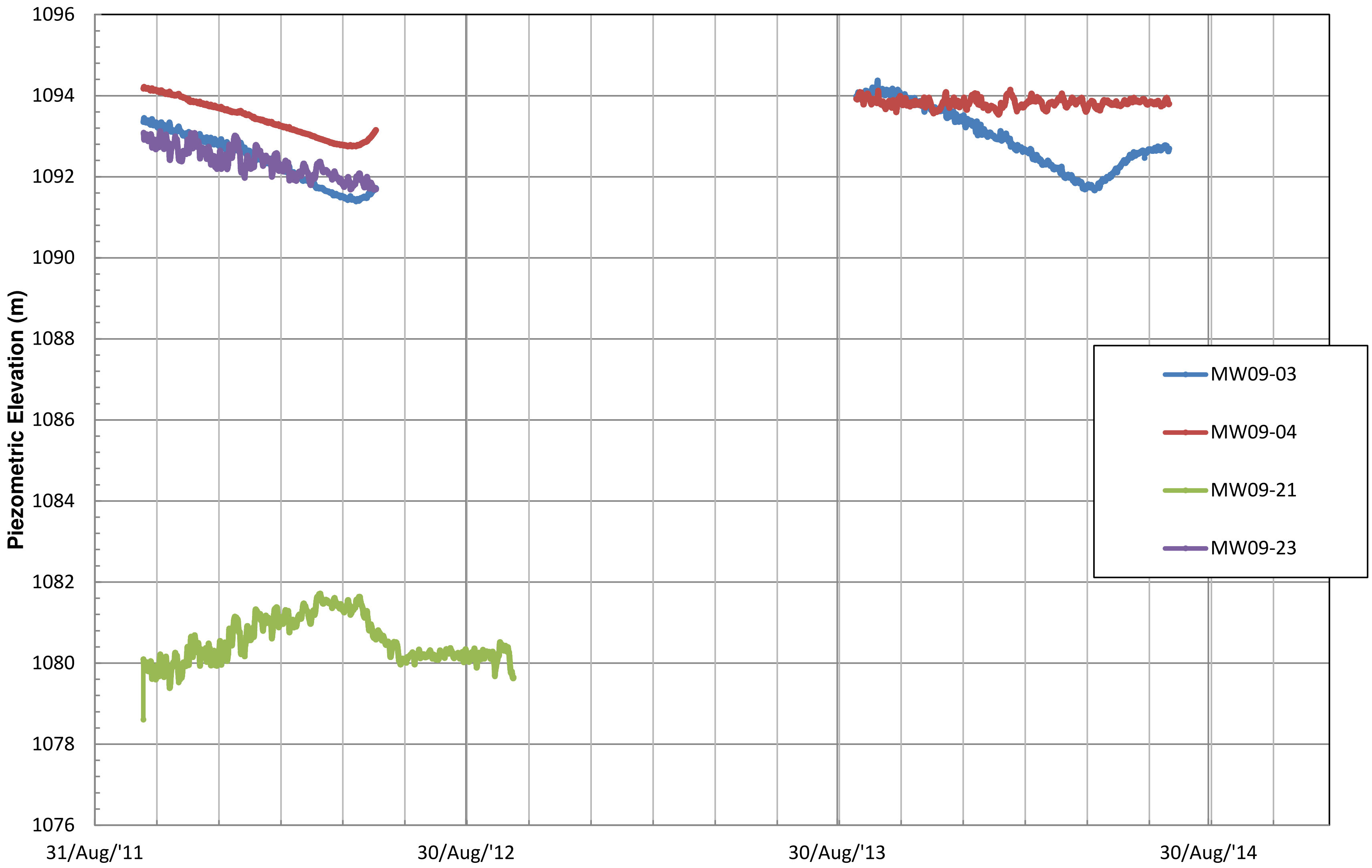
DATE: SEP 2014
PROJECT No.: VM00605J
REV. No.: A
FIGURE No.: 5.4.3-5



CLIENT: Yukon Government	DWN BY: DMcL	PROJECT: MOUNT NANSEN REMEDIATION	DATE: SEP 2014
	CHK'D BY: PRM		PROJECT No.: VM00605J
AMEC Environment & Infrastructure 5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6 PHONE 780-436-2152, FAX 780-435-8425 amec	DATUM: -	TITLE: PIEZOMETRIC ELEVATIONS AT CH-P-13-06	REV. No.: A
	PROJECTION: -		
	SCALE: NTS		FIGURE No.: 5.4.3-6A



CLIENT: Yukon Government	DWN BY: DMcL	PROJECT: MOUNT NANSEN REMEDIATION	DATE: JAN 2015
	CHK'D BY: PRM		PROJECT No.: VM00605J
	DATUM: -	TITLE: TEMPERATURES AT CH-P-13-06	REV. No.: A
AMEC Environment & Infrastructure 5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6 PHONE 780-436-2152, FAX 780-435-8425	PROJECTION: -		FIGURE No.: 5.4.3-6B
	SCALE: NTS		



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AMEC Environment & Infrastructure
5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6
PHONE 780-436-2152, FAX 780-435-8425

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DWN BY: PRM

CHK'D BY: PRM

DATUM: -

PROJECTION: -

SCALE: NTS

PROJECT:

MOUNT NANSEN REMEDIATION

TITLE:

TAILINGS POND FACILITY AND AREA
PIEZOMETRIC ELEVATIONS

DATE: SEP 2014

PROJECT No.: VM00605J

REV. No.: A

FIGURE No.: 5.4.3-7

Figures 5.4.3-2a and 2b show vibrating wire piezometer piezometric and temperature data respectively, for corehole location CH-P-13-02, located approximately 550 m southwest of the centre of the Brown McDade Pit, into which five-sensor instrumentation was installed corresponding to depths of 10 m, 20 m, 30 m, 40 m and 50 m, below surface. The Pit pond elevation and temperature are shown on Figures 5.4.3-2a and b, respectively, as a comparison reference. The shallowest sensor, at 10 m (elevation 1,097.9 m), shows a piezometric elevation of 1,138 m, relative to surface (elevation 1,145 m). The 20 m sensor indicates a semi-confined condition, with the piezometric elevation greater than that for the 10 m sensor. The 30 m and 40 m sensors indicate a deeper and downward drainage condition. The data from the 50 m sensor is unreliable as it stopped providing meaningful piezometric information in November 2013 before it had stabilized. Note that Figure 5.4.3-2a shows an initial period of widely varying data while all the frequency sensors stabilize. This is normal for sensors installed in grout. The temperature data at location CH-P-13-02 appears reasonable. The 10 m temperature data appears to be influenced by surface temperatures, while the deeper elevations show constant temperatures.

Figure 5.4.3-3 shows vibrating wire piezometer piezometric data at CH-P-13-03, approximately 500 m southeast of the Pit centre, with a single sensor at 50 m depth (elevation 1,134.3 m). This sensor shows a continuous decrease in piezometric elevation from 1,140 m to 1,135 m for the data period, indicative of continuous drainage of the bedrock mass. Of interest is an inflection in the piezometric data coinciding with the onset of freshet storage gains to the Pit pond (May 2014). The piezometric elevations on this figure were derived from assumed temperature after December 2013 (based on previously recorded temperatures) as the thermistor (temperature sensor) malfunctioned at that time. Temperature is recorded on a separate channel from frequency, but is used to convert frequency to piezometric elevations. Enough temperature information in the surrounding area is available to support using assumed temperatures.

Figure 5.4.3-4 shows temperature data at CH-P-13-04, approximately 200 m east of the Pit centre, with a single sensor at 35 m depth (elevation 1,190.6 m). The temperature data appears to be valid up to the beginning of July 2014, with the lowest temperature of all the monitored locations (-1.0°C). This is the coldest ground temperature recorded by the project instrumentation to date. Data for July 2014 appears to indicate the thermistor is malfunctioning. Analysis of subsequent data download events will confirm this.

Figure 5.4.3-5 shows vibrating wire piezometer temperature data at CH-P-13-05, constructed into the Pit floor, with a single sensor at 50 m depth (elevation 1,135.6 m). Other than several apparently erroneous data points, the temperature data from this sensor confirm a talik presence below the Pit pond, with consistently positive temperatures (+0.4°C). Note that data for CH-P-13-05 was downloaded to July 2014, but the thermistor appeared to stop functioning after March 2014 by showing very erroneous temperatures.

Figures 5.4.3-6a shows vibrating wire piezometer piezometric data for corehole location CH-P-13-06, constructed into the Pit floor at a 45° inclination and 80° azimuth, into which five-sensor instrumentation was installed corresponding to cored depths of 20 m, 30 m, 40 m, 50 m and 60 m. These sensors commence in the Pit floor and progress east and beyond the east Pit wall. All of the sensors exhibited a period of stabilization, at different rates, with the 50 m and 60 m being the slowest. The 20 m and 30 m sensors stabilized first, showing drainage of the rock mass had progressed to at least elevation 1,164 m, i.e. the installation depth of the 30 m sensor. All of the sensors responded to freshet recharge, with rapid piezometric increases in the beginning of May 2014. A lower reduced response was detected at the 60 m sensor located at the deepest (elevation 1,143.4 m) and greatest horizontal distance from the Pit confines. The decrease in piezometric elevation ceased at the end of April 2014 corresponding to freshet recharge. The sensors experienced a short-lived freshet recharge event as two ‘pulses’ of water (shown as spikes on Figure 5.4.3-6a). The initial spike/pulse is caused by a hydraulic connection between the pond water and the subsurface. Once water depth in the pond reaches a critical depth/pressure it begins to drain into the subsurface rapidly. The second pulse is likely caused by precipitation and seepage from snow melt. This conclusion will require validation based on considerations of future data. It is noteworthy that each piezometric elevation returned to pre-freshet recharge values by July 2014, suggesting that rock mass drainage may be influenced by other factors. To what extent the rock mass re-saturates after the current and prolonged period of drainage can only evaluated after the next datalogger download event, which took place in December and will be assessed in a future scope of work. This location will greatly benefit from having a complete year of stabilized data to at least July 2015 in order to view stabilized piezometric elevations and better understand variations in elevation.

Figure 5.4.3-6b shows the temperature data for location CH-P-13-06, which is very consistent after the initial stabilization period. Essentially, all temperatures at this location are hovering around 0°C.

Figure 5.4.3-7 shows the data from four different Levellogger devices in four different monitoring wells, installed at the Tailings Storage Facility. Two are within the tailings boundary (MW09-03 and 04), one is in the dam crest (MW09-23) and the other is in the downstream dam face (MW09-21). The two Levelloggers installed inside the tailings were installed October 2011 in paired monitoring wells, with screened intake sections at shallower (MW09-04) and deeper (MW09-03) depths to monitor tailings porewater. The downloaded data (October 2011 to June 2012 and September 2013 to July 2014), showed drainage of the tailings throughout the fall and winter of 2011-2012, followed by freshet and storage increase of the Tailings Storage Facility. This pattern was seen in 2013-2014 for MW09-03 but not for MW09-04. The behaviour pattern of the datalogger data for MW09-04 suggests the datalogger was malfunctioning in 2013-2014. This should be confirmed in future data downloads. The consistent behaviour between the paired monitoring wells in 2011-2012 indicates that the shallow and deep tailings are behaving in the same manner. The other two data loggers have 2012 data that show a seasonal water level decrease at the dam crest monitoring well (MW09-23), and a seasonal level increases in the dam downstream monitoring well (MW09-21). These two dataloggers ceased recording data in 2012, presumably due to exceedance of memory capacity. They were erased and re-started in December 2014. Data from MW09-03, MW09-04 and MW09-23 appear to show the same seasonal trend, but the current data set is insufficient to confirm this hypothesis. Future downloads should have concurrent data for all four monitoring wells.

5.4.4 Groundwater Monitoring Results

AMEC reviewed the recent 2014 groundwater monitoring and sampling results and the interpretation, described by Hemmera (2014). In the absence of federal or territorial groundwater guidelines, Hemmera compared the groundwater monitoring results to the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FAL) (CCME, 1999). A summary of the parameters exceeding CCME FAL guidelines is shown on Table 5.4.4-1 for those monitoring wells where samples could be collected.

Table 5.4.4-1: Summary of Parameters in Groundwater that Exceed CCME guidelines (June 2014) (Hemmera, 2014)

Station	Site Area	Parameter Exceeding CCME FAL Guidelines
GSI-DC-06B	Dome Creek	Ammonia, As, Cr, Fe
GSI-DC-07B		As, Fe
GSI-DC-09B		As, Fe
GSI-DC-10B		Al, As, Cr, Fe
MW09-16	Mill Complex	As, Cd, Cu, Zn
MW09-17		As
MW09-18		As
MW09-19		As, Fe
CH-P-13-03/50	Brown McDade Pit	Fe, Zn
CH-P-13-05/50		Cd, Cu, Fe, Zn
GLL07-03		Cd, Fe, Zn
MP09-02	Pony Creek	No exceedances
MP09-08		As, Fe
MP09-04	Tailings Storage Facility and Seepage Pond	No exceedances
MP09-05		As, Cd, Fe
MP09-09		Ammonia, F, free CN, As, Cu, Fe, Hg, Se, Ag
MP09-10		pH, ammonia, F, free CN, As, Cd, Cu, Se, Ag
MP09-11		Ammonia, F, As, Cr, Fe
MP09-12		Ammonia, F, As, Fe, Zn
MW09-02		Ammonia, F, As, Cd, Fe, Zn
MW09-03		Free CN, As, Cd
MW09-04		Ammonia, As, Zn
MW09-07		As, Fe, Ag, Zn
MW09-08		As, Fe
MW09-21		Free CN, As, Fe
MW09-22		Nitrite, free CN, As, Fe
MW09-23		Ammonia, Fe
MW09-24		Cu

From the analytical results for blanks and duplicates, Hemmera indicated that the analytical data was acceptable, and that there was no evidence of cross-contamination during the sampling or transport process. AMEC agrees with this interpretation.

The QA/QC discussion presented by Hemmera in Section 3.3 of their report identified variability in the total cyanide results for MW09-02 and DUP-3. The relative percent difference of 51.6% is considered outside of the normal range of variability for this analysis, and Hemmera attributes this to sample variability. AMEC agrees with this interpretation and concludes that these results are indicative of cyanide-containing sediment in one of the two sample bottles.

At one sampling location, the total cyanide concentration reported in 2014 for the groundwater sample from MP09-10 was 49.9 mg/L, compared to 2.07 mg/L in 2013 for total cyanide. This is the only location where the reported cyanide concentration substantially increased since 2013, and this result is elevated compared to the historical trend for the cyanide compounds at the project site.

Hemmera did not note the inconsistency in the sulphur results reported for DC-06, being the first drive-point well down gradient of the tailings dam along Dome Creek. The reported sulphate concentration of 583 mg/L is inconsistent with the reported dissolved sulphur concentration of 1.6 mg/L.

5.5 Surface Water Hydrology and Water Quality Results

5.5.1 Objectives and Scope

The monitoring program for 2014 covered monthly surface water quality and surface water flow monitoring as well as an extra event in May for freshet monitoring. Details of the program are presented in EDI (2014a). The purpose of the freshet program was to expand the surface water quality and flow data set for this seasonal period of transition. For the purposes of environmental assessment, YESAA guidelines require that seasonal variability be captured and the range of water quality characteristics be understood. The freshet represents a key period for seasonal variability of water quality, especially because it coincides with high flows. The data will also be used for refining the water quality modelling.

The program addressed the following specific objectives:

- Measuring peak flow during the spring runoff period; and
- Combining water quality and stream flow monitoring data for loading calculations.

The freshet monitoring scope of work comprised one trip during the freshet period in May.

5.5.2 Results

Table 5.5.2-1 presents a summary of water quality parameters which exceed CCME guidelines or Mount Nansen Effluent Discharge Standards. The table includes water quality data for the first quarter (April 1 to June 30, 2014) from EDI (2014a). For each sampling data and station sampled, the water quality parameter which exceeded the guidelines or standards is identified.

Table 5.5.2-1: Summary of Parameters that Exceed CCME guidelines and/or Mount Nansen Effluent Discharge Standards (Q1 April 1 to June 30, 2014) (EDI, 2014a)

Sampling Station	Sampling Trip Date			
	April 14-15, 2014	May 8-9, 2014	May 20-21, 2014	June 24-26, 2014
WQ-DC-DX	No sample	TSS, Al, As, Cd, Cu, Fe	Al, As, Cu, Fe	Al, As, Cd, Fe
WQ-DC -DX+105	No sample	Al, As, Cd, Cu, Fe, Pb, Ag, Zn	Al, As, Cd, Cu, Zn	As, Cd, Fe, Mn, Zn
WQ-DC-D1b	No sample	Al, As, Cd, Cu, Fe, Pb, Ag, Zn	As, Cd, Cu, Fe, Pb, Mn, Zn	As, Cd, Fe, Pb, Mn, Zn
WQ-DC-B	TSS, Al, As, Cd, Cu, Fe, Pb, Ag, Zn	TSS, Al, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn	TSS, Al, As, Cd, Cu, Fe	TSS, Al, As, Cd, Cu, Fe, Mn
WQ-DC-U	NH_3, Al, As, Cd, Cu, Fe, Mn	TSS, Al, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn	TSS, Al, As, Cd, Cu, Fe, Mn	NH_3, Al, As, Cd, Fe, Mn
WQ-DC-R	No sample	Al, As, Cd, Cu, Fe, Mn	Al, As, Cd, Cu, Fe, Mn	TSS, Al, As, Cd, Cu, Fe, Pb, Mn
WQ-DESS-01	No sample	pH, Al, Cd, Cu, Fe, Mn, Zn	pH, Al, Cd, Cu, Fe, Zn	pH, Al, Cd, Zn
WQ-DESS-02	No sample	No sample	TSS, Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ag, Zn	TSS, Al
WQ-DESS-03	No sample	TSS, Al, Cd, Cu	Al, Cd, Cu, Fe,	No sample
WQ-CH-P-13-01	No sample	No sample	No sample	pH, Al, Cd, Mn, Zn
WQ-MS-S-08	No sample	Al, As, Cd, Cu, Fe, Pb, Se, Ag, Zn	TSS, Al, As, Cd, Cu, Fe, Pb, Mn, Hg, Se, Ag, Zn	No sample
WQ-PIT-1 (surface)	F, As, Cd, Cu, Zn	No sample	No sample	As, Cd, Cu, Zn
WQ-PIT-2 (md-depth)	F, As, Cd, Cu, Zn	No sample	No sample	F, As, Cd, Cu, Zn
WQ-PIT-3 (bottom)	F, As, Cd, Cu, Fe, Mn, Zn	No sample	No sample	As, Cd, Cu, Mn, Zn
WQ-TP	NH_3, F, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn	Al, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn	F, Al, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn	Al, As, Cd, Cu, Pb, Ag, Zn
WQ-SEEP	NH_3, F, Al, As, Cd, Cu, Fe, Mn	NH_3, Al, As, Cd, Cu, Fe, Mn, Ag	NH_3, Al, As, Cd, Cu, Fe, Mn	NH_3, Al, As, Cd, Cu, Fe, Mn
WQ-VC-U	Al, Cd	TSS, Al, Cd, Cu, Fe	Al, Cu	Al
WQ-VC-DBC	Al, Cd	TSS, Al, As, Cd, Cu, Fe, Pb	Al, Cd, Cu, Fe	Al
WQ-VC-UMN	Al, Cd	TSS, Al, As, Cd, Cu, Fe, Pb	Al, Cu	Al
WQ-VC-R+150[1]	Cd	TSS, Al, Cd, Cu, Fe	-	-
WQ-VC-R	-	-	Al, Cd, Cu, Fe	Al
WQ-BC	No sample	TSS, Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ag, Zn	Al, As, Cd, Cu, Fe	No sample
WQ-PC-U	No sample	Al, Cd, Cu	Al	Al, Cd
WQ-PC-D	No sample	Al, As, Cd, Cu, Fe, Pb, Ag, Zn	Al, Cd, Cu	No sample

Sampling Station	Sampling Trip Date			
	April 14-15, 2014	May 8-9, 2014	May 20-21, 2014	June 24-26, 2014
WQ-ET-1	No sample	TSS, Al, As, Cd, Cu, Fe, Pb, Ag	No sample	No sample
WQ-MS-S-03	No sample	Al, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn	F, As, Cd, Fe, Mn, Zn	No sample
WQ-L2	No sample	No sample	F, As, Cd	No sample
WQ-NW-SEEP-02	No sample	F, Al, As, Cd, Cu, Fe, Pb, Ag, Zn	No sample	No sample
WQ-ORE	No sample	No sample	TSS, F, Al, As, Cd, Cu, Fe, Pb, Mn, Hg, Ag, Zn	No sample

5.6 Mill Complex Landfill

5.6.1 Objectives and Scope

The objective of the test pitting program was to assess the waste content and depth of the landfill area to better define the scope of the landfill remediation design.

5.6.2 Results

5.6.2.1 Field Observations

The waste dump is located at the southeast side of the mill complex. Mechanical parts, metals, woods, plastic, glass and construction materials were noted at the exposed surface of the waste dump. Three tests pits were completed in the waste dump, which extended to a maximum depth of 5 metres, with soil samples collected from two of the pits. No waste material was identified in the first test pit and therefore no soil samples were collected. The waste material appears to have been historically dumped over the crest of the main road fill, then covered with road grading materials or unwanted fill. As a result, it is suspected that the extent of the landfill is larger than initially anticipated. No liner at the base of the landfill was noted during the test pitting program.

5.6.2.2 Analytical Results

The analytical results from the test pit program are shown in Tables 5.6.2.2-1 to 5.6.2.2-3. The analytical results were compared to the CSR PL standards for metals, VOCs, hydrocarbons and PAHs.

Table 5.6.2.2-1: Landfill Samples - Metal Results

			Parameter	Moisture	pH	Total Cyanide (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Tin (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
			Yukon CSR Soils	NA	NA	50	20	20	500	4	2-35	60	50	150	250-500	15	10	100	3	20	NA	50	NA	200	150-450
			Yukon CSR Soils	NA	NA	500	40	20	2,000	8	2-150	60	300	250	250-2,000	150	40	500	10	40	NA	300	NA	NA	150-600
			Detection Limit	0.25	0.1	0.05-1.0	0.1	0.05	0.5	0.2	0.05	0.5	0.1	0.5	0.5	0.05	0.5	0.5	0.2	0.1	0.05	2	0.05	0.2	1
Sample Name	**Sample Date**	**Location**	**Depth below Surface (m)**																						
SED-M-14-TP2 GS@ 0.7M	26-JUL-14	TP-M-14-02	0.7	11.3	7.72	20.1	**51.0**	**618**	141	0.31	2.97	16.6	8.41	68.0	297	0.087	**11.9**	10.3	0.31	14.9	0.308	<2.0	0.419	58.0	290
SED-M-14-TP2 GS@ 3.0M	26-JUL-14	TP-M-14-02	3.0	12.1	7.81	7.31	**52.9**	**520**	255	0.35	3.85	**185**	10.3	**169**	418	0.073	**36.6**	100	0.33	**58.1**	0.351	11.2	0.452	61.1	**671**
SED-M-14-TP2 GS@ 3.6M	26-JUL-14	TP-M-14-02	3.6	6.7	6.47	<0.050	0.55	9.21	75.2	<0.20	0.083	9.93	3.46	6.23	3.91	<0.050	<0.50	6.13	<0.20	<0.10	0.073	<2.0	0.288	24.7	25.1
SED-M-14-TP2 GS@ 3.7M	26-JUL-14	TP-M-14-02	3.7	41.7	6.71	3.50	8.89	**90.5**	160	<0.20	0.626	10.7	6.86	27.7	36.2	<0.050	1.16	7.28	<0.20	1.07	0.151	<2.0	0.402	47.5	94.8
SED-M-14-TP3 GS@ 5.0M	26-JUL-14	TP-M-14-03	5.0	11.1	7.43	3.02	**674**	**4,410**	145	0.33	**30.4**	30.6	7.63	**575**	**3,380**	0.340	**100**	13.5	0.69	**76.7**	1.080	6.7	0.776	39.5	**1,830**

Notes:

Bold and shaded exceeds CSR PL values

Strong acid digestion method was used on all samples

Yukon CSR - Yukon Contaminated Site Regulation, O.I.C. 2002/171, Generic and matrix numerical soil standards for park land use (PL)

Matrix standard used: the most stringent of groundwater flow to surface water used by freshwater aquatic live, human intake of contaminated soil or toxicity to soil invertebrates and plants was used.

Table 5.6.2.2-2: Landfill Samples - Volatile Organic Compound and Hydrocarbon Results

					Volatile Organic Compounds								Hydrocarbons					
			Parameter	Moisture	Benzene	Ethylbenzene	Methyl t-butyl ether (MTBE)	Styrene	Toluene	ortho-Xylene	meta- & para-Xylene	Xylenes	EPH10-19	EPH19-32	LEPH	HEPH	Volatile Hydrocarbons (VH6-10)	VPH (C6-C10)
			Yukon CSR Soils (PL)	NA	10	1	NA	5	1.5	NA	NA	5	NA	NA	1,000	1,000	NA	200
			Yukon CSR Soils (IL)	NA	10	20	NA	50	25	NA	NA	50	NA	NA	2,000	5,000	NA	200
			Detection Limit	0.25	0.04	0.05	0.2	0.05	0.05	0.05	0.05	0.075	200	200	200	200	100	100
Sample Name	**Sample Date**	**Location**	**Depth below Surface (m)**															
SED-M-14-TP2 GS@ 0.7M(JAR)	26-JUL-14	TP-M-14-02	0.7	12.5	<0.040	<0.050	<0.20	<0.050	0.063	<0.050	0.090	0.090	370	920	370	920	<100	<100
SED-M-14-TP2 GS@ 3.0M(JAR)	26-JUL-14	TP-M-14-02	3.0	13.1	<0.040	<0.050	<0.20	<0.050	0.095	0.051	0.122	0.173	1,610	5,090	**1,610**	**5,090**	<100	<100
SED-M-14-TP3 GS@ 5.0M(JAR)	26-JUL-14	TP-M-14-03	5.0	10.8	<0.040	<0.050	<0.20	<0.050	<0.050	<0.050	<0.050	<0.075	<200	2,730	<200	**2,730**	<100	<100

Notes:

Bold and shaded exceeds CSR PL values

Yukon CSR - Yukon Contaminated Site Regulation, O.I.C. 2002/171, Generic and matrix numerical soil standards for park land use (PL) and industrial land use (IL)

Matrix standard used: the most stringent of groundwater flow to surface water used by freshwater aquatic live, human intake of contaminated soil or toxicity to soil invertebrates and plants was used.

Table 5.6.2.2-3: Landfill Samples - Polycyclic Aromatic Hydrocarbon Results

Parameter				Moisture	Polycyclic Aromatic Hydrocarbons																
					Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
Yukon CSR Soils (PL)				NA	NA	NA	NA	1	1	1	NA	1	NA	1	NA	NA	1	NA	5	5	10
Yukon CSR Soils (IL)					NA	NA	NA	10	10	10	NA	10	NA	10	NA	NA	10	NA	50	50	100
Detection Limit				0.25	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sample Name	**Sample Date**	**Location**	**Depth below Surface (m)**																		
SED-M-14-TP2 GS@ 0.7M(JAR)	26-JUL-14	TP-M-14-02	0.7	12.5	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.148	0.073	0.053	0.131
SED-M-14-TP2 GS@ 3.0M(JAR)	26-JUL-14	TP-M-14-02	3.0	13.1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.053	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.159	0.121	<0.060	0.368
SED-M-14-TP3 GS@ 5.0M(JAR)	26-JUL-14	TP-M-14-03	5.0	10.8	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Notes:

Bold and shaded exceeds CSR PL values

Yukon CSR - Yukon Contaminated Site Regulation, O.I.C. 2002/171, Generic and matrix numerical soil standards for park land use (PL)

Matrix standard used: the most stringent of groundwater flow to surface water used by freshwater aquatic live, human intake of contaminated soil or toxicity to soil invertebrates and plants was used.

Test pit TP-M-14-02 had elevated metals above the PL standards for antimony, arsenic and molybdenum at both 0.7 m and 3.0 m depths (Table 5.6.2.2-1). The 3.0 m sample also had elevated chromium, copper and silver concentrations. The sample at 3.6 m depth had no metal exceedances for the CSR PL standards; however, the 3.7 m sample had an elevated arsenic concentration of 90.5 mg/kg. For reference, the CSR PL standard for arsenic is 20 mg/kg.

The single sample for test pit TP-M-14-03 had elevated metal concentrations for antimony, arsenic, cadmium, copper, lead, molybdenum, silver and zinc (Table 5.6.2.2-1). Note that this sample was collected from soil overlying a concrete slab and native soil below the concrete slab could not be reached.

All samples were less than the applicable CSR PL standards for VOCs (Table 5.6.2.2-2).

Test pit TP-M-14-02 had two samples submitted for hydrocarbon analysis (Table 5.6.2.2-2). All hydrocarbon parameters for the sample at 0.7 m were less than the applicable CSR PL standards. At a depth of 3.0 m, the light extractable petroleum hydrocarbon (LEPH) concentration was 1,610 mg/kg as compared to the CSR PL standard of 1,000 mg/kg. The heavy extractable petroleum hydrocarbon (HEPH) concentration was 5,090 mg/kg as compared to the CSR PL standard of 1,000 mg/kg. Note that the industrial land use (IL) standards for LEPH and HEPH are 2,000 mg/kg and 5,000 mg/kg, respectively.

The single sample for test pit TP-M-14-03 had a HEPH concentration of 2,730 mg/kg (Table 5.6.2.2-2). The LEPH and volatile hydrocarbon results were both less than the method detection limit.

All samples were less than the applicable CSR PL standards for PAHs (Table 5.6.2.2-3).

5.7 Waste Rock/Tailings

5.7.1 Objectives and Scope

The main objective of the geochemical scope of work for waste rock and tailings was to improve the characterization of the waste rock and tailings drainage quality. This information will be used to refine the source terms for waste rock and tailings used in the water quality predictions.

The kinetic testing conducted on non-PAG waste rock samples will confirm source terms for non-PAG rock that is expected to be used as construction material or that will be left on surface following remediation activities. The leachate sampling from the field bins will supplement the existing database for tailings seepage, waste rock and ore runoff water quality.

5.7.2 Results

The kinetic testing program was started during the week of August 25, 2014. The tests will run until leachate concentrations stabilize and will be used during the Phase 2 design.

The leachate quality results for the field bins are presented in Table 5.7.2-1. There are no guidelines or standards applicable to the samples from the leachate bins and therefore there are no exceedances to highlight. The ore field bin had the highest results for parameters such as conductivity, hardness, sulphate, arsenic and zinc, while the tailings sand field bin had the lowest. The pH results were lowest for the ore field bin and highest for the tailings sand field bin. The iron concentration was highest for the waste rock field bin.

5.8 Exploration Trenches and Dome Creek

5.8.1 Objectives and Scope

The scope of the 2014 SI program for reclamation was to further assess the Dome Creek Valley and TSF for special habitat features, and to further refine the understanding of the characteristics of the exploration trenches identified for reclamation in Phase 1. The trenches proposed to be reclaimed are limited to those within the OIC boundary that are not subject to a current mining claim. AAM identified active claim areas within the OIC boundary prior to the field survey. AAM also identified a number of attributes that were considered important (see Methods Section 4.5).

The SI program pertaining to reclamation had the following three specific objectives:

.1 Identify special habitat features in the Dome Creek Valley and TSF area to target placement of vegetation patches for reclamation;

.2 Improve the inventory and evaluation of exploration trenches selected for reclamation during Phase 1, based on refined rationales and the OIC boundary within an area not subject to a current mining claim; and

.3 Document the rationale for excluding trenches from selection for reclamation.

5.8.2 Results

5.8.2.1 Reclamation Observations and Ranking

Vegetation cover and landscape features observed within the Dome Creek Valley are relatively uniform, without obvious special features that could be linked to specific vegetation patch placement. Dome Creek Valley is dominated by an alternating tall-shrub to low-shrub willow community, with a braided channel. Substrates are consistently sandy, and channel widths range from 0.3 m to 1 m wide. The reclamation prescription for vegetation patch placement recommended in Phase 1 (AMEC, 2014b) requires no additional updating; however, channel design should mimic a more braided morphology which observes the natural morphology currently exhibited in the valley.

Table 5.7.2-1:Leachate Field Bin Testing Results

Parameters	FIELD BIN - WASTE ROCK	FIELD BIN - ORE	FIELD BIN - TAILINGS + ORGANIC	FIELD BIN - TAILINGS SAND
	24-Jul-14	24-Jul-14	24-Jul-14	24-Jul-14
	16:30	16:30	16:30	16:30
	L1493185-1	L1493185-2	L1493185-3	L1493185-4
Physical Tests				
Conductivity (µS/cm)	2300	2700	2560	1690
Hardness (as CaCO3)	1740	2120	1790	1130
pH	7.58	6.20	7.26	8.46
Anions and Nutrients				
Acidity (as CaCO3) (mg/L)	4.7	11.9	19.8	<1.0
Alkalinity, Total (as CaCO3) (mg/L)	22.5	21.0	93.2	26.5
Chloride (Cl) (mg/L)	<10	<10	<10	<5.0
Fluoride (F) (mg/L)	<0.40	<0.40	<0.40	0.36
Nitrate (as N) (mg/L)	<0.10	<0.10	0.10	<0.050
Nitrite (as N) (mg/L)	<0.020	<0.020	<0.020	<0.010
Total Kjeldahl Nitrogen (mg/L)	0.276	0.230	0.493	0.156
Sulphate (SO4) (mg/L)	1610	1970	1770	1090
Total Metals				
Aluminum (Al) (mg/L)	0.274	0.046	0.064	<0.010
Antimony (Sb) (mg/L)	0.00364	0.0262	0.0124	0.0415
Arsenic (As) (mg/L)	0.0224	0.0713	0.0110	0.0020
Barium (Ba) (mg/L)	0.022	<0.020	0.026	0.030
Beryllium (Be) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
Boron (B) (mg/L)	<0.10	<0.10	<0.10	<0.10
Cadmium (Cd) (mg/L)	0.00529	0.0212	0.0105	0.00097
Calcium (Ca) (mg/L)	438	362	540	368
Chromium (Cr) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Cobalt (Co) (mg/L)	<0.00050	<0.00050	0.00432	0.00557
Copper (Cu) (mg/L)	0.0092	0.0087	0.0059	0.0013
Iron (Fe) (mg/L)	1.04	0.153	0.193	<0.030
Lead (Pb) (mg/L)	0.0152	0.0090	0.0048	<0.0010
Lithium (Li) (mg/L)	<0.050	<0.050	<0.050	<0.050
Magnesium (Mg) (mg/L)	145	287	94.9	46.3
Manganese (Mn) (mg/L)	0.098	0.297	2.06	0.032
Mercury (Hg) (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum (Mo) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Nickel (Ni) (mg/L)	<0.0050	<0.0050	0.0099	<0.0050
Selenium (Se) (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020
Silver (Ag) (mg/L)	0.000405	0.000335	0.000101	<0.000050
Sodium (Na) (mg/L)	<2.0	<2.0	4.7	<2.0
Thallium (Tl) (mg/L)	<0.00020	<0.00020	0.00022	<0.00020
Titanium (Ti) (mg/L)	<0.050	<0.050	<0.050	<0.050
Uranium (U) (mg/L)	0.00027	<0.00020	0.00024	0.00031
Vanadium (V) (mg/L)	<0.030	<0.030	<0.030	<0.030
Zinc (Zn) (mg/L)	0.186	1.95	0.733	0.0170
Dissolved Metals				
Aluminum (Al) (mg/L)	<0.010	<0.010	<0.010	<0.010
Antimony (Sb) (mg/L)	0.00121	0.0251	0.0120	0.0418
Arsenic (As) (mg/L)	0.0019	0.0607	0.0034	0.0017
Barium (Ba) (mg/L)	<0.020	<0.020	0.024	0.029
Beryllium (Be) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
Boron (B) (mg/L)	<0.10	<0.10	<0.10	<0.10
Cadmium (Cd) (mg/L)	0.00494	0.0209	0.0113	0.00084
Calcium (Ca) (mg/L)	457	368	564	374
Chromium (Cr) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Cobalt (Co) (mg/L)	<0.00050	<0.00050	0.00466	0.00502
Copper (Cu) (mg/L)	0.0018	0.0062	0.0049	0.0011
Iron (Fe) (mg/L)	<0.030	<0.030	0.113	<0.030
Lead (Pb) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Lithium (Li) (mg/L)	<0.050	<0.050	<0.050	<0.050
Magnesium (Mg) (mg/L)	145	290	92.6	48.0
Manganese (Mn) (mg/L)	0.050	0.295	2.63	0.016
Mercury (Hg) (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum (Mo) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Nickel (Ni) (mg/L)	<0.0050	<0.0050	0.0099	<0.0050
Selenium (Se) (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020
Silver (Ag) (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na) (mg/L)	<2.0	<2.0	4.5	<2.0
Thallium (Tl) (mg/L)	<0.00020	<0.00020	0.00023	<0.00020
Titanium (Ti) (mg/L)	<0.050	<0.050	<0.050	<0.050
Uranium (U) (mg/L)	0.00022	<0.00020	0.00025	0.00032
Vanadium (V) (mg/L)	<0.030	<0.030	<0.030	<0.030
Zinc (Zn) (mg/L)	0.146	1.91	0.842	0.0137

The exploration trenches recommended for reclamation are listed in Table 5.8.2.1-1. These trenches were selected based on the results of the attribute ranking (Section 4.5.2). Trenches slated for reclamation generally ranked highest within the southern trench area due to their high visibility, ease of access, erosion evidence, sediment transport to Dome Creek, and their location within a wildlife corridor identified in Phase 1. Trenches selected for reclamation ranked from 7 to 16. In some cases, reclamation is not required for the entire length of the trench; only continuous portions that were judged to rank highly require reclamation at this time (Figures 4.5.1-1 and 4.5.1-2).

The rationale for excluding trenches from reclamation was based on the following criteria:

- Do not satisfy criteria that AAM has identified (i.e. erosion potential, physical stability, ease of access for reclamation, barriers to wildlife movements, human health and safety risks, and aesthetics);
- Difficult to access and could cause more environmental harm to reclaim than not;
- Inside the OIC boundary but also within a current mining claim;
- Not within or near a wildlife corridor;
- Low or no erosion evidence or potential; and
- Not causing human health concerns (i.e. transport of sediment into Dome Creek).

Trenches that were proposed for reclamation in Phase 1 but do not meet these defined criteria above were removed from the reclamation plan. These deleted trench areas are highlighted in orange in Figures 4.5.1-1 and 4.5.1-2. The trench areas selected for reclamation are highlighted green in the figures. A proposed trench reclamation schedule and a potential reclamation vegetation trial location are described in the site characterization update in Sections 6.12 and 6.13.

Table 5.8.2.1-1: Trench Areas Selected for Reclamation

Trench/ Access Road	Waypoint	Slope (Deg)	Aspect	Erosion	Access	Wildlife Barrier	Aesthetics	Vegetation Cover	Rank
Access Rd B	308	N/A	N/A	Extreme	Fair	Major	High Visibility	Bare	16
Access Rd D	N/A	N/A	N/A	High	Good	Minor	High Visibility	Bare	14
ST 3	234	8	68	Minor	Good	No	High Visibility	Moderate	9
ST 3	235	6	68	Minor	Good	No	High Visibility	Moderate	9
ST 3	236	13	68	Minor	Good	No	High Visibility	Moderate	9
ST 3	237	Level	70	None	Good	No	High Visibility	Sparse	7
ST 4	248	10	68	Minor	Good	Minor	Low Visibility	Dense	9
ST 4	249	N/A	68	Minor	Good	Minor	Low Visibility	Dense	9
ST 5	260	N/A	N/A	High	Good	Minor	High Visibility	Sparse	14
ST 5	261	15	72	High	Good	No	High Visibility	Bare	13
ST 5	262	N/A	N/A	High	Good	No	High Visibility	Sparse	13
ST 5	263	8	70	High	Good	No	High Visibility	Sparse	13
ST 5	264	Crest	Level	Moderate	Good	No	Moderate Visibility	Sparse	10
ST 9	273	15	90	Moderate	Fair	No	High Visibility	Sparse	9
ST 10	296	15	78	Minor	Good	Moderate	High Visibility	Sparse	11
ST 10	297	15	88	Minor	Good	No	High Visibility	Sparse	9
ST 11/10	295	14	86	None	Good	No	High Visibility	Bare	7
ST 11	298	N/A	N/A	Minor	Good	No	High Visibility	Sparse	9
ST 11/12	294	10	60	None	Good	No	High Visibility	Bare	7
ST 12	290	6	90	None	Good	No	High Visibility	Sparse	7
ST 12	291	N/A	N/A	None	Good	No	High Visibility	Bare	7
ST 13	292	6	60	None	Good	Major	Moderate Visibility	Moderate	9
ST 13	293	10	44	None	Good	Moderate	Moderate Visibility	Moderate	8

5.8.2.2 Reclamation Constructability Observations

The following observations were made by AMEC during the site trench visual reconnaissance:

- No visual signs of trench global instability were noted.
- Some of the site trenches were as deep as 3 m (approximately), and in some areas the slopes of the side walls were too steep to climb.
- During the winter season, snow drift may fill the deeper trenches.

5.9 Background Samples

5.9.1 Objectives and Scope

The objectives of the background soil sampling program were to:

- Enhance the historical background geochemical soil database for metal concentrations; and
- Provide a basis for comparison of impacted areas (predominantly in the Mill Complex) to undisturbed soils using the CSR soil standards.

Analyses for pH and metals were conducted on selected native soil samples collected from the geotechnical boreholes located in the Mill Complex and Camp Area and adjacent to the Tailings Storage Facility. The results of the current samples will be compiled during the design phase with the results from the previous exploration geochemistry and soil sampling programs for a thorough review of upper range limits of metal in the background soil.

5.9.2 Results

5.9.2.1 Strong Acid Digestion

The background samples compared to the CSR park land (PL) standards are shown in Table 5.9.2.1-1. The industrial land (IL) standards are included on the table for reference.

Two samples exceeded the CSR PL standard for antimony of 20 mg/kg, both from borehole BH-T-14-17 on the south side of the Tailings Storage Facility. The sample from a depth of 2 m was 20.6 mg/kg, while the sample from 3 m depth was 30.6 mg/kg. Note that the CSR IL standard for antimony is 40 mg/kg.

Eleven of 26 samples had elevated arsenic concentrations, ranging from 27.7 mg/kg at BH-T-14-06 at 1 m depth to 249 mg/kg at BH-C-14-01 at 3 m depth. The average of all 26 samples was 53.8 mg/kg, while the median was only 9.2 mg/kg. The 95th percentile of all samples was 210 mg/kg. Both the CSR PL and IL standards for arsenic are 20 mg/kg.

Table 5.9.2.1-1: Background Soil Samples - CSR Metal Results

Parameter				pH	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Tin (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
Yukon CSR Soils (PL)				NA	20	20	500	4	2-35	60	50	150	250-500	15	10	100	3	20	NA	50	NA	200	150-450
Yukon CSR Soils (IL)				NA	40	20	2,000	8	2-150	60	300	250	250-2,000	150	40	500	10	40	NA	300	NA	NA	150-600
Detection Limit				0.1	0.1	0.05	0.5	0.2	0.05	0.5	0.1	0.5	0.5	0.05	0.5	0.5	0.2	0.1	0.05	2	0.05	0.2	1
Sample Name	**Sample Date**	**Location**	**Depth below Surface (m)**																				
BH-T-14-01 GS1M	27-Jul-2014	BH-T-14-01	1.0	6.50	0.26	4.42	68	<0.20	0.065	11.1	3.54	7.25	3.17	<0.050	<0.50	7.24	<0.20	<0.10	<0.050	<2.0	0.350	26.2	22.2
BH-T-14-01 GS3M	27-Jul-2014	BH-T-14-01	3.0	7.23	0.29	4.11	66	<0.20	0.056	9.88	3.05	6.27	2.53	<0.050	<0.50	6.05	<0.20	<0.10	<0.050	<2.0	0.345	25.3	20.1
BH-T-14-01 GS4M	27-Jul-2014	BH-T-14-01	4.0	8.79	0.31	4.41	64	0.20	0.058	13.7	3.43	6.68	2.72	<0.050	<0.50	6.30	<0.20	<0.10	<0.050	<2.0	0.495	30.1	20.7
BH-T-14-02 GS2M	27-Jul-2014	BH-T-14-02	2.0	6.86	0.16	4.37	81	<0.20	0.064	12.0	3.62	7.80	2.48	<0.050	<0.50	7.50	<0.20	<0.10	<0.050	<2.0	0.381	26.0	23.6
BH-T-14-02 GS3M	27-Jul-2014	BH-T-14-02	3.0	6.65	0.18	4.69	77	0.23	0.066	13.0	3.92	8.14	2.71	<0.050	<0.50	8.05	<0.20	<0.10	<0.050	<2.0	0.421	28.6	23.8
BH-T-14-06 GS1M	26-Jul-2014	BH-T-14-06	1.0	5.93	0.95	**27.7**	114	0.26	0.448	21.1	4.11	15.6	23.9	<0.050	1.15	13.8	0.72	0.14	0.121	<2.0	0.666	52.6	75.4
BH-T-14-06 GS2M	26-Jul-2014	BH-T-14-06	2.0	6.28	0.53	9.08	59	<0.20	0.171	10.7	3.13	6.98	4.47	<0.050	<0.50	7.65	0.21	<0.10	<0.050	<2.0	0.420	29.2	30.9
BH-T-14-06 GS4.6M	26-Jul-2014	BH-T-14-06	4.6	6.60	0.38	7.28	53	<0.20	0.144	9.79	3.05	6.82	4.43	<0.050	<0.50	6.99	<0.20	<0.10	<0.050	<2.0	0.333	24.9	27.0
BH-T-14-07 GS2M	26-Jul-2014	BH-T-14-07	2.0	6.63	0.82	9.40	45	<0.20	0.116	9.37	2.92	5.94	3.58	<0.050	<0.50	5.99	<0.20	<0.10	<0.050	<2.0	0.305	26.9	28.6
BH-T-14-07 GS4M	26-Jul-2014	BH-T-14-07	4.0	8.65	0.38	5.91	44	<0.20	0.072	7.74	2.64	5.82	2.66	<0.050	<0.50	5.11	<0.20	<0.10	<0.050	<2.0	0.327	21.9	18.5
BH-T-14-08 GS2M	26-Jul-2014	BH-T-14-08	2.0	7.19	0.46	6.01	37	<0.20	0.068	7.97	2.63	4.76	2.73	<0.050	<0.50	4.70	<0.20	<0.10	<0.050	<2.0	0.292	20.7	20.1
BH-T-14-08 GS3M	26-Jul-2014	BH-T-14-08	3.0	7.37	0.41	6.41	35	<0.20	0.078	8.13	2.90	4.56	3.29	<0.050	<0.50	4.58	<0.20	<0.10	<0.050	<2.0	0.323	23.7	20.1
BH-T-14-09 GS1M	26-Jul-2014	BH-T-14-09	1.0	5.99	0.30	4.50	57	<0.20	0.053	9.09	2.55	4.74	2.89	<0.050	<0.50	5.41	<0.20	<0.10	<0.050	<2.0	0.337	21.4	19.2
BH-T-14-09 GS2M	26-Jul-2014	BH-T-14-09	2.0	7.84	0.68	17.5	68	<0.20	0.169	12.0	3.43	8.60	5.26	<0.050	<0.50	8.06	<0.20	<0.10	0.051	<2.0	0.427	27.3	36.0
BH-T-14-17 GS2M	24-Jul-2014	BH-T-14-17	2.0	6.44	**20.6**	**145**	94	0.24	1.59	11.3	3.20	40.3	88.4	<0.050	<0.50	6.90	<0.20	2.67	0.103	<2.0	0.552	29.4	120
BH-T-14-17 GS3M	24-Jul-2014	BH-T-14-17	3.0	6.62	**30.6**	**211**	77	<0.20	**2.13**	10.6	3.31	42.8	129	<0.050	<0.50	6.48	<0.20	3.79	0.118	<2.0	0.458	29.3	164
BH-C-14-01 GS1M	26-Jul-2014	BH-C-14-01	1.0	7.38	13.2	**116**	146	0.48	0.587	29.0	7.79	29.6	39.1	<0.050	0.81	13.9	<0.20	<0.50	0.300	<2.0	0.751	52.6	111
BH-C-14-01 GS3M	26-Jul-2014	BH-C-14-01	3.0	7.69	15.5	**249**	165	0.43	0.637	30.5	8.51	26.1	28.4	<0.050	1.05	13.6	0.20	<0.40	0.273	<2.0	0.807	49.4	103
BH-C-14-02 GS1M	26-Jul-2014	BH-C-14-02	1.0	7.72	0.28	3.86	429	<0.20	0.079	12.8	21.2	112	2.13	<0.050	<0.50	6.20	<0.20	<0.30	0.275	<2.0	0.586	193	87.2
BH-C-14-02 GS2M	26-Jul-2014	BH-C-14-02	2.0	7.85	0.31	3.78	457	<0.20	0.077	12.8	19.6	86.7	1.97	<0.050	<0.50	5.47	<0.20	<0.20	0.238	<2.0	0.585	180	85.9
BH-C-14-03 GS2M	26-Jul-2014	BH-C-14-03	2.0	7.99	10.1	**205**	293	0.34	0.849	31.7	13.1	39.4	23.4	0.055	1.27	16.1	0.21	<0.50	0.370	<2.0	0.538	69.8	138
BH-C-14-03 GS3M	26-Jul-2014	BH-C-14-03	3.0	7.92	5.78	**133**	265	0.33	0.648	41.5	13.0	40.7	18.1	<0.050	1.01	14.7	<0.20	0.33	0.343	<2.0	0.639	81.5	127
BH-C-14-04 GS2M	26-Jul-2014	BH-C-14-04	2.0	7.92	3.98	**67.6**	**661**	0.42	0.260	37.4	16.6	35.3	12.0	<0.050	0.56	11.5	<0.20	0.17	0.363	<2.0	0.497	124	106
BH-C-14-04 GS4M	26-Jul-2014	BH-C-14-04	4.0	7.83	5.25	**73.7**	293	0.32	0.390	28.2	15.2	41.2	19.7	<0.050	0.66	11.3	0.22	0.22	0.289	<2.0	0.581	118	103
BH-M-14-05 GS1M	26-Jul-2014	BH-C-14-05	1.0	8.38	15.5	**28.6**	20	0.57	2.56	7.20	7.68	39.7	27.9	<0.050	<0.50	2.91	<0.20	0.42	0.123	<2.0	0.374	26.1	212
BH-M-14-05 GS2M	26-Jul-2014	BH-C-14-05	2.0	8.26	16.5	**47.1**	173	1.15	1.29	21.4	15.6	52.4	52.7	0.051	<0.50	13.0	0.56	0.78	0.246	<2.0	0.484	68.3	177
Average				7.33	5.5	53.8	151	0.41	0.49	16.5	7.30	26.4	19.6	0.053	0.93	8.44	0.35	1.07	0.230	<2.0	0.472	54.1	73.9
Median				7.38	0.6	9.2	76.6	0.34	0.16	12.0	3.58	12.1	4.5	0.053	1.01	7.12	0.22	0.38	0.260	<2.0	0.443	29.3	55.7
95th Percentile				8.58	19.6	210	450	0.83	2.00	36.0	18.9	78.1	79.5	0.055	1.23	14.5	0.68	3.40	0.365	<2.0	0.730	166.0	174

Notes:

Bold and shaded exceeds CSR PL values

Strong acid digestion method was used on all samples

Yukon CSR - Yukon Contaminated Site Regulation, O.I.C. 2002/171, Generic and matrix numerical soil standards for park land use (PL)

Matrix standard used: the most stringent of groundwater flow to surface water used by freshwater aquatic live, human intake of contaminated soil or toxicity to soil invertebrates and plants was used.

One sample from the Camp Area (BH-C-14-04 at 2 m) had an elevated barium concentration of 661 mg/kg as compared to the CSR PL standard of 500 mg/kg. The CSR IL standard for barium is 2,000 mg/kg.

The sample from BH-T-14-17 at 3 m depth had a cadmium concentration of 2.13, which slightly exceeded the matrix numerical standard of 2 mg/kg for a soil pH less than 7.0.

All other background soil sample concentrations were less than the applicable CSR PL standards.

5.9.2.2 Aqua Regia Digestion

The aqua regia digestion method metal results for background soil samples were evaluated against average elemental crustal compositions that are cited from Guidelines and Recommended Methods of ML/ARD (Price, 1997). For comparative purposes, samples with more than ten times average crustal content for each element were considered to be enriched in that element. Results from the aqua regia digestion testing methods are presented in Table 5.9.2.2-1.

In general, metal testing results obtained from both the strong acid and aqua regia digestion methods were comparable. Antimony, arsenic, antimony, bismuth, cadmium and selenium are the metal parameters that were considered enriched based on the elemental crustal composition.

Antimony concentrations ranged from 0.17 to 30.7 mg/kg with a median value of 0.9 mg/kg. Ten samples had antimony contents above the ten times average crustal abundance of 2 mg/kg.

Arsenic concentrations ranged from 4.2 to 209 mg/kg. Thirteen of 26 samples had enriched arsenic concentrations. This included six samples from the Camp Area (BH-C-14-01 at 1 m and 3 m depth, BH-C-14-03 at 2 m and 3 m depth, and BH-C-14-04 at 2 m and 4 m depth), five samples from the Tailings Storage Facility (BH-T-14-06 at 3 m depth, BH-T-14-08 at 3 m depth, BH-T-14-09 at 2 m depth, and BH-T-14-17 at 2 m and 3 m depth), and two samples from the Mill Complex (BH-M-14-05 at 1 m and 2 m depth).

Two samples from the Tailings Storage Facility (BH-T-14-17 at 1 m and 3 m depth) and two samples from the Mill Complex (BH-M-14-05 at 1 m and 2 m depth) were enriched in bismuth and cadmium. In addition, the two Mill Complex samples had enriched selenium concentrations. Two samples from the Camp Area (BH-C-14-02 at 1 m depth and BH-C-14-03 at 2 m depth) and one sample from the Tailings Storage Facility (BH-T-14-06 at 3 m depth) were also enriched in selenium. In total 16 samples had enriched bismuth concentrations.

Table 5.9.2.2-1: Background Soil Samples - Aqua Regia Metal Results

			Parameter	**Aluminum (%)**	**Antimony (mg/kg)**	**Arsenic (mg/kg)**	**Barium (mg/kg)**	**Beryllium (mg/kg)**	**Bismuth (mg/kg)**	**Boron (mg/kg)**	**Calcium (%)**	**Cadmium (mg/kg)**	**Cerium (mg/kg)**	**Cesium (mg/kg)**	**Chromium (mg/kg)**	**Cobalt (mg/kg)**	**Copper (mg/kg)**	**Gallium (mg/kg)**	**Germanium (mg/kg)**	**Gold (mg/kg)**	**Hafnium (mg/kg)**	**Inadium (mg/kg)**	**Iron (%)**	**Lanthanum (mg/kg)**	**Lithium (mg/kg)**	**Lead (mg/kg)**	**Magnesium (%)**	**Manganese (mg/kg)**	**Mercury (mg/kg)**	**Molybdenum (mg/kg)**	**Nickel (mg/kg)**
			Average Concent	8.23	0.2	1.8	425	3	0.0085	10	4.15	0.15	66.5	ND	102	25	60	19	1.5	0.004	3	0.25	5.63	39	20	14	2.33	950	85	1.2	84
			Ten Times Averag	82.3	2	18	4250	30	0.085	100	41.5	1.5	665	ND	1020	250	600	190	15	0.04	30	2.5	56.3	390	200	140	23.3	9500	850	12	840
			Detection Limit	NA	0.1	0.05	0.5	0.2	NA	NA	NA	0.05	NA	NA	0.5	0.1	0.5	NA	NA	NA	NA	NA	NA	NA	NA	0.5	NA	NA	0.05	0.5	0.5
Sample Name	**Sample Date**	**Location**	**Depth below Surface (m)**																												
BH-T-14-01 GS1M	27-Jul-2014	BH-T-14-01	1.0	0.81	0.55	12.6	90	0.19	0.05	<10	0.31	0.08	19.75	0.56	14	3.9	9.6	2.66	<0.05	<0.2	0.02	0.012	1.3	10.1	5	3.3	0.25	187	<0.01	0.36	8.5
BH-T-14-01 GS3M	27-Jul-2014	BH-T-14-01	3.0	0.63	0.26	4.4	90	0.17	0.07	<10	0.34	0.08	19.95	0.51	11	3.3	7.3	2.25	<0.05	<0.2	0.06	0.011	1.21	10.4	4.1	3.1	0.23	172	0.01	0.3	6.9
BH-T-14-01 GS4M	27-Jul-2014	BH-T-14-01	4.0	0.63	0.33	4.7	100	0.18	0.06	<10	0.56	0.08	21.2	0.53	14	3.8	7.7	2.26	<0.05	<0.2	0.1	0.012	1.28	11.1	4.2	3.6	0.26	168	0.01	0.31	7.2
BH-T-14-02 GS2M	27-Jul-2014	BH-T-14-02	2.0	0.81	0.19	4.6	100	0.22	0.07	<10	0.4	0.08	19.05	0.57	13	4	9.6	2.67	<0.05	<0.2	0.04	0.011	1.23	9.9	5.6	3	0.29	195	0.01	0.25	8.7
BH-T-14-02 GS3M	27-Jul-2014	BH-T-14-02	3.0	0.86	0.17	4.2	90	0.19	0.06	<10	0.37	0.06	17	0.73	15	3.8	8.3	2.6	<0.05	<0.2	0.02	0.009	1.31	9.2	5.3	2.8	0.28	185	0.01	0.27	8
BH-T-14-06 GS1M	26-Jul-2014	BH-T-14-06	1.0	0.97	1.42	**72.6**	140	0.3	**0.15**	<10	0.31	0.58	23	1.23	21	5	19.6	3.32	<0.05	<0.2	0.02	0.024	1.96	13.1	6.8	106	0.36	255	0.01	1.91	17.6
BH-T-14-06 GS2M	26-Jul-2014	BH-T-14-06	2.0	0.72	0.52	12.7	120	0.19	0.08	<10	0.3	0.26	19.2	0.83	15	3.7	9.7	2.51	<0.05	<0.2	0.02	0.014	1.37	10.7	4.9	7.4	0.27	209	0.01	0.61	9.6
BH-T-14-06 GS4.6M	26-Jul-2014	BH-T-14-06	4.6	0.69	0.44	9.4	110	0.18	**0.09**	<10	0.34	0.19	17.2	0.69	14	3.6	8.8	2.23	<0.05	<0.2	0.02	0.011	1.38	9.7	4.5	5.9	0.25	204	0.01	0.5	8.4
BH-T-14-07 GS2M	26-Jul-2014	BH-T-14-07	2.0	0.61	0.85	15.6	100	0.17	0.07	<10	0.3	0.16	17.9	0.65	12	3.4	8.9	2.13	<0.05	<0.2	0.02	0.01	1.38	9.9	4	6.1	0.21	240	0.01	0.49	7.2
BH-T-14-07 GS4M	26-Jul-2014	BH-T-14-07	4.0	0.55	0.59	9.1	110	0.15	0.07	<10	0.41	0.11	18.2	0.59	10	3.1	7.2	1.91	<0.05	<0.2	0.07	0.008	1.26	10.2	3.8	4.3	0.21	194	0.01	0.42	6.4
BH-T-14-08 GS2M	26-Jul-2014	BH-T-14-08	2.0	0.53	0.94	8.2	100	0.17	0.06	<10	0.27	0.1	18.5	0.58	10	3.3	6.3	1.86	<0.05	<0.2	0.06	0.01	1.18	10.2	3.6	4.6	0.18	182	0.01	0.38	6
BH-T-14-08 GS3M	26-Jul-2014	BH-T-14-08	3.0	0.52	0.66	**25**	90	0.16	**0.09**	<10	0.28	0.16	18.25	0.59	10	3.8	6.7	1.89	<0.05	<0.2	0.08	0.009	1.35	9.9	3.6	6.4	0.19	208	0.01	0.42	7.4
BH-T-14-09 GS1M	26-Jul-2014	BH-T-14-09	1.0	0.63	0.32	5.5	90	0.15	0.06	<10	0.25	0.08	15.55	0.67	13	3	6.3	2.08	<0.05	<0.2	0.02	0.01	1.1	8.7	4.5	3.5	0.2	129	<0.01	0.36	6.6
BH-T-14-09 GS2M	26-Jul-2014	BH-T-14-09	2.0	0.67	1.3	**35.6**	110	0.23	**0.14**	<10	0.36	0.28	21.9	1.24	13	4.5	11	2.26	<0.05	<0.2	0.02	0.016	1.57	12.6	4.7	10.3	0.25	280	0.01	0.76	10.7
BH-T-14-17 GS2M	24-Jul-2014	BH-T-14-17	2.0	0.8	**23.6**	**172**	120	0.24	**2.96**	<10	0.54	**1.93**	21.8	0.86	14	3.6	43.7	2.66	<0.05	<0.2	<0.02	0.048	1.57	12.7	5	111.5	0.25	281	0.05	0.52	7.9
BH-T-14-17 GS3M	24-Jul-2014	BH-T-14-17	3.0	0.71	**27.3**	**198**	100	0.23	**3.35**	<10	0.51	**2.25**	20.8	0.75	12	3.7	48.9	2.46	<0.05	0.2	<0.02	0.05	1.56	12.3	4.4	123.5	0.23	292	0.05	0.54	7.6
BH-C-14-01 GS1M	26-Jul-2014	BH-C-14-01	1.0	1.11	**8.63**	**97.9**	160	0.4	**0.31**	<10	0.41	0.55	25.7	2.24	23	7.3	27.1	3.86	0.05	<0.2	0.15	0.034	2.3	14	6.9	42.4	0.34	321	0.04	0.7	12
BH-C-14-01 GS3M	26-Jul-2014	BH-C-14-01	3.0	1.01	**8.41**	**209**	190	0.35	**0.24**	<10	0.39	0.62	27.3	1.92	30	8	24.6	3.39	<0.05	<0.2	0.2	0.033	2.87	14.4	6.5	28.8	0.35	758	0.03	0.95	13.6
BH-C-14-02 GS1M	26-Jul-2014	BH-C-14-02	1.0	3.42	0.35	5	490	0.2	**0.16**	<10	0.73	0.09	24.4	4.73	16	21.2	113	11.05	0.12	<0.2	0.03	0.051	5.46	11.8	31.8	3.2	2.67	517	<0.01	0.19	6.4
BH-C-14-02 GS2M	26-Jul-2014	BH-C-14-02	2.0	3.09	0.31	5.6	480	0.19	**0.09**	<10	0.7	0.08	24	4.52	13	19.8	82.9	10.2	0.12	<0.2	0.03	0.048	4.96	11.8	30.3	3	2.39	558	<0.01	0.26	5.8
BH-C-14-03 GS2M	26-Jul-2014	BH-C-14-03	2.0	1.59	**6.19**	**194.5**	340	0.37	**0.16**	<10	0.62	0.9	28.3	3.84	33	13.6	43.6	5.52	0.08	<0.2	0.26	0.034	3.77	16.1	12.6	28.6	0.74	1380	0.06	1.33	17.5
BH-C-14-03 GS3M	26-Jul-2014	BH-C-14-03	3.0	1.57	**4.6**	**151**	270	0.28	**0.11**	<10	0.67	0.62	22.3	3.19	32	11.7	35.8	5.32	0.08	<0.2	0.22	0.032	3.46	12.3	10.7	20	0.76	1020	0.04	0.89	13.5
BH-C-14-04 GS2M	26-Jul-2014	BH-C-14-04	2.0	2.73	**2.95**	**68.3**	590	0.36	0.07	<10	0.66	0.29	24	10.05	22	14.9	31.3	7.87	0.09	<0.2	0.07	0.035	4.48	12.4	20.5	14.1	1.52	781	0.02	0.49	9.1
BH-C-14-04 GS4M	26-Jul-2014	BH-C-14-04	4.0	1.63	**3.16**	**63.2**	280	0.33	**0.09**	<10	0.61	0.41	28.2	4.57	27	13.4	39.4	6.36	0.09	<0.2	0.11	0.032	3.84	14.1	15.7	18	0.94	676	0.02	0.54	12.3
BH-M-14-05 GS1M	26-Jul-2014	BH-C-14-05	1.0	0.93	**6.94**	**20.6**	30	0.51	**0.26**	<10	1.24	**2.16**	32.2	6.88	5	6.6	35	2.59	0.05	<0.2	0.05	0.032	2.75	16.5	3.5	20.8	0.25	488	0.02	0.29	2.7
BH-M-14-05 GS2M	26-Jul-2014	BH-C-14-05	2.0	1.99	**30.7**	**117**	190	0.99	**0.89**	<10	1.7	**1.67**	34.2	36.2	30	16.1	75.4	5.42	0.07	<0.2	0.08	0.086	4.39	17.6	8.3	115.5	0.76	780	0.05	0.34	13.9
Average				1.16	5.1	58.7	180	0.27	0.38	10	0.52	0.53	22.3	3.5	17.0	7.39	28.0	3.82	0.08	0.20	0.07	0.026	2.32	12.0	8.5	26.9	0.56	410	0.023	0.55	9.29
Median				0.81	0.9	18.1	110.0	0.21	0.09	10	0.41	0.23	21.5	0.8	14.0	3.95	15.3	2.63	0.08	0.20	0.06	0.020	1.57	11.8	5.0	6.9	0.27	268	0.01	0.46	8.20
95th Percentile				3.00	26.4	197	488	0.48	2.44	10	1.11	2.10	31.2	9.3	31.5	18.9	81.0	9.62	0.12	0.20	0.22	0.051	4.84	16.4	27.9	114.5	2.17	960	0.050	1.24	16.6

Notes:

Bold and shaded exceeds 10 times average crustal abundance values

Aqua regia digestion method was used on all samples

APrice (1997)

Table 5.9.2.2-1: Background Soil Samples - Aqua Regia

			Parameter	Niobium(mg/kg)	Phosphorous (mg/kg)	Potassium (%)	Rhenium (mg/kg)	Rubidium (mg/kg)	Scandium (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Sodium (%)	Strontium (mg/kg)	Sulphur (%)	Tantalum (mg/kg)	Tellurium (mg/kg)	Thallium (mg/kg)	Thorium (mg/kg)	Tin (mg/kg)	Titanium (%)	Tungsten (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)	Yttrium (mg/kg)	Zinc (mg/kg)	Zirconium (mg/kg)
			Average Concent	20	1050	2.085	ND	90	22	0.05	75	2.355	370	0.035	2	ND	0.85	9.6	2.3	0.565	1.25	2.7	120	33	70	165
			Ten Times Averag	200	10500	20.85	ND	900	220	0.5	750	23.55	3700	0.35	20	ND	8.5	96	23	5.65	12.5	27	1200	330	700	1650
			Detection Limit	NA	NA	NA	NA	NA	NA	0.2	0.1	NA	NA	NA	NA	NA	0.05	NA	2	NA	NA	0.05	0.2	NA	1	NA
Sample Name	**Sample Date**	**Location**	**Depth below Surface (m)**																							
BH-T-14-01 GS1M	27-Jul-2014	BH-T-14-01	1.0	0.8	370	0.1	<0.001	6.9	2.4	0.3	0.03	0.05	28.3	<0.01	<0.01	0.01	0.06	2.6	0.3	0.058	0.18	0.43	29	4.59	23	1
BH-T-14-01 GS3M	27-Jul-2014	BH-T-14-01	3.0	0.43	370	0.09	<0.001	5.6	2.2	0.3	0.03	0.04	28.4	<0.01	<0.01	0.01	0.05	2.8	0.3	0.052	0.14	0.43	27	4.81	19	2.2
BH-T-14-01 GS4M	27-Jul-2014	BH-T-14-01	4.0	0.45	400	0.1	<0.001	5.8	2.3	0.2	0.03	0.05	34.3	<0.01	<0.01	0.01	0.05	3.1	0.3	0.059	2.06	0.46	31	5.15	19	2.8
BH-T-14-02 GS2M	27-Jul-2014	BH-T-14-02	2.0	0.58	430	0.1	<0.001	7.2	2.5	0.3	0.04	0.05	32.2	<0.01	<0.01	0.01	0.07	2.7	0.3	0.062	0.15	0.44	28	5.48	23	1.7
BH-T-14-02 GS3M	27-Jul-2014	BH-T-14-02	3.0	1.05	420	0.1	<0.001	6.4	2.3	0.3	0.03	0.06	28.3	<0.01	<0.01	0.01	0.06	1.9	0.3	0.064	0.22	0.38	29	5.03	22	0.6
BH-T-14-06 GS1M	26-Jul-2014	BH-T-14-06	1.0	0.92	440	0.16	0.001	10.4	3	**1**	0.29	0.04	28.9	0.04	<0.01	0.04	0.14	3.1	0.4	0.047	0.35	0.83	57	5.45	88	0.6
BH-T-14-06 GS2M	26-Jul-2014	BH-T-14-06	2.0	0.97	380	0.11	<0.001	6.7	2.3	0.4	0.07	0.04	25	0.01	<0.01	0.02	0.08	2.8	0.3	0.047	0.28	0.53	36	4.39	39	0.9
BH-T-14-06 GS4.6M	26-Jul-2014	BH-T-14-06	4.6	0.94	390	0.11	<0.001	5.9	2.1	0.4	0.07	0.05	26.3	<0.01	<0.01	0.02	0.06	2.4	0.3	0.049	0.17	0.46	33	4.47	31	0.9
BH-T-14-07 GS2M	26-Jul-2014	BH-T-14-07	2.0	0.78	350	0.09	<0.001	5.1	2.2	0.3	0.07	0.05	23.4	<0.01	<0.01	0.01	0.06	2.7	0.3	0.047	0.18	0.45	32	4.29	32	1
BH-T-14-07 GS4M	26-Jul-2014	BH-T-14-07	4.0	0.4	320	0.09	<0.001	4.9	1.9	0.3	0.05	0.05	26.2	<0.01	<0.01	0.02	0.05	2.9	0.3	0.044	0.14	0.43	26	4.29	23	2.3
BH-T-14-08 GS2M	26-Jul-2014	BH-T-14-08	2.0	0.5	300	0.09	<0.001	5.1	1.8	0.2	0.04	0.04	23.5	<0.01	<0.01	0.01	0.05	2.8	0.3	0.038	0.15	0.42	24	3.77	23	1.9
BH-T-14-08 GS3M	26-Jul-2014	BH-T-14-08	3.0	0.46	310	0.08	<0.001	4.8	1.9	0.3	0.05	0.04	22.2	<0.01	<0.01	0.02	0.06	2.8	0.3	0.044	0.12	0.39	28	4	28	2.3
BH-T-14-09 GS1M	26-Jul-2014	BH-T-14-09	1.0	0.92	350	0.08	<0.001	5.6	1.7	0.2	0.04	0.04	20.1	<0.01	<0.01	0.01	0.06	1.9	0.3	0.041	0.87	0.43	24	3.49	20	0.6
BH-T-14-09 GS2M	26-Jul-2014	BH-T-14-09	2.0	0.86	380	0.13	<0.001	7.3	2.2	0.4	0.12	0.03	23.1	<0.01	<0.01	0.02	0.1	3.1	0.3	0.045	0.38	0.55	32	4.79	60	0.9
BH-T-14-17 GS2M	24-Jul-2014	BH-T-14-17	2.0	0.82	470	0.08	<0.001	6.2	2.1	0.5	2.94	0.05	38.2	0.26	<0.01	0.07	0.14	0.5	0.4	0.047	0.17	0.65	34	6.28	133	<0.5
BH-T-14-17 GS3M	24-Jul-2014	BH-T-14-17	3.0	0.69	440	0.07	<0.001	5.7	2	0.4	3.41	0.05	38.1	0.28	<0.01	0.07	0.14	0.5	0.4	0.043	0.16	0.6	32	6.14	147	<0.5
BH-C-14-01 GS1M	26-Jul-2014	BH-C-14-01	1.0	0.57	640	0.13	<0.001	10.4	6.3	0.5	0.5	0.03	21	<0.01	<0.01	0.07	0.31	3.9	0.4	0.067	0.27	0.75	51	9.42	99	5.6
BH-C-14-01 GS3M	26-Jul-2014	BH-C-14-01	3.0	0.41	800	0.16	<0.001	10.2	5.7	0.4	0.4	0.03	21.5	<0.01	<0.01	0.07	0.28	4.8	0.4	0.059	0.57	0.88	51	8.7	99	6.5
BH-C-14-02 GS1M	26-Jul-2014	BH-C-14-02	1.0	0.12	1420	1.01	<0.001	38.1	17.2	**0.7**	0.16	0.08	34	0.03	<0.01	0.03	0.28	2.4	0.7	0.196	0.29	0.71	203	9.55	90	0.7
BH-C-14-02 GS2M	26-Jul-2014	BH-C-14-02	2.0	0.1	1490	0.91	<0.001	34.3	15.5	0.5	0.11	0.08	30.8	0.02	<0.01	0.02	0.24	2.2	0.6	0.169	0.42	0.65	178	9.3	83	0.7
BH-C-14-03 GS2M	26-Jul-2014	BH-C-14-03	2.0	0.24	1240	0.42	<0.001	19.4	9.4	**0.6**	0.44	0.04	48.2	<0.01	<0.01	0.04	0.41	4.5	0.8	0.137	0.47	0.75	81	12.2	145	9.4
BH-C-14-03 GS3M	26-Jul-2014	BH-C-14-03	3.0	0.26	1320	0.44	<0.001	18.6	8.5	0.5	0.31	0.05	47.3	<0.01	<0.01	0.04	0.32	3.1	0.6	0.152	0.44	0.66	79	10.55	120	6.9
BH-C-14-04 GS2M	26-Jul-2014	BH-C-14-04	2.0	0.18	1130	1.05	<0.001	42.7	11	0.5	0.17	0.03	82.7	<0.01	<0.01	0.03	0.35	3.2	0.6	0.192	0.26	0.54	124	10.25	101	2.7
BH-C-14-04 GS4M	26-Jul-2014	BH-C-14-04	4.0	0.33	1140	0.45	<0.001	20.3	8.9	**0.7**	0.2	0.05	36.3	0.03	<0.01	0.04	0.25	4.1	0.6	0.127	0.38	0.74	109	10.45	90	4.1
BH-M-14-05 GS1M	26-Jul-2014	BH-C-14-05	1.0	0.07	410	0.1	<0.001	7.6	5.9	**0.8**	0.34	0.01	32.9	0.12	<0.01	0.01	0.13	4.8	0.2	<0.005	0.28	0.37	32	22.7	193	1.2
BH-M-14-05 GS2M	26-Jul-2014	BH-C-14-05	2.0	0.08	990	0.32	0.001	25.5	14.1	**1.3**	1.37	0.01	112.5	0.41	<0.01	0.04	0.27	4.9	0.7	0.037	0.2	0.56	82	19.9	210	1.6
Average				0.54	642	0.25	0.001	12.6	5.3	0.47	0.44	0.04	35.1	0.13	<0.01	0.03	0.157	2.9	<2.0	0.077	0.36	0.557	57.4	7.67	75.4	2.5
Median				0.48	425	0.11	0.001	7.1	2.4	0.40	0.12	0.05	28.7	0.04	<0.01	0.02	0.115	2.8	<2.0	0.052	0.27	0.535	32.5	5.47	71.5	1.7
95th Percentile				0.96	1395	0.99	0.001	37.2	15.2	0.95	2.55	0.08	74.1	0.36	<0.01	0.07	0.343	4.8	<2.0	0.187	0.80	0.810	164.5	17.98	182	6.8

Notes:

Bold and shaded exceeds 10 times average crustal abundance va

Aqua regia digestion method was used on all samples

APrice (1997)

5.9.2.3 Shake Flask Extraction

Results of the Shake Flask Extraction (SFE) tests on six samples are presented in Table 5.9.2.3-1. The results were compared to the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of freshwater aquatic life for reference only.

Leachate pH for the SFE testing on all six samples exhibited circum neutral to slightly alkaline values, with results ranging from 6.58 to 8.28. These pH values were within the pH range for the CCME guideline.

One sample had sulphate and nitrite concentrations above the CCME guideline values. Fluoride concentrations above the CCME value were detected in five samples.

Leached aluminum, arsenic, copper, iron, lead and silver concentrations for five of the six samples were greater than the CCME guidelines for those parameters. Of the five samples with elevated leachable arsenic, four samples had arsenic soil concentrations greater than the CSR PL standard (Table 5.9.2.1-1). However, the copper, iron, lead and silver soil concentrations in all five samples were below the applicable CSR PL standards.

Leachates from all six samples had cadmium concentrations greater than the CCME guideline value, although only one of the samples had a cadmium soil concentration greater than the CSR PL standard. An elevated leachable nickel concentration was measured in sample BH-C-14-03 GS3M. Four samples had leachable zinc concentrations greater than the CCME guideline value.

5.10 General Site Reconnaissance

A general visual site reconnaissance was conducted by AMEC to assess various areas of the site to better define the constructability assumptions for the remediation design. The following subsections discuss the findings of the reconnaissance.

5.10.1 Tailings Storage Facility

An additional test pit (TP-T-14-01) was completed in a relatively flat area at the north side of the pillway channel diversion. The flat area appeared to be a constructed feature and may have been used as laydown area during dam construction. Large boulders and coarse rock fill were observed at the east end of the area. However, the limits of this fill were not obvious at grade. The test pit was completed to determine if the area was comprised entirely of waste rock, or if the rock was simply used as a supporting perimeter berm. The test pit confirmed the later condition and that the base material was comprised of well sorted fine to medium sand materials. No soil samples were collected at this location. The location of this test pit was shown on Figure 4.1-2.

No additional information was noted in the Tailings Storage Facility area beyond what was presented in the Phase 1 Site Characterization Report (AMEC, 2014a).

Table 5.9.2.3-1: Leachable Metal Testing (Shake Flask Extraction) Results of Soil Samples

Parameters	CCME	BH-T-14-08	BH-T-14-17	BH-C-14-01	BH-C-14-03	BH-C-14-04	BH-M-14-05
		GS2M	GS3M	GS1M	GS3M	GS2M	GS1M
Acidity (as CaCO3) (µg/L)		1,300	3,100	1,300	1,300	<1000	<1000
Alkalinity, Total (as CaCO3) (µg/L)		4,200	32,300	9,200	11,500	10,400	53,300
Bromide (Br) (µg/L)		<50	<50	<50	<50	<50	<50
Chloride (Cl) (µg/L)	120,000	<500	640	730	<500	<500	<500
Conductivity (uS/cm)		<40.0	547	<40.0	<40.0	<60.0	253
Fluoride (F) (µg/L)	120	**215**	106	**260**	**557**	**509**	**868**
Nitrate (as N) (µg/L)	13,000	1540	480	107	36.6	18	23.7
Nitrite (as N) (µg/L)	60^{C}	1.7	**344**	1.2	1.6	1.2	1.3
pH	6.5 - 9	7.06	6.58	7.62	8.08	7.96	8.28
Sulfate (SO4) (µg/L)	100,000	730	**238,000**	2,630	2,080	11,700	71,400
Aluminum (Al) (µg/L)	5 - 100^{A}	**9,540**	**181**	**14,500**	**27,300**	**7,140**	8.5
Antimony (Sb) (µg/L)		1.82	119	42.8	24	5.74	34.6
Arsenic (As) (µg/L)	5	**22.2**	**125**	**346**	**530**	**69.2**	<1.0
Barium (Ba) (µg/L)		97.7	114	148	452	106	1.8
Beryllium (Be) (µg/L)		<0.50	<0.50	0.77	<1.0	<0.50	<0.50
Bismuth (Bi) (µg/L)		<0.50	1.77	0.75	<1.0	<0.50	<0.50
Boron (B) (µg/L)	1,500	<10	93	11	21	<10	<10
Cadmium (Cd) (µg/L)	0.04 - 0.37^{B}	**0.209**	**1.42**	**0.988**	**1.7**	**0.207**	**0.18**
Calcium (Ca) (µg/L)		3,310	73,300	3,850	4,960	4,700	29,000
Chromium (Cr) (µg/L)		11.7	0.93	28.9	49.8	8.42	<0.50
Cobalt (Co) (µg/L)		6.1	2.48	8.96	25	3.61	<0.10
Copper (Cu) (µg/L)	2 - 4^{B}	**13.4**	**17**	**55.7**	**79.5**	**15.3**	<1.0
Iron (Fe) (µg/L)	300	**11,500**	**3,280**	**47,500**	**63,900**	**12,600**	<30
Lead (Pb) (µg/L)	1 - 7^{B}	**9.79**	**53.6**	**84**	**54**	**14.6**	<0.10
Lithium (Li) (µg/L)		<5.0	<5.0	8.2	17	7.2	<5.0
Magnesium (Mg) (µg/L)		1,880	14,900	1,670	4,480	1,840	8,100
Manganese (Mn) (µg/L)		399	1,240	299	2,470	309	6.35
Mercury (Hg) (µg/L)	26	<0.050	<0.050	0.163	0.379	<0.050	<0.050
Molybdenum (Mo) (µg/L)	73	1.09	2.05	5.57	24.2	6.05	3.15
Nickel (Ni) (µg/L)	25 - 150^{B}	11.1	2.03	24.6	**38**	5.43	<0.50
Phosphorus (P) (µg/L)		<300	<300	730	790	<300	<300
Potassium (K) (µg/L)		2,360	4,410	2,150	4,190	3,750	3,950
Selenium (Se) µg/L)	1	<0.50	<0.50	0.55	<1.0	<0.50	<0.50
Silicon (Si) (µg/L)		22,900	3,670	39,000	65,100	20,400	3,490
Silver (Ag) (µg/L)	0.1	**0.195**	**0.97**	**1.73**	**2.08**	**0.441**	<0.050
Sodium (Na) (µg/L)		2,020	3,620	2,660	3,460	3,260	3,130
Strontium (Sr) (µg/L)		26.4	365	23.6	45	24	54
Thallium (Tl) (µg/L)	0.8	<0.10	0.27	0.13	0.26	<0.10	0.13
Tin (Sn) (µg/L)		<0.50	<0.50	<0.50	<1.0	<0.50	<0.50
Titanium (Ti) (µg/L)		310	27	637	1210	261	<10
Uranium (U) (µg/L)	15	0.282	0.068	1.34	1.25	0.303	0.127
Vanadium (V) (µg/L)		27.2	9.8	94.6	118	31.8	<1.0
Zinc (Zn) (µg/L)	30	**34**	**67**	**157**	**210**	29	<10

Note: Bold and underscore exceeds CCME guideline values

^{A} *pH dependance; 0.005 mg/L for pH<6.5 and 0.1 for pH>6.5*

^{B} *Hardness dependence*

^{C} *As* NO_2*-N*

Used Shake Flask Extraction Leachate Test at a 3:1 water to solid ratio

5.10.2 Brown McDade Pit

A series of photographs were taken from the crest of the pit walls to help with conceptual level pit wall stability assessments (if open work is required in the pit). Field observations indicated that the majority of the pit benches were filled with talus and debris fallen from the pit walls. In general, observations of the pit walls indicated that the exposed rock mass on the west side of the pit had a higher degree of weathering than the rock face on the east side of the pit. Only the northern pit pond contained water during the SI program and the southern pond was dry.

5.10.3 Waste Rock Area

Waste rock stockpile materials at the west and north side of the Brown McDade pit were visually inspected and photographed. In general, the rocks were highly weathered, red/yellow coloured and had visible sulphides. Field observations suggested that potentially acid generating (PAG) rock could be mixed more extensively with non- acid generating (NAG) rock than is currently estimated. If the remediation design is to optimize the amount of NAG rock recovered for construction works, significant effort may be required to separate it from PAG rock. The additional effort would possibly include geochemical testing and mechanical separation and stockpiling of the waste rock materials.

5.10.4 Mill Complex and Camp Area

There are no significant additions to the previous reconnaissance conducted in 2013 except for the following:

- Previously, it was indicated that main mill level bench likely consists predominantly of waste rock/ore with landfill waste at the south end. Based on the 2014 test pit results and field observations, the extent of the landfill is assumed to extend further north on the main mill level bench. It may be thicker closer to the fill material crest.
- Previously assumed NAG volumes of the Mill Complex appeared to be a mixture of NAG and PAG based on visual observation of the rocks. As mentioned above, a significant effort may be required to separate NAG from PAG rocks, which may require further geochemical testing prior to remedial construction activities.

The Camp Area had shallow bedrock based on observations of a few metres of weathered bedrock/in situ soil on the ground surface. The crest of the slopes appeared to be cut into the slope with minimal fill placed. Remediation works will need to consider the utilities servicing the camp buildings such as the septic tanks, gas lines and power lines.

5.10.5 Dome Creek Valley

The extent of potential contamination of the Dome Creek Valley was visually assessed during the sedimentation sampling and general site reconnaissance carried out for archaeological purposes. The potentially contaminated area consists of the flat area between the toes of the north and south sideslopes adjacent to the creek. The creek alignment appears to have moved several times. In general, eroded materials from the active overburden zone (see Section 6.9) were observed on the south side of the creek. Sediment loading caused by the active overburden zone has caused the creek to meander at several locations. In one location, the creek flow was completely blocked and water was flowing underground. Signs of previous higher water elevations within the creek were observed with iron staining on dead tree trunks and on the taller willow plants within the creek. The high water levels were most likely caused by ice jams or possibly by active overburden movement or both. The actual extent for remediation work is discussed in Section 6.5.

In general, the Dome Creek wetted perimeter is considered to be soft to very soft and saturated. Initial assumptions for remediation of the Dome Creek below the Tailings Storage Facility consisted of having heavy equipment within the creek area to conduct remediation and reclamation works. Based on field observations, this could be difficult to execute. Lighter construction equipment (i.e. spider excavator, small payload tracked trucks, etc.) may be more appropriate. However, working with this type of equipment will likely extend schedules and increase costs.

5.10.6 Potential Borrow Areas

An AMEC site representative conducted an additional site reconnaissance to locate potential borrows sources for remediation/reclamation works. The main purpose for this reconnaissance was to locate additional construction materials if the existing PAG and NAG waste rock materials are difficult and costly to sort before or during construction. One possibility is that all the waste rock materials would be included in the open pit inventory and borrow materials would be used to construct the open pit NAG buttress and reclamation works at the Tailings Storage Facility tie-in areas. Locations of the potential borrow sources are shown on Figure 1.1-1.

A total of six potential borrow areas were identified during the site reconnaissance, of which four (Borrow I, II, III, IV) are within the OIC boundary. Three out of the four potential borrow areas are located inside the inactive claim area (as identified by AAM) near the Tailings Storage Facility and Brown McDade pit (Borrow I, II, and III). These potential borrow areas within the inactive boundary are considered to be “preferred borrow areas” since they are close and would require less effort to develop. A hand dug test pit was completed in Borrow I area, using a hand shovel (see Photographs 5.10.6-1 and 5.10.6-2). The test pit indicated that the upper 1.5 m of material consisted of fine to medium sand with some silt. Increasing gravel content was observed from 1.5 m to 2.1 m depth, where occasional cobbles were also observed. It should be noted that the hand dug test pit was conducted in an existing trench which was 1.2 m below the original ground surface.

Photographs 5.10.6-1 and 5.10.6-2: Hand Dug Test Pit at Potential Borrow I

The fourth potential borrow area (Borrow IV) is located west of the Victoria Creek Wellhouse as shown on Figure 1.1-1. This location is less desirable due to steeper slopes in the vicinity.

The fifth borrow area (Borrow V) is located near the intersection between Victoria Creek and the main road. This location may require additional permitting. Transport distances are also relatively high. Thus, this location was judged the least desirable potential source.

The final possible borrow source (Borrow VI) was identified based on an AMEC site visit to a mining site on Back Creek approximately 1 km due north of the Brown McDade Pit. The mine proponent is currently drilling to determine the extent of the proposed open pit. According to the site superintendent of this mine, till-like materials (glaciolacustrine deposits) have been found at several locations during the drilling program. The till-like material is located underneath the permafrost zone, which is from 16 m to 30 m depth based on their drilling records. AMEC visited one of their boreholes (BH 54), inspected soil cuttings below 30 m depth and visually confirmed that the soil cuttings were glaciolacustrine deposits. The operation is planning to remove the entire overburden layer including the till-like materials during mine development. Depending on their operation and construction timing, it may be possible to use the excavated till-like materials to construct the cover of Brown McDade Pit.

It should be noted that the visual field reconnaissance did not include any soil sampling, testing, permafrost presence determination or volume calculations. As mentioned earlier, priority should be given to the potential borrow areas (Borrow I, II, and III) closer to the planned remediation areas where access roads already exist and less disturbance is required.

5.10.7 Victoria Creek Wellhouse

During the site reconnaissance at the Victoria Creek Wellhouse, AMEC and AAM representatives identified a 100 mm insulated pipe that was buried along the power line (consistent with the understanding that previous wellhouse decommissioning activity had addressed above grade features only). The power line to the Victoria Creek Wellhouse is accessible with an excavator for removal and reclamation purposes. Currently there are two wells at the Victoria Creek Wellhouse, one of which is sealed from the top. However, it is anticipated that these wells would need to be decommissioned by a certified driller(s) to comply with regulatory requirements.

6 Site Characterization Update

6.1 Hydrogeology

6.1.1 Brown McDade Pit

A methodology and the findings of a detailed interpretation of the Pit pond water elevation and temperature have been documented (AMEC, 2014b) and a range of rates at which water leaves the Pit pond quantified, using wintertime linear declines in pond water elevation, when surface water inputs can be expected to be negligible. The Pit pond has been concluded as draining year round, with an outflow continuing throughout winter, below the annual ice cover. The July 2014 downloaded data added a fourth wintertime decline cycle for Pit pond elevation, from which the pond outflow rate refined to 0.48 L/sec (average of four outflow rates).

Coinciding with the Pit pond datalogger download event, the pond water elevation was also surveyed, relative to a geodetic benchmark (Underhill, UU1981), from which a refined datalogger level-to-elevation calibration was derived and applied to all pond level data on record (August 2010 to July 2014, inclusive). This calibration refinement enabled a pond elevation minimum to be more precisely identified, which represents the upper bound elevation range for the rock mass and regional groundwater flow regime underlying the Pit pond. The Pit pond minimum and underlying rock mass upper bound piezometric elevation is verified to be on the order of 1,181 m, as shown in Table 6.1.1-1.

Table 6.1.1-1: Wintertime Minima Pond Elevations

Date	Approximate Pit Pond Elevation Minima (m)
April 2002**	1,182.7
mid-April 2003**	1,181.0
April 24, 2011	1,183.4
April 11, 2012	1183.6
May 3, 2013	1,182.0
April 14, 2014	1,181.7

(**) denotes data reported by Gartner Lee (2004).
Note: the level-to-elevation conversion for in-pond logger data used Underhill benchmark (UU1981).

High vertical gradients are observed in the figures of piezometric elevation between the Pit pond and adjacent instrumentation, as seen in Figure 5.4.3-1 with the Pit elevation and bedrock monitoring well GLL07-03, with consistent downward vertical gradients on the order of 0.5 m/m, year round. Figure 5.4.3-6A shows high vertical gradients in the early time data, from October 2013 to January 2014, most notably from the 50 m and 60 m sensor piezometric elevations, with respect to a prevailing Pit pond elevation of 1,182.5 m. It should be noted that this dataset could have been influenced by groundwater pressures that had not fully equilibrated following installation.

6.1.2 Ground Temperatures

The majority of ground temperature instrumentation revealed temperatures warmer than -0.6°C. Only at one location was the recorded ground temperature colder and closer to -1.0°C (corehole CH-P-13-04), east of the Brown McDade Pit. It appears that permafrost is sufficiently confining to be the cause of sub-artesian and flowing artesian conditions, observed at coreholes CH-P-13-01 and CH-P-13-02, respectively.

6.1.3 Groundwater Quality

Overall, the groundwater analytical results presented by Hemmera in 2014 are consistent with the results and conceptual model of the project site groundwater quality, as concluded by AMEC in 2013 (AMEC, 2014a). In 2014, acid rock drainage appears to be commencing at two locations in the tailings dam area (MW09-21 and MW09-22), with decreases in pH and alkalinity and increases in sulphate, compared to the results from 2009 to 2013 at these locations. Aside from these two groundwater monitoring locations, the 2014 results are generally consistent with the 2013 groundwater quality results.

6.2 Hydrology

This section presents an update to the hydrology of the Mount Nansen site based on 2014 results. The update provides a comparison between 2014 and pre-2014 flow measurements to identify any significant differences. The 2014 hydrology data includes only data which was manually measured on May 8-9, May 20-21 and June 24-26. Continuous flow data (2014) for the site was not available at the time of writing this section. The results of the flow monitoring data are presented in Table 6.2-1 from the quarterly report by EDI (2014).

The manual data presented in Table 6.2-1 represent instantaneous flows, which are snapshot values of flow at the time of measurement. Snapshot values do not capture the trend or the average flow of the period. However it is reasonable to demonstrate that snapshot values fall within the range of previously measured data

The data in Table 6.2-1 also present the range of measured flow results prior to 2014. At all of the stations, and in all cases, the measured 2014 results fall within the range of previously measured flows. Therefore, the 2014 data seem to be consistent with previously collected data.

Table 6.2-1: Flow Monitoring Results 2014 and Range from Pre-2014

Station	2014 Measured Flow Data (m^3/s)			Pre-2014 Measured Flow Data (m^3/s)	
	May 8-9, 2014	May 20-21, 2014	June 24-25, 2014	Min	Max
H-DC-DX+105	0.019	0.011	0.001	0.004	0.024
H-DC-D1b	not measured	not measured	not measured		
H-DC-B	not measured	0.119	0.04	0	0.3
H-DC-M	0.002	0.154	0.045	0	0.5
H-DC-R	0.152	0.056	0.014	0.005	0.2
H-PC-U	0.024	0.006	0.001	0.001	0.05
H-PC-DSP	0.027	0.006	<0.001	0	0.04
H-VC-U	0.058	1.929	0.556	0	4.8
H-VC-DBC	2.388	0.627	0.177	0	5.2
H-VC-UMN	0.022	2.605	0.702	0.3	6.7
H-VC-R	0.261	3.204	0.758	0	8.6

6.3 Surface Water Quality

This section presents an update to the surface water quality characterization of the Mount Nansen site based on 2014 results. The update provides a qualitative assessment of whether the 2014 water quality at the site indicates any significant departures in the understanding of water quality compared to pre-2014 assessments. The 2014 water quality data in this section include data collected on April 14-15, May 8-9, May 20-21 and June 24-26. The key elements of the water quality characteristics assessed include:

- Comparison to CCME guidelines and Mount Nansen Effluent Discharge Standards;
- Temporal variability; and
- Spatial variability.

Understanding these three characteristics of the water quality data is significant for meeting the YESAA guidelines as they relate to baseline and environmental assessment of the site. The above characteristics are also key to the evaluation and implementation of the remedial design for the site.

The following observations are based on a comparison of these 2014 water quality results to those from previous years:

- The primary parameters of concern are the same, namely Al, As, Cd, Cu, Fe and Zn;
- Temporal variability of exceedances at the stations in Dome, Victoria and Pony Creeks are very noticeable, with May 8-9, 2014 (freshet) period showing the most exceedances, followed by May 20-21, 2014, then June 24-16, 2014. April data were not considered because several stations could not be sampled;

- Dome Creek shows less seasonal change in the number of exceedances over the different sampling dates. Dome Creek also shows less spatial variance in parameter exceedances between stations;
- The Victoria Creek sampling station shows clear seasonal variations in the number of exceedances. What is particularly noticeable is that in June, only Al exceeded the guidelines at all of the Victoria Creek stations;
- Pony Creek also exhibits some seasonal variation, with most parameters of concern exceeding guidelines during the freshet (May 8-9, 2014); and
- There is limited spatial variability in exceedances observed within the same creek or sampling area.

6.4 Water Treatment

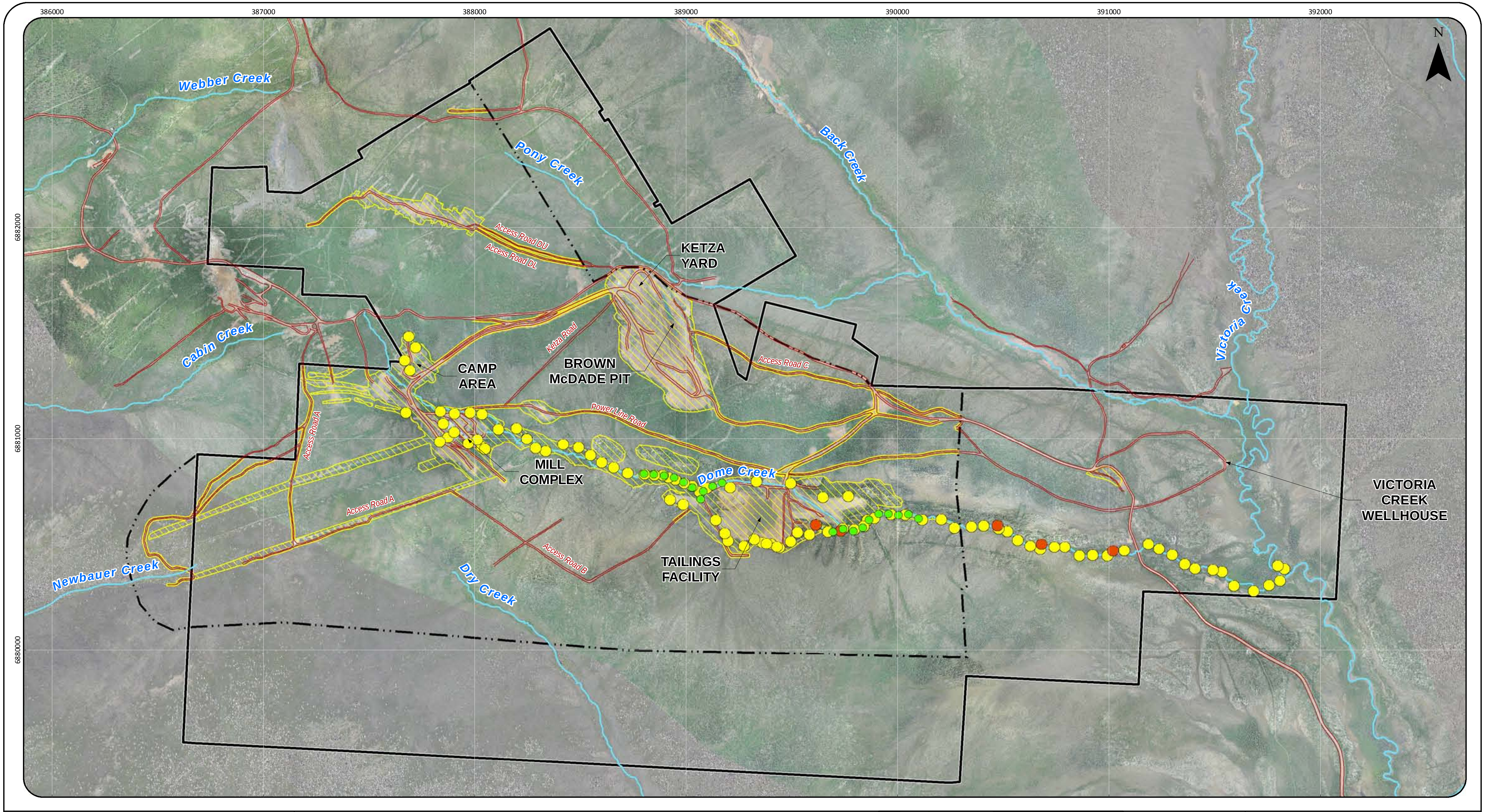
The site investigation sampling of large volumes for treatability testing in the summer of 2014 has provided significant information that can be used in the next level of design for water treatment. The testing provided the information necessary to size the reagent systems for lime, ferric sulphate, and flocculant. The testing also showed that CN can be treated and it defined the required sulphuric acid dosages to reduce the final pH to 7.0 and mitigate ammonia toxicity.

The raw water concentrations of cyanide and ammonia in the collected samples were lower than the previous design basis. This suggests that proper raw water sequencing and blending of different site waters could remove the need to treat for these two contaminants. In this case, two of the planned reagents could be eliminated from the plant design: the peroxide and sulphuric acid. These are the two reagents which pose the greatest health and safety risks in the treatment plant.

Eliminating these two reagents is expected to reduce the estimated water treatment plant costs by approximately 15% as two of the five reagent systems are removed and the building size can also be reduced.

6.5 Creek Sediment Quality

The 2014 sediment sampling program added significantly to the existing database. An overview of the 2013 and 2014 soil and sediment sample locations is shown on Figure 6.5-1. 2013 sediment samples are shown in green, 2014 soil (borehole) and Dome Creek sediment samples are shown in yellow, and five soil samples collected from areas of blackened and/or dead vegetation are shown in red.



Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012
Pleiades Satellite Imagery, 2013

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

- ━ Order in Council Boundary
- ─ · · Extent of Inactive Claim Areas
- ━ Public Road
- ═ Road
- ━ Stream
- ▨ Remediation Area

Metal Testing Results

- ● 2014 Sediment and Soil Samples
- ● 2014 Soil Samples and Blackened Vegetation Areas
- ● 2013 Sediment Samples

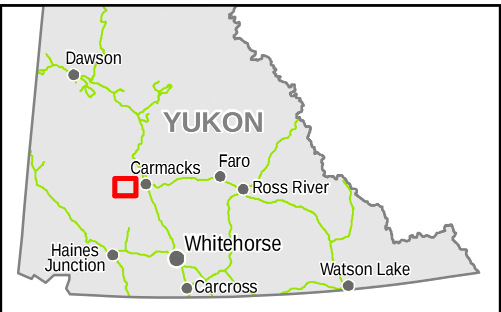


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Figure No. 6.5-1

2014 SITE INVESTIGATION REPORT

SEDIMENT AND SOIL SAMPLING
FOR METALS TESTING

Scale 1:17,500
Metres
0 450 900

October 1, 2014

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Table 6.5-1 gives a summary of Dome Creek sediment samples collected in 2013 and 2014. It can be seen that the 2014 sampling program confirmed the parameters of concern identified in previous years.

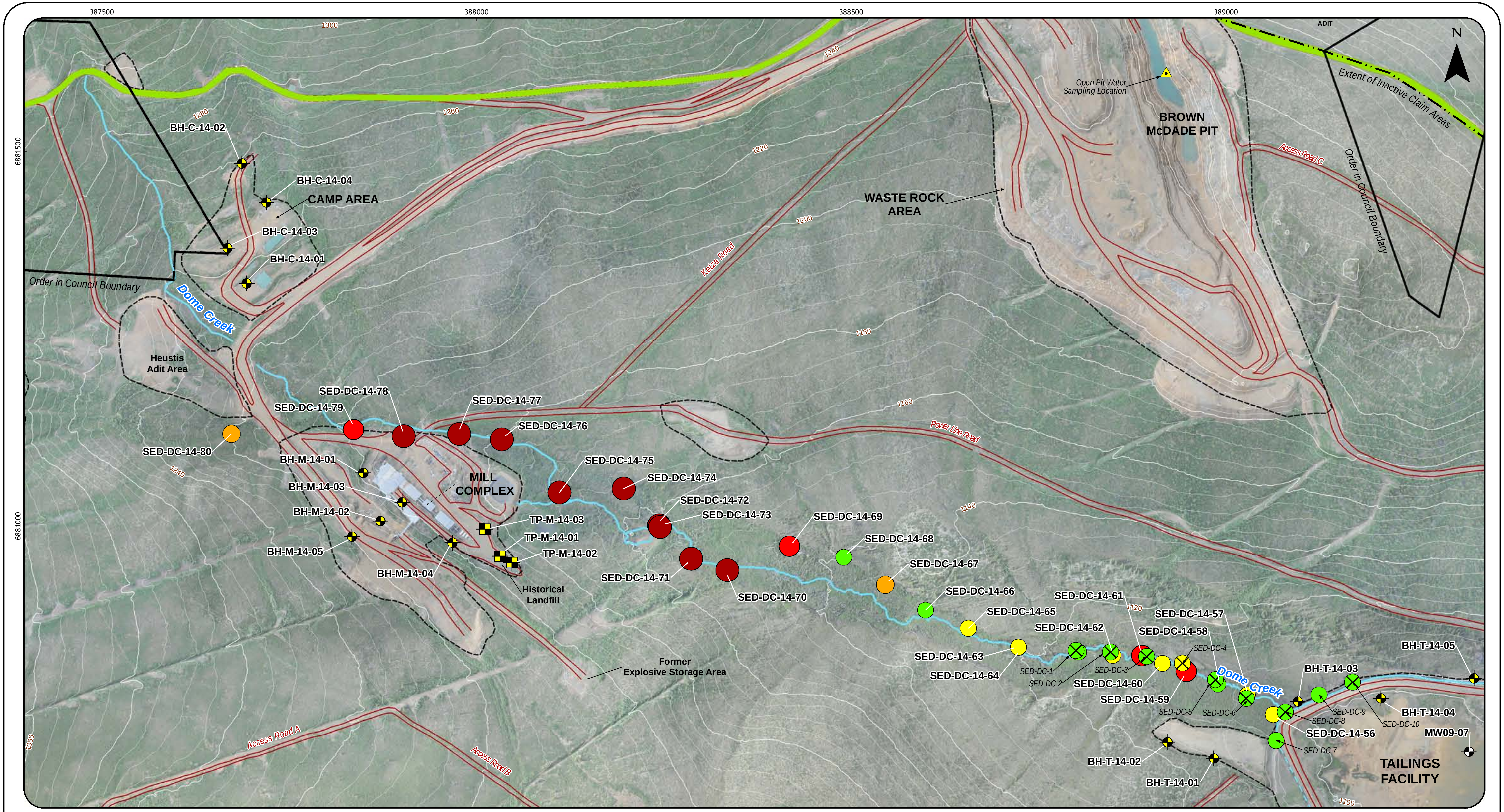
Table 6.5-1: Summary of Dome Creek Sediment Samples

Year	Company	Number of Samples	Parameters Elevated above CSR PL Standards
2013	Little Salmon Carmacks First Nation	9	As, Ba, Cd, Ag, Zn
2013	AMEC	20	As, Cd
2014	AMEC	63	Sb, As, Ba, Cd, Cu, Pb, Ag, Zn

As found in 2013 and shown in Table 5.2.1-1, arsenic is the predominant parameter of concern for the sediments and elevated concentrations are widespread. Figures 6.5-2 to 6.5-4 show the arsenic concentrations along Dome Creek for the upper, middle and lower sections of the creek. The results are displayed by concentration range, and it is clear that in general, the Mill Complex (including one of the trenches and/or mill ponds), the Tailings Storage Facility and the road (where it crosses Dome Creek) are significant sources of arsenic to the creek. Note that the 2013 and 2014 arsenic results are in general agreement. Figure 6.5-4 also shows some elevated arsenic concentrations upstream of the road. The source of those elevated arsenic concentrations is presumed to be from water backing up above the road due to ice blockages in winter and spring.

The remaining parameters of concern all coincided with samples that had elevated arsenic concentrations for the 2014 field program and did not have as many exceedances (Table 5.2.1-1). This indicates that arsenic is the controlling contaminant of concern in these areas.

The photographs collected during the 2014 sediment sampling program indicated there are visual impacts to the creek from previous mining activities that often correlate with elevated metal concentrations, but not always. Significant iron staining and precipitation were observed at many of the 2014 sediment sampling locations, but the observations did not always correlate with elevated metals. Photograph 6.5-1 shows sample location SED-DC-14-33, just downstream of the road. The sediments at this location had an arsenic concentration of 1,220 mg/kg, as well as elevated antimony and cadmium concentrations. The creek bed has orange iron staining and precipitation and the water is cloudy, but the surrounding vegetation is very lush.



Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

- Order in Council Boundary
- Extent of Inactive Claim Areas
- Public Road
- Road
- Stream
- Diversion Channel
- Contour (20 m)
- Contour (5 m)
- Disturbed Area

2014 Test Holes and Samples

- Borehole
- Test Pit
- Water Sample

Existing Monitoring Wells Sampled

- Borehole

Sediment/Soil Samples: Arsenic (As) (mg/kg)

- 501 - 3130
- 101 - 500
- 51 - 100
- 21 - 50
- 11 - 20
- ⨂ 2013 Samples

→ Yukon Contaminated Site Regulation O.I.C. 2002/171

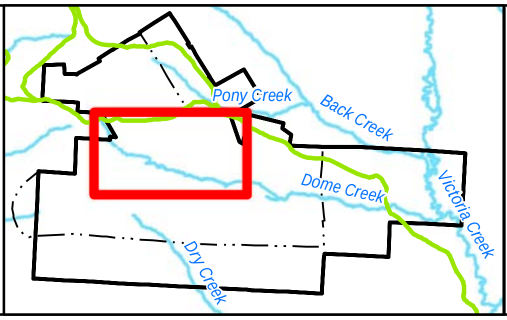


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Figure No. 6.5-2

2014 SITE INVESTIGATION REPORT

UPPER DOME CREEK -
ARSENIC CONCENTRATIONS IN SEDIMENTS

Scale 1:5,000
Metres
0 100 200

October 1, 2014

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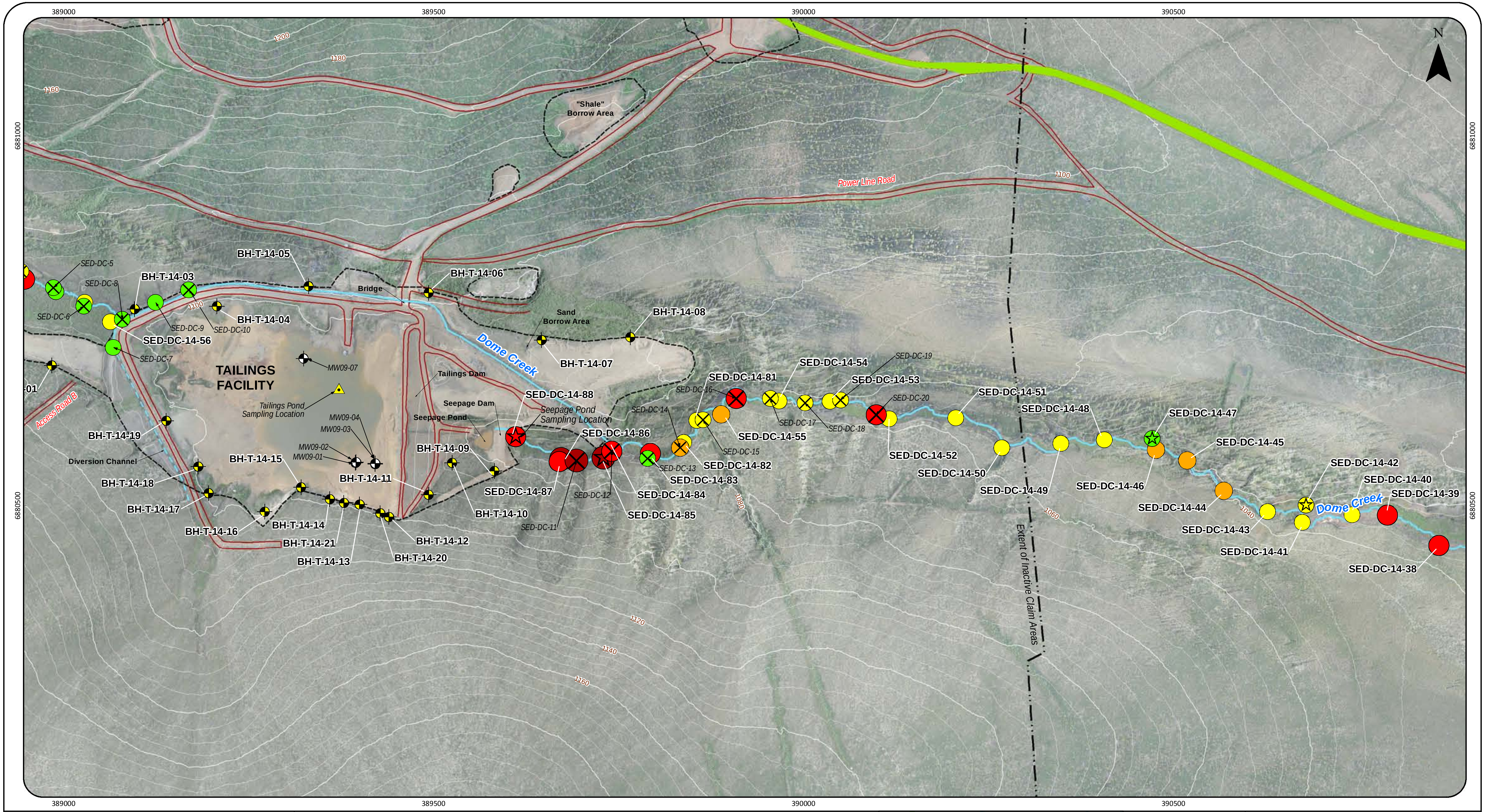


Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012

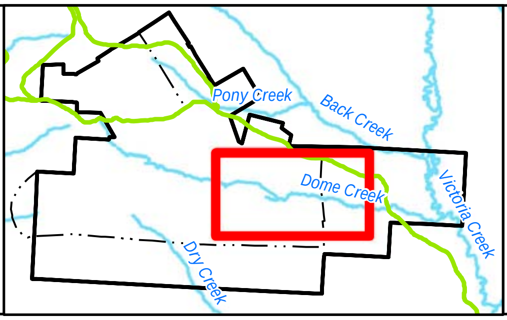
Datum: NAD 1983 CSRS UTM Zone 8N

Legend

Order in Council Boundary
Extent of Inactive Claim Areas
Public Road
Road
Stream
Diversion Channel
Contour (20 m)
Contour (5 m)

Disturbed Area
2014 Test Holes and Samples
Borehole
Test Pit
Water Sample
Existing Monitoring Wells Sampled
Borehole

Sediment/Soil Samples: Arsenic (As) (mg/kg)
● 501 - 3130
● 101 - 500
● 51 - 100
● 21 - 50 → Yukon Contaminated Site Regulation O.I.C. 2002/171
● 11 - 20
⊗ 2013 Samples
☆ Soil Samples



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MOUNT NANSEN REMEDIATION PROJECT
Figure No. 6.5-3

2014 SITE INVESTIGATION REPORT

MIDDLE DOME CREEK -
ARSENIC CONCENTRATIONS IN SEDIMENTS

Scale 1:5,000
Metres
0 100 200

October 1, 2014

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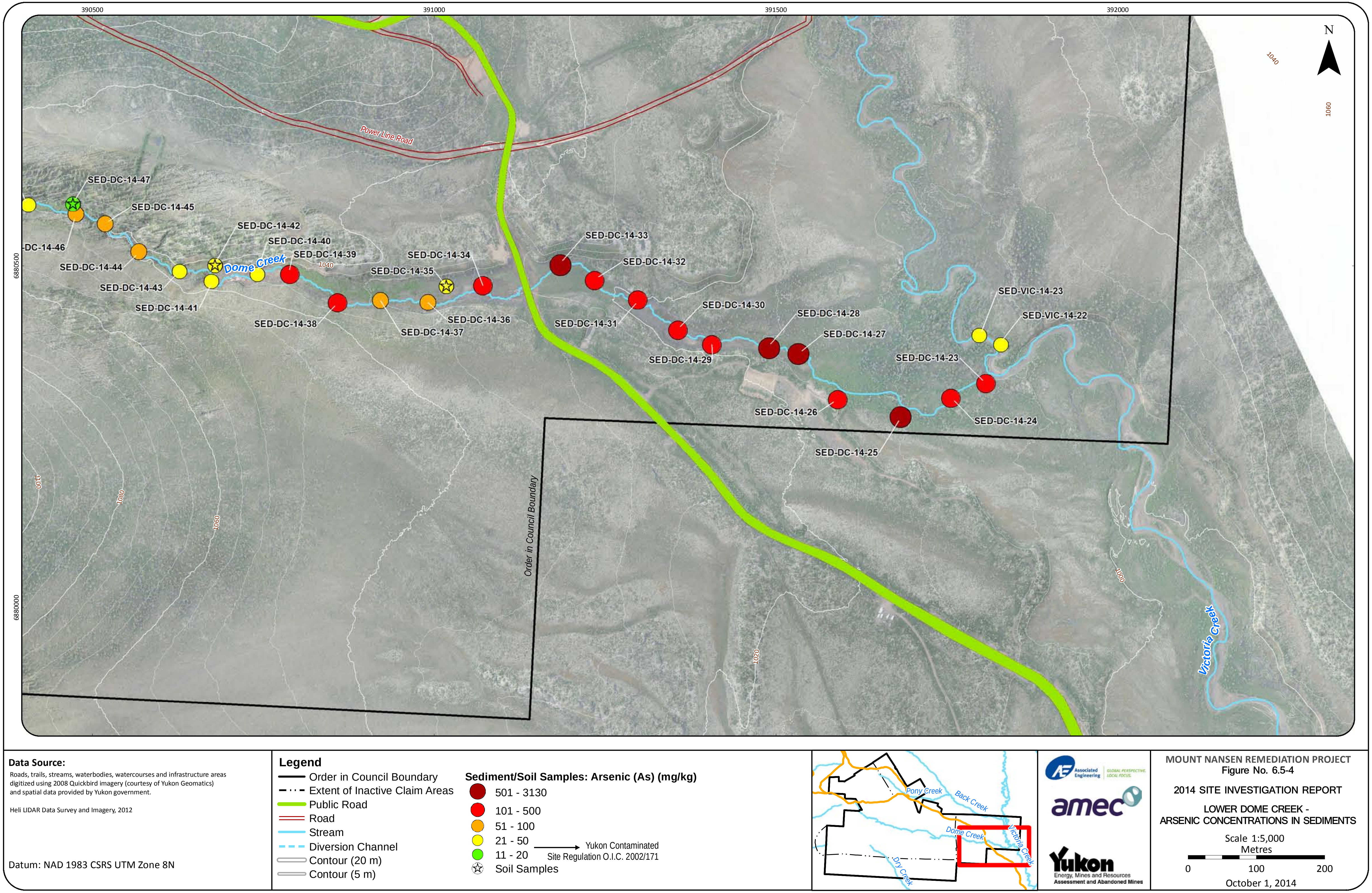

Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

▬	Order in Council Boundary
-··	Extent of Inactive Claim Areas
▬	Public Road
═	Road
▬	Stream
- -	Diversion Channel
═	Contour (20 m)
═	Contour (5 m)

Sediment/Soil Samples: Arsenic (As) (mg/kg)

●	501 - 3130
●	101 - 500
●	51 - 100
●	21 - 50
●	11 - 20
☆	Soil Samples

→ Yukon Contaminated Site Regulation O.I.C. 2002/171

MOUNT NANSEN REMEDIATION PROJECT
Figure No. 6.5-4

2014 SITE INVESTIGATION REPORT

LOWER DOME CREEK -
ARSENIC CONCENTRATIONS IN SEDIMENTS

Scale 1:5,000
Metres
0 100 200
October 1, 2014

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Photograph 6.5-1: Dome Creek Sediment Sample Location SED-DC-14-33

Photograph 6.5-2 shows sample location SED-DC-14-66, where no CSR PL standards are exceeded for metals, yet the creek bed appears impacted by way of iron staining and/or precipitation just upstream of the sample location. This shows that not all areas displaying visible iron staining have elevated sediment metal concentrations, particularly arsenic.

Photograph 6.5-2: Dome Creek Sediment Sample Location SED-DC-14-66

Conversely, some of the sample sites with the highest arsenic concentrations exhibited no visual indicators, as shown in Photograph 6.5-3 (note the lack of visual indicators of elevated antimony, arsenic, cadmium and zinc).

Photograph 6.5-3: Dome Creek Sediment Sample Location SED-DC-14-73

Photograph 6.5-4 is an example of iron staining on vegetation from presumed creek blockages during winter and spring (SED-DC-14-71). The arsenic concentration was 2,670 mg/kg at this location. Barium was the only other elevated metal, with a slightly elevated concentration of 506 mg/kg.

Photograph 6.5-4: Dome Creek Sediment Sample Location SED-DC-14-71 showing iron stained vegetation

In summary, Dome Creek is impacted along most of its length, but the impacts are highest immediately downstream of known sources.

Shallow soil samples were collected from areas of blackened and/or dead vegetation in the Dome Creek valley floor between the Tailings Storage Facility and the road. Previous work (EDI, 2006) found that the areas of blackened vegetation had elevated metal concentrations in vegetation and shallow soils, but lower concentrations in the deeper soils. The three 2014 samples from the areas of blackened vegetation exhibited arsenic concentrations ranging from 18.0 mg/kg at SED-DC-14-47 to 48.2 mg/kg at SED-DC-14-42. The CSR PL standard for arsenic is 20 mg/kg. Photograph 6.5-5 shows sample location SED-DC-14-42.

Photograph 6.5-5: Dome Creek Sediment Sample Location SED-DC-14-42 showing blackened vegetation

Closer to the Tailings Storage Facility, the areas of blackened and/or dead vegetation had higher arsenic concentrations in soil. Photograph 6.5-6 shows the location for SED-DC-14-87, which had elevated arsenic and copper concentrations of 157 mg/kg and 499 mg/kg, respectively.

Photograph 6.5-6: Dome Creek Sediment Sample Location SED-DC-14-87 showing blackened vegetation

In conclusion, the areas of blackened and/or dead vegetation immediately downstream of the Tailings Storage Facility have significantly higher arsenic concentrations and potentially elevated copper concentrations (only seen in one of two samples). Further downstream of the TSF, the areas of blackened vegetation seem to be of lower concern.

6.6 Disturbed Area Limits

The following presents some of the key observations that were made during the site investigation program, which will need to be considered during the upcoming 60% design stage:

- Permafrost was noted at shallower depths along the north facing slopes (south side) of the Tailings Facility, with a depth typically on the order of 1 m to 3.5 m.

- As noted in earlier sections, the moisture content of the unfrozen soil ranged between 3% and 77%, with the higher values typically reflecting the presence of organics. Excluding the soil samples with organics content, the average moisture content of the unfrozen soil was on the order of 11%.
- The moisture content in the permafrost soils generally ranged between 14% and 145%, with the majority of the values within the 20% to 60% range. Figure 6.6-1 presents the variation of moisture content with depth in the unfrozen and permafrost soils. It is significant that the water contents of unfrozen (and likely thawed permafrost) samples are typically less than the frozen or permafrost samples, reflecting the “excess” water content of the permafrost. This water is drained out of the permafrost as it thaws, and can create settlement and terrain instability if not appropriately managed in design.
- The soils encountered at the disturbed / undisturbed boundaries of the Tailings Storage Facility generally consist of fine to medium grained sand and silt. Such soils are prone to water induced erosion, which has been noted in several locations along the south slopes adjacent to the Tailings Facility. This will need to be considered in the future during the design of the tie-in zones (including filter compatibility).
- Permafrost was not encountered at the camp and mill complex where the subsurface conditions are generally more favourable than in the Tailings Storage Facility, given that bedrock was encountered at relatively shallow depths.
- The extent of the historical landfill at the mill complex was found to be greater than initially anticipated. This is illustrated in Figure 6.6-2.

6.7 Brown McDade Pit

There are no changes to the Open Pit Site Characterization presented in the Phase 1 Site Characterization Report (AMEC, 2014a).

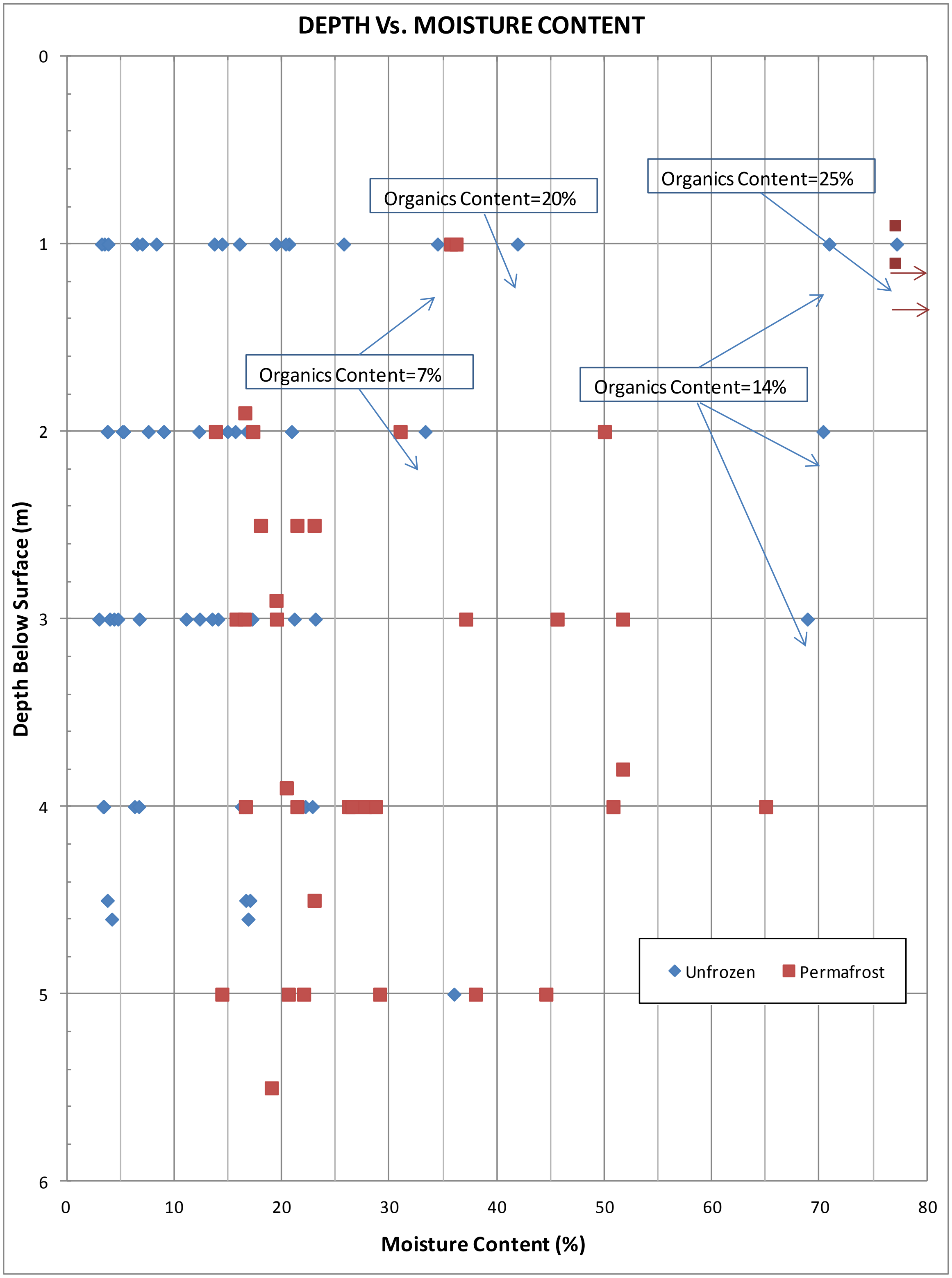
6.8 Waste Rock Areas

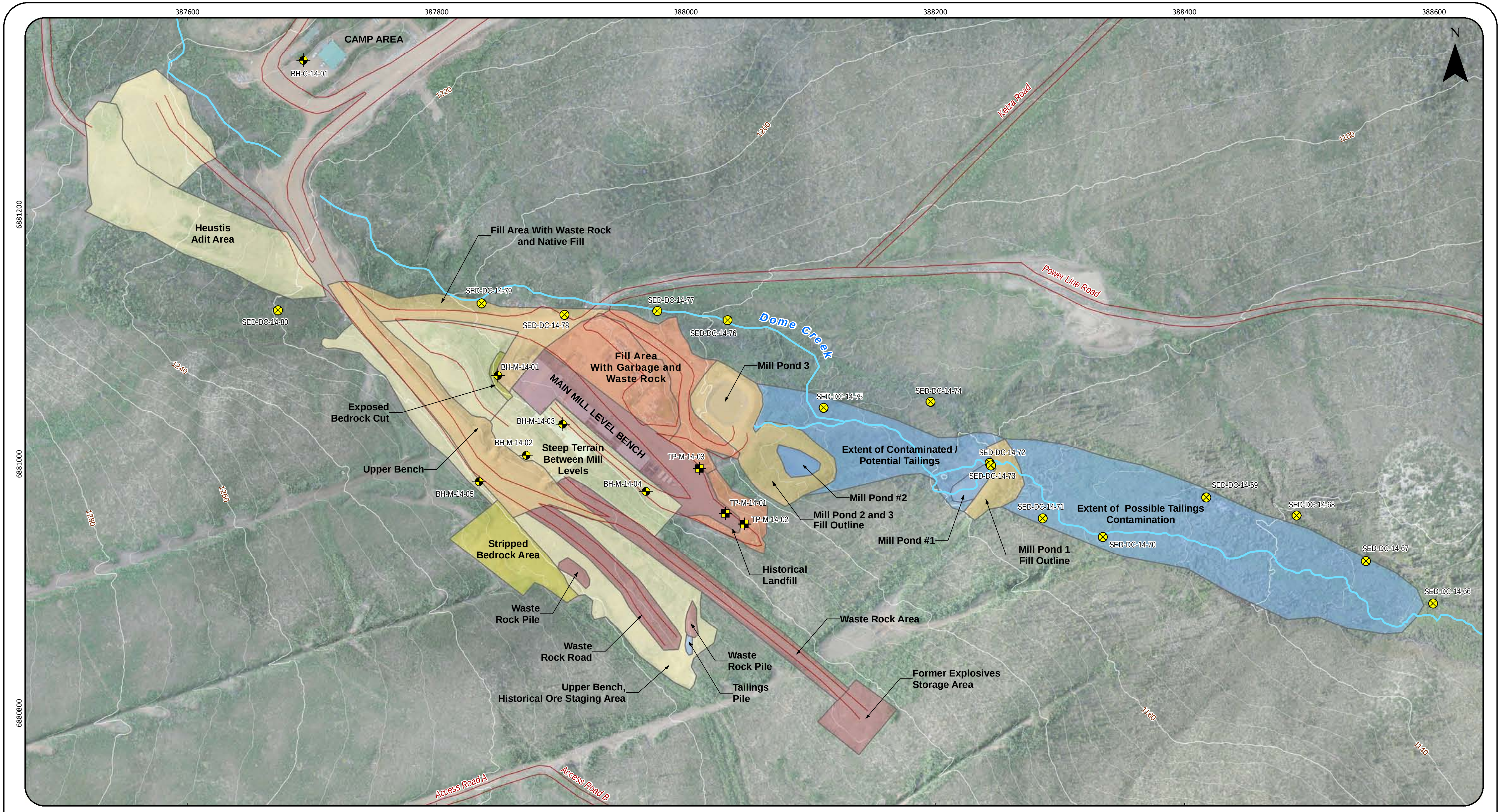
There are no major changes to the Waste Rock Areas Site Characterization. However, as discussed earlier in Section 5.10.3, field observations (iron staining, presence of sulphides and signs of oxidation) suggest that PAG rocks may be mixed with NAG rocks more extensively than was characterized in 2013. If the remediation design requires additional volumes of NAG rock for the construction works, significant effort may be required to separate NAG from PAG rock.

6.9 Tailings Storage Facility

The results from the borehole drilling and laboratory testing program completed around the Tailings Facility were in general agreement with the findings from the 2013 site investigation. The in situ soils along the margins of the Tailings Facility had fines content typically varying between about 5% and to 60%. The in situ soils sampled in 2013 under the tailings had fines content generally varying between 5% to 35%. Summaries of the sieve analyses are presented in Appendix 4D.

Figure 6.6-1: Variation of Moisture Content with Depth in the Unfrozen and Permafrost Soils





Data Source:

Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

Heli LIDAR Data Survey and Imagery, 2012
Pleiades Satellite Imagery, 2013

Datum: NAD 1983 CSRS UTM Zone 8N

Legend

Public Road
Road
Stream
Contour (20 m)
Contour (5 m)

2014 Test Holes and Samples

Borehole
Sediment Sample
Test Pit

Mill Complex Soil Types

Bedrock
Bedrock Shallow, Shallow Native/Waste Rock
Tailings
Waste Rock
Waste Rock and Native Fill
Waste Rock/Ore and Garbage

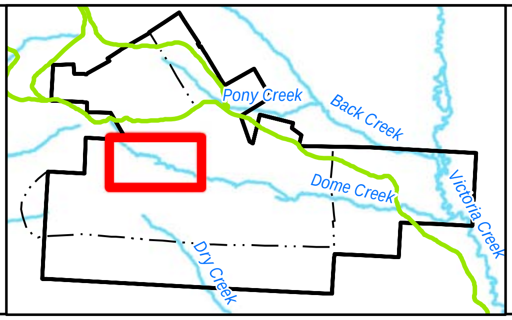


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Figure No. 6.6-2

2014 SITE INVESTIGATION REPORT

MILL COMPLEX SOIL TYPES

Scale 1:3,000
Metres
0 75 150

October 2, 2014

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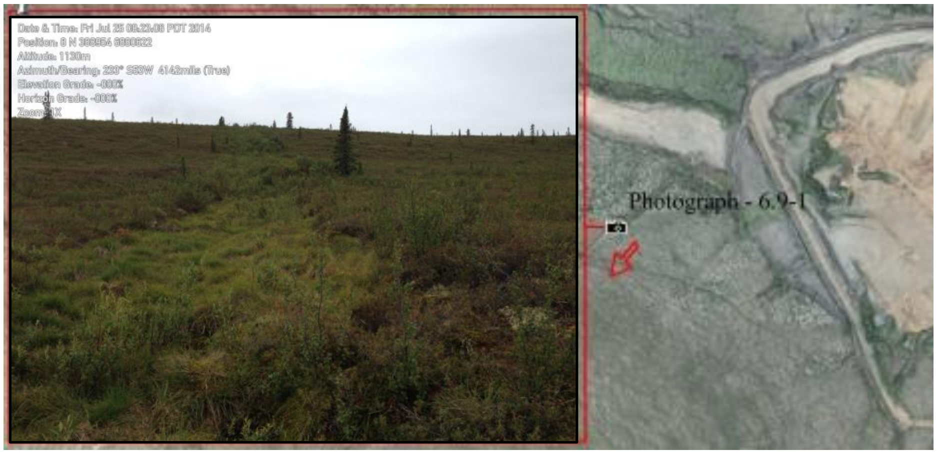
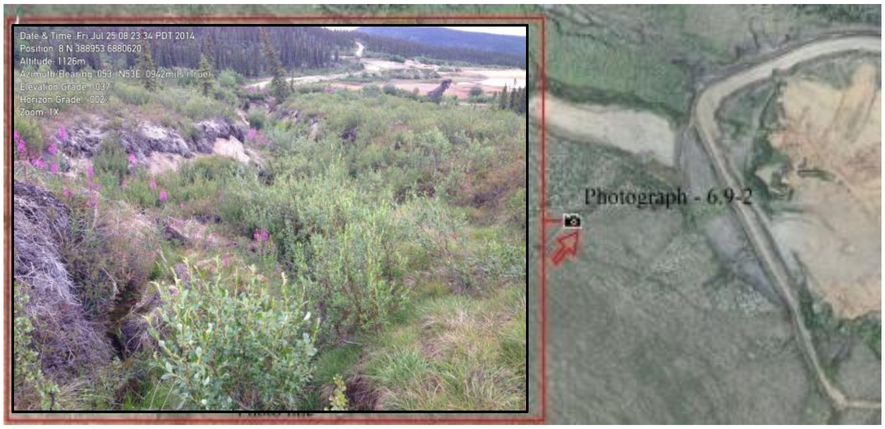
Based on the drilling information, there is shallow permafrost in the disturbed/undisturbed boundaries at the Tailings Storage Facility area, particularly on the south side of the Tailings Storage Facility where the slope is steeper (average depth on the south side is on the order of 1 m to 3.5 m). Permafrost soils in the disturbed/undisturbed boundaries of the Tailings Storage Facility appear to have a higher silt content as well as amorphous organics (decayed plant and animals) that have a distinctive smell. Mosses and low lying shrubs are located on the south slopes, whereas evergreen and some aspen trees grow on the south facing (or north) slopes. In addition, dense willow grows in the Dome Creek valley upstream and downstream of the Tailings Facility.

The top vegetation layer in the undisturbed area consists of thick moss and shrubs. This layer not only provides considerable insulation to the ground in the summer, but also protects the underlying fine to medium grained sand with varying silt content (active layer) from deeper thawing. The active layer material is also subject to seasonal freeze-thaw cycles. The active layer in undisturbed terrain is vulnerable to surface disturbance, which results in thawing, subsequent settlement, focusing of runoff, and then the development of erosion channels in silty soils. The resulting erosion and environmental damage is apparent. For example, wash out areas at the south side of the sand borrow source upstream of the Tailings Storage Facility (Photographs 6.9-1 and 6.9-2) appear to have been caused by passing vehicles disturbing the fragile insulating top layer, causing observed erosion and settlement..



Photograph 6.9-1: Looking Upstream at a Disturbed Zone Caused by Vehicles - Access Road B



Photograph 6.9-2: Looking Downstream at an Erosion Trench Zone Caused by Vehicles - Access Road B

Other active erosion sites, which may have been initiated some time ago, can be seen at the south side of the borrow area at the downstream of Tailings Storage Facility (Photograph 6.9-3). Such damage may have been initiated by trafficking over permafrost in summer months.

Photograph 6.9-3: Looking North – Largest Erosion Trench (Scar) up to Approximately 5-6 m Deep

6.10 Mill Complex

Test pits completed in the Mill Complex suggest that the historical landfill may extend further north than previously reported. TP-M-14-03, located approximately 10 m north of the previous estimate of landfill extent, encountered significant waste material. This material appears to extend along the edge of the fill materials of the main mill road. The extent of the landfill and the extent of historical tailings are shown on Figure 6.6-2.

6.11 Geochemical Considerations

Leachate bin concentrations are dependent on site precipitation. Higher precipitation will result in lower concentrations because of dilution. This section discusses the differences in concentration between 2013 and 2014 in the leachate bins, but also presents a comparison of loadings to the extent possible. Leachate bin volumes were recorded in 2014 but are only estimated from 2013 by comparing photos from 2013 and 2014. Leachate bin volumes are not available for the waste rock plus organics bin or the tailings plus organics bin because the tube does not discharge into a secondary container. In addition, the waste rock plus organics bin was dry in 2014 and there was no sample.

In general, sulphate and dissolved metal concentrations in the leachates collected from the unsaturated tailings field bin and ore field bin were comparable with the concentrations of those parameters in the leachates collected from previous sampling programs. Some exceptions are that relatively high arsenic and iron concentrations were measured in the leachate collected from the saturated tailings bin. Arsenic and iron concentrations were around three times higher compared to the concentrations of those two parameters in the leachates from previous sampling programs. The 2014 results will be used to refine the tailings source terms for water quality modelling.

The waste rock field bin leachates are used to generate source terms for water quality modelling in the absence of kinetic testing results. Additional sampling serves to refine the source terms. Changes were observed in concentrations of arsenic, cadmium, and iron collected from the unsaturated waste rock bin. Arsenic and iron concentrations in this leachate were higher compared to arsenic and iron concentrations from the previous sampling program. The recent arsenic concentrations were around one order of magnitude higher than concentrations in leachate collected during the 2013 site investigation program. The iron concentration increased by approximately three times compared to the iron concentration in the leachate from the 2013 sampling program. The cadmium concentration in the recent leachates was around one order of magnitude lower than previous sampling programs. The 2014 results did not replicate the high zinc concentration measured in waste rock leachate from the 2013 sampling program.

The waste rock field bin results suggest some changes in the concentrations of certain parameters for the waste rock source terms. However, the source terms for this rock are also influenced by the monitoring results for the seepage and runoff quality from the existing waste rock pile. Both the field bin leachate quality and the waste rock dump seepage quality data will be reviewed and used to update the source terms for the waste rock that will be relocated to the pit.

The water volumes for the waste rock, ore and tailings sand bins were slightly lower in 2014 than in 2013. Table 6.11-1 shows the comparison of loadings between 2013 and 2014 for the three bins with measured volumes and concentrations above detection limit. In general, loadings were lower in 2014 than in 2013, even though many of the concentrations were higher. Total aluminum, arsenic and iron loadings were greater in 2014 for the waste rock field bin, adding to the finding above that the waste rock source term may need to be adjusted in the next phase of design. The total manganese in the tailings sand leachate bin was the only other result where the 2014 loading was appreciably greater than the 2013 loading. The variability in leachate field bin results over time is to be expected due to variability in site weather conditions.

Table 6.11-1: Comparison of 2013 and 2014 Loadings from Leachate Field Bins

Parameters	FIELD BIN - WASTE ROCK	FIELD BIN - WASTE ROCK	FIELD BIN - ORE	FIELD BIN - ORE	FIELD BIN - TAILINGS SAND	FIELD BIN - TAILINGS SAND
	24-Jul-14	18-SEP-13	24-Jul-14	18-SEP-13	24-Jul-14	18-SEP-13
Water Volume (L)	1.5	1.5	8	10	17	20
Sulfate (SO4) (mg/L)	2415	3615	15760	25400	18530	24200
Total Metals						
Aluminum (Al) (mg/L)	0.411	0.0885	0.368	0.872	N/A	0.146
Antimony (Sb) (mg/L)	0.00546	N/A	0.2096	0.368	0.7055	1.616
Arsenic (As) (mg/L)	0.0336	0.00555	0.5704	1.19	0.034	0.037
Barium (Ba) (mg/L)	0.033	0.0399	N/A	0.112	0.51	0.778
Beryllium (Be) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Boron (B) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium (Cd) (mg/L)	0.007935	0.0456	0.1696	0.181	0.01649	0.01848
Calcium (Ca) (mg/L)	657	715.5	2896	4000	6256	8900
Chromium (Cr) (mg/L)	N/A	N/A	N/A	0.0021	N/A	N/A
Cobalt (Co) (mg/L)	N/A	0.03465	N/A	N/A	0.09469	0.1668
Copper (Cu) (mg/L)	0.0138	N/A	0.0696	0.093	0.0221	0.026
Iron (Fe) (mg/L)	1.56	0.5295	1.224	3.14	N/A	0.24
Lead (Pb) (mg/L)	0.0228	N/A	0.072	0.188	N/A	N/A
Lithium (Li) (mg/L)	N/A	0.0426	N/A	0.073	N/A	0.028
Magnesium (Mg) (mg/L)	217.5	394.5	2296	3570	787.1	772
Manganese (Mn) (mg/L)	0.147	144.3	2.376	6.25	0.544	0.1206
Mercury (Hg) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Molybdenum (Mo) (mg/L)	N/A	N/A	N/A	0.0011	N/A	0.0188
Nickel (Ni) (mg/L)	N/A	0.147	N/A	0.011	N/A	0.07
Selenium (Se) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Silver (Ag) (mg/L)	0.000608	N/A	0.00268	0.0039	N/A	N/A
Sodium (Na) (mg/L)	N/A	10.245	N/A	22.6	N/A	19.2
Thallium (Tl) (mg/L)	N/A	0.000555	N/A	0.00135	N/A	0.00072
Titanium (Ti) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Uranium (U) (mg/L)	0.000405	N/A	N/A	0.00134	0.00527	0.01534
Vanadium (V) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Zinc (Zn) (mg/L)	0.279	10.815	15.6	12.4	0.289	0.408
Dissolved Metals						
Aluminum (Al) (mg/L)	N/A	0.0165	N/A	0.046	N/A	0.142
Antimony (Sb) (mg/L)	0.0018	0.0018	0.2008	0.33	0.7106	1.622
Arsenic (As) (mg/L)	0.00285	0.0051	0.4856	0.987	0.0289	0.034
Barium (Ba) (mg/L)	N/A	0.03825	N/A	0.1	0.493	0.778
Beryllium (Be) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Boron (B) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium (Cd) (mg/L)	0.00741	0.012615	0.1672	0.178	0.01428	0.01802
Calcium (Ca) (mg/L)	685.5	679.5	2944	4110	6358	8740
Chromium (Cr) (mg/L)	N/A	N/A	N/A	N/A	N/A	0.0058
Cobalt (Co) (mg/L)	N/A	0.05535	N/A	N/A	0.08534	0.1644
Copper (Cu) (mg/L)	0.0027	0.00375	0.0496	0.0608	0.0187	0.0218
Iron (Fe) (mg/L)	N/A	0.2805	N/A	N/A	N/A	0.2
Lead (Pb) (mg/L)	N/A	N/A	N/A	0.0022	N/A	N/A
Lithium (Li) (mg/L)	N/A	0.0402	N/A	0.068	N/A	0.028
Magnesium (Mg) (mg/L)	217.5	372	2320	3660	816	778
Manganese (Mn) (mg/L)	0.075	163.5	2.36	6.01	0.272	0.0352
Mercury (Hg) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Molybdenum (Mo) (mg/L)	N/A	N/A	N/A	N/A	N/A	0.0178
Nickel (Ni) (mg/L)	N/A	0.1455	N/A	0.01	N/A	0.066
Selenium (Se) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Silver (Ag) (mg/L)	N/A	N/A	N/A	0.00032	N/A	N/A
Sodium (Na) (mg/L)	N/A	10.035	N/A	22.5	N/A	19.2
Thallium (Tl) (mg/L)	N/A	0.000585	N/A	0.00117	N/A	0.0007
Titanium (Ti) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Uranium (U) (mg/L)	0.00033	0.00021	N/A	0.00119	0.00544	0.01486
Vanadium (V) (mg/L)	N/A	N/A	N/A	N/A	N/A	N/A
Zinc (Zn) (mg/L)	0.219	11.13	15.28	12	0.2329	0.37

Notes:

N/A - No value calculated as concentration was less than method detection limit.

The source term for non-PAG rock that will be left at surface following remediation activities or used as construction material will be determined by the pending kinetic testing results (trickle leach column testing).

The previous tailings source terms were mainly determined by the results of humidity cell testing. The recent results from the tailings field bin leachate testing are unlikely to change the tailings source terms used in the water quality model.

The lab analysis results for the field ore bin leachate confirm there is no major change in the ore rock source terms used in the water quality model.

Results of a statistical analysis of the geochemical database will be used to define the upper range limits of background concentrations to assist in defining remediation limits for the Mount Nansen site.

6.12 Exploration Trenches

6.12.1 Remediation/Reclamation Rankings and Schedule

The proposed exploration trench reclamation order is listed in Table 6.12-1. The order is numbered according to reclamation rank and location, order rationale is discussed below.

Table 6.12-1: Trench Reclamation Order

Reclamation Schedule	Trench/Access Road	Erosion	Access	Rank
1	Access Rd B	Extreme	Fair	16
2	ST 5	High	Good	14
3	ST 3	Minor	Good	9
	ST 4	Minor	Good	9
4	ST 10	Minor	Good	11
	ST 9	Moderate	Fair	9
	ST 11	Minor	Good	9
	ST 13	None	Good	9
	ST 11/10	None	Good	7
	ST 11/12	None	Good	7
	ST 12	None	Good	7
TBD	*Access Rd D	High	Good	14

**The area above Access Road D is recommended for reclamation trials; see Section 6.13 for details.*

The northernmost section of Access Road B is highest priority for reclamation because this lower section of road has been continuously eroding a natural sand deposit at the base of the slope. The eroding sand deposit connects to the north western edge of the interceptor ditch, located along the west edge of the Tailings Pond (Figure 4.5.1-1). The sand is transported to the upstream side of the interceptor ditch, which flows into Dome Creek, causing significant sediment deposition into Dome Creek. This deposition causes annual maintenance problems associated with water and ice.

Southern Trench 5 is sustaining a high level of erosion, which is causing sediment to be transported to the Mill Area and along the road ditch connected to Dome Creek. Seepage water from Southern Trench 5 may also be entering the Mill Area and adding to water seepage and contamination issues within the Mill Area site (pers. comm. Josee Peron AAM, July 24, 2014). Southern Trenches 3 and 4 are close to each other and can also be accessed via the Mill Area road system. Some erosion and seepage was observed in these trenches.

Southern Trenches 9, 10, 11, 12 and 13, all situated above the Huestis Adit, can be accessed and reclaimed simultaneously (Figure 4.5.1-2). These trenches are within a wildlife corridor (as reported in Phase 1). This area is highly fragmented, and reclamation of these trenches will increase wildlife habitat value and reduce obstruction to movement through this corridor.

Access Road D is ranked high for reclamation; however, in lieu of trench reclamation, reclamation trials are recommended in the cleared areas that are accessed by this road (specifically, the Northern Trench area; see Section 6.13 for details, Figure 4.5.1-1). If the trials proceed as recommended, reclamation of Access Road D would be postponed until they are concluded because this road provides the access required to complete the trials.

6.13 Reclamation

6.13.1 Reclamation Trials

As stated in the Phase 1 report, reclamation trials are essential to the success of a reclamation program (Gonzales, 2013). Some trials have been implemented at the Mount Nansen site (the Pony Creek Adit, and Huestis Adit, EDI, 2008; ELR, 2013; LORAX, 2011); however, few of these sites have been monitored for success or have had reclamation implemented at a scale comparable to the proposed MNRP program. Reclamation trials are recommended at the Northern Trench area, specifically the cleared and stripped areas that are bisected by the Northern Trenches (Figure 4.5.1-1). This area is currently accessed via Access Road D. Reclamation trial results within the cleared area can be applied to final reclamation planning for the Mill Area, Brown McDade Pit, Huestis Adit and all other compacted cleared areas to be reclaimed on the Mount Nansen Site. Successful reclamation trial methods in selected sections of the Northern Trenches can be applied to the reclamation of the Southern Trenches. In summary, development and implementation of a detailed trial program is recommended to help refine reclamation prescriptions that were proposed in Phase 1 for the Mount Nansen Project. This trial would need to be integrated appropriately with the broader project execution schedule. It may be more effective to execute these trials in parallel with at least some remedial activity and to develop reclamation Adaptive Management Plans to adjust reclamation prescriptions following remediation based on long term trial outcomes (i.e. trials need not be part of a linear project development and execution process in which all trial outcomes are known before remediation proceeds).

6.13.2 Vegetation Sources

Availability of organics for use in reclamation is a limiting factor at the Mount Nansen site. In addition to vegetation and organic sources recommended in Phase 1 (i.e. willows present in the Dome Creek Valley within the Mount Nansen site), another vegetation source should be considered. A large source of willow was observed in the Dome Creek Valley during the Dome Creek sediment sample survey. This willow source is located within the lower Dome Creek Valley, 250 m to the east of Mount Nansen Road where it crosses Dome Creek (08V 391590N 6880308E). The willow could be brushed (leaving sufficient stem length to ensure the survival of the donator willow) and used for willow stakes and for applying organics as woody debris. This would aid soil development and patch creation on the site.

6.14 Borrow Areas

Two additional potential sand borrow areas were identified in the 2014 Site Investigation:

- Borrow Areas I and II are located upstream of the Tailings Storage Facility and may be used to supplement the existing sand borrow areas adjacent to the tailings.
- Borrow Area VI may contain appropriate fine grained material for a cover system; however, it is located on an external placer claim and procurement constraints and haul distances may make this borrow unfeasible.

7 Limitations and Closure

This report was prepared exclusively for Assessment and Abandoned Mines, Energy Mines and Resources by AMEC Environment & Infrastructure, a wholly owned subsidiary of AMEC Americas Limited. The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by Assessment and Abandoned Mines, Energy Mines and Resources only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

Yours truly,
AMEC Environment & Infrastructure

Reviewed by:

R. Brian Geddes, P.Eng.
Senior Design Lead

Ed McRoberts

E.C. McRoberts, Ph.D., P.Eng.
Geotechnical

Christine Peters

Christine M. Peters, P.Eng.
Project Manager & Water Quality Lead

S.J.N. Sibbick, P.Geo., P.Geol.
Geochemistry

ROBERT BRIAN GEDDES
Mar 3 2015

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Date March 3 2015
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Appendix 3A – Site Investigation Locations

Mount Nansen Remediation Project
2014 Site Investigation Locations

Location ID	Type of Investigation	Investigation Location (UTM Zone 8, NAD83)				Summary of Work Completed		
		Site Area	Easting	Northing	Ground Elevation (m)	Date Completed	Depth of Investigation (m)	Lab Tests
BH-C-14-01	Borehole	Camp Area	387,693	6,881,324	1234.6	July-26-14	3.0	Geotechnical Geochemical
BH-C-14-02	Borehole	Camp Area	387,687	6,881,484	1256.9	July-26-14	2.3	Geotechnical Geochemical
BH-C-14-03	Borehole	Camp Area	387,668	6,881,371	1243.5	July-26-14	3.2	Geotechnical Geochemical
BH-C-14-04	Borehole	Camp Area	387,720	6,881,432	1244.6	July-26-14	4.0	Geotechnical Geochemical
BH-M-14-01	Borehole	Mill Complex	387,849	6,881,071	1197.3	July-26-14	1.1	Geotechnical Geochemical
BH-M-14-02	Borehole	Mill Complex	387,872	6,881,007	1210.4	July-26-14	2.2	Geotechnical
BH-M-14-03	Borehole	Mill Complex	387,901	6,881,032	1197.6	July-26-14	1.8	Geotechnical
BH-M-14-04	Borehole	Mill Complex	387,968	6,880,978	1196.8	July-26-14	1.6	Geotechnical
BH-M-14-05	Borehole	Mill Complex	387,834	6,880,986	1218.8	July-26-14	4.5	Geotechnical
BH-T-14-01	Borehole	Tailings Facility	388,984	6,880,690	1115.6	July-27-14	4.5	Geotechnical Geochemical
BH-T-14-02	Borehole	Tailings Facility	388,922	6,880,712	1117.8	July-27-14	4.5	Geotechnical Geochemical
BH-T-14-03	Borehole	Tailings Facility	389,096	6,880,766	1100.8	July-26-14	3.8	Geotechnical Geochemical
BH-T-14-04	Borehole	Tailings Facility	389,207	6,880,770	1098.8	July-25-14	4.3	Geotechnical
BH-T-14-05	Borehole	Tailings Facility	389,331	6,880,797	1100.9	July-26-14	4.6	Geotechnical
BH-T-14-06	Borehole	Tailings Facility	389,493	6,880,788	1103.7	July-25-14	4.6	Geotechnical
BH-T-14-07	Borehole	Tailings Facility	389,646	6,880,724	1090.9	July-25-14	5.0	Geotechnical Geochemical
BH-T-14-08	Borehole	Tailings Facility	389,766	6,880,728	1083.9	July-25-14	4.5	Geotechnical Geochemical
BH-T-14-09	Borehole	Tailings Facility	389,582	6,880,547	1082.1	July-25-14	4.3	Geotechnical Geochemical
BH-T-14-10	Borehole	Tailings Facility	389,525	6,880,558	1083.4	July-25-14	5.0	Geotechnical Geochemical
BH-T-14-11	Borehole	Tailings Facility	389,493	6,880,515	1090.8	July-25-14	3.9	Geotechnical
BH-T-14-12	Borehole	Tailings Facility	389,440	6,880,485	1100.0	July-24-14	4.5	Geotechnical
BH-T-14-13	Borehole	Tailings Facility	389,400	6,880,502	1098.0	July-24-14	3.0	Geotechnical
BH-T-14-14	Borehole	Tailings Facility	389,360	6,880,509	1098.0	July-24-14	5.0	Geotechnical
BH-T-14-15	Borehole	Tailings Facility	389,321	6,880,525	1097.2	July-24-14	5.0	Geotechnical
BH-T-14-16	Borehole	Tailings Facility	389,272	6,880,492	1100.1	July-24-14	5.0	Geotechnical
BH-T-14-17	Borehole	Tailings Facility	389,196	6,880,517	1098.7	July-24-14	4.3	Geotechnical
BH-T-14-18	Borehole	Tailings Facility	389,182	6,880,553	1099.5	July-24-14	5.0	Geotechnical Geochemical
BH-T-14-19	Borehole	Tailings Facility	389,139	6,880,615	1102.4	July-24-14	5.5	Geotechnical
BH-T-14-20	Borehole	Tailings Facility	389,428	6,880,490	1099.5	July-27-14	2.7	Geotechnical
BH-T-14-21	Borehole	Tailings Facility	389,379	6,880,504	1098.9	July-27-14	4.5	Geotechnical
TP-M-14-01	Test Pit	Mill Complex	388,032	6,880,960	1192.2	July-26-14	5.0	Geochemical
TP-M-14-02	Test Pit	Mill Complex	388,047	6,880,952	1191.6	July-26-14	4.0	Geochemical
TP-M-14-03	Test Pit	Mill Complex	388,011	6,880,996	1190.4	July-26-14	5.0	Geochemical
SED-DC-14-23	Grab Sample	Dome Cr	391,807	6,880,328	1006.2	July-22-14	Surface	Geochemical
SED-DC-14-24	Grab Sample	Dome Cr	391,756	6,880,306	1007.6	July-22-14	Surface	Geochemical
SED-DC-14-25	Grab Sample	Dome Cr	391,682	6,880,279	1010.2	July-22-14	Surface	Geochemical
SED-DC-14-26	Grab Sample	Dome Cr	391,590	6,880,305	1012.5	July-22-14	Surface	Geochemical
SED-DC-14-27	Grab Sample	Dome Cr	391,533	6,880,371	1014.1	July-22-14	Surface	Geochemical
SED-DC-14-28	Grab Sample	Dome Cr	391,490	6,880,380	1014.9	July-22-14	Surface	Geochemical
SED-DC-14-29	Grab Sample	Dome Cr	391,406	6,880,385	1016.3	July-22-14	Surface	Geochemical
SED-DC-14-30	Grab Sample	Dome Cr	391,356	6,880,406	1017.1	July-22-14	Surface	Geochemical
SED-DC-14-31	Grab Sample	Dome Cr	391,297	6,880,450	1018.8	July-22-14	Surface	Geochemical
SED-DC-14-32	Grab Sample	Dome Cr	391,235	6,880,479	1020.8	July-22-14	Surface	Geochemical
SED-DC-14-33	Grab Sample	Dome Cr	391,185	6,880,501	1022.4	July-22-14	Surface	Geochemical

Location ID	Type of Investigation	Investigation Location (UTM Zone 8, NAD83)				Summary of Work Completed		
		Site Area	Easting	Northing	Ground Elevation (m)	Date Completed	Depth of Investigation (m)	Lab Tests
SED-DC-14-34	Grab Sample	Dome Cr	391,071	6,880,471	1026.8	July-22-14	Surface	Geochemical
SED-DC-14-35	Grab Sample	Dome Cr	391,017	6,880,470	1027.3	July-22-14	Surface	Geochemical
SED-DC-14-36	Grab Sample	Dome Cr	390,991	6,880,447	1027.7	July-22-14	Surface	Geochemical
SED-DC-14-37	Grab Sample	Dome Cr	390,921	6,880,449	1029.3	July-22-14	Surface	Geochemical
SED-DC-14-38	Grab Sample	Dome Cr	390,859	6,880,446	1030.7	July-22-14	Surface	Geochemical
SED-DC-14-39	Grab Sample	Dome Cr	390,789	6,880,488	1033.1	July-22-14	Surface	Geochemical
SED-DC-14-40	Grab Sample	Dome Cr	390,741	6,880,488	1033.7	July-22-14	Surface	Geochemical
SED-DC-14-41	Grab Sample	Dome Cr	390,674	6,880,478	1035.6	July-22-14	Surface	Geochemical
SED-DC-14-42	Grab Sample	Dome Cr	390,679	6,880,501	1037.0	July-22-14	Surface	Geochemical
SED-DC-14-43	Grab Sample	Dome Cr	390,627	6,880,492	1036.8	July-22-14	Surface	Geochemical
SED-DC-14-44	Grab Sample	Dome Cr	390,568	6,880,521	1038.5	July-22-14	Surface	Geochemical
SED-DC-14-45	Grab Sample	Dome Cr	390,519	6,880,561	1040.1	July-22-14	Surface	Geochemical
SED-DC-14-46	Grab Sample	Dome Cr	390,476	6,880,576	1041.7	July-22-14	Surface	Geochemical
SED-DC-14-47	Grab Sample	Dome Cr	390,471	6,880,591	1043.5	July-22-14	Surface	Geochemical
SED-DC-14-48	Grab Sample	Dome Cr	390,406	6,880,589	1045.3	July-22-14	Surface	Geochemical
SED-DC-14-49	Grab Sample	Dome Cr	390,348	6,880,585	1047.2	July-22-14	Surface	Geochemical
SED-DC-14-50	Grab Sample	Dome Cr	390,268	6,880,579	1051.9	July-22-14	Surface	Geochemical
SED-DC-14-51	Grab Sample	Dome Cr	390,206	6,880,619	1051.7	July-22-14	Surface	Geochemical
SED-DC-14-52	Grab Sample	Dome Cr	390,116	6,880,617	1055.1	July-22-14	Surface	Geochemical
SED-DC-14-53	Grab Sample	Dome Cr	390,035	6,880,641	1057.2	July-22-14	Surface	Geochemical
SED-DC-14-54	Grab Sample	Dome Cr	389,967	6,880,641	1060.1	July-22-14	Surface	Geochemical
SED-DC-14-55	Grab Sample	Dome Cr	389,889	6,880,624	1063.0	July-22-14	Surface	Geochemical
SED-DC-14-56	Grab Sample	Dome Cr	389,063	6,880,749	1101.6	July-24-14	Surface	Geochemical
SED-DC-14-57	Grab Sample	Dome Cr	389,028	6,880,775	1104.2	July-24-14	Surface	Geochemical
SED-DC-14-58	Grab Sample	Dome Cr	388,989	6,880,789	1105.8	July-24-14	Surface	Geochemical
SED-DC-14-59	Grab Sample	Dome Cr	388,947	6,880,806	1107.6	July-24-14	Surface	Geochemical
SED-DC-14-60	Grab Sample	Dome Cr	388,915	6,880,817	1109.4	July-24-14	Surface	Geochemical
SED-DC-14-61	Grab Sample	Dome Cr	388,888	6,880,827	1110.6	July-24-14	Surface	Geochemical
SED-DC-14-62	Grab Sample	Dome Cr	388,849	6,880,828	1112.7	July-24-14	Surface	Geochemical
SED-DC-14-63	Grab Sample	Dome Cr	388,723	6,880,837	1119.3	July-24-14	Surface	Geochemical
SED-DC-14-64	Grab Sample	Dome Cr	388,723	6,880,838	1119.4	July-24-14	Surface	Geochemical
SED-DC-14-65	Grab Sample	Dome Cr	388,656	6,880,864	1124.6	July-24-14	Surface	Geochemical
SED-DC-14-66	Grab Sample	Dome Cr	388,599	6,880,888	1129.1	July-24-14	Surface	Geochemical
SED-DC-14-67	Grab Sample	Dome Cr	388,545	6,880,922	1134.1	July-24-14	Surface	Geochemical
SED-DC-14-68	Grab Sample	Dome Cr	388,490	6,880,959	1138.8	July-24-14	Surface	Geochemical
SED-DC-14-69	Grab Sample	Dome Cr	388,417	6,880,973	1142.3	July-24-14	Surface	Geochemical
SED-DC-14-70	Grab Sample	Dome Cr	388,335	6,880,941	1149.5	July-24-14	Surface	Geochemical
SED-DC-14-71	Grab Sample	Dome Cr	388,286	6,880,956	1151.8	July-24-14	Surface	Geochemical
SED-DC-14-72	Grab Sample	Dome Cr	388,244	6,881,001	1157.9	July-24-14	Surface	Geochemical
SED-DC-14-73	Grab Sample	Dome Cr	388,245	6,880,999	1157.8	July-24-14	Surface	Geochemical
SED-DC-14-74	Grab Sample	Dome Cr	388,196	6,881,050	1163.3	July-24-14	Surface	Geochemical
SED-DC-14-75	Grab Sample	Dome Cr	388,110	6,881,045	1167.5	July-24-14	Surface	Geochemical
SED-DC-14-76	Grab Sample	Dome Cr	388,033	6,881,116	1177.8	July-24-14	Surface	Geochemical
SED-DC-14-77	Grab Sample	Dome Cr	387,977	6,881,123	1184.4	July-24-14	Surface	Geochemical

Mount Nansen Remediation Project
2014 Site Investigation Locations

Location ID	Type of Investigation	Investigation Location (UTM Zone 8, NAD83)				Summary of Work Completed		
		Site Area	Easting	Northing	Ground Elevation (m)	Date Completed	Depth of Investigation (m)	Lab Tests
SED-DC-14-78	Grab Sample	Dome Cr	387,903	6,881,120	1193.1	July-24-14	Surface	Geochemical
SED-DC-14-79	Grab Sample	Dome Cr	387,836	6,881,129	1196.9	July-24-14	Surface	Geochemical
SED-DC-14-80	Grab Sample	Dome Cr	387,673	6,881,123	1219.3	July-24-14	Surface	Geochemical
SED-DC-14-81	Grab Sample	Dome Cr	389,855	6,880,615	1064.6	July-25-14	Surface	Geochemical
SED-DC-14-82	Grab Sample	Dome Cr	389,838	6,880,586	1065.0	July-25-14	Surface	Geochemical
SED-DC-14-83	Grab Sample	Dome Cr	389,793	6,880,571	1066.8	July-25-14	Surface	Geochemical
SED-DC-14-84	Grab Sample	Dome Cr	389,740	6,880,576	1069.3	July-25-14	Surface	Geochemical
SED-DC-14-85	Grab Sample	Dome Cr	389,729	6,880,565	1069.7	July-25-14	Surface	Geochemical
SED-DC-14-86	Grab Sample	Dome Cr	389,672	6,880,563	1072.1	July-25-14	Surface	Geochemical
SED-DC-14-87	Grab Sample	Dome Cr	389,670	6,880,560	1072.4	July-25-14	Surface	Geochemical
SED-DC-14-88	Grab Sample	Dome Cr	389,611	6,880,593	1074.4	July-25-14	Surface	Geochemical
SED-VIC-14-22	Grab Sample	Victoria Cr	391,829	6,880,385	1005.3	July-22-14	Surface	Geochemical
SED-VIC-14-23	Grab Sample	Victoria Cr	391,797	6,880,398	1006.2	July-22-14	Surface	Geochemical
Pit Pond Sample	Grab Sample	Open Pit	388,920	6,881,606	1084.0	July-25-14	0.3	Water
Seepage Pond Sample	Grab Sample	Seepage Pond	389,614	6,880,594	1074.2	July-24-14	Discharge Pipe	Water
Tailings Pond Sample	Grab Sample	Tailings Facility	389,372	6,880,659	1096.0	July-23-14	0.3	Water

Appendix 3B – Daily Field Reports

DAILY FIELD REPORT

Project Mount Nansen Remediation Project - 2014 Site Investigation Program

Prepared By: Hamid Yousefbeigi

Date July 21, 2014 Project Number: VM00605J

Shift: Daytime 07:00 – 19:00 on Report Reference: MNDR14-0721
Weather: Low/High 11°C/27°C – Sunny with cloudy periods

A – SUMMARY OF WORK ITEMS OR MILESTONES ACCOMPLISHED

- AMEC (Hamid Yousefbeigi) and AE (Nicole Jacques and Carrie Nadeau) arrived on site.
- Water and soil sampling equipments were delivered to site.
- AMEC/AE completed Site Safety Orientations.

B – ISSUES OF CONCERNS

- No items of concern

C – SUMMARY OF PROGRESS AND COST TRACKING INFORMATION

Staff	Activity	Hours
Hamid Yousefbeigi	Travel time/pickup supplies and food	12
Nicole Jacques	Shopping for SI supplies/ travel time/supplies and food	8
Carrie Nadeau	Travel time/pickup supplies and food	12

D – PLAN FORWARD

- AMEC to conduct sedimentation sampling in Dome creek.
- AE to conduct ecology data collection in Dome creek.
- AE to download data logger.
- AAM staff to help with sedimentation sampling in Dome Creek and downloading data logger.

DAILY FIELD REPORT

Project Mount Nansen Remediation Project - 2014 Site Investigation Program

Prepared By: Hamid Yousefbeigi

Date July 22, 2014 Project Number: VM00605J

Shift: Daytime 07:00 – 19:00 on Report Reference: MNDR14-0722
Weather: Low/High 3°C/27°C – Mostly Sunny

A – SUMMARY OF WORK ITEMS OR MILESTONES ACCOMPLISHED

- AMEC (Hamid Yousefbeigi) conducted sedimentation sampling in Dome creek starting from Victoria creek to approximately 250 m downstream of TSF. Samples were generally collected at approximately 50 m regular intervals along Dome Creek. Samples were labelled, coordinates recorded using handheld GPS, and sample locations were photographed. In addition, samples were collected from three blackened vegetation areas noticed based on visual observations. Sediments samples were placed in buckets filled with ice pack and were transported to camp fridge at mid day and at the end of the day.
- AE (Carrie Nadeau) conducted ecology data collection in Dome creek from Victoria creek to 250 m downstream of TSF. Soil and vegetation samples were taken at 3 vegetation sites where blackened roots of dead patches of willow and scrub birch were observed. General ecology data collection included:
  - Dominant riparian vegetation species;
  - General creek morphology, including substrate description
  - Reclamation notes including sources for organic vegetation and stability concerns of permafrost.
  - Photodocumentation of each site including creek substrate and creek banks, sloughing and unstable banks where present, Dome Creek Valley upstream and downstream, riparian vegetation understory and overstory, and detailed willow photos where able.
- Jeff Moore of YG-AAM helped to collect the sediment sampling.
- AE (Nicole Jacques) and Luca Poroni (of YG-AAM) completed the data logger downloads.
- Data collection started with high priority locations (in the open pit) and worked to those noted as lower priorities (around the tailings pond).

B – ISSUES OF CONCERNS

Issues raised by Nicole during data logger downloading program:

- The surface water elevation of the Open Pit was not captured as there is no staff gauge or survey point in the Open Pit water. Instead, we found a survey pin from Underhill Geomatics 1981. We used a level and rod to survey the elevation difference between the survey pin and the Open Pit's water level. The Back Shot (from the survey point to the pin) was 0.78 m. The Fore Shot (from the survey point to the water level) was 2.99 m. A GPS reading of the survey point indicated it is located at 08V 0388,938; 6,881,558.

- CH-P-13-03's monument is labelled as CH-P-13-02. We don't believe this is CH-P-13-02 as another well had this label and matched with the document GPS coordinates. It seems to have been a mistake.
- CH-P-13-05/50m was a small width well, Waterra containing water was removed from the well before we could measure the water level. Most of the water drained from the Waterra as sand was stuck in the footvalve. Despite this, there is not an accurate reading of the water level. I replaced the Waterra in the pipe to reduce potential contamination of the Waterra

Issues raised by Hamid during Dome Creek sampling program:

- DES to consider accepting using hiking boots vs steel toed boots for some of the 2014 SI program (i.e., reconnaissance of the trenches) as it will be a safety concern to use inappropriate footwear.
- DES also to consider inclusion of speed limits onsite and left hand or right hand driving rules on Mount Nansen site in their safety orientation package.

C – SUMMARY OF PROGRESS AND COST TRACKING INFORMATION

Staff	Activity	Hours
Hamid Yousefbeigi	Dome Creek Sediment sampling	16
Nicole Jacques	Download data logger information	12
Carrie Nadeau	Dome Creek collect ecology data	12

D – PLAN FORWARD

- AMEC to complete sedimentation sampling, downstream and upstream of Dome creek.
- AE to complete ecology data collection in Dome creek.
- AMEC/AE start looking at the trenches, if there is enough time in the afternoon.
- AE to sample water from monitoring wells at TSF.
- AAM staff to help with sedimentation sampling in Dome Creek and water sampling.
- AMEC (Dan) to arrive on site and complete site safety orientation in the evening.
- Kryotek to arrive and complete the site safety orientation in the evening.

E – SAFETY REPORTING

Tailgate Meeting: no (yes/no) (minutes are kept on file at site)

Near Misses: no (yes/no) Description: ______
(if yes, complete a near miss report)

Property Damage Incident: no (yes/no) Description: ______
(if yes, complete appropriate incident report(s))

First Aide Incident: no (yes/no) Description: ______

(if yes, complete appropriate report(s))

F – DAILY ACTIVITIES PHOTOGRAPHS

Photo 1: End portion of the Dome Creek where it enters into the Victoria Creek.

Photo 2: Samples were generally collected at approximately 50 m regular intervals along Dome Creek

Photo 3 and 4: samples were collected from three blackened vegetation areas noticed based on visual observations.

Photo 5: a view of the leveloger cable running "underground" horizontally towards the Open Pit water level.

Photo 6: Survey Marker - Open Pit is the survey marker we may be able to get an elevation from to back calculate the elevation of the open pit

DAILY FIELD REPORT

Project Mount Nansen Remediation Project - 2014 Site Investigation Program

Prepared By: Hamid Yousefbeigi

Date July 23, 2014 Project Number: VM00605J.03.301

Shift: Daytime 07:00 – 19:00 on Report Reference: MNDR14-0723
Weather: Low/High 5°C/25°C – Mostly cloudy with sunny breaks

A – SUMMARY OF WORK ITEMS OR MILESTONES ACCOMPLISHED

- Trenches and all access road within the sharpie line boundary provided by AAM were labelled by AMEC for identification purposes to be used by AMEC/AE/AAM throughout the 2014 SI program as well as for reporting purposes. Trenches were divided into four sections, south, west north and pit areas, having Camp as a dividing point. For example, trenches at south side of the Mill and Camp were labelled STn where S is for South, T is for Trench and n is of the trench number (i.e., ST1, ST2, etc.). A photo of the labels is attached to this daily report for reference.
- AMEC/AE/AAM conducted trench reconnaissance of trench number ST3 and ST4.
- AE/AAM continued trench reconnaissance in the after noon for ST1, ST2, ST5 to ST9, inclusiv.
- Generally the trenches were assessed for the following:
    - Erosion
    - Wildlife Impacts and Use
    - Assess priority/feasibility for Reclamation
    - Access
- 40 GPS locations were taken, at each site the following was recorded:
    - Slope
    - Aspect
    - Wildlife sign
    - Ability for wildlife to transverse the trench
    - Erosion observations
    - Feasibility for reclamation
    - Additional notes
- At this time Trenches 3-5 (sections east of the upper access road) are tentatively recommended for reclamation; further study will need to be completed on the remaining trenches that were analyzed today.
- Sediment samples collected yesterday from Dome Creek were shipped to ALS in Whitehorse. (see attached Chain of Custody form).
- Sedimentation sampling in Dome creek was cancelled for today due to 72 hour waiting time limit for testing sedimentations. Samples will be collected tomorrow so they can be shipped on Friday.
- AE (Nicole Jacques) and Luca Poloni (of YG-AAM) collected tailings pore water samples from MW09-04 and MW09-03 and collected Tailings Pond water sample. The samples were collected using a peristaltic pump (at an approximate rate of 0.6 L/min). At each of these monitoring locations we filled a 20L pail to approximately 1” below their brims (not

completely full as they are to be shipped via air to Montreal) and four laboratory supplied bottles (cyanide, ammonia, dissolved and total each filtered and preserved as per laboratory program requirements).

- AMEC located all boreholes and staked them so they are ready for tomorrow's drilling.
- Kryotek arrived on site at 6:50PM. Jim conducted site safety training and signed AMEC safety forms.
- Daniel Kennedy from AMEC Arrive at 8:15 PM.

B – ISSUES OF CONCERNS

Issues raised by Nicole during water sampling:

- The tailings pond pore water pumping went slow (0.6 L/min). This produced some concern over our allotted time for this field work.

- When we purged a second well (MW09-03) with a bailer (after purging until parameters stabilized and less than thee well volumes) we observed noticeable colour (orange) remained in the water. We then attached the pump and purged the same well (we found the water colour immediately cleared up). We continued purging until the parameters stabilized. We sampled from the peristaltic pump.

C – SUMMARY OF PROGRESS AND COST TRACKING INFORMATION

Staff	Activity	Hours
Hamid Yousefbeigi	See summary of activities	15
Nicole Jacques	See summary of activities	12
Carrie Nadeau	See summary of activities	12
Daniel Kennedy	Site trip/supply	12
Kryotek (Jim and Astrid)	Site trip/supply	0

D – PLAN FORWARD

- AMEC/AAM to complete sedimentation sampling, upstream of Dome creek.
- AE to continue trench reconnaissance with Josée.
- AE to complete the porewater sampling of MW09-01, 02 and 07 as well as water sampling from the Open Pit and seepage pond.
- AMEC (Dan) and Kryotek (Astrid) to complete safety indoctrination in the morning.
- AMEC (Dan) and Kryotek to start drilling in the TSF areas.

E – SAFETY REPORTING

Tailgate Meeting: yes (yes/no) (minutes are kept on file at site)

Near Misses: no (yes/no) Description: ______
(if yes, complete a near miss report)

Property Damage Incident: no (yes/no) Description: ______
(if yes, complete appropriate incident report(s))

First Aide Incident: no (yes/no) Description: ______
(if yes, complete appropriate report(s))

F – DAILY ACTIVITIES PHOTOGRAPHS

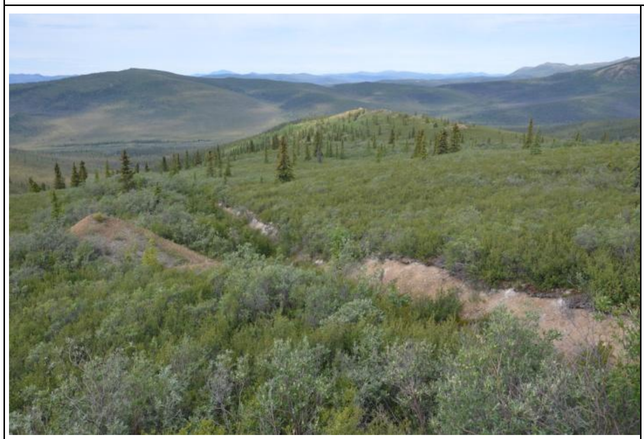
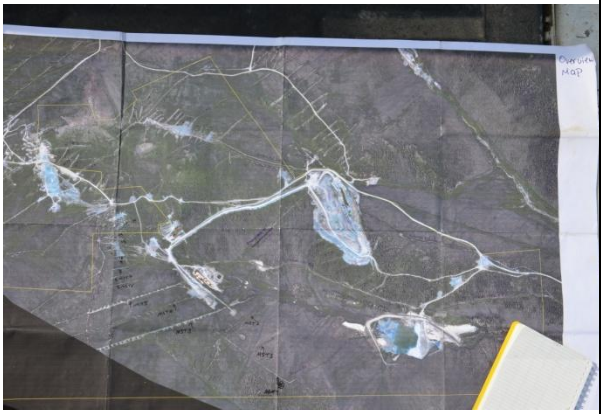


Photo 1: Looking west at South Trench #4 (ST4).	Photo 2: Looking east at South Trench # 3 (ST3).
	
Photo 3:. Looking east at South Trench # 3 (ST3).	Photo 4: Trenches and roads labelled within the Sharpie line provided by AAM.
	
Photo 5: Sampling of MW09-04 (MW09-03 is on the right)	Photo 6: Sampling of the Tailings Pond using EDI's boat.

Subcontractors: Kryotek Drilling – Jim Coates
(Refer to subcontractor invoice)

DAILY FIELD REPORT

Project Mount Nansen Remediation Project - 2014 Site Investigation Program

Prepared By: Hamid Yousefbeigi

Date July 24, 2014 Project Number: VM00605J.03.301

Shift: Daytime 07:00 – 19:00 on Report Reference: MNDR14-0724
Weather: Low/High 6ºC/21ºC – Mostly cloudy

A – SUMMARY OF WORK ITEMS OR MILESTONES ACCOMPLISHED

- AE and AAM completed the Trench exploration assessment. AE and AAM walked trenches in the southern, western and northern sections of the property, and the trenches below the waste dump, 34 GPS locations were recorded. Trench assessment and data collection was the same as collected July 23.
- Reclamation priorities were noted and summarized in the field notes. All the trenches within the property were assigned numbers and recommended potential-treatment or no-treatment rationale will be discussed in detail during the 60% design reporting stage.
- AE and AAM also assessed the following sites for potential reclamation recommendations:
    - Pony Creek Audit
    - Powerline Road
    - Victoria Creek Well location
    - Brown McDade Waste Dump
    - Mill Site
    - Mill Storage Ponds
    - Dome Creek Channel adjacent to the Mill Site
    - Dome Creek Upstream of the Taillings Pond
    - Interceptor Ditch and potential local sources for edimentation
    - Camp and Cookhouse Site
- Huestis Audit area and disturbed sites above the audit Sites with historical vegetation trials were also visited and assessed.
- Drilling started at the TSF area and total of 8 boreholes were completed today (BH-T-14-12 to BH-T-14-19).
- Sediment samples collected from Dome Creek between TSF and Mill area today. The samples will be shipped to ALS in Whitehorse tomorrow to meet the 72 hour holding time.
- AE/AAM collected two completed samples today. The first was collected from the Seepage Pond effluent pipe. The second was collected from MW09-02, using the low flow pump method. At each of these locations we filled a 20L pail to approximately 1” below their brims (not completely full as they are to be shipped via air to Montreal) and four laboratory supplied bottles (cyanide, ammonia, dissolved and total each filtered and preserved as per laboratory requirements).
- We attempted to collect a water samples from MW09-01, it was dry. We also attempted to collect a sample from MW09-07, this well contained approximately 1m of water. We pumped the pump on the lowest speed, but it still drew the well level down to 0.5m. We shut off the pump so we were not sampling sediment (at this time, we had been pumping

for approximately 1.5 hrs. and we had collected 1-2 L of water). We allowed the well to recharge for an additional 1.5 hrs., in that time it was not quite recharged.

- We collected the leachate bin samples: Waste Rock, Ore, Tailings and Organic and Tailings Sand. For each of these, we filled five bottles (general, total metals, dissolved metals, total mercury and dissolved mercury) and filtered and preserved them as per laboratory requirements. There was no visible water in the Rock and Organic bin. When we tried to get water out of the tube, none came out.

B – ISSUES OF CONCERNS

Issues raised by Nicole during water sampling:

- There was insufficient water in MW09-01 and MW09-07 (tailings pond pore water wells)

C – SUMMARY OF PROGRESS AND COST TRACKING INFORMATION

Staff	Activity	Hours
Hamid Yousefbeigi	See summary of activities	14
Nicole Jacques	See summary of activities	12
Carrie Nadeau	See summary of activities	12
Daniel Kennedy	Site trip/supply	12
Kryotek (Jim and Astrid)	Drilling	10

D – PLAN FORWARD

- AMEC/AE to complete sedimentation sampling 250 m downstream of Dome creek.
- AMEC to revisit some of the trenches with AE.
- AE to complete final water sampling for the open pit pond and remaining water wells.
- AMEC and Kryotek to continue with drilling.
- AE to leave the site and drop off soil and water samples at Whitehorse.

E – SAFETY REPORTING

Tailgate Meeting: yes (yes/no) (minutes are kept on file at site)

Near Misses: no (yes/no) Description: ______
(if yes, complete a near miss report)

Property Damage Incident: no (yes/no) Description: ______
(if yes, complete appropriate incident report(s))

First Aide Incident: no (yes/no) Description: ______
(if yes, complete appropriate report(s))

F – DAILY ACTIVITIES PHOTOGRAPHS

Photo 1: Section of the south trenches above the Huestis Audit.

Photo 2: Small section of erosion upslope of the Huestis Audit.

Photo 3:. Seepage Pond Discharge Sampling

Photo 4: Leachate Bin Water Sampling

Photo 5: Drilling started today and 8 BH were completed.

Photo 6: Hot water added five times, periodically throughout the day, to the frozen MW-GLL07-01.

DAILY FIELD REPORT

Project Mount Nansen Remediation Project - 2014 Site Investigation Program

Prepared By: Hamid Yousefbeigi

Date July 25, 2014 Project Number: VM00605J.03.301

Shift: Daytime 07:00 – 19:00 on Report Reference: MNDR14-0725
Weather: Low/High 9°C/20°C – Mostly cloudy

A – SUMMARY OF WORK ITEMS OR MILESTONES ACCOMPLISHED

- Safety meeting with AMEC, AE, AAM, and Denison at 07:00 AM in the Bunk House.
- AE and AAM completed sampling Open Pit pond water. The sampling included collecting 2 X 20 L plastic pails via pump, as well as 4 analytical samples, including total, dissolved, cyanide, and ammonia. All sampling within the pond was completed by 9:55 AM (photo #1).
- AE and AAM completed sampling of monitoring well MW09-07 within the Tailings Pond. Only a small quantity of water could be extracted. In terms of the analytical data, we were able to retrieve a sample for the Total, Dissolved, and Ammonia samples however, due to low recharge, we were unable to extract one for the cyanide. After Nicole followed up with Paul Morton, he proposed that the remaining water within the pail that was extracted from the well be used for a cyanide sample. This was performed (photo #2).
- AMEC/AE/AAM completed sediment sampling in the remaining 250 m of the Dome Creek downstream of TSF.
- AE requested AMEC to review some of the trenches for further assessment. AE/AMEC walked trenches in the southern and western sections of the property.
- Drilling continued at the TSF area and total of 7 boreholes were drilled as per the following:
    - BH-T-14-7, Completion depth 5m
    - BH-T-14-6, Completion depth 4.6m
    - BH-T-14-8 Completion depth 4.5m
    - BH-T-14-4 Completion depth 4.3m/auger refusal
    - BH-T-14-10 Completion depth 1.7m, slow hard drilling, auger refusal at 1.7m, attempt tomorrow with Talon.
    - BH-T-14-9 Completion depth 4.3 m, auger refusal at 4.3 m, moved hole 3 times to reach 4.3m.
    - BH-T-14-11 Completion depth 3.9m, switched to Talon drilling at 1.2 m to reach 3.9 m.
- All sediment samples and water samples collected from the SI program were shipped to Whitehorse. The sediment samples were dropped off at ALS in Whitehorse (note that the 72 hour holding time was lifted, and 7 day holding time used in accordance with BC MOE.
- Water samples were dropped of at AGAT lab/depot for storage in their fridge and the smaller samples will be shipped to AGAT lab in Burnaby tomorrow.
- AMEC completed visual inspection and photographed the open pit to assist with pit stability analysis.

B – ISSUES OF CONCERNS

Issues raised by Nicole during water sampling:

- There was insufficient water in MW09-07 (tailings pond pore water well)

C – SUMMARY OF PROGRESS AND COST TRACKING INFORMATION

Staff	Activity	Hours
Hamid Yousefbeigi	See summary of activities	14
Nicole Jacques	See summary of activities	12
Carrie Nadeau	See summary of activities	12
Daniel Kennedy	Drilling	12
Kryotek (Jim and Astrid)	Drilling	10

D – PLAN FORWARD

- AMEC/AAM will start site reconnaissance.
- AMEC to complete test pit program at the dump area at the Mill site.
- AMEC and Kryotek to continue with the drilling.

E – SAFETY REPORTING

Tailgate Meeting: yes (yes/no) (minutes are kept on file at site)

Near Misses: no (yes/no) Description: ________
(if yes, complete a near miss report)

Property Damage Incident: no (yes/no) Description: ________
(if yes, complete appropriate incident report(s))

First Aide Incident: no (yes/no) Description: ________
(if yes, complete appropriate report(s))

F – DAILY ACTIVITIES PHOTOGRAPHS

Photo 1: Nicole sampling water within the McDade Open Pit.

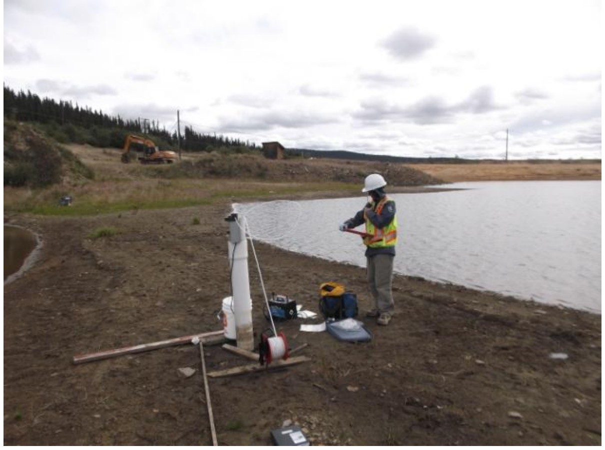


Photo 2: Looking Northeast - Nicole Sampling water from Monitoring Well MW09-07.

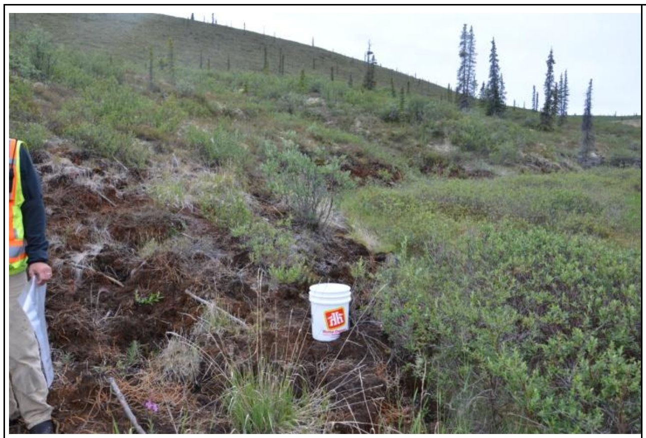


Photo 3:. In addition to the Dome Creek sediments, soils at the blackened vegetation area were also sampled.

Photo 4: AMEC/AE completed trench reconnaissance.

Photo 5: All soil and water samples that shipped at 13:30, arrived at 17:05 in Whitehorse.

Photo 6: Hot steam was forced down the frozen monitoring well GLL07-01, but only melted about 0.3 m.

Photo 7: Open pit wall conditions were photographed and partial reconnaissance made to assist with pit stability analysis. Note Mill and camp in the background.

DAILY FIELD REPORT

Project Mount Nansen Remediation Project - 2014 Site Investigation Program

Prepared By: Hamid Yousefbeigi

Date July 26, 2014 Project Number: VM00605J.03.301

Shift: Daytime 07:00 – 19:00 on Report Reference: MNDR14-0726
Weather: Low/High 3°C/20°C – Mostly cloudy with sunny periods & light rain in the evening

A – SUMMARY OF WORK ITEMS OR MILESTONES ACCOMPLISHED

- Daily general meeting and tailgate meetings completed in the morning with AMEC, AAM, Kryotek and Denison at 07:00 AM in the Bunk House.
- Drilling continued at the TSF, Mill and Camp areas and total of 11 boreholes were drilled. All boreholes at the Mill and Camp were terminated in shallow bedrock before reaching the 5 m depth.
- AMEC completed visual inspection and conducted field reconnaissance at the tailing facility area.
- We were able to thaw out the frozen data logger in MW GLL07-01 after several attempt using a steamer and have downloaded the data. The data logger doesn't appear to be damaged except for the string, which appears to be frayed.
- AMEC conducted three test pits in the vicinity of the landfill at the Mill site and collected several soil samples for analytical testing.

B – ISSUES OF CONCERNS

Issues or concerns:

There has been some sort of stomach flu (my interpretation) going around the camp and so far four people (Hamid with AMEC, Karen with DES, Astrid with Kryotek and Dan with AMEC) have had the symptoms in the last few days. The symptoms include vomiting, and diarrhea, low-grade fever, lost of appetite, and reduced energy level.

C – SUMMARY OF PROGRESS AND COST TRACKING INFORMATION

Staff	Activity	Hours
Hamid Yousefbeigi	See summary of activities	14
Daniel Kennedy	Drilling	12
Kryotek (Jim and Astrid)	Drilling	10

D – PLAN FORWARD

- AMEC/AAM will continue with site reconnaissance at the Mill, waste rock and pit areas.
- AMEC to complete test pit program at the dump area at the Mill site.
- AMEC and Kryotek to continue and complete the drilling program.

E – SAFETY REPORTING

Tailgate Meeting: yes (yes/no) (minutes are kept on file at site)

Near Misses: no (yes/no) Description: ______
(if yes, complete a near miss report)

Property Damage Incident: no (yes/no) Description: ______
(if yes, complete appropriate incident report(s))

First Aide Incident: no (yes/no) Description: ______
(if yes, complete appropriate report(s))

F – DAILY ACTIVITIES PHOTOGRAPHS

	
Photo 1: Drilling continued in the TSF, Mill and Camp areas.	Photo 2: Drilling, using the above bit, in the Mill and Camp area terminated in shallow bed rock.
	
Photo 3: Excavation of the dump at the Mill area completed.	Photo 4: Photo of an exposed section of the dump area at the Mill.

DAILY FIELD REPORT

Project Mount Nansen Remediation Project - 2014 Site Investigation Program

Prepared By: Hamid Yousefbeigi

Date July 27, 2014 Project Number: VM00605J.03.301

Shift: Daytime 07:00 – 19:00 on Report Reference: MNDR14-0727

Weather: Low/High 6°C/23°C – Mostly cloudy with sunny periods

A – SUMMARY OF WORK ITEMS OR MILESTONES ACCOMPLISHED

- Daily general meeting and tailgate meetings completed in the morning with AMEC, AAM, Kryotek and Denison at 07:00 AM in the Bunk House.
- Drilling continued at the TSF in the morning and total of 5 boreholes were drilled. All drilling has now been completed on site, and details of drilling today is below:

BH-T-14-02, Completion depth 4.6m
BH-T-14-01, Completion depth 4.6m
BH-T-14-20 Completion depth 2.7m/auger refusal
BH-T-14-21 Completion depth 4.6m/auger refusal
Re-Drilling with Talon BH-T-14-10 Completion Depth 5m/auger refusal

- AMEC completed field reconnaissance at the tailings facility, Mill and waste rock areas.
- Several potential construction materials borrow source were visually inspected during the field reconnaissance, including an area near Victoria Creek as well as an area between Dome Creek and Power Line Road where a small hand dug test pit was completed to assess the materials.
- Kryotek staff: Jim Coates and Astrid Grawehr left the camp at 2:00 pm.
- AAM staff: Josée Perron, Jeff Moore, and Luca Poloni left the site at 4:00 pm.

B – ISSUES OF CONCERNS

- None

C – SUMMARY OF PROGRESS AND COST TRACKING INFORMATION

Staff	Activity	Hours
Hamid Yousefbeigi	See summary of activities	14
Daniel Kennedy	See summary of activities	12
Kryotek (Jim and Astrid)	Drilling	10

D – PLAN FORWARD

- AMEC will leave the camp at 7:00 am and drop off soil samples collected from the test pit program to ALS in Whitehorse.
- AMEC will also arrange to ship the soil samples collected during the 2014 SI program to AMEC's Surrey lab from Whitehorse via FedEx.

- Return rental trucks to K&K truck rental and have lunch.
- AMEC staff: Hamid Yousefbeigi and Daniel Kennedy to depart Whitehorse at 2:20 pm and arrive in Vancouver at 4:45 pm.

E – SAFETY REPORTING

Tailgate Meeting: yes (yes/no) (minutes are kept on file at site)

Near Misses: no (yes/no) Description: ______
(if yes, complete a near miss report)

Property Damage Incident: no (yes/no) Description: ______
(if yes, complete appropriate incident report(s))

First Aide Incident: no (yes/no) Description: ______
(if yes, complete appropriate report(s))

F – DAILY ACTIVITIES PHOTOGRAPHS

Photo 1: Last remaining four boreholes were drilled at TSF that completed the 2014 SI drilling program.

Photo 2: Near Victoria Creek, potential construction materials borrow source visually inspected.

Photo 3: hand dug an area between Dome Creek and power line road. High potential borrow pit.

Photo 4: Looking at the waste rock fill near open pit.
Field reconnaissance completed at Mill/pit & TSF areas.

DAILY FIELD REPORT

Project Mount Nansen Remediation Project - 2014 Site Investigation Program

Prepared By: Hamid Yousefbeigi

Date July 28, 2014 Project Number: VM00605J.03.301

Shift: Daytime 07:00 – 19:00 Report Reference: MNDR14-0728
Weather: Low/High 3^{o}C/22^{o}C – Sunny with cloudy periods

A – SUMMARY OF WORK ITEMS OR MILESTONES ACCOMPLISHED

- AMEC staff conducted the last daily tailgate meetings in the morning and prior to leaving the site at 07:00 AM in the Bunk House.
- AMEC left the site at 7:45 to Whitehorse.
- Soil samples from the test pitting was dropped off at ALS in Whitehorse
- Total of 7 bucket of soil samples from the drilling program was dropped off at UPS store at 108 Elliot St. in Whitehorse to be shipped to AMEC Surrey office.
- Returned rental trucks as per K&K instructions.
- Completed the AMEC internal check-in procedure (TigerTel).

B – ISSUES OF CONCERNS

- None

C – SUMMARY OF PROGRESS AND COST TRACKING INFORMATION

Staff	Activity	Hours
Hamid Yousefbeigi	See summary of activities	12
Daniel Kennedy	Site trip/supply	12

D – PLAN FORWARD

- AMEC to complete the SI program report

E – SAFETY REPORTING

Tailgate Meeting: yes (yes/no) (minutes are kept on file at site)

Near Misses: no (yes/no) Description: ______
(if yes, complete a near miss report)

Property Damage Incident: no (yes/no) Description: ______
(if yes, complete appropriate incident report(s))

First Aide Incident: no (yes/no) Description: ______
(if yes, complete appropriate report(s))

Appendix 3C – SI Program Photographs

Mount Nansen 2014 Site Investigation

LIST OF PHOTOS

LIST OF PHOTOS

Drilling Photos

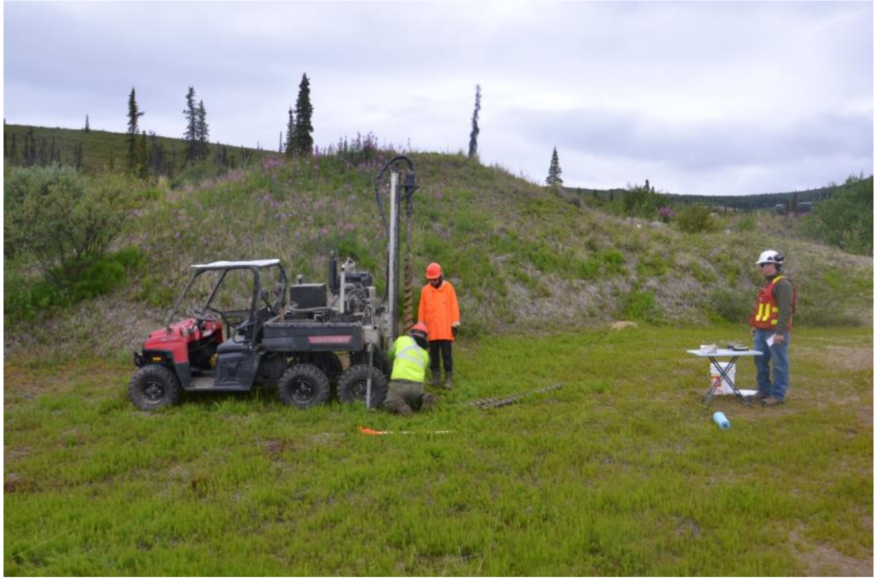


PHOTO 1: First drilling set up at BH-T-14-19, July 24, 2014.

PHOTO 2: Subsurface soil cuttings on soild stem auger at BH-T14-19, July 24, 2014.

AMEC Environment & Infrastructure

Energy, Mines and Resources

Government of Yukon - AAM
Mount Nansen 2014 Site Investigation
Selected Photographs

Logged by: HY	Scale: NTS	Date: Sept.2014	Project: VM00605J	Page 1

PHOTO 3: Auger drilling in undisturbed area at BH-T-14-03, July 26, 2014.

PHOTO 4: Drilling using Talon equipment at BH-T-14-11, July 25, 2014.

Test Pit Photos

PHOTO 5: Test pit TP-M-14-02, July 26, 2014.

PHOTO 6: Test pit TP-M-14-03, July 26, 2014.

AMEC Environment & Infrastructure

Energy, Mines and Resources

Government of Yukon - AAM
Mount Nansen 2014 Site Investigation
Selected Photographs

Logged by: HY	Scale: NTS	Date: Sept 2014	Project: VM00605J	Page 3

Site Trench Photos

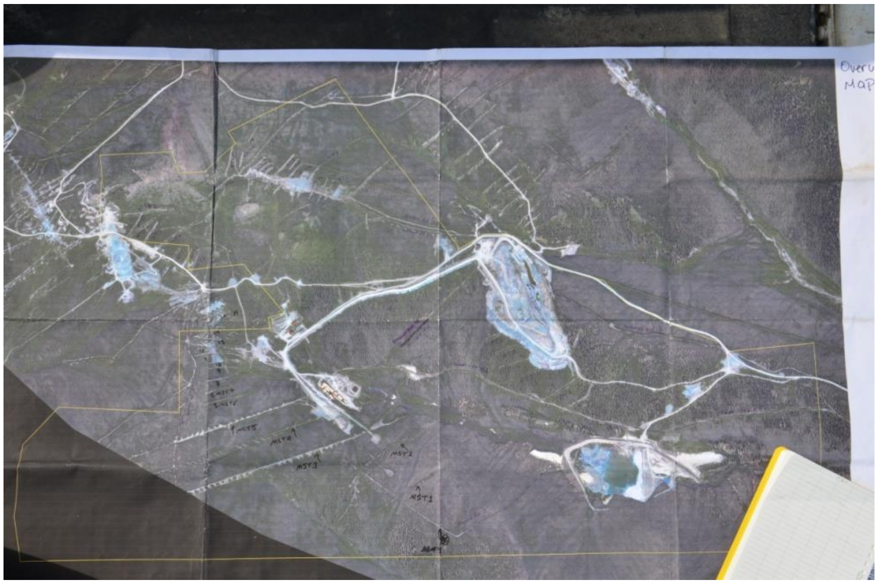


PHOTO 7: Trenches and access road were labelled prior to trench reconnaissance, July 23, 2014.

PHOTO 8: Looking south west at trench ST3, July 23, 2014.

PHOTO 9: Looking north east in trench ST3, July 23, 2014.

PHOTO 10: Looking north east from access road A at trench ST4, July 23, 2014.

Water Sampling Photos (Data Logger)

PHOTO 11: Downloading data logger at Monitoring Wells CH-P-13-05 & CH-P-13-06, July 22, 2014.

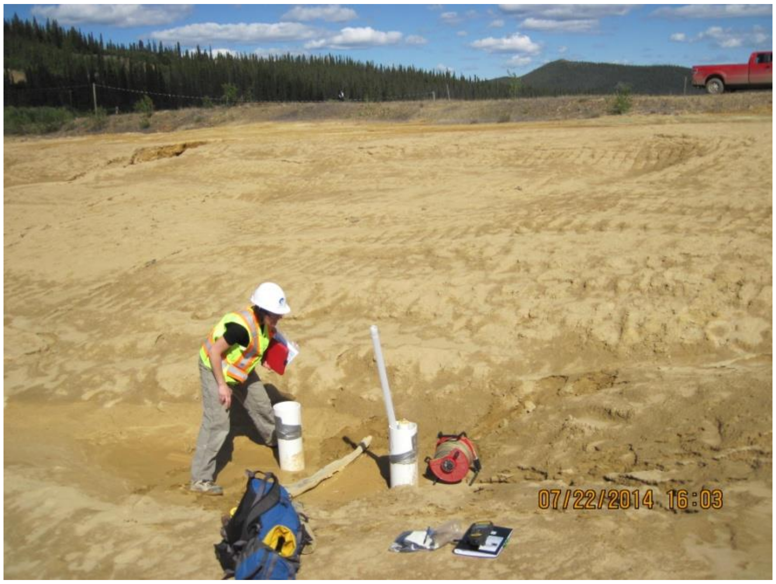


PHOTO 12: Downloading data logger at Monitoring Wells MW09-03 & MW09-04, July 22, 2014.

Water Sampling Photos (Leachate Bins)

PHOTO 13: View of the Leachate bins, July 24, 2014.

PHOTO 14: Labelling small sample containers for analytical testing, July 24, 2014.

Water Sampling Photos (Pond Water)

PHOTO 15: TSF pond water sampling, July 25, 2014.

PHOTO 16: McDade Pit pond water sampling, July 25, 2014.

Dome Creek Sediment Sampling Photos

PHOTO 17: Dome Creek sediment sampling collected for analytical testing, July 22, 2014.

PHOTO 18: Sediment samples collected at approx. 50 m intervals, July 25, 2014.

AMEC Environment & Infrastructure Energy, Mines and Resources	Government of Yukon - AAM Mount Nansen 2014 Site Investigation Selected Photographs

Logged by: HY	Scale: NTS	Date: Sept 2014	Project: VM00605J	Page 9

PHOTO 19: Soil sediment from blackened vegetation were collected, July 26, 2014.

PHOTO 20: Dome Creek sediments were shipped to ALS for analytical testing, July 26, 2014.

Brown McDade Pit Photos

PHOTO 21: Open Pit Looking west, July 25, 2014.

PHOTO 22: Open Pit, Looking North, July 25, 2014.

Waste Rock Area Photos

PHOTO 23: Looking north - View of the waste rock piles near the open pit, July 26, 2014.

PHOTO 24: Looking north – closer view of the waste rock piles, July 26, 2014.

PHOTO 25: Looking west at upper waste rock pile, July 26, 2014.

PHOTO 26: Looking west at lower waste rock pile, July 26, 2014.

Mill Complex Photos

PHOTO 27: Overall view of the Mill complex, July 26, 2014.

PHOTO 28: Looking North West - Dump area of the mill, July 26, 2014.

General Site Reconnaissance Photos

PHOTO 29: Looking south at the start of erosion area south of the borrow area downstream of Tailings Storage Facility, July 26, 2014.

PHOTO 30: Looking north at the erosion area south of the borrow area downstream of Tailings Storage Facility, July 26, 2014.

PHOTO 31: Buried insulated pipe along the power line near Victoria Creek Wellhouse, July 27, 2014.

PHOTO 32: Top sealed well at Victoria Creek Wellhouse, July 27, 2013.

PHOTO 33: Possible Borrow area near Victoria Creek Wellhouse, July 27, 2014.

PHOTO 34: Possible borrow source near Victoria Creek, July 27, 2014.

Appendix 4A – Borehole Logs

EXPLANATION OF TERMS FOR GEOTECHNICAL SOIL LOGS

1.0 SOIL CONSTITUENTS

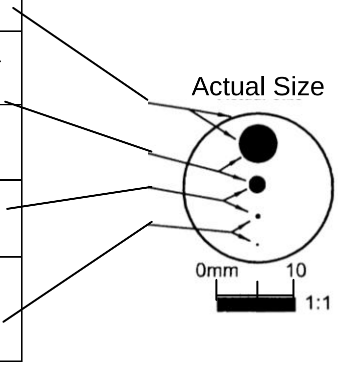
Based on particle size and distribution per the Modified Unified Soil Classification System as described in the following tables.

Proportions of Constituents:

Descriptive Term	Proportion by Weight
noun (e.g. sand, etc.)	over 50%
and (e.g. and sand, etc.)	over 35%
adjective (e.g. sandy, etc.)	20% to 35%
some (e.g. some sand, etc.)	10% to 20%
trace (e.g. trace sand, etc.)	0% to 10%

Particle Sizes:

Material	Fraction	Sieve Size (grain size)	Approx Scale
Boulders		> 200 mm	Larger than a soccer ball
Cobbles		Less than 200 mm & retained on 3-in (75 mm) sieve	Fist sized to soccer ball sized
Gravel	Coarse	Passes 3-in (75 mm) sieve & retained on ¾-in (19 mm) sieve	Thumb sized to fist sized
	Fine	Passes ¾-in (19 mm) sieve & retained on No. 4 (4.75 mm) sieve	Pea sized to thumb sized
Sand	Coarse	Passes No. 4 (4.75 mm) sieve & retained on No. 10 (2.00 mm) sieve	Rock salt sized to pea sized
	Medium	Passes No. 10 (2.00 mm) sieve & retained on No. 40 (425 µm) sieve	Sugar sized to rock salt sized
	Fine	Passes No. 40 (425 µm) sieve & Retained on No. 200 (75 µm) sieve	Flour sized to sugar sized
Fines (silt & clay)		Passes No. 200 (75 µm) sieve	Flour sized and smaller (indiscernible to naked eye)



Gradation of Coarse Fraction:

Descriptive Term	Field Identification
Well graded	contains particles of sizes assorted over a wide range with no one size predominating or missing
Poorly Graded	contains a limited range of particle sizes
Uniform Graded	contains a predominance of one size
Gap Graded	missing a size within a range

Explanation of Terms for Geotechnical Logs

2.0 RELATIVE DENSITY / CONSISTENCY

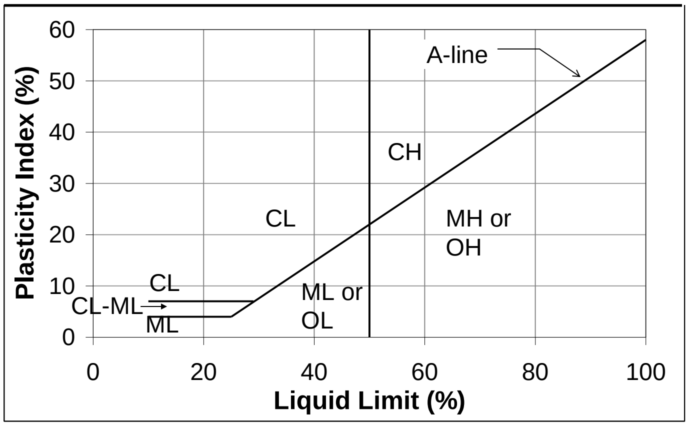
For Coarse Grained Soils:

Descriptive Term	Relative Density	SPT N-Value
Very Loose	0 - 20 %	0 – 4
Loose	20 – 40 %	4 – 10
Compact	40 – 70 %	10 – 30
Dense	70 – 90 %	30 – 50
Very Dense	90 – 100 %	> 50

For Fine Grained Soils:

Consistency	Field Identification	Undrained Strength (kPa)	SPT N Value
Very Soft	Easily penetrated several centimetres by the fist	< 12	0 - 2
Soft	Easily penetrated several centimetres by the thumb	12 – 25	2 - 4
Firm	Can be penetrated several centimetres by the thumb with moderate effort	25 – 50	4 - 8
Stiff	Readily indented by the thumb but penetrated only with great effort	20 – 100	8 - 15
Very Stiff	Readily indented by the Thumbnail	100 – 200	15 - 30
Hard	Indented with difficulty by the Thumbnail	> 200	> 30

3.0 PLASTICITY



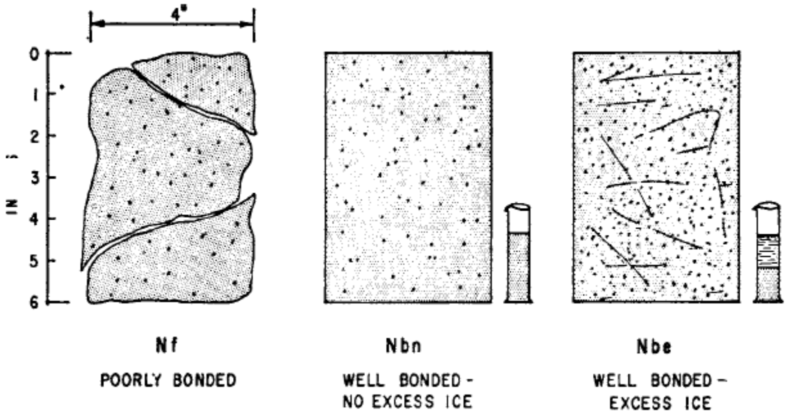
4.0 MOISTURE

Descriptive Term	Field Identification
Dry	no visible moisture, dusty
Damp	slight moisture content but fingers do not become moistened when touching soil. Only fines sticks to fingers.
Moist	visible moisture, but no visible free water, finger becomes moistened when touching the soil. Soil does not stick to fingers. Near the plastic limit for cohesive soil.
Wet	a film of water is present on particle surface, soil sticks to fingers.
Free water	water is separated from soil particles.

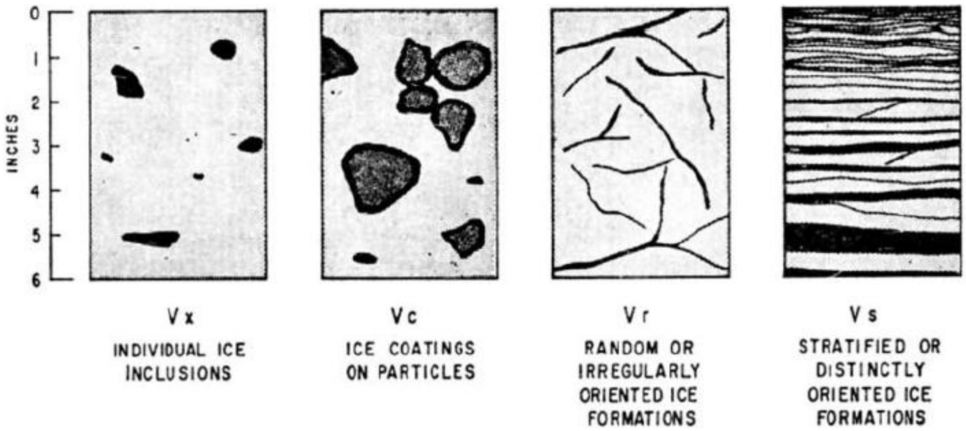
5.0 FROZEN SOIL DESCRIPTION

Permafrost (see ASTM D4083)
Three main categories – not visible (i.e. a frozen soil but ice is not visible to the naked eye), visible (can see ice but there is more soil than ice), and ice (>1" thickness where there is more ice than soil). Each has subdivisions as follows:

Non visible Ice:

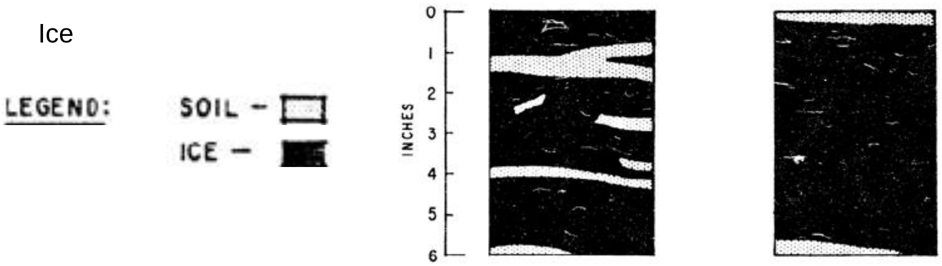


Visible Ice



Explanation of Terms for Geotechnical Logs

Ice



ICE & SOIL
ICE WITH SOIL INCLUSIONS

ICE
ICE WITHOUT SOIL INCLUSIONS

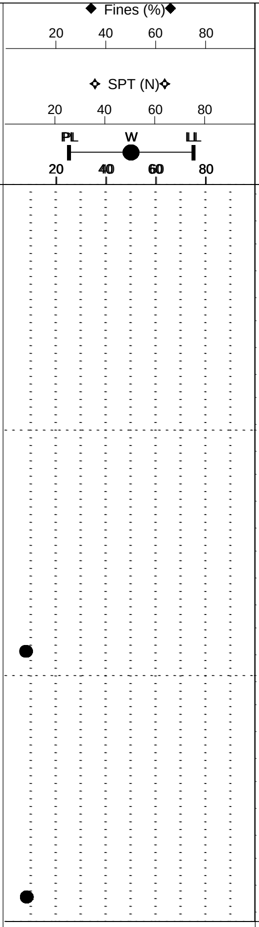
6.0 DEFINITION OF SYMBOLS USED ON LOGS

SOIL		SOIL		WELL DETAILS	
▨	GRAVEL, well graded, to and SAND little to no fines,(GW)	▨	SILT, high plastic (MH)	▨	Solid pipe with BACKFILL
▨	GRAVEL, poorly graded, to and SAND little to no fines (GP)	▨	CLAY, low plastic (CL)	▨	Solid Pipe with BENTONITE
▨	GRAVEL, silty to and SAND, and SILT(GM)	▨	CLAY, medium plastic (CI)	▨	Solid pipe with GROUT
▨	GRAVEL, clayey to and SAND, and CLAY (GC)	▨	CLAY, high plastic (CH)	▨	Solid pipe with SAND
▨	SAND, well graded, to gravely, little to no fines, (SW)	▨	ORGANIC silt or clay, low plastic (OL)	▨	Slotted pipe with SAND
▨	SAND, poorly graded, to gravely, little to no fines (SW)	▨	ORGANIC silt or clay, high plastic (OH)	▨	Slotted pipe with NO BACKFILL
▨	SAND, silty (SM)	▨	PEAT (Pt)	▨	SAND backfill
▨	SAND, clayey to SAND and CLAY (SC)	ROCK		▨	GROUT backfill
▨	FILL	▨	Granodiorite (GRDR)	▨	GENERAL BACKFILL (e.g. drill cutting, slough)
▨	SILT, low plastic (ML)	▨	Andesite (ANDS)		

Project: Mount Nansen 2014 Site Investigation	Area: Camp Area	Borehole No: BH-C-14-01
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387693	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6881324	Elevation (m): 1235

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough



DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
0.0–3.0	SILTY SAND - fine to coarse, trace angular gravel, brown, moist. [Weathered Bedrock]				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1235
		☰	1			1234
1						1233
		☰	2			
2						1232
		☰	3			
3	END OF HOLE at 3.0 m Auger hit refusal. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					1231
4						1230
5						1229

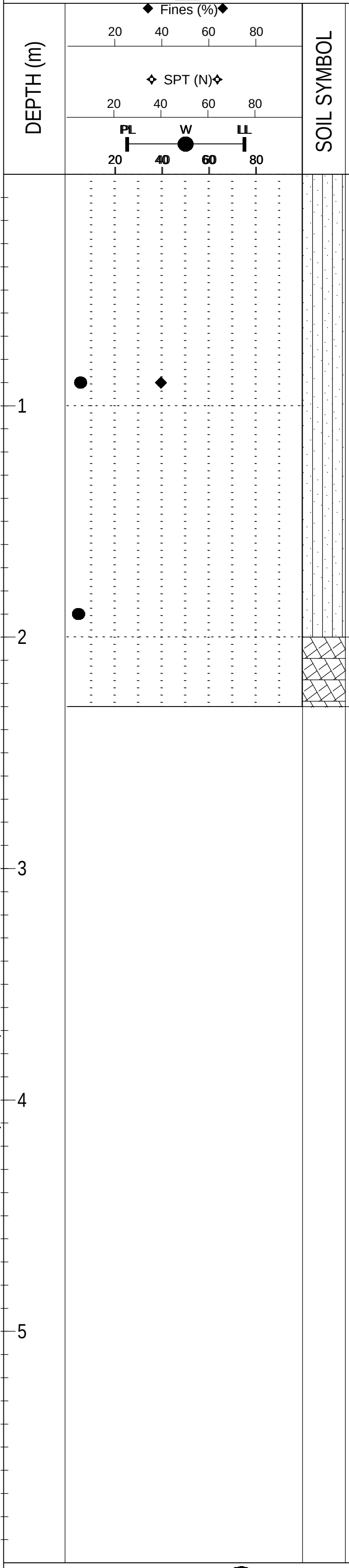
Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date: 26/07/2014	Reviewed By: MS/HY
Completion Depth: 3.00 m	Page 1 of 1

amec

Project: Mount Nansen 2014 Site Investigation	Area: Camp Area	Borehole No: BH-C-14-02
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387687	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6881484	Elevation (m): 1257

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough



SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
SILTY SAND - fine to medium, trace subangular gravel, grey, moist. [Weathered Bedrock]				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
	☰	1			1256
	☰	2			1255
BEDROCK - Grey					
END OF HOLE at 2.3 m Auger hit refusal. Reached target criteria. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.				... From 2.0 to 2.3 m: very hard drilling.	1254
					1253
					1252
					1251

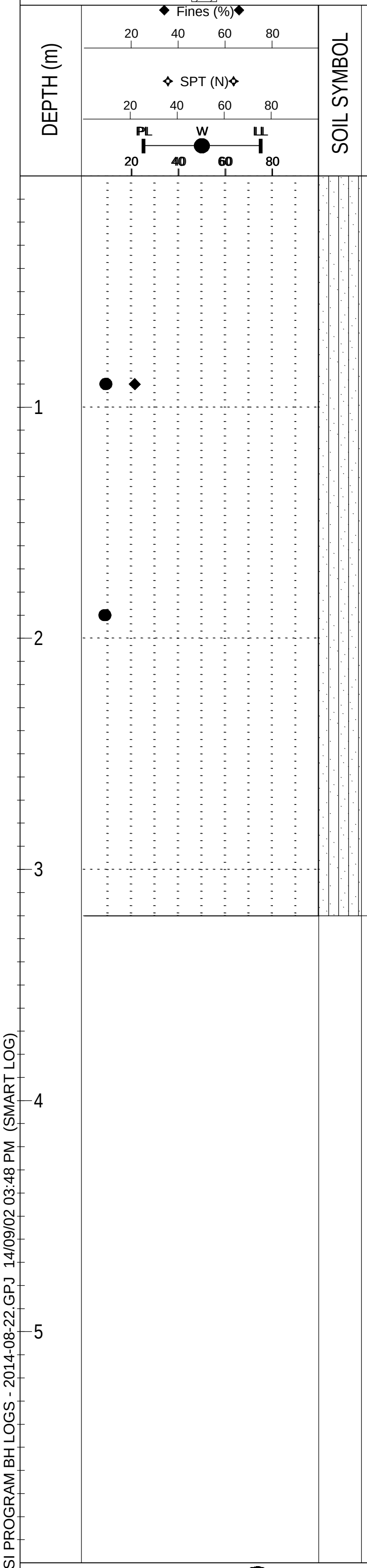
amec

Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date: 26/07/2014	Reviewed By: MS/HY
Completion Depth: 2.30 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Camp Area	Borehole No: BH-C-14-03
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387668	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6881371	Elevation (m): 1244

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS
SAND AND SILT - fine to coarse grained sand, poorly graded, some fine subangular gravel, brown, moist. [Weathered Bedrock]				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.
	☰	1		
	☰	2		
- grades to grey/brown				
	☰	3		
END OF HOLE at 3.2 m Auger hit refusal. Reached target criteria. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.				

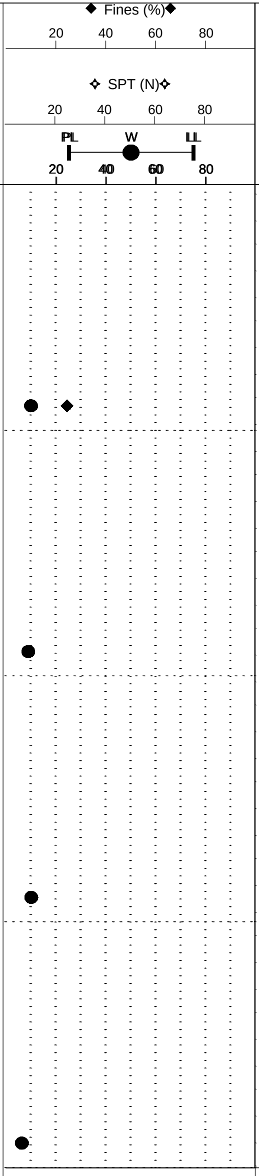
ELEVATION (m)
1243
1242
1241
1240
1239
1238

Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date: 26/07/2014	Reviewed By: MS/HY
Completion Depth: 3.20 m	

Project: Mount Nansen 2014 Site Investigation	Area: Camp Area	Borehole No: BH-C-14-04
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387720	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6881432	Elevation (m): 1245

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



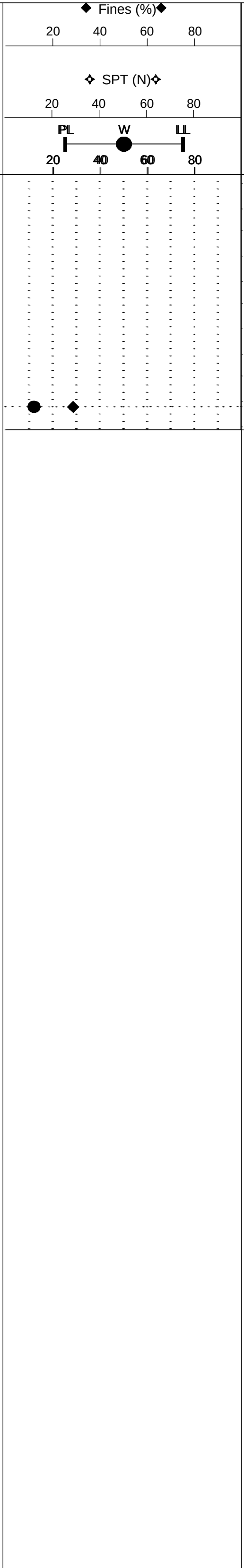
DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
	SILTY SAND - sands of fine to medium, low plasticity, gravelly, subrounded fine to coarse gravel, poorly graded, moist, brown. [Weathered Bedrock]				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
						1244
1		☰	1			
						1243
2		☰	2			
	- coarse rock fragments inferred, difficult drilling below 2.5 m depth					1242
3		☰	3			
						1241
4		☰	4			
	END OF HOLE at 4.0 m Auger hit refusal. Reached target criteria. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.				No groundwater encountered during drilling.	
						1240
5						
						1239

Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date: 26/07/2014	Reviewed By: MS/HY
Completion Depth: 4.00 m	

Project: Mount Nansen 2014 Site Investigation	Area: Mill Complex	Borehole No: BH-M-14-01
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387849	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6881071	Elevation (m): 1197

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
0 – 1.1	SAND AND SILT - fine to medium, silt is low plastic, trace angular gravel, light brown (oxidized), moist. [Weathered Bedrock]	☰	1		... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1197
1.1	END OF HOLE at 1.1 m Auger hit refusal. Reached target criteria. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					1196

Depth scale (m): 1, 2, 3, 4, 5

Elevation scale (m): 1197, 1196, 1195, 1194, 1193, 1192

amec

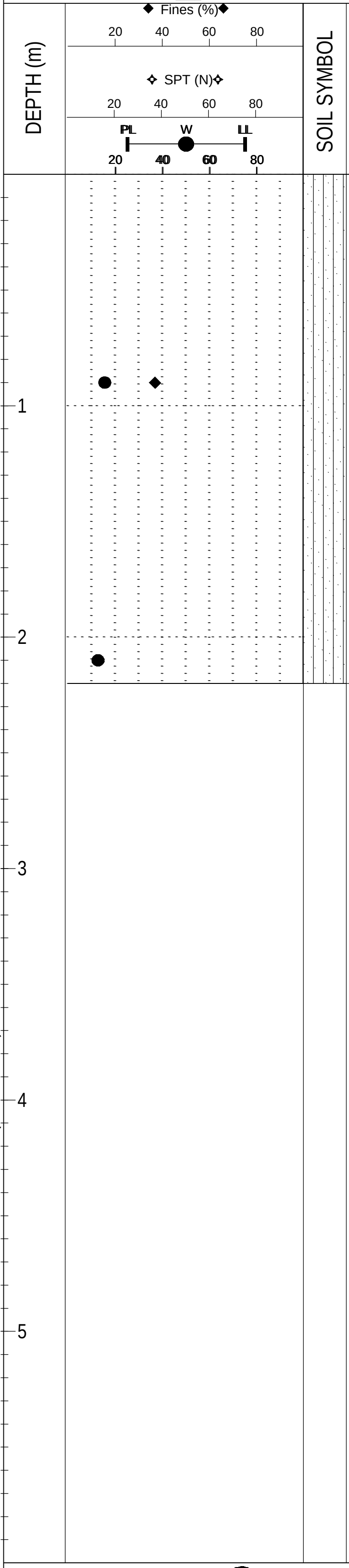
Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date:26/07/2014	Reviewed By: MS/HY
Completion Depth:1.10 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Mill Complex	Borehole No: BH-M-14-02
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387872	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6881007	Elevation (m): 1210

SAMPLE TYPE ▨ Shelby Tube ▌ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough

DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
0	SAND AND SILT - fine to medium, trace fine angular gravel, silt is low plastic, brown, moist. [Weathered Bedrock]				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1210
1	- Increasing gravel from 1.0 m to 1.4 m depth.	☰	1			1209
2		☰	2			1208
2.2	END OF HOLE at 2.2 m Auger hit refusal. Reached target criteria. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					



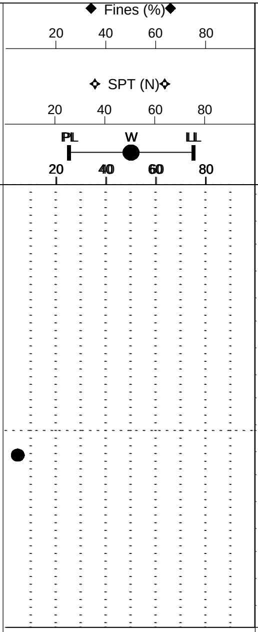
Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date: 26/07/2014	Reviewed By: MS/HY
Completion Depth: 2.20 m	

Project: Mount Nansen 2014 Site Investigation	Area: Mill Complex	Borehole No: BH-M-14-03
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387901	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6881032	Elevation (m): 1198

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ▨ Slough

DEPTH (m)	Fines (%) / SPT (N) / PL W LL	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
0.0–1.8			SAND AND GRAVEL, silty, fine to medium sand, subangular to angular gravel, yellow/tan, dry. [FILL]	☰ (at ~1.1 m)	1		... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1197, 1196
1.8			END OF HOLE at 1.8 m Auger hit refusal. Reached target criteria. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					1195, 1194, 1193, 1192



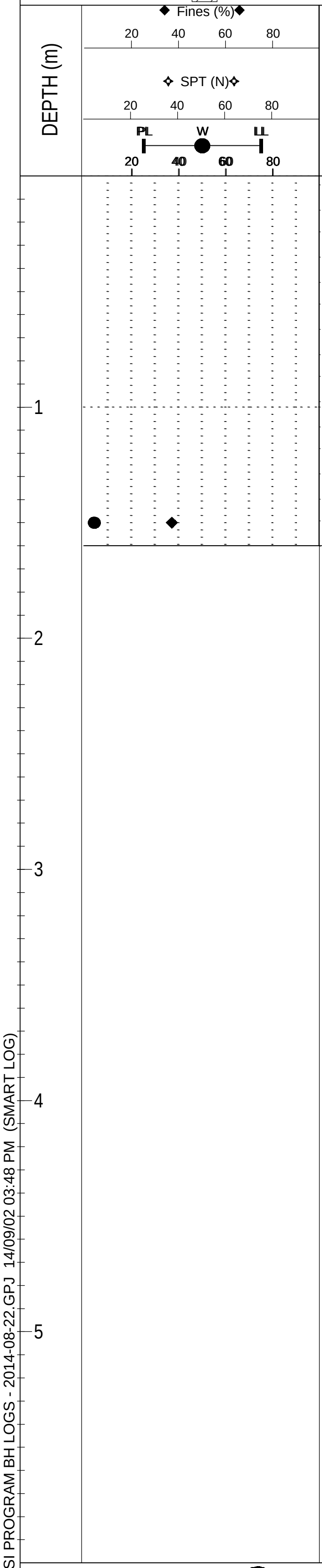
Depth scale: 1, 2, 3, 4, 5

Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date: 26/07/2014	Reviewed By: MS/HY
Completion Depth: 1.80 m	

Project: Mount Nansen 2014 Site Investigation	Area: Mill Complex	Borehole No: BH-M-14-04
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387968	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880978	Elevation (m): 1197

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough



SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
▥	SAND AND SILT - fine to medium sand, cobbles and angular gravel, grey, dry. [Weathered Bedrock]	☰	1		... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV. ... Below 0.0 m: difficult drilling, auger cutting up weathered bedrock.	1196
	END OF HOLE at 1.6 m Auger hit refusal. Reached target criteria. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					1195 1194 1193 1192 1191

amec

Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date:26/07/2014	Reviewed By: MS/HY
Completion Depth:1.60 m	

Project: Mount Nansen 2014 Site Investigation	Area: Mill Complex	Borehole No: BH-M-14-05
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):387834	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880986	Elevation (m): 1219

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough

SOIL DESCRIPTION

SANDY SILT - trace to some fine subangular gravel, low plasticity silt, light brown (oxidized), dry.
[Weathered Bedrock]

- Below 2.0 m: higher silt/clay content, low to medium plasticity, moist.

END OF HOLE at 4.5 m
No well/instrument installation.
Hole backfilled with drill cuttings.
No groundwater encountered during drilling.

OTHER TESTS, COMMENTS

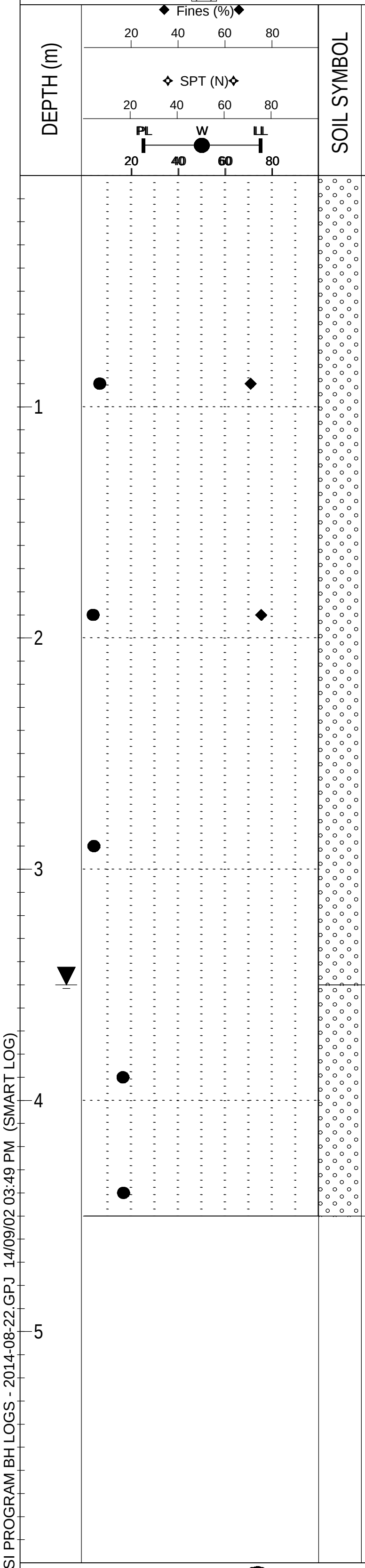
... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey.
... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.

amec	Start Date: 26/07/2014	Logged By: D.Kennedy
	Completion Date:26/07/2014	Reviewed By: MS/HY
	Completion Depth:4.50 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Borrow Area	Borehole No: BH-T-14-01
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):388984	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880690	Elevation (m): 1116

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ▩ Slough



SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
SAND - fine to medium, some silt, trace fine gravel, subrounded to subangular, occasional organic pockets (red), light brown, moist.	☰	1		... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1115
	☰	2			1114
	☰	3			1113
SAND - fine to medium, trace silt, fines are plastic, trace fine gravel, grey, wet.	☰	4		Soil turns grey at 3.5 meters below ground surface. Wet at 3.5 meters below ground surface.	1112
	☰	4.5			
END OF HOLE at 4.5 m No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 3.5 m during drilling.					1111
					1110

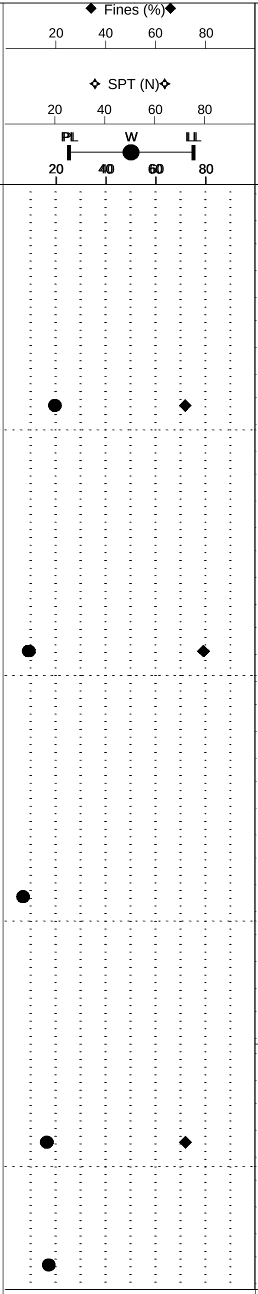
amec

Start Date: 27/07/2014	Logged By: D.Kennedy
Completion Date:27/07/2014	Reviewed By: MS/HY
Completion Depth:4.50 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Borrow Area	Borehole No: BH-T-14-02
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):388922	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880712	Elevation (m): 1118

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough



DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
		SILTY SAND - fine to medium, trace rounded to subrounded gravel, occasional organic rootlets, brown, moist.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
			☰	1			1117
1							
		- Grades no rootlets					
			☰	2			1116
2							
			☰	3			1115
3							
▼		SAND - fine to medium, trace to some silt, wet, grey.					
			☰	4			1114
4							
			☰	4.5			
		END OF HOLE at 4.5 m No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 3.5 m during drilling.					1113
5							
							1112

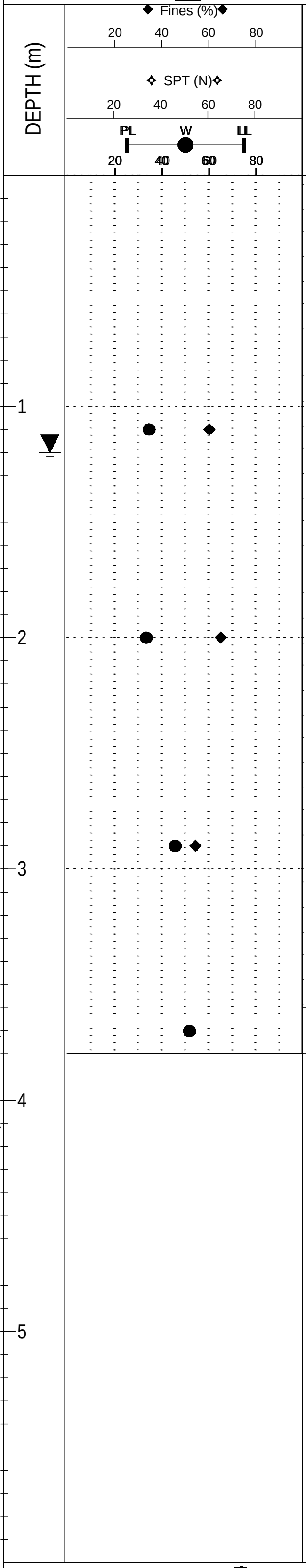
amec

Start Date: 27/07/2014	Logged By: D.Kennedy
Completion Date: 27/07/2014	Reviewed By: MS/HY
Completion Depth: 4.50 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Diversion Channel	Borehole No: BH-T-14-03
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389096	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880766	Elevation (m): 1101

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



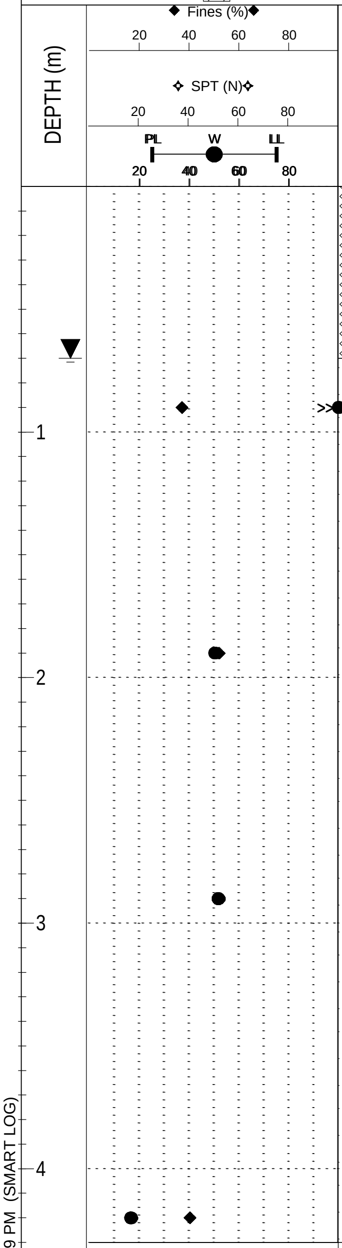
DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
0	SILTY SAND - fine to medium, organic (amorphous and fibrous), trace gravel, moist, dark grey/black.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
						1100
1	- Organics content test result was 6.6%.	☰	1			
	- Grades wet below 1.2 m depth.				Groundwater encountered during drilling at 1.2 meters below ground surface.	
						1099
2	- Organics content test result was 6.1%. Organics grades more amorphous and sand grades finer with depth.	☰	2			
						1098
3	- Frozen at 2.8 m below ground surface, -1.0 degree C, well bonded in places, no visible/excess ice.	☰	3		Very hard drilling from 2.8 to 3.8 meters below ground surface.	
	GRAVEL - some clayey sand, gravel is coarse, wet, light brown.	☰	3.8			
	END OF HOLE at 3.8 m Auger hit refusal. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 1.2 m during drilling.					1097
4						
						1096
5						
						1095

Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date:26/07/2014	Reviewed By: MS/HY
Completion Depth:3.80 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Tailings Beach	Borehole No: BH-T-14-04
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389207	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880770	Elevation (m): 1099

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough



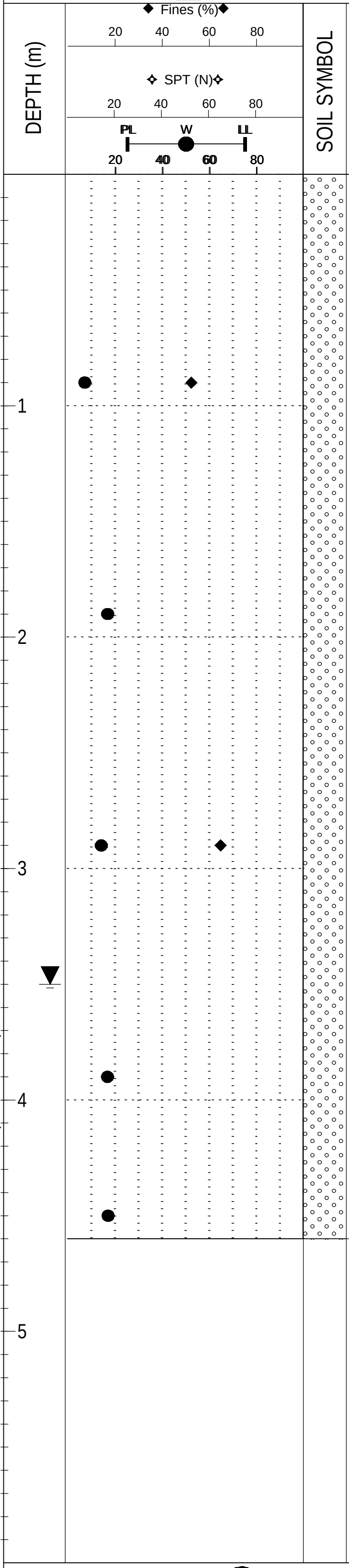
SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
	MOSS and ROOTS - decomposed wood pieces, red/brown, moist. No Recovery.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
	ORGANIC SAND AND SILT- fine grained sand with thin lenses of amorphous organic, dark grey/black black, wet. **Frozen at 0.7 meters below ground surface, -1°C, well bonded pieces approximately 100 mm in diameter, no excess ice.	☰	1		Groundwater encountered during drilling at 0.7 meters below ground surface.	1098
		☰	2			1097
	- Organics content test result was 22.9%.					
		☰	3			1096
	SILTY ORGANIC SAND - fine to medium, low plasticity, trace gravel, subrounded to subangular, wet. light grey/olive. **Frozen, weakly bonded, frozen pieces less than 10 mm in diameter.					1095
		☰	4.3			
	END OF HOLE at 4.3 m Auger hit refusal. Bedrock or cobbles/boulders inferred. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 0.7 m during drilling.					1094
						1093

Start Date: 25/07/2014	Logged By: D.Kennedy
Completion Date:25/07/2014	Reviewed By: MS/HY
Completion Depth:4.30 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Diversion Channel	Borehole No: BH-T-14-05
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389331	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880797	Elevation (m): 1101

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



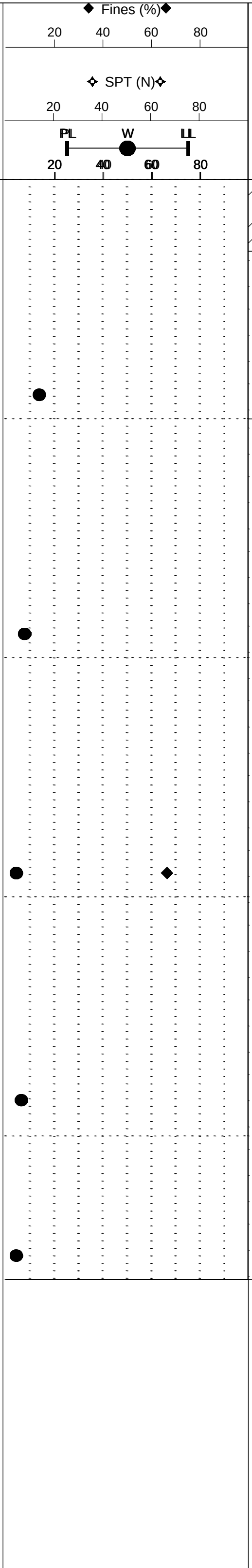
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
SAND - fine to medium, trace gravel, trace silt, , gravel is subangular, gap graded, light brown, moist.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
	☰	1			1100
- Grades fine to medium at below 1.5 m depth.					
	☰	2			1099
	☰	3			1098
- Grades trace gravel below 3.0 m depth.					
	☰	4			1097
	☰	4.6			
END OF HOLE at 4.6 m No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 3.5 m during drilling.					
					1096
					1095

Start Date: 26/07/2014	Logged By: D.Kennedy
Completion Date:26/07/2014	Reviewed By: MS/HY
Completion Depth:4.60 m	

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Borrow Area	Borehole No: BH-T-14-06
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389493	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880788	Elevation (m): 1104

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ▨ Slough



DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
	SILT - some sand, some organic, brown/black, moist [Topsoil].				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
	SILTY SAND - fine to medium, trace fibrous organic, moist, brown. [Fill] - Organics content test result at 1.0 m depth was 16.4%.	☰	1			1103
1	SAND - fine to medium, some silt, poorly graded, trace fine angular to subangular gravel, trace organic wood debris, moist, light brown.					1102
2		☰	2			
		☰	3			1101
3	- Sand grades fine below 3.0 m depth.					1100
4		☰	4			
		☰	4.6			
	END OF HOLE at 4.6 m No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					1099
5						1098

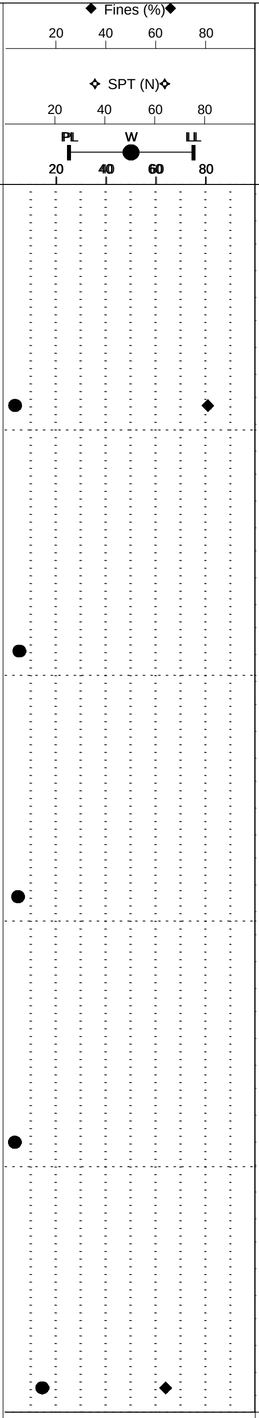
Start Date: 25/07/2014	Logged By: D.Kennedy
Completion Date: 25/07/2014	Reviewed By: MS/HY
Completion Depth: 4.60 m	

amec

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Borrow Area	Borehole No: BH-T-14-07
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389646	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880724	Elevation (m): 1091

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ⁘ Sand ☐ Slough



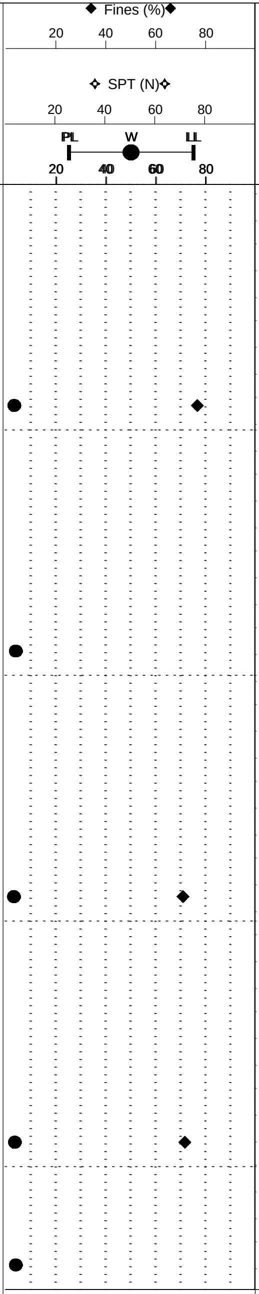
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
	⁘	SAND - fine to medium, poorly graded, some silt, moist, light brown.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
	⁘		☰	1			1090
1	⁘						
	⁘		☰	2			1089
2	⁘	- Trace fine subangular gravel below 2.0 m depth					
	⁘		☰	3			1088
3	⁘						
	⁘		☰	4			1087
4	⁘						
	⁘	- Grades silty and grey below 4.8 m. - Frozen at 4.8 m, 10 to 20 mm diameter frozen pieces, weakly bonded, ice is approximately 10% of total sample by volume.	☰	5			1086
5		END OF HOLE at 5.0 m. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					
							1085

Start Date: 25/07/2014	Logged By: D.Kennedy
Completion Date:25/07/2014	Reviewed By: MS/HY
Completion Depth:5.00 m	

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Borrow Area	Borehole No: BH-T-14-08
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389766	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880728	Elevation (m): 1084

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ⁘ Sand ☐ Slough



DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
	⁘	SAND - fine to medium, trace silt, trace fine angular gravel, poorly graded, moist, light brown				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
			☰	1			1083
1							
			☰	2			1082
2							
			☰	3			1081
3							
			☰	4			1080
4						Non-frozen, no permafrost encountered.	
			☰	4.5			
		END OF HOLE at 4.5 m No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					
5							1079
							1078

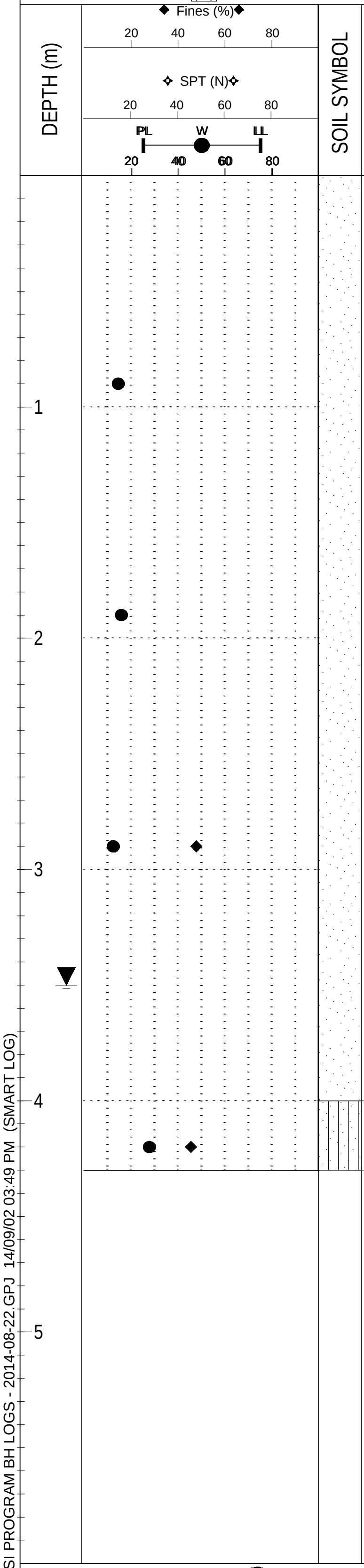
Start Date: 25/07/2014	Logged By: D.Kennedy
Completion Date:25/07/2014	Reviewed By: MS/HY
Completion Depth:4.50 m	

amec

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-09
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389582	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880547	Elevation (m): 1082

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



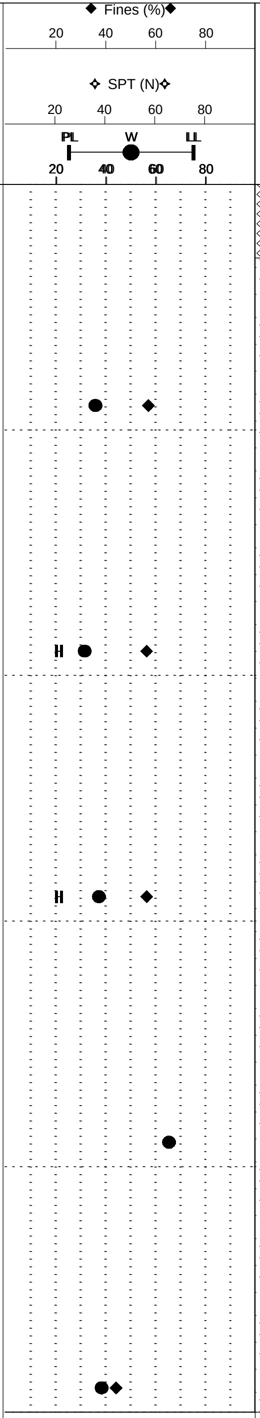
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
SAND - fine to medium, gap graded, trace to some silt, some angular to subangular gravel, moist, brown.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1082
	☰	1			1081
	☰	2			1080
	☰	3			
- Grades some silt and gravelly below 3.0 m depth.					1079
SAND and SILT - fine to medium, trace angular to subangular coarse gravel, poorly graded, grey, wet. **Frozen at 4.0 meters below ground surface, frozen pieces, weakly bonded, no visible/excess ice.	☰	4			1078
END OF HOLE at 4.3 m. Auger hit refusal. Bedrock or cobbles/boulders inferred. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 3.5 m during drilling.					1077

Start Date: 25/07/2014	Logged By: D.Kennedy
Completion Date: 25/07/2014	Reviewed By: MS/HY
Completion Depth: 4.30 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-10
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389525	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880558	Elevation (m): 1083

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ▫ Slough



DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
0	MOSS and ROOTS - organics				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1083
	SAND and SILT - fine grained, low plasticity, poorly graded, occasional trace of rootlets and decomposed wood pieces, strong organic odor, wet, grey/black. **Frozen at 0.5 meters below ground surface, -1°C, well bonded/firm, no excess ice, frost can be seen on sample.	☰	1			
1						1082
		☰	2		... At 1.7 m: 150 mm diameter auger met refusal. Switched to 50 mm diameter Talon drilling system at 1.7 m.	
2						1081
		☰	3			
3						1080
		☰	4			
4	**Frozen soil becomes increasingly more well bonded with depth, frost can be seen on samples GS @ 4m and GS @ 5m.					1079
		☰	5			
5	END OF HOLE at 5.0 m. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					1078

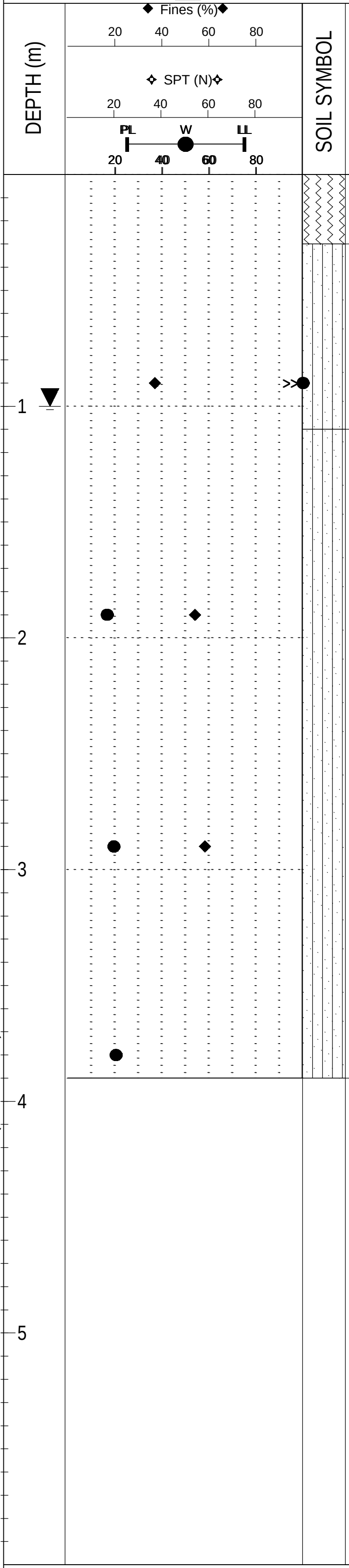
amec

Start Date: 25/07/2014	Logged By: D.Kennedy
Completion Date: 25/07/2014	Reviewed By: MS/HY
Completion Depth: 5.00 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-11
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389493	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880515	Elevation (m): 1091

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ▨ Slough



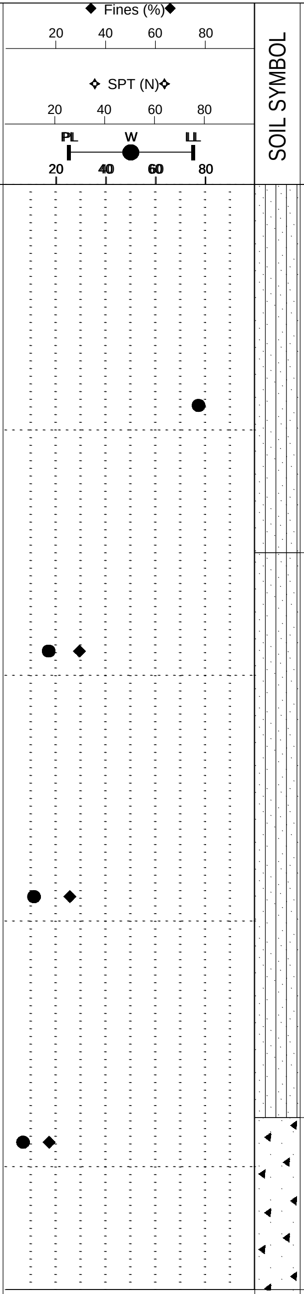
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
MOSS and ROOTS - organics				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
SILT and SAND - fine, trace wood debris (peat), wet, dark grey/brown. **Frozen at 1.0 meters below ground surface, -1°C, no excess/visible ice, well bonded/blocky.	☰	1			1090
SILTY SAND - fine to medium, wet, light brown. - Grades clayey below 3.0 m depth approximately	☰ ☰ ☰	2 3 4		... At 1.1 m: 150 mm diameter auger met refusal. Switched to 50 mm diameter Talon drilling system at 1.2m.	1089 1088 1087
END OF HOLE at 3.9 m. Talon drill hit refusal. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 1.0 m during drilling.					1086 1085

Start Date: 25/07/2014	Logged By: D.Kennedy
Completion Date:25/07/2014	Reviewed By: MS/HY
Completion Depth:3.90 m	

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-12
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389440	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880485	Elevation (m): 1100

SAMPLE TYPE ▨ Shelby Tube ▌ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough



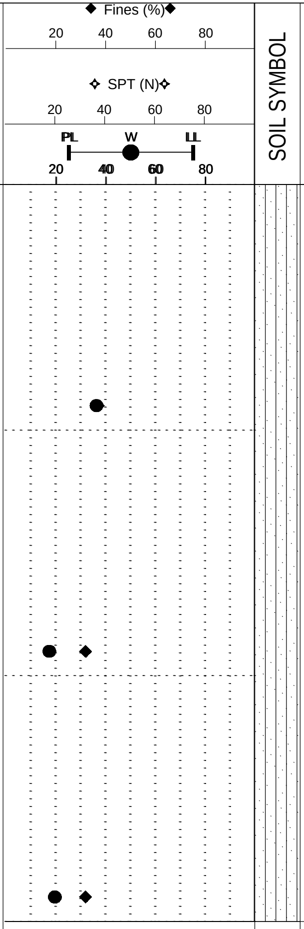
DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
	SILT - organic rich (peat), trace sand, decomposed wood pieces and rootlets (topsoil).				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
		☰	1			
1	- Organics contnet test result was 25.1%.					1099
	SILTY SAND - fine to medium, some fine angular to subangular gravel, moist, brown.					
		☰	2			
2						1098
		☰	3			
3	- Grades gravelly below 3.0 m depth approximately.					1097
	GRAVELY SAND and SILT - fine to coarse, gravel is subrounded, moist, redish/brown.	☰	4			
4						1096
	END OF HOLE at 4.5 m. Auger hit refusal. Bedrock or cobbles/boulders inferred. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					
5						1095

Start Date: 24/07/2014	Logged By: D.Kennedy
Completion Date:24/07/2014	Reviewed By: MS/HY
Completion Depth:4.50 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-13
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389400	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880502	Elevation (m): 1098

SAMPLE TYPE ▨ Shelby Tube ▌ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough



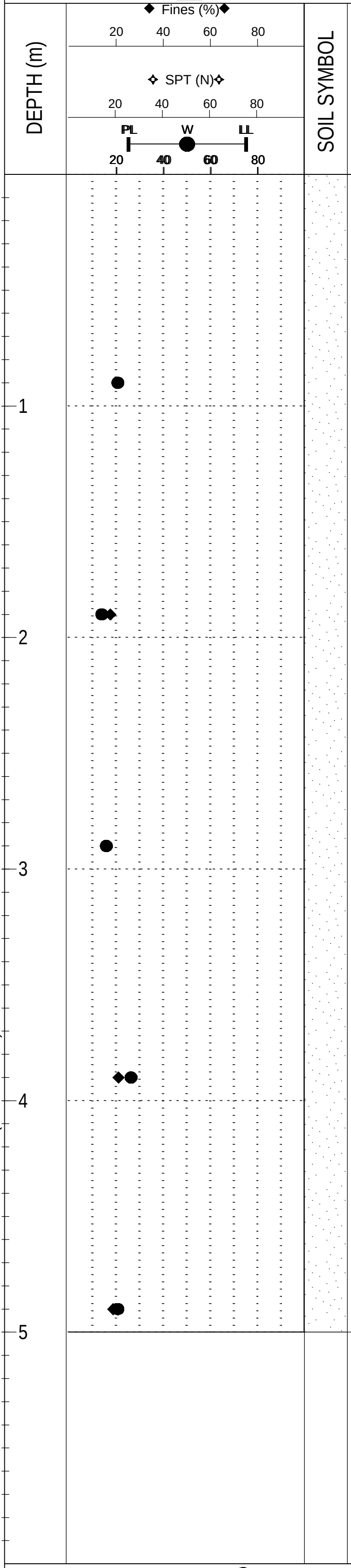
DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
	SILTY SAND - fine to medium, occasional lenses of amorphous organics, occasional rootlets, trace fine angular to subangular gravel, moist, dark brown.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
▼	**Frozen at 0.8 meters below ground surface, -1°C, weakly bonded ice pieces approximately 10 to 20 mm in diameter, ice/frozen content approximately 10 to 15% total sample volume. - Grades light brown.	☰	1		Wet at 0.8 meters below ground surface, possibly melted ice pockets.	
1						1097
		☰	2			
2						1096
		☰	3			
3	END OF HOLE at 3.0 m. Auger hit refusal. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 0.8 m during drilling.					1095
4						1094
5						1093

Start Date: 24/07/2014	Logged By: D.Kennedy
Completion Date: 24/07/2014	Reviewed By: MS/HY
Completion Depth: 3.00 m	

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-14
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389360	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880509	Elevation (m): 1098

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
0.0	SAND - fine to medium, some silt to silty, trace fine subangular gravel, trace rootlets, trace amorphous organics, moist, brown.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
1		☰	1			1097
2	**Frozen at 2.0 meters below ground surface, 0°C, ice bonded pieces approximately 10 to 20 mm in diameter, no visible ice, weakly bonded, ice/frozen content is approximately 10 to 15% of sample volume.	☰	2			1096
3		☰	3			1095
	- Grades to light brown.					
4		☰	4			1094
5	END OF HOLE at 5.0 m. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.	☰	5			1093

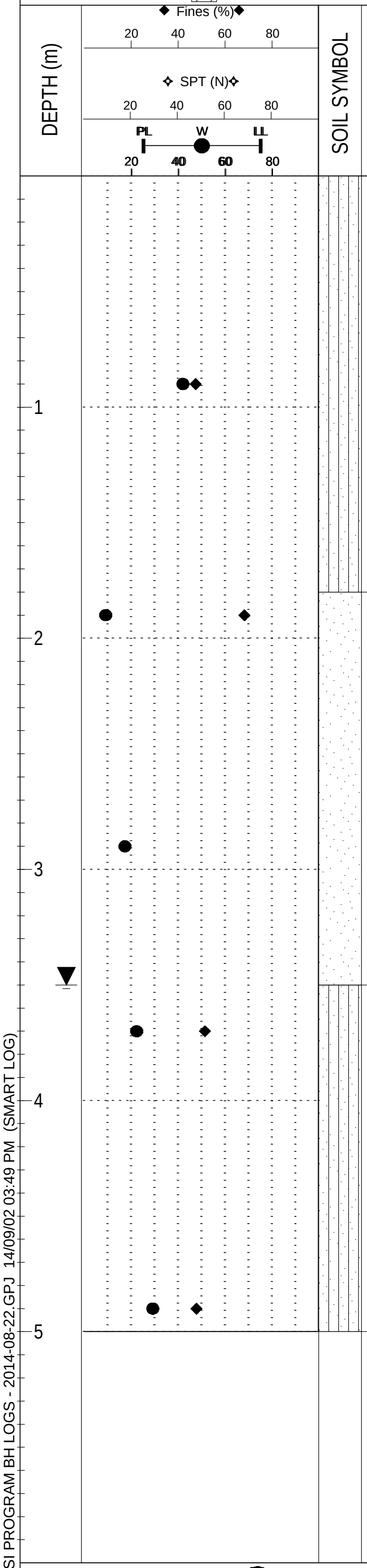
amec

Start Date: 24/07/2014	Logged By: D.Kennedy
Completion Date:24/07/2014	Reviewed By: MS/HY
Completion Depth:5.00 m	

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-15
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389321	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880525	Elevation (m): 1097

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
SAND and ORGANIC SILT - fine to medium, trace subangular fine gravel, trace to some clay (low plasticity), some fibrous organics (decomposed wood pieces, rootlets), moist, black. - Organics content test result was 19.9%.	☰	1		... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1097 1096
SAND - fine to medium, some silt (occasional silt clusters, few mm in diameter), moist, light brown.	☰ ☰	2 3			1095 1094
SAND and SILT - fine to medium, silt is non plastic, wet, grey. **Frozen at 4.0 meters below ground surface, weakly ice bonded in places, no visible ice.	☰ ☰	4 5			1093
End of Borehole at 5.0 m. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 3.5 m during drilling.					1092

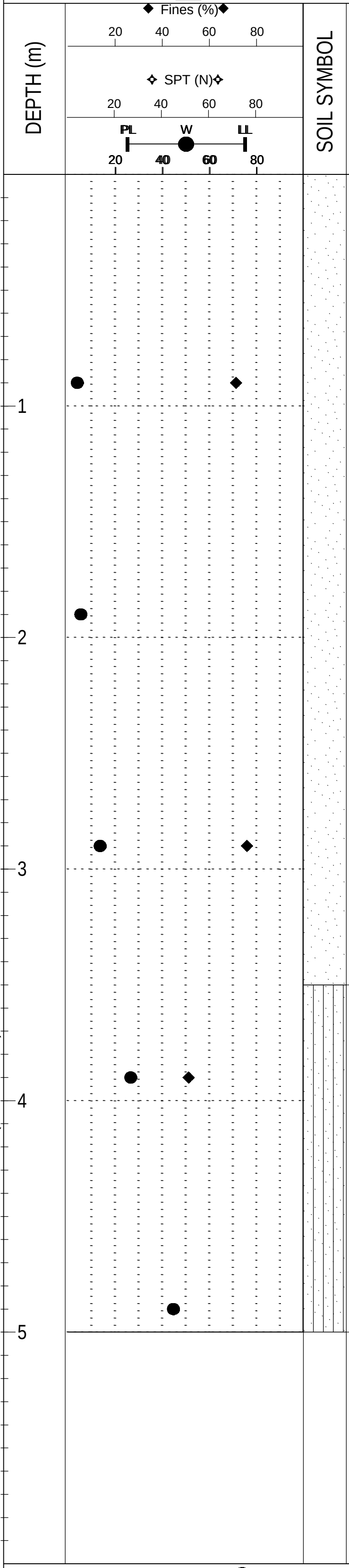
amec

Start Date: 24/07/2014	Logged By: D.Kennedy
Completion Date: 24/07/2014	Reviewed By: MS/HY
Completion Depth: 5.00 m	

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-16
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389272	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880492	Elevation (m): 1100

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



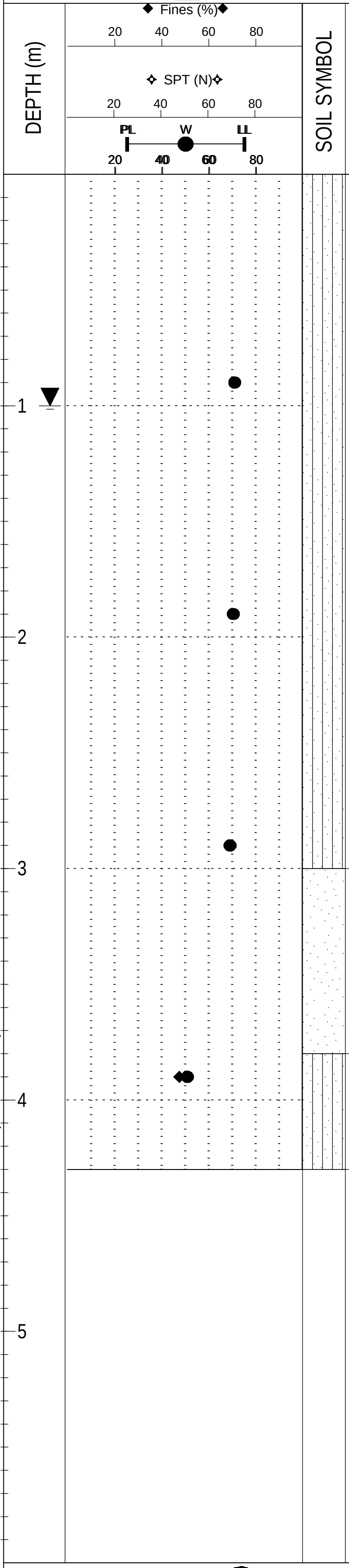
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
SAND - fine to medium, poorly graded, trace fine gravel, trace silt, moist, light brown.	☰	1 2 3		... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1100 1099 1098 1097
SAND and SILT - fine, trace fine gravel, some organic pieces, wet, grey. **Frozen at 3.5 meters below ground surface, cloudy, hard, free ice crystals approximately 10 to 20 mm can be seen, weakly bonded.	☰	4 5		Hard drilling from 4.5 to 5.0 mbgs.	1096
END OF HOLE at 5.0 m. No well/instrument installation. Hole backfilled with drill cuttings. No groundwater encountered during drilling.					1095

Start Date: 24/07/2014	Logged By: D.Kennedy
Completion Date: 24/07/2014	Reviewed By: MS/HY
Completion Depth: 5.00 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-17
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389196	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880517	Elevation (m): 1099

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ▨ Slough



SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS
ORGANIC SILT - Some sand, decomposed wood pieces, rootlets, wet, dark brown.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV. Ponded water on ground surface.
- Organics content test result was 13.5%.	☰	1		
- Grades organic silty sand below 2.0 m depth.	☰	2		
	☰	3		
SAND - some silt, grey, moist/frozen. **Frozen at 4.0 meters below ground surface, weakly bonded. - Strong odor down to 3.5 m depth.				Strong odor down to 3.5 m depth.
SAND and SILT - fine, trace organic rootlets, wet, grey.	☰	4		Hard drilling from 4.0 to 4.3 meters below ground surface.
END OF HOLE at 4.3 m. Auger hit refusal. Bedrock or cobbles/boulders inferred. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 1.0 m during drilling.				

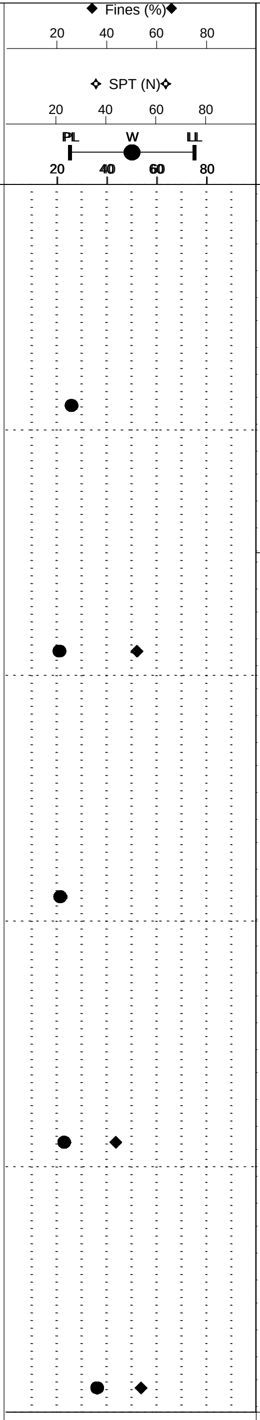
ELEVATION (m)
1098
1097
1096
1095
1094
1093

Start Date: 24/07/2014	Logged By: D.Kennedy
Completion Date:24/07/2014	Reviewed By: MS/HY
Completion Depth:4.30 m	

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Tailings Beach	Borehole No: BH-T-14-18
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389182	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880553	Elevation (m): 1100

SAMPLE TYPE ▨ Shelby Tube ◧ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough



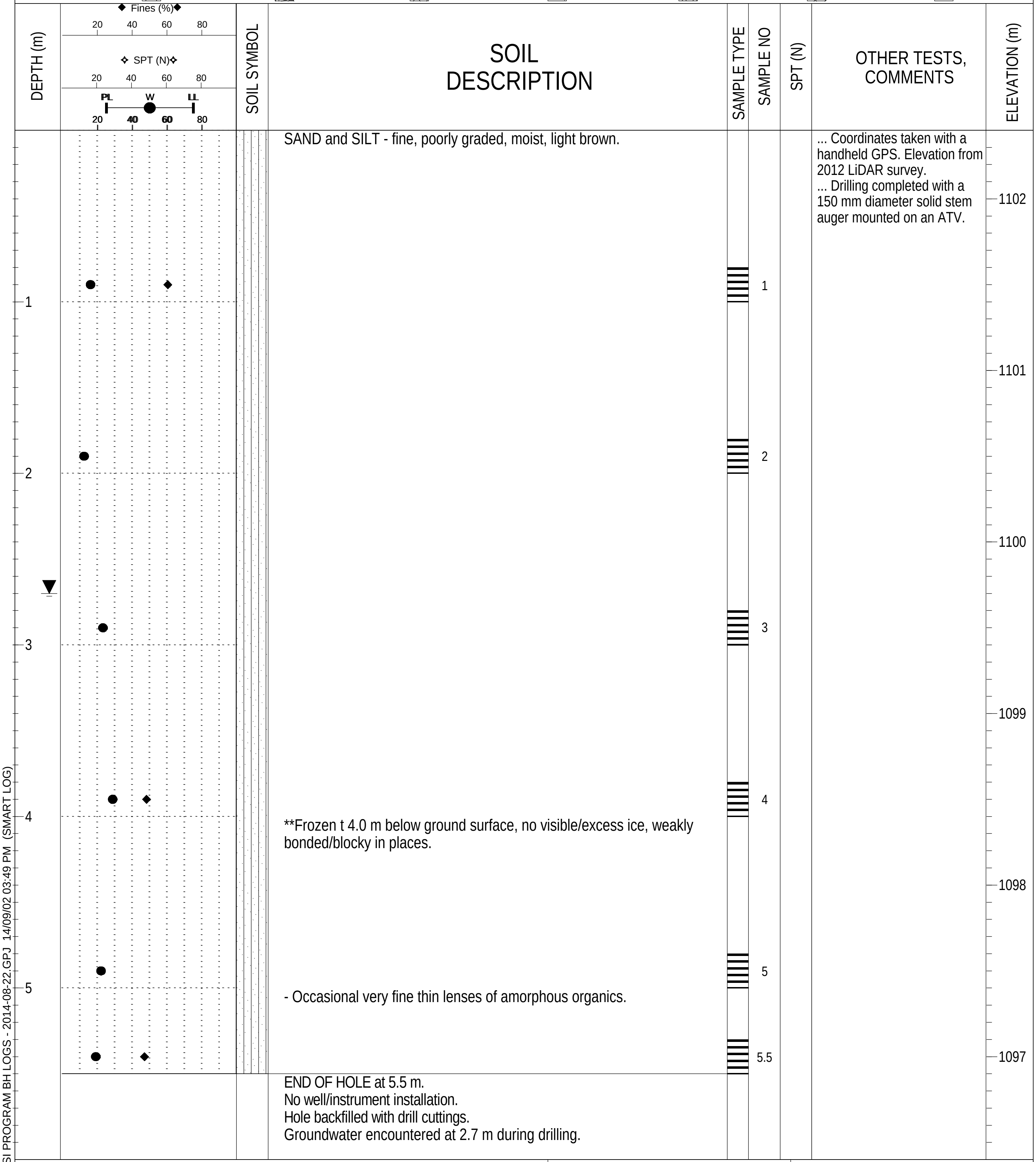
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
1	▒	SAND - fine to medium, some silt, trace to some organic (decomposed wood pieces and rootlets), brown, wet (Tailings).	☰	1		... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV. Ponded water at surface.	1099
2 3 4	▥	SAND and SILT - fine, grey, wet.	☰ ☰ ☰ ☰	2 3 4 5		Strong organic odor after 4.0 m depth.	1098 1097 1096 1095
5		END OF HOLE at 5.0 m. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at surface during drilling.				End of borehole at 5.0 meters below ground surface.	1094

amec	Start Date: 24/07/2014	Logged By: D.Kennedy
	Completion Date:24/07/2014	Reviewed By: MS/HY
	Completion Depth:5.00 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Tailings Beach	Borehole No: BH-T-14-19
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389139	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880615	Elevation (m): 1102

SAMPLE TYPE ▨ Shelby Tube ◧ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ▨ Slough



SAND and SILT - fine, poorly graded, moist, light brown.

**Frozen t 4.0 m below ground surface, no visible/excess ice, weakly bonded/blocky in places.

- Occasional very fine thin lenses of amorphous organics.

END OF HOLE at 5.5 m.
No well/instrument installation.
Hole backfilled with drill cuttings.
Groundwater encountered at 2.7 m during drilling.

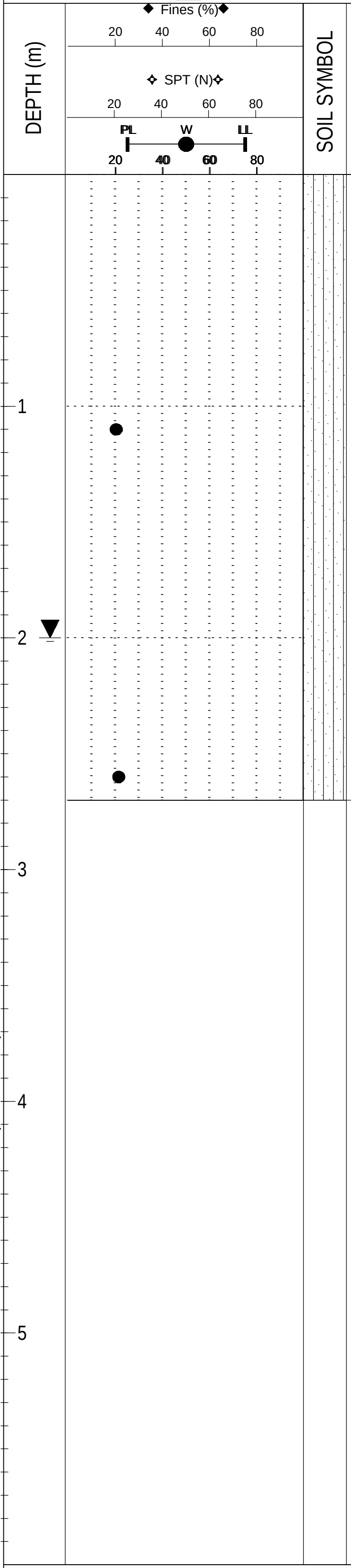
... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey.
... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.

amec	Start Date: 24/07/2014	Logged By: D.Kennedy
	Completion Date:24/07/2014	Reviewed By: MS/HY
	Completion Depth:5.50 m	

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-20
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389428	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880490	Elevation (m): 1100

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▨ Bentonite Grout ▨ Bentonite Pellets ▨ Cement Grout ☒ Drill Cuttings ▨ Sand ☐ Slough



SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
SILTY GRAVELLY SAND - fine to medium, trace rootlets with organic, moist, brown. (Fill)				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	1099
- Organics content test result was 3.8%.	☰	1			1098
- Grades lighter colour below 1.8 m depth.				Groundwater encountered at 2.0 meters below ground surface during drilling. No recovery/auger cuttings from 1.5 to 2.5 meters below ground surface.	
**Frozen at 2.5 meters below ground surface, -1°C, ice crystals less than 1 cm in diameter, weakly bonded, total ice is approximately 10 to 15% of sample.	☰	2			1097
END OF HOLE at 2.7 m. Auger hit refusal. Bedrock or cobbles/boulders inferred. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 2.0 m during drilling.					1096
					1095
					1094

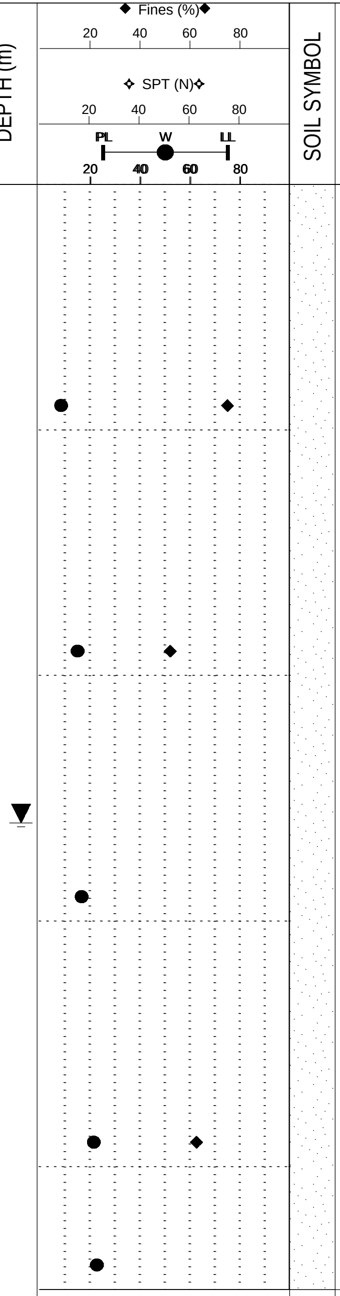
amec

Start Date: 27/07/2014	Logged By: D.Kennedy
Completion Date: 27/07/2014	Reviewed By: MS/HY
Completion Depth: 2.70 m	Page 1 of 1

Project: Mount Nansen 2014 Site Investigation	Area: Tailings Facility - Southern Margin	Borehole No: BH-T-14-21
Client: Yukon Government AAM	Northing (UTM Zone 8, NAD 83):389379	Project No: VM00605J
Contractor & Method: Dark Side Drilling - Auger	Easting (UTM Zone 8, NAD 83):6880504	Elevation (m): 1099

SAMPLE TYPE ▨ Shelby Tube ▮ Core ☒ SPT (N) ☰ Grab Sample

BACKFILL TYPE ▨ Bentonite Chips ▩ Bentonite Grout ▩ Bentonite Pellets ▩ Cement Grout ☒ Drill Cuttings ▩ Sand ☐ Slough

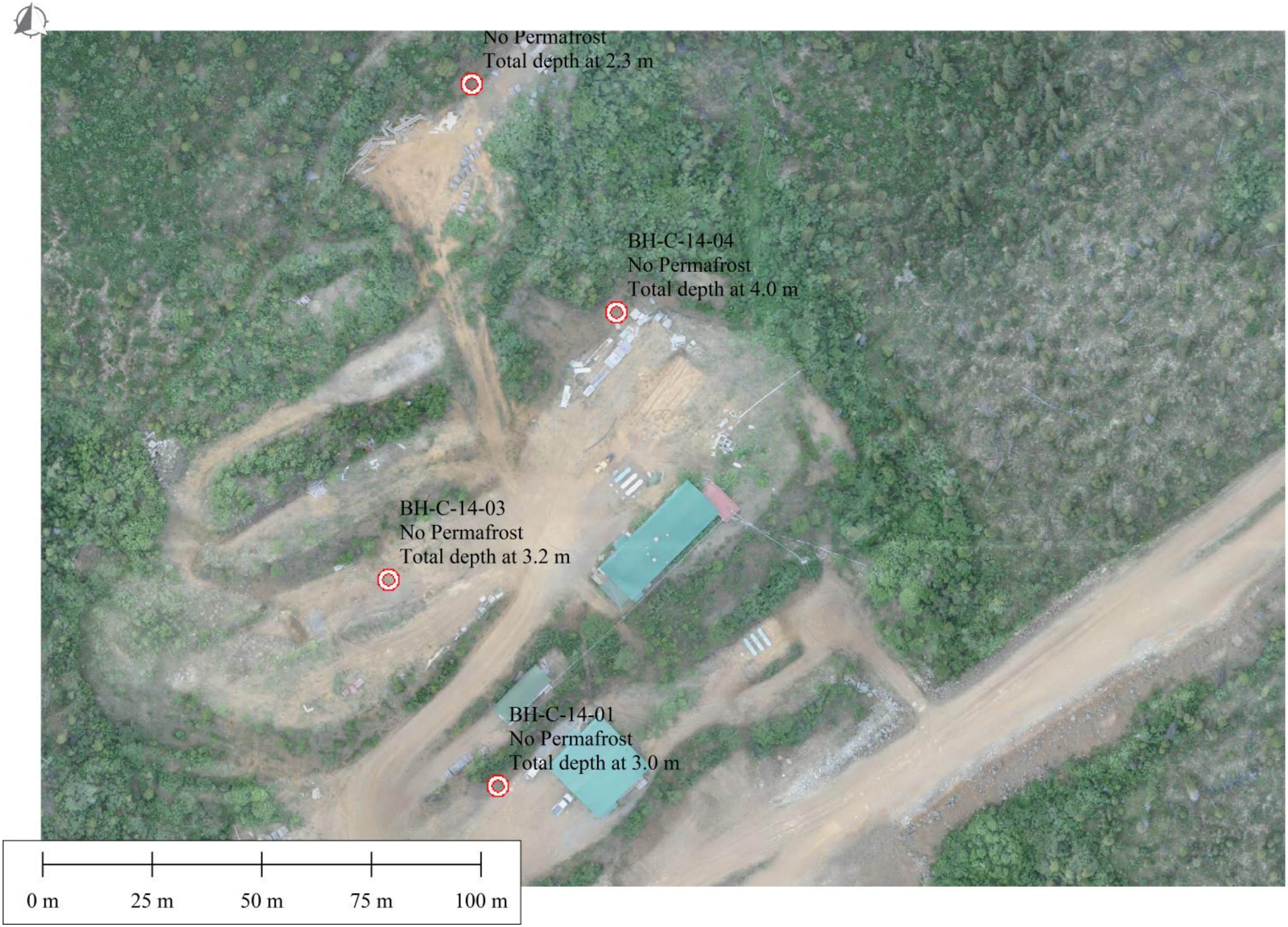


DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS, COMMENTS	ELEVATION (m)
	SAND - fine to medium, some silt, trace gravel, moist, light brown with orange mottling.				... Coordinates taken with a handheld GPS. Elevation from 2012 LiDAR survey. ... Drilling completed with a 150 mm diameter solid stem auger mounted on an ATV.	
1		☰	1			1098
2		☰	2			1097
	- Grades silty, no mottling below 2.0 m depth.					
3	**Frozen at 2.8 meters below ground surface , -1°C, weakly bonded, ice is approximately 10 to 15% of total sample volume.	☰	3		Groundwater encountered at 2.6 meters below ground surface during drilling.	1096
4		☰	4			1095
		☰	4.5			
	END OF HOLE at 4.5 m. No well/instrument installation. Hole backfilled with drill cuttings. Groundwater encountered at 2.6 m during drilling.					
5						1094
						1093

Start Date: 27/07/2014	Logged By: D.Kennedy
Completion Date:27/07/2014	Reviewed By: MS/HY
Completion Depth:4.50 m	

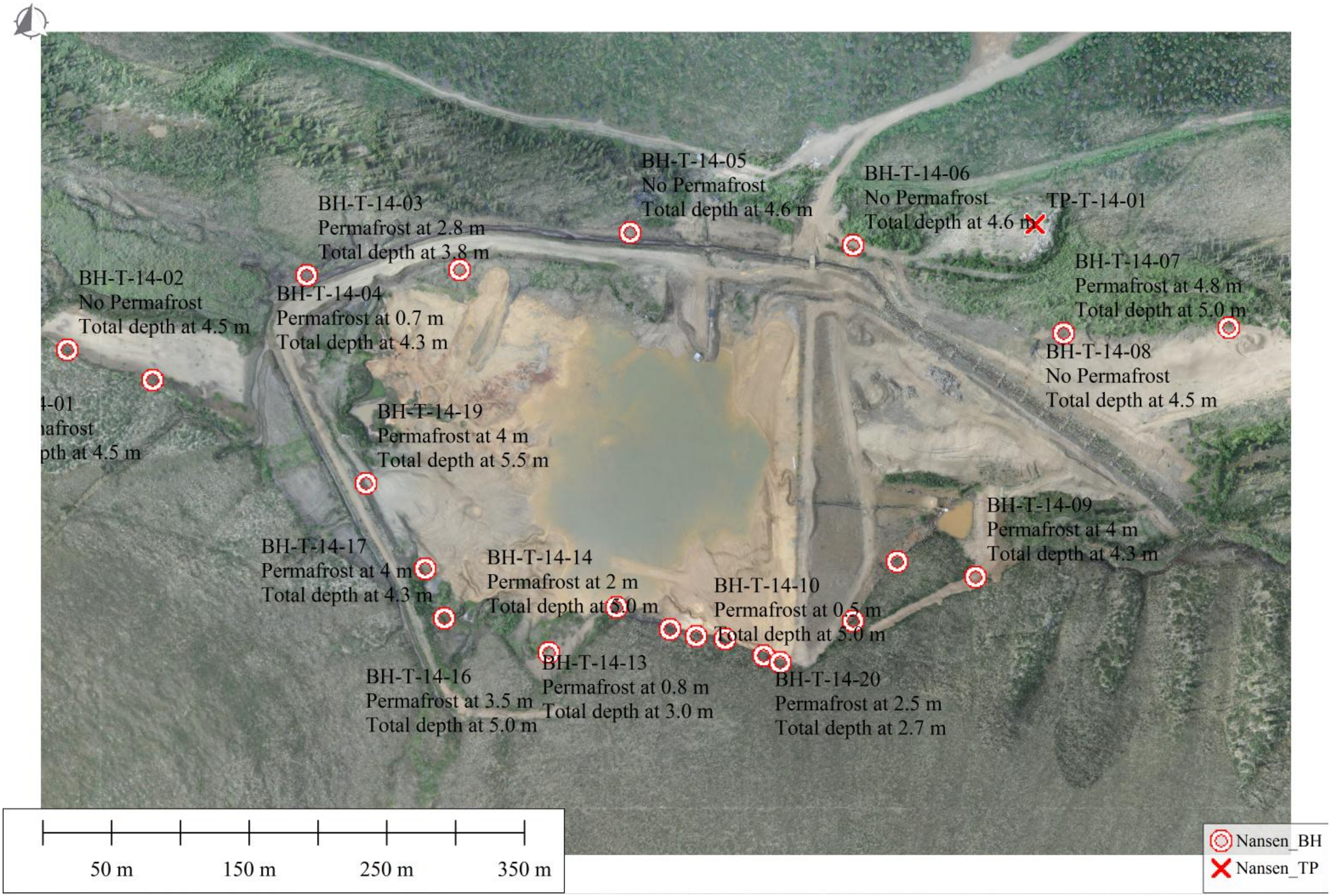
Appendix 4B – Imagery of Test Hole Locations

Mount Nansen 2014 SI Program



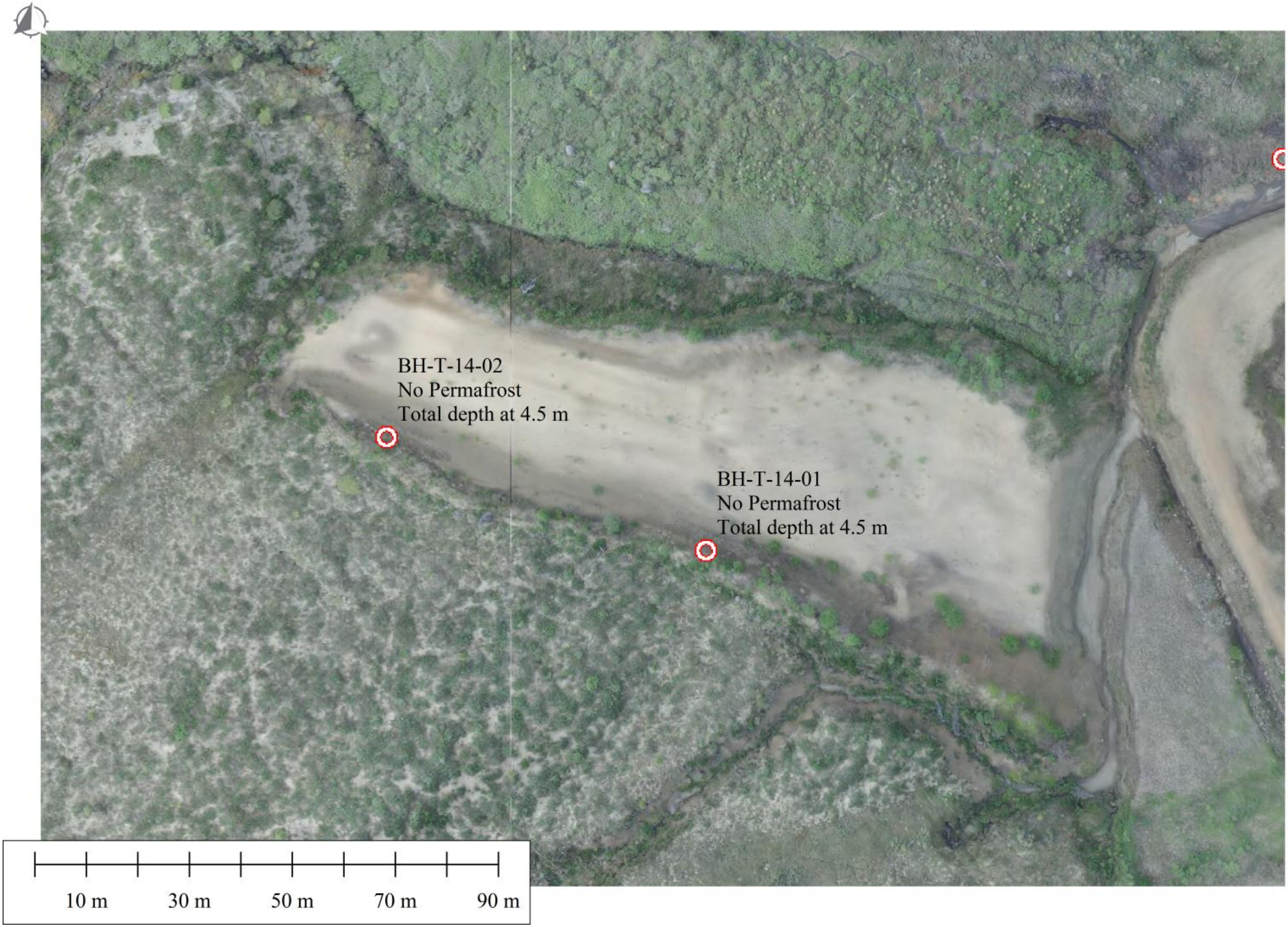
Mount Nansen 2014 SI Program

Mount Nansen 2014 SI Program



Tailings Overall Plan

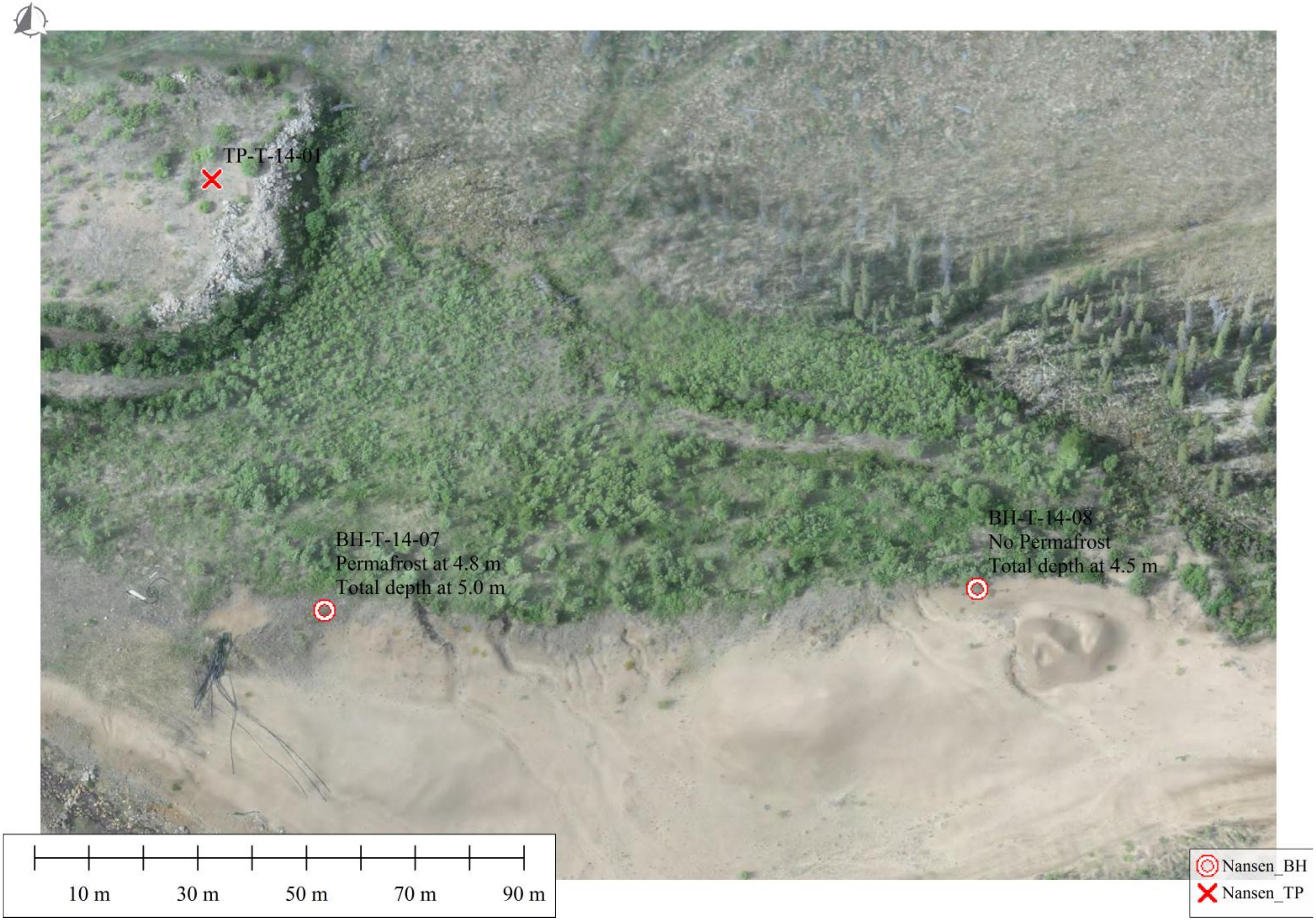
Mount Nansen 2014 SI Program



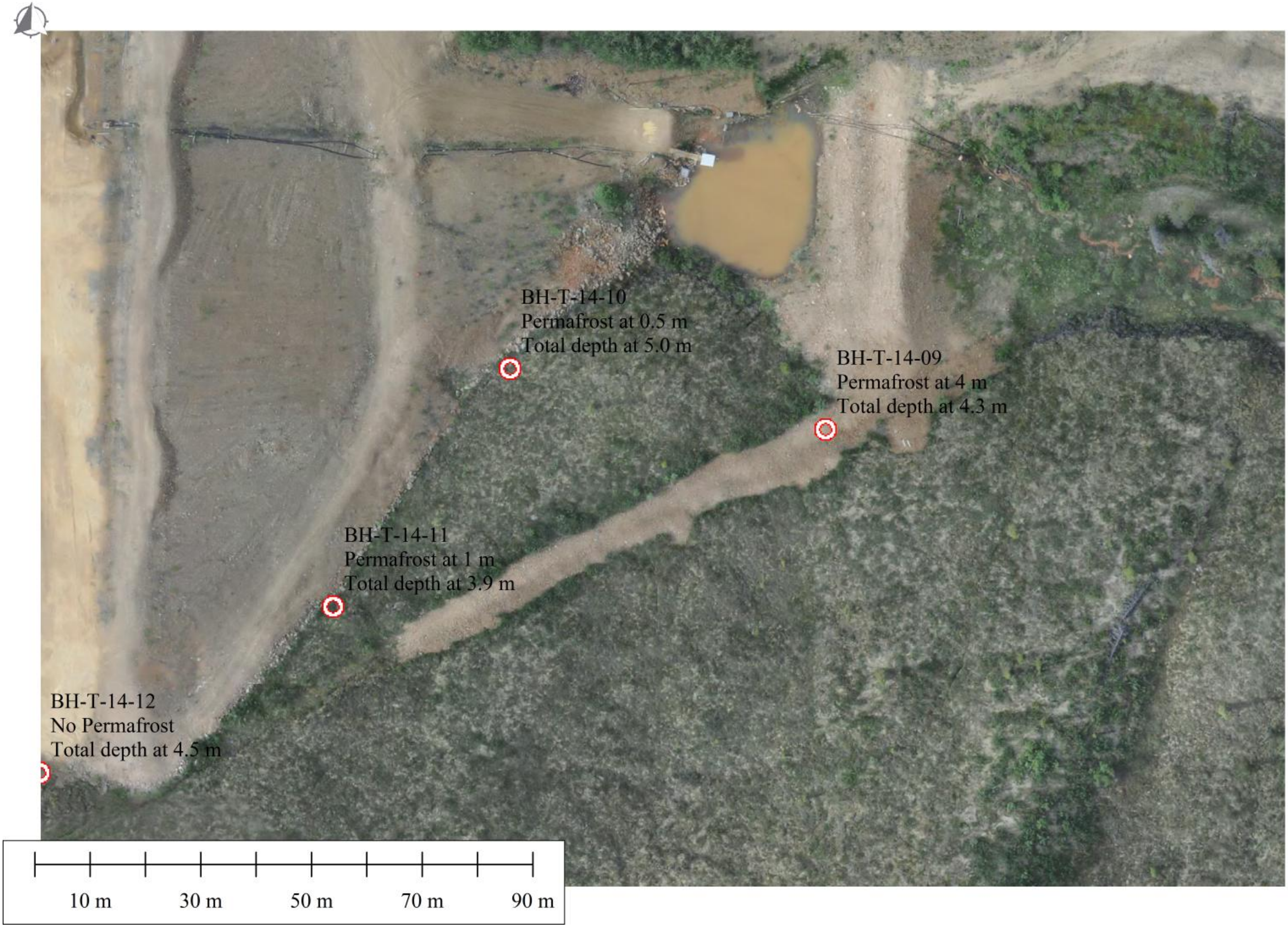
Mount Nansen 2014 SI Program

Mount Nansen 2014 SI Program

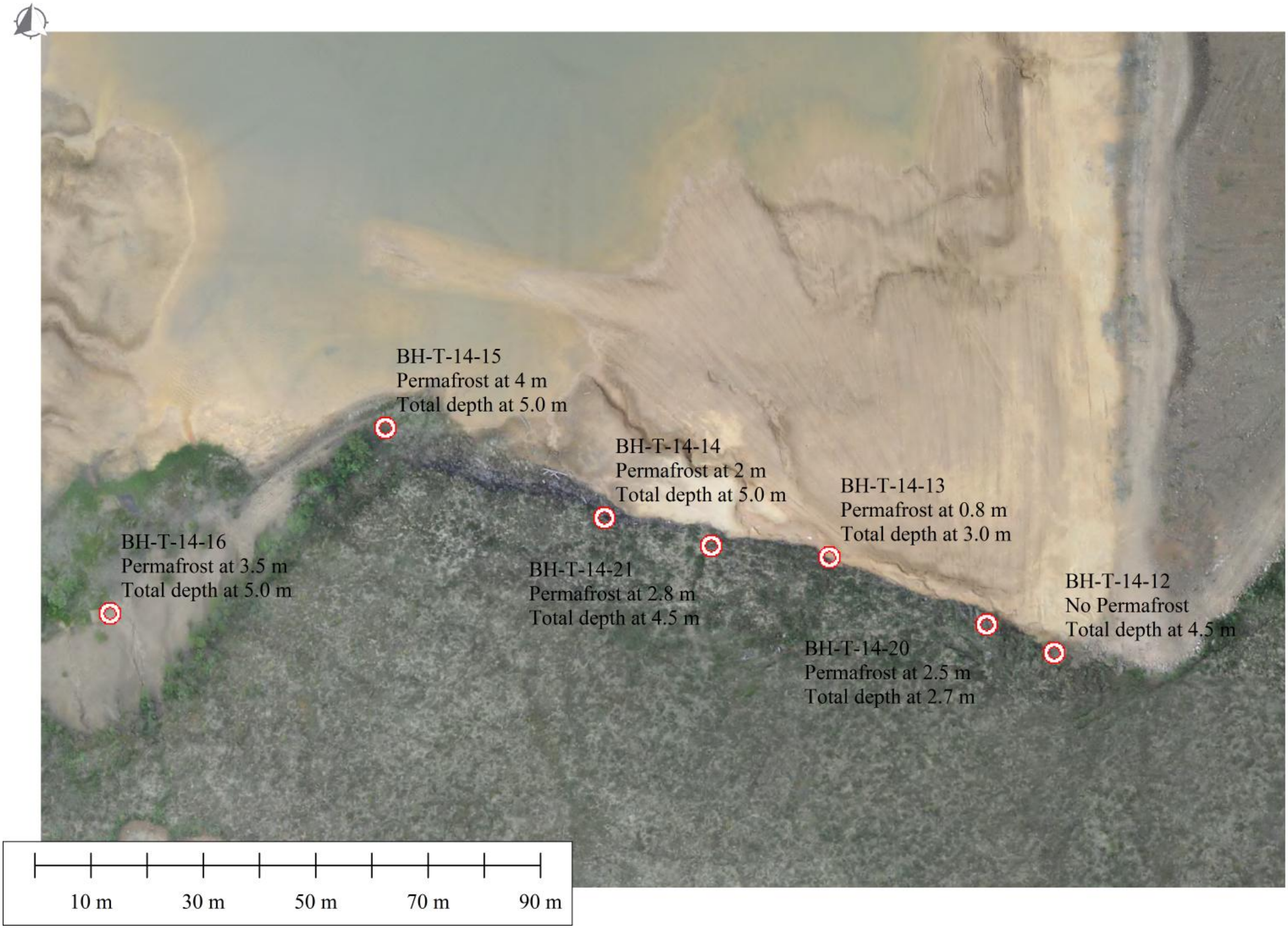
Mount Nansen 2014 SI Program



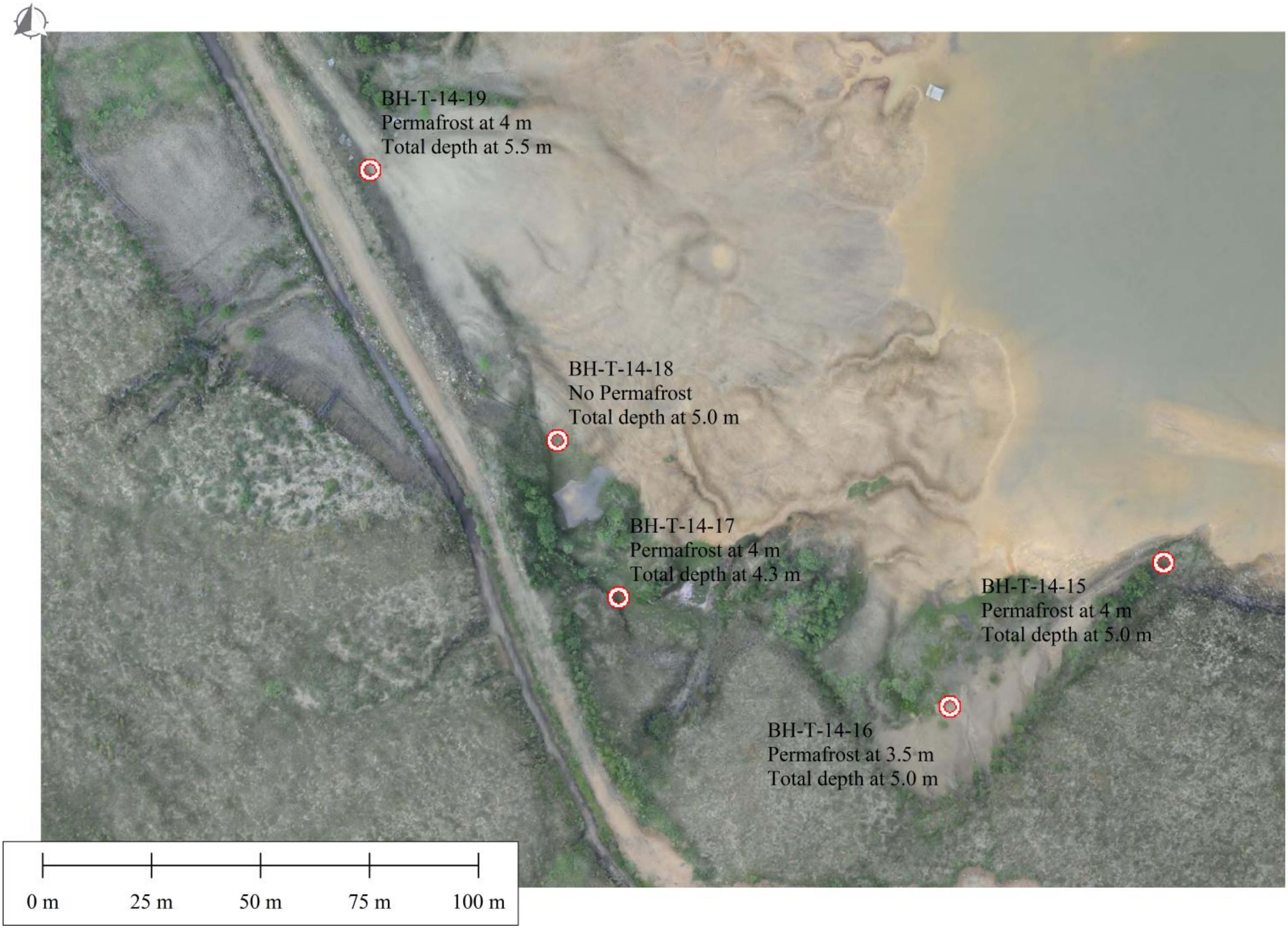
Mount Nansen 2014 SI Program



Mount Nansen 2014 SI Program



Mount Nansen 2014 SI Program



Appendix 4C – Test Pit Logs

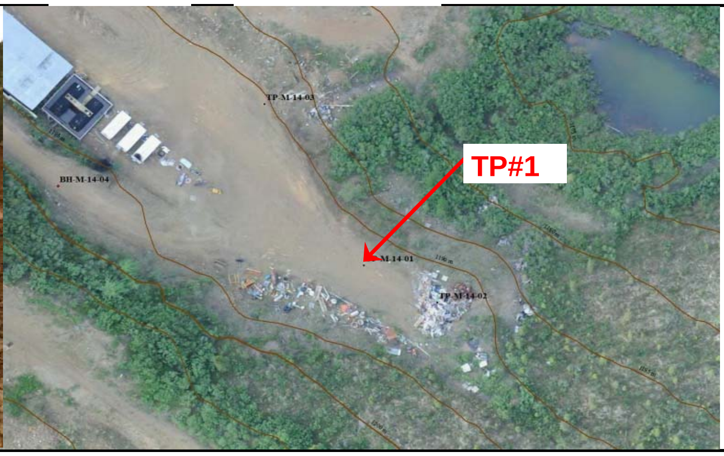
AMEC Environme Infrastructure
a division of AMEC America
Suite 600 - 4445 Lougheed Hwy
Burnaby, BC V5C 0E4
tel: 604-294-3811
Fax: 604-294-4664

TEST PIT (TP-M-14-01)

Project Number: VM00605J
Project Name: Mount Nansen Remediation Project - 2014 SI Program
Project Location: Mount Nansen, Yukon
Date: March 9, 2015

Test Pit Photo

Test Pit Plan Location



TP Completion Date: 26-Jul-14 **Logged by :** HY
Equipment:[4] Case CX210 – track excavtor **Reviewed by :**
Ground Elevation (m): 1192.2 **TP Station:** N/A
Coordinates (m): **N** 6880960 **E** 388032

Depth Interval (m)	Sample Type, Number and Depth (m)	% Gravel[1]	% Sand[2]	% Fines[3]	% Moisture	Soil Description	Classification[5]
0.0 - 5.0						Fill - Granular rock fragments, sand and silt, trace organic roots, compact, moist, brown.	

Notes:
No garbage found at this location, no soil samples were collected.
Test pit backfilled with excavated materials and bucket compacted.
No ground water or seepage encountered.
Test pit terminated at 5.0 m depth.
Vertical walls.

---

[1] Particles smaller than 75mm and larger than 4.75 mm in diameter.
[2] Particles smaller than 4.75 mm and larger than 0.075 mm in diameter.
[3] Materials passing sieve size 200 (0.075 mm US Standard Sieve Size).
[4] Track excavator owned by contractor, Denison Environmental Services.
[5] Soil are classified according to their particle size, distribution and plasticity based upon the *Modified Unified Soil Classification System* .

AMEC Environme Infrastructure
a division of AMEC America
Suite 600 - 4445 Lougheed Hwy
Burnaby, BC V5C 0E4
tel: 604-294-3811
Fax: 604-294-4664

TEST PIT (TP-M-14-02)

Project Number: VM00605J
Project Name: Mount Nansen Remediation Project - 2014 SI Program
Project Location: Mount Nansen, Yukon
Date: March 9, 2015

Test Pit Photo

Test Pit Plan Location

TP Completion Date: 26-Jul-14 **Logged by :** HY
Equipment:[4] Case CX210 – track excavtor **Reviewed by :**
Ground Elevation (m): 1191.6 **TP Station:** N/A
Coordinates (m): **N** 6880952 **E** 388047

Depth Interval (m)	Sample Type, Number and Depth (m)	% Gravel[1]	% Sand[2]	% Fines[3]	% Moisture	Soil Description	Classification[5]
0.0 - 1.0	GS1 - 0.7					Waste - metals, woods, construction materials, plastic, wire, bottles, oil filter, hose, cardboard, paper, rope, plywood, nails, car parts, etc.	
1.0 - 3.1	GS2 - 3.0					Fill - Sand, gravels, compact, moist brown,	
3.1 - 3.5						Topsoil/Ash	
3.5 - 4.0	GS3 - 3.6 GS4 - 3.7					Sand, fine to medium, compact, moist, tan	

Notes:
-Grab Samples (GS) were tested for moisture, pH, total Cyanide, metal, and hydrocarbon contamination.
No ground water or seepage encountered. Side walls collapsing.
Test pit terminated at 4.0 m depth.
Test pit backfilled with excavated materials and bucket compacted.

[1] Particles smaller than 75mm and larger than 4.75 mm in diameter.
[2] Particles smaller than 4.75 mm and larger than 0.075 mm in diameter.
[3] Materials passing sieve size 200 (0.075 mm US Standard Sieve Size).
[4] Track excavator owned by contractor, Denison Environmental Services.
[5] Soil are classified according to their particle size, distribution and plasticity based upon the *Modified Unified Soil Classification System* .

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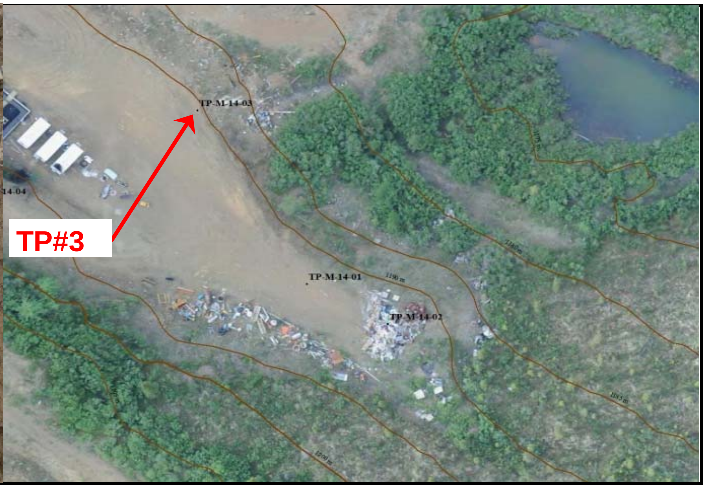
a division of AMEC America
Suite 600 - 4445 Lougheed Hwy
Burnaby, BC V5C 0E4
tel: 604-294-3811
Fax: 604-294-4664

TEST PIT (TP-M-14-03)

Project Number: VM00605J
Project Name: Mount Nansen Remediation Project - 2014 SI Program
Project Location: Mount Nansen, Yukon
Date: March 9, 2015

Test Pit Photo

Test Pit Plan Location



TP Completion Date: 26-Jul-14 **Logged by :** HY
Equipment:[4] Case CX210 – track excavtor **Reviewed by :**
Ground Elevation (m): 1190.4 **TP Station:** N/A
Coordinates (m): **N** 6880996 **E** 388011

Depth Interval (m)	Sample Type, Number and Depth (m)	% Gravel[1]	% Sand[2]	% Fines[3]	% Moisture	Soil Description	Classification[5]
0.0 - 5.0						Waste - metals, wood, construction materials, plastic, wire, bottles, oil filter, hose, cardboard, paper, rope, plywood, nails, car parts, etc.	
	GS1 - 1.5					- White soft and moist substance found at 1.5 m depth  	
	GS2 - 5.0					Concrete slab	
						Notes: -Grab Samples (GS) were tested for moisture, pH, total Cyanide, metal, and hydrocarbon contamination. No ground water or seepage encountered. Side walls collapsing. Test pit terminated at 5.0 m depth, where a concrete slab found. Not able to determine bottom of the waste due to the concrete slab. Test pit backfilled with excavated materials and bucket compacted.	

---

[1] Particles smaller than 75mm and larger than 4.75 mm in diameter.
[2] Particles smaller than 4.75 mm and larger than 0.075 mm in diameter.
[3] Materials passing sieve size 200 (0.075 mm US Standard Sieve Size).
[4] Track excavator owned by contractor, Denison Environmental Services.
[5] Soil are classified according to their particle size, distribution and plasticity based upon the *Modified Unified Soil Classification System* .

Appendix 4D – Geotechnical Results

Mount Nansen Remediation Project
2014 Site Investigation Report
Summary of 2014 Geotechnical Lab Results

						Moisture content		Organic	Grain Size Analysis (Summary)			Filter Compatibility			Atterberg Limits		
						Lab MC	Permafrost MC	Organic Matter	Gravel (75-4.75 mm)	Sand (4.75-0.075 mm)	Fines (<0.075 mm)	D15	D50	D85	Liquid Limit	Plastic Limit	Plasticity Index
Site Area	**Test Hole ID**	**Sample**	**Depth (m)**	**Soil Type**	**Soil Description**	%	%	%	%	%	%	mm	mm	mm	Index	Index	Index
Camp	BH-C-14-01	GS2	2	In Situ	Weathered Bedrock	8											
Camp	BH-C-14-01	GS3	3	In Situ	Weathered Bedrock	8											
Camp	BH-C-14-02	GS1	1	In Situ	Weathered Bedrock	5			7	67	26	<0.075	0.23	1.17			
Camp	BH-C-14-02	GS2	2	In Situ	Weathered Bedrock	4											
Camp	BH-C-14-03	GS1	1	In Situ	Weathered Bedrock	9			17	47	37	<0.075	0.21	5.51			
Camp	BH-C-14-03	GS2	2	In Situ	Weathered Bedrock	9											
Camp	BH-C-14-04	GS1	1	In Situ	Weathered Bedrock	10			26	41	33	<0.075	0.23	21.63			
Camp	BH-C-14-04	GS2	2	In Situ	Weathered Bedrock	9											
Camp	BH-C-14-04	GS3	3	In Situ	Weathered Bedrock	10											
Camp	BH-C-14-04	GS4	4	In Situ	Weathered Bedrock	6											
Mill	BH-M-14-01	GS1	1	In Situ	Weathered Bedrock	12			3	52	45	<0.075	0.15	0.84			
Mill	BH-M-14-02	GS1	1	In Situ	Weathered Bedrock	16			5	58	37	<0.075	0.11	0.86			
Mill	BH-M-14-02	GS2	2	In Situ	Weathered Bedrock	13											
Mill	BH-M-14-03	GS1	1	Fill	Fill	5											
Mill	BH-M-14-04	GS1	1	In Situ	Weathered Bedrock	4			3	60	36	<0.075	0.14	0.98			
Mill	BH-M-14-05	GS1	1	In Situ	Weathered Bedrock	6											
Mill	BH-M-14-05	GS2	2	In Situ	Weathered Bedrock	16											
Mill	BH-M-14-05	GS3	3	In Situ	Weathered Bedrock	15			6	44	50	<0.075	<0.075	1.49			
Mill	BH-M-14-05	GS4	4	In Situ	Weathered Bedrock	13											
TF-Borrow	BH-T-14-01	GS1	1	In Situ	Unfrozen	7			1	81	18	<0.075	0.13	0.33			
TF-Borrow	BH-T-14-01	GS2	2	In Situ	Unfrozen	4			0	87	13	0.078	0.14	0.38			
TF-Borrow	BH-T-14-01	GS3	3	In Situ	Unfrozen	4											
TF-Borrow	BH-T-14-01	GS4	4	In Situ	Unfrozen	16											
TF-Borrow	BH-T-14-01	GS5	4.5	In Situ	Unfrozen	17											
TF-Borrow	BH-T-14-02	GS1	1	In Situ	Unfrozen	19			0	77	23	<0.075	0.12	0.26			
TF-Borrow	BH-T-14-02	GS2	2	In Situ	Unfrozen	9			0	82	18	<0.075	0.12	0.24			
TF-Borrow	BH-T-14-02	GS3	3	In Situ	Unfrozen	7											
TF-Borrow	BH-T-14-02	GS4	4	In Situ	Unfrozen	16			0	79	21	<0.075	0.12	0.27			
TF-Borrow	BH-T-14-02	GS5	4.5	In Situ	Unfrozen	17											
TF-North	BH-T-14-03	GS1	1	In Situ	Unfrozen	34		6.6	1	74	25	0.083	0.15	0.31			
TF-North	BH-T-14-03	GS2	2	In Situ	Unfrozen	33		6.1	3	72	24	<0.075	0.13	0.36			
TF-North	BH-T-14-03	GS3	3	In Situ	Frozen	43	46		11	60	29	0.096	0.20	0.48			
TF-North	BH-T-14-03	GS4	3.8	In Situ	Frozen	24	52										
TF-North	BH-T-14-04	GS1	1	In Situ	Frozen	88	145		0	41	59	0.103	0.24	0.55			
TF-North	BH-T-14-04	GS2	2	In Situ	Frozen	50		22.9	0	56	44	0.096	0.22	0.52			
TF-North	BH-T-14-04	GS3	3	In Situ	Frozen	44	52										
TF-North	BH-T-14-04	GS4	4	In Situ	Frozen	17			2	68	31	<0.075	0.15	0.44			
TF-North	BH-T-14-05	GS1	1	In Situ	Unfrozen	7			20	75	4	<0.075	0.13	0.30			
TF-North	BH-T-14-05	GS2	2	In Situ	Unfrozen	17											

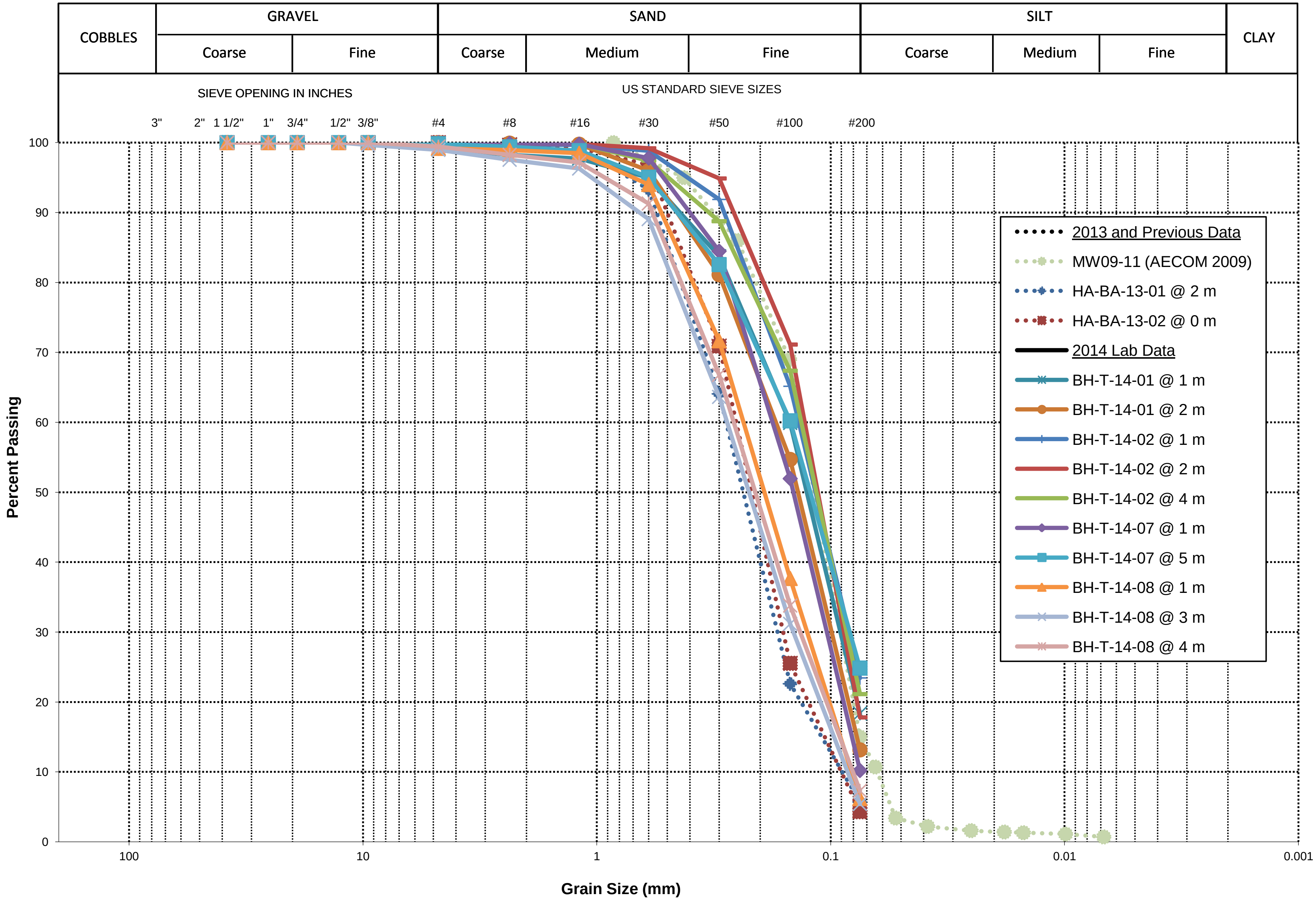
Mount Nansen Remediation Project
2014 Site Investigation Report
Summary of 2014 Geotechnical Lab Results

						Moisture content		Organic	Grain Size Analysis (Summary)			Filter Compatibility			Atterberg Limits		
						Lab MC	Permafrost MC	Organic Matter	Gravel (75-4.75 mm)	Sand (4.75-0.075 mm)	Fines (<0.075 mm)	D15	D50	D85	Liquid Limit	Plastic Limit	Plasticity Index
Site Area	Test Hole ID	Sample	Depth (m)	Soil Type	Soil Description	%	%	%	%	%	%	mm	mm	mm	Index	Index	Index
TF-North	BH-T-14-05	GS3	3	In Situ	Unfrozen	14			7	85	8	<0.075	0.12	0.53			
TF-North	BH-T-14-05	GS4	4	In Situ	Unfrozen	17											
TF-North	BH-T-14-05	GS5	4.6	In Situ	Unfrozen	17											
TF-North	BH-T-14-06	GS1	1	Fill	Unfrozen	14		16.4									
TF-North	BH-T-14-06	GS2	2	In Situ	Unfrozen	8											
TF-North	BH-T-14-06	GS3	3	In Situ	Unfrozen	4			0	88	11	<0.075	<0.075	0.18			
TF-North	BH-T-14-06	GS4	4	In Situ	Unfrozen	6											
TF-North	BH-T-14-06	GS5	4.6	In Situ	Unfrozen	4											
TF-Borrow	BH-T-14-07	GS1	1	In Situ	Unfrozen	3			0	90	10	<0.075	0.09	0.22			
TF-Borrow	BH-T-14-07	GS2	2	In Situ	Unfrozen	5											
TF-Borrow	BH-T-14-07	GS3	3	In Situ	Unfrozen	5											
TF-Borrow	BH-T-14-07	GS4	4	In Situ	Unfrozen	3											
TF-Borrow	BH-T-14-07	GS5	5	In Situ	Frozen	14			0	75	25	<0.075	0.19	1.01			
TF-Borrow	BH-T-14-08	GS1	1	In Situ	Unfrozen	3			1	93	6	0.118	0.31	7.22			
TF-Borrow	BH-T-14-08	GS2	2	In Situ	Unfrozen	4											
TF-Borrow	BH-T-14-08	GS3	3	In Situ	Unfrozen	3			1	94	5	0.092	0.22	0.91			
TF-Borrow	BH-T-14-08	GS4	4	In Situ	Unfrozen	3			1	92	7	0.084	0.21	0.54			
TF-Borrow	BH-T-14-08	GS5	4.5	In Situ	Unfrozen	4											
TF-South	BH-T-14-09	GS1	1	In Situ	Unfrozen	14											
TF-South	BH-T-14-09	GS2	2	In Situ	Unfrozen	16											
TF-South	BH-T-14-09	GS3	3	In Situ	Unfrozen	12			25	64	12	0.089	0.29	22.98			
TF-South	BH-T-14-09	GS4	4	In Situ	Frozen	25	28		6	55	39	<0.075	0.11	0.45			
TF-South	BH-T-14-10	GS1	1	In Situ	Frozen	35	36		0	63	37	<0.075	0.11	0.27			
TF-South	BH-T-14-10	GS2	2	In Situ	Frozen	31											
TF-South	BH-T-14-10	GS3	3	In Situ	Frozen	37	37										
TF-South	BH-T-14-10	GS4	4	In Situ	Frozen	65											
TF-South	BH-T-14-10	GS5	5	In Situ	Frozen	38			0	47	53	<0.075	<0.075	0.19	Non-Plastic		
TF-South	BH-T-14-10	GS2+3	2 & 3	In Situ	Frozen	23			0	59	41	<0.075	0.09	0.20	22	20	2
TF-South	BH-T-14-11	GS1	1	In Situ	Frozen	108	108		0	43	57	<0.075	<0.075	0.25			
TF-South	BH-T-14-11	GS1.9	1.9	In Situ	Frozen	17			0	66	34	<0.075	0.13	0.39			
TF-South	BH-T-14-11	GS3	2.9	In Situ	Frozen	19											
TF-South	BH-T-14-11	GS3.9	3.9	In Situ	Frozen	20			0	68	32	<0.075	0.13	0.33			
TF-South	BH-T-14-12	GS1	1	In Situ	Unfrozen	77		25.1									
TF-South	BH-T-14-12	GS2	2	In Situ	Unfrozen	17			17	56	27	<0.075	0.28	5.56			
TF-South	BH-T-14-12	GS3	3	In Situ	Unfrozen	11			27	52	21	<0.075	0.58	11.85			
TF-South	BH-T-14-12	GS4	4	In Situ	Unfrozen	7			22	49	30	<0.075	0.56	6.96			
TF-South	BH-T-14-13	GS1	1	In Situ	Frozen	31	36		20	57	23	<0.075	0.23	8.71			
TF-South	BH-T-14-13	GS3	3	In Situ	Frozen	19	20										
TF-South	BH-T-14-13	GS2	2	In Situ	Frozen	17	17										

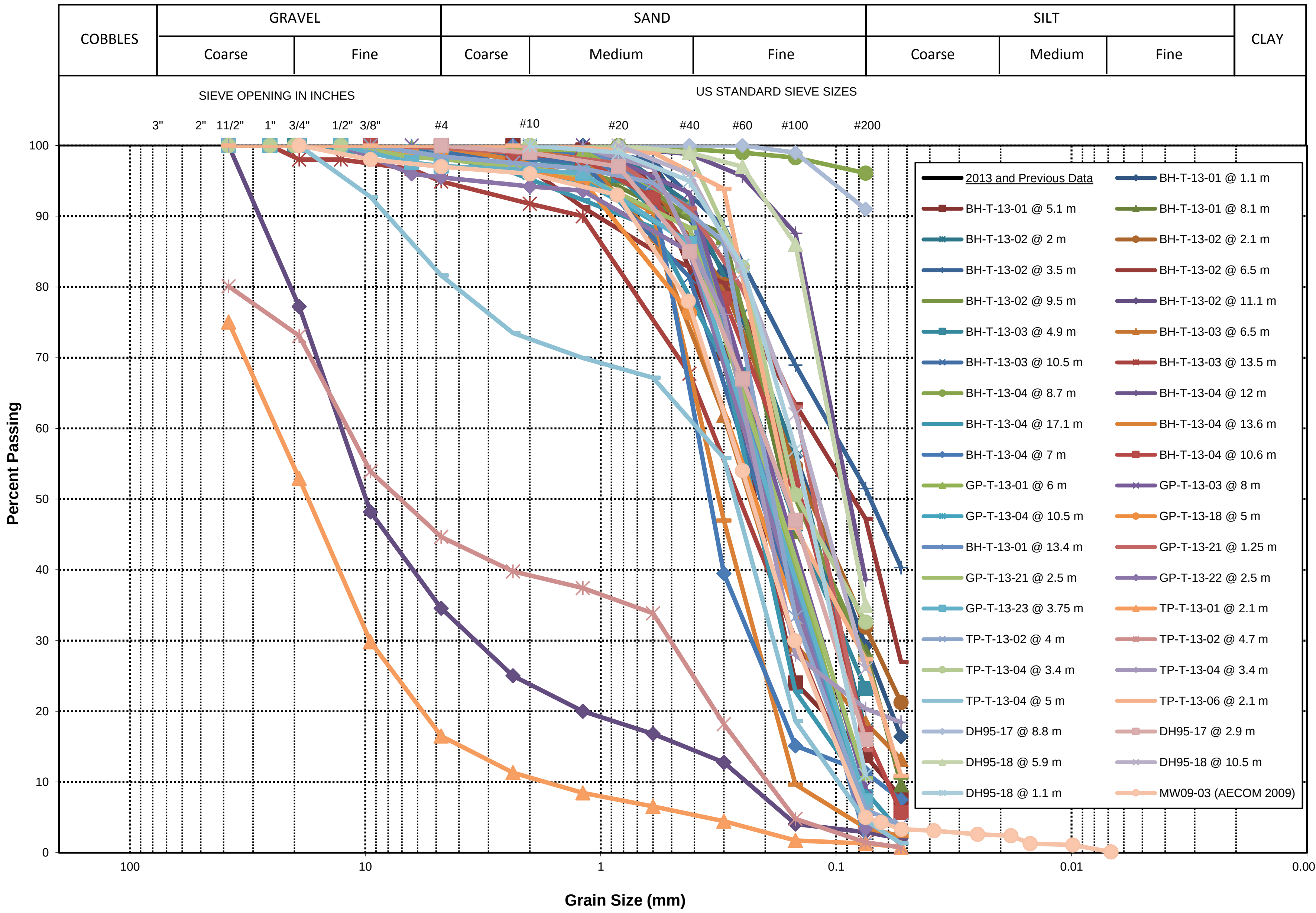
Mount Nansen Remediation Project
2014 Site Investigation Report
Summary of 2014 Geotechnical Lab Results

						Moisture content		Organic	Grain Size Analysis (Summary)			Filter Compatibility			Atterberg Limits		
						Lab MC	Permafrost MC	Organic Matter	Gravel (75-4.75 mm)	Sand (4.75-0.075 mm)	Fines (<0.075 mm)	D15	D50	D85	Liquid Limit	Plastic Limit	Plasticity Index
Site Area	Test Hole ID	Sample	Depth (m)	Soil Type	Soil Description	%	%	%	%	%	%	mm	mm	mm	Index	Index	Index
TF-South	BH-T-14-13	GS2 & 3	2 & 3	In Situ	Frozen	18			10	59	32	<0.075	0.20	2.64			
TF-South	BH-T-14-14	GS1	1	In Situ	Unfrozen	21			7	73	20	<0.075	0.14	0.93			
TF-South	BH-T-14-14	GS2	2	In Situ	Frozen	14			9	73	18	<0.075	0.20	1.00			
TF-South	BH-T-14-14	GS3	3	In Situ	Frozen	16											
TF-South	BH-T-14-14	GS4	4	In Situ	Frozen	23	26		0	79	21	<0.075	0.17	0.45			
TF-South	BH-T-14-14	GS5	5	In Situ	Frozen	19	21		1	81	19	<0.075	0.18	0.48			
TF-South	BH-T-14-15	GS1	1	In Situ	Unfrozen	42		19.9	1	62	37	<0.075	0.13	0.45			
TF-South	BH-T-14-15	GS2	2	In Situ	Unfrozen	9			0	88	12	0.082	0.20	0.50			
TF-South	BH-T-14-15	GS3	3	In Situ	Unfrozen	17											
TF-South	BH-T-14-15	GS4	4	In Situ	Unfrozen	22			0	64	36	<0.075	0.11	0.39			
TF-South	BH-T-14-15	GS5	5	In Situ	Frozen	25	29		0	55	45	<0.075	0.09	0.27			
TF-South	BH-T-14-16	GS1	1	In Situ	Unfrozen	4			1	94	6	0.096	0.22	0.55			
TF-South	BH-T-14-16	GS2	2	In Situ	Unfrozen	5											
TF-South	BH-T-14-16	GS3	3	In Situ	Unfrozen	14			0	94	6	0.093	0.19	0.48			
TF-South	BH-T-14-16	GS4	4	In Situ	Frozen	19	27		0	60	40	<0.075	0.10	0.29			
TF-South	BH-T-14-16	GS5	5	In Situ	Frozen	45											
TF-South	BH-T-14-17	GS1	1	In Situ	Unfrozen	71		13.5									
TF-South	BH-T-14-17	GS2	2	In Situ	Unfrozen	70											
TF-South	BH-T-14-17	GS3	3	In Situ	Unfrozen	69											
TF-South	BH-T-14-17	GS4	4	In Situ	Frozen	48	51		0	53	47	<0.075	0.08	0.25			
TF-South	BH-T-14-18	GS1	1	Tailings	Unfrozen	26											
TF-South	BH-T-14-18	GS2	2	In Situ	Unfrozen	21			0	56	44	<0.075	0.09	0.23			
TF-South	BH-T-14-18	GS3	3	In Situ	Unfrozen	21											
TF-South	BH-T-14-18	GS4	4	In Situ	Unfrozen	23			0	45	55	<0.075	<0.075	0.15			
TF-South	BH-T-14-18	GS5	5	In Situ	Unfrozen	35	36		0	57	43	<0.075	0.09	0.21			
TF-South	BH-T-14-19	GS1	1	In Situ	Unfrozen	16			0	63	37	<0.075	0.10	0.17			
TF-South	BH-T-14-19	GS2	2	In Situ	Unfrozen	12											
TF-South	BH-T-14-19	GS3	3	In Situ	Unfrozen	23											
TF-South	BH-T-14-19	GS4	4	In Situ	Frozen	29			0	49	51	<0.075	<0.075	0.13			
TF-South	BH-T-14-19	GS5	5	In Situ	Frozen	22											
TF-South	BH-T-14-19	GS5.5	5.5	In Situ	Frozen	19			0	47	53	<0.075	<0.075	0.13			
TF-South	BH-T-14-20	GS1	1	Fill	Unfrozen	20		3.8									
TF-South	BH-T-14-20	GS2	2.5	In Situ	Frozen	17	21										
TF-South	BH-T-14-21	GS1	1	In Situ	Unfrozen	8			1	85	14	0.076	0.13	0.32			
TF-South	BH-T-14-21	GS2	2	In Situ	Unfrozen	15			2	67	31	<0.075	0.12	0.52			
TF-South	BH-T-14-21	GS3	3	In Situ	Frozen	17	17										
TF-South	BH-T-14-21	GS4	4	In Situ	Frozen	20	21		1	68	31	<0.075	0.10	0.23			
TF-South	BH-T-14-21	GS5	4.5	In Situ	Frozen	23											

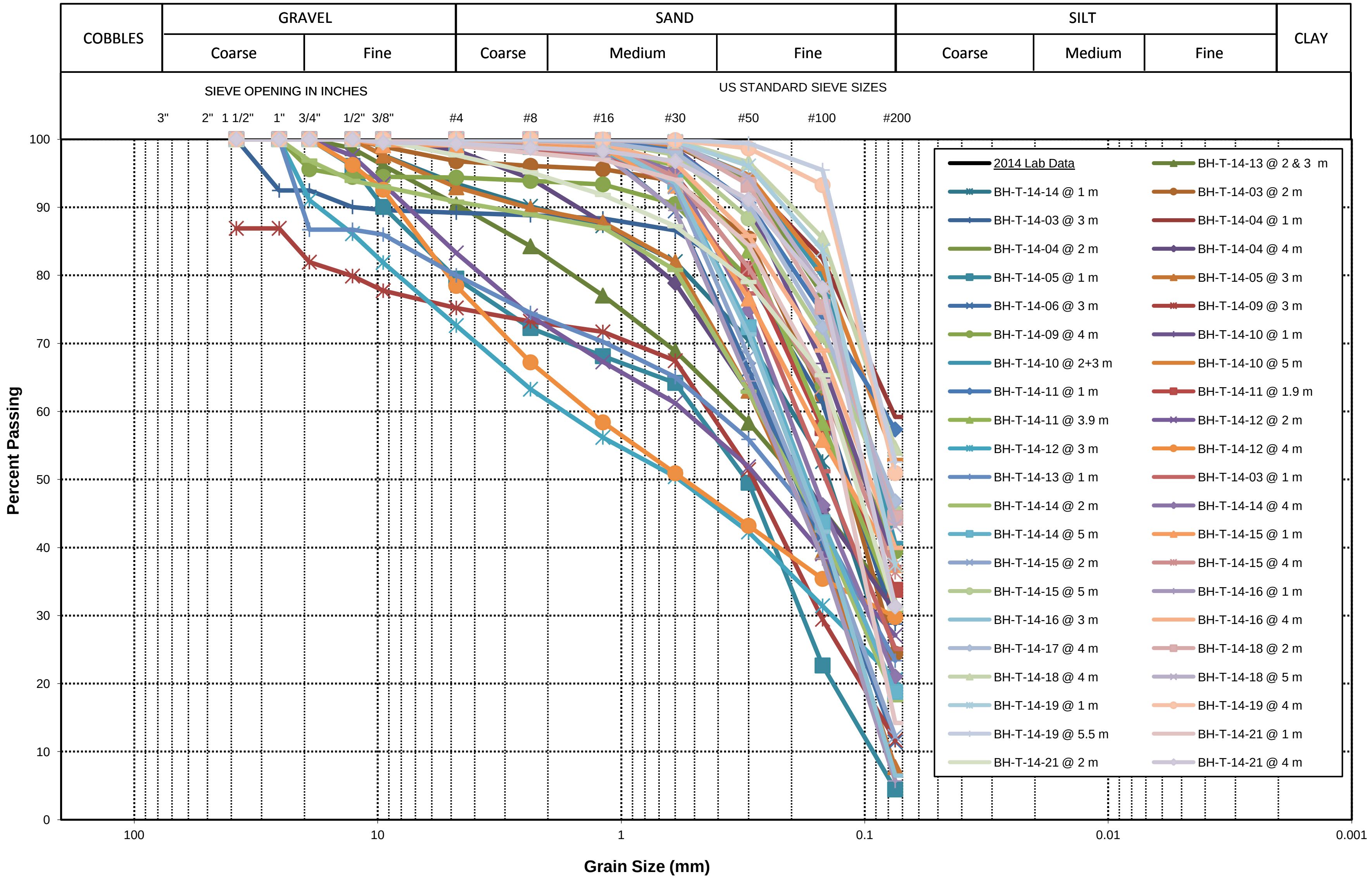
Tailings Facility Borrow Area Sieve Results



Tailings Facility – In Situ Soil Below Tailings Sieve 2013 and Historical Results

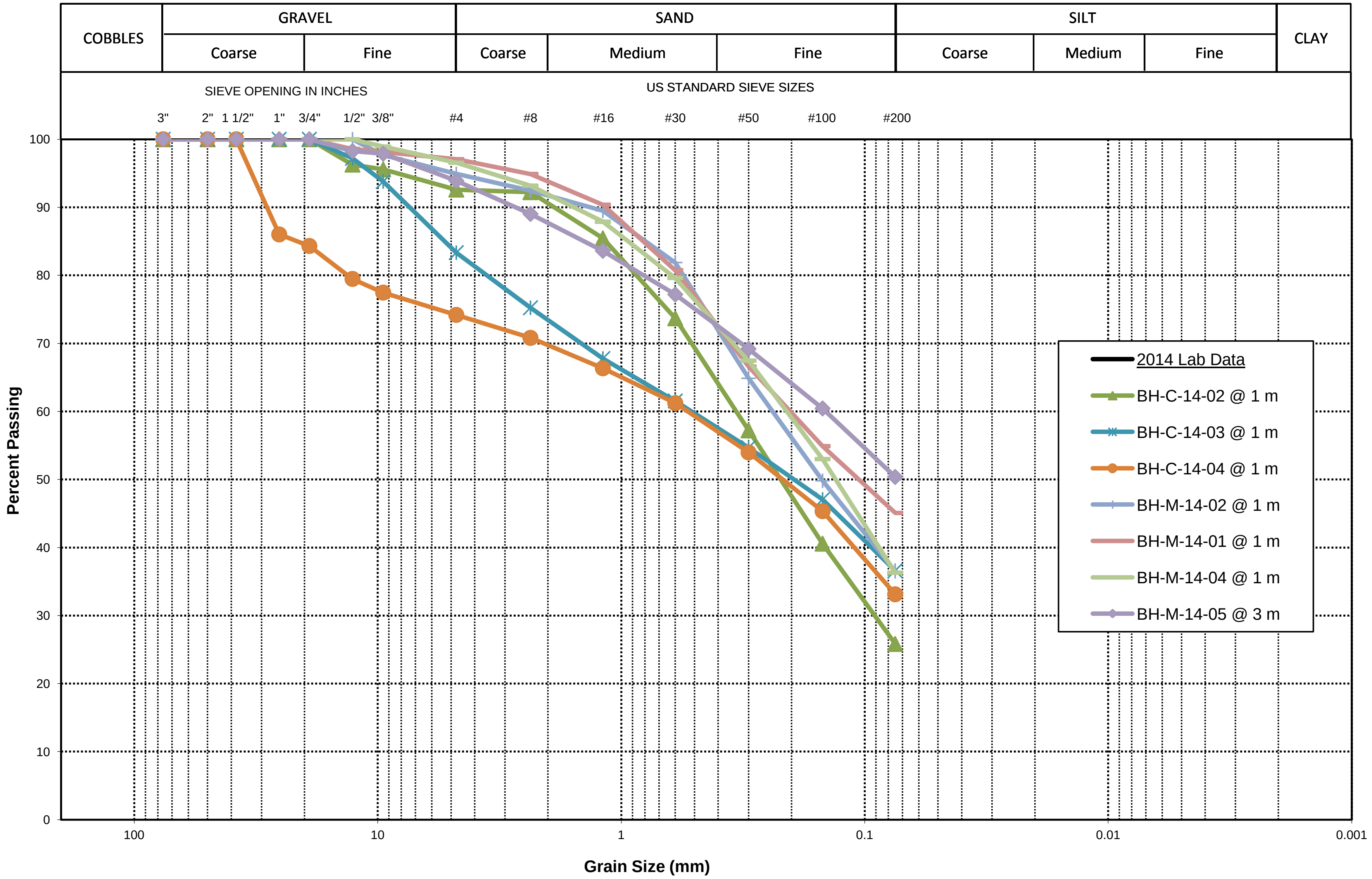


Tailings Facility - Insitu Soil Sieve 2014 Results



Mount Nansen Remediation Project
2014 Site Investigation Report
Appendix B Lab Testing Results

Mill and Camp Area Sieve Results



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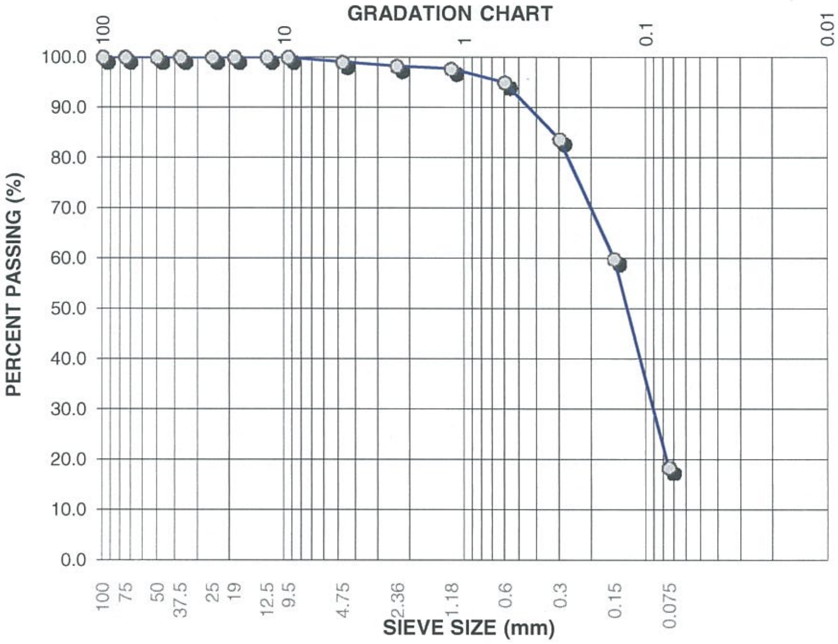
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-1

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-01

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
4.75	99	-	
2.36	98	-	
1.18	98	-	
0.6	95	-	
0.3	84	-	
0.15	60	-	
0.075	18	-	

Natural Moisture Content = 6.5%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

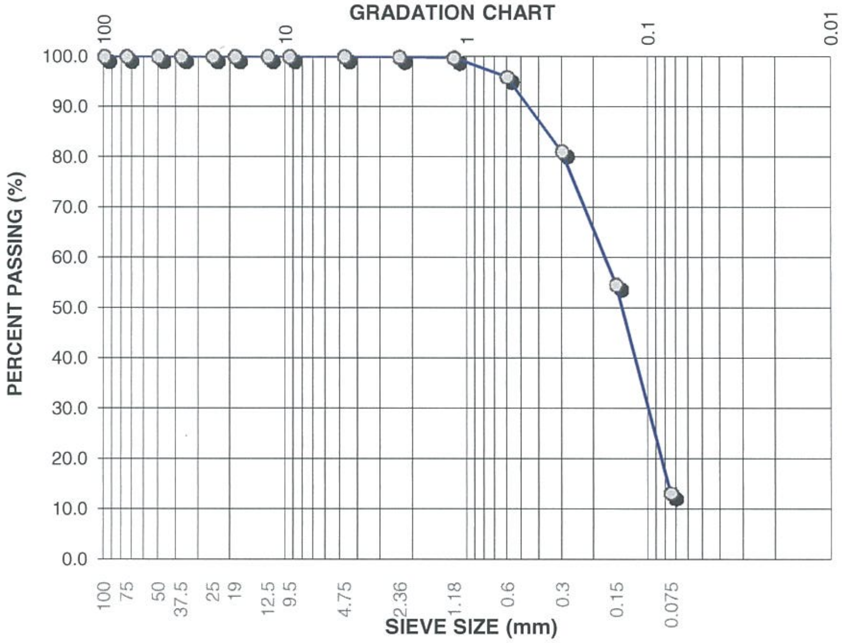
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program

GRADATION CHART



Lab Number: L5165-2

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-01

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	96	-	
0.3	81	-	
0.15	55	-	
0.075	13	-	

Natural Moisture Content = 3.7%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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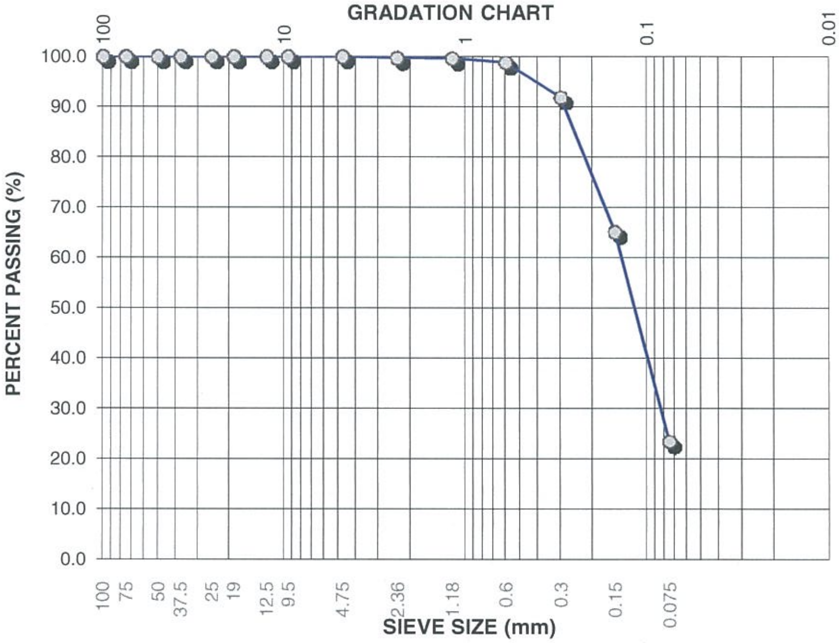
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-3

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-02

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	99	-	
0.3	92	-	
0.15	65	-	
0.075	23	-	

Natural Moisture Content = 19.5%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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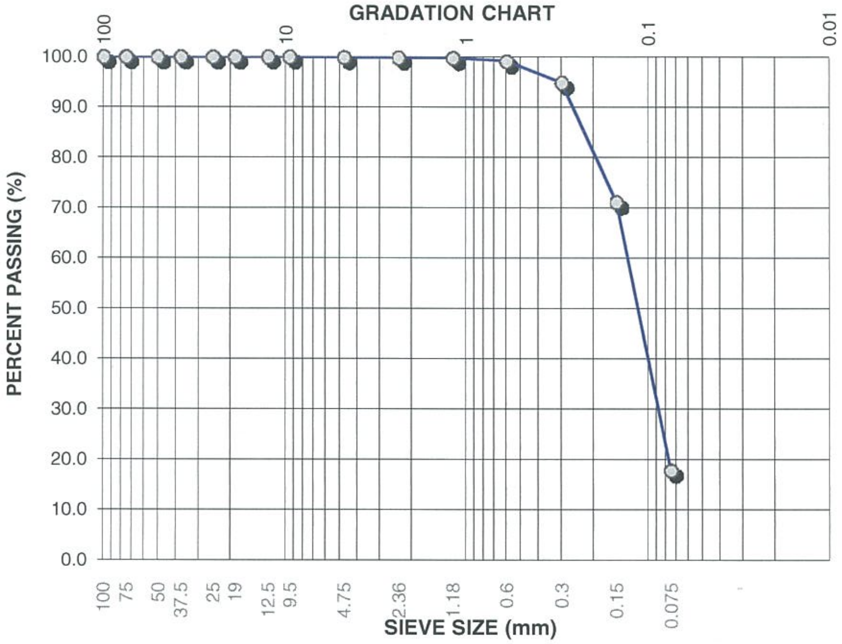
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-4

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-02

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	99	-	
0.3	95	-	
0.15	71	-	
0.075	18	-	

Natural Moisture Content = 9.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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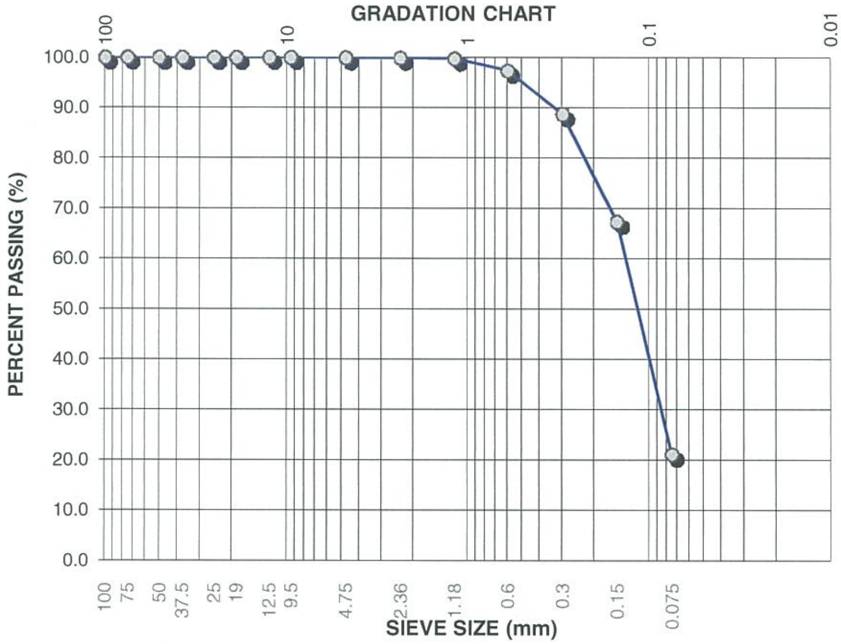
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-5

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-02

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	97	-	
0.3	89	-	
0.15	67	-	
0.075	21	-	

Natural Moisture Content = 16.2%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

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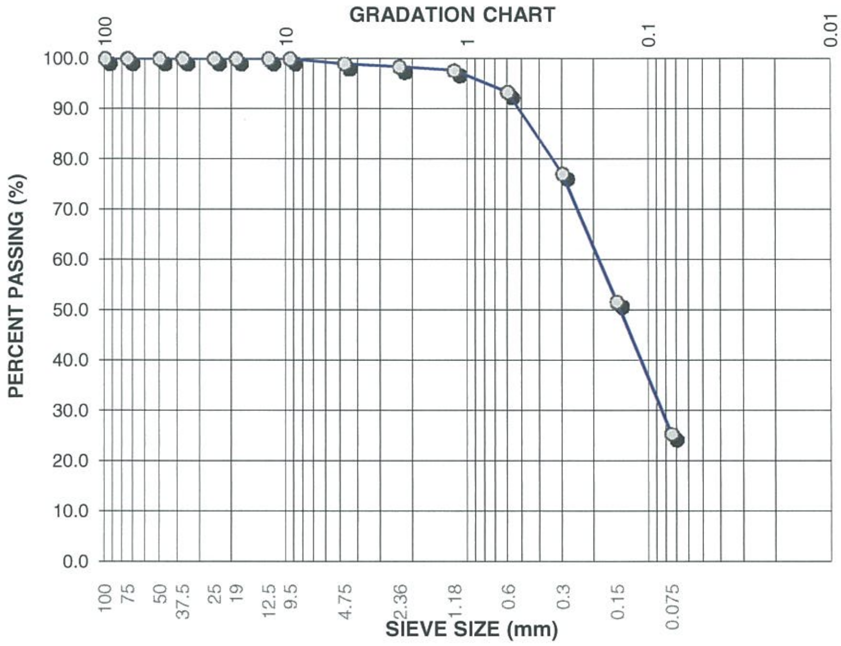
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-6

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-03

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	98	-	
1.18	98	-	
0.6	93	-	
0.3	77	-	
0.15	52	-	
0.075	25	-	

Natural Moisture Content = 34.5%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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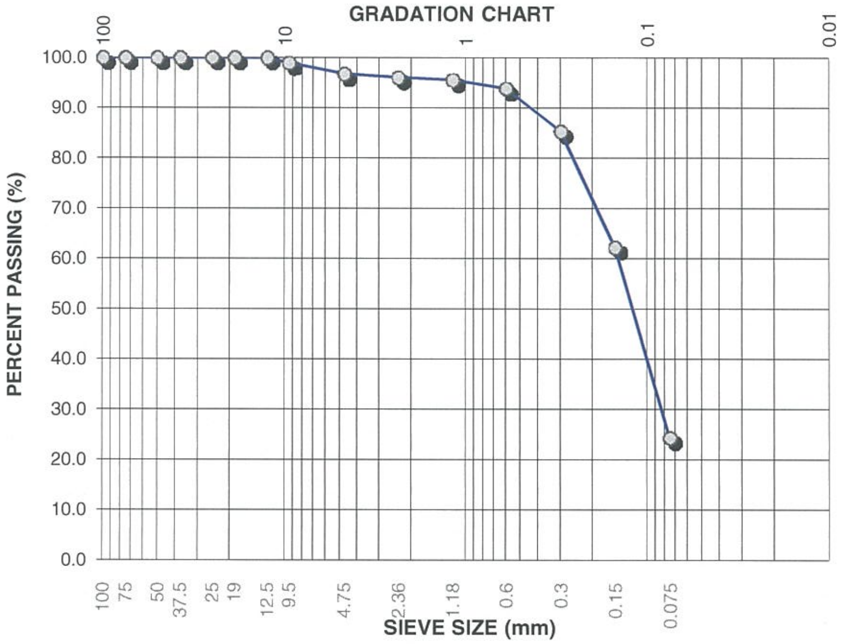
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-7

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-03

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	99	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	97	-	
2.36	96	-	
1.18	96	-	
0.6	94	-	
0.3	85	-	
0.15	62	-	
0.075	24	-	

Natural Moisture Content = 33.3%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Tell: 604-295-8657
Fax: 604-295-8658

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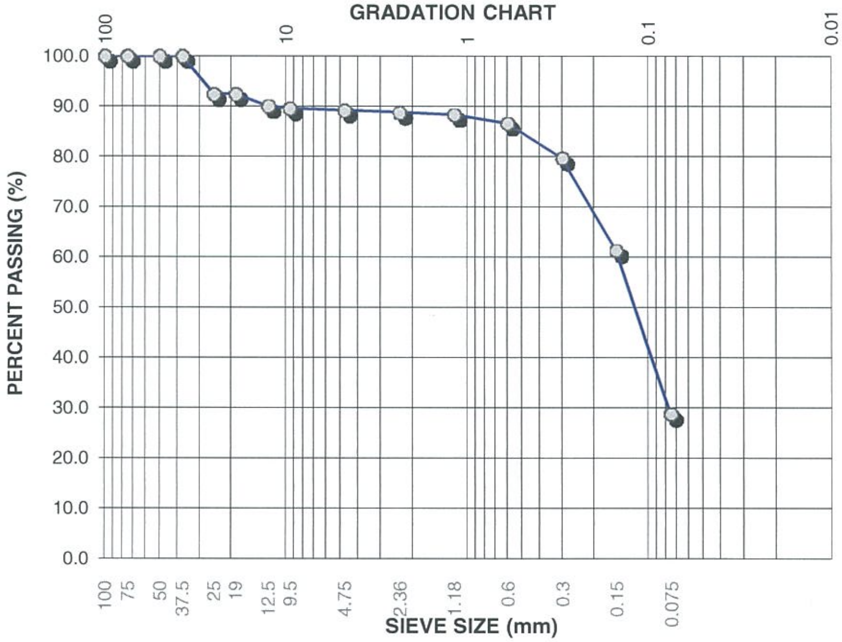
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-8

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-03

Source: Mt. Nansen Mine Site

Depth (m): 3
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	92	-	
19	92	-	
12.5	90	-	
9.5	90	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
4.75	89	-	
2.36	89	-	
1.18	88	-	
0.6	87	-	
0.3	80	-	
0.15	61	-	
0.075	29	-	

Natural Moisture Content = 42.5%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
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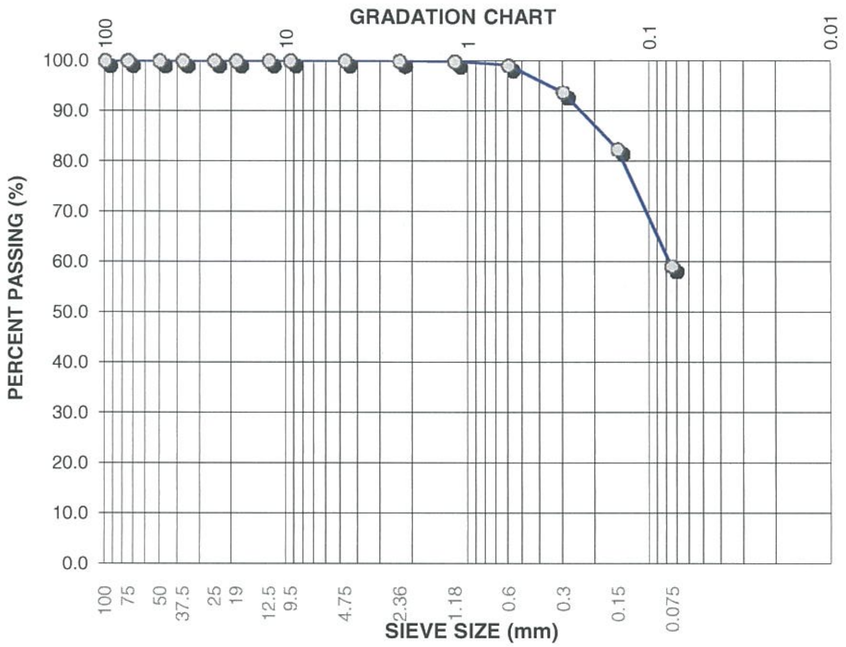
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-9

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-04

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	99	-	
0.3	94	-	
0.15	82	-	
0.075	59	-	

Natural Moisture Content = 87.7%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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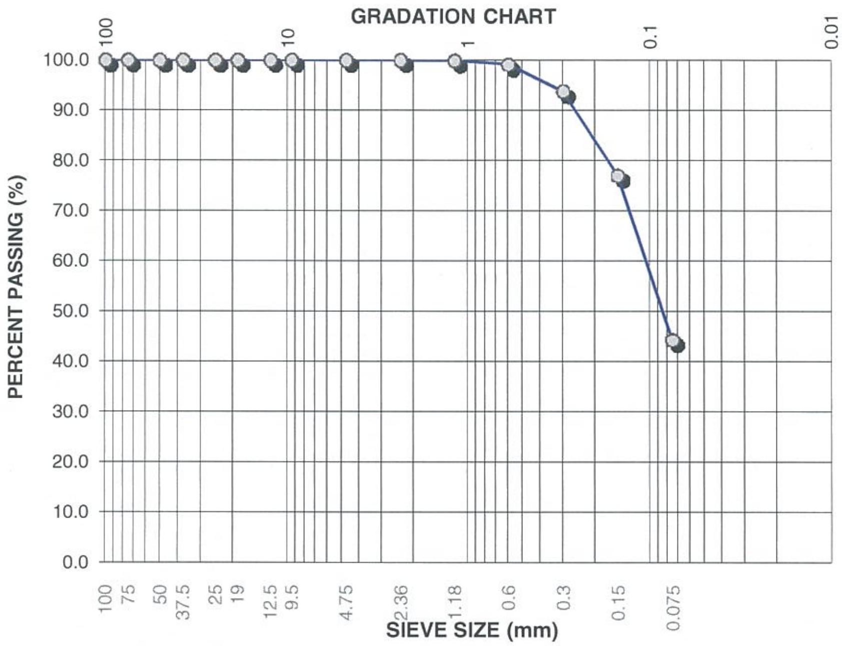
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-10

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-04

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	99	-	
0.3	94	-	
0.15	77	-	
0.075	44	-	

Natural Moisture Content = 50.4%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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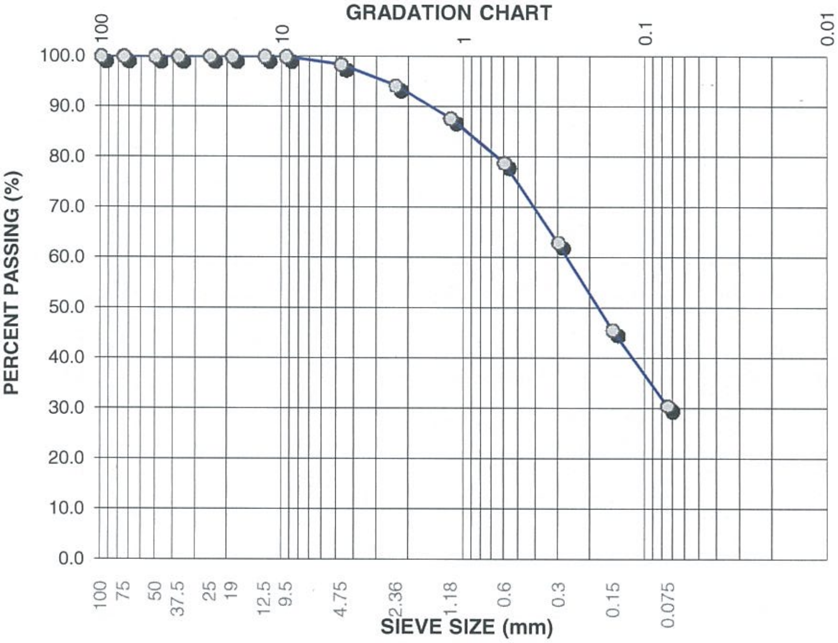
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-11

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-04

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	98	-	
2.36	94	-	
1.18	88	-	
0.6	79	-	
0.3	63	-	
0.15	46	-	
0.075	31	-	

Natural Moisture Content = 16.6%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Tell: 604-295-8657
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SIEVE ANALYSIS REPORT

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Project Number: VM00605J.03.301
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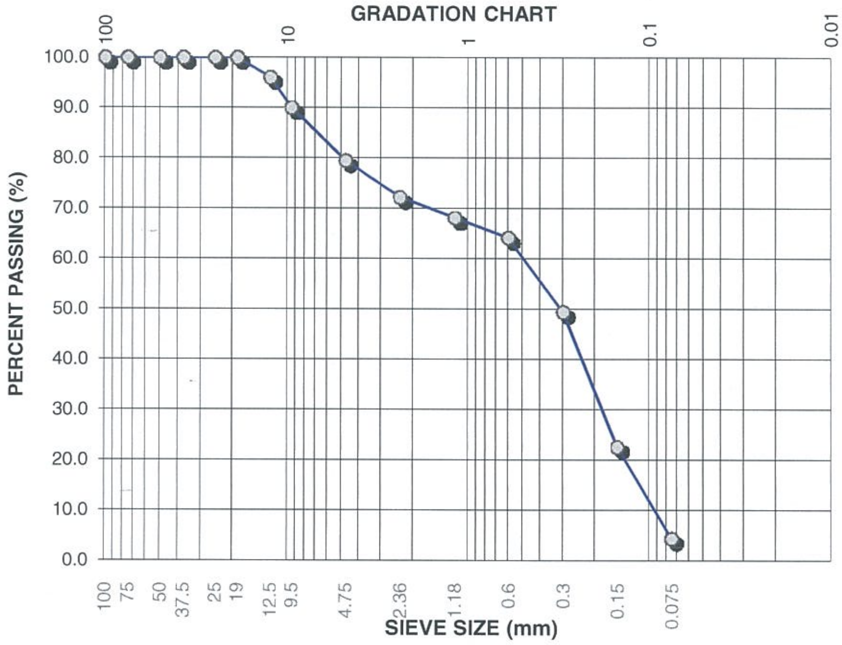
ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-12

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-05

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	96	-	
9.5	90	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	80	-	
2.36	72	-	
1.18	68	-	
0.6	64	-	
0.3	50	-	
0.15	23	-	
0.075	4	-	

Natural Moisture Content = 7.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Tell: 604-295-8657
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SIEVE ANALYSIS REPORT

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Project Number: VM00605J.03.301
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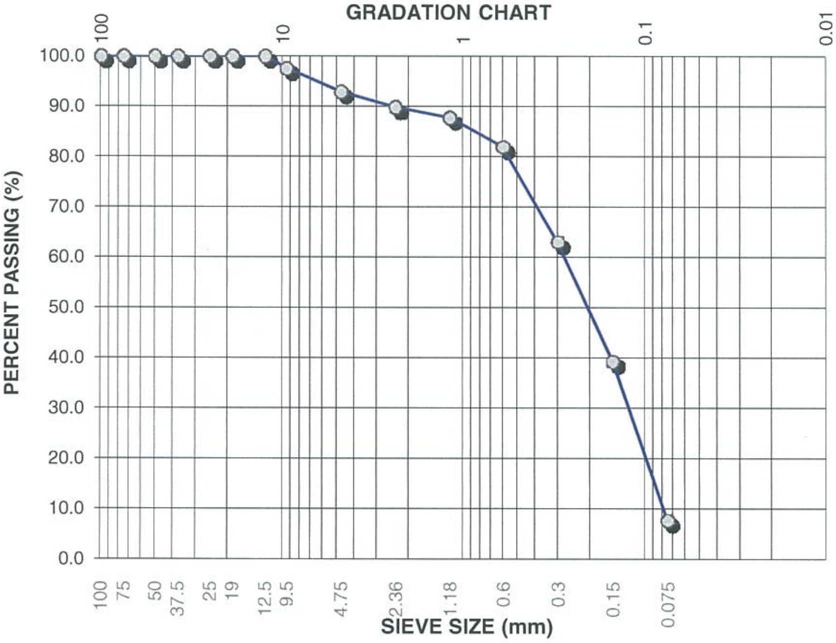
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-13

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-05

Source: Mt. Nansen Mine Site

Depth (m): 3
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	98	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	93	-	
2.36	90	-	
1.18	88	-	
0.6	82	-	
0.3	63	-	
0.15	39	-	
0.075	8	-	

Natural Moisture Content = 14.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

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Project Number: VM00605J.03.301
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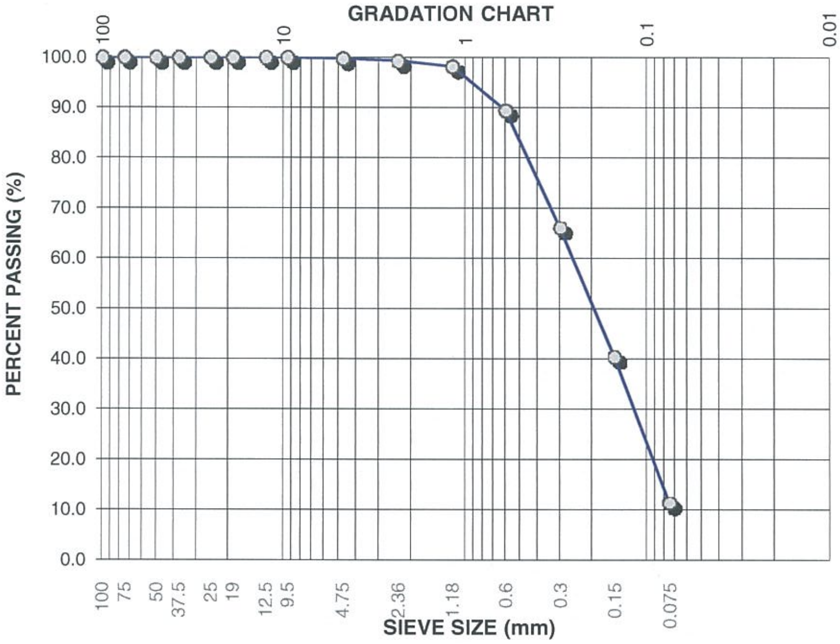
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-14

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-06

Source: Mt. Nansen Mine Site

Depth (m): 3
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	99	-	
1.18	98	-	
0.6	89	-	
0.3	66	-	
0.15	40	-	
0.075	11	-	

Natural Moisture Content = 4.2%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Tell: 604-295-8657
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SIEVE ANALYSIS REPORT

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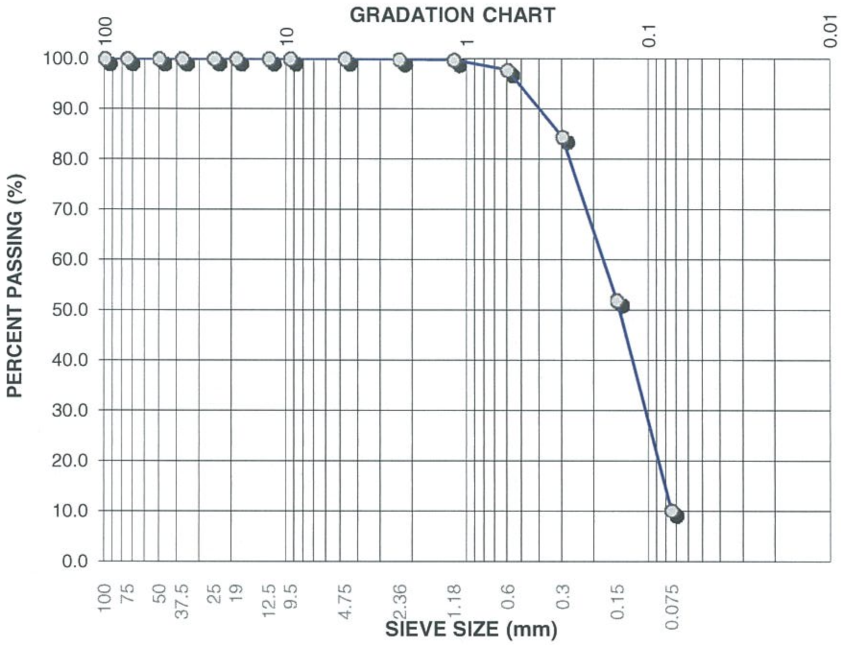

Lab Number: L5165-15

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-07

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	98	-	
0.3	84	-	
0.15	52	-	
0.075	10	-	

Natural Moisture Content = 3.5%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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Project Number: VM00605J.03.301
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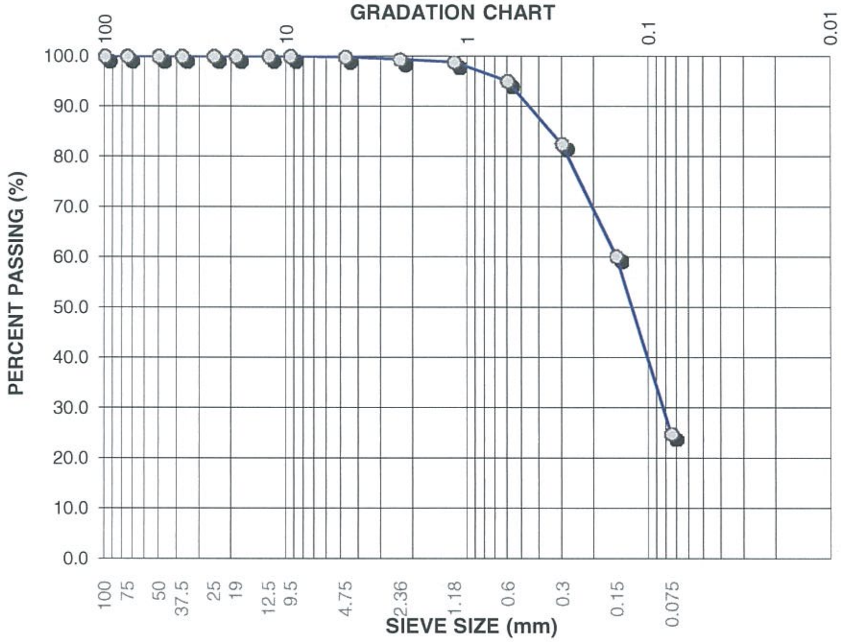
PROJECT: Nansen 2014 Site Investigation Program

GRADATION CHART



Lab Number: L5165-16

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-07

Source: Mt. Nansen Mine Site

Depth (m): 5
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
4.75	100	-	
2.36	99	-	
1.18	99	-	
0.6	95	-	
0.3	83	-	
0.15	60	-	
0.075	25	-	

Natural Moisture Content = 14.4%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

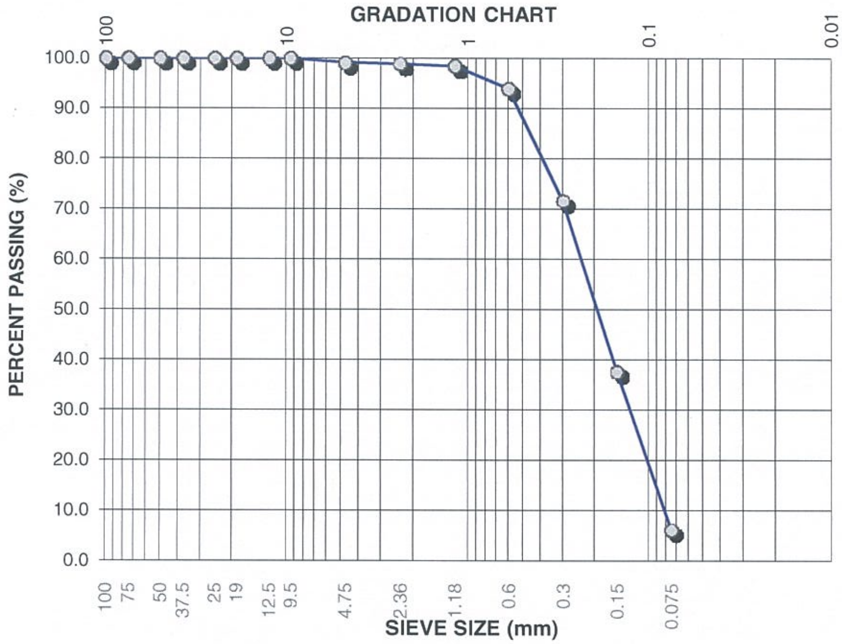
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-17

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-08

Source: Mt. Nansen Mine Site
Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	99	-	
1.18	98	-	
0.6	94	-	
0.3	72	-	
0.15	38	-	
0.075	6	-	

Natural Moisture Content = 3.2%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

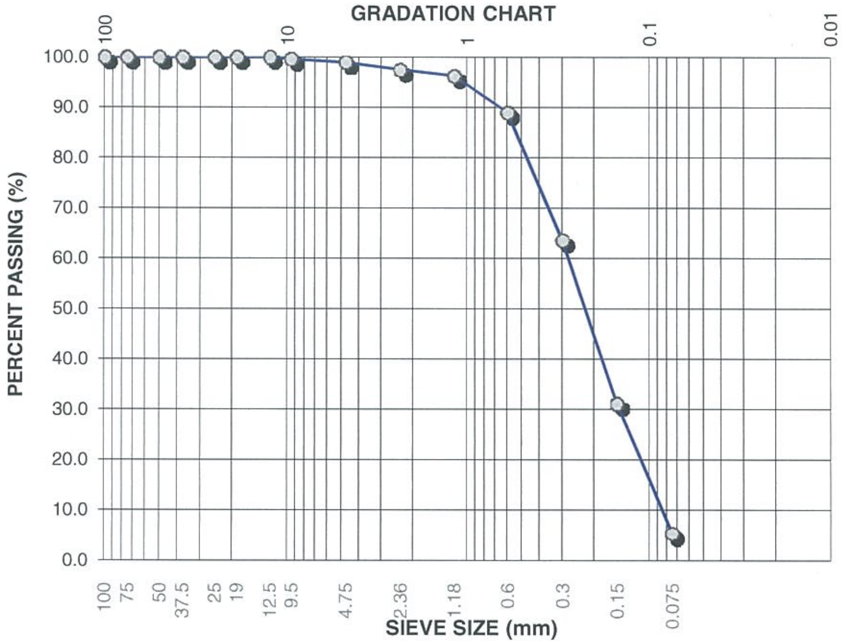
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-18

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-08

Source: Mt. Nansen Mine Site

Depth (m): 3
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	98	-	
1.18	96	-	
0.6	89	-	
0.3	64	-	
0.15	31	-	
0.075	5	-	

Natural Moisture Content = 3.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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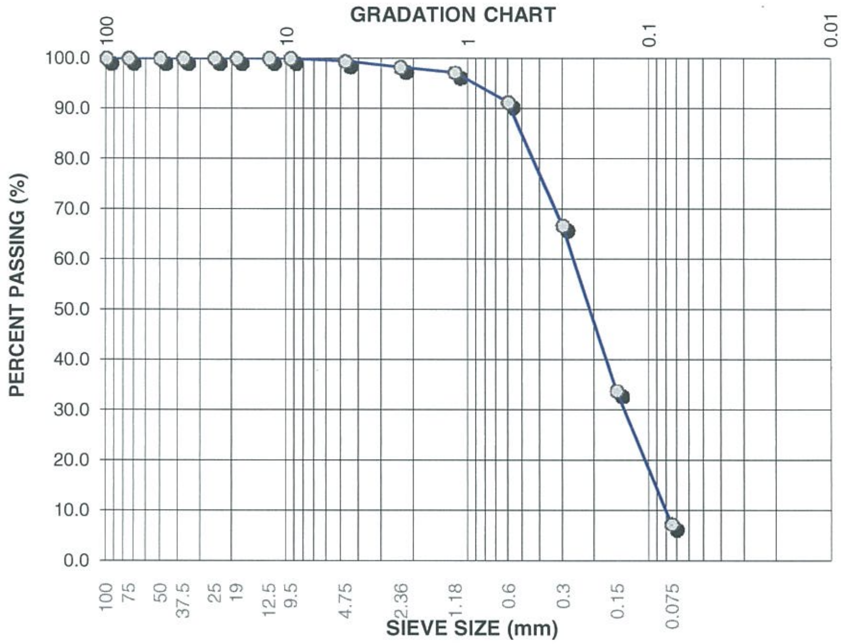
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-19

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-08

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	98	-	
1.18	97	-	
0.6	91	-	
0.3	67	-	
0.15	34	-	
0.075	7	-	

Natural Moisture Content = 3.4%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

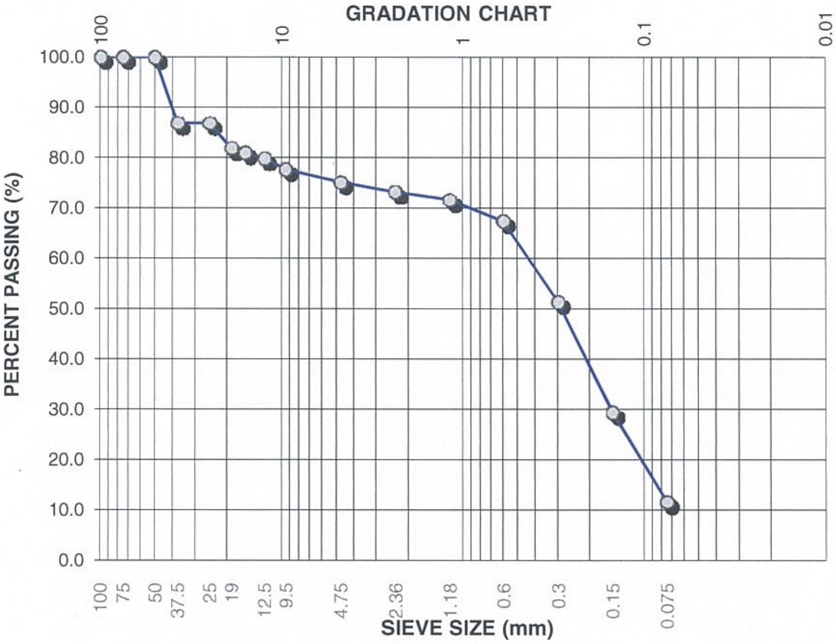
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-20
Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez
Sample Location: BH-T-14-09
Source: Mt. Nansen Mine Site
Depth (m): 3
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
100	100	-	
75	100	-	
50	100	-	
37.5	87	-	
25	87	-	
19	82	-	
12.5	80	-	
9.5	78	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
4.75	75	-	
2.36	73	-	
1.18	72	-	
0.6	67	-	
0.3	51	-	
0.15	29	-	
0.075	12	-	

Natural Moisture Content = 12.3%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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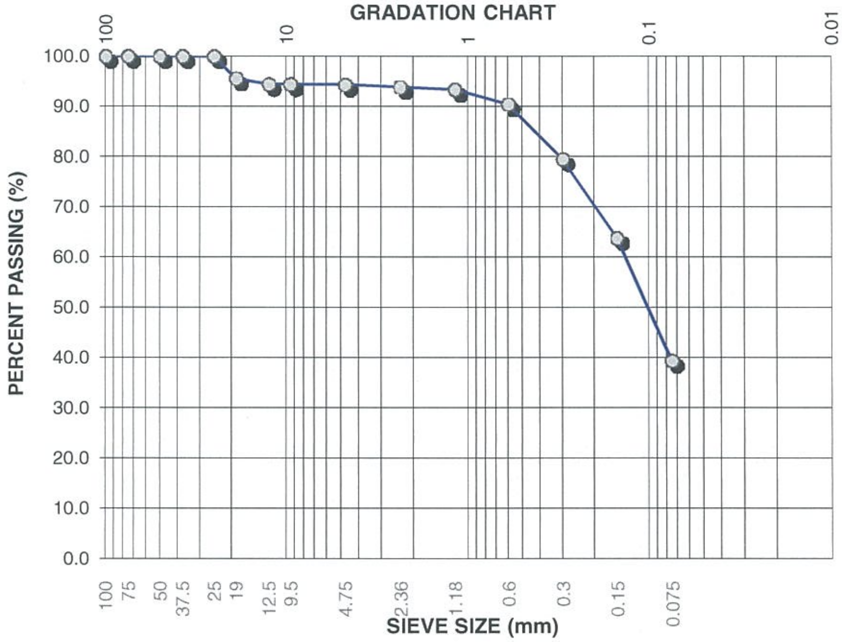
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-21

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-09

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	96	-	
12.5	94	-	
9.5	94	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	94	-	
2.36	94	-	
1.18	93	-	
0.6	90	-	
0.3	80	-	
0.15	64	-	
0.075	39	-	

Natural Moisture Content = 25.3%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
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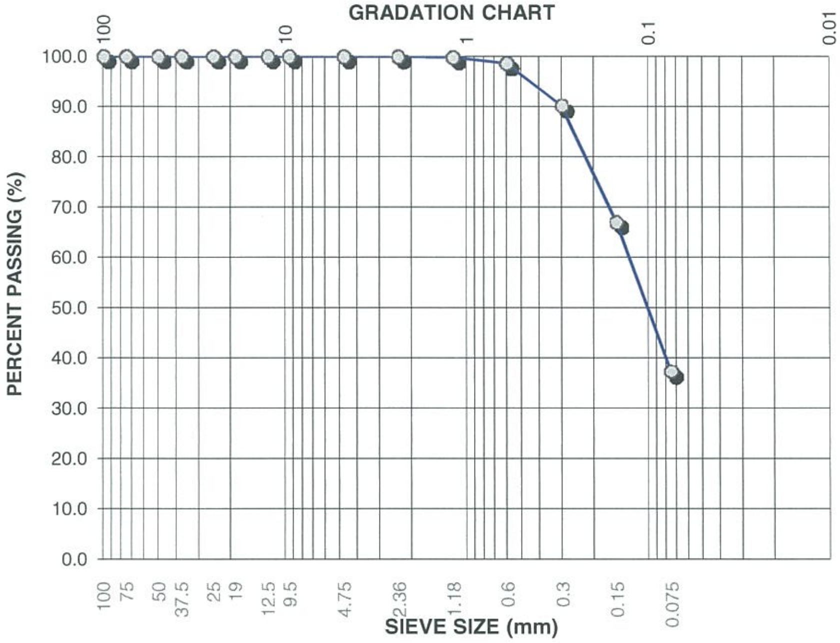
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-22

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-10

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	99	-	
0.3	90	-	
0.15	67	-	
0.075	37	-	

Natural Moisture Content = 35.3%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

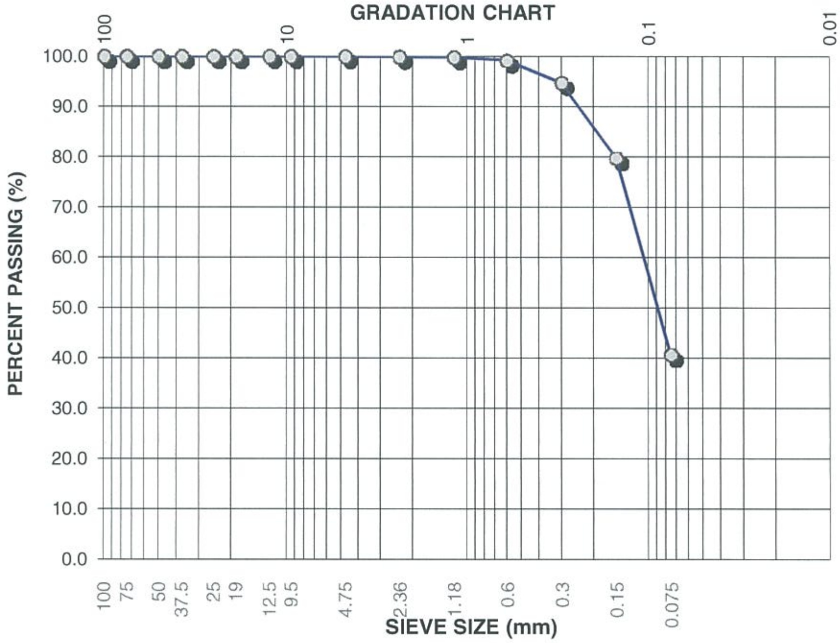
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program

GRADATION CHART



Lab Number: L5165-23

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-10

Source: Mt. Nansen Mine Site

Depth (m): 2+3 combined
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	99	-	
0.3	95	-	
0.15	80	-	
0.075	41	-	

Natural Moisture Content = 33.2%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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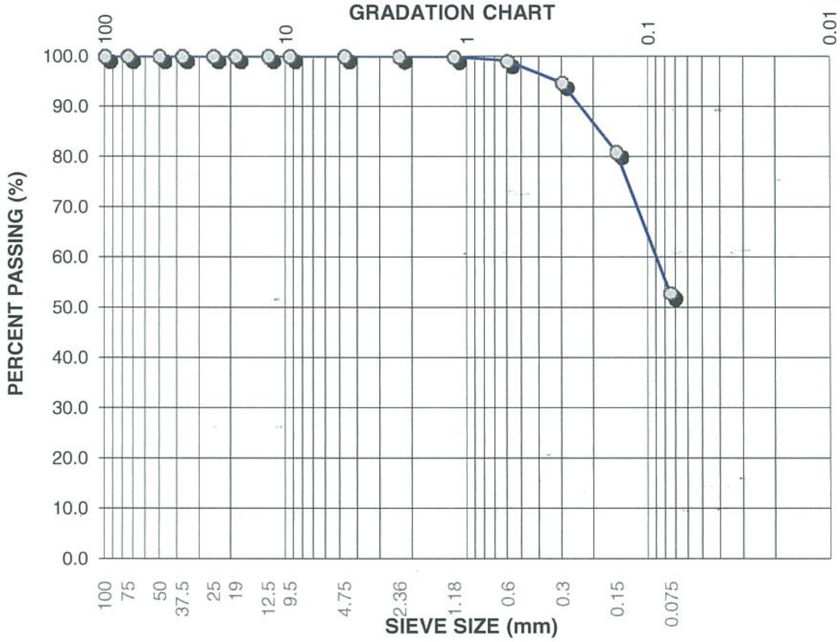
Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-24

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-10

Source: Mt. Nansen Mine Site

Depth (m): 5
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	99	-	
0.3	95	-	
0.15	81	-	
0.075	53	-	

Natural Moisture Content = 38.2%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

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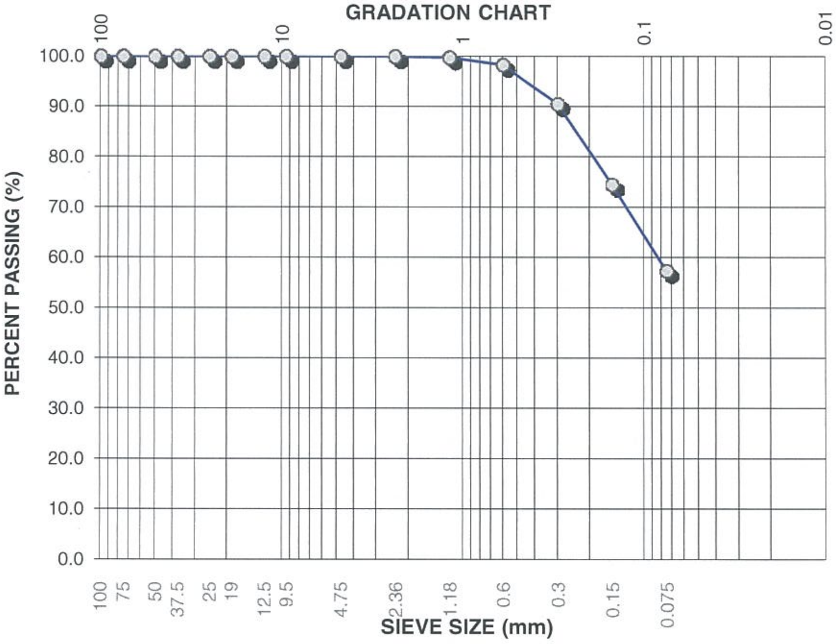

Lab Number: L5165-25

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-11

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	98	-	
0.3	91	-	
0.15	75	-	
0.075	57	-	

Natural Moisture Content = 108.1%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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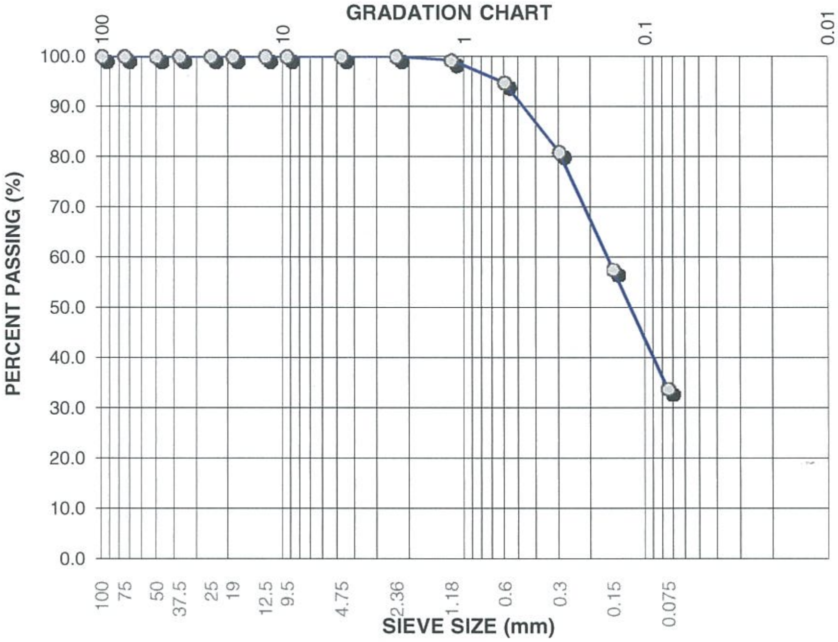
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-26

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-11

Source: Mt. Nansen Mine Site

Depth (m): 1.9
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	99	-	
0.6	95	-	
0.3	81	-	
0.15	58	-	
0.075	34	-	

Natural Moisture Content = 16.6%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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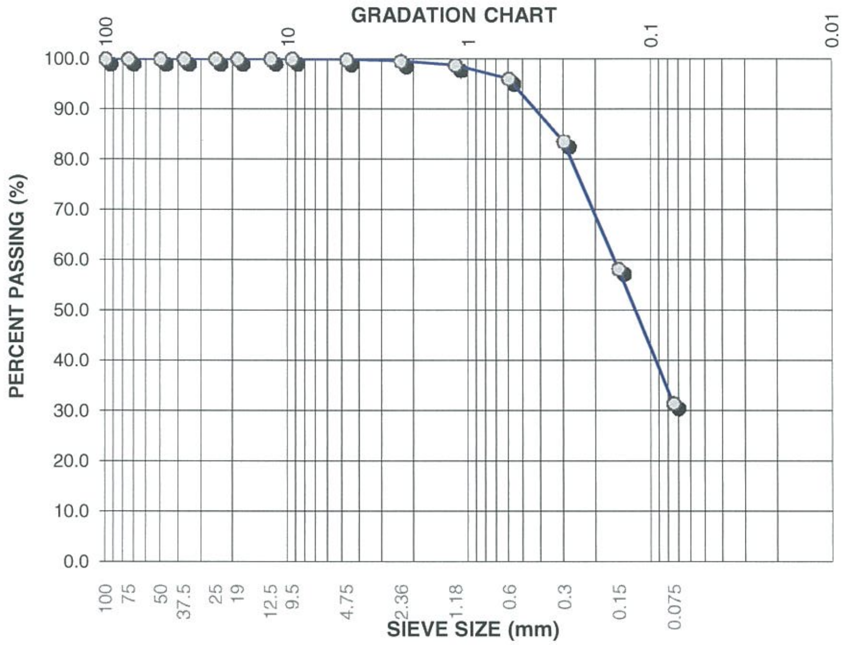
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-27

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-11

Source: Mt. Nansen Mine Site

Depth (m): 3.9
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	99	-	
0.6	96	-	
0.3	84	-	
0.15	58	-	
0.075	32	-	

Natural Moisture Content = 20.4%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

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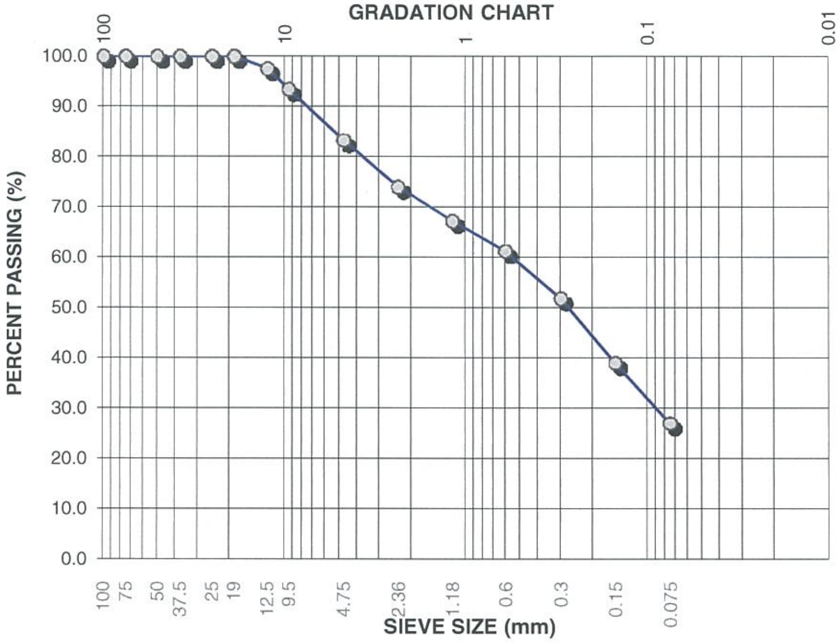

Lab Number: L5165-28

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-12

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	98	-	
9.5	93	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	83	-	
2.36	74	-	
1.18	67	-	
0.6	61	-	
0.3	52	-	
0.15	39	-	
0.075	27	-	

Natural Moisture Content = 17.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

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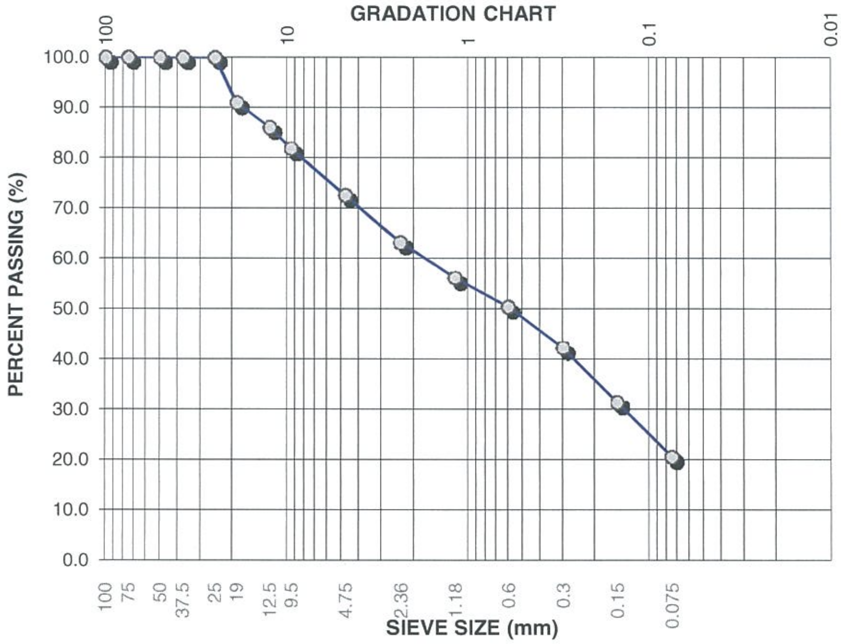
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-29

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-12

Source: Mt. Nansen Mine Site

Depth (m): 3
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	91	-	
12.5	86	-	
9.5	82	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	73	-	
2.36	63	-	
1.18	56	-	
0.6	50	-	
0.3	42	-	
0.15	31	-	
0.075	21	-	

Natural Moisture Content = 11.1%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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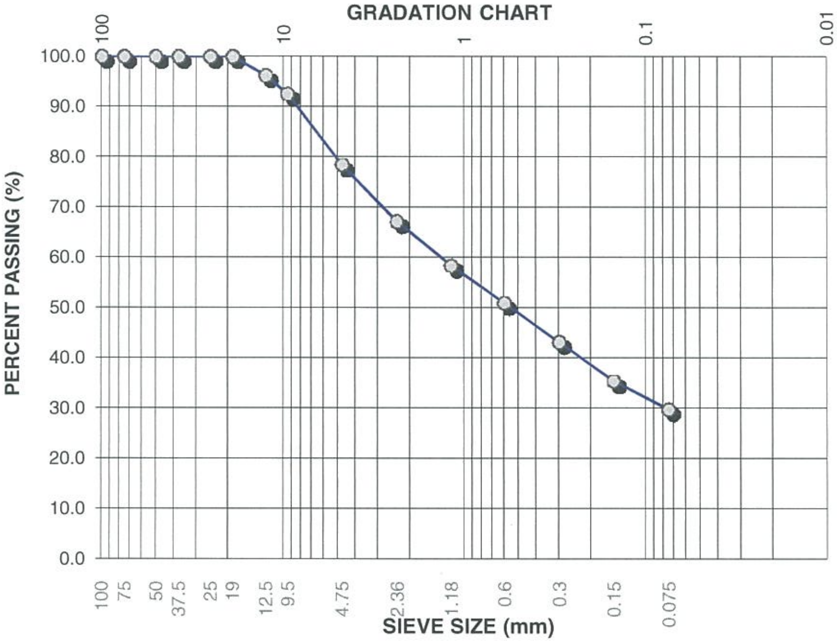
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-30

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-12

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	96	-	
9.5	93	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	78	-	
2.36	67	-	
1.18	58	-	
0.6	51	-	
0.3	43	-	
0.15	35	-	
0.075	30	-	

Natural Moisture Content = 6.7%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 μm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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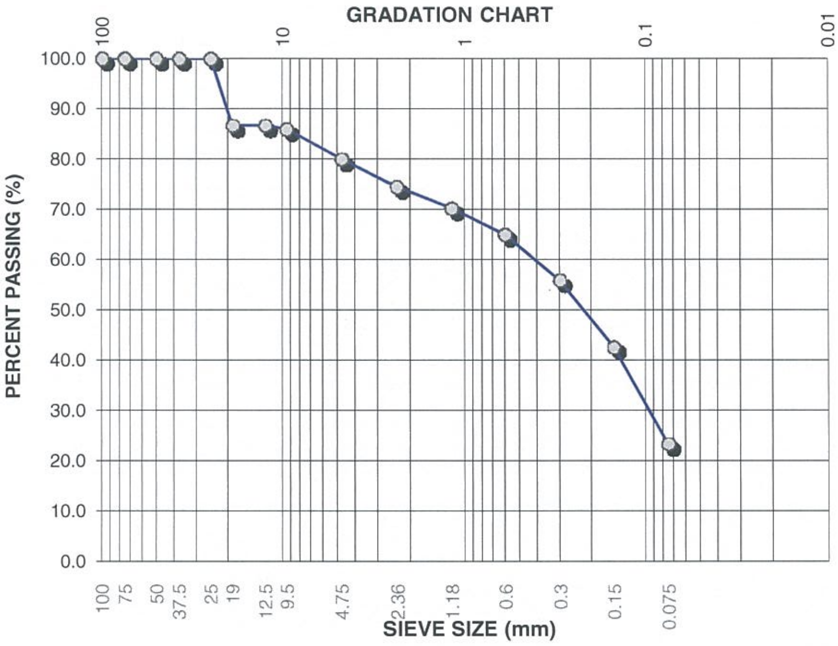
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-31

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-13

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	87	-	
12.5	87	-	
9.5	86	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	80	-	
2.36	74	-	
1.18	70	-	
0.6	65	-	
0.3	56	-	
0.15	43	-	
0.075	23	-	

Natural Moisture Content = 31.4%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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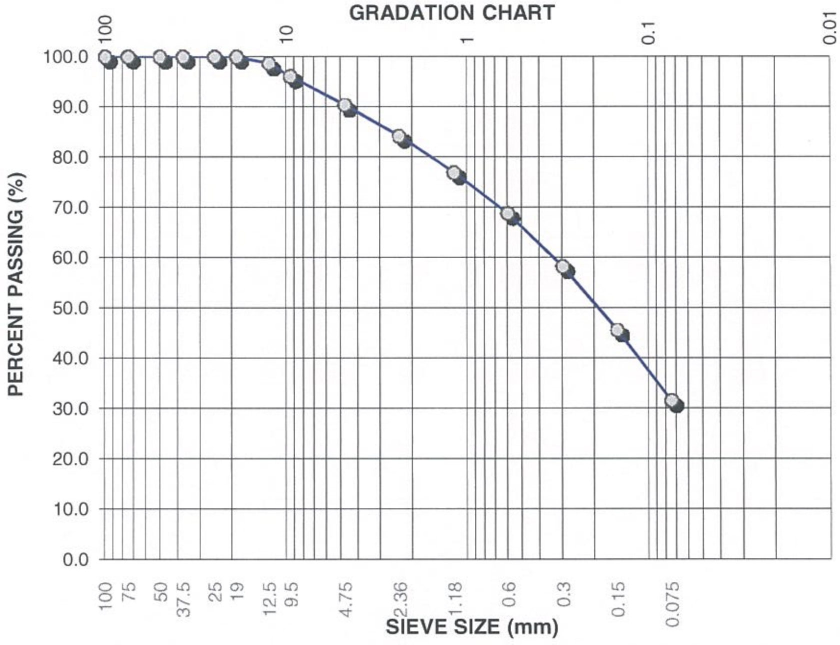
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-32

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-13

Source: Mt. Nansen Mine Site

Depth (m): 2 & 3 combined
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	99	-	
9.5	96	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	90	-	
2.36	84	-	
1.18	77	-	
0.6	69	-	
0.3	58	-	
0.15	46	-	
0.075	32	-	

Natural Moisture Content = 18.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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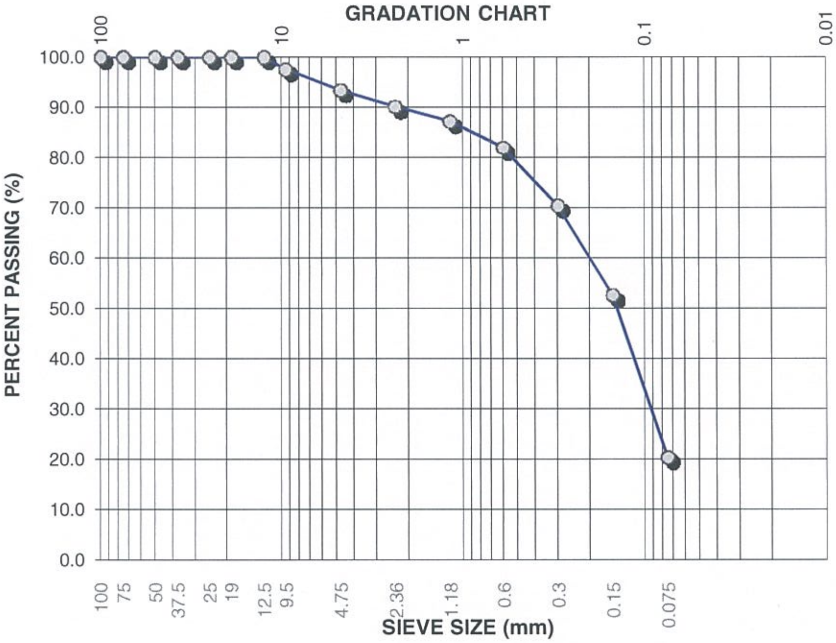
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-33

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-14

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	98	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	93	-	
2.36	90	-	
1.18	87	-	
0.6	82	-	
0.3	70	-	
0.15	53	-	
0.075	20	-	

Natural Moisture Content = 20.6%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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Project Number: VM00605J.03.301
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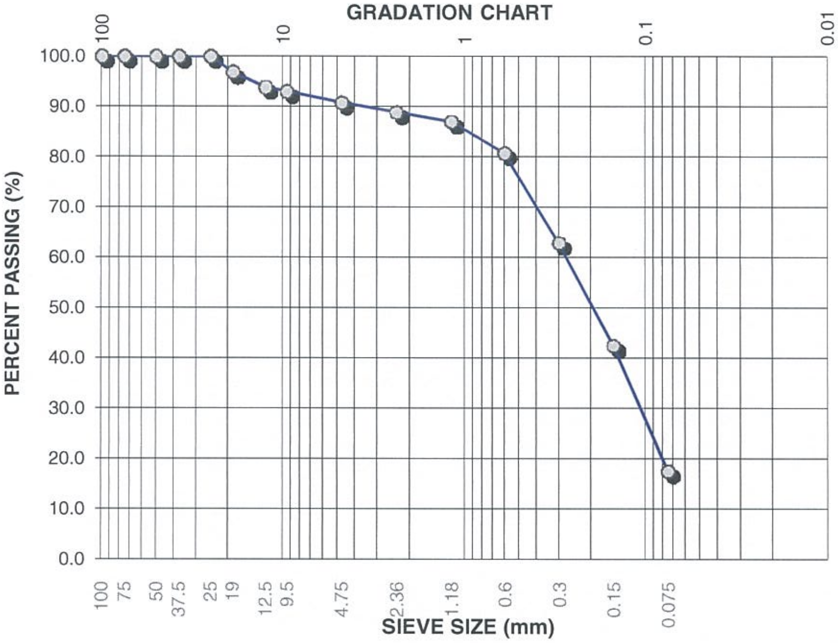
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-34

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-14

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	97	-	
12.5	94	-	
9.5	93	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	91	-	
2.36	89	-	
1.18	87	-	
0.6	81	-	
0.3	63	-	
0.15	43	-	
0.075	18	-	

Natural Moisture Content = 13.8%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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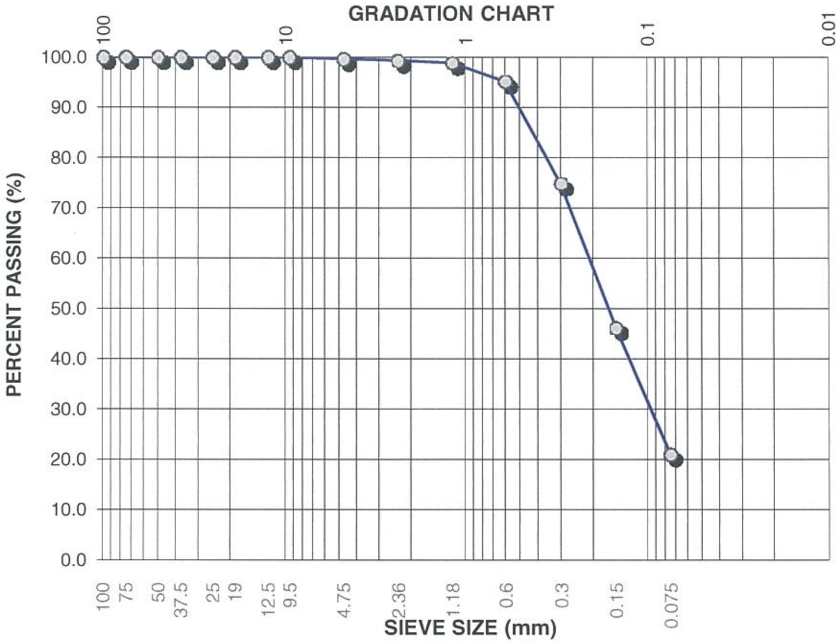
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-35

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-14

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits Lower	Gradation Limits Upper
4.75	100	-	
2.36	99	-	
1.18	99	-	
0.6	95	-	
0.3	75	-	
0.15	46	-	
0.075	21	-	

Natural Moisture Content = 22.8%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

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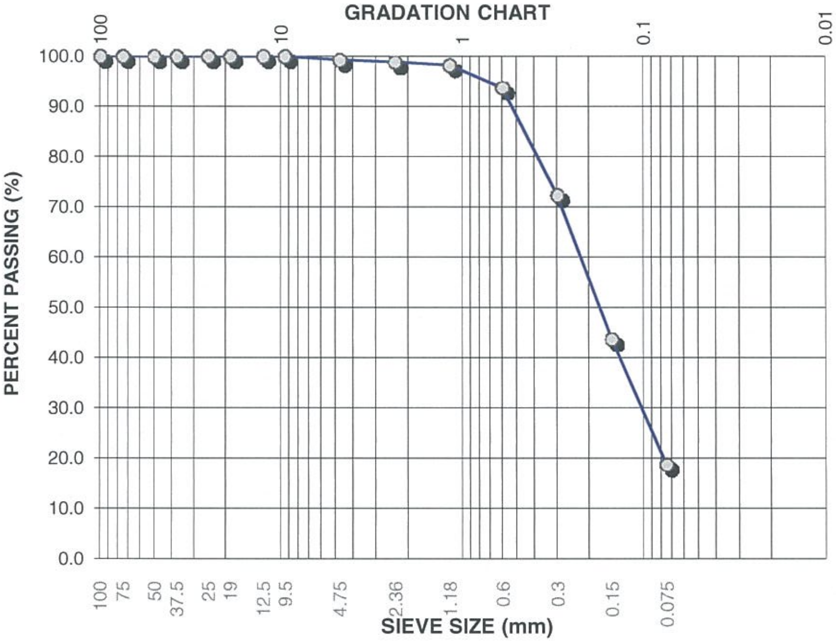

Lab Number: L5165-36

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-14

Source: Mt. Nansen Mine Site

Depth (m): 5
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	99	-	
1.18	98	-	
0.6	94	-	
0.3	72	-	
0.15	44	-	
0.075	19	-	

Natural Moisture Content = 19.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
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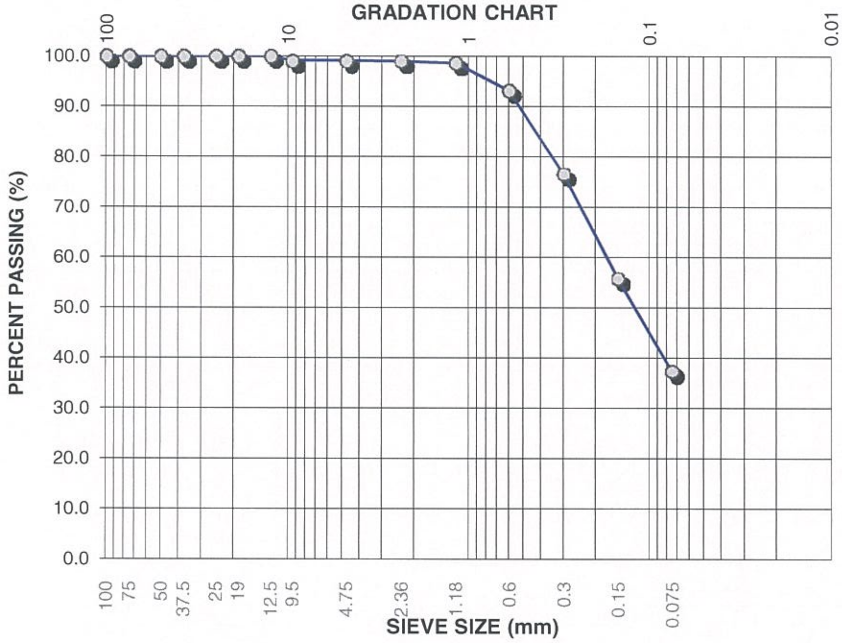
ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-37

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-15

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	99	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	99	-	
1.18	99	-	
0.6	93	-	
0.3	77	-	
0.15	56	-	
0.075	37	-	

Natural Moisture Content = 41.9%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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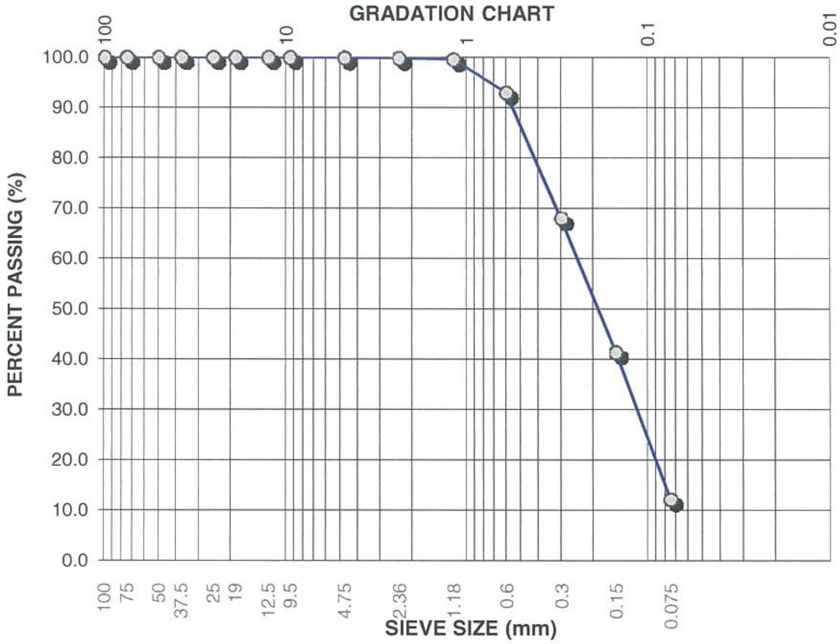
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-38

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-15

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	93	-	
0.3	68	-	
0.15	41	-	
0.075	12	-	

Natural Moisture Content = 9.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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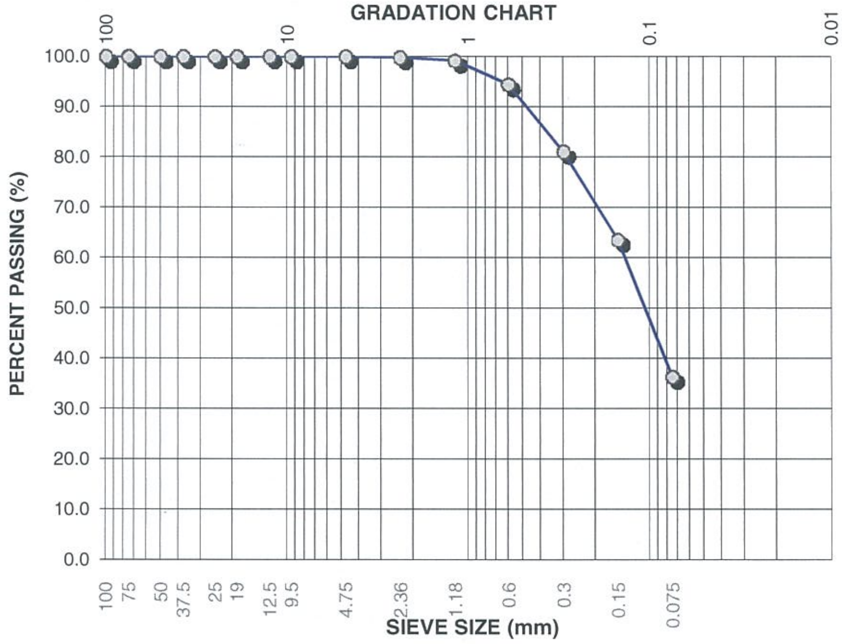
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-39

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-15

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	99	-	
0.6	94	-	
0.3	81	-	
0.15	64	-	
0.075	36	-	

Natural Moisture Content = 22.2%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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Project Number: VM00605J.03.301
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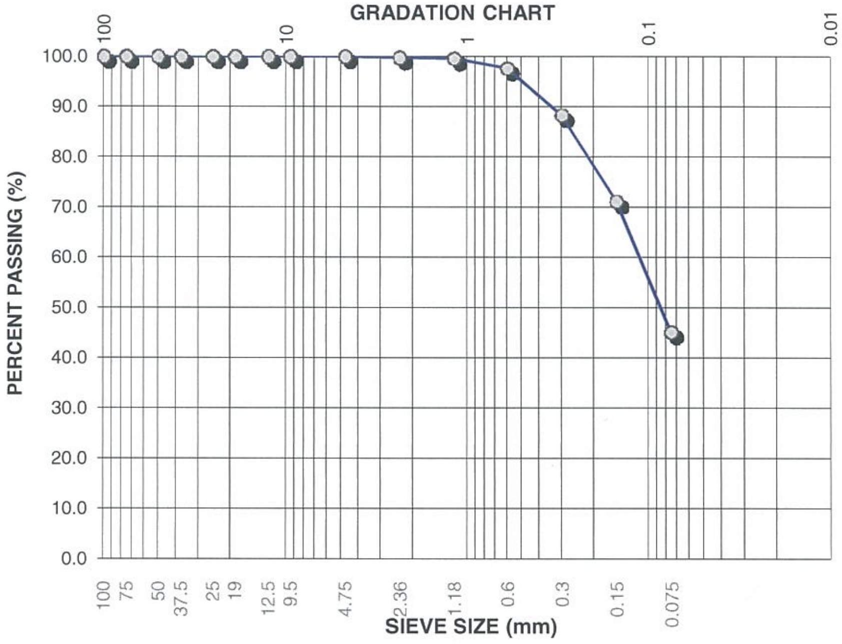
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-40

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-15

Source: Mt. Nansen Mine Site

Depth (m): 5
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	98	-	
0.3	88	-	
0.15	71	-	
0.075	45	-	

Natural Moisture Content = 24.9%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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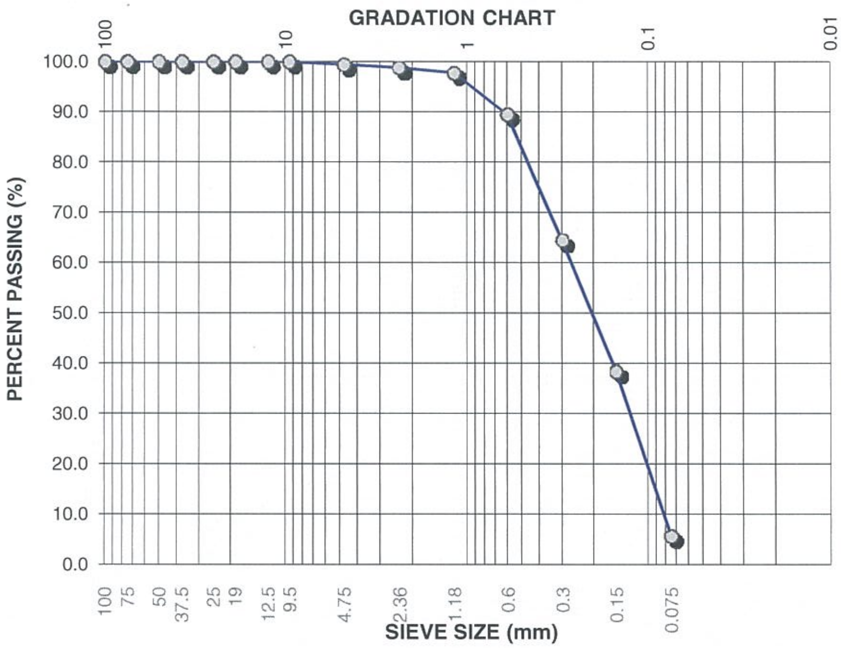
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-41

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-16

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	99	-	
1.18	98	-	
0.6	90	-	
0.3	64	-	
0.15	38	-	
0.075	6	-	

Natural Moisture Content = 3.8%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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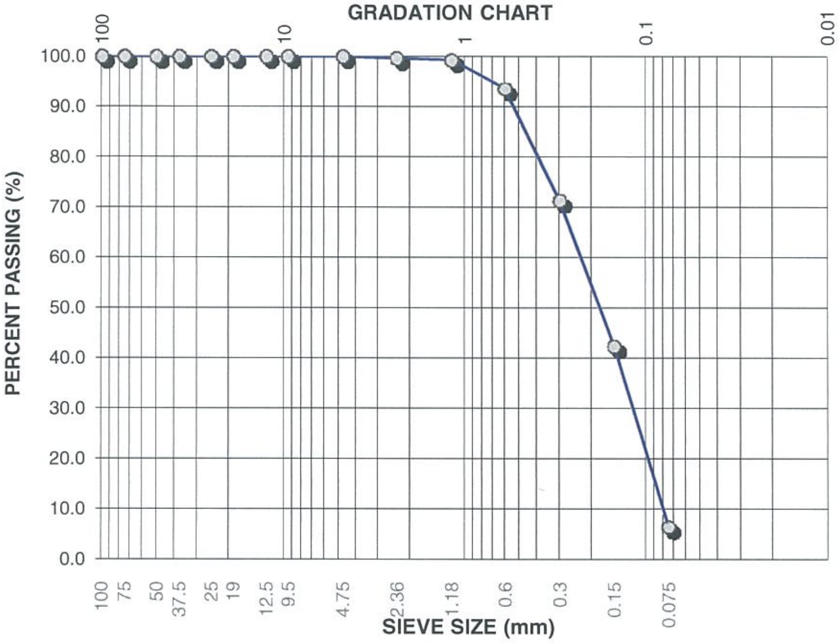
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-42

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-16

Source: Mt. Nansen Mine Site

Depth (m): 3
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	99	-	
0.6	94	-	
0.3	71	-	
0.15	42	-	
0.075	6	-	

Natural Moisture Content = 13.5%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

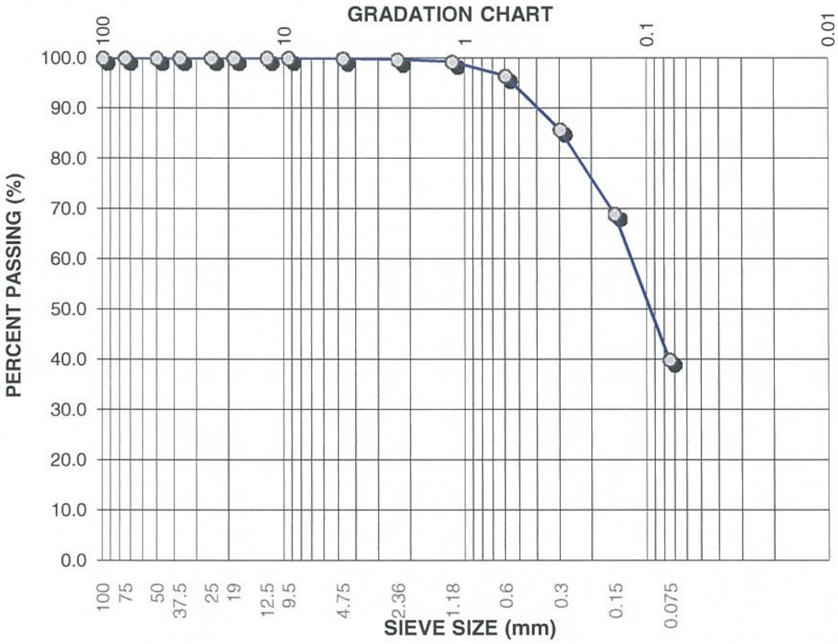
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-43

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-16

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	99	-	
0.6	96	-	
0.3	86	-	
0.15	69	-	
0.075	40	-	

Natural Moisture Content = 18.6%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
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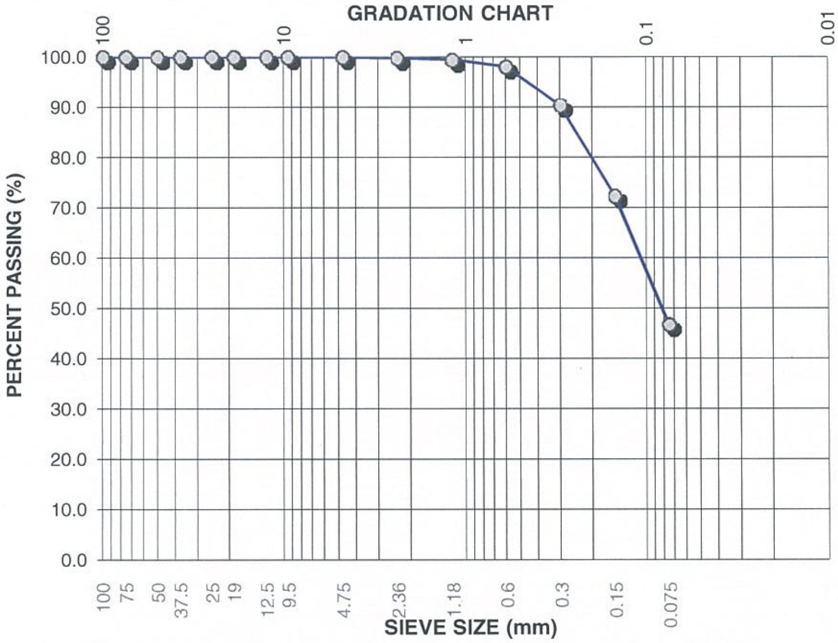
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-44

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-17

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	99	-	
0.6	98	-	
0.3	90	-	
0.15	72	-	
0.075	47	-	

Natural Moisture Content = 48.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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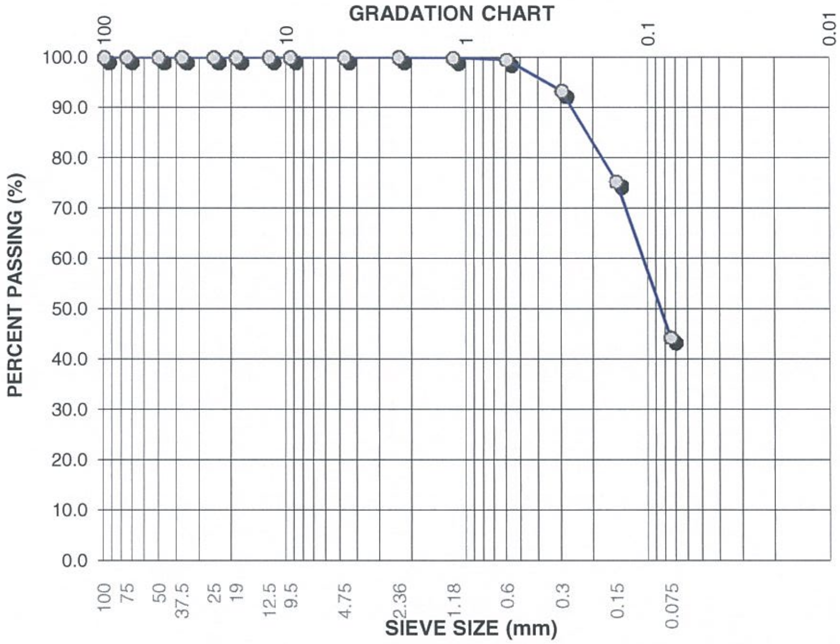
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-45

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: Mark Elmasry

Sample Location: BH-T-14-18

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	100	-	
0.3	93	-	
0.15	75	-	
0.075	44	-	

Natural Moisture Content = 20.9%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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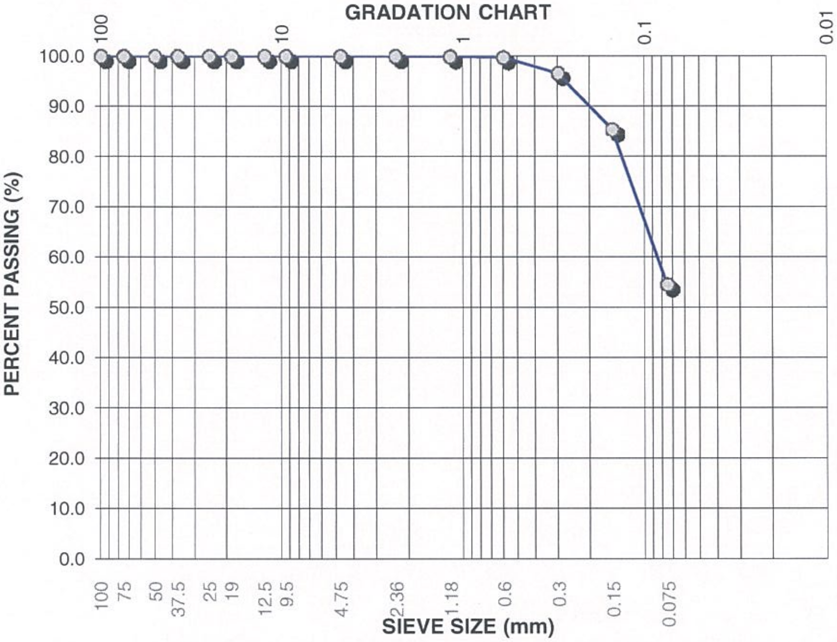
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-46

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-18

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	100	-	
0.3	97	-	
0.15	85	-	
0.075	55	-	

Natural Moisture Content = 22.8%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Tell: 604-295-8657
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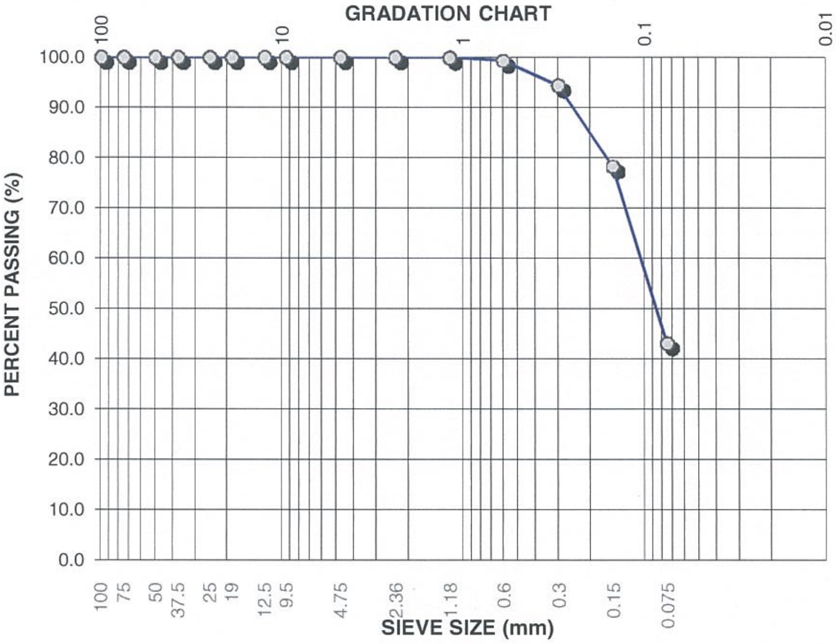
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-47

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-18

Source: Mt. Nansen Mine Site

Depth (m): 5
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	99	-	
0.3	94	-	
0.15	78	-	
0.075	43	-	

Natural Moisture Content = 35.5%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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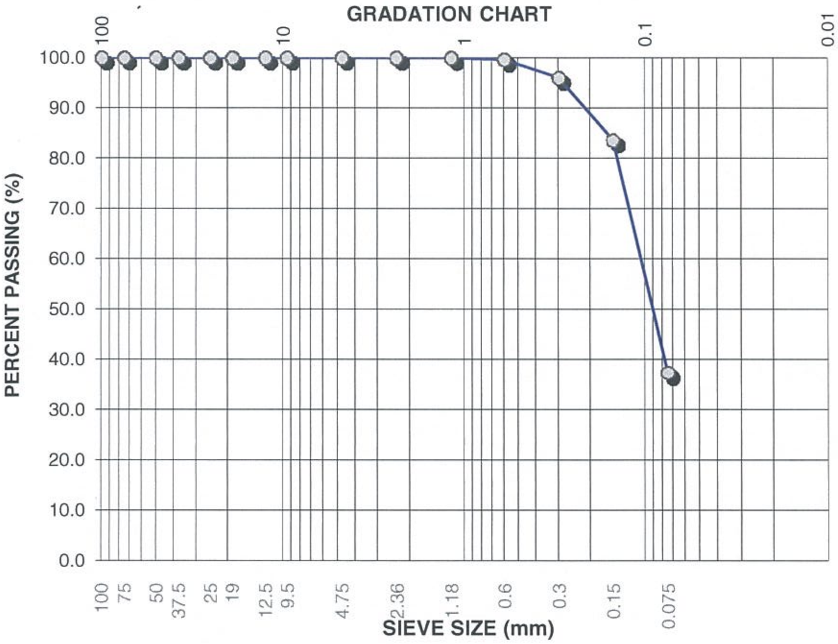
Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: **Nansen 2014 Site Investigation Program**



Lab Number: L5165-48

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-19

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	100	-	
0.3	96	-	
0.15	84	-	
0.075	37	-	

Natural Moisture Content = 16.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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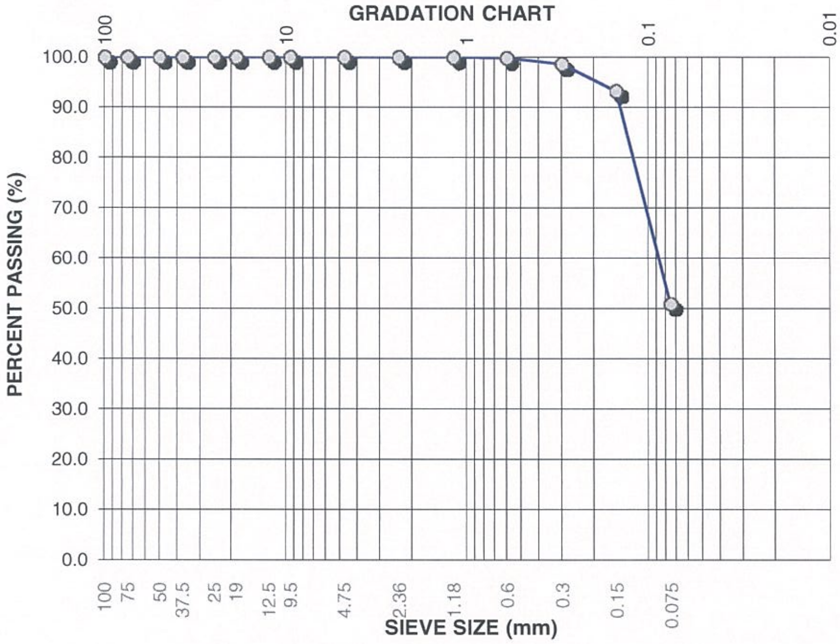
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-49

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-19

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	100	-	
0.3	99	-	
0.15	93	-	
0.075	51	-	

Natural Moisture Content = 28.7%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

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Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
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Client P.O.:

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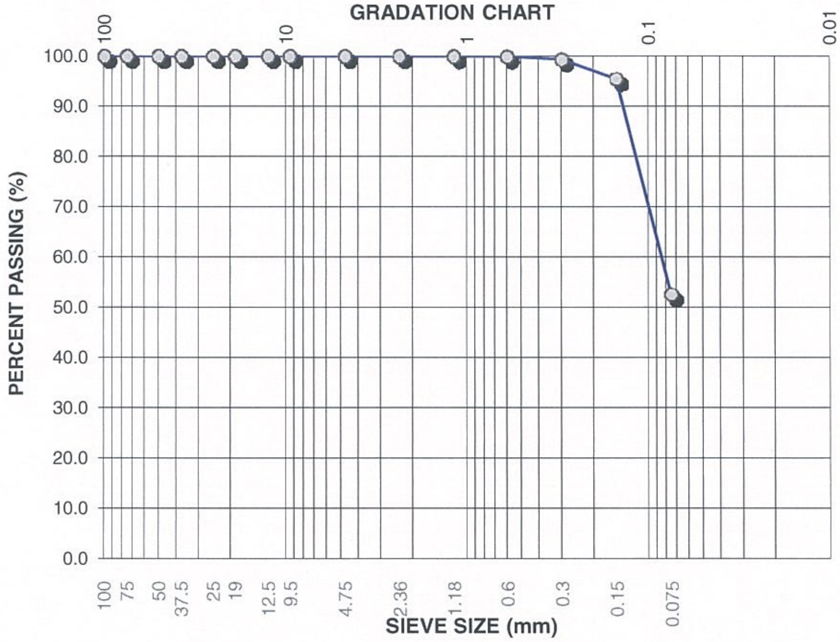
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-50

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-19

Source: Mt. Nansen Mine Site

Depth (m): 5.5
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	100	-	
2.36	100	-	
1.18	100	-	
0.6	100	-	
0.3	99	-	
0.15	95	-	
0.075	53	-	

Natural Moisture Content = 19.0%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

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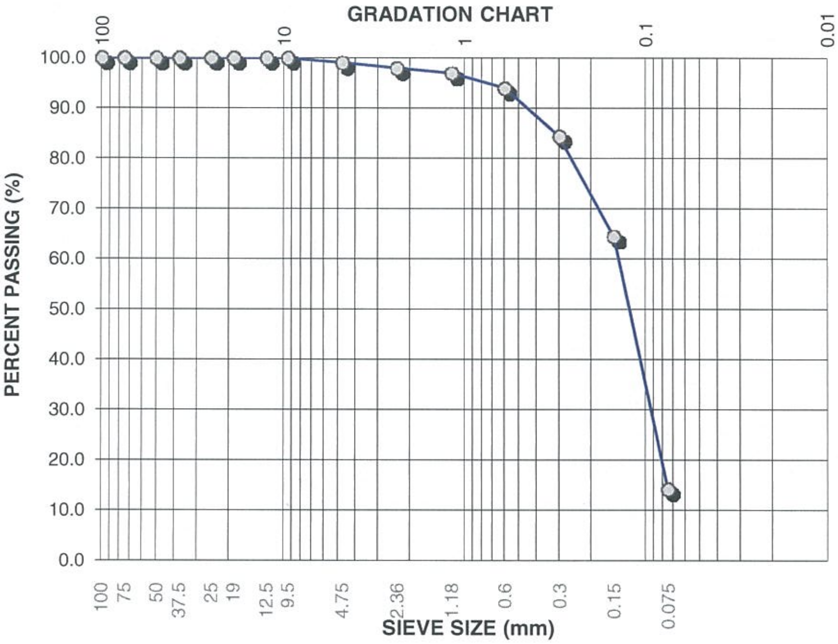
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-51

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-21

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	98	-	
1.18	97	-	
0.6	94	-	
0.3	84	-	
0.15	64	-	
0.075	14	-	

Natural Moisture Content = 8.3%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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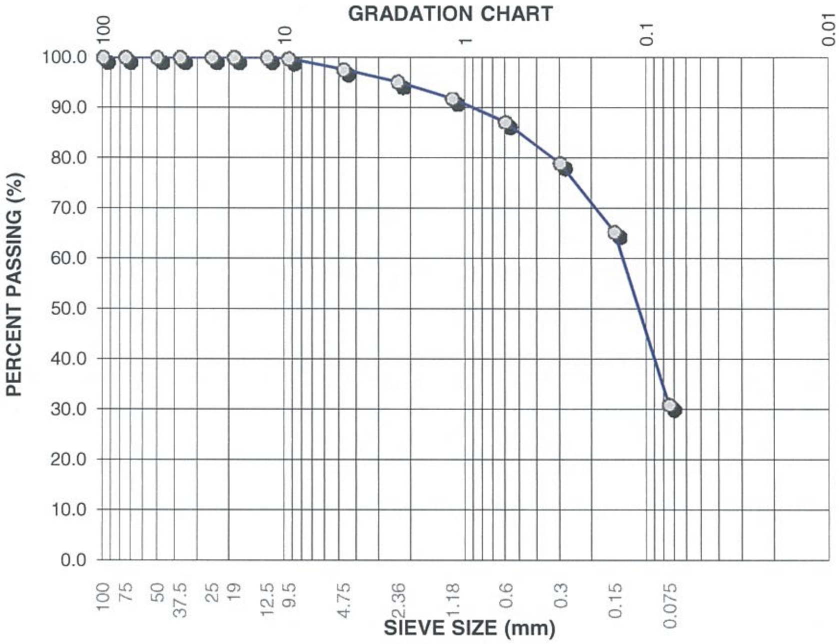
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-52

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-21

Source: Mt. Nansen Mine Site

Depth (m): 2
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	98	-	
2.36	95	-	
1.18	92	-	
0.6	87	-	
0.3	79	-	
0.15	65	-	
0.075	31	-	

Natural Moisture Content = 14.9%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

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Project Number: VM00605J.03.301
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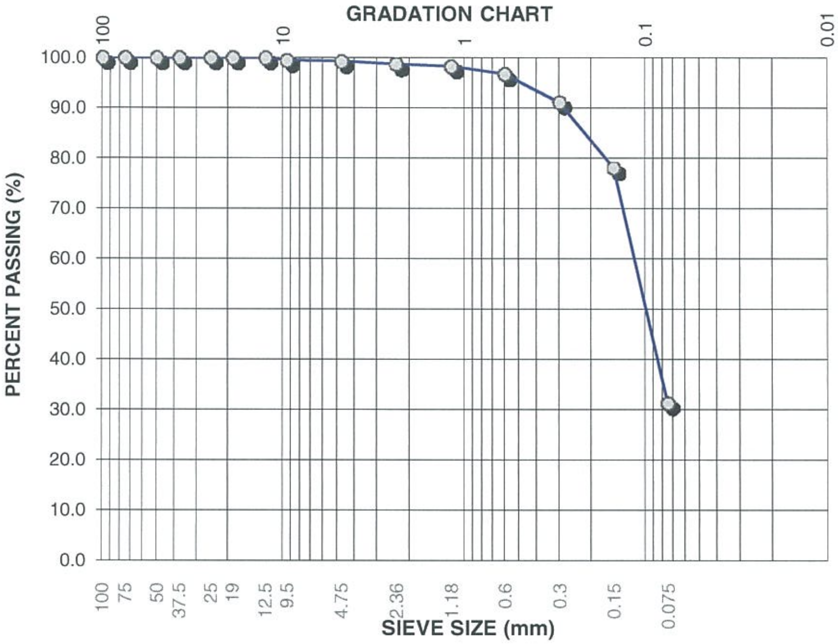
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-53

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-T-14-21

Source: Mt. Nansen Mine Site

Depth (m): 4
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	100	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	99	-	
2.36	99	-	
1.18	98	-	
0.6	97	-	
0.3	91	-	
0.15	78	-	
0.075	31	-	

Natural Moisture Content = 19.8%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Tell: 604-295-8657
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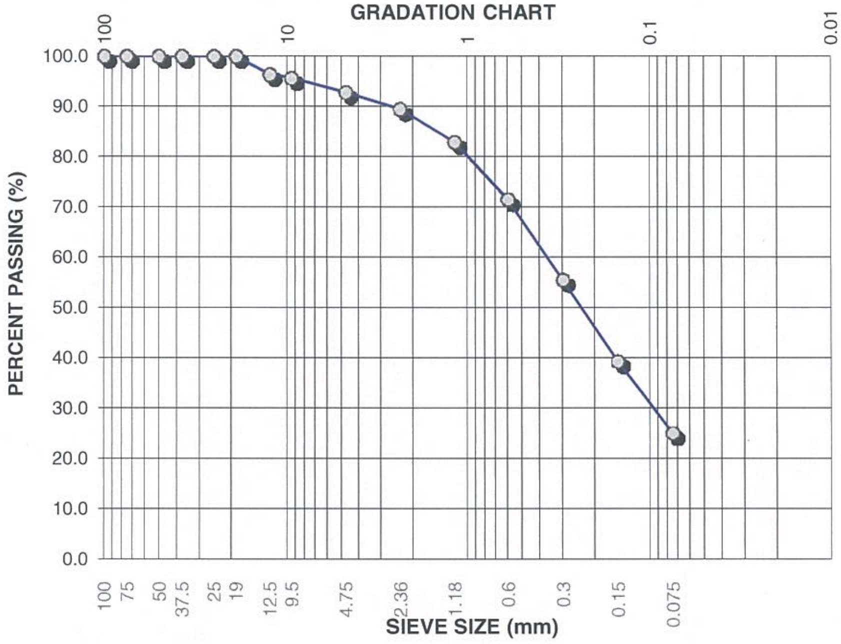
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-54

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-C-14-02

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	96	-	
9.5	96	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	93	-	
2.36	89	-	
1.18	83	-	
0.6	71	-	
0.3	56	-	
0.15	39	-	
0.075	25	-	

Natural Moisture Content = 5.3%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Canada, V4N 3P9
Tell: 604-295-8657
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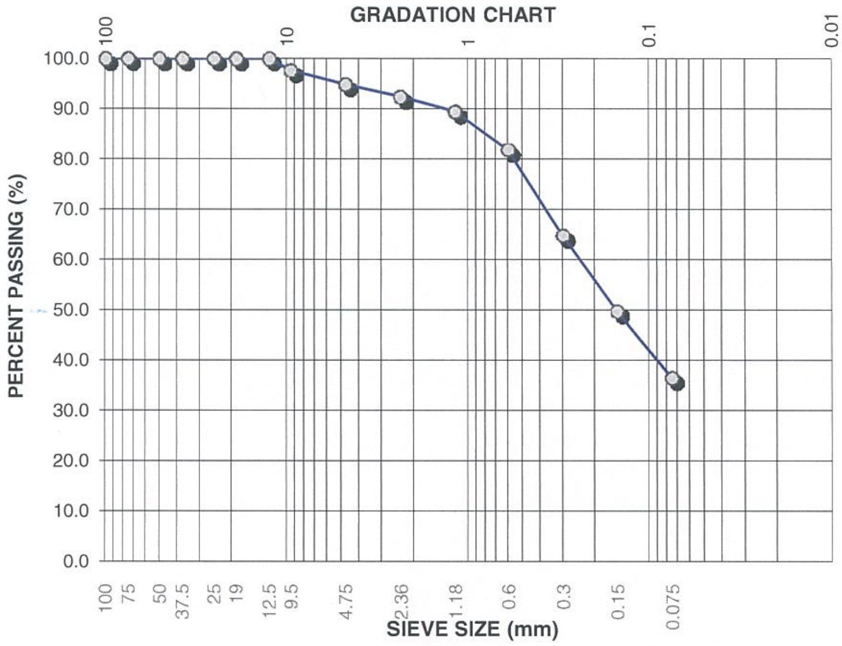
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-55

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-M-14-02

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	98	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	95	-	
2.36	92	-	
1.18	89	-	
0.6	82	-	
0.3	65	-	
0.15	50	-	
0.075	37	-	

Natural Moisture Content = 15.5%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Tell: 604-295-8657
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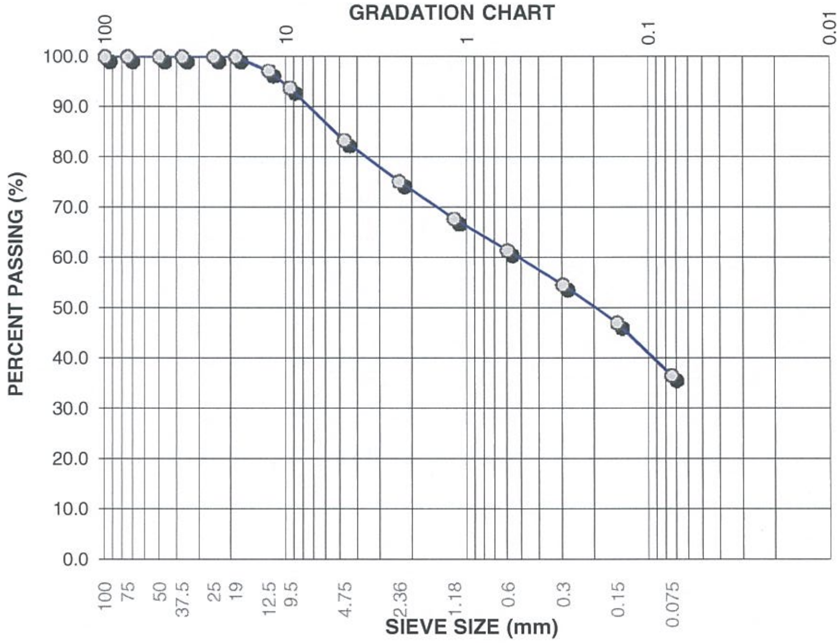
CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-56

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-C-14-03

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	97	-	
9.5	94	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	83	-	
2.36	75	-	
1.18	68	-	
0.6	62	-	
0.3	55	-	
0.15	47	-	
0.075	37	-	

Natural Moisture Content = 9.1%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

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Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

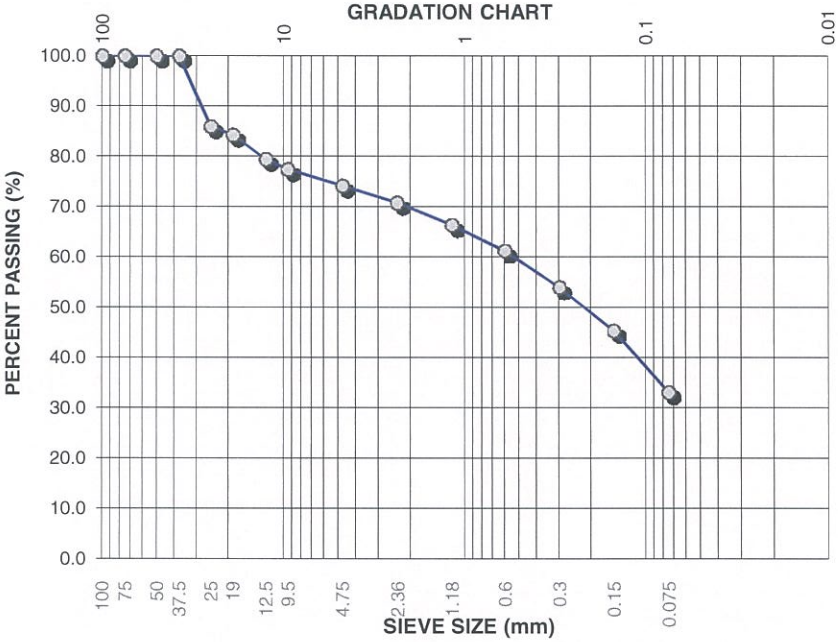
SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program

GRADATION CHART



Lab Number: L5165-57

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-C-14-04

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	86	-	
19	84	-	
12.5	79	-	
9.5	77	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	74	-	
2.36	71	-	
1.18	66	-	
0.6	61	-	
0.3	54	-	
0.15	45	-	
0.075	33	-	

Natural Moisture Content = 9.9%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

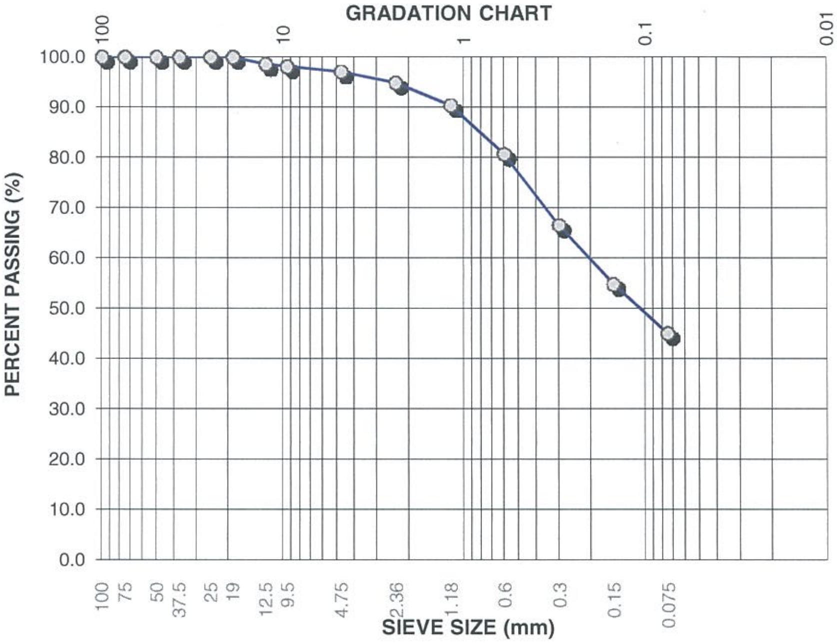
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-58

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-M-14-01

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	99	-	
9.5	98	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	97	-	
2.36	95	-	
1.18	90	-	
0.6	81	-	
0.3	67	-	
0.15	55	-	
0.075	45	-	

Natural Moisture Content = 11.9%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

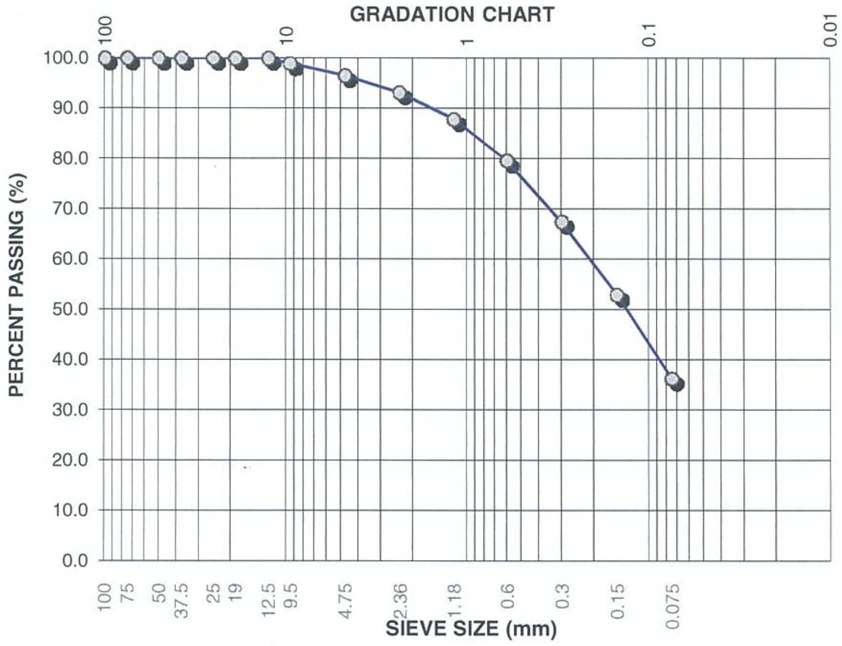
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-59

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-M-14-04

Source: Mt. Nansen Mine Site

Depth (m): 1
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	100	-	
9.5	99	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	97	-	
2.36	93	-	
1.18	88	-	
0.6	80	-	
0.3	67	-	
0.15	53	-	
0.075	36	-	

Natural Moisture Content = 4.1%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

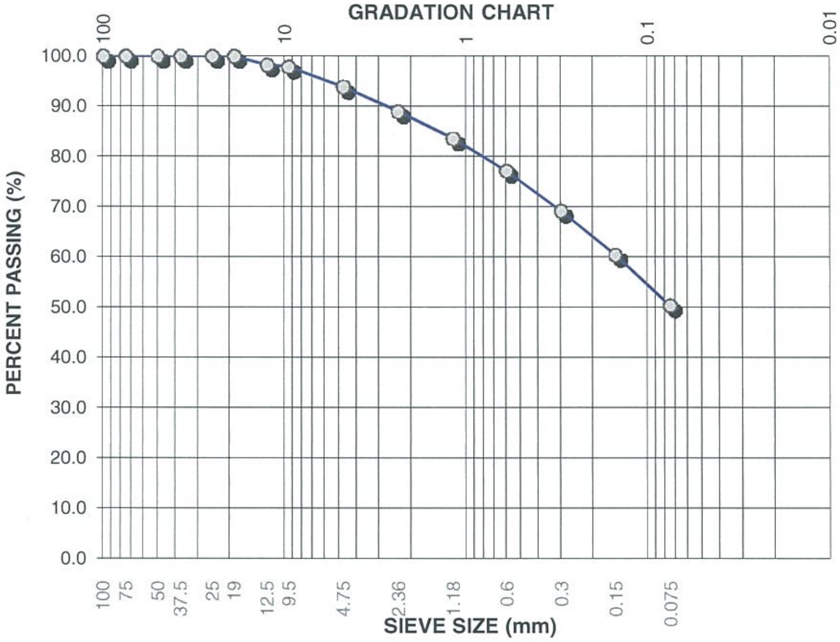
AMEC Environment & Infrastructure
#110 - 18568 - 96th Avenue
Surrey British Columbia
Canada, V4N 3P9
Tell: 604-295-8657
Fax: 604-295-8658

SIEVE ANALYSIS REPORT

CLIENT: Yukon Government AAM

Project Number: VM00605J.03.301
Date: 15-Aug-14
Client P.O.:

ATTN: Josée Perron, Sr. Project Manager
PROJECT: Nansen 2014 Site Investigation Program



Lab Number: L5165-60

Date Sampled:
Date Received: 8-Aug-14
Date Tested: 13-Aug-14
Sampled By: Hamid Yousefbeigi
Tested By: William Mendez

Sample Location: BH-M-14-05

Source: Mt. Nansen Mine Site

Depth (m): 3
Soil Classification:

Gravel Sizes (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
100	100	-	
75	100	-	
50	100	-	
37.5	100	-	
25	100	-	
19	100	-	
12.5	98	-	
9.5	98	-	

Sand Sizes And Fines (mm)	Percent Passing	Gradation Limits	
		Lower	Upper
4.75	94	-	
2.36	89	-	
1.18	84	-	
0.6	77	-	
0.3	69	-	
0.15	60	-	
0.075	50	-	

Natural Moisture Content = 14.7%

Comments: Sieve Analysis test was conducted in accordance with ASTM C136-06
Materials finer than 75 µm (No. 200) sieve were tested in accordance with ASTM C117-13

Reviewed By: Theodore Alanes, P.Eng.

AMEC Environment & Infrastructure
4445 Lougheed Highway
Burnaby, British Columbia
Canada, V5C 0E4
Tell: 604-294-3811
Fax: 604-294-4664

ATTERBERG LIMITS REPORT

Yukon Government AAM

Project Number: VM00605J.03.3001
Date: September 23, 2014
Client P.O. Number:
CC: Hamid Yousefbeigi - AMEC

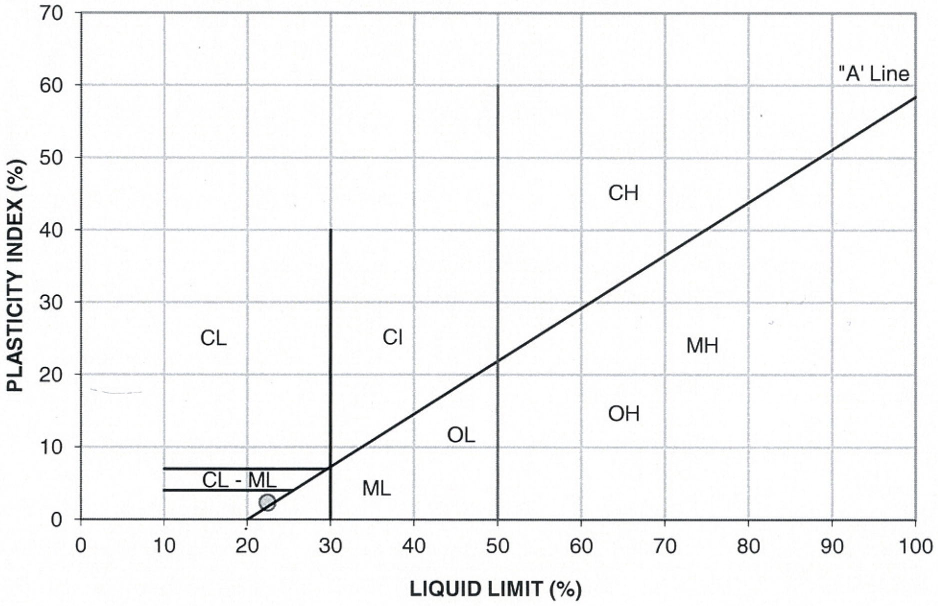
Attention: **Josee Perron**

PROJECT: Nansen 2014 SI Lab Program

Results Summary

Borehole Location	Sample Type & Number	Depth (m)	Elevation (m)	Natural Moisture Content (%)	Atterberg Limits (%)			Retained on 425-µm Sieve (%)	Soil Type
					LL	PL	PI		
BH-T-14-10	GS2 & GS3	2 & 3	-	33	22	20	2	3	ML
BH-T-14-10	GS5	5		38					NP

PLASTICITY CHART FOR SOILS PASSING 425-µm SIEVE



Lab Number: L5165

Date sampled: 5-Aug-14

Sampled By: DK

ate Received: 8-Aug-14

Tested By: RL

Date Tested: 13-Aug-14

Preparation: Dry preparation

Comments: Atterberg Limit tests were conducted in accordance with ASTM D 4318-00, Method A

Approved By:

Theodore Alanes, P.Eng.

AMEC Environment & Infrastructure
4445 Lougheed Highway
Burnaby, British Columbia
Canada, V5C 0E4
Tell: 604-294-3811
Fax: 604-294-4664

Moisture content

Yukon Government AAM

Project Number: VM00605J.03.301
Date: 23-Sep-14
Client P.O. Number:
CC: Hamid Yousefbeigi - AMEC
Lab Number: L5165
Date Tested: 15-Aug-14
Tested By: RL

Attention: Josee Perron

PROJECT: Nansen 2014 SI Lab Program

Hole #	Grab sample #	Depth (m)	Tare #	Mass wet+ tare (g)	Mass dry + tare (g)	Mass of water (g)	Tare container (g)	Mass dry sample (g)	Moisture content (%)
BH-T-14-01	GS1	1	HA	838.00	813.30	24.7	434.00	379.3	6.5
BH-T-14-01	GS2	2	#1	741.00	726.20	14.8	331.50	394.7	3.7
BH-T-14-01	GS3	3	SR	147.72	142.68	5.0	16.10	126.6	4.0
BH-T-14-01	GS4	4	EB	145.08	126.87	18.2	15.96	110.9	16.4
BH-T-14-01	GS5	4.5	JA	146.12	127.55	18.6	15.94	111.6	16.6
BH-T-14-02	GS1	1	1E	811.30	747.80	63.5	421.40	326.4	19.5
BH-T-14-02	GS2	2	BMW	854.90	819.30	35.6	423.10	396.2	9.0
BH-T-14-02	GS3	3	AAX	160.46	151.35	9.1	15.94	135.4	6.7
BH-T-14-02	GS4	4	#5	788.50	724.60	63.9	331.30	393.3	16.2
BH-T-14-02	GS5	4.5	ABK	143.39	124.86	18.5	16.03	108.8	17.0
BH-T-14-03	GS1	1	1J	862.50	750.60	111.9	426.30	324.3	34.5
BH-T-14-03	GS2	2	10-D	736.10	632.70	103.4	322.40	310.3	33.3
BH-T-14-03	GS3	3	SOL	995.50	863.80	131.7	554.20	309.6	42.5
BH-T-14-03	GS4	3.8	BQ1	117.13	97.86	19.3	15.99	81.9	23.5
BH-T-14-04	GS1	1	007	747.40	567.00	180.4	361.40	205.6	87.7
BH-T-14-04	GS2	2	K	764.20	630.50	133.7	365.10	265.4	50.4
BH-T-14-04	GS3	3	ACQ	145.98	106.00	40.0	15.90	90.1	44.4
BH-T-14-04	GS4	4.0	ABA	925.50	869.60	55.9	533.00	336.6	16.6
BH-T-14-05	GS1	1	REZ	966.10	939.20	26.9	554.80	384.4	7.0
BH-T-14-05	GS2	2	OF	135.34	118.21	17.1	15.91	102.3	16.7
BH-T-14-05	GS3	3	RK1	585.70	536.10	49.6	183.00	353.1	14.0
BH-T-14-05	GS4	4	ABK	151.46	132.18	19.3	15.84	116.3	16.6
BH-T-14-05	GS5	4.6	IZ	142.36	124.13	18.2	15.96	108.2	16.9
BH-T-14-06	GS1	1	AAA	127.72	114.25	13.5	15.98	98.3	13.7
BH-T-14-06	GS2	2	BD-4	131.72	123.58	8.1	15.98	107.6	7.6
BH-T-14-06	GS3	3	X2C	554.00	538.80	15.2	177.70	361.1	4.2
BH-T-14-06	GS4	4	AAY	123.81	117.42	6.4	15.86	101.6	6.3
BH-T-14-06	GS5	4.6	JD	125.16	120.79	4.4	16.01	104.8	4.2
BH-T-14-07	GS1	1	E	697.40	684.40	13.0	312.10	372.3	3.5
BH-T-14-07	GS2	2	IA	127.81	122.32	5.5	15.79	106.5	5.2
BH-T-14-07	GS3	3	JLI	122.60	117.78	4.8	15.98	101.8	4.7
BH-T-14-07	GS4	4	SN	126.26	122.60	3.7	15.93	106.7	3.4

Comments :

Technician : Mark Elmasry

Project: Nansen 2014 SI Lab Program **Date:** 15-Aug-14

Project#: VM00605J.03.301 **Lab#:** L5165

Hole #	Grab sample #	Depth (m)	Tare #	Mass wet+ tare (g)	Mass dry + tare (g)	Mass of water (g)	Tare container (g)	Mass dry sample (g)	Moisture content (%)
BH-T-14-07	GS5	5	MH	953.70	903.50	50.2	555.30	348.2	14.4
BH-T-14-08	GS1	1	CCC	928.80	916.50	12.3	534.90	381.6	3.2
BH-T-14-08	GS2	2	JLI	132.94	128.68	4.3	15.96	112.7	3.8
BH-T-14-08	GS3	3	V	504.00	495.00	9.0	192.20	302.8	3.0
BH-T-14-08	GS4	4	GI	794.80	780.40	14.4	351.90	428.5	3.4
BH-T-14-08	GS5	4.5	JR	128.70	124.61	4.1	15.86	108.8	3.8
BH-T-14-09	GS1	1	OK	136.20	121.03	15.2	15.81	105.2	14.4
BH-T-14-09	GS2	2	ABS	116.64	103.01	13.6	15.95	87.1	15.7
BH-T-14-09	GS3	3	AA	918.80	842.60	76.2	225.10	617.5	12.3
BH-T-14-09	GS4	4	FRY-1	787.60	691.40	96.2	311.40	380.0	25.3
BH-T-14-10	GS1	1	A	853.20	677.40	175.8	179.60	497.8	35.3
BH-T-14-10	GS2	2	AK	73.76	59.94	13.8	15.87	44.1	31.4
BH-T-14-10	GS3	3	SL	89.67	70.02	19.7	16.00	54.0	36.4
BH-T-14-10	GS4	4	ABX	111.44	73.80	37.6	16.09	57.7	65.2
BH-T-14-10	GS5	5	B4	822.20	645.20	177.0	181.30	463.9	38.2
BH-T-14-11	GS1	1	B1-A	622.20	393.10	229.1	181.20	211.9	108.1
BH-T-14-11	GS2	1.9	LAC	387.30	360.00	27.3	195.10	164.9	16.6
BH-T-14-11	GS3	2.9	ACP	159.68	136.28	23.4	16.01	120.3	19.5
BH-T-14-11	GS4	3.9	HX	808.00	704.40	103.6	196.90	507.5	20.4
BH-T-14-12	GS1	1	YM37	145.36	89.02	56.3	16.02	73.0	77.2
BH-T-14-12	GS2	2	DZ	1027.4	958.10	69.3	550.40	407.7	17.0
BH-T-14-12	GS3	3	BB1	806.40	744.80	61.6	189.40	555.4	11.1
BH-T-14-12	GS4	4	MARY	737.00	702.90	34.1	192.90	510.0	6.7
BH-T-14-13	GS1	1	X2C	622.30	516.10	106.2	177.60	338.5	31.4
BH-T-14-13	GS2	2	ACF	147.09	127.89	19.2	16.15	111.7	17.2
BH-T-14-13	GS3	3	IS	159.72	136.76	23.0	16.12	120.6	19.0
BH-T-14-14	GS1	1	HA	858.20	785.60	72.6	434.00	351.6	20.6
BH-T-14-14	GS2	2	V	639.40	585.10	54.3	192.20	392.9	13.8
BH-T-14-14	GS3	3	ACR	158.70	139.29	19.4	15.98	123.3	15.7
BH-T-14-14	GS4	4	#5	867.20	767.80	99.4	331.30	436.5	22.8
BH-T-14-14	GS5	5	#1	698.40	639.80	58.6	331.50	308.3	19.0
BH-T-14-15	GS1	1	BMW	697.80	616.70	81.1	423.20	193.5	41.9
BH-T-14-15	GS2	2	B53	537.50	504.20	33.3	134.70	369.5	9.0
BH-T-14-15	GS3	3	DH	150.21	130.50	19.7	16.07	114.4	17.2
BH-T-14-15	GS4	4	GI	810.90	727.60	83.3	351.90	375.7	22.2
BH-T-14-15	GS5	5	MH	1013.9	922.50	91.4	555.40	367.1	24.9
BH-T-14-16	GS1	1	RK1	623.00	606.80	16.2	183.00	423.8	3.8
BH-T-14-16	GS2	2	AAU	151.37	144.58	6.8	15.99	128.6	5.3
BH-T-14-16	GS3	3	1J	856.70	805.50	51.2	426.30	379.2	13.5
BH-T-14-16	GS4	4	K	824.30	752.30	72.0	365.10	387.2	18.6
BH-T-14-16	GS5	5	OO	240.41	171.26	69.2	16.06	155.2	44.6
BH-T-14-17	GS1	1	ACO	160.54	100.61	59.9	16.08	84.5	70.9
BH-T-14-17	GS2	2	AAV	133.04	84.71	48.3	15.99	68.7	70.3
BH-T-14-17	GS3	3	ACH	168.86	106.53	62.3	16.03	90.5	68.9
BH-T-14-17	GS4	4	1E	953.50	781.00	172.5	421.40	359.6	48.0

Comments :

Technician : Mark Elmasry

Project: Nansen 2014 SI Lab Program **Date:** 15-Aug-14
Project#: VM00605J.03.301 **Lab#:** L5165

Hole #	Grab sample #	Depth (m)	Tare #	Mass wet+ tare (g)	Mass dry + tare (g)	Mass of water (g)	Tare container (g)	Mass dry sample (g)	Moisture content (%)
BH-T-14-18	GS1	1	JP	174.53	142.09	32.4	16.08	126.0	25.7
BH-T-14-18	GS2	2	SOL	962.10	891.60	70.5	554.20	337.4	20.9
BH-T-14-18	GS3	3	OJ	167.08	140.72	26.4	16.10	124.6	21.2
BH-T-14-18	GS4	4	10-D	737.30	660.20	77.1	322.40	337.8	22.8
BH-T-14-18	GS5	5	AA	714.10	586.10	128.0	225.10	361.0	35.5
BH-T-14-19	GS1	1	MARY	631.00	570.40	60.6	192.80	377.6	16.0
BH-T-14-19	GS2	2	YM17	139.19	125.73	13.5	16.09	109.6	12.3
BH-T-14-19	GS3	3	BJ	186.18	154.26	31.9	16.13	138.1	23.1
BH-T-14-19	GS4	4	BB1	602.40	510.30	92.1	189.40	320.9	28.7
BH-T-14-19	GS5	5	JNI	138.89	116.74	22.2	16.17	100.6	22.0
BH-T-14-19	GS6	5.5	DZ	961.70	896.00	65.7	550.50	345.5	19.0
BH-T-14-20	GS1	1	IU	311.47	261.55	49.9	16.18	245.4	20.3
BH-T-14-20	GS2	2.5	OD	227.14	196.04	31.1	16.05	180.0	17.3
BH-T-14-21	GS1	1	HX	595.60	565.00	30.6	197.10	367.9	8.3
BH-T-14-21	GS2	2	G5	592.30	538.40	53.9	177.60	360.8	14.9
BH-T-14-21	GS3	3	ABN	162.50	141.91	20.6	16.18	125.7	16.4
BH-T-14-21	GS4	4	LAC	681.30	600.90	80.4	195.20	405.7	19.8
BH-T-14-21	GS5	4.5	SH	162.59	135.59	27.0	16.12	119.5	22.6
BH-C-14-01	GS2	2	AAB	166.27	155.24	11.0	16.34	138.9	7.9
BH-C-14-01	GS3	3	AA	165.62	154.34	11.3	16.23	138.1	8.2
BH-C-14-02	GS1	1	REZ	980.30	959.00	21.3	554.80	404.2	5.3
BH-C-14-02	GS2	2	JKI	166.62	160.25	6.4	16.11	144.1	4.4
BH-C-14-03	GS1	1	B1A	590.70	556.70	34.0	181.40	375.3	9.1
BH-C-14-03	GS2	2	CAN	158.59	147.23	11.4	15.98	131.3	8.7
BH-C-14-04	GS1	1	ABA	1200.6	1140.6	60.0	533.40	607.2	9.9
BH-C-14-04	GS2	2	YM44	151.43	140.49	10.9	16.09	124.4	8.8
BH-C-14-04	GS3	3	JUI	146.20	134.37	11.8	16.13	118.2	10.0
BH-C-14-04	GS4	4	YM14	170.14	161.14	9.0	16.08	145.1	6.2
BH-M-14-01	GS1	1	A	637.90	589.20	48.7	179.60	409.6	11.9
BH-M-14-02	GS1	1	CCC	988.40	927.40	61.0	534.80	392.6	15.5
BH-M-14-02	GS2	2	ACW	169.10	151.94	17.2	15.96	136.0	12.6
BH-M-14-03	GS1	1	DT	231.24	221.76	9.5	16.09	205.7	4.6
BH-M-14-04	GS1	1	007	769.40	753.30	16.1	361.40	391.9	4.1
BH-M-14-05	GS1	1	DC	168.17	159.58	8.6	16.28	143.3	6.0
BH-M-14-05	GS2	2	ABM	185.50	162.41	23.1	16.23	146.2	15.8
BH-M-14-05	GS3	3	GO2	744.20	673.80	70.4	196.30	477.5	14.7
BH-M-14-05	GS4	4	JTI-X	212.30	190.07	22.2	16.22	173.9	12.8

Technician : Mark Elmasry

Comments: Moisture Content Tests were conducted in accordance with ASTM D 42216.

Approved By:

Theodore Alanes, P.Eng.

AMEC Environment & Infrastructure
4445 Lougheed Highway
Burnaby, British Columbia
Canada, V5C 0E4
Tell: 604-294-3811
Fax: 604-294-4664

ORGANIC CONTENT REPORT

Yukon Government AAM

Project Number: VM00605J.03.301
Date: September 23, 2014
Client P.O. Number:
CC: Hamid Yousefbeigi - AMEC

Attention: **Josee Perron**

PROJECT: Nansen 2014 SI Lab Program

Results Summary

Sample I.D	**BH-T-14-03**	**BH-T-14-03**	**BH-T-14-04**	**BH-T-14-06**
Depth	1.0m	2.0m	2.0m	1.0m
Oven-dry test specimen (g)	40.83	73.70	24.59	36.89
Mass of ash (g)	38.14	69.17	18.95	30.85
Mass loss (g)	2.69	4.53	5.64	6.04
Ash Content (%)	93.4	93.9	77.1	83.6
Organic Matter (%)	6.6	6.1	22.9	16.4
Sample I.D	**BH-T-14-12**	**BH-T-14-15**	**BH-T-14-17**	**BH-T-14-20**
Depth	1.0m	1.0m	1.0m	1.0m
Oven-dry test specimen (g)	37.82	39.92	49.84	60.00
Mass of ash (g)	28.33	31.99	43.12	57.74
Mass loss (g)	9.49	7.93	6.72	2.26
Ash Content (%)	74.9	80.1	86.5	96.2
Organic Matter (%)	25.1	19.9	13.5	3.8

Oven temperature:	440°C	**Project:**	Nansen 2014 SI Lab Program
		Report Date:	22-Aug-14
Date Sampled:		**Source:**	Mt. Nansen Mine Site
Test No:	1	**Type of Sample:**	Bore holes
Tested by:	GG/TA	**Date Tested:**	20-Aug-14

Comments: Organic Content tests were conducted in accordance with ASTM D 2974, Method C.

Approved By:

Theodore Alanes, P.Eng.

Appendix 4E – Soil and Sediment Results

AMEC Environment & Infrastructure
ATTN: Hamid Yousefbeigi
600 - 4445 Lougheed Hwy
Burnaby BC V5C 0E4

Date Received:	23-JUL-14
Report Date:	11-SEP-14 19:28 (MT)
Version:	FINAL REV. 3

Client Phone: 604-295-6181

Certificate of Analysis

Lab Work Order #:	**L1491427**
Project P.O. #:	NOT SUBMITTED
Job Reference:	VM00605J
C of C Numbers:	1
Legal Site Desc:	

Comments: ADDITIONAL 01-AUG-14 16:31

6-AUG-2014 Sample L1491427-5 added for metals analyses and labeled per client's request.

Selam Worku
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1491427-2	L1491427-3	L1491427-4	L1491427-5	L1491427-6
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED-VIC-14-22	SED-VIC-14-23	SED-DC-14-24	SED-DC-14-23	SED-DC-14-25
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	16.4	25.6	46.2	29.5	79.3
	pH (1:2 soil:water) (pH)	7.76	7.85	7.91	7.75	7.23
Cyanides	Cyanide, Total (mg/kg)	0.056	<0.050	0.22		0.78
Metals	Antimony (Sb) (mg/kg)	1.24	1.30	4.95	3.05	137
	Arsenic (As) (mg/kg)	27.0	30.5	187	112	1420
	Barium (Ba) (mg/kg)	81.6	99.1	180	99.0	374
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	<0.20	0.55
	Cadmium (Cd) (mg/kg)	0.380	0.483	0.823	0.434	5.78
	Chromium (Cr) (mg/kg)	5.98	8.07	12.4	7.90	22.3
	Cobalt (Co) (mg/kg)	3.68	4.69	6.46	4.39	12.8
	Copper (Cu) (mg/kg)	9.84	12.1	10.5	6.96	291
	Lead (Pb) (mg/kg)	14.9	18.4	20.5	13.4	792
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	0.226
	Molybdenum (Mo) (mg/kg)	0.83	0.95	0.59	<0.50	2.24
	Nickel (Ni) (mg/kg)	4.17	5.13	9.11	6.17	23.7
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	1.45
	Silver (Ag) (mg/kg)	<0.10	0.11	0.40	0.19	20.3
	Thallium (Tl) (mg/kg)	<0.050	0.057	0.070	0.057	0.432
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.457	0.633	0.472	0.367	5.39
	Vanadium (V) (mg/kg)	22.6	27.3	32.8	21.0	50.4
	Zinc (Zn) (mg/kg)	49.3	62.2	108	64.6	409

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1491427-7	L1491427-8	L1491427-9	L1491427-10	L1491427-11
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED-DC-14-26	SED-DC-14-27	SED-DC-14-28	SED-DC-14-29	SED-DC-14-30
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	45.9	54.8	74.8	42.4	18.7
	pH (1:2 soil:water) (pH)	7.69	7.77	7.79	7.93	7.90
Cyanides	Cyanide, Total (mg/kg)	<0.50 DLM	<0.50 DLM	<1.0 DLM	<1.0 DLM	<0.050
Metals	Antimony (Sb) (mg/kg)	5.96	9.67	9.41	5.54	2.34
	Arsenic (As) (mg/kg)	212	817	702	326	108
	Barium (Ba) (mg/kg)	129	386	231	102	38.8
	Beryllium (Be) (mg/kg)	0.21	0.24	0.30	0.22	<0.20
	Cadmium (Cd) (mg/kg)	0.610	1.48	1.49	0.888	0.176
	Chromium (Cr) (mg/kg)	14.1	12.5	14.8	9.13	4.55
	Cobalt (Co) (mg/kg)	5.93	11.3	6.93	3.36	2.03
	Copper (Cu) (mg/kg)	14.4	18.4	22.2	13.8	4.45
	Lead (Pb) (mg/kg)	30.3	29.6	37.7	28.2	11.3
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	1.16	0.64	<0.50	<0.50
	Nickel (Ni) (mg/kg)	9.29	10.8	10.0	6.14	3.66
	Selenium (Se) (mg/kg)	0.22	0.47	0.51	0.33	<0.20
	Silver (Ag) (mg/kg)	0.73	0.56	0.71	0.48	0.11
	Thallium (Tl) (mg/kg)	0.083	0.123	0.139	0.081	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.667	0.913	0.820	0.523	0.214
	Vanadium (V) (mg/kg)	35.3	38.5	36.8	22.7	14.2
	Zinc (Zn) (mg/kg)	89.9	173	142	81.4	37.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1491427-12	L1491427-13	L1491427-14	L1491427-15	L1491427-16
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED-DC-14-30 DUP	SED-DC-14-31	SED-DC-14-32	SED-DC-14-33	SED-DC-14-34
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	21.3	21.6	35.1	72.9	43.2
	pH (1:2 soil:water) (pH)	7.93	7.91	7.32	7.13	7.83
Cyanides	Cyanide, Total (mg/kg)	<0.050	<0.050	<1.0	DLM <1.0	DLM <1.0
Metals	Antimony (Sb) (mg/kg)	1.95	5.48	5.65	31.9	7.20
	Arsenic (As) (mg/kg)	109	120	150	1220	189
	Barium (Ba) (mg/kg)	38.4	40.9	65.2	222	74.6
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	0.42	<0.20
	Cadmium (Cd) (mg/kg)	0.185	0.424	0.754	3.96	1.03
	Chromium (Cr) (mg/kg)	4.59	6.87	10.7	27.2	12.9
	Cobalt (Co) (mg/kg)	1.92	2.47	3.54	11.6	3.96
	Copper (Cu) (mg/kg)	3.63	4.66	8.21	57.2	9.19
	Lead (Pb) (mg/kg)	11.7	21.7	29.8	106	38.9
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	0.066	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	1.02	<0.50
	Nickel (Ni) (mg/kg)	3.29	4.47	6.34	16.4	6.66
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	0.71	<0.20
	Silver (Ag) (mg/kg)	0.18	0.22	0.43	3.02	0.76
	Thallium (Tl) (mg/kg)	<0.050	0.052	0.078	0.209	0.068
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.196	0.292	0.403	1.85	0.471
	Vanadium (V) (mg/kg)	13.6	16.8	24.6	85.5	31.9
	Zinc (Zn) (mg/kg)	34.7	55.2	84.1	364	93.7

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1491427-17	L1491427-18	L1491427-19	L1491427-20	L1491427-21
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED-DC-14-35	SED-DC-14-36	SED-DC-14-37	SED-DC-14-38	SED-DC-14-39
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	18.8	21.1	16.5	60.6	35.7
	pH (1:2 soil:water) (pH)	8.08	6.29	7.77	7.38	6.48
Cyanides	Cyanide, Total (mg/kg)	<0.050	<0.50 DLM	<0.050	<1.0 DLM	<1.0 DLM
Metals	Antimony (Sb) (mg/kg)	1.04	2.36	1.62	5.48	3.19
	Arsenic (As) (mg/kg)	26.1	51.5	66.1	163	238
	Barium (Ba) (mg/kg)	38.0	51.4	28.7	132	85.3
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	0.35	0.20
	Cadmium (Cd) (mg/kg)	0.171	0.375	0.158	0.884	0.434
	Chromium (Cr) (mg/kg)	7.32	9.04	4.46	20.2	12.3
	Cobalt (Co) (mg/kg)	2.73	2.52	2.08	6.45	4.09
	Copper (Cu) (mg/kg)	4.48	5.02	3.48	27.2	12.4
	Lead (Pb) (mg/kg)	5.39	11.8	9.65	29.5	13.0
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	0.051	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	0.58	<0.50
	Nickel (Ni) (mg/kg)	4.88	4.93	3.63	13.0	7.87
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	0.51	0.23
	Silver (Ag) (mg/kg)	<0.10	0.21	<0.10	0.45	0.17
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	0.125	0.081
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.306	0.325	0.195	1.41	0.559
	Vanadium (V) (mg/kg)	18.0	23.1	13.4	43.3	28.8
	Zinc (Zn) (mg/kg)	28.8	47.6	31.6	92.1	64.7

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1491427-22	L1491427-23	L1491427-24	L1491427-25	L1491427-26
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED-DC-14-40	SED-DC-14-40 DUP	SED-DC-14-41	SED-DC-14-42	SED-DC-14-43
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	17.3	17.5	25.0	28.2	25.0
	pH (1:2 soil:water) (pH)	7.82	7.88	7.57	6.94	7.98
Cyanides	Cyanide, Total (mg/kg)	0.057	<0.050	<0.50	<1.0	<0.50
Metals	Antimony (Sb) (mg/kg)	0.60	0.50	0.68	1.63	1.71
	Arsenic (As) (mg/kg)	23.0	18.6	25.2	48.2	34.3
	Barium (Ba) (mg/kg)	33.7	31.9	52.0	93.1	57.9
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	0.22	<0.20
	Cadmium (Cd) (mg/kg)	0.084	0.151	0.131	1.50	0.146
	Chromium (Cr) (mg/kg)	5.90	6.31	14.9	15.7	11.9
	Cobalt (Co) (mg/kg)	2.17	1.99	3.55	4.99	3.61
	Copper (Cu) (mg/kg)	3.91	3.29	5.53	24.1	5.87
	Lead (Pb) (mg/kg)	3.57	3.51	4.37	9.67	5.53
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	4.14	3.66	5.84	9.94	6.34
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	0.23	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	1.54	0.82
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	0.081	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.221	0.235	0.404	0.597	0.369
	Vanadium (V) (mg/kg)	15.2	15.6	48.6	36.6	31.1
	Zinc (Zn) (mg/kg)	23.5	26.4	34.3	155	37.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L1491427-27	L1491427-28	L1491427-29	L1491427-30	L1491427-31
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED-DC-14-44	SED-DC-14-45	SED-DC-14-46	SED-DC-14-47	SED-DC-14-48
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	24.6	45.7	25.1	19.9	17.4
	pH (1:2 soil:water) (pH)	8.04	7.80	8.12	5.71	7.97
Cyanides	Cyanide, Total (mg/kg)	<1.0	<1.0	<0.50	<1.0	<0.50
Metals	Antimony (Sb) (mg/kg)	0.98	1.43	0.96	0.84	0.81
	Arsenic (As) (mg/kg)	53.1	80.5	50.8	18.0	34.7
	Barium (Ba) (mg/kg)	59.1	78.7	56.8	70.4	32.7
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	0.226	0.304	0.199	0.968	0.093
	Chromium (Cr) (mg/kg)	9.78	11.1	8.92	12.8	4.07
	Cobalt (Co) (mg/kg)	3.43	3.86	3.27	3.96	1.92
	Copper (Cu) (mg/kg)	6.91	8.05	5.60	23.2	4.60
	Lead (Pb) (mg/kg)	5.51	7.23	5.27	5.60	8.18
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	6.10	6.87	5.41	9.25	3.43
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	0.13	<0.10	1.60	<0.10
	Thallium (Tl) (mg/kg)	0.051	0.057	<0.050	0.064	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.319	0.379	0.283	0.474	0.203
	Vanadium (V) (mg/kg)	25.0	26.1	21.4	26.8	12.0
	Zinc (Zn) (mg/kg)	41.9	51.4	39.5	147	24.3

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1491427-32	L1491427-33	L1491427-34	L1491427-35	L1491427-36
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14	22-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED-DC-14-49	SED-DC-14-50	SED-DC-14-50 DUP	SED-DC-14-51	SED-DC-14-52
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	20.7	16.1	16.6	27.1	21.7
	pH (1:2 soil:water) (pH)	7.88	7.99	8.04	7.47	8.13
Cyanides	Cyanide, Total (mg/kg)	<0.50	<0.050	0.068	<0.50	0.066
Metals	Antimony (Sb) (mg/kg)	1.85	0.82	0.87	1.01	1.71
	Arsenic (As) (mg/kg)	47.1	36.3	31.9	40.7	45.9
	Barium (Ba) (mg/kg)	47.1	37.0	41.0	46.7	43.9
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	0.174	0.157	0.110	0.191	0.308
	Chromium (Cr) (mg/kg)	10.4	9.58	7.36	9.46	9.36
	Cobalt (Co) (mg/kg)	3.28	2.83	2.53	2.85	3.10
	Copper (Cu) (mg/kg)	6.31	5.60	4.60	6.09	6.18
	Lead (Pb) (mg/kg)	9.94	5.10	4.23	6.87	8.35
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	6.43	4.76	4.40	5.50	5.76
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	0.22
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.344	0.287	0.247	0.297	0.264
	Vanadium (V) (mg/kg)	29.8	34.3	24.3	28.4	21.9
	Zinc (Zn) (mg/kg)	41.6	31.2	30.1	36.2	48.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L1491427-37	L1491427-38	L1491427-39		
	Description	Sediment	Sediment	Sediment		
	Sampled Date	22-JUL-14	22-JUL-14	22-JUL-14		
	Sampled Time	12:00	12:00	12:00		
	Client ID	SED-DC-14-53	SED-DC-14-54	SED-DC-14-55		
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	22.3	28.9	36.6		
	pH (1:2 soil:water) (pH)	8.21	8.07	7.74		
Cyanides	Cyanide, Total (mg/kg)	0.088	<1.0	<1.0		
Metals	Antimony (Sb) (mg/kg)	1.30	1.04	1.57		
	Arsenic (As) (mg/kg)	36.9	36.6	65.6		
	Barium (Ba) (mg/kg)	49.0	61.6	69.7		
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20		
	Cadmium (Cd) (mg/kg)	0.267	0.204	0.393		
	Chromium (Cr) (mg/kg)	10.2	12.4	13.1		
	Cobalt (Co) (mg/kg)	3.17	3.59	4.33		
	Copper (Cu) (mg/kg)	6.97	7.46	11.6		
	Lead (Pb) (mg/kg)	10.2	8.35	8.13		
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050		
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50		
	Nickel (Ni) (mg/kg)	6.10	7.12	7.94		
	Selenium (Se) (mg/kg)	<0.20	<0.20	0.21		
	Silver (Ag) (mg/kg)	0.19	<0.10	0.12		
	Thallium (Tl) (mg/kg)	<0.050	0.058	0.064		
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		
	Uranium (U) (mg/kg)	0.278	0.355	0.460		
	Vanadium (V) (mg/kg)	28.8	27.0	32.9		
	Zinc (Zn) (mg/kg)	42.0	41.7	58.9		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Arsenic (As)	B	L1491427-10, -11, -12, -13, -14, -15, -16, -6, -7, -8, -9
Duplicate	Antimony (Sb)	DUP-H	L1491427-17, -18, -19, -20, -21, -22, -23, -24, -25, -26, -27, -28, -29, -30, -31, -32, -33, -34, -35, -36, -37, -38, -39
Duplicate	Silver (Ag)	DUP-H	L1491427-17, -18, -19, -20, -21, -22, -23, -24, -25, -26, -27, -28, -29, -30, -31, -32, -33, -34, -35, -36, -37, -38, -39
Duplicate	pH (1:2 soil:water)	J,G	L1491427-2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J,G	QC result did not meet ALS DQO. Refer to narrative comments for further information. Duplicate expressed in terms of absolute difference.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CN-T-NAOH-CFA-VA	Soil	Total Cyanide in soil by CFA	ONMOE CN-E3015/ISO 14403:2002

This analysis is carried out using procedures adapted from the Ontario Ministry of Environment CN-E3015 and ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by rotary extraction of the soil with 0.04M Sodium Hydroxide, followed by in-line UV digestion along with sample distillation and final determination by colourimetric analysis.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/245.7

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

ALS Test Code	Matrix	Test Description	Method Reference**
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

ALS Test Code	Matrix	Test Description	Method Reference**
MOISTURE-VA	Soil	Moisture content	ASTM D2974-00 Method A

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

ALS Test Code	Matrix	Test Description	Method Reference**
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

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GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1491427 Report Date: 11-SEP-14

Client: AMEC Environment & Infrastructure
600 - 4445 Lougheed Hwy
Burnaby BC V5C 0E4
Contact: Hamid Yousefbeigi

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-NAOH-CFA-VA	**Soil**							
Batch R2898835								
WG1918734-4 DUP		**L1491427-19**						
Cyanide, Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	35	27-JUL-14
WG1918734-3 IRM		**ALS-TCN-IRM1**						
Cyanide, Total			93.3		%		80-120	27-JUL-14
WG1918734-2 LCS								
Cyanide, Total			96.5		%		80-120	27-JUL-14
WG1918734-1 MB								
Cyanide, Total			<0.050		mg/kg		0.05	27-JUL-14
Batch R2901809								
WG1918850-4 DUP		**L1491427-33**						
Cyanide, Total		<0.050	0.083	RPD-NA	mg/kg	N/A	35	28-JUL-14
WG1918850-3 IRM		**ALS-TCN-IRM1**						
Cyanide, Total			94.8		%		80-120	28-JUL-14
WG1918850-2 LCS								
Cyanide, Total			102.8		%		80-120	28-JUL-14
WG1918850-1 MB								
Cyanide, Total			<0.050		mg/kg		0.05	28-JUL-14
HG-200.2-CVAF-VA	**Soil**							
Batch R2898911								
WG1918895-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			95.2		%		70-130	27-JUL-14
WG1918895-4 LCS								
Mercury (Hg)			99.97		%		70-130	27-JUL-14
WG1918895-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	27-JUL-14
Batch R2900005								
WG1918804-2 DUP		**L1491427-23**						
Mercury (Hg)		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	28-JUL-14
WG1918804-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			102.0		%		70-130	28-JUL-14
WG1918921-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			111.3		%		70-130	28-JUL-14
WG1918804-4 LCS								
Mercury (Hg)			99.6		%		70-130	28-JUL-14
WG1918921-4 LCS								
Mercury (Hg)			98.6		%		70-130	28-JUL-14
WG1918804-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	28-JUL-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAF-VA	**Soil**							
Batch R2900005								
WG1918921-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	28-JUL-14
Batch R2908478								
WG1923817-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			96.5		%		70-130	05-AUG-14
WG1923817-4 LCS								
Mercury (Hg)			94.6		%		70-130	05-AUG-14
WG1923817-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	05-AUG-14
MET-200.2-CCMS-VA	**Soil**							
Batch R2899924								
WG1918895-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			102.8		%		70-130	27-JUL-14
Arsenic (As)			97.5		%		70-130	27-JUL-14
Barium (Ba)			99.5		%		70-130	27-JUL-14
Beryllium (Be)			106.7		%		70-130	27-JUL-14
Cadmium (Cd)			100.0		%		70-130	27-JUL-14
Chromium (Cr)			100.6		%		70-130	27-JUL-14
Cobalt (Co)			101.2		%		70-130	27-JUL-14
Copper (Cu)			101.2		%		70-130	27-JUL-14
Lead (Pb)			98.8		%		70-130	27-JUL-14
Molybdenum (Mo)			78.9		%		70-130	27-JUL-14
Nickel (Ni)			100.3		%		70-130	27-JUL-14
Selenium (Se)			98.3		%		70-130	27-JUL-14
Silver (Ag)			96.7		%		70-130	27-JUL-14
Thallium (Tl)			100.0		%		70-130	27-JUL-14
Tin (Sn)			103.0		%		70-130	27-JUL-14
Uranium (U)			99.1		%		70-130	27-JUL-14
Vanadium (V)			102.8		%		70-130	27-JUL-14
Zinc (Zn)			104.3		%		70-130	27-JUL-14
WG1918895-4 LCS								
Antimony (Sb)			96.0		%		70-130	27-JUL-14
Arsenic (As)			99.5		%		70-130	27-JUL-14
Barium (Ba)			95.8		%		70-130	27-JUL-14
Beryllium (Be)			93.6		%		70-130	27-JUL-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2899924								
WG1918895-4 LCS								
Cadmium (Cd)			96.0		%		70-130	27-JUL-14
Chromium (Cr)			96.1		%		70-130	27-JUL-14
Cobalt (Co)			94.2		%		70-130	27-JUL-14
Copper (Cu)			94.4		%		70-130	27-JUL-14
Lead (Pb)			95.7		%		70-130	27-JUL-14
Molybdenum (Mo)			97.2		%		70-130	27-JUL-14
Nickel (Ni)			94.9		%		70-130	27-JUL-14
Selenium (Se)			104.6		%		70-130	27-JUL-14
Silver (Ag)			92.3		%		70-130	27-JUL-14
Thallium (Tl)			93.4		%		70-130	27-JUL-14
Tin (Sn)			99.3		%		70-130	27-JUL-14
Uranium (U)			92.5		%		70-130	27-JUL-14
Vanadium (V)			97.6		%		70-130	27-JUL-14
Zinc (Zn)			97.3		%		70-130	27-JUL-14
WG1918895-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	27-JUL-14
Arsenic (As)			<0.050		mg/kg		0.05	27-JUL-14
Barium (Ba)			<0.50		mg/kg		0.5	27-JUL-14
Beryllium (Be)			<0.20		mg/kg		0.2	27-JUL-14
Cadmium (Cd)			<0.050		mg/kg		0.05	27-JUL-14
Chromium (Cr)			<0.50		mg/kg		0.5	27-JUL-14
Cobalt (Co)			<0.10		mg/kg		0.1	27-JUL-14
Copper (Cu)			<0.50		mg/kg		0.5	27-JUL-14
Lead (Pb)			<0.50		mg/kg		0.5	27-JUL-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	27-JUL-14
Nickel (Ni)			<0.50		mg/kg		0.5	27-JUL-14
Selenium (Se)			<0.20		mg/kg		0.2	27-JUL-14
Silver (Ag)			<0.10		mg/kg		0.1	27-JUL-14
Thallium (Tl)			<0.050		mg/kg		0.05	27-JUL-14
Tin (Sn)			<2.0		mg/kg		2	27-JUL-14
Uranium (U)			<0.050		mg/kg		0.05	27-JUL-14
Vanadium (V)			<0.20		mg/kg		0.2	27-JUL-14
Zinc (Zn)			<1.0		mg/kg		1	27-JUL-14

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2901436								
WG1918804-2 DUP		**L1491427-23**						
Antimony (Sb)		0.50	1.03	DUP-H	mg/kg	69	30	28-JUL-14
Arsenic (As)		18.6	18.6		mg/kg	0.0	30	28-JUL-14
Barium (Ba)		31.9	32.5		mg/kg	2.1	40	28-JUL-14
Beryllium (Be)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	28-JUL-14
Cadmium (Cd)		0.151	0.074	J	mg/kg	0.077	0.1	28-JUL-14
Chromium (Cr)		6.31	5.84		mg/kg	7.7	30	28-JUL-14
Cobalt (Co)		1.99	2.00		mg/kg	0.7	30	28-JUL-14
Copper (Cu)		3.29	3.45		mg/kg	4.8	30	28-JUL-14
Lead (Pb)		3.51	3.58		mg/kg	1.8	40	28-JUL-14
Molybdenum (Mo)		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	28-JUL-14
Nickel (Ni)		3.66	3.97		mg/kg	8.0	30	28-JUL-14
Selenium (Se)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	28-JUL-14
Silver (Ag)		<0.10	0.20	DUP-H	mg/kg	N/A	40	28-JUL-14
Thallium (Tl)		<0.050	<0.050	RPD-NA	mg/kg	N/A	30	28-JUL-14
Tin (Sn)		<2.0	<2.0	RPD-NA	mg/kg	N/A	40	28-JUL-14
Uranium (U)		0.235	0.218		mg/kg	7.9	30	28-JUL-14
Vanadium (V)		15.6	15.3		mg/kg	1.8	30	28-JUL-14
Zinc (Zn)		26.4	21.6		mg/kg	20	30	28-JUL-14
WG1918804-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			97.3		%		70-130	28-JUL-14
Arsenic (As)			101.9		%		70-130	28-JUL-14
Barium (Ba)			100.5		%		70-130	28-JUL-14
Beryllium (Be)			102.5		%		70-130	28-JUL-14
Cadmium (Cd)			100.1		%		70-130	28-JUL-14
Chromium (Cr)			100.7		%		70-130	28-JUL-14
Cobalt (Co)			100.8		%		70-130	28-JUL-14
Copper (Cu)			102.3		%		70-130	28-JUL-14
Lead (Pb)			100.3		%		70-130	28-JUL-14
Molybdenum (Mo)			81.2		%		70-130	28-JUL-14
Nickel (Ni)			100.6		%		70-130	28-JUL-14
Selenium (Se)			95.9		%		70-130	28-JUL-14
Silver (Ag)			95.7		%		70-130	28-JUL-14
Thallium (Tl)			110.9		%		70-130	28-JUL-14
Tin (Sn)			106.3		%		70-130	28-JUL-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2901436								
WG1918804-3 IRM		**ALS MET IRM1**						
Uranium (U)			97.3		%		70-130	28-JUL-14
Vanadium (V)			99.7		%		70-130	28-JUL-14
Zinc (Zn)			101.2		%		70-130	28-JUL-14
WG1918921-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			102.5		%		70-130	28-JUL-14
Arsenic (As)			100.8		%		70-130	28-JUL-14
Barium (Ba)			106.5		%		70-130	28-JUL-14
Beryllium (Be)			107.5		%		70-130	28-JUL-14
Cadmium (Cd)			99.8		%		70-130	28-JUL-14
Chromium (Cr)			104.7		%		70-130	28-JUL-14
Cobalt (Co)			101.3		%		70-130	28-JUL-14
Copper (Cu)			100.7		%		70-130	28-JUL-14
Lead (Pb)			103.3		%		70-130	28-JUL-14
Molybdenum (Mo)			82.2		%		70-130	28-JUL-14
Nickel (Ni)			101.5		%		70-130	28-JUL-14
Selenium (Se)			98.6		%		70-130	28-JUL-14
Silver (Ag)			101.4		%		70-130	28-JUL-14
Thallium (Tl)			107.2		%		70-130	28-JUL-14
Tin (Sn)			113.3		%		70-130	28-JUL-14
Uranium (U)			102.4		%		70-130	28-JUL-14
Vanadium (V)			104.7		%		70-130	28-JUL-14
Zinc (Zn)			103.6		%		70-130	28-JUL-14
WG1918804-4 LCS								
Antimony (Sb)			101.9		%		70-130	28-JUL-14
Arsenic (As)			104.6		%		70-130	28-JUL-14
Barium (Ba)			104.6		%		70-130	28-JUL-14
Beryllium (Be)			100.0		%		70-130	28-JUL-14
Cadmium (Cd)			99.4		%		70-130	28-JUL-14
Chromium (Cr)			102.4		%		70-130	28-JUL-14
Cobalt (Co)			100.5		%		70-130	28-JUL-14
Copper (Cu)			98.5		%		70-130	28-JUL-14
Lead (Pb)			101.0		%		70-130	28-JUL-14
Molybdenum (Mo)			97.1		%		70-130	28-JUL-14
Nickel (Ni)			101.8		%		70-130	28-JUL-14
Selenium (Se)			102.3		%		70-130	28-JUL-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2901436								
WG1918804-4 LCS								
Silver (Ag)			95.5		%		70-130	28-JUL-14
Thallium (Tl)			102.3		%		70-130	28-JUL-14
Tin (Sn)			102.4		%		70-130	28-JUL-14
Uranium (U)			100.0		%		70-130	28-JUL-14
Vanadium (V)			103.2		%		70-130	28-JUL-14
Zinc (Zn)			97.8		%		70-130	28-JUL-14
WG1918921-4 LCS								
Antimony (Sb)			100.7		%		70-130	28-JUL-14
Arsenic (As)			107.0		%		70-130	28-JUL-14
Barium (Ba)			105.3		%		70-130	28-JUL-14
Beryllium (Be)			102.8		%		70-130	28-JUL-14
Cadmium (Cd)			102.0		%		70-130	28-JUL-14
Chromium (Cr)			104.9		%		70-130	28-JUL-14
Cobalt (Co)			103.3		%		70-130	28-JUL-14
Copper (Cu)			101.6		%		70-130	28-JUL-14
Lead (Pb)			102.9		%		70-130	28-JUL-14
Molybdenum (Mo)			100.2		%		70-130	28-JUL-14
Nickel (Ni)			103.3		%		70-130	28-JUL-14
Selenium (Se)			101.3		%		70-130	28-JUL-14
Silver (Ag)			93.9		%		70-130	28-JUL-14
Thallium (Tl)			102.8		%		70-130	28-JUL-14
Tin (Sn)			100.6		%		70-130	28-JUL-14
Uranium (U)			100.7		%		70-130	28-JUL-14
Vanadium (V)			104.2		%		70-130	28-JUL-14
Zinc (Zn)			102.8		%		70-130	28-JUL-14
WG1918804-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	28-JUL-14
Arsenic (As)			<0.050		mg/kg		0.05	28-JUL-14
Barium (Ba)			<0.50		mg/kg		0.5	28-JUL-14
Beryllium (Be)			<0.20		mg/kg		0.2	28-JUL-14
Cadmium (Cd)			<0.050		mg/kg		0.05	28-JUL-14
Chromium (Cr)			<0.50		mg/kg		0.5	28-JUL-14
Cobalt (Co)			<0.10		mg/kg		0.1	28-JUL-14
Copper (Cu)			<0.50		mg/kg		0.5	28-JUL-14
Lead (Pb)			<0.50		mg/kg		0.5	28-JUL-14

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2901436								
WG1918804-1 MB								
Molybdenum (Mo)			<0.50		mg/kg		0.5	28-JUL-14
Nickel (Ni)			<0.50		mg/kg		0.5	28-JUL-14
Selenium (Se)			<0.20		mg/kg		0.2	28-JUL-14
Silver (Ag)			<0.10		mg/kg		0.1	28-JUL-14
Thallium (Tl)			<0.050		mg/kg		0.05	28-JUL-14
Tin (Sn)			<2.0		mg/kg		2	28-JUL-14
Uranium (U)			<0.050		mg/kg		0.05	28-JUL-14
Vanadium (V)			<0.20		mg/kg		0.2	28-JUL-14
Zinc (Zn)			<1.0		mg/kg		1	28-JUL-14
WG1918921-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	28-JUL-14
Arsenic (As)			0.063	B	mg/kg		0.05	28-JUL-14
Barium (Ba)			<0.50		mg/kg		0.5	28-JUL-14
Beryllium (Be)			<0.20		mg/kg		0.2	28-JUL-14
Cadmium (Cd)			<0.050		mg/kg		0.05	28-JUL-14
Chromium (Cr)			<0.50		mg/kg		0.5	28-JUL-14
Cobalt (Co)			<0.10		mg/kg		0.1	28-JUL-14
Copper (Cu)			<0.50		mg/kg		0.5	28-JUL-14
Lead (Pb)			<0.50		mg/kg		0.5	28-JUL-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	28-JUL-14
Nickel (Ni)			<0.50		mg/kg		0.5	28-JUL-14
Selenium (Se)			<0.20		mg/kg		0.2	28-JUL-14
Silver (Ag)			<0.10		mg/kg		0.1	28-JUL-14
Thallium (Tl)			<0.050		mg/kg		0.05	28-JUL-14
Tin (Sn)			<2.0		mg/kg		2	28-JUL-14
Uranium (U)			<0.050		mg/kg		0.05	28-JUL-14
Vanadium (V)			<0.20		mg/kg		0.2	28-JUL-14
Zinc (Zn)			<1.0		mg/kg		1	28-JUL-14
Batch R2909238								
WG1923817-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			102.0		%		70-130	05-AUG-14
Arsenic (As)			94.8		%		70-130	05-AUG-14
Barium (Ba)			96.4		%		70-130	05-AUG-14
Beryllium (Be)			102.5		%		70-130	05-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2909238								
WG1923817-3 IRM		**ALS MET IRM1**						
Cadmium (Cd)			98.0		%		70-130	05-AUG-14
Chromium (Cr)			97.8		%		70-130	05-AUG-14
Cobalt (Co)			98.3		%		70-130	05-AUG-14
Copper (Cu)			100.0		%		70-130	05-AUG-14
Lead (Pb)			98.3		%		70-130	05-AUG-14
Molybdenum (Mo)			80.7		%		70-130	05-AUG-14
Nickel (Ni)			99.0		%		70-130	05-AUG-14
Selenium (Se)			94.9		%		70-130	05-AUG-14
Silver (Ag)			98.7		%		70-130	05-AUG-14
Thallium (Tl)			103.5		%		70-130	05-AUG-14
Tin (Sn)			101.3		%		70-130	05-AUG-14
Uranium (U)			98.0		%		70-130	05-AUG-14
Vanadium (V)			100.0		%		70-130	05-AUG-14
Zinc (Zn)			98.0		%		70-130	05-AUG-14
WG1923817-4 LCS								
Antimony (Sb)			91.2		%		70-130	05-AUG-14
Arsenic (As)			91.7		%		70-130	05-AUG-14
Barium (Ba)			100.7		%		70-130	05-AUG-14
Beryllium (Be)			97.4		%		70-130	05-AUG-14
Cadmium (Cd)			98.1		%		70-130	05-AUG-14
Chromium (Cr)			99.4		%		70-130	05-AUG-14
Cobalt (Co)			100.0		%		70-130	05-AUG-14
Copper (Cu)			99.2		%		70-130	05-AUG-14
Lead (Pb)			99.9		%		70-130	05-AUG-14
Molybdenum (Mo)			91.1		%		70-130	05-AUG-14
Nickel (Ni)			100.4		%		70-130	05-AUG-14
Selenium (Se)			91.1		%		70-130	05-AUG-14
Silver (Ag)			94.6		%		70-130	05-AUG-14
Thallium (Tl)			101.0		%		70-130	05-AUG-14
Tin (Sn)			92.2		%		70-130	05-AUG-14
Uranium (U)			99.9		%		70-130	05-AUG-14
Vanadium (V)			102.2		%		70-130	05-AUG-14
Zinc (Zn)			96.3		%		70-130	05-AUG-14
WG1923817-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	05-AUG-14

Quality Control Report

Workorder: L1491427 Report Date: 11-SEP-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2909238								
WG1923817-1 MB								
Arsenic (As)			<0.050		mg/kg		0.05	05-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	05-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	05-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	05-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	05-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	05-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	05-AUG-14
Lead (Pb)			<0.50		mg/kg		0.5	05-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	05-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	05-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	05-AUG-14
Silver (Ag)			<0.10		mg/kg		0.1	05-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	05-AUG-14
Tin (Sn)			<2.0		mg/kg		2	05-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	05-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	05-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	05-AUG-14
MOISTURE-VA	**Soil**							
Batch R2898372								
WG1918812-2 LCS								
Moisture			94.2		%		90-110	25-JUL-14
WG1918812-1 MB								
Moisture			<0.25		%		0.25	25-JUL-14
Batch R2898373								
WG1918810-3 DUP		**L1491427-17**						
Moisture		18.8	21.0		%	11	20	25-JUL-14
WG1918810-4 DUP		**L1491427-36**						
Moisture		21.7	21.8		%	0.5	20	25-JUL-14
WG1918810-2 LCS								
Moisture			100.2		%		90-110	25-JUL-14
WG1918810-1 MB								
Moisture			<0.25		%		0.25	25-JUL-14
Batch R2898482								
WG1918900-2 LCS								
Moisture			100.5		%		90-110	26-JUL-14
WG1918900-1 MB								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-VA	**Soil**							
Batch R2898482								
WG1918900-1 MB								
Moisture			<0.25		%		0.25	26-JUL-14
Batch R2901886								
WG1920977-2 LCS								
Moisture			96.2		%		90-110	29-JUL-14
WG1920977-1 MB								
Moisture			<0.25		%		0.25	29-JUL-14
Batch R2906978								
WG1923665-2 LCS								
Moisture			99.8		%		90-110	02-AUG-14
WG1923665-1 MB								
Moisture			<0.25		%		0.25	02-AUG-14
PH-1:2-VA	**Soil**							
Batch R2898802								
WG1918804-2 DUP		**L1491427-23**						
pH (1:2 soil:water)		7.88	7.89	J	pH	0.01	0.3	27-JUL-14

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
G	QC result did not meet ALS DQO. Refer to narrative comments for further information.
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1491427-COFC

COC Number: 14 -

Page ___ of ___

Report To ENVIRONMENT &
Company: AMEC INFRASTRUCTURE
Contact: Hamid Yousefbeigi
Address: 4445 Loughed Hwy Burnaby, BC
Phone: 604-295-6181 604-838-9858

Report Format / Distribution

Select Report Format: ☐ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ Yes ☐ No
☐ Criteria on Report - provide details below if box checked
Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax hamid.Yousefbeigi@amec.com
Email 2

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

R ☑ Regular (Standard TAT if received by 3 pm - business days)
P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Specify Date Required for E2,E or P:

Invoice To Same as Report To ☑ Yes ☐ No
Copy of Invoice with Report ☐ Yes ☐ No
Company:
Contact:

Invoice Distribution

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax
Email 2

Project Information

ALS Quote #:
Job #: VM00665 J
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)

Approver ID:
Cost Center:
GL Account:
Routing Code:
Activity Code:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact:
Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Metals (including pH)	Total Cyanide	Number of Containers
	DC-SED-21 SED-DC-14_21 TROUGH .55	22 ~~25~~-Jul-14	[illegible]	Sediment	R	R	1
	DUP-01	22 ~~23~~-Jul-14	~~1230~~	Sediment	R	R	1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ Yes ☑ No
Are samples for human drinking water use?
☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C: 5.5
FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)

Released by: Date: Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: 23 7/14 Time: 2:20

FINAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

[1] If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

NA-FM-0326e v09 Front/04 January 2014

AMEC Environment & Infrastructure
ATTN: Hamid Yousefbeigi
600 - 4445 Lougheed Hwy
Burnaby BC V5C 0E4

Date Received: 28-JUL-14
Report Date: 08-AUG-14 14:44 (MT)
Version: FINAL

Client Phone: 604-295-6187

Certificate of Analysis

Lab Work Order #: L1493277
Project P.O. #: NOT SUBMITTED
Job Reference: VM00605J
C of C Numbers: 1
Legal Site Desc:

Selam Worku
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1493277-1	L1493277-2	L1493277-3	L1493277-4	L1493277-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED.DC.14-56	SED.DC.14-57	SED.DC.14-58	SED.DC.14-59	SED.DC.14-60
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	31.3	21.4	21.9	37.4	38.5
	pH (1:2 soil:water) (pH)	7.77	7.47	7.87	7.94	7.58
Cyanides	Cyanide, Total (mg/kg)	<1.0 DLM	<0.050	<0.050	<0.50 DLM	<1.0 DLM
Metals	Antimony (Sb) (mg/kg)	0.69	0.42	0.41	6.96	1.89
	Arsenic (As) (mg/kg)	21.9	25.1	11.1	185	39.6
	Barium (Ba) (mg/kg)	57.4	53.3	73.8	101	69.1
	Beryllium (Be) (mg/kg)	<0.20	<0.20	0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	0.141	0.089	0.106	1.01	0.498
	Chromium (Cr) (mg/kg)	12.2	10.9	11.3	12.9	10.9
	Cobalt (Co) (mg/kg)	3.65	3.27	3.57	5.26	3.59
	Copper (Cu) (mg/kg)	9.45	5.70	7.00	10.1	8.15
	Lead (Pb) (mg/kg)	3.77	3.00	3.05	23.7	8.39
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	7.53	6.14	7.47	8.83	6.97
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	0.33	0.23
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	0.73	0.13
	Thallium (Tl) (mg/kg)	0.058	<0.050	0.059	0.140	0.085
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.390	0.338	0.308	0.674	0.524
	Vanadium (V) (mg/kg)	25.4	28.8	25.1	30.5	25.5
	Zinc (Zn) (mg/kg)	41.4	25.1	28.2	214	86.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L1493277-6	L1493277-7	L1493277-8	L1493277-9	L1493277-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED.DC.14-60 DUP	SED.DC.14-61	SED.DC.14-62	SED.DC.14-63	SED.DC.14-64
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	40.5	68.0	25.8	22.9	31.4
	pH (1:2 soil:water) (pH)	7.52	7.31	7.72	7.81	7.34
Cyanides	Cyanide, Total (mg/kg)	<1.0 DLM	<1.0 DLM	<0.50 DLM	<1.0 DLM	<1.0 DLM
Metals	Antimony (Sb) (mg/kg)	2.38	7.74	2.88	1.03	1.15
	Arsenic (As) (mg/kg)	46.4	147	41.9	20.0	33.1
	Barium (Ba) (mg/kg)	88.1	224	59.5	71.4	48.7
	Beryllium (Be) (mg/kg)	<0.20	0.49	<0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	0.549	1.87	0.440	0.200	0.239
	Chromium (Cr) (mg/kg)	13.2	28.2	9.28	11.5	8.82
	Cobalt (Co) (mg/kg)	4.02	8.54	3.56	4.02	2.92
	Copper (Cu) (mg/kg)	11.2	45.6	5.18	6.60	4.90
	Lead (Pb) (mg/kg)	8.39	32.5	9.67	4.55	4.51
	Mercury (Hg) (mg/kg)	<0.050	0.100	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	0.95	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	8.28	20.1	6.05	7.63	5.44
	Selenium (Se) (mg/kg)	0.28	1.23	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	0.23	0.68	0.41	<0.10	<0.10
	Thallium (Tl) (mg/kg)	0.113	0.253	0.086	0.095	0.067
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.705	2.24	0.369	0.446	0.429
	Vanadium (V) (mg/kg)	30.0	62.8	20.9	24.3	20.1
	Zinc (Zn) (mg/kg)	102	257	81.2	65.4	55.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1493277-11	L1493277-12	L1493277-13	L1493277-14	L1493277-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED.DC.14-65	SED.DC.14-66	SED.DC.14-67	SED.DC.14-68	SED.DC.14-69
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	33.5	23.2	52.3	22.6	54.9
	pH (1:2 soil:water) (pH)	7.69	7.41	6.86	7.54	7.28
Cyanides	Cyanide, Total (mg/kg)	<1.0 DLM	<0.050	<1.0 DLM	<0.50 DLM	<1.0 DLM
Metals	Antimony (Sb) (mg/kg)	0.96	0.56	2.71	0.53	2.37
	Arsenic (As) (mg/kg)	27.5	13.9	63.2	13.6	209
	Barium (Ba) (mg/kg)	69.4	53.8	233	68.8	212
	Beryllium (Be) (mg/kg)	<0.20	<0.20	0.34	<0.20	0.24
	Cadmium (Cd) (mg/kg)	0.118	0.071	0.682	0.120	0.381
	Chromium (Cr) (mg/kg)	8.98	8.34	19.9	11.2	13.9
	Cobalt (Co) (mg/kg)	3.37	2.94	7.73	3.93	9.57
	Copper (Cu) (mg/kg)	5.72	3.69	25.7	6.81	18.3
	Lead (Pb) (mg/kg)	3.95	3.42	8.87	3.05	7.77
	Mercury (Hg) (mg/kg)	<0.050	<0.050	0.067	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	0.61	<0.50	0.52
	Nickel (Ni) (mg/kg)	6.11	5.30	13.3	7.64	9.40
	Selenium (Se) (mg/kg)	<0.20	<0.20	0.51	<0.20	0.36
	Silver (Ag) (mg/kg)	<0.10	<0.10	0.24	<0.10	0.22
	Thallium (Tl) (mg/kg)	0.063	0.057	0.171	0.062	0.120
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.432	0.345	2.02	0.367	1.04
	Vanadium (V) (mg/kg)	23.2	21.4	45.9	22.9	39.9
	Zinc (Zn) (mg/kg)	35.3	28.3	82.7	28.1	88.3

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L1493277-16	L1493277-17	L1493277-18	L1493277-19	L1493277-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED.DC.14-70	SED.DC.14-70 DUP	SED.DC.14-71	SED.DC.14-72	SED.DC.14-73
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	39.8	34.5	78.6	45.5	51.2
	pH (1:2 soil:water) (pH)	7.82	7.91	7.94	7.84	7.98
Cyanides	Cyanide, Total (mg/kg)	<1.0 DLM	<0.50 DLM	0.618	<1.0 DLM	7.0 DLM
Metals	Antimony (Sb) (mg/kg)	62.3	66.5	19.5	58.7	73.6
	Arsenic (As) (mg/kg)	1340	1110	2670	789	732
	Barium (Ba) (mg/kg)	173	121	506	93.1	213
	Beryllium (Be) (mg/kg)	0.24	<0.20	<0.20	<0.20	0.29
	Cadmium (Cd) (mg/kg)	11.0	9.88	3.26	11.1	26.3
	Chromium (Cr) (mg/kg)	13.7	8.55	4.45	9.93	12.8
	Cobalt (Co) (mg/kg)	5.61	5.87	9.10	4.44	10.5
	Copper (Cu) (mg/kg)	40.0	29.8	7.28	34.1	42.8
	Lead (Pb) (mg/kg)	246	232	47.5	257	262
	Mercury (Hg) (mg/kg)	0.074	0.054	<0.050	0.062	0.103
	Molybdenum (Mo) (mg/kg)	<0.50	0.51	1.78	<0.50	0.71
	Nickel (Ni) (mg/kg)	8.16	6.05	4.25	7.23	14.3
	Selenium (Se) (mg/kg)	0.60	0.36	0.36	0.33	0.48
	Silver (Ag) (mg/kg)	4.26	4.54	0.89	5.31	6.78
	Thallium (Tl) (mg/kg)	0.291	0.249	0.088	0.253	0.570
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	1.04	0.554	0.799	0.572	0.667
	Vanadium (V) (mg/kg)	34.1	27.1	15.9	24.8	38.2
	Zinc (Zn) (mg/kg)	1110	913	400	1110	3050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1493277-21	L1493277-22	L1493277-23	L1493277-24	L1493277-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED.DC.14-74	SED.DC.14-75	SED.DC.14-76	SED.DC.14-77	SED.DC.14-78
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	47.0	48.8	67.4	72.1	25.1
	pH (1:2 soil:water) (pH)	7.98	8.07	7.93	7.84	7.98
Cyanides	Cyanide, Total (mg/kg)	6.3 DLM	0.192	<1.0 DLM	0.54 DLM	0.466
Metals	Antimony (Sb) (mg/kg)	29.4	136	127	146	91.8
	Arsenic (As) (mg/kg)	522	1850	2490	3130	895
	Barium (Ba) (mg/kg)	157	196	523	460	173
	Beryllium (Be) (mg/kg)	0.20	0.23	0.62	0.57	0.39
	Cadmium (Cd) (mg/kg)	8.75	42.1	187	191	12.5
	Chromium (Cr) (mg/kg)	11.3	8.07	17.3	15.2	8.18
	Cobalt (Co) (mg/kg)	6.00	10.4	46.8	43.4	10.5
	Copper (Cu) (mg/kg)	23.7	83.9	96.6	102	69.7
	Lead (Pb) (mg/kg)	57.8	370	377	405	378
	Mercury (Hg) (mg/kg)	0.058	0.060	0.174	0.159	0.054
	Molybdenum (Mo) (mg/kg)	0.57	2.06	2.37	3.06	0.99
	Nickel (Ni) (mg/kg)	7.70	11.0	46.5	54.4	7.91
	Selenium (Se) (mg/kg)	0.43	0.55	0.93	0.94	0.35
	Silver (Ag) (mg/kg)	1.10	8.65	6.31	7.58	7.45
	Thallium (Tl) (mg/kg)	0.235	0.525	2.01	2.29	0.402
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.540	0.915	1.41	1.47	0.685
	Vanadium (V) (mg/kg)	32.9	27.0	60.5	53.4	51.4
	Zinc (Zn) (mg/kg)	1410	3670	18700	16700	1240

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1493277-26	L1493277-27	L1493277-28	L1493277-29	L1493277-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-JUL-14	24-JUL-14	24-JUL-14	25-JUL-14	25-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED.DC.14-79	SED.DC.14-80	SED.DC.14-80 DUP	SED.DC.14-81	SED.DC.14-82
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	29.3	23.3	31.6	31.8	26.5
	pH (1:2 soil:water) (pH)	7.52	7.40	7.41	7.73	8.13
Cyanides	Cyanide, Total (mg/kg)	<1.0 DLM	<1.0 DLM	<1.0 DLM	<1.0 DLM	1.3
Metals	Antimony (Sb) (mg/kg)	29.4	3.21	3.01	2.68	1.34
	Arsenic (As) (mg/kg)	301	65.8	72.3	36.5	46.6
	Barium (Ba) (mg/kg)	114	49.3	53.4	92.7	55.9
	Beryllium (Be) (mg/kg)	0.29	<0.20	<0.20	0.21	<0.20
	Cadmium (Cd) (mg/kg)	13.0	0.152	0.164	0.311	0.190
	Chromium (Cr) (mg/kg)	12.1	6.28	7.05	13.0	9.95
	Cobalt (Co) (mg/kg)	9.27	4.05	3.87	5.46	3.27
	Copper (Cu) (mg/kg)	27.9	7.51	7.02	24.7	7.47
	Lead (Pb) (mg/kg)	61.9	9.98	9.44	5.79	7.57
	Mercury (Hg) (mg/kg)	0.062	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	0.83	<0.50	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	10.7	3.73	4.00	8.75	6.46
	Selenium (Se) (mg/kg)	0.24	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	1.11	0.12	0.13	0.26	0.10
	Thallium (Tl) (mg/kg)	0.446	0.152	0.133	0.089	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.593	0.339	0.338	0.520	0.346
	Vanadium (V) (mg/kg)	46.0	29.0	29.1	29.8	22.5
	Zinc (Zn) (mg/kg)	1140	43.1	42.7	68.1	43.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1493277-31	L1493277-32	L1493277-33	L1493277-34	L1493277-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	25-JUL-14	25-JUL-14	25-JUL-14	25-JUL-14	25-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED.DC.14-83	SED.DC.14-84	SED.DC.14-85	SED.DC.14-86	SED.DC.14-87
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	36.2	21.2	57.5	66.6	21.0
	pH (1:2 soil:water) (pH)	7.65	8.00	7.61	7.90	5.55
Cyanides	Cyanide, Total (mg/kg)	<1.0 DLM	<0.50 DLM	7.06 DLM	13.7 DLM	1.1 DLM
Metals	Antimony (Sb) (mg/kg)	2.43	0.65	11.5	2.87	15.8
	Arsenic (As) (mg/kg)	217	58.3	607	1130	157
	Barium (Ba) (mg/kg)	87.2	50.1	253	254	107
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	0.479	0.149	8.08	4.51	1.22
	Chromium (Cr) (mg/kg)	13.2	7.75	4.70	6.36	2.17
	Cobalt (Co) (mg/kg)	3.61	2.83	5.88	4.47	3.42
	Copper (Cu) (mg/kg)	12.8	5.60	93.8	35.5	499
	Lead (Pb) (mg/kg)	8.60	3.60	49.1	6.71	77.1
	Mercury (Hg) (mg/kg)	<0.050	<0.050	0.177	<0.050	0.171
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	1.79	1.53	1.41
	Nickel (Ni) (mg/kg)	6.56	5.56	8.19	6.07	7.14
	Selenium (Se) (mg/kg)	<0.20	<0.20	0.67	0.55	0.27
	Silver (Ag) (mg/kg)	0.18	<0.10	15.0	1.04	5.03
	Thallium (Tl) (mg/kg)	0.069	<0.050	0.091	<0.050	0.071
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.495	0.449	1.26	1.11	1.48
	Vanadium (V) (mg/kg)	47.2	20.7	19.5	25.5	4.61
	Zinc (Zn) (mg/kg)	62.2	34.4	108	87.1	99.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1493277-36 Sediment 25-JUL-14 12:00 SED.DC.14-88				
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	82.3				
	pH (1:2 soil:water) (pH)	7.62				
Cyanides	Cyanide, Total (mg/kg)	19.5 DLM				
Metals	Antimony (Sb) (mg/kg)	1.68				
	Arsenic (As) (mg/kg)	210				
	Barium (Ba) (mg/kg)	80.3				
	Beryllium (Be) (mg/kg)	<0.20				
	Cadmium (Cd) (mg/kg)	1.62				
	Chromium (Cr) (mg/kg)	8.74				
	Cobalt (Co) (mg/kg)	3.88				
	Copper (Cu) (mg/kg)	18.6				
	Lead (Pb) (mg/kg)	7.08				
	Mercury (Hg) (mg/kg)	<0.050				
	Molybdenum (Mo) (mg/kg)	0.83				
	Nickel (Ni) (mg/kg)	7.54				
	Selenium (Se) (mg/kg)	0.25				
	Silver (Ag) (mg/kg)	0.28				
	Thallium (Tl) (mg/kg)	0.061				
	Tin (Sn) (mg/kg)	<2.0				
	Uranium (U) (mg/kg)	0.574				
	Vanadium (V) (mg/kg)	22.1				
	Zinc (Zn) (mg/kg)	48.2				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Arsenic (As)	B	L1493277-10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -20, -21, -22, -23, -24, -6, -7, -8, -9
Duplicate	Arsenic (As)	DUP-H	L1493277-1, -2, -3, -4
Duplicate	Lead (Pb)	DUP-H	L1493277-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CN-T-NAOH-CFA-VA	Soil	Total Cyanide in soil by CFA	ONMOE CN-E3015/ISO 14403:2002

This analysis is carried out using procedures adapted from the Ontario Ministry of Environment CN-E3015 and ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by rotary extraction of the soil with 0.04M Sodium Hydroxide, followed by in-line UV digestion along with sample distillation and final determination by colourimetric analysis.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/245.7

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

ALS Test Code	Matrix	Test Description	Method Reference**
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

ALS Test Code	Matrix	Test Description	Method Reference**
MOISTURE-VA	Soil	Moisture content	ASTM D2974-00 Method A

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

ALS Test Code	Matrix	Test Description	Method Reference**
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg	*milligrams per kilogram based on dry weight of sample.*
mg/kg wwt	*milligrams per kilogram based on wet weight of sample.*
mg/kg lwt	*milligrams per kilogram based on lipid-adjusted weight of sample.*
mg/L	*milligrams per litre.*
<	*Less than.*
D.L.	*The reported Detection Limit, also known as the Limit of Reporting (LOR).*
N/A	*Result not available. Refer to qualifier code and definition for explanation.*

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1493277 Report Date: 08-AUG-14

Client: AMEC Environment & Infrastructure
600 - 4445 Lougheed Hwy
Burnaby BC V5C 0E4
Contact: Hamid Yousefbeigi

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-NAOH-CFA-VA	**Soil**							
Batch R2911008								
WG1924080-4 DUP		**L1493277-2**						
Cyanide, Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	35	06-AUG-14
WG1924080-3 IRM		**ALS-TCN-IRM1**						
Cyanide, Total			93.0		%		80-120	06-AUG-14
WG1924080-2 LCS								
Cyanide, Total			93.4		%		80-120	06-AUG-14
WG1924080-1 MB								
Cyanide, Total			<0.050		mg/kg		0.05	06-AUG-14
Batch R2911013								
WG1924086-4 DUP		**L1493277-27**						
Cyanide, Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	35	06-AUG-14
WG1924086-3 IRM		**ALS-TCN-IRM1**						
Cyanide, Total			94.5		%		80-120	06-AUG-14
WG1924086-2 LCS								
Cyanide, Total			97.8		%		80-120	06-AUG-14
WG1924086-1 MB								
Cyanide, Total			<0.050		mg/kg		0.05	06-AUG-14
HG-200.2-CVAF-VA	**Soil**							
Batch R2907103								
WG1922651-2 DUP		**L1493277-24**						
Mercury (Hg)		0.159	0.173		mg/kg	8.1	40	03-AUG-14
WG1922651-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			105.6		%		70-130	03-AUG-14
WG1922653-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			105.6		%		70-130	03-AUG-14
WG1922651-4 LCS								
Mercury (Hg)			111.5		%		70-130	03-AUG-14
WG1922653-4 LCS								
Mercury (Hg)			107.9		%		70-130	03-AUG-14
WG1922651-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	03-AUG-14
WG1922653-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	03-AUG-14
Batch R2909703								
WG1924792-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			91.7		%		70-130	06-AUG-14
WG1924792-4 LCS								
Mercury (Hg)			97.8		%		70-130	06-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAF-VA	**Soil**							
Batch R2909703								
WG1924792-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	06-AUG-14
Batch R2910190								
WG1924789-6 CRM		**VA-NRC-STSD1**						
Mercury (Hg)			94.1		%		70-130	07-AUG-14
WG1924789-7 CRM		**VA-CANMET-TILL1**						
Mercury (Hg)			89.9		%		70-130	07-AUG-14
WG1924789-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			89.1		%		70-130	07-AUG-14
WG1924789-4 LCS								
Mercury (Hg)			77.3		%		70-130	07-AUG-14
WG1924789-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	07-AUG-14
MET-200.2-CCMS-VA	**Soil**							
Batch R2908403								
WG1922651-2 DUP		**L1493277-24**						
Antimony (Sb)		146	155		mg/kg	5.7	30	02-AUG-14
Arsenic (As)		3130	3160		mg/kg	0.9	30	02-AUG-14
Barium (Ba)		460	470		mg/kg	2.1	40	02-AUG-14
Beryllium (Be)		0.57	0.59		mg/kg	2.1	30	02-AUG-14
Cadmium (Cd)		191	200		mg/kg	4.7	30	02-AUG-14
Chromium (Cr)		15.2	13.9		mg/kg	8.7	30	02-AUG-14
Cobalt (Co)		43.4	43.8		mg/kg	0.8	30	02-AUG-14
Copper (Cu)		102	111		mg/kg	8.2	30	02-AUG-14
Lead (Pb)		405	466		mg/kg	14	40	02-AUG-14
Molybdenum (Mo)		3.06	3.08		mg/kg	0.5	40	02-AUG-14
Nickel (Ni)		54.4	55.1		mg/kg	1.3	30	02-AUG-14
Selenium (Se)		0.94	1.05		mg/kg	11	30	02-AUG-14
Silver (Ag)		7.58	8.21		mg/kg	7.9	40	02-AUG-14
Thallium (Tl)		2.29	2.52		mg/kg	9.9	30	02-AUG-14
Tin (Sn)		<2.0	<2.0	RPD-NA	mg/kg	N/A	40	02-AUG-14
Uranium (U)		1.47	1.62		mg/kg	9.6	30	02-AUG-14
Vanadium (V)		53.4	52.3		mg/kg	2.0	30	02-AUG-14
Zinc (Zn)		16700	16400		mg/kg	1.9	30	02-AUG-14
WG1922651-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			100.7		%		70-130	02-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2908403								
WG1922651-3 IRM		**ALS MET IRM1**						
Arsenic (As)			102.2		%		70-130	02-AUG-14
Barium (Ba)			101.3		%		70-130	02-AUG-14
Beryllium (Be)			106.1		%		70-130	02-AUG-14
Cadmium (Cd)			100.2		%		70-130	02-AUG-14
Chromium (Cr)			98.2		%		70-130	02-AUG-14
Cobalt (Co)			104.3		%		70-130	02-AUG-14
Copper (Cu)			105.0		%		70-130	02-AUG-14
Lead (Pb)			100.7		%		70-130	02-AUG-14
Molybdenum (Mo)			92.2		%		70-130	02-AUG-14
Nickel (Ni)			105.0		%		70-130	02-AUG-14
Selenium (Se)			98.3		%		70-130	02-AUG-14
Silver (Ag)			104.6		%		70-130	02-AUG-14
Thallium (Tl)			103.6		%		70-130	02-AUG-14
Tin (Sn)			102.2		%		70-130	02-AUG-14
Uranium (U)			98.6		%		70-130	02-AUG-14
Vanadium (V)			101.2		%		70-130	02-AUG-14
Zinc (Zn)			105.3		%		70-130	02-AUG-14
WG1922653-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			102.1		%		70-130	02-AUG-14
Arsenic (As)			100.6		%		70-130	02-AUG-14
Barium (Ba)			102.5		%		70-130	02-AUG-14
Beryllium (Be)			108.6		%		70-130	02-AUG-14
Cadmium (Cd)			103.5		%		70-130	02-AUG-14
Chromium (Cr)			102.4		%		70-130	02-AUG-14
Cobalt (Co)			103.4		%		70-130	02-AUG-14
Copper (Cu)			105.0		%		70-130	02-AUG-14
Lead (Pb)			100.8		%		70-130	02-AUG-14
Molybdenum (Mo)			80.7		%		70-130	02-AUG-14
Nickel (Ni)			104.1		%		70-130	02-AUG-14
Selenium (Se)			99.4		%		70-130	02-AUG-14
Silver (Ag)			104.8		%		70-130	02-AUG-14
Thallium (Tl)			105.1		%		70-130	02-AUG-14
Tin (Sn)			108.1		%		70-130	02-AUG-14
Uranium (U)			103.6		%		70-130	02-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2908403								
WG1922653-3 IRM		**ALS MET IRM1**						
Vanadium (V)			101.5		%		70-130	02-AUG-14
Zinc (Zn)			108.1		%		70-130	02-AUG-14
WG1922651-4 LCS								
Antimony (Sb)			102.0		%		70-130	02-AUG-14
Arsenic (As)			103.2		%		70-130	02-AUG-14
Barium (Ba)			105.9		%		70-130	02-AUG-14
Beryllium (Be)			99.6		%		70-130	02-AUG-14
Cadmium (Cd)			101.0		%		70-130	02-AUG-14
Chromium (Cr)			100.9		%		70-130	02-AUG-14
Cobalt (Co)			102.6		%		70-130	02-AUG-14
Copper (Cu)			102.6		%		70-130	02-AUG-14
Lead (Pb)			100.8		%		70-130	02-AUG-14
Molybdenum (Mo)			98.9		%		70-130	02-AUG-14
Nickel (Ni)			103.6		%		70-130	02-AUG-14
Selenium (Se)			102.6		%		70-130	02-AUG-14
Silver (Ag)			98.8		%		70-130	02-AUG-14
Thallium (Tl)			102.8		%		70-130	02-AUG-14
Tin (Sn)			104.1		%		70-130	02-AUG-14
Uranium (U)			97.6		%		70-130	02-AUG-14
Vanadium (V)			103.9		%		70-130	02-AUG-14
Zinc (Zn)			101.5		%		70-130	02-AUG-14
WG1922653-4 LCS								
Antimony (Sb)			100.1		%		70-130	02-AUG-14
Arsenic (As)			102.6		%		70-130	02-AUG-14
Barium (Ba)			104.2		%		70-130	02-AUG-14
Beryllium (Be)			99.7		%		70-130	02-AUG-14
Cadmium (Cd)			101.6		%		70-130	02-AUG-14
Chromium (Cr)			98.8		%		70-130	02-AUG-14
Cobalt (Co)			100.0		%		70-130	02-AUG-14
Copper (Cu)			100.5		%		70-130	02-AUG-14
Lead (Pb)			98.2		%		70-130	02-AUG-14
Molybdenum (Mo)			100.2		%		70-130	02-AUG-14
Nickel (Ni)			102.6		%		70-130	02-AUG-14
Selenium (Se)			100.8		%		70-130	02-AUG-14
Silver (Ag)			98.6		%		70-130	02-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2908403								
WG1922653-4 LCS								
Thallium (Tl)			100.1		%		70-130	02-AUG-14
Tin (Sn)			101.9		%		70-130	02-AUG-14
Uranium (U)			100.9		%		70-130	02-AUG-14
Vanadium (V)			100.3		%		70-130	02-AUG-14
Zinc (Zn)			101.3		%		70-130	02-AUG-14
WG1922651-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	02-AUG-14
Arsenic (As)			0.050	B	mg/kg		0.05	02-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	02-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	02-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	02-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	02-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	02-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	02-AUG-14
Lead (Pb)			<0.50		mg/kg		0.5	02-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	02-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	02-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	02-AUG-14
Silver (Ag)			<0.10		mg/kg		0.1	02-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	02-AUG-14
Tin (Sn)			<2.0		mg/kg		2	02-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	02-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	02-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	02-AUG-14
Batch R2909238								
WG1922653-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	05-AUG-14
Arsenic (As)			<0.050		mg/kg		0.05	05-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	05-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	05-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	05-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	05-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	05-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	05-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2909238								
WG1922653-1 MB								
Lead (Pb)			<0.50		mg/kg		0.5	05-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	05-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	05-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	05-AUG-14
Silver (Ag)			<0.10		mg/kg		0.1	05-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	05-AUG-14
Tin (Sn)			<2.0		mg/kg		2	05-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	05-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	05-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	05-AUG-14
Batch R2909767								
WG1924792-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			102.2		%		70-130	06-AUG-14
Arsenic (As)			103.1		%		70-130	06-AUG-14
Barium (Ba)			95.0		%		70-130	06-AUG-14
Beryllium (Be)			100.4		%		70-130	06-AUG-14
Cadmium (Cd)			98.5		%		70-130	06-AUG-14
Chromium (Cr)			99.2		%		70-130	06-AUG-14
Cobalt (Co)			99.2		%		70-130	06-AUG-14
Copper (Cu)			100.4		%		70-130	06-AUG-14
Lead (Pb)			99.7		%		70-130	06-AUG-14
Molybdenum (Mo)			91.4		%		70-130	06-AUG-14
Nickel (Ni)			101.4		%		70-130	06-AUG-14
Selenium (Se)			97.5		%		70-130	06-AUG-14
Silver (Ag)			95.7		%		70-130	06-AUG-14
Thallium (Tl)			101.7		%		70-130	06-AUG-14
Tin (Sn)			98.8		%		70-130	06-AUG-14
Uranium (U)			100.8		%		70-130	06-AUG-14
Vanadium (V)			98.5		%		70-130	06-AUG-14
Zinc (Zn)			100.6		%		70-130	06-AUG-14
WG1924792-4 LCS								
Antimony (Sb)			97.3		%		70-130	06-AUG-14
Arsenic (As)			102.9		%		70-130	06-AUG-14
Barium (Ba)			98.5		%		70-130	06-AUG-14
Beryllium (Be)			96.4		%		70-130	06-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2909767								
WG1924792-4 LCS								
Cadmium (Cd)			100.5		%		70-130	06-AUG-14
Chromium (Cr)			100.1		%		70-130	06-AUG-14
Cobalt (Co)			101.4		%		70-130	06-AUG-14
Copper (Cu)			100.2		%		70-130	06-AUG-14
Lead (Pb)			98.4		%		70-130	06-AUG-14
Molybdenum (Mo)			96.8		%		70-130	06-AUG-14
Nickel (Ni)			101.6		%		70-130	06-AUG-14
Selenium (Se)			103.9		%		70-130	06-AUG-14
Silver (Ag)			91.8		%		70-130	06-AUG-14
Thallium (Tl)			96.1		%		70-130	06-AUG-14
Tin (Sn)			98.8		%		70-130	06-AUG-14
Uranium (U)			100.4		%		70-130	06-AUG-14
Vanadium (V)			99.5		%		70-130	06-AUG-14
Zinc (Zn)			100.6		%		70-130	06-AUG-14
WG1924792-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	06-AUG-14
Arsenic (As)			<0.050		mg/kg		0.05	06-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	06-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	06-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	06-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	06-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	06-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	06-AUG-14
Lead (Pb)			<0.50		mg/kg		0.5	06-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	06-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	06-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	06-AUG-14
Silver (Ag)			<0.10		mg/kg		0.1	06-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	06-AUG-14
Tin (Sn)			<2.0		mg/kg		2	06-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	06-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	06-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	06-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2911051								
WG1924789-6 CRM		**VA-NRC-STSD1**						
Antimony (Sb)			105.3		%		70-130	07-AUG-14
Arsenic (As)			100.2		%		70-130	07-AUG-14
Barium (Ba)			93.4		%		70-130	07-AUG-14
Beryllium (Be)			102.5		%		70-130	07-AUG-14
Cadmium (Cd)			96.0		%		70-130	07-AUG-14
Chromium (Cr)			99.9		%		70-130	07-AUG-14
Cobalt (Co)			99.8		%		70-130	07-AUG-14
Copper (Cu)			101.2		%		70-130	07-AUG-14
Lead (Pb)			97.3		%		70-130	07-AUG-14
Molybdenum (Mo)			96.8		%		70-130	07-AUG-14
Nickel (Ni)			101.3		%		70-130	07-AUG-14
Selenium (Se)			102.1		%		70-130	07-AUG-14
Silver (Ag)			107.5		%		70-130	07-AUG-14
Thallium (Tl)			101.9		%		70-130	07-AUG-14
Tin (Sn)			98.7		%		70-130	07-AUG-14
Vanadium (V)			102.7		%		70-130	07-AUG-14
Zinc (Zn)			102.8		%		70-130	07-AUG-14
WG1924789-7 CRM		**VA-CANMET-TILL1**						
Antimony (Sb)			98.7		%		70-130	07-AUG-14
Arsenic (As)			106.4		%		70-130	07-AUG-14
Barium (Ba)			104.4		%		70-130	07-AUG-14
Beryllium (Be)			0.50		mg/kg		0.34-0.74	07-AUG-14
Cadmium (Cd)			117.4		%		70-130	07-AUG-14
Chromium (Cr)			108.9		%		70-130	07-AUG-14
Cobalt (Co)			101.5		%		70-130	07-AUG-14
Copper (Cu)			98.6		%		70-130	07-AUG-14
Lead (Pb)			117.6		%		70-130	07-AUG-14
Molybdenum (Mo)			0.66		mg/kg		0.24-1.24	07-AUG-14
Nickel (Ni)			102.3		%		70-130	07-AUG-14
Selenium (Se)			0.36		mg/kg		0.12-0.52	07-AUG-14
Silver (Ag)			0.22		mg/kg		0.12-0.32	07-AUG-14
Thallium (Tl)			0.129		mg/kg		0.075-0.175	07-AUG-14
Tin (Sn)			1.2		mg/kg		0-3	07-AUG-14
Uranium (U)			108.4		%		70-130	07-AUG-14

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2911051								
WG1924789-7 CRM		**VA-CANMET-TILL1**						
Vanadium (V)			109.8		%		70-130	07-AUG-14
Zinc (Zn)			106.0		%		70-130	07-AUG-14
WG1924789-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			95.5		%		70-130	07-AUG-14
Arsenic (As)			98.2		%		70-130	07-AUG-14
Barium (Ba)			97.6		%		70-130	07-AUG-14
Beryllium (Be)			101.5		%		70-130	07-AUG-14
Cadmium (Cd)			95.7		%		70-130	07-AUG-14
Chromium (Cr)			97.8		%		70-130	07-AUG-14
Cobalt (Co)			99.3		%		70-130	07-AUG-14
Copper (Cu)			102.0		%		70-130	07-AUG-14
Lead (Pb)			94.9		%		70-130	07-AUG-14
Molybdenum (Mo)			81.2		%		70-130	07-AUG-14
Nickel (Ni)			99.3		%		70-130	07-AUG-14
Selenium (Se)			93.7		%		70-130	07-AUG-14
Silver (Ag)			91.1		%		70-130	07-AUG-14
Thallium (Tl)			99.7		%		70-130	07-AUG-14
Tin (Sn)			97.8		%		70-130	07-AUG-14
Uranium (U)			95.2		%		70-130	07-AUG-14
Vanadium (V)			98.4		%		70-130	07-AUG-14
Zinc (Zn)			99.5		%		70-130	07-AUG-14
WG1924789-4 LCS								
Antimony (Sb)			97.9		%		70-130	07-AUG-14
Arsenic (As)			100.7		%		70-130	07-AUG-14
Barium (Ba)			99.9		%		70-130	07-AUG-14
Beryllium (Be)			98.0		%		70-130	07-AUG-14
Cadmium (Cd)			99.5		%		70-130	07-AUG-14
Chromium (Cr)			99.4		%		70-130	07-AUG-14
Cobalt (Co)			97.5		%		70-130	07-AUG-14
Copper (Cu)			98.3		%		70-130	07-AUG-14
Lead (Pb)			96.3		%		70-130	07-AUG-14
Molybdenum (Mo)			95.9		%		70-130	07-AUG-14
Nickel (Ni)			97.0		%		70-130	07-AUG-14
Selenium (Se)			100.6		%		70-130	07-AUG-14
Silver (Ag)			93.1		%		70-130	07-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2911051								
WG1924789-4 LCS								
Thallium (Tl)			96.1		%		70-130	07-AUG-14
Tin (Sn)			99.6		%		70-130	07-AUG-14
Uranium (U)			94.7		%		70-130	07-AUG-14
Vanadium (V)			99.5		%		70-130	07-AUG-14
Zinc (Zn)			97.2		%		70-130	07-AUG-14
WG1924789-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	07-AUG-14
Arsenic (As)			<0.050		mg/kg		0.05	07-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	07-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	07-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	07-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	07-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	07-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	07-AUG-14
Lead (Pb)			<0.50		mg/kg		0.5	07-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	07-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	07-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	07-AUG-14
Silver (Ag)			<0.10		mg/kg		0.1	07-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	07-AUG-14
Tin (Sn)			<2.0		mg/kg		2	07-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	07-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	07-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	07-AUG-14
MOISTURE-VA	**Soil**							
Batch R2905338								
WG1922649-2 LCS								
Moisture			98.5		%		90-110	31-JUL-14
WG1922649-1 MB								
Moisture			<0.25		%		0.25	31-JUL-14
Batch R2908518								
WG1924785-2 LCS								
Moisture			98.1		%		90-110	05-AUG-14
WG1924785-1 MB								
Moisture			<0.25		%		0.25	05-AUG-14

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-1:2-VA	**Soil**							
Batch R2906322								
WG1922651-2 DUP		**L1493277-24**						
pH (1:2 soil:water)		7.84	7.81	J	pH	0.03	0.3	01-AUG-14

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

COC / Analytical Request Form

Canada Toll Free: 1 800 668 9878

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L1493277-COFC

COC Number:

Page 1 of 1

Report To	Hamid Yousefbeigi
Company:	AMEC Environmental and Infrastructure
Contact:	
Address:	Suit 600 - 4445 Lougheed Hwy Burnaby, BC V5C 0E4
Phone:	604-295-6187

Invoice To Same as Report To ☑ Yes ☐ No

Copy of Invoice with Report ☑ Yes ☐ No

Company: AMEC Environmental and Infrastructure

Contact: Christine Peters

Select Invoice Distribution: ☐ EMAIL ☐ MAIL

Invoice Email:

Lab Work Order # (lab use only)

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

☐ Criteria on Report - provide details below if box checked

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2 hamid.yousefbeigi@amec.com

Email 3 christine.peters@amec.com

Project Information

Job #: VM00605J

PO / AFE:

LSD:

Quote #:

ALS Contact:

Sampler:

Service Request:(E2, E and P TATs are not available for all tests)

- **R** ☐ Regular (Standard Turnaround Times - business days)
- **P** ☐ Priority (2-4 business days) 50% surcharge - contact ALS to confirm TAT
- **E** ☐ Emergency (1-2 business days) 100% surcharge - contact ALS to confirm TAT
- **E2** ☐ Same day or weekend emergency - contact ALS to confirm TAT

Specify Date Required for E2,E or P:

Analysis Request

Indicate Filtered(F), Preserved (P)or Filtered and Preserved (F/P) below

Sample #	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH	Total Cyanide	Metal Scan											Number of Containers
	SED.DC.14-56 to SED.DC.14.80 inclusive	24-Jul-14		Sediment	X	X	X											
	SED.DC.14-60 DUP	24-Jul-14		Sediment	X	X	X											
	SED.DC.14-70 DUP	24-Jul-14		Sediment	X	X	X											
	SED.DC.14-80 DUP	24-Jul-14		Sediment	X	X	X											
	SED.DC.14-81 to SED.DC.14.88, inclusive	25-Jul-14		Sediment	X	X	X											

Oil and Gas Required Fields (client use)

Approver ID		Cost Center		Location	
GL Account		Routing Code		Activity Code	

Special Instructions and/or Criteria/Regulation/Standard to add to final report (client use)

THE MAXIMUM HOLD TIME FOR SEDIMENTS IS 72 HOURS.

Drinking Water (DW) Samples[1]

Are samples taken from a Regulated DW System?

☐ Yes ☐ No

Are samples for human drinking water use?

☐ Yes ☐ No

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ Ice packs Yes ☐ No ☐ Cooling Initiated ☐

SIF Observations Yes ☐ No ☐

Custody seal intact Yes ☐ No ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
7.6	15.4	17.2			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date: 25-J-14.	Time: 10:40pm.	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326e v06 Front/03 October 2013

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

Footnote 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AMEC Environment & Infrastructure
ATTN: Hamid Yousefbeigi
600 - 4445 Lougheed Hwy
Burnaby BC V5C 0E4

Date Received:	28-JUL-14
Report Date:	12-AUG-14 14:46 (MT)
Version:	FINAL

Client Phone: 604-295-6187

Certificate of Analysis

Lab Work Order #:	**L1493447**
Project P.O. #:	NOT SUBMITTED
Job Reference:	
C of C Numbers:	10-152784
Legal Site Desc:	

Selam Worku
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

	Sample ID	L1493447-1	L1493447-3	L1493447-4	L1493447-5	L1493447-7
	Description	Soil	Soil	Soil	Soil	Soil
	Sampled Date	26-JUL-14	26-JUL-14	26-JUL-14	26-JUL-14	26-JUL-14
	Sampled Time	12:00	12:00	12:00	12:00	12:00
	Client ID	SED-M-14-TP2 GS@ 3.6M	SED-M-14-TP2 GS@ 0.7M	SED-M-14-TP3 GS@ 5.0M	SED-M-14-TP2 GS@ 3.7M	SED-M-14-TP3 GS@ 5.0M(JAR)
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	6.65	11.3	11.1	41.7	10.8
	pH (1:2 soil:water) (pH)	6.47	7.72	7.43	6.71	
Cyanides	Cyanide, Total (mg/kg)	<0.050	20.1 DLM	3.02	3.5 DLM	
Metals	Antimony (Sb) (mg/kg)	0.55	51.0	674	8.89	
	Arsenic (As) (mg/kg)	9.21	618	4410	90.5	
	Barium (Ba) (mg/kg)	75.2	141	145	160	
	Beryllium (Be) (mg/kg)	<0.20	0.31	0.33	<0.20	
	Cadmium (Cd) (mg/kg)	0.083	2.97	30.4	0.626	
	Chromium (Cr) (mg/kg)	9.93	16.6	30.6	10.7	
	Cobalt (Co) (mg/kg)	3.46	8.41	7.63	6.86	
	Copper (Cu) (mg/kg)	6.23	68.0	575	27.7	
	Lead (Pb) (mg/kg)	3.91	297	3380	36.2	
	Mercury (Hg) (mg/kg)	<0.050	0.087	0.340	<0.050	
	Molybdenum (Mo) (mg/kg)	<0.50	11.9	100	1.16	
	Nickel (Ni) (mg/kg)	6.13	10.3	13.5	7.28	
	Selenium (Se) (mg/kg)	<0.20	0.31	0.69	<0.20	
	Silver (Ag) (mg/kg)	<0.10	14.9		1.07	
	Thallium (Tl) (mg/kg)	0.073	0.308	1.08	0.151	
	Tin (Sn) (mg/kg)	<2.0	<2.0	6.7	<2.0	
	Uranium (U) (mg/kg)	0.288	0.419	0.776	0.402	
	Vanadium (V) (mg/kg)	24.7	58.0	39.5	47.5	
	Zinc (Zn) (mg/kg)	25.1	290	1830	94.8	
Volatile Organic Compounds	Benzene (mg/kg)					<0.040
	Ethylbenzene (mg/kg)					<0.050
	Methyl t-butyl ether (MTBE) (mg/kg)					<0.20
	Styrene (mg/kg)					<0.050
	Toluene (mg/kg)					<0.050
	ortho-Xylene (mg/kg)					<0.050
	meta- & para-Xylene (mg/kg)					<0.050
	Xylenes (mg/kg)					<0.075
	Surrogate: 4-Bromofluorobenzene (SS) (%)					95.3
	Surrogate: 1,4-Difluorobenzene (SS) (%)					96.0
Hydrocarbons	EPH10-19 (mg/kg)					<200
	EPH19-32 (mg/kg)					2730
	LEPH (mg/kg)					<200
	HEPH (mg/kg)					2730
	Volatile Hydrocarbons (VH6-10) (mg/kg)					<100

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L1493447-8	L1493447-9	L1493447-10	L1493447-11	L1493447-12
	Description	Soil	Soil	Soil		
	Sampled Date	26-JUL-14	26-JUL-14	26-JUL-14		
	Sampled Time	12:00	12:00	12:00		
	Client ID	SED-M-14-TP2 GS@ 3.0M(JAR)	SED-M-14-TP2 GS@ 0.7M(JAR)	SED-M-14-TP2 GS@ 3.0M	SED-M-14-TP3 GS@ 5.0M AG	SED-M-14-TP2 GS@ 3.0M AG
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	13.1	12.5	12.1		
	pH (1:2 soil:water) (pH)			7.81		
Cyanides	Cyanide, Total (mg/kg)			DLM 7.31		
Metals	Antimony (Sb) (mg/kg)			52.9		
	Arsenic (As) (mg/kg)			520		
	Barium (Ba) (mg/kg)			255		
	Beryllium (Be) (mg/kg)			0.35		
	Cadmium (Cd) (mg/kg)			3.85		
	Chromium (Cr) (mg/kg)			185		
	Cobalt (Co) (mg/kg)			10.3		
	Copper (Cu) (mg/kg)			169		
	Lead (Pb) (mg/kg)			418		
	Mercury (Hg) (mg/kg)			0.073		
	Molybdenum (Mo) (mg/kg)			36.6		
	Nickel (Ni) (mg/kg)			100		
	Selenium (Se) (mg/kg)			0.33		
	Silver (Ag) (mg/kg)				76.7	58.1
	Thallium (Tl) (mg/kg)			0.351		
	Tin (Sn) (mg/kg)			11.2		
	Uranium (U) (mg/kg)			0.452		
	Vanadium (V) (mg/kg)			61.1		
	Zinc (Zn) (mg/kg)			671		
Volatile Organic Compounds	Benzene (mg/kg)	<0.040	<0.040			
	Ethylbenzene (mg/kg)	<0.050	<0.050			
	Methyl t-butyl ether (MTBE) (mg/kg)	<0.20	<0.20			
	Styrene (mg/kg)	<0.050	<0.050			
	Toluene (mg/kg)	0.095	0.063			
	ortho-Xylene (mg/kg)	0.051	<0.050			
	meta- & para-Xylene (mg/kg)	0.122	0.090			
	Xylenes (mg/kg)	0.173	0.090			
	Surrogate: 4-Bromofluorobenzene (SS) (%)	88.9	95.6			
	Surrogate: 1,4-Difluorobenzene (SS) (%)	91.5	91.4			
Hydrocarbons	EPH10-19 (mg/kg)	1610	370			
	EPH19-32 (mg/kg)	5090	920			
	LEPH (mg/kg)	1610	370			
	HEPH (mg/kg)	5090	920			
	Volatile Hydrocarbons (VH6-10) (mg/kg)	<100	<100			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1493447-1 Soil 26-JUL-14 12:00 SED-M-14-TP2 GS@ 3.6M	L1493447-3 Soil 26-JUL-14 12:00 SED-M-14-TP2 GS@ 0.7M	L1493447-4 Soil 26-JUL-14 12:00 SED-M-14-TP3 GS@ 5.0M	L1493447-5 Soil 26-JUL-14 12:00 SED-M-14-TP2 GS@ 3.7M	L1493447-7 Soil 26-JUL-14 12:00 SED-M-14-TP3 GS@ 5.0M(JAR)
Grouping	**Analyte**					
SOIL						
Hydrocarbons	VPH (C6-C10) (mg/kg)					<100
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					90.2
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					<0.050
	Acenaphthylene (mg/kg)					<0.050
	Anthracene (mg/kg)					<0.050
	Benz(a)anthracene (mg/kg)					<0.050
	Benzo(a)pyrene (mg/kg)					<0.050
	Benzo(b)fluoranthene (mg/kg)					<0.050
	Benzo(g,h,i)perylene (mg/kg)					<0.050
	Benzo(k)fluoranthene (mg/kg)					<0.050
	Chrysene (mg/kg)					<0.050
	Dibenz(a,h)anthracene (mg/kg)					<0.050
	Fluoranthene (mg/kg)					<0.050
	Fluorene (mg/kg)					<0.050
	Indeno(1,2,3-c,d)pyrene (mg/kg)					<0.050
	2-Methylnaphthalene (mg/kg)					<0.050
	Naphthalene (mg/kg)					<0.050
	Phenanthrene (mg/kg)					<0.050
	Pyrene (mg/kg)					<0.050
	Surrogate: Acenaphthene d10 (%)					97.9
	Surrogate: Chrysene d12 (%)					112.9
	Surrogate: Naphthalene d8 (%)					79.5
	Surrogate: Phenanthrene d10 (%)					103.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1493447-8	L1493447-9	L1493447-10	L1493447-11	L1493447-12
	Description	Soil	Soil	Soil		
	Sampled Date	26-JUL-14	26-JUL-14	26-JUL-14		
	Sampled Time	12:00	12:00	12:00		
	Client ID	SED-M-14-TP2 GS@ 3.0M(JAR)	SED-M-14-TP2 GS@ 0.7M(JAR)	SED-M-14-TP2 GS@ 3.0M	SED-M-14-TP3 GS@ 5.0M AG	SED-M-14-TP2 GS@ 3.0M AG
Grouping	**Analyte**					
SOIL						
Hydrocarbons	VPH (C6-C10) (mg/kg)	<100	<100			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	Not Reportable ^{SMI}	128.5			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.050	<0.050			
	Acenaphthylene (mg/kg)	<0.050	<0.050			
	Anthracene (mg/kg)	<0.050	<0.050			
	Benz(a)anthracene (mg/kg)	<0.050	<0.050			
	Benzo(a)pyrene (mg/kg)	<0.050	<0.050			
	Benzo(b)fluoranthene (mg/kg)	<0.050	<0.050			
	Benzo(g,h,i)perylene (mg/kg)	0.053	<0.050			
	Benzo(k)fluoranthene (mg/kg)	<0.050	<0.050			
	Chrysene (mg/kg)	<0.050	<0.050			
	Dibenz(a,h)anthracene (mg/kg)	<0.050	<0.050			
	Fluoranthene (mg/kg)	<0.050	<0.050			
	Fluorene (mg/kg)	<0.050	<0.050			
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.050	<0.050			
	2-Methylnaphthalene (mg/kg)	0.159	0.148			
	Naphthalene (mg/kg)	0.121	0.073			
	Phenanthrene (mg/kg)	<0.060 ^{DLM}	0.053			
	Pyrene (mg/kg)	0.368	0.131			
	Surrogate: Acenaphthene d10 (%)	109.5	92.9			
	Surrogate: Chrysene d12 (%)	103.0	119.0			
	Surrogate: Naphthalene d8 (%)	87.0	79.5			
	Surrogate: Phenanthrene d10 (%)	104.1	103.4			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Chromium (Cr)	DUP-H	L1493447-1, -10, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
SMI	Surrogate recovery could not be measured due to sample matrix interference.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CN-T-NAOH-CFA-VA	Soil	Total Cyanide in soil by CFA	ONMOE CN-E3015/ISO 14403:2002

This analysis is carried out using procedures adapted from the Ontario Ministry of Environment CN-E3015 and ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by rotary extraction of the soil with 0.04M Sodium Hydroxide, followed by in-line UV digestion along with sample distillation and final determination by colourimetric analysis.

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-TUMB-FID-VA	Soil	EPH in Solids by Tumbler and GCFID	BC MOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Solids by GC/FID", v2.1, July 1999. Soil samples are extracted with a 1:1 mixture of hexane and acetone using a rotary extraction technique modified from EPA 3570 prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

ALS Test Code	Matrix	Test Description	Method Reference**
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/245.7

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

ALS Test Code	Matrix	Test Description	Method Reference**
LEPH/HEPH-CALC-VA	Soil	LEPHs and HEPHs	BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in Solids. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

ALS Test Code	Matrix	Test Description	Method Reference**
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

ALS Test Code	Matrix	Test Description	Method Reference**
MOISTURE-VA	Soil	Moisture content	ASTM D2974-00 Method A

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

ALS Test Code	Matrix	Test Description	Method Reference**
PAH-TMB-H/A-MS-VA	Soil	PAH - Rotary Extraction (Hexane/Acetone)	EPA 3570/8270

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3570 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

ALS Test Code	Matrix	Test Description	Method Reference**
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

Reference Information

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

VH-HSFID-VA	Soil	VH in soil by Headspace GCFID	EPA8260B, 5021, 5035, BC MOE

This analysis involves the extraction of a subsample of the sediment/soil with methanol. Aliquots of the methanol extract are then added to water and reagents, then heated in a sealed vial to equilibrium. The headspace from the vial is analyzed for Volatile Hydrocarbons (VH) by capillary column gas chromatography with flame-ionization detection (GC/FID). The methanol extraction and VH analysis are carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1 July 1999).

VH-SURR-FID-VA	Soil	VH Surrogates for Soils	BCMELP CSR ANALYTICAL METHOD 2
VOC7-L-HSMS-VA	Soil	VOCs in soil by Headspace GCMS	EPA8260B, 5021, 5035, BC MOE

The soil methanol extract is added to water and reagents, then heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Soil	VOC7 and/or VOC Surrogates for Soils	EPA METHODS 8260B & 524.2
VPH-CALC-VA	Soil	VPH is VH minus select aromatics	BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

XYLENES-CALC-VA	Soil	Sum of Xylene Isomer Concentrations	EPA 8260B & 524.2

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	**Laboratory Location**
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

10-152784

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1493447 Report Date: 12-AUG-14

Client: AMEC Environment & Infrastructure
\# 600 - 4445 Lougheed Hwy
Burnaby BC V5C 0E4

Contact: Hamid Yousefbeigi

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-NAOH-CFA-VA	**Soil**							
Batch R2911013								
WG1924086-3 IRM		**ALS-TCN-IRM1**						
Cyanide, Total			94.5		%		80-120	06-AUG-14
WG1924086-2 LCS								
Cyanide, Total			97.8		%		80-120	06-AUG-14
WG1924086-1 MB								
Cyanide, Total			<0.050		mg/kg		0.05	06-AUG-14
EPH-TUMB-FID-VA	**Soil**							
Batch R2904873								
WG1921799-3 IRM		**ALS PHC2 RM**						
EPH10-19			91.0		%		70-130	31-JUL-14
EPH19-32			96.2		%		70-130	31-JUL-14
WG1921799-1 MB								
EPH10-19			<200		mg/kg		200	31-JUL-14
EPH19-32			<200		mg/kg		200	31-JUL-14
HG-200.2-CVAF-VA	**Soil**							
Batch R2906617								
WG1922294-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			108.7		%		70-130	01-AUG-14
WG1922294-4 LCS								
Mercury (Hg)			90.0		%		70-130	01-AUG-14
WG1922294-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	01-AUG-14
MET-200.2-CCMS-VA	**Soil**							
Batch R2909493								
WG1924376-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			101.3		%		70-130	05-AUG-14
Arsenic (As)			100.6		%		70-130	05-AUG-14
Barium (Ba)			97.2		%		70-130	05-AUG-14
Beryllium (Be)			102.2		%		70-130	05-AUG-14
Cadmium (Cd)			97.3		%		70-130	05-AUG-14
Chromium (Cr)			94.0		%		70-130	05-AUG-14
Cobalt (Co)			97.3		%		70-130	05-AUG-14
Copper (Cu)			100.9		%		70-130	05-AUG-14
Lead (Pb)			100.2		%		70-130	05-AUG-14
Molybdenum (Mo)			84.0		%		70-130	05-AUG-14
Nickel (Ni)			98.6		%		70-130	05-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2909493								
WG1924376-3 IRM		**ALS MET IRM1**						
Selenium (Se)			95.8		%		70-130	05-AUG-14
Silver (Ag)			97.2		%		70-130	05-AUG-14
Thallium (Tl)			105.8		%		70-130	05-AUG-14
Tin (Sn)			101.6		%		70-130	05-AUG-14
Uranium (U)			97.4		%		70-130	05-AUG-14
Vanadium (V)			97.4		%		70-130	05-AUG-14
Zinc (Zn)			99.1		%		70-130	05-AUG-14
WG1924376-4 LCS								
Antimony (Sb)			92.5		%		70-130	05-AUG-14
Arsenic (As)			95.4		%		70-130	05-AUG-14
Barium (Ba)			104.2		%		70-130	05-AUG-14
Beryllium (Be)			100.1		%		70-130	05-AUG-14
Cadmium (Cd)			101.4		%		70-130	05-AUG-14
Chromium (Cr)			103.6		%		70-130	05-AUG-14
Cobalt (Co)			101.1		%		70-130	05-AUG-14
Copper (Cu)			102.6		%		70-130	05-AUG-14
Lead (Pb)			98.4		%		70-130	05-AUG-14
Molybdenum (Mo)			90.0		%		70-130	05-AUG-14
Nickel (Ni)			101.6		%		70-130	05-AUG-14
Selenium (Se)			94.9		%		70-130	05-AUG-14
Silver (Ag)			96.8		%		70-130	05-AUG-14
Thallium (Tl)			99.9		%		70-130	05-AUG-14
Tin (Sn)			95.5		%		70-130	05-AUG-14
Uranium (U)			96.9		%		70-130	05-AUG-14
Vanadium (V)			102.3		%		70-130	05-AUG-14
Zinc (Zn)			98.5		%		70-130	05-AUG-14
WG1924376-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	05-AUG-14
Arsenic (As)			<0.050		mg/kg		0.05	05-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	05-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	05-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	05-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	05-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	05-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	05-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2909493								
WG1924376-1 MB								
Lead (Pb)			<0.50		mg/kg		0.5	05-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	05-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	05-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	05-AUG-14
Silver (Ag)			<0.10		mg/kg		0.1	05-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	05-AUG-14
Tin (Sn)			<2.0		mg/kg		2	05-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	05-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	05-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	05-AUG-14
Batch R2915698								
WG1928491-5 CRM		**VA-NRC-STSD1**						
Silver (Ag)			92.3		%		70-130	11-AUG-14
WG1928491-6 CRM		**VA-CANMET-TILL1**						
Silver (Ag)			0.21		mg/kg		0.12-0.32	11-AUG-14
WG1928491-4 LCS								
Silver (Ag)			93.6		%		70-130	11-AUG-14
WG1928491-1 MB								
Silver (Ag)			<0.10		mg/kg		0.1	11-AUG-14
MOISTURE-VA	**Soil**							
Batch R2903438								
WG1921805-2 LCS								
Moisture			95.9		%		90-110	30-JUL-14
WG1921805-1 MB								
Moisture			<0.25		%		0.25	30-JUL-14
Batch R2905339								
WG1922297-2 LCS								
Moisture			99.6		%		90-110	31-JUL-14
WG1922297-1 MB								
Moisture			<0.25		%		0.25	31-JUL-14
Batch R2905340								
WG1922451-2 LCS								
Moisture			98.3		%		90-110	31-JUL-14
WG1922451-1 MB								
Moisture			<0.25		%		0.25	31-JUL-14
PAH-TMB-H/A-MS-VA	**Soil**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-VA	**Soil**							
Batch R2905169								
WG1921799-4 IRM		**ALS PAH1 RM**						
Acenaphthene			65.3		%		60-130	06-AUG-14
Acenaphthylene			96.7		%		60-130	06-AUG-14
Anthracene			79.4		%		60-130	06-AUG-14
Benz(a)anthracene			91.6		%		60-130	06-AUG-14
Benzo(a)pyrene			78.9		%		60-130	06-AUG-14
Benzo(b)fluoranthene			89.7		%		60-130	06-AUG-14
Benzo(g,h,i)perylene			98.5		%		60-130	06-AUG-14
Benzo(k)fluoranthene			83.1		%		60-130	06-AUG-14
Chrysene			94.6		%		60-130	06-AUG-14
Dibenz(a,h)anthracene			102.7		%		60-130	06-AUG-14
Fluoranthene			95.6		%		60-130	06-AUG-14
Fluorene			60.5		%		60-130	06-AUG-14
Indeno(1,2,3-c,d)pyrene			91.5		%		60-130	06-AUG-14
2-Methylnaphthalene			90.9		%		60-130	06-AUG-14
Naphthalene			84.4		%		50-130	06-AUG-14
Phenanthrene			94.7		%		60-130	06-AUG-14
Pyrene			94.9		%		60-130	06-AUG-14
WG1921799-1 MB								
Acenaphthene			<0.0050		mg/kg		0.005	06-AUG-14
Acenaphthylene			<0.0050		mg/kg		0.005	06-AUG-14
Anthracene			<0.0040		mg/kg		0.004	06-AUG-14
Benz(a)anthracene			<0.010		mg/kg		0.01	06-AUG-14
Benzo(a)pyrene			<0.010		mg/kg		0.01	06-AUG-14
Benzo(b)fluoranthene			<0.010		mg/kg		0.01	06-AUG-14
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	06-AUG-14
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	06-AUG-14
Chrysene			<0.010		mg/kg		0.01	06-AUG-14
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	06-AUG-14
Fluoranthene			<0.010		mg/kg		0.01	06-AUG-14
Fluorene			<0.010		mg/kg		0.01	06-AUG-14
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	06-AUG-14
2-Methylnaphthalene			<0.010		mg/kg		0.01	06-AUG-14
Naphthalene			<0.010		mg/kg		0.01	06-AUG-14
Phenanthrene			<0.010		mg/kg		0.01	06-AUG-14

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-VA	**Soil**							
Batch R2905169								
WG1921799-1 MB								
Pyrene			<0.010		mg/kg		0.01	06-AUG-14
Surrogate: Naphthalene d8			91.2		%		50-130	06-AUG-14
Surrogate: Acenaphthene d10			90.3		%		60-130	06-AUG-14
Surrogate: Phenanthrene d10			88.7		%		60-130	06-AUG-14
Surrogate: Chrysene d12			82.8		%		60-130	06-AUG-14
VH-HSFID-VA	**Soil**							
Batch R2908410								
WG1921820-2 LCS								
Volatile Hydrocarbons (VH6-10)			117.2		%		70-130	05-AUG-14
WG1921820-1 MB								
Volatile Hydrocarbons (VH6-10)			<100		mg/kg		100	05-AUG-14
VOC7-L-HSMS-VA	**Soil**							
Batch R2906352								
WG1921820-2 LCS								
Benzene			102.4		%		70-130	04-AUG-14
Ethylbenzene			105.7		%		70-130	04-AUG-14
Methyl t-butyl ether (MTBE)			101.2		%		70-130	04-AUG-14
Styrene			107.0		%		70-130	04-AUG-14
Toluene			101.2		%		70-130	04-AUG-14
meta- & para-Xylene			100.7		%		70-130	04-AUG-14
ortho-Xylene			103.3		%		70-130	04-AUG-14
WG1921820-1 MB								
Benzene			<0.0050		mg/kg		0.005	04-AUG-14
Ethylbenzene			<0.015		mg/kg		0.015	04-AUG-14
Methyl t-butyl ether (MTBE)			<0.20		mg/kg		0.2	04-AUG-14
Styrene			<0.050		mg/kg		0.05	04-AUG-14
Toluene			<0.050		mg/kg		0.05	04-AUG-14
meta- & para-Xylene			<0.050		mg/kg		0.05	04-AUG-14
ortho-Xylene			<0.050		mg/kg		0.05	04-AUG-14

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

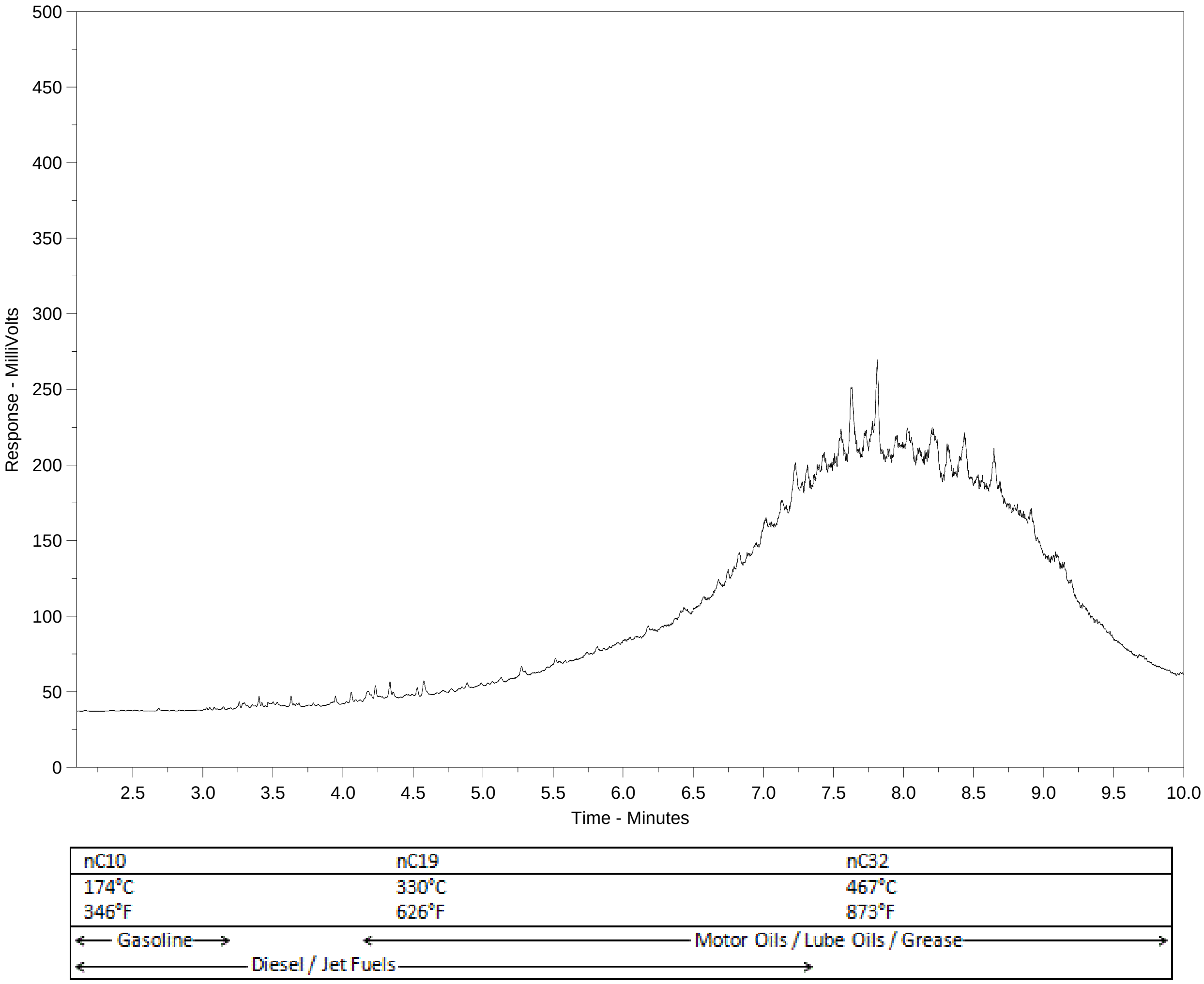
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report

ALS Sample ID: L1493447-7
Client Sample ID: SED-M-14-TP3 GS@ 5.0M(JAR)



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

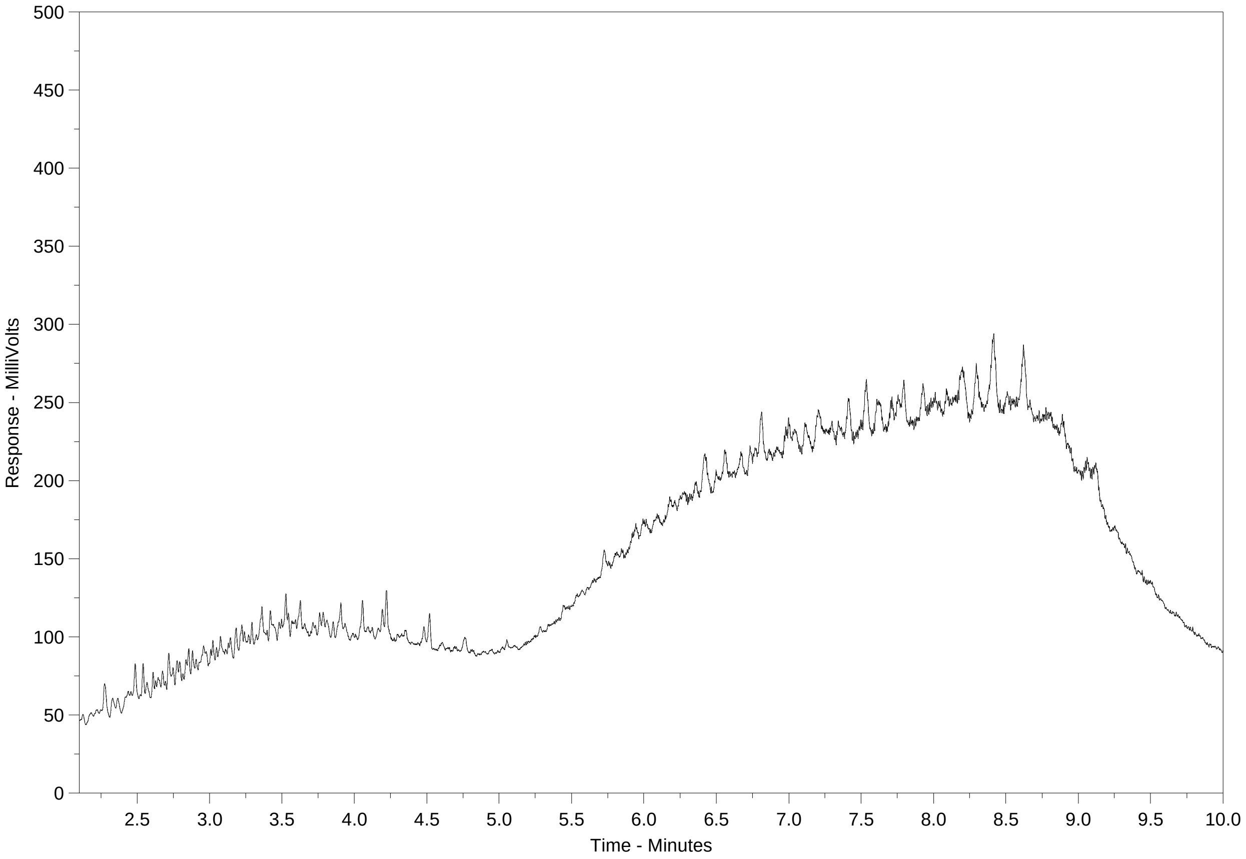
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1493447-8
Client Sample ID: SED-M-14-TP2 GS@ 3.0M(JAR)



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

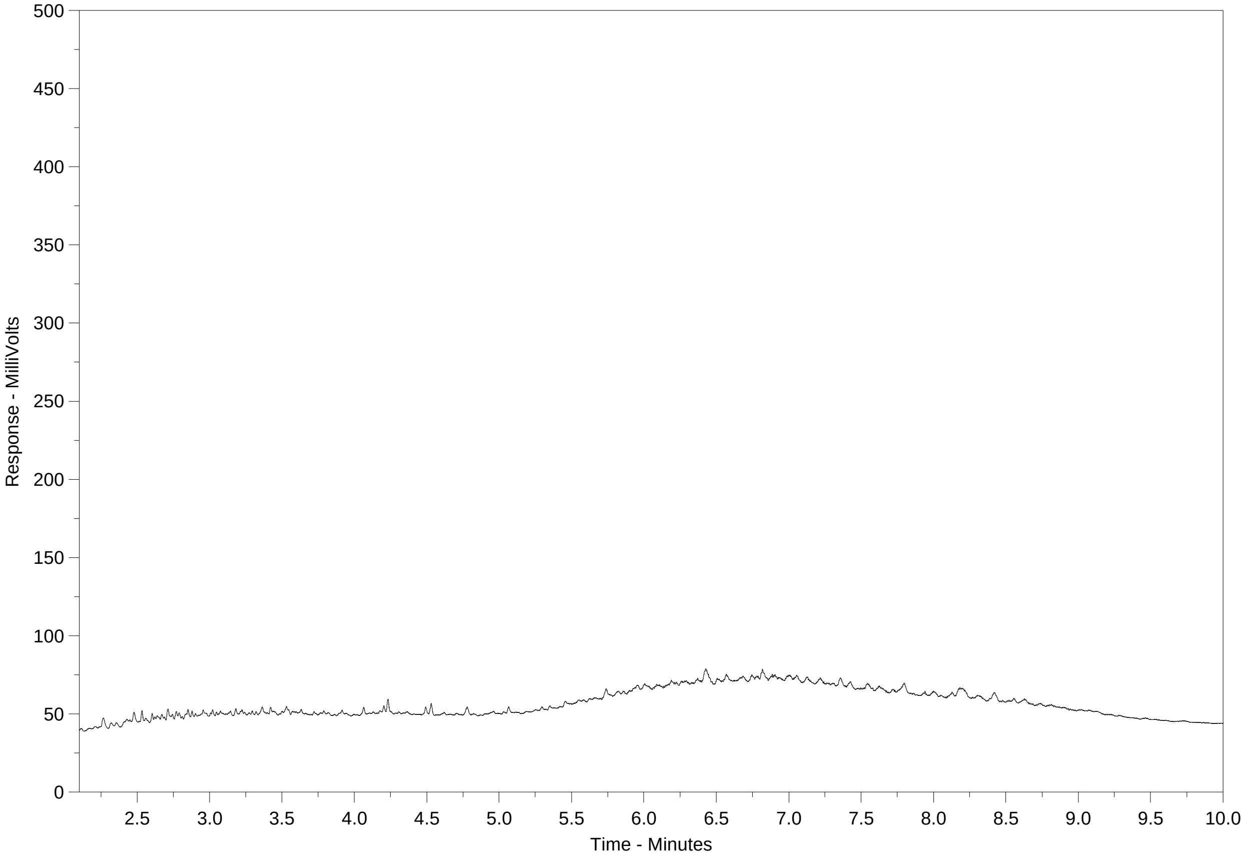
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1493447-9
Client Sample ID: SED-M-14-TP2 GS@ 0.7M(JAR)



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline →
← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

10- 152784

ALS Environmental

Chain of Custody / Analytic
Canada Toll Free: 1 80
www.alsglobal.c

L1493447-COFC

Page ____ of ____

Report To Hamid Yousefbeigi
Company: AMEC
Contact:
Address: 4555 Lougheed Hwy
BURNABY, BC
Phone: 604-295-6187 Fax:

Invoice To Same as Report ? (circle) Yes or No (if No, provide details)
Copy of Invoice with Report? (circle) Yes or No
Company:
Contact:
Address:
Phone: Fax:

Lab Work Order # (lab use only)

Report Format / Distribution
Standard: Other (specify):
Select: PDF ✓ Excel ✓ Digital Fax
Email 1:
Email 2:

Client / Project Information
Job #:
PO / AFE:
LSD:
Quote #:
ALS Contact:
Sampler:

Service Request:(Rush subject to availability - Contact ALS to confirm TAT)
☒ Regular (Standard Turnaround Times - Business Days)
☐ Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
☐ Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
☐ Same Day or Weekend Emergency - Contact ALS to confirm TAT

Analysis Request
(Indicate Filtered or Preserved, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH	Total Cyanide	metals	LEPH/HEPH	BTEX/VPH								Number of Containers
	SED-M-14-TP2 GS@3.6m	26 July 14		SOIL	X	X	X										
	SED-M-14-TP2 @ 2.3m	" " "		SOIL	X	X	X										
	SED-M-14-TP2 @0.7m	" " "		SOIL	X	X	X										
	SED-M-14-TP3 @ 5.0m	" " "		SOIL	X	X	X										
	SED-M-14-TP2 @ 3.7m	" " "		SOIL	X	X	X										
	SED-M-14-TP3 @ 1.5m	" " "		HOLD													
	SED-M-14-TP3 @ 5.0m (JAR)	" " "		SOIL				X	X								
	SED-M-14-TP2 @ 3.0m (JAR)	" " "		SOIL				X	X								
	SED-M-14-TP2 @ 0.7m (JAR)	" " "		SOIL				X	X								

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)
Released by: Date: Time:

SHIPMENT RECEPTION (lab use only)
Received by: Date: 28/7/14 Time: 11:30 Temperature: 0.2 °C

SHIPMENT VERIFICATION (lab use only)
Verified by: Date: Time: Observations: Yes / No ? If Yes add SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

GENF 18.01 Front

AMEC Environment & Infrastructure
ATTN: HAMID YOUSEFBEIGI
600 - 4445 Lougheed Hwy
Burnaby BC V5C 0E4

Date Received: 08-AUG-14
Report Date: 12-SEP-14 14:56 (MT)
Version: FINAL REV. 2

Client Phone: --

Certificate of Analysis

Lab Work Order #: **L1499580**
Project P.O. #: NOT SUBMITTED
Job Reference: VM00605J
C of C Numbers: 10-334267
Legal Site Desc:

Comments: 29-AUG-14 Please note that additional shake flask analyses have been added to ALS sample numbers 11, 16, 17, 22, 23 and 25 in this report.

Selam Worku
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

	Sample ID	L1499580-1	L1499580-2	L1499580-3	L1499580-4	L1499580-5
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-T-14-01 GS1M	BH-T-14-01 GS3M	BH-T-14-01 GS4M	BH-T-14-02 GS2M	BH-T-14-02 GS3M
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)					
	pH (1:2 soil:water) (pH)	6.50	7.23	8.79	6.86	6.65
Leachable Anions & Nutrients	Acidity (as CaCO3) (ug/L)					
	Alkalinity, Total (as CaCO3) (ug/L)					
	Bromide (Br) (ug/L)					
	Chloride (Cl) (ug/L)					
	Conductivity (uS/cm)					
	Fluoride (F) (ug/L)					
	Nitrate (as N) (ug/L)					
	Nitrite (as N) (ug/L)					
	pH (pH)					
	Sulfate (SO4) (ug/L)					
Metals	Antimony (Sb) (mg/kg)	0.26	0.29	0.31	0.16	0.18
	Arsenic (As) (mg/kg)	4.42	4.11	4.41	4.37	4.69
	Barium (Ba) (mg/kg)	68.4	66.1	64.4	80.8	76.5
	Beryllium (Be) (mg/kg)	<0.20	<0.20	0.20	<0.20	0.23
	Cadmium (Cd) (mg/kg)	0.065	0.056	0.058	0.064	0.066
	Chromium (Cr) (mg/kg)	11.1	9.88	13.7	12.0	13.0
	Cobalt (Co) (mg/kg)	3.54	3.05	3.43	3.62	3.92
	Copper (Cu) (mg/kg)	7.25	6.27	6.68	7.80	8.14
	Lead (Pb) (mg/kg)	3.17	2.53	2.72	2.48	2.71
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	7.24	6.05	6.30	7.50	8.05
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.350	0.345	0.495	0.381	0.421
	Vanadium (V) (mg/kg)	26.2	25.3	30.1	26.0	28.6
	Zinc (Zn) (mg/kg)	22.2	20.1	20.7	23.6	23.8
Leachable Metals	Aluminum (Al)-Leachable (ug/L)					
	Antimony (Sb)-Leachable (ug/L)					
	Arsenic (As)-Leachable (ug/L)					
	Barium (Ba)-Leachable (ug/L)					
	Beryllium (Be)-Leachable (ug/L)					
	Bismuth (Bi)-Leachable (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1499580-6	L1499580-7	L1499580-8	L1499580-9	L1499580-10
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-T-14-06 GS1M	BH-T-14-06 GS2M	BH-T-14-06 GS4.6M	BH-T-14-07 GS2M	BH-T-14-07 GS4M
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)					
	pH (1:2 soil:water) (pH)	5.93	6.28	6.60	6.63	8.65
Leachable Anions & Nutrients	Acidity (as CaCO3) (ug/L)					
	Alkalinity, Total (as CaCO3) (ug/L)					
	Bromide (Br) (ug/L)					
	Chloride (Cl) (ug/L)					
	Conductivity (uS/cm)					
	Fluoride (F) (ug/L)					
	Nitrate (as N) (ug/L)					
	Nitrite (as N) (ug/L)					
	pH (pH)					
	Sulfate (SO4) (ug/L)					
Metals	Antimony (Sb) (mg/kg)	0.95	0.53	0.38	0.82	0.38
	Arsenic (As) (mg/kg)	27.7	9.08	7.28	9.40	5.91
	Barium (Ba) (mg/kg)	114	58.6	52.6	45.1	44.0
	Beryllium (Be) (mg/kg)	0.26	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	0.448	0.171	0.144	0.116	0.072
	Chromium (Cr) (mg/kg)	21.1	10.7	9.79	9.37	7.74
	Cobalt (Co) (mg/kg)	4.11	3.13	3.05	2.92	2.64
	Copper (Cu) (mg/kg)	15.6	6.98	6.82	5.94	5.82
	Lead (Pb) (mg/kg)	23.9	4.47	4.43	3.58	2.66
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	1.15	<0.50	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	13.8	7.65	6.99	5.99	5.11
	Selenium (Se) (mg/kg)	0.72	0.21	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	0.14	<0.10	<0.10	<0.10	<0.10
	Thallium (Tl) (mg/kg)	0.121	<0.050	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.666	0.420	0.333	0.305	0.327
	Vanadium (V) (mg/kg)	52.6	29.2	24.9	26.9	21.9
	Zinc (Zn) (mg/kg)	75.4	30.9	27.0	28.6	18.5
Leachable Metals	Aluminum (Al)-Leachable (ug/L)					
	Antimony (Sb)-Leachable (ug/L)					
	Arsenic (As)-Leachable (ug/L)					
	Barium (Ba)-Leachable (ug/L)					
	Beryllium (Be)-Leachable (ug/L)					
	Bismuth (Bi)-Leachable (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L1499580-11	L1499580-12	L1499580-13	L1499580-14	L1499580-15
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-T-14-08 GS2M	BH-T-14-08 GS3M	BH-T-14-09 GS1M	BH-T-14-09 GS2M	BH-T-14-17 GS2M
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	2.42				
	pH (1:2 soil:water) (pH)	7.19	7.37	5.99	7.84	6.44
Leachable Anions & Nutrients	Acidity (as CaCO3) (ug/L)	1300				
	Alkalinity, Total (as CaCO3) (ug/L)	4200				
	Bromide (Br) (ug/L)	<50				
	Chloride (Cl) (ug/L)	<500				
	Conductivity (uS/cm)	<40.0				
	Fluoride (F) (ug/L)	215				
	Nitrate (as N) (ug/L)	1540				
	Nitrite (as N) (ug/L)	1.7				
	pH (pH)	7.06				
	Sulfate (SO4) (ug/L)	730				
Metals	Antimony (Sb) (mg/kg)	0.46	0.41	0.30	0.68	20.6
	Arsenic (As) (mg/kg)	6.01	6.41	4.50	17.5	145
	Barium (Ba) (mg/kg)	37.1	34.7	56.7	67.5	93.5
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	<0.20	0.24
	Cadmium (Cd) (mg/kg)	0.068	0.078	0.053	0.169	1.59
	Chromium (Cr) (mg/kg)	7.97	8.13	9.09	12.0	11.3
	Cobalt (Co) (mg/kg)	2.63	2.90	2.55	3.43	3.20
	Copper (Cu) (mg/kg)	4.76	4.56	4.74	8.60	40.3
	Lead (Pb) (mg/kg)	2.73	3.29	2.89	5.26	88.4
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)	4.70	4.58	5.41	8.06	6.90
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	2.67
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	0.051	0.103
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.292	0.323	0.337	0.427	0.552
	Vanadium (V) (mg/kg)	20.7	23.7	21.4	27.3	29.4
	Zinc (Zn) (mg/kg)	20.1	20.1	19.2	36.0	120
Leachable Metals	Aluminum (Al)-Leachable (ug/L)	9540				
	Antimony (Sb)-Leachable (ug/L)	1.82				
	Arsenic (As)-Leachable (ug/L)	22.2				
	Barium (Ba)-Leachable (ug/L)	97.7				
	Beryllium (Be)-Leachable (ug/L)	<0.50				
	Bismuth (Bi)-Leachable (ug/L)	<0.50				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L1499580-16	L1499580-17	L1499580-18	L1499580-19	L1499580-20
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-T-14-17 GS3M	BH-C-14-01 GS1M	BH-C-14-01 GS3M	BH-C-14-02 GS1M	BH-C-14-02 GS2M
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	34.3	8.88			
	pH (1:2 soil:water) (pH)	6.62	7.38	7.69	7.72	7.85
Leachable Anions & Nutrients	Acidity (as CaCO3) (ug/L)	3100	1300			
	Alkalinity, Total (as CaCO3) (ug/L)	32300	9200			
	Bromide (Br) (ug/L)	<50	<50			
	Chloride (Cl) (ug/L)	640	730			
	Conductivity (uS/cm)	547	<40.0			
	Fluoride (F) (ug/L)	106	260			
	Nitrate (as N) (ug/L)	480	107			
	Nitrite (as N) (ug/L)	344	1.2			
	pH (pH)	6.58	7.62			
	Sulfate (SO4) (ug/L)	238000	2630			
Metals	Antimony (Sb) (mg/kg)	30.6	13.2	15.5	0.28	0.31
	Arsenic (As) (mg/kg)	211	116	249	3.86	3.78
	Barium (Ba) (mg/kg)	76.7	146	165	429	457
	Beryllium (Be) (mg/kg)	<0.20	0.48	0.43	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	2.13	0.587	0.637	0.079	0.077
	Chromium (Cr) (mg/kg)	10.6	29.0	30.5	12.8	12.8
	Cobalt (Co) (mg/kg)	3.31	7.79	8.51	21.2	19.6
	Copper (Cu) (mg/kg)	42.8	29.6	26.1	112	86.7
	Lead (Pb) (mg/kg)	129	39.1	28.4	2.13	1.97
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	0.81	1.05	<0.50	<0.50
	Nickel (Ni) (mg/kg)	6.48	13.9	13.6	6.20	5.47
	Selenium (Se) (mg/kg)	<0.20	<0.20	0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	3.79	<0.50	<0.40	<0.30	<0.20
	Thallium (Tl) (mg/kg)	0.118	0.300	0.273	0.275	0.238
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.458	0.751	0.807	0.586	0.585
	Vanadium (V) (mg/kg)	29.3	52.6	49.4	193	180
	Zinc (Zn) (mg/kg)	164	111	103	87.2	85.9
Leachable Metals	Aluminum (Al)-Leachable (ug/L)	181	14500			
	Antimony (Sb)-Leachable (ug/L)	119	42.8			
	Arsenic (As)-Leachable (ug/L)	125	346			
	Barium (Ba)-Leachable (ug/L)	114	148			
	Beryllium (Be)-Leachable (ug/L)	<0.50	0.77			
	Bismuth (Bi)-Leachable (ug/L)	1.77	0.75			

	Sample ID	L1499580-21	L1499580-22	L1499580-23	L1499580-24	L1499580-25
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-C-14-03 GS2M	BH-C-14-03 GS3M	BH-C-14-04 GS2M	BH-C-14-04 GS4M	BH-M-14-05 GS1M
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)		6.85	8.55		6.59
	pH (1:2 soil:water) (pH)	7.99	7.92	7.92	7.83	8.38
Leachable Anions & Nutrients	Acidity (as CaCO3) (ug/L)		1300	<1000		<1000
	Alkalinity, Total (as CaCO3) (ug/L)		11500	10400		53300
	Bromide (Br) (ug/L)		<50	<50		<50
	Chloride (Cl) (ug/L)		<500	<500		<500
	Conductivity (uS/cm)		<40.0	<60.0		253
	Fluoride (F) (ug/L)		557	509		868
	Nitrate (as N) (ug/L)		36.6	18.0		23.7
	Nitrite (as N) (ug/L)		1.6	1.2		1.3
	pH (pH)		8.08	7.96		8.28
	Sulfate (SO4) (ug/L)		2080	11700		71400
Metals	Antimony (Sb) (mg/kg)	10.1	5.78	3.98	5.25	15.5
	Arsenic (As) (mg/kg)	205	133	67.6	73.7	28.6
	Barium (Ba) (mg/kg)	293	265	661	293	19.7
	Beryllium (Be) (mg/kg)	0.34	0.33	0.42	0.32	0.57
	Cadmium (Cd) (mg/kg)	0.849	0.648	0.260	0.390	2.56
	Chromium (Cr) (mg/kg)	31.7	41.5	37.4	28.2	7.20
	Cobalt (Co) (mg/kg)	13.1	13.0	16.6	15.2	7.68
	Copper (Cu) (mg/kg)	39.4	40.7	35.3	41.2	39.7
	Lead (Pb) (mg/kg)	23.4	18.1	12.0	19.7	27.9
	Mercury (Hg) (mg/kg)	0.055	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	1.27	1.01	0.56	0.66	<0.50
	Nickel (Ni) (mg/kg)	16.1	14.7	11.5	11.3	2.91
	Selenium (Se) (mg/kg)	0.21	<0.20	<0.20	0.22	<0.20
	Silver (Ag) (mg/kg)	<0.50	0.33	0.17	0.22	0.42
	Thallium (Tl) (mg/kg)	0.370	0.343	0.363	0.289	0.123
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.538	0.639	0.497	0.581	0.374
	Vanadium (V) (mg/kg)	69.8	81.5	124	118	26.1
	Zinc (Zn) (mg/kg)	138	127	106	103	212
Leachable Metals	Aluminum (Al)-Leachable (ug/L)		27300	7140		8.5
	Antimony (Sb)-Leachable (ug/L)		24.0	5.74		34.6
	Arsenic (As)-Leachable (ug/L)		530	69.2		<1.0
	Barium (Ba)-Leachable (ug/L)		452	106		1.8
	Beryllium (Be)-Leachable (ug/L)		DLA <1.0	<0.50		<0.50
	Bismuth (Bi)-Leachable (ug/L)		DLA <1.0	<0.50		<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

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	Sample ID	L1499580-26				
	Description	SOIL				
	Sampled Date	08-AUG-14				
	Sampled Time	13:45				
	Client ID	BH-M-14-05 GS2M				
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)					
	pH (1:2 soil:water) (pH)	8.26				
Leachable Anions & Nutrients	Acidity (as CaCO3) (ug/L)					
	Alkalinity, Total (as CaCO3) (ug/L)					
	Bromide (Br) (ug/L)					
	Chloride (Cl) (ug/L)					
	Conductivity (uS/cm)					
	Fluoride (F) (ug/L)					
	Nitrate (as N) (ug/L)					
	Nitrite (as N) (ug/L)					
	pH (pH)					
	Sulfate (SO4) (ug/L)					
Metals	Antimony (Sb) (mg/kg)	16.5				
	Arsenic (As) (mg/kg)	47.1				
	Barium (Ba) (mg/kg)	173				
	Beryllium (Be) (mg/kg)	1.15				
	Cadmium (Cd) (mg/kg)	1.29				
	Chromium (Cr) (mg/kg)	21.4				
	Cobalt (Co) (mg/kg)	15.6				
	Copper (Cu) (mg/kg)	52.4				
	Lead (Pb) (mg/kg)	52.7				
	Mercury (Hg) (mg/kg)	0.051				
	Molybdenum (Mo) (mg/kg)	<0.50				
	Nickel (Ni) (mg/kg)	13.0				
	Selenium (Se) (mg/kg)	0.56				
	Silver (Ag) (mg/kg)	0.78				
	Thallium (Tl) (mg/kg)	0.246				
	Tin (Sn) (mg/kg)	<2.0				
	Uranium (U) (mg/kg)	0.484				
	Vanadium (V) (mg/kg)	68.3				
	Zinc (Zn) (mg/kg)	177				
Leachable Metals	Aluminum (Al)-Leachable (ug/L)					
	Antimony (Sb)-Leachable (ug/L)					
	Arsenic (As)-Leachable (ug/L)					
	Barium (Ba)-Leachable (ug/L)					
	Beryllium (Be)-Leachable (ug/L)					
	Bismuth (Bi)-Leachable (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

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	Sample ID	L1499580-1	L1499580-2	L1499580-3	L1499580-4	L1499580-5
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-T-14-01 GS1M	BH-T-14-01 GS3M	BH-T-14-01 GS4M	BH-T-14-02 GS2M	BH-T-14-02 GS3M
Grouping	**Analyte**					
SOIL						
Leachable Metals	Boron (B)-Leachable (ug/L)					
	Cadmium (Cd)-Leachable (ug/L)					
	Calcium (Ca)-Leachable (ug/L)					
	Chromium (Cr)-Leachable (ug/L)					
	Cobalt (Co)-Leachable (ug/L)					
	Copper (Cu)-Leachable (ug/L)					
	Iron (Fe)-Leachable (ug/L)					
	Lead (Pb)-Leachable (ug/L)					
	Lithium (Li)-Leachable (ug/L)					
	Magnesium (Mg)-Leachable (ug/L)					
	Manganese (Mn)-Leachable (ug/L)					
	Mercury (Hg)-Leachable (ug/L)					
	Molybdenum (Mo)-Leachable (ug/L)					
	Nickel (Ni)-Leachable (ug/L)					
	Phosphorus (P)-Leachable (ug/L)					
	Potassium (K)-Leachable (ug/L)					
	Selenium (Se)-Leachable (ug/L)					
	Silicon (Si)-Leachable (ug/L)					
	Silver (Ag)-Leachable (ug/L)					
	Sodium (Na)-Leachable (ug/L)					
	Strontium (Sr)-Leachable (ug/L)					
	Thallium (Tl)-Leachable (ug/L)					
	Tin (Sn)-Leachable (ug/L)					
	Titanium (Ti)-Leachable (ug/L)					
	Uranium (U)-Leachable (ug/L)					
	Vanadium (V)-Leachable (ug/L)					
	Zinc (Zn)-Leachable (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1499580-6	L1499580-7	L1499580-8	L1499580-9	L1499580-10
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-T-14-06 GS1M	BH-T-14-06 GS2M	BH-T-14-06 GS4.6M	BH-T-14-07 GS2M	BH-T-14-07 GS4M
Grouping	**Analyte**					
SOIL						
Leachable Metals	Boron (B)-Leachable (ug/L)					
	Cadmium (Cd)-Leachable (ug/L)					
	Calcium (Ca)-Leachable (ug/L)					
	Chromium (Cr)-Leachable (ug/L)					
	Cobalt (Co)-Leachable (ug/L)					
	Copper (Cu)-Leachable (ug/L)					
	Iron (Fe)-Leachable (ug/L)					
	Lead (Pb)-Leachable (ug/L)					
	Lithium (Li)-Leachable (ug/L)					
	Magnesium (Mg)-Leachable (ug/L)					
	Manganese (Mn)-Leachable (ug/L)					
	Mercury (Hg)-Leachable (ug/L)					
	Molybdenum (Mo)-Leachable (ug/L)					
	Nickel (Ni)-Leachable (ug/L)					
	Phosphorus (P)-Leachable (ug/L)					
	Potassium (K)-Leachable (ug/L)					
	Selenium (Se)-Leachable (ug/L)					
	Silicon (Si)-Leachable (ug/L)					
	Silver (Ag)-Leachable (ug/L)					
	Sodium (Na)-Leachable (ug/L)					
	Strontium (Sr)-Leachable (ug/L)					
	Thallium (Tl)-Leachable (ug/L)					
	Tin (Sn)-Leachable (ug/L)					
	Titanium (Ti)-Leachable (ug/L)					
	Uranium (U)-Leachable (ug/L)					
	Vanadium (V)-Leachable (ug/L)					
	Zinc (Zn)-Leachable (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L1499580-11	L1499580-12	L1499580-13	L1499580-14	L1499580-15
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-T-14-08 GS2M	BH-T-14-08 GS3M	BH-T-14-09 GS1M	BH-T-14-09 GS2M	BH-T-14-17 GS2M
Grouping	**Analyte**					
SOIL						
Leachable Metals	Boron (B)-Leachable (ug/L)	<10				
	Cadmium (Cd)-Leachable (ug/L)	0.209				
	Calcium (Ca)-Leachable (ug/L)	3310				
	Chromium (Cr)-Leachable (ug/L)	11.7				
	Cobalt (Co)-Leachable (ug/L)	6.10				
	Copper (Cu)-Leachable (ug/L)	13.4				
	Iron (Fe)-Leachable (ug/L)	11500				
	Lead (Pb)-Leachable (ug/L)	9.79				
	Lithium (Li)-Leachable (ug/L)	<5.0				
	Magnesium (Mg)-Leachable (ug/L)	1880				
	Manganese (Mn)-Leachable (ug/L)	399				
	Mercury (Hg)-Leachable (ug/L)	<0.050				
	Molybdenum (Mo)-Leachable (ug/L)	1.09				
	Nickel (Ni)-Leachable (ug/L)	11.1				
	Phosphorus (P)-Leachable (ug/L)	<300				
	Potassium (K)-Leachable (ug/L)	2360				
	Selenium (Se)-Leachable (ug/L)	<0.50				
	Silicon (Si)-Leachable (ug/L)	22900				
	Silver (Ag)-Leachable (ug/L)	0.195				
	Sodium (Na)-Leachable (ug/L)	2020				
	Strontium (Sr)-Leachable (ug/L)	26.4				
	Thallium (Tl)-Leachable (ug/L)	<0.10				
	Tin (Sn)-Leachable (ug/L)	<0.50				
	Titanium (Ti)-Leachable (ug/L)	310				
	Uranium (U)-Leachable (ug/L)	0.282				
	Vanadium (V)-Leachable (ug/L)	27.2				
	Zinc (Zn)-Leachable (ug/L)	34				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1499580-16	L1499580-17	L1499580-18	L1499580-19	L1499580-20
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-T-14-17 GS3M	BH-C-14-01 GS1M	BH-C-14-01 GS3M	BH-C-14-02 GS1M	BH-C-14-02 GS2M
Grouping	**Analyte**					
SOIL						
Leachable Metals	Boron (B)-Leachable (ug/L)	93	11			
	Cadmium (Cd)-Leachable (ug/L)	1.42	0.988			
	Calcium (Ca)-Leachable (ug/L)	73300	3850			
	Chromium (Cr)-Leachable (ug/L)	0.93	28.9			
	Cobalt (Co)-Leachable (ug/L)	2.48	8.96			
	Copper (Cu)-Leachable (ug/L)	17.0	55.7			
	Iron (Fe)-Leachable (ug/L)	3280	47500			
	Lead (Pb)-Leachable (ug/L)	53.6	84.0			
	Lithium (Li)-Leachable (ug/L)	<5.0	8.2			
	Magnesium (Mg)-Leachable (ug/L)	14900	1670			
	Manganese (Mn)-Leachable (ug/L)	1240	299			
	Mercury (Hg)-Leachable (ug/L)	<0.050	0.163			
	Molybdenum (Mo)-Leachable (ug/L)	2.05	5.57			
	Nickel (Ni)-Leachable (ug/L)	2.03	24.6			
	Phosphorus (P)-Leachable (ug/L)	<300	730			
	Potassium (K)-Leachable (ug/L)	4410	2150			
	Selenium (Se)-Leachable (ug/L)	<0.50	0.55			
	Silicon (Si)-Leachable (ug/L)	3670	39000			
	Silver (Ag)-Leachable (ug/L)	0.970	1.73			
	Sodium (Na)-Leachable (ug/L)	3620	2660			
	Strontium (Sr)-Leachable (ug/L)	365	23.6			
	Thallium (Tl)-Leachable (ug/L)	0.27	0.13			
	Tin (Sn)-Leachable (ug/L)	<0.50	<0.50			
	Titanium (Ti)-Leachable (ug/L)	27	637			
	Uranium (U)-Leachable (ug/L)	0.068	1.34			
	Vanadium (V)-Leachable (ug/L)	9.8	94.6			
	Zinc (Zn)-Leachable (ug/L)	67	157			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1499580-21	L1499580-22	L1499580-23	L1499580-24	L1499580-25
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14	08-AUG-14
	Sampled Time	13:45	13:45	13:45	13:45	13:45
	Client ID	BH-C-14-03 GS2M	BH-C-14-03 GS3M	BH-C-14-04 GS2M	BH-C-14-04 GS4M	BH-M-14-05 GS1M
Grouping	**Analyte**					
SOIL						
Leachable Metals	Boron (B)-Leachable (ug/L)		21	<10		<10
	Cadmium (Cd)-Leachable (ug/L)		1.70	0.207		0.180
	Calcium (Ca)-Leachable (ug/L)		4960	4700		29000
	Chromium (Cr)-Leachable (ug/L)		49.8	8.42		<0.50
	Cobalt (Co)-Leachable (ug/L)		25.0	3.61		<0.10
	Copper (Cu)-Leachable (ug/L)		79.5	15.3		<1.0
	Iron (Fe)-Leachable (ug/L)		63900	12600		<30
	Lead (Pb)-Leachable (ug/L)		54.0	14.6		<0.10
	Lithium (Li)-Leachable (ug/L)		17	7.2		<5.0
	Magnesium (Mg)-Leachable (ug/L)		4480	1840		8100
	Manganese (Mn)-Leachable (ug/L)		2470	309		6.35
	Mercury (Hg)-Leachable (ug/L)		0.379	<0.050		<0.050
	Molybdenum (Mo)-Leachable (ug/L)		24.2	6.05		3.15
	Nickel (Ni)-Leachable (ug/L)		38.0	5.43		<0.50
	Phosphorus (P)-Leachable (ug/L)		790	<300		<300
	Potassium (K)-Leachable (ug/L)		4190	3750		3950
	Selenium (Se)-Leachable (ug/L)		<1.0 DLA	<0.50		<0.50
	Silicon (Si)-Leachable (ug/L)		65100	20400		3490
	Silver (Ag)-Leachable (ug/L)		2.08	0.441		<0.050
	Sodium (Na)-Leachable (ug/L)		3460	3260		3130
	Strontium (Sr)-Leachable (ug/L)		45.0	24.0		54.0
	Thallium (Tl)-Leachable (ug/L)		0.26	<0.10		0.13
	Tin (Sn)-Leachable (ug/L)		<1.0 DLA	<0.50		<0.50
	Titanium (Ti)-Leachable (ug/L)		1210	261		<10
	Uranium (U)-Leachable (ug/L)		1.25	0.303		0.127
	Vanadium (V)-Leachable (ug/L)		118	31.8		<1.0
	Zinc (Zn)-Leachable (ug/L)		210	29		<10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1499580-26				
	Description	SOIL				
	Sampled Date	08-AUG-14				
	Sampled Time	13:45				
	Client ID	BH-M-14-05 GS2M				
Grouping	**Analyte**					
SOIL						
Leachable Metals	Boron (B)-Leachable (ug/L)					
	Cadmium (Cd)-Leachable (ug/L)					
	Calcium (Ca)-Leachable (ug/L)					
	Chromium (Cr)-Leachable (ug/L)					
	Cobalt (Co)-Leachable (ug/L)					
	Copper (Cu)-Leachable (ug/L)					
	Iron (Fe)-Leachable (ug/L)					
	Lead (Pb)-Leachable (ug/L)					
	Lithium (Li)-Leachable (ug/L)					
	Magnesium (Mg)-Leachable (ug/L)					
	Manganese (Mn)-Leachable (ug/L)					
	Mercury (Hg)-Leachable (ug/L)					
	Molybdenum (Mo)-Leachable (ug/L)					
	Nickel (Ni)-Leachable (ug/L)					
	Phosphorus (P)-Leachable (ug/L)					
	Potassium (K)-Leachable (ug/L)					
	Selenium (Se)-Leachable (ug/L)					
	Silicon (Si)-Leachable (ug/L)					
	Silver (Ag)-Leachable (ug/L)					
	Sodium (Na)-Leachable (ug/L)					
	Strontium (Sr)-Leachable (ug/L)					
	Thallium (Tl)-Leachable (ug/L)					
	Tin (Sn)-Leachable (ug/L)					
	Titanium (Ti)-Leachable (ug/L)					
	Uranium (U)-Leachable (ug/L)					
	Vanadium (V)-Leachable (ug/L)					
	Zinc (Zn)-Leachable (ug/L)					

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Lead (Pb)-Leachable	B	L1499580-11, -16, -17, -22, -23, -25
Method Blank	Sodium (Na)-Leachable	B	L1499580-11, -16, -17, -22, -23, -25
Duplicate	Antimony (Sb)	DUP-H	L1499580-22, -23, -24, -25, -26
Duplicate	Arsenic (As)	DUP-H	L1499580-22, -23, -24, -25, -26
Duplicate	Antimony (Sb)	DUP-H	L1499580-1, -10, -11, -12, -13, -14, -15, -16, -2, -3, -4, -5, -6, -7, -8, -9
Method Blank	Nitrate (as N)	MB-LOR	L1499580-11, -16, -17, -22, -23, -25
Method Blank	Conductivity	MB-LOR	L1499580-11, -16, -17, -22, -23, -25
Matrix Spike	Iron (Fe)-Leachable	MS-B	L1499580-11, -16, -17, -22, -23, -25
Matrix Spike	Silicon (Si)-Leachable	MS-B	L1499580-11, -16, -17, -22, -23, -25
Certified Reference Material	Silver (Ag)	RM-H	L1499580-17, -18, -19, -20, -21

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLA	Detection Limit adjusted for required dilution
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RM-H	Reference Material recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-SHKFLSK-PCT-VA	Soil	Acidity by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2310 "Acidity".

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-SHKFLSK-PCT-VA	Soil	Alkalinity by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2320 "Alkalinity".

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-SHKFLSK-IC-VA	Soil	Anions by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.

This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ALS Test Code	Matrix	Test Description	Method Reference**
EC-SHKFLSK-PCT-VA	Soil	EC by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2510 "Conductivity".

ALS Test Code	Matrix	Test Description	Method Reference**
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/245.7

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-SHKFLSK-CVAFS-VA	Soil	Mercury by CVAFS (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES

Reference Information

This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

MET-200.2-CCMS-VA Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MET-SHKFLSK-ICP-VA Soil Metals by ICPOES (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-SHKFLSK-MS-VA Soil Metals by ICPMS (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using inductively coupled plasma - mass spectrophotometry (EPA Method 6020A).

MOISTURE-VA Soil Moisture content ASTM D2974-00 Method A

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

PH-1:2-VA Soil pH in Soil (1:2 Soil:Water Extraction) BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

PH-SHKFLSK-MAN-VA Soil pH by Manual Meter (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently analysed using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

10-334267

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: AMEC Environment & Infrastructure
600 - 4445 Lougheed Hwy
Burnaby BC V5C 0E4
Contact: HAMID YOUSEFBEIGI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACY-SHKFLSK-PCT-VA	**Soil**							
Batch R2942443								
WG1943070-1 MB								
Acidity (as CaCO3)			<1.0		mg/L		1	05-SEP-14
ALK-SHKFLSK-PCT-VA	**Soil**							
Batch R2942698								
WG1943070-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	08-SEP-14
ANIONS-SHKFLSK-IC-VA	**Soil**							
Batch R2940895								
WG1943070-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	06-SEP-14
Chloride (Cl)			<0.50		mg/L		0.5	06-SEP-14
Fluoride (F)			<0.020		mg/L		0.02	06-SEP-14
Nitrite (as N)			<0.0010		mg/L		0.001	06-SEP-14
Nitrate (as N)			1.56	MB-LOR	mg/L		0.005	06-SEP-14
Sulfate (SO4)			<0.50		mg/L		0.5	06-SEP-14
EC-SHKFLSK-PCT-VA	**Soil**							
Batch R2942698								
WG1943070-1 MB								
Conductivity			<40.0	MB-LOR	uS/cm		2	08-SEP-14
HG-200.2-CVAF-VA	**Soil**							
Batch R2918788								
WG1929248-5 CRM		**VA-NRC-STSD1**						
Mercury (Hg)			98.7		%		70-130	14-AUG-14
WG1929248-6 CRM		**VA-CANMET-TILL1**						
Mercury (Hg)			97.0		%		70-130	14-AUG-14
WG1929248-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			106.4		%		70-130	14-AUG-14
WG1929248-4 LCS								
Mercury (Hg)			85.7		%		70-130	14-AUG-14
WG1929248-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	14-AUG-14

Quality Control Report

Workorder: L1499580 Report Date: 12-SEP-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAF-VA	**Soil**							
Batch R2919013								
WG1929063-5 CRM		**VA-NRC-STSD1**						
Mercury (Hg)			97.6		%		70-130	14-AUG-14
WG1929063-6 CRM		**VA-CANMET-TILL1**						
Mercury (Hg)			92.0		%		70-130	14-AUG-14
WG1929127-5 CRM		**VA-NRC-STSD1**						
Mercury (Hg)			92.5		%		70-130	14-AUG-14
WG1929127-6 CRM		**VA-CANMET-TILL1**						
Mercury (Hg)			94.3		%		70-130	14-AUG-14
WG1929063-2 DUP		**L1499580-9**						
Mercury (Hg)		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	14-AUG-14
WG1929063-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			96.9		%		70-130	14-AUG-14
WG1929127-3 IRM		**ALS MET IRM1**						
Mercury (Hg)			96.6		%		70-130	14-AUG-14
WG1929063-4 LCS								
Mercury (Hg)			83.5		%		70-130	14-AUG-14
WG1929127-4 LCS								
Mercury (Hg)			85.5		%		70-130	14-AUG-14
WG1929063-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	14-AUG-14
WG1929127-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	14-AUG-14
HG-SHKFLSK-CVAFS-VA	**Soil**							
Batch R2939938								
WG1943070-1 MB								
Mercury (Hg)-Leachable			<0.000050		mg/L		0.00005	06-SEP-14
WG1946067-1 MB								
Mercury (Hg)-Leachable			<0.000050		mg/L		0.00005	06-SEP-14
MET-200.2-CCMS-VA	**Soil**							
Batch R2920417								
WG1929127-5 CRM		**VA-NRC-STSD1**						
Antimony (Sb)			97.9		%		70-130	14-AUG-14
Arsenic (As)			97.4		%		70-130	14-AUG-14
Barium (Ba)			94.2		%		70-130	14-AUG-14
Beryllium (Be)			106.0		%		70-130	14-AUG-14
Cadmium (Cd)			94.2		%		70-130	14-AUG-14
Chromium (Cr)			98.4		%		70-130	14-AUG-14
Cobalt (Co)			101.1		%		70-130	14-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2920417								
WG1929127-5 CRM		**VA-NRC-STSD1**						
Copper (Cu)			98.7		%		70-130	14-AUG-14
Lead (Pb)			96.1		%		70-130	14-AUG-14
Molybdenum (Mo)			101.6		%		70-130	14-AUG-14
Nickel (Ni)			99.9		%		70-130	14-AUG-14
Selenium (Se)			97.1		%		70-130	14-AUG-14
Silver (Ag)			97.9		%		70-130	14-AUG-14
Thallium (Tl)			97.9		%		70-130	14-AUG-14
Tin (Sn)			120.3		%		70-130	14-AUG-14
Vanadium (V)			98.3		%		70-130	14-AUG-14
Zinc (Zn)			96.6		%		70-130	14-AUG-14
WG1929127-6 CRM		**VA-CANMET-TILL1**						
Antimony (Sb)			103.6		%		70-130	14-AUG-14
Arsenic (As)			105.6		%		70-130	14-AUG-14
Barium (Ba)			101.1		%		70-130	14-AUG-14
Beryllium (Be)			0.49		mg/kg		0.34-0.74	14-AUG-14
Cadmium (Cd)			96.7		%		70-130	14-AUG-14
Chromium (Cr)			108.4		%		70-130	14-AUG-14
Cobalt (Co)			102.9		%		70-130	14-AUG-14
Copper (Cu)			98.7		%		70-130	14-AUG-14
Lead (Pb)			92.1		%		70-130	14-AUG-14
Molybdenum (Mo)			0.70		mg/kg		0.24-1.24	14-AUG-14
Nickel (Ni)			104.6		%		70-130	14-AUG-14
Selenium (Se)			0.33		mg/kg		0.12-0.52	14-AUG-14
Silver (Ag)			0.22		mg/kg		0.12-0.32	14-AUG-14
Thallium (Tl)			0.135		mg/kg		0.075-0.175	14-AUG-14
Tin (Sn)			1.0		mg/kg		0-3	14-AUG-14
Uranium (U)			107.7		%		70-130	14-AUG-14
Vanadium (V)			106.3		%		70-130	14-AUG-14
Zinc (Zn)			98.9		%		70-130	14-AUG-14
WG1929248-5 CRM		**VA-NRC-STSD1**						
Antimony (Sb)			101.2		%		70-130	14-AUG-14
Arsenic (As)			99.3		%		70-130	14-AUG-14
Barium (Ba)			96.8		%		70-130	14-AUG-14
Beryllium (Be)			106.8		%		70-130	14-AUG-14
Cadmium (Cd)			98.3		%		70-130	14-AUG-14

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2920417								
WG1929248-5 CRM		**VA-NRC-STSD1**						
Chromium (Cr)			100.0		%		70-130	14-AUG-14
Cobalt (Co)			100.3		%		70-130	14-AUG-14
Copper (Cu)			99.2		%		70-130	14-AUG-14
Lead (Pb)			101.5		%		70-130	14-AUG-14
Molybdenum (Mo)			103.0		%		70-130	14-AUG-14
Nickel (Ni)			101.2		%		70-130	14-AUG-14
Selenium (Se)			101.4		%		70-130	14-AUG-14
Silver (Ag)			104.8		%		70-130	14-AUG-14
Thallium (Tl)			107.9		%		70-130	14-AUG-14
Tin (Sn)			98.1		%		70-130	14-AUG-14
Vanadium (V)			100.3		%		70-130	14-AUG-14
Zinc (Zn)			98.1		%		70-130	14-AUG-14
WG1929248-6 CRM		**VA-CANMET-TILL1**						
Antimony (Sb)			103.8		%		70-130	14-AUG-14
Arsenic (As)			104.0		%		70-130	14-AUG-14
Barium (Ba)			101.6		%		70-130	14-AUG-14
Beryllium (Be)			0.54		mg/kg		0.34-0.74	14-AUG-14
Cadmium (Cd)			99.7		%		70-130	14-AUG-14
Chromium (Cr)			107.4		%		70-130	14-AUG-14
Cobalt (Co)			103.9		%		70-130	14-AUG-14
Copper (Cu)			99.1		%		70-130	14-AUG-14
Lead (Pb)			92.6		%		70-130	14-AUG-14
Molybdenum (Mo)			0.70		mg/kg		0.24-1.24	14-AUG-14
Nickel (Ni)			107.2		%		70-130	14-AUG-14
Selenium (Se)			0.33		mg/kg		0.12-0.52	14-AUG-14
Silver (Ag)			0.33	RM-H	mg/kg		0.12-0.32	14-AUG-14
Thallium (Tl)			0.132		mg/kg		0.075-0.175	14-AUG-14
Tin (Sn)			1.1		mg/kg		0-3	14-AUG-14
Uranium (U)			106.4		%		70-130	14-AUG-14
Vanadium (V)			107.0		%		70-130	14-AUG-14
Zinc (Zn)			100.6		%		70-130	14-AUG-14
WG1929127-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			103.6		%		70-130	14-AUG-14
Arsenic (As)			97.4		%		70-130	14-AUG-14
Barium (Ba)			96.7		%		70-130	14-AUG-14

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2920417								
WG1929127-3 IRM		**ALS MET IRM1**						
Beryllium (Be)			109.3		%		70-130	14-AUG-14
Cadmium (Cd)			95.8		%		70-130	14-AUG-14
Chromium (Cr)			98.9		%		70-130	14-AUG-14
Cobalt (Co)			98.8		%		70-130	14-AUG-14
Copper (Cu)			98.8		%		70-130	14-AUG-14
Lead (Pb)			103.6		%		70-130	14-AUG-14
Molybdenum (Mo)			102.7		%		70-130	14-AUG-14
Nickel (Ni)			99.8		%		70-130	14-AUG-14
Selenium (Se)			91.6		%		70-130	14-AUG-14
Silver (Ag)			105.0		%		70-130	14-AUG-14
Thallium (Tl)			106.5		%		70-130	14-AUG-14
Tin (Sn)			99.0		%		70-130	14-AUG-14
Uranium (U)			103.5		%		70-130	14-AUG-14
Vanadium (V)			99.9		%		70-130	14-AUG-14
Zinc (Zn)			95.9		%		70-130	14-AUG-14
WG1929248-3 IRM		**ALS MET IRM1**						
Antimony (Sb)			96.6		%		70-130	14-AUG-14
Arsenic (As)			99.2		%		70-130	14-AUG-14
Barium (Ba)			98.6		%		70-130	14-AUG-14
Beryllium (Be)			111.5		%		70-130	14-AUG-14
Cadmium (Cd)			100.1		%		70-130	14-AUG-14
Chromium (Cr)			100.9		%		70-130	14-AUG-14
Cobalt (Co)			101.4		%		70-130	14-AUG-14
Copper (Cu)			100.5		%		70-130	14-AUG-14
Lead (Pb)			101.3		%		70-130	14-AUG-14
Molybdenum (Mo)			98.1		%		70-130	14-AUG-14
Nickel (Ni)			101.8		%		70-130	14-AUG-14
Selenium (Se)			113.6		%		70-130	14-AUG-14
Silver (Ag)			102.8		%		70-130	14-AUG-14
Thallium (Tl)			122.0		%		70-130	14-AUG-14
Tin (Sn)			112.7		%		70-130	14-AUG-14
Uranium (U)			100.3		%		70-130	14-AUG-14
Vanadium (V)			100.0		%		70-130	14-AUG-14
Zinc (Zn)			98.1		%		70-130	14-AUG-14
WG1929127-4 LCS								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2920417								
WG1929127-4 LCS								
Antimony (Sb)			103.1		%		70-130	14-AUG-14
Arsenic (As)			102.7		%		70-130	14-AUG-14
Barium (Ba)			103.3		%		70-130	14-AUG-14
Beryllium (Be)			104.4		%		70-130	14-AUG-14
Cadmium (Cd)			99.3		%		70-130	14-AUG-14
Chromium (Cr)			103.2		%		70-130	14-AUG-14
Cobalt (Co)			101.8		%		70-130	14-AUG-14
Copper (Cu)			98.0		%		70-130	14-AUG-14
Lead (Pb)			101.8		%		70-130	14-AUG-14
Molybdenum (Mo)			105.4		%		70-130	14-AUG-14
Nickel (Ni)			102.7		%		70-130	14-AUG-14
Selenium (Se)			103.3		%		70-130	14-AUG-14
Silver (Ag)			99.1		%		70-130	14-AUG-14
Thallium (Tl)			104.2		%		70-130	14-AUG-14
Tin (Sn)			101.3		%		70-130	14-AUG-14
Uranium (U)			100.9		%		70-130	14-AUG-14
Vanadium (V)			99.9		%		70-130	14-AUG-14
Zinc (Zn)			97.9		%		70-130	14-AUG-14
WG1929248-4 LCS								
Antimony (Sb)			101.1		%		70-130	14-AUG-14
Arsenic (As)			101.6		%		70-130	14-AUG-14
Barium (Ba)			101.6		%		70-130	14-AUG-14
Beryllium (Be)			102.9		%		70-130	14-AUG-14
Cadmium (Cd)			99.3		%		70-130	14-AUG-14
Chromium (Cr)			98.2		%		70-130	14-AUG-14
Cobalt (Co)			99.5		%		70-130	14-AUG-14
Copper (Cu)			95.4		%		70-130	14-AUG-14
Lead (Pb)			99.5		%		70-130	14-AUG-14
Molybdenum (Mo)			102.7		%		70-130	14-AUG-14
Nickel (Ni)			98.5		%		70-130	14-AUG-14
Selenium (Se)			100.9		%		70-130	14-AUG-14
Silver (Ag)			97.2		%		70-130	14-AUG-14
Thallium (Tl)			100.8		%		70-130	14-AUG-14
Tin (Sn)			100.1		%		70-130	14-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2920417								
WG1929248-4 LCS								
Uranium (U)			101.0		%		70-130	14-AUG-14
Vanadium (V)			97.7		%		70-130	14-AUG-14
Zinc (Zn)			95.2		%		70-130	14-AUG-14
WG1929127-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	14-AUG-14
Arsenic (As)			<0.050		mg/kg		0.05	14-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	14-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	14-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	14-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	14-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	14-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	14-AUG-14
Lead (Pb)			<0.50		mg/kg		0.5	14-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	14-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	14-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	14-AUG-14
Silver (Ag)			<0.10		mg/kg		0.1	14-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	14-AUG-14
Tin (Sn)			<2.0		mg/kg		2	14-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	14-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	14-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	14-AUG-14
WG1929248-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	14-AUG-14
Arsenic (As)			<0.050		mg/kg		0.05	14-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	14-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	14-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	14-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	14-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	14-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	14-AUG-14
Lead (Pb)			<0.50		mg/kg		0.5	14-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	14-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	14-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	14-AUG-14

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2920417								
WG1929248-1 MB								
Silver (Ag)			<0.10		mg/kg		0.1	14-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	14-AUG-14
Tin (Sn)			<2.0		mg/kg		2	14-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	14-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	14-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	14-AUG-14
Batch R2920641								
WG1929063-5 CRM		**VA-NRC-STSD1**						
Antimony (Sb)			106.5		%		70-130	14-AUG-14
Arsenic (As)			98.1		%		70-130	14-AUG-14
Barium (Ba)			99.4		%		70-130	14-AUG-14
Beryllium (Be)			110.6		%		70-130	14-AUG-14
Cadmium (Cd)			102.6		%		70-130	14-AUG-14
Chromium (Cr)			103.1		%		70-130	14-AUG-14
Cobalt (Co)			100.0		%		70-130	14-AUG-14
Copper (Cu)			97.2		%		70-130	14-AUG-14
Lead (Pb)			111.9		%		70-130	14-AUG-14
Molybdenum (Mo)			101.8		%		70-130	14-AUG-14
Nickel (Ni)			99.4		%		70-130	14-AUG-14
Selenium (Se)			107.5		%		70-130	14-AUG-14
Silver (Ag)			106.8		%		70-130	14-AUG-14
Thallium (Tl)			110.8		%		70-130	14-AUG-14
Tin (Sn)			104.0		%		70-130	14-AUG-14
Vanadium (V)			105.7		%		70-130	14-AUG-14
Zinc (Zn)			104.8		%		70-130	14-AUG-14
WG1929063-6 CRM		**VA-CANMET-TILL1**						
Antimony (Sb)			109.6		%		70-130	14-AUG-14
Arsenic (As)			105.8		%		70-130	14-AUG-14
Barium (Ba)			104.3		%		70-130	14-AUG-14
Beryllium (Be)			0.56		mg/kg		0.34-0.74	14-AUG-14
Cadmium (Cd)			98.5		%		70-130	14-AUG-14
Chromium (Cr)			109.4		%		70-130	14-AUG-14
Cobalt (Co)			102.6		%		70-130	14-AUG-14
Copper (Cu)			97.9		%		70-130	14-AUG-14
Lead (Pb)			98.6		%		70-130	14-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2920641								
WG1929063-6 CRM		**VA-CANMET-TILL1**						
Molybdenum (Mo)			0.75		mg/kg		0.24-1.24	14-AUG-14
Nickel (Ni)			101.0		%		70-130	14-AUG-14
Selenium (Se)			0.33		mg/kg		0.12-0.52	14-AUG-14
Silver (Ag)			0.23		mg/kg		0.12-0.32	14-AUG-14
Thallium (Tl)			0.142		mg/kg		0.075-0.175	14-AUG-14
Tin (Sn)			1.1		mg/kg		0-3	14-AUG-14
Uranium (U)			118.8		%		70-130	14-AUG-14
Vanadium (V)			112.7		%		70-130	14-AUG-14
Zinc (Zn)			108.6		%		70-130	14-AUG-14
WG1929063-2 DUP		**L1499580-9**						
Antimony (Sb)		0.82	0.60	DUP-H	mg/kg	30	30	14-AUG-14
Arsenic (As)		9.40	11.1		mg/kg	17	30	14-AUG-14
Barium (Ba)		45.1	42.6		mg/kg	5.7	40	14-AUG-14
Beryllium (Be)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	14-AUG-14
Cadmium (Cd)		0.116	0.127		mg/kg	8.8	30	14-AUG-14
Chromium (Cr)		9.37	9.74		mg/kg	3.9	30	14-AUG-14
Cobalt (Co)		2.92	3.09		mg/kg	5.6	30	14-AUG-14
Copper (Cu)		5.94	6.45		mg/kg	8.2	30	14-AUG-14
Lead (Pb)		3.58	4.45		mg/kg	22	40	14-AUG-14
Molybdenum (Mo)		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	14-AUG-14
Nickel (Ni)		5.99	6.06		mg/kg	1.2	30	14-AUG-14
Selenium (Se)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	14-AUG-14
Silver (Ag)		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	14-AUG-14
Thallium (Tl)		<0.050	0.052	RPD-NA	mg/kg	N/A	30	14-AUG-14
Tin (Sn)		<2.0	<2.0	RPD-NA	mg/kg	N/A	40	14-AUG-14
Uranium (U)		0.305	0.341		mg/kg	11	30	14-AUG-14
Vanadium (V)		26.9	28.7		mg/kg	6.4	30	14-AUG-14
Zinc (Zn)		28.6	24.4		mg/kg	16	30	14-AUG-14
WG1929063-4 LCS								
Antimony (Sb)			107.9		%		70-130	14-AUG-14
Arsenic (As)			101.7		%		70-130	14-AUG-14
Barium (Ba)			103.2		%		70-130	14-AUG-14
Beryllium (Be)			102.2		%		70-130	14-AUG-14
Cadmium (Cd)			100.7		%		70-130	14-AUG-14
Chromium (Cr)			99.4		%		70-130	14-AUG-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2920641								
WG1929063-4 LCS								
Cobalt (Co)			98.4		%		70-130	14-AUG-14
Copper (Cu)			96.5		%		70-130	14-AUG-14
Lead (Pb)			105.3		%		70-130	14-AUG-14
Molybdenum (Mo)			102.0		%		70-130	14-AUG-14
Nickel (Ni)			96.6		%		70-130	14-AUG-14
Selenium (Se)			104.1		%		70-130	14-AUG-14
Silver (Ag)			98.7		%		70-130	14-AUG-14
Thallium (Tl)			104.7		%		70-130	14-AUG-14
Tin (Sn)			103.6		%		70-130	14-AUG-14
Uranium (U)			108.3		%		70-130	14-AUG-14
Vanadium (V)			101.1		%		70-130	14-AUG-14
Zinc (Zn)			101.2		%		70-130	14-AUG-14
Batch R2922522								
WG1929063-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	17-AUG-14
Arsenic (As)			<0.050		mg/kg		0.05	17-AUG-14
Barium (Ba)			<0.50		mg/kg		0.5	17-AUG-14
Beryllium (Be)			<0.20		mg/kg		0.2	17-AUG-14
Cadmium (Cd)			<0.050		mg/kg		0.05	17-AUG-14
Chromium (Cr)			<0.50		mg/kg		0.5	17-AUG-14
Cobalt (Co)			<0.10		mg/kg		0.1	17-AUG-14
Copper (Cu)			<0.50		mg/kg		0.5	17-AUG-14
Lead (Pb)			<0.50		mg/kg		0.5	17-AUG-14
Molybdenum (Mo)			<0.50		mg/kg		0.5	17-AUG-14
Nickel (Ni)			<0.50		mg/kg		0.5	17-AUG-14
Selenium (Se)			<0.20		mg/kg		0.2	17-AUG-14
Silver (Ag)			<0.10		mg/kg		0.1	17-AUG-14
Thallium (Tl)			<0.050		mg/kg		0.05	17-AUG-14
Tin (Sn)			<2.0		mg/kg		2	17-AUG-14
Uranium (U)			<0.050		mg/kg		0.05	17-AUG-14
Vanadium (V)			<0.20		mg/kg		0.2	17-AUG-14
Zinc (Zn)			<1.0		mg/kg		1	17-AUG-14
MET-SHKFLSK-ICP-VA	**Soil**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-SHKFLSK-ICP-VA	**Soil**							
Batch R2940671								
WG1943070-1 MB								
Iron (Fe)-Leachable			<0.030		mg/L		0.03	05-SEP-14
Phosphorus (P)-Leachable			<0.30		mg/L		0.3	05-SEP-14
Silicon (Si)-Leachable			<0.050		mg/L		0.05	05-SEP-14
Titanium (Ti)-Leachable			<0.010		mg/L		0.01	05-SEP-14
WG1943070-3 MS		**L1499580-16**						
Iron (Fe)-Leachable			N/A	MS-B	%		-	05-SEP-14
Phosphorus (P)-Leachable			104.6		%		70-130	05-SEP-14
Silicon (Si)-Leachable			N/A	MS-B	%		-	05-SEP-14
Titanium (Ti)-Leachable			97.2		%		70-130	05-SEP-14
MET-SHKFLSK-MS-VA	**Soil**							
Batch R2942414								
WG1943070-1 MB								
Aluminum (Al)-Leachable			<0.0050		mg/L		0.005	08-SEP-14
Antimony (Sb)-Leachable			<0.00010		mg/L		0.0001	08-SEP-14
Arsenic (As)-Leachable			<0.0010		mg/L		0.001	08-SEP-14
Barium (Ba)-Leachable			<0.0010		mg/L		0.001	08-SEP-14
Beryllium (Be)-Leachable			<0.00050		mg/L		0.0005	08-SEP-14
Bismuth (Bi)-Leachable			<0.00050		mg/L		0.0005	08-SEP-14
Boron (B)-Leachable			<0.010		mg/L		0.01	08-SEP-14
Cadmium (Cd)-Leachable			<0.000050		mg/L		0.00005	08-SEP-14
Calcium (Ca)-Leachable			<0.10		mg/L		0.1	08-SEP-14
Chromium (Cr)-Leachable			<0.00050		mg/L		0.0005	08-SEP-14
Cobalt (Co)-Leachable			<0.00010		mg/L		0.0001	08-SEP-14
Copper (Cu)-Leachable			<0.0010		mg/L		0.001	08-SEP-14
Lead (Pb)-Leachable			0.00018	B	mg/L		0.0001	08-SEP-14
Lithium (Li)-Leachable			<0.0050		mg/L		0.005	08-SEP-14
Magnesium (Mg)-Leachable			<0.050		mg/L		0.05	08-SEP-14
Manganese (Mn)-Leachable			<0.00050		mg/L		0.0005	08-SEP-14
Molybdenum (Mo)-Leachable			<0.00010		mg/L		0.0001	08-SEP-14
Nickel (Ni)-Leachable			<0.00050		mg/L		0.0005	08-SEP-14
Potassium (K)-Leachable			<0.050		mg/L		0.05	08-SEP-14
Selenium (Se)-Leachable			<0.00050		mg/L		0.0005	08-SEP-14
Silver (Ag)-Leachable			<0.000050		mg/L		0.00005	08-SEP-14
Sodium (Na)-Leachable			0.067	B	mg/L		0.05	08-SEP-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-SHKFLSK-MS-VA	**Soil**							
Batch R2942414								
WG1943070-1 MB								
Strontium (Sr)-Leachable			<0.00050		mg/L		0.0005	08-SEP-14
Thallium (Tl)-Leachable			<0.00010		mg/L		0.0001	08-SEP-14
Tin (Sn)-Leachable			<0.00050		mg/L		0.0005	08-SEP-14
Uranium (U)-Leachable			<0.000010		mg/L		0.00001	08-SEP-14
Vanadium (V)-Leachable			<0.0010		mg/L		0.001	08-SEP-14
Zinc (Zn)-Leachable			<0.010		mg/L		0.01	08-SEP-14
MOISTURE-VA	**Soil**							
Batch R2933558								
WG1941409-2 LCS								
Moisture			100.1		%		90-110	29-AUG-14
WG1941409-1 MB								
Moisture			<0.25		%		0.25	29-AUG-14
PH-1:2-VA	**Soil**							
Batch R2919058								
WG1929063-2 DUP		**L1499580-9**						
pH (1:2 soil:water)		6.63	6.59	J	pH	0.04	0.3	14-AUG-14

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RM-H	Reference Material recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Moisture content							
	11	08-AUG-14 13:45	29-AUG-14 04:53	14	21	days	EHT
	16	08-AUG-14 13:45	29-AUG-14 04:53	14	21	days	EHT
	17	08-AUG-14 13:45	29-AUG-14 04:53	14	21	days	EHT
	22	08-AUG-14 13:45	29-AUG-14 04:53	14	21	days	EHT
	23	08-AUG-14 13:45	29-AUG-14 04:53	14	21	days	EHT
	25	08-AUG-14 13:45	29-AUG-14 04:53	14	21	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1499580 were received on 08-AUG-14 16:05.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Minerals

ALS Canada Ltd.

2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Finalized Date: 20- AUG- 2014
Account: APN

CERTIFICATE VA14123203

Project: L1499580

P.O. No.: L1499580

This report is for 26 Sediment samples submitted to our lab in Vancouver, BC, Canada on 12- AUG- 2014.

The following have access to data associated with this certificate:

ALSE VANCOUVER WEBTRIEVE	SELAM WORKU	

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
LOG- 22	Sample login - Rcd w/o BarCode
PUL- 31	Pulverize split to 85% <75 um

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION
ME- MS41	51 anal. aqua regia ICPMS

To: ALS ENVIRONMENTAL
ATTN: SELAM WORKU
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

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 Minerals

ALS Canada Ltd.

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To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Project: L1499580

CERTIFICATE OF ANALYSIS VA14123203

Sample Description	Method Analyte Units LOR	WEI- 21 Recvd Wt. kg 0.02	ME- MS41 Ag ppm 0.01	ME- MS41 Al % 0.01	ME- MS41 As ppm 0.1	ME- MS41 Au ppm 0.2	ME- MS41 B ppm 10	ME- MS41 Ba ppm 10	ME- MS41 Be ppm 0.05	ME- MS41 Bi ppm 0.01	ME- MS41 Ca % 0.01	ME- MS41 Cd ppm 0.01	ME- MS41 Ce ppm 0.02	ME- MS41 Co ppm 0.1	ME- MS41 Cr ppm 1	ME- MS41 Cs ppm 0.05
L1499580- 1		0.18	0.03	0.81	12.6	<0.2	<10	90	0.19	0.05	0.31	0.08	19.75	3.9	14	0.56
L1499580- 2		0.20	0.03	0.63	4.4	<0.2	<10	90	0.17	0.07	0.34	0.08	19.95	3.3	11	0.51
L1499580- 3		0.24	0.03	0.63	4.7	<0.2	<10	100	0.18	0.06	0.56	0.08	21.2	3.8	14	0.53
L1499580- 4		0.20	0.04	0.81	4.6	<0.2	<10	100	0.22	0.07	0.40	0.08	19.05	4.0	13	0.57
L1499580- 5		0.18	0.03	0.86	4.2	<0.2	<10	90	0.19	0.08	0.37	0.06	17.00	3.8	15	0.73
L1499580- 6		0.18	0.29	0.97	72.6	<0.2	<10	140	0.30	0.15	0.31	0.58	23.0	5.0	21	1.23
L1499580- 7		0.20	0.07	0.72	12.7	<0.2	<10	120	0.19	0.08	0.30	0.26	19.20	3.7	15	0.83
L1499580- 8		0.20	0.07	0.69	9.4	<0.2	<10	110	0.18	0.09	0.34	0.19	17.20	3.6	14	0.69
L1499580- 9		0.18	0.07	0.61	15.6	<0.2	<10	100	0.17	0.07	0.30	0.16	17.90	3.4	12	0.65
L1499580- 10		0.18	0.05	0.55	9.1	<0.2	<10	110	0.15	0.07	0.41	0.11	18.20	3.1	10	0.59
L1499580- 11		0.20	0.04	0.53	8.2	<0.2	<10	100	0.17	0.06	0.27	0.10	18.50	3.3	10	0.58
L1499580- 12		0.20	0.05	0.52	25.0	<0.2	<10	90	0.16	0.09	0.28	0.16	18.25	3.8	10	0.59
L1499580- 13		0.22	0.04	0.63	5.5	<0.2	<10	90	0.15	0.06	0.25	0.08	15.55	3.0	13	0.67
L1499580- 14		0.24	0.12	0.67	35.6	<0.2	<10	110	0.23	0.14	0.36	0.28	21.9	4.5	13	1.24
L1499580- 15		0.22	2.94	0.80	172.0	<0.2	<10	120	0.24	2.96	0.54	1.93	21.8	3.6	14	0.86
L1499580- 16		0.22	3.41	0.71	198.0	0.2	<10	100	0.23	3.35	0.51	2.25	20.8	3.7	12	0.75
L1499580- 17		0.20	0.50	1.11	97.9	<0.2	<10	160	0.40	0.31	0.41	0.55	25.7	7.3	23	2.24
L1499580- 18		0.22	0.40	1.01	209	<0.2	<10	190	0.35	0.24	0.39	0.62	27.3	8.0	30	1.92
L1499580- 19		0.20	0.16	3.42	5.0	<0.2	<10	490	0.20	0.16	0.73	0.09	24.4	21.2	16	4.73
L1499580- 20		0.20	0.11	3.09	5.6	<0.2	<10	480	0.19	0.09	0.70	0.08	24.0	19.8	13	4.52
L1499580- 21		0.20	0.44	1.59	194.5	<0.2	<10	340	0.37	0.16	0.62	0.90	28.3	13.6	33	3.84
L1499580- 22		0.20	0.31	1.57	151.0	<0.2	<10	270	0.28	0.11	0.67	0.62	22.3	11.7	32	3.19
L1499580- 23		0.20	0.17	2.73	68.3	<0.2	<10	590	0.36	0.07	0.66	0.29	24.0	14.9	22	10.05
L1499580- 24		0.22	0.20	1.63	63.2	<0.2	<10	280	0.33	0.09	0.61	0.41	28.2	13.4	27	4.57
L1499580- 25		0.22	0.34	0.93	20.6	<0.2	<10	30	0.51	0.26	1.24	2.16	32.2	6.6	5	6.88
L1499580- 26		0.20	1.37	1.99	117.0	<0.2	<10	190	0.99	0.89	1.70	1.67	34.2	16.1	30	36.2

***** See Appendix Page for comments regarding this certificate *****

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To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Project: L1499580

CERTIFICATE OF ANALYSIS VA14123203

Method	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41
Analyte	Cu	Fe	Ga	Ge	Hf	Hg	In	K	La	Li	Mg	Mn	Mo	Na	Nb
Units	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	%	ppm
Sample Description LOR	0.2	0.01	0.05	0.05	0.02	0.01	0.005	0.01	0.2	0.1	0.01	5	0.05	0.01	0.05
L1499580- 1	9.6	1.30	2.66	<0.05	0.02	<0.01	0.012	0.10	10.1	5.0	0.25	187	0.36	0.05	0.80
L1499580- 2	7.3	1.21	2.25	<0.05	0.06	0.01	0.011	0.09	10.4	4.1	0.23	172	0.30	0.04	0.43
L1499580- 3	7.7	1.28	2.26	<0.05	0.10	0.01	0.012	0.10	11.1	4.2	0.26	168	0.31	0.05	0.45
L1499580- 4	9.6	1.23	2.67	<0.05	0.04	0.01	0.011	0.10	9.9	5.6	0.29	195	0.25	0.05	0.58
L1499580- 5	8.3	1.31	2.60	<0.05	0.02	0.01	0.009	0.10	9.2	5.3	0.28	185	0.27	0.06	1.05
L1499580- 6	19.6	1.96	3.32	<0.05	0.02	0.01	0.024	0.16	13.1	6.8	0.36	255	1.91	0.04	0.92
L1499580- 7	9.7	1.37	2.51	<0.05	0.02	0.01	0.014	0.11	10.7	4.9	0.27	209	0.61	0.04	0.97
L1499580- 8	8.8	1.36	2.23	<0.05	0.02	0.01	0.011	0.11	9.7	4.5	0.25	204	0.50	0.05	0.94
L1499580- 9	8.9	1.38	2.13	<0.05	0.02	0.01	0.010	0.09	9.9	4.0	0.21	240	0.49	0.05	0.78
L1499580- 10	7.2	1.26	1.91	<0.05	0.07	0.01	0.008	0.09	10.2	3.5	0.21	194	0.42	0.05	0.40
L1499580- 11	6.3	1.18	1.86	<0.05	0.06	0.01	0.010	0.09	10.2	3.6	0.18	182	0.38	0.04	0.50
L1499580- 12	6.7	1.35	1.89	<0.05	0.08	0.01	0.009	0.08	9.9	3.6	0.19	208	0.42	0.04	0.46
L1499580- 13	6.3	1.10	2.08	<0.05	0.02	<0.01	0.010	0.08	8.7	4.5	0.20	129	0.36	0.04	0.92
L1499580- 14	11.0	1.57	2.26	<0.05	0.02	0.01	0.016	0.13	12.6	4.7	0.25	280	0.76	0.03	0.85
L1499580- 15	43.7	1.57	2.66	<0.05	<0.02	0.05	0.048	0.08	12.7	5.0	0.25	281	0.52	0.05	0.82
L1499580- 16	48.9	1.56	2.46	<0.05	<0.02	0.05	0.050	0.07	12.3	4.4	0.23	292	0.54	0.05	0.69
L1499580- 17	27.1	2.30	3.86	0.05	0.15	0.04	0.034	0.13	14.0	6.9	0.34	321	0.70	0.03	0.57
L1499580- 18	24.6	2.87	3.39	<0.05	0.20	0.03	0.033	0.16	14.4	6.5	0.35	758	0.95	0.03	0.41
L1499580- 19	113.0	5.46	11.05	0.12	0.03	<0.01	0.051	1.01	11.8	31.8	2.67	517	0.19	0.08	0.12
L1499580- 20	82.9	4.96	10.20	0.12	0.03	<0.01	0.048	0.91	11.8	30.3	2.39	558	0.26	0.08	0.10
L1499580- 21	43.6	3.77	5.52	0.08	0.26	0.06	0.034	0.42	16.1	12.6	0.74	1380	1.33	0.04	0.24
L1499580- 22	35.8	3.46	5.32	0.08	0.22	0.04	0.032	0.44	12.3	10.7	0.76	1020	0.89	0.05	0.26
L1499580- 23	31.3	4.48	7.87	0.09	0.07	0.02	0.035	1.05	12.4	20.5	1.52	781	0.49	0.03	0.18
L1499580- 24	39.4	3.84	6.36	0.09	0.11	0.02	0.032	0.45	14.1	15.7	0.94	676	0.54	0.05	0.33
L1499580- 25	35.0	2.75	2.59	0.05	0.05	0.02	0.032	0.10	16.5	3.5	0.25	488	0.29	0.01	0.07
L1499580- 26	75.4	4.39	5.42	0.07	0.08	0.05	0.086	0.32	17.6	8.3	0.76	780	0.34	0.01	0.08

***** See Appendix Page for comments regarding this certificate *****

To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Project: L1499580

CERTIFICATE OF ANALYSIS VA14123203

Method	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41
Analyte	Ni	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti
Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
Sample Description LOR	0.2	10	0.2	0.1	0.001	0.01	0.05	0.1	0.2	0.2	0.2	0.01	0.01	0.2	0.005
L1499580- 1	8.5	370	3.3	6.9	<0.001	<0.01	0.55	2.4	0.3	0.3	28.3	<0.01	0.01	2.6	0.058
L1499580- 2	6.9	370	3.1	5.6	<0.001	<0.01	0.26	2.2	0.3	0.3	28.4	<0.01	0.01	2.8	0.052
L1499580- 3	7.2	400	3.6	5.8	<0.001	<0.01	0.33	2.3	0.2	0.3	34.3	<0.01	0.01	3.1	0.059
L1499580- 4	8.7	430	3.0	7.2	<0.001	<0.01	0.19	2.5	0.3	0.3	32.2	<0.01	0.01	2.7	0.062
L1499580- 5	8.0	420	2.8	6.4	<0.001	<0.01	0.17	2.3	0.3	0.3	28.3	<0.01	0.01	1.9	0.064
L1499580- 6	17.6	440	106.0	10.4	0.001	0.04	1.42	3.0	1.0	0.4	28.9	<0.01	0.04	3.1	0.047
L1499580- 7	9.6	380	7.4	6.7	<0.001	0.01	0.52	2.3	0.4	0.3	25.0	<0.01	0.02	2.8	0.047
L1499580- 8	8.4	390	5.9	5.9	<0.001	<0.01	0.44	2.1	0.4	0.3	26.3	<0.01	0.02	2.4	0.049
L1499580- 9	7.2	350	6.1	5.1	<0.001	<0.01	0.85	2.2	0.3	0.3	23.4	<0.01	0.01	2.7	0.047
L1499580- 10	6.4	320	4.3	4.9	<0.001	<0.01	0.59	1.9	0.3	0.3	26.2	<0.01	0.02	2.9	0.044
L1499580- 11	6.0	300	4.6	5.1	<0.001	<0.01	0.94	1.8	0.2	0.3	23.5	<0.01	0.01	2.8	0.038
L1499580- 12	7.4	310	6.4	4.8	<0.001	<0.01	0.66	1.9	0.3	0.3	22.2	<0.01	0.02	2.8	0.044
L1499580- 13	6.6	350	3.5	5.6	<0.001	<0.01	0.32	1.7	0.2	0.3	20.1	<0.01	0.01	1.9	0.041
L1499580- 14	10.7	380	10.3	7.3	<0.001	<0.01	1.30	2.2	0.4	0.3	23.1	<0.01	0.02	3.1	0.045
L1499580- 15	7.9	470	111.5	6.2	<0.001	0.26	23.6	2.1	0.5	0.4	38.2	<0.01	0.07	0.5	0.047
L1499580- 16	7.6	440	123.5	5.7	<0.001	0.28	27.3	2.0	0.4	0.4	38.1	<0.01	0.07	0.5	0.043
L1499580- 17	12.0	640	42.4	10.4	<0.001	<0.01	8.63	6.3	0.5	0.4	21.0	<0.01	0.07	3.9	0.067
L1499580- 18	13.6	800	28.8	10.2	<0.001	<0.01	8.41	5.7	0.4	0.4	21.5	<0.01	0.07	4.8	0.059
L1499580- 19	6.4	1420	3.2	38.1	<0.001	0.03	0.35	17.2	0.7	0.7	34.0	<0.01	0.03	2.4	0.196
L1499580- 20	5.6	1490	3.0	34.3	<0.001	0.02	0.31	15.5	0.5	0.6	30.8	<0.01	0.02	2.2	0.169
L1499580- 21	17.5	1240	28.6	19.4	<0.001	<0.01	6.19	9.4	0.6	0.6	48.2	<0.01	0.04	4.5	0.137
L1499580- 22	13.5	1320	20.0	16.6	<0.001	<0.01	4.60	8.5	0.5	0.6	47.3	<0.01	0.04	3.1	0.152
L1499580- 23	9.1	1130	14.1	42.7	<0.001	<0.01	2.95	11.0	0.5	0.6	62.7	<0.01	0.03	3.2	0.192
L1499580- 24	12.3	1140	18.0	20.3	<0.001	0.03	3.16	8.9	0.7	0.6	36.3	<0.01	0.04	4.1	0.127
L1499580- 25	2.7	410	20.8	7.6	<0.001	0.12	6.94	5.9	0.8	0.2	32.9	<0.01	0.01	4.8	<0.005
L1499580- 26	13.9	990	115.5	25.5	0.001	0.41	30.7	14.1	1.3	0.7	112.5	<0.01	0.04	4.9	0.037

***** See Appendix Page for comments regarding this certificate *****

To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Project: L1499580

CERTIFICATE OF ANALYSIS VA14123203

Sample Description	Method Analyte Units LOR	ME- MS41 Tl ppm 0.02	ME- MS41 U ppm 0.05	ME- MS41 V ppm 1	ME- MS41 W ppm 0.05	ME- MS41 Y ppm 0.05	ME- MS41 Zn ppm 2	ME- MS41 Zr ppm 0.5
L1499580- 1		0.06	0.43	29	0.18	4.59	23	1.0
L1499580- 2		0.05	0.43	27	0.14	4.81	19	2.2
L1499580- 3		0.05	0.46	31	2.06	5.15	19	2.8
L1499580- 4		0.07	0.44	28	0.15	5.48	23	1.7
L1499580- 5		0.06	0.38	29	0.22	5.03	22	0.6
L1499580- 6		0.14	0.83	57	0.35	5.45	88	0.6
L1499580- 7		0.08	0.53	36	0.28	4.39	39	0.9
L1499580- 8		0.06	0.46	33	0.17	4.47	31	0.9
L1499580- 9		0.06	0.45	32	0.18	4.29	32	1.0
L1499580- 10		0.05	0.43	26	0.14	4.29	23	2.3
L1499580- 11		0.05	0.42	24	0.15	3.77	23	1.9
L1499580- 12		0.06	0.39	28	0.12	4.00	28	2.3
L1499580- 13		0.06	0.43	24	0.87	3.49	20	0.6
L1499580- 14		0.10	0.55	32	0.38	4.79	60	0.9
L1499580- 15		0.14	0.65	34	0.17	6.28	133	<0.5
L1499580- 16		0.14	0.60	32	0.16	6.14	147	<0.5
L1499580- 17		0.31	0.75	51	0.27	9.42	99	5.6
L1499580- 18		0.28	0.88	51	0.57	8.70	99	6.5
L1499580- 19		0.28	0.71	203	0.29	9.55	90	0.7
L1499580- 20		0.24	0.65	178	0.42	9.30	83	0.7
L1499580- 21		0.41	0.75	81	0.47	12.20	145	9.4
L1499580- 22		0.32	0.66	79	0.44	10.55	120	6.9
L1499580- 23		0.35	0.54	124	0.26	10.25	101	2.7
L1499580- 24		0.25	0.74	109	0.38	10.45	90	4.1
L1499580- 25		0.13	0.37	32	0.28	22.7	193	1.2
L1499580- 26		0.27	0.56	82	0.20	19.90	210	1.6

***** See Appendix Page for comments regarding this certificate *****

Project: L1499580

CERTIFICATE OF ANALYSIS VA14123203

CERTIFICATE COMMENTS

ANALYTICAL COMMENTS

Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5g).

Applies to Method: ME-MS41

LABORATORY ADDRESSES

Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.

Applies to Method: LOG-22 ME-MS41 PUL-31 WEI-21

ALS Minerals

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Page: 1
Total # Pages: 2 (A - D)
Plus Appendix Pages
Finalized Date: 20- AUG- 2014
Account: APN

QC CERTIFICATE VA14123203

Project: L1499580
P.O. No.: L1499580
This report is for 26 Sediment samples submitted to our lab in Vancouver, BC, Canada on 12- AUG- 2014.

The following have access to data associated with this certificate:

ALSE VANCOUVER WEBTRIEVE	SELAM WORKU	

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
LOG- 22	Sample login - Rcd w/o BarCode
PUL- 31	Pulverize split to 85% <75 um

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION
ME- MS41	51 anal. aqua regia ICPMS

To: ALS ENVIRONMENTAL
ATTN: SELAM WORKU
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

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 Minerals

ALS Canada Ltd.

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North Vancouver BC V7H 0A7
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To: ALS ENVIRONMENTAL
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Project: L1499580

QC CERTIFICATE OF ANALYSIS VA14123203

Method Analyte Units LOR	ME- MS41 Ag ppm 0.01	ME- MS41 Al % 0.01	ME- MS41 As ppm 0.1	ME- MS41 Au ppm 0.2	ME- MS41 B ppm 10	ME- MS41 Ba ppm 10	ME- MS41 Be ppm 0.05	ME- MS41 Bi ppm 0.01	ME- MS41 Ca % 0.01	ME- MS41 Cd ppm 0.01	ME- MS41 Ce ppm 0.02	ME- MS41 Co ppm 0.1	ME- MS41 Cr ppm 1	ME- MS41 Cs ppm 0.05	ME- MS41 Cu ppm 0.2
Sample Description															
STANDARDS															
GBM908- 10	3.00	1.02	54.5	0.6	<10	110	0.34	1.37	0.72	1.72	89.2	14.3	22	0.80	3800
Target Range - Lower Bound	2.69	0.85	49.4	<0.2	<10	70	0.17	1.09	0.62	1.52	79.3	12.9	20	0.66	3380
Upper Bound	3.31	1.06	60.6	0.8	30	140	0.40	1.35	0.79	1.86	97.0	15.9	27	0.94	3880
GBM908- 5	58.0	1.16	6.0	0.2	<10	200	0.36	0.90	0.73	0.14	193.0	10.3	18	1.20	497
Target Range - Lower Bound	52.4	1.02	5.8	<0.2	<10	160	0.30	0.79	0.63	0.12	170.5	9.4	15	0.98	465
Upper Bound	64.0	1.26	7.4	0.6	30	230	0.54	0.98	0.79	0.17	208	11.7	20	1.31	535
MRGeo08	4.40	2.64	30.7	<0.2	<10	460	0.86	0.65	1.08	2.19	74.1	18.4	90	10.55	629
Target Range - Lower Bound	4.00	2.44	28.9	<0.2	<10	370	0.66	0.62	1.00	2.01	66.7	17.5	81	9.85	587
Upper Bound	4.92	3.00	35.5	0.6	20	530	0.94	0.78	1.24	2.47	81.5	21.6	102	12.15	675
OREAS 90	0.04	2.23	4.4	<0.2	<10	50	0.52	0.83	0.37	0.01	61.1	14.6	38	1.01	106.0
Target Range - Lower Bound	0.03	2.09	4.1	<0.2	<10	30	0.46	0.82	0.33	<0.01	54.5	13.7	35	0.86	102.0
Upper Bound	0.07	2.57	5.2	0.4	20	80	0.74	1.02	0.43	0.03	66.7	16.9	45	1.16	118.0
BLANKS															
BLANK	<0.01	<0.01	0.1	<0.2	<10	<10	<0.05	<0.01	<0.01	<0.01	<0.02	<0.1	<1	<0.05	<0.2
BLANK	<0.01	<0.01	0.1	<0.2	<10	<10	<0.05	<0.01	<0.01	<0.01	<0.02	<0.1	<1	<0.05	<0.2
Target Range - Lower Bound	<0.01	<0.01	<0.1	<0.2	<10	<10	<0.05	<0.01	<0.01	<0.01	<0.02	<0.1	<1	<0.05	<0.2
Upper Bound	0.02	0.02	0.2	0.4	20	20	0.10	0.02	0.02	0.02	0.04	0.2	2	0.10	0.4
DUPLICATES															
ORIGINAL	0.11	1.60	4.6	<0.2	<10	120	0.24	0.06	1.21	0.17	12.30	9.6	37	0.40	52.8
DUP	0.12	1.55	4.7	<0.2	<10	110	0.19	0.06	1.19	0.15	11.70	9.2	36	0.40	51.3
Target Range - Lower Bound	0.10	1.49	4.3	<0.2	<10	100	0.15	0.05	1.13	0.14	11.40	8.8	34	0.33	50.0
Upper Bound	0.13	1.66	5.0	0.4	20	130	0.28	0.07	1.27	0.18	12.60	10.0	39	0.47	54.1
L1499580- 14	0.12	0.67	35.6	<0.2	<10	110	0.23	0.14	0.36	0.28	21.9	4.5	13	1.24	11.0
DUP	0.12	0.67	37.2	<0.2	<10	120	0.24	0.15	0.37	0.29	21.6	4.8	13	1.22	11.6
Target Range - Lower Bound	0.10	0.63	34.5	<0.2	<10	100	0.17	0.13	0.34	0.26	20.6	4.3	11	1.12	10.7
Upper Bound	0.14	0.71	38.3	0.4	20	130	0.30	0.16	0.39	0.31	22.9	5.0	15	1.34	11.9

***** See Appendix Page for comments regarding this certificate *****

ALS Minerals

ALS Canada Ltd.

2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Finalized Date: 20- AUG- 2014
Account: APN

Project: L1499580

QC CERTIFICATE OF ANALYSIS VA14123203

Sample Description / Method	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41
Analyte	Fe	Ga	Ge	Hf	Hg	In	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni
Units	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	%	ppm	ppm
LOR	0.01	0.05	0.05	0.02	0.01	0.005	0.01	0.2	0.1	0.01	5	0.05	0.01	0.05	0.2
STANDARDS															
GBM908- 10	2.67	4.45	0.10	0.63	0.01	0.030	0.43	47.3	6.4	0.56	309	62.7	0.14	0.33	2360
Target Range - Lower Bound	2.35	4.18	0.09	0.62	<0.01	0.012	0.37	43.2	5.6	0.47	259	57.9	0.09	0.38	2030
Upper Bound	2.89	5.22	0.31	0.80	0.04	0.034	0.48	53.2	7.1	0.59	327	70.9	0.15	0.63	2480
GBM908- 5	2.36	5.80	0.15	0.33	0.02	0.021	0.83	110.5	10.0	0.78	355	52.3	0.03	0.88	418
Target Range - Lower Bound	2.13	5.31	0.08	0.29	<0.01	<0.005	0.73	91.9	9.4	0.68	315	49.5	0.02	0.69	381
Upper Bound	2.62	6.60	0.30	0.41	0.05	0.026	0.91	112.5	11.7	0.86	396	60.6	0.06	1.20	466
MRGeo08	3.53	8.94	0.14	0.75	0.06	0.168	1.23	36.5	36.3	1.19	425	13.40	0.33	1.05	697
Target Range - Lower Bound	3.22	8.89	0.10	0.67	0.04	0.142	1.12	33.2	30.2	1.03	378	13.10	0.30	0.79	622
Upper Bound	3.96	10.95	0.32	0.87	0.10	0.184	1.40	41.0	37.2	1.29	473	16.10	0.39	1.09	760
OREAS 90	3.61	5.99	0.07	0.67	<0.01	0.033	0.34	33.6	16.5	1.36	593	0.32	0.01	0.38	83.6
Target Range - Lower Bound	3.39	5.78	<0.05	0.61	<0.01	0.016	0.31	27.9	17.8	1.21	515	0.28	<0.01	0.27	76.5
Upper Bound	4.17	7.17	0.19	0.79	0.02	0.038	0.40	34.5	22.0	1.50	641	0.52	0.04	0.51	93.9
BLANKS															
BLANK	<0.01	<0.05	<0.05	<0.02	<0.01	<0.005	<0.01	<0.2	<0.1	<0.01	<5	<0.05	<0.01	0.05	<0.2
BLANK	<0.01	<0.05	<0.05	<0.02	<0.01	<0.005	<0.01	<0.2	0.1	<0.01	<5	<0.05	<0.01	0.05	0.3
Target Range - Lower Bound	<0.01	<0.05	<0.05	<0.02	<0.01	<0.005	<0.01	<0.2	<0.1	<0.01	<5	<0.05	<0.01	<0.05	<0.2
Upper Bound	0.02	0.10	0.10	0.04	0.02	0.010	0.02	0.4	0.2	0.02	10	0.10	0.02	0.10	0.4
DUPLICATES															
ORIGINAL	2.99	5.22	0.07	0.30	0.02	0.024	0.10	5.5	10.4	0.79	520	5.76	0.09	0.23	33.9
DUP	2.97	5.16	0.08	0.32	0.03	0.024	0.10	5.2	8.3	0.77	502	5.51	0.09	0.24	32.3
Target Range - Lower Bound	2.82	4.88	<0.05	0.27	<0.01	0.018	0.09	4.9	8.8	0.73	480	5.30	0.08	0.17	31.2
Upper Bound	3.14	5.50	0.10	0.35	0.04	0.030	0.12	5.8	9.9	0.83	542	5.97	0.10	0.30	35.0
L1499580- 14	1.57	2.26	<0.05	0.02	0.01	0.016	0.13	12.6	4.7	0.25	280	0.76	0.03	0.86	10.7
DUP	1.61	2.33	<0.05	0.02	0.01	0.016	0.13	12.1	4.4	0.26	289	0.74	0.03	0.88	11.3
Target Range - Lower Bound	1.50	2.13	<0.05	<0.02	<0.01	0.010	0.11	11.5	4.2	0.23	265	0.66	0.02	0.78	10.3
Upper Bound	1.68	2.46	0.10	0.04	0.02	0.022	0.15	13.2	4.9	0.28	304	0.84	0.04	0.96	11.8

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North Vancouver BC V7H 0A7
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To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Project: L1499580

QC CERTIFICATE OF ANALYSIS VA14123203

Sample Description	Method	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41
	Analyte	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl
	Units	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm
	LOR	10	0.2	0.1	0.001	0.01	0.05	0.1	0.2	0.2	0.2	0.01	0.01	0.2	0.005	0.02
		STANDARDS														
GBM908- 10		890	2100	29.5	<0.001	0.39	1.12	2.1	1.0	1.7	35.7	<0.01	0.04	16.7	0.322	0.23
Target Range - Lower Bound		760	1860	26.4	<0.001	0.33	1.06	1.8	0.5	1.2	30.8	<0.01	0.02	15.2	0.276	0.15
Upper Bound		960	2270	32.4	0.003	0.43	1.55	2.4	1.3	2.2	38.0	0.03	0.07	19.0	0.348	0.27
GBM908- 5		1290	369	54.6	0.001	0.16	0.13	1.6	1.1	1.7	56.2	0.01	0.04	37.4	0.176	0.42
Target Range - Lower Bound		1140	345	50.8	<0.001	0.14	<0.05	1.3	0.5	1.1	47.3	<0.01	0.02	34.4	0.146	0.31
Upper Bound		1410	422	62.3	0.003	0.20	0.25	1.9	1.4	2.0	58.2	0.03	0.07	42.4	0.189	0.47
MRGeo08		1030	1070	139.5	0.007	0.30	2.86	7.3	1.5	3.3	78.4	0.01	0.03	20.9	0.362	0.81
Target Range - Lower Bound		900	959	132.0	0.007	0.27	2.80	6.8	0.9	2.8	73.2	<0.01	<0.01	19.5	0.350	0.66
Upper Bound		1130	1175	162.0	0.011	0.36	3.90	8.6	1.9	4.0	89.9	0.04	0.04	24.3	0.439	0.94
OREAS 90		640	5.3	19.9	<0.001	0.06	0.38	2.3	0.9	1.3	11.2	0.01	0.02	15.9	0.090	0.12
Target Range - Lower Bound		570	4.8	18.0	<0.001	0.05	0.31	2.1	0.4	0.8	10.5	<0.01	<0.01	14.3	0.070	0.06
Upper Bound		720	6.3	22.3	0.002	0.09	0.60	2.7	1.3	1.8	13.3	0.04	0.05	17.9	0.098	0.16
		BLANKS														
BLANK		<10	<0.2	<0.1	<0.001	<0.01	<0.05	<0.1	<0.2	<0.2	<0.2	<0.01	0.01	<0.2	<0.005	<0.02
BLANK		<10	<0.2	<0.1	<0.001	<0.01	<0.05	<0.1	<0.2	<0.2	<0.2	<0.01	<0.01	<0.2	<0.005	<0.02
Target Range - Lower Bound		<10	<0.2	<0.1	<0.001	<0.01	<0.05	<0.1	<0.2	<0.2	<0.2	<0.01	<0.01	<0.2	<0.005	<0.02
Upper Bound		20	0.4	0.2	0.002	0.02	0.10	0.2	0.4	0.4	0.4	0.02	0.02	0.4	0.010	0.04
		DUPLICATES														
ORIGINAL		610	4.2	4.3	0.001	0.06	0.54	5.2	0.6	1.1	50.7	<0.01	0.03	1.2	0.153	0.06
DUP		590	4.1	4.3	0.002	0.06	0.53	5.1	0.6	1.1	49.3	<0.01	0.03	1.1	0.153	0.06
Target Range - Lower Bound		560	3.7	4.0	<0.001	0.05	0.44	4.8	0.4	0.8	47.3	<0.01	0.02	0.9	0.140	0.04
Upper Bound		640	4.6	4.6	0.002	0.07	0.63	5.5	0.8	1.4	52.7	0.02	0.04	1.4	0.166	0.08
L1499580- 14		380	10.3	7.3	<0.001	<0.01	1.30	2.2	0.4	0.3	23.1	<0.01	0.02	3.1	0.045	0.10
DUP		390	11.0	7.7	<0.001	<0.01	1.28	2.4	0.4	0.3	24.5	<0.01	0.02	3.3	0.047	0.10
Target Range - Lower Bound		360	9.9	7.0	<0.001	<0.01	1.14	2.1	<0.2	<0.2	22.4	<0.01	<0.01	2.8	0.039	0.07
Upper Bound		410	11.4	8.0	0.002	0.02	1.44	2.5	0.6	0.4	25.2	0.02	0.03	3.6	0.053	0.13

***** See Appendix Page for comments regarding this certificate *****

ALS Minerals

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2103 Dollarton Hwy
North Vancouver BC V7H 0A7
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To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Finalized Date: 20- AUG- 2014
Account: APN

Project: L1499580

QC CERTIFICATE OF ANALYSIS VA14123203

Method	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41	ME- MS41
Analyte	U	V	W	Y	Zn	Zr
Units	ppm	ppm	ppm	ppm	ppm	ppm
Sample Description / LOR	0.05	1	0.05	0.05	2	0.5
STANDARDS						
GBM908- 10	1.34	50	1.96	19.00	1020	25.1
Target Range - Lower Bound	1.15	41	1.57	17.55	939	24.0
Upper Bound	1.61	53	2.24	21.6	1155	33.6
GBM908- 5	3.00	27	2.28	29.3	221	8.7
Target Range - Lower Bound	2.64	22	1.75	25.4	214	8.8
Upper Bound	3.34	29	2.48	31.1	266	10.5
MRGeo08	5.67	103	2.53	18.50	768	20.1
Target Range - Lower Bound	4.99	90	2.44	17.85	708	18.1
Upper Bound	6.21	112	3.42	21.9	870	25.7
OREAS 90	2.10	20	0.42	17.25	53	24.3
Target Range - Lower Bound	1.81	19	0.28	15.40	51	20.6
Upper Bound	2.33	25	0.56	18.90	66	29.1
BLANKS						
BLANK	<0.05	<1	<0.05	<0.05	<2	<0.5
BLANK	<0.05	<1	<0.05	<0.05	<2	<0.5
Target Range - Lower Bound	<0.05	<1	<0.05	<0.05	<2	<0.5
Upper Bound	0.10	2	0.10	0.10	4	1.0
DUPLICATES						
ORIGINAL	0.34	67	0.62	8.12	44	8.5
DUP	0.33	65	0.44	8.04	43	8.5
Target Range - Lower Bound	0.27	62	0.44	7.63	39	7.4
Upper Bound	0.40	70	0.62	8.53	48	9.6
L1499580- 14	0.55	32	0.38	4.79	60	0.9
DUP	0.60	32	0.39	5.08	61	0.9
Target Range - Lower Bound	0.50	29	0.31	4.64	55	<0.5
Upper Bound	0.65	35	0.46	5.23	66	1.0

***** See Appendix Page for comments regarding this certificate *****

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: ALS ENVIRONMENTAL
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Page: Appendix 1
Total # Appendix Pages: 1
Finalized Date: 20- AUG- 2014
Account: APN

Project: L1499580

QC CERTIFICATE OF ANALYSIS VA14123203

CERTIFICATE COMMENTS

ANALYTICAL COMMENTS

Gold determinations by this method are semi- quantitative due to the small sample weight used (0.5g).

Applies to Method: ME- MS41

LABORATORY ADDRESSES

Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.

Applies to Method: LOG- 22 ME- MS41 PUL- 31 WEI- 21

10- 334267

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

Page ____ of ____

Report To HAMID YOUSEFBEIGI
Company: AMEC
Contact:
Address: 4445 LOUGHEED HWY SUITE 600
BURNABY, BC V5C 0E4
Phone: 604-295-6187 Fax:

Invoice To Same as Report ? (circle) Yes or No (if No, provide details)
Copy of Invoice with Report? (circle) Yes or No
Company: Same as above
Contact:
Address:
Phone:
Lab Work Or

L1499580-COFC

Report Format / Distribution
Standard: Other (specify):
Select: PDF ✓ Excel ✓ Digital Fax
Email 1:
Email 2:

Client / Project Information
Job #: VM00605J
PO / AFE:
LSD:
Quote #:
ALS Contact:
Sampler: Avger

Service Request:(Rush subject to availability - Contact ALS to confirm TAT)

✓	Regular (Standard Turnaround Times - Business Days)
	Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
	Same Day or Weekend Emergency - Contact ALS to confirm TAT

Analysis Request
(Indicate Filtered or Preserved, F/P)

Sample #	(This description will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	PH - 1:2-VA	Total Metal CSR	METAL-AquaRegia ME-MS41	SHKFLSK-ICP+MS-HG-VA									Number of Containers
	BH-T-14-01	GS1m, GS3m GS4m	08-Aug-14	13:45	SOIL	X	X	X										
	BH-T-14-02	GS 2m, GS3m	" " "	" "	"	X	X	X	HOLD - HOLD									
	BH-T-14-06	GS1m, GS2m, GS 4.6m	" " "	" "	"	X	X	X										
	BH-T-14-07	GS1m, GS4m	" " "	" "	"	X	X	X										
	BH-T-14-08	GS 2m, GS3m	" " "	" "	"	X	X	X										
	BH-T-14-09	GS1m, GS2m	" " "	" "	"	X	X	X										
	BH-T-14-17	GS 2m, GS3 m	" " "	" "	"	X	X	X										
	BH-C-14-01	GS1 m, GS3 m	" " "	" "	"	X	X	X										
	BH-C-14-02	GS1m, GS 2m	" " "	" "	"	X	X	X										
	BH-C-14-03	GS2m, GS3 m	" " "	" "	"	X	X	X										
	BH-C-14-04	GS 2m, GS 4m	" " "	" "	"	X	X	X										
	BH-M-14-05	GS1m, GS2m	" " "	" "	"	X	X	X										

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

HOLD FOR "SHKFLSK-ICP+MS-HG-VA" tests ONCE WE GET THE RESULTS, WE WILL SELECT WHICH SAMPLES TO BE TESTE
SAMPLES

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Hamid	Date: Aug. 8/14	Time: 14:00	Received by:	Date: Aug. 8/14	Time: 14:05	Temperature: 25.5 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Mount Nansen Remediation Project
2014 Site Investigation Locations
Sediment Sample Quality Assurance and Quality Control

Parameter	**Unit**	**Detection Limits**	SED-DC-14-30 22-JUL-14 L1491427-11	SED-DC-14-30 DUP 22-JUL-14 L1491427-12	RPD	SED-DC-14-40 22-JUL-14 L1491427-22	SED-DC-14-40 DUP 22-JUL-14 L1491427-23	RPD	SED-DC-14-50 22-JUL-14 L1491427-33	SED-DC-14-50 DUP 22-JUL-14 L1491427-34	RPD	SED.DC.14-60 24-JUL-14 L1493277-5	SED.DC.14-60 DUP 24-JUL-14 L1493277-6	RPD	SED.DC.14-70 24-JUL-14 L1493277-16	SED.DC.14-70 DUP 24-JUL-14 L1493277-17	RPD	SED.DC.14-80 24-JUL-14 L1493277-27	SED.DC.14-80 DUP 24-JUL-14 L1493277-28	RPD
Moisture	%	0.25	18.7	21.3	13.0%	17.3	17.5	1.1%	16.1	16.6	3.1%	38.5	40.5	5.1%	39.8	34.5	14.3%	23.3	31.6	30.2%
pH (1:2 soil:water)		0.1	7.90	7.93	0.4%	7.82	7.88	0.8%	7.99	8.04	0.6%	7.58	7.52	0.8%	7.82	7.91	1.1%	7.40	7.41	0.1%
Cyanide, Total	mg/kg	0.05-1.0	<0.050	<0.050	---	0.057	<0.050	---	<0.050	0.068	---	<1.0	<1.0	---	<1.0	<0.50	---	<1.0	<1.0	---
Antimony (Sb)	mg/kg	0.1	2.34	1.95	18.2%	0.60	0.50	18.2%	0.82	0.87	5.9%	1.89	2.38	23.0%	62.3	66.5	6.5%	3.21	3.01	6.4%
Arsenic (As)	mg/kg	0.05	108	109	0.9%	23.0	18.6	21.2%	36.3	31.9	12.9%	39.6	46.4	15.8%	1340	1110	18.8%	65.8	72.3	9.4%
Barium (Ba)	mg/kg	0.5	38.8	38.4	1.0%	33.7	31.9	5.5%	37.0	41.0	10.3%	69.1	88.1	24.2%	173.0	121.0	35.4%	49.3	53.4	8.0%
Beryllium (Be)	mg/kg	0.2	<0.20	<0.20	---	<0.20	<0.20	---	<0.20	<0.20	---	<0.20	<0.20	---	0.24	<0.20	---	<0.20	<0.20	---
Cadmium (Cd)	mg/kg	0.05	0.176	0.185	5.0%	0.084	0.151	57.0%	0.157	0.110	35.2%	0.498	0.549	9.7%	11.0	9.88	10.7%	0.152	0.164	7.6%
Chromium (Cr)	mg/kg	0.5	4.55	4.59	0.9%	5.90	6.31	6.7%	9.58	7.36	26.2%	10.9	13.2	19.1%	13.7	8.55	46.3%	6.28	7.05	11.6%
Cobalt (Co)	mg/kg	0.1	2.03	1.92	5.6%	2.17	1.99	8.7%	2.83	2.53	11.2%	3.59	4.02	11.3%	5.61	5.87	4.5%	4.05	3.87	4.5%
Copper (Cu)	mg/kg	0.5	4.45	3.63	20.3%	3.91	3.29	17.2%	5.60	4.60	19.6%	8.15	11.2	31.5%	40.0	29.80	29.2%	7.51	07.0	6.7%
Lead (Pb)	mg/kg	0.5	11.3	11.7	3.5%	3.57	3.51	1.7%	5.10	4.23	18.6%	8.39	8.39	0.0%	246	232	5.9%	9.98	9.44	5.6%
Mercury (Hg)	mg/kg	0.05	<0.050	<0.050	---	<0.050	<0.050	---	<0.050	<0.050	---	<0.050	<0.050	---	0.074	0.054	31.3%	<0.050	<0.050	---
Molybdenum (Mo)	mg/kg	0.5	<0.50	<0.50	---	<0.50	<0.50	---	<0.50	<0.50	---	<0.50	<0.50	---	<0.50	0.51	---	<0.50	<0.50	---
Nickel (Ni)	mg/kg	0.5	3.66	3.29	10.6%	4.14	3.66	12.3%	4.76	4.40	7.9%	6.97	8.28	17.2%	8.16	6.05	29.7%	3.73	4.00	7.0%
Selenium (Se)	mg/kg	0.2	<0.20	<0.20	---	<0.20	<0.20	---	<0.20	<0.20	---	0.23	0.28	19.6%	0.60	0.36	50.0%	<0.20	<0.20	---
Silver (Ag)	mg/kg	0.1	0.11	0.18	48.3%	<0.10	<0.10	---	<0.10	<0.10	---	0.13	0.23	55.6%	4.26	4.54	6.4%	0.12	0.13	8.0%
Thallium (Tl)	mg/kg	0.05	<0.050	<0.050	---	<0.050	<0.050	---	<0.050	<0.050	---	0.085	0.113	28.3%	0.291	0.249	15.6%	0.152	0.133	13.3%
Tin (Sn)	mg/kg	2	<2.0	<2.0	---	<2.0	<2.0	---	<2.0	<2.0	---	<2.0	<2.0	---	<2.0	<2.0	---	<2.0	<2.0	---
Uranium (U)	mg/kg	0.05	0.214	0.196	8.8%	0.221	0.235	6.1%	0.287	0.247	15.0%	0.524	0.705	29.5%	1.040	0.554	61.0%	0.339	0.338	0.3%
Vanadium (V)	mg/kg	0.2	14.20	13.60	4.3%	15.2	15.6	2.6%	34.3	24.3	34.1%	25.5	30.0	16.2%	34.1	27.1	22.9%	29	29.1	0.3%
Zinc (Zn)	mg/kg	1	37.00	34.70	6.4%	23.5	26.4	11.6%	31.2	30.1	3.6%	86.2	102	16.8%	1110	913	19.5%	43.1	42.7	0.9%

Note:

For concentrations greater than or equal to five times the MDL, the RPD should be less than or equal to 40%.

For concentrations less than five times the MDL, the difference between two laboratory duplicate values should not be more than four times the detection limit.

RPD value outside the QA/QC limits

Analysis

Keep original sample SED.DC.14-70 as it is more conservative than the duplicate.

Appendix 4F – Geochemical Results

SUMMIT ENVIRONMENTAL CONSULTANTS INC.
ATTN: Nicole Jacques
301 - 4109 4th Avenue
Whitehorse YT Y1A 1H6

Date Received:	25-JUL-14
Report Date:	07-AUG-14 14:44 (MT)
Version:	FINAL

Client Phone: 867-456-2711

Certificate of Analysis

Lab Work Order #:	**L1493185**
Project P.O. #:	NOT SUBMITTED
Job Reference:	SEC400-AGR300-VA
C of C Numbers:	1
Legal Site Desc:	

Dean Watt
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1493185-1	L1493185-2	L1493185-3	L1493185-4
	Description	Leachate	Leachate	Leachate	Leachate
	Sampled Date	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14
	Sampled Time	16:30	16:30	16:30	16:30
	Client ID	FIELD BIN - WASTE ROCK	FIELD BIN - ORE	FIELD BIN - TAILINGS + ORGANIC	FIELD BIN - TAILINGS SAND
Grouping	**Analyte**				
WATER					
Physical Tests	Conductivity (uS/cm)	2300	2700	2560	1690
	Hardness (as CaCO3) (mg/L)	1740	2120	1790	1130
	pH (pH)	7.58	6.20	7.26	8.46
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	4.7	11.9	19.8	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	22.5	21.0	93.2	26.5
	Chloride (Cl) (mg/L)	<10 DLA	<10 DLA	<10 DLA	<5.0 DLA
	Fluoride (F) (mg/L)	<0.40 DLA	<0.40 DLA	<0.40 DLA	0.36
	Nitrate (as N) (mg/L)	<0.10 DLA	<0.10 DLA	0.10	<0.050 DLA
	Nitrite (as N) (mg/L)	<0.020 DLA	<0.020 DLA	<0.020 DLA	<0.010 DLA
	Total Kjeldahl Nitrogen (mg/L)	0.276	0.230	0.493	0.156
	Sulfate (SO4) (mg/L)	1610	1970	1770	1090
Total Metals	Aluminum (Al)-Total (mg/L)	0.274	0.046	0.064	<0.010
	Antimony (Sb)-Total (mg/L)	0.00364	0.0262	0.0124	0.0415
	Arsenic (As)-Total (mg/L)	0.0224	0.0713	0.0110	0.0020
	Barium (Ba)-Total (mg/L)	0.022	<0.020	0.026	0.030
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.00529	0.0212	0.0105	0.00097
	Calcium (Ca)-Total (mg/L)	438	362	540	368
	Chromium (Cr)-Total (mg/L)	<0.0010 DLA	<0.0010 DLA	<0.0010 DLA	<0.0010 DLA
	Cobalt (Co)-Total (mg/L)	<0.00050	<0.00050	0.00432	0.00557
	Copper (Cu)-Total (mg/L)	0.0092	0.0087	0.0059	0.0013
	Iron (Fe)-Total (mg/L)	1.04	0.153	0.193	<0.030
	Lead (Pb)-Total (mg/L)	0.0152	0.0090	0.0048	<0.0010
	Lithium (Li)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050
	Magnesium (Mg)-Total (mg/L)	145	287	94.9	46.3
	Manganese (Mn)-Total (mg/L)	0.098	0.297	2.06	0.032
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	<0.0050	<0.0050	0.0099	<0.0050
	Selenium (Se)-Total (mg/L)	<0.0020 DLA	<0.0020 DLA	<0.0020 DLA	<0.0020 DLA
	Silver (Ag)-Total (mg/L)	0.000405	0.000335	0.000101	<0.000050
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	4.7	<2.0
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	0.00022	<0.00020
	Titanium (Ti)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050
	Uranium (U)-Total (mg/L)	0.00027	<0.00020	0.00024	0.00031
	Vanadium (V)-Total (mg/L)	<0.030	<0.030	<0.030	<0.030

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1493185-1	L1493185-2	L1493185-3	L1493185-4	
	Description	Leachate	Leachate	Leachate	Leachate	
	Sampled Date	24-JUL-14	24-JUL-14	24-JUL-14	24-JUL-14	
	Sampled Time	16:30	16:30	16:30	16:30	
	Client ID	FIELD BIN - WASTE ROCK	FIELD BIN - ORE	FIELD BIN - TAILINGS + ORGANIC	FIELD BIN - TAILINGS SAND	
Grouping	**Analyte**					
WATER						
Total Metals	Zinc (Zn)-Total (mg/L)	0.186	1.95	0.733	0.0170	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Antimony (Sb)-Dissolved (mg/L)	0.00121	0.0251	0.0120	0.0418	
	Arsenic (As)-Dissolved (mg/L)	0.0019	0.0607	0.0034	0.0017	
	Barium (Ba)-Dissolved (mg/L)	<0.020	<0.020	0.024	0.029	
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Dissolved (mg/L)	0.00494	0.0209	0.0113	0.00084	
	Calcium (Ca)-Dissolved (mg/L)	457	368	564	374	
	Chromium (Cr)-Dissolved (mg/L)	<0.0010 DLA	<0.0010 DLA	<0.0010 DLA	<0.0010 DLA	
	Cobalt (Co)-Dissolved (mg/L)	<0.00050	<0.00050	0.00466	0.00502	
	Copper (Cu)-Dissolved (mg/L)	0.0018	0.0062	0.0049	0.0011	
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	0.113	<0.030	
	Lead (Pb)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Lithium (Li)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Magnesium (Mg)-Dissolved (mg/L)	145	290	92.6	48.0	
	Manganese (Mn)-Dissolved (mg/L)	0.050	0.295	2.63 DTC	0.016	
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Dissolved (mg/L)	<0.0050	<0.0050	0.0099	<0.0050	
	Selenium (Se)-Dissolved (mg/L)	<0.0020 DLA	<0.0020 DLA	<0.0020 DLA	<0.0020 DLA	
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	4.5	<2.0	
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	0.00023	<0.00020	
	Titanium (Ti)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Uranium (U)-Dissolved (mg/L)	0.00022	<0.00020	0.00025	0.00032	
	Vanadium (V)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	
	Zinc (Zn)-Dissolved (mg/L)	0.146	1.91	0.842	0.0137	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Chloride (Cl)	DLA	L1493185-1, -2, -3, -4
Duplicate	Fluoride (F)	DLA	L1493185-1, -2, -3, -4
Duplicate	Nitrite (as N)	DLA	L1493185-1, -2, -3, -4
Duplicate	Nitrate (as N)	DLA	L1493185-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1493185-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1493185-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ANIONS-CL-IC-WR	Water	Chloride by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.

ANIONS-F-IC-WR	Water	Fluoride by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.

ANIONS-NO2-IC-WR	Water	Nitrite Nitrogen by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.

ANIONS-NO3-IC-WR	Water	Nitrate Nitrogen by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.

ANIONS-SO4-IC-WR	Water	Sulphate by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS	EPA SW-846 3005A & EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

HG-TOT-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7

Reference Information

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-LOW-MS-VA Water Dissolved Metals in Water by ICPMS(Low) EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures involves preliminary sample treatment by filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-LOW-MS-VA Water Total Metals in Water by ICPMS(Low) EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Requ
Canada Toll Free: 1 800 668 9
www.alsglobal.com

L1493185-COFC

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Page 1 of 1

Report To
Company: Summit Environmental Consultants Inc.
Contact: Nicole Jacques
Address: 301 - 4109 4th Avenue
Whitehorse, YT, Y1A iH6
Phone: 867 - 456 - 2711 Fax: 604 - 291 - 6163

Invoice To Same as Report ? ☒ Yes ☑ No
Hardcopy of Invoice with Report? ☐ Yes ☑ No
Company: AMEC
Contact: Judy Andrina
Address: 4445 Lougheed Highway, Suite 600, Burnaby, BC, V5C 0E4
Phone: 604-294-3811 Fax: 604-294-4664

Lab Work Order # (lab use only)

Report Format / Distribution
☐ Standard ☐ Other
☑ PDF ☑ Excel ☐ Digital ☐ Fax
Email 1:
Email 2:
Email 3:

Client / Project Information
Job #:
PO / AFE:
LSD:
Quote #: Summit Environmental - General Price List

ALS Contact:
Sampler: NJ ~~and SG~~

Service Requested (Rush for routine analysis subject to availability)
● Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	F/P Metals - Dissolved + Mercury	P Metals - Total + Mercury	P Total Kinetic Nitrogen	pH, EC, Alkalinity, Acidity, An	Number of Containers
	Field Bin - Waste rock	24-Jul-14	4:30pm	Leachate	X	X	X	X	
	Field Bin - Ore	↓	↓	↓	X	X	X	X	
	~~Field Bin - Waste rock + organic~~				X	X	X	X	
	Field Bin - Tailings + organic				X	X	X	X	
	Field Bin - Tailings sand				X	X	X	X	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)
Released by:
Date (dd-mmm-yy)
Time (hh-mm)

SHIPMENT RECEPTION (lab use only)
Received by:
Date: 25 Jul 14
Time: 10:00pm
Temperature: 7.2 °C

SHIPMENT VERIFICATION (lab use only)
Verified by:
Date:
Time:
Observations: Yes / No ? If Yes add SIF

GENF 18.01 Front

VA14123203 - Finalized
CLIENT : "APN - ALS Environmental"
# of SAMPLES : 26
DATE RECEIVED : 2014-08-12 DATE FINALIZED : 2014-08-20
PROJECT : "L1499580"
CERTIFICATE COMMENTS : "ME-MS41:Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5g). "
PO NUMBER : "L1499580"

	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
SAMPLE	Ag	Al	As	Au	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr
DESCRIPTION	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
L1499580-1	0.03	0.81	12.6	<0.2	<10	90	0.19	0.05	0.31	0.08	19.75	3.9	14
L1499580-2	0.03	0.63	4.4	<0.2	<10	90	0.17	0.07	0.34	0.08	19.95	3.3	11
L1499580-3	0.03	0.63	4.7	<0.2	<10	100	0.18	0.06	0.56	0.08	21.2	3.8	14
L1499580-4	0.04	0.81	4.6	<0.2	<10	100	0.22	0.07	0.4	0.08	19.05	4	13
L1499580-5	0.03	0.86	4.2	<0.2	<10	90	0.19	0.06	0.37	0.06	17	3.8	15
L1499580-6	0.29	0.97	72.6	<0.2	<10	140	0.3	0.15	0.31	0.58	23	5	21
L1499580-7	0.07	0.72	12.7	<0.2	<10	120	0.19	0.08	0.3	0.26	19.2	3.7	15
L1499580-8	0.07	0.69	9.4	<0.2	<10	110	0.18	0.09	0.34	0.19	17.2	3.6	14
L1499580-9	0.07	0.61	15.6	<0.2	<10	100	0.17	0.07	0.3	0.16	17.9	3.4	12
L1499580-10	0.05	0.55	9.1	<0.2	<10	110	0.15	0.07	0.41	0.11	18.2	3.1	10
L1499580-11	0.04	0.53	8.2	<0.2	<10	100	0.17	0.06	0.27	0.1	18.5	3.3	10
L1499580-12	0.05	0.52	25	<0.2	<10	90	0.16	0.09	0.28	0.16	18.25	3.8	10
L1499580-13	0.04	0.63	5.5	<0.2	<10	90	0.15	0.06	0.25	0.08	15.55	3	13
L1499580-14	0.12	0.67	35.6	<0.2	<10	110	0.23	0.14	0.36	0.28	21.9	4.5	13
L1499580-15	2.94	0.8	172	<0.2	<10	120	0.24	2.96	0.54	1.93	21.8	3.6	14
L1499580-16	3.41	0.71	198	0.2	<10	100	0.23	3.35	0.51	2.25	20.8	3.7	12
L1499580-17	0.5	1.11	97.9	<0.2	<10	160	0.4	0.31	0.41	0.55	25.7	7.3	23
L1499580-18	0.4	1.01	209	<0.2	<10	190	0.35	0.24	0.39	0.62	27.3	8	30
L1499580-19	0.16	3.42	5	<0.2	<10	490	0.2	0.16	0.73	0.09	24.4	21.2	16
L1499580-20	0.11	3.09	5.6	<0.2	<10	480	0.19	0.09	0.7	0.08	24	19.8	13
L1499580-21	0.44	1.59	194.5	<0.2	<10	340	0.37	0.16	0.62	0.9	28.3	13.6	33
L1499580-22	0.31	1.57	151	<0.2	<10	270	0.28	0.11	0.67	0.62	22.3	11.7	32
L1499580-23	0.17	2.73	68.3	<0.2	<10	590	0.36	0.07	0.66	0.29	24	14.9	22
L1499580-24	0.2	1.63	63.2	<0.2	<10	280	0.33	0.09	0.61	0.41	28.2	13.4	27
L1499580-25	0.34	0.93	20.6	<0.2	<10	30	0.51	0.26	1.24	2.16	32.2	6.6	5
L1499580-26	1.37	1.99	117	<0.2	<10	190	0.99	0.89	1.7	1.67	34.2	16.1	30

	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
SAMPLE	Cs	Cu	Fe	Ga	Ge	Hf	Hg	In	K	La	Li	Mg	Mn
DESCRIPTION	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
L1499580-1	0.56	9.6	1.3	2.66	<0.05	0.02	<0.01	0.012	0.1	10.1	5	0.25	187
L1499580-2	0.51	7.3	1.21	2.25	<0.05	0.06	0.01	0.011	0.09	10.4	4.1	0.23	172
L1499580-3	0.53	7.7	1.28	2.26	<0.05	0.1	0.01	0.012	0.1	11.1	4.2	0.26	168
L1499580-4	0.57	9.6	1.23	2.67	<0.05	0.04	0.01	0.011	0.1	9.9	5.6	0.29	195
L1499580-5	0.73	8.3	1.31	2.6	<0.05	0.02	0.01	0.009	0.1	9.2	5.3	0.28	185
L1499580-6	1.23	19.6	1.96	3.32	<0.05	0.02	0.01	0.024	0.16	13.1	6.8	0.36	255
L1499580-7	0.83	9.7	1.37	2.51	<0.05	0.02	0.01	0.014	0.11	10.7	4.9	0.27	209
L1499580-8	0.69	8.8	1.38	2.23	<0.05	0.02	0.01	0.011	0.11	9.7	4.5	0.25	204
L1499580-9	0.65	8.9	1.38	2.13	<0.05	0.02	0.01	0.01	0.09	9.9	4	0.21	240
L1499580-10	0.59	7.2	1.26	1.91	<0.05	0.07	0.01	0.008	0.09	10.2	3.8	0.21	194
L1499580-11	0.58	6.3	1.18	1.86	<0.05	0.06	0.01	0.01	0.09	10.2	3.6	0.18	182
L1499580-12	0.59	6.7	1.35	1.89	<0.05	0.08	0.01	0.009	0.08	9.9	3.6	0.19	208
L1499580-13	0.67	6.3	1.1	2.08	<0.05	0.02	<0.01	0.01	0.08	8.7	4.5	0.2	129
L1499580-14	1.24	11	1.57	2.26	<0.05	0.02	0.01	0.016	0.13	12.6	4.7	0.25	280
L1499580-15	0.86	43.7	1.57	2.66	<0.05	<0.02	0.05	0.048	0.08	12.7	5	0.25	281
L1499580-16	0.75	48.9	1.56	2.46	<0.05	<0.02	0.05	0.05	0.07	12.3	4.4	0.23	292
L1499580-17	2.24	27.1	2.3	3.86	0.05	0.15	0.04	0.034	0.13	14	6.9	0.34	321
L1499580-18	1.92	24.6	2.87	3.39	<0.05	0.2	0.03	0.033	0.16	14.4	6.5	0.35	758
L1499580-19	4.73	113	5.46	11.05	0.12	0.03	<0.01	0.051	1.01	11.8	31.8	2.67	517
L1499580-20	4.52	82.9	4.96	10.2	0.12	0.03	<0.01	0.048	0.91	11.8	30.3	2.39	558
L1499580-21	3.84	43.6	3.77	5.52	0.08	0.26	0.06	0.034	0.42	16.1	12.6	0.74	1380
L1499580-22	3.19	35.8	3.46	5.32	0.08	0.22	0.04	0.032	0.44	12.3	10.7	0.76	1020
L1499580-23	10.05	31.3	4.48	7.87	0.09	0.07	0.02	0.035	1.05	12.4	20.5	1.52	781
L1499580-24	4.57	39.4	3.84	6.36	0.09	0.11	0.02	0.032	0.45	14.1	15.7	0.94	676
L1499580-25	6.88	35	2.75	2.59	0.05	0.05	0.02	0.032	0.1	16.5	3.5	0.25	488
L1499580-26	36.2	75.4	4.39	5.42	0.07	0.08	0.05	0.086	0.32	17.6	8.3	0.76	780

	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
SAMPLE	Mo	Na	Nb	Ni	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn
DESCRIPTION	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
L1499580-1	0.36	0.05	0.8	8.5	370	3.3	6.9	<0.001	<0.01	0.55	2.4	0.3	0.3
L1499580-2	0.3	0.04	0.43	6.9	370	3.1	5.6	<0.001	<0.01	0.26	2.2	0.3	0.3
L1499580-3	0.31	0.05	0.45	7.2	400	3.6	5.8	<0.001	<0.01	0.33	2.3	0.2	0.3
L1499580-4	0.25	0.05	0.58	8.7	430	3	7.2	<0.001	<0.01	0.19	2.5	0.3	0.3
L1499580-5	0.27	0.06	1.05	8	420	2.8	6.4	<0.001	<0.01	0.17	2.3	0.3	0.3
L1499580-6	1.91	0.04	0.92	17.6	440	106	10.4	0.001	0.04	1.42	3	1	0.4
L1499580-7	0.61	0.04	0.97	9.6	380	7.4	6.7	<0.001	0.01	0.52	2.3	0.4	0.3
L1499580-8	0.5	0.05	0.94	8.4	390	5.9	5.9	<0.001	<0.01	0.44	2.1	0.4	0.3
L1499580-9	0.49	0.05	0.78	7.2	350	6.1	5.1	<0.001	<0.01	0.85	2.2	0.3	0.3
L1499580-10	0.42	0.05	0.4	6.4	320	4.3	4.9	<0.001	<0.01	0.59	1.9	0.3	0.3
L1499580-11	0.38	0.04	0.5	6	300	4.6	5.1	<0.001	<0.01	0.94	1.8	0.2	0.3
L1499580-12	0.42	0.04	0.46	7.4	310	6.4	4.8	<0.001	<0.01	0.66	1.9	0.3	0.3
L1499580-13	0.36	0.04	0.92	6.6	350	3.5	5.6	<0.001	<0.01	0.32	1.7	0.2	0.3
L1499580-14	0.76	0.03	0.86	10.7	380	10.3	7.3	<0.001	<0.01	1.3	2.2	0.4	0.3
L1499580-15	0.52	0.05	0.82	7.9	470	111.5	6.2	<0.001	0.26	23.6	2.1	0.5	0.4
L1499580-16	0.54	0.05	0.69	7.6	440	123.5	5.7	<0.001	0.28	27.3	2	0.4	0.4
L1499580-17	0.7	0.03	0.57	12	640	42.4	10.4	<0.001	<0.01	8.63	6.3	0.5	0.4
L1499580-18	0.95	0.03	0.41	13.6	800	28.8	10.2	<0.001	<0.01	8.41	5.7	0.4	0.4
L1499580-19	0.19	0.08	0.12	6.4	1420	3.2	38.1	<0.001	0.03	0.35	17.2	0.7	0.7
L1499580-20	0.26	0.08	0.1	5.8	1490	3	34.3	<0.001	0.02	0.31	15.5	0.5	0.6
L1499580-21	1.33	0.04	0.24	17.5	1240	28.6	19.4	<0.001	<0.01	6.19	9.4	0.6	0.8
L1499580-22	0.89	0.05	0.26	13.5	1320	20	18.6	<0.001	<0.01	4.6	8.5	0.5	0.6
L1499580-23	0.49	0.03	0.18	9.1	1130	14.1	42.7	<0.001	<0.01	2.95	11	0.5	0.6
L1499580-24	0.54	0.05	0.33	12.3	1140	18	20.3	<0.001	0.03	3.16	8.9	0.7	0.6
L1499580-25	0.29	0.01	0.07	2.7	410	20.8	7.6	<0.001	0.12	6.94	5.9	0.8	0.2
L1499580-26	0.34	0.01	0.08	13.9	990	115.5	25.5	0.001	0.41	30.7	14.1	1.3	0.7

	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
SAMPLE	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr
DESCRIPTION	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
L1499580-1	28.3	<0.01	0.01	2.6	0.058	0.06	0.43	29	0.18	4.59	23	1
L1499580-2	28.4	<0.01	0.01	2.8	0.052	0.05	0.43	27	0.14	4.81	19	2.2
L1499580-3	34.3	<0.01	0.01	3.1	0.059	0.05	0.46	31	2.06	5.15	19	2.8
L1499580-4	32.2	<0.01	0.01	2.7	0.062	0.07	0.44	28	0.15	5.48	23	1.7
L1499580-5	28.3	<0.01	0.01	1.9	0.064	0.06	0.38	29	0.22	5.03	22	0.6
L1499580-6	28.9	<0.01	0.04	3.1	0.047	0.14	0.83	57	0.35	5.45	88	0.6
L1499580-7	25	<0.01	0.02	2.8	0.047	0.08	0.53	36	0.28	4.39	39	0.9
L1499580-8	26.3	<0.01	0.02	2.4	0.049	0.06	0.46	33	0.17	4.47	31	0.9
L1499580-9	23.4	<0.01	0.01	2.7	0.047	0.06	0.45	32	0.18	4.29	32	1
L1499580-10	26.2	<0.01	0.02	2.9	0.044	0.05	0.43	26	0.14	4.29	23	2.3
L1499580-11	23.5	<0.01	0.01	2.8	0.038	0.05	0.42	24	0.15	3.77	23	1.9
L1499580-12	22.2	<0.01	0.02	2.8	0.044	0.06	0.39	28	0.12	4	28	2.3
L1499580-13	20.1	<0.01	0.01	1.9	0.041	0.06	0.43	24	0.87	3.49	20	0.6
L1499580-14	23.1	<0.01	0.02	3.1	0.045	0.1	0.55	32	0.38	4.79	60	0.9
L1499580-15	38.2	<0.01	0.07	0.5	0.047	0.14	0.65	34	0.17	6.28	133	<0.5
L1499580-16	38.1	<0.01	0.07	0.5	0.043	0.14	0.6	32	0.16	6.14	147	<0.5
L1499580-17	21	<0.01	0.07	3.9	0.067	0.31	0.75	51	0.27	9.42	99	5.6
L1499580-18	21.5	<0.01	0.07	4.8	0.059	0.28	0.88	51	0.57	8.7	99	6.5
L1499580-19	34	<0.01	0.03	2.4	0.196	0.28	0.71	203	0.29	9.55	90	0.7
L1499580-20	30.8	<0.01	0.02	2.2	0.169	0.24	0.65	178	0.42	9.3	83	0.7
L1499580-21	48.2	<0.01	0.04	4.5	0.137	0.41	0.75	81	0.47	12.2	145	9.4
L1499580-22	47.3	<0.01	0.04	3.1	0.152	0.32	0.66	79	0.44	10.55	120	6.9
L1499580-23	82.7	<0.01	0.03	3.2	0.192	0.35	0.54	124	0.26	10.25	101	2.7
L1499580-24	36.3	<0.01	0.04	4.1	0.127	0.25	0.74	109	0.38	10.45	90	4.1
L1499580-25	32.9	<0.01	0.01	4.8	<0.005	0.13	0.37	32	0.28	22.7	193	1.2
L1499580-26	112.5	<0.01	0.04	4.9	0.037	0.27	0.56	82	0.2	19.9	210	1.6

Appendix 4G – Water Treatment Results

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M870562
N° DE PROJET:
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 31 juil. 2014
DATE D’ÉCHANTILLONN 30 juil. 2014
DATE DU RAPPORT: 05 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	**Matrice**	**Critères Normes**	**Nom de l'ensemble**
X01	Eaude surface		Analyses Inorganiques - Eau de Surface
X02	Eaude surface		Métaux Extractibles Totaux (basse limite)

Analyses Inorganiques - Eau de Surface

Identification de l’échantillon				**OP**	**SP**	**TP**	**TP-PW-02**	**TP-PW-03**	**TP-PW-04**
Date d’échantillonnage				**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5640107**	**5640143**	**5640144**	**5640148**	**5640153**	**5640156**
Azote ammoniacal	mg/L - N		0.05	<0.05	4.98	<0.05	11.8	1.74	6.49
Cyanures totaux	mg/L - CN		0.005	0.018	0.613	0.018	0.759	0.095	0.092

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Extractibles Totaux (basse limite)

Identification de l’échantillon				**OP-F**	**SP-F**	**TP-F**	**TP-PW-02-F**	**TP-PW-03-F**	**TP-PW-04-F**
Date d’échantillonnage				**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5640073**	**5640096**	**5640102**	**5640103**	**5640105**	**5640106**
Aluminium	µg/L		10	<10	<10	12	<10	<10	<10
Antimoine	µg/L		1	4	<1	38	2	428	346
Arsenic	µg/L		1	9	3	55	8340	591	2810
Baryum	µg/L		5	17	67	8	6	34	6
Béryllium	µg/L		1	<1	3	<1	1	<1	<1
Bismuth	ug/L		1	<1	<1	<1	<1	<1	<1
Cadmium	µg/L		0.5	2.3	<0.5	0.7	<0.5	1.2	<0.5
Calcium	µg/L		100	244000	244000	190000	441000	411000	413000
Chrome	µg/L		1	<1	<1	<1	<1	<1	<1
Cobalt	ug/L		0.5	<0.5	8.6	<0.5	10.8	3.9	<0.5
Cuivre	µg/L		1	2	3	12	2	3	2
Fer	µg/L		70	<70	<70	<70	19200	109	<70
Lithium	µg/L		1	6	<1	6	16	<1	3
Magnésium	µg/L		100	61300	48300	34400	86800	58600	96700
Manganèse	µg/L		1	23	6210	47	28200	46000	4640
Nickel	µg/L		1	4	6	3	8	7	6
Plomb	µg/L		1	<1	<1	<1	<1	<1	<1
Potassium	µg/L		100	2820	5710	10400	54100	14300	32100
Sélénium	µg/L		1	<1	<1	<1	<1	<1	<1
Silicium	mg/L		2	3	7	<2	7	17	11
Sodium	µg/L		1000	10500	39000	16400	65000	23600	41000
Soufre	mg/L		0.1	317	338	252	724	594	698
Strontium	µg/L		10	913	901	538	970	1520	1360
Thallium	µg/L		1	<1	<1	<1	<1	<1	<1
Zinc	µg/L		3	247	25	37	346	22	51

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence
Métaux Extractibles Totaux (basse limite)							
Aluminium	5628427	NA	NA	NA	0.0%	< 10	81%
Antimoine	5628427	NA	NA	NA	0.0%	< 1	113%
Arsenic	5628427	NA	NA	NA	0.0%	< 1	103%
Baryum	5628427	NA	NA	NA	0.0%	< 5	96%
Béryllium	5628427	NA	NA	NA	0.0%	< 1	87%
Bismuth	5628427	NA	NA	NA	0.0%	< 1	NA
Cadmium	5628427	NA	NA	NA	0.0%	< 0.5	103%
Calcium	5628427	NA	NA	NA	0.0%	< 100	104%
Chrome	5628427	NA	NA	NA	0.0%	< 1	92%
Cobalt	5628427	NA	NA	NA	0.0%	< 0.5	106%
Cuivre	5628427	NA	NA	NA	0.0%	< 1	94%
Fer	5628427	NA	NA	NA	0.0%	< 70	107%
Lithium	5628427	NA	NA	NA	0.0%	< 1	NA
Magnésium	5628427	NA	NA	NA	0.0%	< 100	88%
Manganèse	5628427	NA	NA	NA	NA	< 1	112%
Nickel	5628427	NA	NA	NA	0.0%	< 1	93%
Plomb	5628427	NA	NA	NA	0.0%	< 1	103%
Potassium	5628427	NA	NA	NA	0.0%	< 100	93%
Sélénium	5628427	NA	NA	NA	0.0%	< 1	106%
Silicium	1	NA	NA	NA	0.0%	< 2	95%
Sodium	5628427	NA	NA	NA	0.0%	< 1000	95%
Soufre	1	NA	NA	NA	0.0%	< 0.1	100%
Strontium	5628427	NA	NA	NA	0.0%	< 10	106%
Thallium	5628427	NA	NA	NA	0.0%	< 1	106%
Zinc	5628427	NA	NA	NA	0.0%	< 3	107%
Analyses Inorganiques - Eau de Surface							
Azote ammoniacal	1	5640107	< 0.05	< 0.05	0.0%	< 0.05	109%
Cyanures totaux	1	5640107	0.018	0.018	0.0%	< 0.005	100%

Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
80%	120%	96%	80%	120%	93%	80%	120%
80%	120%	95%	80%	120%	117%	80%	120%
80%	120%	102%	80%	120%	NA	80%	120%
80%	120%	101%	80%	120%	NA	80%	120%
80%	120%	88%	80%	120%	105%	80%	120%
80%	120%	97%	80%	120%	103%	80%	120%
80%	120%	103%	80%	120%	NA	80%	120%
80%	120%	96%	80%	120%	NA	80%	120%
80%	120%	91%	80%	120%	NA	80%	120%
80%	120%	95%	80%	120%	119%	80%	120%
80%	120%	98%	80%	120%	NA	80%	120%
80%	120%	95%	80%	120%	NA	80%	120%
80%	120%	91%	80%	120%	91%	80%	120%
80%	120%	98%	80%	120%	NA	80%	120%
80%	120%	98%	80%	120%	NA	80%	120%
80%	120%	104%	80%	120%	NA	80%	120%
80%	120%	99%	80%	120%	NA	80%	120%
80%	120%	90%	80%	120%	103%	80%	120%
80%	120%	104%	80%	120%	NA	80%	120%
80%	120%	98%	80%	120%	NA	80%	120%
80%	120%	98%	80%	120%	NA	80%	120%
80%	120%	102%	80%	120%	NA	80%	120%
80%	120%	96%	80%	120%	NA	80%	120%
80%	120%	102%	80%	120%	110%	80%	120%
80%	120%	105%	80%	120%	NA	80%	120%
80%	120%	95%	80%	120%	104%	80%	120%
80%	120%	108%	80%	120%	NA	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M872762
N° DE PROJET: VM006051.05.502
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 07 août 2014
DATE D’ÉCHANTILLONI 06 août 2014
DATE DU RAPPORT: 12 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau surface		Analyses Inorganiques

Analyses Inorganiques

Identification de l’échantillon				**SP (2)**	**SP test 3**
Date d’échantillonnage				**08-06-2014**	**08-06-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5661709**	**5661710**
Cyanures totaux	mg/L - CN		0.005	0.855	0.875

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	92%	80%	120%	111%	80%	120%	109%	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M873242
N° DE PROJET: VM00605J-502-02
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 07 août 2014
DATE D’ÉCHANTILLON 07 août 2014
DATE DU RAPPORT: 12 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau de surface		Analyses Inorganiques

Analyses Inorganiques

Identification de l'échantillon				**SP-TEST-4**	**SP-TEST-5**	**SP-TEST-10.1**
Date d'échantillonnage				**08-07-2014**	**08-07-2014**	**08-07-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5665735**	**5665736**	**5665737**
Cyanures totaux	mg/L - CN		0.005	0.723	1.42	1.34

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	103%	80%	120%	107%	80%	120%	119%	80%	120%
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	85%	80%	120%	112%	80%	120%	NA	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL:	14M873242
N° DE PROJET:	VM00605J-502-02
NOM DU CLIENT:	AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE:	Jessica Huza
DATE DE RÉCEPTION:	07 août 2014
DATE D’ÉCHANTILLONI	07 août 2014
DATE DU RAPPORT:	12 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau de surface		Analyses Inorganiques

Analyses Inorganiques

Identification de l'échantillon				**SP-TEST-4**	**SP-TEST-5**	**SP-TEST-10.1**
Date d'échantillonnage				**08-07-2014**	**08-07-2014**	**08-07-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5665735**	**5665736**	**5665737**
Cyanures totaux	mg/L - CN		0.005	0.723	1.42	1.34

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	103%	80%	120%	107%	80%	120%	119%	80%	120%
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	85%	80%	120%	112%	80%	120%	NA	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M873524
N° DE PROJET: VM006051.502.02
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 08 août 2014
DATE D’ÉCHANTILLONI 08 août 2014
DATE DU RAPPORT: 11 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau de surface		Analyses Inorganiques

Analyses Inorganiques

Identification de l’échantillon				**SP- TEST 6**
Date d’échantillonnage				**08-08-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5668177**
Cyanures totaux	mg/L - CN		0.005	0.427

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	103%	80%	120%	107%	80%	120%	119%	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL:	14M873586
N° DE PROJET:	VM00605J-502.02
NOM DU CLIENT:	AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE:	Jessica Huza
DATE DE RÉCEPTION:	07 août 2014
DATE D’ÉCHANTILLONN	07 août 2014
DATE DU RAPPORT:	19 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau de surface		Métaux Extractibles Totaux
X02	Eau de surface		Métaux Extractibles Totaux (basse limite)

Métaux Extractibles Totaux

Identification de l’échantillon				SP-TEST4	SP-TEST4-F	SP-TEST5	SP-TEST5-F	SP-TEST10:1	SP-TEST10:1-F
Date d’échantillonnage				**08-07-2014**	**08-07-2014**	**08-07-2014**	**08-07-2014**	**08-07-2014**	**08-07-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5669032**	**5669040**	**5669041**	**5669046**	**5669048**	**5669061**
Soufre	mg/L		0.1	296	319	333	*	322	305

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

5669046 * Échantillon insuffisant reçu.

Métaux Extractibles Totaux (basse limite)

Identification de l'échantillon				**SP-TEST4**	**SP-TEST4-F**	**SP-TEST5**	**SP-TEST5-F**	**SP-TEST10:1**	**SP-TEST10:1-F**
Date d'échantillonnage				**08-07-2014**	**08-07-2014**	**08-07-2014**	**08-07-2014**	**08-07-2014**	**08-07-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5669032**	**5669040**	**5669041**	**5669046**	**5669048**	**5669061**
Aluminium	µg/L		10	22	22	<10	26	<10	22
Antimoine	µg/L		1	<1	<1	<1	<1	<1	<1
Arsenic	µg/L		1	4	3	1	3	<1	3
Baryum	µg/L		5	18	18	18	19	16	16
Béryllium	µg/L		1	<1	<1	<1	<1	<1	<1
Bismuth	µg/L		1	<1	<1	<1	<1	<1	<1
Cadmium	µg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	µg/L		100	219000	223000	149000	213000	133000	201000
Chrome	µg/L		1	2	2	3	2	3	2
Cobalt	µg/L		0.5	5.9	6.0	5.0	5.9	5.1	5.6
Cuivre	µg/L		1	4	4	2	6	2	3
Fer	µg/L		70	163	<70	<70	<70	<70	<70
Lithium	µg/L		1	2	2	1	1	2	1
Magnésium	µg/L		100	64600	65000	6620	64400	7010	59700
Manganèse	µg/L		1	329	274	26	192	22	166
Nickel	µg/L		1	6	6	3	5	4	5
Plomb	µg/L		1	<1	<1	<1	<1	<1	<1
Potassium	µg/L		100	6420	6620	7090	6380	7090	6250
Sélénium	µg/L		1	<1	<1	<1	<1	<1	<1
Sodium	µg/L		200	41100	40800	2890000	40700	3140000	37900
Strontium	µg/L		10	630	625	593	623	575	585
Titane	µg/L		3	<3	<3	<3	<3	<3	<3
Zinc	µg/L		13	<13	<13	<13	47	<13	<13
Silicium	mg/L		2	7	7	4	7	3	7

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Métaux Extractibles Totaux (basse limite)															
Aluminium	5669036	NA	NA	NA	0.0%	< 10	95%	80%	120%	101%	80%	120%	NA	80%	120%
Antimoine	5669036	NA	NA	NA	0.0%	< 1	110%	80%	120%	92%	80%	120%	NA	80%	120%
Arsenic	5669036	NA	NA	NA	0.0%	< 1	102%	80%	120%	109%	80%	120%	NA	80%	120%
Baryum	5669036	NA	NA	NA	0.0%	< 5	107%	80%	120%	101%	80%	120%	NA	80%	120%
Béryllium	5669036	NA	NA	NA	0.0%	< 1	115%	80%	120%	104%	80%	120%	NA	80%	120%
Bismuth	5669036	NA	NA	NA	0.0%	< 1	NA	80%	120%	91%	80%	120%	NA	80%	120%
Cadmium	5669036	NA	NA	NA	0.0%	< 0.5	101%	80%	120%	102%	80%	120%	NA	80%	120%
Calcium	5669036	NA	NA	NA	0.0%	< 100	98%	80%	120%	100%	80%	120%	NA	80%	120%
Chrome	5669036	NA	NA	NA	0.0%	< 1	108%	80%	120%	101%	80%	120%	NA	80%	120%
Cobalt	5669036	NA	NA	NA	0.0%	< 0.5	108%	80%	120%	99%	80%	120%	NA	80%	120%
Cuivre	5669036	NA	NA	NA	0.0%	< 1	105%	80%	120%	101%	80%	120%	NA	80%	120%
Fer	5669036	NA	NA	NA	0.0%	< 70	101%	80%	120%	101%	80%	120%	NA	80%	120%
Lithium	5669036	NA	NA	NA	0.0%	< 1	NA	80%	120%	108%	80%	120%	NA	80%	120%
Magnésium	5669036	NA	NA	NA	0.0%	< 100	107%	80%	120%	105%	80%	120%	NA	80%	120%
Manganèse	5669036	NA	NA	NA	0.0%	< 1	102%	80%	120%	103%	80%	120%	NA	80%	120%
Nickel	5669036	NA	NA	NA	0.0%	< 1	108%	80%	120%	105%	80%	120%	NA	80%	120%
Plomb	5669036	NA	NA	NA	0.0%	< 1	105%	80%	120%	99%	80%	120%	NA	80%	120%
Potassium	5669036	NA	NA	NA	0.0%	< 100	100%	80%	120%	101%	80%	120%	NA	80%	120%
Sélénium	5669036	NA	NA	NA	0.0%	< 1	111%	80%	120%	105%	80%	120%	NA	80%	120%
Sodium	5669036	NA	NA	NA	0.0%	< 200	100%	80%	120%	99%	80%	120%	NA	80%	120%
Strontium	5669036	NA	NA	NA	0.0%	< 10	98%	80%	120%	94%	80%	120%	NA	80%	120%
Titane	5669036	NA	NA	NA	0.0%	< 3	NA	80%	120%	109%	80%	120%	99%	80%	120%
Zinc	1	NA	NA	NA	0.0%	< 13	109%	80%	120%	101%	80%	120%	NA	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	103%	80%	120%	NA	80%	120%
Métaux Extractibles Totaux															
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	93%	80%	120%	NA	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M873636
N° DE PROJET: VM00605J.05.502
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 07 août 2014
DATE D’ÉCHANTILLONI 05 août 2014
DATE DU RAPPORT: 18 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau de surface		Métaux Extractibles Totaux
X02	Eau de surface		Métaux Extractibles Totaux (basse limite)

Métaux Extractibles Totaux

Identification de l'échantillon				**SP-TEST3-F**	**SP-TEST3**	**TP-TEST2-F**	**TP-TEST2**	**OP-TEST1-F**	**OP-TEST1**
Date d'échantillonnage				**08-06-2014**	**08-06-2014**	**08-06-2014**	**08-06-2014**	**08-05-2014**	**08-05-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5669311**	**5669327**	**5669333**	**5669334**	**5669336**	**5669337**
Soufre	mg/L		0.1	325	325	250	243	318	304

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Extractibles Totaux (basse limite)

Identification de l’échantillon				SP-TEST3-F	SP-TEST3	TP-TEST2-F	TP-TEST2	OP-TEST1-F	OP-TEST1
Date d’échantillonnage				**08-06-2014**	**08-06-2014**	**08-06-2014**	**08-06-2014**	**08-05-2014**	**08-05-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5669311**	**5669327**	**5669333**	**5669334**	**5669336**	**5669337**
Aluminium	µg/L		10	24	23	71	98	110	110
Antimoine	µg/L		1	<1	<1	39	38	3	3
Arsenic	µg/L		1	4	6	52	80	4	5
Baryum	µg/L		5	18	18	8	9	7	7
Béryllium	µg/L		1	<1	<1	<1	<1	<1	<1
Bismuth	ug/L		1	<1	<1	<1	<1	<1	<1
Cadmium	µg/L		0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5
Calcium	µg/L		100	217000	217000	210000	213000	223000	231000
Chrome	µg/L		1	2	2	<1	<1	1	1
Cobalt	ug/L		0.5	6.4	6.2	<0.5	<0.5	<0.5	<0.5
Cuivre	µg/L		1	5	5	13	18	3	3
Fer	µg/L		70	<70	139	<70	181	<70	<70
Lithium	µg/L		1	1	1	9	10	10	10
Magnésium	µg/L		100	63900	63400	46700	47600	77200	77800
Manganèse	µg/L		1	386	412	22	71	3	3
Nickel	µg/L		1	7	7	7	7	5	5
Plomb	µg/L		1	<1	<1	<1	4	<1	<1
Potassium	µg/L		100	6420	6210	12500	12400	3090	3030
Sélénium	µg/L		1	<1	<1	<1	<1	<1	<1
Sodium	µg/L		200	40200	39700	17100	16600	9090	8840
Strontium	µg/L		10	635	647	529	517	731	732
Titane	µg/L		3	<3	<3	<3	<3	<3	<3
Zinc	µg/L		3	25	14	23	44	12	18
Silicium	mg/L		2	7	7	<2	<2	3	3

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Métaux Extractibles Totaux (basse limite)															
Aluminium	5669036	NA	NA	NA	0.0%	< 10	95%	80%	120%	101%	80%	120%	NA	80%	120%
Antimoine	5669036	NA	NA	NA	0.0%	< 1	110%	80%	120%	92%	80%	120%	NA	80%	120%
Arsenic	5669036	NA	NA	NA	0.0%	< 1	102%	80%	120%	109%	80%	120%	NA	80%	120%
Baryum	5669036	NA	NA	NA	0.0%	< 5	107%	80%	120%	101%	80%	120%	NA	80%	120%
Béryllium	5669036	NA	NA	NA	0.0%	< 1	115%	80%	120%	104%	80%	120%	NA	80%	120%
Bismuth	5669036	NA	NA	NA	0.0%	< 1	NA	80%	120%	91%	80%	120%	NA	80%	120%
Cadmium	5669036	NA	NA	NA	0.0%	< 0.5	101%	80%	120%	102%	80%	120%	NA	80%	120%
Calcium	5669036	NA	NA	NA	0.0%	< 100	98%	80%	120%	100%	80%	120%	NA	80%	120%
Chrome	5669036	NA	NA	NA	0.0%	< 1	108%	80%	120%	101%	80%	120%	NA	80%	120%
Cobalt	5669036	NA	NA	NA	0.0%	< 0.5	108%	80%	120%	99%	80%	120%	NA	80%	120%
Cuivre	5669036	NA	NA	NA	0.0%	< 1	105%	80%	120%	101%	80%	120%	NA	80%	120%
Fer	5669036	NA	NA	NA	0.0%	< 70	101%	80%	120%	101%	80%	120%	NA	80%	120%
Lithium	5669036	NA	NA	NA	0.0%	< 1	NA	80%	120%	108%	80%	120%	NA	80%	120%
Magnésium	5669036	NA	NA	NA	0.0%	< 100	107%	80%	120%	105%	80%	120%	NA	80%	120%
Manganèse	5669036	NA	NA	NA	0.0%	< 1	102%	80%	120%	103%	80%	120%	NA	80%	120%
Nickel	5669036	NA	NA	NA	0.0%	< 1	108%	80%	120%	105%	80%	120%	NA	80%	120%
Plomb	5669036	NA	NA	NA	0.0%	< 1	105%	80%	120%	99%	80%	120%	NA	80%	120%
Potassium	5669036	NA	NA	NA	0.0%	< 100	100%	80%	120%	101%	80%	120%	NA	80%	120%
Sélénium	5669036	NA	NA	NA	0.0%	< 1	111%	80%	120%	105%	80%	120%	NA	80%	120%
Sodium	5669036	NA	NA	NA	0.0%	< 200	100%	80%	120%	99%	80%	120%	NA	80%	120%
Strontium	5669036	NA	NA	NA	0.0%	< 10	98%	80%	120%	94%	80%	120%	NA	80%	120%
Titane	5669036	NA	NA	NA	0.0%	< 3	NA	80%	120%	109%	80%	120%	NA	80%	120%
Zinc	5669036	NA	NA	NA	0.0%	< 3	109%	80%	120%	101%	80%	120%	NA	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	103%	80%	120%	NA	80%	120%
Métaux Extractibles Totaux															
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	94%	80%	120%	NA	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M875048
N° DE PROJET:
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 12 août 2014
DATE D’ÉCHANTILLONI 12 août 2014
DATE DU RAPPORT: 15 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau usée		Analyses Inorganiques

Analyses Inorganiques

Identification de l'échantillon				**TP-PWBLEND**	**TP-PWBLEND-test 7**
Date d'échantillonnage				**08-12-2014**	**08-12-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5681946**	**5681963**
Cyanures totaux	mg/L - CN		0.005	0.387	0.380

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	97%	80%	120%	109%	80%	120%	NA	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL:	14M875285
N° DE PROJET:	
NOM DU CLIENT:	AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE:	Jessica Huza
DATE DE RÉCEPTION:	08 août 2014
DATE D’ÉCHANTILLONI	08 août 2014
DATE DU RAPPORT:	18 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau de surface		Métaux Extractibles Totaux
X02	Eau de surface		Métaux Extractibles Totaux (basse limite)

Métaux Extractibles Totaux

Identification de l’échantillon				**SP-TEST6**	**SP-TEST6-F**
Date d’échantillonnage				**08-08-2014**	**08-08-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5683831**	**5683846**
Soufre	mg/L		0.1	300	309

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Extractibles Totaux (basse limite)

Identification de l’échantillon				**SP-TEST6**	**SP-TEST6-F**
Date d’échantillonnage				**08-08-2014**	**08-08-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5683831**	**5683846**
Aluminium	µg/L		10	21	19
Antimoine	µg/L		1	<1	<1
Arsenic	µg/L		1	3	2
Baryum	µg/L		5	18	17
Béryllium	µg/L		1	<1	<1
Bismuth	µg/L		1	<1	<1
Cadmium	µg/L		0.5	<0.5	<0.5
Calcium	µg/L		100	208000	210000
Chrome	µg/L		1	2	2
Cobalt	µg/L		0.5	4.4	4.3
Cuivre	µg/L		1	560	254
Fer	µg/L		70	<70	<70
Lithium	µg/L		1	1	1
Magnésium	µg/L		100	61700	64500
Manganèse	µg/L		1	152	123
Nickel	µg/L		1	4	4
Plomb	µg/L		1	<1	<1
Potassium	µg/L		100	6300	6360
Sélénium	µg/L		1	<1	<1
Sodium	µg/L		200	41100	42100
Strontium	µg/L		10	596	592
Titane	µg/L		3	<3	<3
Zinc	µg/L		3	4	7
Silicium	mg/L		2	7	7

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Métaux Extractibles Totaux (basse limite)															
Aluminium	5682616	NA	NA	NA	0.0%	< 10	103%	80%	120%	110%	80%	120%	118%	80%	120%
Antimoine	5682616	NA	NA	NA	0.0%	< 1	118%	80%	120%	92%	80%	120%	114%	80%	120%
Arsenic	5682616	NA	NA	NA	0.0%	< 1	108%	80%	120%	105%	80%	120%	NA	80%	120%
Baryum	5682616	NA	NA	NA	0.0%	< 5	109%	80%	120%	94%	80%	120%	NA	80%	120%
Béryllium	5682616	NA	NA	NA	0.0%	< 1	108%	80%	120%	107%	80%	120%	NA	80%	120%
Bismuth	5682616	NA	NA	NA	0.0%	< 1	NA	80%	120%	95%	80%	120%	107%	80%	120%
Cadmium	5682616	NA	NA	NA	0.0%	< 0.5	102%	80%	120%	103%	80%	120%	NA	80%	120%
Calcium	5682616	NA	NA	NA	0.0%	< 100	99%	80%	120%	94%	80%	120%	NA	80%	120%
Chrome	5682616	NA	NA	NA	0.0%	< 1	110%	80%	120%	92%	80%	120%	NA	80%	120%
Cobalt	5682616	NA	NA	NA	0.0%	< 0.5	107%	80%	120%	97%	80%	120%	105%	80%	120%
Cuivre	5682616	NA	NA	NA	0.0%	< 1	100%	80%	120%	104%	80%	120%	NA	80%	120%
Fer	5682616	NA	NA	NA	0.0%	< 70	97%	80%	120%	86%	80%	120%	NA	80%	120%
Lithium	5682616	NA	NA	NA	0.0%	< 1	NA	80%	120%	112%	80%	120%	NA	80%	120%
Magnésium	5682616	NA	NA	NA	0.0%	< 100	100%	80%	120%	108%	80%	120%	NA	80%	120%
Manganèse	5682616	NA	NA	NA	0.0%	< 1	102%	80%	120%	96%	80%	120%	NA	80%	120%
Nickel	5682616	NA	NA	NA	0.0%	< 1	104%	80%	120%	99%	80%	120%	NA	80%	120%
Plomb	5682616	NA	NA	NA	0.0%	< 1	102%	80%	120%	99%	80%	120%	97%	80%	120%
Potassium	5682616	NA	NA	NA	0.0%	< 100	97%	80%	120%	95%	80%	120%	NA	80%	120%
Sélénium	5682616	NA	NA	NA	0.0%	< 1	105%	80%	120%	100%	80%	120%	NA	80%	120%
Sodium	5682616	NA	NA	NA	0.0%	< 200	103%	80%	120%	107%	80%	120%	NA	80%	120%
Strontium	5682616	NA	NA	NA	0.0%	< 10	101%	80%	120%	94%	80%	120%	NA	80%	120%
Titane	5682616	NA	NA	NA	0.0%	< 3	NA	80%	120%	96%	80%	120%	113%	80%	120%
Zinc	5682616	NA	NA	NA	0.0%	< 3	104%	80%	120%	108%	80%	120%	NA	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	105%	80%	120%	NA	80%	120%
Métaux Extractibles Totaux															
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	89%	80%	120%	NA	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL:	14M876191
N° DE PROJET:	VM00605J
NOM DU CLIENT:	AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE:	Jessica Huza
DATE DE RÉCEPTION:	12 août 2014
DATE D’ÉCHANTILLONI	30 juil. 2014
DATE DU RAPPORT:	21 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	**Matrice**	**Critères Normes**	**Nom de l'ensemble**
X01	Eau usée		Métaux Extractibles Totaux

Métaux Extractibles Totaux

Identification de l'échantillon				**TP-PWBLEND-TEST7**	**TP-PWBLEND-F-TEST7**	**OP**	**SP**	**TP**	**TP-PW-02**	**TP-PW-03**	**TP-PW-04**
Date d'échantillonnage				**08-12-2014**	**08-12-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**	**07-30-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5692982**	**5692987**	**5692988**	**5692989**	**5692990**	**5692991**	**5692993**	**5692994**
Aluminium	mg/L		0.04	<0.04	<0.04	<0.04	<0.04	0.06	<0.04	<0.04	<0.04
Antimoine	mg/L		0.02	0.18	0.17	<0.02	<0.02	0.04	<0.02	0.53	0.41
Argent	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic	mg/L		0.05	1.10	1.00	<0.05	0.06	0.10	17.3	0.84	3.63
Baryum	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Béryllium	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bismuth	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bore	mg/L		5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium	mg/L		0.5	479	482	246	268	187	460	468	472
Chrome	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cuivre	mg/L		0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Étain	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fer	mg/L		0.1	0.1	<0.1	<0.1	7.5	0.2	34.1	0.2	<0.1
Lithium	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Magnésium	mg/L		0.5	121	122	76.6	67.1	46.2	108	84.2	139
Manganèse	mg/L		0.01	6.03	5.83	0.02	6.35	0.08	27.7	52.7	4.22
Molybdène	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	mg/L		0.01	0.01	0.02	<0.01	0.01	<0.01	0.02	0.02	0.02
Plomb	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L		0.5	45.8	47.9	2.9	6.0	12.0	61.3	16.0	35.0
Sélénium	mg/L		0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Silicium	mg/L		2	7	6	3	7	<2	7	17	11
Sodium	mg/L		1.0	61.6	62.0	10.7	39.4	17.3	69.1	23.3	44.4
Soufre	mg/L		0.1	604	684	309	319	245	700	588	664
Strontium	mg/L		0.01	1.03	0.99	0.79	0.77	0.49	0.85	1.43	1.23
Thallium	mg/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Titane	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	mg/L		0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Vanadium	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	mg/L		0.02	<0.02	<0.02	0.27	0.03	0.06	0.42	0.02	0.07

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Métaux Extractibles Totaux															
Aluminium	5683861	NA	NA	NA	0.0%	< 0.04	96%	80%	120%	108%	80%	120%	NA	80%	120%
Antimoine	5683861	NA	NA	NA	0.0%	< 0.02	110%	80%	120%	96%	80%	120%	92%	80%	120%
Argent	5683861	NA	NA	NA	0.0%	< 0.020	NA	80%	120%	101%	80%	120%	99%	80%	120%
Arsenic	5683861	NA	NA	NA	0.0%	< 0.05	104%	80%	120%	106%	80%	120%	NA	80%	120%
Baryum	5683861	NA	NA	NA	0.0%	< 0.5	101%	80%	120%	99%	80%	120%	NA	80%	120%
Béryllium	5683861	NA	NA	NA	0.0%	< 0.5	107%	80%	120%	100%	80%	120%	115%	80%	120%
Bismuth	5683861	NA	NA	NA	0.0%	< 0.01	NA	80%	120%	100%	80%	120%	87%	80%	120%
Bore	5683861	NA	NA	NA	0.0%	< 5	100%	80%	120%	116%	80%	120%	NA	80%	120%
Cadmium	5683861	NA	NA	NA	0.0%	< 0.01	103%	80%	120%	101%	80%	120%	116%	80%	120%
Calcium	5683861	NA	NA	NA	0.0%	< 0.5	93%	80%	120%	100%	80%	120%	NA	80%	120%
Chrome	5683861	NA	NA	NA	0.0%	< 0.01	100%	80%	120%	103%	80%	120%	NA	80%	120%
Cobalt	5683861	NA	NA	NA	0.0%	< 0.01	97%	80%	120%	102%	80%	120%	94%	80%	120%
Cuivre	5683861	NA	NA	NA	0.0%	< 0.1	105%	80%	120%	102%	80%	120%	NA	80%	120%
Étain	5683861	NA	NA	NA	0.0%	< 0.5	NA	80%	120%	100%	80%	120%	NA	80%	120%
Fer	5683861	NA	NA	NA	0.0%	< 0.1	97%	80%	120%	99%	80%	120%	NA	80%	120%
Lithium	5683861	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	103%	80%	120%	NA	80%	120%
Magnésium	5683861	NA	NA	NA	0.0%	< 0.5	106%	80%	120%	101%	80%	120%	NA	80%	120%
Manganèse	5683861	NA	NA	NA	0.0%	< 0.01	94%	80%	120%	100%	80%	120%	NA	80%	120%
Molybdène	5683861	NA	NA	NA	0.0%	< 0.01	99%	80%	120%	100%	80%	120%	NA	80%	120%
Nickel	5683861	NA	NA	NA	0.0%	< 0.01	105%	80%	120%	99%	80%	120%	NA	80%	120%
Plomb	5683861	NA	NA	NA	0.0%	< 0.05	103%	80%	120%	104%	80%	120%	91%	80%	120%
Potassium	5683861	NA	NA	NA	0.0%	< 0.5	95%	80%	120%	97%	80%	120%	NA	80%	120%
Sélénium	5683861	NA	NA	NA	0.0%	< 0.15	100%	80%	120%	105%	80%	120%	NA	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	103%	80%	120%	NA	80%	120%
Sodium	5683861	NA	NA	NA	0.0%	< 1.0	105%	80%	120%	105%	80%	120%	NA	80%	120%
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	95%	80%	120%	NA	80%	120%
Strontium	5683861	NA	NA	NA	0.0%	< 0.01	91%	80%	120%	95%	80%	120%	NA	80%	120%
Thallium	5683861	NA	NA	NA	0.0%	< 1	100%	80%	120%	103%	80%	120%	95%	80%	120%
Titane	5683861	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	100%	80%	120%	NA	80%	120%
Uranium	5683861	NA	NA	NA	0.0%	< 0.3	97%	80%	120%	99%	80%	120%	97%	80%	120%
Vanadium	5683861	NA	NA	NA	0.0%	< 0.5	102%	80%	120%	107%	80%	120%	NA	80%	120%
Zinc	5683861	NA	NA	NA	0.0%	< 0.02	109%	80%	120%	100%	80%	120%	NA	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M876203
N° DE PROJET: VM00605J.502.02
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 14 août 2014
DATE D’ÉCHANTILLONN 13 août 2014
DATE DU RAPPORT: 19 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau usée		Analyses Inorganiques
X02	Eau usée		Métaux Extractibles Totaux

Analyses Inorganiques

Identification de l'échantillon				**TP-PWBLEND-TEST10**	**TP-PWBLEND-TEST9**	**TP-PWBLEND-TEST8**
Date d'échantillonnage				**08-13-2014**	**08-13-2014**	**08-13-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5693045**	**5693051**	**5693053**
Cyanures totaux	mg/L - CN		0.005	0.415	0.399	1.27

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Extractibles Totaux

Identification de l'échantillon				**TP-PWBLEND-TEST10**	**TP-PWBLEND-F-TEST10**	**TP-PWBLEND-TEST9**	**TP-PWBLEND-F-TEST9**	**TP-PWBLEND-TEST8**	**TP-PWBLEND-F-TEST8**
Date d'échantillonnage				**08-13-2014**	**08-13-2014**	**08-13-2014**	**08-13-2014**	**08-13-2014**	**08-13-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5693045**	**5693047**	**5693051**	**5693052**	**5693053**	**5693061**
Aluminium	mg/L		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Antimoine	mg/L		0.02	0.05	0.04	<0.02	<0.02	0.04	0.06
Argent	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic	mg/L		0.05	0.11	0.08	0.05	<0.05	<0.05	0.13
Baryum	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Béryllium	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bismuth	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bore	mg/L		5	<5	<5	<5	<5	<5	<5
Cadmium	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium	mg/L		0.5	532	534	566	573	448	513
Chrome	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cuivre	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Étain	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fer	mg/L		0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1
Lithium	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Magnésium	mg/L		0.5	110	111	110	113	62.3	110
Manganèse	mg/L		0.01	1.65	1.58	1.62	1.51	0.17	3.76
Molybdène	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Nickel	mg/L		0.01	0.02	0.02	0.02	0.02	0.01	0.02
Plomb	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L		0.5	49.7	48.1	49.5	47.8	46.0	48.0
Sélénium	mg/L		0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Silicium	mg/L		2	4	4	2	2	<2	4
Sodium	mg/L		1.0	56.8	56.9	59.5	59.6	2940	56.0
Soufre	mg/L		0.1	734	766	781	754	739	744
Strontium	mg/L		0.01	1.11	1.08	1.10	1.09	0.93	1.07
Thallium	mg/L		1	<1	<1	<1	<1	<1	<1
Titane	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	mg/L		0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Vanadium	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	mg/L		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Métaux Extractibles Totaux															
Aluminium	5694879	NA	NA	NA	0.0%	< 0.04	93%	80%	120%	99%	80%	120%	NA	80%	120%
Antimoine	5694879	NA	NA	NA	0.0%	< 0.02	113%	80%	120%	97%	80%	120%	NA	80%	120%
Argent	5694879	NA	NA	NA	0.0%	< 0.020	NA	80%	120%	102%	80%	120%	NA	80%	120%
Arsenic	5694879	NA	NA	NA	0.0%	< 0.05	104%	80%	120%	107%	80%	120%	NA	80%	120%
Baryum	5694879	NA	NA	NA	0.0%	< 0.5	102%	80%	120%	101%	80%	120%	NA	80%	120%
Béryllium	5694879	NA	NA	NA	0.0%	< 0.5	105%	80%	120%	97%	80%	120%	NA	80%	120%
Bismuth	5694879	NA	NA	NA	0.0%	< 0.01	NA	80%	120%	93%	80%	120%	115%	80%	120%
Bore	5694879	NA	NA	NA	0.0%	< 5	96%	80%	120%	103%	80%	120%	NA	80%	120%
Cadmium	5694879	NA	NA	NA	0.0%	< 0.01	105%	80%	120%	100%	80%	120%	NA	80%	120%
Calcium	5694879	NA	NA	NA	0.0%	< 0.5	98%	80%	120%	97%	80%	120%	NA	80%	120%
Chrome	5694879	NA	NA	NA	0.0%	< 0.01	104%	80%	120%	97%	80%	120%	NA	80%	120%
Cobalt	5694879	NA	NA	NA	0.0%	< 0.01	106%	80%	120%	101%	80%	120%	NA	80%	120%
Cuivre	5694879	NA	NA	NA	0.0%	< 0.1	99%	80%	120%	103%	80%	120%	NA	80%	120%
Étain	5694879	NA	NA	NA	0.0%	< 0.5	NA	80%	120%	100%	80%	120%	NA	80%	120%
Fer	5694879	NA	NA	NA	0.0%	< 0.1	105%	80%	120%	103%	80%	120%	NA	80%	120%
Lithium	5694879	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	101%	80%	120%	NA	80%	120%
Magnésium	5694879	NA	NA	NA	0.0%	< 0.5	97%	80%	120%	101%	80%	120%	NA	80%	120%
Manganèse	5694879	NA	NA	NA	0.0%	< 0.01	102%	80%	120%	100%	80%	120%	NA	80%	120%
Molybdène	5694879	NA	NA	NA	0.0%	< 0.01	98%	80%	120%	98%	80%	120%	NA	80%	120%
Nickel	5694879	NA	NA	NA	0.0%	< 0.01	101%	80%	120%	103%	80%	120%	NA	80%	120%
Plomb	5694879	NA	NA	NA	0.0%	< 0.05	101%	80%	120%	95%	80%	120%	111%	80%	120%
Potassium	5694879	NA	NA	NA	0.0%	< 0.5	100%	80%	120%	97%	80%	120%	NA	80%	120%
Sélénium	5694879	NA	NA	NA	0.0%	< 0.15	108%	80%	120%	113%	80%	120%	NA	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	101%	80%	120%	NA	80%	120%
Sodium	5694879	NA	NA	NA	0.0%	< 1.0	101%	80%	120%	98%	80%	120%	NA	80%	120%
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	94%	80%	120%	NA	80%	120%
Strontium	5694879	NA	NA	NA	0.0%	< 0.01	91%	80%	120%	96%	80%	120%	NA	80%	120%
Thallium	5694879	NA	NA	NA	0.0%	< 1	103%	80%	120%	98%	80%	120%	NA	80%	120%
Titane	5694879	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	102%	80%	120%	NA	80%	120%
Uranium	5694879	NA	NA	NA	0.0%	< 0.3	96%	80%	120%	96%	80%	120%	NA	80%	120%
Vanadium	5694879	NA	NA	NA	0.0%	< 0.5	103%	80%	120%	99%	80%	120%	NA	80%	120%
Zinc	5694879	NA	NA	NA	0.0%	< 0.02	105%	80%	120%	103%	80%	120%	NA	80%	120%
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	86%	80%	120%	113%	80%	120%	116%	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M876203
N° DE PROJET: VM00605J.502.02
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 14 août 2014
DATE D’ÉCHANTILLON 13 août 2014
DATE DU RAPPORT: 19 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau usée		Analyses Inorganiques
X02	Eau usée		Métaux Extractibles Totaux

Analyses Inorganiques

Identification de l’échantillon				**TP-PWBLEND-TEST10**	**TP-PWBLEND-TEST9**	**TP-PWBLEND-TEST8**
Date d’échantillonnage				**08-13-2014**	**08-13-2014**	**08-13-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5693045**	**5693051**	**5693053**
Cyanures totaux	mg/L - CN		0.005	0.415	0.399	1.27

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Extractibles Totaux

Identification de l’échantillon				**TP-PWBLEND-TEST10**	**TP-PWBLEND-F-TEST10**	**TP-PWBLEND-TEST9**	**TP-PWBLEND-F-TEST9**	**TP-PWBLEND-TEST8**	**TP-PWBLEND-F-TEST8**
Date d’échantillonnage				**08-13-2014**	**08-13-2014**	**08-13-2014**	**08-13-2014**	**08-13-2014**	**08-13-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5693045**	**5693047**	**5693051**	**5693052**	**5693053**	**5693061**
Aluminium	mg/L		0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Antimoine	mg/L		0.02	0.05	0.04	<0.02	<0.02	0.04	0.06
Argent	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic	mg/L		0.05	0.11	0.08	0.05	<0.05	<0.05	0.13
Baryum	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Béryllium	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bismuth	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bore	mg/L		5	<5	<5	<5	<5	<5	<5
Cadmium	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium	mg/L		0.5	532	534	566	573	448	513
Chrome	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cuivre	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Étain	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fer	mg/L		0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1
Lithium	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Magnésium	mg/L		0.5	110	111	110	113	62.3	110
Manganèse	mg/L		0.01	1.65	1.58	1.62	1.51	0.17	3.76
Molybdène	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Nickel	mg/L		0.01	0.02	0.02	0.02	0.02	0.01	0.02
Plomb	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L		0.5	49.7	48.1	49.5	47.8	46.0	48.0
Sélénium	mg/L		0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Silicium	mg/L		2	4	4	2	2	<2	4
Sodium	mg/L		1.0	56.8	56.9	59.5	59.6	2940	56.0
Soufre	mg/L		0.1	734	766	781	754	739	744
Strontium	mg/L		0.01	1.11	1.08	1.10	1.09	0.93	1.07
Thallium	mg/L		1	<1	<1	<1	<1	<1	<1
Titane	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	mg/L		0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Vanadium	mg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	mg/L		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Métaux Extractibles Totaux															
Aluminium	5694879	NA	NA	NA	0.0%	< 0.04	93%	80%	120%	99%	80%	120%	NA	80%	120%
Antimoine	5694879	NA	NA	NA	0.0%	< 0.02	113%	80%	120%	97%	80%	120%	NA	80%	120%
Argent	5694879	NA	NA	NA	0.0%	< 0.020	NA	80%	120%	102%	80%	120%	NA	80%	120%
Arsenic	5694879	NA	NA	NA	0.0%	< 0.05	104%	80%	120%	107%	80%	120%	NA	80%	120%
Baryum	5694879	NA	NA	NA	0.0%	< 0.5	102%	80%	120%	101%	80%	120%	NA	80%	120%
Béryllium	5694879	NA	NA	NA	0.0%	< 0.5	105%	80%	120%	97%	80%	120%	NA	80%	120%
Bismuth	5694879	NA	NA	NA	0.0%	< 0.01	NA	80%	120%	93%	80%	120%	115%	80%	120%
Bore	5694879	NA	NA	NA	0.0%	< 5	96%	80%	120%	103%	80%	120%	NA	80%	120%
Cadmium	5694879	NA	NA	NA	0.0%	< 0.01	105%	80%	120%	100%	80%	120%	NA	80%	120%
Calcium	5694879	NA	NA	NA	0.0%	< 0.5	98%	80%	120%	97%	80%	120%	NA	80%	120%
Chrome	5694879	NA	NA	NA	0.0%	< 0.01	104%	80%	120%	97%	80%	120%	NA	80%	120%
Cobalt	5694879	NA	NA	NA	0.0%	< 0.01	106%	80%	120%	101%	80%	120%	NA	80%	120%
Cuivre	5694879	NA	NA	NA	0.0%	< 0.1	99%	80%	120%	103%	80%	120%	NA	80%	120%
Étain	5694879	NA	NA	NA	0.0%	< 0.5	NA	80%	120%	100%	80%	120%	NA	80%	120%
Fer	5694879	NA	NA	NA	0.0%	< 0.1	105%	80%	120%	103%	80%	120%	NA	80%	120%
Lithium	5694879	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	101%	80%	120%	NA	80%	120%
Magnésium	5694879	NA	NA	NA	0.0%	< 0.5	97%	80%	120%	101%	80%	120%	NA	80%	120%
Manganèse	5694879	NA	NA	NA	0.0%	< 0.01	102%	80%	120%	100%	80%	120%	NA	80%	120%
Molybdène	5694879	NA	NA	NA	0.0%	< 0.01	98%	80%	120%	98%	80%	120%	NA	80%	120%
Nickel	5694879	NA	NA	NA	0.0%	< 0.01	101%	80%	120%	103%	80%	120%	NA	80%	120%
Plomb	5694879	NA	NA	NA	0.0%	< 0.05	101%	80%	120%	95%	80%	120%	111%	80%	120%
Potassium	5694879	NA	NA	NA	0.0%	< 0.5	100%	80%	120%	97%	80%	120%	NA	80%	120%
Sélénium	5694879	NA	NA	NA	0.0%	< 0.15	108%	80%	120%	113%	80%	120%	NA	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	101%	80%	120%	NA	80%	120%
Sodium	5694879	NA	NA	NA	0.0%	< 1.0	101%	80%	120%	98%	80%	120%	NA	80%	120%
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	94%	80%	120%	NA	80%	120%
Strontium	5694879	NA	NA	NA	0.0%	< 0.01	91%	80%	120%	96%	80%	120%	NA	80%	120%
Thallium	5694879	NA	NA	NA	0.0%	< 1	103%	80%	120%	98%	80%	120%	NA	80%	120%
Titane	5694879	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	102%	80%	120%	NA	80%	120%
Uranium	5694879	NA	NA	NA	0.0%	< 0.3	96%	80%	120%	96%	80%	120%	NA	80%	120%
Vanadium	5694879	NA	NA	NA	0.0%	< 0.5	103%	80%	120%	99%	80%	120%	NA	80%	120%
Zinc	5694879	NA	NA	NA	0.0%	< 0.02	105%	80%	120%	103%	80%	120%	NA	80%	120%
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	86%	80%	120%	113%	80%	120%	116%	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M878079
N° DE PROJET: VM00605J.502.02
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 15 août 2014
DATE D’ÉCHANTILLONN 15 août 2014
DATE DU RAPPORT: 25 août 2014

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau usée		Analyses Inorganiques
X02	Eau usée		Métaux Extractibles Totaux (basse limite)

Analyses Inorganiques

Identification de l’échantillon				**TP-PWBLEND-TEST11**
Date d’échantillonnage				**08-15-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5711267**
Cyanures totaux	mg/L - CN		0.005	0.392

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Extractibles Totaux (basse limite)

Identification de l'échantillon				**TP-PWBLEND-TEST11**	**TP-PWBLEND-F-TEST11**
Date d'échantillonnage				**08-15-2014**	**08-15-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5711267**	**5711268**
Aluminium	µg/L		10	<10	<10
Antimoine	µg/L		1	13	12
Arsenic	µg/L		1	40	27
Baryum	µg/L		5	5	5
Béryllium	µg/L		1	<1	<1
Bismuth	µg/L		1	<1	<1
Cadmium	µg/L		0.5	<0.5	<0.5
Calcium	µg/L		100	577000	582000
Chrome	µg/L		1	<1	<1
Cobalt	µg/L		0.5	1.0	0.9
Cuivre	µg/L		1	3	3
Fer	µg/L		70	131	<70
Lithium	µg/L		1	14	15
Magnésium	µg/L		100	107000	111000
Manganèse	µg/L		1	821	762
Nickel	µg/L		1	11	11
Plomb	µg/L		1	<1	<1
Potassium	µg/L		100	46300	44500
Sélénium	µg/L		1	<1	<1
Sodium	µg/L		200	55500	56200
Strontium	µg/L		10	1160	1120
Titane	µg/L		3	<3	<3
Zinc	µg/L		3	4	6
Silicium	mg/L		2	<2	<2
Soufre	mg/L		0.1	800	789

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d’écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Métaux Extractibles Totaux (basse limite)															
Aluminium	5708788	NA	NA	NA	0.0%	< 10	100%	80%	120%	94%	80%	120%	NA	80%	120%
Antimoine	5708788	NA	NA	NA	0.0%	< 1	109%	80%	120%	93%	80%	120%	NA	80%	120%
Arsenic	5708788	NA	NA	NA	0.0%	< 1	104%	80%	120%	103%	80%	120%	NA	80%	120%
Baryum	5708788	NA	NA	NA	0.0%	< 5	97%	80%	120%	92%	80%	120%	NA	80%	120%
Béryllium	5708788	NA	NA	NA	0.0%	< 1	108%	80%	120%	100%	80%	120%	NA	80%	120%
Bismuth	5708788	NA	NA	NA	0.0%	< 1	NA	80%	120%	95%	80%	120%	NA	80%	120%
Cadmium	5708788	NA	NA	NA	0.0%	< 0.5	99%	80%	120%	97%	80%	120%	NA	80%	120%
Calcium	5708788	NA	NA	NA	0.0%	< 100	96%	80%	120%	99%	80%	120%	NA	80%	120%
Chrome	5708788	NA	NA	NA	0.0%	< 1	102%	80%	120%	102%	80%	120%	NA	80%	120%
Cobalt	5708788	NA	NA	NA	0.0%	< 0.5	104%	80%	120%	108%	80%	120%	NA	80%	120%
Cuivre	5708788	NA	NA	NA	0.0%	< 1	102%	80%	120%	98%	80%	120%	NA	80%	120%
Fer	5708788	NA	NA	NA	0.0%	< 70	101%	80%	120%	106%	80%	120%	NA	80%	120%
Lithium	5708788	NA	NA	NA	0.0%	< 1	NA	80%	120%	108%	80%	120%	NA	80%	120%
Magnésium	5708788	NA	NA	NA	0.0%	< 100	99%	80%	120%	106%	80%	120%	NA	80%	120%
Manganèse	5708788	NA	NA	NA	0.0%	< 1	100%	80%	120%	101%	80%	120%	NA	80%	120%
Nickel	5708788	NA	NA	NA	0.0%	< 1	102%	80%	120%	100%	80%	120%	NA	80%	120%
Plomb	5708788	NA	NA	NA	0.0%	< 1	101%	80%	120%	98%	80%	120%	NA	80%	120%
Potassium	5708788	NA	NA	NA	0.0%	< 100	97%	80%	120%	100%	80%	120%	NA	80%	120%
Sélénium	5708788	NA	NA	NA	0.0%	< 1	98%	80%	120%	100%	80%	120%	NA	80%	120%
Sodium	5708788	NA	NA	NA	0.0%	< 200	99%	80%	120%	100%	80%	120%	NA	80%	120%
Strontium	5708788	NA	NA	NA	0.0%	< 10	96%	80%	120%	101%	80%	120%	NA	80%	120%
Titane	5708788	NA	NA	NA	0.0%	< 3	NA	80%	120%	101%	80%	120%	NA	80%	120%
Zinc	5708788	NA	NA	NA	0.0%	< 3	102%	80%	120%	93%	80%	120%	NA	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	100%	80%	120%	NA	80%	120%
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	95%	80%	120%	NA	80%	120%
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	94%	80%	120%	110%	80%	120%	118%	80%	120%

CERTIFICAT D’ANALYSE

N° BON DE TRAVAIL: 14M884028
N° DE PROJET: VM006051-502-02
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L’ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 03 sept. 2014
DATE D’ÉCHANTILLONI 03 sept. 2014
DATE DU RAPPORT:

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau usée		Analyses Inorganiques
X02	Eau usée	QC PTC (ES cons.)	Métaux Dissous
X03	Eau usée		Métaux Extractibles Totaux

Analyses Inorganiques

Identification de l’échantillon				**TEST12-BEFORE**	**TEST12-AFTER**
Date d’échantillonnage				**09-03-2014**	**09-03-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5767208**	**5767227**
Cyanures totaux	mg/L - CN		0.005	0.139	0.142
Azote ammoniacal	mg/L - N		0.05		4.22

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Dissous

Identification de l’échantillon				**TEST12-BEFORE-F**	**TEST12-AFTER-F**
Date d’échantillonnage				**09-03-2014**	**09-03-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5767226**	**5767228**
Aluminium dissous	µg/L		10	<10	23
Antimoine dissous	µg/L	6	1	**107**	**51**
Arsenic dissous	µg/L	25	1	**314**	6
Baryum dissous	µg/L	1000	1	7	6
Bismuth dissous	µg/L		1	<1	<1
Béryllium dissous	µg/L		0.5	<0.5	<0.5
Cadmium dissous	µg/L	5	0.5	<0.5	<0.5
Calcium dissous	µg/L		100	298000	344000
Chrome dissous	µg/L	50	1	<1	<1
Cobalt dissous	µg/L		0.5	2.4	0.6
Cuivre dissous	µg/L	1000	1	7	4
Fer dissous	µg/L		70	<70	<70
Lithium dissous	µg/L		1	11	11
Magnésium dissous	µg/L		100	76500	77900
Manganèse dissous	µg/L	50	1	**8550**	**2570**
Nickel dissous	µg/L	20	1	8	9
Plomb dissous	µg/L	10	1	<1	<1
Potassium dissous	µg/L		100	30000	32100
Sélénium dissous	µg/L	10	1	<1	<1
Sodium dissous	µg/L	200 000	200	37000	37700
Soufre dissous	mg/L		0.1	698	722
Strontium dissous	µg/L		10	825	804
Thallium dissous	µg/L		1	<1	<1
Zinc dissous	µg/L	5000	3	81	4
Silicium dissous	mg/L		2	4	2

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Extractibles Totaux

Identification de l'échantillon Date d'échantillonnage **Paramètre**	**Unités**	**C / N**	**LDR**	TEST12-BEFORE 09-03-2014 5767208	TEST12-AFTER 09-03-2014 5767227
Aluminium	mg/L		0.04	<0.04	<0.04
Antimoine	mg/L		0.02	0.12	0.06
Arsenic	mg/L		0.05	4.09	<0.05
Baryum	mg/L		0.5	<0.5	<0.5
Béryllium	mg/L		0.5	<0.5	<0.5
Bismuth	mg/L		0.01	<0.01	<0.01
Cadmium	mg/L		0.01	<0.01	<0.01
Calcium	mg/L		0.5	334	348
Chrome	mg/L		0.01	<0.01	<0.01
Cobalt	mg/L		0.01	<0.01	<0.01
Cuivre	mg/L		0.1	<0.1	<0.1
Fer	mg/L		0.1	6.6	<0.1
Lithium	mg/L		0.1	<0.1	<0.1
Magnésium	mg/L		0.5	79.2	78.6
Manganèse	mg/L		0.01	9.17	2.64
Nickel	mg/L		0.01	<0.01	<0.01
Plomb	mg/L		0.05	<0.05	<0.05
Potassium	mg/L		0.5	29.4	30.5
Sélénium	mg/L		0.15	<0.15	<0.15
Silicium	mg/L		2	5	3
Sodium	mg/L		1.0	37.0	37.5
Strontium	mg/L		0.01	0.81	0.80
Thallium	mg/L		1	<1	<1
Zinc	mg/L		0.02	0.13	<0.02
Soufre	mg/L		0.1	610	738

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Métaux Extractibles Totaux															
Aluminium	5764025	NA	NA	NA	0.0%	< 0.04	89%	80%	120%	109%	80%	120%	NA	80%	120%
Antimoine	5764025	NA	NA	NA	0.0%	< 0.02	112%	80%	120%	95%	80%	120%	117%	80%	120%
Arsenic	5764025	NA	NA	NA	0.0%	< 0.05	102%	80%	120%	104%	80%	120%	NA	80%	120%
Baryum	5764025	NA	NA	NA	0.0%	< 0.5	104%	80%	120%	94%	80%	120%	NA	80%	120%
Béryllium	5764025	NA	NA	NA	0.0%	< 0.5	120%	80%	120%	115%	80%	120%	NA	80%	120%
Bismuth	5764025	NA	NA	NA	0.0%	< 0.01	NA	80%	120%	97%	80%	120%	94%	80%	120%
Cadmium	5764025	NA	NA	NA	0.0%	< 0.01	105%	80%	120%	99%	80%	120%	NA	80%	120%
Calcium	5764025	NA	NA	NA	0.0%	< 0.5	99%	80%	120%	99%	80%	120%	NA	80%	120%
Chrome	5764025	NA	NA	NA	0.0%	< 0.01	101%	80%	120%	91%	80%	120%	NA	80%	120%
Cobalt	5764025	NA	NA	NA	0.0%	< 0.01	101%	80%	120%	95%	80%	120%	99%	80%	120%
Cuivre	5764025	NA	NA	NA	0.0%	< 0.1	99%	80%	120%	93%	80%	120%	95%	80%	120%
Fer	5764025	NA	NA	NA	0.0%	< 0.1	89%	80%	120%	94%	80%	120%	NA	80%	120%
Lithium	5764025	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	103%	80%	120%	NA	80%	120%
Magnésium	5764025	NA	NA	NA	0.0%	< 0.5	108%	80%	120%	95%	80%	120%	NA	80%	120%
Manganèse	5764025	NA	NA	NA	0.0%	< 0.01	92%	80%	120%	107%	80%	120%	NA	80%	120%
Nickel	5764025	NA	NA	NA	0.0%	< 0.01	100%	80%	120%	91%	80%	120%	NA	80%	120%
Plomb	5764025	NA	NA	NA	0.0%	< 0.05	104%	80%	120%	101%	80%	120%	95%	80%	120%
Potassium	5764025	NA	NA	NA	0.0%	< 0.5	98%	80%	120%	95%	80%	120%	NA	80%	120%
Sélénium	5764025	NA	NA	NA	0.0%	< 0.15	111%	80%	120%	102%	80%	120%	80%	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	102%	80%	120%	NA	80%	120%
Sodium	5764025	NA	NA	NA	0.0%	< 1.0	108%	80%	120%	94%	80%	120%	NA	80%	120%
Strontium	5764025	NA	NA	NA	0.0%	< 0.01	88%	80%	120%	100%	80%	120%	NA	80%	120%
Thallium	5764025	NA	NA	NA	0.0%	< 1	103%	80%	120%	99%	80%	120%	104%	80%	120%
Zinc	5764025	NA	NA	NA	0.0%	< 0.02	109%	80%	120%	106%	80%	120%	NA	80%	120%
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	90%	80%	120%	NA	80%	120%
Analyses Inorganiques															
Cyanures totaux	1	NA	NA	NA	0.0%	< 0.005	119%	80%	120%	118%	80%	120%	103%	80%	120%
Analyses Inorganiques															
Azote ammoniacal	1	NA	NA	NA	0.0%	< 0.05	107%	80%	120%	97%	80%	120%	106%	80%	120%
Métaux Dissous															
Aluminium dissous	5770675	NA	NA	NA	0.0%	< 10	100%	80%	120%	95%	80%	120%	103%	80%	120%
Antimoine dissous	5770675	NA	NA	NA	0.0%	< 1	101%	80%	120%	91%	80%	120%	106%	80%	120%
Arsenic dissous	5770675	NA	NA	NA	0.0%	< 1	108%	80%	120%	101%	80%	120%	NA	80%	120%
Baryum dissous	5770675	NA	NA	NA	0.0%	< 1	87%	80%	120%	93%	80%	120%	NA	80%	120%
Bismuth dissous	5770675	NA	NA	NA	0.0%	< 1	NA	80%	120%	88%	80%	120%	NA	80%	120%
Béryllium dissous	5770675	NA	NA	NA	0.0%	< 0.5	117%	80%	120%	NA	80%	120%	NA	80%	120%
Cadmium dissous	5770675	NA	NA	NA	0.0%	< 0.5	101%	80%	120%	96%	80%	120%	NA	80%	120%
Calcium dissous	5770675	NA	NA	NA	0.0%	< 100	100%	80%	120%	98%	80%	120%	NA	80%	120%
Chrome dissous	5770675	NA	NA	NA	0.0%	< 1	104%	80%	120%	100%	80%	120%	110%	80%	120%
Cobalt dissous	5770675	NA	NA	NA	0.0%	< 0.5	111%	80%	120%	102%	80%	120%	104%	80%	120%
Cuivre dissous	5770675	NA	NA	NA	0.0%	< 1	98%	80%	120%	96%	80%	120%	NA	80%	120%
Fer dissous	5770675	NA	NA	NA	0.0%	< 70	101%	80%	120%	103%	80%	120%	NA	80%	120%
Lithium dissous	5770675	NA	NA	NA	0.0%	< 1	108%	80%	120%	109%	80%	120%	NA	80%	120%
Magnésium dissous	5770675	NA	NA	NA	0.0%	< 100	108%	80%	120%	108%	80%	120%	NA	80%	120%
Manganèse dissous	5770675	NA	NA	NA	0.0%	< 1	106%	80%	120%	100%	80%	120%	111%	80%	120%
Nickel dissous	5770675	NA	NA	NA	0.0%	< 1	99%	80%	120%	96%	80%	120%	96%	80%	120%
Plomb dissous	5770675	NA	NA	NA	0.0%	< 1	98%	80%	120%	94%	80%	120%	88%	80%	120%
Potassium dissous	5770675	NA	NA	NA	0.0%	< 100	109%	80%	120%	109%	80%	120%	NA	80%	120%
Sélénium dissous	5770675	NA	NA	NA	0.0%	< 1	112%	80%	120%	101%	80%	120%	NA	80%	120%
Sodium dissous	5770675	NA	NA	NA	0.0%	< 200	104%	80%	120%	107%	80%	120%	NA	80%	120%
Soufre dissous	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	84%	80%	120%	NA	80%	120%
Strontium dissous	5770675	NA	NA	NA	0.0%	< 10	103%	80%	120%	101%	80%	120%	NA	80%	120%
Thallium dissous	5770675	NA	NA	NA	0.0%	< 1	100%	80%	120%	95%	80%	120%	104%	80%	120%
Zinc dissous	5770675	NA	NA	NA	0.0%	< 3	105%	80%	120%	98%	80%	120%	NA	80%	120%
Silicium dissous	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	108%	80%	120%	NA	80%	120%

CERTIFICAT D'ANALYSE

N° BON DE TRAVAIL: 14M885701
N° DE PROJET: VM006065J-502-02
NOM DU CLIENT: AMEC ENVIRONMENT & INFRASTRUCTURE
À L'ATTENTION DE: Jessica Huza
DATE DE RÉCEPTION: 04 sept. 2014
DATE D'ÉCHANTILLONI 09 avr. 2014
DATE DU RAPPORT:

L'INFORMATION DE L'ENSEMBLE:

Nom de feuille de travail	Matrice	Critères Normes	Nom de l'ensemble
X01	Eau usée		Analyses Inorganiques
X02	Eau usée	QC PTC (ES cons.)	Métaux Dissous
X03	Eau usée		Métaux Extractibles Totaux (basse limite)

Analyses Inorganiques

Identification de l’échantillon				**TEST 13-BEFORE**	**TEST 13-AFTER**
Date d’échantillonnage				**04-09-2014**	**04-09-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5781227**	**5781413**
Cyanures totaux	mg/L - CN		0.005	0.011	0.011
Azote ammoniacal	mg/L - N		0.02		2.20

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Dissous

Identification de l'échantillon Date d'échantillonnage Paramètre	Unités	C / N	LDR	TEST 13-BEFORE-F 04-09-2014 5781405	TEST 13-AFTER-F 04-09-2014 5781422
Aluminium dissous	µg/L		10	<10	<10
Antimoine dissous	µg/L	6	1	2	2
Arsenic dissous	µg/L	25	1	6	1
Baryum dissous	µg/L	1000	1	40	15
Bismuth dissous	µg/L		1	<1	<1
Béryllium dissous	µg/L		0.5	<0.5	<0.5
Cadmium dissous	µg/L	5	0.5	1.1	<0.5
Calcium dissous	µg/L		100	286000	236000
Chrome dissous	µg/L	50	1	<1	2
Cobalt dissous	µg/L		0.5	3.5	2.7
Cuivre dissous	µg/L	1000	1	3	3
Fer dissous	µg/L		70	<70	<70
Lithium dissous	µg/L		1	5	5
Magnésium dissous	µg/L		100	76000	70108
Manganèse dissous	µg/L	50	1	**3890**	**341**
Nickel dissous	µg/L	20	1	6	5
Plomb dissous	µg/L	10	1	<1	<1
Potassium dissous	µg/L		100	5100	6320
Sélénium dissous	µg/L	10	1	<1	<1
Sodium dissous	µg/L	200 000	200	26000	25500
Soufre dissous	µg/L			411000	434000
Strontium dissous	µg/L		10	885	726
Thallium dissous	µg/L		1	<1	<1
Zinc dissous	µg/L	5000	3	113	5
Silicium dissous	µg/L		2	4460	2170

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Métaux Extractibles Totaux (basse limite)

Identification de l'échantillon				**TEST 13-BEFORE**	**TEST 13-AFTER**
Date d'échantillonnage				**04-09-2014**	**04-09-2014**
Paramètre	**Unités**	**C / N**	**LDR**	**5781227**	**5781413**
Aluminium	µg/L		10	<10	<10
Antimoine	µg/L		1	2	2
Arsenic	µg/L		1	22	1
Baryum	µg/L		5	43	15
Béryllium	µg/L		1	<1	<1
Bismuth	µg/L		1	<1	<1
Cadmium	µg/L		0.5	1.3	<0.5
Calcium	µg/L		100	275000	229000
Chrome	µg/L		1	<1	2
Cobalt	µg/L		0.5	3.7	2.8
Cuivre	µg/L		1	4	3
Fer	µg/L		70	2400	151
Lithium	µg/L		1	5	6
Magnésium	µg/L		100	70100	67700
Manganèse	µg/L		1	3680	347
Nickel	µg/L		1	6	6
Plomb	µg/L		1	<1	<1
Potassium	µg/L		100	4840	5940
Sélénium	µg/L		1	<1	<1
Sodium	µg/L		200	24400	25100
Strontium	µg/L		10	891	693
Titane	µg/L		3	<3	<3
Zinc	µg/L		3	135	4
Silicium	mg/L		2	5	2
Soufre	mg/L		0.1	483	494

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

Paramètre	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	Matériau de référence	Inf.	Sup.	BLANC FORTIFIÉ	Inf.	Sup.	ÉCH. FORTIFIÉ	Inf.	Sup.
Analyses Inorganiques															
Cyanures totaux	1	5781227	0.011	0.011	0.0%	< 0.005	91%	80%	120%	110%	80%	120%	116%	80%	120%
Analyses Inorganiques															
Azote ammoniacal	1	NA	NA	NA	0.0%	< 0.02	97%	80%	120%	94%	80%	120%	91%	80%	120%
Métaux Extractibles Totaux (basse limite)															
Aluminium	5783535	NA	NA	NA	0.0%	< 10	95%	80%	120%	96%	80%	120%	NA	80%	120%
Antimoine	5783535	NA	NA	NA	0.0%	< 1	113%	80%	120%	93%	80%	120%	115%	80%	120%
Arsenic	5783535	NA	NA	NA	0.0%	< 1	106%	80%	120%	105%	80%	120%	NA	80%	120%
Baryum	5783535	NA	NA	NA	0.0%	< 5	104%	80%	120%	97%	80%	120%	NA	80%	120%
Béryllium	5783535	NA	NA	NA	0.0%	< 1	117%	80%	120%	100%	80%	120%	NA	80%	120%
Bismuth	5783535	NA	NA	NA	0.0%	< 1	NA	80%	120%	93%	80%	120%	91%	80%	120%
Cadmium	5783535	NA	NA	NA	0.0%	< 0.5	107%	80%	120%	98%	80%	120%	NA	80%	120%
Calcium	5783535	NA	NA	NA	0.0%	< 100	99%	80%	120%	96%	80%	120%	NA	80%	120%
Chrome	5783535	NA	NA	NA	0.0%	< 1	109%	80%	120%	97%	80%	120%	105%	80%	120%
Cobalt	5783535	NA	NA	NA	0.0%	< 0.5	111%	80%	120%	96%	80%	120%	106%	80%	120%
Cuivre	5783535	NA	NA	NA	0.0%	< 1	107%	80%	120%	97%	80%	120%	97%	80%	120%
Fer	5783535	NA	NA	NA	0.0%	< 70	111%	80%	120%	101%	80%	120%	NA	80%	120%
Lithium	5783535	NA	NA	NA	0.0%	< 1	NA	80%	120%	94%	80%	120%	120%	80%	120%
Magnésium	5783535	NA	NA	NA	0.0%	< 100	105%	80%	120%	101%	80%	120%	NA	80%	120%
Manganèse	5783535	NA	NA	NA	0.0%	< 1	108%	80%	120%	99%	80%	120%	NA	80%	120%
Nickel	5783535	NA	NA	NA	0.0%	< 1	108%	80%	120%	94%	80%	120%	100%	80%	120%
Plomb	5783535	NA	NA	NA	0.0%	< 1	105%	80%	120%	96%	80%	120%	90%	80%	120%
Potassium	5783535	NA	NA	NA	0.0%	< 100	99%	80%	120%	97%	80%	120%	NA	80%	120%
Sélénium	5783535	NA	NA	NA	0.0%	< 1	105%	80%	120%	115%	80%	120%	119%	80%	120%
Sodium	5783535	NA	NA	NA	0.0%	< 200	101%	80%	120%	95%	80%	120%	NA	80%	120%
Strontium	5783535	NA	NA	NA	0.0%	< 10	104%	80%	120%	99%	80%	120%	NA	80%	120%
Titane	5783535	NA	NA	NA	0.0%	< 3	NA	80%	120%	99%	80%	120%	NA	80%	120%
Zinc	5783535	NA	NA	NA	0.0%	< 3	109%	80%	120%	106%	80%	120%	NA	80%	120%
Silicium	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	96%	80%	120%	NA	80%	120%
Soufre	1	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	82%	80%	120%	NA	80%	120%
Métaux Extractibles Totaux (basse limite)															
Calcium	2		NA	NA	NA	< 100	NA	80%	120%	96%	80%	120%	NA	80%	120%
Magnésium	2		NA	NA	NA	< 100	NA	80%	120%	101%	80%	120%	NA	80%	120%
Manganèse	2		NA	NA	NA	< 1	NA	80%	120%	102%	80%	120%	NA	80%	120%
Sodium	2		NA	NA	NA	< 200	NA	80%	120%	95%	80%	120%	NA	80%	120%
Métaux Dissous															
Aluminium dissous	5777904	NA	NA	NA	0.0%	< 10	101%	80%	120%	84%	80%	120%	91%	80%	120%
Antimoine dissous	5777904	NA	NA	NA	0.0%	< 1	96%	80%	120%	94%	80%	120%	99%	80%	120%
Arsenic dissous	5777904	NA	NA	NA	0.0%	< 1	107%	80%	120%	101%	80%	120%	NA	80%	120%
Baryum dissous	5777904	NA	NA	NA	0.0%	< 1	84%	80%	120%	93%	80%	120%	NA	80%	120%
Bismuth dissous	5777904	NA	NA	NA	0.0%	< 1	NA	80%	120%	92%	80%	120%	82%	80%	120%
Béryllium dissous	5777904	NA	NA	NA	0.0%	< 0.5	107%	80%	120%	99%	80%	120%	105%	80%	120%
Cadmium dissous	5777904	NA	NA	NA	0.0%	< 0.5	100%	80%	120%	96%	80%	120%	106%	80%	120%
Calcium dissous	5777904	NA	NA	NA	0.0%	< 100	102%	80%	120%	101%	80%	120%	NA	80%	120%
Chrome dissous	5777904	NA	NA	NA	0.0%	< 1	104%	80%	120%	97%	80%	120%	NA	80%	120%
Cobalt dissous	5777904	NA	NA	NA	0.0%	< 0.5	108%	80%	120%	102%	80%	120%	101%	80%	120%
Cuivre dissous	5777904	NA	NA	NA	0.0%	< 1	104%	80%	120%	91%	80%	120%	89%	80%	120%
Fer dissous	5777904	NA	NA	NA	0.0%	< 70	106%	80%	120%	103%	80%	120%	NA	80%	120%
Lithium dissous	5777904	NA	NA	NA	0.0%	< 1	99%	80%	120%	90%	80%	120%	NA	80%	120%
Magnésium dissous	5777904	NA	NA	NA	0.0%	< 100	100%	80%	120%	104%	80%	120%	NA	80%	120%
Manganèse dissous	5777904	NA	NA	NA	0.0%	< 1	105%	80%	120%	109%	80%	120%	NA	80%	120%
Nickel dissous	5777904	NA	NA	NA	0.0%	< 1	104%	80%	120%	89%	80%	120%	NA	80%	120%
Plomb dissous	5777904	NA	NA	NA	0.0%	< 1	98%	80%	120%	92%	80%	120%	NA	80%	120%
Potassium dissous	5777904	NA	NA	NA	0.0%	< 100	103%	80%	120%	116%	80%	120%	NA	80%	120%
Sélénium dissous	5777904	NA	NA	NA	0.0%	< 1	109%	80%	120%	108%	80%	120%	NA	80%	120%
Sodium dissous	5777904	NA	NA	NA	0.0%	< 200	97%	80%	120%	107%	80%	120%	NA	80%	120%
Soufre dissous	1	NA	NA	NA	0.0%	<	NA	80%	120%	90%	80%	120%	NA	80%	120%
Strontium dissous	5777904	NA	NA	NA	0.0%	< 10	99%	80%	120%	105%	80%	120%	NA	80%	120%
Thallium dissous	5777904	NA	NA	NA	0.0%	< 1	101%	80%	120%	94%	80%	120%	96%	80%	120%
Zinc dissous	5777904	NA	NA	NA	0.0%	< 3	104%	80%	120%	92%	80%	120%	NA	80%	120%
Silicium dissous	1	NA	NA	NA	0.0%	< 2	NA	80%	120%	91%	80%	120%	NA	80%	120%

CERTIFICATE OF ANALYSIS

AGAT WORK ORDER: 14V869471
PROJECT: Mt. Nansen SI2014
CLIENT NAME: AMEC ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Jessica Huzza
DATE RECEIVED: Jul 29, 2014
DATE SAMPLED: Jul 23, 2014
DATE REPORTED: Sep 08, 2014

PACKAGE INFORMATION:

Work Sheet Name	Sample Ty	Guideline / Standard	Package Name
X01	Water		British Columbia CSR- Schedule 6 Total Metals
X02	Water	QC PTC (ES cons.)	Dissolved Metals
X03	Water		Inorganic Analysis - Mtl
X04	Water		Total Extractable Metals

British Columbia CSR- Schedule 6 Total Metals

Sample Description				**Open Pit**
Date Sampled				**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**
Aluminum Total	µg/L		5	20
Antimony Total	µg/L		0.5	3.2
Arsenic Total	µg/L		0.1	10.3
Barium Total	µg/L		0.5	18.6
Beryllium Total	µg/L		0.05	<0.05
Boron Total	µg/L		5	<5
Cadmium Total	µg/L		0.01	2.17
Calcium Total	µg/L		500	267000
Chromium Total	µg/L		0.5	<0.5
Cobalt Total	µg/L		0.05	<0.05
Copper Total	µg/L		0.5	3.0
Iron Total	µg/L		10	30
Lead Total	µg/L		0.05	0.51
Lithium Total	µg/L		0.5	8.1
Magnesium Total	µg/L		50	77500
Manganese Total	µg/L		1	22
Mercury Total	µg/L		0.01	<0.01
Molybdenum Total	µg/L		0.1	0.2
Nickel Total	µg/L		0.5	<0.5
Selenium Total	µg/L		0.5	<0.5
Silver Total	µg/L		0.02	<0.02
Sodium Total	µg/L		100	11400
Sulphur Total	µg/L		5000	278000
Thallium Total	µg/L		0.02	0.15
Titanium Total	µg/L		1	1
Uranium Total	µg/L		0.01	3.63
Vanadium Total	µg/L		1	<1
Zinc Total	µg/L		5	239
Total Hardness (calc)	ug CaCO3/L		100	986000

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Dissolved Metals

Sample Description				**Open Pit**	**Seepage Pond**	**Tailings Pond**	**MW09-02**	**MW09-03**	**MW09-04**	**MW09-07**
Date Sampled				**07/25/2014**	**07/24/2014**	**07/23/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629961**	**5629962**	**5629963**	**5629964**	**5629965**	**5629966**
Aluminium Dissolved	µg/L		10	<10	<10	14	<10	<10	<10	51
Antimony Dissolved	µg/L	6	1	3	<1	**38**	4	**541**	**419**	**10**
Silver Dissolved	µg/L	100	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.6
Arsenic Dissolved	µg/L	25	1	10	**56**	**56**	**22900**	**807**	**3570**	**488**
Barium Dissolved	µg/L	1000	1	18	76	8	8	39	7	21
Boron Dissolved	µg/L		40	<40	62	79	42	92	288	63
Beryllium Dissolved	µg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium Dissolved	µg/L	5	0.5	2.3	0.5	0.5	<0.5	1.4	<0.5	<0.5
Calcium Dissolved	µg/L		100	277000	285000	192000	457000	464000	479000	277000
Chromium Dissolved	µg/L	50	1	<1	2	<1	<1	<1	<1	2
Cobalt Dissolved	µg/L		0.5	<0.5	7.3	<0.5	9.4	3.3	<0.5	29.6
Copper Dissolved	µg/L	1000	1	3	4	15	4	4	3	14
Iron Dissolved	µg/L		70	<70	7050	<70	49400	242	<70	7310
Lithium Dissolved	µg/L		1	7	1	8	28	<1	4	4
Magnesium Dissolved	µg/L		100	74900	61100	43000	91600	72800	126000	50600
Manganese Dissolved	µg/L	50	1	22	**6810**	**57**	**35900**	**55400**	**4150**	**26500**
Molybdenum Dissolved	µg/L	70	1	<1	<1	1	5	3	8	<1
Nickel Dissolved	µg/L	20	1	3	6	3	8	8	6	**28**
Lead Dissolved	µg/L	10	1	<1	<1	<1	<1	<1	<1	<1
Selenium Dissolved	µg/L	10	1	<1	<1	<1	<1	<1	<1	<1
Sodium Dissolved	µg/L	200 000	200	9480	37700	15700	85000	22800	43900	49300
Thallium Dissolved	µg/L		1	<1	<1	<1	<1	<1	<1	<1
Titanium Dissolved	µg/L		3	<3	<3	<3	<3	5	3	4
Uranium Dissolved	µg/L		0.5	3.5	2.1	0.9	<0.5	1.4	<0.5	0.9
Vanadium Dissolved	µg/L		1	<1	2	<1	<1	<1	<1	2
Zinc Dissolved	µg/L	5000	3	332	9	28	384	10	35	611

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5629959 Analyses were performed at AGAT Laboratories, Montreal.
For this sample, the results for certain dissolved metals (Ca) are higher than those of total metals. The difference between these results is within the variability of the method acceptability.

5629961 Analyses were performed at AGAT Laboratories, Montreal.
For this sample, the results for certain dissolved metals (Ca, Cr, Mn) are higher than those of total metals. The difference between these results is within the variability of the method acceptability.

5629962 Analyses were performed at AGAT Laboratories, Montreal.
For this sample, the results for certain dissolved metals (Ca) are higher than those of total metals. The difference between these results is within the variability of the method acceptability.

5629963 Analyses were performed at AGAT Laboratories, Montreal.
For this sample, the results for certain dissolved metals (As, Ca, Fe) are higher than those of total metals. The difference between these results is within the variability of the method acceptability.
For this sample, the results for the dissolved metal (Cu) is higher than that of the total metal. The analyses were done on 2 different bottles submitted by the client.

5629964 Analyses were performed at AGAT Laboratories, Montreal.
For this sample, the results for certain dissolved metals (Sb, As, Ba, Cd, Ca, Mn) are higher than those of total metals. The difference between these results is within the variability of the method acceptability.

5629965 Analyses were performed at AGAT Laboratories, Montreal.
For this sample, the results for certain dissolved metals (As, Ba, B, Ca, Mn) are higher than those of total metals. The difference between these results is within the variability of the method acceptability.

5629966 Analyses were performed at AGAT Laboratories, Montreal.
For this sample, the results for certain dissolved metals (Ca, Mn, Mg) are higher than those of total metals. The difference between these results is within the variability of the method acceptability.
For this sample, the results for the dissolved metal (Cr) is higher than that of the total metal. The analyses were done on 2 different bottles submitted by the client.

Inorganic Analysis - Mtl

Sample Description				Open Pit	Open Pit	Seepage Pond	Seepage Pond	Tailings Pond	Tailings Pond	MW09-02	MW09-02	MW09-03	MW09-03	MW09-04	MW09-04	MW09-07	MW09-07
Date Sampled				**07/25/2014**	**07/25/2014**	**07/24/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/24/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**	**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629959**	**5629961**	**5629961**	**5629962**	**5629962**	**5629963**	**5629963**	**5629964**	**5629964**	**5629965**	**5629965**	**5629966**	**5629966**
Ammonia-N	mg/L - N		0.05	<0.05	<0.05	4.84	4.84	<0.05	<0.05	13.4	13.4	1.70	1.70	6.27	6.27	1.60	1.60
Total Cyanide	mg/L - CN		0.005	<0.005	<0.005	1.96	1.96	0.006	0.006	1.08	1.08	0.119	0.119	0.087	0.087	0.017	0.017

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5629959-5629966 Analyses were performed at AGAT Laboratories, Montreal.

Total Extractable Metals

Sample Description				**Open Pit**	**Seepage Pond**	**Tailings Pond**	**MW09-02**	**MW09-03**	**MW09-04**	**MW09-07**
Date Sampled				**07/25/2014**	**07/24/2014**	**07/23/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629961**	**5629962**	**5629963**	**5629964**	**5629965**	**5629966**
Aluminium	µg/L		10	<250	31	57	<10	<10	<10	110
Antimony	µg/L		1	<25	<1	38	4	521	421	19
Silver	µg/L		0.2	<5.0	<0.2	<0.2	<0.2	<0.2	<0.2	2.9
Arsenic	µg/L		1	<25	72	95	21700	805	3530	633
Barium	µg/L		125	<125	78	9	8	37	6	22
Beryllium	µg/L		1	<25	<1	<1	<1	<1	<1	<1
Boron	µg/L		1000	<1000	73	90	46	99	260	71
Cadmium	µg/L		0.5	<12.5	0.6	0.9	<0.5	1.2	<0.5	2.6
Calcium	µg/L		100	263000	274000	189000	443000	451000	463000	262000
Chromium	µg/L		1	<25	<1	<1	<1	<1	<1	1
Cobalt	µg/L		0.5	<12.5	7.6	<0.5	9.7	3.7	<0.5	31.7
Copper	µg/L		1	<25	6	22	3	4	3	48
Iron	µg/L		1750	<1750	9420	255	47500	255	<70	7730
Lithium	µg/L		1	<25	1	9	32	<1	5	4
Magnesium	µg/L		100	78300	66100	46800	96900	74500	132000	50100
Manganese	µg/L		1	38	6730	92	36100	53300	4110	26100
Molybdenum	µg/L		1	<25	1	2	5	3	9	<1
Nickel	µg/L		1	<25	7	3	8	8	6	28
Lead	µg/L		1	<25	<1	6	1	<1	3	5
Selenium	µg/L		1	<25	1	<1	1	<1	<1	1
Sodium	µg/L		200	11000	42200	17300	92300	24100	45600	50500
Thallium	µg/L		1	<25	<1	<1	<1	<1	<1	<1
Titanium	µg/L		3	<75	5	<3	<3	5	4	7
Uranium	µg/L		0.5	<12.5	2.1	0.9	<0.5	1.4	<0.5	0.9
Vanadium	µg/L		1	<25	2	<1	<1	<1	<1	2
Zinc	µg/L		10	502	16	60	401	17	64	962
Soufre	mg/L		0.1	12	299	230	753	260	684	281

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5629959-5629966 Analyses were performed at AGAT Laboratories, Montreal.

Parameter	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Reference Material	Lower	Upper	Method Blank Spike	Lower	Upper	Matrix Spike	Lower	Upper
British Columbia CSR- Schedule 6 Total Metals															
Aluminum Total	5629959	5629959	20	19	NA	< 5	100%	85%	115%	103%	85%	115%			
Antimony Total	5629959	5629959	3.2	3.3	0.6%	< 0.5	111%	85%	115%	98%	90%	110%			
Arsenic Total	5629959	5629959	10.3	10.1	2.0%	< 0.1	95%	85%	115%	98%	90%	110%			
Barium Total	5629959	5629959	18.6	18.6	0.1%	< 0.5	106%	85%	115%	101%	90%	110%			
Beryllium Total	5629959	5629959	<0.05	<0.05	0.0%	< 0.05	104%	85%	115%	101%	90%	110%			
Boron Total	5629959	5629959	<5	<5	0.0%	< 5	102%	85%	115%	108%	80%	120%			
Cadmium Total	5629959	5629959	2.17	2.20	1.5%	< 0.01	101%	85%	115%	99%	90%	110%			
Calcium Total	5629959	5629959	267000	267000	0.2%	< 50	104%	85%	115%	101%	90%	110%			
Chromium Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	105%	85%	115%	100%	90%	110%			
Cobalt Total	5629959	5629959	<0.05	<0.05	0.0%	< 0.05	110%	85%	115%	98%	90%	110%			
Copper Total	5629959	5629959	3.0	2.7	10.6%	< 0.5	107%	85%	115%	101%	90%	110%			
Iron Total	5629959	5629959	30	29	0.0%	< 10	105%	85%	115%	105%	90%	110%			
Lead Total	5629959	5629959	0.51	0.41	20.0%	< 0.05	101%	85%	115%	96%	90%	110%			
Lithium Total	5629959	5629959	8.1	7.9	1.6%	< 0.5				101%	90%	110%			
Magnesium Total	5629959	5629959	73300	73000	0.4%	< 50	107%	85%	115%	102%	90%	110%			
Manganese Total	5629959	5629959	<10	<10	0.0%	< 1	109%	85%	115%	104%	90%	110%			
Mercury Total	5629959		< 0.01	< 0.01	0.0%	< 0.01	97%	85%	115%	97%	90%	110%			
Molybdenum Total	5629959	5629959	0.2	0.3	NA	< 0.1	104%	85%	115%	101%	90%	110%			
Nickel Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	109%	85%	115%	101%	90%	110%			
Selenium Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	96%	85%	115%	99%	85%	115%			
Silver Total	5629959	5629959	<0.02	<0.02	0.0%	< 0.02				99%	90%	110%			
Sodium Total	5629959	5629959	11400	11400	0.4%	< 100	106%	85%	115%	109%	90%	110%			
Sulphur Total	5629959	5629959	278000	287000	3.0%	< 500				99%	90%	110%			
Titanium Total	5629959	5629959	1	2	NA	< 1				105%	90%	110%			
Uranium Total	5629959	5629959	3.63	3.70	2.0%	< 0.01	101%	85%	115%	98%	90%	110%			
Vanadium Total	5629959	5629959	<1	<1	0.0%	< 1	103%	85%	115%	99%	90%	110%			
Zinc Total	5629959	5629959	239	233	2.3%	< 5	100%	85%	115%	100%	80%	120%			
Comments:	RPDs are calculated using raw analytical data and not the rounded duplicate values reported.														
Inorganic Analysis - Mtl															
Total Cyanide	1	NA	NA	NA	0.0%	< 0.005	100%	80%	120%	108%	80%	120%	NA	80%	120%
Inorganic Analysis - Mtl															
Ammonia-N	1	5629959	< 0.05	< 0.05	0.0%	< 0.05	103%	80%	120%	103%	80%	120%	99%	80%	120%
Dissolved Metals															
Aluminium Dissolved	5629959	5629959	<10	<10	0.0%	< 10	99%	80%	120%	105%	80%	120%	100%	80%	120%
Antimony Dissolved	5629959	5629959	3	3	0.0%	< 1	100%	80%	120%	100%	80%	120%	108%	80%	120%
Silver Dissolved	5629959	5629959	<0.2	<0.2	0.0%	< 0.2	NA	80%	120%	100%	80%	120%	NA	80%	120%
Arsenic Dissolved	5629959	5629959	10	10	0.0%	< 1	107%	80%	120%	100%	80%	120%	NA	80%	120%
Barium Dissolved	5629959	5629959	18	18	0.0%	< 1	92%	80%	120%	99%	80%	120%	NA	80%	120%
Boron Dissolved	5629959	5629959	<40	<40	0.0%	< 40	105%	80%	120%	100%	80%	120%	112%	80%	120%
Beryllium Dissolved	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	99%	80%	120%	94%	80%	120%	110%	80%	120%
Cadmium Dissolved	5629959	5629959	2.3	2.3	0.0%	< 0.5	105%	80%	120%	101%	80%	120%	120%	80%	120%
Calcium Dissolved	5629959	5629959	277000	277000	0.0%	< 100	101%	80%	120%	99%	80%	120%	NA	80%	120%
Chromium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	98%	80%	120%	96%	80%	120%	104%	80%	120%
Cobalt Dissolved	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	102%	80%	120%	97%	80%	120%	94%	80%	120%
Copper Dissolved	5629959	5629959	3	3	0.0%	< 1	103%	80%	120%	103%	80%	120%	106%	80%	120%
Iron Dissolved	5629959	5629959	<70	<70	0.0%	< 70	102%	80%	120%	100%	80%	120%	NA	80%	120%
Lithium Dissolved	5629959	5629959	7	8	13.3%	< 1	94%	80%	120%	95%	80%	120%	NA	80%	120%
Magnesium Dissolved	5629959	5629959	74900	75500	0.8%	< 100	100%	80%	120%	99%	80%	120%	NA	80%	120%
Manganese Dissolved	5629959	5629959	22	22	0.0%	< 1	98%	80%	120%	96%	80%	120%	NA	80%	120%
Molybdenum Dissolved	5629959	5629959	<1	<1	0.0%	< 1	97%	80%	120%	92%	80%	120%	116%	80%	120%
Nickel Dissolved	5629959	5629959	3	3	0.0%	< 1	105%	80%	120%	98%	80%	120%	106%	80%	120%
Lead Dissolved	5629959	5629959	<1	<1	0.0%	< 1	101%	80%	120%	102%	80%	120%	86%	80%	120%
Selenium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	101%	80%	120%	90%	80%	120%	NA	80%	120%
Sodium Dissolved	5629959	5629959	9480	9460	0.2%	< 200	99%	80%	120%	98%	80%	120%	NA	80%	120%
Thallium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	100%	80%	120%	100%	80%	120%	104%	80%	120%
Titanium Dissolved	5629959	5629959	<3	<3	0.0%	< 3	NA	80%	120%	95%	80%	120%	115%	80%	120%
Uranium Dissolved	5629959	5629959	3.5	3.5	0.0%	< 0.5	101%	80%	120%	104%	80%	120%	108%	80%	120%
Vanadium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	100%	80%	120%	97%	80%	120%	111%	80%	120%
Zinc Dissolved	5629959	5629959	332	294	12.1%	< 3	107%	80%	120%	105%	80%	120%	NA	80%	120%

Total Extractable Metals

Aluminium	5640147	NA	NA	NA	0.0%	< 10	109%	80%	120%	109%	80%	120%	NA	80%	120%
Antimony	5640147	NA	NA	NA	0.0%	< 1	111%	80%	120%	100%	80%	120%	114%	80%	120%
Silver	5640147	NA	NA	NA	0.0%	< 0.2	NA	80%	120%	102%	80%	120%	NA	80%	120%
Arsenic	5640147	NA	NA	NA	0.0%	< 1	107%	80%	120%	99%	80%	120%	NA	80%	120%
Barium	5640147	NA	NA	NA	0.0%	< 5	110%	80%	120%	100%	80%	120%	NA	80%	120%
Beryllium	5640147	NA	NA	NA	0.0%	< 1	106%	80%	120%	105%	80%	120%	83%	80%	120%
Boron	5640147	NA	NA	NA	0.0%	< 40	110%	80%	120%	113%	80%	120%	NA	80%	120%
Cadmium	5640147	NA	NA	NA	0.0%	< 0.5	107%	80%	120%	106%	80%	120%	NA	80%	120%
Calcium	5640147	NA	NA	NA	0.0%	< 100	99%	80%	120%	102%	80%	120%	NA	80%	120%
Chromium	5640147	NA	NA	NA	0.0%	< 1	101%	80%	120%	99%	80%	120%	NA	80%	120%
Cobalt	5640147	NA	NA	NA	0.0%	< 0.5	105%	80%	120%	104%	80%	120%	113%	80%	120%
Copper	5640147	NA	NA	NA	0.0%	< 1	108%	80%	120%	101%	80%	120%	NA	80%	120%
Iron	5640147	NA	NA	NA	0.0%	< 70	92%	80%	120%	94%	80%	120%	NA	80%	120%
Lithium	5640147	NA	NA	NA	0.0%	< 1	NA	80%	120%	116%	80%	120%	NA	80%	120%
Magnesium	5640147	NA	NA	NA	0.0%	< 100	110%	80%	120%	113%	80%	120%	NA	80%	120%
Manganese	5640147	NA	NA	NA	0.0%	< 1	99%	80%	120%	97%	80%	120%	NA	80%	120%
Molybdenum	5640147	NA	NA	NA	0.0%	< 1	106%	80%	120%	98%	80%	120%	96%	80%	120%
Nickel	5640147	NA	NA	NA	0.0%	< 1	117%	80%	120%	107%	80%	120%	NA	80%	120%
Lead	5640147	NA	NA	NA	0.0%	< 1	105%	80%	120%	103%	80%	120%	NA	80%	120%
Selenium	5640147	NA	NA	NA	0.0%	< 1	108%	80%	120%	89%	80%	120%	NA	80%	120%
Sodium	5640147	NA	NA	NA	0.0%	< 200	108%	80%	120%	113%	80%	120%	NA	80%	120%
Thallium	5640147	NA	NA	NA	0.0%	< 1	107%	80%	120%	102%	80%	120%	108%	80%	120%
Titanium	5640147	NA	NA	NA	0.0%	< 3	NA	80%	120%	95%	80%	120%	NA	80%	120%
Uranium	5640147	NA	NA	NA	0.0%	< 0.5	98%	80%	120%	103%	80%	120%	109%	80%	120%
Vanadium	5640147	NA	NA	NA	0.0%	< 1	99%	80%	120%	99%	80%	120%	NA	80%	120%
Zinc	5640147	NA	NA	NA	0.0%	< 3	115%	80%	120%	112%	80%	120%	NA	80%	120%
Soufre	5640147	NA	NA	NA	0.0%	< 0.1	NA	80%	120%	81%	80%	120%	NA	80%	120%

CERTIFICATE OF ANALYSIS

AGAT WORK ORDER: 14V869471
PROJECT: Mt. Nansen SI2014
CLIENT NAME: AMEC ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Jessica Huzza
DATE RECEIVED: Jul 29, 2014
DATE SAMPLED: Jul 23, 2014
DATE REPORTED:

PACKAGE INFORMATION:

Work Sheet Name	Sample Ty	Guideline / Standard	Package Name
X01	Water		British Columbia CSR- Schedule 6 Total Metals
X02	Water	QC PTC (ES cons.)	Dissolved Metals
X03	Water		Inorganic Analysis - Mtl
X04	Water		Total Extractable Metals

British Columbia CSR- Schedule 6 Total Metals

Sample Description				**Open Pit**
Date Sampled				**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**
Aluminum Total	µg/L		5	20
Antimony Total	µg/L		0.5	3.2
Arsenic Total	µg/L		0.1	10.3
Barium Total	µg/L		0.5	18.6
Beryllium Total	µg/L		0.05	<0.05
Boron Total	µg/L		5	<5
Cadmium Total	µg/L		0.01	2.17
Calcium Total	µg/L		500	267000
Chromium Total	µg/L		0.5	<0.5
Cobalt Total	µg/L		0.05	<0.05
Copper Total	µg/L		0.5	3.0
Iron Total	µg/L		10	30
Lead Total	µg/L		0.05	0.51
Lithium Total	µg/L		0.5	8.1
Magnesium Total	µg/L		50	77500
Manganese Total	µg/L		1	22
Mercury Total	µg/L		0.01	<0.01
Molybdenum Total	µg/L		0.1	0.2
Nickel Total	µg/L		0.5	<0.5
Selenium Total	µg/L		0.5	<0.5
Silver Total	µg/L		0.02	<0.02
Sodium Total	µg/L		100	11400
Sulphur Total	µg/L		5000	278000
Thallium Total	µg/L		0.02	0.15
Titanium Total	µg/L		1	1
Uranium Total	µg/L		0.01	3.63
Vanadium Total	µg/L		1	<1
Zinc Total	µg/L		5	239
Total Hardness (calc)	ug CaCO3/L		100	986000

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Dissolved Metals

Sample Description				**Open Pit**	**Seepage Pond**	**Tailings Pond**	**MW09-02**	**MW09-03**	**MW09-04**	**MW09-07**
Date Sampled				**07/25/2014**	**07/24/2014**	**07/23/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629961**	**5629962**	**5629963**	**5629964**	**5629965**	**5629966**
Aluminium Dissolved	µg/L		10	<10	<10	14	<10	<10	<10	51
Antimony Dissolved	µg/L	6	1	3	<1	**38**	4	**541**	**419**	**10**
Silver Dissolved	µg/L	100	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.6
Arsenic Dissolved	µg/L	25	1	10	**56**	**56**	**22900**	**807**	**3570**	**488**
Barium Dissolved	µg/L	1000	1	18	76	8	8	39	7	21
Boron Dissolved	µg/L		40	<40	62	79	42	92	288	63
Beryllium Dissolved	µg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium Dissolved	µg/L	5	0.5	2.3	0.5	0.5	<0.5	1.4	<0.5	<0.5
Calcium Dissolved	µg/L		100	277000	285000	192000	457000	464000	479000	277000
Chromium Dissolved	µg/L	50	1	<1	2	<1	<1	<1	<1	2
Cobalt Dissolved	µg/L		0.5	<0.5	7.3	<0.5	9.4	3.3	<0.5	29.6
Copper Dissolved	µg/L	1000	1	3	4	15	4	4	3	14
Iron Dissolved	µg/L		70	<70	7050	<70	49400	242	<70	7310
Lithium Dissolved	µg/L		1	7	1	8	28	<1	4	4
Magnesium Dissolved	µg/L		100	74900	61100	43000	91600	72800	126000	50600
Manganese Dissolved	µg/L	50	1	22	**6810**	**57**	**35900**	**54500**	**4150**	**26500**
Molybdenum Dissolved	µg/L	70	1	<1	<1	1	5	3	8	<1
Nickel Dissolved	µg/L	20	1	3	6	3	8	8	6	**28**
Lead Dissolved	µg/L	10	1	<1	<1	<1	<1	<1	<1	<1
Selenium Dissolved	µg/L	10	1	<1	<1	<1	<1	<1	<1	<1
Sodium Dissolved	µg/L	200 000	200	9480	37700	15700	85000	22800	43900	49300
Thallium Dissolved	µg/L		1	<1	<1	<1	<1	<1	<1	<1
Titanium Dissolved	µg/L		3	<3	<3	<3	<3	5	3	4
Uranium Dissolved	µg/L		0.5	3.5	2.1	0.9	<0.5	1.4	<0.5	0.9
Vanadium Dissolved	µg/L		1	<1	2	<1	<1	<1	<1	2
Zinc Dissolved	µg/L	5000	3	332	9	28	384	10	35	611

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Inorganic Analysis - Mtl

Sample Description				Open Pit	Open Pit	Seepage Pond	Seepage Pond	Tailings Pond	Tailings Pond	MW09-02	MW09-02	MW09-03	MW09-03	MW09-04	MW09-04	MW09-07	MW09-07
Date Sampled				**07/25/2014**	**07/25/2014**	**07/24/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/24/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**	**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629959**	**5629961**	**5629961**	**5629962**	**5629962**	**5629963**	**5629963**	**5629964**	**5629964**	**5629965**	**5629965**	**5629966**	**5629966**
Ammonia-N	mg/L - N		0.05	<0.05	<0.05	4.84	4.84	<0.05	<0.05	13.4	13.4	1.70	1.70	6.27	6.27	1.60	1.60
Total Cyanide	mg/L - CN		0.005	<0.005	<0.005	1.96	1.96	0.006	0.006	1.08	1.08	0.119	0.119	0.087	0.087	0.017	0.017

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Total Extractable Metals

Sample Description				Open Pit	Seepage Pond	Tailings Pond	MW09-02	MW09-03	MW09-04	MW09-07
Date Sampled				**07/25/2014**	**07/24/2014**	**07/23/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629961**	**5629962**	**5629963**	**5629964**	**5629965**	**5629966**
Aluminium	µg/L		10	<250	31	57	<10	<10	<10	110
Antimony	µg/L		1	<25	<1	38	4	521	421	19
Silver	µg/L		0.2	<5.0	<0.2	<0.2	<0.2	<0.2	<0.2	2.9
Arsenic	µg/L		1	<25	72	95	21700	805	3530	633
Barium	µg/L		125	<125	78	9	8	37	6	22
Beryllium	µg/L		1	<25	<1	<1	<1	1	1	<1
Bore	µg/L		1000	<1000	60	76	<40	84	260	57
Cadmium	µg/L		0.5	<12.5	0.6	0.9	<0.5	1.2	<0.5	2.6
Calcium	µg/L		100	263000	274000	189000	443000	451000	463000	262000
Chromium	µg/L		1	<25	<1	<1	<1	<1	<1	1
Cobalt	µg/L		0.5	<12.5	7.6	<0.5	9.7	3.7	<0.5	31.7
Copper	µg/L		1	<25	6	22	3	4	3	48
Iron	µg/L		1750	<1750	9420	255	47500	255	<70	7730
Lithium	µg/L		1	<25	1	8	30	<1	4	4
Magnesium	µg/L		100	78300	66100	46800	96900	74500	132000	50100
Manganese	µg/L		1	38	6730	92	36100	53300	4110	26100
Molybdenum	µg/L		1	<25	1	2	5	3	9	<1
Nickel	µg/L		1	<25	7	3	8	8	6	28
Lead	µg/L		1	<25	<1	6	1	<1	3	5
Selenium	µg/L		1	<25	1	<1	1	<1	<1	1
Sodium	µg/L		200	11000	42200	17300	92300	24100	45600	50500
Thallium	µg/L		1	<25	<1	<1	<1	<1	<1	<1
Titanium	µg/L		3	<75	5	<3	<3	5	4	7
Uranium	µg/L		0.5	<12.5	2.1	0.9	<0.5	1.4	<0.5	0.9
Vanadium	µg/L		1	<25	2	<1	<1	<1	<1	2
Zinc	µg/L		10	502	16	60	401	17	64	962

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5629962 For this sample, the results for certain dissolved metals (As, B, Ca) are higher than those of total extractable metals. The difference between these results is within the variability of the method acceptability.

Parameter	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Reference Material	Lower	Upper	Method Blank Spike	Lower	Upper	Matrix Spike	Lower	Upper
British Columbia CSR- Schedule 6 Total Metals															
Aluminum Total	5629959	5629959	20	19	NA	< 5	100%	85%	115%	103%	85%	115%			
Antimony Total	5629959	5629959	3.2	3.3	0.6%	< 0.5	111%	85%	115%	98%	90%	110%			
Arsenic Total	5629959	5629959	10.3	10.1	2.0%	< 0.1	95%	85%	115%	98%	90%	110%			
Barium Total	5629959	5629959	18.6	18.6	0.1%	< 0.5	106%	85%	115%	101%	90%	110%			
Beryllium Total	5629959	5629959	<0.05	<0.05	0.0%	< 0.05	104%	85%	115%	101%	90%	110%			
Boron Total	5629959	5629959	<5	<5	0.0%	< 5	102%	85%	115%	108%	80%	120%			
Cadmium Total	5629959	5629959	2.17	2.20	1.5%	< 0.01	101%	85%	115%	99%	90%	110%			
Calcium Total	5629959	5629959	267000	267000	0.2%	< 50	104%	85%	115%	101%	90%	110%			
Chromium Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	105%	85%	115%	100%	90%	110%			
Cobalt Total	5629959	5629959	<0.05	<0.05	0.0%	< 0.05	110%	85%	115%	98%	90%	110%			
Copper Total	5629959	5629959	3.0	2.7	10.6%	< 0.5	107%	85%	115%	101%	90%	110%			
Iron Total	5629959	5629959	30	29	0.0%	< 10	105%	85%	115%	105%	90%	110%			
Lead Total	5629959	5629959	0.51	0.41	20.0%	< 0.05	101%	85%	115%	96%	90%	110%			
Lithium Total	5629959	5629959	8.1	7.9	1.6%	< 0.5				101%	90%	110%			
Magnesium Total	5629959	5629959	73300	73000	0.4%	< 50	107%	85%	115%	102%	90%	110%			
Manganese Total	5629959	5629959	<10	<10	0.0%	< 1	109%	85%	115%	104%	90%	110%			
Mercury Total	5629959		< 0.01	< 0.01	0.0%	< 0.01	97%	85%	115%	97%	90%	110%			
Molybdenum Total	5629959	5629959	0.2	0.3	NA	< 0.1	104%	85%	115%	101%	90%	110%			
Nickel Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	109%	85%	115%	101%	90%	110%			
Selenium Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	96%	85%	115%	99%	85%	115%			
Silver Total	5629959	5629959	<0.02	<0.02	0.0%	< 0.02				99%	90%	110%			
Sodium Total	5629959	5629959	11400	11400	0.4%	< 100	106%	85%	115%	109%	90%	110%			
Sulphur Total	5629959	5629959	278000	287000	3.0%	< 500				99%	90%	110%			
Titanium Total	5629959	5629959	1	2	NA	< 1				105%	90%	110%			
Uranium Total	5629959	5629959	3.63	3.70	2.0%	< 0.01	101%	85%	115%	98%	90%	110%			
Vanadium Total	5629959	5629959	<1	<1	0.0%	< 1	103%	85%	115%	99%	90%	110%			
Zinc Total	5629959	5629959	239	233	2.3%	< 5	100%	85%	115%	100%	80%	120%			
Comments:	RPDs are calculated using raw analytical data and not the rounded duplicate values reported.														
Inorganic Analysis - Mtl															
Total Cyanide	1	NA	NA	NA	0.0%	< 0.005	100%	80%	120%	108%	80%	120%	NA	80%	120%
Inorganic Analysis - Mtl															
Ammonia-N	1	5629959	< 0.05	< 0.05	0.0%	< 0.05	103%	80%	120%	103%	80%	120%	99%	80%	120%
Dissolved Metals															
Aluminium Dissolved	5629959	5629959	<10	<10	0.0%	< 10	99%	80%	120%	105%	80%	120%	100%	80%	120%
Antimony Dissolved	5629959	5629959	3	3	0.0%	< 1	100%	80%	120%	100%	80%	120%	108%	80%	120%
Silver Dissolved	5629959	5629959	<0.2	<0.2	0.0%	< 0.2	NA	80%	120%	100%	80%	120%	NA	80%	120%
Arsenic Dissolved	5629959	5629959	10	10	1.1%	< 1	107%	80%	120%	100%	80%	120%	NA	80%	120%
Barium Dissolved	5629959	5629959	18	18	0.9%	< 1	92%	80%	120%	99%	80%	120%	NA	80%	120%
Boron Dissolved	5629959	5629959	<40	<40	0.0%	< 40	105%	80%	120%	100%	80%	120%	112%	80%	120%
Beryllium Dissolved	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	99%	80%	120%	94%	80%	120%	110%	80%	120%
Cadmium Dissolved	5629959	5629959	2.3	2.3	0.0%	< 0.5	105%	80%	120%	101%	80%	120%	120%	80%	120%
Calcium Dissolved	5629959	5629959	277000	277000	0.0%	< 100	101%	80%	120%	99%	80%	120%	NA	80%	120%
Chromium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	98%	80%	120%	96%	80%	120%	104%	80%	120%
Cobalt Dissolved	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	102%	80%	120%	97%	80%	120%	94%	80%	120%
Copper Dissolved	5629959	5629959	3	3	0.0%	< 1	103%	80%	120%	103%	80%	120%	106%	80%	120%
Iron Dissolved	5629959	5629959	<70	<70	0.0%	< 70	102%	80%	120%	100%	80%	120%	NA	80%	120%
Lithium Dissolved	5629959	5629959	7	8	5.9%	< 1	94%	80%	120%	95%	80%	120%	NA	80%	120%
Magnesium Dissolved	5629959	5629959	74900	75500	0.8%	< 100	100%	80%	120%	99%	80%	120%	NA	80%	120%
Manganese Dissolved	5629959	5629959	22	22	0.0%	< 1	98%	80%	120%	96%	80%	120%	NA	80%	120%
Molybdenum Dissolved	5629959	5629959	<1	<1	0.0%	< 1	97%	80%	120%	92%	80%	120%	116%	80%	120%
Nickel Dissolved	5629959	5629959	3	3	0.0%	< 1	105%	80%	120%	98%	80%	120%	106%	80%	120%
Lead Dissolved	5629959	5629959	<1	<1	0.0%	< 1	101%	80%	120%	102%	80%	120%	86%	80%	120%
Selenium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	101%	80%	120%	90%	80%	120%	NA	80%	120%
Sodium Dissolved	5629959	5629959	9480	9460	0.3%	< 200	99%	80%	120%	98%	80%	120%	NA	80%	120%
Thallium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	100%	80%	120%	100%	80%	120%	104%	80%	120%
Titanium Dissolved	5629959	5629959	<3	<3	0.0%	< 3	NA	80%	120%	95%	80%	120%	115%	80%	120%
Uranium Dissolved	5629959	5629959	3.5	3.5	1.6%	< 0.5	101%	80%	120%	104%	80%	120%	108%	80%	120%
Vanadium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	100%	80%	120%	97%	80%	120%	111%	80%	120%
Zinc Dissolved	5629959	5629959	332	294	12.0%	< 3	107%	80%	120%	105%	80%	120%	NA	80%	120%

Total Extractable Metals

Aluminium	5640147	NA	NA	NA	0.0%	< 10	109%	80%	120%	109%	80%	120%	NA	80%	120%
Antimony	5640147	NA	NA	NA	0.0%	< 1	111%	80%	120%	100%	80%	120%	114%	80%	120%
Silver	5640147	NA	NA	NA	0.0%	< 0.2	NA	80%	120%	102%	80%	120%	NA	80%	120%
Arsenic	5640147	NA	NA	NA	0.0%	< 1	107%	80%	120%	99%	80%	120%	NA	80%	120%
Barium	5640147	NA	NA	NA	0.0%	< 5	110%	80%	120%	100%	80%	120%	NA	80%	120%
Beryllium	5640147	NA	NA	NA	0.0%	< 1	106%	80%	120%	105%	80%	120%	83%	80%	120%
Bore	5640147	NA	NA	NA	0.0%	< 40	110%	80%	120%	113%	80%	120%	NA	80%	120%
Cadmium	5640147	NA	NA	NA	0.0%	< 0.5	107%	80%	120%	106%	80%	120%	NA	80%	120%
Calcium	5640147	NA	NA	NA	0.0%	< 100	99%	80%	120%	102%	80%	120%	NA	80%	120%
Chromium	5640147	NA	NA	NA	0.0%	< 1	101%	80%	120%	99%	80%	120%	NA	80%	120%
Cobalt	5640147	NA	NA	NA	0.0%	< 0.5	105%	80%	120%	104%	80%	120%	113%	80%	120%
Copper	5640147	NA	NA	NA	0.0%	< 1	108%	80%	120%	101%	80%	120%	NA	80%	120%
Iron	5640147	NA	NA	NA	0.0%	< 70	92%	80%	120%	94%	80%	120%	NA	80%	120%
Lithium	5640147	NA	NA	NA	0.0%	< 1	NA	80%	120%	116%	80%	120%	NA	80%	120%
Magnesium	5640147	NA	NA	NA	0.0%	< 100	110%	80%	120%	113%	80%	120%	NA	80%	120%
Manganese	5640147	NA	NA	NA	0.0%	< 1	99%	80%	120%	97%	80%	120%	NA	80%	120%
Molybdenum	5640147	NA	NA	NA	0.0%	< 1	106%	80%	120%	98%	80%	120%	96%	80%	120%
Nickel	5640147	NA	NA	NA	0.0%	< 1	117%	80%	120%	107%	80%	120%	NA	80%	120%
Lead	5640147	NA	NA	NA	0.0%	< 1	105%	80%	120%	103%	80%	120%	NA	80%	120%
Selenium	5640147	NA	NA	NA	0.0%	< 1	108%	80%	120%	89%	80%	120%	NA	80%	120%
Sodium	5640147	NA	NA	NA	0.0%	< 200	108%	80%	120%	113%	80%	120%	NA	80%	120%
Thallium	5640147	NA	NA	NA	0.0%	< 1	107%	80%	120%	102%	80%	120%	108%	80%	120%
Titanium	5640147	NA	NA	NA	0.0%	< 3	NA	80%	120%	95%	80%	120%	NA	80%	120%
Uranium	5640147	NA	NA	NA	0.0%	< 0.5	98%	80%	120%	103%	80%	120%	109%	80%	120%
Vanadium	5640147	NA	NA	NA	0.0%	< 1	99%	80%	120%	99%	80%	120%	NA	80%	120%
Zinc	5640147	NA	NA	NA	0.0%	< 3	115%	80%	120%	112%	80%	120%	NA	80%	120%

CERTIFICATE OF ANALYSIS

AGAT WORK ORDER:	14V869471
PROJECT:	Mt. Nansen SI2014
CLIENT NAME:	AMEC ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO:	Jessica Huzza
DATE RECEIVED:	Jul 29, 2014
DATE SAMPLED:	Jul 23, 2014
DATE REPORTED:	

PACKAGE INFORMATION:

Work Sheet Name	**Sample Ty**	**Guideline / Standard**	**Package Name**
X01	Water		British Columbia CSR- Schedule 6 Total Metals
X02	Water	QC PTC (ES cons.)	Dissolved Metals
X03	Water		Inorganic Analysis - Mtl
X04	Water		Total Extractable Metals

British Columbia CSR- Schedule 6 Total Metals

Sample Description				**Open Pit**
Date Sampled				**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**
Aluminum Total	µg/L		5	20
Antimony Total	µg/L		0.5	3.2
Arsenic Total	µg/L		0.1	10.3
Barium Total	µg/L		0.5	18.6
Beryllium Total	µg/L		0.05	<0.05
Boron Total	µg/L		5	<5
Cadmium Total	µg/L		0.01	2.17
Calcium Total	µg/L		500	267000
Chromium Total	µg/L		0.5	<0.5
Cobalt Total	µg/L		0.05	<0.05
Copper Total	µg/L		0.5	3.0
Iron Total	µg/L		10	30
Lead Total	µg/L		0.05	0.51
Lithium Total	µg/L		0.5	8.1
Magnesium Total	µg/L		50	77500
Manganese Total	µg/L		1	22
Mercury Total	µg/L		0.01	<0.01
Molybdenum Total	µg/L		0.1	0.2
Nickel Total	µg/L		0.5	<0.5
Selenium Total	µg/L		0.5	<0.5
Silver Total	µg/L		0.02	<0.02
Sodium Total	µg/L		100	11400
Sulphur Total	µg/L		5000	278000
Thallium Total	µg/L		0.02	0.15
Titanium Total	µg/L		1	1
Uranium Total	µg/L		0.01	3.63
Vanadium Total	µg/L		1	<1
Zinc Total	µg/L		5	239
Total Hardness (calc)	ug CaCO3/L		100	986000

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Dissolved Metals

Sample Description				**Open Pit**	**Seepage Pond**	**Tailings Pond**	**MW09-02**	**MW09-03**	**MW09-04**	**MW09-07**
Date Sampled				**07/25/2014**	**07/24/2014**	**07/23/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629961**	**5629962**	**5629963**	**5629964**	**5629965**	**5629966**
Aluminium Dissolved	µg/L		10	<10	<10	14	<10	<10	<10	51
Antimony Dissolved	µg/L	6	1	3	<1	**38**	4	**541**	**419**	**10**
Silver Dissolved	µg/L	100	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.6
Arsenic Dissolved	µg/L	25	1	10	**56**	**56**	**22900**	**807**	**3570**	**488**
Barium Dissolved	µg/L	1000	1	18	76	8	8	39	7	21
Boron Dissolved	µg/L		40	<40	62	79	42	92	288	63
Beryllium Dissolved	µg/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium Dissolved	µg/L	5	0.5	2.3	0.5	0.5	<0.5	1.4	<0.5	<0.5
Calcium Dissolved	µg/L		100	277000	285000	192000	457000	464000	479000	277000
Chromium Dissolved	µg/L	50	1	<1	2	<1	<1	<1	<1	2
Cobalt Dissolved	µg/L		0.5	<0.5	7.3	<0.5	9.4	3.3	<0.5	29.6
Copper Dissolved	µg/L	1000	1	3	4	15	4	4	3	14
Iron Dissolved	µg/L		70	<70	7050	<70	49400	242	<70	7310
Lithium Dissolved	µg/L		1	7	1	8	28	<1	4	4
Magnesium Dissolved	µg/L		100	74900	61100	43000	91600	72800	126000	50600
Manganese Dissolved	µg/L	50	1	22	**6810**	**57**	**35900**	**54500**	**4150**	**26500**
Molybdenum Dissolved	µg/L	70	1	<1	<1	1	5	3	8	<1
Nickel Dissolved	µg/L	20	1	3	6	3	8	8	6	**28**
Lead Dissolved	µg/L	10	1	<1	<1	<1	<1	<1	<1	<1
Selenium Dissolved	µg/L	10	1	<1	<1	<1	<1	<1	<1	<1
Sodium Dissolved	µg/L	200 000	200	9480	37700	15700	85000	22800	43900	49300
Thallium Dissolved	µg/L		1	<1	<1	<1	<1	<1	<1	<1
Titanium Dissolved	µg/L		3	<3	<3	<3	<3	5	3	4
Uranium Dissolved	µg/L		0.5	3.5	2.1	0.9	<0.5	1.4	<0.5	0.9
Vanadium Dissolved	µg/L		1	<1	2	<1	<1	<1	<1	2
Zinc Dissolved	µg/L	5000	3	332	9	28	384	10	35	611

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Inorganic Analysis - Mtl

Sample Description				**Open Pit**	**Open Pit**	**Seepage Pond**	**Seepage Pond**	**Tailings Pond**	**Tailings Pond**	**MW09-02**
Date Sampled				**07/25/2014**	**07/25/2014**	**07/24/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/24/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629959**	**5629961**	**5629961**	**5629962**	**5629962**	**5629963**
Ammonia-N	mg/L - N		0.05	<0.05	<0.05	4.84	4.84	<0.05	<0.05	13.4
Total Cyanide	mg/L - CN		0.005	<0.005	<0.005	1.96	1.96	0.006	0.006	1.08

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

MW09-02	**MW09-03**	**MW09-03**	**MW09-04**	**MW09-04**	**MW09-07**	**MW09-07**
07/24/2014	**07/23/2014**	**07/23/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**	**07/25/2014**
5629963	**5629964**	**5629964**	**5629965**	**5629965**	**5629966**	**5629966**
13.4	1.70	1.70	6.27	6.27	1.60	1.60
1.08	0.119	0.119	0.087	0.087	0.017	0.017

Total Extractable Metals

Sample Description				Open Pit	Seepage Pond	Tailings Pond	MW09-02	MW09-03	MW09-04	MW09-07
Date Sampled				**07/25/2014**	**07/24/2014**	**07/23/2014**	**07/24/2014**	**07/23/2014**	**07/23/2014**	**07/25/2014**
Parameter	**Unit**	**G / S**	**RDL**	**5629959**	**5629961**	**5629962**	**5629963**	**5629964**	**5629965**	**5629966**
Aluminium	µg/L		10	<250	31	57	<10	<10	<10	110
Antimony	µg/L		1	<25	<1	38	4	521	421	19
Silver	µg/L		0.2	<5.0	<0.2	<0.2	<0.2	<0.2	<0.2	2.9
Arsenic	µg/L		1	<25	72	95	21700	805	3530	633
Barium	µg/L		125	<125	78	9	8	37	6	22
Beryllium	µg/L		1	<25	<1	<1	<1	1	1	<1
Bore	µg/L		1000	<1000	60	76	<40	84	260	57
Cadmium	µg/L		0.5	<12.5	0.6	0.9	<0.5	1.2	<0.5	2.6
Calcium	µg/L		100	263000	274000	189000	443000	451000	463000	262000
Chromium	µg/L		1	<25	<1	<1	<1	<1	<1	1
Cobalt	µg/L		0.5	<12.5	7.6	<0.5	9.7	3.7	<0.5	31.7
Copper	µg/L		1	<25	6	22	3	4	3	48
Iron	µg/L		1750	<1750	9420	255	47500	255	<70	7730
Lithium	µg/L		1	<25	1	8	30	<1	4	4
Magnesium	µg/L		100	78300	66100	46800	96900	74500	132000	50100
Manganese	µg/L		1	38	6730	92	36100	53300	4110	26100
Molybdenum	µg/L		1	<25	1	2	5	3	9	<1
Nickel	µg/L		1	<25	7	3	8	8	6	28
Lead	µg/L		1	<25	<1	6	1	<1	3	5
Selenium	µg/L		1	<25	1	<1	1	<1	<1	1
Sodium	µg/L		200	11000	42200	17300	92300	24100	45600	50500
Thallium	µg/L		1	<25	<1	<1	<1	<1	<1	<1
Titanium	µg/L		3	<75	5	<3	<3	5	4	7
Uranium	µg/L		0.5	<12.5	2.1	0.9	<0.5	1.4	<0.5	0.9
Vanadium	µg/L		1	<25	2	<1	<1	<1	<1	2
Zinc	µg/L		10	502	16	60	401	17	64	962

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5629962 For this sample, the results for certain dissolved metals (As, B, Ca) are higher than those of total extractable metals. The difference between these results is within the variability of the method acceptability.

Parameter	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Reference Material
British Columbia CSR- Schedule 6 Total Metals							
Aluminum Total	5629959	5629959	20	19	NA	< 5	100%
Antimony Total	5629959	5629959	3.2	3.3	0.6%	< 0.5	111%
Arsenic Total	5629959	5629959	10.3	10.1	2.0%	< 0.1	95%
Barium Total	5629959	5629959	18.6	18.6	0.1%	< 0.5	106%
Beryllium Total	5629959	5629959	<0.05	<0.05	0.0%	< 0.05	104%
Boron Total	5629959	5629959	<5	<5	0.0%	< 5	102%
Cadmium Total	5629959	5629959	2.17	2.20	1.5%	< 0.01	101%
Calcium Total	5629959	5629959	267000	267000	0.2%	< 50	104%
Chromium Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	105%
Cobalt Total	5629959	5629959	<0.05	<0.05	0.0%	< 0.05	110%
Copper Total	5629959	5629959	3.0	2.7	10.6%	< 0.5	107%
Iron Total	5629959	5629959	30	29	0.0%	< 10	105%
Lead Total	5629959	5629959	0.51	0.41	20.0%	< 0.05	101%
Lithium Total	5629959	5629959	8.1	7.9	1.6%	< 0.5	
Magnesium Total	5629959	5629959	73300	73000	0.4%	< 50	107%
Manganese Total	5629959	5629959	<10	<10	0.0%	< 1	109%
Mercury Total	5629959		< 0.01	< 0.01	0.0%	< 0.01	97%
Molybdenum Total	5629959	5629959	0.2	0.3	NA	< 0.1	104%
Nickel Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	109%
Selenium Total	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	96%
Silver Total	5629959	5629959	<0.02	<0.02	0.0%	< 0.02	
Sodium Total	5629959	5629959	11400	11400	0.4%	< 100	106%
Sulphur Total	5629959	5629959	278000	287000	3.0%	< 500	
Titanium Total	5629959	5629959	1	2	NA	< 1	
Uranium Total	5629959	5629959	3.63	3.70	2.0%	< 0.01	101%
Vanadium Total	5629959	5629959	<1	<1	0.0%	< 1	103%
Zinc Total	5629959	5629959	239	233	2.3%	< 5	100%
Comments:	RPDs are calculated using raw analytical data and not the rounded duplicate values reported.						
Inorganic Analysis - Mtl							
Total Cyanide	1	NA	NA	NA	0.0%	< 0.005	100%

Inorganic Analysis - Mtl

Ammonia-N	1	5629959	< 0.05	< 0.05	0.0%	< 0.05	103%

Dissolved Metals

Aluminium Dissolved	5629959	5629959	<10	<10	0.0%	< 10	99%
Antimony Dissolved	5629959	5629959	3	3	0.0%	< 1	100%
Silver Dissolved	5629959	5629959	<0.2	<0.2	0.0%	< 0.2	NA
Arsenic Dissolved	5629959	5629959	10	10	1.1%	< 1	107%
Barium Dissolved	5629959	5629959	18	18	0.9%	< 1	92%
Boron Dissolved	5629959	5629959	<40	<40	0.0%	< 40	105%
Beryllium Dissolved	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	99%
Cadmium Dissolved	5629959	5629959	2.3	2.3	0.0%	< 0.5	105%
Calcium Dissolved	5629959	5629959	277000	277000	0.0%	< 100	101%
Chromium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	98%
Cobalt Dissolved	5629959	5629959	<0.5	<0.5	0.0%	< 0.5	102%
Copper Dissolved	5629959	5629959	3	3	0.0%	< 1	103%
Iron Dissolved	5629959	5629959	<70	<70	0.0%	< 70	102%
Lithium Dissolved	5629959	5629959	7	8	5.9%	< 1	94%
Magnesium Dissolved	5629959	5629959	74900	75500	0.8%	< 100	100%
Manganese Dissolved	5629959	5629959	22	22	0.0%	< 1	98%
Molybdenum Dissolved	5629959	5629959	<1	<1	0.0%	< 1	97%
Nickel Dissolved	5629959	5629959	3	3	0.0%	< 1	105%
Lead Dissolved	5629959	5629959	<1	<1	0.0%	< 1	101%
Selenium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	101%
Sodium Dissolved	5629959	5629959	9480	9460	0.3%	< 200	99%
Thallium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	100%
Titanium Dissolved	5629959	5629959	<3	<3	0.0%	< 3	NA
Uranium Dissolved	5629959	5629959	3.5	3.5	1.6%	< 0.5	101%
Vanadium Dissolved	5629959	5629959	<1	<1	0.0%	< 1	100%
Zinc Dissolved	5629959	5629959	332	294	12.0%	< 3	107%

Total Extractable Metals

Aluminium	5640147	NA	NA	NA	0.0%	< 10	109%
Antimony	5640147	NA	NA	NA	0.0%	< 1	111%
Silver	5640147	NA	NA	NA	0.0%	< 0.2	NA
Arsenic	5640147	NA	NA	NA	0.0%	< 1	107%
Barium	5640147	NA	NA	NA	0.0%	< 5	110%

Beryllium	5640147	NA	NA	NA	0.0%	< 1	106%
Bore	5640147	NA	NA	NA	0.0%	< 40	110%
Cadmium	5640147	NA	NA	NA	0.0%	< 0.5	107%
Calcium	5640147	NA	NA	NA	0.0%	< 100	99%
Chromium	5640147	NA	NA	NA	0.0%	< 1	101%
Cobalt	5640147	NA	NA	NA	0.0%	< 0.5	105%
Copper	5640147	NA	NA	NA	0.0%	< 1	108%
Iron	5640147	NA	NA	NA	0.0%	< 70	92%
Lithium	5640147	NA	NA	NA	0.0%	< 1	NA
Magnesium	5640147	NA	NA	NA	0.0%	< 100	110%
Manganese	5640147	NA	NA	NA	0.0%	< 1	99%
Molybdenum	5640147	NA	NA	NA	0.0%	< 1	106%
Nickel	5640147	NA	NA	NA	0.0%	< 1	117%
Lead	5640147	NA	NA	NA	0.0%	< 1	105%
Selenium	5640147	NA	NA	NA	0.0%	< 1	108%
Sodium	5640147	NA	NA	NA	0.0%	< 200	108%
Thallium	5640147	NA	NA	NA	0.0%	< 1	107%
Titanium	5640147	NA	NA	NA	0.0%	< 3	NA
Uranium	5640147	NA	NA	NA	0.0%	< 0.5	98%
Vanadium	5640147	NA	NA	NA	0.0%	< 1	99%
Zinc	5640147	NA	NA	NA	0.0%	< 3	115%

Lower	Upper	Method Blank Spike	Lower	Upper	Matrix Spike	Lower	Upper
85%	115%	103%	85%	115%			
85%	115%	98%	90%	110%			
85%	115%	98%	90%	110%			
85%	115%	101%	90%	110%			
85%	115%	101%	90%	110%			
85%	115%	108%	80%	120%			
85%	115%	99%	90%	110%			
85%	115%	101%	90%	110%			
85%	115%	100%	90%	110%			
85%	115%	98%	90%	110%			
85%	115%	101%	90%	110%			
85%	115%	105%	90%	110%			
85%	115%	96%	90%	110%			
		101%	90%	110%			
85%	115%	102%	90%	110%			
85%	115%	104%	90%	110%			
85%	115%	97%	90%	110%			
85%	115%	101%	90%	110%			
85%	115%	101%	90%	110%			
85%	115%	99%	85%	115%			
		99%	90%	110%			
85%	115%	109%	90%	110%			
		99%	90%	110%			
		105%	90%	110%			
85%	115%	98%	90%	110%			
85%	115%	99%	90%	110%			
85%	115%	100%	80%	120%			
80%	120%	108%	80%	120%	NA	80%	120%

80%	120%	103%	80%	120%	99%	80%	120%
80%	120%	105%	80%	120%	100%	80%	120%
80%	120%	100%	80%	120%	108%	80%	120%
80%	120%	100%	80%	120%	NA	80%	120%
80%	120%	100%	80%	120%	NA	80%	120%
80%	120%	99%	80%	120%	NA	80%	120%
80%	120%	100%	80%	120%	112%	80%	120%
80%	120%	94%	80%	120%	110%	80%	120%
80%	120%	101%	80%	120%	120%	80%	120%
80%	120%	99%	80%	120%	NA	80%	120%
80%	120%	96%	80%	120%	104%	80%	120%
80%	120%	97%	80%	120%	94%	80%	120%
80%	120%	103%	80%	120%	106%	80%	120%
80%	120%	100%	80%	120%	NA	80%	120%
80%	120%	95%	80%	120%	NA	80%	120%
80%	120%	99%	80%	120%	NA	80%	120%
80%	120%	96%	80%	120%	NA	80%	120%
80%	120%	92%	80%	120%	116%	80%	120%
80%	120%	98%	80%	120%	106%	80%	120%
80%	120%	102%	80%	120%	86%	80%	120%
80%	120%	90%	80%	120%	NA	80%	120%
80%	120%	98%	80%	120%	NA	80%	120%
80%	120%	100%	80%	120%	104%	80%	120%
80%	120%	95%	80%	120%	115%	80%	120%
80%	120%	104%	80%	120%	108%	80%	120%
80%	120%	97%	80%	120%	111%	80%	120%
80%	120%	105%	80%	120%	NA	80%	120%
80%	120%	109%	80%	120%	NA	80%	120%
80%	120%	100%	80%	120%	114%	80%	120%
80%	120%	102%	80%	120%	NA	80%	120%
80%	120%	99%	80%	120%	NA	80%	120%
80%	120%	100%	80%	120%	NA	80%	120%

80%	120%	105%	80%	120%	83%	80%	120%
80%	120%	113%	80%	120%	NA	80%	120%
80%	120%	106%	80%	120%	NA	80%	120%
80%	120%	102%	80%	120%	NA	80%	120%
80%	120%	99%	80%	120%	NA	80%	120%
80%	120%	104%	80%	120%	113%	80%	120%
80%	120%	101%	80%	120%	NA	80%	120%
80%	120%	94%	80%	120%	NA	80%	120%
80%	120%	116%	80%	120%	NA	80%	120%
80%	120%	113%	80%	120%	NA	80%	120%
80%	120%	97%	80%	120%	NA	80%	120%
80%	120%	98%	80%	120%	96%	80%	120%
80%	120%	107%	80%	120%	NA	80%	120%
80%	120%	103%	80%	120%	NA	80%	120%
80%	120%	89%	80%	120%	NA	80%	120%
80%	120%	113%	80%	120%	NA	80%	120%
80%	120%	102%	80%	120%	108%	80%	120%
80%	120%	95%	80%	120%	NA	80%	120%
80%	120%	103%	80%	120%	109%	80%	120%
80%	120%	99%	80%	120%	NA	80%	120%
80%	120%	112%	80%	120%	NA	80%	120%

Appendix 4H – Comments Log

COMMENT LOG

Document Title: Mount Nansen Remediation Project - Phase 1 Site Investigation Report and Site Characterization Update

Document Dates: 28 and 29 October 2014, 03 November 2014, 03 December 2014 **AMEC File No.** VM00605J
Follow-up on log draft from AAM on 3 February 2015

Comments By: J.K. Perron, I.D. Poloni (AAM); Kim Winnicky (Bill Slater Environmental Consulting, for LSCFN); Jason Berkers (AANDC)

Responses By: AMEC – Brian Geddes, Christine Peters

Response Dates: 16 January 2015; additional response edits completed 03 March 2015

Note 1 – Page numbers per commented document.

Comment ID[1]	Comment	Response
jkperron, cover **03/12/2014 2:30:36 PM**	Please ensure that all files (excel, dwg, etc.) are provided for the final deliverables as well as 4 copies of the deliverables, MSA calls for 5 however 4 will be sufficient.	Acknowledged.
idpoloni, table of contents **28/10/2014 2:40:15 PM**	Include sections for Groundwater and Hydrology/Water Quality (performed by EDI and ELR).	Additional sections and content have been added.
idpoloni, table of contents **03/12/2014 11:40:52 AM**	Please insert Conclusion / Recommendations Sections	An Executive Summary has been added to the document that describes the content and conduct of the investigation and summarizes key findings and conclusions. Specific recommendations have not been included because the output of the SI effort is an update of the site characterization. The findings of this update will be interpreted and used during the upcoming Phase 2 design effort, and any additional investigative requirements would be identified and scoped during that Phase 2 design effort.
idpoloni, page 9 **03/12/2014 11:41:47 AM**	Please add this reference to the list and make correct reference.	Reference corrected (was incorrectly labelled in this reference).

Comment ID[1]	Comment	Response
idpoloni, page 10 29/10/2014 8:11:25 AM	What about the test pit north of diversion?	Added reference to an additional test pit (TP-T-14-01) north of the diversion.
idpoloni, page 10 29/10/2014 8:11:13 AM	What about the test pit north of diversion?	Added reference to an additional test pit (TP-T-14-01) north of the diversion.
idpoloni, page 10 03/12/2014 1:52:17 PM	In addition, EDI (freshet and monthly program) and ELR (freshet and fall) programs, as recommended by AMEC and data logger download of all instrumentation. Please insert.	Reference to the EDI and ELR programs has been added to the text.
idpoloni, page 12 29/10/2014 8:13:11 AM	Please revise.	Figure headings clarified and revised.
idpoloni, page 12 29/10/2014 8:13:25 AM	Please revise.	
idpoloni, page 14 03/11/2014 11:44:00 AM	There were actually 4.	Reference to the fourth test pit (TP-T-14-01) has been added to the text and in Figure 4.1-2.
jkperron, page 14 03/12/2014	3 at the mill and 1 north of the diversion.	Reference to the fourth test pit (TP-T-14-01) has been added to the text and in Figure 4.1-2.
idpoloni, page 15 03/12/2014 1:56:03 PM	Please verify location of BH-C-14-02 and BH-C-14-04, they seem to be mismatch. **3 Feb Follow-up** This has not been corrected on the figure, further on this log your response is that it was not mismatched. When looking at our note and photos the 2 boreholes seem to be mismatched. Can this be confirm with Hamid and modify accordingly.	**2 Mar Response** As per phone and email conversations with AAM, as well as checking AAM daily logs and AMEC field notes, the BH locations and labels on the figure are correct.
idpoloni, page 15 03/12/2014 1:57:03 PM	Please insert on the map the locations of the loggers downloaded and groundwater sampled by ELR, AE, and/or AAM.	Groundwater and water sample locations were already on Figures 4.1-1 and 4.1-2. Title has been revised. Dataloggers were added to the figures.
idpoloni, page 15 03/12/2014 1:58:27 PM	Please verify this borehole (BH-T-14-04) and its location, we thought it was drilled north of the diversion. **3 Feb Follow-up** and is it in the right location. Can you please confirm with Dan or Hamid?	The BH location has been reviewed and verified. **2 Mar Response** It was drilled on undisturbed ground inside the tailings facility and south of the road. The goal was to drill in undisturbed ground as close to the tailings as possible. The GPS location was obtained at the time of drilling. Note that BH-T-14-05 was planned for inside the tailings facility and south of the road, but that the actual drilled location was north of the road and the facility.

Comment ID[1]	Comment	Response
idpoloni, page 16 03/12/2014 2:00:06 PM	Please verify if this BH was completed; it is not documented.	The BH location has been reviewed and verified.
idpoloni, page 19 29/10/2014 8:38:11 AM	Prior to sending samples from Nansen, I recorded all pails. I have noted in my book that we did in fact fetch a 20 L from this well.	A 20 L sample was collected from this well and the text has been revised accordingly.
idpoloni, page 19 29/10/2014 8:40:42 AM	We were able to get 1.5 L. From this, we filled bottles for testing (as recommended by AMEC). This, as well as Table 4.4.2-1 says otherwise.	References to the limited sampling and testing completed for this well have been revised in the text.
idpoloni, page 20 29/10/2014 8:41:25 AM	Were able to collect a 20 L pail.	This has been corrected in the text and Table 4.4.2-1.
idpoloni, page 20 29/10/2014 8:42:12 AM	Collected 1.5 L from well. Filled bottles from this 1.5 L pail for testing.	References to the limited sampling and testing completed for this well have been revised in the text.
idpoloni, page 20 03/11/2014 11:46:41 AM	What is the reasoning behind this? Why did this not produce enough of a sample?	Text revised to provide explanation.
idpoloni, page 22 03/12/2014 2:03:44 PM	What about remediation of trenches/disturbed areas within the tailings area (e.g., southeast of the tailing and northwest of the tailing)? JP and Hamid did walk these to location and they were discussed as areas that may require attention, they should be identified on this map.	References to these additional disturbances that are not former exploration trenches have been added to the figure.
idpoloni, page 24 03/11/2014 11:47:40 AM	Why or how is this linked with erosion? Elaborate please.	The linkages to Human Health and Safety have been added to the text.
idpoloni, page 26 03/12/2014 2:05:14 PM	The site reconnaissance was also conducted to find appropriate location for water treatment plant. Please make comment concerning this.	Water treatment plant siting was not part of the original 2014 SI Program scope (see Section 3 and SI Program Execution Plan). However, preliminary considerations of potential plant sites were added to the general site reconnaissance effort and reference to this has been added to the text (e.g. this was the primary rationale for locating TP-T-14-01).
idpoloni, page 28 03/11/2014 11:48:37 AM	Why was there insufficient material?	Text modified to provide explanation.
idpoloni, page 29 11/12/2014 8:57:40 AM	Why was this? Commented earlier on this.	Text modified to provide explanation.

Comment ID[1]	**Comment**	**Response**
idpoloni, page 30 03/12/2014 2:21:29 PM	Verify BH-T-14-04 location. **3 Feb Follow-up** and....	The location of BH-T-14-04 has been reviewed and verified. **2 Mar Response** It was drilled inside the tailings facility limits and was located by GPS at the time of drilling.
idpoloni, page 31 03/12/2014 2:07:37 PM	What about power/pipeline along this road? It should be highlighted since disturbance will be created.	Text revised to note that the remedial scope will also include decommissioning and removal of some comparatively minor ancillary infrastructure (e.g., power lines along road alignments) that may fall outside the limits indicated on Figure 5.1.1-1.
idpoloni, page 31 03/12/2014 2:08:02 PM	What about along Dome Creek all the way to Victoria due to sediment results? Should it be identified?	Added to Figure 5.1.1-1.
jkperron, page 32 03/12/2014 2:09:21 PM	In BH-T-13 - see last year.	The reference here is to BH-T-14-13 which was completed during the 2014 SI program (i.e., location 13 for the 2014 program).
idpoloni, page 34 03/12/2014 2:22:17 PM	Should use standard sheet size for pdf document for ease of printing.	Done.
idpoloni, page 37 03/11/2014 11:50:46 AM	What about MW09-07?	Text modified to provide explanation.
idpoloni, page 37 03/11/2014 11:51:07 AM	Is this the right standard to use as a proper threshold?	Yes it is because they are “end-of-pipe” discharge criteria. It is understood that MMER do not apply to Mount Nansen site because it is closed, but they have been used at other closed mine sites in Canada as reference discharge criteria. Explanation and reference have been provided in the text.
idpoloni, page 38 29/10/2014 9:16:18 AM	Compared to what standard? Please specify.	Compared to MMER criteria, as outlined in the text. MMER column added to Table 5.1.1-1.
idpoloni, page 39 29/10/2014 12:59:33 PM	Why is it compared to MMER?	Text modified to provide explanation.
idpoloni, page 43 03/12/2014 2:24:43 PM	ELR groundwater sampling should be inserted, with results discussed and interpreted. All data with respect to the project proposal and design requirement requested by AMEC for this field season should be discussed even if not collected by AMEC. Please include summary and summary table. Please note that as per our discussion the ELR report is being reissued	Added table of groundwater parameters exceeding guidelines to Section 6 along the same lines as the surface water table. **2 Mar Response** Yes, the report “Mount Nansen June 2014 Groundwater Monitoring and Sampling” report by Hemmera and dated November 2014 was used to prepare this section.

Comment ID[1]	**Comment**	**Response**
	since there was some mistake, we will provide the revised report shortly as well as the fall program. **3 Feb Follow-up** Can you please confirm that the revised report was utilised to populate this section. I.e originally AAM had provided the groundwater report and it had erroneous results, AAM reissued the report to AMEC at a later date. Why was the content within 6.1.3 significantly reduced in the revised version?	The content within 6.1.3 was not removed from the report. Rather, methodology descriptions were moved to Section 4 and results were moved to Section 5.
idpoloni, page 44 **03/11/2014 11:52:44 AM**	All data should be graphed to July. Verify with previous reports (Lorax and last year's AMEC). If you are lacking the Lorax report, this could be provided.	The data for GLL07-01 and MW09-15 cannot be graphed to July because data is only available to Feb/March. The loggers were reset in late 2014 and the next download should provide additional data. GLL07-01 is frozen and has been ever since it was installed. MW09-15 seems to go through a cycle relating to surrounding ground freeze-thaw conditions. No, vibrating wires in grout or sand pack cannot be fixed without overdrilling and replacing the well and instrumentation. Another option is to drill an adjacent well. Both are costly. The thermistor for CH-P-13-05 stopped working after March. The data was clearly invalid between March and July. The invalid data was not graphed in order to avoid confusion. **2 Mar Response** For the tailings wells, the previous data from the dataloggers for MW09-03 and MW09-04 were obtained from AAM and are now added to Figure 5.4.3-7. The interpretation of this figure has been edited in the text. It was apparent after receiving the 2011-2012 data that the datalogger for MW09-04 was not working properly in 2013-2014. Dataloggers for MW09-21 and MW09-23 appear to have run out of memory. They were reset in late 2014 and the next download should provide additional data.
idpoloni, page 44 **29/10/2014 1:10:14 PM**	I thought the data from this logger was incorrect? Can you confirm this or is the data good up to March 07? (This was the frozen well).	
idpoloni, page 44 **29/10/2014 9:34:14 AM**	Why? And can it be fixed?	
idpoloni, page 44 **29/10/2014 9:34:22 AM**	Why? And can it be fixed?	
idpoloni, page 44 **29/10/2014 9:34:26 AM**	Why? And can it be fixed?	
idpoloni, page 44 **29/10/2014 9:31:34 AM**	Why not to July?	
idpoloni, page 44 **03/12/2014 2:26:09 PM**	Why don't we have data to July? And shouldn't we have earlier data for the MWs wells? **3 Feb Follow-up** With respect to 09-03 and -04 they were not installed in 2013 and they have been downloaded previously by Lorax/Northwest. Let us know if you do not have the data, we will send it to you.	

Comment ID[1]	Comment	Response
idpoloni, page 45 03/11/2014 11:53:40 AM	Not according to the previous table. Seems as though there are multiple malfunctioning loggers.	Text has been revised.
idpoloni, page 45 03/12/2014 2:26:36 PM	Can this paragraph be clarified? Not understanding this paragraph. Specifically the conclusion.	
idpoloni, page 46 03/11/2014 11:54:24 AM	Please ensure that Excel files are provided.	The Excel files will be provided with the TAR deliverables.
idpoloni, page 46 03/12/2014 2:32:25 PM	Is this logger functioning properly, I thought Paul mentioned that it was not and that it was frozen?	This is true if it is frozen; however, data for this well (GLL07-01) and MW09-15 are displayed for completeness.
idpoloni, page 46 29/10/2014 10:17:42 AM	The temperature of the pit pond never goes below 0 degrees. At what depth is temperature taken?	The datalogger is installed at elevation 1179.3935 masl. The depth below water will fluctuate with water levels. However, on average, it is approximately at 11 metres below water surface.
idpoloni, page 46 29/10/2014 10:18:48 AM	What does the flat line represent?	The flat line represents the periods in time when the water level dipped below the elevation of the datalogger. This can be fixed by lowering the elevation of the datalogger. Text has been revised.
idpoloni, page 47 29/10/2014 10:19:08 AM	Why does it stop here?	The frequency wire for the 50 m vibrating wire appears to have malfunctioned as starting in November 2013, it started recording only zero values or no values. The temperature channel is working. This VW is grouted in and cannot be replaced or fixed.
idpoloni, page 47 03/12/2014 2:43:06 PM	Colours for 10 m and 50 m depths very similar.	Figure colours have been changed.
idpoloni, page 48 03/12/2014 2:43:24 PM	Colours for 10 m and 50 m depth similar and hard to differentiate.	Figure colours have been changed.
idpoloni, page 49 03/12/2014 2:43:58 PM	Do you need temperature to get the piezometer readings and why was the temperature bead not available? **3 Feb Follow-up** I still don't understand the note about the assumed piezo due to non-valid thermistor, can you please explain?	No, temperature and frequency are recorded on separate channels and are independent of each other. The thermistor is on this VW is not working and is, therefore, not providing temperature readings. **2 Mar Response** Note has been edited on figure. The VW piezometers have both temperature and frequency channels. The frequency can be converted to piezometric elevation but the calculation requires the temperature data. In this

Comment ID[1]	Comment	Response
		case, the temperature channel was not working and so temperature was assumed by inserting a typical value starting in December 2013. For reference, Solinst level loggers record water level directly. They also collect temperature data, but it is more for reference and data interpretation.
idpoloni, page 50 29/10/2014 10:21:29 AM	Reason for this? Has issue been resolved?	The thermistor is malfunctioning, which could be temporary. This will be assessed when the next download values are reviewed. Thermistors often malfunction, especially when exposed to extreme temperatures.
idpoloni, page 51 03/12/2014 2:44:36 PM	Do we only have data till this date? Why and how to rectify it?	An assessment of thermistor function can be made following interpretation of the AAM data logger downloads completed in November/December.
idpoloni, page 54 03/12/2014 2:45:20 PM	Isn't there supposed to be continuous logging? Why is there a gap here? In addition, there should be older data on these wells, see Lorax report. **3 Feb Follow-up** Not the case - see comment above on page 4.	The Lorax report contains data for the Pit Lake, GLL07-03 and MW09-15 only, not the wells on this figure. **2 Mar Response** Earlier data from dataloggers in MW09-03 and MW09-04 have been obtained from AAM and added to Figure 5.4.3-7. Dataloggers for MW09-21 and MW09-23 appear to have reached memory capacity, as they may be older units with a capacity of roughly 8,000 readings. They were reset in late 2014 and the next download will determine if that was the reason for lack of data.
idpoloni, page 55 29/10/2014 10:27:35 AM	How is 1,191.6 and 1,170.4 m obtained? Verify if this is depth of instrument.	This is the lowest screened interval, which may not necessarily be the PVC screen (i.e., it could be the sand pack below the screen which is the deepest hydraulic connection to screen/well).
idpoloni, page 55 03/11/2014 11:56:44 AM	Can you please explain this sentence? How did you come to these conclusions?	Data from 10 m and 50 m were mistakenly confused in the text. Text has been corrected.
idpoloni, page 55 29/10/2014 10:29:15 AM	Why is there no temperature?	There is no temperature because the thermistor is not working (see page 50 comment, in comment ID).

Comment ID[1]	Comment	Response
idpoloni, page 55 29/10/2014 10:30:09 AM	Can it be fixed? Why is there no piezometer elevation?	The thermistor is malfunctioning (see page 50 in comment ID column). The piezometric elevation data was not usable. No, it cannot be fixed, it can only be replaced. Replacement would overdrilling and reinstalling the well to then place new instrumentation.
idpoloni, page 55 03/12/2014 2:46:40 PM	Why no piezometer readings and why is graph not up to July when the download was completed?	The frequency/piezometer wire has been malfunctioning since installation. The thermistor started malfunctioning after March 2014. Many of the vibrating wires could be damaged due to freeze thaw conditions. The graph is not updated because all data since March 2014 is unreliable.
idpoloni, page 55 29/10/2014 10:31:31 AM	30 m and 40 m have similar trends too?	No, 40 m is similar to 50 m and 60 m, and 30 m is similar to 20 m; however, all display pronounced spikes during freshet, except 60 m.
idpoloni, page 56 29/10/2014 10:31:31 AM	Can you please rephrase or explain this sentence? This does not make sense to us.	The initial spike/pulse is caused by a hydraulic connection between the pond water and the subsurface. Once water depth in the pond reaches a critical depth/ pressure, it begins to drain into the subsurface rapidly. The second pulse is caused by precipitation and seepage from snow melt. This conclusion will require validation based on considerations of future data. Text has been revised.
idpoloni, page 56 29/10/2014 1:18:28 PM	No discussion on temperature? As well, when does this occur? When should we do this download?	Temperature is irrelevant; it is very consistent in groundwater as can be seen in the figure for CH-P-13-06. Text has been revised to clarify.
idpoloni, page 56 29/10/2014 1:20:25 PM	Why? Are they full?	Yes, they were erased and restarted by AAM in December. The next download will show whether the memory was full or if there is something else wrong with them. Text has been revised to provide explanation.
idpoloni, page 56 03/12/2014 2:48:18 PM	Poor section. EDI only collect and do not interpret. Please insert info and provide some interpretation for the full set of data. EDI freshet sampling events and monthly event being collected for the design should be discussed as well as the groundwater event.	Text expanded and modified.
idpoloni, page 56 29/10/2014 1:26:45 PM	Were there any deficiencies? Results should be discussed and interpreted.	

Comment ID[1]	Comment	Response
idpoloni, page 57 03/11/2014 11:58:12 AM	Insert in document please.	Done.
idpoloni, page 57 03/11/2014 11:59:13 AM	Please specify if there was no sample for the test pit and provide any reasoning for this.	Text modified to provide explanation.
idpoloni, page 57 03/12/2014 2:49:22 PM	Please make reference to the TP that was created in the tailings pond area. Please make reference to the figure for location.	Reference to this additional test pit has been added to Section 5.10.1 of the text.
idpoloni, page 61 29/10/2014 1:38:42 PM	Results should be discussed and exceedance highlighted if there is any.	No regulations or criteria applicable to the field bins and, therefore, no exceedances to report. Added some text to describe which bins had highest and lowest concentrations.
idpoloni, page 65 03/12/2014 2:50:58 PM	Please state or reference them.	Reclamation attributes or criteria have been added to the text.
idpoloni, page 65 03/12/2014 2:51:22 PM	Should be part of the current report?	Background sampling data have been included in this SI report, but the development of that data into representations of background conditions was always part of the design scope.
idpoloni, page 72 03/12/2014 2:52:36 PM	As well as a potential location for water treatment plant, please discuss this component.	Water treatment plant siting was never a part of the 2014 SI Program scope (see Section 3 and SI Program Execution Plan).
idpoloni, page 73 11/12/2014 9:50:41 AM	Could not find..... Please verify this.	Should have referenced Section 6.5. Text corrected.
idpoloni, page 75 03/12/2014 2:53:40 PM	It was not removed, since it is underground. DES only removed above ground pipelines. Update this sentence.	Text revised.
idpoloni, page 78 29/10/2014 10:44:51 AM	Discuss results/trends.	Additional comment on data trends has been added to the text.
idpoloni, page 78 03/12/2014 2:54:16 PM	Where is data for these? If not available, identify, please verify the data first.	Missing data have been added to the table.
idpoloni, page 81 29/10/2014 1:43:33 PM	What is the quantity and should it be mobile or fixed treatment?	These issues will be addressed during the design phase.
idpoloni, page 81 03/11/2014 12:03:02 PM	Could you please elaborate on this paragraph?	Text has been clarified.
idpoloni, page 87 29/10/2014 10:53:07 AM	Explanation for this.	Text revised.

Comment ID[1]	Comment	Response
idpoloni, page 90 **03/12/2014 2:56:57 PM**	What is the extent of contamination at dome creek as a result? What is the remediation requirement (if any) as a result? What do we do? Please elaborate on related issues.	Examination of these issues was always included in the design development scope and budget.
idpoloni, page 91 **03/12/2014 2:57:36 PM**	Fix this, the axis title is over the x axis value. **3 Feb Follow-up** The figure was not modified.	**2 Mar Response** Figure was pasted incorrectly and is now pasted properly to correct.
idpoloni, page 93 **29/10/2014 10:57:17 AM**	Show location on map.	The locations of these photos have now been highlighted at their point of reference in the text and on Figure 4.5.1-1.
idpoloni, page 94 **29/10/2014 10:57:40 AM**	Show location on map.	The locations of these photos have now been highlighted at their point of reference in the text and on Figure 4.5.1-1.
idpoloni, page 94 **03/12/2014 2:58:55 PM**	Please verify this figure. It seems to be making reference to the wrong figure.	Figure reference corrected.
jkperron, page 96 **03/12/2014**	The breaching statement is inaccurate, please remove.	Breaching reference removed.
idpoloni, page 99 **03/12/2014 3:00:48 PM**	Verify this date. 2014.	2013 date is correct.
Appendix 3A		
idpoloni, page 3 **03/12/2014 3:01:26 PM**	Thought seepage pond was also sampled at depth? It was supposed to be part of the program, why was it not completed?	It was concluded that the water flowing from the seepage pond discharge pipe would be representative of seepage water going to a water treatment plant.
Appendix 3B		
idpoloni, page 11 **03/12/2014 3:01:55 PM**	MW-GLL07-01 not 03.	Reference corrected.
Appendix 3C		
idpoloni, page 7 **29/10/2014 11:03:59 AM**	Delete 'with'.	Deleted.
idpoloni, page 12 **29/10/2014 11:03:59 AM**	2014?	Corrected.
idpoloni, page 17 **29/10/2014 11:05:42 AM**	TF?	Revised to Tailings Storage Facility.
idpoloni, page 17 **29/10/2014 11:04:49 AM**	TF?	Revised to Tailings Storage Facility.

Comment ID[1]	**Comment**	**Response**
Appendix 4B		
idpoloni, page 1 **29/10/2014 11:06:36 AM**	Verify BH-C-14-02 and 04 locations. **3 Feb Follow-up** not the case see comment above on page 2	**3 Feb Follow-up** Verified and correct. We simply relocated BH-C-14-02 location north of BH-C-14-04 due to field conditions and access issues. It was originally planned for south of BH-C-14-04. BH-C-14-04 remained where it was. The confusion with the daily report and the BH locations have been resolved (see Page 2 above).
idpoloni, page 4 **29/10/2014 11:08:53 AM**	Difficult to see blue marker.	Revised.
idpoloni, page 4 **03/12/2014 3:04:38 PM**	Verify this BH and its location. Thought it was drilled north of the diversion and not within the tailing pond. Where is BH-T-14-05?	Verified and BH location is correct (was never moved from its initial layout). BH-T-14-05 is on the next page (page 5).
idpoloni, page 11 **03/12/2014 3:05:27 PM**	Please remove this title. It is not an overall plan?	Figure title has been revised.
Appendix 4D		
idpoloni, page 5 **03/12/2014 3:06:47 PM**	Clarify title; is it correct?	Title corrected.
Section 1.1 - last sentence **J. Berkers (AANDC)**	The project has not moved into Phase 2 design as outlined at the time of this draft. It is agreed that the project advanced some si scope associated with the AMEC phase II design; however, the phase 1 design as it stands has not been accepted to date. This will need to be adjusted in the remainder of the text.	Text has been modified to reflect current Phase 2 status.
Section 1.2 – Scope of Remediation **K. Winnicky (LSCFN)**	The last bullet of this section states that a remediated landscape will be created which complements the natural topography and vegetation of the area. It will be difficult to create such a landscape with the proposed use of sand cover without amendments.	It is true that applying reclamation concepts that do not incorporate organic amendments will limit the range of available reclamation outcomes. This approach was adopted during the Phase 1 design as a cost control measure, acknowledging that additional assessment and consultation regarding the balance between reclamation outcomes and costs would be required during subsequent design development and cost review activities.

Comment ID[1]	**Comment**	**Response**
Section 1.2 - first sentence **J. Berkers (AANDC)**	Leads to reader to infer that these bullets are from the LORAX 2011 Option 4, but we believe these are the bullets from AMEC's Phase 1 design of their further definition of Option 4. For example the third bullet indicates that option 4 relocates mineralized waste rock to the open pit, but in LORAX 2011 section 5.7.1 indicates the waste rock will be used on top of the tailings and graded to direct runoff away from the pit and 5.7.4.2 assumes the waste rock is non-acid generating. Please reword as required.	Text has been modified to reflect the correct design reference.
Table 3.2-1 - Information Needs Planned to be Addressed in 2014 Site Investigation Program **K. Winnicky (LSCFN)**	The 2014 site investigation program included the advancement of shallow boreholes to a maximum depth of 5 m to identify areas of ice-rich permafrost at the boundary of disturbed/undisturbed areas. Was 5 m sufficient to delineate the vertical extent of permafrost?	AMEC believes that the 5 m target depth established in the SI program design satisfied the program's data compilation objectives (see Report Sections 5.1 and 6.6).
Table 3.2-1 **K. Winnicky (LSCFN)**	The site investigation included the collection of soil samples along the length of Dome Creek to determine the extent of past migration of tailings along the creek and to delineate the extent of remediation required downstream and upstream of the Tailings Storage Facility (TSF). Sample sites included the area of blackened vegetation downstream of the TSF. Were vegetation samples collected from these areas as well to assess metal concentrations in plants along the creek?	The intent of the SI program scope was to provide the data needed to support an estimate of the contaminated sediment volumes that will require management during the remedial effort. The collection and analysis of vegetation samples that might support other objectives (e.g., ecological risk assessments) was not part of the SI program scope.
Section 3.5 - Evolution of Investigative Program **K. Winnicky (LSCFN)**	AMEC states that the required volumes of tailings porewater samples could only be taken from two of the designated five monitoring wells. A partial porewater sample was recovered from a third well with a limited yield, and the remaining two designated monitoring wells did not yield sufficient volumes of porewater. AMEC does not discuss potential reasons for the lack of water observed in three of the five monitoring wells. Given that these wells provide data required to assess the geochemistry of tailings porewater, and potential acidification of the tailings, some discussion of these	To clarify, full bulk water samples were collected from three of five monitoring wells. It is not unusual for wells completed in tailings to be low-producing or dry because of the fine-grained nature of the tailings. Another possible reason is the low tailings pond water level in 2014. Text revised to explain. The tailings porewater sampling requirement was driven by the treatability testing requirements for the Phase 2 water treatment plant design. It was not intended to supplement the general tailings characterization effort; the current body of tailings characterization data was

Comment ID[1]	**Comment**	**Response**
	reasons, and the potential impacts to ongoing site monitoring and refinement of closure options is warranted. Comment as to whether these wells should be rehabilitated or replaced is also recommended.	adequate for the requirements of the Phase 2 design and there is no need for MW09-01 and MW09-07 to be rehabilitated or replaced.
Section 4.3 - Leachate Bins	AMEC collected leachate samples from the unsaturated waste rock bin, unsaturated ore bin, unsaturated sand tailings bin and from water columns from the saturated tailings + organic bin. AMEC reports that leachate from the saturated waste rock bin was not available. It is unclear if this means that there was no leachate in the bin, or if there was some other reason that leachate was not available for sampling. Again, some description of the reason why leachate was not collected and potential remedies for the issue is warranted.	Text revised.
Section 4.7.3.1 - Kinetic Testing of Waste Rock Samples	AMEC reports that trickle leach columns were set up for non-PAG waste rock and that trickle leach column testing will be run for 20 weeks, by which time the concentrations in the column leachates are expected to stabilize. It is unclear if the column test time will be extended beyond 20 weeks should the concentrations not stabilize within that time. It is also not clear if samples of PAG waste rock were also submitted for kinetic testing, and it is unclear if humidity cell tests are being performed on any samples.	Text revised. Non-PAG waste rock will be used in the TSF area (among other areas of the site) as surface construction material. AMEC needed to have kinetic tests done on this material to determine a source term for drainage quality. Trickle leach columns can be set up using site precipitation values, as opposed to humidity cells, which use fixed water volumes. PAG waste rock samples were not submitted for testing as the material will be mixed with tailings in the pit and tailings would be considered the dominant material for the source term. If trickle leach columns are not stabilized after 20 weeks, AMEC will discuss continuing tests with AAM. Text revised to reflect explanations above.
Section 4.7.3.2 - Metal Testing of Background Soil Samples	AMEC selected 26 soil samples from 12 boreholes located adjacent to the Tailings Storage Facility, the Camp Area, and the Mill Complex area for pH and metals analysis. AMEC reports that following the analysis of these soils, six samples were selected for further metal leachable metal testing. It is unclear what criteria were used to select the samples submitted for further analysis.	Text revised.

Comment ID[1]	Comment	Response
Section 5.1.2 - Results for the Tailing Storage Facility	Permafrost was encountered in 14 of the 21 boreholes advanced in the vicinity of the Tailings Storage Facility. AMEC indicates that the southern side of the disturbed/ undisturbed boundary area had permafrost at a shallower depth, ranging from 0.8 m to 5 m depth, and the northern side for the facility had permafrost at a greater depth. It is unclear if the depths reported are the total vertical extent of permafrost, or the depth at which permafrost was initially encountered (i.e. no vertical delineation of permafrost completed).	The depth range indicated refers to the depth at which permafrost was initially encountered, not the vertical delineation of permafrost.
Section 5.10.3 - Waste Rock Area **K. Winnicky (LSCFN)**	AMEC reports that field observations suggest that potentially acid generating (PAG) rock could be mixed more extensively with non-acid generating rock than is currently estimated. It is unclear if this comment is based on visual observations only (i.e.) is it possible to distinguish PAG from non-PAG waste rock from visible observation only? Some discussion on this point is warranted as the ease of identify, separating and managing two waste rock streams will have significant impacts on the refinement of the closure options.	This conclusion was based on preliminary PAG/NAG distinctions that were made on the basis of visual field observations, with the suspect PAG materials exhibiting weathering, red/yellow colouration and visible sulphides.
General Comment	Has mineralogical testing been completed on waste rock or soil samples in previous studies? If not, it should be completed to assist in understanding site geochemistry.	Yes, mineralogical testing (x-ray diffraction) was previously completed on seven waste rock samples and one ore sample. AMEC does not feel that further mineralogical testing will benefit the remedial design at this time.
General Comment **K. Winnicky (LSCFN)**	The report presents a summary of the 2014 investigation program and the associated results. Some interpretation of these results (i.e.) hypothesis as to why certain trends are being observed, and the implications of the results as we move into closure option refinement and permitting of closure activities would be useful. For example, Section 6.11 Geochemical Considerations states that arsenic and iron concentrations in the leachate bin were higher than concentrations in leachate collected during the 2013 site investigation program. Arsenic concentrations in this leachate were one order of magnitude higher in 2014 than in 2013. No	Revisions made to text. Variability is expected due to site weather conditions. Added some comparison of loadings from 2013 to 2014 and some comments on interpretation.

Comment ID[1]	Comment	Response
	interpretation of the significant change between 2013 and 2104 is presented. If such interpretation was not part of the 2014 SI/Site Characterization scope of work, I would highly recommend that it be added to future site characterization updates. In my opinion, a detailed interpretation of analytical results, and how these results may influence refinement of closure options would be very useful as the project moves forward and would ensure that the project team has a comprehensive understanding of the geochemical characteristics of the site.	

Appendix 4I – Native Files CD