MEMO

To	Josée Perron		
From	Renata Wood		
Tel	604-294-3811	**AMEC File No.**	VM00605E
Fax	604-294-4664	**cc**	Patricia Randell
Date	05 March 2014		

Subject **Mount Nansen Remediation Project - Summary of 2013 Site Investigation Program, Rev 1**

1.0 INTRODUCTION

AMEC in association with Associated Engineering carried out an investigation program at the Mount Nansen site in September and October 2013. The investigation was completed to support the remediation design effort and was developed based on the findings from the gap analysis completed (AMEC 2013a[1], 2013b[2]). The work was carried out under TA 4 and 5.

The following memorandum summarizes the work that was completed during the fall 2013 investigation program and is intended to simply present a record of the work completed. It has been issued as Rev 1 to address comments provided by the Mount Nansen Remediation Project (MNRP) partners. The memo has not been otherwise updated to include information that has become available since the original date the memo was issued (November 15, 2013). The results of the investigations, including a similar summary of work completed, will be presented under separate cover (AMEC 2013c[3] and AMEC 2014[4]) with the reporting work completed under TA6. Drafts of these reports will be submitted during the month of December with finalized documents produced by March 31, 2014.

2.0 OBJECTIVES OF INVESTIGATION PROGRAM

The investigation program was a multidisciplinary effort with the following broad objectives:

- Improve the geotechnical characterization of the tailings particularly with regards to response to excavation and trafficability.

1 AMEC 2013a, "Mount Nansen Remediation Project Data Gap Analysis", Memo submitted to Josée Perron, Assessment and Abandoned Mines, Energy Mines and Resources, 24 July 2014.
2 AMEC 2013b, "Mount Nansen Remediation Project 2013 Site Investigation Plan", Memo submitted to Josée Perron, Assessment and Abandoned Mines, Energy Mines and Resources, 25 July 2014.
3 AMEC 2013c, "Mount Nansen Remediation Project 2013 Site Investigation Data Report - DRAFT", Draft Report submitted to Assessment and Abandoned Mines, Energy Mines and Resources, December 2013. Report to be finalized March 2014
4 AMEC 2014, "Mount Nansen Remediation Project Site Characterization Report" Draft Report submitted to Assessment and Abandoned Mines, Energy Mines and Resources, January 2014. Report to be finalized March 2014.

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- Expand the geochemical dataset for the waste rock material to provide an improved estimate of the volumes of material requiring storage in the open pit vs. volumes available for borrow.
- Improve the geotechnical characterization of the waste rock, primarily with regards to grain size and the type of borrow material that could be expected from the waste rock.
- Improve the geotechnical and geochemical characterization of the insitu material under the tailings and the understanding of the thermal regime in the insitu material.
- Confirm the general type of onsite borrow material available including geotechnical and geochemical assessment.
- Confirm the general understanding of the site wide geotechnical framework.
- Observe, document, and quantify watershed and creek characteristics.
- Characterize the type and geochemical nature of creek sediments.
- Improve the understanding of groundwater flow pathways from the open pit (towards Dome Creek primarily).
- Improve the understanding of the thermal regime around the open pit.
- Quantify groundwater - surface water interaction and quality along Dome and Pony Creeks.
- Improve understanding of groundwater flow and quality around the Huestis adit.
- Increase groundwater chemistry data set by sampling all existing wells on site.
- Increase surface water chemistry dataset to better understand the conditions and in particular the spatial heterogeneity of surface water chemistry.
- Increase the geochemical dataset for fill materials in mill area and along roads where additional information needed to quantify remediation volumes.
- Develop geochemical dataset for the dam fill material to quantify the volume available for borrow and volume requiring storage in the open pit.
- Improve the understanding of the materials at the mill and historic tailings areas to identify and quantify materials requiring relocation during remediation activities through reconnaissance and limited grab samples.
- Complete hazardous material inventory including sampling of the rail car contents.
- Develop a dataset of soil contamination in areas of known / suspected contaminant release to quantify degree of contamination and approximate volumes.
- Characterize potential landfill contaminant plume.
- Preliminarily confirm and improve the assessment of the building infrastructure to identify scope of work required to support the development of demolition plans and volumes.

- Develop preliminary site reclamation objectives and confirm existing landform, soils and vegetation conditions.

The site investigation completed to achieve these objectives is shown in Figures 1 through 5 and presented in the attached Tables 1, 2 and 3 which summarize the original high level work plan, provide details of the site investigation completed, and list the groundwater wells that were sampled.

3.0 SUMMARY OF WORK COMPLETE

The investigation locations are shown in Figures 1 through 5 attached. The program included various investigative techniques as listed below and briefly described in the following subsections.

- Drilling
- Test pitting and hand augers
- Instrumentation and well installation
- In-situ testing and measurements
- Groundwater sampling
- Surface water and sediment sampling
- Hazardous material sampling
- Visual reconnaissance
- Geophysics
- Surveying
- Laboratory testing

3.1 Drilling, Test pits and Hand Augers

Table 1 summarizes the drill holes and test pits advanced at the site during the 2013 investigation. Soil and rock was visually classified by on-site field personnel. Where conditions allowed, rock core was oriented to allow more detailed logging of fractures. An on-site laboratory was used to measure the moisture content of tailings and insitu samples in select locations. Selected soil soils were sent to offsite laboratories for additional geotechnical, geochemical and environmental testing. The drilling and test pitting comprised generally of:

- 40 test pits - advanced with a tracked excavator in the waste rock area, sand borrow areas, the historic “shale” borrow area, the mill site, historic tailings disposal locations, and on the tailings beach to characterize the soil conditions and collect samples for geotechnical, geochemical and environmental testing. The test pits on the tailings beach also provided an opportunity to observe the response of the tailings to excavation. Select samples from the waste rock and tailings area test pits were shipped off site for

laboratory testing. The rest have been stored inside the old cook shack, with each sample placed at the recovered moisture content in a labelled plastic bag and then grouped into larger rice bags by test pit. Large bulk samples are stored in 5-gallon pails.

- 16 sonic drill holes - advanced at the waste rock area, tailings beach, tailings dam, mill area, and former Ketza shop. Select holes drilled from the tailings beach had standpipe piezometers installed. Samples were collected and sent to laboratories for additional environmental, geochemical and geotechnical testing. The remaining soil core from the tailings facility and waste rock area was placed in core boxes which are stored outside in the core racks near the bunk house.
- 9 GeoProbe holes – advanced into the tailings from a barge on the tailings pond and from the tailings beach in areas where the sonic drill could not traffic. Select samples were sent to the laboratory for geotechnical and chemical analyses. Remaining samples were placed at the recovered moisture content into labelled plastic bags grouped into larger rice bags by borehole and stored inside the old cook shack on site should they be required for future testing.
- 4 hand augers – completed in the sand borrow area upstream of the tailings facility to replace two of the test pits (where excavator access was not possible) and along Dome creek as simple probe locations to confirm ground conditions inferred from refusal during installation of the mini piezometers (see Section 3.2). Samples from the borrow area were sent to the laboratory for geochemical and geotechnical testing.
- 10 diamond drill holes – advanced in and around the open pit. In four locations the holes were paired with a deep and shallow hole drilled. Monitoring wells and instrumentation were installed in all holes except the deep hole at CH-P-13-01 where high artesian pressure 11 m above the ground surface was encountered preventing installation of instrumentation without mobilizing a much larger water well type drill that could counteract the pressure. While installing instrumentation at this location would have provided ongoing information to potentially provide some certainty with regards to the flow regime, the single point information obtained (pressure and flow), is useful and has significantly increased our knowledge about the groundwater flow regime. As the design evolves, the potential benefit of greater certainty with regards to the hydrogeology in this area and the impact on the design should be assessed to determine if additional investigation is warranted however at the current time the cost and effort is not considered to be balanced by the likely outcomes.

Table 1: Summary of Drill Hole and Test Pits

Location Area		Summary of Work Completed
Ketza Shop	(BH-KZ)	2 sonic drill holes
	(TP-KZ)	2 test pits
Mill Area	(BH-M)	8 sonic drill holes
	(TP-M)	5 test pits
	(TP-SP)	4 grab sample locations at the former explosives storage area

Location Area		Summary of Work Completed
Former Explosive Storage Area (TP-SP)		4 grab samples
Waste Rock Area	(TP-W)	11 test pits
	(BH-W)	1 sonic drill hole
Open Pit	(CH-P)	10 diamond drill holes at 6 sites
Tailings Facility	(TP-TD)	3 test pits on the tailings dam
	(BH-TD)	1 sonic drill hole on the tailings dam
	(TP-T)	7 test pits on the tailings surface
	(BH-T)	4 sonic drill holes on the tailings surface
	(CPT-T)	8 CPTs advanced from the barge (CPT-T-13-03,04,08,09,10,13, 14, 18) 12 CPTs advanced from the tailings surface 11 dissipation tests completed in CPT-T-13-10,13,18,14,12,15 and 19
	(GP-T)	5 geoprobe holes from the barge (GP-T-13-01,02,03,04 and 10) 4 geoprobe holes on the tailings beach surface
	(HA-B)	2 hand augers in the borrow area upstream of the tailings facility
	(TP-B)	3 test pits in the sand borrow area downstream of the tailings facility 3 test pit in the shale borrow area north of the tailings facility
Roads	(TP-R)	5 test pits on the roads
Dome Creek	(HA-DC)	2 and augers advanced as probes to confirm refusal conditions encountered when installing drive point piezometers

3.2 Instrumentation and Well Installations

Instrumentation and monitoring wells were installed at various locations around the site to provide information with regards to the groundwater and thermal regimes. The installations are detailed in Table 2 appended and consisted of:

- 14 paired mini piezometers – at each location paired mini piezometers were manually driven into the ground near the creek bank. An upper piezometer was installed at about 1.1 m depth and a lower piezometer at a depth of 2 to 3 m, depending on ground conditions, to measure the groundwater – surface water interaction and also allow collection of water quality samples. Ten sites were planned along Dome Creek, however although several attempts were made at location 4 installation was not possible due to ground conditions and was abandoned resulting in nine sites along Dome Creek. Five sites were installed along Pony Creek. These are semi permanent installations and should be monitored in the spring.
- 5 single point mini piezometers - installed near the Huestis adit to allow groundwater monitoring.
- 3 deep monitoring wells plus a vibrating wire with temperature measurement - installed in CH-P-13-03/50 and CH-P-13-04/50 around the open pit and in CH-13-05/50 located in the open pit to measure water level, temperature and allow collection of groundwater sample. Heat tracing was provided should the monitoring well be in groundwater below a

permafrost unit. The heat tracing would allow thawing of the portion of the well that is installed in permafrost so that a sample of the underlying groundwater can be obtained. The vibrating wires were connected to data loggers to allow frequent readings to be recorded and subsequently to provide information regarding connectivity to the open pit on November 14 and 15, 2013.

- 2 strings of 5 nested vibrating wire piezometers with temperature measurement – installed in CH-P-13-06/VWP which was drilled from the base of the open pit at an angle of 45 degrees and in CH-P-13-02/50 located south of the pit. Vibrating wires are located at 10 m intervals and measure water pressure and temperature. The vibrating wires are connected to data loggers to provide information regarding connectivity to the open pit.
- 4 shallow monitoring wells - installed around the open pit in CH-P-13-01/10, CH-P-13-02/10, CH-P-13-03/10 and CH-P-13-04/10.

3.3 In-situ testing and Measurements

The in-situ testing and measurements completed during the 2013 investigation program included:

- 20 cone penetration tests (CPT) completed through the tailings deposits from a barge and from the tailings beach. Dissipation tests were also completed at select locations.
- 23 packer tests completed in the deep diamond drill holes. Where conditions allowed, packers were completed at 5 m intervals using single packers as the hole was drilled.
- Flow measurements completed at 5 locations in Dome Creek.
- Flow measurements completed at 2 locations in Pony Creek.
- 14 seepage meter measurements competed at 10 locations in Dome and 4 locations in Pony Creeks (at locations of mini piezometer installations; several duplicate measurements made for quality assurance are not included in total number).
- 47 temperature and electrical conductivity readings in Dome and Pony Creeks.
- 15 pneumatic piezometer readings at 8 existing locations.
- Thermistor readings at 19 existing instrumentation locations.
- Pressure and flow measurement of artesian conditions in CH-P-01 prior to plugging the hole.

3.4 Groundwater Sampling

Groundwater sampling locations from the fall 2013 investigation program are shown in Figure 2. Samples were also gathered during a site visit completed during freshet (AMEC 2013d[5]). At select locations duplicate samples were collected to examine the potential for a field bias due to the presence of sulphide in the groundwater. In addition during the groundwater monitoring

[5] AMEC 2013d, “Freshet Site Visits memo.

program, gas concentrations were monitored in the well headspace and other potential areas of concern. The groundwater sampling program consisted of:

- Samples from 28 existing groundwater well locations and locations of interest around the site. Some of the existing wells had been destroyed or were dry or frozen and could therefore not be sampled. The wells that were successfully sampled are summarized in Table 3. Gas concentrations in well headspace was also monitored during groundwater sampling.
- Collection of groundwater samples was attempted at 19 newly installed monitoring locations in and around the open pit, at the mill area near the Huestis adit, and along Pony and Dome Creeks. Samples could not be obtained from some of the newly installed drive point piezometers (GSI locations) due to freezing conditions. The successful sampling is summarized in Table 3.
- On site assessment of sulphide concentration was completed.

3.5 Surface Water and Sediment Sampling

The surface water and sediment sampling program consisted of:

- Sampling ore and waste rock leachate bins.
- Samples from three locations in the open pit to delineate the vertical profile.
- On site assessment of sulphide concentration was completed.
- 20 sediment soil grab samples were completed in Dome Creek and sent to a laboratory for particle size and chemical analyses.

3.6 Hazardous Material Sampling

An inventory of the chemicals remaining on site was completed and where significant volumes of material were observed, samples were obtained. The inventory and sampling program included:

- 21 samples gathered mainly from the mill tanks.
- Attempted sampling of the rail tanker. The rail tanker was found to be empty although a small amount of sulphur dioxide gas was released upon opening the first valve.
- Inventory of tanks, drums and other vessels around the site.

3.7 Reconnaissances

Several general reconnaissances were completed to support the 2013 site investigation. These included:

- Visual assessment of existing topography and features in support of the development of landform design and final grading concepts.

- Surveys of the surficial soils and vegetation including collection of grab samples to confirm current conditions and help develop reclamation concepts. The surveys focused on the disturbed areas within the project area and the adjacent undisturbed areas but also included some offsite areas.
- Assessment of the general condition of the mill building, bunkhouse and cookhouse.
- General visual reconnaissance with regards to on site borrow characteristics and availability as well as a visual reconnaissance of the Victoria Creek borrow area.
- General visual reconnaissance of site around major project components with regards to major geohazards.
- Visual assessment of tailings performance and behaviour when subjected to loading by different equipment (excavator, trucks, drill rigs, foot traffic) and the behaviour of tailings samples when transported in the truck.
- Visual reconnaissance of the mill and historic tailings disposal area focused on observing surficial materials and in particular areas of waste rock and tailings.
- Observation and documentation of the undisturbed conditions in Dome and Pony Creeks.

3.8 Geophysics

Twelve resistivity surveys were completed at the site as follows:

- 3 lines completed at the tailings facility to provide insight into the permafrost conditions
- 2 lines completed near the Huestis adit to aide in locating the buried adit and thus target locations for well points.
- 7 lines completed in the mill area to clear investigation locations of utilities and underground obstructions; delineate potential voids and potential flow or contaminant plumes.

3.9 Surveying

To support analyses of the data gathered during the 2013 investigation program and to confirm historic information the following survey work was completed:

- Survey of newly installed wells and instrumentation.
- Confirmation of existing well elevations of interest.
- Survey of Dome Creek, 11 cross sections and 2 longitudinal sections.
- Landfill perimeter.
- Pony Creek adit (exposed ties).

3.10 Laboratory Program

The laboratory program is currently underway and is a phased program. To date the laboratory testing includes approximately:

- 82 grain size tests on waste rock, tailings, and insitu soil materials.
- 117 geochemical analyses of soil samples including acid base accounting, total inorganic carbon, sulphate-sulphur, leachable metals and shake flask extraction tests.
- Environmental analyses of approximately 50 soil samples including tests for hydrocarbons, volatiles, metals, glycols, cyanide and alkalinity.
- 20 grain size tests and metal and cyanide concentration analyses on sediment samples
- Analyses of surface and groundwater samples collected (see Section 3.4 and 3.5) including general chemistry, dissolved and total metals, cyanide species and nitrogen species.
- 4 specific gravity tests on tailings samples.
- 8 Atterberg limits tests on tailings samples.
- 63 moisture content tests completed on site on tailings and insitu samples.
- 3 tailings samples tested for cyanide.
- 21 hazcat tests on hazardous materials chemicals.

Further testing will be completed based on the results of the initial rounds of testing. This is expected to include:

- Additional environmental sampling (“step out – step down” testing).
- Additional geotechnical index testing as required (sieves, hydrometers, Atterberg limits)
- Proctor tests on tailings samples
- Odometer tests (1-dimension) on tailings samples.
- Tempe cell or similar tests on tailings samples.

4.0 CONCLUSION

The work completed in the 2013 Site Investigation program at the Mount Nansen Site was generally consistent with the planned activities. Certain aspects such as specific location or depth of investigation were altered based on the conditions encountered. There were several changes of significance from the scope of work outlined in TA 5. These were discussed during the program with AAM and included:

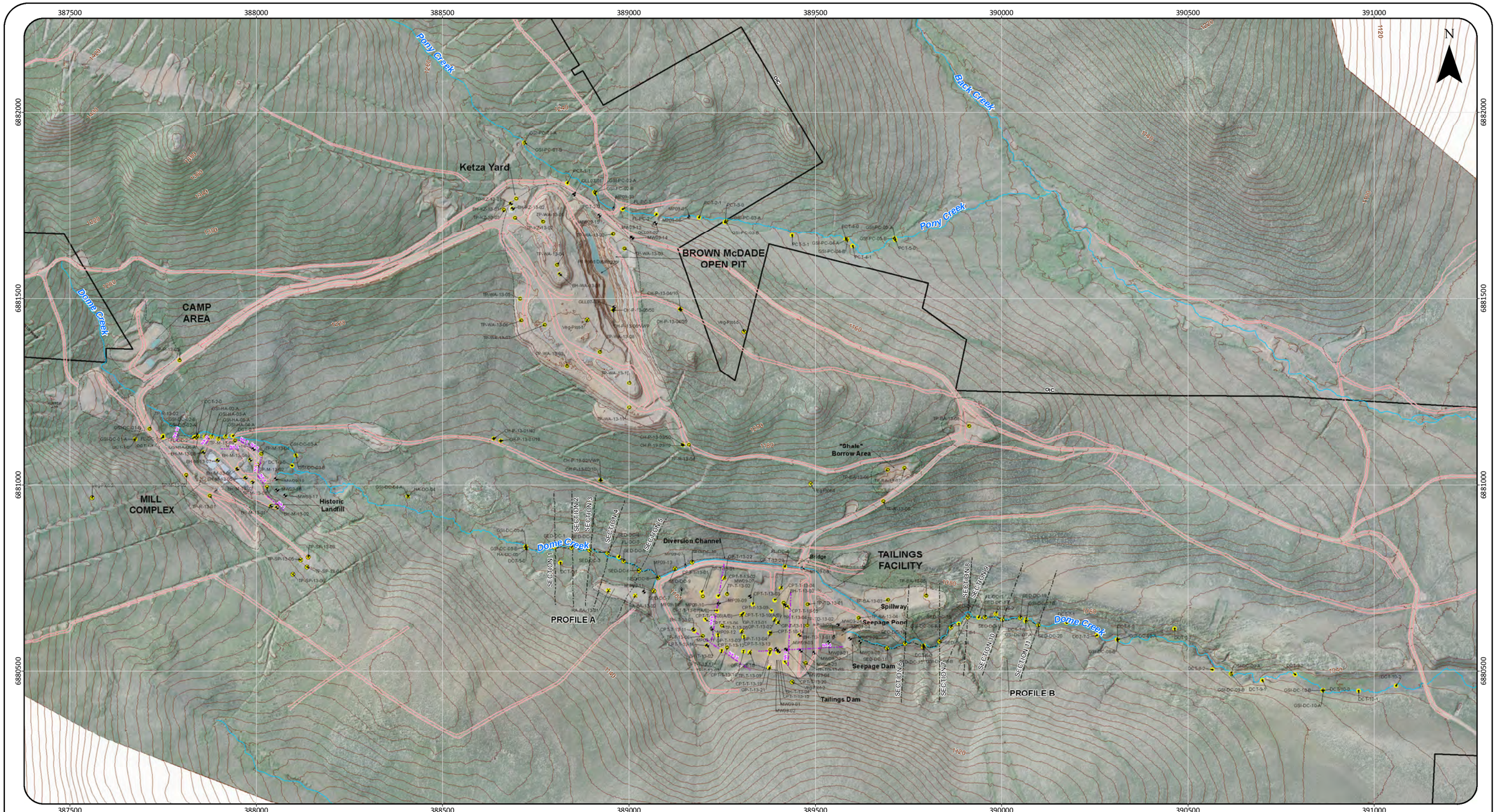
- Replacing the CMT well with conventional monitoring wells and vibrating wire installations and deletion of borehole geophysical surveys (acoustic televiewer, heat pulse flow survey and temperature measurement). The change was made in response to the observed ground conditions which indicated that the boreholes were unlikely to

remain open for the geophysical surveys and/or for the installation of the CMT wells. Installation of the vibrating wires will compensate for information not obtained through the geophysics by providing stabilized temperature readings and where thawed conditions are present, continuously monitored pore pressure readings. This will allow measurement of the interconnectivity between the installation locations and the pit and will provide a better understanding of the thermal regime. Paired shallow wells were drilled at each location allowing installation of a deep and shallow monitoring well providing the same groundwater coverage as would have been provided by the CMT wells.

- Replacing the open pit and adit reconnaissances with desktop studies. This was done because the available information is considered to be sufficiently detailed for the current design needs, particularly with regards to the open pit. Further assessment would be more effectively completed once the base case design is further developed and a better understanding of the role of the Pony Creek adit in the final pit configuration exists. Should further assessment be required to support design efforts, it will not require drilling or mobilization of a subcontractor to site and it therefore can be completed if or when it is needed.
- Inclusion of geophysics to confirm safety of investigation locations with regards to underground obstruction and utilities, provide insight into permafrost, and aide in locating the groundwater piezometers around the Huestis adit.
- Only one groundwater sampling campaign was completed rather than two. When the program was initially developed, it was envisioned that there would be a late spring / early summer sampling program and a fall program. Given the start date of the investigation program the first sampling event was not possible.

Although upcoming design work may uncover issues and questions that require additional information to reduce uncertainty, the project team is confident that the information obtained in the 2013 program has provided the information necessary to complete the preliminary design. Follow up site visits to provide additional details regarding the building and infrastructure are planned and were included in TA6. Investigation needs may evolve as the design progresses but other than those stated, there are currently no significant outstanding information needs identified at this time.

FIGURES



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

- Borehole
- Hydrogeological
- CPT
- Geoprobe
- Grab Sample
- Hand Auger
- Mini Piezometer
- Temperature or Flow Measurement
- Test Pit
- 2013 Locations
- OIC
- Geophysics Lines
- Surveyed Sections
- Contour (5 m)
- Disturbed Area
- Roads
- Streams

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MOUNT NANSEN REMEDIATION PROJECT
Figure 1

SITE INVESTIGATION COMPLETION MEMO

2013 SITE INVESTIGATION OVERVIEW SITE PLAN

Scale 1:10,000
Metres

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March 10, 2014

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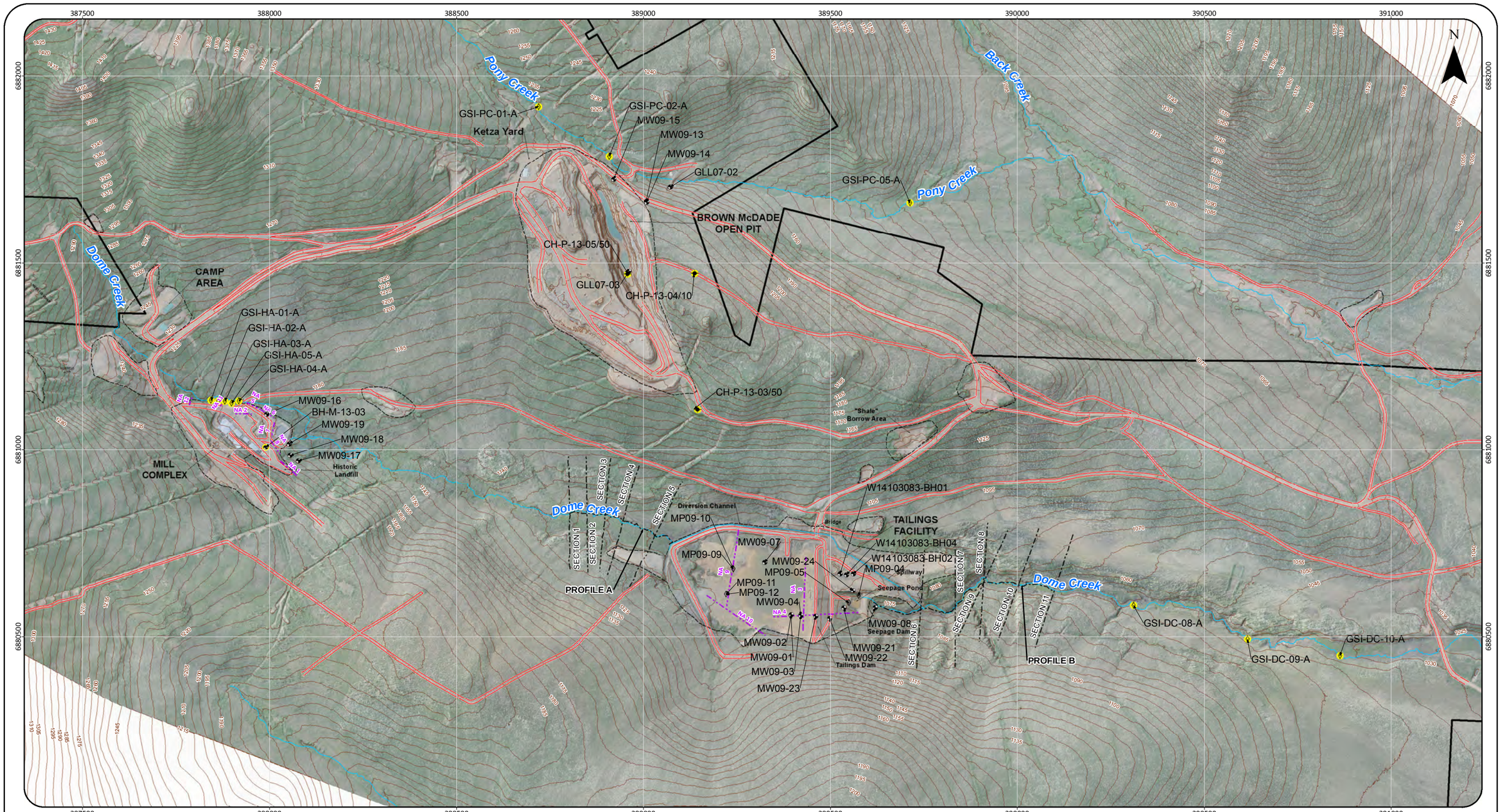

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Roads, trails, streams, waterbodies, watercourses and infrastructure areas digitized using 2008 Quickbird imagery (courtesy of Yukon Geomatics) and spatial data provided by Yukon government.

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Note:
Refer to Appendix B7 and D3 in the 2013 Site Investigation Report for details of groundwater sampling.

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MOUNT NANSEN REMEDIATION PROJECT
Figure 2

SITE INVESTIGATION COMPLETION MEMO

2013 SITE INVESTIGATION
GROUNDWATER MONITORING LOCATIONS FALL 2013

Scale 1:10,000
Metres
0 250 500

March 10, 2014

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Testhole	Drilled Depth (m)	Instrument(s) Installed
CH-P-13-01/10	10	MW
CH-P-13-01/40	40	-
CH-P-13-02/10	10	MW
CH-P-13-02/VWP	50	VWP
CH-P-13-03/10	10	MW
CH-P-13-03/50	50	MW, VWP
CH-P-13-04/10	10	MW
CH-P-13-04/35	50	MW, VWP
CH-P-13-05/50	50	MW, VWP
CH-P-13-06/VWP	60	VWP

MW = Monitoring Well
VWP = Vibrating Wire Piezometer with temperature measurement

388000 388500 389000 389500

6882000 6881500 6881000

Pony Creek
Ketza Yard
WASTE ROCK AREA
BROWN McDADE OPEN PIT
PONY CREEK ADIT
Pit Pond Datalogger
Northwest Pile
West Mid Pile
West Lower Pile
Ore Stockpile
South Pile
Low Grade Ore Backfill
Southwest Upper Pile
Southwest Lower Pile
East Pile
"Shale" Borrow Area
"Shale" Borrow Area

GSI-PC-01-A
GSI-PC-01-B
PCT-1-1
GLL07-01
GSI-PC-02-A
GSI-PC-02-B
MP09-03
FL-PC-1
PCT-2-0
MP09-01
PCT-2-1
PCT-3-0
FL-PC-2
MP09-08
GSI-PC-03-A
GSI-PC-03-B
MW09-15
MW09-13
GLL07-02
MW09-14
PCT-3-1
PCT-4-0
GSI-PC-05-A
GSI-PC-05-B
PCT-5-0
GSI-PC-04-A
GSI-PC-04-B
PCT-4-1
TP-KZ-13-01
BH-KZ-13-01
BH-KZ-13-02
TP-KZ-13-03
TP-WA-13-01
TP-KZ-13-02
TP-WA-13-02
TP-WA-13-03
TP-WA-13-04
BH-WA-13-01
TP-WA-13-05
TP-WA-13-06
TP-WA-13-07
TP-WA-13-08
TP-WA-13-09
TP-WA-13-10
TP-WA-13-11
Veg-Plot-1
Veg-Plot-5
GLL07-03
CH-P-13-05/50
CH-P-13-06/VWP
CH-P-13-04/10
CH-P-13-04/35
CH-P-13-01/40
CH-P-13-01/10
CH-P-13-03/50
CH-P-13-03/10
TP-R-13-04
CH-P-13-02/VWP
CH-P-13-02/10
TP-BA-13-08
TP-BA-13-06
TP-BA-13-07
GSI-DC-03-A
GSI-DC-03-B
TP-M-13-04
TP-M-13-02
DCT-3-0
MW09-19

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

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- Contour (5 m)
- Disturbed Area
- Roads
- Streams
- Waste Pile Area

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MOUNT NANSEN REMEDIATION PROJECT
Figure 3

SITE INVESTIGATION COMPLETION MEMO

2013 SITE INVESTIGATION
OPEN PIT DETAIL

Scale 1:5,000
Metres
0 100 200

March 10, 2014

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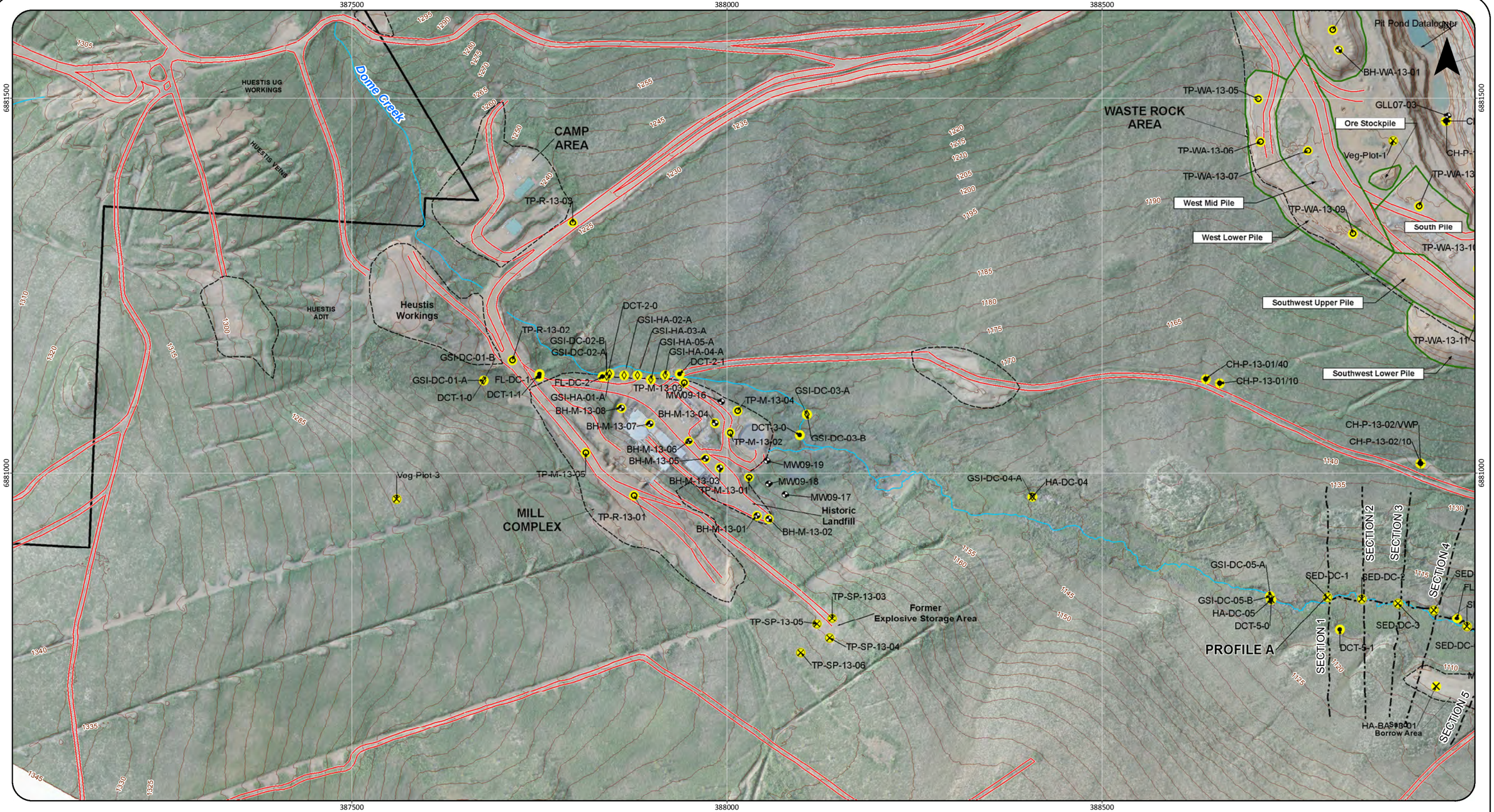

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MOUNT NANSEN REMEDIATION PROJECT
Figure 4

SITE INVESTIGATION COMPLETION MEMO

2013 SITE INVESTIGATION MILL DETAIL

Scale 1:5,000
Metres

0 100 200

March 10, 2014

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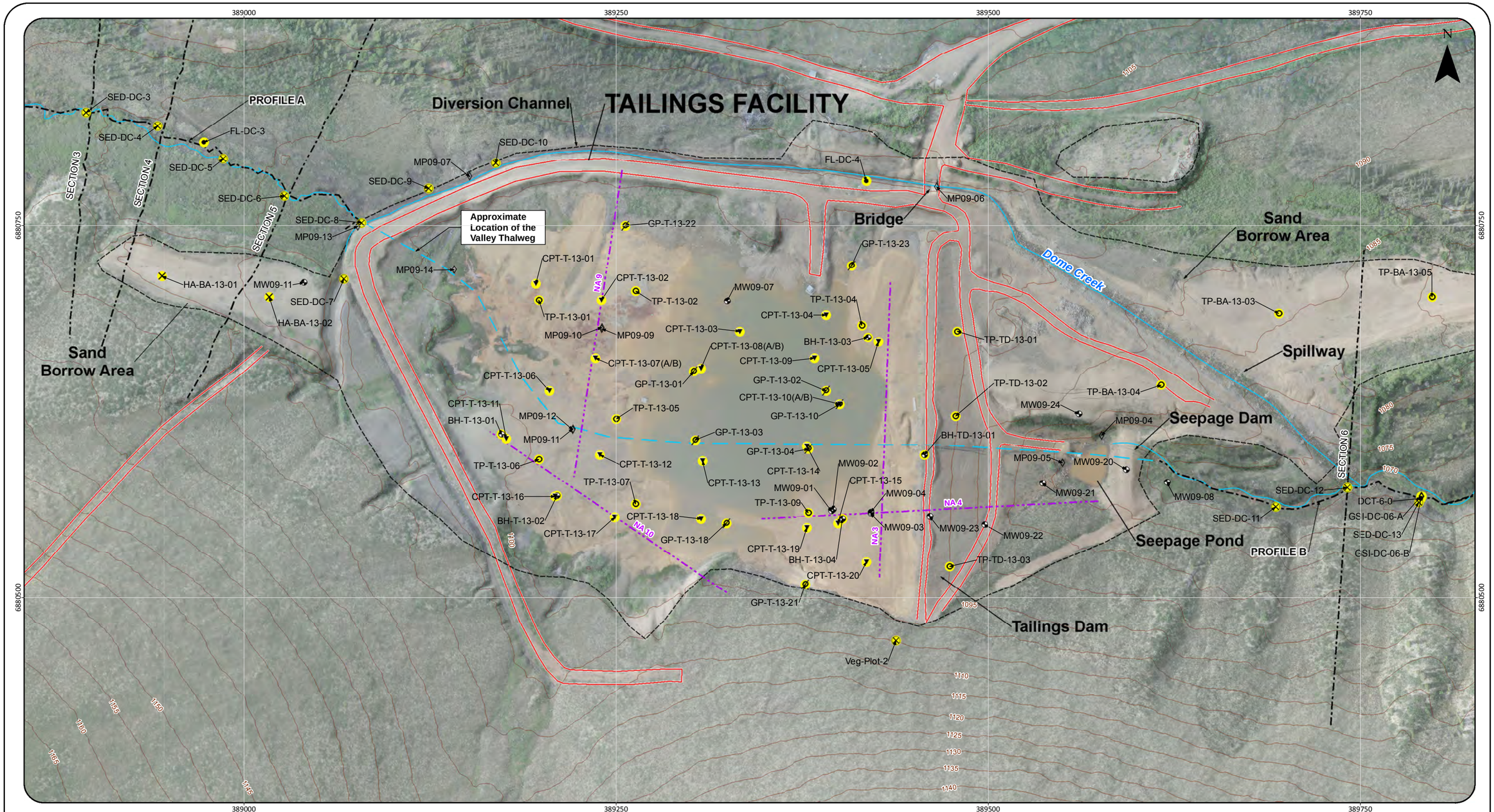

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- Geoprobe
- Grab Sample
- Hand Auger
- Mini Piezometer
- Temperature or Flow Measurement
- Test Pit
- 2013 Locations
- OIC
- Geophysics Lines
- Surveyed Sections
- Contour (5 m)
- Disturbed Area
- Roads
- Streams
- Waste Pile Area

Associated Engineering | amec | Yukon Energy, Mines and Resources, Assessment and Abandoned Mines

MOUNT NANSEN REMEDIATION PROJECT
Figure 5

SITE INVESTIGATION COMPLETION MEMO

2013 SITE INVESTIGATION
TAILINGS FACILITY DETAIL

Scale 1:2,500
Metres
0 50 100

March 10, 2014

S:\PROJECTS\VM00605 - Mount Nansen\GIS\Mapping\VM00605_0014e_11x17_2013SiteInvestigationPlan_TSFDetail.mxd

TABLES

Table 1A Work Plan for Drilling – details of actual work completed included in Table 2

ID	Planned												Status
	Type	Location	Planned E (UTM)	Planned N (UTM)	Location Comments	Responsible Discipline	Purpose	Target Depth	Expected depth	Sampling / in-situ testing	Observations Required	Installations	
BH-T-13-01	Sonic drill hole	Tailings	389,241	6,880,654	Locations selected to target areas of thickest tailings (see tailings isopach map) and underlying thalweg and should be located along this orientation as close as safely possible to the pond.	Geotech	- characterize tailings, particularly gradation, moisture content, density, location of water table and permafrost if any (not expected within tailings) - characterize insitu material particularly type, moisture content, presence of permafrost - obtain geochemical samples of insitu material to assess how much material requires excavation - establish depth to permafrost or bedrock (whichever is shallowest) to assess effect of thawing and freeze back and to support hydrogeologic understanding. - allow correlation to CPT measurements	permafrost or bedrock + 5 m (shallowest)	15 to 25 m (based on tailings thickness 5 m to 15 m + permafrost several meters below tailings)	-SPT at 1.5 m interval in upper 10 m (whether tailings or in-situ) then at 3 m intervals. Can modify based on consistency. If insitu materials are gravelly and SPT not meaningful, can discontinue unless stratigraphy changes. - continuous sonic samples - geochemical sampling in insitu (frozen and unfrozen) -approximately 5 field moisture contents per location in tailings (or every 2 m whichever is less), ensure moisture content sample gathered above water table and below water table. - moisture content in insitu materials in each material unit, especially in any silt or finer grained material and minimum 2 m intervals.	- photograph of samples - soil description per logging conventions - water levels - permafrost description per logging conventions - temperature measurement (not necessary when clearly unfrozen) - observations and comments about drill rig trafficability - general drilling conditions - response of tailings deposit to drilling	Standpipe within tailings deposit (below water table, about mid thickness)	Completed 4 boreholes with some modification - SPTs not completed, relied on CPT tip resistance. - Standpipe piezometer not installed in BH-T-13-01 due to drilling conditions.
BH-T-13-02	Sonic drill hole	Tailings	389,247	6,880,604		Geotech							
BH-T-13-03	Sonic drill hole	Tailings	389,432	6,880,588	Locations selected to target areas of relatively thick tailings (see tailings isopach map) and to assess talik in insitu material . Can be field fit for access or safety.	Geotech							
BH-T-13-04	Sonic drill hole	Tailings	389,427	6,880,539		Geotech							

ID	Planned												Status
	Type	Location	Planned E (UTM)	Planned N (UTM)	Location Comments	Responsible Discipline	Purpose	Target Depth	Expected depth	Sampling / in-situ testing	Observations Required	Installations	
BH-TD-13-01	Sonic drill hole	Tailings Dam	389,461	6,880,599	Location targeted highest dam section. Can be field fit for access / safety while maintaining intent of location.	Geotech	- geochemical characterization of the dam fill (sand) and underlying insitu materials - geotechnical characterization of dam fill and underlying insitu materials - establish depth of material to be removed during remediation	permafrost or bedrock + 5 m (shallowest)	30 m (based on dam height of 20 m + permafrost several meters below tailings)	- SPTs not required - continuous sonic samples - geochemical sub samples - on site moisture content of insitu materials	- photograph of samples - soil description per logging conventions - permafrost description per logging conventions - water levels - general drilling conditions	None	Completed
BH-WA-13-01	Odex / Sonic drill hole	Waste Rock Area	388,816	6,881,563	Location targeted in thickest waste rock area. Can be field fit several meters for access/safety	Geotech	- geochemical characterization of the waste rock - geotechnical characterization of the waste rock, particularly gradation - geotechnical characterization of the underlying foundation -assess location of water table (if any) and permafrost depth	Bedrock + 2 m	11 m (7 m waste rock thickness + 2 m overburden + 2 m into bedrock)	- continuous sonic sampling if possible otherwise Odex cuttings. - geochemical subsamples at 1 m intervals in waste material.	- photograph of samples - soil description including amount of oversize per logging convention - permafrost description - water levels - general drilling conditions.	If water is encountered during drilling, standpipe should be installed below water table. It isn't expected that groundwater will be encountered so no expecting an installation.	Completed, no groundwater encountered so no standpipe installed.
BH-M-13-01	Sonic drill hole	Mill Site	388,026	6,880,954	Location is approximate. Can be field fit for access, safety or in consideration of visual observation of conditions and materials	Site Charac.	Delineation (depth) of hazardous materials from landfill and waste rock/tailings to depth (directly adjacent to landfill)	To where field screening indicates no contamination exits (at least below the road material) or to 1.5 m below gw	10 m	PCOCs are hydrocarbons, landfill parameters and leachable metals. Photo-ionization detector screening to be done every 0.5 m and soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	N/A	Completed 8 boreholes at the mill

ID	Planned												Status
	Type	Location	Planned E (UTM)	Planned N (UTM)	Location Comments	Responsible Discipline	Purpose	Target Depth	Expected depth	Sampling / in-situ testing	Observations Required	Installations	
BH-M-13-02	Sonic drill hole	Mill Site	388,041	6,880,943		Site Charac.	Delineation (to the south) of hazardous materials from landfill and waste rock/tailings to depth Characterization of materials to determine if tailings or waste rock was used in the construction of the area	To where field screening indicates no contaminatio n exits (at least below the road material) or to 1.5 m below gw	10 m	PCOCs are geochemicals, metals and hydrocarbons. Photo-ionization detector screening to be done every 0.5 m and soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	N/A	
BH-M-13-03	Sonic drill hole	Mill Site	387,986	6,881,001	Location is approximate based on historic spill records. Can be field fit based on access, safety or visual observation of contamination	Site Charac.	Characterization of materials which may have been contaminated by 2 historical fuel spills Characterization of materials to determine if tailings or waste rock was used in the construction of the area Characterize if contaminants form waste oil barrel storage exists at this location		4 m		Soil stratigraphy and depth to groundwater (if reached).	N/A	
BH-M-13-04	Sonic drill hole		387,973	6,881,072	Location is approximate based on historic spill records. Can be field fit based on access, safety or visual observation of contamination	Site Charac.	Characterization of materials which may have been contaminated by 2 historical fuel spills Characterization of spills near transformer storage area Characterization of materials to determine if tailings or waste rock was used in the construction of the area		4 m		Soil stratigraphy and depth to groundwater (if reached).	N/A	
BH-M-13-05	Sonic drill hole	Mill Site	387,957	6,881,018		Site Charac.	Characterization of materials which may have been contaminated by 2 historical fuel spills Characterization of spills near transformer storage area Characterization of materials to determine if tailings or waste rock was used in the construction of the area	To where field screening indicates no contaminatio n exits (at least below the road material) or to 1.5 m below gw	3 m	PCOCs are geochemicals, cyanide, metals and hydrocarbons. Photo-ionization detector screening to be done every 0.5 m and soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	N/A	

ID	Planned												Status
	Type	Location	Planned E (UTM)	Planned N (UTM)	Location Comments	Responsible Discipline	Purpose	Target Depth	Expected depth	Sampling / in-situ testing	Observations Required	Installations	
BH-M-13-06	Sonic drill hole	Mill Site	387,943	6,881,038	Location is approximate based on historic spill records. Can be field fit based on access, safety or visual observation of contamination	Site Charac.	Characterization of materials which may have been contaminated by 2 historical fuel spillsConfirm waste oil soil contamination from drum storage has not extended to this locationConfirm if contamination from the AST is at this locationCharacterization of materials to determine if tailings or waste rock was used in the construction of the area	To where field screening indicates no contaminatio n exits (at least below the road material) or to 1.5 m below gw	3 m	to be confirmed as drilling approaches	Soil stratigraphy and depth to groundwater (if reached).	N/A	
BH-M-13-07	Sonic drill hole	Mill Site	387,903	6,881,073		Site Charac.	Characterization of materials which may have been contaminated by 2 historical fuel spills Confirm contamination in stained soil in front of generator building Determine if contamination from fuel storage and spills in the generator building have extended to this location Characterization of materials to determine if tailings or waste rock was used in the construction of the area	To where field screening indicates no contaminatio n exits (at least below the road material) or to 1.5 m below gw	3 m	PCOCs are geochemicals, metals, antifreeze parameters and hydrocarbons. Photo-ionization detector screening to be done every 0.5 m and soil sampling to be done above, at and below potentially contaminated materials. Additionally, cyanide and metals.	Soil stratigraphy and depth to groundwater (if reached).	N/A	
BH-M-13-08	Sonic drill hole	Mill Site	387,859	6,881,087	Location is approximate based on historic spill records. Can be field fit based on access, safety or visual observation of contamination	Site Charac.	Characterization of materials which may have been contaminated by 2 historical fuel spills Determine if contamination from spills in the mill building have extended to this location Characterization of materials to determine if tailings or waste rock was used in the construction of the area	To where field screening indicates no contaminatio n exits (at least below the road material) or to 1.5 m below gw	3 m	PCOCs are geochemicals, metals and hydrocarbons. Photo-ionization detector screening to be done every 0.5 m and soil sampling to be done above, at and below potentially contaminated materials. Additionally, cyanide and metals.	Soil stratigraphy and depth to groundwater (if reached).	N/A	

ID	Planned												Status
	Type	Location	Planned E (UTM)	Planned N (UTM)	Location Comments	Responsible Discipline	Purpose	Target Depth	Expected depth	Sampling / in-situ testing	Observations Required	Installations	
BH-KZ-13-01	Sonic drill hole	Former Ketza shop	388,676	6,881,732	Location is approximate based on historic spill records. Can be field fit based on access, safety or visual observation of contamination	Site Charac.	Delineate hydrocarbon contamination from spills (depth of spill beneath former AST)	Beneath area of hydrocarbon contamination	4 m	PCOCs are hydrocarbons and their associated metals. Photo-ionization detector screening to be done every 0.5 m and soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy	N/A	Completed 2 boreholes at the Ketza shop.
BH-KZ-13-02	Sonic drill hole	Former Ketza shop	388,687	6,881,742		Site Charac.	Delineate hydrocarbon contamination from spills (depth of spill beneath former Ketza Shop)	Beneath area of hydrocarbon contamination	3 m		Soil stratigraphy	N/A	
CH-P-13-01	Core drill hole	South of pit	388,641	6,881,128	location can be modified for access / safety	Hydrogeo	- characterize bedrock rock mass;- characterize fractures;- assess groundwater pathways by packer testing (K);- allow geophysical logging on open core holes;- install groundwater monitor wells for groundwater quality.- characterize the overburden soils including presence of permafrost	through permafrost	50	- continuous coringshort core runs at low RPM to reduce heat energy imparted to cores;- packer testing at 5 m intervals (single packer, on the way down) follow AMEC procedures and SOP;- geophysical e-logs: (1) temperature (2) acoustic televiewer (3) heat pulse flow meter;-	- rock core logging, using AMEC work method, including: RQD, SCR and permafrost; - basic overburden description (especially type, presence of permafrost);- permafrost logging (US Army Corp manual);- rock logging, RQD,	- core holes to fully topped up with drill water on completion and safety cover place over open core hole;- nominal casing from 0.5 m AGL socketed into bedrock surface, to protect collar and case off overburden;- geophysics will	Completed drilling at 6 locations and added paired shallow holes at the four locations outside the pit. Geophysics not completed in favour of instrumentation installation and in consideration of ground conditions. CMT wells
CH-P-13-02	Core drill hole	South of pit	388,928	6,881,014		Hydrogeo		through permafrost	50				
CH-P-13-03	Core drill hole	South of pit	389,185	6,881,002	Location will be modified to provide better access	Hydrogeo		through permafrost	50				
CH-P-13-04	Core drill hole	North east of pit	389,016	6,881,699	location can be modified for access/safety	Hydrogeo		through permafrost	50				
CH-P-13-05	Core drill hole	Pit bottom	388,958	6,881,481	location can be modified for safety / access in same	Hydrogeo		below open pit pond invert.	50				

ID	Planned												Status
	Type	Location	Planned E (UTM)	Planned N (UTM)	Location Comments	Responsible Discipline	Purpose	Target Depth	Expected depth	Sampling / in-situ testing	Observations Required	Installations	
					general area - note once safety measures in place hole location should not be changed.					water quality sampling to follow.	SCR- fracture characterization;- core hole conditions from Driller (e.g., caving, lost circulation, etc.);- photo log cores in boxes c/w labels showing: run number, top and bottom depths, 'Sharpie' way up arrows across all solid core and fractures, use colour reference chart and wet core (use spray bottle).	follow ~7 days after each core hole completion for follow-on geophysics.- following geophysics groundwater monitoring wells will be manually installed (i.e. without drill rig)	substituted with vibrating wire piezometers and monitoring wells. No deep installation in CH-P-13-01 because of high artesian pressures.
CH-P-13-06	Core drill hole	Pit bottom - inclined	388,962	6,881,471		Hydrogeo		span across Hanging Wall Fault.	50				
CPT-T-13-01	CPT	Tailings	389,198	6,880,711	Locations selected to provide a general grid of CPTs. Can be field fit based on pond and access constraints.4 locations should be paired with the Sonic hole locationsAnticipated that about half will require use of the barge.	Geotech	-CPTu measurements of tailings and insitu soils until refusal (sleeve friction, tip resistance and pore pressure). This will allow measurement of dynamic pore pressure, correlations to strength, material type and other properties.-Dissipation tests to measure static water level and estimate hydraulic conductivity.	refusal	7 to 20 m based on tailings thickness + permafrost several meters below tailings	-dissipation tests near surface and near bottom of tailings (to assess potential for downward seepage gradient)	- rig trafficability- general CPT conditions- response of tailings deposit to work, traffic, etc.	None	Completed 20 CPTs and 11 dissipations (note an additional 15 dissipations were attempted but either the pore pressure was already below hydrostatic or sufficient pore pressure dissipation was not achieved during the test)
CPT-T-13-02	CPT	Tailings	389,244	6,880,699		Geotech							
CPT-T-13-03	CPT	Tailings	389,306	6,880,692		Geotech							
CPT-T-13-04	CPT	Tailings	389,370	6,880,687		Geotech							
CPT-T-13-05	CPT	Tailings	389,437	6,880,681		Geotech							
CPT-T-13-06	CPT	Tailings	389,207	6,880,635		Geotech							
CPT-T-13-07	CPT	Tailings	389,243	6,880,655		Geotech							
CPT-T-13-08	CPT	Tailings	389,306	6,880,640		Geotech							
CPT-T-13-09	CPT	Tailings	389,372	6,880,637		Geotech							
CPT-T-13-10	CPT	Tailings	389,432	6,880,632		Geotech							
CPT-T-13-11	CPT	Tailings	389,196	6,880,592		Geotech							
CPT-T-13-12	CPT	Tailings	389,245	6,880,604		Geotech							
CPT-T-13-13	CPT	Tailings	389,305	6,880,598		Geotech							
CPT-T-13-14	CPT	Tailings	389,373	6,880,594		Geotech							
CPT-T-13-15	CPT	Tailings	389,433	6,880,588		Geotech							
CPT-T-13-16	CPT	Tailings	389,209	6,880,549		Geotech							
CPT-T-13-17	CPT	Tailings	389,251	6,880,560		Geotech							
CPT-T-13-18	CPT	Tailings	389,308	6,880,549		Geotech							
CPT-T-13-19	CPT	Tailings	389,376	6,880,547		Geotech							
CPT-T-13-20	CPT	Tailings	389,433	6,880,532		Geotech							
GP-T-13-01	geoprobe	Tailings	389,304	6,880,639	Locations selected to pair with CPT locations in the pond,	Geotech	Obtain samples to correlate CPT measurements	refusal likely on permafrost	15 to 20 m based on tailings	- continuous sample - subsamples for geochemistry if insitu	- soil description per logging conventions	None	Completed 9 GeoProbe holes. Individual holes

ID	Planned												Status
	Type	Location	Planned E (UTM)	Planned N (UTM)	Location Comments	Responsible Discipline	Purpose	Target Depth	Expected depth	Sampling / in-situ testing	Observations Required	Installations	
GP-T-13-02	geoprobe	Tailings	389,371	6,880,637	particularly in areas with thickest tailings. Can be field fit to maintain this intent	Geotech			thickness + permafrost several meters below tailings	material encountered - sub samples for onsite moisture content	- permafrost description per logging conventions photograph of samples - water levels - observations of drill rig trafficability - general drilling conditions - response of tailings deposit to drilling		depth less than expected, due to thin tailings thickness and refusal in insitu soils. Five additional holes were included (to result in a total of 9) added to provide information in areas where excavator could not traffic.
GP-T-13-03	geoprobe	Tailings	389,304	6,880,597		Geotech							
GP-T-13-04	geoprobe	Tailings	389,373	6,880,593		Geotech							

Table 1B Work Plan for Test Pits

ID	Type	Location	E (UTM)	N (UTM)	Location comments	Responsible Discipline	Purpose	Target Depth	Expected Depth	Sampling / in-situ testing	Observations Required	Install	Status
TP-BA-13-01	Test Pit	Sand Borrow Area	388,942	6,880,721	Coordinates are approximate. Locations can be changed in the field as required for access, safety or to a more representative location within the general area.	Geotech	- geotechnical characterization of sand borrow material - obtain bulk samples for testing if required during design - obtain geochemical samples to confirm suitability for use in reclamation	reach of excavator	6 m	- photograph of test pit - samples at 0.5 to 1 m intervals as appropriate for geotechnical index testing - samples at 1 m intervals for geochemical testing - 1 bulk sample (5 gallon pail) approximately every other test pit as appropriate or combined from adjacent test pits to provide representative sample.	- geotechnical characterization of materials per logging conventions. - observations test pit wall stability - observations of seepage if any -observations of permafrost, if any	None	Completed as 2 hand augers due to access restrictions for excavator.
TP-BA-13-02	Test Pit	Sand Borrow Area	389,019	6,880,703		Geotech							
TP-BA-13-03	Test Pit	Sand Borrow Area	389,620	6,880,636		Geotech							Completed 3 test pits.
TP-BA-13-04	Test Pit	Sand Borrow Area	389,701	6,880,687		Geotech							
TP-BA-13-05	Test Pit	Sand Borrow Area	389,773	6,880,701		Geotech							
TP-BA-13-06	Test Pit	Gravel / Rock Borrow Area	389,696	6,881,016	Coordinates are intended to provide general area. Within the area, test pit locations and number should be field fit based on conditions. Intent it to find source of good, strong rock.	Geotech	- geotechnical characterization of "shale" borrow source, potential source of gravel or rip rap - assess ripability - obtain samples for geochemical testing to confirm suitability for use in reclamation (if required)	refusal / reach of excavator	2 m	- photograph of test pit - samples for geochemical testing - samples for durability testing as appropriate based on conditions	- geotechnical / geological characterization / classification of material - indication of ease of excavation	None	Completed 3 test pits
TP-BA-13-07	Test Pit	Gravel / Rock Borrow Area	389,735	6,881,040		Geotech							
TP-BA-13-08	Test Pit	Gravel / Rock Borrow Area	389,922	6,881,161		Geotech							
TP-KZ-13-01	Test Pit	Former Ketza Shop	388,703	6,881,766	Coordinates are approximate, location can be field fit for safety, access or in consideration of visual observation of contamination while maintaining the purpose of the location.	Site Charac.	- Delineation (to the north) of hydrocarbon spills (from within the shop, to the west of the shop and to the south of the shop)	To where field screening indicates no contamination exits (at least below 2 m) or to 1.5 m below gw	3 m	- PCOCs are geochemicals, hydrocarbons and their associated metals. - Photo-ionization detector screening to be done every 0.5 m - Soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	None	Completed 3 test pits.
TP-KZ-13-02	Test Pit	Former Ketza Shop	388,694	6,881,717		Site Charac.	- Delineation (to the west) of hydrocarbon spills (from within the shop, to the west of the shop and to the south of the shop)		3 m			None	
TP-KZ-13-03	Test Pit	Former Ketza Shop	388,660	6,881,742		Site Charac.	- Delineation (to the southwest) of hydrocarbon spills (from within the shop, to the west of the shop and to the south of the shop)		3 m			None	

ID	Type	Location	E (UTM)	N (UTM)	Location comments	Responsible Discipline	Purpose	Target Depth	Expected Depth	Sampling / in-situ testing	Observations Required	Install	Status
TP-M-13-01	Test Pit	Mill Site	388,029	6,880,995	Coordinates are based on reported spill locations. Locations can be modified for safety or access or based on visual indications of contamination	Site Charac.	-Characterization of materials which may have been contaminated by 2 historical fuel spills -Characterization of materials to determine if tailings or waste rock was used in the construction of the area	To where field screening indicates no contamination exits (at least below 2 m) or to 1.5 m below gw	3 m	- PCOCs are geochemicals, hydrocarbons and their associated metals. - Photo-ionization detector screening to be done every 0.5 m - Soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	None	Completed 5 test pits.
TP-M-13-02	Test Pit	Mill Site	388,004	6,881,054		Site Charac.	- Characterization of materials which may have been contaminated by 2 historical fuel spills - Characterization of spills near transformer storage area - Characterization of materials to determine if tailings or waste rock was used in the construction of the area		3 m	- PCOCs are geochemicals, cyanide, metals and hydrocarbons. - Photo-ionization detector screening to be done every 0.5 m - soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	None	
TP-M-13-03	Test Pit	Mill Site	387,943	6,881,120	Coordinates are based on reported spill locations. Locations can be modified for safety or access or based on visual indications of contamination	Site Charac.	- Characterization of materials which may have been contaminated by 2 historical fuel spills- Characterization of spills near transformer storage area- Characterization of materials to determine if tailings or waste rock was used in the construction of the area	To where field screening indicates no contamination exits (at least below 2 m) or to 1.5 m below gw	3 m	- PCOCs are geochemicals, cyanide, metals and hydrocarbons.- Photo-ionization detector screening to be done every 0.5 m- soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	None	
TP-M-13-04	Test Pit	Mill Site	388,014	6,881,083		Site Charac.	- Characterization of materials which may have been contaminated by 2 historical fuel spills - Characterization of spills near transformer storage area - Characterization of materials to determine if tailings or waste rock was used in the construction of the area		3 m		Soil stratigraphy and depth to groundwater (if reached).	None	

ID	Type	Location	E (UTM)	N (UTM)	Location comments	Responsible Discipline	Purpose	Target Depth	Expected Depth	Sampling / in-situ testing	Observations Required	Install	Status
TP-M-13-05	Test Pit	Mill Site	387,812	6,881,027		Site Charac.	- Delineation (vertical) of hydrocarbon contamination from a spill		3 m	- PCOCs are geochemicals, hydrocarbons (with their associated metals). - Photo-ionization detector screening to be done every 0.5 m - Soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	None	
TP-R-13-01	Test Pit	Road	387,876	6,880,970	Coordinates are approximate. Locations can be changed in the field for safety / access or based on visual observations of contamination	Site Charac.	- Characterization of materials to determine if hydrocarbons were used on the road - Characterization of materials to determine if tailings or waste rock was used in the construction of the area	2 m or, if hydrocarbon contamination is indicated, to beneath area of contamination.	2 m	- PCOCs are geochemicals, hydrocarbons and their associated metals. - Photo-ionization detector screening to be done every 0.5 m - Soil sampling to be done above, at and below potentially contaminated materials.	Soil stratigraphy and depth to groundwater (if reached).	None	Completed 5 test pits
TP-R-13-02	Test Pit	Road	387,714	6,881,151		Site Charac.			2 m			None	
TP-R-13-03	Test Pit	Road	387,794	6,881,334		Site Charac.			2 m			None	
TP-R-13-04	Test Pit	Road	389,161	6,881,108		Site Charac.			2 m			None	
TP-R-13-05	Test Pit	Road	389,683	6,880,956		Site Charac.			2 m			None	
TP-SP-13-01	Hand Auger	Historic tailings in Dome Creek	388,228	6,880,990	Locations are approximate. Actual locations and final number of auger locations will be determined from field reconnaissance.	Site Charac.	- Characterization of historical tailings, mainly to understand type, saturation and methods of relocation. - Obtain samples for geochemical characterization of the tailings and underlying insitu materials	Extent of hand auger	2 m	- samples for potential geotechnical index testing and geochemical testing within each stratigraphic unit or at 0.5 m intervals (whichever is more frequent)	- photograph of location and general area - description of tailings and underlying insitu material per conventions, particularly moisture (saturated or not), type (coarse or fine) and consistency	None	Not completed at planned locations due to excavator access restrictions. Historic tailings area was visually assessed but hand augers not advanced to avoid damaging the liner. Four new locations labelled "TP-SP-03 through -06" were sampled as grab samples at the former explosives area.
TP-SP-13-02	Hand Auger		388,101	6,881,007		Site Charac.			2 m			None	
TP-T-13-01	Test Pit	Tailings	389,198	6,880,696	Co-ordinates are approximate. Intent is that locations will be field fit with a focus on excavating test pits as close as safely possible to	Geotech	- characterize tailings, particularly response to excavation, seepage, etc.- obtain bulk samples for characterization and lab testing- characterize insitu material if encountered- observe groundwater and permafrost conditions	reach of excavator	6 m	- photograph of test pit- video of behaviour if warranted- samples at 1 m intervals as appropriate for index testing or at each change in stratigraphy (whichever is more frequent)- 1 bulk sample (5 gallon pail) of tailings approximately every other hole or combined from	- description of behaviour during and after excavation- geotechnical characterization of tailings and insitu soil per logging conventions-	None	Completed 7 test pits (TP-T-13-03 and 08 were not completed due to unsafe access). Locations field fit based on pond extent, trafficability and coverage. Some
TP-T-13-02	Test Pit	Tailings	389,290	6,880,695		Geotech							
TP-T-13-03	Test Pit	Tailings	389,354	6,880,690		Geotech							
TP-T-13-04	Test Pit	Tailings	389,422	6,880,684		Geotech							

ID	Type	Location	E (UTM)	N (UTM)	Location comments	Responsible Discipline	Purpose	Target Depth	Expected Depth	Sampling / in-situ testing	Observations Required	Install	Status
TP-T-13-05	Test Pit	Tailings	389,266	6,880,639	the tailings pond, in areas of thick tailings. Additional test pits should also be excavated to provide representative coverage in tailings area.	Geotech				adjacent test pits to provide representative material.- if insitu material is encountered, obtain sample suitable for geochemical testing at 0.5 m intervals.	description of trafficability and tailings response to work- observations of seepage, water table, any permafrost etc.		additional geoprobe holes were advance to provide additional coverage in very soft areas.
TP-T-13-06	Test Pit	Tailings	389,229	6,880,609		Geotech							
TP-T-13-07	Test Pit	Tailings	389,267	6,880,559		Geotech							
TP-T-13-08	Test Pit	Tailings	389,323	6,880,551		Geotech							
TP-T-13-09	Test Pit	Tailings	389,392	6,880,547		Geotech							
TP-TD-13-01	Test Pit	Tailings Dam	389,474	6,880,685	Co-ordinates have been selected to provide representative coverage. Locations can be field fit for access, safety or to a more representative location based on conditions encountered.	Geotech	- obtain samples for geochemical characterization of dam fill to assess suitability for reclamation work or need to relocate to open pit.	reach of excavator	6 m	- photograph of test pit - Samples for geochemical testing at 1 m interval and at any change in stratigraphy. Need samples above and below water table	- geotechnical characterization of materials per logging conventions. - observations test pit wall stability - observations of seepage if any -observations of permafrost, if any and measurement of temperature	None	Completed 3 test pits
TP-TD-13-02	Test Pit	Tailings Dam	389,479	6,880,633		Geotech							
TP-TD-13-03	Test Pit	Tailings Dam	389,472	6,880,526		Geotech							
TP-WA-13-01	Test Pit	Waste Area	388,778	6,881,702	Locations have been targeted based on previous geochemical sampling to fill in gaps in data. Locations can be moved several meters to facilitate access, for safety etc.	Geotech	- geotechnical characterization of materials, particularly amount of oversize material obtain bulk samples for geotechnical testing if required during design - obtain samples for geochemical testing to assess how much NAG and PAG is present - assess permafrost state - confirm water level below insitu ground - confirm foundation conditions if insitu material encountered.	reach of excavator	6 m	- photograph of test pit - samples at 0.5 to 1 m intervals as appropriate for geotechnical index testing - samples at 1 m intervals for geochemical testing - 1 bulk sample (5 gallon pail) every other test pit or combined with adjacent test pits to provide representative sample.	- geotechnical characterization of materials per logging conventions. - observations test pit wall stability - observations of seepage if any -observations of permafrost, if any and measurement of temperature.	None	Completed 11 test pits
TP-WA-13-02	Test Pit	Waste Area	388,961	6,881,672		Geotech							
TP-WA-13-03	Test Pit	Waste Area	388,983	6,881,642		Geotech							
TP-WA-13-04	Test Pit	Waste Area	388,802	6,881,595		Geotech							
TP-WA-13-05	Test Pit	Waste Area	388,705	6,881,485		Geotech							
TP-WA-13-06	Test Pit	Waste Area	388,703	6,881,446		Geotech							
TP-WA-13-07	Test Pit	Waste Area	388,777	6,881,408		Geotech							
TP-WA-13-08	Test Pit	Waste Area	388,922	6,881,352		Geotech							
TP-WA-13-09	Test Pit	Waste Area	388,807	6,881,320		Geotech							
TP-WA-13-10	Test Pit	Waste Area	388,996	6,881,276		Geotech							

ID	Type	Location	E (UTM)	N (UTM)	Location comments	Responsible Discipline	Purpose	Target Depth	Expected Depth	Sampling / in-situ testing	Observations Required	Install	Status
TP-WA-13-11	Test Pit	Waste Area	388,994	6,881,200		Geotech							

Table 1C Installations and Reconnaissances Work Plan

Task	Location	Responsible Discipline	Purpose	Observations / Sampling / Testing Required	Status
Tailings Trafficability and Excavation Assessment	Tailings Impoundment	Geotech	- qualitatively assess tailings trafficability and response to excavation	- drive equipment up and down tailings beach in same tracks, record number of passes that can be safety made, distance to pond that can be safely achieved, changes in tailings response with increasing number of equipment passes, observations of rutting, water upwelling etc. - observations of behaviour of excavated slope (e.g. in test pits), sloughing behaviour, amount of time excavation will stand, seepage etc. - video as appropriate, photos etc. - written record of observations	Completed
Read geotechnical instrumentation	Tailings Impoundment	Geotech	- measure conditions during investigation program for calibration of drill observations and understanding of historic measurements	- water levels - thermistor readings	Completed, results provided in data report
General site reconnaissance	Site Wide	Geotech	- observe general conditions of disturbed areas to support general site characterization. - observe conditions around open pit to assess constraints on backfill configuration and potential stability concerns - observe conditions at mill, old landfill, and in historic tailings deposition in Dome Creek area - observe conditions at seepage collection pond and tailings pond in consideration of relocation efforts and methods	- photographs with written log and observations - if warranted obtain grab samples in areas of interest (e.g. seepage collection pond, historic tailings area etc.)	Completed
Reconnaissance, flow measurement and sediment sampling - Dome Creek	Dome Creek	Hydrology	- characterization of the watershed and channel of Dome creek to support hydrological modeling - characterization of undisturbed portions of the Dome channel upstream and downstream of the tailings area to support design of reclaimed Dome Creek - Obtain sediment samples for particle size distribution analysis - Obtain sediment geochemical data for water quality model	- photographs and written observations - flow measurement along the creek - sediment samples collected at 50 m intervals (total of 20) - mark locations for channel survey to be completed by YES	Completed flow measured at 5 sites in Dome Creek
Reconnaissance and flow measurement - Pony Creek	Pony Creek	Hydrology	- baseline data for creek restoration design. - characterization of the watershed and channel to support hydrological modeling	- photographs and written observations - flow measurement along the creek	Completed flow measured at 2 sites in Pony Creek
General reconnaissance and grab samples	Mill Site in particular and site wide as needed	Geochemical / site characterization	- observations to delineate old landfill- observation of historic tailings deposition areas in Dome Creek to assess extent of material likely requiring removal- observation of waste rock used for fill material, particularly looking for signs of ARD or other issues- observation of signs of contaminated material (e.g. from spills etc.)	- photographs and written record of observations with GPS locations of key features- grab samples as appropriate in areas of concern.	Completed
Hazardous material inventory	Mill site	Site Characterization	- confirm hazardous material inventory on site and amount and nature of sampling required to characterize and quantify hazardous materials.	- photographs - written record of observations and inventory	Completed

Task	Location	Responsible Discipline	Purpose	Observations / Sampling / Testing Required	Status
Water quality sampling of pit pond	Open Pit water quality profile	water quality	- obtain vertical profiles of water quality in open pit to support water quality model	- water quality sampling per protocols	Completed
Water quality sampling of tailings pond	Tailings Area	water quality	- obtain vertical profile of water quality in tailings pond as representative of tailings pore water chemistry to support water quality model	- water quality sampling per protocols	Not deemed necessary, existing information sufficient
Groundwater sampling of existing wells	Site Wide	water quality	- obtain groundwater quality samples in support of water quality model	- water quality sampling per protocols	Completed some wells, dry, frozen or destroyed, see Table 3 or successful sampling locations
Water quality sample from seeps and adits	Seeps/Adits (near mill site)	water quality	- obtain water quality samples in support of water quality model	- water quality sampling per protocols	Completed, results provided in data report
Clear walkway access to creek mini-piezometer sites (~10)	Creeks	Hydrogeo	- provide access for mini piezometer installations (hand clearing of brush and willows)		Completed
Install shallow and deep mini-piezometers (pair), creek bed manometer testing, creek bed seepage meter testing, creek bed temperature survey.	Dome Ck (10 stations), Pony Ck (5 stations), temperature survey every 50 to 100 m.	Hydrogeo	- allow measurement groundwater surface water interaction in support of hydrogeology and water quality model	- install mini piezometers at 50 to 100 m intervals along creek per protocols - log of observed conditions and installation details - photograph of each installation - GPS coordinates of each location - installation of location marker (stake with flagging)	Completed 9 installations, one site (GSI-DC-04) abandoned due to refusal
Install single mini-piezometers (up to 5) at Huestis Adit opening.	Huestis Adit opening approximated from aerial photo, upper Dome Ck.	Hydrogeo	- allow measurement of water levels and sampling of groundwater in area of Huestis adit in support of water quality model	- install mini piezometer per protocols - log of observed conditions and installation details - photograph of each installation - GPS coordinates of each location - installation of location marker (stake with flagging)	Completed, locations finalized through geophysics
Groundwater sampling - Dome Creek mini-piezometers (10)	Dome Creek	water quality	- obtain groundwater quality samples in support of water quality model	- collect groundwater samples per protocols	Completed, some locations had low flow / were frozen and could not be sampled (see Table 3 for sampled locations)
Groundwater sampling - Pony Creek mini-piezometers (5)	Pony Creek	water quality	- obtain groundwater quality samples in support of water quality model	- collect groundwater samples per protocols	Completed, some locations had low flow / were frozen and could not be sampled (see Table 3 for sampled locations)
3 e-logs: temperature, acoustic televiewer and heat pulse flow meter.	Open pit, north of pit and south of pit.	Hydrogeo (done by Worley Parsons)	- characterize rock mass and groundwater flow regime around open pit in support of developing a groundwater glow model	- complete surveys listed	Not completed in favour of permanent instrumentation installations and

Task	Location	Responsible Discipline	Purpose	Observations / Sampling / Testing Required	Status
Geophysics first day help setup, open pit safety person.	Open pit, north of pit and south of pit.	Hydrogeo			because of concerns about the ability to complete the geophysics given the fractured rock conditions encountered.
Install monitor wells, c/w pre-packed well screens, one-strand heat tracing, plus pneumatic piezometers (2 per core hole).	6 core holes, including: open pit (2), north pit (1) and south pit (4).	Hydrogeo	- piezometric elevations; - in-well hydraulic conductivity testing - water quality.	- install wells per protocols	Replaced with conventional shallow wells (paired deep and shallow holes)
Initial TAR 5 Reconnaissance for Landform and revegetation	Site wide	Landform / Reveg	- complete initial high level reconnaissance of natural topography, landforms and vegetation and assess conditions of disturbed areas	- photographs - written log of observations - sketches - grab samples of soil as required	Completed
Initial TAR 5 Reconnaissance for Initial reconnaissance for buildings and infrastructure	Site wide	Infrastructure	- complete high level reconnaissance to identify and confirm key infrastructure on site, assess requirements for additional surveys and develop concepts for demolition and on site storage of debris, recycling etc.	- photographs - written log of observations - preliminary inventory	Completed
TAR 6 hazmat sampling	Mill Area	Site Characterization	To come upon TAR approval		To come if required
TAR 6 building and infrastructure surveys and inventories	Site Wide	Infrastructure	To come upon TAR approval		Planned
TAR 6 reveg and landform surveys and observations	Site Wide	Landform / Reveg	To come upon TAR approval		TA5 work was somewhat augmented and likely sufficient for design.

Table 2 Fall 2013 Investigations Completed

Location ID	Type of Investigation [1]	Investigation Location (UTM Zone 8, NAD83)				Summary of Installations, Lab Tests and Insitu Tests			
		Area	Easting, UTM (m)	Northing, UTM (m)	Ground Elevation (masl)	Depth of Investigation	Installations [2,3]	Lab tests[3]	Insitu Tests[3,4]
BH-KZ-13-01	BH	Ketza Shop	388,683.4	6,881,754.8	1232.2	4.0		Environmental	Volatile organic compounds
BH-KZ-13-02	BH	Ketza Shop	388,687.4	6,881,741.8	1232.1	5.0		Environmental	Volatile organic compounds
BH-M-13-01	BH	Mill	388,026.0	6,880,954.0	1192.3	3.0		Environmental	Volatile organic compounds
BH-M-13-02	BH	Mill	388,055.4	6,880,939.0	1191.1	3.5		Environmental	Volatile organic compounds
BH-M-13-03	BH	Mill	387,990.2	6,881,007.1	1190.6	4.0	MW	Environmental	Volatile organic compounds
BH-M-13-04	BH	Mill	387,983.9	6,881,066.6	1184.4	4.5		Geochemistry Environmental	Volatile organic compounds
BH-M-13-05	BH	Mill	387,971.1	6,881,019.5	1191.3	5.5		Environmental	Volatile organic compounds
BH-M-13-06	BH	Mill	387,949.4	6,881,042.7	1191.5	4.5		Environmental	Volatile organic compounds
BH-M-13-07	BH	Mill	387,903.2	6,881,073.2	1192.5	3.0		Environmental	Volatile organic compounds
BH-M-13-08	BH	Mill	387,862.6	6,881,086.5	1194.4	4.0		Environmental	Volatile organic compounds
BH-T-13-01	BH	TSF-Tailings	389,173.0	6,880,610.0	1101.2	13.5		Geochemistry Geotechnical	
BH-T-13-02	BH	TSF-Tailings	389,210.1	6,880,568.4	1098.5	12.0	standpipe	Geochemistry Geotechnical	
BH-T-13-03	BH	TSF-Tailings	389,419.0	6,880,675.0	1096.8	16.5	standpipe	Geochemistry Geotechnical	
BH-T-13-04	BH	TSF-Tailings	389,402.0	6,880,553.0	1097.0	18.5	standpipe	Geochemistry Geotechnical	
BH-TD-13-01	BH	TSF-Dam	389,457.0	6,880,596.0	1099.5	25.0		Geochemistry Geotechnical	
BH-WA-13-01	BH	Waste Area	388,815.0	6,881,564.0	1227.9	12.5		Geotechnical	
CH-P-13-01/10	CH	Open Pit	388,656.6	6,881,119.2	1151.0	10.0	MW		
CH-P-13-01/40	CH	Open Pit	388,638.0	6,881,125.0	1150.9	40.0	No - Abandoned		
CH-P-13-02/10	CH	Open Pit	388,924.8	6,881,012.4	1145.9	10.0	MW		
CH-P-13-02/VWP	CH	Open Pit	388,923.9	6,881,013.0	1146.0	50.0	5 nested VWP		Packer, Falling Head
CH-P-13-03/10	CH	Open Pit	389,145.1	6,881,106.5	1184.0	10.0	MW		
CH-P-13-03/50	CH	Open Pit	389,144.5	6,881,108.0	1184.0	50.0	MW and single VWP		Packer, Falling Head
CH-P-13-04/10	CH	Open Pit	389,137.4	6,881,471.0	1225.5	10.0	MW		
CH-P-13-04/35	CH	Open Pit	389,138.5	6,881,470.5	1225.5	50.0	MW and single VWP		Packer, Falling Head
CH-P-13-05/50	CH	Open Pit	388,957.8	6,881,468.9	1185.0	50.0	MW and single VWP		Packer, Falling Head
CH-P-13-06/VWP	CH	Open Pit	388,958.8	6,881,469.2	1185.0	60.0	5 nested VWP		Packer, Falling Head
CPT-T-13-01	CPT	TSF-Tailings	389,196.0	6,880,711.0	1098.1	5.9			CPT
CPT-T-13-02	CPT	TSF-Tailings	389,240.0	6,880,700.0	1097.3	3.9			CPT
CPT-T-13-03	CPT	TSF-Tailings	389,333.0	6,880,679.0	1096.0	3.4			CPT
CPT-T-13-04	CPT	TSF-Tailings	389,391.0	6,880,690.0	1096.0	3.0			CPT
CPT-T-13-05	CPT	TSF-Tailings	389,426.0	6,880,672.0	1097.0	5.0			CPT
CPT-T-13-06	CPT	TSF-Tailings	389,205.0	6,880,639.0	1097.2	4.0			CPT
CPT-T-13-07A/B	CPT	TSF-Tailings	389,236.0	6,880,661.0	1096.6	4.2			CPT
CPT-T-13-08A/B	CPT	TSF-Tailings	389,307.0	6,880,654.0	1096.0	4.1			CPT
CPT-T-13-09	CPT	TSF-Tailings	389,383.0	6,880,661.0	1096.0	4.9			CPT
CPT-T-13-10A/B	CPT	TSF-Tailings	389,400.0	6,880,630.0	1096.0	8.7			CPT
CPT-T-13-11	CPT	TSF-Tailings	389,176.0	6,880,607.0	1101.1	0.5			CPT
CPT-T-13-12	CPT	TSF-Tailings	389,239.0	6,880,596.0	1097.2	4.3			CPT
CPT-T-13-13	CPT	TSF-Tailings	389,308.0	6,880,592.0	1096.0	8.2			CPT
CPT-T-13-14	CPT	TSF-Tailings	389,378.0	6,880,602.0	1096.0	9.7			CPT
CPT-T-13-15	CPT	TSF-Tailings	389,399.0	6,880,550.0	1097.0	5.2			CPT
CPT-T-13-16	CPT	TSF-Tailings	389,209.0	6,880,568.0	1098.6	4.7			CPT
CPT-T-13-17	CPT	TSF-Tailings	389,249.0	6,880,554.0	1097.3	3.4			CPT
CPT-T-13-18	CPT	TSF-Tailings	389,307.0	6,880,553.0	1096.1	6.6			CPT

Location ID	Type of Investigation [1]	Investigation Location (UTM Zone 8, NAD83)				Summary of Installations, Lab Tests and Insitu Tests			
		Area	Easting, UTM (m)	Northing, UTM (m)	Ground Elevation (masl)	Depth of Investigation	Installations [2,3]	Lab tests[3]	Insitu Tests[3,4]
CPT-T-13-19	CPT	TSF-Tailings	389,378.0	6,880,547.0	1096.7	7.7			CPT
CPT-T-13-20	CPT	TSF-Tailings	389,418.0	6,880,524.0	1099.7	6.2			CPT
DCT-10-0	Temp	Dome Cr	390,860.9	6,880,448.8	1030.5				Temperature, EC Readings
DCT-10-1	Temp	Dome Cr	390,957.1	6,880,447.9	1028.6				Temperature, EC Readings
DCT-10-2	Temp	Dome Cr	391,058.1	6,880,461.2	1026.8				Temperature, EC Readings
DCT-1-0	Temp	Dome Cr	387,675.7	6,881,123.3	1218.7				Temperature, EC Readings
DCT-1-1	Temp	Dome Cr	387,750.4	6,881,131.5	1210.4				Temperature, EC Readings
DCT-2-0	Temp	Dome Cr	387,839.5	6,881,128.5	1196.6				Temperature, EC Readings
DCT-2-1	Temp	Dome Cr	387,937.2	6,881,131.4	1189.1				Temperature, EC Readings
DCT-3-0	Temp	Dome Cr	388,096.9	6,881,051.1	1168.8				Temperature, EC Readings
DCT-4-0	Temp	Dome Cr	388,406.6	6,880,968.3	1143.2				Temperature, EC Readings
DCT-4-1	Temp	Dome Cr	388,461.5	6,880,923.1	1140.6				Temperature, EC Readings
DCT-5-0	Temp	Dome Cr	388,725.2	6,880,830.9	1119.6				Temperature, EC Readings
DCT-5-1	Temp	Dome Cr	388,816.5	6,880,790.9	1115.1				Temperature, EC Readings
DCT-6-0	Temp	Dome Cr	389,790.6	6,880,566.7	1066.5				Temperature, EC Readings
DCT-6-1	Temp	Dome Cr	389,884.5	6,880,626.8	1063.1				Temperature, EC Readings
DCT-6-2	Temp	Dome Cr	389,985.0	6,880,653.0	1059.6				Temperature, EC Readings
DCT-7-0	Temp	Dome Cr	390,064.2	6,880,634.4	1057.1				Temperature, EC Readings
DCT-7-1	Temp	Dome Cr	390,174.3	6,880,628.8	1052.9				Temperature, EC Readings
DCT-7-2	Temp	Dome Cr	390,255.9	6,880,594.9	1050.6				Temperature, EC Readings
DCT-8-0	Temp	Dome Cr	390,310.0	6,880,584.0	1048.5				Temperature, EC Readings
DCT-8-1	Temp	Dome Cr	390,463.6	6,880,613.0	1052.6				Temperature, EC Readings
DCT-8-2	Temp	Dome Cr	390,565.7	6,880,503.9	1041.4				Temperature, EC Readings
DCT-9-0	Temp	Dome Cr	390,615.5	6,880,493.1	1037.0				Temperature, EC Readings
DCT-9-1	Temp	Dome Cr	390,699.4	6,880,475.8	1035.7				Temperature, EC Readings
DCT-9-2	Temp	Dome Cr	390,787.0	6,880,491.0	1033.3				Temperature, EC Readings
FL-DC-1	FL	Dome Cr	387,750.0	6,881,128.0	1211.7	0			Flow Measurement
FL-DC-2	FL	Dome Cr	387,834.0	6,881,128.0	1197.3	0			Flow Measurement
FL-DC-3	FL	Dome Cr	388,973.0	6,880,806.0	1106.5	0			Flow Measurement
FL-DC-4	FL	Dome Cr	389,418.0	6,880,780.0	1100.1	0			Flow Measurement
FL-DC-5	FL	Dome Cr	389,938.0	6,880,644.0	1060.7	0			Flow Measurement
FL-PC-1	FL	Pony Cr	388,983.2	6,881,739.7	1193.3	0			Flow Measurement
FL-PC-2	FL	Pony Cr	389,073.7	6,881,726.1	1182.9	0			Flow Measurement
GP-T-13-01	GP	TSF-Tailings	389,302.0	6,880,652.0	1096.0	7.0		Geotechnical	
GP-T-13-02	GP	TSF-Tailings	389,391.0	6,880,639.0	1096.0	6.5		Geotechnical	
GP-T-13-03	GP	TSF-Tailings	389,303.0	6,880,606.0	1096.0	9.0		Geotechnical	
GP-T-13-04	GP	TSF-Tailings	389,379.0	6,880,600.0	1096.0	11.5		Geotechnical	
GP-T-13-10	GP	TSF-Tailings	389,400.0	6,880,630.0	1096.0	9.5		Geotechnical	
GP-T-13-18	GP	TSF-Tailings	389,324.0	6,880,550.0	1096.0	6.3		Geotechnical	
GP-T-13-21	GP	TSF-Tailings	389,377.0	6,880,509.0	1098.0	3.3		Geotechnical	
GP-T-13-22	GP	TSF-Tailings	389,256.0	6,880,750.0	1097.5	5.1		Geotechnical	
GP-T-13-23	GP	TSF-Tailings	389,408.0	6,880,723.0	1096.8	8.8		Geotechnical	
GSI-DC-01-A	MP-P	Dome Cr	387,675.7	6,881,123.3	1218.7	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-01-B	MP-P	Dome Cr	387,675.7	6,881,122.9	1218.8	2.8	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-02-A	MP-P	Dome Cr	387,839.5	6,881,128.5	1196.6	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-02-B	MP-P	Dome Cr	387,839.7	6,881,128.5	1196.6	3.0	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-03-A	MP-P	Dome Cr	388,106.5	6,881,078.2	1170.0	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-03-B	MP-P	Dome Cr	388,106.8	6,881,078.1	1170.0	2.9	Drive Point Piezo	Water Quality	Seepage Tests

Location ID	Type of Investigation [1]	Investigation Location (UTM Zone 8, NAD83)				Summary of Installations, Lab Tests and Insitu Tests			
		Area	Easting, UTM (m)	Northing, UTM (m)	Ground Elevation (masl)	Depth of Investigation	Installations [2,3]	Lab tests[3]	Insitu Tests[3,4]
GSI-DC-04-A	Seepage	Dome Cr	388,407.0	6,880,968.0	1143.1	0.0		Water Quality	Seepage Tests
GSI-DC-05-A	MP-P	Dome Cr	388,723.5	6,880,835.8	1119.2	1.0	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-05-B	MP-P	Dome Cr	388,723.7	6,880,835.2	1119.2	2.3	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-06-A	MP-P	Dome Cr	389,790.7	6,880,568.1	1066.6	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-06-B	MP-P	Dome Cr	389,791.1	6,880,568.1	1066.5	2.4	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-07-A	MP-P	Dome Cr	390,066.1	6,880,639.1	1056.7	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-07-B	MP-P	Dome Cr	390,065.7	6,880,639.3	1056.7	2.9	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-08-A	MP-P	Dome Cr	390,310.9	6,880,583.9	1048.5	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-08-B	MP-P	Dome Cr	390,311.5	6,880,583.7	1048.5	2.5	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-09-A	MP-P	Dome Cr	390,615.5	6,880,493.1	1037.0	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-09-B	MP-P	Dome Cr	390,615.6	6,880,492.6	1037.0	2.9	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-10-A	MP-P	Dome Cr	390,862.6	6,880,449.0	1030.6	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-DC-10-B	MP-P	Dome Cr	390,862.4	6,880,449.2	1030.6	2.8	Drive Point Piezo	Water Quality	Seepage Tests
GSI-HA-01-A	MP	Mill	387,843.5	6,881,132.0	1196.7	1.9	Drive Point Piezo	Water Quality	
GSI-HA-02-A	MP	Mill	387,863.1	6,881,129.8	1195.9	1.6	Drive Point Piezo	Water Quality	
GSI-HA-03-A	MP	Mill	387,880.8	6,881,129.8	1194.0	1.3	Drive Point Piezo	Water Quality	
GSI-HA-04-A	MP	Mill	387,917.6	6,881,130.5	1190.0	1.6	Drive Point Piezo	Water Quality	
GSI-HA-05-A	MP	Mill	387,898.5	6,881,124.4	1192.4	1.3	Drive Point Piezo	Water Quality	
GSI-PC-01-A	MP-P	Pony Cr	388,719.8	6,881,918.1	1224.1	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-PC-01-B	MP-P	Pony Cr	388,720.1	6,881,917.9	1224.1	2.9	Drive Point Piezo	Water Quality	Seepage Tests
GSI-PC-02-A	MP-P	Pony Cr	388,908.6	6,881,785.4	1202.5	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-PC-02-B	MP-P	Pony Cr	388,908.1	6,881,785.5	1202.5	2.9	Drive Point Piezo	Water Quality	Seepage Tests
GSI-PC-03-A	MP-P	Pony Cr	389,260.0	6,881,707.4	1159.8	1.1	Drive Point Piezo	Water Quality	Seepage Tests
GSI-PC-03-B	MP-P	Pony Cr	389,260.3	6,881,707.3	1159.7	2.0	Drive Point Piezo	Water Quality	Seepage Tests
GSI-PC-04-A	MP-P	Pony Cr	389,585.4	6,881,658.1	1129.2	1.0	Drive Point Piezo	Water Quality	Seepage Tests
GSI-PC-04-B	MP-P	Pony Cr	389,586.0	6,881,657.6	1129.2	2.9	Drive Point Piezo	Water Quality	Seepage Tests
GSI-PC-05-A	MP-P	Pony Cr	389,713.0	6,881,660.5	1116.5	1.1	Drive Point Piezo	Water Quality	
GSI-PC-05-B	MP-P	Pony Cr	389,713.3	6,881,660.6	1116.4	2.8	Drive Point Piezo	Water Quality	
HA-BA-13-01	HA	TSF-Borrow	388,945.0	6,880,716.0	1113.8	3.0		Geochemistry Geotechnical	
HA-BA-13-02	HA	TSF-Borrow	389,017.0	6,880,702.0	1108.7	3.0		Geochemistry Geotechnical	
HA-DC-04	HA	Dome Cr	388,407.0	6,880,968.0	1143.1	1.0			Augers to refusal
HA-DC-05	HA	Dome Cr	388,725.0	6,880,831.0	1119.7	2.5			Augers to refusal
PCT-1-0	Temp	Pony Cr	388,711.3	6,881,929.2	1225.7				Temperature, EC Readings
PCT-1-1	Temp	Pony Cr	388,834.8	6,881,809.1	1210.9				Temperature, EC Readings
PCT-2-0	Temp	Pony Cr	388,909.5	6,881,781.7	1202.4				Temperature, EC Readings
PCT-2-1	Temp	Pony Cr	389,188.2	6,881,717.9	1166.2				Temperature, EC Readings
PCT-3-0	Temp	Pony Cr	389,257.2	6,881,705.4	1160.0				Temperature, EC Readings
PCT-3-1	Temp	Pony Cr	389,437.4	6,881,669.2	1146.4				Temperature, EC Readings
PCT-4-0	Temp	Pony Cr	389,581.8	6,881,659.1	1129.8				Temperature, EC Readings
PCT-4-1	Temp	Pony Cr	389,600.5	6,881,641.0	1128.2				Temperature, EC Readings
PCT-5-0	Temp	Pony Cr	389,714.5	6,881,656.6	1116.5				Temperature, EC Readings
SED-DC-1	GS	Dome Cr	388,800.0	6,880,834.0	1116.4	0.2		Geochemistry Hydrotechnical	
SED-DC-10	GS	Dome Cr	389,169.0	6,880,792.0	1100.2	0.2		Geochemistry Hydrotechnical	
SED-DC-11	GS	Dome Cr	389,693.0	6,880,561.0	1070.8	0.2		Geochemistry Hydrotechnical	
SED-DC-12	GS	Dome Cr	389,741.0	6,880,574.0	1069.2	0.2		Geochemistry Hydrotechnical	
SED-DC-13	GS	Dome Cr	389,789.0	6,880,564.0	1067.3	0.2		Geochemistry Hydrotechnical	
SED-DC-14	GS	Dome Cr	389,833.0	6,880,579.0	1065.0	0.2		Geochemistry Hydrotechnical	
SED-DC-15	GS	Dome Cr	389,864.0	6,880,616.0	1064.0	0.2		Geochemistry Hydrotechnical	

Location ID	Type of Investigation [1]	Investigation Location (UTM Zone 8, NAD83)				Summary of Installations, Lab Tests and Insitu Tests			
		Area	Easting, UTM (m)	Northing, UTM (m)	Ground Elevation (masl)	Depth of Investigation	Installations [2,3]	Lab tests[3]	Insitu Tests[3,4]
SED-DC-16	GS	Dome Cr	389,909.0	6,880,645.0	1062.3	0.2		Geochemistry Hydrotechnical	
SED-DC-17	GS	Dome Cr	389,955.0	6,880,645.0	1060.1	0.2		Geochemistry Hydrotechnical	
SED-DC-18	GS	Dome Cr	390,002.0	6,880,639.0	1058.4	0.2		Geochemistry Hydrotechnical	
SED-DC-19	GS	Dome Cr	390,050.0	6,880,643.0	1056.9	0.2		Geochemistry Hydrotechnical	
SED-DC-2	GS	Dome Cr	388,846.0	6,880,832.0	1112.6	0.2		Geochemistry Hydrotechnical	
SED-DC-20	GS	Dome Cr	390,098.0	6,880,623.0	1055.6	0.2		Geochemistry Hydrotechnical	
SED-DC-3	GS	Dome Cr	388,894.0	6,880,826.0	1110.4	0.2		Geochemistry Hydrotechnical	
SED-DC-4	GS	Dome Cr	388,942.0	6,880,817.0	1108.1	0.2		Geochemistry Hydrotechnical	
SED-DC-5	GS	Dome Cr	388,986.0	6,880,795.0	1105.9	0.2		Geochemistry Hydrotechnical	
SED-DC-6	GS	Dome Cr	389,027.0	6,880,770.0	1104.1	0.2		Geochemistry Hydrotechnical	
SED-DC-7	GS	Dome Cr	389,067.0	6,880,714.0	1101.2	0.2		Geochemistry Hydrotechnical	
SED-DC-8	GS	Dome Cr	389,079.0	6,880,752.0	1100.4	0.2		Geochemistry Hydrotechnical	
SED-DC-9	GS	Dome Cr	389,124.0	6,880,775.0	1100.9	0.2		Geochemistry Hydrotechnical	
TP-BA-13-03	TP	TSF-Borrow	389,695.0	6,880,691.0	1085.7	5.2		Geochemistry Geotechnical	
TP-BA-13-04	TP	TSF-Borrow	389,616.0	6,880,643.0	1086.6	5.5		Geochemistry Geotechnical	
TP-BA-13-05	TP	TSF-Borrow	389,798.0	6,880,702.0	1079.4	5.3		Geochemistry Geotechnical	
TP-BA-13-06	TP	TSF-Borrow	389,694.0	6,881,040.0	1141.8	1.3		Geochemistry Geotechnical	
TP-BA-13-07	TP	TSF-Borrow	389,739.0	6,881,045.0	1140.5	1.2		Geochemistry Geotechnical	
TP-BA-13-08	TP	TSF-Borrow	389,913.0	6,881,158.0	1147.8	1.4		Geochemistry Geotechnical	
TP-KZ-13-01	TP	Ketza Shop	388,683.4	6,881,754.8	1232.2	2.0		Environmental	Volatile organic compounds
TP-KZ-13-02	TP	Ketza Shop	388,694.0	6,881,716.5	1231.4	2.0		Environmental	Volatile organic compounds
TP-KZ-13-03	TP	Ketza Shop	388,665.1	6,881,737.6	1232.5	2.0		Environmental	Volatile organic compounds
TP-M-13-01	TP	Mill	388,029.3	6,880,994.6	1182.6	3.5		Geochemistry Environmental	Volatile organic compounds
TP-M-13-02	TP	Mill	388,003.9	6,881,053.9	1181.8	2.0		Geochemistry Environmental	Volatile organic compounds
TP-M-13-03	TP	Mill	387,943.0	6,881,120.0	1188.5	5.0		Geochemistry Environmental	Volatile organic compounds
TP-M-13-04	TP	Mill	388,014.0	6,881,083.0	1180.8	2.0		Geochemistry Environmental	Volatile organic compounds
TP-M-13-05	TP	Mill	387,811.8	6,881,026.9	1218.3	2.0		Geochemistry Environmental	Volatile organic compounds
TP-R-13-01	TP	Road	387,876.1	6,880,969.8	1218.6	2.0		Geochemistry Environmental	Volatile organic compounds
TP-R-13-02	TP	Road	387,714.1	6,881,150.7	1217.6	1.5		Geochemistry Environmental	Volatile organic compounds
TP-R-13-03	TP	Road	387,794.3	6,881,334.1	1228.2	2.0		Geochemistry Environmental	Volatile organic compounds
TP-R-13-04	TP	Road	389,160.9	6,881,108.2	1183.4	2.0		Environmental	Volatile organic compounds
TP-R-13-05	TP	Road	389,682.7	6,880,955.7	1127.3	2.0		Environmental	Volatile organic compounds
TP-SP-13-03	GS	Mill	388,140.2	6,880,806.2	1203.6			Environmental	Volatile organic compounds
TP-SP-13-04	GS	Mill	388,136.7	6,880,779.8	1204.7			Environmental	Volatile organic compounds
TP-SP-13-05	GS	Mill	388,119.7	6,880,798.6	1204.5			Environmental	Volatile organic compounds
TP-SP-13-06	GS	Mill	388,098.4	6,880,760.5	1211.9			Environmental	Volatile organic compounds
TP-T-13-01	TP	TSF-Tailings	389,198.0	6,880,700.0	1097.7	2.7		Geochemistry Geotechnical	
TP-T-13-02	TP	TSF-Tailings	389,263.0	6,880,706.0	1097.4	4.8		Geochemistry Geotechnical	
TP-T-13-04	TP	TSF-Tailings	389,415.0	6,880,683.0	1096.8	5.2		Geochemistry Geotechnical	
TP-T-13-05	TP	TSF-Tailings	389,250.0	6,880,620.0	1096.8	2.6		Geotechnical	
TP-T-13-06	TP	TSF-Tailings	389,198.0	6,880,593.0	1099.5	4.1		Geochemistry Geotechnical	
TP-T-13-07	TP	TSF-Tailings	389,263.0	6,880,563.0	1097.7	3.4		Geotechnical	
TP-T-13-09	TP	TSF-Tailings	389,379.0	6,880,557.0	1096.5	4.4		Geotechnical	
TP-TD-13-01	TP	TSF-Dam	389,479.0	6,880,679.0	1096.2	4.7		Geochemistry Geotechnical	
TP-TD-13-02	TP	TSF-Dam	389,478.0	6,880,622.0	1095.4	6.0		Geochemistry Geotechnical	
TP-TD-13-03	TP	TSF-Dam	389,474.0	6,880,521.0	1095.0	6.0		Geochemistry Geotechnical	
TP-WA-13-01	TP	Waste Area	388,770.0	6,881,707.0	1231.8	4.5		Geotechnical	
TP-WA-13-02	TP	Waste Area	388,958.0	6,881,673.0	1213.0	5.6		Geochemistry Geotechnical	

Location ID	Type of Investigation [1]	Investigation Location (UTM Zone 8, NAD83)				Summary of Installations, Lab Tests and Insitu Tests			
		Area	Easting, UTM (m)	Northing, UTM (m)	Ground Elevation (masl)	Depth of Investigation	Installations [2,3]	Lab tests[3]	Insitu Tests[3,4]
TP-WA-13-03	TP	Waste Area	388,988.0	6,881,634.0	1216.8	4.6		Geochemistry Geotechnical	
TP-WA-13-04	TP	Waste Area	388,807.0	6,881,591.0	1228.0	6.1		Geotechnical	
TP-WA-13-05	TP	Waste Area	388,708.0	6,881,499.0	1211.3	4.2		Geochemistry Geotechnical	
TP-WA-13-06	TP	Waste Area	388,711.0	6,881,442.0	1209.1	4.5		Geochemistry Geotechnical	
TP-WA-13-07	TP	Waste Area	388,774.0	6,881,430.0	1214.2	5.8		Geotechnical	
TP-WA-13-08	TP	Waste Area	388,922.0	6,881,356.0	1214.7	4.7		Geochemistry Geotechnical	
TP-WA-13-09	TP	Waste Area	388,834.0	6,881,319.0	1204.9	5.2		Geochemistry Geotechnical	
TP-WA-13-10	TP	Waste Area	389,001.0	6,881,272.0	1214.0	4.1		Geochemistry Geotechnical	
TP-WA-13-11	TP	Waste Area	389,001.0	6,881,208.0	1202.0	5.0		Geochemistry Geotechnical	
Veg-Plot-1	GS	Waste Area	388,888.0	6,881,443.0	1214.0	1.0			Vegetation Reclamation
Veg-Plot-2	GS	TSF	389,438.0	6,880,471.0	1105.0	1.0			Vegetation Reclamation
Veg-Plot-3	GS	Mill	387,560.0	6,880,965.0	1275.0	1.0			Vegetation Reclamation
Veg-Plot-4	GS	Shale Borrow	389,488.0	6,881,001.0	1154.0	1.0			Vegetation Reclamation
Veg-Plot-5	GS	Open Pit	389,309.0	6,881,412.0	1219.0	1.0			Vegetation Reclamation
Veg-Plot-6	GS	Victoria Cr	391,539.0	6,880,871.0	1024.0	1.0			Vegetation Reclamation
Veg-Plot-7	GS	Off OIC	411,006.0	6,886,033.0	916.0	1.0			Vegetation Reclamation

Notes:

1. BH=sonic borehole; CH = diamond core hole; TP = test pit; CPT = cone penetration test; FLOW = flow measurement; TEMP&EC = temperature and electrical conductivity measurement; Seepage = seepage meter test only; DP-P = paired drive point piezometer with temperature and electrical conductivity measurement and seepage meter test location, DP = single drive point piezometer with temperature and electrical conductivity measurement; GS=grab sample, GP=GeoProbe hole, HA=Hand auger.
2. MW = monitoring well, VWP = vibrating wire piezometer with temperature measurement
3. Details of installations, lab and insitu testing provided in data report (AMEC 2013c)
4. In all locations a visual characterization of the soils was completed.

Table 3 Fall 2013 Groundwater Sampling Locations

Well ID	Area	Northing	Easting	Top of Casing Elevation	Depth to Water	Groundwater Elevation
		(m)	(m)	(masl)	(mBTOP)	(masl)
BH-M-13-03	Mill	6881007	387990	1190.6	2.8	1187.8
CH-P-13-03/50 m	Open Pit	6881108	389145	1184.5	42.2	1142.4
CH-P-13-04/10 m	Open Pit	6881471	389137	1226.2	0.4	1225.8
CH-P-13-05/50 m	Open Pit	6881469	388958	1185.9	19.4	1166.4
GLL07-02	Open Pit	6881703	389072	1184.6	6.4	1178.2
GLL07-03	Open Pit	6881477	388961	1185.9	4.1	1181.8
GSI-DC-08-A	Dome Cr	6880584	390311	1049.3	2.2	1047.2
GSI-DC-09-A	Dome Cr	6880493	390615	1037.8	1.0	1036.8
GSI-DC-10-A	Dome Cr	6880449	390863	1031.3	0.9	1030.5
GSI-HA-01-A	Mill	6881132	387844	1197.7	2.2	1195.5
GSI-HA-02-A	Mill	6881130	387863	1197.2	2.0	1195.1
GSI-HA-03-A	Mill	6881130	387881	1194.9	1.1	1193.9
GSI-HA-04-A	Mill	6881130	387918	1190.5	1.0	1189.5
GSI-HA-05-A	Mill	6881124	387898	1193.1	1.0	1192.0
GSI-PC-01-A	Pony Cr	6881918	388720	1224.8	2.2	1222.6
GSI-PC-02-A	Pony Cr	6881785	388909	1203.1	1.2	1201.9
GSI-PC-05-A	Pony Cr	6881660	389713	1117.1	2.8	1114.3
MP09-04	TSF	6880609	389576	1079.6	2.0	1077.7
MP09-05	TSF	6880591	389550	1079.1	1.4	1077.7
MP09-05	TSF	6880591	389550	1079.1	1.4	1077.7
MP09-09	TSF-Tailings	6880681	389240	1098.9	2.4	1096.5
MP09-10	TSF-Tailings	6880682	389240	1098.9	2.2	1096.7
MP09-11	TSF-Tailings	6880614	389221	1099.3	1.5	1097.8
MP09-12	TSF-Tailings	6880613	389221	1099.3	1.8	1097.6
MW09-01	TSF-Tailings	6880558	389395	1097.3	4.2	1093.1

Well ID	Area	Northing	Easting	Top of Casing Elevation	Depth to Water	Groundwater Elevation
MW09-02	TSF-Tailings	6880559	389396	1097.2	1.8	1095.4
MW09-03	TSF-Tailings	6880556	389421	1096.9	3.5	1093.4
MW09-04	TSF-Tailings	6880558	389421	1096.8	2.0	1094.7
MW09-07	TSF-Tailings	6880699	389324	1097.0	1.8	1095.2
MW09-08	TSF	6880578	389620	1075.2	1.2	1074.0
MW09-13	Open Pit	6881663	389007	1208.6	7.2	1201.4
MW09-14	Open Pit	6881662	389008	1208.6	8.2	1200.4
MW09-15	Open Pit	6881724	388921	1207.4	9.2	1198.2
MW09-16	Mill	6881095	387992	1183.5	10.2	1173.3
MW09-17	Mill	6880971	388077	1178.6	11.2	1167.4
MW09-18	Mill	6880985	388055	1179.6	12.2	1167.4
MW09-19	Mill	6881016	388053	1177.5	13.2	1164.3
MW09-21	TSF	6880577	389536	1081.6	1.8	1079.9
MW09-22	TSF-Dam	6880549	389497	1089.4	3.5	1085.9
MW09-23	TSF-Dam	6880555	389460	1099.6	10.7	1088.9
MW09-24	TSF	6880623	389561	1088.3	9.2	1079.1
W14103083-BH01	TSF	6880668	389526	1094.8	6.5	1088.3
W14103083-BH02	TSF	6880668	389561	1091.6	6.2	1085.4
W14103083-BH04	TSF	6880666	389543	1092.8	6.2	1086.6