



Energy, Mines and Resources
Assessment and Abandoned Mines

Box 2703 - K-419
Whitehorse, YT Y1A 2C6

January, 23 2013

MEMORANDUM

Re: EBA Engineering Report “Mount Nansen Instrumentation Inspections and Installation” (November 2012)

This memorandum is to preface the “Mount Nansen Instrumentation Inspections and Installation” (November 2012) written by EBA Engineering (EBA) for Yukon Government Assessment and Abandoned Mines (AAM).

Introduction

EBA Engineering (EBA) was retained in Spring 2012 to repair, label and install instrumentation associated with the tailings pond and seepage site at the Mount Nansen site. Following two site visits, EBA submitted a report describing the work completed and recommendations for on-going data collection. This memo summarizes the recommendations outlined by EBA in the report.

Contractor Recommendations

EBA proposed recommendations in their report; the following is a summary of those recommendations. For more specific details on the recommendations, please see the full report.

New Thermistor Cables and Piezometers:

- Continue collecting data from four new instrument locations (three drilled in October 2012 on the north side of the seepage collection dam; and one more drilled at the west end of the tailings pond).

Staff Gauges:

- AAM should pass on new tailings pond and seepage pond staff gauge survey information (to determine water surface elevations) to EBA for interpretation with the piezometer data.

On-going Data Collection:

- Data should be collected every three months from working thermistors and piezometers in conjunction with staff gauge readings. Use data collection sheets provided in Appendix A.
- Check that all borehole and instrument labels are correct and legible when the data are collected.

Thermistor Calibration Information:

- Thermistor calibration data should be obtained for wells installed by AECOM (wells GT09-01, GT09-02, GT09-03, GT09-04 AND GT09-05).

Work to be Completed

Recommendations for instrumentation should be implemented in the planning and design phase of the Mount Nansen Remediation Project to ensure accurate piezometer and thermistor data is being provided to the project design team for remediation planning.

Sincerely,

Adrienne Turcotte
Project Officer – Environmental Monitoring
Assessment and Abandoned Mines

GOVERNMENT OF YUKON

MOUNT NANSEN INSTRUMENTATION INSPECTIONS AND INSTALLATION



REPORT

NOVEMBER 2012
ISSUED FOR USE
EBA FILE: W23101555

creating & delivering | BETTER SOLUTIONS



eba
A TETRA TECH COMPANY

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Assessment and Abandoned Mines, Government of Yukon and their agents. EBA Engineering Consultants Ltd. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Assessment and Abandoned Mines, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement. EBA's General Conditions are attached to this report (Appendix D).

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 BACKGROUND INFORMATION REVIEW	1
3.0 SCOPING SITE VISIT	1
3.1 Staff Gauges	1
3.2 Thermistor Cables and Pneumatic Piezometers	1
4.0 INTERIM MEMO AND RECOMMENDATIONS	2
5.0 SECOND SITE VISIT	2
5.1 Borehole Casing and Frame Labelling	2
5.2 Labelled Thermistor Cables and Pneumatic Piezometer Cables	4
5.3 Staff Gauges	4
5.3.1 Seepage Pond Staff Gauge	4
5.3.2 Tailings Pond Staff Gauge	6
6.0 RECOMMENDATIONS	7
6.1 New Thermistor Cables and Piezometers	7
6.2 Staff Gauges	7
6.3 On-going Data Collection	8
6.4 Thermistor Calibration Information	8
7.0 CLOSURE	9
REFERENCES	10

TABLES

Table 1	Summary of Labelled Instrumentation
Table 2	Pneumatic Piezometer Cable Installation Information
Table 3	Thermistor Cable Installation Information

FIGURES

Figure 1	Staff Gauge, Piezometer and Thermistor Locations
Figure 2	Staff Gauge, Functioning Piezometer and Thermistor Locations

APPENDICES

Appendix A	Piezometer and Thermistor Field Data Sheets
Appendix B	Staff Gauge Information
Appendix C	Tailings Pond Surveyed Water Elevation Method
Appendix D	EBA's General Conditions

1.0 INTRODUCTION

On April 16, 2012 EBA Engineering Consultants Ltd, operating as EBA, A Tetra Tech Company (EBA) was retained by Assessment and Abandoned Mines (AAM), Government of Yukon, to repair, label and install instrumentation associated with the tailings pond and seepage pond at the Mount Nansen site near Carmacks, Yukon. This report provides details of the work completed on site and provides recommendations for on-going data collection.

2.0 BACKGROUND INFORMATION REVIEW

EBA reviewed reports that contained pertinent information about the existing instrumentation on site, namely, the thermistor cables and the pneumatic piezometer instrumentation that was installed between 1996 and 2009 by at least three different consultants. Details of the pertinent documents are provided in the reference section of this report. The reports provided valuable information regarding the installation of the existing instrumentation, including locations, depths below ground surface, and identification numbers.

3.0 SCOPING SITE VISIT

A site visit, initially scheduled for May 16, 2012 was postponed due to inclement weather. The scoping site visit was completed on May 22 and 23 by Glenn Rudman and David Barrett of EBA. The objective of the site visit was to test thermistor cables and pneumatic piezometer instrumentation and install two staff gauges, one in the tailings pond and one in the seepage pond.

3.1 Staff Gauges

During the scoping site visit in May two staff gauges were installed. One was installed adjacent to the pump house at the seepage pond and mounted to an existing two by four inch wooden upright post. The other was installed approximately 25 m from the east shore of the tailings pond, close to the deepest part of the tailings pond. The tailings pond staff gauge was mounted on a two by four inch wooden upright post and bolted to galvanised steel angle-bar and driven with a post driver into the bed of the pond. The staff gauges were installed to provide relative and comparative data between the elevation of the water in the tailings pond and the elevation of the water in the seepage pond, and for the interpretation of piezometer readings taken from existing instrumentation in and around the tailings dam.

On June 4, 2012 an EBA staff member reported that the staff gauge in the tailings pond could not be located. A new staff gauge was later installed at a new location (See Section 5.3). On July 17, 2012 Mr. Jeff Moore of AAM requested that the staff gauge at the seepage pond be relocated as the two by four inch wooden upright that the staff gauge was attached to was scheduled to be removed at a later date. The staff gauge was relocated during the second field visit (see Section 5.3).

3.2 Thermistor Cables and Pneumatic Piezometers

During the scoping field visit the field crew inspected all the thermistor cables and pneumatic piezometers between and adjacent to the tailings pond and seepage pond (Figure 1) and, where possible, collected data

from the instruments. Photographs of the instruments and hand-held GPS UTM coordinates were also collected for reference purposes. The locations of boreholes and instrumentation frames were later professionally surveyed by Yukon Engineering Services (YES) and the data were provided to EBA. EBA confirms that the locations of the boreholes and frames obtained using a handheld GPS unit (Garmin Legend H) were all within four metres of the UTM coordinates supplied by YES.

The thermistor cable at the current meteorological station was also noted but it was hard-wired into the station and so data were not collected manually.

4.0 INTERIM MEMO AND RECOMMENDATIONS

EBA produced an interim memo for AAM with recommendations on June 12, 2012 that provided recommendations on actions to be completed during the second site visit along with approximate costs. Glenn Rudman and Richard Trimble (EBA) discussed the memo with Josée Perron (AAM) on June 28, 2012. A follow-up meeting took place between Richard Trimble, Glenn Rudman and Jeff Moore on July 17, 2012 to finalize the scheduled tasks during the second site visit.

The interim memo recommended that most of the thermistor cables that were not working be abandoned as the site has an adequate number of cables at various locations and depths that provide sufficient data to allow the temperatures in the tailings and seepage pond dams to be monitored. One exception to this was EBA's thermistor cable #1383 located to the east of the seepage pond dam crest. It was recommended that the cable connector for thermistor #1383 be taken apart and the wire connections checked. If the connector was not working then the thermistor would be abandoned.

The interim memo recommended that all the pneumatic piezometers that were not working be abandoned. EBA believes that as long as the working pneumatic piezometers continue to provide reliable data then sufficient data are available to allow groundwater elevations to be established within the dam.

EBA also recommended that each instrument and borehole case be labelled more clearly. The borehole cases or wooden frames would have the names of the boreholes labelled with oil-based black paint and individual instruments would be tagged with stamped brass identification tags that were wired to each instrument.

5.0 SECOND SITE VISIT

Glenn Rudman and David Barrett of EBA completed a second site visit on July 18 and 19, 2012. The details of the tasks completed are presented below.

5.1 Borehole Casing and Frame Labelling

The borehole casings or instrument frames were painted with the relevant identification, as listed in the original consultant's installation report along with the corresponding consultant's name, i.e., "EBA", "KLOHN" and "AECOM". Photographs 1 and 2 below provide examples of the labelled casings or wooden frames. Oil-based "Rust Coat" was used to label the casings.



Photo 1: Example of a labelled borehole casing (July 18, 2012)



Photo 2: Example of a labelled wooden frame (July 18, 2012)

5.2 Labelled Thermistor Cables and Pneumatic Piezometer Cables

In total, 17 thermistor cable connectors and 19 pneumatic piezometer connectors were tagged with brass tags that were attached to each instrument with tie wire. Each brass tag was stamped with the relevant consultant's project number and a unique instrumentation identification number that was taken from the consultant's original installation report. An example of a tagged thermistor cable and tagged pneumatic piezometer cable are presented in Photographs 3 and 4 respectively. If the thermistor cable or pneumatic piezometer cable were abandoned then the tag was also stamped with "ABANDONED JULY 2012". Figure 2 indicates the location of thermistors and piezometers that were working on May 22, 2012.

Table 1 presents a summary of how the boreholes and individual instruments were labelled on site during the second field visit. Table 2 presents a summary of all the thermistor and pneumatic piezometer instrumentation including elevations of ground surface and depths below surface of instruments.

The thermistor cable #1383 in Borehole BH01-03 was checked on site by Doug Langila of Denison Environmental Services on July 18, 2012. The first two thermistor beads of the 16 available beads were returning faulty readings. The faulty beads represent relatively shallow depths while the others continue to provide useful data. The field data sheet provided in Appendix A for the collection of future readings has been prepared to take account of the available data from this thermistor cable.

EBA received logged thermistor data from the AAM office on August 3, 2012 pertaining to the thermistor cable (#2304) installed at the meteorological station. The cable is hard-wired into the meteorological station. EBA confirms that the ten beads of the thermistor cable (supplied by EBA) appear to be functioning correctly. EBA was not involved in the installation of the cable and is not able to confirm the depths of the thermistor beads. However, the bead depths provided by AAM have been included in Table 3.

5.3 Staff Gauges

5.3.1 Seepage Pond Staff Gauge

At the request of AAM the one metre staff gauge installed during the scoping visit to Mount Nansen was re-installed on the culvert supporting the pump house on July 18, 2012 (Photograph 5). The gauge was mounted on a two by four inch timber that was attached to the culvert by two bolts and secured with nuts and washers on the inside of the culvert. Copper pipe spacers were used between the culvert and the two by four inch timber to prevent squashing the insulation wrapped around the culvert which may loosen over time. The staff gauge needs to be surveyed to establish an elevation of the gauge. The staff gauge can easily be read with the naked eye to the nearest centimetre from the edge of the seepage pond. The distance between the top of the metal gauge and the top of the two by four inch timber is 0.801 m. Information about the type of staff gauge installed is provided in Appendix B.



Photo 3: Example of a thermistor cable connector labeled with a brass tag and stamped with the consultant's project number (top) and the individual instrument number (bottom), July 18, 2012



Photo 4: Example of a pneumatic piezometer cable connector labeled with a brass tag and stamped with the consultant's project number (top) and the individual instrument number (bottom), July 18, 2012



Photo 5: Re-installed Staff Gauge in the Seepage Pond. Installed July 18, 2012

5.3.2 Tailings Pond Staff Gauge

The two one metre staff gauges that were installed in the tailings pond in May and later failed, could not be found in July using the boat that was taken to site as the water was too turbid. The field crew tried unsuccessfully to ‘fish’ for the staff gauges at the bottom of tailings pond. Two new staff gauges were installed on one of the water monitoring wells in the east end of the tailings pond. The casing of the well was not labelled but is believed to be MW09-05/06. Two staff gauges were attached to a length of two by four inch timber which was driven into the tailings with a sledgehammer and then secured to the well casing with a nut and bolt and a modified hose clamp (Photograph 6). The upper gauge has been labelled “No. 1” and the lower gauge (almost entirely submerged in the tailings) has been labelled “No. 2”. The distance between the top of the metal gauge and the top of the timber is 0.106 m. The staff gauge needs to be surveyed to establish an elevation of the gauge. The staff gauge can be read to the nearest centimetre from the closest shoreline of the pond using either binoculars or a digital camera with a zoom feature. If the water in the tailings pond is not surrounding the gauge and a gauge reading cannot be obtained then one of two methods can be used to obtain a reading.

- Method 1: The tailings around the bottom of the gauge can be shovelled away from the staff gauge to see if there is any standing water around the gauge. If there is standing water around the gauge then a water elevation can be read from the gauge.
- Method 2: A surveyed water elevation can be obtained using a rod and level and two people. This will allow the water elevation to be calculated against the known elevation of the staff gauge. More details about this method are provided in Appendix C.



Photo 6: New staff Gauge Installed in the Tailings Pond, attached to a Monitoring Well (July 18, 2012)

6.0 RECOMMENDATIONS

6.1 New Thermistor Cables and Piezometers

Since this report was initially drafted three new instrument boreholes were drilled in October 2012 on the north side of the seepage collection dam, through the sand terrace between the spillway and the dam. Both thermistor cables and pneumatic piezometers were installed in the three boreholes. The rationale for this is that more data are required to determine if there is any hydraulic connection between the spillway and the seepage collection pond. A fourth additional borehole with instrumentation was also installed at the west end of the tailings pond. Full details of the new boreholes and instrumentation will be provided by EBA to AAM in a separate report (EBA File: W14103083-001).

6.2 Staff Gauges

It is EBA's understanding that, as recommended, the staff gauges in both the seepage pond and tailings pond have been surveyed to allow the water surface elevations in the seepage pond and tailings pond to be used in conjunction with the readings taken from the piezometers in the tailings dam. This information should be passed on to EBA to allow the piezometer data to be fully interpreted.

6.3 On-going Data Collection

EBA recommends that data be collected regularly (every three months) from the thermistor and piezometers that are working. Readings from the staff gauges must be collected at the same time. The data collection sheets provided in Appendix A should be used for this purpose. Field staff should check that all borehole and instrument labels are correct and legible when the data are collected.

6.4 Thermistor Calibration Information

EBA recommends that the thermistor cable calibration data be obtained for the thermistors installed by AECOM in wells GT09-01, GT09-02, GT09-03, GT09-04, and GT09-05. The information can be requested from AECOM. The AECOM project number is 112359. The calibration information will allow the thermistor data to be plotted along with the data obtained from the EBA thermistor cables.

7.0 CLOSURE

EBA hopes that the information above meets your requirements and would welcome the opportunity to meet with AAM staff to discuss the recommendations. If you have any questions, please contact the undersigned.

Sincerely,
EBA Engineering Consultants Ltd.

Prepared by:



Glenn Rudman, M.Sc.
Biologist, Arctic Region
Direct Line: 867.668.2071 x236
grudman@eba.ca

Reviewed by:



J. Richard Trimble, P.Eng., FEC
Principal Consultant, Arctic Region
Direct Line: 867.668.2071 x222
rtrimble@eba.ca

REFERENCES

AECOM 2009. Mount Nansen Mine Closure. Project Number: 112359. AECOM, Whitehorse, Yukon.

EBA 1997. Instrumentation Installation Mount Nansen Mine Northwest of Carmacks. Project Number: 0201-97-12861. EBA, Whitehorse, Yukon

EBA 2002. Mount Nansen Dam Safety Assessment. Project Number: 0201-00-14618. EBA, Whitehorse, Yukon

KLOHN KRIPPEN 1996. Mount Nansen Tailings Facility Construction Report. May to October 1996. Project Number: 5314-504B. Klohn-Crippen, Calgary, Alberta

TABLES

Table 1	Summary of Labelled Instrumentation
Table 2	Pneumatic Piezometer Cable Installation Information
Table 3	Thermistor Cable Installation Information

Table 1: Summary of Instrumentation Labelled on July 18-19, 2012 - Mount Nansen

Borehole Name on Casing or Wooden Frame	Thermistor/Piezometer Identification	Notes
EBA BH01	Thermistor: 0201 97 12861 1178	Continue to collect data
	Piezometer: 0201 97 12861 9377	Abandoned July 2012 Readings not stabilizing
	Piezometer: 0201 97 12861 22713	Abandoned July 2012 Readings not stabilizing
	Piezometer: 0201 97 12861 22715	Continue to collect data
KLOHN DH9601*	Thermistor: 5314 08 No ID.	Abandoned July 2012 No connector
	Piezometer: 5314 08 20382	Abandoned July 2012 No connector
	Piezometer: 5314 08 20383	Continue to collect data
AECOM GT09-02	Thermistor: 112359 Cable 5	Continue to collect data
EBA BH05	Thermistor: 0201 97 12861 1181	Continue to collect data
	Piezometer: 0201 97 12861 22714	Continue to collect data
	Piezometer: 0201 97 12861 22716	Continue to collect data
	Piezometer: 0201 97 12861 22720	Continue to collect data
EBA BH08	Thermistor: 0201 97 12861 1143	Abandoned July 2012 No readings available
EBA BH06	Thermistor: 0201 97 12861 1182	Continue to collect data

Table 1: Summary of Instrumentation Labelled on July 18-19, 2012 - Mount Nansen

Borehole Name on Casing or Wooden Frame	Thermistor/Piezometer Identification	Notes
EBA BH07	Thermistor: 0201 97 12861 1183	Continue to collect data
	Piezometer: 0201 97 12861 22718	Continue to collect data
	Piezometer: 0201 97 12861 22719	Continue to collect data
	Piezometer: 0201 97 12861 22721	Continue to collect data
AECOM GT09-03	Thermistor: 112359 Cable 4	Continue to collect data
EBA BH04	Thermistor: 0201 97 12861 "1"	Continue to collect data. Two input cables to meter only
KLOHN DH9504*	Thermistor: 531408 No ID DH9504	Abandoned July 2012 Connector not compatible with switch box
KLOHN DH9602**	Thermistor: 531408 No ID	Abandoned July 2012 No connector
	Piezometer: 531408 20376	Abandoned July 2012 No readings available
	Piezometer: 531408 20377	Abandoned July 2012 Unreliable readings
AECOM GT09-05	Thermistor: 112359 CABLE 2	Continue to collect data
EBA BH09	Not located	Not located. Abandoned. Previously reported in March 2012 as not working. Site conditions indicate that the well casing has been destroyed.
EBA BH01-01	Thermistor: 0201 00 14618 1385	Continue to collect data
AECOM GT09-04	Thermistor: 112359 CABLE 3	Continue to collect data

Table 1: Summary of Instrumentation Labelled on July 18-19, 2012 - Mount Nansen

Borehole Name on Casing or Wooden Frame	Thermistor/Piezometer Identification	Notes
EBA BH01-03	Thermistor: 0201 00 14618 1383	Continue to collect data from beads that are functioning correctly
EBA BH01-04	Thermistor: 0201 00 14618 1384	Continue to collect data
AECOM GT09-01	Thermistor: 112359 CABLE 1	Continue to collect data
EBA BH03	Thermistor: 0201 97 12861 1180	Continue to collect data
	Piezometer: 0201 97 12861 22592	Continue to collect data
	Piezometer: 0201 97 12861 22793	Continue to collect data
	Piezometer: 0201 97 12861 19172	Continue to collect data
EBA BH02	Thermistor: 0201 97 12861 1179	Continue to collect data
	Piezometer: 0201 97 12861 No ID	Abandoned July 2012 Original report states that piezometer numbers were 7658, 9362, and 7711. Labelling on each cable was not legible and a reading from at least one of the cables did not stabilize when tested in May 2012.

* Klohn Krippen borehole names should start with "D", not "B" as per the original installation report, December 1996

** DH9602 is the correct name for the drill hole that had been previously mislabelled as BH9603

Table 2: Mount Nansen Pneumatic Piezometer Cable Installation Information

Borehole/Frame ID	Piezometer No.	Ground Elevation (m) ^A	Approximate Depth Below Ground Surface (m)	Approximate Piezometer Elevation (m)	Comment
EBA BH01	22715	1099.25	10.5	1088.73	Continue to collect data
	22713	1099.25	14.5	1084.73	Abandoned
	9377	1099.25	16.5	1082.73	Abandoned
EBA BH02	7658	1099.38	14.7	1084.73	Abandoned
	9362	1099.38	19.7	1079.73	Abandoned
	7711	1099.38	21.7	1077.73	Abandoned
EBA BH03	19172	1099.59	16.2	1083.43	Continue to collect data
	22592	1099.59	18.2	1081.43	Continue to collect data
	22793	1099.59	22.2	1077.43	Continue to collect data
EBA BH05	22720	1087.77	6.9	1080.83	Continue to collect data
	22716	1087.77	8.9	1078.83	Continue to collect data
	22714	1087.77	12.9	1074.83	Continue to collect data
EBA BH07	22721	1091.38	4.2	1087.23	Continue to collect data
	22719	1091.38	6.2	1085.23	Continue to collect data
	22718	1091.38	10.2	1081.23	Continue to collect data
DH9601	20383	1092.94	5.8	1087.13	Formerly BH9601. Continue to collect data
	20382	1092.94	8.4	1084.53	Abandoned
DH9602	20377	1094.46	3.2	1091.23	Abandoned
	20376	1094.46	4.9	1089.53	Abandoned

Notes

A - Ground surface elevations based on data supplied to EBA by Yukon Engineering Services on July 13, 2012

Table 3: Mount Nansen Thermistor Cable Installation Details

Borehole/Frame ID.	Ground Surface Elevation (m) ^A	Thermistor Instrument No.	Thermistor Bead Information ^D																COMMENTS
			Bead Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
EBA BH01	1099.25	1178	Bead Number	1	2	3													
			Approximate Bead Elevation (m)	1086.73	1136.6	1134.6													
EBA BH02	1099.38	1179	Bead Number	1	2	3	4	5	6	7	8								
			Approximate Bead Elevation (m)	1087.08	1084.58	1081.58	1079.58	1078.58	1077.58	1076.58	1074.08								
EBA BH03	1099.59	1180	Bead Number	1	2	3													
			Approximate Bead Elevation (m)	1099.59	1099.29	1095.29													
EBA BH04	1095.52	1	Bead Number	1															
			Approximate Bead Elevation (m)	1043.65															
EBA BH05	1087.77	1181	Bead Number	1	2	3													
			Approximate Bead Elevation (m)	1080.77	1078.77	1074.77													
EBA BH06	1087.96	1182	Bead Number	1	2	3	4	5	6	7	8	9							
			Approximate Bead Elevation (m)	1083.46	1081.16	1079.16	1077.16	1076.16	1075.16	1074.16	1073.16	1071.16							
EBA BH07	1091.38	1183	Bead Number	1	2	3													
			Approximate Bead Elevation (m)	1087.18	1085.18	1081.18													
EBA BH08	1080.6	1143	Bead Number	1	2	3	4	5	6	7									
			Approximate Bead Elevation (m)	1079.9	1079.4	1078.4	1076.4	1072.4	1068.4	1065.4									
EBA BH09	Not Located	2	NOT LOCATED - BELIEVED TO BE DESTROYED																Not Located
EBA BH10	Destroyed	1144	DESTROYED																Destroyed when seepage pond dam installed
EBA BH01-01	1078.44	1385	Bead Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
			Approximate Bead Elevation (m)	1077.94	1076.94	1075.94	1074.94	1073.94	1073.44	1072.94	1072.44	1071.94	1071.44	1070.94	1070.44	1069.44	1068.44	1067.44	1066.44
EBA BH01-03	1074.74	1383	Bead Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
			Approximate Bead Elevation (m)	1074.24	1073.24	1072.74	1072.24	1071.74	1071.24	1070.74	1070.24	1069.74	1069.24	1068.74	1068.24	1067.74	1066.74	1065.74	1064.74
EBA BH01-04	1076.1	1384	Bead Number	1	2	3	4	5	6	7	8	9							
			Approximate Bead Elevation (m)	1075.6	1074.6	1074.1	1073.6	1073.1	1072.6	1072.1	1071.6	1071.1							
GT09-01	1099.61	CABLE 1	Bead Number	1	2	3	4	5	6	7	8	9	10	11	12	13			
			Approximate Bead Elevation (m)	1099.61	1090.61	1087.61	1084.61	1081.61	1080.11	1079.11	1078.11	1077.11	1076.11	1074.61	1072.11	1069.61			
GT09-02	1088.55	CABLE 5	Bead Number	1	2	3	4	5	6	7	8								
			Approximate Bead Elevation (m)	1086.55	1085.55	1084.55	1083.55	1082.55	1079.05	1075.05	1071.85								
GT09-03	1090.55	CABLE 4	Bead Number	1	2	3	4	5	6	7	8	9	10						
			Approximate Bead Elevation (m)	1088.55	1086.55	1084.55	1082.55	1080.55	1078.55	1076.55	1074.55	1072.55	1070.75						
GT09-04	1078.94	CABLE 3	Bead Number	1	2	3	4	5	6	7	8								
			Approximate Bead Elevation (m)	1076.94	1075.94	1074.94	1073.94	1072.94	1069.44	1065.44	1062.74								
GT09-05	1087.8	CABLE 2	Bead Number	1	2	3	4	5	6	7	8	9	10						
			Approximate Bead Elevation (m)	1085.8	1083.8	1081.8	1079.8	1077.8	1075.8	1073.8	1071.8	1069.8	1068						
Meteorological Station	Approx. 1241 ^B	2304	Bead Number	1	2	3	4	5	6	7	8	9	10						
			Approximate Bead Elevation (m) ^C	1241	1240.9	1240.8	1240.7	1240.5	1240.3	1240	1239.5	1239	1238						

Notes

A - Ground surface elevations based on data supplied to EBA by Yukon Engineering Services (YES) on July 13, 2012

B - Approximate elevation taken from hand-held GPS unit in May 2012

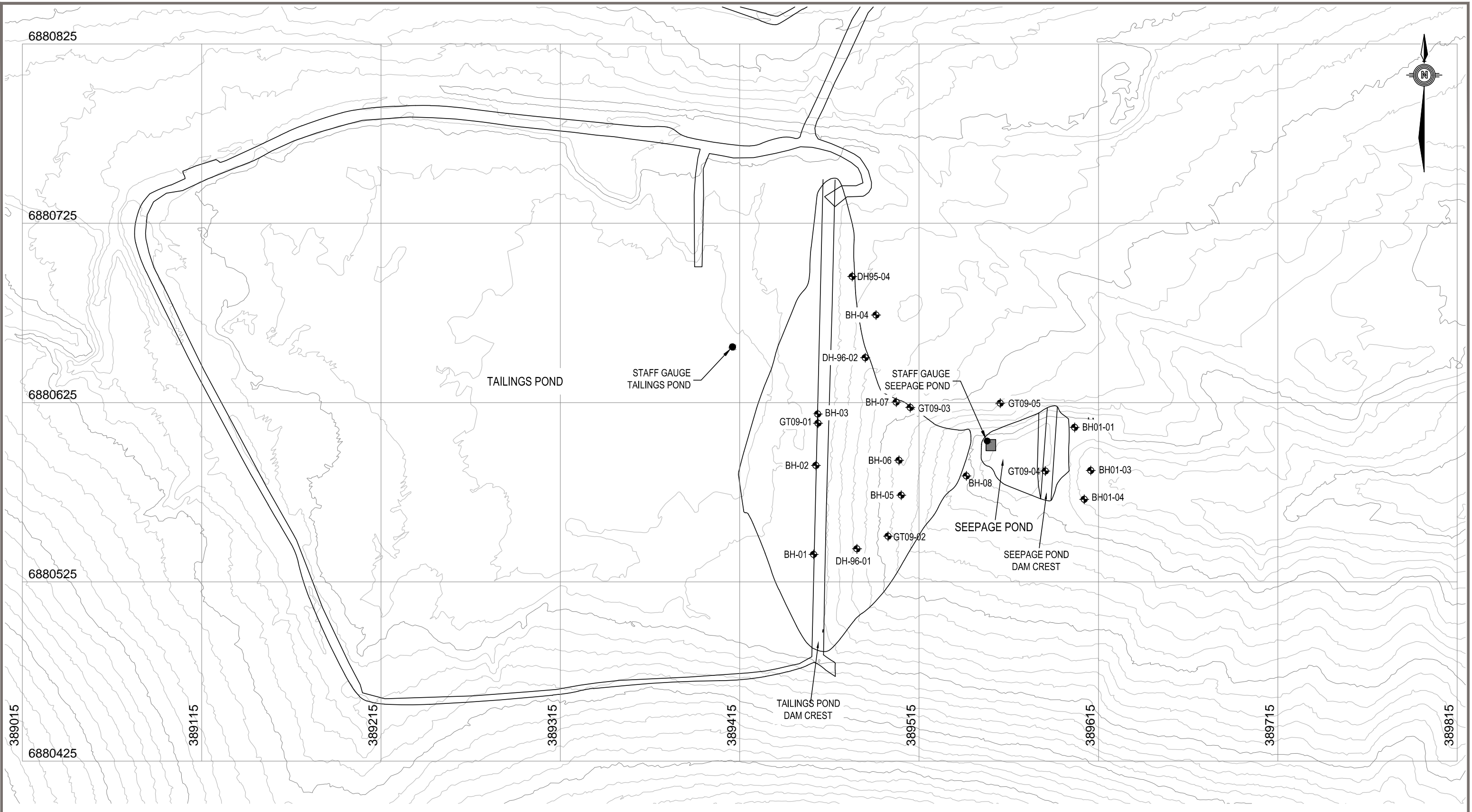
C - Bead depths provided by AAM to EBA on August 4, 2012

D - All the presented bead elevations are the original elevations less 51.87 m due to the revised geodetic data provided by YES on July 13, 2012

FIGURES

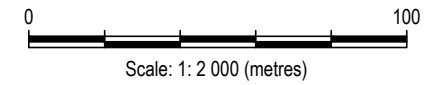
-
- Figure 1 Staff Gauge, Piezometer and Thermistor Locations
Figure 2 Staff Gauge, Functioning Piezometer and Thermistor Locations

Q:\Whitehorse\Data\0201\Drawings\Mt Nansen\W23 01555 Staff Gauge, Piezometer and Thermistor Locations\W23 01555 Fig. 1-2, RD.dwg [FIGURE 1] November 07, 2012 - 9:56:24 am (BY: BUCHAN, CAMERON)



- LEGEND:**
- ◆ - INSTRUMENTATION LOCATION
 - - STAFF GAUGE LOCATION
 - - SEEPAGE POND PUMP HOUSE

- NOTES :**
- BOREHOLE LOCATIONS PROVIDED BY YES, JULY 13, 2012
 - STAFF GAUGE LOCATIONS BASED ON HAND-HELD GPS UNIT CO-ORDINATES JULY 18, 2012 (NAD 83)
 - THERMISTOR (# 2304) AT METEOROLOGICAL STATION IS NOT SHOWN



CLIENT



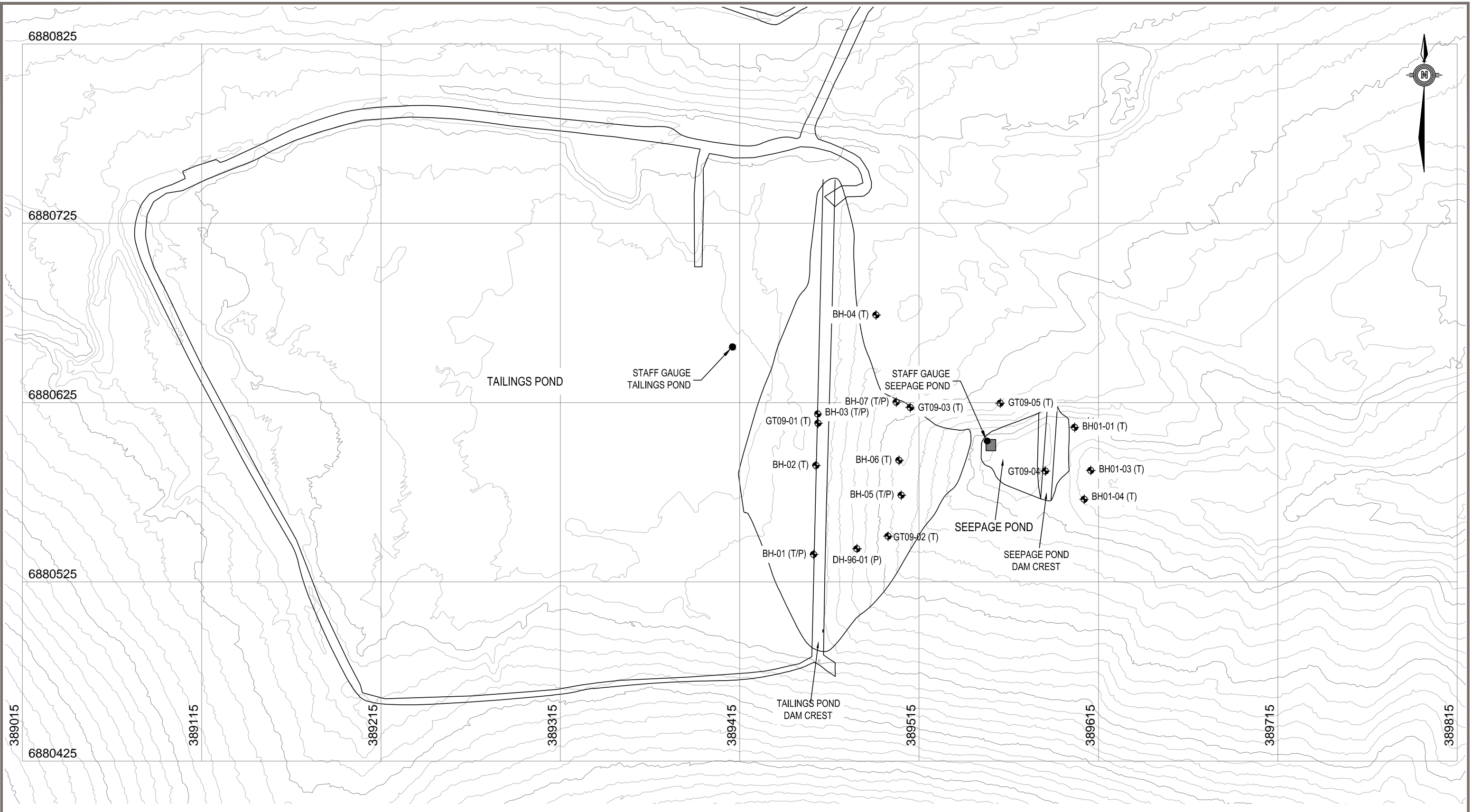
**INSTRUMENTATION ASSESSMENT
MOUNT NANSEN MINE SITE, YUKON**

**STAFF GAUGE, PIEZOMETER
AND THERMISTOR LOCATIONS**

PROJECT NO. W23101555	DWN CB	CKD GMR	REV 0
OFFICE EBA-WHSE	DATE July 30, 2012		

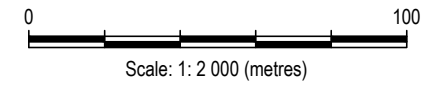
Figure 1

Q:\Whitehorse\Data\0201\Drawings\Mt Nansen\W23 101555 Staff Gauge, Piezometer and Thermistor Locations\W23 101555 Fig. 1-2, RD.dwg [FIGURE 2] November 07, 2012 - 9:56:57 am (BY: BUCHAN, CAMERON)



- LEGEND:**
- ◆ - INSTRUMENTATION LOCATION
 - (T) - INDICATES WORKING THERMISTOR (MAY 2012)
 - (P) - INDICATES WORKING PIEZOMETER (MAY 2012)
 - - STAFF GAUGE LOCATION
 - - SEEPAGE POND PUMP HOUSE

- NOTES :**
- BOREHOLE LOCATIONS PROVIDED BY YES, JULY 13, 2012
 - STAFF GAUGE LOCATIONS BASED ON HAND-HELD GPS UNIT CO-ORDINATES JULY 18, 2012 (NAD 83)
 - THERMISTOR CABLE (# 2304) AT METEOROLOGICAL STATION IS NOT SHOWN



CLIENT



INSTRUMENTATION ASSESSMENT MOUNT NANSEN MINE SITE, YUKON				
STAFF GAUGE, FUNCTIONING PIEZOMETER AND THERMISTOR LOCATIONS				
PROJECT NO. W23101555	DWN CB	CKD GMR	REV 0	Figure 2
OFFICE EBA-WHSE	DATE July 30, 2012			

APPENDIX A

PIEZOMETER AND THERMISTOR FIELD DATA SHEETS

MOUNT NANSEN PIEZOMETER FIELD DATA SHEET

DATE _____ TECHNICIAN _____

BOREHOLE NAME	PIEZOMETER NO.	READING (PSI)	BYPASS POSITION	COMMENTS
EBA BH01	22715		BYPASS OPEN	
			BYPASS CLOSED	
EBA BH03	19172		BYPASS OPEN	
			BYPASS CLOSED	
	22592		BYPASS OPEN	
			BYPASS CLOSED	
	22793		BYPASS OPEN	
			BYPASS CLOSED	
EBA BH05	22714		BYPASS OPEN	
			BYPASS CLOSED	
	22716		BYPASS OPEN	
			BYPASS CLOSED	
	22720		BYPASS OPEN	
			BYPASS CLOSED	
EBA BH07	22718		BYPASS OPEN	
			BYPASS CLOSED	
	22719		BYPASS OPEN	
			BYPASS CLOSED	
	22721		BYPASS OPEN	
			BYPASS CLOSED	
DH9601	20383		BYPASS OPEN	Formerly BH9601
			BYPASS CLOSED	

Seepage pond staff gauge reading (m) _____

Tailings pond staff gauge reading (m) _____ Gauge 1 or 2? _____

MOUNT NANSEN THERMISTOR FIELD DATA SHEET

DATE _____

TECHNICIAN _____

OUTSIDE AIR TEMPERATURE (°Celsius) _____

BOREHOLE NAME	THERMISTOR CABLE NO.	SWITCH POSITION / THERMISTOR BEAD READINGS (kilo-ohms)																COMMENTS
		1	2	3														
EBA BH01	1178																	
EBA BH02	1179	1	2	3	4	5	6	7	8									
EBA BH03	1180	1	2	3														
EBA BH04	1	1																
EBA BH05	1181	1	2	3														
EBA BH06	1182	1	2	3	4	5	6	7	8	9								
EBA BH07	1183	1	2	3														
EBA BH01-01	1385	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
EBA BH01-03	1383	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
EBA BH01-04	1384	1	2	3	4	5	6	7	8	9								
GT09-01	CABLE 1	1	2	3	4	5	6	7	8	9	10	11	12	13				
GT09-02	CABLE 5	1	2	3	4	5	6	7	8									
GT09-03	CABLE 4	1	2	3	4	5	6	7	8	9	10							
GT09-04	CABLE 3	1	2	3	4	5	6	7	8									
GT09-05	CABLE 2	1	2	3	4	5	6	7	8	9	10							

APPENDIX B

STAFF GAUGE INFORMATION

Suitable for measuring water depths in streams, irrigation channels, sewage plants, weirs or flumes, these staff gauges and separate figure plates are designed to be easily read.

Designed to the specifications of Water Survey of Canada, the gauges are manufactured from 18 gauge plate steel which is then porcelain coated to resist rust and discoloration. Slotted brass eyelets allow the gauge height to be adjusted during mounting.

Blue markings on a white background make for ease of readability at a distance. Each gauge has incremental markings in decimetres and centimetres, alternating from right to left over the length of the gauge. Each decimetre is prominently numbered, with smaller numbers indicating centimetre increments.

Individual figure plates are constructed in the same manner as the staff gauges. In addition there is a horizontal bar beneath the numeral to aid in mounting orientation.

Dimensions:
 Staff Gauge 1.0m long × 80mm wide
 Figure Plates 80mm long × 38mm wide

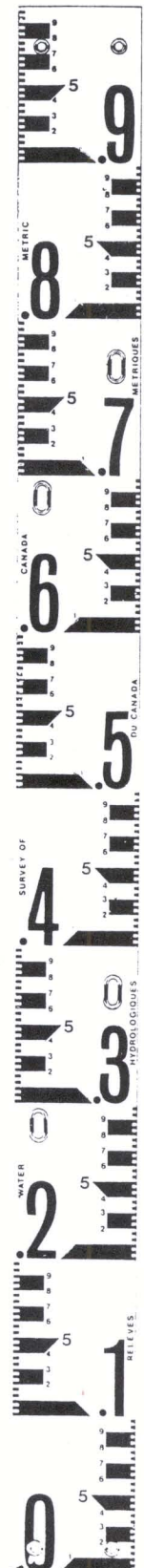
Ordering Information:

#209 - SG - 1 Staff Gauge, 1 Metre
 #209 - SG - N "X" Staff Gauge Number
 (Specify Number for "X")

239 East 6th Avenue
 Vancouver, BC
 V5T 1J7
 (604) 872-7894
 Fax (604) 872-0281

4210 Morris Drive
 Burlington, ON
 L7L 5L6
 (905) 333-5510
 Fax (905) 333-4976

8425 Devonshire
 Montreal, PQ
 H4P 2L1
 (514) 735-5267
 Fax (514) 735-3454



APPENDIX C

TAILINGS POND SURVEYED WATER ELEVATION METHOD

EBA PROJECT NO.W23101555

Mount Nansen: Obtaining a water surface elevation at the Tailings Pond when water does not surround the staff gauge.

There may be times during the year when water in the tailings pond does not surround the staff gauge that was installed in July 2012. When this occurs and a water surface elevation reading is required the procedure outlined below should be followed. The procedure assumes that the top of the staff gauge has been surveyed and has a known elevation.

Equipment:

- Survey rod
- Survey level and tripod
- Notebook and pencil
- Calculator
- Two people (one to take the readings and one to hold the survey rod)

Procedure:

1. Set up the tripod and level in a location where both the two by four timber that the staff gauge is attached to and the survey rod at the water's edge can be viewed clearly through the survey level.
2. Make sure the survey level is stable and level in all directions by checking the bubble on the instrument.
3. Create a table in your notebook similar to the one shown below.
4. The top of the staff gauge timber is the benchmark (known elevation).
5. Place the survey rod on top of the staff gauge timber and record a reading in metres.
6. Place the survey rod at the water's edge and record a reading in metres.
7. Repeat steps five and six to check numbers (aim for an accuracy of 10 mm or less).
8. The top of the timber with the staff gauge has a known elevation. Add the rod reading to the known staff gauge elevation to obtain the elevation of the level.
9. Subtract the water's edge reading from the elevation of the level to obtain a water surface elevation.

Date:		Time:	Technicians:	
	Rod on Staff Gauge Reading (m)	Elevation of Level (m). known elevation (m) plus rod reading	Rod at Water's Edge Reading (m)	Water Surface Elevation (m) Elevation of level less water's edge reading
Try 1				
Try 2				

APPENDIX D

EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.