2011 Annual Geotechnical Inspection
Doris North Project,
Hope Bay, Nunavut

Report Prepared for

Hope Bay Mining Ltd.

Report Prepared by

SRK Consulting (Canada) Inc

1CH008.046
March 2012

2011 Annual Geotechnical Inspection, Doris North Project, Hope Bay, Nunavut

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Executive Summary

The Doris North Project (Project) is a mining and milling undertaking of Hope Bay Mining Limited (HBML), a wholly owned subsidiary of Newmont Mining Company (NMC). The site is located in the Kitikmeot Region of Nunavut, about 170 km southwest of Cambridge Bay. The Project is licensed to conduct mining, milling and associated activities. Construction of the Project started in 2007, and is expected to continue through to 2013. Mine development started in the summer of 2010; however, ore processing is not scheduled until 2013 at the earliest. In addition to supporting ongoing construction activities, the site is currently used to carry out regional exploration.

Site operations are currently conducted under a Type “A” Nunavut Water Board (NWB) License 2AM-DOH0713 (the License), dated September 19, 2007, which entitles HBML (the Licensee) to use water and dispose of waste associated with their operations. HBML contracted SRK Consulting (Canada) Inc. (SRK) to conduct the annual geotechnical site inspection of the Doris North Project in accordance with stipulated License conditions. This investigation was carried out during the week of July 25 – 29, 2011.

Table A below provides a summary of the inspection components and the primary recommendations stemming from the inspection. There were no issues that require urgent and immediate action, and for many of the issues highlighted, HBML site staff had already stated implementation of mitigation measures at the time of the inspection. It should also be noted that since the site is currently under construction many areas will be remediated as part of the current planned construction activities.

Table A: Summary of Inspection Items and Associated Inspection Recommendations

Inspection Item	2010 Recommendations	2011 Recommendations
Thermistors	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site • Continue to collect quarterly thermistor data as a minimum (August, November, February and May) • Consider installing data loggers for select remote thermistors to ease the burden of frequent manual data downloads	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site • Continue to collect quarterly thermistor data as a minimum (August, November, February and May) • Consider installing data loggers for select remote thermistors to ease the burden of frequent manual data downloads
Old Beach Laydown Area	• Relocate the last two explosives magazines from the tundra vegetation onto the beach	• Relocate the last two explosives magazines from the tundra vegetation onto the beach • Remove any remaining debris

Inspection Item	2010 Recommendations	2011 Recommendations
Roberts Bay Jetty	• Continue to collect quarterly thermistor data as a minimum (August, November, February and May) • Conduct annual survey of the jetty to allow for actual measurement of ongoing settlement • Remind operational staff annually about the operational limitations of the jetty	• Continue to collect quarterly thermistor data as a minimum (August, November, February and May) • Conduct annual survey of the jetty to allow for actual measurement of ongoing settlement • Remind operational staff annually about the operational limitations of the jetty
Shoreline Laydown Area	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
5ML Roberts Bay Tank Farm	• Monitor overburden ponding immediately above the high wall and construct a new drainage channel in 2011 • Construct a nominal rock containment berm at the downstream toe of the overburden stockpile to mitigate uncontrolled silt release • Install permanent sumps within the secondary containment area to facilitate complete surface water drainage • Install a sump in the jet fuel and hydraulic oil storage area, or re-grade the area to allow free draining off the pad • Install settlement beacons along the fuel transfer station and sections of the secondary containment facility not constructed on bedrock. Monitor the beacons quarterly • Confirm that the secondary containment facility has sufficient storage capacity to allow storage of jet fuel drums inside the containment area	• Monitor overburden ponding immediately above the high wall and construct a new drainage channel in 2012 • Install permanent sumps within the secondary containment area to facilitate complete surface water drainage • Install settlement beacons along the fuel transfer station and sections of the secondary containment facility not constructed on bedrock. Monitor the beacons quarterly
20ML Roberts Bay Tank Farm	• n/a	• No action required

Inspection Item	2010 Recommendations	2011 Recommendations
Roberts Bay Laydown Area	• Ensure that all equipment and supplies are stored completely on the laydown pad footprint • Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor flow from drainage channels beneath pad. If flow stops, the blockage must be traced to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor flow from drainage channels beneath pad. If flow stops, the blockage must be traced to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion
Quarry #1 Overburden Dump	• n/a	• Monitor surface runoff and consider requirement for alternate sedimentation control measures • If the surface is used as a laydown area implement appropriate management protocols to account for sinkhole and differential settlement risk
Airstrip	• Monitor areas where rock was relocated from the tundra for signs of thermal erosion • Maintain practice of inspecting the runway toe line during freshet and after significant or prolonged rainfall events. Pump ponded water to prevent onset of thermal erosion • Conduct daily inspections of the airstrip shoulder to monitor the tension cracks • Relocate the jet fuel and diesel storage and associated secondary containment facilities at least 3 m from the apron shoulder	• Monitor areas where rock was relocated from the tundra for signs of thermal erosion • Maintain practice of inspecting the runway toe line during freshet and after significant or prolonged rainfall events. Pump ponded water to prevent onset of thermal erosion • Conduct daily inspections of the airstrip shoulder to monitor the tension cracks
All Weather Roads (Doris Site)	• Inspect road toe lines during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion	• Inspect road toe lines during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion • Implement a monitoring protocol and erect warning signs at the site of the slope failure until the buttress have been installed

Inspection Item	2010 Recommendations	2011 Recommendations
Doris Creek Bridge	• n/a	• Monitor thermistor strings in accordance with the recommendations set out in Section 3.2
Wash Bay/Explosives Mixing Plant	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
Upper and Lower Reagent Pads	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Ponded water should be pumped to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Ponded water should be pumped to prevent onset of thermal erosion
Quarry #2 and Crusher Area	• Continue to follow the Quarry Management Plan	• Continue to follow the Quarry Management Plan
Batch Plant Pad (previously Crusher Pad)	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
Landfarm	• n/a	• HBML to continue to follow the designated Landfarm Management Plan • Conduct regular visual inspections to monitor for signs of settlement
Sewage Treatment Plant Outfall	• Develop and implement a long-term solution for discharge of grey water to prevent vegetation dieback and subsequent thermal and physical erosion	• Develop and implement a long-term solution for discharge of grey water to prevent vegetation dieback and subsequent thermal and physical erosion. *An improved system is currently under construction*
Quarry # 2 Overburden Dump	• No action required	• No action required
Doris North Camp	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Construct a catch berm at the toe of the high wall and install appropriate signage and barricades to warn people and equipment of the danger • Develop and implement and interim water management plan to collect and discharge surface runoff to bridge the period until the sedimentation pond is constructed	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Construct a catch berm at the toe of the high wall and install appropriate signage and barricades to warn people and equipment of the danger • High wall stabilization measures designed for the tank farm and mill pad should be installed as planned. • Develop and implement a differential settlement monitoring protocol for heated buildings constructed directly onto the thermal rock fill pads

Inspection Item	2010 Recommendations	2011 Recommendations
7.5 ML Doris North Camp Tank Farm	• Revisit the secondary containment requirements for fuel tanks on site	• No action required
Other Site Wide Fuel Storage	• Revisit the secondary containment requirements for fuel tanks on site	• Revisit the secondary containment requirements for fuel tanks on site
Sedimentation and Pollution Control Ponds	• n/a	• Implement remedial measures as designed
Doris North Portal	• n/a	• No action required
Waste Rock Pile	• n/a	• HBML to continue to follow the designated Waste Rock Management Plan
Temporary Pond	• n/a	• Conduct daily visual inspections to check for obvious signs of distress
Doris Fresh Water Intake	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
Frozen Core Plant Pad	• n/a	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
North Dam	• n/a	• Complete construction of dam and installation of required instrumentation in accordance with the stipulated design • Implement monitoring program for dam instrumentation in accordance with recommendations by the Engineer-of-Record • Conduct thorough review of the dam performance monitoring data during the 2012 geotechnical inspection
Doris-Windy All Weather Road	• Inspect road toe lines during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion	• Inspect road toe lines during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion • Implement inspection protocol to monitor shoulder cracks and potholes

Inspection Item	2010 Recommendations	2011 Recommendations
Doris-Windy All Weather Road Stream Crossings	• The crossings were not constructed at the time of the inspection. No action required	• Install the required thermistor strings and commence monitoring in accordance with recommendations in Section 3.2
Quarry A	• Continue to follow the Quarry Management Plan	• Continue to follow the Quarry Management Plan
Quarry B	• Continue to follow the Quarry Management Plan	• Continue to follow the Quarry Management Plan
Quarry D	• Continue to follow the Quarry Management Plan	• Continue to follow the Quarry Management Plan

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1 Introduction

1.1 Inspection Requirement

The Doris North Project (Project) is a mining and milling undertaking of Hope Bay Mining Limited (HBML), a wholly owned subsidiary of Newmont Mining Company (NMC). The site is located in the Kitikmeot Region of Nunavut, about 170 km southwest of Cambridge Bay (with general coordinates of latitude 68°09'N and longitude 106°40'W, as shown in Figure 1).

The Project is licensed to conduct mining, milling and associated activities. HBML temporally delayed mine development pending re-evaluation of project economics and therefore much of the licensed infrastructure components have not been constructed, as illustrated in Figures 2 and 3. Construction of the Project started in 2007, and is expected to continue through to 2013. Mine development started in the summer of 2010; however, ore processing is not scheduled until 2013 at the earliest. In addition to supporting ongoing construction activities (Figure 4), the site is currently used to carry out regional exploration.

Site operations are currently conducted under a Type "A" Nunavut Water Board (NWB) License 2AM-DOH0713 (the License), dated September 19, 2007, which entitles HBML (the Licensee) to use water and dispose of waste associated with their operations. Part J, Items 18 and 19 of the License states the following:

"18. The Licensee shall ensure that a geotechnical inspection is carried out annually between July and September by a Geotechnical Engineer. The inspection shall be conducted in accordance with the Canadian Dam Safety Guidelines where applicable and take into account all major earthworks, including the following:

- *a. North and South Dams;*
- *b. Geotechnical instrumentation and associated monitoring data;*
- *c. Tailings Impoundment Area shoreline and erosion strip monitoring results;*
- *d. Emergency Dump Catch Basins;*
- *e. All weather access roads;*
- *f. Roberts Bay Jetty;*
- *g. Landfill;*
- *h. Landfarm;*
- *i. Fuel Storage and Containment Facilities at the Plant site and Roberts Bay site;*
- *j. Sedimentation Pond;*
- *k. Pollution control Pond;*
- *l. Sumps;*
- *m. Underground mine openings;*
- *n. Groundwater conditions underground; and*
- *o. Rock temperature measurements and groundwater inflow in the underground mine workings.*

19. The Licensee shall submit to the Board within sixty (60) days of completion of the geotechnical inspection, the Geotechnical Engineer's inspection report. The report shall include a cover letter from the Licensee outlining an implementation plan addressing each of the Geotechnical Engineer's recommendations."

In fulfillment of these regulatory requirements, Mr. Chris Hanks, Director for Environment and Social Responsibility (ESR) from HBML, requested that SRK Consulting (Canada) Inc. (SRK) conduct the 2011 geotechnical site inspection. This report provides a summary of the conditions observed and the resulting mitigation recommendations. This is the third formal annual geotechnical inspection carried out for this site in fulfillment of the stipulated Water Licence Condition. Inspections completed in 2009 and 2010 were also completed by SRK (SRK 2009e, SRK 2011a).

A 10 km all-weather road linking the Doris Camp and the Windy Camp is under construction. This road does not fall under the Doris North Water Licence; however, the water management plans for the three rock quarries along the road is administered through the NWB. HBML therefore requested that the geotechnical inspection include the all-weather road.

It should be noted that most of the site is still under construction, and as a result, many of the elements listed for inspection under the Water Licence has not yet been constructed and are therefore not reported on. This is illustrated in Figures 2 and 3.

1.2 Report Structure

Section 2 of this report provides a brief summary of the site history and physical conditions to provide context for the report content. Inspection conditions are described in Section 3 and an overall summary of recommendations is provided in Section 4. All elements of the site discussed in this report are presented on the enclosed figures, which includes a detailed photo log. Details pertaining to the site thermistors are presented in the Appendices. The annual Jetty inspection report submitted under separate cover to the Nunavut Impact Review Board (NIRB) is also included as an Appendix for completeness.

1.3 Disclaimer

This report and the opinions and conclusions contained herein ("Report") contains the expression of the professional opinion of SRK Consulting (Canada) Inc. ("SRK") as to the matters set out herein, subject to the terms and conditions of the agreement dated September 2008, HBML Professional Services Agreement (HBML.BOC.CM.PSA.003) (the "Agreement") between SRK and Hope Bay Mining Ltd. ("Hope Bay Mining"), the methodology, procedures and sampling techniques used, SRK's assumptions, and the circumstances and constraints under which Services under the Agreement were performed by SRK. This Report is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of Hope Bay Mining, whose remedies are limited to those set out in the Agreement. This Report is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context. In addition, this Report is based in part on information not within the control of SRK. Accordingly, use of such Report shall be at the user's sole risk. Such use by users other than Hope Bay Mining and its corporate affiliates shall constitute a release and agreement to defend and indemnify SRK from and against any liability (including but not limited to liability for special, indirect or consequential damages) in connection with such use. Such release from and indemnification against liability shall apply in contract, tort (including negligence of SRK whether active, passive, joint or concurrent), strict liability, or other theory of legal liability; provided, however, such release, limitation and indemnity provisions shall be effective to, and only to, the maximum extent, scope or amount allowable by law.

2 Site Conditions

2.1 Site History

A brief summary of the site history is listed in Table 1.

Table 1: Summary of Pertinent Site Ownership History

Period	Comment
1964	Sporadic exploration in the Hope Bay area begins, resulting in several gold and silver showings including Ida Point, Ida Bay and Roberts Lake.
1970	Roberts Bay Mining explores the area for about a decade up to 1980.
1977	Noranda begins exploring for volcanogenic massive sulphide deposits. They leave the belt in 1990. Prior to 1980, Roberts Bay Mining also explored the area.
1987	Abermin Corporation stake claims in the vicinity of Spyder- and Doris Lakes. After completing some exploration, they allow their claims to expire.
1988	BHP Minerals Canada Inc. (BHP) explores the southern portion of Hope Bay Volcanic Belt.
1991	BHP acquires a contiguous block of claims covering about 1,106 square kilometres.
1992	BHP commences exploration drilling at the Boston property.
1996 and 1997	BHP complete 2,300 m of underground development, underground exploration (drilling and sampling) and bulk sampling of the Boston deposit.
1999	BHP sells all its interests in the Hope Bay Belt to Hope Bay Joint Venture (HBJV), a 50:50 joint venture between Hope Bay Gold Corporation Inc. (formerly Cambiex Exploration Inc.), and Miramar Hope Bay Limited (MHBL), a wholly owned subsidiary of Miramar Mining Corporation (MMC).
2002	Hope Bay Gold Corporation Inc. formerly merges with MMC, and the Hope Bay site is operated under MHBL.
2003	MHBL completes a feasibility study to develop the Doris North Project as a small high grade underground mine.
2005	MHBL completes an Environmental Assessment (EA) for the Doris North Project.
2006	MHBL receives an approved and signed Project Certificate for the Doris North Project.
2007	The Doris North Project Water Licence is issued, and construction of the Doris North Project commences.
2008	Hope Bay Mining Limited (HBML), a wholly owned subsidiary of Newmont Mining Corporation (NMC) buys out all interests in the Hope Bay Belt from MMC. HBML announces a delay in the construction of the Doris North Project. Construction of select surface infrastructure continues, but mine development is not started.
2009 to 2011	Construction of select surface infrastructure elements of the Doris North Project continues. Mine development is started in the summer of 2010.

2.2 Site Infrastructure

The Doris North Project site is located on a narrow north-south trending stretch of land spanning approximately 8 km long and 3 km wide from Roberts Bay in the north to the southern end of Tail Lake in the south, as illustrated on Figures 2, 3 and 4. Outside of this area, immediately to the northwest along the Roberts Bay shoreline, there is a beach which has historically been used as a barge landing site and laydown area. This beach is not permanently connected to the Project, since its only link to the greater site is a seasonal ice-road constructed over the Roberts Bay sea ice.

At the north end of the Project there is a Jetty and shoreline laydown area. An all-weather road connects these facilities to the Roberts Bay laydown area and the two 5 Million Liter (ML) and 20 ML fuel tanks which have been constructed in the disused Quarry #1 and another bedrock outcrop zone respectively. The all-weather road continues south from this laydown area towards the camp, about 4 km further along. Part of this road has been widened for use as an all-weather airstrip. Between the camp and the airstrip, there is a spur road heading east towards a pad housing the wash bay and explosives mixing plant. Further along the road heading towards the camp, there is a large laydown area (*aka* the Upper and Lower Reagent pads) which is currently used as the operational base for the exploration drilling contractor, as well as general equipment and supply storage.

Beyond the Upper and Lower Reagent pads, there is a spur road servicing an active construction rock quarry (Quarry #2). This spur road also serves as an access to the construction crusher complex and stockpile area, as well as the Quarry #2 overburden pile.

The camp area, also known as Quarry #4, consists of multiple tiered foundation pads, cut partially into bedrock. The westernmost pad contains the two camps, sewage treatment plant, fire water tank and other miscellaneous camp services. The lower tier houses the temporary site power plant and warehousing and exploration support facilities.

The 7.5 ML camp tank farm is located immediately north of the camp, on bedrock outcrop and the pad immediately south of it will house the permanent power station. Immediately to the east, the mill pad has been blasted into a bedrock zone and this pad is currently hosting the lined Temporary Pond. Moving further east the ore stockpile pad is located between the mill pad and the portal. Immediately downslope of these facilities are additional mine area laydown pads as well as the waste rock pile.

The all-weather road running along the south of the site (*aka* Float Plane Access Road) acts as the downstream walls of the Sedimentation and Pollution Control Ponds, facilitating proper site water management. This road links the camp area to Doris Lake, where the fresh water intake is located for the camp potable water supply.

The all-weather Secondary Road (*aka* Tail Lake Access Road) junctions off the Float Plane Access Road along the western shore of Doris Lake before crossing Doris Creek and on to the Frozen Core Plant pad and the North Dam.

A helicopter support base is located due south of the camp, at the junction from where the 10 km long Doris-Windy all-weather road starts. This road meanders due south along high ground, passing by three construction quarries as illustrated in Figure 3.

2.3 Climate

The project area has a low arctic eco-climate with a mean annual temperature of -12°C with winter (October to May) and summer (June to September) mean daily temperature ranges of -50°C to +11°C and -14°C to +30°C, respectively. The mean annual precipitation is about 207 mm, with just over one third of that falling as snow. Significant and persistent site winds, results in substantial snow redistribution throughout the season, which often leads to protected slopes having almost year round snow cover. The annual lake evaporation (typically occurring between June and September) is estimated at about 220 mm.

2.4 Regional Geology

During the Quaternary period, the region was subjected to multiple glaciations. The northwestern sector of the vast Laurentide Ice Sheet covered the area during each glaciation, and the present day landscape provides clear evidence of the most recent (Late Wisconsin) glaciation. Striations, orientation of eskers, grooves and drumlins indicate that the predominant glacial ice movement was north-northwest (EBA 1996).

The ice disappeared about 8,800 years ago leaving a blanket of basal till. The sea level was about 200 m higher than present immediately following de-glaciation. At that time, the project area was submerged and the edge of the ice sheet abutted the open sea. Melt water streams from the ice carried fine grained sediments towards the sea, resulting in the accumulation of marine sediments on top of the till, with the greatest accumulation in deeper water zones, which now form the valley bottoms (EBA 1996).

Isostatic rebound after de-glaciation resulted in emergent landforms, and during this process all parts of the land were washed by waves. The easily erodible marine sediments, till and glacio-fluvial sands and gravels were subsequently reworked by waves, currents and sea ice. This has resulted in the present day outcrops where thin soil veneers were washed off the uplands and deposited in the valley bottoms. Since emergence, the natural effects of slope processes, frost action and permafrost have transformed the landscape to its present day shape (EBA 1996).

2.5 Permafrost and Geotechnical Conditions

There have been numerous subsurface geotechnical investigations in the area and SRK (2009a) and SRK (2011b) provides a comprehensive summary of this information. The area is characterized by extensive areas of bedrock outcrop zones transitioning to deep overburden soils at the contact zones. Geotechnical laboratory testing (moisture contents, Atterberg Limits, grain size distribution, pore water salinity, strength, permeability, mineralogy, thermal conductivity, bulk density, Proctor density and consolidation) on disturbed and intact samples collected during the various field campaigns confirms that overburden soils are comprised mainly of ice-rich, saline marine silt and clay ranging in thickness from 5 to 35 m. Isolated historic beach deposits containing small amounts of sand are present. Bedrock generally consists of competent basalt, and the interface zone between overburden and bedrock are typically associated with a relatively small rubble zone.

The area is completely within the cold continuous permafrost region of Canada, and site specific thermistor data, dating back to 2003 confirm the average surface ground temperature is about -9oC. The active layer is somewhat variable, but is typically about 1 m thick, and the depth of zero annual amplitude is about 10 m. Based on data from a deep thermistor installed in 2003, total permafrost depth is estimated to be about 570 m.

3 Inspection Conditions

3.1 General

Mr. Maritz Rykaart, P.Eng., Ph.D., a Principal Geotechnical Engineer with SRK, conducted the geotechnical inspection during the week of July 25 – 29, 2011. The detailed site inspection was carried out using a pickup truck with frequent stops for actual physical inspections, after conducting a reconnaissance fly-over of the site via helicopter. Mr. Dave Vokey and Ms. Katsky Venter, the HBML Environmental site representatives, did not accompany SRK on the inspection but was available for questioning.

Weather conditions during the inspection were cool but sunny with light winds, but no precipitation. A photo log of the inspection has been incorporated into the figures accompanying this report.

3.2 Thermistors

Figures 3 and 5 presents location maps of all 70 Project area thermistors installed between 2002 and 2011, as well as proposed new installations. 30 of these strings are still active (Appendix A, D and E), 22 are inactive (Appendix B), four were not recorded in 2011 so their status is unknown (Appendix C) and 16 are proposed new installations. Appendix G provides a complete summary listing reconciling these strings to the Water License conditions. In addition to the listed thermistor strings, there is also a number of historic thermistor installations dating back to the 1990's (SRK 2009a); however, data from these cables are not reported in this document.

In the Project area, the bulk of the thermistors are less than 20 m deep, with the exception of five thermistors at an approximate depth of 50 m (SRK-38, SRK-39, SRK-40, SRK-42 and SRK-43), and three deeper thermistors (SRK-50 at 200m, 08TDD632 at 350 m and TDD-242 at 70 m).

Based on about five years of data from the thermistor in SRK-50, the geothermal gradient below a depth of 90 m is about 10.9°C/km, which in turn implies a depth of permafrost of about 570 m in the area of the drill-hole. Using one year of data from the thermistor in drill hole 08TDD632, the geothermal gradient below a depth of approximately 90 m is about 17.9°C/km, which in turn implies a depth of permafrost of about 435 m in the area of that drill-hole. Another deep string (about 70 m long) was installed in drill hole TDD-242 in 2000. Golder (2001) presents data from this string, but reports that this data is likely unreliable due to an unidentified malfunction, and has thus not been used in any assessments of the deep thermal gradient.

The numerous shallow thermistors (5 to 20 m deep), some with data spanning more than nine years, consistently show an active layer of about 1 m thick and a depth of zero annual amplitude of about 10 m. The surface permafrost temperature is consistently about -9^{o}C.

Two thermistors were installed through the jetty into submarine permafrost in 2009 (SRK 2009b). Data from these strings supports an observation that the submarine permafrost has similar trends to onshore conditions. See also Appendix F for a more complete discussion of this data.

A more comprehensive discussion of the North Dam thermistor strings are provided in Section 3.30 and data from the available stings are listed in Appendix D and E

There are no data loggers connected to any of the project thermistors. HBML ESR and survey staff collects manual readings at roughly monthly intervals. This data is forwarded to SRK, who maintains a database with the relevant information.

Recommendations:

1. Re-evaluate thermistor requirements taking into consideration the surface infrastructure elements currently on site. Where appropriate inactive thermistors should be inspected, and where practical they should be repaired and re-commissioned.
2. The thermistor monitoring frequency should be formalized. Ideally monthly readings should be targeted; however, site operational demand may not allow for this. As a minimum, quarterly readings should be taken, with the readings scheduled around the maximum thermal activity expected in the area, i.e., late August (maximum thaw depth), late November, late February (maximum frost), and late May. Please refer to Section 3.30 for specific monitoring requirements related to the North Dam.
3. Consideration should be given to installing data loggers on some of the remote thermistors to ease the burden of frequent manual data downloads.

3.3 Old Beach Laydown Area

Prior to construction of the Doris North Project jetty, barges resupplying the site were beached at a location along the western shore of Roberts Bay (see Figures 2 and 4). This area has sufficiently deep water to allow barges to be pushed up onto the shore for safe offloading. Once offloaded, supplies and equipment were stored on the beach until such time that there was sufficient sea-ice and snow to construct an ice road to allow transport of the supplies and equipment to their final destination on the belt.

HBML used this facility during early construction stages of the Project, and may continue to use this facility for the life of the project for offloading of heavier loads which exceed the design capacity of the Roberts Bay jetty.

During the 2007 to 2011 construction seasons, this site was primarily used for storage of construction explosives, in five (two added in 2009) self-contained Type-4 magazines. At the time of the inspection, these magazines were still located at this site (see Figure 4). During winter time, explosives are transported to their intended areas of use via an explosives truck on an ice road, and during the summer period, explosives are transported via helicopter.

The beach landing site is a large un-vegetated sandy area, and there have been no surface improvements to the site since it was first used in the 1990’s.

At the time of the inspection two explosives magazines were located on the perimeter of the beach area, partially on tundra vegetation, while the remaining three were on the un-vegetated beach area. Given the short growth season in the area, SRK recommends that these two magazines be relocated to avoid permanent vegetation damage, which may lead to permafrost degradation.

There is a small pile of debris on the site consisting of pallets and empty super-sacks which was not present during the 2010 inspection. The beach is covered in wheel tracks; however, given the sandy nature of the beach, and the fact that there have been no signs of physical and/or thermal erosion, there are no concerns associated with these ruts.

Recommendations:

1. Relocate two explosives magazines to an area where it is on the sandy beach as opposed to partially on the tundra vegetation.
2. Remove any remaining debris.

3.4 Roberts Bay Jetty

The jetty was constructed in the summer of 2007, and was put in use for the first time in August 2007. It is used as a berthing facility from which to offload barges during the annual resupply sealift. This jetty is designed to replace the use of the old beach laydown area for normal resupply operations of the Project.

Foundation conditions beneath the jetty are very weak, and as a result the jetty is subject to extensive consolidation settlement (SRK 2004, 2005a, b, 2006). This settlement was expected, and to facilitate more controlled settlement, the rock fill structure was underlain by a double layer of geogrid placed directly onto the seabed. The jetty was originally designed to extend a total length of 103 m from the shoreline, such that the barges could berth in 5 m deep water; however, during construction, and due to very weak foundation conditions in the deep water, the front section of the jetty slumped. The design was subsequently modified to allow berthing in shallower water (about 2 m deep), which resulted in a slightly shorter overall jetty length (SRK 2009c, d).

Extensive settlement monitoring of the berthing face of the jetty was undertaken in 2007, and by the summer of 2008, the jetty was observed to have settled about 0.5 m, in accordance with original design expectations (SRK 2005a). Subsequently the jetty was raised in the summer of 2008 to ready the facility for the 2008 sealift. No further settlement monitoring was undertaken after this, and no further raising of the jetty was required prior to the 2009 sealift. Further levelling and raising of the jetty was done prior to the 2010 sealift; however, no surveys were available to confirm how much settlement had occurred. Observational information suggests that since the last repairs have been made the settlement had likely reached steady state.

A significant portion of the jetty has been constructed on submarine permafrost, and in accordance with a Water Licence stipulation, HBML installed two thermistors to confirm the presence of this condition. These thermistors were installed by HBML in March 2009 under supervision of SRK (SRK 2009b), and the data was reported in Section 3.2.

The 2011 geotechnical inspection of this structure revealed no cause for concern (Figure 6). There were no obvious signs of distress anywhere on the structure, and based on these observations, supported by verbal descriptions from site staff, settlement appears to have reached steady state. The SRK inspector has inspected the jetty annually since construction, and no visual differences could be observed since the 2010 inspection, other than the fact that the facility was raised and levelled. SRK imposed strict design and operational limitations on the use of the jetty due to the weak foundation conditions (SRK 2005a, 2009c, d), and based on observations, supported by staff interviews, HBML are following these recommendations carefully.

A more comprehensive stand-alone summary of the jetty inspection is included as Appendix H as it was submitted to the NIRB in November 2011.

Recommendations:

1. An annual survey of the jetty should be carried out at the same time the bathymetric survey around the jetty is carried out. This would allow for actual measurement of ongoing settlement.
2. Operational staff responsible for the operation and maintenance of the jetty should be reminded annually of the operational limitations of the jetty imposed by its design. Excessive loading may result in catastrophic failure.
3. Continue monitoring the jetty thermistors in accordance with the protocols stipulated in Section 3.2.

3.5 Shoreline Laydown Area

A small laydown area has been constructed adjacent to the jetty. This area was initially used for the construction office facilities, but is currently used to stage equipment, supplies and garbage which will be backhauled via the annual sealift return barges (see Figure 6). The area consists of one large triangle shaped pad, connected via a short all-weather road to the construction phase helipad (now used as laydown area), and a short spur road further west (intended to join up with a mooring bollard, but that was not constructed). All these elements are thermal rock fill pads between 1 and 2 m thick placed directly on the tundra. The main laydown pad was constructed in the winter of 2006/2007 to final design grade; however, the road spurs were only constructed as tote roads at that time. The roads were completed to design grade, and the helipad constructed during the summer of 2007. The access road between the jetty and the Roberts Bay laydown area was widened during the 2010 construction season to facilitate barge off-loading activities.

Although this seasonal construction technique is not desirable, visual inspection show no sign of permafrost degradation, or undue settlement of any of the shoreline laydown area pads. Some natural surface overland flow is blocked by the shoreline laydown area pad, and no culverts or rock drains have been installed. There are however no signs of ponding upstream of the pads, suggesting that the run-of-quarry fill used in pad construction is sufficiently coarse to not impede drainage.

Recommendations:

1. Conduct visual inspections upstream of the pad during freshet and immediately following significant or prolonged rainfall events. If ponding is observed, the water must be pumped out to prevent the onset of thermal erosion.

3.6 5 ML Roberts Bay Tank Farm

Primary project fuel storage is in three on-site locations and the purpose built single 5 ML steel tank located in the disused Quarry #1 at Roberts Bay (Figure 7) is one of these facilities. The steel tank is placed in an engineered secondary containment facility designed and constructed by SNC Lavalin

Engineers and Contractors (SLEC) in 2008. Secondary containment is provided with a double-lined system consisting of an HDPE liner overlying a geosynthetic clay liner. This liner system is protected with a gravel topping. Appropriate quality control and quality assurance were carried out during construction of the secondary containment facility (SRK 2009c, d).

The tank sits on a competent bedrock foundation, but the eastern section of the secondary containment and the fuel transfer station sit on engineered fill (compacted quarry rock) overlying a permafrost overburden foundation. Rock high walls are present along about 30% of the perimeter of the secondary containment. These high walls have been scaled and there are no concerns about their general condition.

Immediately north of the secondary containment area, a large deep pocket of frozen overburden soil was encountered overlying the quarry rock. During quarry development much of this overburden was relocated to a stockpile northeast of the tank farm (Quarry #1 Overburden Dump, see Figure 8); however, this has resulted in areas of ponding above the north high wall of the secondary containment area. To alleviate any risk of overtopping and spilling of water into the secondary containment area, a drainage channel was constructed to convey this water away from the high wall towards the tundra east of the quarry. Thaw settlement of this drainage channel has occurred, and as a result the amount of ponding has increased. While there does not appear to be any immediate risk of overtopping, the increased ponding will further promote thermal erosion of the overburden pockets and possibly water may find its way through cracks in the rock and flow underneath the liner. This could compromise the performance of the liner. SRK recommends that these ponds be closely monitored, and during the 2011 summer season a new drainage channel should be constructed.

At the time of the inspection there was no ponded water, but watermarks confirmed that there were at least two separate areas, at opposite ends of the facility, where water does pond within the secondary containment facility. Since these are the obvious low spots, consideration should be given to installing sumps which would allow for pumping out any standing water. Whilst the presence of this water should not impact the integrity of the facility, it is good practice to ensure that it is well drained at all times.

Since the fuel transfer station and part of the secondary containment are only partially constructed on bedrock, the area should be carefully monitored for any signs of settlement. It is recommended that permanent settlement beacons be installed in key areas to facilitate such monitoring.

During the geotechnical inspection it was noted that significant quantities of jet fuel in drums were stored within the secondary containment facility, both on pallets and in sea cans. At the time of the inspection HBML was in discussion with Environment Canada regarding the acceptability of this method of storage, following which HBML removed all sea cans from the storage area.

HBML reviewed as-built data for the secondary containment in 2011 and concluded that the required capacity to allow the fuel tank to be filled to capacity was not met. Subsequently the fuel level in the tank was lowered to ensure compliance with appropriate regulations. At the time of the inspection HBML was evaluating options for remediating this deficiency.

Recommendations:

1. Ponding in the overburden immediately above the north high wall of the secondary containment facility should be monitored and a new drainage channel should be constructed.
2. Permanent sumps should be installed within the secondary containment area to facilitate complete draining of captured surface water.
3. Consider installation of settlement beacons along the fuel transfer station and on sections of the secondary containment facility not constructed on bedrock.

3.7 20 ML Roberts Bay Tank Farm

A 20 ML tank farm was under construction at Roberts Bay at the time of the inspection (Figure 7). The facility is constructed on a rock foundation which was created through drilling and blasting of a rock outcrop due south of the Roberts Bay laydown area. The high wall created is up to 17 m in height and has one catch bench. The high wall had been scaled and was generally in good condition; however; design drawings for permanent high wall stabilization has been developed and is scheduled for installation in 2012.

Recommendations:

1. No action required.

3.8 Roberts Bay Laydown Area

The laydown area at Roberts Bay (Figure 8) is a thermal rock fill pad approximately 1 to 2 m thick, placed directly on the tundra. The pad essentially follows the natural topography in the area; however, there are some levelling tiers included. This laydown pad is intended to serve as the staging area for receipt of supplies and equipment from the annual sealift. Currently this site is also used to house the workshop and warehousing facilities (including power generation) of the site services contractor, the site and contractor construction fleet and spares, the primary camp incinerator, and other general warehousing in the form of converted sea cans.

The incinerator has been installed within a fully lined facility (HDPE liner), and all other fuel storage on the pad is in double-lined tanks, placed within secondary lined fuel containment berms.

The laydown pad shows no obvious signs of distress in the form of thaw settlement, and there was no evidence of ponding water on the pad. The southeastern section of the pad was constructed over a couple of drainage channels which used to direct overland surface runoff towards Roberts Bay. There was no special care taken to place rock drains over there areas; however, a reconnaissance investigation along the perimeter toe of the pad showed no signs of standing or ponding water, suggesting that the pad is coarse enough to allow subsurface drainage. This observation is also supported by the fact that where the drainage channels emerge from the pad, water was visibly flowing unimpeded from the pad. Within this general area, a large quantity of quarry rock was temporarily stored on the tundra, but this has subsequently been relocated. The contractor took great care to not damage the tundra whilst removing the rock; however, the net effect is that there is a thin veneer of gravel covering the tundra vegetation. This will affect the thermal response and most likely result in a localized increase in the active layer thickness. Significant long-term thermal erosion is not expected; however, these areas should be monitored.

Recommendations:

1. The perimeter of the pad should be carefully inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed, it should be pumped out to prevent onset of thermal erosion.
2. At the time of the inspection the drainage channels which had been covered by placement of the laydown pad were flowing unimpeded. The flow in these channels should be monitored and if there are signs of reduced flow, remedial action to prevent the onset of thermal erosion should be taken.
3. The area to the east of the laydown area, where rock fill was removed from the tundra should be monitored for signs of thermal erosion.

3.9 Quarry #1 Overburden Dump

A temporary overburden dump was constructed north of Quarry #1 during its initial development; however, there was no sedimentation control in place at the time. A sedimentation control berm was subsequently constructed in 2011 and overburden, organics, snow and ice and oversize material from the quarry development of the 20 ML tank farm was deposited in this Overburden Dump as shown in Figure 8. Poor dumping practices resulted in zero separation between the sedimentation control berm and the toe of the overburden dump and therefore surface runoff can flow unimpeded directly onto the tundra.

Following completion of dumping the surface of the pile was levelled and covered with a layer of surfacing material to allow the pile to be used as general laydown area. The surface is however riddled with large sinkholes which are simply a function of the fact that the pile contains large voids and the fine grained surfacing material is falling though as the pile undergoes settlement and snow and ice lenses melt. Should this area be used as laydown area careful monitoring of these potholes will be required with regular maintenance. It is also possible that equipment or supplies stored on this pile could be damaged if potholes develop under it.

Recommendations:

1. Surface runoff can flow unimpeded directly onto the tundra since there is no separation between the overburden toe and the sedimentation control berm. The coarse make-up of the pile makes surface runoff unlikely but it should be monitored and if runoff is observed alternate sedimentation control measures must be implemented.
2. If the surface is used as a laydown area appropriate management protocols must be put in place taking into consideration the propensity for sinkhole development and overall differential settlement.

3.10 Airstrip

The all-weather airstrip (runway) is 900 m long and 23 m wide and is a 2 m thick thermal rock fill pad constructed directly on the tundra (Figure 9). At each end of the runway there is an apron which measures about 80 m x 50 m. The base course of the airstrip consists of run-of quarry material, followed by a layer of 2-inch crush. The surfacing material is a ¾-inch gravel topping layer. The north end of the airstrip, up to the first drainage crossing was constructed in 2007, and the remainder was completed in 2008. An airstrip expansion was under construction at the time of the inspection which would increase the airstrip length to 1,900 m and its width to 45 m. The north airstrip apron extension was also under construction.

This airstrip doubles as the main access road between Roberts Bay and the Doris North Camp, and traffic control is managed via access control booms at each end of the runway. A permanent aircraft control tower is located on the north apron, complete with a portable wash station and power supply. Fuel for the generator is stored in a double walled fuel tank housed in a portable secondary containment berm. Drummed jet fuel is also housed in a portable secondary containment berm. Both of these facilities are located right on the shoulder of the apron.

The airstrip is equipped with permanent runway lights (power supplied by the generator at the control tower), Global Positioning System (GPS) approach instrumentation, and a standard wind sock. During installation of the runway lighting and windsock, temporary rock fill roads were pushed out onto the tundra. During the removal of these roads, care was taken not to damage the tundra; however, that meant that a thin veneer of gravel was left behind. This will likely affect the thermal response of the active layer and these areas should be monitored for signs of thermal erosion.

There are two ephemeral drainage channels passing under the airstrip, and at each of these locations rock drains were installed to allow unimpeded flow of water. At the location of the two rock drains, flow appears to be unimpeded, suggesting that they are functioning as intended.

The airstrip required a significant amount of maintenance during since its completion in 2008, which according to the staff was mostly as a result of frequent construction traffic passing over the runway. Some of the maintenance can also be ascribed to ongoing settlement. The settlement is to be expected, since the airstrip was not completely constructed to design grade during the winter, and as such, there was not complete frost in the foundation which would result in consolidation settlement of the active layer. There were tension cracks along the edge of the runway present at the time of the inspection, which supports the observation that minor settlement is occurring; however, the manifestation of these cracks are also partially as a result of the over-steepened shoulders. Based on site feedback the level of maintenance has decreased in 2011, suggesting a steady state condition is being approached.

Although no water was present during the inspection, there was clear evidence of significant ponding of water against the airstrip, which would result in thermal erosion which in turn would lead to increased runway settlement. It is however understood that there is a management protocol in place whereby ponding is pumped out, and therefore this is likely not a significant contributing factor to runway settlement.

Recommendations:

1. Conduct daily inspections of the airstrip shoulder to monitor the tension cracks.
2. Areas where temporary roads were removed leaving behind a veneer of gravel should be monitored for signs of thermal erosion.
3. Maintain the practice of inspecting the runway during freshet and after significant and prolonged rainfall events for ponding water and pumping it out.

3.11 All-Weather Roads (Doris Site)

The following all-weather roads have been constructed on site, as illustrated in Figures 2 and 10:

- 120 m long, 8.3 m wide single lane link between Quarry #1 Overburden Dump and shoreline in support of the fuel offloading barges;
- 250 m long, 10 m wide single lane link between the jetty and Roberts Bay laydown area;
- 600 m long, 8.3 m wide single lane link between Roberts Bay laydown area and the north airstrip apron;
- 2.6 km long, 8.3 m wide single lane link between the south airstrip apron and Doris Camp (aka Primary Road);
- 75 m long, 8.3 m wide single lane spur from the main camp road to the wash bay;
- 300 m long, 8.3 m wide single lane spur from main camp road to Quarry #2;
- 870 m long, 8.3 m wide single lane link between Doris Camp and Doris Lake (aka Float Plane Access Road);
- 1,570 m long, 8.3 m wide single lane link between Doris Camp and North Dam and Frozen Core Plant pad called the Secondary Road (*aka* Tail Lake Access Road); and
- 2m long 8.3 m wide single lane link between the Frozen Core Plant pad and the Tail Lake fish-out pad.

The roads are above grade thermal rock fill pads constructed directly on the tundra. Road fill thickness is variable between 1 m and in some places up to 3 m. The roads have been constructed with run-of -quarry material with a surfacing layer of 2-inch crush. All roads are single lane roads with turnouts. There are no culverts or rock drains under the roads to allow drainage of overland surface runoff flow. Visual inspection revealed that there are only a few isolated areas where ponding exist along the toe of the road, suggesting that the fill material is generally sufficiently coarse to not impede flow. Where ponding does occur, it appears to be associated with areas of the tundra where construction damage occurred. There were however no signs of thermal erosion, but these ponded areas should be monitored and pumped out during freshet and after significant or prolonged rainfall events.

As per the Mines Act, road turnouts were constructed every four truck-lengths to facilitate road construction. Many of these have been picked up, and since care was taken not to damage the tundra, a thin veneer of gravel remains present at these locations. This gravel will change the thermal response of the underlying soils and these areas should be monitored for signs of thermal erosion.

A surficial slope failure occurred in August 2010 during construction of the Secondary Road at approximately chainage 0+550 (Figure 17). At the time construction in this area was stopped and a temporary bypass was constructed. The ground was allowed to freeze during the subsequent winter season and road construction commenced completing this section of road in April 2011. SRK recommended that a buttress be constructed at the same time to ensure that the failure would not get remobilized. This was not yet constructed at the time of the 2011 inspection; however, no further movement in the road shoulder was observed in 2011.

Recommendations:

1. The road toe line should be inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed, it should be pumped out to prevent onset of thermal erosion.
2. Areas where road turnouts were removed leaving behind a veneer of gravel should be monitored for signs of thermal erosion.
3. The buttress recommended for the Secondary Road should be constructed, and until such time as the buttress is constructed a visual monitoring system should be put in place and warning signs posted along the section in question.

3.12 Doris Creek Bridge

The Secondary Road crosses Doris Creek via a single span prefabricated bridge constructed on two thermal pad abutments. The bridge was installed in 2010. Two thermistor cables was installed in 2011 (one at each abutment) to monitor the integrity of permafrost conditions. Visual inspection revealed no issues of concern.

Recommendations:

1. Monitor thermistor strings in accordance with the recommendations set out in Section 3.2.

3.13 Wash Bay/Explosives Mixing Plant

The wash bay pad houses two modular buildings, some sea cans as well as a double walled steel fuel tank within a secondary lined containment area (Figure 9). One of the buildings contains mixing tanks for brine to support exploration drilling activities. The pad is a thermal rock fill pad about 1 m thick. Visual inspection showed no signs of ponding at the toe of the pad.

Recommendations:

1. The pad toe line should be inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed, it should be pumped out to prevent onset of thermal erosion.

3.14 Upper and Lower Reagent Pads

Between the airstrip and Doris North Camp two large laydown areas have been constructed (Figure 10). These areas, which are at two different elevations, are called the Upper and Lower Reagent pads. The lower pad is used as the primary sea can storage and warehousing area. The Upper Reagent pad is used as a general laydown yard for equipment and construction supplies as well as the workshop and warehousing facilities for the exploration drilling contractor. These pads was constructed to cover mitigate an area of permafrost degradation which was inadvertently caused as part of the 2008 construction activities. The pads range between 1 and 3 m thick and there are no concerns associated with them based on the visual inspection.

Recommendations:

1. The pad toe line should be inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed it should be pumped out to prevent onset of thermal erosion.

3.15 Quarry #2 and Crusher Area

At the time of the inspection Quarry #2 was active, and is continuously used as the primary source for construction materials. The quarry has been developed using two benches, each about 6 m high as illustrated in Figure 11. There were no signs of standing water on either of the quarry benches, and no evidence of overland surface runoff flowing uncontrolled onto the tundra. There are no significant natural water bodies near the quarry site and therefore no risk of an uncontrolled sediment release into a water body.

Prior to development of the quarry, a significant amount of overburden (frozen silt and clay) was stripped and stockpiled on the tundra in an area immediately west of the quarry. This overburden was relocated to an area north of the quarry as shown in Figure 11. At the time of the inspection this overburden material was spread out and levelled and is the landfarm site.

The construction crusher was relocated into a disused part of the quarry in late 2010 as sown in Figure 11. Multiple stockpiles of various crusher products are stockpiled in the quarry.

Recommendations:

1. HBML to continue to follow the designated Quarry Management Plan.

3.16 Batch Plant Pad (Previously Crusher Pad)

At the junction between the main road to the camp and the quarry spur road (Figure 2) a 1 m thick run-of quarry pad measuring about 125 m x 125 m has been constructed (Figure 11) linking up with the Lower Reagent pad. This thermal pad previously housed the construction crusher plant, crusher power and fuel supply as well as stockpiles of crushed rock; however, it now houses a prefabricated building which contains the concrete batch mixing plant. Fuel supply for the plant is a double walled steel tank placed in a lined and bermed secondary containment facility immediately outside the building. A stockpile of 6-inch crush product remains on part of the pad.

Visual inspection of the pad perimeter showed no signs of standing water, and given the fact that this pad has been constructed on the natural watershed divide, surface overland flow is limited.

Recommendations:

1. The pad toe line should be carefully inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed, it should be pumped out to prevent onset of thermal erosion.
2. A protocol needs to be in place so that water in the fuel tank secondary containment area is pumped out and managed in an appropriate manner.

3.17 Landfarm

A landfarm has been constructed immediately north of Quarry #2. The facility consists of three distinct cells; one for contaminated snow, one for contaminated soils and the last for hydrocarbon contaminated water. The facility is a fully lined facility designed to temporarily hold these contaminated materials rather than being a facility that can be used to remediate the materials. A Landfarm Management Plan has been prepared outlining its use.

The landfarm has been constructed on a levelled pad consisting of a random mix of overburden, organics, snow and ice and oversize material from early Quarry #2 development. To minimize the risk of differential settlement the landfarm foundation was designed to include a layer of woven geotextile; however, this facility should be monitored for signs of distress. The visual inspection did not show any cause for concern.

Recommendations:

1. HBML to continue to follow the designated Landfarm Management Plan.
2. Conduct regular visual inspections to monitor for signs of settlement.

3.18 Sewage Treatment Plant Outfall

The grey water (sewage treatment effluent) pipeline is discharged directly onto the tundra immediately south of the crusher pad (Figure 10). Visual inspection confirmed that there was significant ponding of water; and tundra vegetation dieback has started with associated erosion damage. This practice should not continue for an indefinite time and an alternate strategy should be implemented. SRK understands that an alternate diffuser system was under construction and was to be implemented in 2012.

Recommendations:

1. A long-term solution needs to be developed for discharge of grey water. If the practice of tundra discharge remains to be used, the discharge should be frequently moved to prevent vegetation dieback and subsequent thermal and physical erosion. An improved system is currently under construction.

3.19 Quarry #2 Overburden Dump

A permanent overburden dump has been constructed north of Quarry #2 as shown in Figures 10 and 11. Overburden stripped from Quarry # 2 and #4, and oversize quarry rock that is not suitable for construction is hauled to this location. Material is end dumped and then spread with a dozer. The overall dump construction consists of a series of cells, primarily to facilitate constructability. The material is therefore a random mix of organics, marine silts and clays and quarry rock. A sedimentation berm has been constructed downstream of the overburden dump to ensure that no sediment is released from the dump area. At the time of inspection there were isolated pockets of ponding within the dump area; however, there was no water in the vicinity of the sedimentation berm.

Recommendations:

1. No action required, other than to continue monitoring the condition of the sedimentation berm.

3.20 Doris North Camp Pads

The Doris North Camp area is also the designated Quarry #4 area as illustrated in Figures 12 and 13. The permanent camp has been constructed on a bedrock foundation which was achieved through a benched cut with a high wall at the north side of the camp. This pad is increased in size via a fill zone extended to the south placed directly on tundra. This pad is variable in thickness but generally at least 1 m thick. A lower fill pad (about 2 m lower than the upper pad) provides additional space for camp facilities.

The upper camp pad houses the camp, temporary power generation station, equipment storage shed, the sewage treatment plant, fire water tank and pump house and a muster station. The lower camp pad, which extends all the way to the location of the Sedimentation and Pollution Control ponds houses the temporary (construction) power station and fuel supply, joint geology/warehousing building, additional warehousing in the form of modified sea cans, as well as general miscellaneous equipment and supplies and core storage.

Immediately south of the lower camp pad is the helicopter base pad, which houses four helipads, a helicopter base station as well as other related support facilities. Towards the east, immediately below the portal are two pads that will serve as primary support for the mining activities. At the time of the inspection they contained the mine power house, the underground drilling contractor’s shop and warehousing facilities as well as general mining supplies.

Immediately northeast of the camp, a rock excavation was completed which now houses the primary 7.5 ML camp fuel tank farm. Immediately south of this facility the permanent power house of the site was under construction on a levelled rock fill pad. Between these facilities and the portal is another rock excavation which will form the foundation of the mill building. At the time of the inspection this area was occupied by a temporary lined pond used as part of the interim site water management plan.

Between the mill pad and the portal is an elevated ore storage pad and immediately below the mill pad is the waste rock pile. Downslope of the facilities at the natural collection point for the site is the Sedimentation and Pollution Control ponds.

All the pads in question range in thickness between at least 1 m and in some cases up to 6 m thick. All the pads have been designed as thermal pads to preserve the underlying permafrost. By design no permanent heated buildings are to be constructed directly onto these pads; however, at the time of the inspection the geotechnical core cutting building as well as the ERT and mine services workshops did not comply. These heat sources may lead to permafrost degradation which in turn would lead to foundation settlement. There are no immediate concerns; however HBML should closely monitor for signs of settlement and take appropriate remedial measures.

Visual inspection of the pad perimeters showed no signs of ponding water, and there was no ponding water visible anywhere on the pad surfaces. The high wall behind the camp has been scaled clean and a partial catch berm was constructed behind wooden cabins constructed immediately beneath the wall. It is however recommended that a catch berm be placed along at the base of the entire length of the high wall in case rocks loosen and fall from the highly fractured face. Furthermore, appropriate barricades and signage should be erected to keep people and equipment at a safe distance from the wall.

The high walls behind the tank farm and the mill pad were scaled clean and were generally in good conditions. Recommendations for permanent stabilization of these walls have been provided and at the time of the inspection construction of those remedial measures was scheduled for 2012.

Recommendations:

1. The pad toe line should be carefully inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed, it should be pumped out to prevent the onset of thermal erosion.
2. A catch berm should be constructed at the toe of the camp pad high wall and appropriate signage and barricades should be put in place to prevent people and equipment from coming to close to the high wall.
3. The high wall stabilization measures for the tank farm and mill pad high walls should be installed as planned.
4. A monitoring protocol must be put in place for any heated building constructed directly onto the thermal rock fill pads.

3.21 7.5 ML Doris North Camp Tank Farm

The primary camp fuel supply is contained within the 7.5 ML tank farm constructed on a blasted rock foundation immediately north of the camp. This facility was completed in 2010. At the time of the inspection there was no visible ponding, but there are clear signs of ponding which drains towards the engineered sump. This water is pumped from the facility in accordance with the site Water Management Plan.

The high wall behind the tank farm is in good condition; however long term stabilization measures which have been designed should be implemented as discussed in Section 3.20.

Recommendations:

1. No action required.

3.22 Other Site Wide Fuel Storage

A number of other double lined fuel tanks are scattered throughout the site. All of these tanks are placed in lined secondary containment; however, SRK is convinced that in most cases these secondary contain facilities are not adequately sized.

Recommendations:

1. Although secondary containment is provided under all other single tanks throughout the site, the capacity of this secondary containment is not adequate in accordance with standard Federal Regulations. HBML should re-evaluate their policy regarding this secondary containment and clearly stipulate what their containment requirements are.

3.23 Sedimentation and Pollution Control Ponds

All non-contact and contact water from the Doris North camp pads flows to the Sedimentation and Pollution Control ponds respectively (Figures 12 and 13). Both ponds have been designed with downstream liners keyed and frozen into the permafrost but without bottom liners. The ponds was constructed and commissioned in 2011. Both ponds leaked and the primary mode of leakage was water bypassing the liner keyed into the permafrost. This most likely cause of this was due to the late season construction of the ponds (May 2011) which meant that there was no time for the liner to freeze-back into the permafrost. A decision was subsequently made to reconstruct both ponds; the Sedimentation Control pond was to be completely lined and the Pollution Control pond would have its key trench deepened and reseated. In addition two downstream sumps would be constructed to allow collection of any water that does manage to bypass any of the reconstructed ponds.

Recommendations:

1. Implement remedial measures as designed.

3.24 Doris North Portal

Mine development started in 2010 and at the time of the inspection about 300 m of development had been completed and was ongoing. The high wall above the collar had been scaled and meshed in accordance with recommendations of a specialist. The collar had been properly supported in accordance with recommendations of a specialist.

Recommendations:

1. No action required.

3.25 Waste Rock Pile

Waste rock from mine development are brought up via the portal and dumped on the waste rock dump. A Waste Rock Management Plan (SRK 2010) outlines how waste is characterized, tested and how segregated placement is to be carried out. From discussions with site staff the appropriate protocols are being followed. Less than 25% of the available waste rock storage space was occupied at the time of the inspection.

Recommendations:

1. HBML to continue to follow the designated Waste Rock Management Plan.

3.26 Temporary Pond

A 6,000 m^3 total capacity lined Temporary Pond was constructed on the Mill Pad in early 2011 as part of the 2011 Interim Water Management Plan. The pond was constructed using compacted waste rock berms and a HDPE liner. The pond is founded on bedrock and the liner is bedded in ¾-inch gravel. At the time of the inspection the pond was at its full supply level (FSL), which is 300 mm below crest elevation. The pond has no spillway, so care must be taken to not operate the facility beyond its FSL. This pond will only be in use until such time as the North Dam is constructed and Tail Lake can be used as part of the site wide water management plan. This is scheduled for 2012.

The facility showed no signs of distress during the inspection. Given that this facility was constructed as a temporary emergency measure it was not subject to the same rigorous design and construction protocols as permanent facilities and therefore it should be carefully monitored.

Recommendations:

1. Daily visual inspections of the facility are required to check for obvious signs of distress.

3.27 Doris Fresh Water Intake

A small thermal pad has been constructed on the shoreline of Doris Lake to support the fresh water intake facilities which consist of a pump house, generator and fuel supply. The fuel tank is a double-walled steel tank within a portable secondary containment facility. A removable boat dock extends from the pad during the open water season.

Visual inspection of the pad toe showed no signs of ponding or thermal erosion.

Recommendations:

1. The pad toe line should be carefully inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed it should be pumped out to prevent the potential onset of thermal erosion.

3.28 Frozen Core Plant Pad

A 1 to 2 m thick thermal pad was constructed due north of the North Dam along the Secondary Road to support construction of the North Dam. The pad houses a prefabricated building housing the asphalt plant used for mixing the saturated core material used in dam construction. A large stockpile of frozen core material occupies the remaining space on the pad. Visual inspection of the pad toe showed no signs of ponding or thermal erosion.

Recommendations:

1. The pad toe line should be carefully inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed it should be pumped out to prevent the potential onset of thermal erosion.

3.29 North Dam

Tail Lake is the designated Tailings Containment Area (TCA) for the project. Tailings deposition will be sub-aqueous and therefore two water retaining dams have been designed as the primary containment method. Due to the complex foundation conditions both these dams have been designed as frozen core structures with a secondary upstream liner.

The dams have been designed to maintain “critical sections” of the core and the underlying saline permafrost foundation sufficiently cold and over a wide enough section to be an impermeable barrier to seepage. The critical section of the core is defined as the part of the core that is colder than -2^{o}C during impoundment under normal operating conditions, or colder than -1^{o}C during impoundment under upset conditions. The critical section of the saline permafrost foundation is defined as the portion of the saline permafrost layer that is colder than -8^{o}C under normal or upset conditions. The dams have been designed with a 25-year design life in mind, taking into account global warming and upset conditions.

Construction of the North Dam started in February 2011 and was scheduled to be completed in May 2011; however, unforeseen circumstances led to construction stopping partway through. As a result the partially constructed structure was covered with a 3 m thick temporary thermal cover of run-of-quarry rock until construction can be completed in 2012. Photos of the partially completed, but covered dam is shown in Figure 17.

The North Dam will be instrumented with a series of instrumentation which includes thermal monitoring (ground temperature cables *aka* thermistors), settlement beacons and slope indicators. When construction ceased in 2011 the only instrumentation installed was the 11 vertical ground temperature cables and five of the 13 horizontal ground temperature cables (see Appendix D and E). The data collected at the time of the inspection is not representative of the dam performance and are therefore not discussed at this time.

Visual inspection of the partially completed structure showed no signs of concern.

Recommendations:

1. Complete construction of the dam and installation of the required instrumentation in accordance with the stipulated design.
2. Implement a monitoring program for the dam instrumentation in accordance with recommendations by the Engineer-of-Record.
3. Conduct a thorough review of the dam performance monitoring data during the 2012 geotechnical inspection.

3.30 Doris-Windy All-Weather Road

The Doris-Windy road is a 10 km all-weather road that stretches from the Doris Camp, due south to the Windy Camp (Figure 14). The road is an 8.3 m wide single lane road with turnouts designed based on lines of sight. Construction of this road started during the winter of 2009/2010 and was completed in 2011.

The roads are above grade thermal rock fill pads constructed directly on the tundra. Road fill thickness is variable between 1 m to over 2 m. The roads have been constructed with run-of -quarry material with a surfacing layer of 2-inch crush. There are no culverts or rock drains under the road to allow drainage of overland surface runoff flow. Visual inspection revealed that there are only a few isolated areas where ponding exist along the toe of the road, suggesting that the fill material is generally sufficiently coarse to not impede flow. Where ponding does occur, it appears to be associated with areas of the tundra where construction damage occurred. There were however no signs of thermal erosion, but these ponded areas should be monitored and pumped out during freshet and after significant or prolonged rainfall events.

Some cracking along the shoulder of the road can be observed along sections of the road which is most likely as a result of settlement of the shoulders. A few potholes was also observed and these are most likely just due to the fact that the surfacing layer is infilling the larger voids of the underlying run-of-quarry material.

As per the Mines Act, road turnouts were constructed every four truck-lengths to facilitate road construction. Many of these have been picked up, and since care was taken not to damage the tundra, a thin veneer of gravel remains present at these locations. This gravel will change the thermal response of the underlying soils and these areas should be monitored for signs of thermal erosion.

Recommendations:

1. The road toe line should be inspected during freshet, and immediately following significant and prolonged rainfall events. If ponding is observed, it should be pumped out to prevent onset of thermal erosion.
2. Areas where road turnouts were removed leaving behind a veneer of gravel should be monitored for signs of thermal erosion.
3. An inspection protocol should be put in place to monitor the shoulder cracks and potholes. Normal maintenance procedures should however be sufficient to manage these issues.

3.31 Doris-Windy All-Weather Road Stream Crossings

There are four designated stream crossings along the Doris-Windy all-weather road (Figure 15). The first crossing was installed in 2010 and consists of an arch culvert. The culvert is founded on add-freeze piles. The inspection revealed no concerns.

The remaining crossings will have bridges with thermal pad abutments. Only the first was under construction during the inspection. Installation was completed after the inspection. The abutment integrity will be monitored using thermistor strings, but these have not yet been installed.

Recommendations:

1. No action required.

3.32 Doris-Windy All-Weather Road Quarries (A, B and D)

Three rock quarries have been designated and are used to construct the Doris-Windy road as illustrated in Figure 16. At the time of the inspection none of these quarries was in use; however, all three quarries may continue to be used at some time in future. Currently Quarry A is used as a temporary explosives storage area and it houses an access road and two Type 4 magazines.

There were no signs of standing water on either of the quarry benches, and no evidence of overland surface runoff flowing uncontrolled onto the tundra. There are no natural water bodies near any of the quarry sites and therefore no risk of an uncontrolled sediment release into a water body.

Recommendations:

1. HBML to continue to follow the designated Quarry Management Plan at each of these sites.

4 Summary of Recommendations

This report provides a performance assessment of the numerous foundation pads and infrastructure at the Doris North Project site. The findings are based on a site visit and walkover survey between July 25 - 29, 2011 and subsequent consultation with site staff and contractors. This is the third formal annual geotechnical inspection undertaken at the site. The site is still under active construction and therefore many of the remedial recommendations identified during this geotechnical investigation are likely to be addressed as part of ongoing construction.

Table 2 below provides a summary of the inspection components and the primary recommendations stemming from the inspection. There were no issues that require urgent and immediate action, and for many of the issues highlighted, HBML site staff had already started implementation of mitigation measures at the time of the inspection.

Table 2: Summary of Inspection Items and Associated Recommendations

Inspection Item	2010 Recommendations	2011 Recommendations
Thermistors	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site • Continue to collect quarterly thermistor data as a minimum (August, November, February and May) • Consider installing data loggers for select remote thermistors to ease the burden of frequent manual data downloads	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site • Continue to collect quarterly thermistor data as a minimum (August, November, February and May) • Consider installing data loggers for select remote thermistors to ease the burden of frequent manual data downloads
Old Beach Laydown Area	• Relocate the last two explosives magazines from the tundra vegetation onto the beach	• Relocate the last two explosives magazines from the tundra vegetation onto the beach • Remove any remaining debris
Roberts Bay Jetty	• Continue to collect quarterly thermistor data as a minimum (August, November, February and May) • Conduct annual survey of the jetty to allow for actual measurement of ongoing settlement • Remind operational staff annually about the operational limitations of the jetty	• Continue to collect quarterly thermistor data as a minimum (August, November, February and May) • Conduct annual survey of the jetty to allow for actual measurement of ongoing settlement • Remind operational staff annually about the operational limitations of the jetty
Shoreline Laydown Area	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion

Inspection Item	2010 Recommendations	2011 Recommendations
5ML Roberts Bay Tank Farm	• Monitor overburden ponding immediately above the high wall and construct a new drainage channel in 2011 • Construct a nominal rock containment berm at the downstream toe of the overburden stockpile to mitigate uncontrolled silt release • Install permanent sumps within the secondary containment area to facilitate complete surface water drainage • Install a sump in the jet fuel and hydraulic oil storage area, or re-grade the area to allow free draining off the pad • Install settlement beacons along the fuel transfer station and sections of the secondary containment facility not constructed on bedrock. Monitor the beacons quarterly • Confirm that the secondary containment facility has sufficient storage capacity to allow storage of jet fuel drums inside the containment area	• Monitor overburden ponding immediately above the high wall and construct a new drainage channel in 2012 • Install permanent sumps within the secondary containment area to facilitate complete surface water drainage • Install settlement beacons along the fuel transfer station and sections of the secondary containment facility not constructed on bedrock. Monitor the beacons quarterly
20ML Roberts Bay Tank Farm	• n/a	• No action required
Roberts Bay Laydown Area	• Ensure that all equipment and supplies are stored completely on the laydown pad footprint • Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor flow from drainage channels beneath pad. If flow stops, the blockage must be traced to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor flow from drainage channels beneath pad. If flow stops, the blockage must be traced to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion
Quarry #1 Overburden Dump	• n/a	• Monitor surface runoff and consider requirement for alternate sedimentation control measures • If the surface is used as a laydown area implement appropriate management protocols to account for sinkhole and differential settlement risk

Inspection Item	2010 Recommendations	2011 Recommendations
Airstrip	• Monitor areas where rock was relocated from the tundra for signs of thermal erosion • Maintain practice of inspecting the runway toe line during freshet and after significant or prolonged rainfall events. Pump ponded water to prevent onset of thermal erosion • Conduct daily inspections of the airstrip shoulder to monitor the tension cracks • Relocate the jet fuel and diesel storage and associated secondary containment facilities at least 3 m from the apron shoulder	• Monitor areas where rock was relocated from the tundra for signs of thermal erosion • Maintain practice of inspecting the runway toe line during freshet and after significant or prolonged rainfall events. Pump ponded water to prevent onset of thermal erosion • Conduct daily inspections of the airstrip shoulder to monitor the tension cracks
All Weather Roads (Doris Site)	• Inspect road toe lines during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion	• Inspect road toe lines during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion • Implement a monitoring protocol and erect warning signs at the site of the slope failure until the buttress have been installed
Doris Creek Bridge	• n/a	• Monitor thermistor strings in accordance with the recommendations set out in Section 3.2
Wash Bay/Explosives Mixing Plant	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
Upper and Lower Reagent Pads	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Ponded water should be pumped to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Ponded water should be pumped to prevent onset of thermal erosion
Quarry #2 and Crusher Area	• Continue to follow the Quarry Management Plan	• Continue to follow the Quarry Management Plan
Batch Plant Pad (previously Crusher Pad)	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion

Inspection Item	2010 Recommendations	2011 Recommendations
Landfarm	• n/a	• HBML to continue to follow the designated Landfarm Management Plan • Conduct regular visual inspections to monitor for signs of settlement
Sewage Treatment Plant Outfall	• Develop and implement a long-term solution for discharge of grey water to prevent vegetation dieback and subsequent thermal and physical erosion	• Develop and implement a long-term solution for discharge of grey water to prevent vegetation dieback and subsequent thermal and physical erosion. An improved system is currently under construction
Quarry # 2 Overburden Dump	• No action required	• No action required
Doris North Camp	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Construct a catch berm at the toe of the high wall and install appropriate signage and barricades to warn people and equipment of the danger • Develop and implement and interim water management plan to collect and discharge surface runoff to bridge the period until the sedimentation pond is constructed	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Construct a catch berm at the toe of the high wall and install appropriate signage and barricades to warn people and equipment of the danger • High wall stabilization measures designed for the tank farm and mill pad should be installed as planned. • Develop and implement a differential settlement monitoring protocol for heated buildings constructed directly onto the thermal rock fill pads
7.5 ML Doris North Camp Tank Farm	• Revisit the secondary containment requirements for fuel tanks on site	• No action required
Other Site Wide Fuel Storage	• Revisit the secondary containment requirements for fuel tanks on site	• Revisit the secondary containment requirements for fuel tanks on site
Sedimentation and Pollution Control Ponds	• n/a	• Implement remedial measures as designed
Doris North Portal	• n/a	• No action required
Waste Rock Pile	• n/a	• HBML to continue to follow the designated Waste Rock Management Plan
Temporary Pond	• n/a	• Conduct daily visual inspections to check for obvious signs of distress

Inspection Item	2010 Recommendations	2011 Recommendations
Doris Fresh Water Intake	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
Frozen Core Plant Pad	• n/a	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
North Dam	• n/a	• Complete construction of dam and installation of required instrumentation in accordance with the stipulated design • Implement monitoring program for dam instrumentation in accordance with recommendations by the Engineer-of-Record • Conduct thorough review of the dam performance monitoring data during the 2012 geotechnical inspection
Doris-Windy All Weather Road	• Inspect road toe lines during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion	• Inspect road toe lines during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Monitor areas where rock was relocated from the tundra for signs of thermal erosion • Implement inspection protocol to monitor shoulder cracks and potholes
Doris-Windy All Weather Road Stream Crossings	• The crossings were not constructed at the time of the inspection. No action required	• Install the required thermistor strings and commence monitoring in accordance with recommendations in Section 3.2
Quarry A	• Continue to follow the Quarry Management Plan	• Continue to follow the Quarry Management Plan
Quarry B	• Continue to follow the Quarry Management Plan	• Continue to follow the Quarry Management Plan
Quarry D	• Continue to follow the Quarry Management Plan	• Continue to follow the Quarry Management Plan

This report, **"2011 Annual Geotechnical Inspection, Doris North Project, Hope Bay, Nunavut"** has been prepared by SRK Consulting (Canada) Inc.

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Staff Consultant

Maritz Rykaart, P.Eng., Ph.D.
Practice Leader

5 References

EBA Engineering Consultants Ltd. 1996. *Boston Gold Project, Surficial Geology and Permafrost Features*. Report prepared for Rescan Environmental Services Ltd., Report No. 0101-96-12259. December.

Golder Associates Ltd. 2001. Report on Thermistor Data Review – Hope Bay Project. Letter report prepared for Miramar Mining Corporation, Project No. 012-1507, November 27.

SRK Consulting (Canada) Inc. 2004*. Phase I Foundation Investigation, Proposed Roberts Bay Jetty Location, Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Limited, Report No. 1CM014.002, April.

SRK Consulting (Canada) Inc. 2005a. *Preliminary Jetty Design: Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Limited, Report No. 1CM014.006, October.

SRK Consulting (Canada) Inc. 2005b. *Phase II Foundation Investigation, Proposed Roberts Bay Jetty Location, Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Limited, Report No. 1CM014.04-0110, May.

SRK Consulting (Canada) Inc. 2006*. Phase III Foundation Investigation, Proposed Roberts Bay Jetty Location, Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Limited, Report No. 1CM014.008-260, August.

SRK Consulting (Canada) Inc. 2009a. *Hope Bay Gold Project: Stage 2 Overburden Characterization Report, Hope Bay, Nunavut, Canada*. Report prepared for Hope Bay Mining Limited, Report No. 1CH008.002, September.

SRK Consulting (Canada) Inc. 2009b. *Hope Bay Project: Roberts Bay Jetty Thermistor Installation*. Memo prepared for Hope Bay Mining Limited, Project No. 1CH008.015.400, March 30.

SRK Consulting (Canada) Inc. 2009c. *Doris North Project: 2008 SRK Construction Support*. Letter Report prepared for Hope Bay Mining Limited, Report No. 1CH008.004, February 12.

SRK Consulting (Canada) Inc. 2009d. *Doris North Project: 2007 SRK Construction Support*. Letter Report prepared for Hope Bay Mining Limited, Report No. 1CH008.025, September 29.

SRK Consulting (Canada) Inc. 2009e. *2009 Annual Geotechnical Inspection, Doris North Project, Hope Bay, Nunavut*. Report prepared for Hope Bay Mining Limited, Report No. 1CH008.021, November.

SRK Consulting, 2010*. Hope Bay Project Doris North Waste Rock and Ore Management Plan*. Prepared for Hope Bay Mining Limited, Report no. 1CH008.029, December.

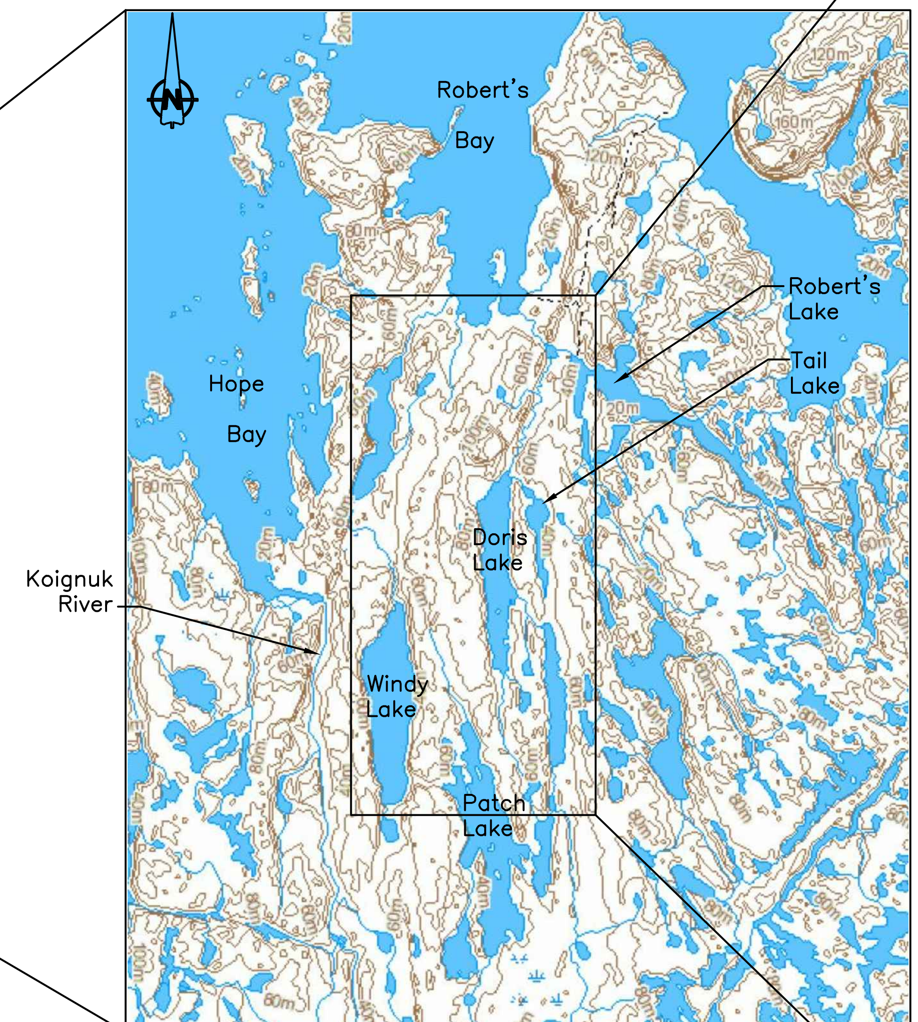
SRK Consulting (Canada) Inc. 2011a. *2010 Annual Geotechnical Inspection, Doris North Project, Hope Bay, Nunavut*. Report prepared for Hope Bay Mining Limited, Report No. 1CH008.032, March.

SRK Consulting (Canada) Inc. 2011b. *Hope Bay Project – Geotechnical Design Parameters*. Report prepared for Hope Bay Mining Limited, Report No. 1CH008.033.216, October.

Figures

TERRITORIAL LOCATION

Approx. Scale 0 500 1000 Km



REGIONAL LOCATION

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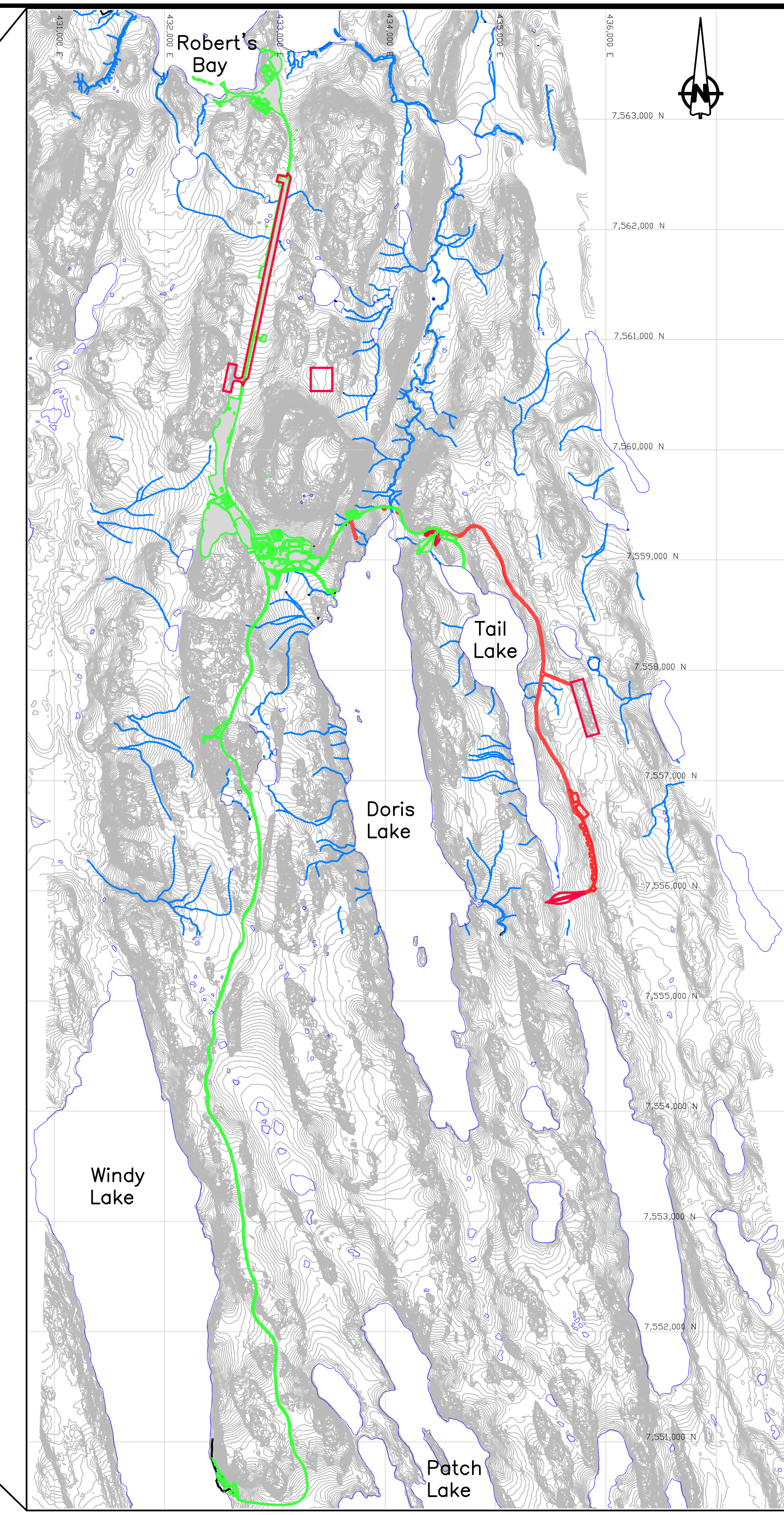

SITE LOCATION

1:30000 0 600 1200 1800 2400 3000 Metres

LEGEND

- Asbuilt
- Licenced but not yet constructed

srk consulting	NEWMONT NORTH AMERICA	2011 Geotechnical Inspection
SRK JOB NO.: 1CH008.046		Location Map
FILE NAME: 1CH008_032-GT10-1.dwg	HOPE BAY MINING LTD.	DATE: March 2012 / APPROVED: EMR / FIGURE: 1

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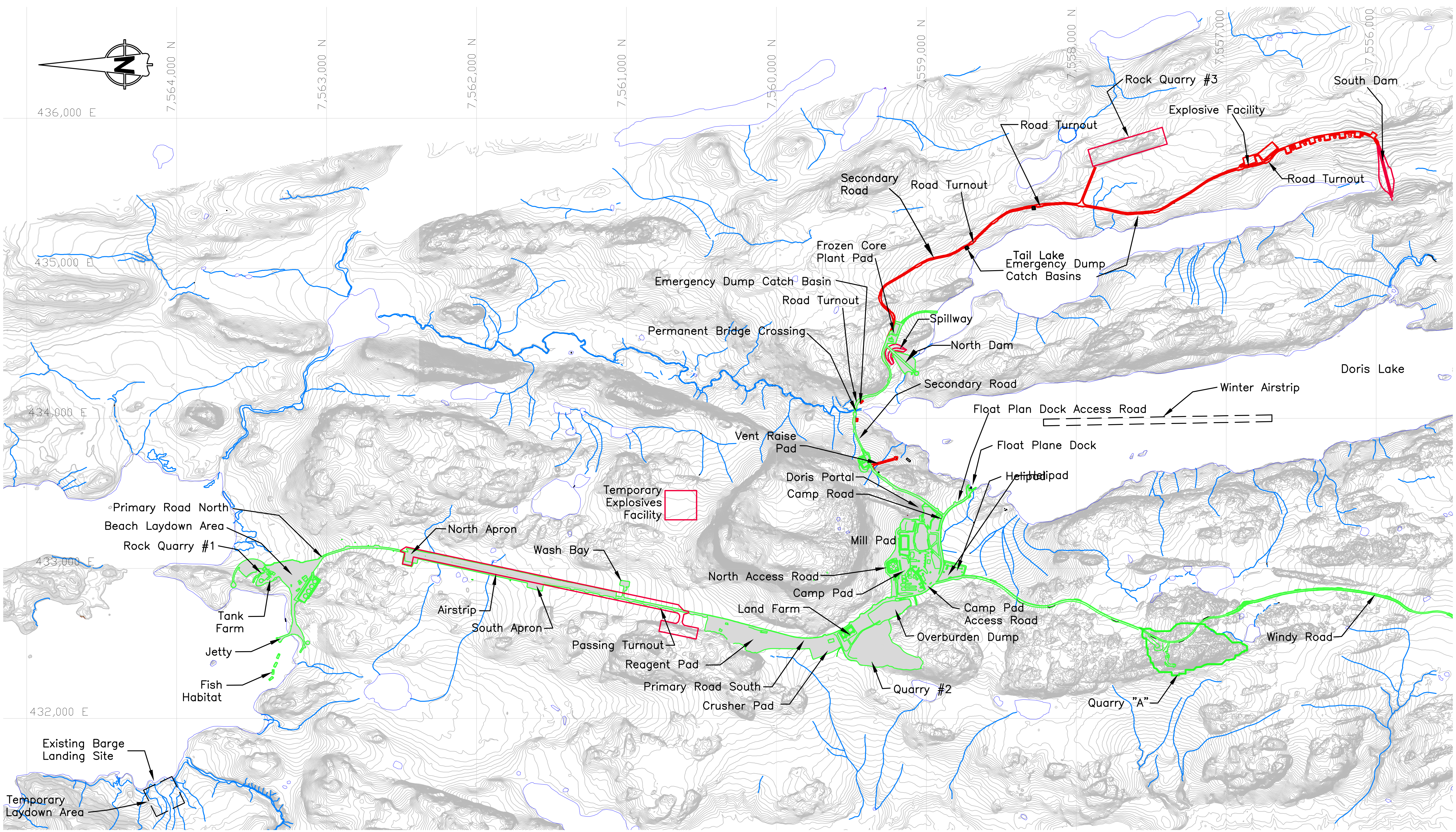

LEGEND

- Asbuilt
- Licenced but not yet constructed

0 200 400 600 800 1000 Metres

srk consulting	NEWMONT NORTH AMERICA	2011 Geotechnical Inspection Overall Site Layout (Sheet 1)
SRK JOB NO.: 1CH008.046 FILE NAME: 1CH008_032-GT10-1.dwg	HOPE BAY MINING LTD.	DATE: March 2012 / APPROVED: EMR / FIGURE: 2

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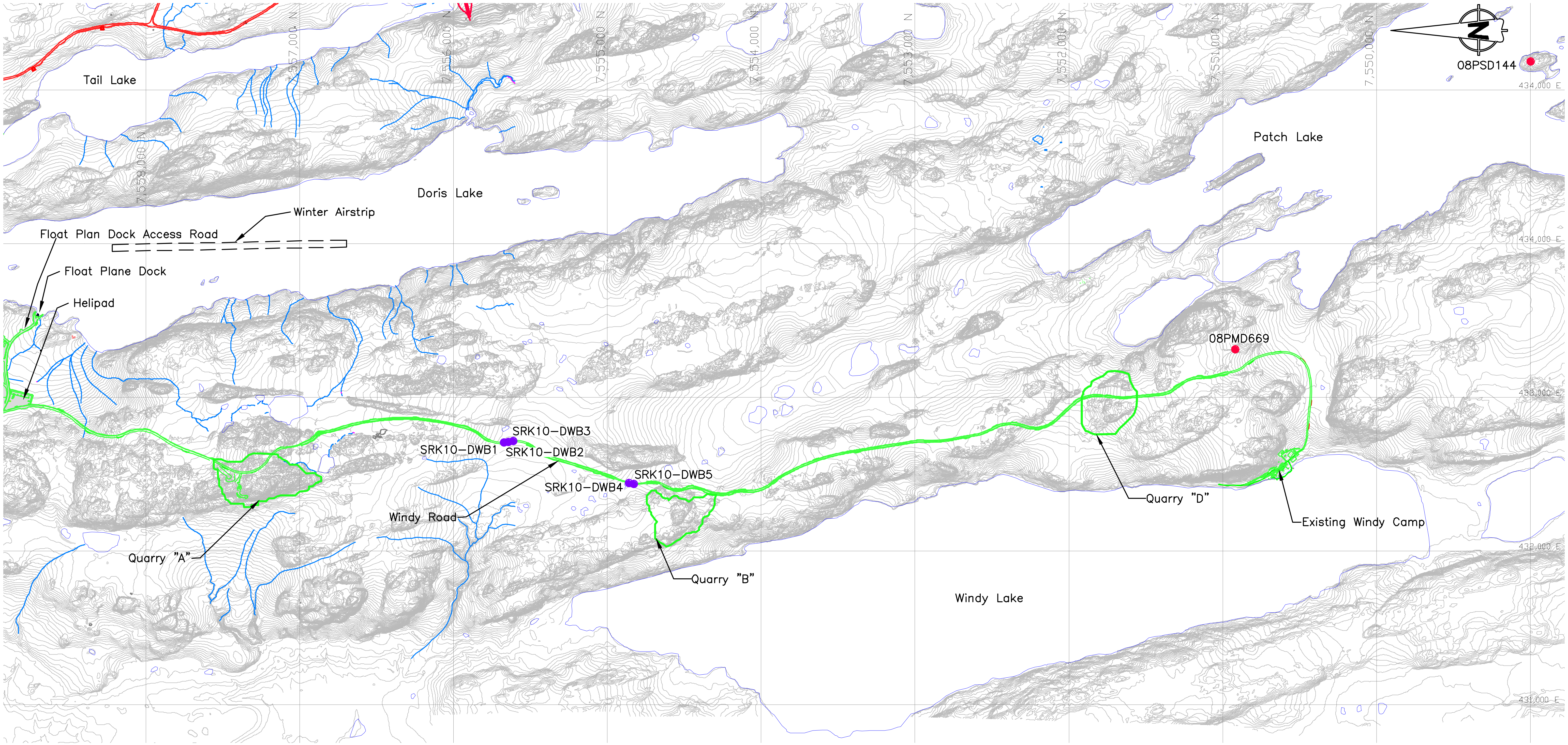

LEGEND

- Active Thermistor Installation
- Inactive Thermistor Installation
- Status Unknown
- Westbay Wells
- Proposed Thermistor Location
- Asbuilt
- Licensed but not yet Constructed

0 200 400 600 800 1000 Metres

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NEWMONT. NORTH AMERICA

HOPE BAY MINING LTD.

2011 Geotechnical Inspection

Overall Site Layout (Sheet 2)

SRK JOB NO.:	1CH008.046
FILE NAME:	1CH008_032-GT10-1.dwg

DATE:	APPROVED:	FIGURE:
March 2012	EMR	3

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Oblique view of Roberts Bay Tank Farm looking south

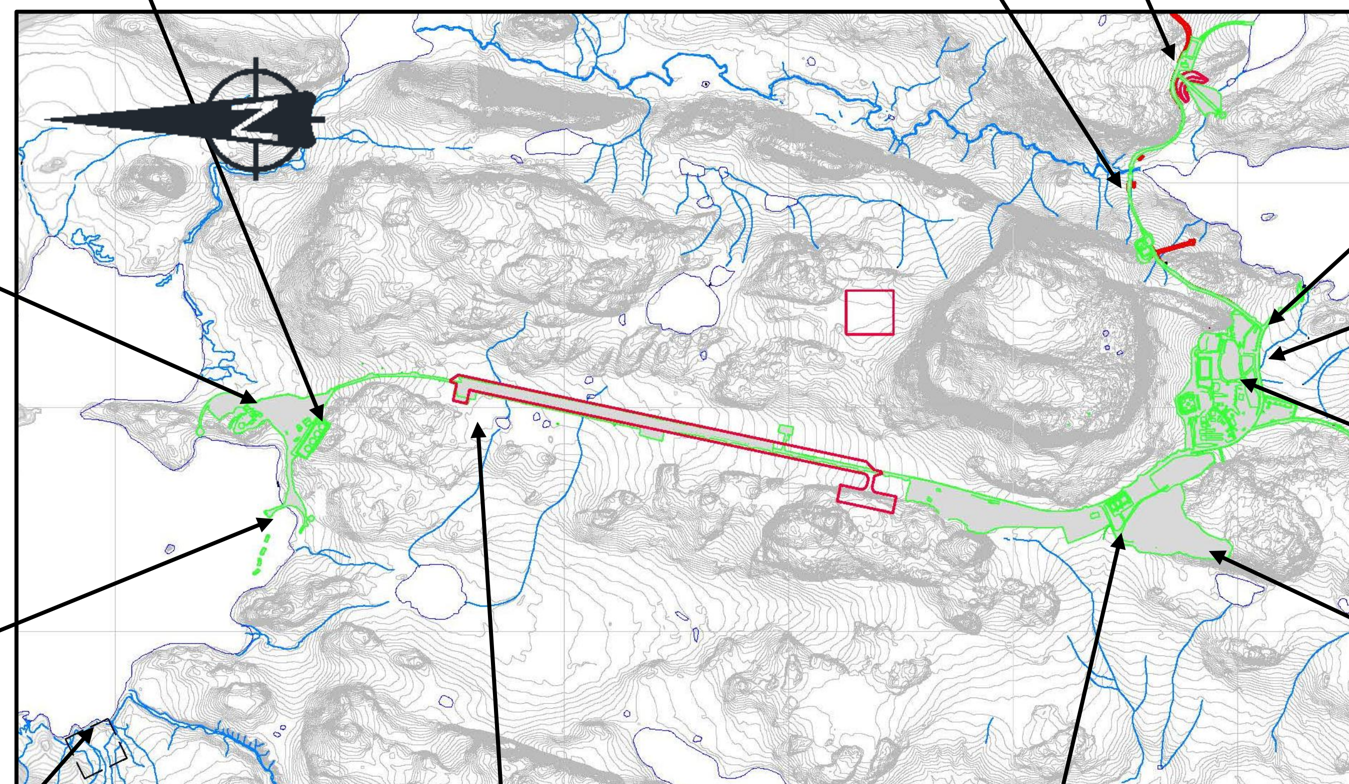

Oblique view of Doris Creek Bridge


North Dam looking East, Frozen Core Plant and Tail Lake Access Road in background


Looking northwest across Doris Camp

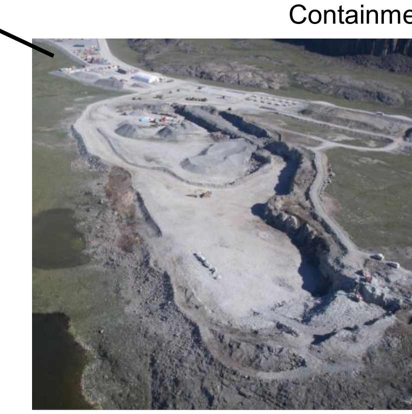

Northwest view across Roberts Bay Fuel Tank Farms and Laydown Area


Looking northwest across the Sedimentation Pollution Control Ponds




Looking northwest across waste rock pile and Temporary Containment Pond


Southwest view of the barge, Jetty and Laydown Area


Looking northeast across Quarry 2


Looking south across Landfarm


Looking northwest across the Airstrip and North Apron


Oblique aerial view of old beach laydown area and explosives magazines

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NEWMONT NORTH AMERICA

Job No: 1CH008.046

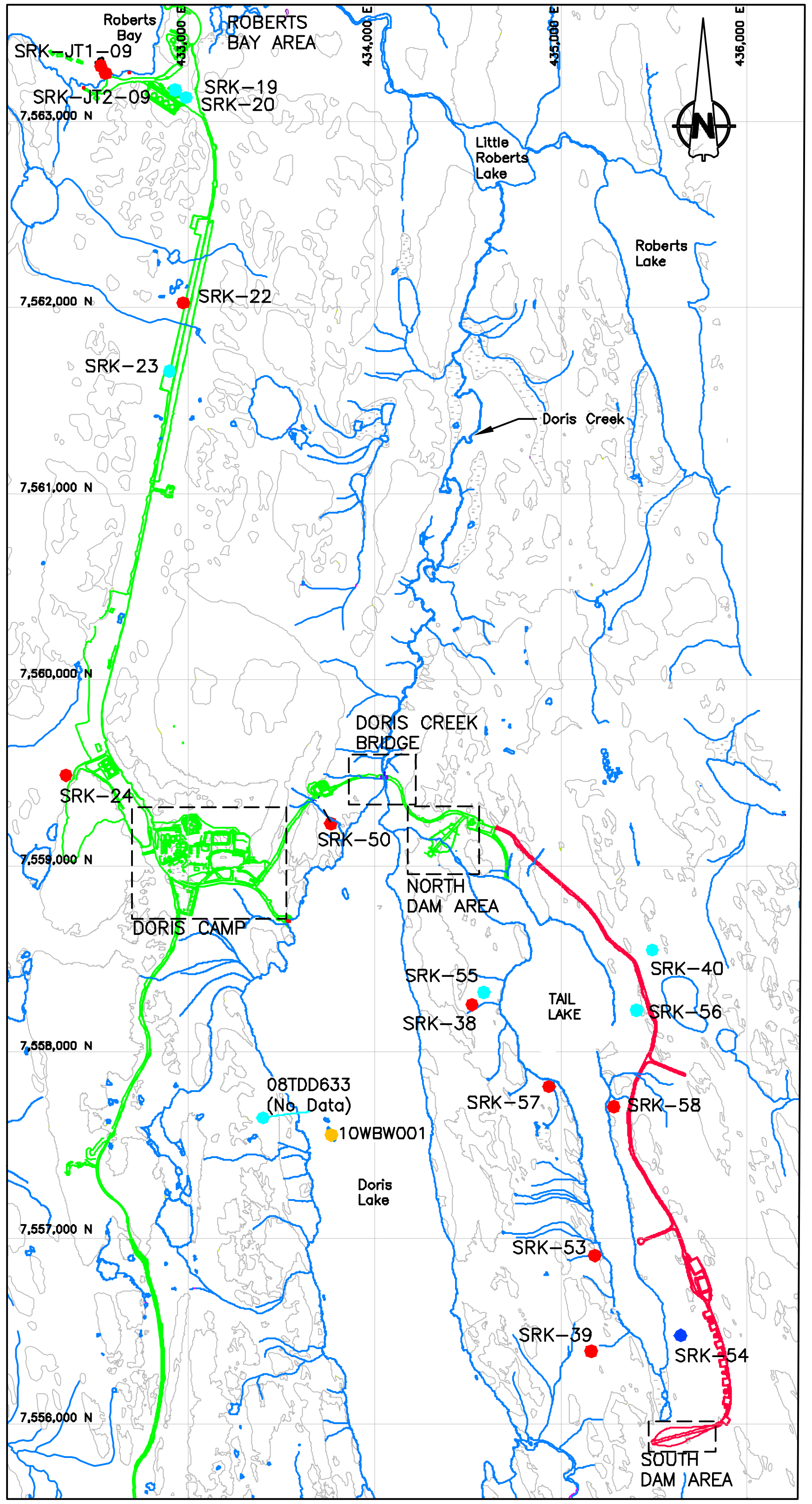
Filename: 2011GeotechInsp_20111128_rev0_kk.odp

HOPE BAY MINING LTD.

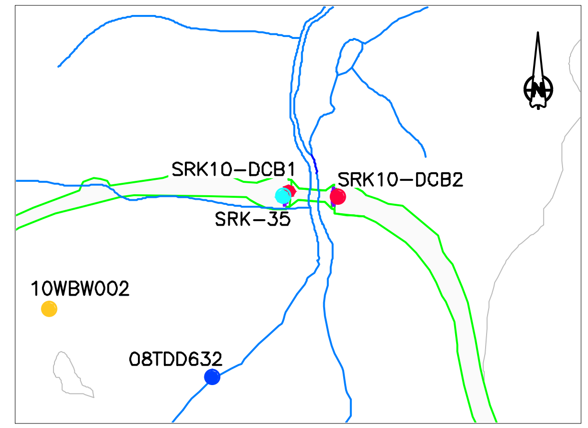
2011 Geotechnical Inspection

Current Site Layout

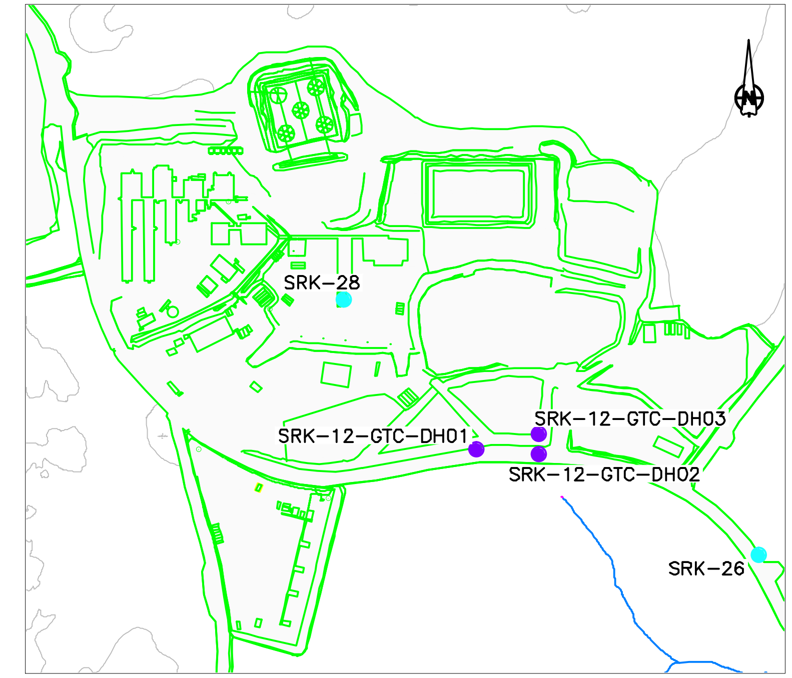
Date:	Approved:	Figure:
March 2012	EMR	4



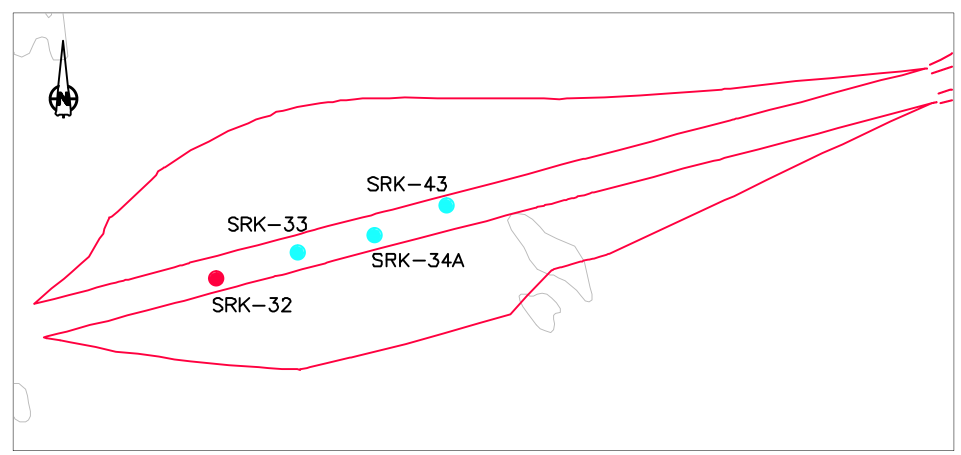
DORIS NORTH OVERVIEW



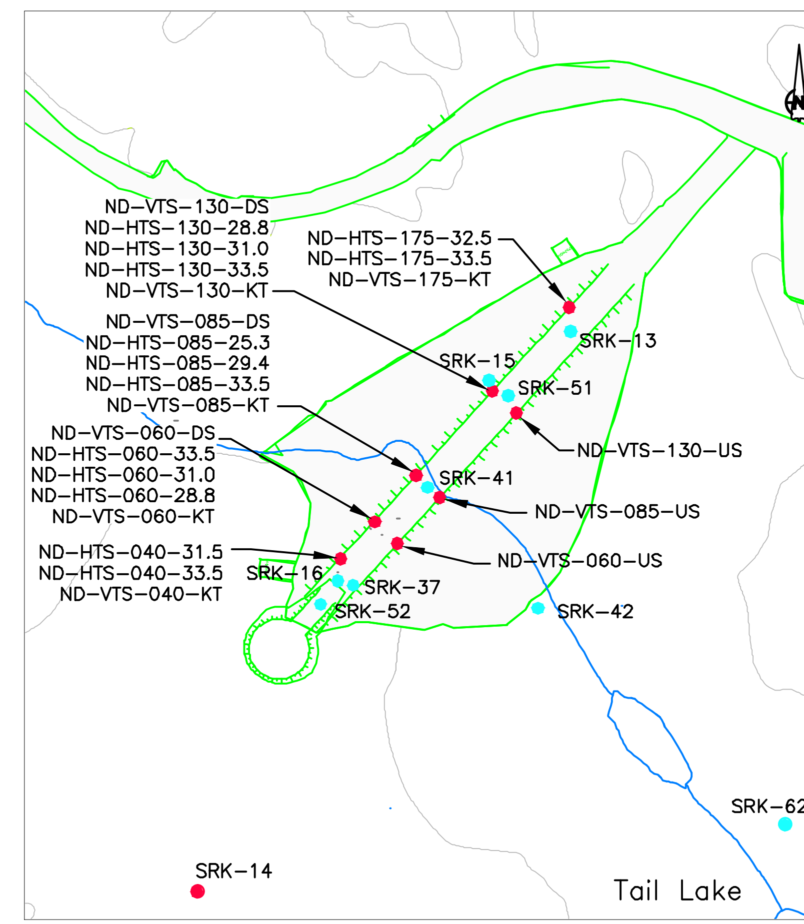
DORIS CREEK BRIDGE



DORIS CAMP



SOUTH DAM AREA



NORTH DAM AREA

LEGEND

- Active Thermistor Installation
- Inactive Thermistor Installation
- Status Unknown
- Westbay Wells
- Proposed Thermistor Location
- Asbuilt
- Licensed but not yet Constructed

srk consulting	NEWMONT NORTH AMERICA	2011 Geotechnical Inspection
SRK JOB NO.: 1CH008.032		Thermistor Locations
FILE NAME: 1CH008_032–GT09–3.dwg	HOPE BAY MINING LTD.	DATE: Mar. 2012 · APPROVED: EMR · FIGURE: 5

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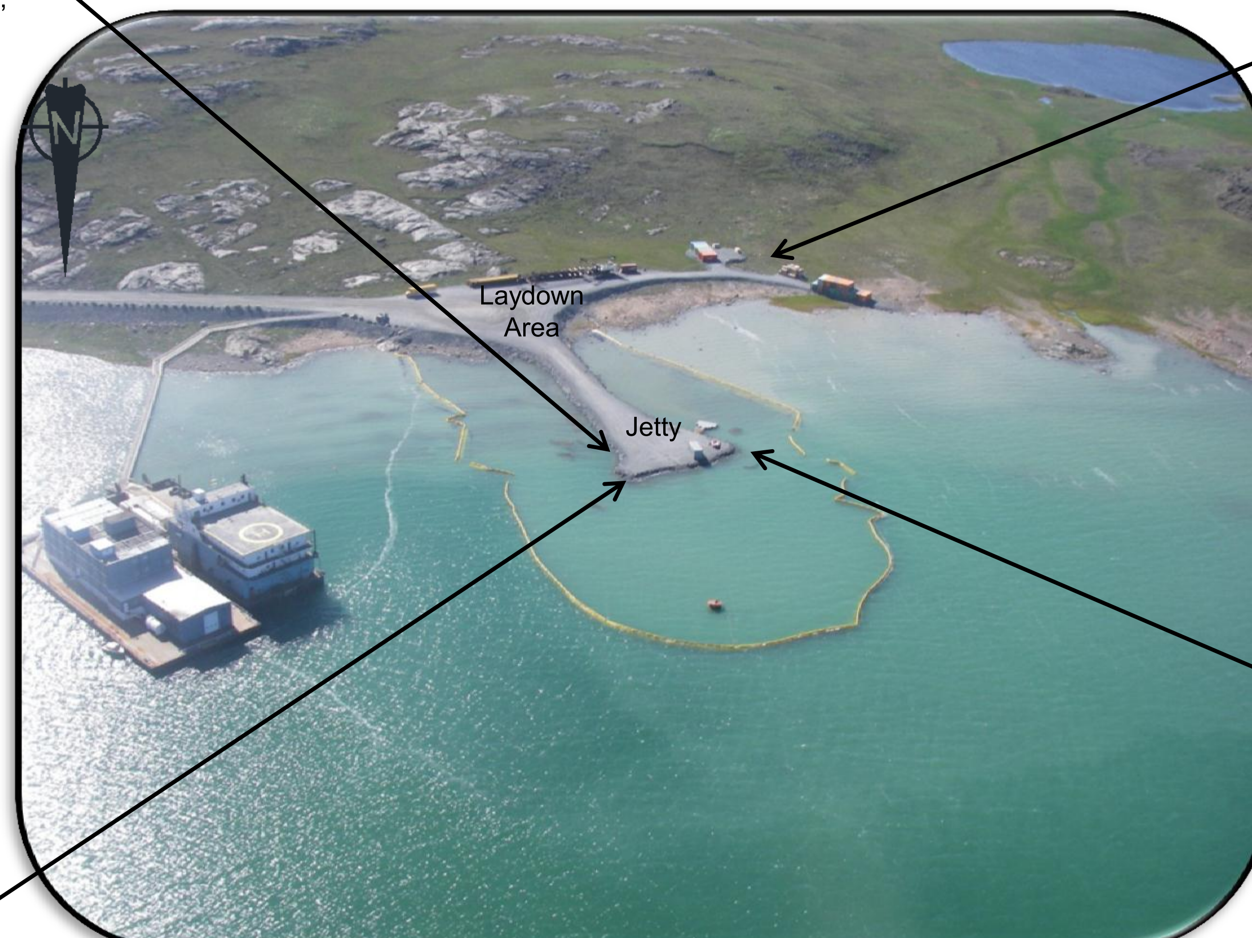
Oblique view of Jetty at connection to Shoreline Laydown Area, photo looking northwest

Aerial view of Shoreline Laydown Area



Oblique aerial view of Jetty and Shoreline Laydown Area, photo looking east

Oblique aerial view of Jetty and silt fence looking southeast.

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2011 Geotechnical Inspection

Jetty and Shoreline Laydown Area

Job No:	1CH008.046	Date:	Approved:	Figure:
Filename:	2011GeotechInsp_20111128_rev0_kk.odp	March 2012	EMR	6

Southwest view across the new Tank Farm, which is under construction

5ML Tank Farm and jet fuel storage in seacans, photo looking southwest

Bench along highwall of the new Tank Farm, photo looking northwest

Looking northwest at the 5ML tank and fuel/ lubricant storage area

Closer look at highwall above bench of Tank Farm

Roberts Bay Laydown Area, photo looking northeast from top of highwall behind new tank farm

Typical tank farm pedestal in new tank farm

Empty fuel drum storage area, south of 5ML tank

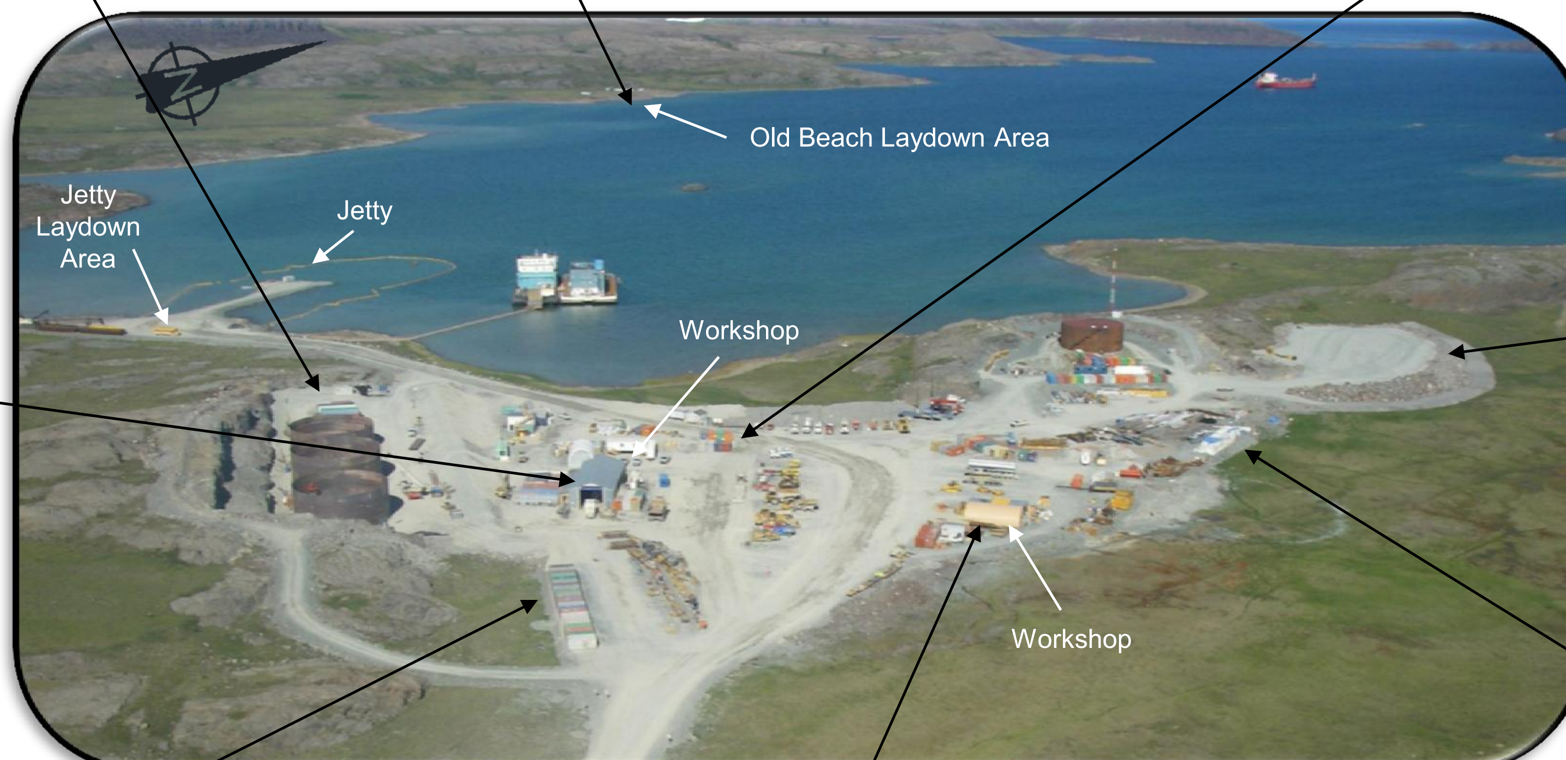
srk consulting	NEWMONT NORTH AMERICA	2011 Geotechnical Inspection **Roberts Bay Tank Farms**
Job No: 1CH008.046 Filename: 2011GeotechInsp_20111128_rev0_kk.odp	**HOPE BAY MINING LTD.**	Date: March 2012 · Approved: EMR · Figure: 7

Temporary seacan storage in new Roberts Bay Tank Farm

West view of old Beach Laydown Area

Expanded laydown area (Laydown 5) near Sealift Command Center

Northwest view across central laydown area. Heavy equipment workshop in the foreground, waste management area back left



Overburden Storage Area and Sedimentation Berm, photo looking northwest

Northwest view across the Laydown Area near the south end of the Robert Bay Laydown Area

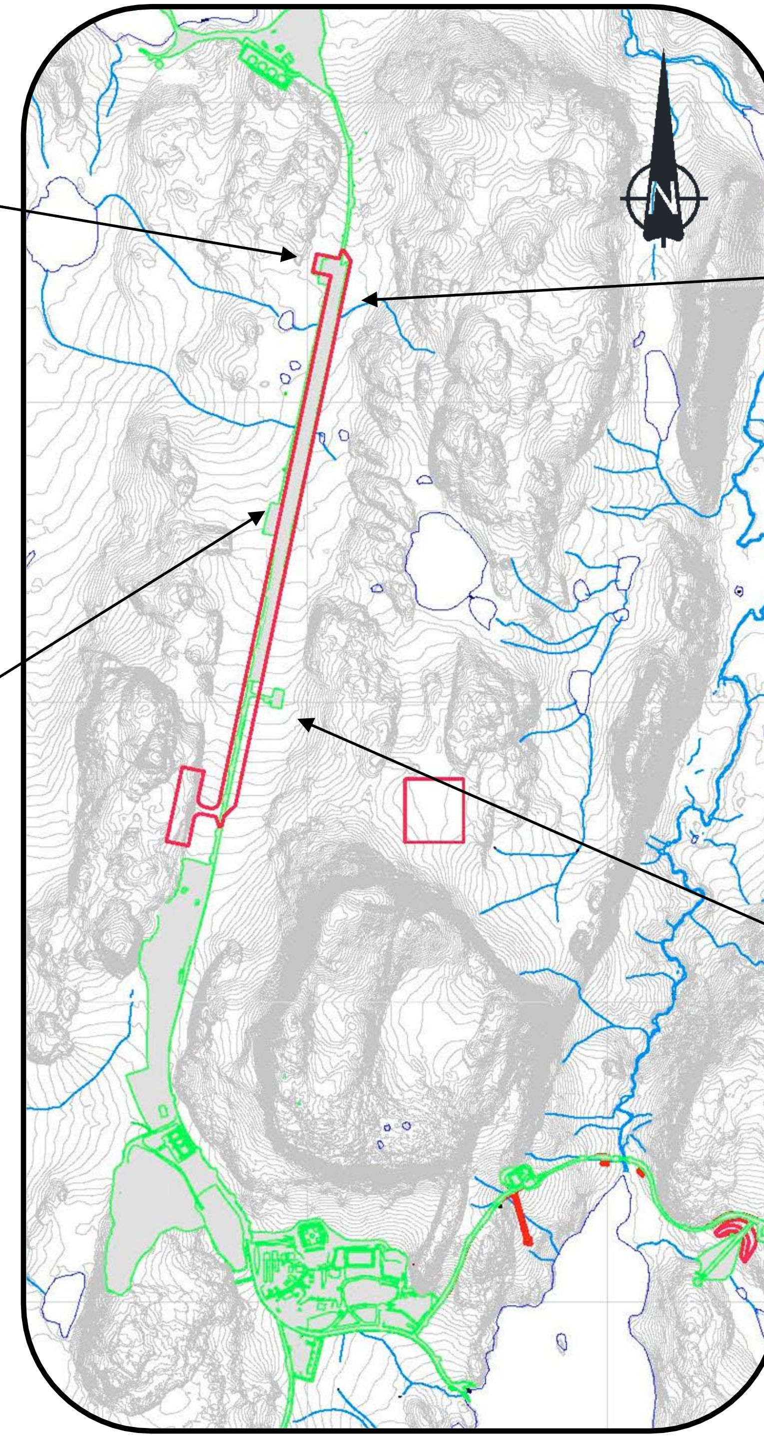
View of drillers workshop and laydown area

West view of laydown area

srk consulting	NEWMONT NORTH AMERICA	2011 Geotechnical Inspection
		Roberts Bay Laydown Area
Job No: 1CH008.046 Filename: 2011GeotechInsp_20111128_rev0_kk.odp	**HOPE BAY MINING LTD.**	Date: March 2012 / Approved: EMR / Figure: 8

Looking northwest across expanded North Apron

Looking northwest across Airstrip, the lighter grey material on the right side is the start of the airstrip expansion



Looking northwest across airstrip, Roberts Bay in the background

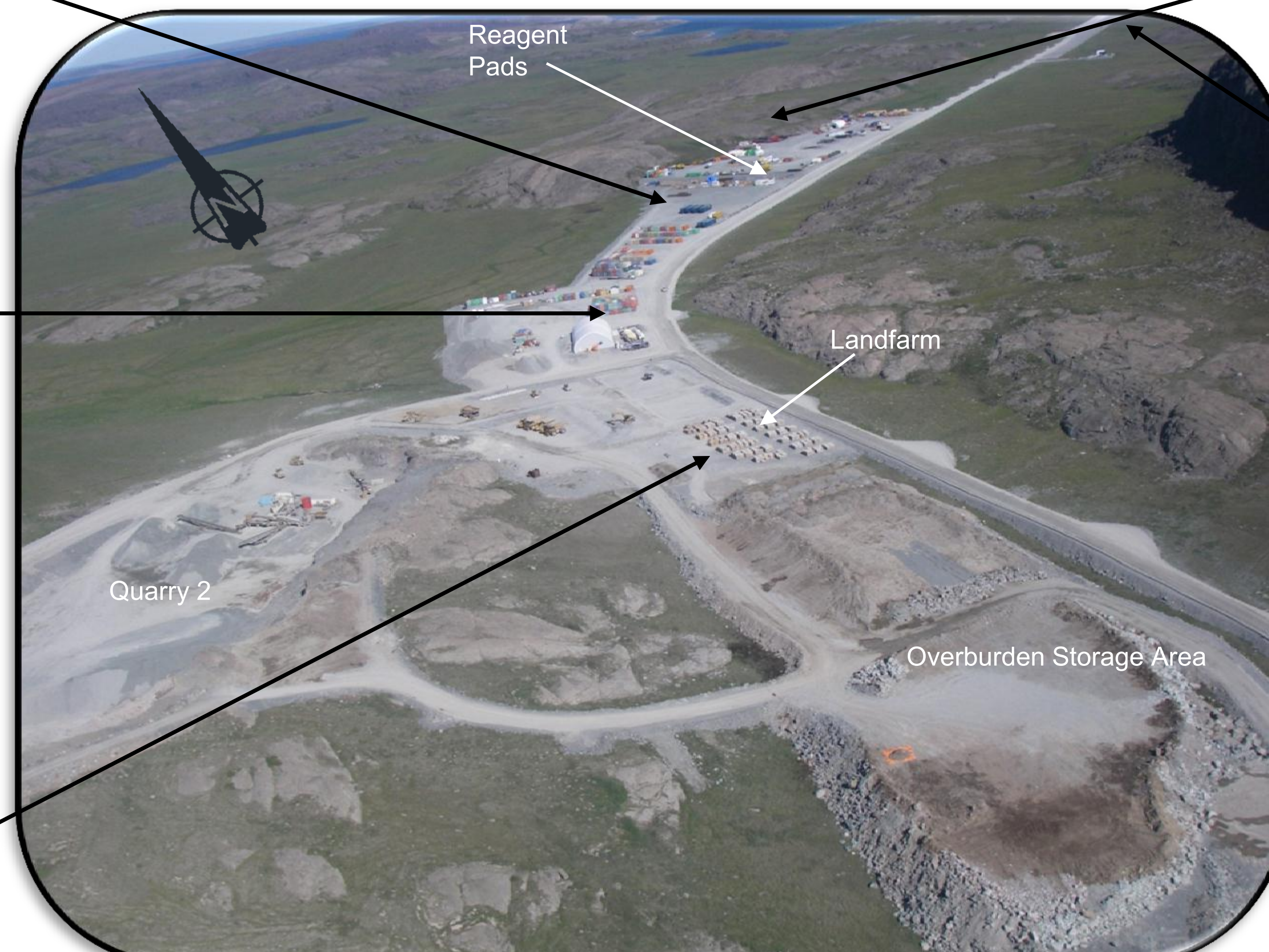
Looking northwest across the ANFO mixing facility in the old wash bay

srk consulting	NEWMONT NORTH AMERICA	2011 Geotechnical Inspection
		Airstrip
Job No: 1CH008.046 Filename: 2011GeotechInsp_20111128_rev0_kk.odp	**HOPE BAY MINING LTD.**	Date: March 2012 · Approved: EMR · Figure: 9

Lower Reagent Pad, photo looking west

Doris Camp sewage effluent discharge point, photo looking east

Looking northwest across the Upper Reagent Pad



Looking northwest across the south end of the Lower Reagent Pad near the concrete mixing plant

Aerial view of All Weather Road between the Airstrip and Roberts Bay Laydown Area

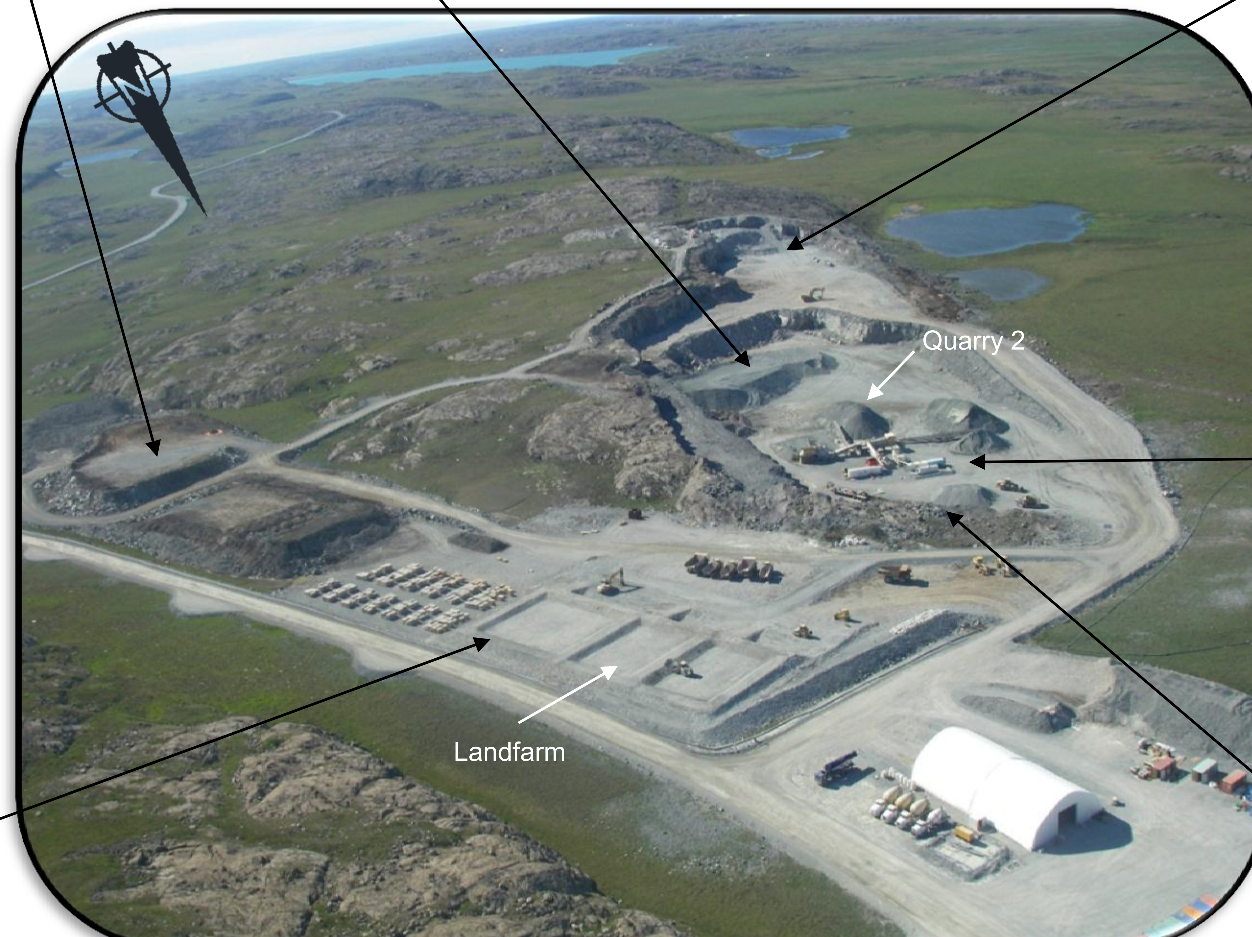
Core boxes laydown area looking northeast

srk consulting	NEWMONT. NORTH AMERICA	2011 Geotechnical Inspection **All Weather Road and Reagent Pads**
Job No: 1CH008.046 Filename: 2011GeotechInsp_20111128_rev0_kk.odp	**HOPE BAY MINING LTD.**	Date: March 2012 / Approved: EMR / Figure: **10**

Looking southwest across the Overburden Storage Area

Looking southeast across Quarry 2

Quarry 2 active quarrying area



Looking northwest across Quarry 2 crusher area

Crushed material stockpiles in Quarry 2

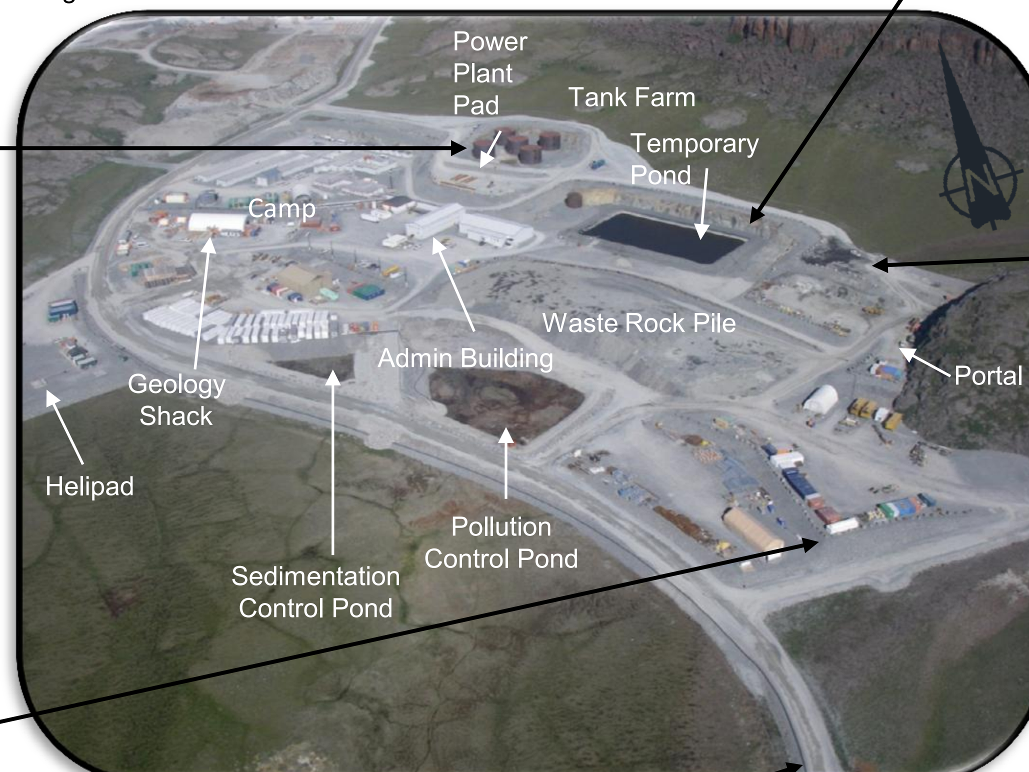
Looking southeast across the Doris North Landfarm

srk consulting	NEWMONT. NORTH AMERICA	2011 Geotechnical Inspection **Quarry #2, Crusher and Landfarm**
Job No: 1CH008.046 Filename: 2011GeotechInsp_20111128_rev0_kk.odp	**HOPE BAY MINING LTD.**	Date: March 2012 / Approved: EMR / Figure: 11

Oblique view of Doris North Camp looking southwest

Looking southwest across the Temporary Containment Pond on Pad D

Oblique view of Doris North Tank Farm looking southwest



Water Ponding along the Doris Diversion Berm, near the Portal. Photo taken September 2011

Laydown area by the Secondary Road and Float Plane Dock Access Road

Aerial Photo of Pump Station at Doris Lake

srk consulting	NEWMONT NORTH AMERICA	2011 Geotechnical Inspection
Job No: 1CH008.046	HOPE BAY MINING LTD.	**Doris North Camp (Sheet 1)**
Filename: 2011GeotechInsp_20111128_rev0_kk.odp		Date: March 2012 · Approved: EMR · Figure: 12


Photo looking northeast at Sedimentation Control Pond


Photo looking west at Water Diversion Berm
behind Doris Camp


Looking northwest across the waste rock pile and the Temporary Containment Pond


Photo looking north at Helicopter Pad and Doris Camp


Photo looking north at Pollution Control Pond


Rip rap aprons constructed for water dissipation, at pond culvert outlets

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2011 Geotechnical Inspection

Doris North Camp (Sheet 2)

Job No: 1CH008.046

Filename: 2011GeotechInsp_20111128_rev0_kk.odp

HOPE BAY MINING LTD.

Date: March 2012

Approved: EMR

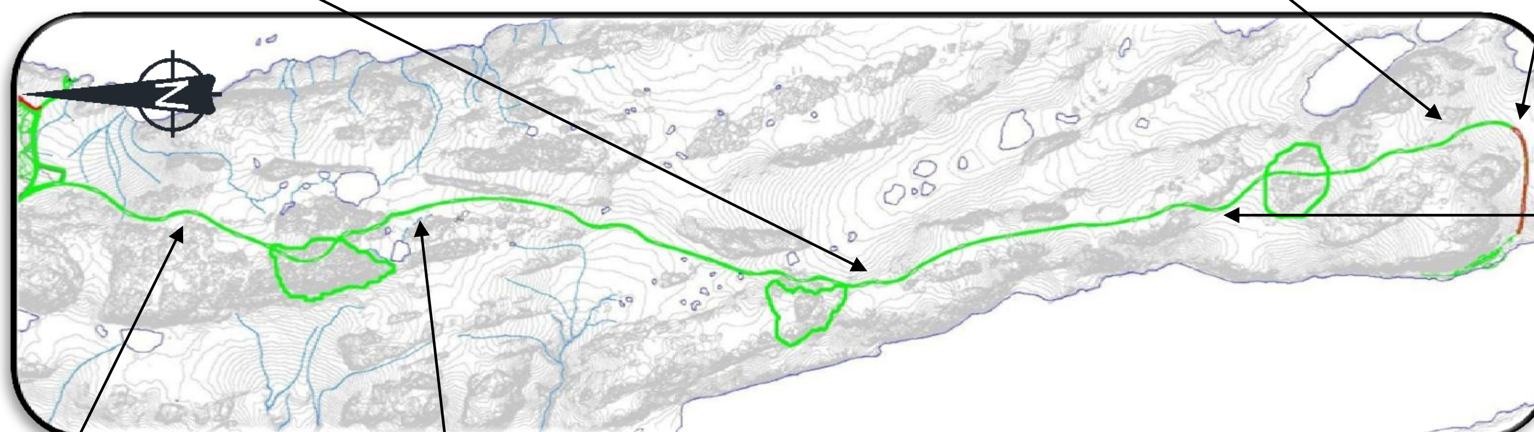
Figure: 13


Settlement/ Pothole along the edge of the road


Doris-Windy Road, photo looking northeast


End of the constructed portion of the Doris-Windy Road. Photo looking northeast. The road was continued later in 2011


Tension cracks on side of Doris-Windy All Weather Road




Tension cracks on the side of the Doris-Windy Road


Aerial view of Doris-Windy Road from Doris Camp to Quarry A


Looking east at Doris-Windy All Weather Road near Crossing 1

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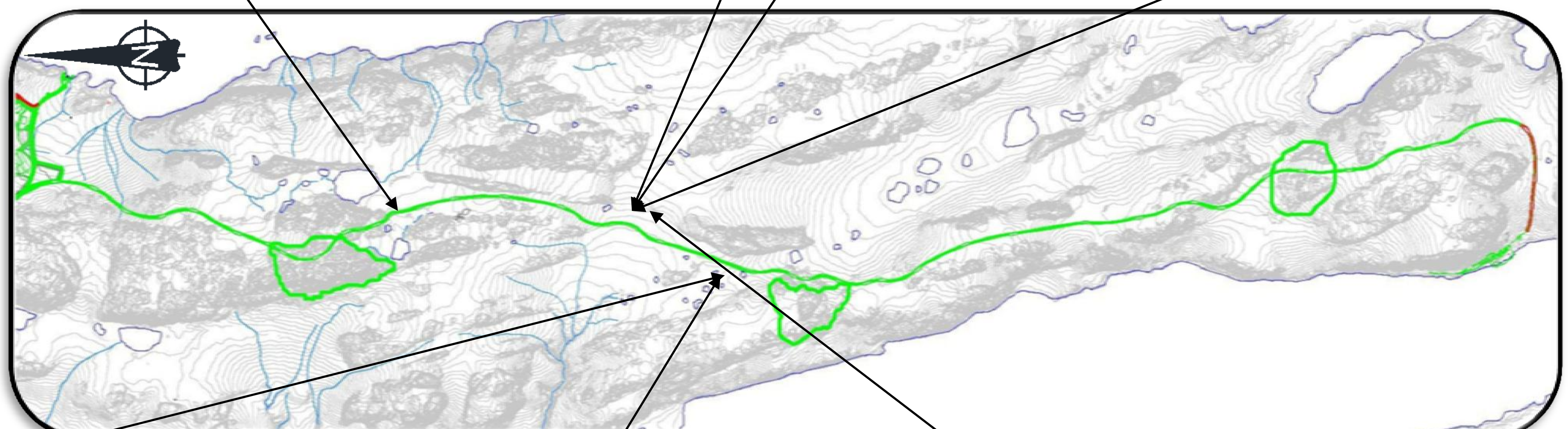
Job No: 1CH008.046 Filename: 2011GeotechInsp_20111128_rev0_kk.odp	**HOPE BAY MINING LTD.**	Date: March 2012 / Approved: EMR / Figure: 14

Looking west across culvert at Crossing 1

Stream crossing 2 and 3, photo looking south

Stream crossings 2 and 3, photo looking east

Construction of bridges at stream crossings 2 and 3, photo taken September 2011



Stream crossing 4 looking east

Closer look at stream crossing 4 looking east

Completed stream crossings 2 and 3 southbound (Photo taken November 2011)

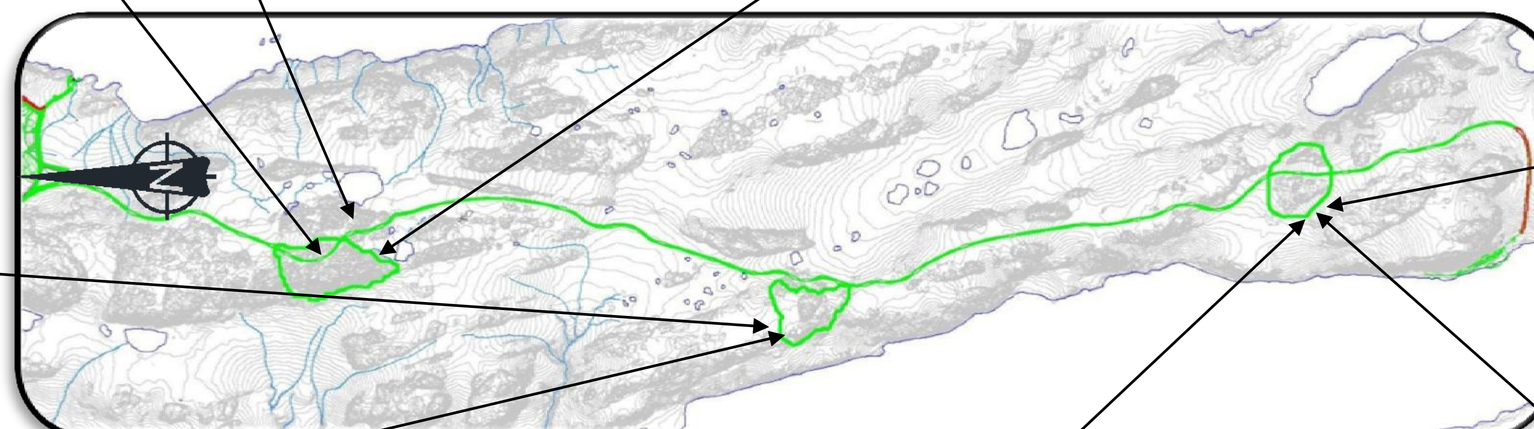
srk consulting	NEWMONT. NORTH AMERICA	2011 Geotechnical Inspection
Job No: 1CH008.046	HOPE BAY MINING LTD.	**Doris-Windy All Weather Road Stream Crossings**
Filename: 2011GeotechInsp_20111128_rev0_kk.odp		Date: March 2012 / Approved: EMR / Figure: 15

Quarry A, photo looking northwest

Quarry A and explosives storage area, photo looking north

Quarry A, photo looking southwest

Quarry B looking east



Quarry D looking northeast

Quarry B looking north

Quarry D looking northeast

Quarry D looking southeast

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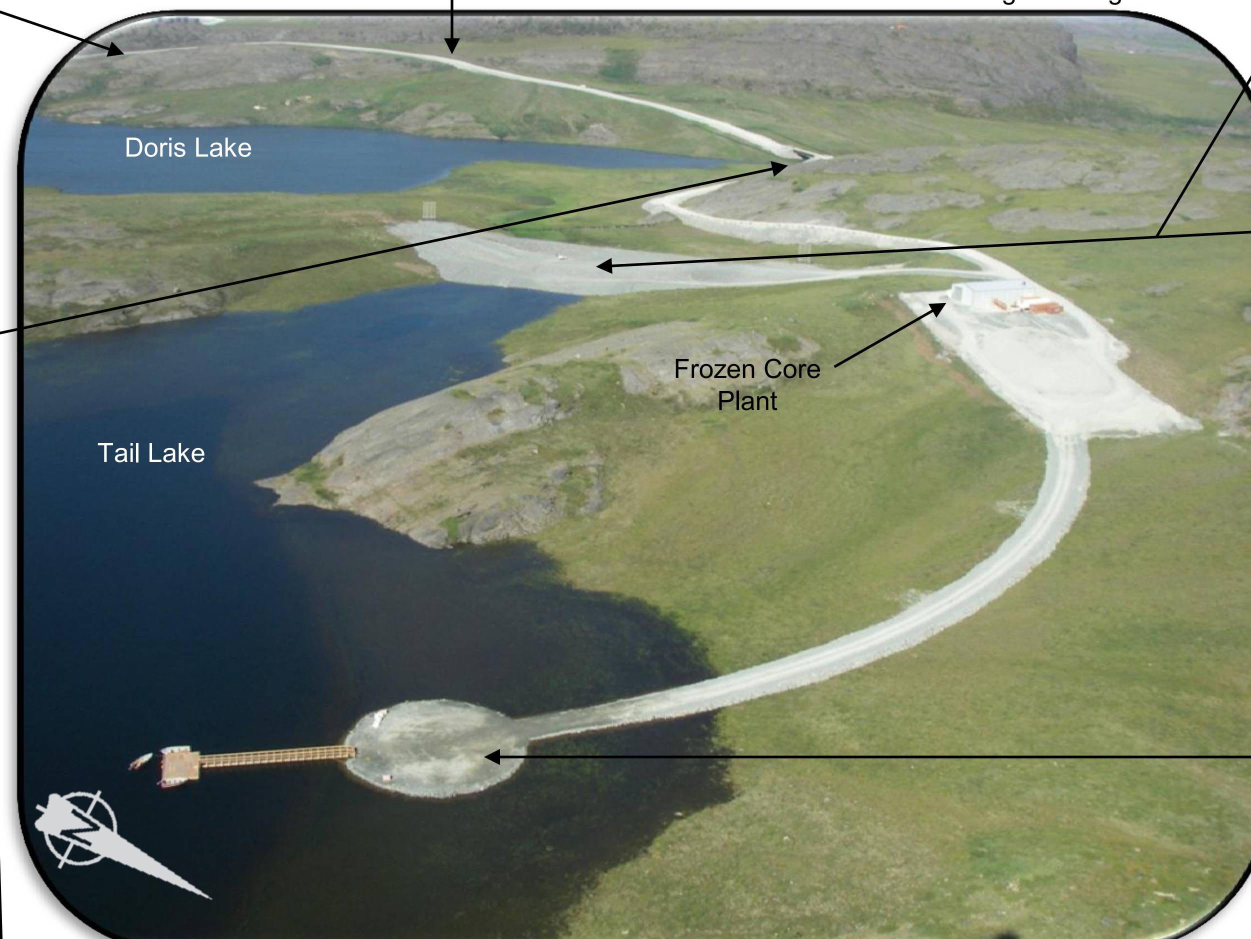
Job No: 1CH008.046 Filename: 2011GeotechInsp_20111128_rev0_kk.odp	HOPE BAY MINING LTD.	**Doris-Windy All Weather Road Quarries**
		Date: March 2012 / Approved: EMR / Figure: 16

Secondary road, photo looking southwest

Secondary road, slope failure area

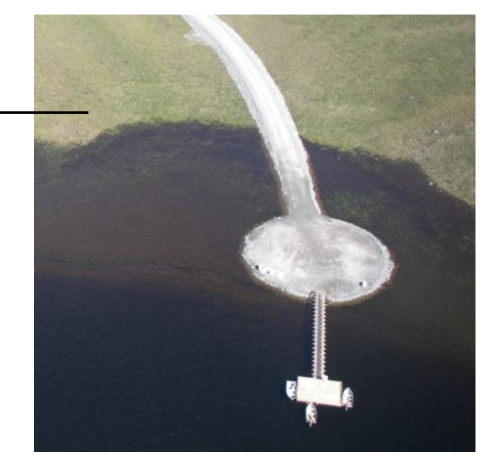
Overview of North Dam, Frozen Core Plant Pad, and Doris Creek Bridge looking northwest

North Dam, not complete, looking west



North Dam, not complete, looking southwest

Doris Creek Bridge, photo looking north



Looking north at Tail Lake Access Road and dock

Doris Creek Bridge looking south

Doris Creek Bridge looking west

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2011 Geotechnical Inspection

North Dam and Secondary Road

Job No: 1CH008.046

Filename: 2011GeotechInsp_20111128_rev0_kk.odp

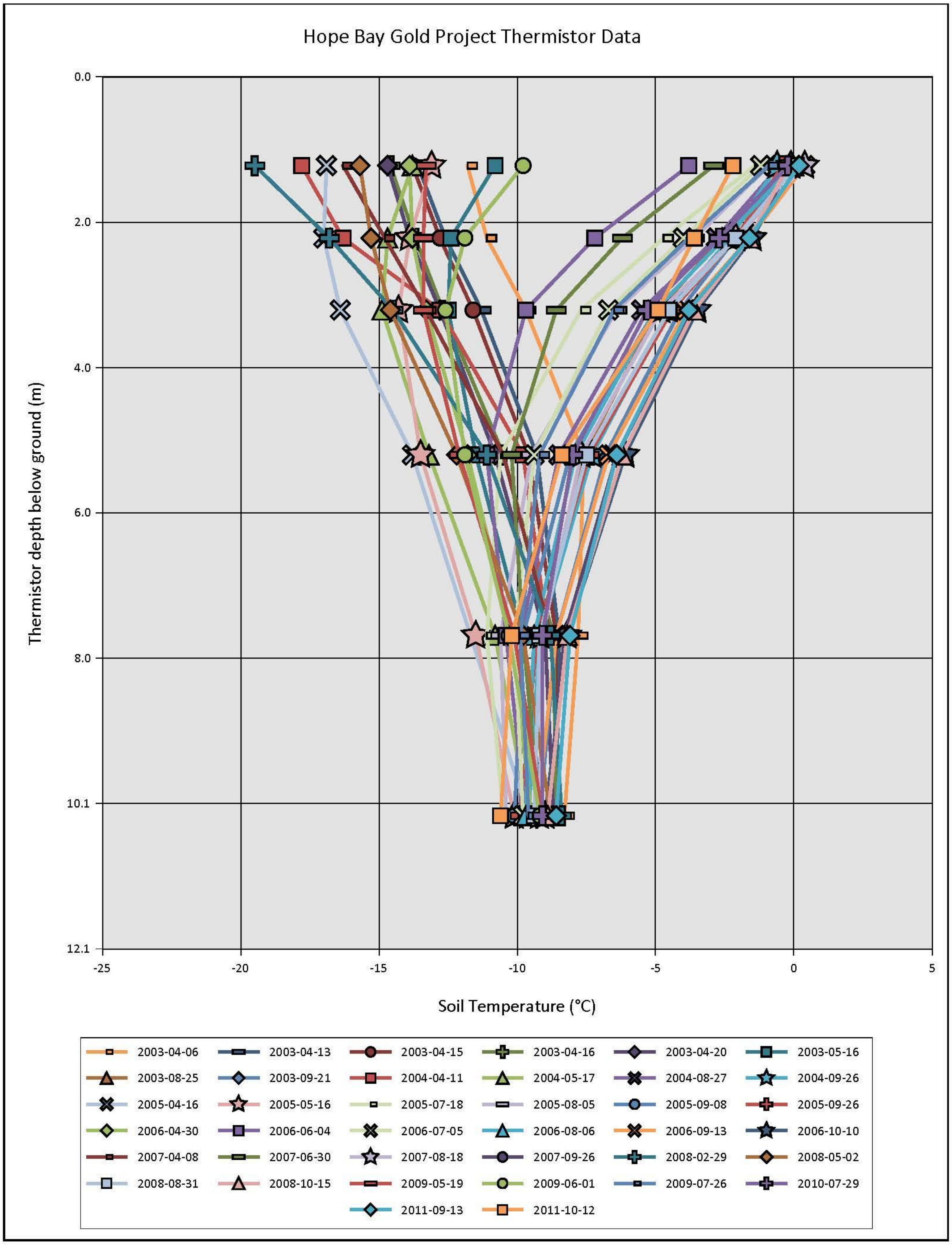
Date: March 2012

Approved: EMR

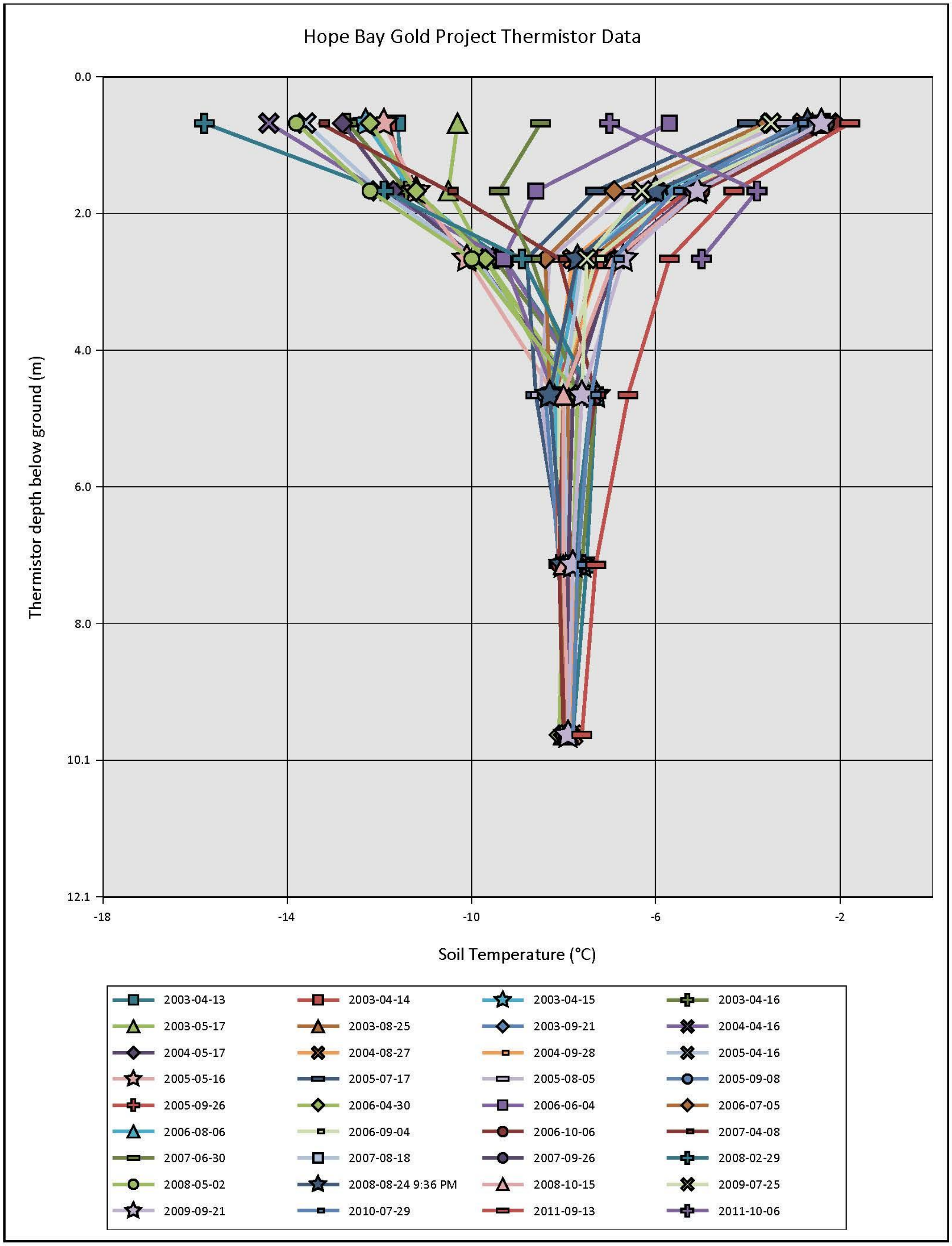
Figure: 17

Appendix A
Active Thermistor Profiles

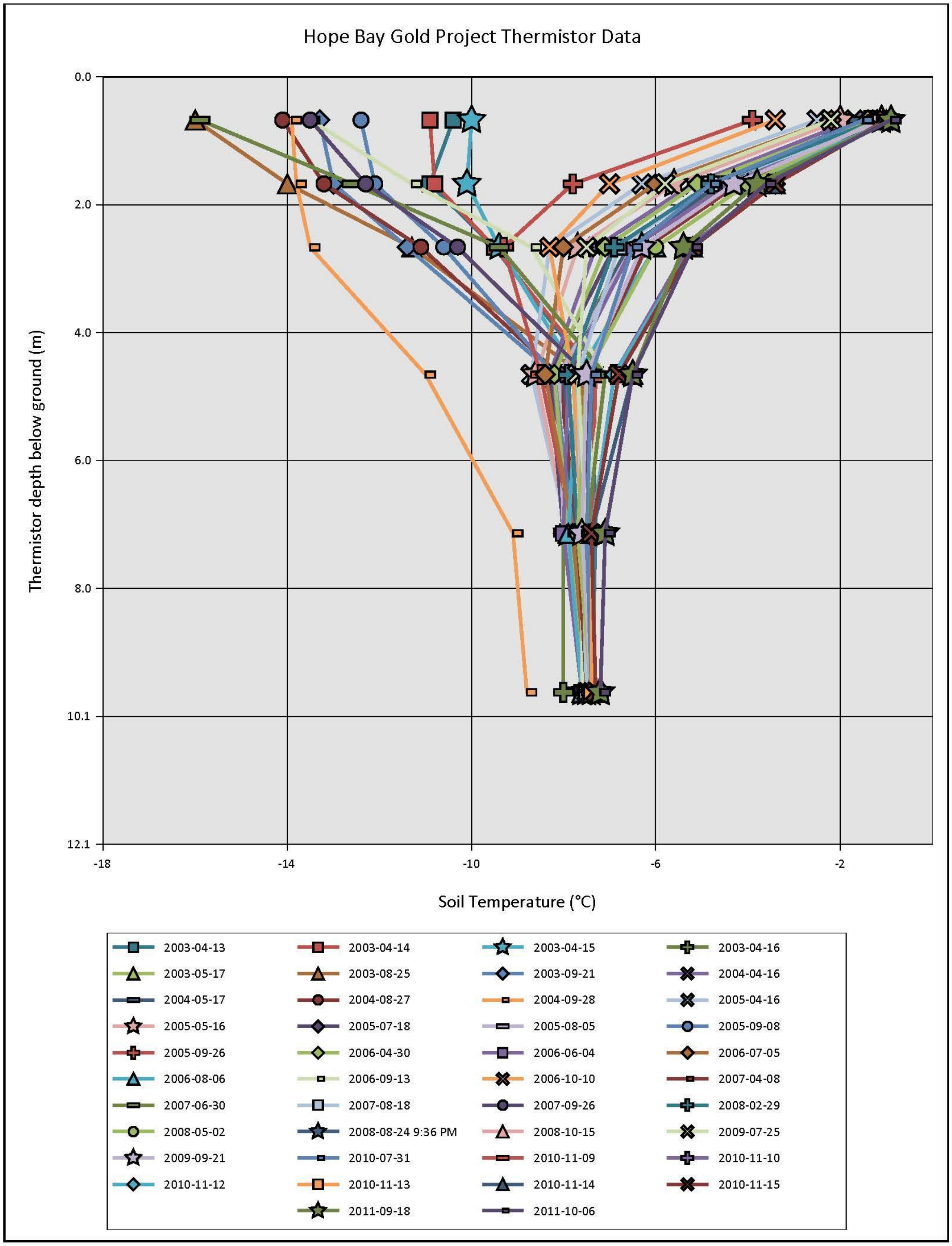
Thermistor Data (SRK-14)



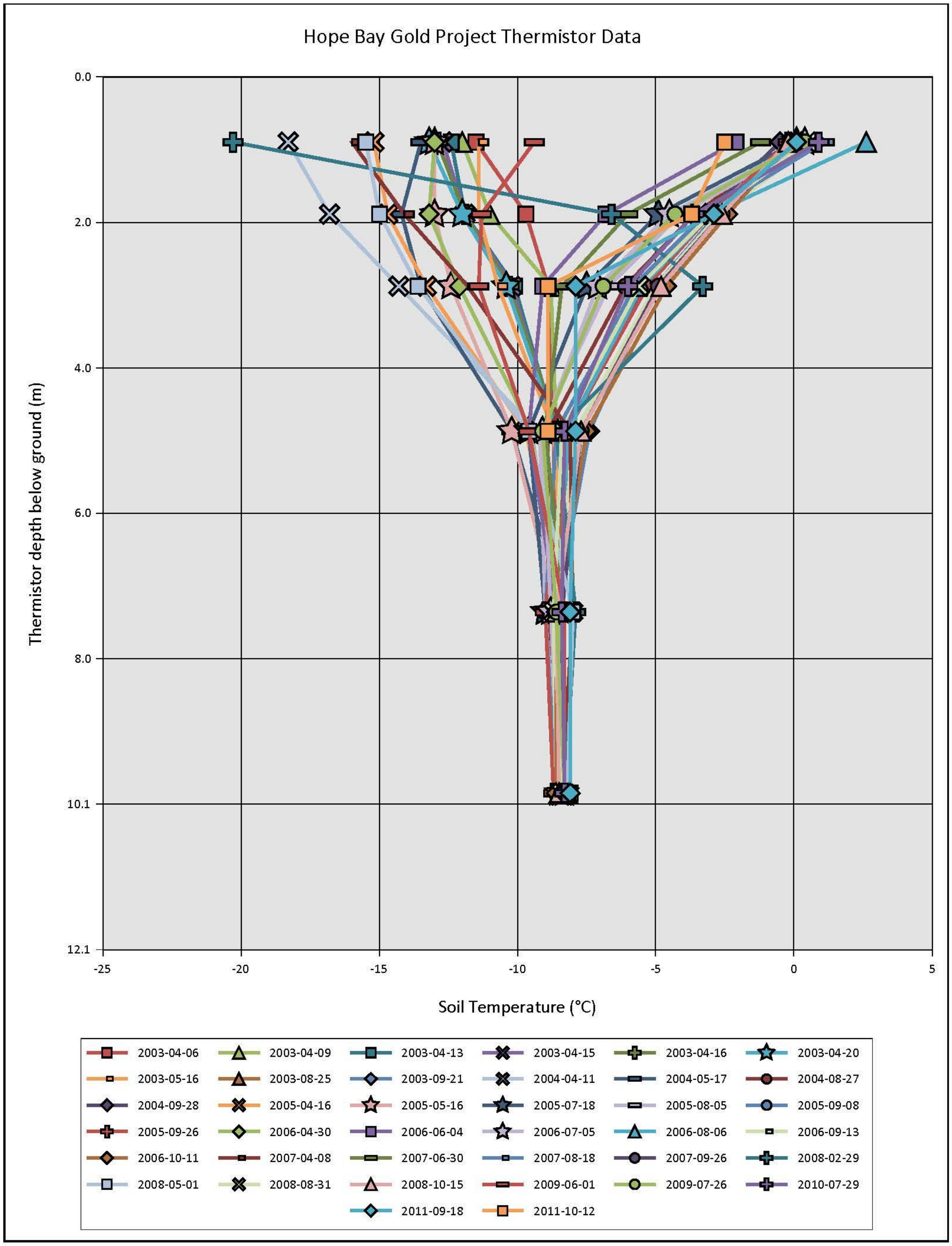
Thermistor Data (SRK-22)



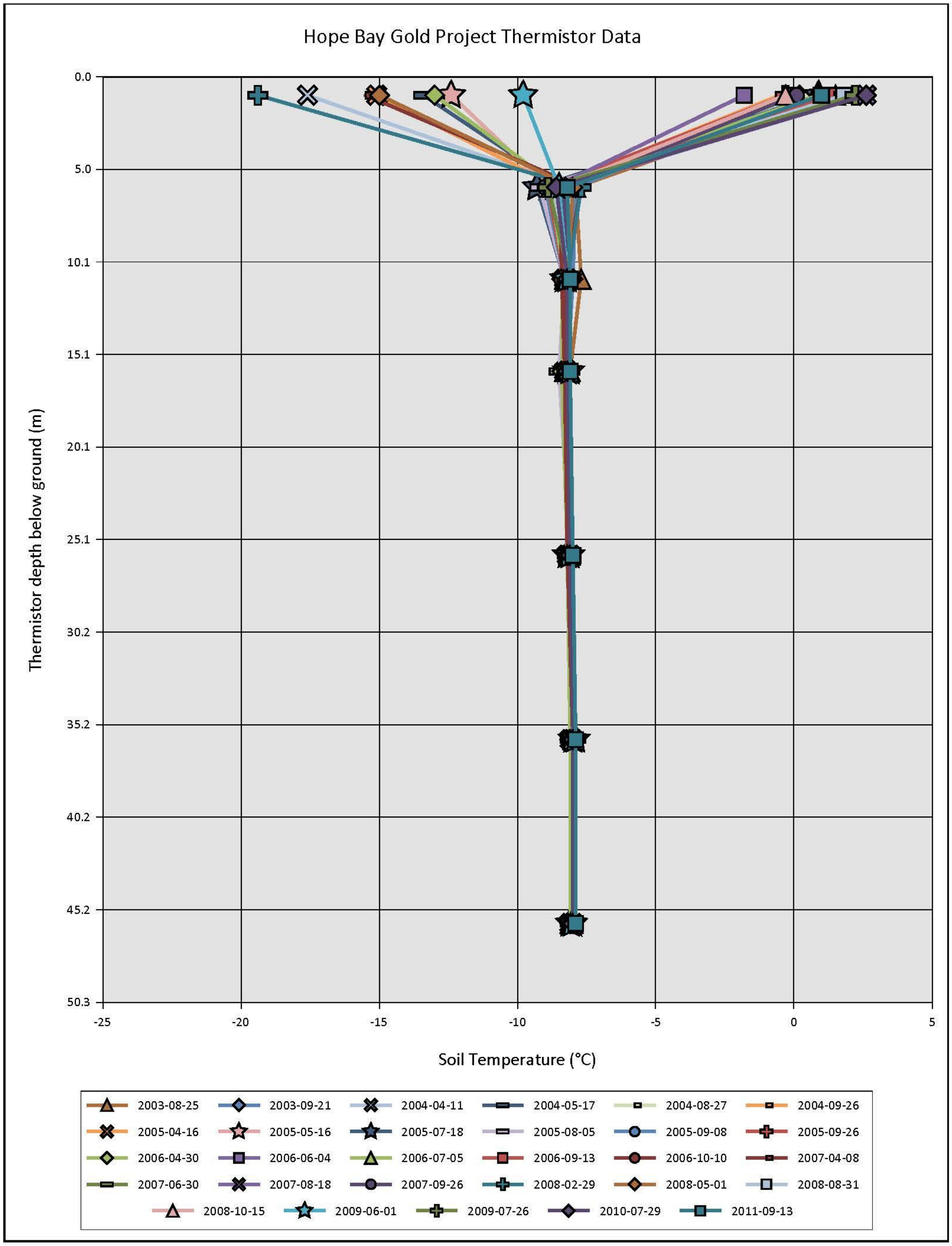
Thermistor Data (SRK-24)



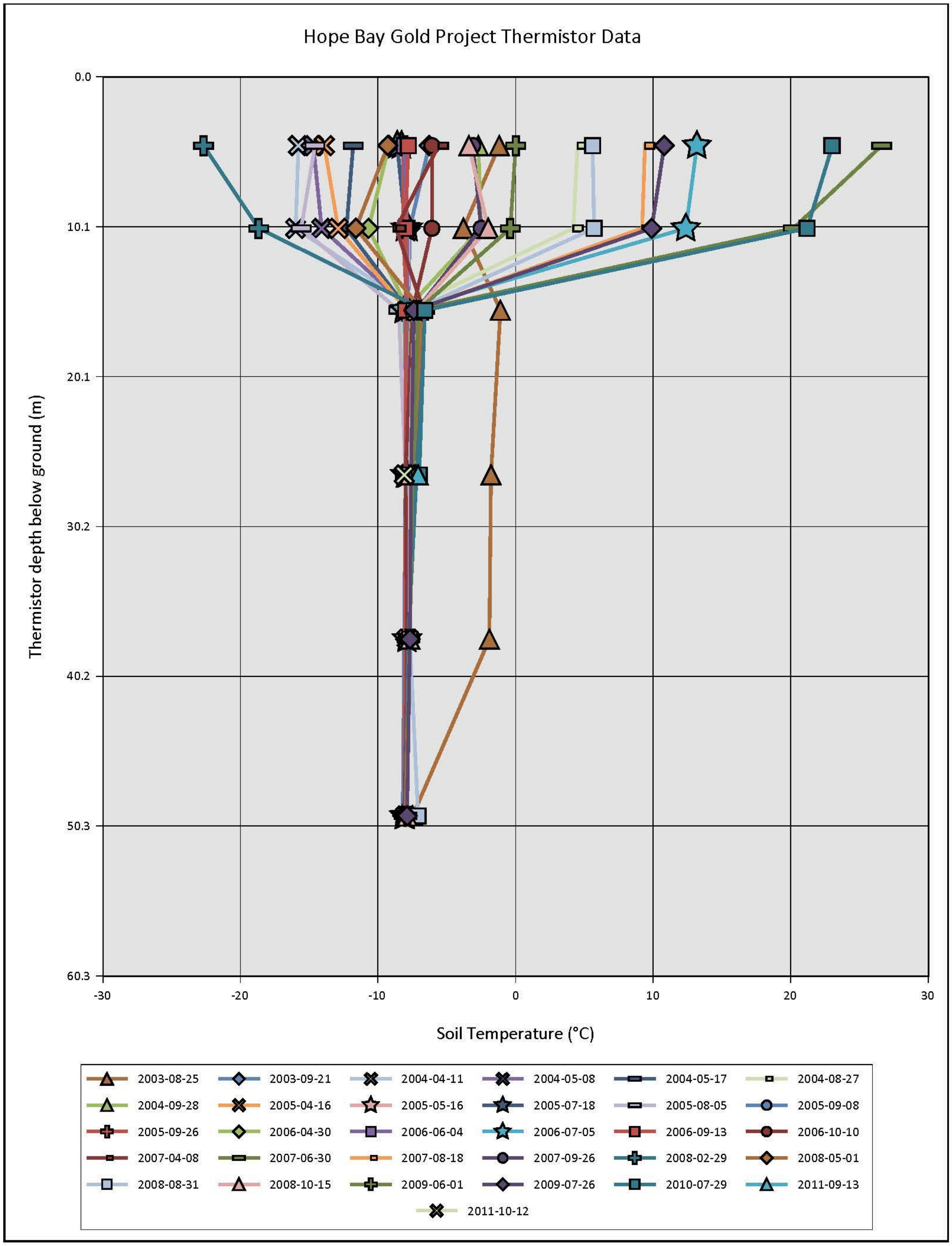
Thermistor Data (SRK-32)



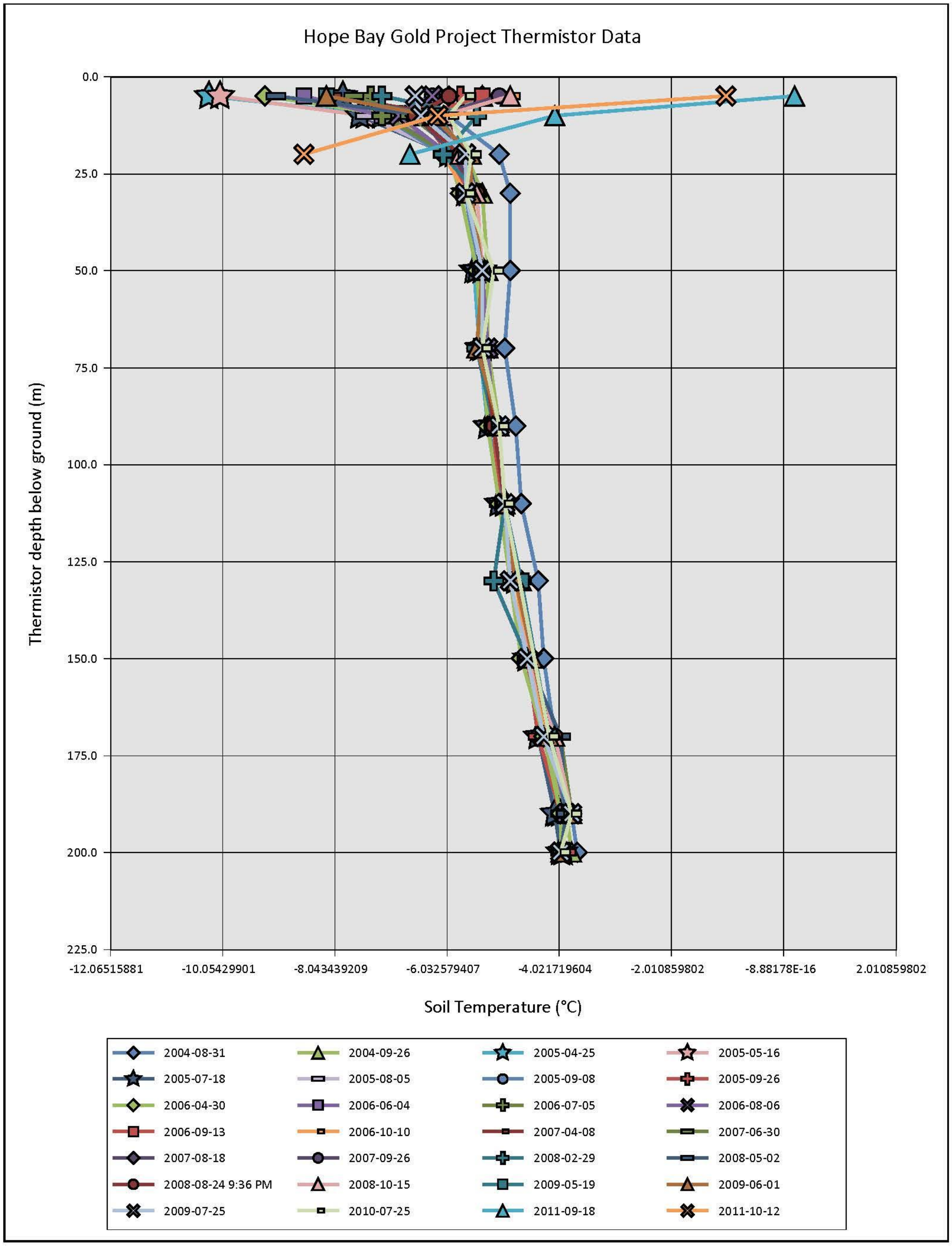
Thermistor Data (SRK-38)



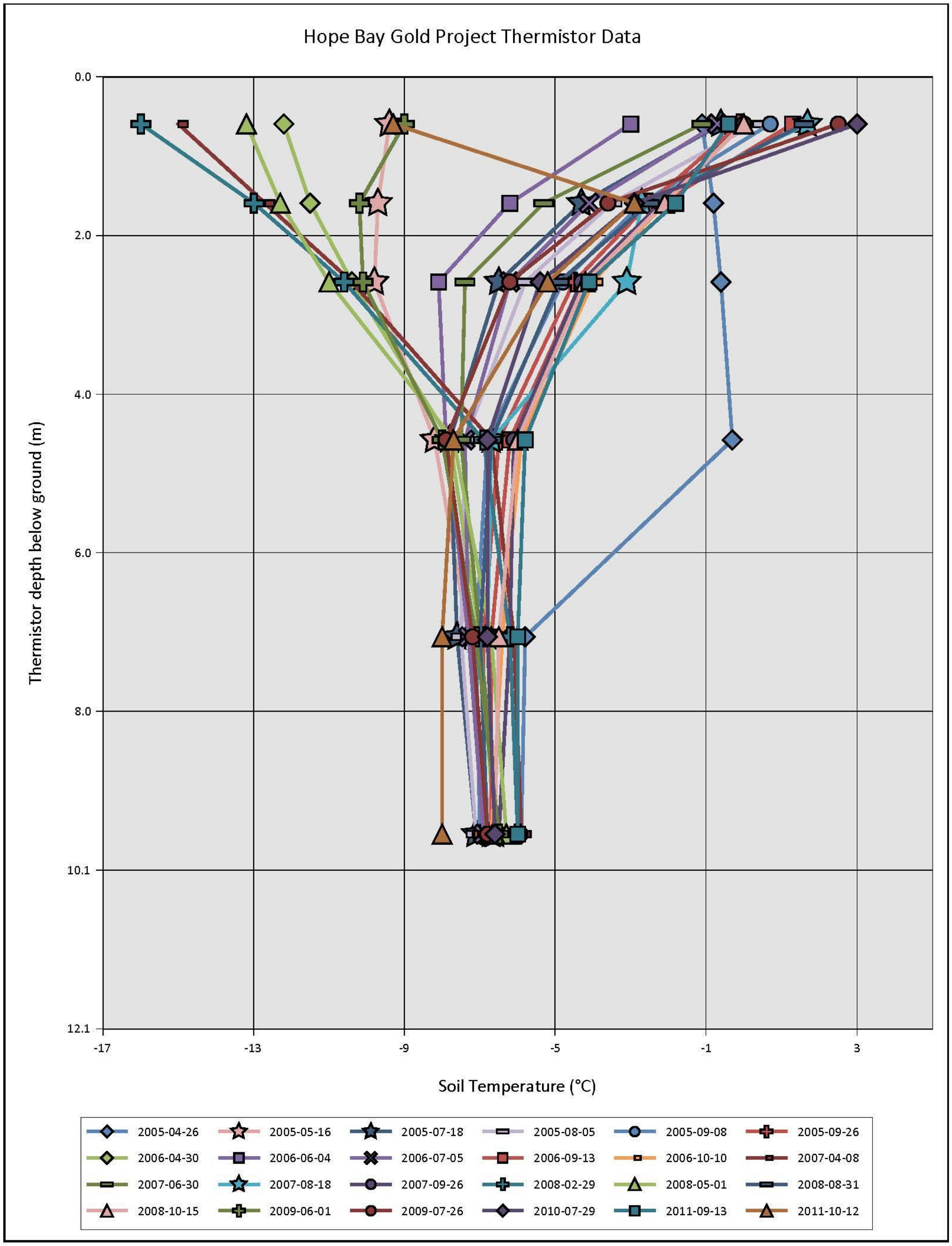
Thermistor Data (SRK-39)



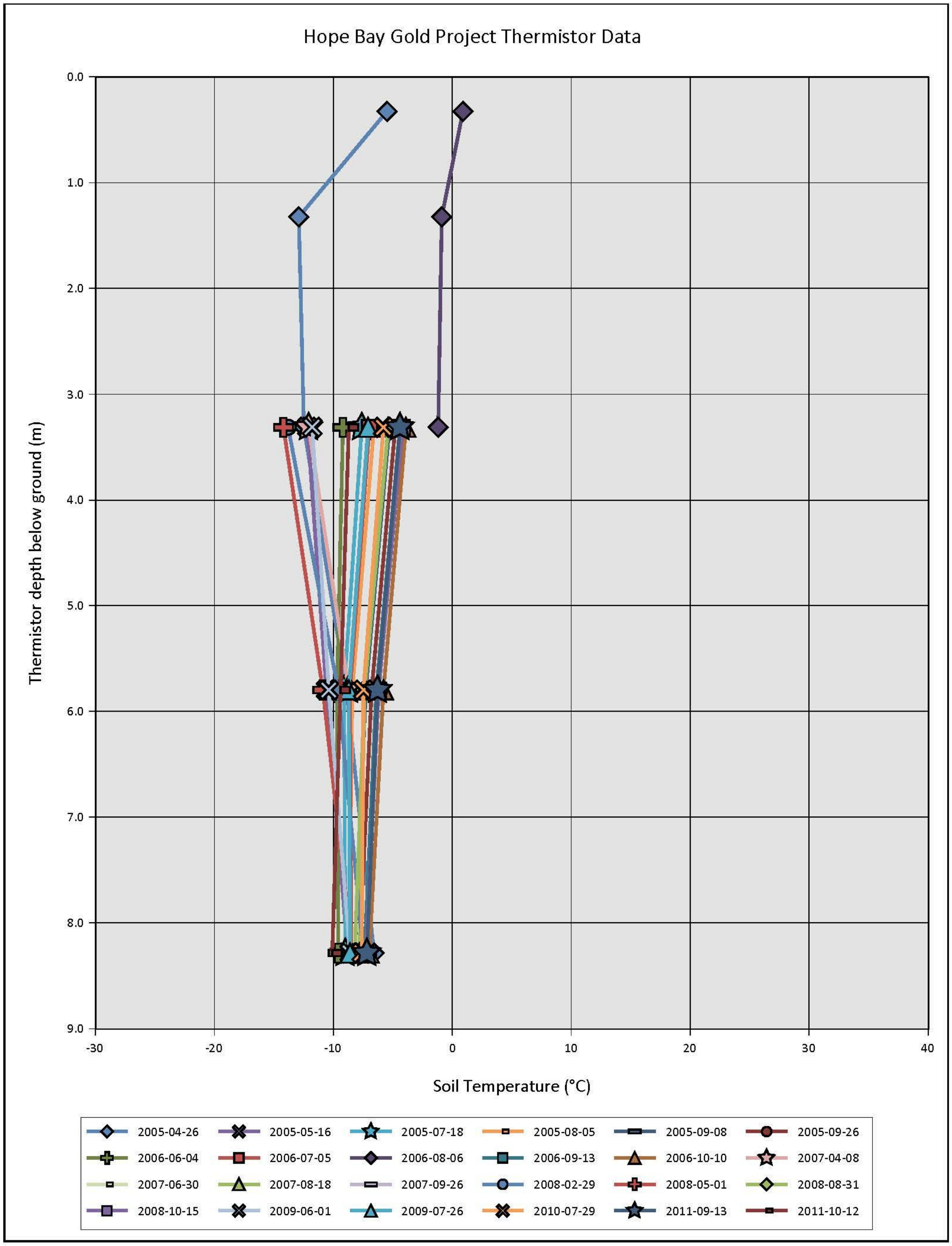
Thermistor Data (SRK-50)



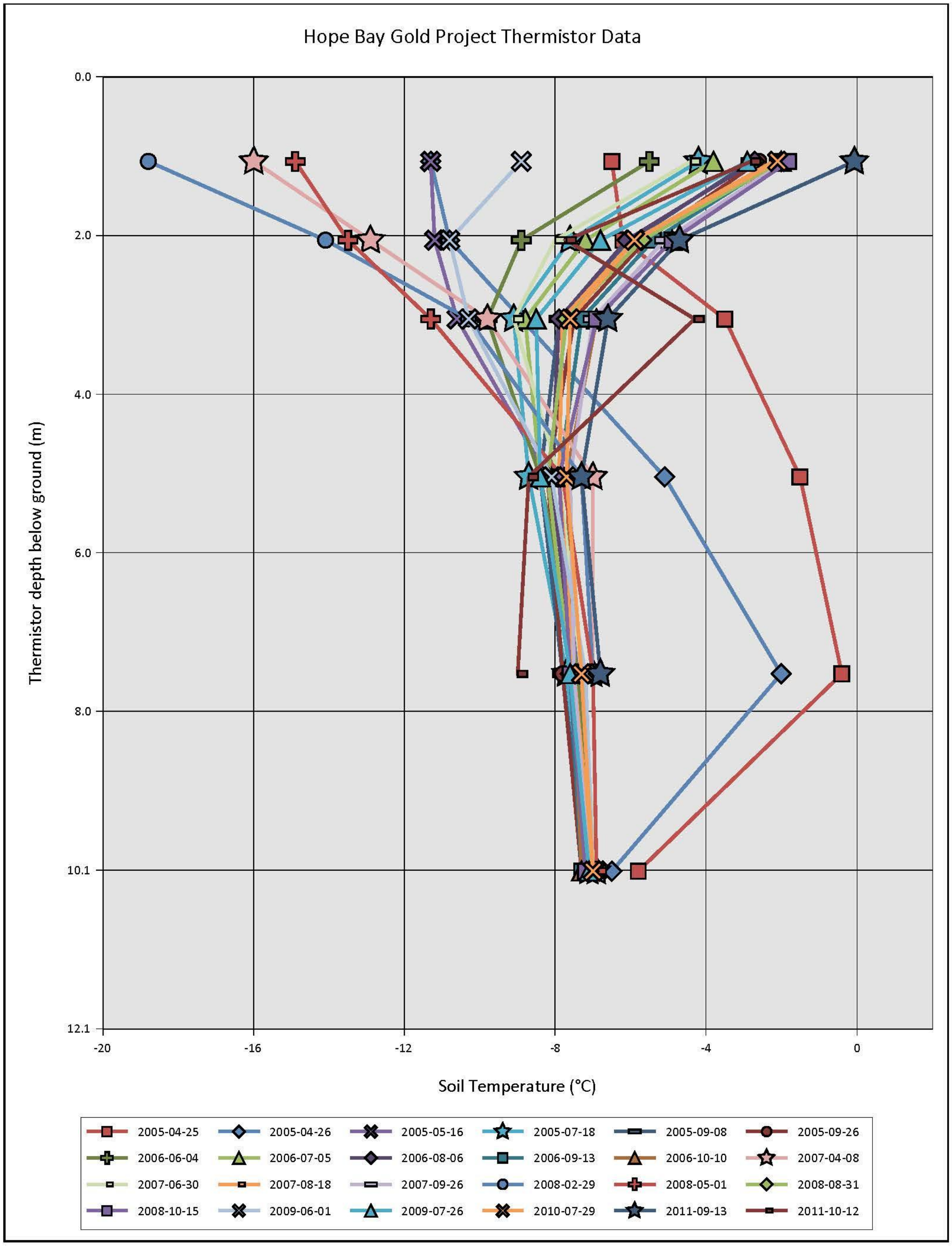
Thermistor Data (SRK-53)



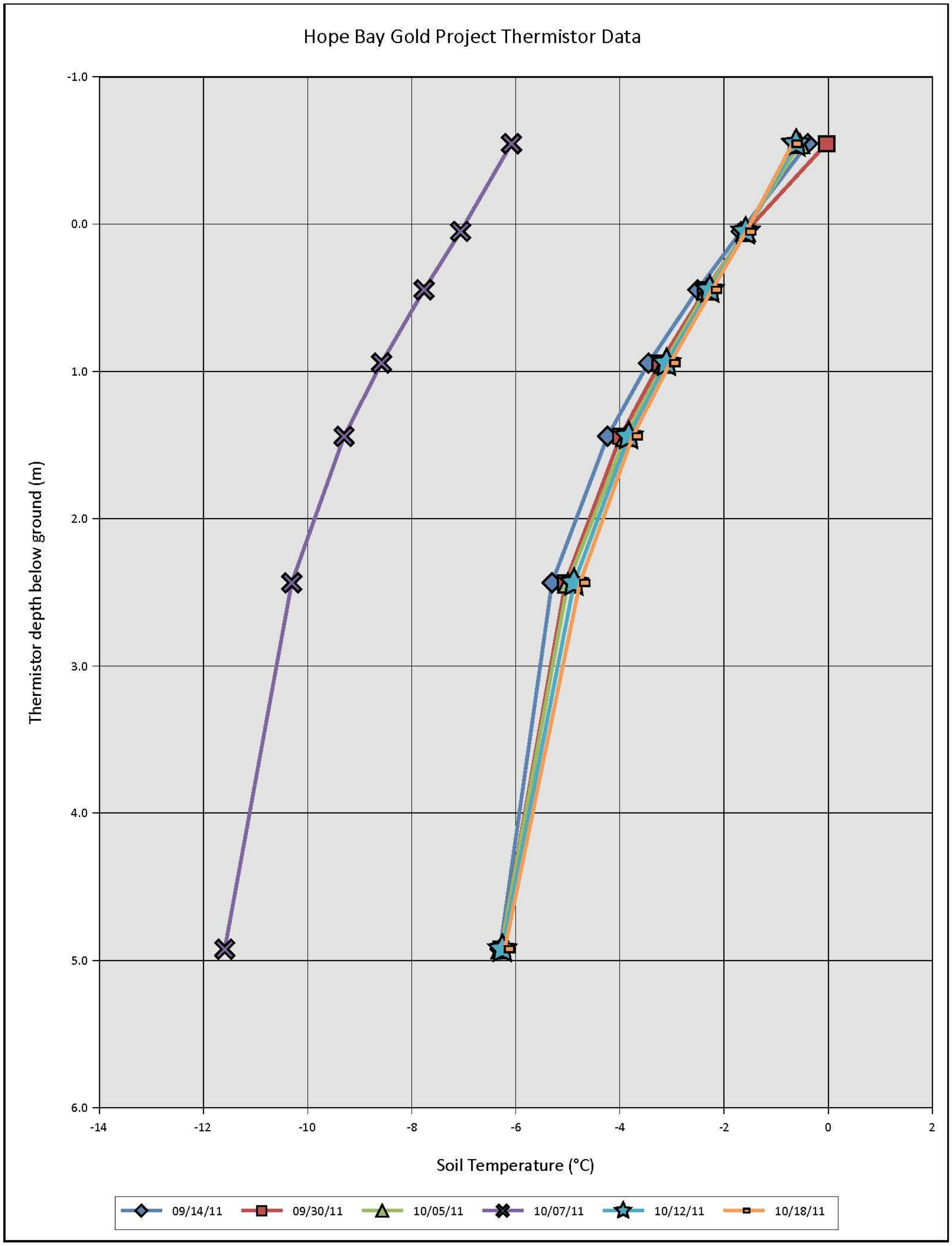
Thermistor Data (SRK-57)



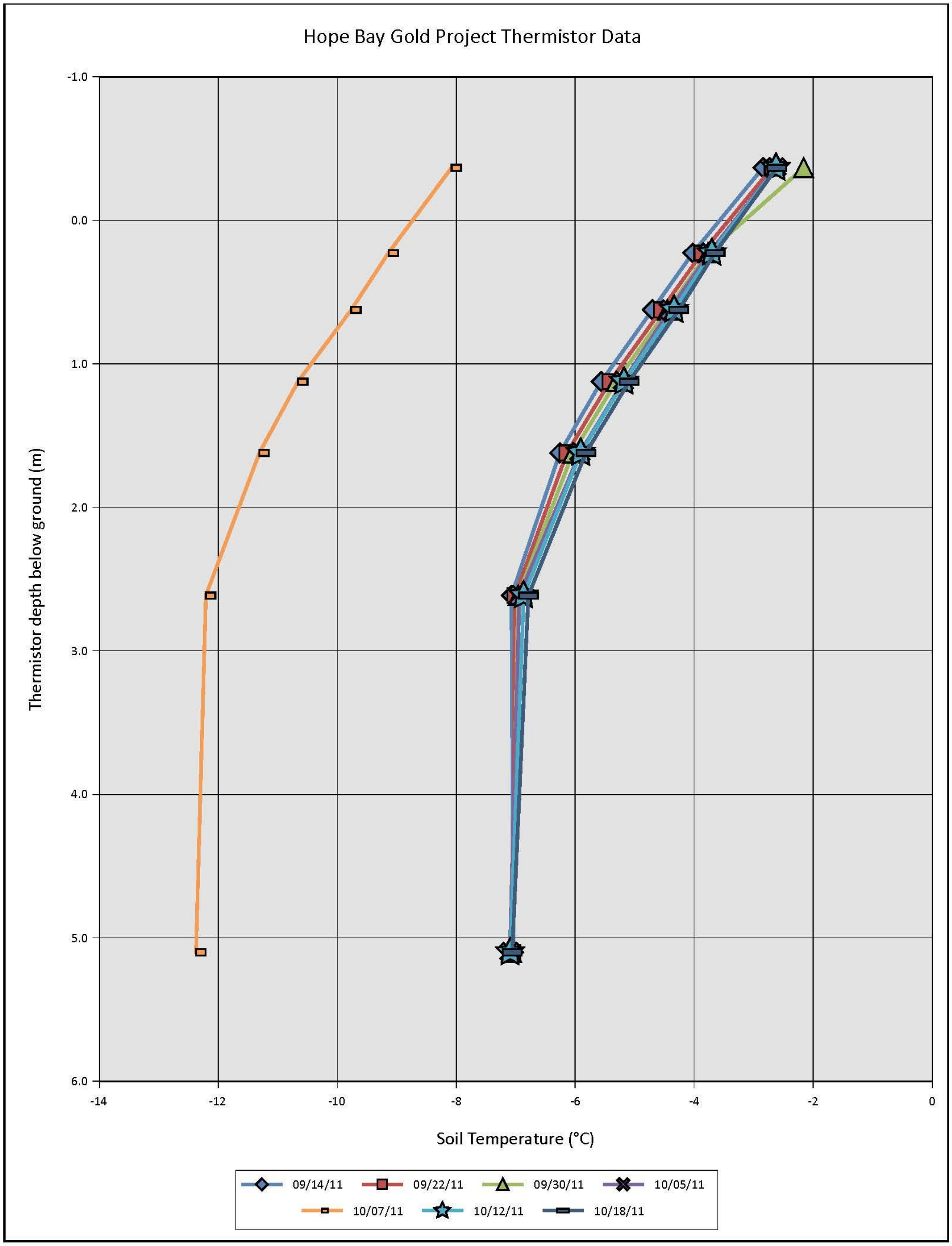
Thermistor Data (SRK-58)



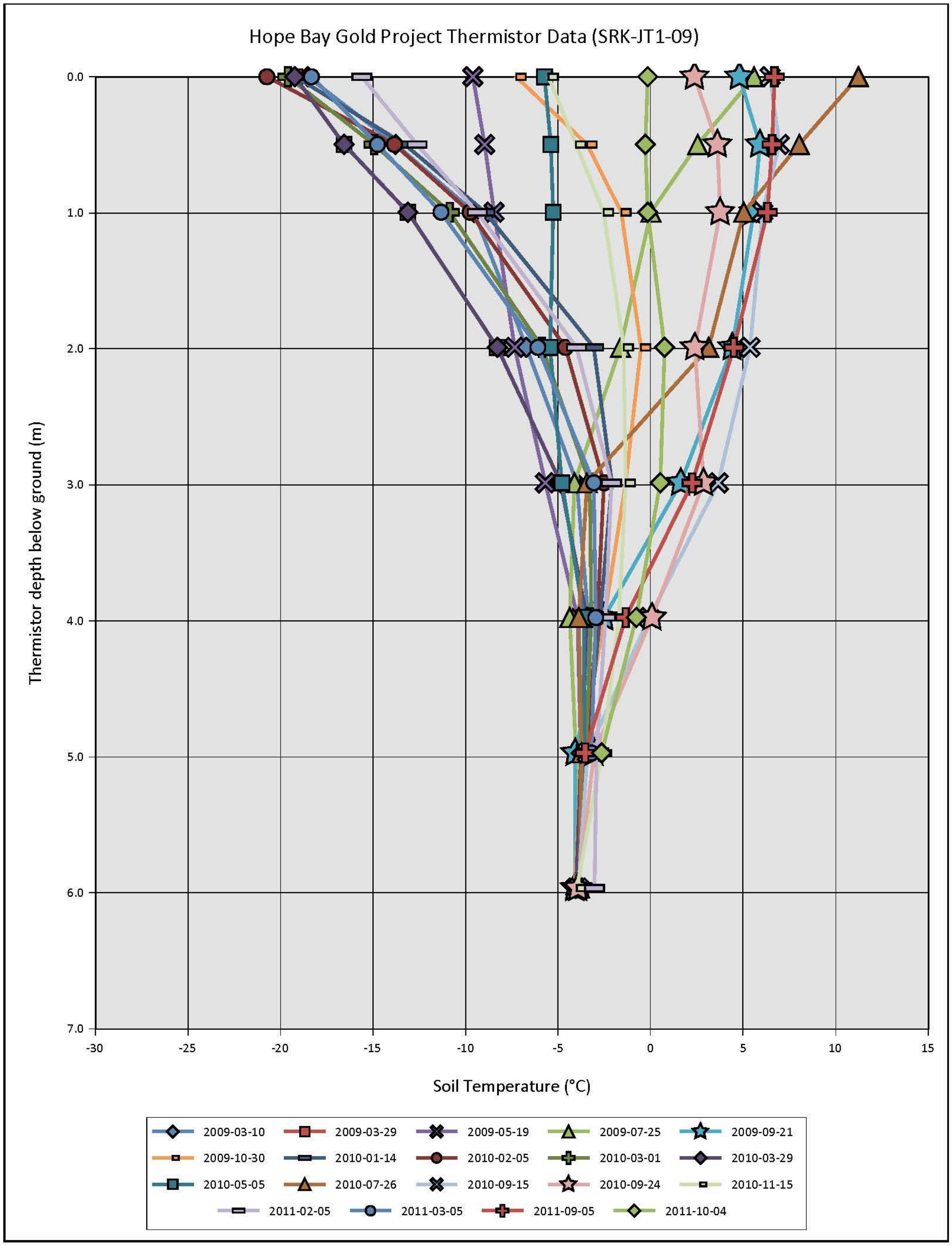
Thermistor Data (SRK10-DCB1)



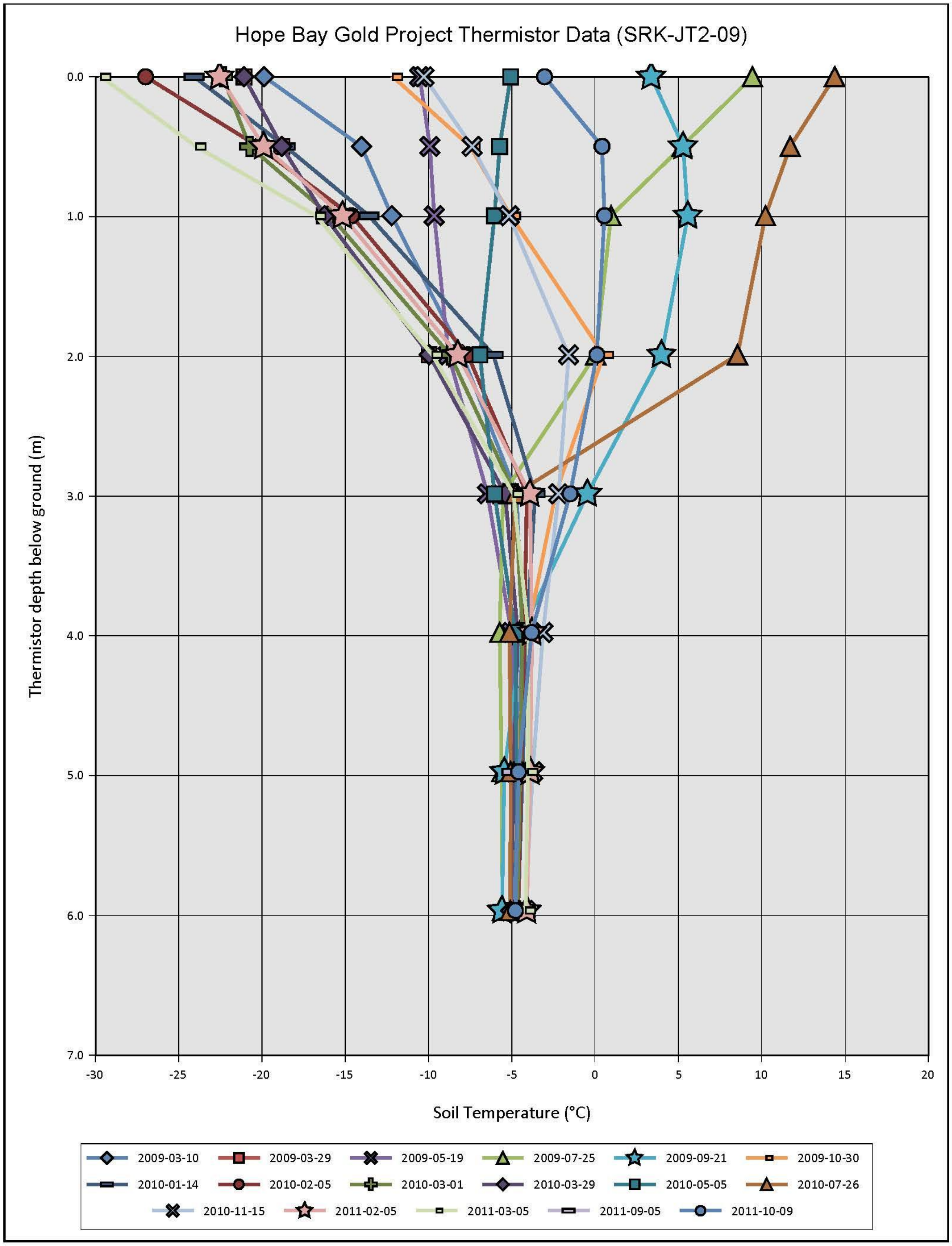
Thermistor Data (SRK10-DCB2)



Thermistor Data (SRK-JT1-09)

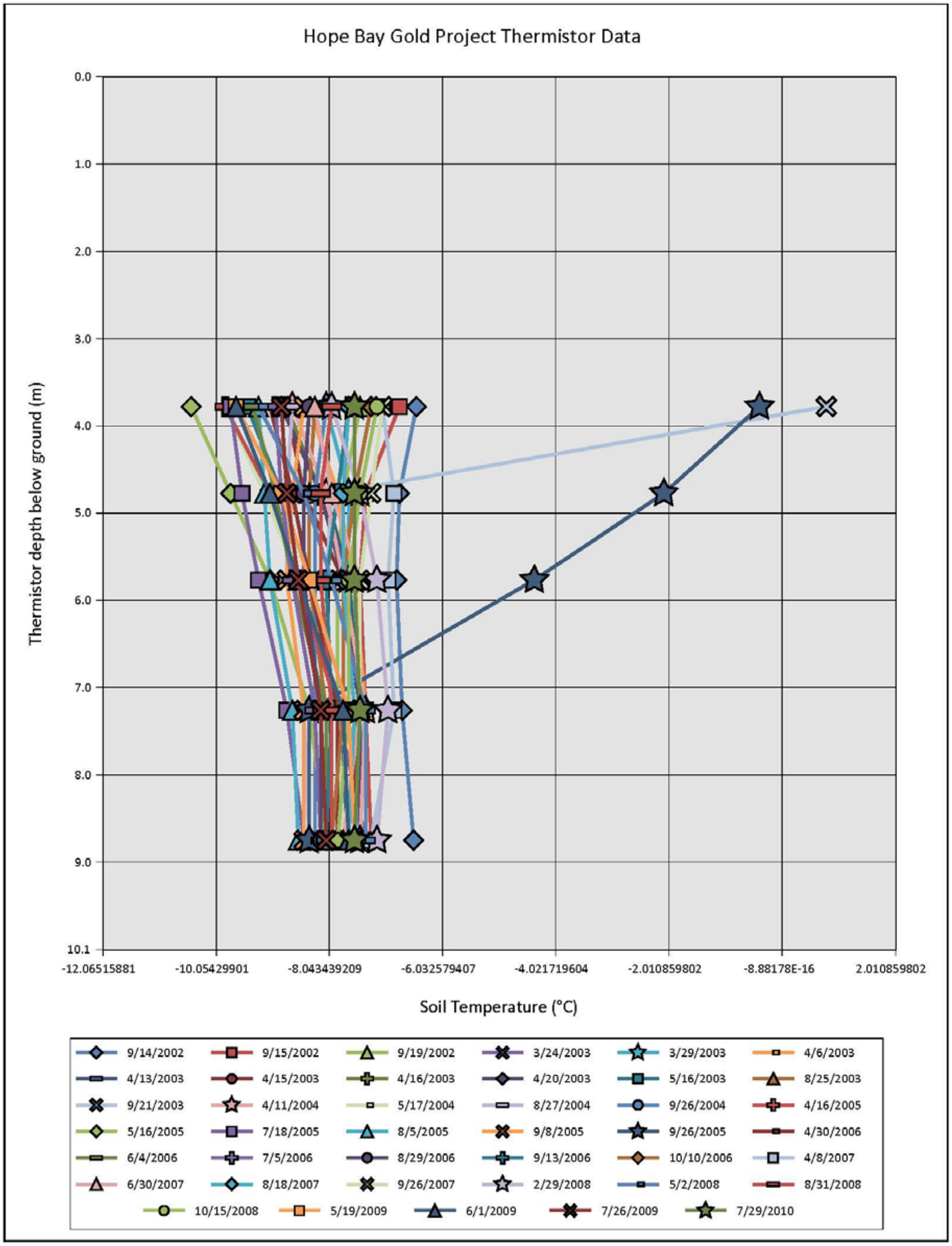


Thermistor Data (SRK-JT2-09)

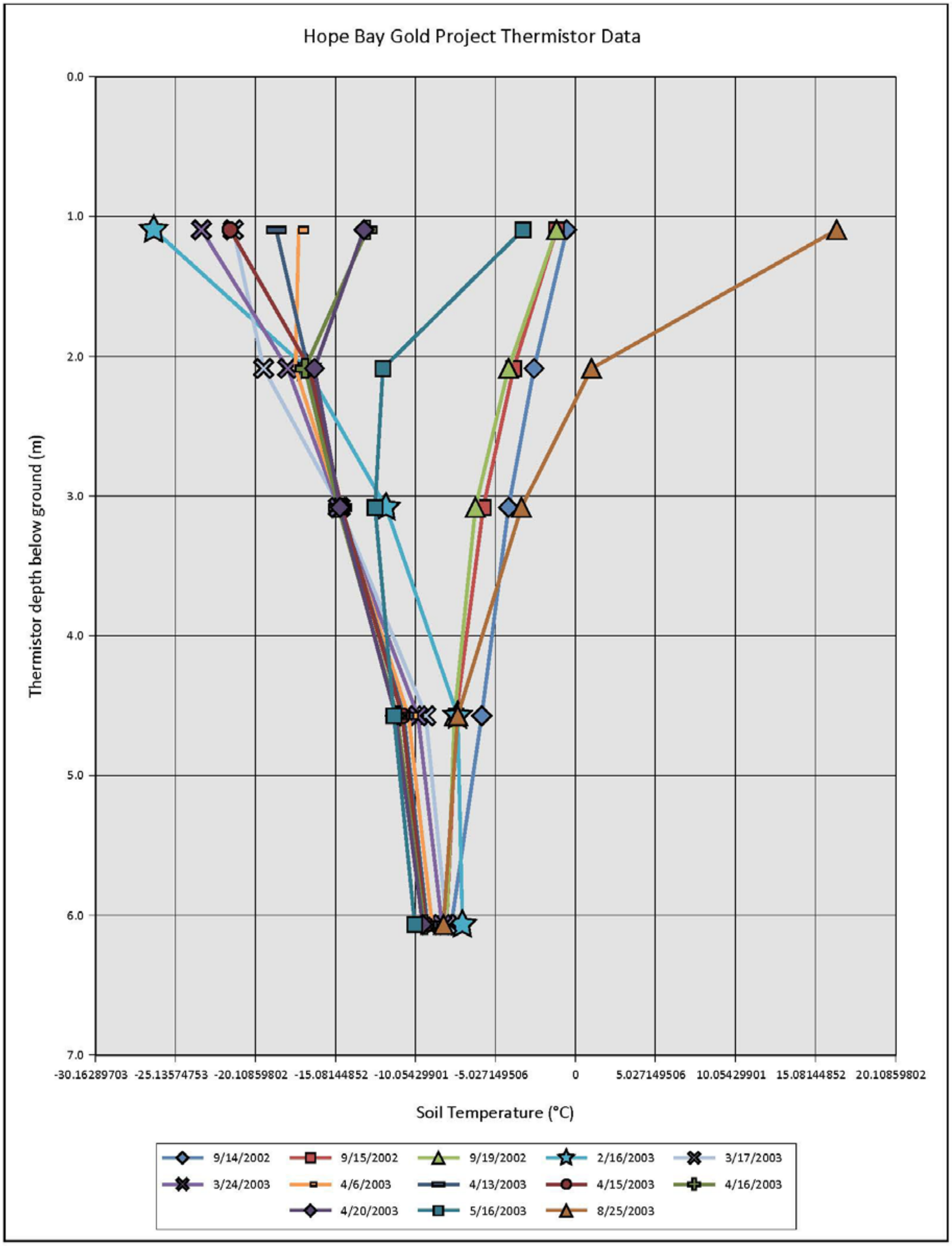


Appendix B
Inactive Thermistor Profiles

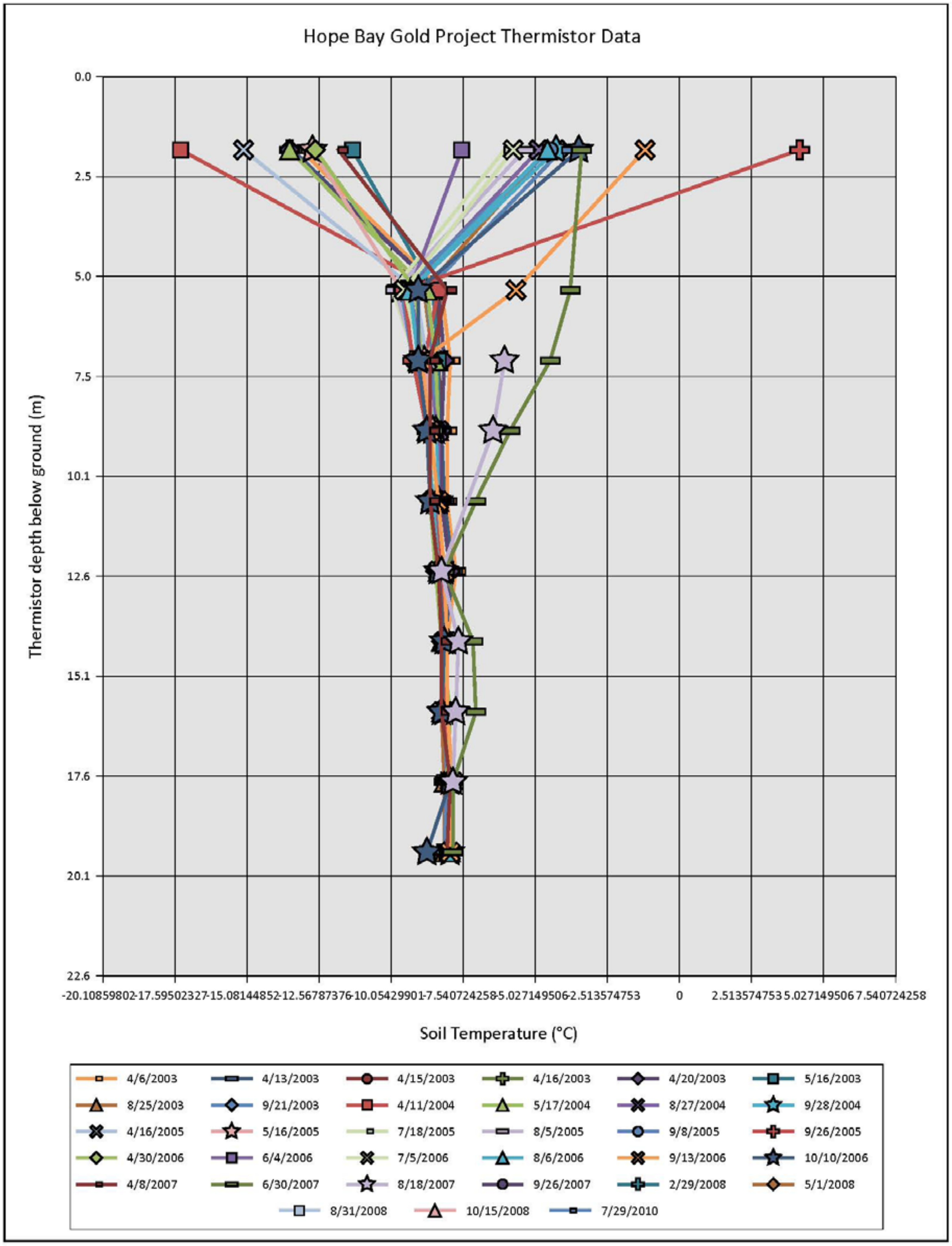
Thermistor Data (SRK-11)



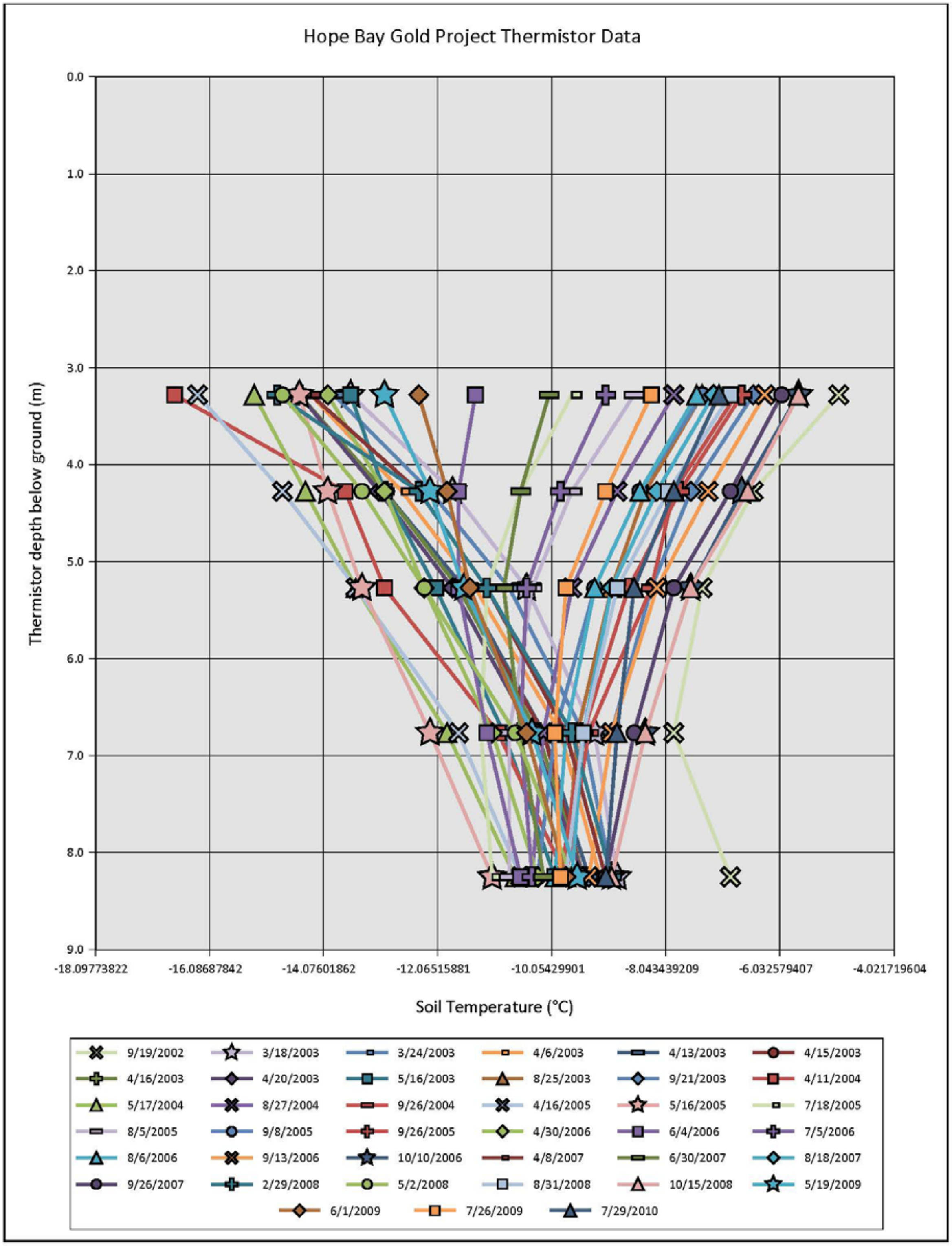
Thermistor Data (SRK-13)



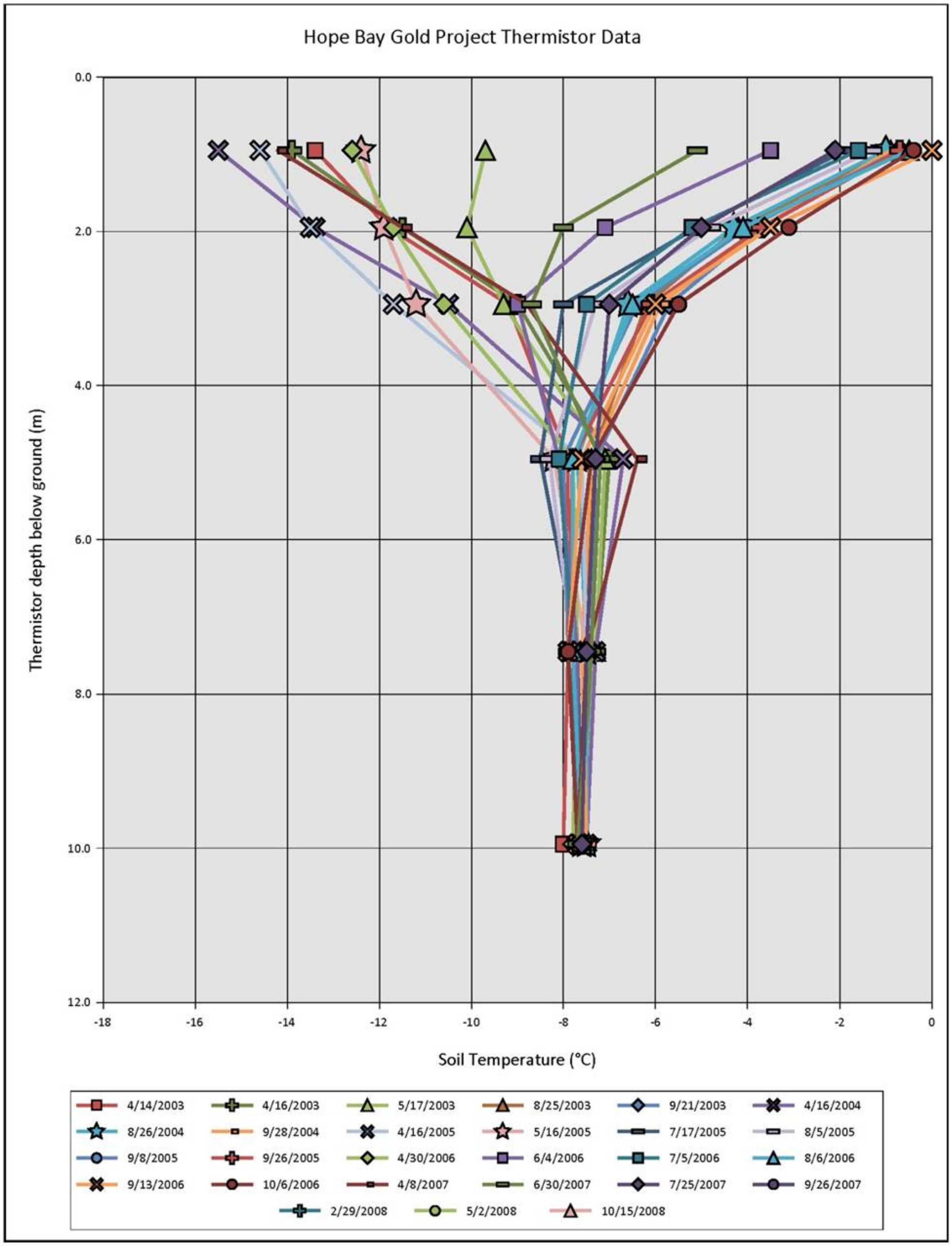
Thermistor Data (SRK-15)



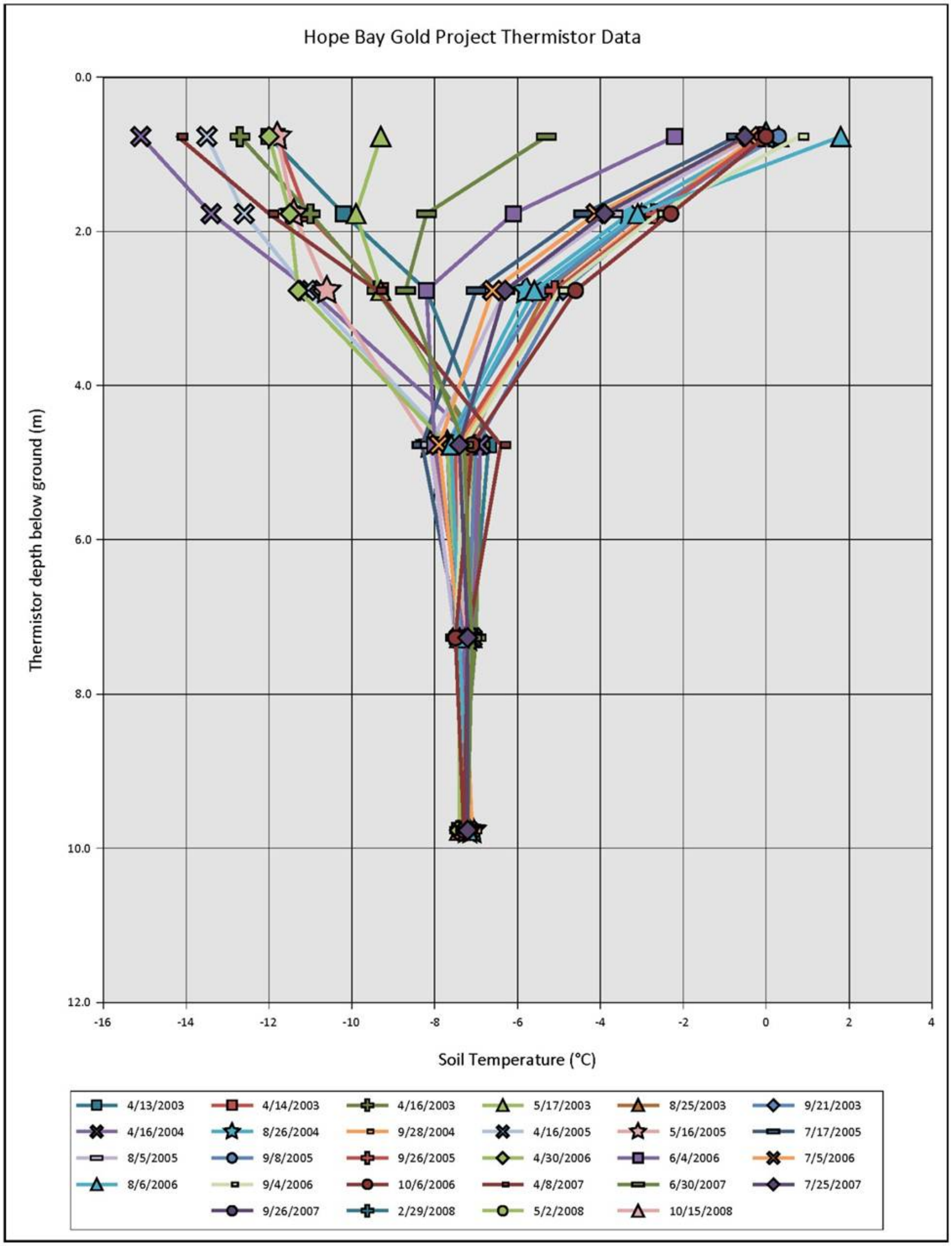
Thermistor Data (SRK-16)



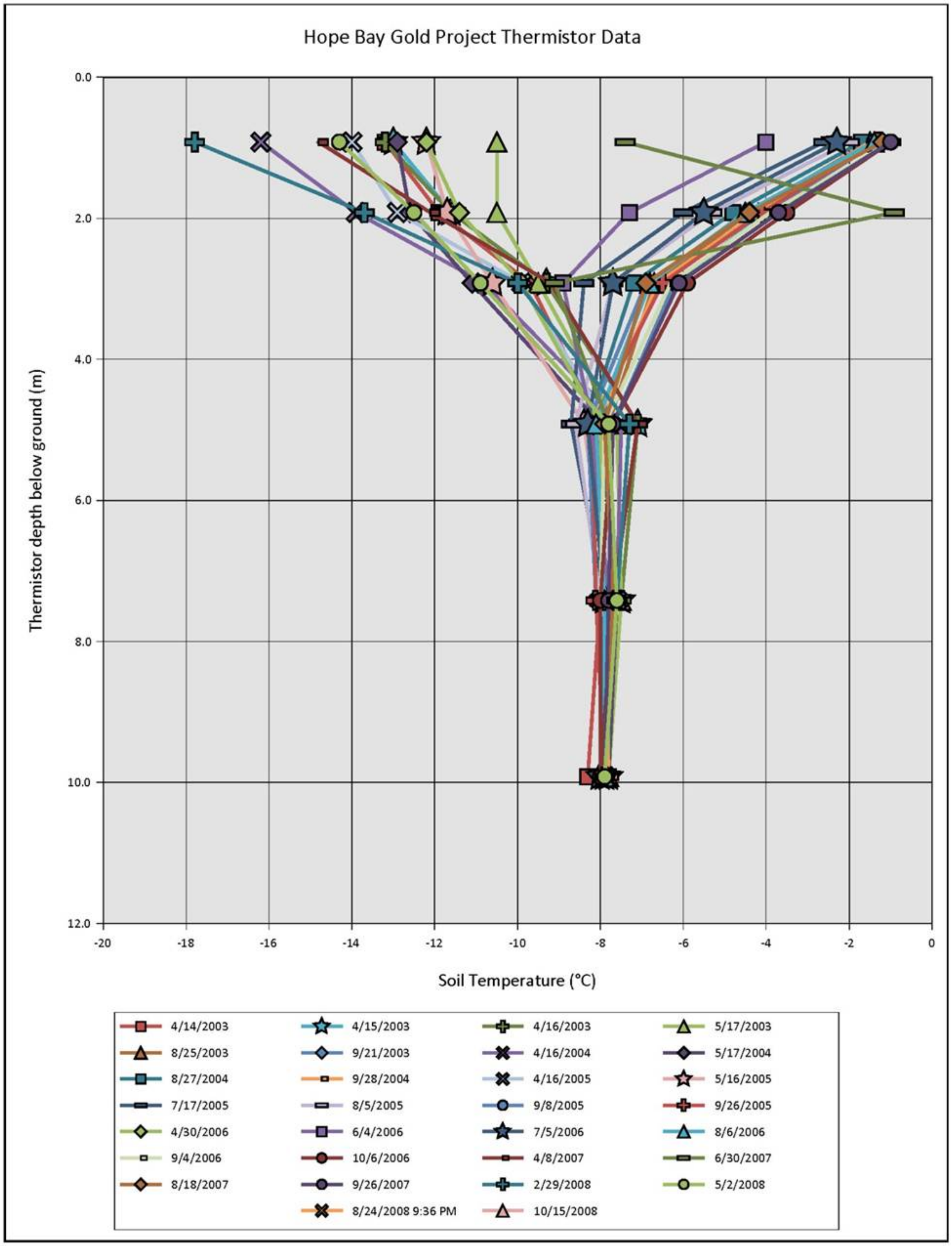
Thermistor Data (SRK-19)



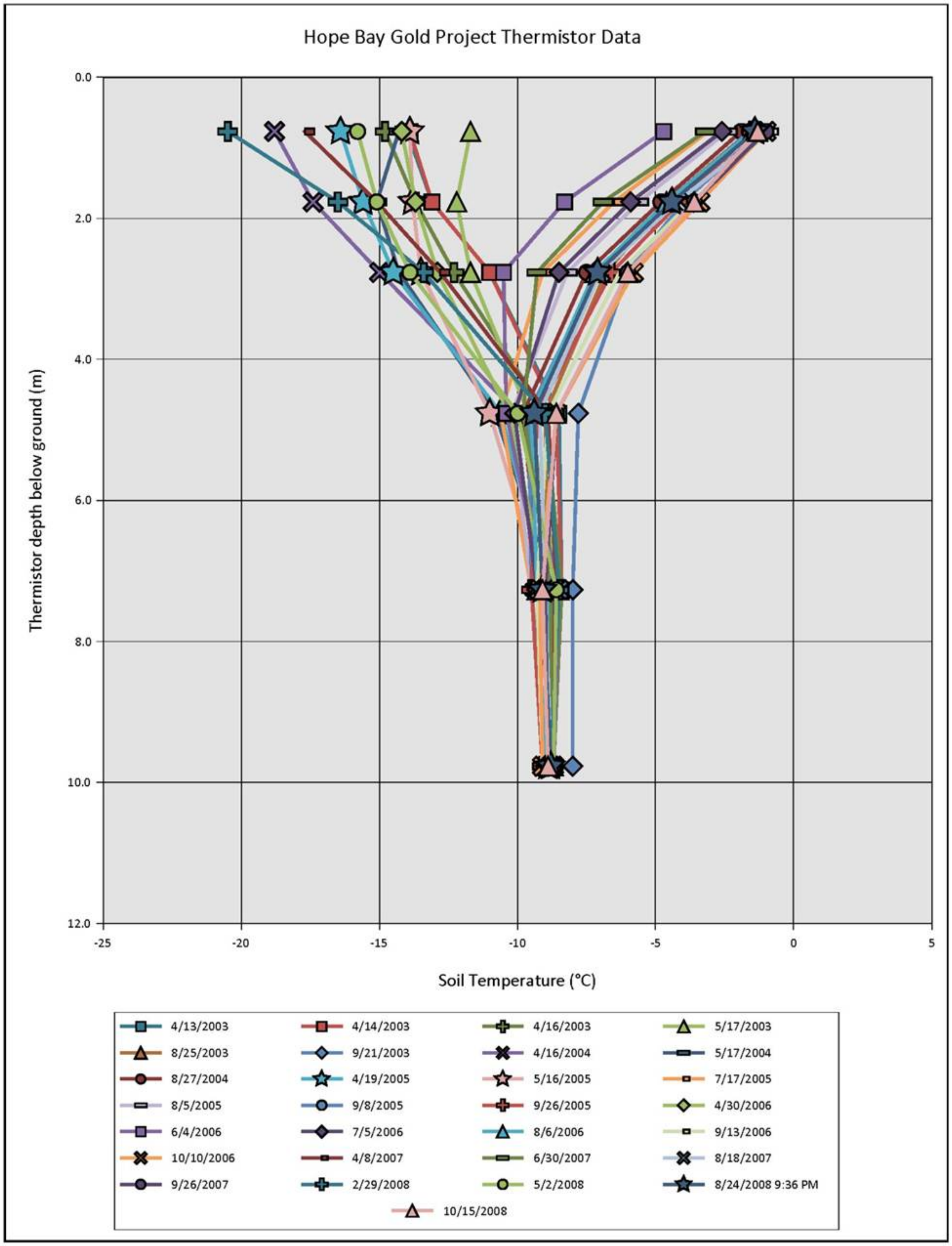
Thermistor Data (SRK-20)



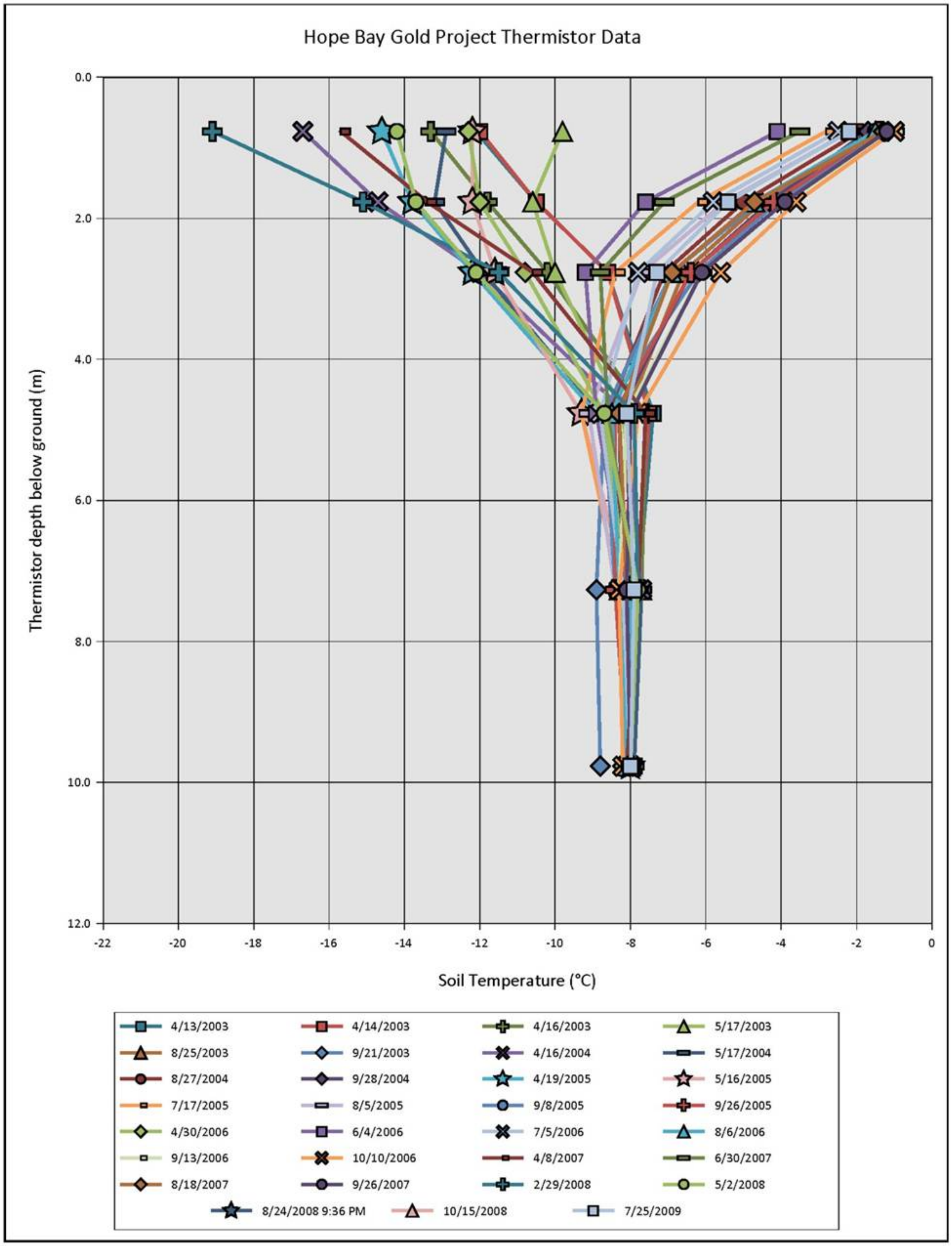
Thermistor Data (SRK-23)



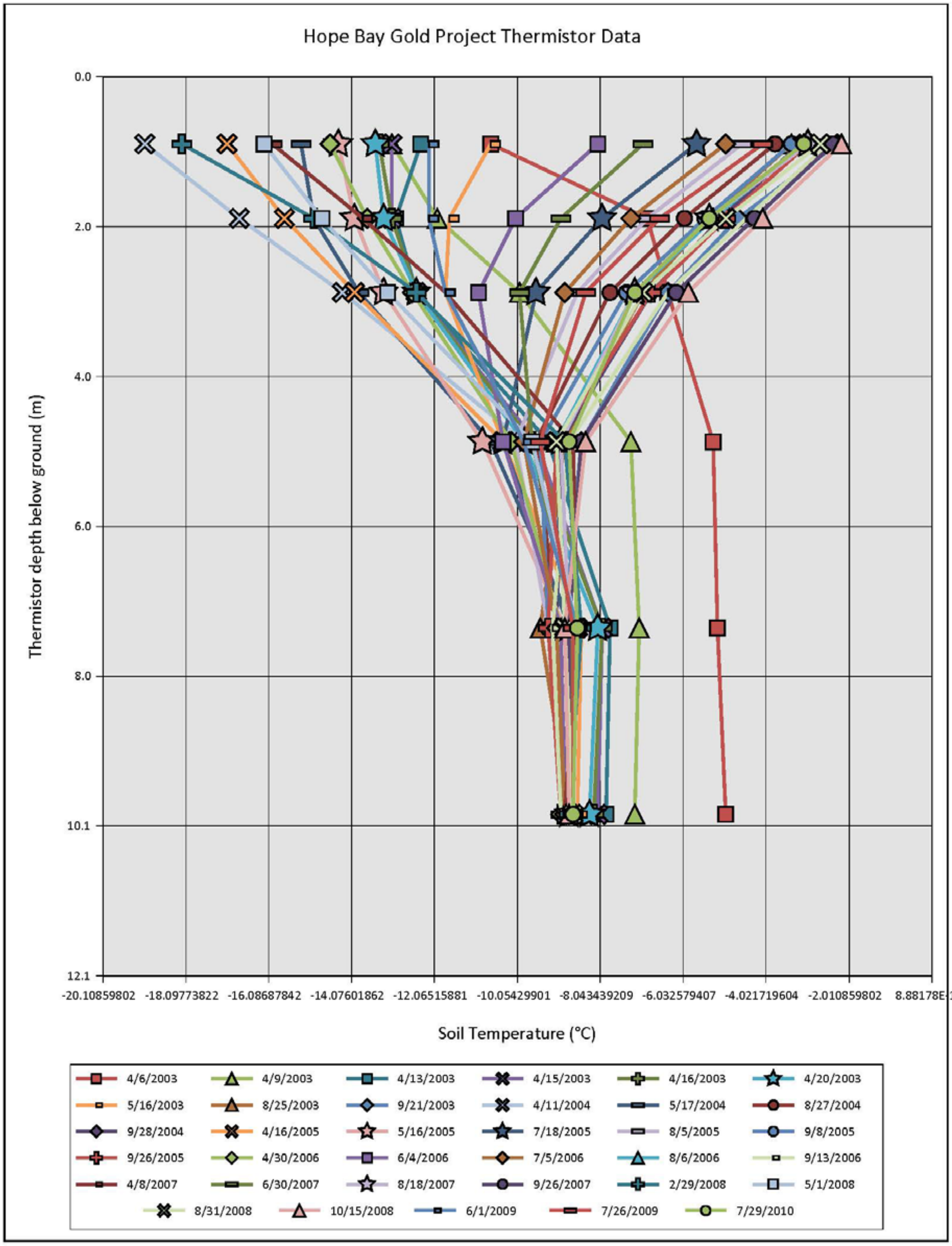
Thermistor Data (SRK-26)



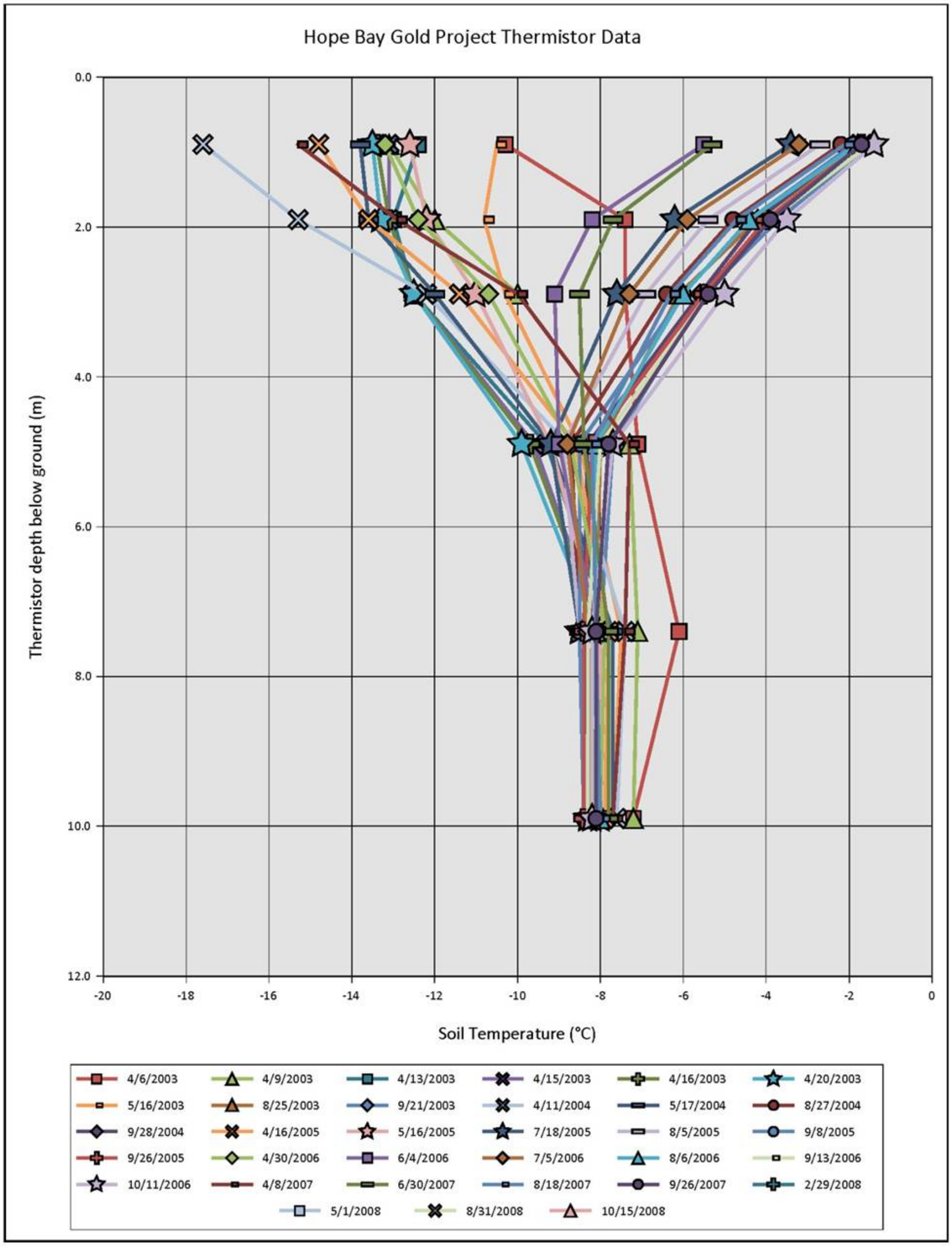
Thermistor Data (SRK-28)



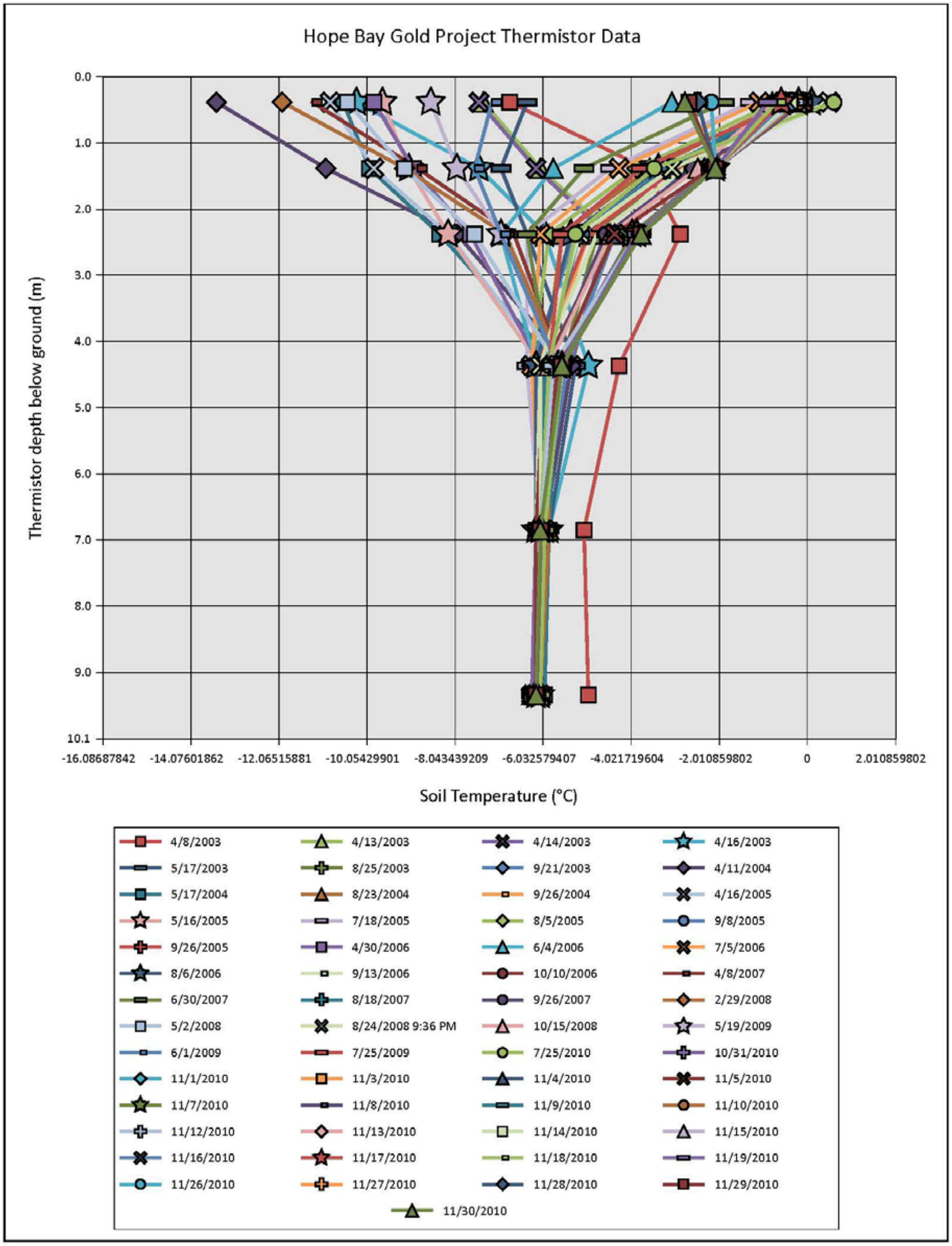
Thermistor Data (SRK-33)



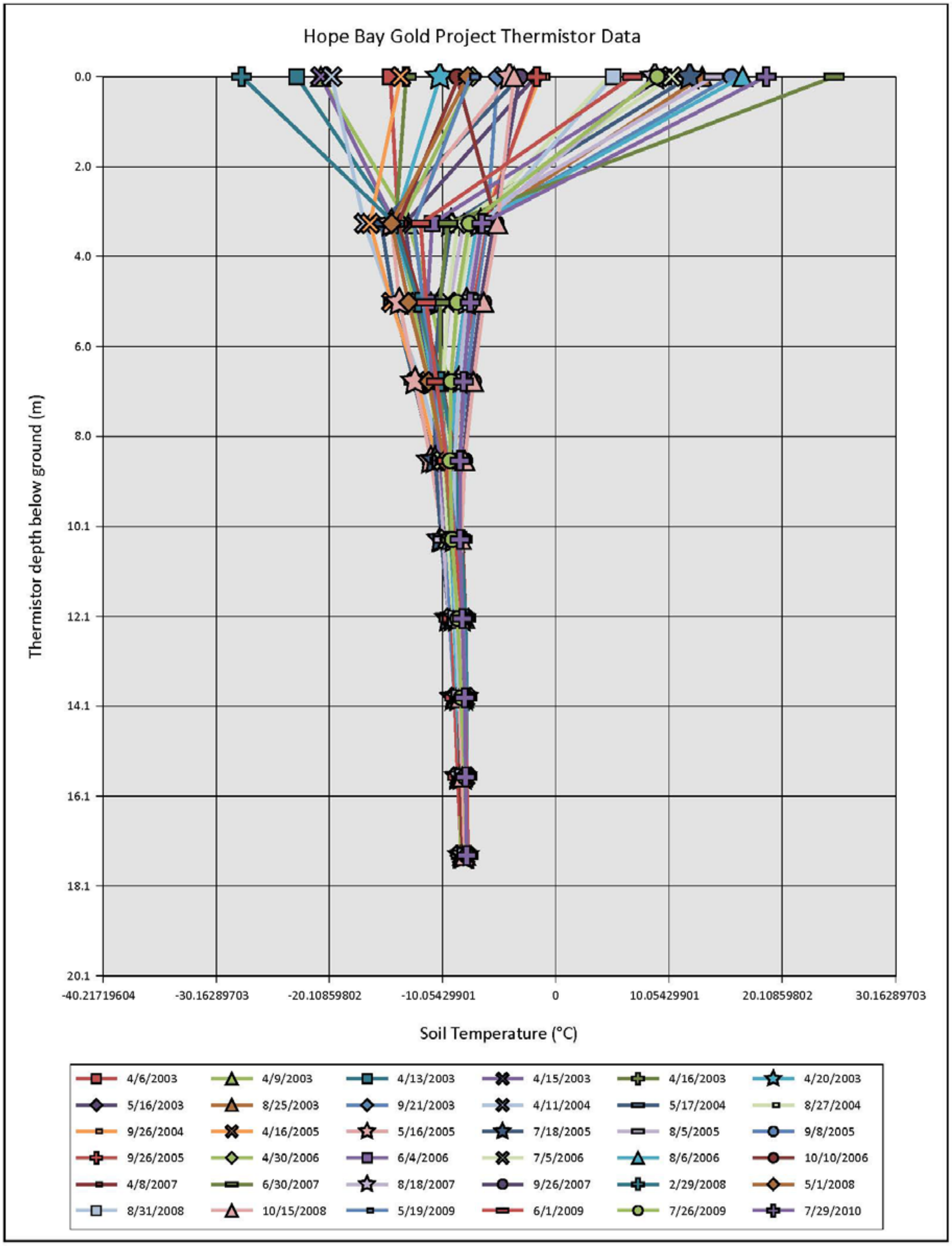
Thermistor Data (SRK-34A)



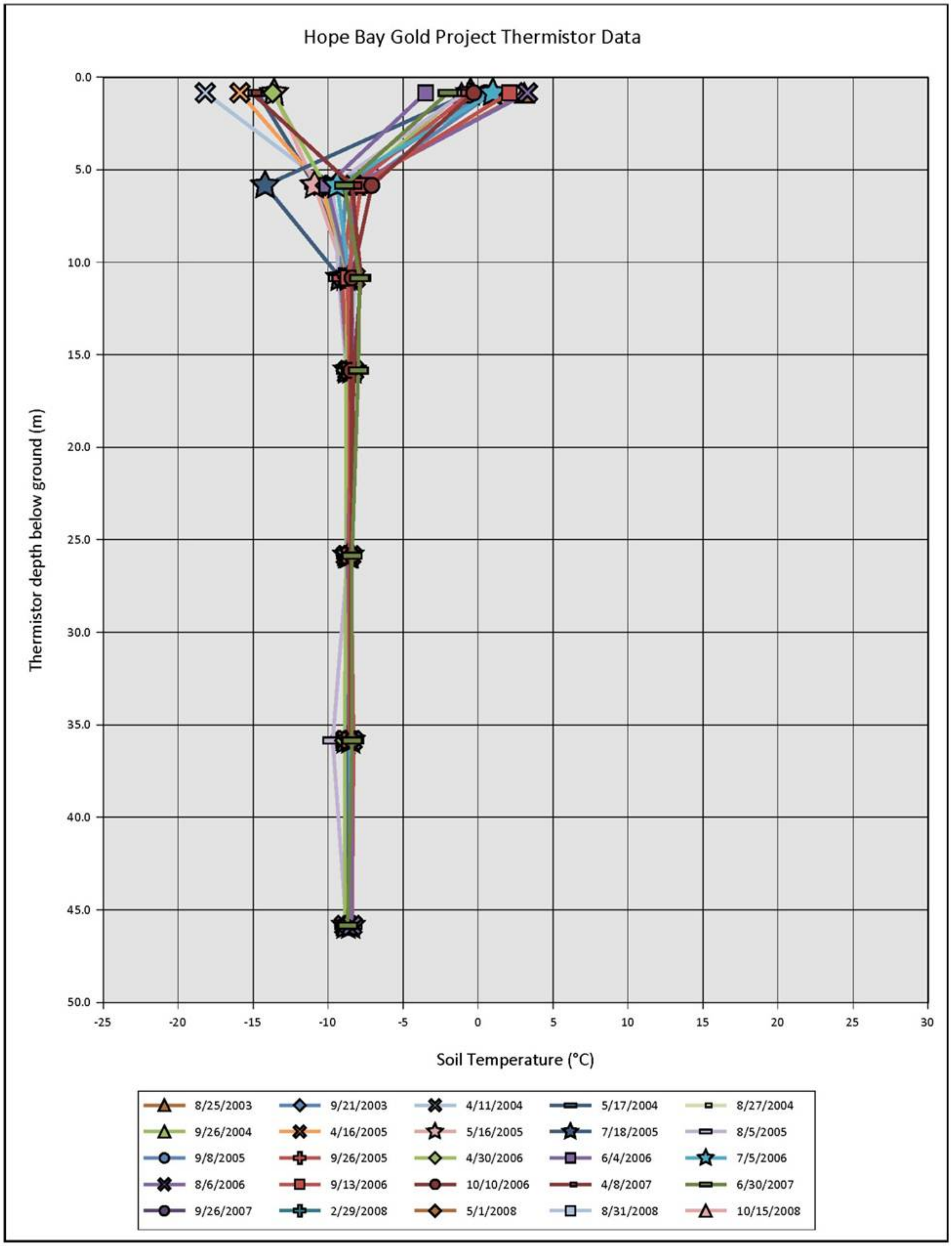
Thermistor Data (SRK-35)



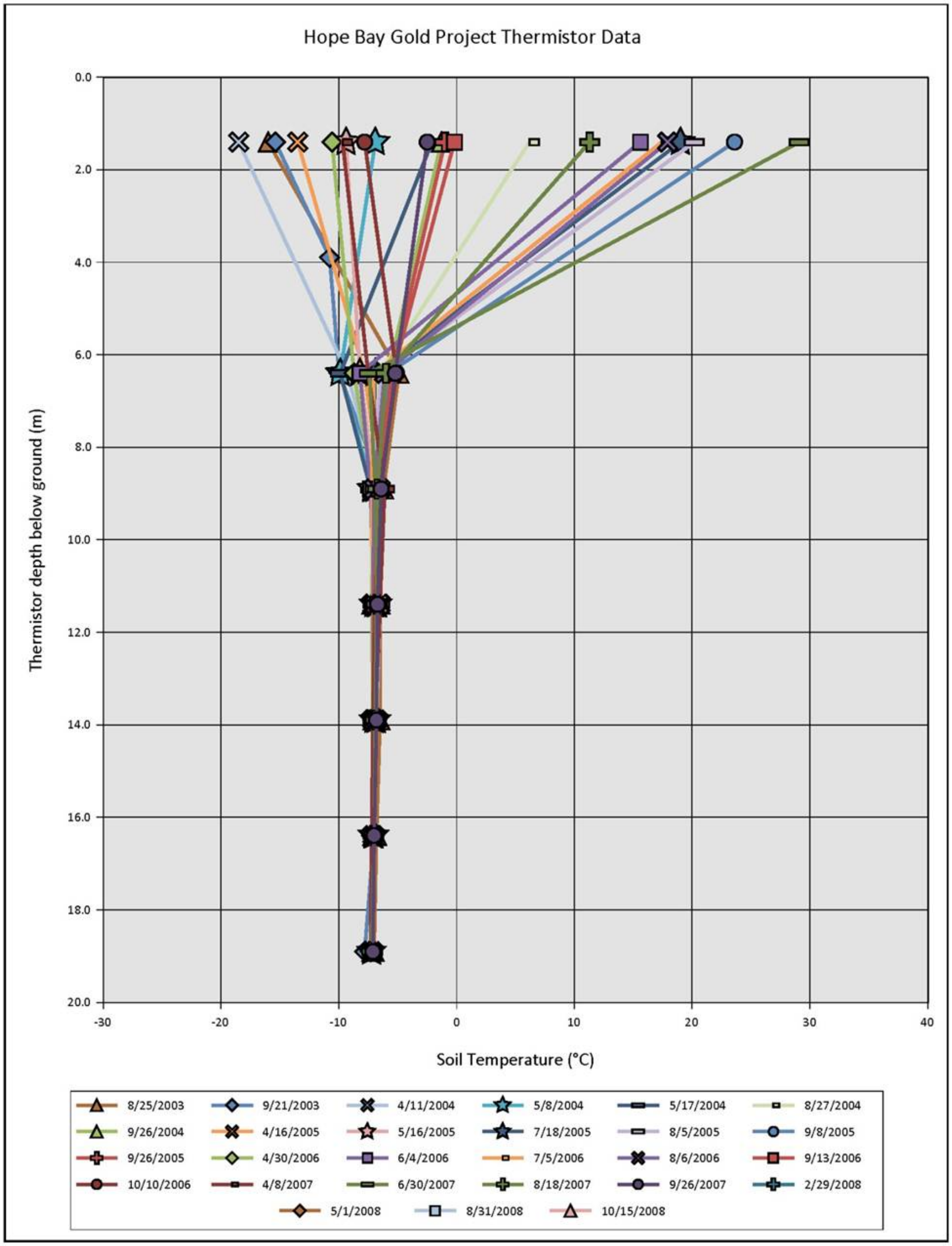
Thermistor Data (SRK-37)



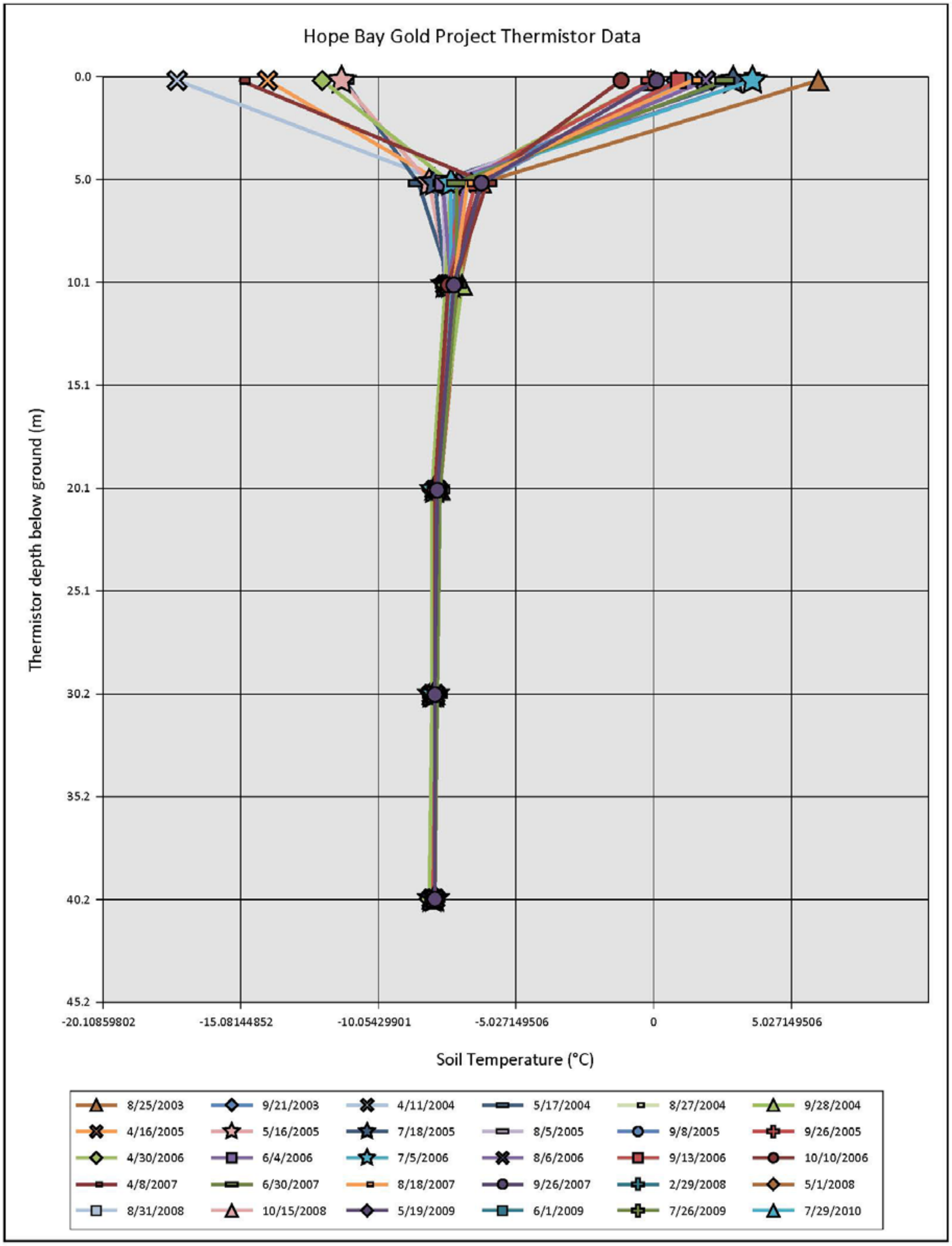
Thermistor Data (SRK-40)



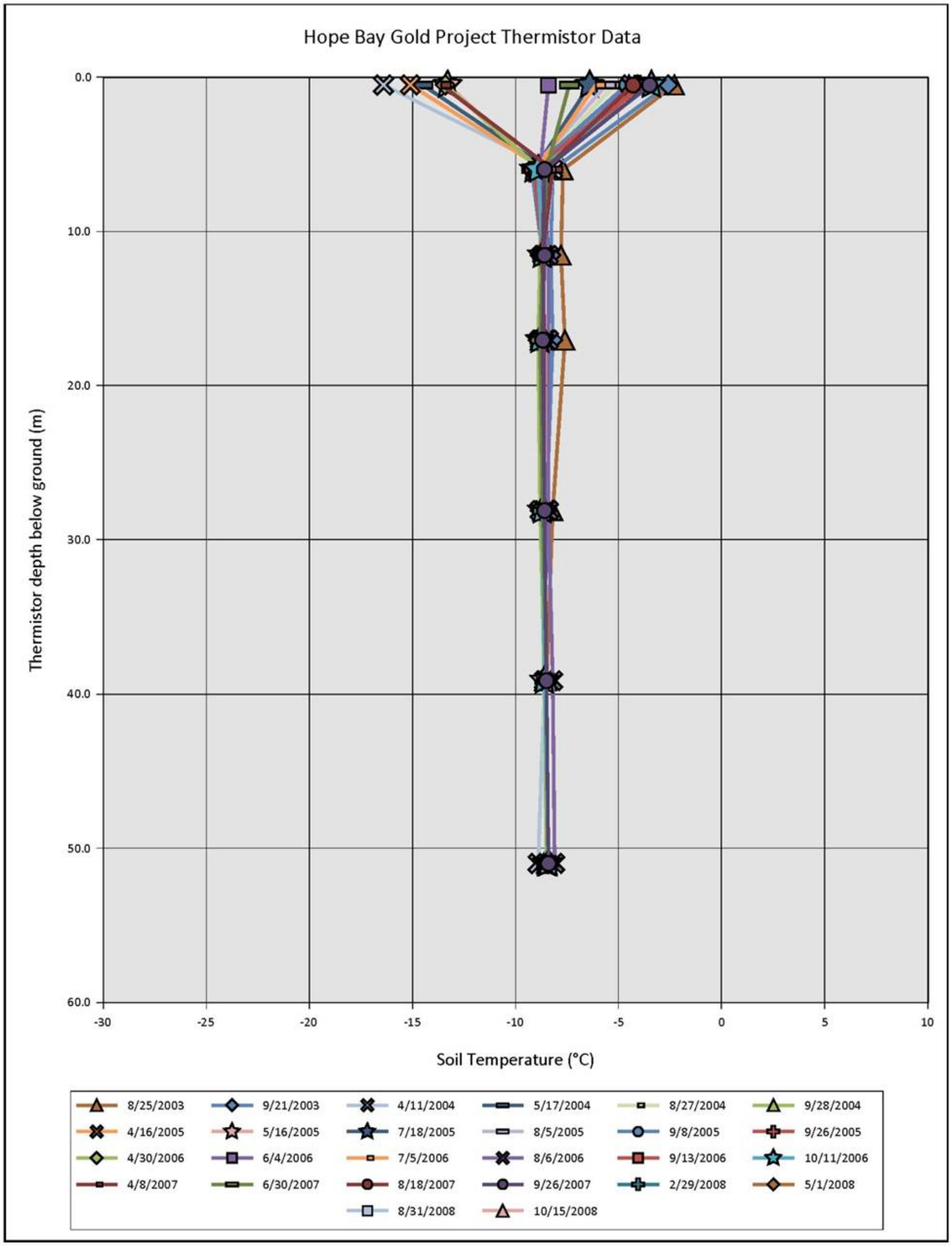
Thermistor Data (SRK-41)



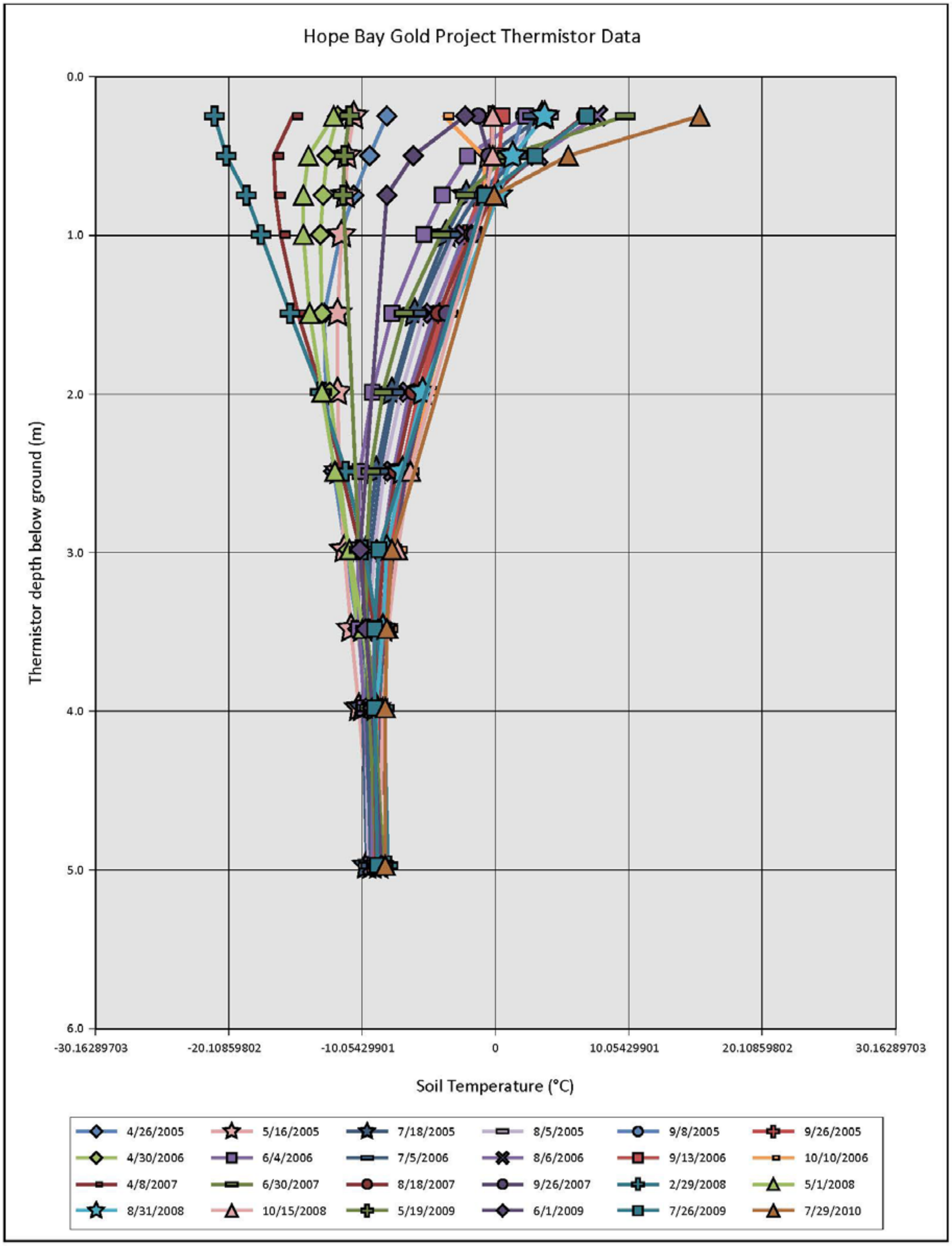
Thermistor Data (SRK-42)



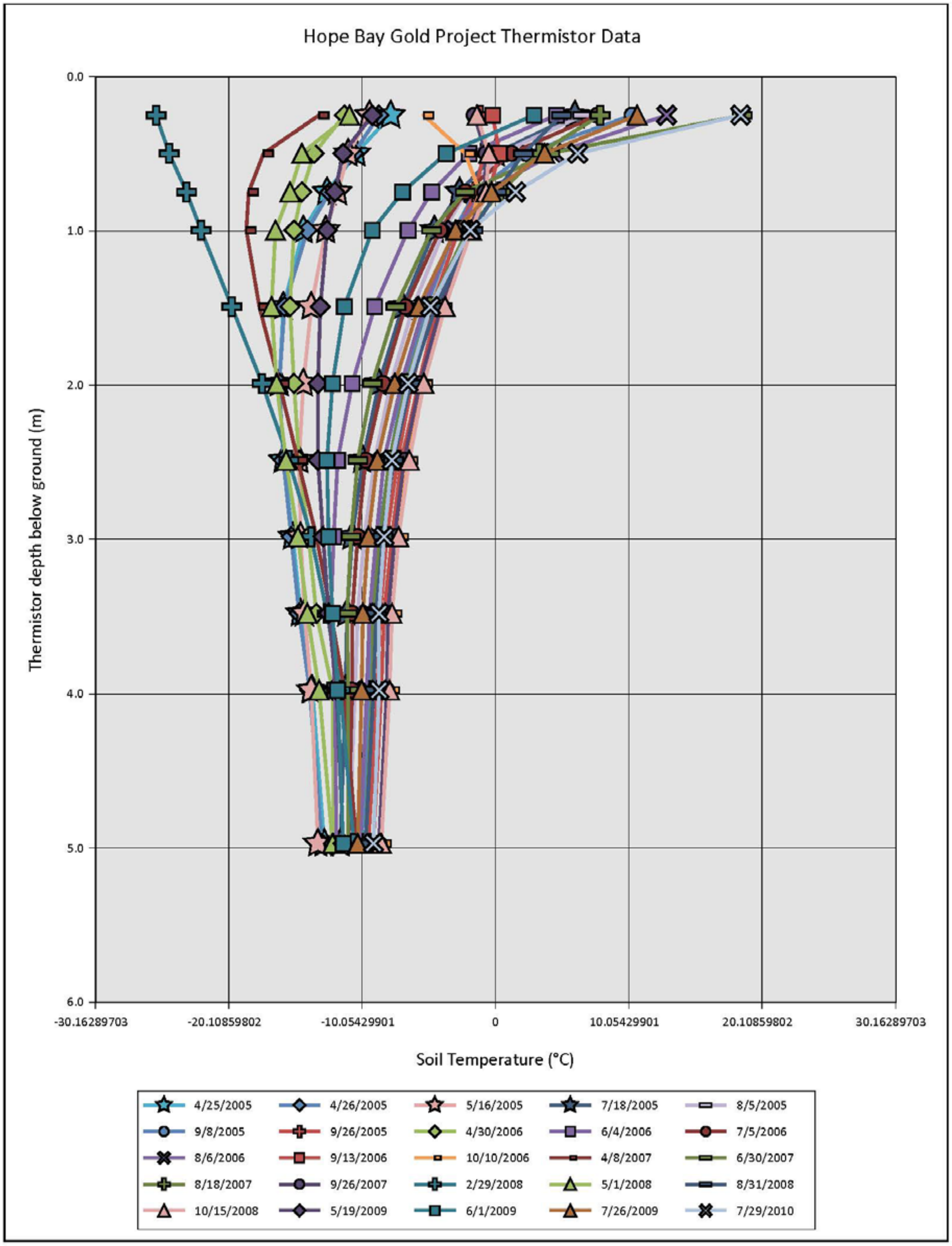
Thermistor Data (SRK-43)



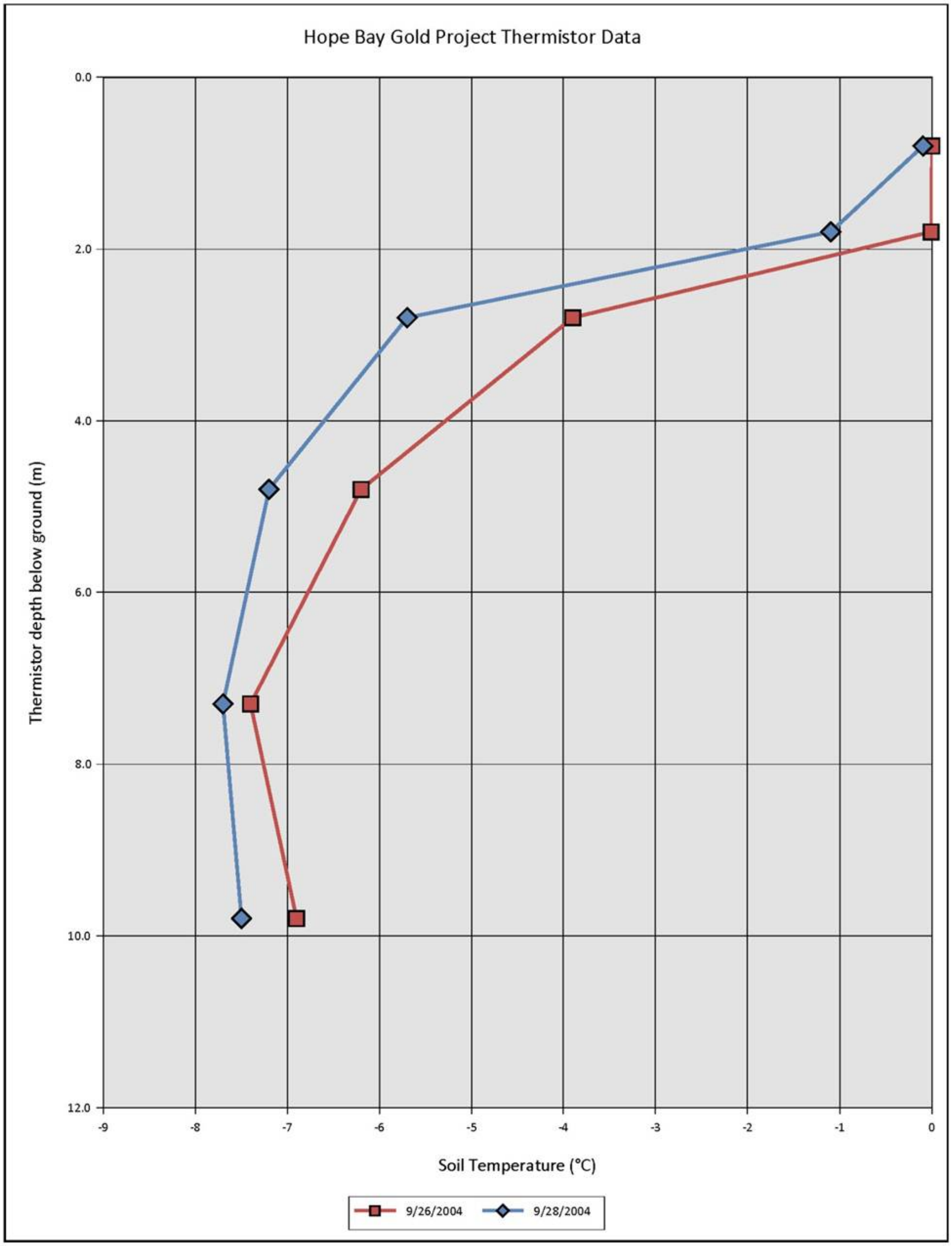
Thermistor Data (SRK-51)



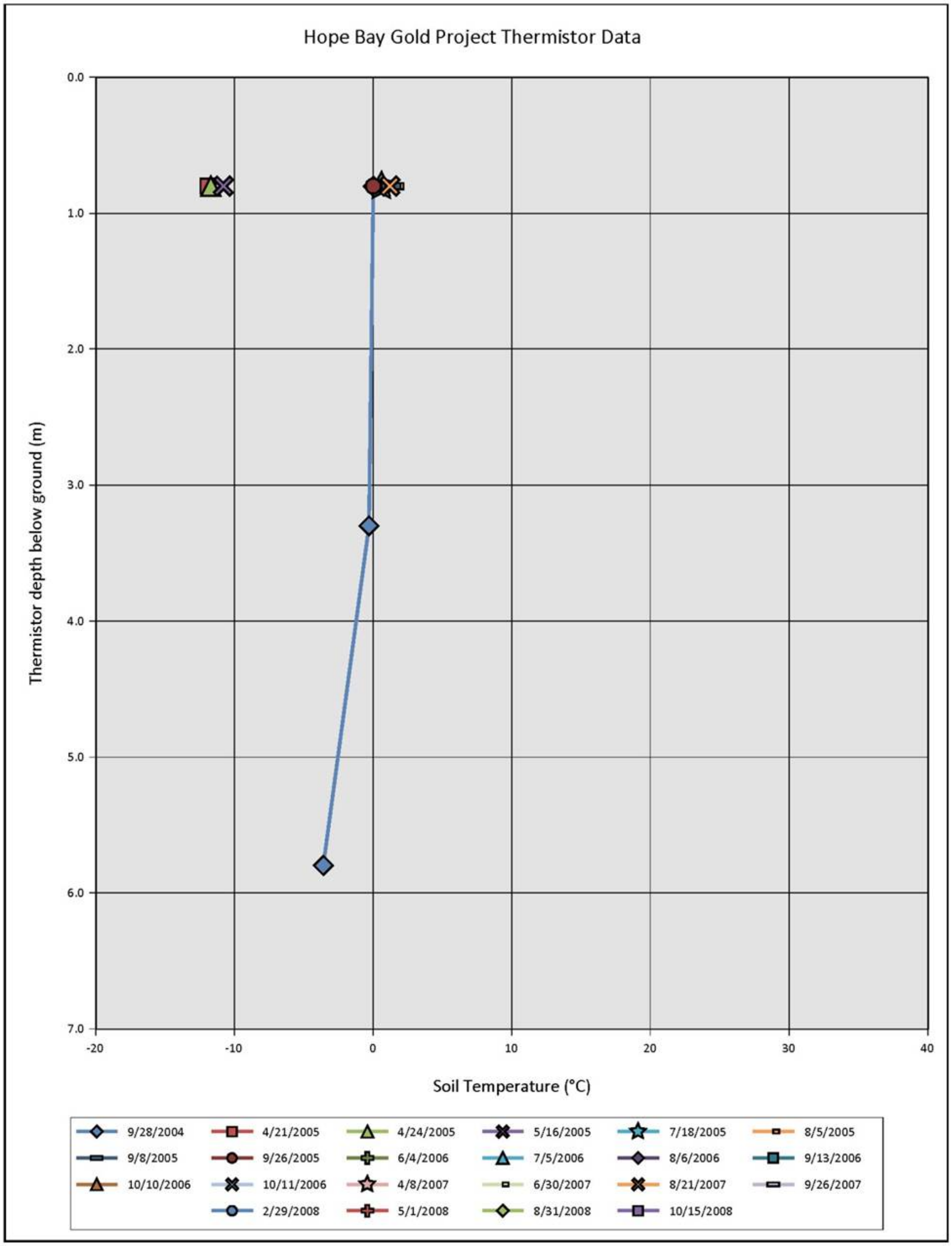
Thermistor Data (SRK-52)



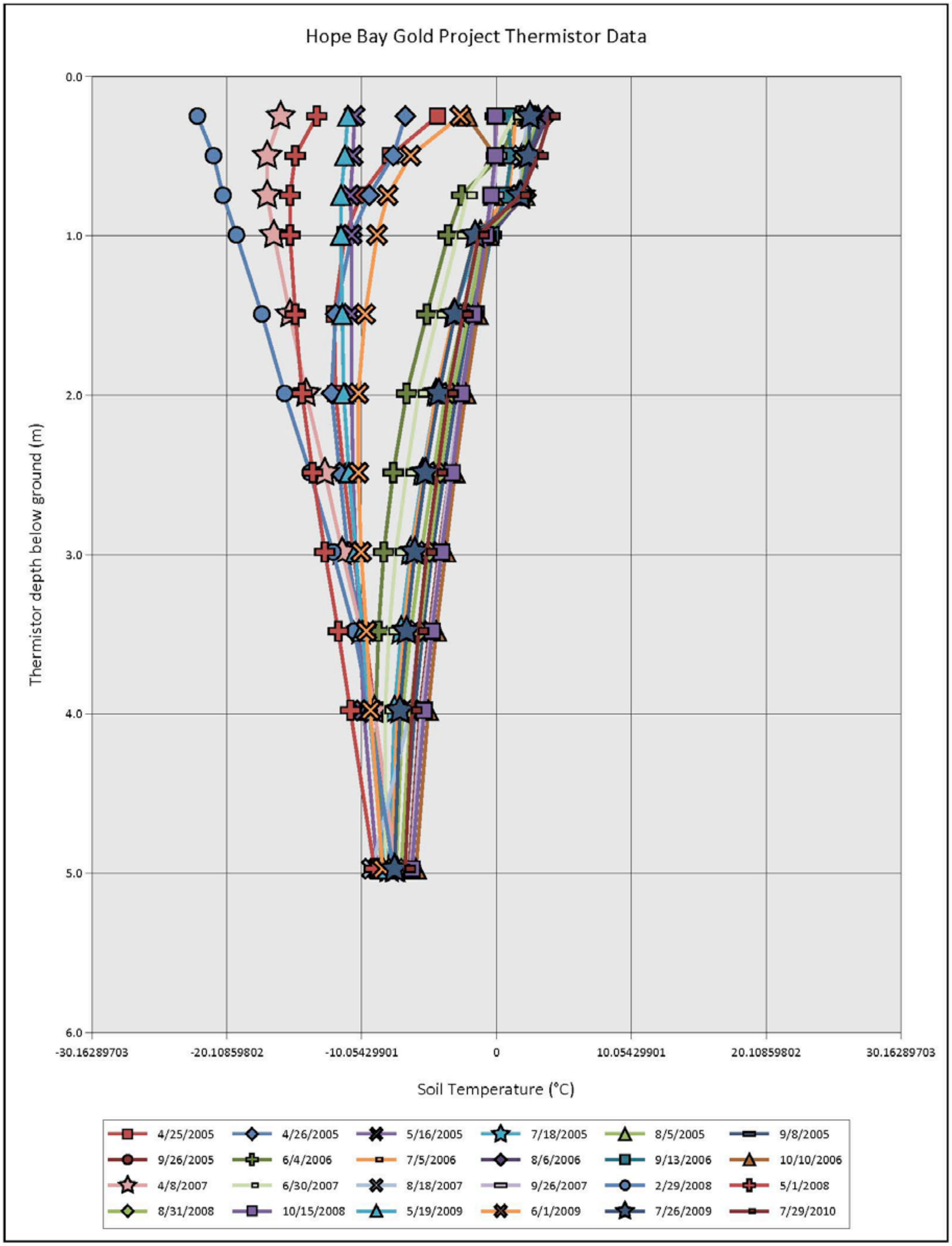
Thermistor Data (SRK-55)



Thermistor Data (SRK-56)

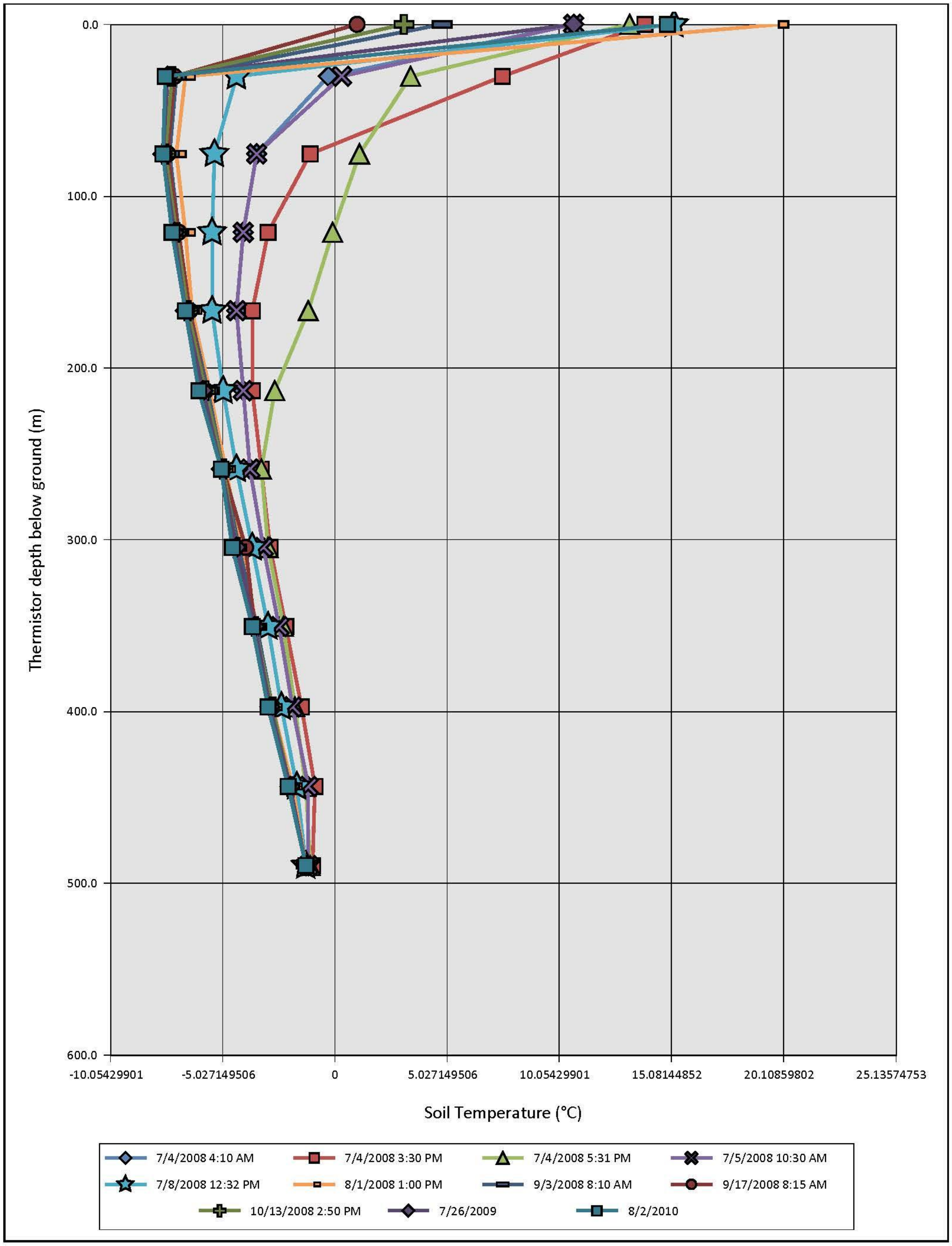


Thermistor Data (SRK-62)

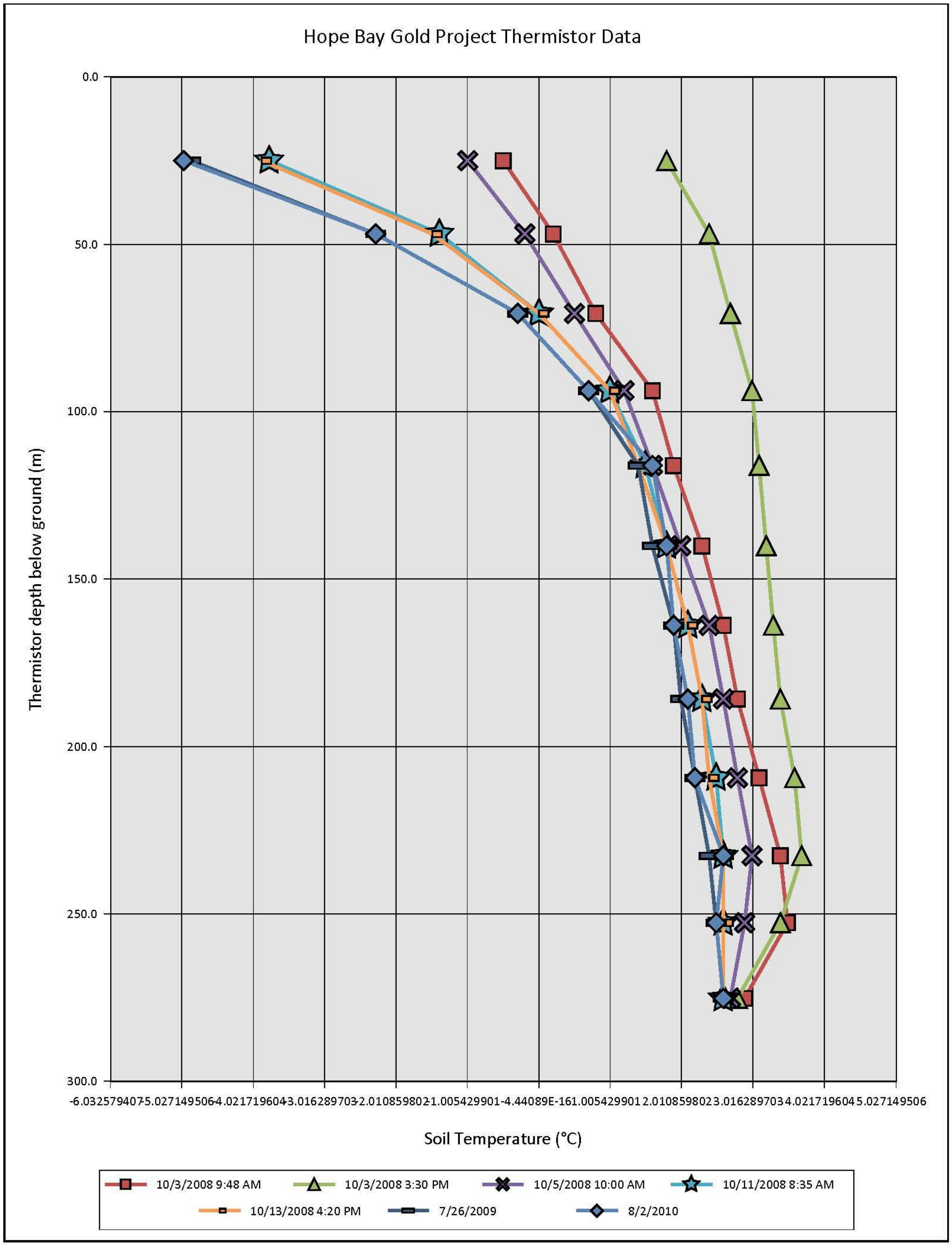


Appendix C
Status Unknown Thermistor Profiles

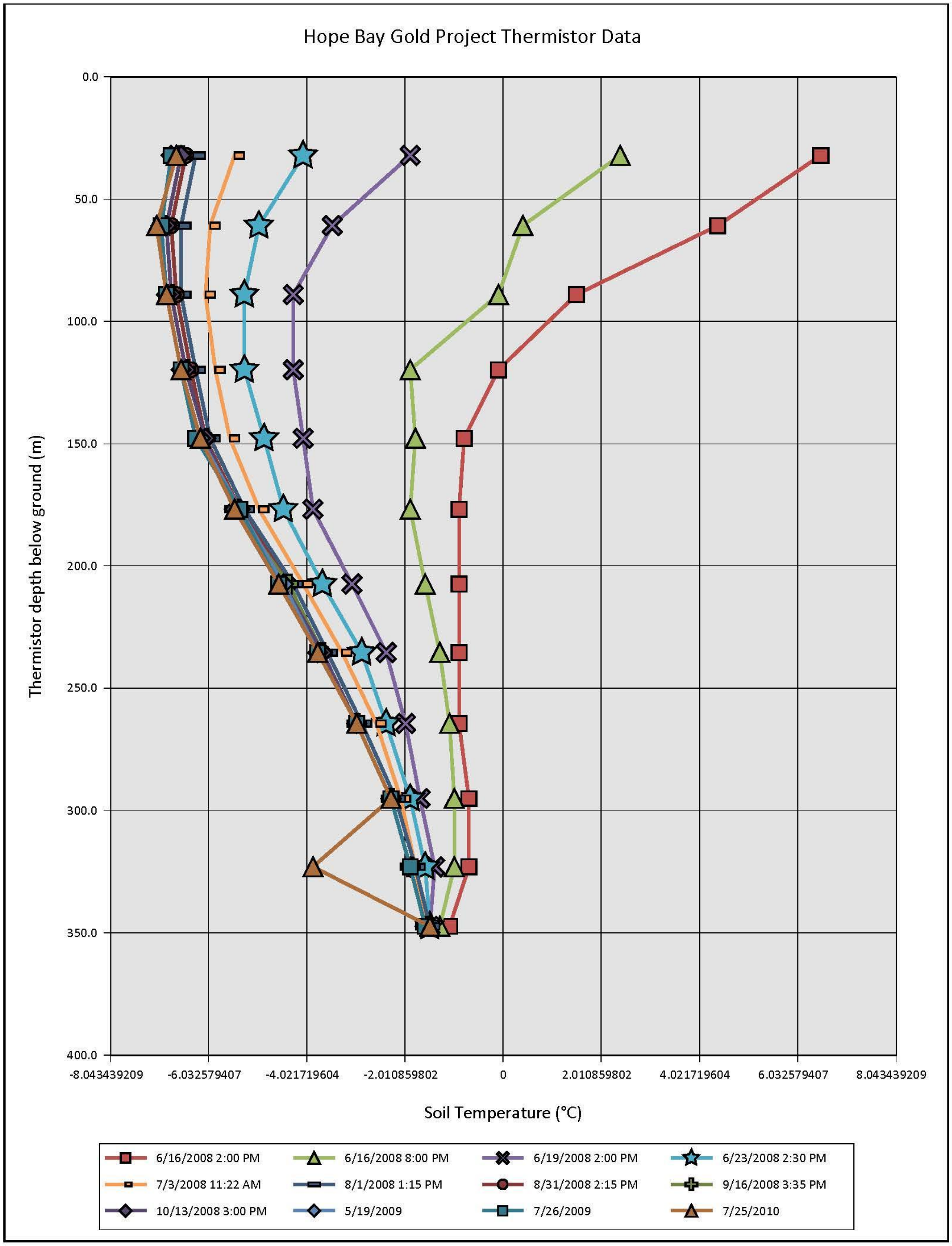
Thermistor Data (08PMD669)



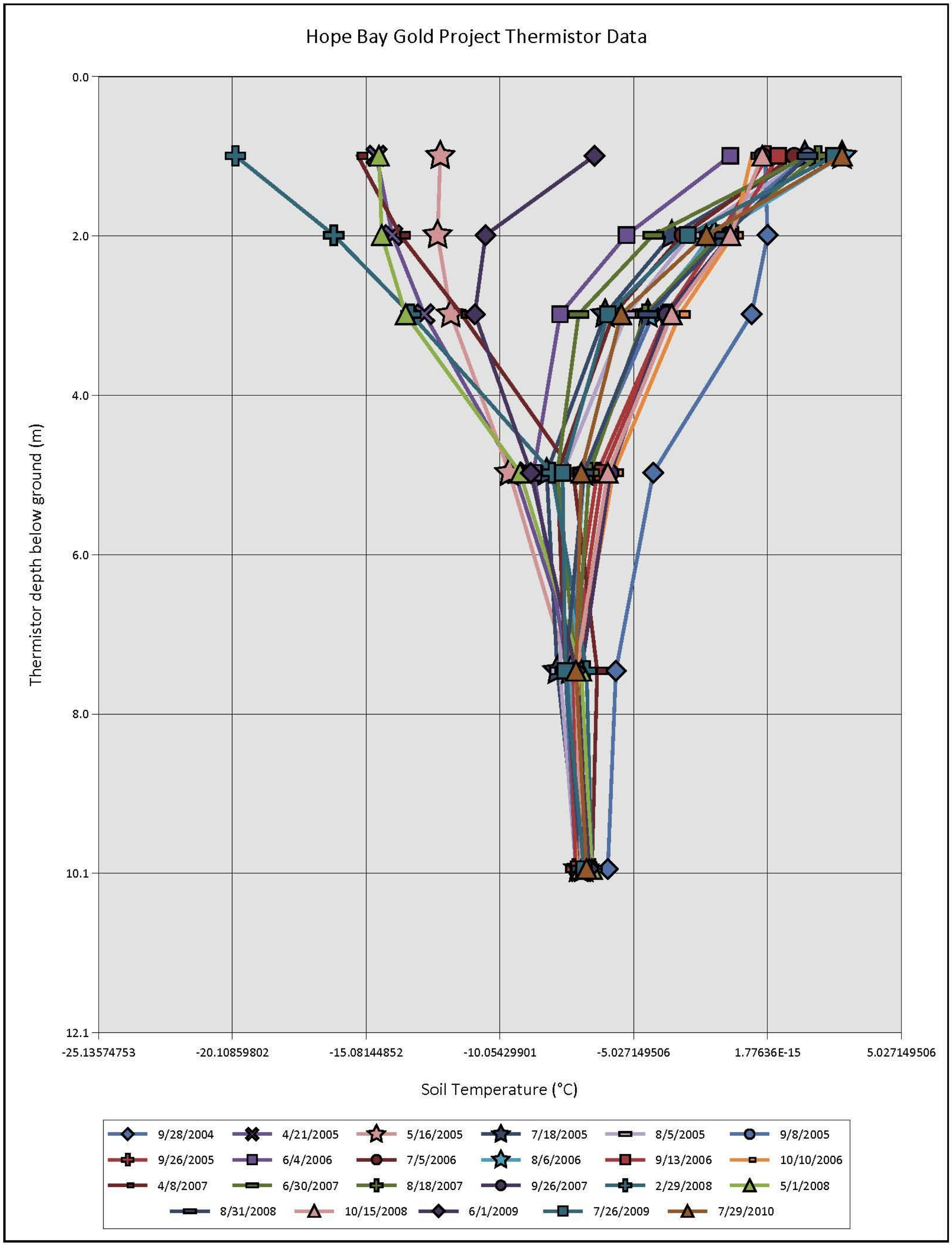
Thermistor Data (08PSD144)



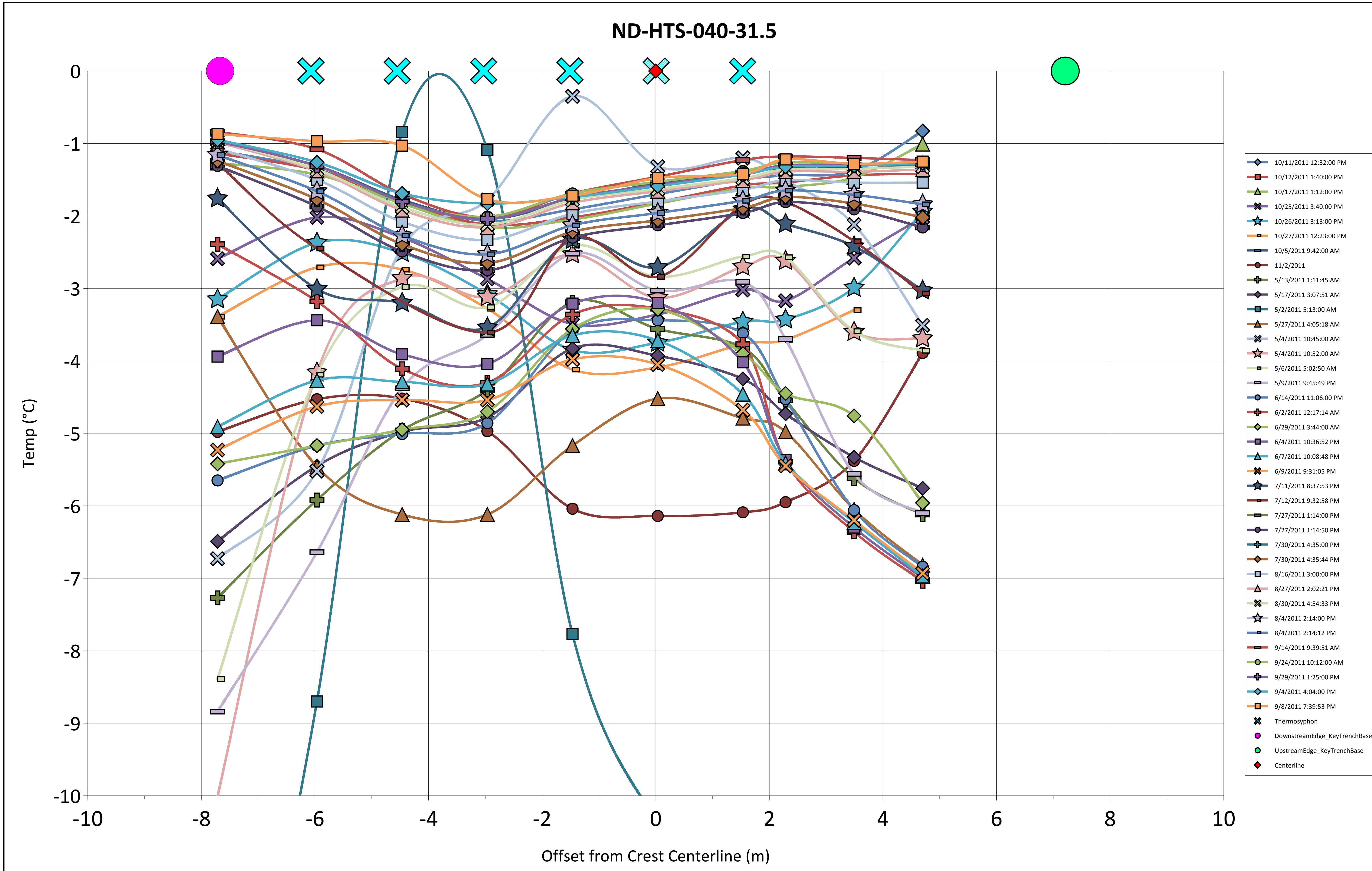
Thermistor Data (08TDD632)



Thermistor Data (SRK-54)



Appendix D
North Dam Horizontal Thermistor Profiles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-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-10
-8
-6
-4
-2
0
2
4
6
8
10
Offset from Crest Centerline (m)
10/11/2011 12:32:00 PM
10/12/2011 1:40:00 PM
10/17/2011 1:12:00 PM
10/25/2011 3:40:00 PM
10/26/2011 3:13:00 PM
10/27/2011 12:23:00 PM
10/5/2011 9:42:00 AM
11/2/2011
5/13/2011 1:11:45 AM
5/17/2011 3:07:51 AM
5/2/2011 5:13:00 AM
5/27/2011 4:05:18 AM
5/4/2011 10:45:00 AM
5/4/2011 10:52:00 AM
5/6/2011 5:02:50 AM
5/9/2011 9:45:49 PM
6/14/2011 11:06:00 PM
6/2/2011 12:17:14 AM
6/29/2011 3:44:00 AM
6/4/2011 10:36:52 PM
6/7/2011 10:08:48 PM
6/9/2011 9:31:05 PM
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7/12/2011 9:32:58 PM
7/27/2011 1:14:00 PM
7/27/2011 1:14:50 PM
7/30/2011 4:35:00 PM
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8/16/2011 3:00:00 PM
8/27/2011 2:02:21 PM
8/30/2011 4:54:33 PM
8/4/2011 2:14:00 PM
8/4/2011 2:14:12 PM
9/14/2011 9:39:51 AM
9/24/2011 10:12:00 AM
9/29/2011 1:25:00 PM
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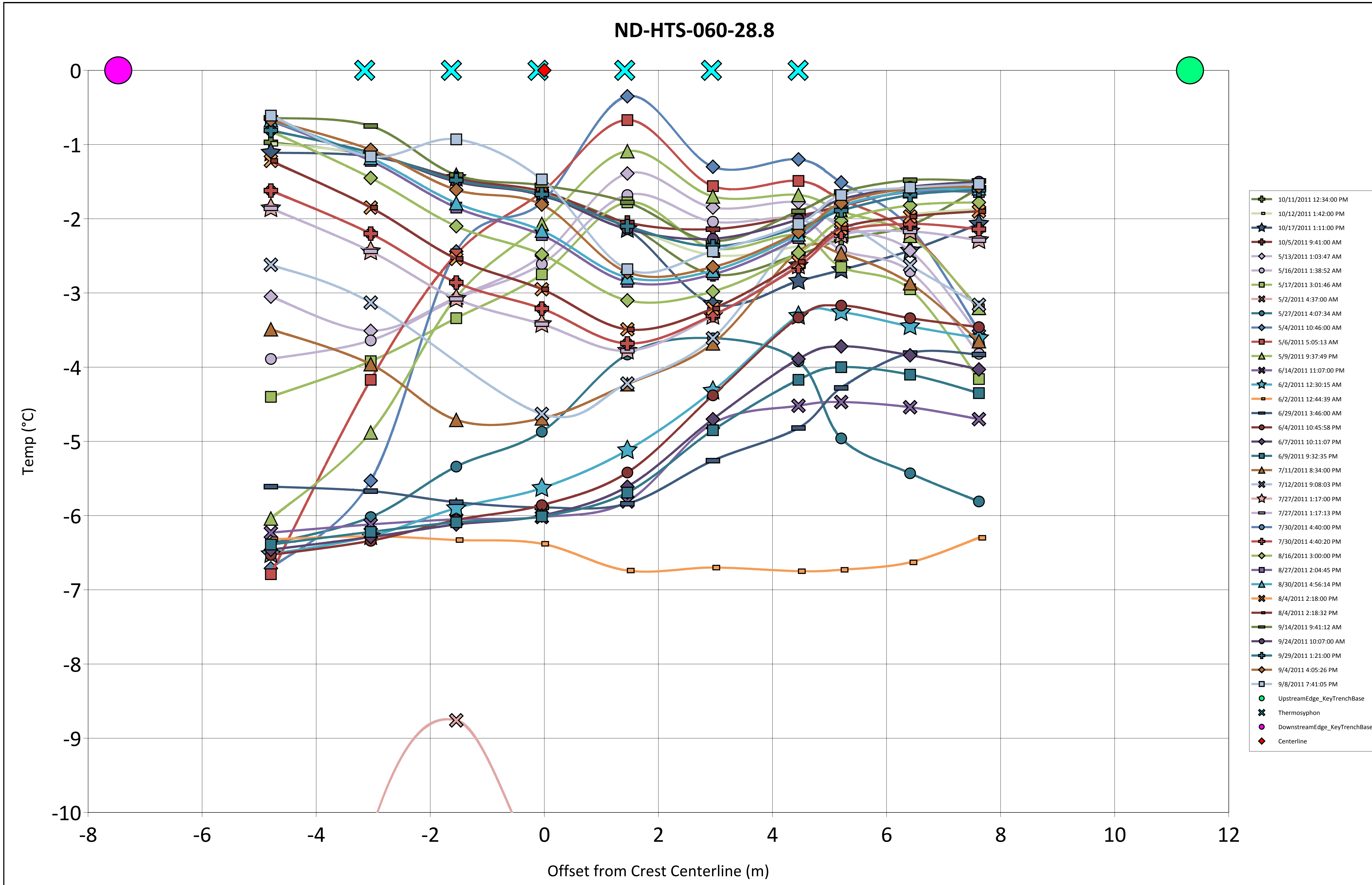
UpstreamEdge_KeyTrenchBase
Centerline


ND-HTS-060-28.8
Temp (°C)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
Offset from Crest Centerline (m)
10/11/2011 12:34:00 PM
10/12/2011 1:42:00 PM
10/17/2011 1:11:00 PM
10/5/2011 9:41:00 AM
5/13/2011 1:03:47 AM
5/16/2011 1:38:52 AM
5/17/2011 3:01:46 AM
5/2/2011 4:37:00 AM
5/27/2011 4:07:34 AM
5/4/2011 10:46:00 AM
5/6/2011 5:05:13 AM
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7/12/2011 9:08:03 PM
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7/27/2011 1:17:13 PM
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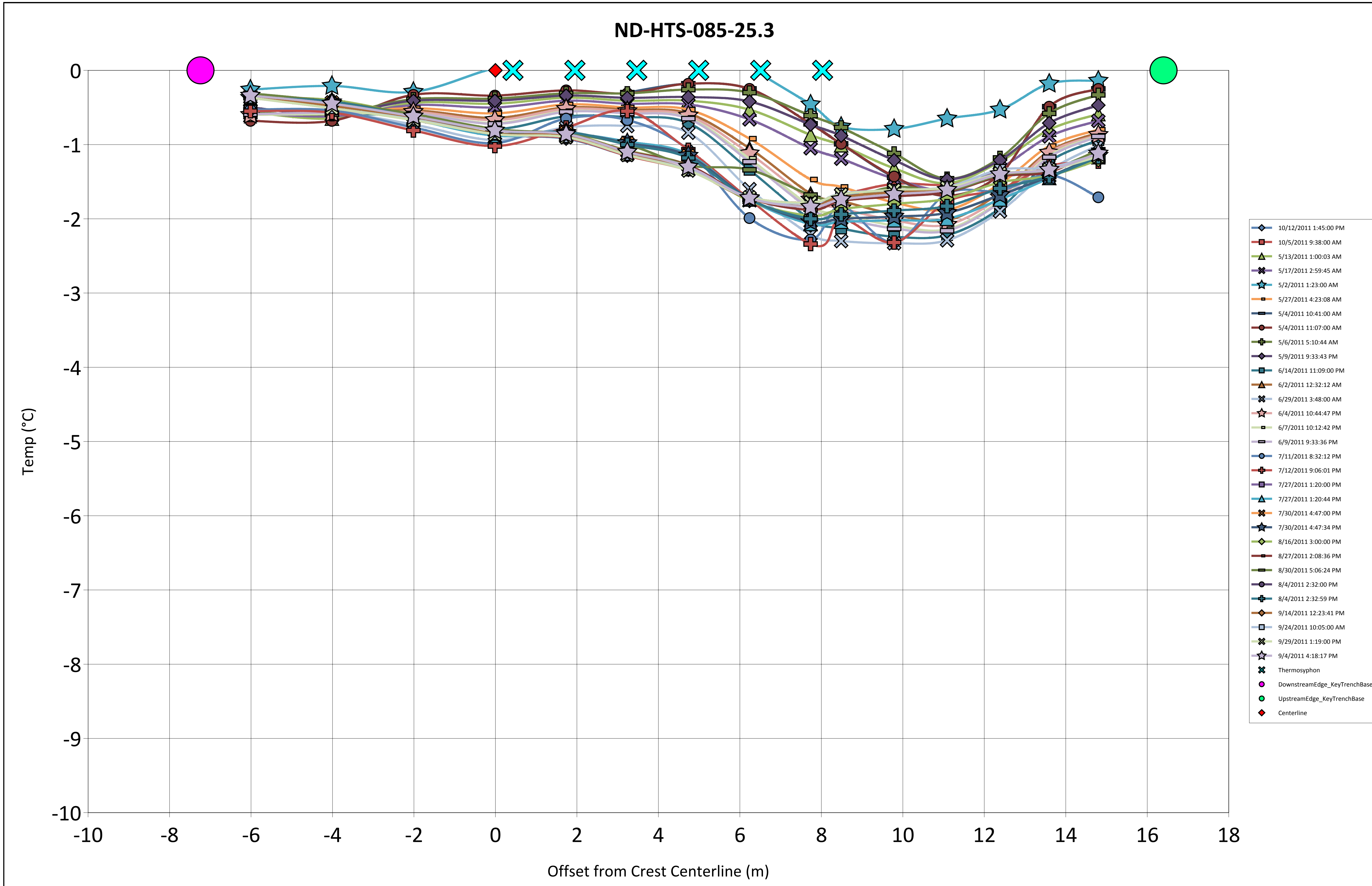
9/29/2011 1:21:00 PM
9/4/2011 4:05:26 PM
9/8/2011 7:41:05 PM
UpstreamEdge_KeyTrenchBase
Thermosyphon
DownstreamEdge_KeyTrenchBase
Centerline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-3
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-5
-6
-7
-8
-9
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-8
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-4
-2
0
2
4
6
8
10
12
14
16
18
Offset from Crest Centerline (m)
10/12/2011 1:45:00 PM
10/5/2011 9:38:00 AM
5/13/2011 1:00:03 AM
5/17/2011 2:59:45 AM
5/2/2011 1:23:00 AM
5/27/2011 4:23:08 AM
5/4/2011 10:41:00 AM
5/4/2011 11:07:00 AM
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7/27/2011 1:20:00 PM
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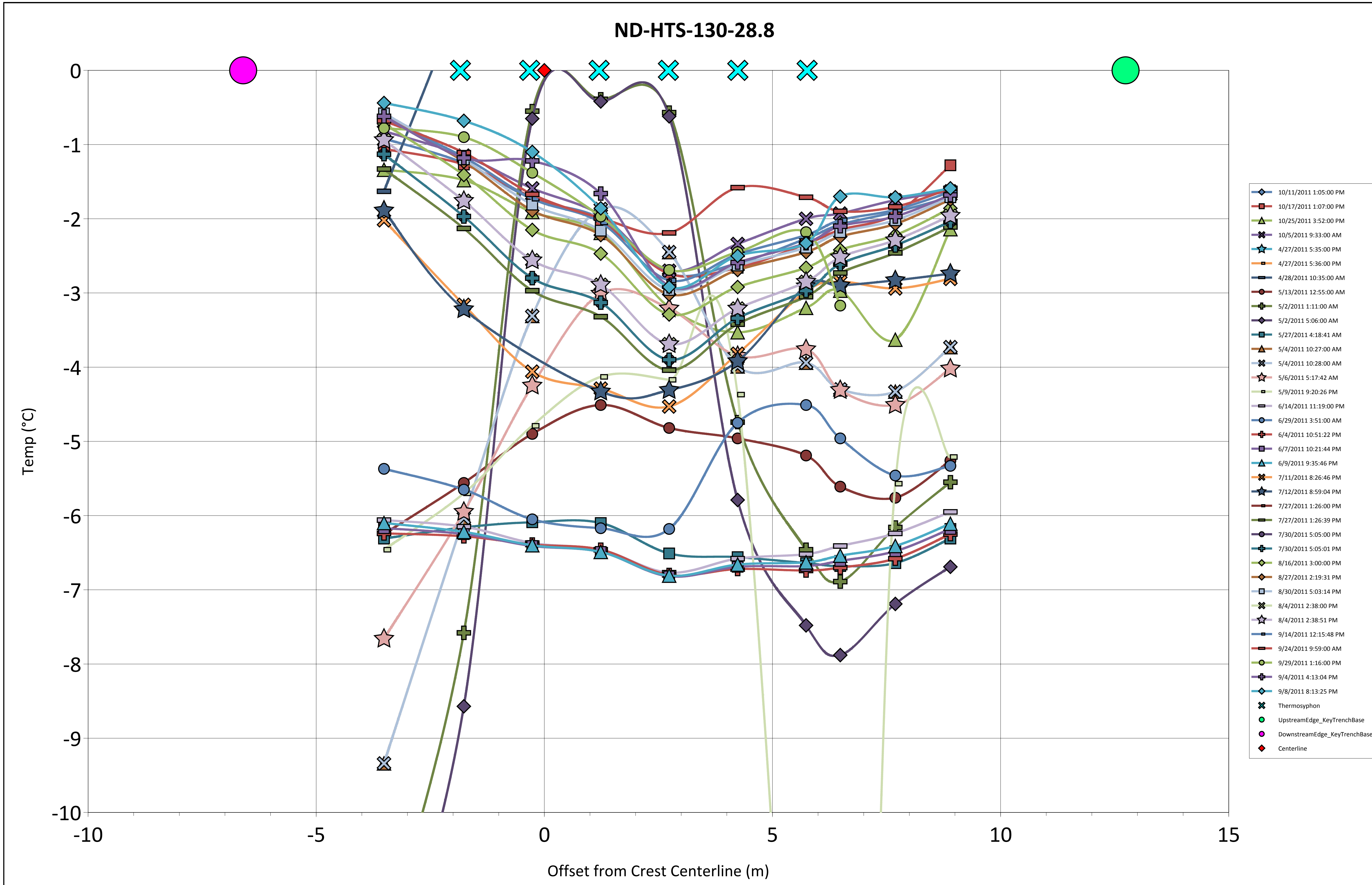
9/24/2011 10:05:00 AM
9/29/2011 1:19:00 PM
9/4/2011 4:18:17 PM
Thermosyphon
DownstreamEdge_KeyTrenchBase
UpstreamEdge_KeyTrenchBase
Centerline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-3
-4
-5
-6
-7
-8
-9
-10
-10
-5
0
5
10
15
Offset from Crest Centerline (m)
10/11/2011 1:05:00 PM
10/17/2011 1:07:00 PM
10/25/2011 3:52:00 PM
10/5/2011 9:33:00 AM
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5/2/2011 1:11:00 AM
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5/4/2011 10:27:00 AM
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8/4/2011 2:38:00 PM
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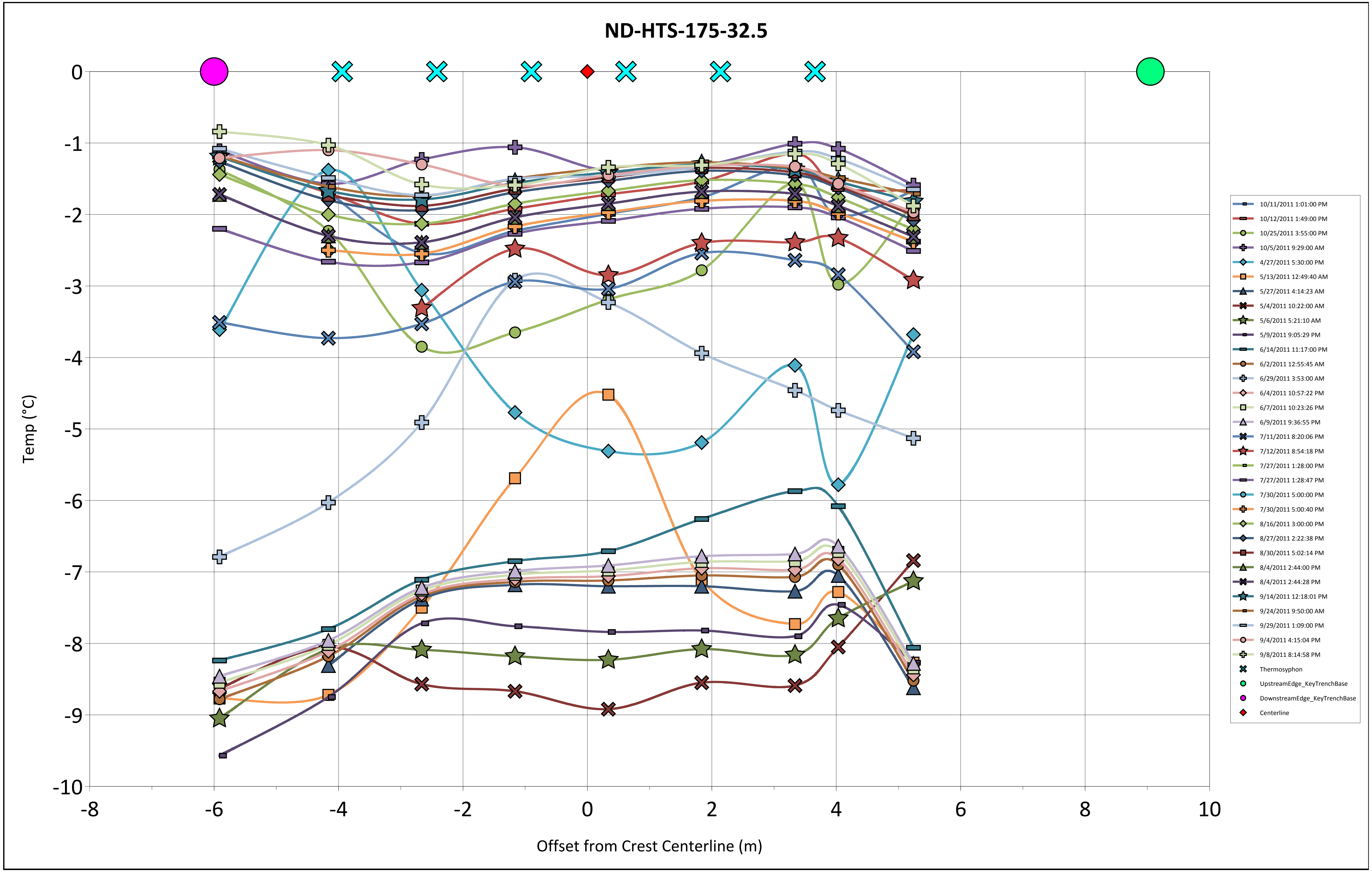
9/29/2011 1:16:00 PM
9/4/2011 4:13:04 PM
9/8/2011 8:13:25 PM
Thermosyphon
UpstreamEdge_KeyTrenchBase
DownstreamEdge_KeyTrenchBase
Centerline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-5
-6
-7
-8
-9
-10
Temp (°C)
-8
-6
-4
-2
0
2
4
6
8
10
Offset from Crest Centerline (m)
10/11/2011 1:01:00 PM
10/12/2011 1:49:00 PM
10/25/2011 3:55:00 PM
10/5/2011 9:29:00 AM
4/27/2011 5:30:00 PM
5/13/2011 12:49:40 AM
5/27/2011 4:14:23 AM
5/4/2011 10:22:00 AM
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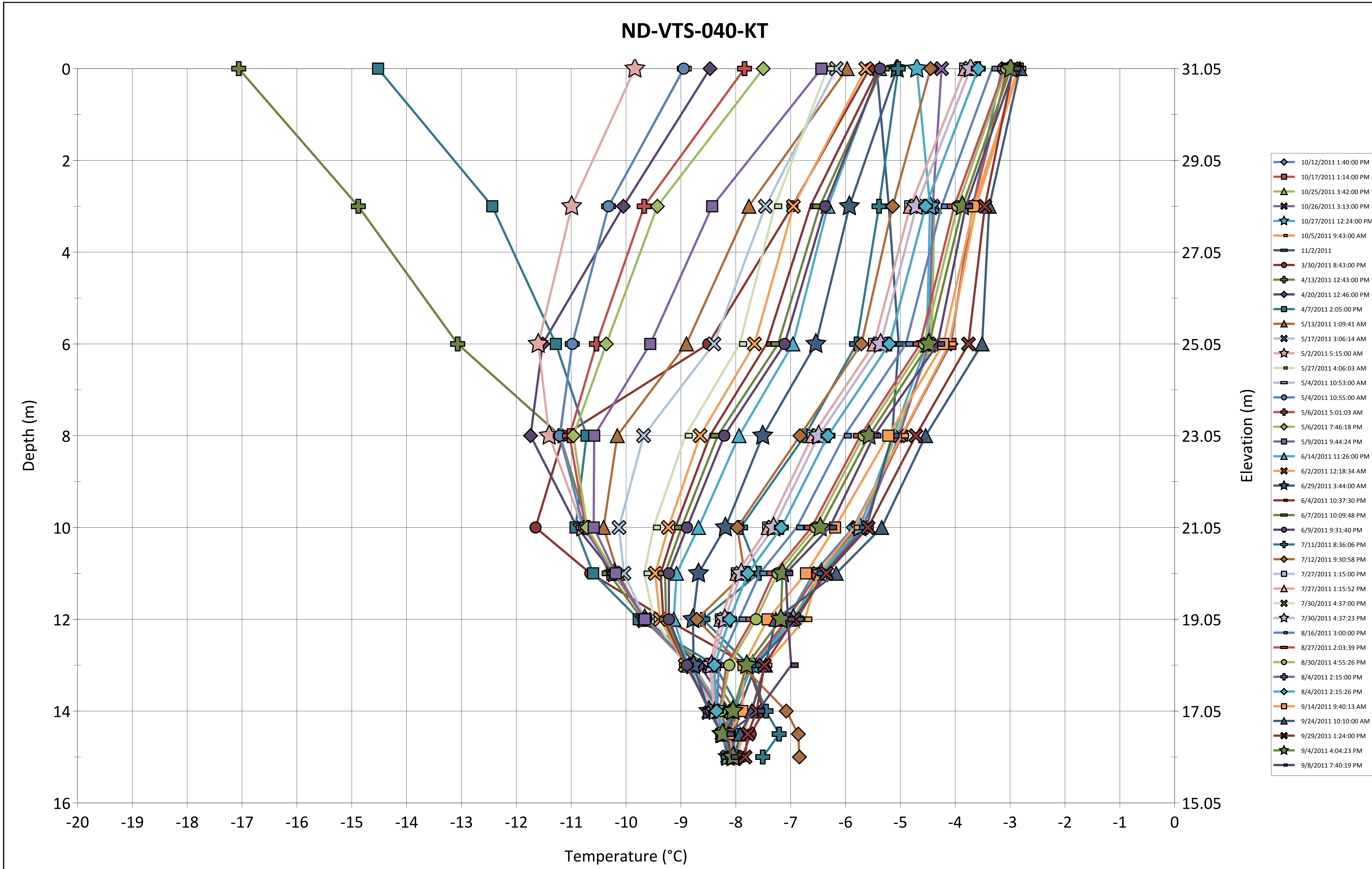
9/29/2011 1:09:00 PM
9/4/2011 4:15:04 PM
9/8/2011 8:14:58 PM
Thermosyphon
UpstreamEdge_KeyTrenchBase
DownstreamEdge_KeyTrenchBase
Centerline

Appendix E
North Dam Vertical Thermistor Profiles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2
4
6
8
10
12
14
16
Elevation (m)
31.05
29.05
27.05
25.05
23.05
21.05
19.05
17.05
15.05
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
Temperature (°C)
10/12/2011 1:40:00 PM
10/17/2011 1:14:00 PM
10/25/2011 3:42:00 PM
10/26/2011 3:13:00 PM
10/27/2011 12:24:00 PM
10/5/2011 9:43:00 AM
11/2/2011
3/30/2011 8:43:00 PM
4/13/2011 12:43:00 PM
4/20/2011 12:46:00 PM
4/7/2011 2:05:00 PM
5/13/2011 1:09:41 AM
5/17/2011 3:06:14 AM
5/2/2011 5:15:00 AM
5/27/2011 4:06:03 AM
5/4/2011 10:53:00 AM
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5/6/2011 5:01:03 AM
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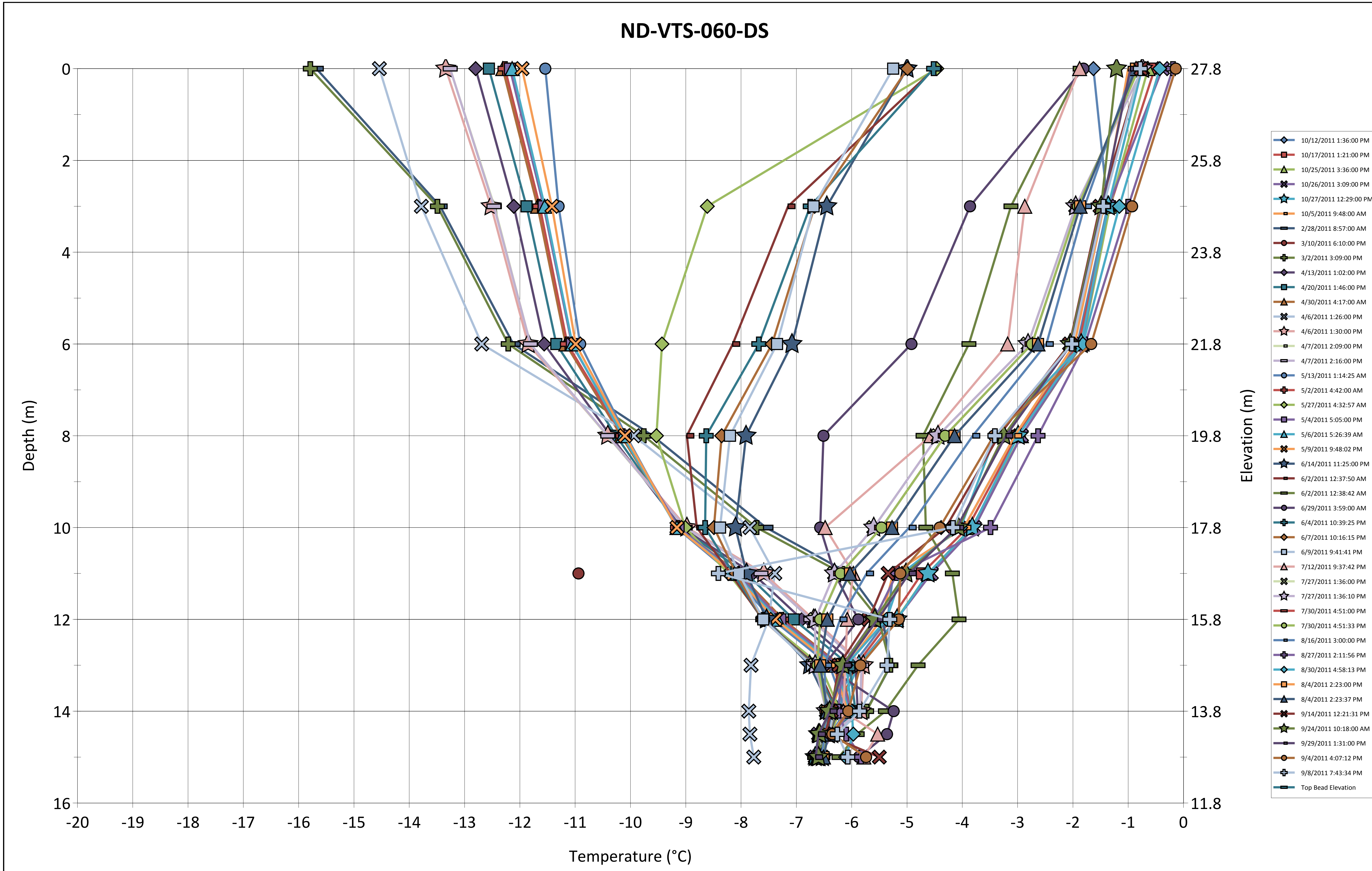
7/12/2011 9:30:58 PM
7/27/2011 1:15:00 PM
7/27/2011 1:15:52 PM
7/30/2011 4:37:00 PM
7/30/2011 4:37:23 PM
8/16/2011 3:00:00 PM
8/27/2011 2:03:39 PM
8/30/2011 4:55:26 PM
8/4/2011 2:15:00 PM
8/4/2011 2:15:26 PM
9/14/2011 9:40:13 AM
9/24/2011 10:10:00 AM
9/29/2011 1:24:00 PM
9/4/2011 4:04:23 PM
9/8/2011 7:40:19 PM


ND-VTS-060-DS
Depth (m)
0
2
4
6
8
10
12
14
16
Elevation (m)
27.8
25.8
23.8
21.8
19.8
17.8
15.8
13.8
11.8
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
Temperature (°C)
10/12/2011 1:36:00 PM
10/17/2011 1:21:00 PM
10/25/2011 3:36:00 PM
10/26/2011 3:09:00 PM
10/27/2011 12:29:00 PM
10/5/2011 9:48:00 AM
2/28/2011 8:57:00 AM
3/10/2011 6:10:00 PM
3/2/2011 3:09:00 PM
4/13/2011 1:02:00 PM
4/20/2011 1:46:00 PM
4/30/2011 4:17:00 AM
4/6/2011 1:26:00 PM
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8/27/2011 2:11:56 PM
8/30/2011 4:58:13 PM
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9/4/2011 4:07:12 PM
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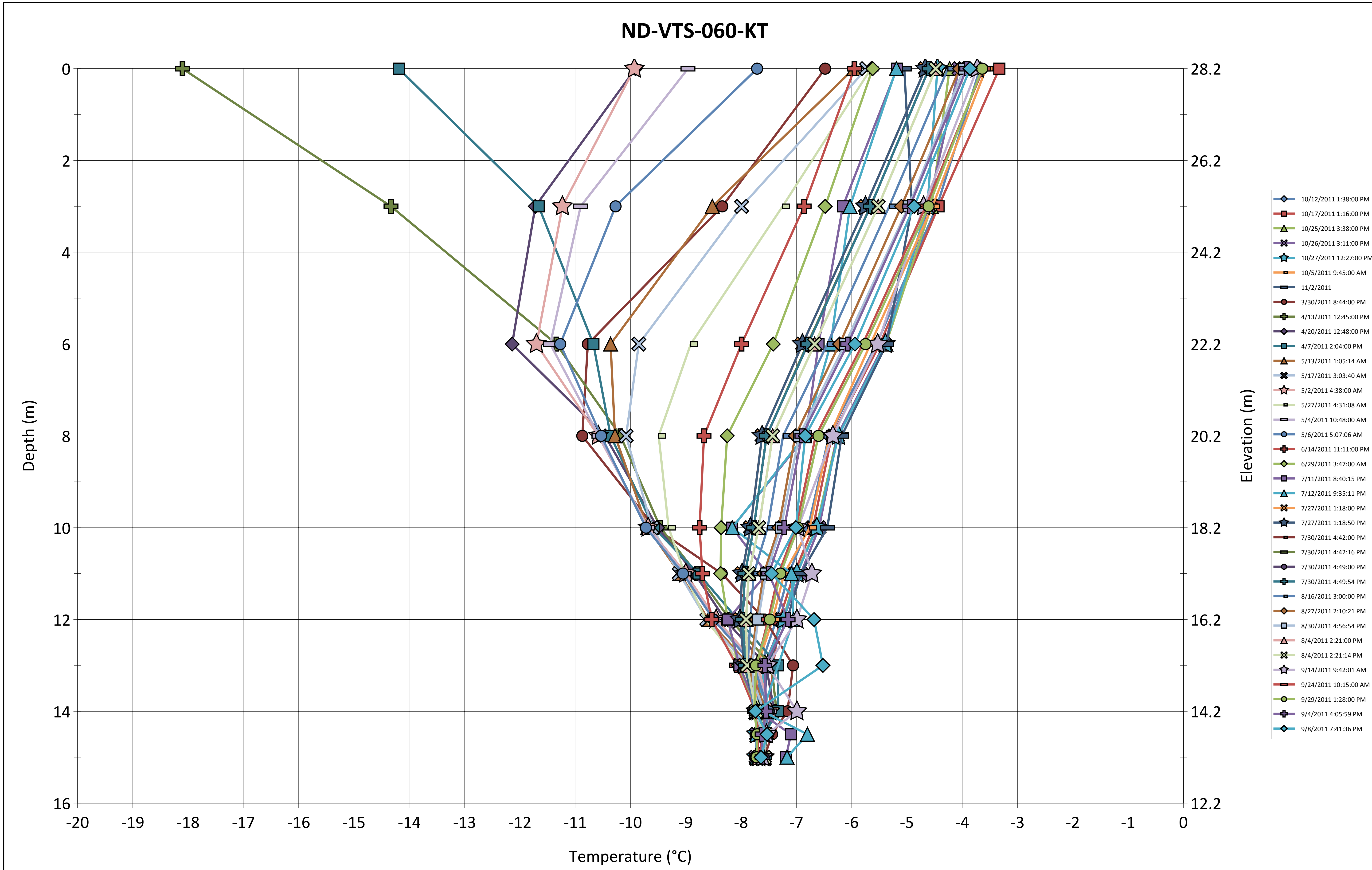
Top Bead Elevation


ND-VTS-060-KT
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2
4
6
8
10
12
14
16
Elevation (m)
28.2
26.2
24.2
22.2
20.2
18.2
16.2
14.2
12.2
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
Temperature (°C)
10/12/2011 1:38:00 PM
10/17/2011 1:16:00 PM
10/25/2011 3:38:00 PM
10/26/2011 3:11:00 PM
10/27/2011 12:27:00 PM
10/5/2011 9:45:00 AM
11/2/2011
3/30/2011 8:44:00 PM
4/13/2011 12:45:00 PM
4/20/2011 12:48:00 PM
4/7/2011 2:04:00 PM
5/13/2011 1:05:14 AM
5/17/2011 3:03:40 AM
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8/4/2011 2:21:14 PM
9/14/2011 9:42:01 AM
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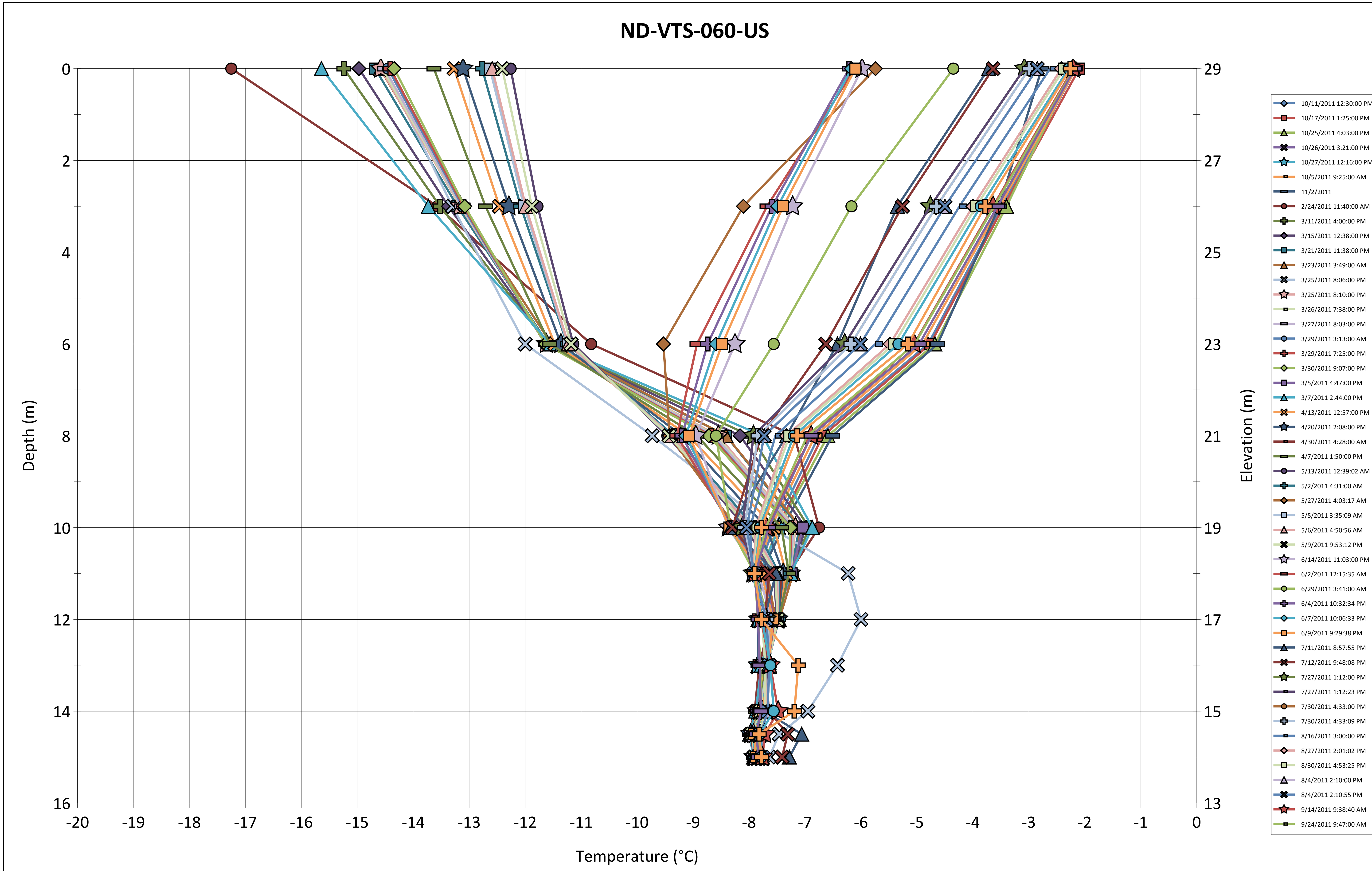
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6
8
10
12
14
16
Elevation (m)
29
27
25
23
21
19
17
15
13
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
Temperature (°C)
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10/17/2011 1:25:00 PM
10/25/2011 4:03:00 PM
10/26/2011 3:21:00 PM
10/27/2011 12:16:00 PM
10/5/2011 9:25:00 AM
11/2/2011
2/24/2011 11:40:00 AM
3/11/2011 4:00:00 PM
3/15/2011 12:38:00 PM
3/21/2011 11:38:00 PM
3/23/2011 3:49:00 AM
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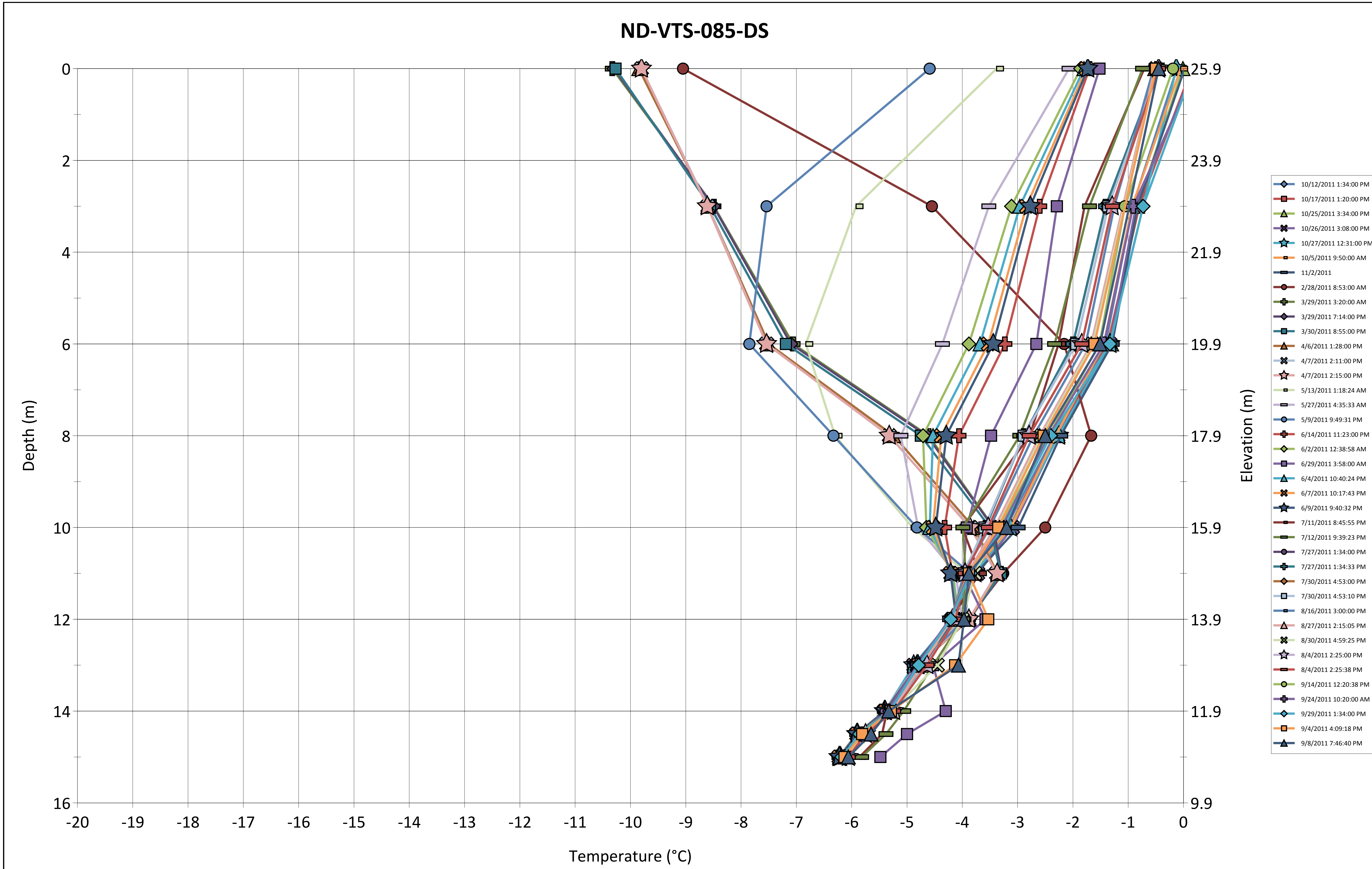
9/24/2011 9:47:00 AM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6
8
10
12
14
16
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23.9
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-1
0
Temperature (°C)
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10/5/2011 9:50:00 AM
11/2/2011
2/28/2011 8:53:00 AM
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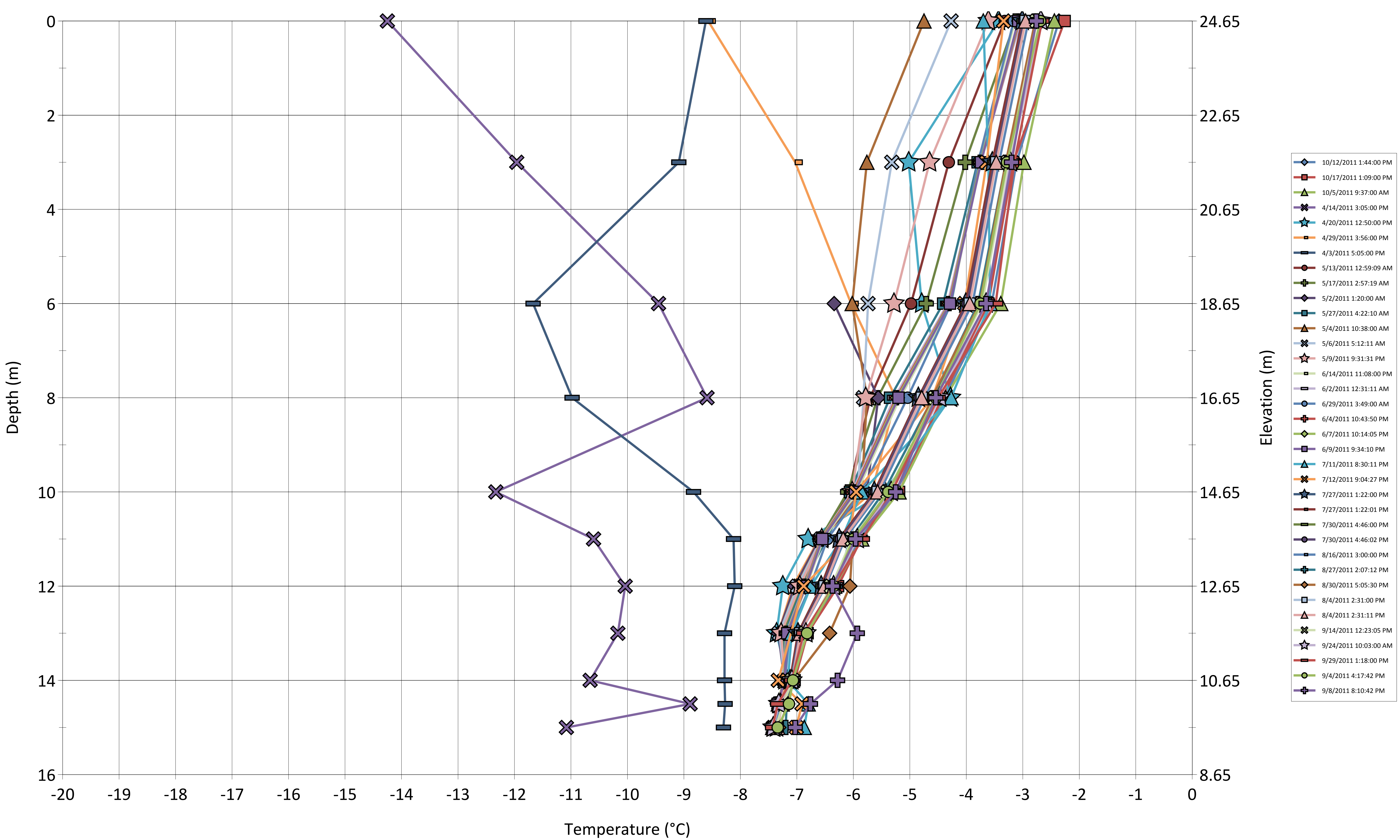
ND-VTS-085-KT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12
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-2
-1
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Temperature (°C)
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10/17/2011 1:09:00 PM
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4/29/2011 3:56:00 PM
4/3/2011 5:05:00 PM
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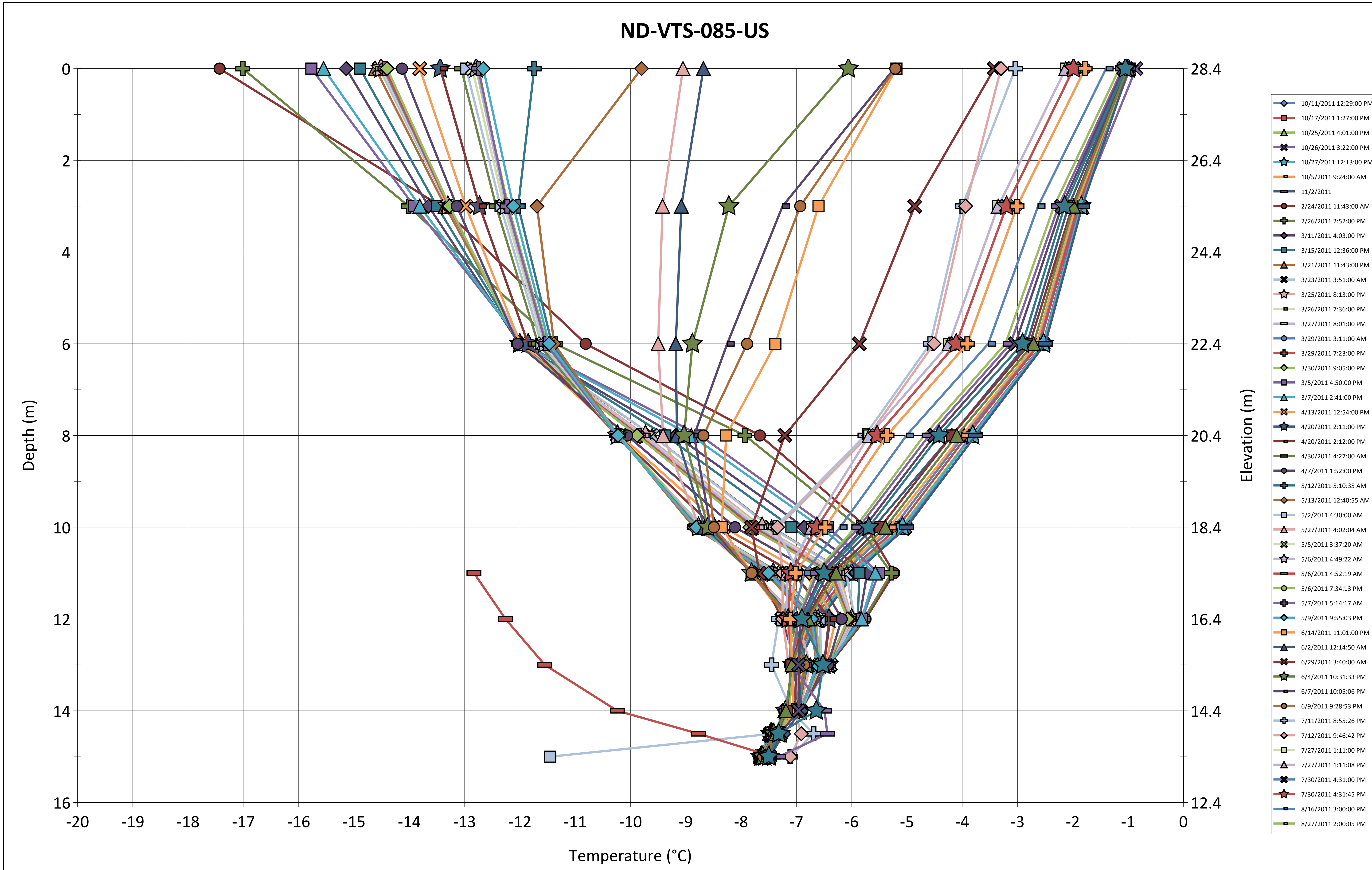
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4
6
8
10
12
14
16
Elevation (m)
28.4
26.4
24.4
22.4
20.4
18.4
16.4
14.4
12.4
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
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-7
-6
-5
-4
-3
-2
-1
0
Temperature (°C)
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10/17/2011 1:27:00 PM
10/25/2011 4:01:00 PM
10/26/2011 3:22:00 PM
10/27/2011 12:13:00 PM
10/5/2011 9:24:00 AM
11/2/2011
2/24/2011 11:43:00 AM
2/26/2011 2:52:00 PM
3/11/2011 4:03:00 PM
3/15/2011 12:36:00 PM
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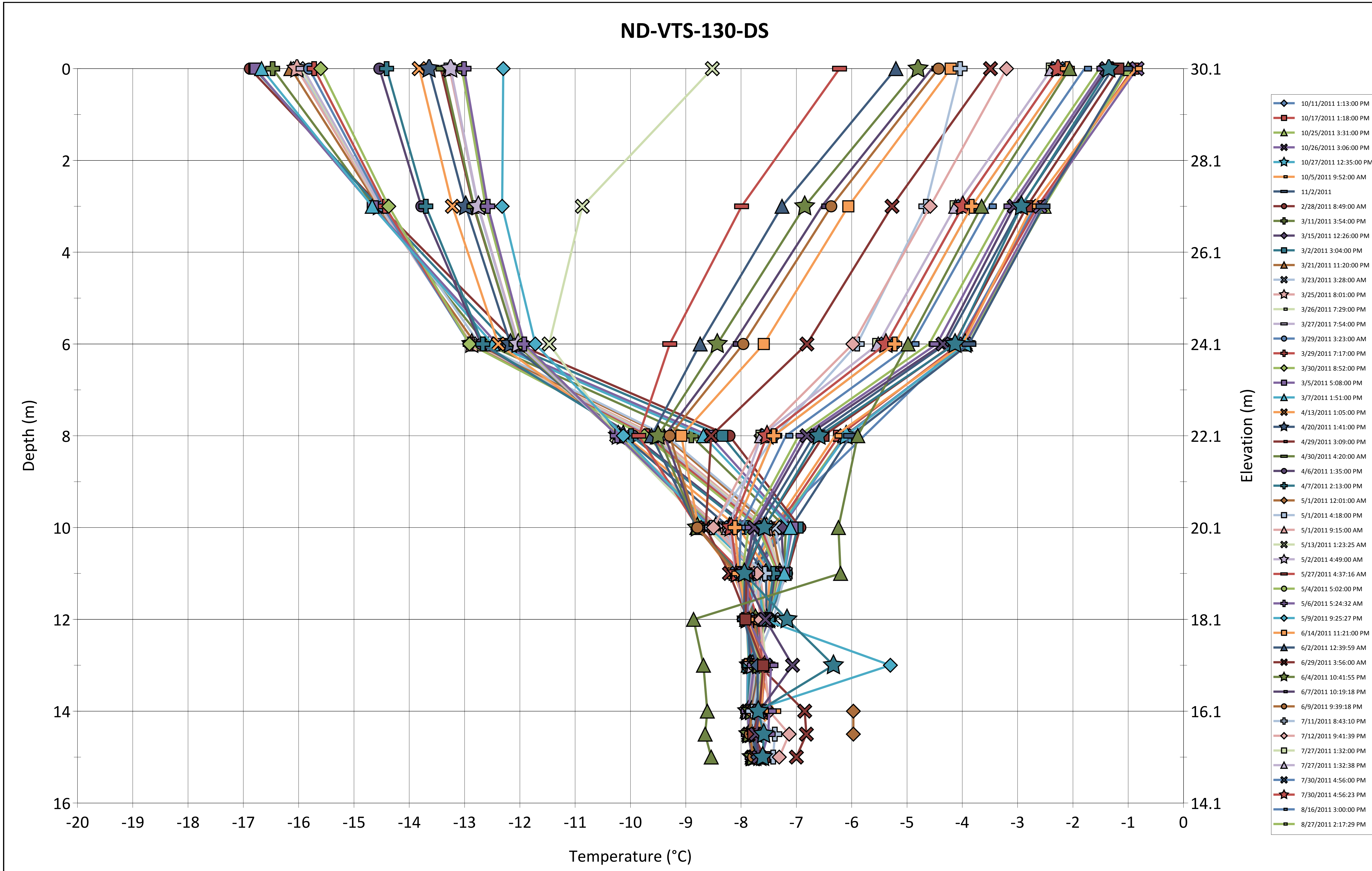
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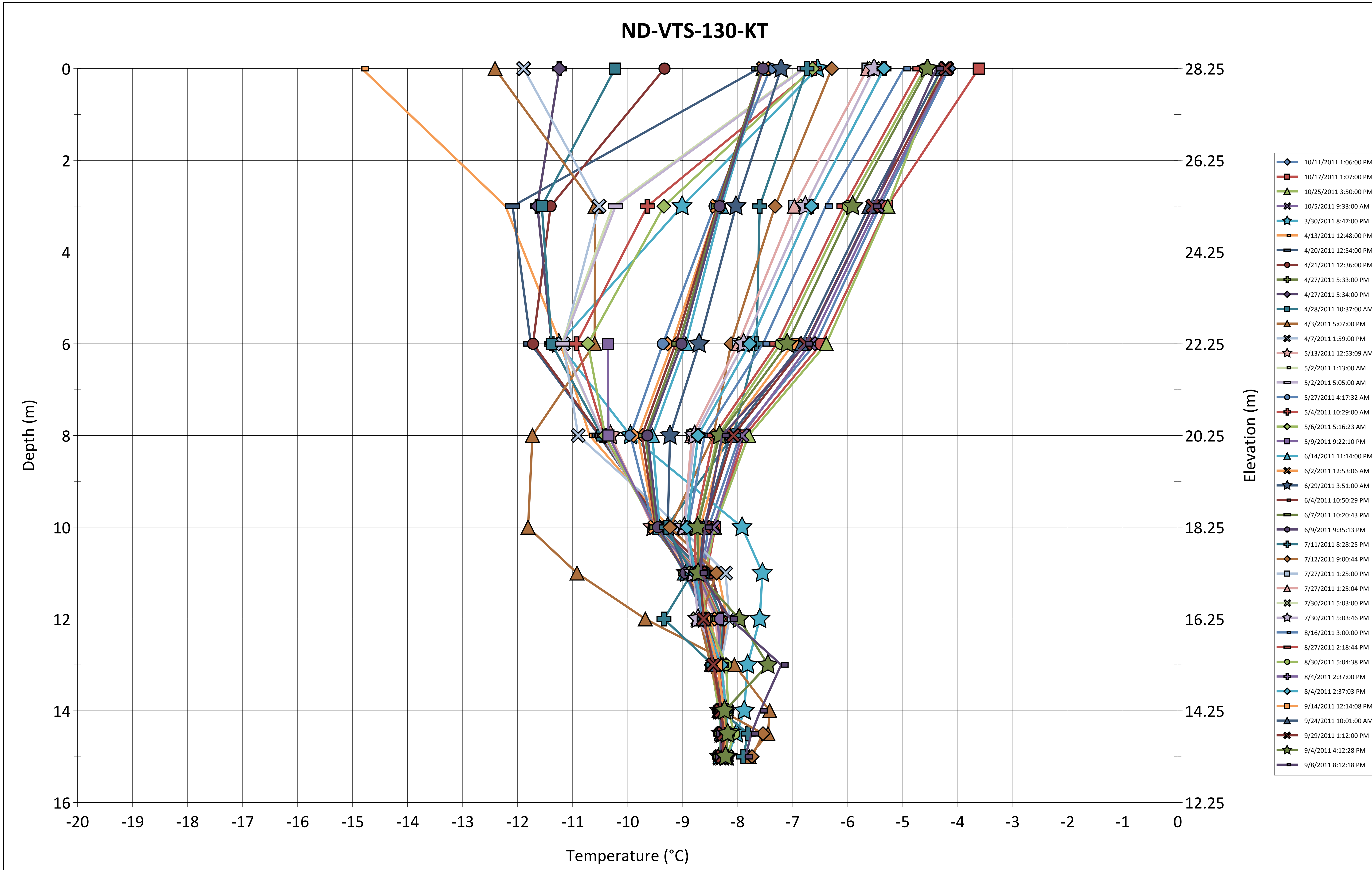
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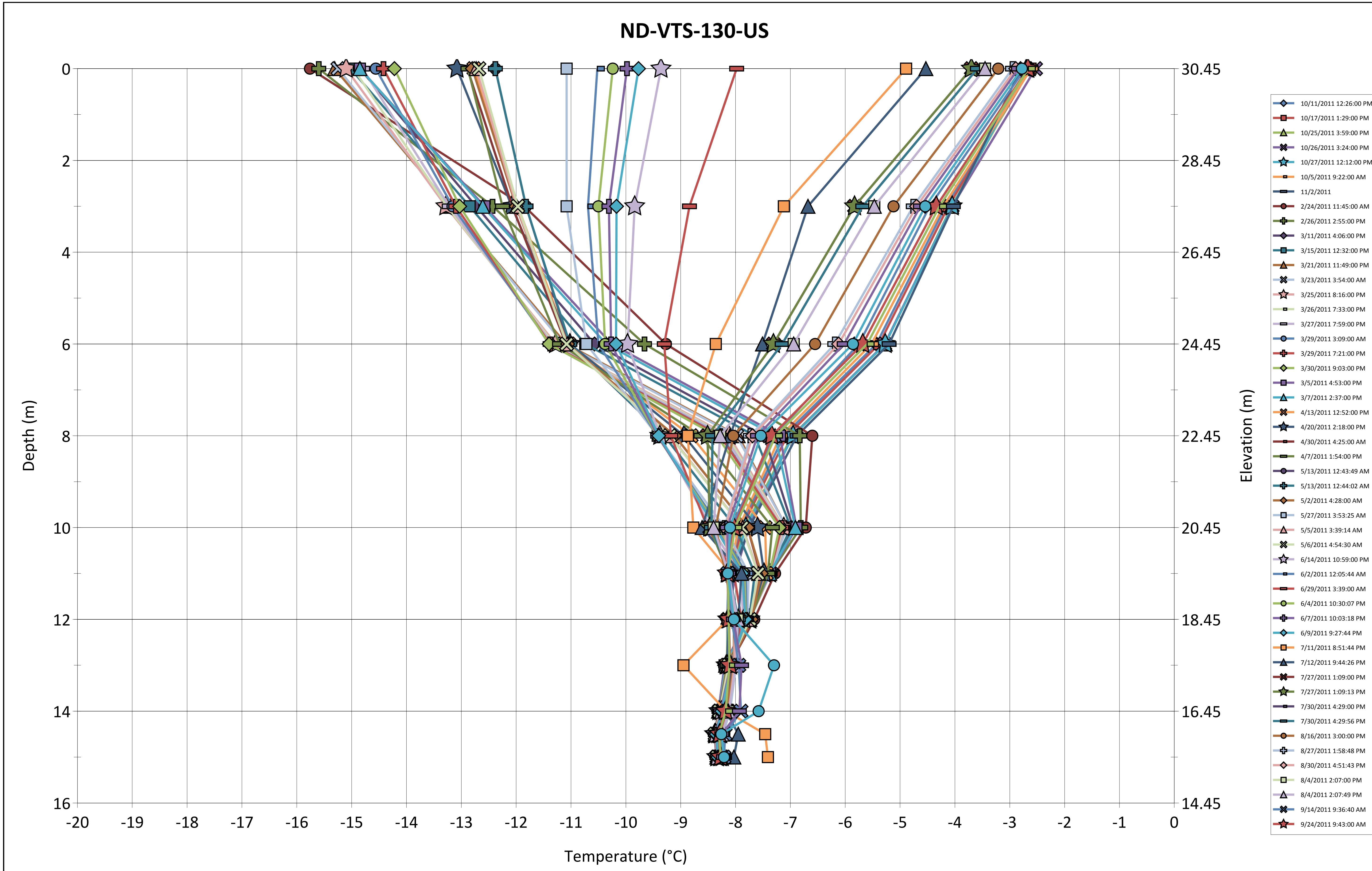
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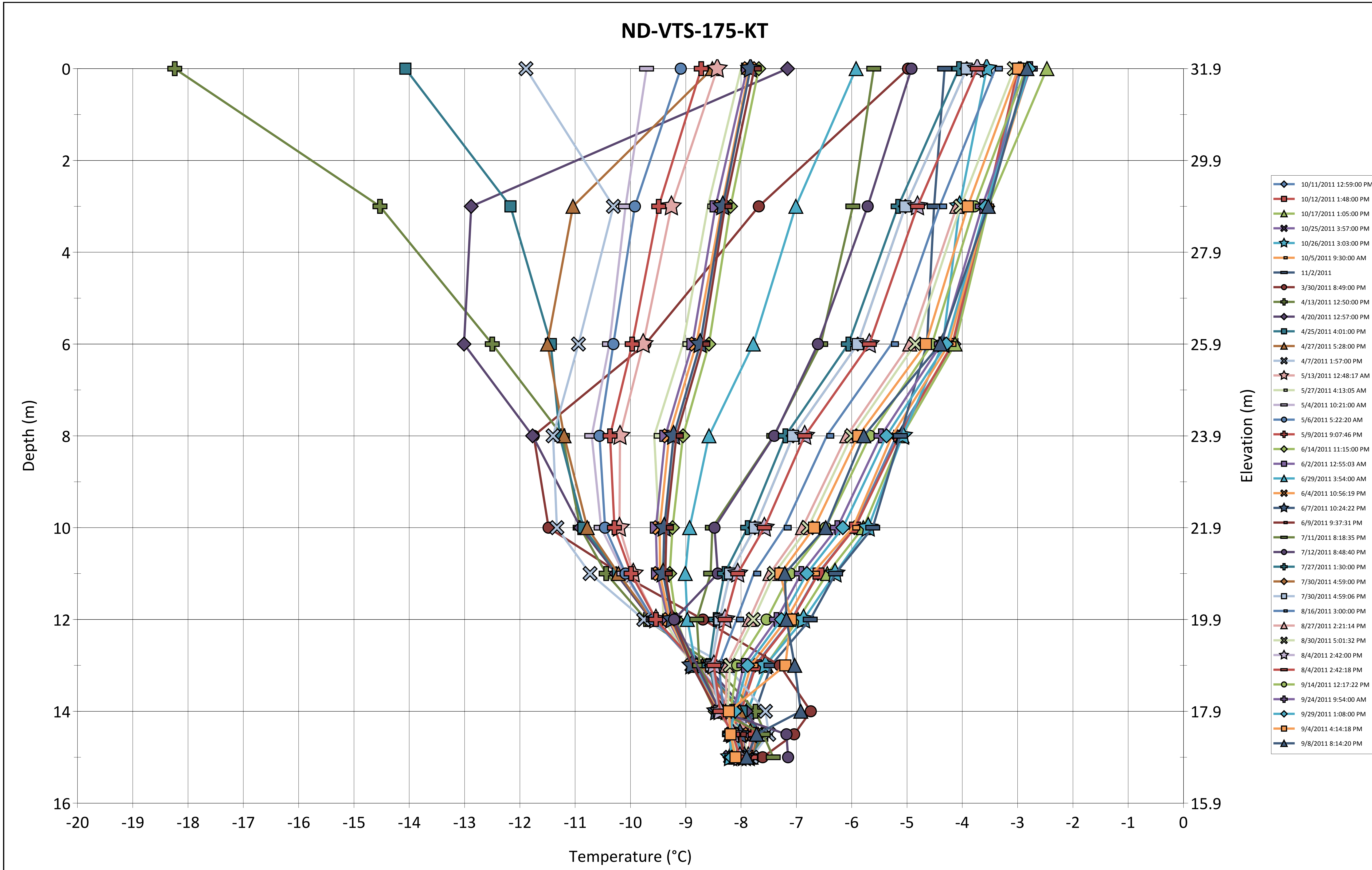
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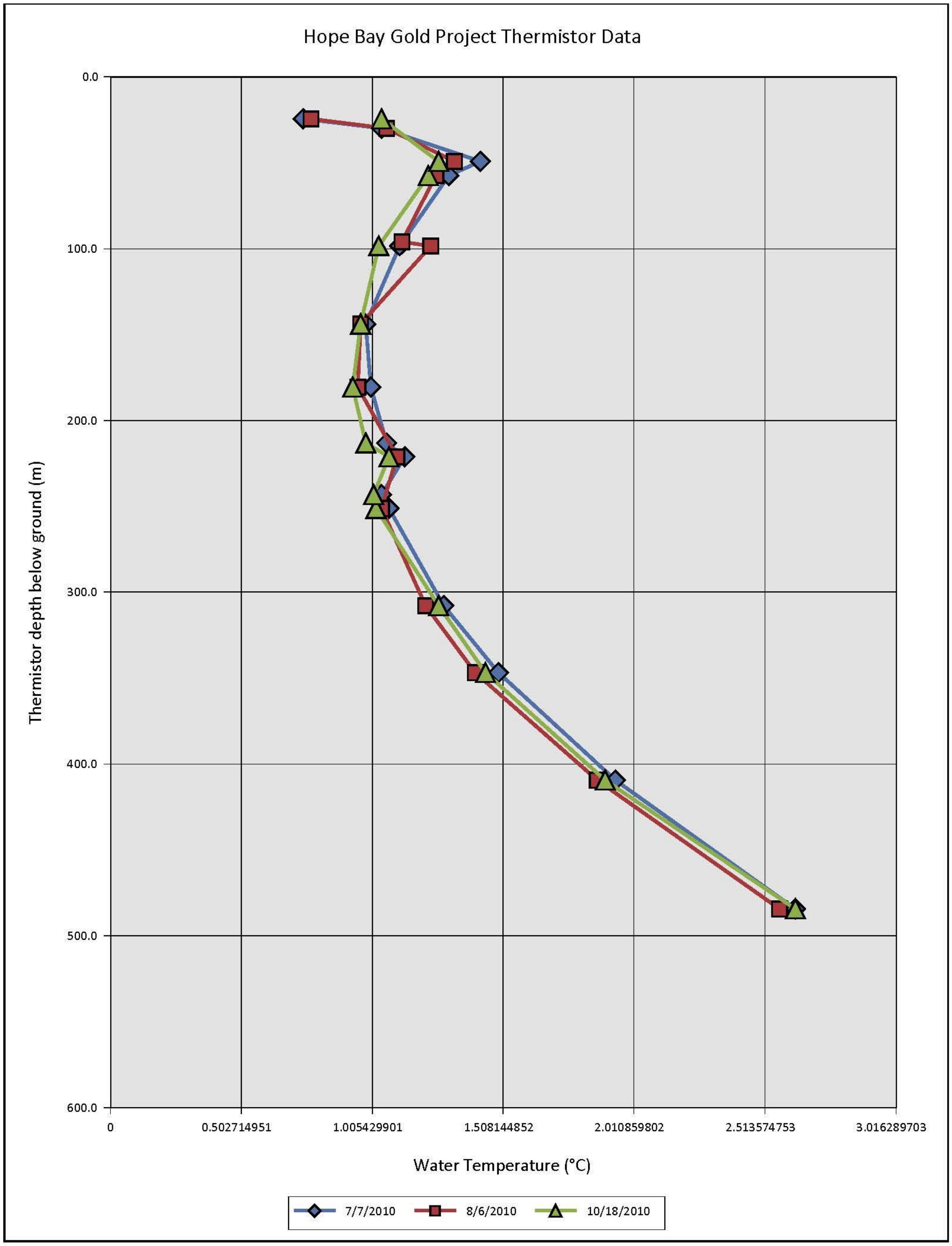
Appendix F
Westbay Well Thermistor Profiles

Thermistor Data (10WBW001)



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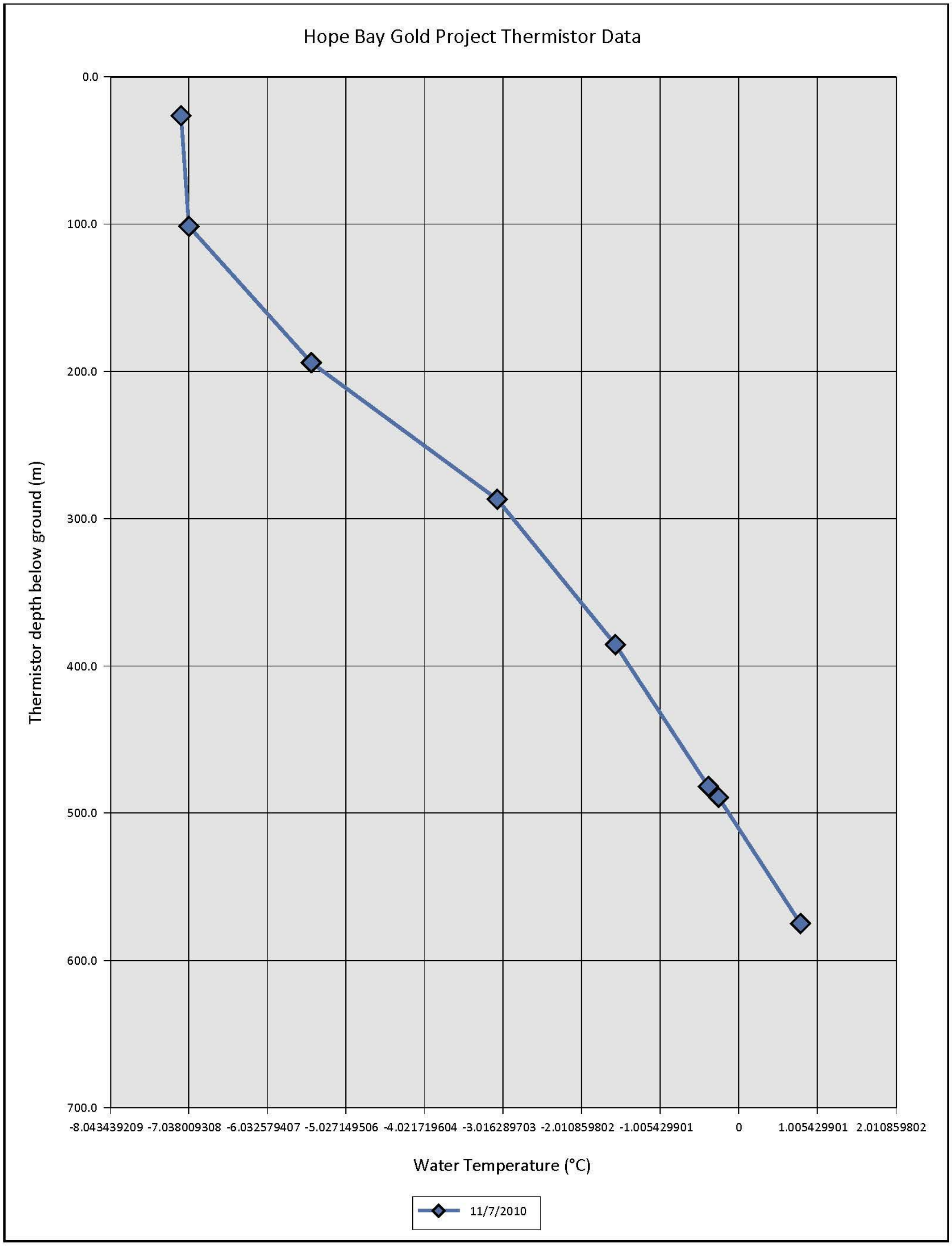


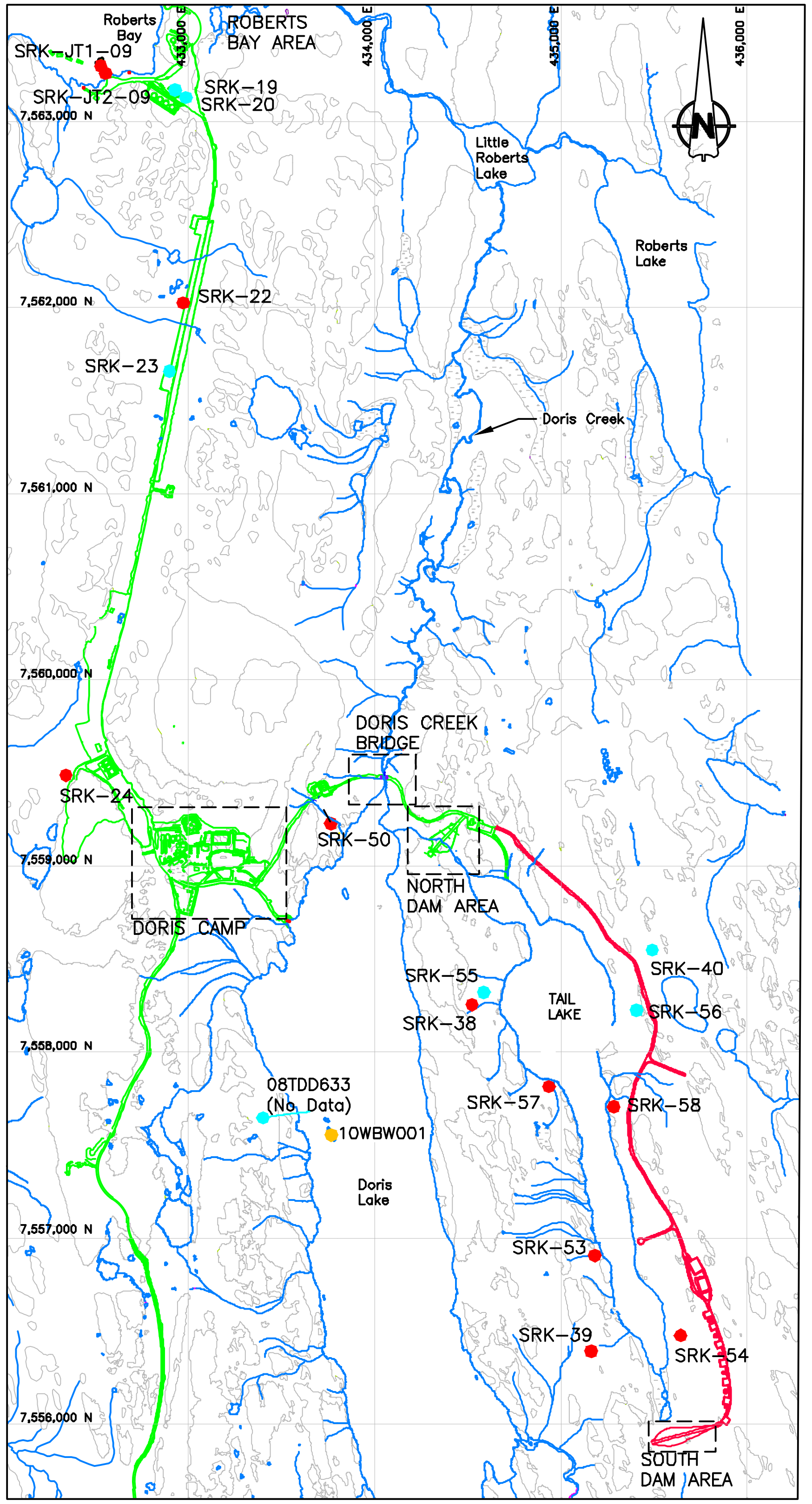
Appendix G
Reconciliation of SRK and Water License Thermistor Station ID's

Station ID		Northing	Easting	Status	Location	Area	Comments
Water License 2AM-DOH0713	SRK						
n/a	SRK-11	7559117.00	434347.00	Inactive	North Dam	Doris Mining Area	Replaced by NI1 to NI24 series
n/a	SRK-13	7559171.72	434383.32	Inactive	North Dam	Doris Mining Area	Replaced by NI1 to NI24 series
n/a	SRK-14	7559059.45	434291.66	Active	Near North Dam	Doris Mining Area	Baseline data
n/a	SRK-15	7559171.62	434383.00	Inactive	North Dam	Doris Mining Area	Replaced by NI1 to NI24 series
n/a	SRK-16	7559092.00	434323.20	Inactive	North Dam	Doris Mining Area	Replaced by NI1 to NI24 series
T4	SRK-19	7563211.92	432983.69	Inactive	Beach Laydown Area	Roberts Bay	Baseline data - Destroyed during construction
T5	SRK-20	7563129.78	432986.02	Inactive	Beach Laydown Area	Roberts Bay	Baseline data - Destroyed during construction
T8	SRK-22	7562026.69	432971.94	Active	East of Doris Airstrip	Roberts Bay	Baseline data
T7	SRK-23	7561665.77	432901.86	Inactive	South Apron Doris Airstrip	Roberts Bay	Baseline data - Destroyed during construction
n/a	SRK-24	7559493.64	432344.49	Active	Near crusher at Q2	Doris Mining Area	Baseline data
DOR-5	SRK-26	7558819.91	433422.37	Inactive	Junction Doris Rd and Tail Lk Road	Doris Mining Area	Baseline data - Destroyed during construction
DOR-1	SRK-28	7559046.27	433043.30	Inactive	Camp Pad	Doris Mining Area	Baseline data - Destroyed during construction
SI2	SRK-32	7555914.51	435554.73	Active	South Dam Area	Doris Mining Area	Baseline data
SI3	SRK-33	7555930.36	435613.59	Inactive	South Dam Area	Doris Mining Area	Baseline data - No longer functioning
SI4	SRK-34A	7555941.61	435640.69	Inactive	South Dam Area	Doris Mining Area	Baseline data - No longer functioning
T1	SRK10-DCB1	7559478.35	434036.99	Active	Doris Creek Abutment - West	Doris Mining Area	New installation 2011 specifically for Water Licence
T2	SRK10-DCB2	7559475.15	434067.76	Active	Doris Creek Abutment - East	Doris Mining Area	New installation 2011 specifically for Water Licence
n/a	SRK-35	7559477.53	434035.64	Inactive	Doris Creek - West	Doris Mining Area	Baseline data: Replaced by T1
n/a	SRK-37	7559090.54	434328.97	Inactive	North Dam	Doris Mining Area	Replaced by NI1 to NI24 series
n/a	SRK-38	7558254.33	434525.84	Active	Tail Lake West Side	Doris Mining Area	Baseline data
n/a	SRK-39	7556391.33	435164.13	Active	Tail Lake West Side	Doris Mining Area	Baseline data
n/a	SRK-40	7558546.86	435492.39	Inactive	Tail Lake East Side	Doris Mining Area	Baseline data - No longer functioning
n/a	SRK-41	7559129.11	434358.55	Inactive	North Dam Area	Doris Mining Area	Baseline data - No longer functioning
n/a	SRK-42	7559081.34	434402.62	Inactive	North Dam Area	Doris Mining Area	Baseline data - No longer functioning
SI5	SRK-43	7555923.82	435584.52	Inactive	South Dam Area	Doris Mining Area	Baseline data - No longer functioning
n/a	SRK-50	7559177.00	433807.00	Active	Doris Lake North End	Doris Mining Area	Baseline data
n/a	SRK-51	7559165.54	434390.70	Inactive	North Dam Area	Doris Mining Area	Baseline data - No longer functioning
n/a	SRK-52	7559082.73	434316.33	Inactive	North Dam Area	Doris Mining Area	Baseline data - No longer functioning
SRK-53	SRK-53	7556906.93	435184.24	Active	Tail Lake West Side	Doris Mining Area	Baseline data
SRK-54	SRK-54	7556467.00	435632.00	Unknown	Tail Lake East Side	Doris Mining Area	Baseline data - Surrounded by Water Sep. 2011
SRK-56	SRK-55	7557813.27	434935.95	Inactive	Tail Lake West Side	Doris Mining Area	Baseline data - No longer functioning
SRK-56	SRK-56	7558258.00	435334.00	Inactive	Tail Lake East Side	Doris Mining Area	Baseline data - No longer functioning
SRK-57	SRK-57	7557812.13	434937.72	Active	Tail Lake West Side	Doris Mining Area	Baseline data
SRK-58	SRK-58	7557704.54	435284.89	Active	Tail Lake East Side	Doris Mining Area	Baseline data
n/a	SRK-62	7558994.93	434500.74	Inactive	Tail Lake North End	Doris Mining Area	Baseline data - No longer functioning
T1	SRK-JT1-09	7563297.00	432534.00	Active	Jetty	Roberts Bay Jetty	New installation 2009 specifically for Water Licence
T2	SRK-JT2-09	7563264.00	432550.00	Active	Jetty	Roberts Bay Jetty	New installation 2009 specifically for Water Licence

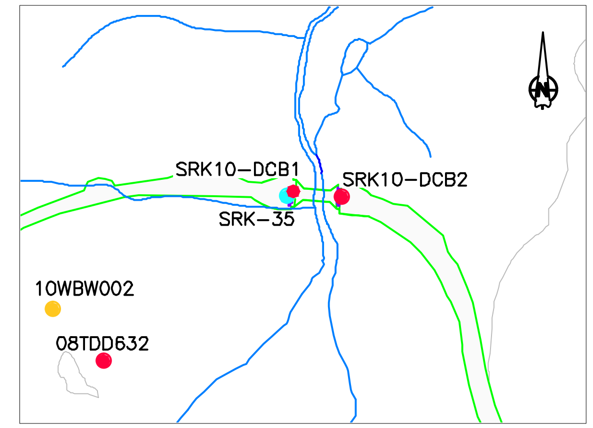
Station ID		Northing	Easting	Status	Location	Area	Comments
Water License 2AM-DOH0713	SRK						
n/a	08SBD380	7504780.24	441079.71	Active	South of Boston Camp	Boston Mining Area	Baseline data - Boston Water License
n/a	08SBD381A	7504813.94	441070.40	Unknown	South of Boston Camp	Boston Mining Area	Baseline data - Boston Water License
n/a	08SBD382	7505140.53	441025.86	Unknown	South of Boston Camp	Boston Mining Area	Baseline data - Boston Water License
n/a	08PMD669	7550955.12	433300.23	Unknown	Between Patch and Windy Lakes (N)	Madrid Mining Area	Baseline data - Windy Water License
n/a	08PSD144	7548989.92	435177.97	Unknown	Patch Lake Island	Madrid Mining Area	Baseline data - Windy Water License
n/a	08TDD632	7559369.75	433915.20	Unknown	West Side Doris Lake N	Doris Mining Area	Baseline data
n/a	08TDD633	7557646.05	433402.21	Inactive	West Side Doris Lake	Doris Mining Area	Baseline data - No longer functioning
n/a	SRK-12-GTC-DH01	7558917.20	433169.18	To be Installed	Pollution Control Pond	Doris Mining Area	New instllation planned for 2012 specifically for Water License
n/a	SRK-12-GTC-DH02	7558912.96	433225.25	To be Installed	Pollution Control Pond	Doris Mining Area	New instllation planned for 2012 specifically for Water License
n/a	SRK-12-GTC-DH03	7558930.81	433225.25	To be Installed	Pollution Control Pond	Doris Mining Area	New instllation planned for 2012 specifically for Water License
DOR-6	SRK-10-DWB1	7555673.50	432703.40	To be Installed	Doris-Windy Road Bridge #2	Madrid Mining Area	New instllation planned for 2012 specifically for Water License
DOR-7	SRK-10-DWB2	7555644.40	432708.20	To be Installed	Doris-Windy Road Bridge #2 / #3	Madrid Mining Area	New instllation planned for 2012 specifically for Water License
DOR-8	SRK-10-DWB3	755615.00	432712.80	To be Installed	Doris-Windy Road Bridge #3	Madrid Mining Area	New instllation planned for 2012 specifically for Water License
DOR-9	SRK-10-DWB4	7554860.30	432444.00	To be Installed	Doris-Windy Road Bridge #4	Madrid Mining Area	New instllation planned for 2012 specifically for Water License
DOR-10	SRK-10-DWB5	7554831.30	732437.00	To be Installed	Doris-Windy Road Bridge #4	Madrid Mining Area	New instllation planned for 2012 specifically for Water License
NI1	ND-HTS-040-31.5	7559100.71	434324.01	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI2	ND-HTS-040-33.5	7559100.71	434324.01	To be Installed	North Dam	Doris Mining Area	New instllation planned for 2012 specifically for Water License
NI3	ND-VTS-040-KT	7559100.71	434324.01	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI4	ND-VTS-060-DS	7559115.28	434337.72	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI5	ND-HTS-060-33.5	7559115.28	434337.72	To be Installed	North Dam	Doris Mining Area	New instllation planned for 2012 specifically for Water License
NI6	ND-HTS-060-31.0	7559115.28	434337.72	To be Installed	North Dam	Doris Mining Area	New instllation planned for 2012 specifically for Water License
NI7	ND-HTS-060-28.8	7559115.28	434337.72	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI8	ND-VTS-060-KT	7559115.28	434337.72	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI9	ND-VTS-060-US	7559106.54	434346.46	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI10	ND-VTS-085-DS	7559133.96	434353.91	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI11	ND-HTS-085-25.3	7559133.96	434353.91	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI12	ND-HTS-085-29.4	7559133.96	434353.91	To be Installed	North Dam	Doris Mining Area	New instllation planned for 2012 specifically for Water License
NI13	ND-HTS-085-33.5	7559133.96	434353.91	To be Installed	North Dam	Doris Mining Area	New instllation planned for 2012 specifically for Water License
NI14	ND-VTS-085-KT	7559133.96	434353.91	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI15	ND-VTS-085-US	7559125.08	434363.23	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI16	ND-VTS-130-DS	7559167.23	434384.47	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI17	ND-HTS-130-28.8	7559167.23	434384.47	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI18	ND-HTS-130-31.0	7559167.23	434384.47	To be Installed	North Dam	Doris Mining Area	New instllation planned for 2012 specifically for Water License
NI19	ND-HTS-130-33.5	7559167.23	434384.47	To be Installed	North Dam	Doris Mining Area	New instllation planned for 2012 specifically for Water License
NI20	ND-VTS-130-KT	7559167.23	434384.47	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI21	ND-VTS-130-US	7559158.49	434393.93	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI22	ND-HTS-175-32.5	7559200.63	434414.72	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License
NI23	ND-HTS-175.33.5	7559200.63	434414.72	To be Installed	North Dam	Doris Mining Area	New instllation planned for 2012 specifically for Water License
NI24	ND-VTS-175-KT	7559200.63	434414.72	Active	North Dam	Doris Mining Area	New installation 2011 specifically for Water License

ACTIVE THERMISTOR COORDINATE TABLE:

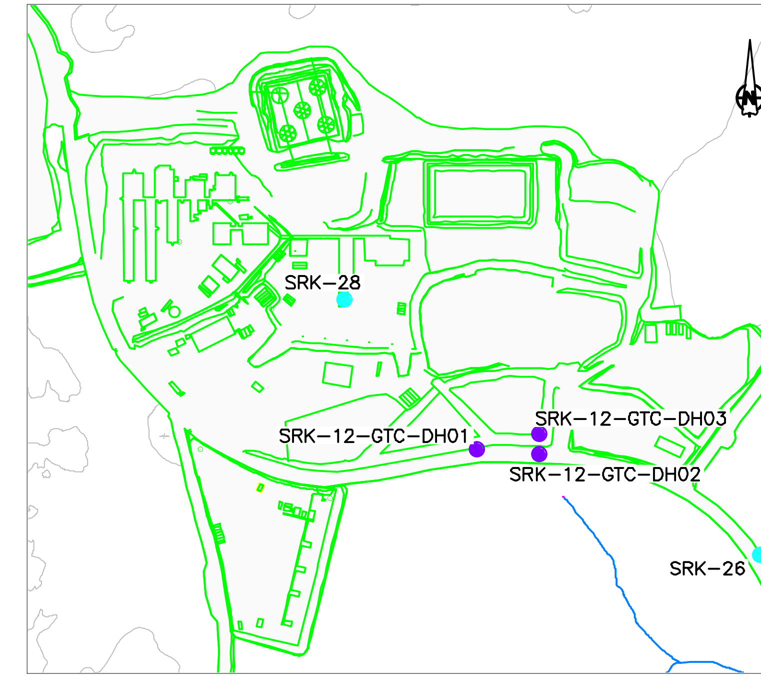
Station ID		Northing	Easting
SRK	Water License 2AM-DOH0713		
SRK-14		7559059.45	434291.66
SRK-22	T8	7562026.69	432971.94
SRK-24		7559493.64	432344.49
SRK-32	SI2	7555914.51	435554.73
SRK10-DCB1	T1	7559478.35	434036.99
SRK10-DCB2	T2	7559475.15	434067.76
SRK-38		7558254.33	434525.84
SRK-39		7556391.33	435164.13
SRK-50		7559177.00	433807.00
SRK-53	SRK-53	7556906.93	435184.24
SRK-57	SRK-57	7557812.13	434937.72
SRK-58	SRK-58	7557704.54	435284.89
SRK-JT1-09	T1	7563297.00	432534.00
SRK-JT2-09	T2	7563264.00	432550.00
08PMD669		7550955.12	433300.23
08PSD144		7548989.92	435177.97
08TDD632		7559369.75	433915.20
ND-040-DS (Multiple)		7559100.710	434324.010
ND-VTS-060-US		7559106.540	434346.460
ND-060-DS (Multiple)		7559115.280	434337.720
ND-VTS-085-US		7559125.080	434363.230
ND-085-DS (Multiple)		7559133.960	434353.910
ND-VTS-130-US		7559158.490	434393.930
ND-130-DS (Multiple)		7559167.230	434384.470
ND-175-DS (Multiple)		7559200.630	434414.720



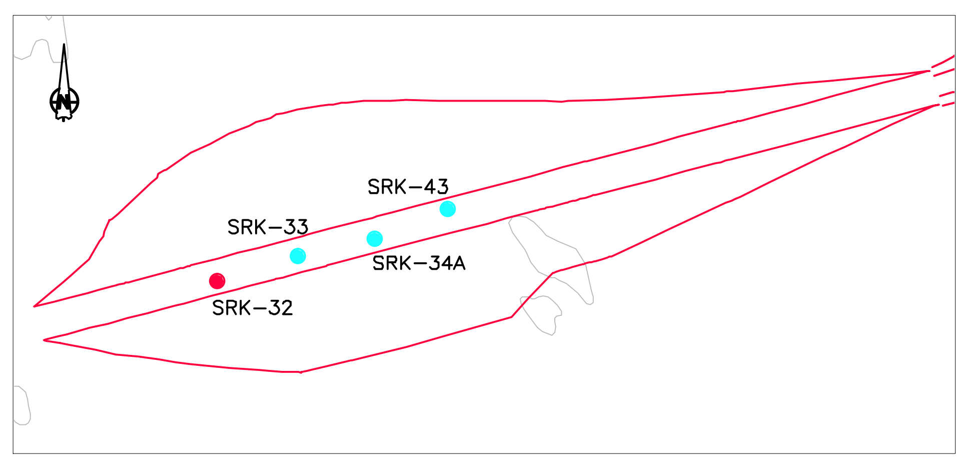
DORIS NORTH OVERVIEW



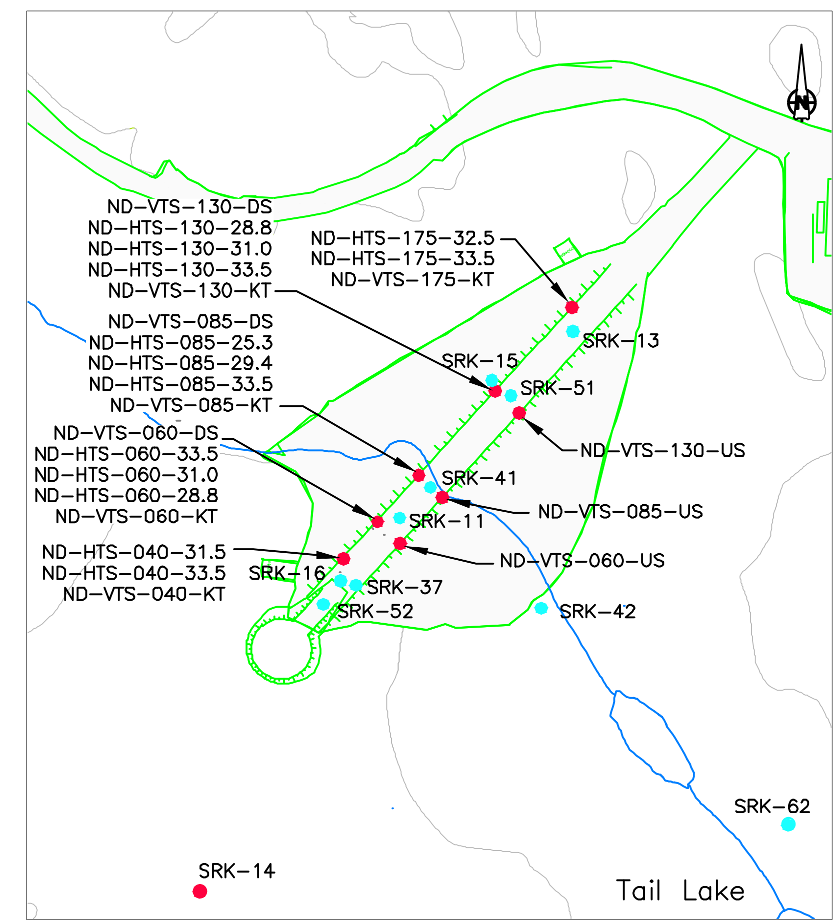
DORIS CREEK BRIDGE



DORIS CAMP



SOUTH DAM AREA



NORTH DAM AREA

LEGEND

- Active Thermistor Installation
- Inactive Thermistor Installation
- Westbay Wells
- Proposed Thermistor Location
- Asbuilt
- Licensed but not yet Constructed

srk consulting

NEWMONT NORTH AMERICA

SRK JOB NO.: 1CH008.032	HOPE BAY MINING LTD.	2011 Geotechnical Inspection
FILE NAME: 1CH008_032-GT09-3.dwg		Ground Temperature Station Names
		DATE: Mar. 2012 · APPROVED: EMR · FIGURE: 1

O:\01_SITES\Hope.Bay\Thermistor Dwgs\1CH008_032-GT09-3.dwg

Appendix H
Doris North Project 2011 Annual Roberts Bay Jetty Inspection Memo

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Memo

To:	Lea-Marie Bowes-Lyon	**Date:**	November 3, 2011
Company:	Hope Bay Mining Ltd.	**From:**	Maritz Rykaart, Ph.D., P.Eng.
Copy to:	Chris Hanks	**Project #:**	1CH008.046
Subject:	Doris North Project: 2011 Annual Roberts Bay Jetty Inspection		

1 Introduction

The Doris North Project (Project) is a mining and milling undertaking of Hope Bay Mining Limited (HBML), a wholly owned subsidiary of Newmont Mining Company (NMC). The site is located in the Kitikmeot Region of Nunavut, about 170 km southwest of Cambridge Bay (with general coordinates of latitude 68°09'N and longitude 106°40'W).

The Project is licensed to conduct mining, milling and associated activities. Construction of the Project started in 2007, and is expected to continue through to 2013. Mine development started in the summer of 2010; however, ore processing is not scheduled until 2013 at the earliest. In addition to supporting ongoing construction activities, the site is currently used to carry out regional exploration.

Site operations are currently conducted under a Type "A" Nunavut Water Board (NWB) License 2AM-DOH0713, dated September 19, 2007, which entitles HBML (the Licensee) to use water and dispose of waste associated with their operations. In addition, the Project is governed by its Project Certificate issued by the Nunavut Impact Review Board (NIRB) on September 15, 2006.

In accordance with Part J, Items 18 and 19 of the License HBML must ensure that a geotechnical inspection is carried out annually by a licensed Geotechnical Engineer. The inspection shall be conducted in accordance with the Canadian Dam Safety Guidelines where applicable; and take into account all major earthworks, including the Roberts Bay jetty (jetty). Furthermore, the Project Certificate requires that HBML install and monitor thermistor cables in the jetty foundation to monitor submarine permafrost.

In fulfillment of these regulatory obligations, Mr. Chris Hanks, Director for Environment and Social Responsibility (ESR) from HBML, requested that SRK Consulting (Canada) Inc. (SRK) conduct the 2011 geotechnical site inspection of the jetty. This memo provides a summary of the conditions observed at the jetty. This is the third annual geotechnical inspection completed for the Project, each of which has included the jetty (SRK 2009a; SRK 2011); however, this is the first time a separate report has been produced covering only the jetty.

2 Site Conditions

The Project site is located on a narrow north-south trending stretch of land spanning approximately 8 km long and 3 km wide from Roberts Bay in the north to the southern end of Tail Lake in the south. Outside of this area, immediately to the north-west along the Roberts Bay shoreline, there is a beach which has historically been used as a barge landing site and lay down area. This beach is not permanently connected to the Project, since its only link to the greater site is a seasonal ice-road constructed over the Roberts Bay sea ice.

At the north end of the Project there is a jetty and shoreline lay down area. An all-weather road connects these facilities to the Roberts Bay lay down area and primary fuel tank farm which has been constructed in the disused Quarry #1. Immediately opposite another larger fuel tank farm is located. The all-weather road continues south from this lay down area towards the camp, about 4 km further along. Part of this road has been widened for use as an all-weather airstrip. Between the camp and the airstrip, there is a spur road heading east towards a pad housing the wash bay and explosives mixing plant. Further along the road heading towards the camp, there is a large lay down area and the Lower and Upper Reagent pads which is currently used as the operational base for the exploration drilling contractor, as well as general equipment and supply storage.

Beyond the road lay down area, there is a spur road servicing an active construction rock quarry (Quarry #2). This spur road also serves as an access to the construction crusher complex and stockpile area, as well as the primary overburden pile.

The camp area, also known as Quarry #4, consists of multiple tiered foundation pads, cut partially into bedrock. The westernmost pad contains the two camps, sewage treatment plant, fire water tank and other miscellaneous camp services. The lower tier houses the site power plant, fuel storage, as well as warehousing and exploration support facilities. Moving east a pad houses the camp fuel tank farm, and along the easternmost end there are a series of pads that support underground mining activities. The all-weather road running along the south of the site links the camp area to Doris Lake, where the fresh water intake is located for the camp potable water supply. The Pollution Control and Sediment Control Ponds are located immediately north of this road.

A helicopter support base is located due south of the camp, at the junction from where the 10 km long Doris-Windy all-weather road starts. This road meanders due south along high ground, passing by three construction quarries.

An all-weather road, known as the Secondary Road connects the camp area with the tailings impoundment area at Tail Lake. At this point the road is only complete to just past the North Dam, which is also currently under construction. Along this route, Doris Creek is crossed using a permanent bridge.

Site climate, regional geology, permafrost and geotechnical conditions are discussed in SRK 2011 and will not be repeated here.

3 Inspection Conditions

3.1 General

Mr. Maritz Rykaart, P.Eng., Ph.D., a Principal Geotechnical Engineer with SRK, conducted the geotechnical inspection during the week of July 26-29, 2011. The detailed site inspection was carried out on foot, after conducting a reconnaissance fly-over of the site via helicopter.

Ms. Jill Turk, the HBML Environmental site representative on rotation, did not accompany SRK on the inspection but was available for questioning.

Weather conditions during the inspection were cool but sunny with light winds, but no precipitation.

3.2 Thermistors

Two thermistor strings were installed through the jetty into submarine permafrost in 2009 (SRK 2009b). There are no data loggers connected to these thermistor strings. HBML ESR and survey staff collects manual readings at roughly quarterly intervals. This data is forwarded to SRK, who maintains a database with the relevant information.

The complete dataset for each of the two strings are presented in Attachment A, and an as-built drawing showing the location of these strings are included as Attachment B. This data confirms that the active layer is between 1.4 and 1.6 m below seabed elevation, and there is no indication that the active layer has changed since installation of the strings in 2009. It can therefore be concluded that the approximately 2 m thick engineered fill used to construct the jetty has not altered the submarine permafrost regime.

3.3 Sediment Transport and Deposition

In accordance with HBML's obligations under Section 5 of the Authorization for Works or Undertakings Affecting Fish Habitat granted by the Department of Fisheries and Oceans (DRO) (DFO File No: NU-02-0117) for construction of the jetty, three years of sediment transport and deposition monitoring has been carried out (Golder 2008; Rescan 2009 and Rescan 2010). Bathymetric surveys were conducted in Roberts Bay in the vicinity of the jetty in 2006 (Golder 2006), 2008, 2009 and 2010 with the specific aim of identifying sediment transport and deposition changes due to the presence of the jetty.

Rescan (2010) reported that changes observed between pre-construction (2006) and post construction (2008 onwards) were minor. The largest difference was observed immediately following construction (i.e. between 2006 and 2008). Changes in subsequent years are small and Rescan (2010) suggested that steady state conditions had likely been reached.

3.4 Roberts Bay Jetty

The jetty was constructed in the summer of 2007, and was put in use for the first time in August 2007. It was used as a berthing facility from which to offload barges during the annual resupply sealift. This jetty was designed to replace the use of the old lay down area for normal resupply operations of the Project.

Foundation conditions beneath the jetty consist of very weak marine sediments. Submarine permafrost is present for about the first 55 m from shoreline, transitioning to unfrozen soils. The unfrozen soils have very little strength, and as a result the jetty is subject to extensive consolidation settlement (SRK 2004; 2005a, b and 2006). This settlement was expected, and to facilitate more controlled settlement, the rock fill structure was underlain by a double layer of geogrid placed directly onto the seabed. The jetty was originally designed to extend a total length of 103 m from the shoreline, such that the barges could berth in 5 m deep water; however, during construction, and due to very weak foundation conditions in the deep water, the front section of the jetty slumped. The design was subsequently modified to allow berthing in shallower water (about 2 m deep), which resulted in a slightly shorter overall jetty length (SRK 2009c, d). The failure occurred in the unfrozen soils and is not a result of submarine permafrost thaw.

Extensive settlement monitoring of the berthing face of the jetty was undertaken in 2007, and by the summer of 2008, the jetty was observed to have settled about 0.5 m, in accordance with original design expectations (SRK 2005a). Subsequently the jetty was raised in the summer of 2008 to ready the facility for the 2008 sealift. No further settlement monitoring was undertaken after this, and no further raising of the jetty was required prior to the 2009 sealift. Further levelling and raising of the jetty was done prior to the 2010 sealift; however, no surveys were available to confirm how much settlement had occurred. No further work was done on the jetty prior to the 2011 sealift. Observational information suggests that since the last repairs have been made the settlement had likely reached steady state.

The 2011 geotechnical inspection of this structure revealed no cause for concern. There were no obvious signs of distress anywhere on the structure, and based on these observations, supported by verbal descriptions from site staff, settlement appears to have reached steady state. The SRK inspector has inspected the jetty annually since construction, and no visual differences could be observed since the 2010 inspection, other than the fact that the facility was raised and levelled. SRK imposed strict design and operational limitations on the use of the jetty due to the weak foundation conditions (SRK 2005a; 2009c, d), and based on observations, supported by staff interviews, HBML are following these recommendations carefully.

SRK understands that HBML is planning extensive upgrades to the jetty in 2012, which would improve the off-loading weight restrictions of the existing structure, as well as prolong its design life while reducing the maintenance requirements. This work will be limited to the unfrozen submarine sediments.

4 Conclusions and Recommendations

This memo provides a performance assessment of the Roberts Bay jetty. The findings are based on a review of the structure history since design and construction, a site visit and walkover survey between July 26-29, 2011 and subsequent consultation with site staff and contractors. This is the third formal annual geotechnical inspection undertaken for the Project which has included inspection of the jetty.

The followings observations are important:

- Thermal monitoring from two thermistor strings installed through the jetty into the underlying submarine permafrost suggests that there has been no degradation of permafrost resulting from the construction of the jetty.
- Visual observation, annual bathymetric surveys and historic settlement surveys suggest that jetty settlement has reached steady state.

To ensure continued functional use of the jetty, SRK recommends that the following actions be undertaken:

- Continue to collect quarterly thermistor string data as a minimum (August, November, February and May).
- Conduct an annual survey of the jetty to allow for actual measurement of ongoing settlement.
- Remind operational staff annually about the operational limitations of the jetty.

Regards

SRK Consulting (Canada) Inc.

Maritz Rykaart, Ph.D., P.Eng.
Principal Engineer

5 References

Golder Associates Ltd. 2006. *Bathymetric Surveys, Hope Bay, Nunavut*. Report prepared for SRK Consulting (Canada) Inc., Report No. 06-1419-007.

Golder Associates Ltd. 2008. 2008 *Roberts bay Fisheries Authorization Monitoring Report*. Report prepared for Hope Bay Mining Limited, North Vancouver, BC by Golder Associates Ltd., Edmonton, AB. Golder Report No. 08-1373-0026-8000: 35 p. + 2 app.

Rescan Engineers & Scientists. 2009. *Doris North Gold Mine Project: 2009 Roberts Bay Jetty Fisheries Authorization Monitoring Report*. Report prepared for Hope Bay Mining Ltd., Project #1009-002-19, December.

Rescan Engineers & Scientists. 2010. *Doris North Gold Mine Project: 2010 Roberts Bay Jetty Fisheries Authorization Monitoring Report*. Report prepared for Hope Bay Mining Ltd., Project #1009-002-19, December.

SRK Consulting (Canada) Inc. 2004. *Phase I Foundation Investigation, Proposed Roberts Bay Jetty Location, Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Limited, Report No. 1CM014.002, April.

SRK Consulting (Canada) Inc. 2005a. *Preliminary Jetty Design: Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Limited, Report No. 1CM014.006, October.

SRK Consulting (Canada) Inc. 2005b. *Phase II Foundation Investigation, Proposed Roberts Bay Jetty Location, Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Limited, Report No. 1CM014.04-0110, May.

SRK Consulting (Canada) Inc. 2006. *Phase III Foundation Investigation, Proposed Roberts Bay Jetty Location, Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Limited, Report No. 1CM014.008-260, August.

SRK Consulting (Canada) Inc. 2009a. *2009 Annual Geotechnical Inspection, Doris North Project, Hope Bay, Nunavut*. Report prepared for Hope Bay Mining Limited, Report No. 1CH008.021, November.

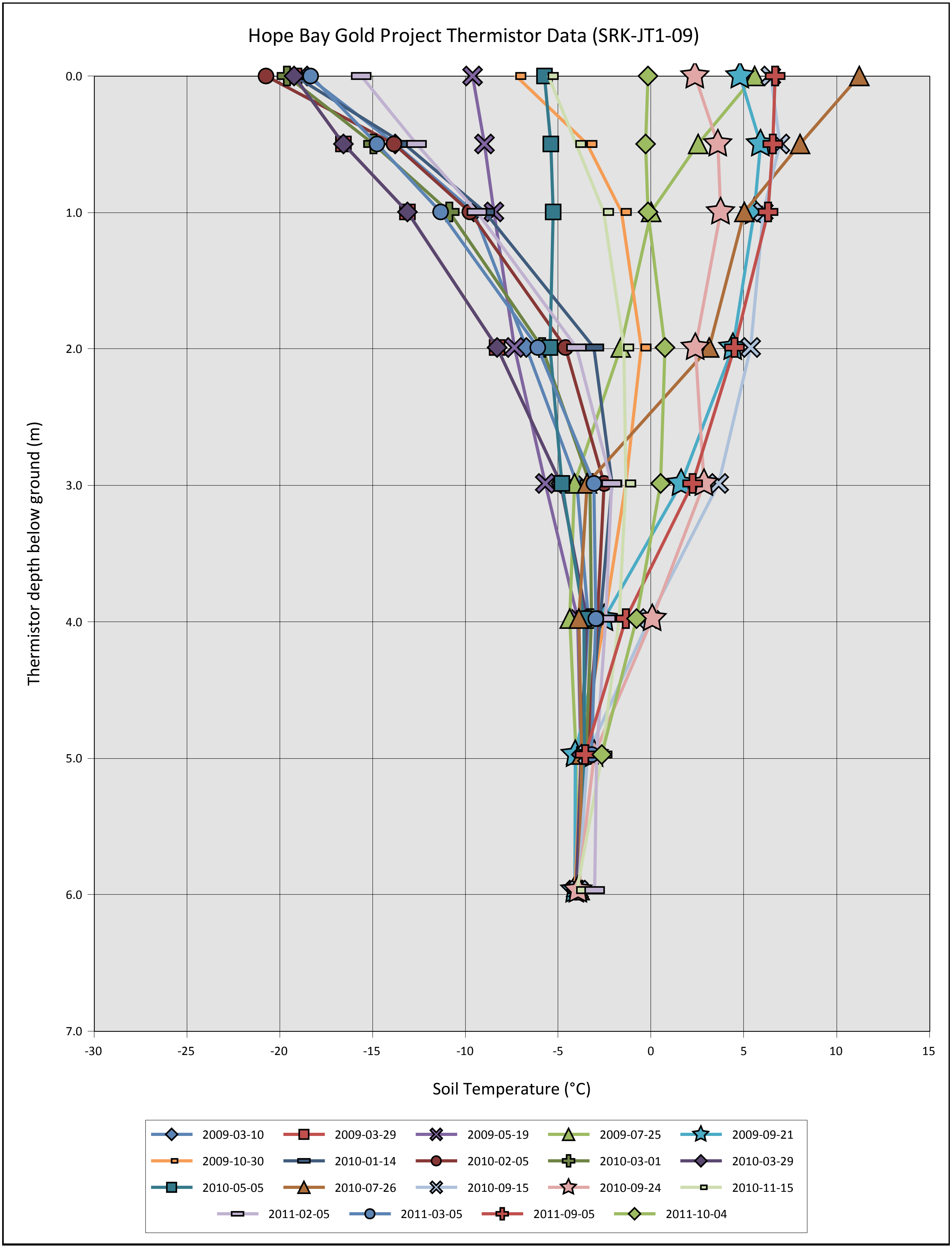
SRK Consulting (Canada) Inc. 2009b. *Hope Bay Project: Roberts Bay Jetty Thermistor Installation*. Memo prepared for Hope Bay Mining Limited, Project No. 1CH008.015.400, March 30.

SRK Consulting (Canada) Inc. 2009c. *Doris North Project: 2008 SRK Construction Support*. Letter Report prepared for Hope Bay Mining Limited, Report No. 1CH008.004, February 12.

SRK Consulting (Canada) Inc. 2009d. *Doris North Project: 2007 SRK Construction Support*. Letter Report prepared for Hope Bay Mining Limited, Report No. 1CH008.025, September 29.

SRK Consulting (Canada) Inc. 2011. *2010 Annual Geotechnical Inspection, Doris North Project, Hope Bay, Nunavut*. Report prepared for Hope Bay Mining Ltd., Report No. 1CH008.032, March.

Attachment 1: Hope Bay Gold Project Thermistor Data



Hope Bay Gold Project Thermistor Data (SRK-JT1-09)
Thermistor depth below ground (m)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
-30
-25
-20
-15
-10
-5
0
5
10
15
Soil Temperature (°C)
2009-03-10
2009-03-29
2009-05-19
2009-07-25
2009-09-21
2009-10-30
2010-01-14
2010-02-05
2010-03-01
2010-03-29
2010-05-05
2010-07-26
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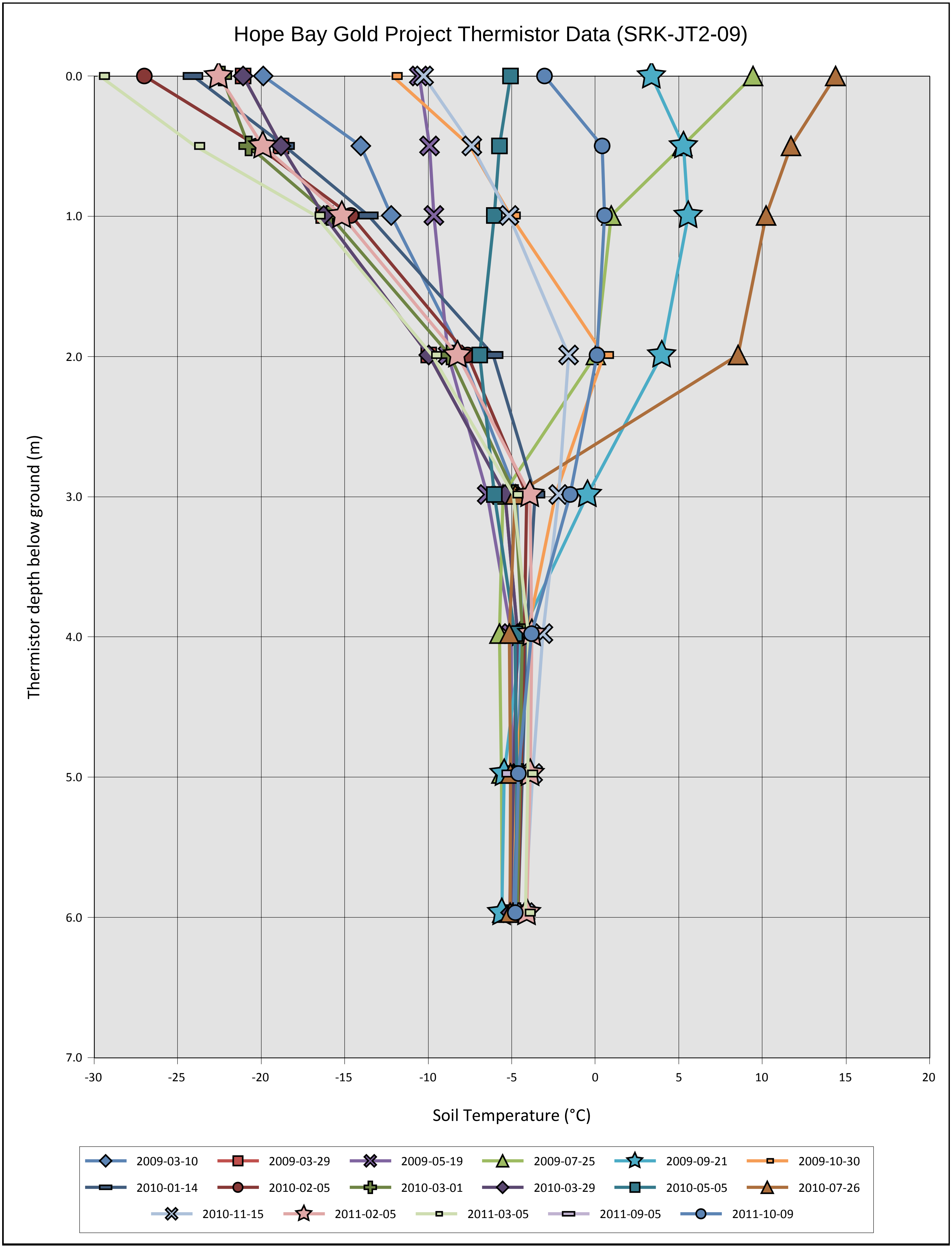
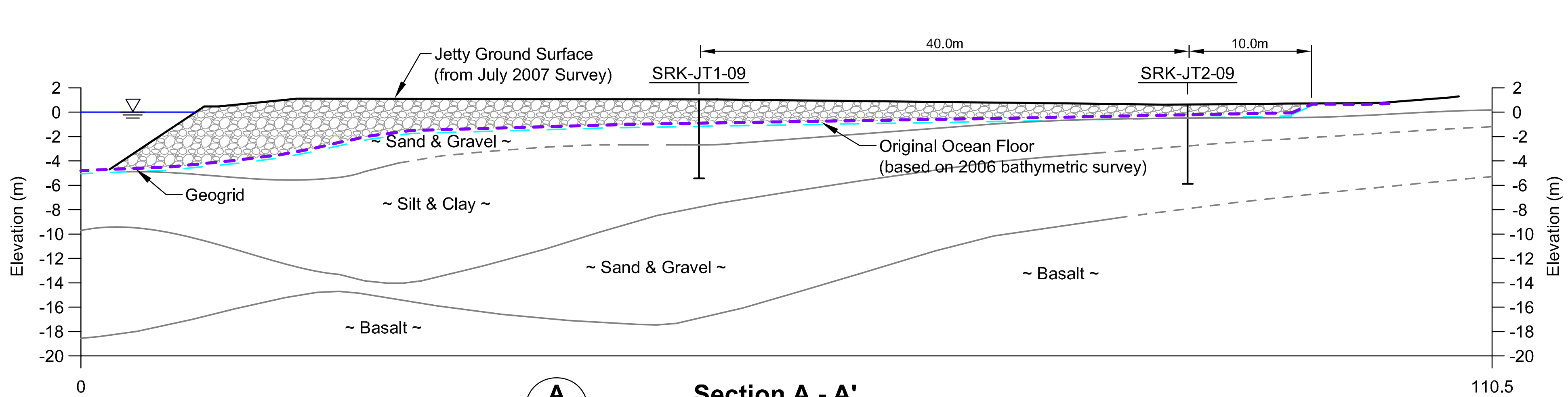
2011-10-04

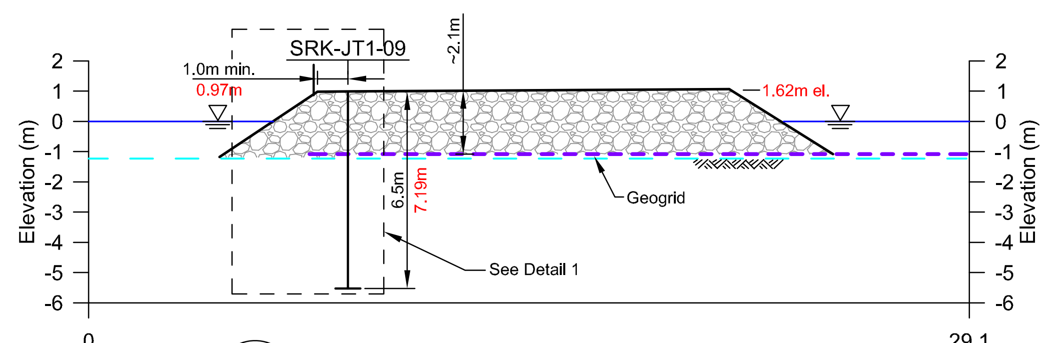

Hope Bay Gold Project Thermistor Data (SRK-JT2-09)
Thermistor depth below ground (m)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
-30
-25
-20
-15
-10
-5
0
5
10
15
20
Soil Temperature (°C)
2009-03-10
2009-03-29
2009-05-19
2009-07-25
2009-09-21
2009-10-30
2010-01-14
2010-02-05
2010-03-01
2010-03-29
2010-05-05
2010-07-26
2010-11-15
2011-02-05
2011-03-05
2011-09-05
2011-10-09

Attachment 2: Thermistor Installation – Section and Profile



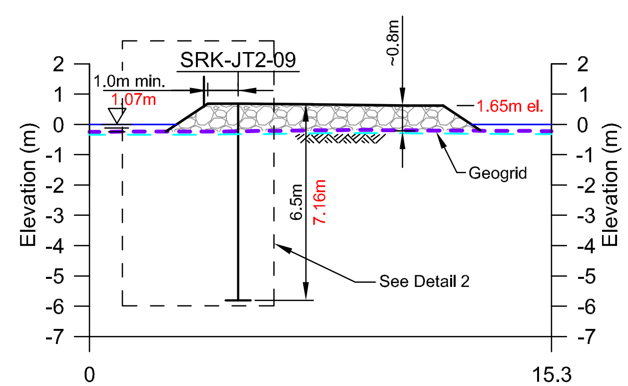
A / 1 — Section A - A'

0 5 10 15 20 25
Scale in Metres



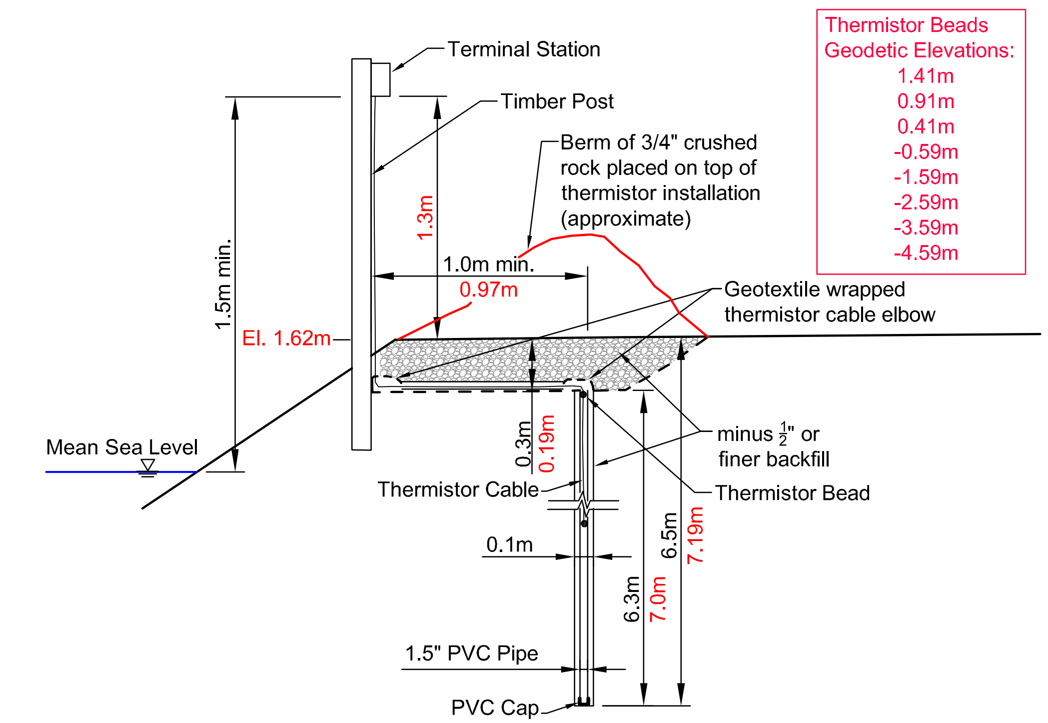
B / 1 — Section B - B'

0 2 4 6 8 10
Scale in Metres



C / 1 — Section C - C'

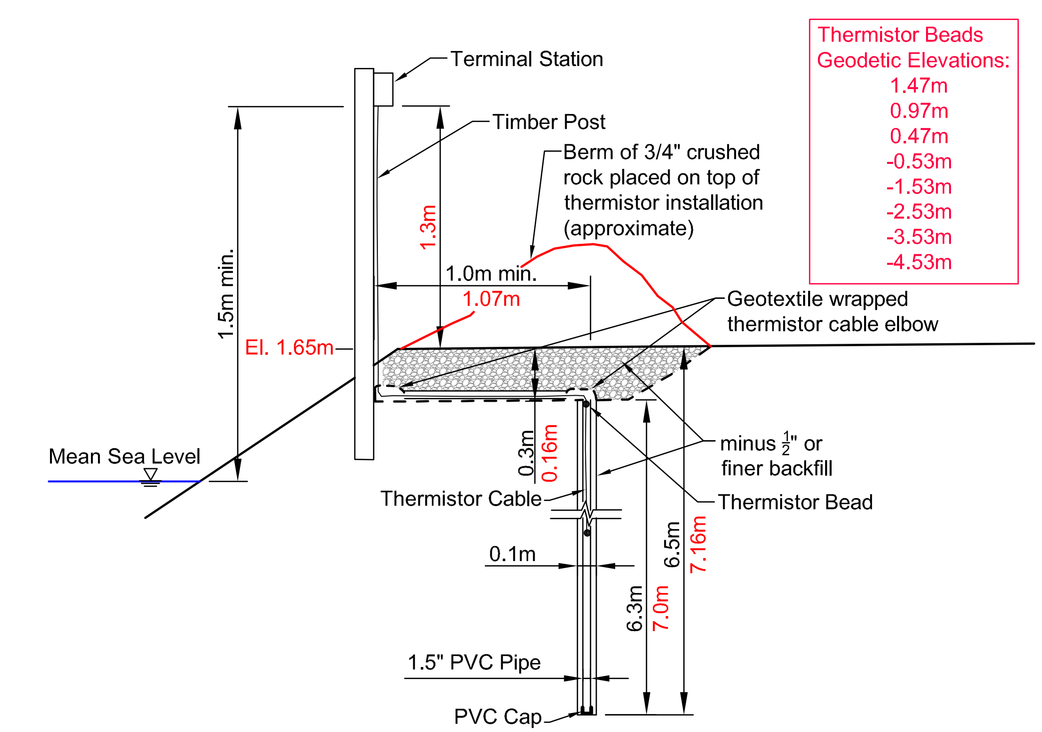
0 2 4 6 8 10
Scale in Metres



Detail 1

1 — Thermistor Installation SRK-JT1-09

0 0.4 0.8 1.2 1.6 2
Scale in Metres



Detail 2

2 — Thermistor Installation SRK-JT2-09

0 0.4 0.8 1.2 1.6 2
Scale in Metres

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE
JT-1	Thermistor Installation – Plan View		

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
B	Asbuilt	LW	EMR	13Mar09
A	Issued for Review	AT	EMR	5Mar09

REVISIONS

PROFESSIONAL ENGINEERS STAMP

SRK Consulting
Engineers and Scientists
Vancouver

DESIGN: MM/AT DRAWN: NV REVIEWED: EMR
CHECKED: LW APPROVED: EMR DATE: March 2009
FILE NAME: Jetty Asbuilt Feb2009.dwg

HOPE BAY MINING LTD

Hope Bay Gold Project

SRK JOB NO.: 1CH008.015–400

Jetty Thermistor Installation Program

DRAWING TITLE: Thermistor Installation - Section and Profile

DRAWING NO.: JT-2 SHEET: 2 OF 2 REVISION NO.: B

J:\01_SITES\Hope.Bay\!ACAD\2009 Drawings\Jetty Asbuilt Feb2009.dwg