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April 18, 2014

Phyllis Beaulieu
Manager of Licensing
Nunavut Water Board
P.O. Box 119
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(867) 360-6338

Re: 2AM-DOH1323 – 2013 Annual Geotechnical Inspection Report

Dear Ms. Beaulieu,

Please find enclosed with this letter TMAC Resources Inc.'s ("TMAC") 2013 Annual Geotechnical Inspection Reports for water licence 2AM-DOH1323.

The Geotechnical Inspection Report is being submitted as per Part J Items 18 and 19 of water licence 2AM-DOH1323. As per Part J Item 19, this cover letter outlines TMAC's implementation plan addressing each of the report's recommendations (see attached table).

Should you have any questions or concerns regarding this submission, please do not hesitate to contact me at lea-marie.bowes-lyon@tmacresources.com.

Sincerely,

Léa-Marie Bowes-Lyon
Tenure and Permitting Manager
Hope Bay Project

Inspection Item	2013 Recommendations	Actions
Thermistors	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site. Where appropriate, inactive thermistors should be inspected and where practical they should be repaired and re-commissioned for the collection of baseline data • Inspect and evaluate if the thermistors marked as "Status Unknown" are active • Include Westbay Well thermistors in monitoring program • The thermistor monitoring frequency was reduced under Care & Maintenance with a couple sets of readings taken around the maximum thermal activity expected in the area, i.e. in July or August (maximum thaw depth). This should continue until the project is started up again • North Dam thermistor data must continue to be collected in accordance with the monitoring recommendations provided in Section 7 of the North Dam As-Built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures Report (2013b).	• To be evaluated in 2014 field season and action undertaken where necessary. • To be evaluated during 2014 field season. • These will be added for 2014 field season. • Thermistor monitoring will continue as per suggested Care & Maintenance frequency. • Data collection will continue as indicated.
Old Beach Laydown Area	• Relocate two of the explosives magazines to an area where they are on the sandy beach as opposed to partially on the tundra vegetation	• All explosives magazines from the Old Beach Laydown Area were moved to Doris Camp in March 2014.
Roberts Bay Jetty	• Continue monitoring the jetty thermistor in accordance with the protocols stipulated in Section 3.2. • If the project moves beyond Care & Maintenance, repair or replace the damaged thermistor SRK-JT2-12 • Follow the recommendations for construction and monitoring provided by PND (2013)	• Data collection will continue as indicated. • SRK-JT2-12 will be repaired or replaced if the project moves beyond Care & Maintenance. • Recommendations will be followed.
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	• This is part of regular site water management practices.
5 ML Roberts Bay Tank Farm	• Backfill the trenches excavated to confirm liner elevation • Should the facility be re-commissioned, the liner repairs should be completed to ensure design capacity and consider the installation of settlement beacons along the fuel transfer station and on sections of the secondary containment facility not constructed on bedrock	• To be undertaken prior to the facility being re-commissioned. • To be undertaken prior to the facility being re-commissioned.
20 ML Roberts Bay Tank Farm	• In the areas were there has been potential for the liner to be compromised, it should be exposed and evaluated by a qualified person to confirm the integrity of the bunded area before the facility is refilled	• To be undertaken prior to refueling of facility.

Inspection Item	2013 Recommendations	Actions
	• Prior to refilling the fuel tanks the pedestals and area of the bunded area need to be reconstructed. Under Care & Maintenance, no action is required (unless further erosion continues) • Maintain improved water management practices to prevent the ponding of water and further erosion of the interior on the containment facility • Additional high wall stabilization and management practices should be considered	• To be undertaken prior to refueling of facility. • Improved water management practices will be continued. • Stabilization will be considered based on the condition of the high wall face and, should work be required, will be undertaken when an underground mining contractor is on site.
Roberts Bay 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 • 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	• This is part of regular site water management practices. • This is part of regular site water management practices. • This is part of regular site maintenance.
Quarry #1 Overburden Dump	• Monitor surface runoff and consider requirement for alternate sedimentation control measures • 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	• Monitoring will be undertaken and alternate control measures will be considered if required. • This area will not be used as laydown for the time being.
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 inspections of the airstrip shoulder and aprons to monitor the tension cracks prior to each use	• This is part of regular site maintenance. • This is part of regular site water management practices. • This is part of regular site maintenance.
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 • 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	• This is part of regular site maintenance. • This is part of regular site maintenance. • Regular visual inspections for tension cracks on the shoulder will be undertaken while the project remains in care and maintenance.

Inspection Item	2013 Recommendations	Actions
Doris Creek Bridge	• Ensure the correct thermistor reader, set to the correct thermistor bead resistivity, is used for each thermistor cable as listed on the Doris Thermistor Data Field Sheet. • Continue monitoring the thermistor strings with the recommendations set out in Section 3.2 • Monitor and ultimately replace the rock gabions	• To be implemented in 2014. • Data collection will continue as indicated. • Gabions will be monitored and replaced when needed.
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	• This is part of regular site water management practices.
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	• This is part of regular site water management practices.
Quarry #2 and Crusher Area	• Continue to follow the Quarry Management Plan • A barricade at the Quarry entrance is recommended	• This is part of regular site maintenance. • This area receives very little vehicle traffic so a barricade is not deemed necessary.
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	• This is part of regular site water management practices.
Upper Reagent Pad AN Storage	• Should the facility be used to provide secondary containment, the design criteria must be confirmed and appropriate remedial measures must be implemented. Under Care & Maintenance no action is required	• Facility is not currently being used.
Landfarm	• TMAC to continue to follow the designated Landfarm Management Plan • Conduct regular visual inspections to monitor for signs of settlement • Repair the sinkhole along the outside berm face of the Soil Containment Pond and the pothole in the access ramp into snow containment pond	• This is part of regular site maintenance. • Regular visual inspections will continue. • Sinkhole will be repaired. Pothole in snow containment pond ramp was repaired in August 2013 following inspection.
Sewage Treatment Plant Outfall	• Monitor for permafrost degradation at old outfall location • No action required at new outfall location	• This is part of regular site maintenance. • No action required.
Quarry # 2 Overburden Dump	• No action required	• No action required.
Doris North Camp Pads	• 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, along Pad D and install appropriate signage and barricades to warn people of the danger	• This is part of regular site water management practices. • Signage and barricades will be installed during 2014 field season. The requirement for a berm will be evaluated and will only be constructed if deemed necessary.

Inspection Item	2013 Recommendations	Actions
	• High wall stabilization measures designed for the mill pad should be installed as planned if the project moves beyond Care & Maintenance • Develop and implement a differential settlement monitoring protocol for heated buildings constructed directly onto the thermal rock fill pads	• Site is still in Care & Maintenance so no action currently planned. • A plan will be developed during 2014 field season and implemented.
7.5 ML Doris North Camp Tank Farm	• High wall stabilization measures designed for the 7.5 ML Tank Farm should be installed as planned (SRK 2011d)	• Stabilization will be considered based on the condition of the high wall face and, should work be required, will be undertaken when an underground mining contractor is on site.
Power Generation Station (Pad B)	• Monitor the survey monuments on Pad B to allow for tracking and advance notice of any deformations as part of the annual survey	• Monitoring to occur as part of regular monthly surveying effort.
Other Site Wide Fuel Storage	• No action required	• No action required.
Sedimentation and Pollution Control Ponds	• The Sedimentation and Pollution Control Ponds should be kept free of standing water, as this will lead to permafrost degradation • Remove the large rocks and over liner material from the exposed liner within the Sedimentation Pond • Keep a close watch on the Pollution Control Pond thermistor data as well as the sump water quality and flow • Carry out a comprehensive review of the ground conditions below the ponds to evaluate whether there is a further evidence of leakage	• This is part of regular site water management practices. • Rock removed from liner in September 2013 following inspection. • This is part of regular site water management practices and thermistor monitoring protocol. • This was undertaken in August of 2013 and a report has been prepared.
Sumps #1 and #2	• Both sumps should be kept free of standing water as this will lead to permafrost degradation • Inspect sump perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • The depression around Sump #1 must be backfilled with overburden to prevent further permafrost degradation	• This is part of regular site water management practices. • This is part of regular site water management practices. • This will be addressed during 2014 field season.
Doris North Portal	• No action required	• No action required.
Waste Rock Pile	• Once underground development resumes, TMAC should continue to follow the designated Waste Rock Management Plan	• No underground development planned for 2014 field season.
Temporary Pond	• No action required	• Pond removed in fall 2013.
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	• This is part of regular site water management practices.

Inspection Item	2013 Recommendations	Actions
Doris Primary Vent Raise Pad	• Install catch berm and appropriate signage along high wall • Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Remove metal debris from fuel transfer station	• Signage installed in fall 2013. Catch berm to be constructed if necessary when site no longer in Care & Maintenance. • This is part of regular site water management practices. • To be undertaken during 2014 field season.
Frozen Core Plant Pad	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• This is part of regular site water management practices.
North Dam	• Increase frequency of surveying North Dam monitoring points in accordance with the recommendations by the Engineer-of-Record in Section 7 of the North Dam As-built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures Report (SRK 2013b). This needs to be implemented immediately. • Survey and monitor the two depressions on the upstream face of the dam in conjunction with the instrumentation monitoring program • Backfill the erosion around Deep Settling Monitoring Point ND-DSP-100 • Repair the contact thermistor bead on the North #2 thermosyphon and test the functionality of the thermosyphon and re-charge the thermosyphon if required	• Required surveying will be undertaken during 2014 field season. • Required surveying will be undertaken during 2014 field season. • To be undertaken during 2014 field season. • To be undertaken during 2014 field season.
Shoreline Erosion	• Continue to implement measures to maintain the water level in Tail Lake at 28.2 masl to prevent onset of permafrost degradation	• This is part of regular site water management practices.
Doris North Diversion Berm	• Repair area of exposed liner next to where the water line passes over the berm	• To be undertaken during 2014 field season.
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 • Implement inspection protocol to monitor shoulder cracks and potholes • Backfill the dip in the road by the Helipad	• This is part of regular site water management practices. • This is part of regular site maintenance. • Protocol to be developed during 2014 field season. • Completed in September 2013.
Doris-Windy All Weather Road Stream Crossings	• Ensure the correct thermistor reader is used for each thermistor cable as listed on the Doris Thermistor Data Field Sheet. • Continue monitoring the thermistor strings in accordance with recommendations in Section 3.2 • Install additional railings between the two bridge superstructures • The depressions and ponded water against the thermal pad abutments should be covered	• To be addressed during 2014 field season. • To be addressed during 2014 field season. • To be addressed during 2014 field season. • To be addressed during 2014 field season.

Inspection Item	2013 Recommendations	Actions
	with rock fill to prevent thermal degradation of the permafrost	
Quarry A	• Continue to follow the Quarry Management Plan	• This is part of regular site maintenance.
Quarry B	• Continue to follow the Quarry Management Plan	• This is part of regular site maintenance.
Quarry D	• Continue to follow the Quarry Management Plan	• This is part of regular site maintenance.

2013 Annual Geotechnical Inspection
Doris North Project
Hope Bay, Nunavut

Prepared for

TMAC Resources Inc.

Prepared by

SRK Consulting (Canada) Inc.
1CT022.000
March 2014

2013 Annual Geotechnical Inspection Doris North Project Hope Bay, Nunavut

March 2014

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srk consulting

Executive Summary

The Doris North Project (Project) is a mining and milling undertaking of TMAC Resources Inc. (TMAC). 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 was expected to continue through to 2013. Mine development started in the summer of 2010; however, ore processing was not scheduled until 2013 at the earliest. In addition to supporting ongoing construction activities, the site was used to carry out regional exploration. In February 2012, Hope Bay Mining Limited (HBML) announced the Project had been placed into Care & Maintenance. In March 2013, the Hope Bay Gold Project was sold to TMAC and the Doris North Camp was re-opened to a limited extent to permit exploration activities on the Doris North Project.

Site operations are conducted under a Type "A" Nunavut Water Board (NWB) License 2AM-DOH1323 (the License), dated August 16, 2013, which entitles TMAC (the Licensee) to use water and dispose of waste associated with their operations. TMAC 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 annual investigation was carried out from August 20 to 23, 2013.

Table A below provides a summary of the inspection components and the primary recommendations stemming from the inspection. The recommendations make reference to the fact that the site is currently under Care & Maintenance, with only limited exploration activities, as opposed to being under active construction. This includes recognition that the site will only be occupied with minimal staff. The only issue that requires immediate action is a commitment to carry out the North Dam monitoring in accordance with the recommendations prescribed in Section 7 of the North Dam As-Built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures (SRK 2013b).

Table A: Summary of the Inspection Items and Associated Inspection Recommendations

Inspection Item	2012 Recommendations	2013 Recommendations
Thermistors	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site • Continue formal monitoring once a year in July or August • North Dam thermistors must be monitored in accordance with recommendations provided in the As-built Report (SRK 2012b)	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site. Where appropriate, inactive thermistors should be inspected and where practical they should be repaired and re-commissioned for the collection of baseline data • Inspect and evaluate if the thermistors marked as “Status Unknown” are active • Include Westbay Well thermistors in monitoring program • The thermistor monitoring frequency was reduced under Care & Maintenance with a couple sets of readings taken around the maximum thermal activity expected in the area, i.e. in July or August (maximum thaw depth). This should continue until the project is started up again • North Dam thermistor data must continue to be collected in accordance with the monitoring recommendations provided in Section 7 of the North Dam As-Built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures Report (2013b).
Old Beach Laydown Area	• Relocate the last two explosives magazines and the 11 sea cans from the tundra vegetation onto the beach • Remove any remaining debris	• Relocate two of the explosives magazines to an area where they are on the sandy beach as opposed to partially on the tundra vegetation
Roberts Bay Jetty	• Continue formal monitoring once a year in July or August • Remind operational staff annually about the operational limitations of the jetty	• Continue monitoring the jetty thermistor in accordance with the protocols stipulated in Section 3.2. • If the project moves beyond Care & Maintenance, repair or replace the damaged thermistor SRK-JT2-12 • Follow the recommendations for construction and monitoring provided by PND (2013)
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
5 ML Roberts Bay Tank Farm	• Backfill test pits excavated to confirm liner elevation • Should the facility be re-commissioned, consider installation of settlement beacons along the fuel transfer station and on sections of the secondary containment facility not constructed on bedrock	• Backfill the trenches excavated to confirm liner elevation • Should the facility be re-commissioned, the liner repairs should be completed to ensure design capacity and consider the installation of settlement beacons along the fuel transfer station and on sections of the secondary containment facility not constructed on bedrock

Inspection Item	2012 Recommendations	2013 Recommendations
20 ML Roberts Bay Tank Farm	• Areas within the bunded area along the berm's incline that have experienced disturbance should be evaluated for integrity of the liner system and repairs made, if required, by a qualified person • Reconstruct pedestals prior to re-commissioning tank farm	• In the areas were there has been potential for the liner to be compromised, it should be exposed and evaluated by a qualified person to confirm the integrity of the bunded area before the facility is refilled • Prior to refilling the fuel tanks the pedestals and area of the bunded area need to be reconstructed. Under Care & Maintenance, no action is required (unless further erosion continues) • Maintain improved water management practices to prevent the ponding of water and further erosion of the interior on the containment facility • Additional high wall stabilization and management practices should be considered
Roberts Bay 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 • 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	• 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	• Monitor surface runoff and consider requirement for alternate sedimentation control measures • 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
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	• 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 inspections of the airstrip shoulder and aprons to monitor the tension cracks prior to each use

Inspection Item	2012 Recommendations	2013 Recommendations
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 • Implement a monitoring protocol and erect warning signs at the site of the slope failure until the buttress have been installed	• 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 • 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
Doris Creek Bridge	• Monitor thermistor strings in accordance with the recommendations set out in Section 3.2 • Monitor and ultimately replace the rock gabions	• Ensure the correct thermistor reader, set to the correct thermistor bead resistivity, is used for each thermistor cable as listed on the Doris Thermistor Data Field Sheet. • Continue monitoring the thermistor strings with the recommendations set out in Section 3.2 • Monitor and ultimately replace the rock gabions
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	• No action required	• Continue to follow the Quarry Management Plan • A barricade at the Quarry entrance is recommended
Batch Plant Pad (Previously Crusher Pad)	• No action required	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
Upper Reagent Pad AN Storage	• Confirm design criteria before re-commissioning	• Should the facility be used to provide secondary containment, the design criteria must be confirmed and appropriate remedial measures must be implemented. Under Care & Maintenance no action is required
Landfarm	• HBML to continue to follow the designated Landfarm Management Plan • Conduct regular visual inspections to monitor for signs of settlement	• TMAC to continue to follow the designated Landfarm Management Plan • Conduct regular visual inspections to monitor for signs of settlement • Repair the sinkhole along the outside berm face of the Soil Containment Pond and the pothole in the access ramp into snow containment pond

Inspection Item	2012 Recommendations	2013 Recommendations
Sewage Treatment Plant Outfall	• Continue to monitor old sewage outfall location for signs of permafrost degradation	• Monitor for permafrost degradation at old outfall location • No action required at new outfall location
Quarry # 2 Overburden Dump	• No action required	• No action required
Doris North Camp Pads	• 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 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	• 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, along Pad D and install appropriate signage and barricades to warn people of the danger • High wall stabilization measures designed for the mill pad should be installed as planned if the project moves beyond Care & Maintenance • 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	• Remove crushed rock pedestal supports for the piping and replace with fabricated supports that do not reduce containment capacity (if the facility is to be re-commissioned) • High wall stabilization measures designed for the mill pad should be installed as planned	• High wall stabilization measures designed for the 7.5 ML Tank Farm should be installed as planned (SRK 2011d)
Power Generation Station (Pad B)	• Install a monitoring system for tracking, and advance notice of any deformations of Pad B	• Monitor the survey monuments on Pad B to allow for tracking and advance notice of any deformations as part of the annual survey
Other Site Wide Fuel Storage	• No action required	• No action required
Sedimentation and Pollution Control Ponds	• Pump out ponded water to prevent onset of thermal erosion • Carefully track thermistors and sump water quality and flow data	• The Sedimentation and Pollution Control Ponds should be kept free of standing water, as this will lead to permafrost degradation • Remove the large rocks and over liner material from the exposed liner within the Sedimentation Pond • Keep a close watch on the Pollution Control Pond thermistor data as well as the sump water quality and flow • Carry out a comprehensive review of the ground conditions below the ponds to evaluate whether there is a further evidence of leakage

Inspection Item	2012 Recommendations	2013 Recommendations
Sumps #1 and #2	• Pump out standing water to prevent thermal erosion • Inspect sump perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Both sumps should be kept free of standing water as this will lead to permafrost degradation • Inspect sump perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • The depression around Sump #1 must be backfilled with overburden to prevent further permafrost degradation
Doris North Portal	• No action required	• No action required
Waste Rock Pile	• HBML to continue to follow the designated Waste Rock Management Plan	• Once underground development resumes, TMAC should continue to follow the designated Waste Rock Management Plan
Temporary Pond	• Conduct daily visual inspections to check for obvious signs of distress (at times when it contains water)	• No action required
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
Doris Primary Vent Raise Pad	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Install catch berm and appropriate signage along high wall • Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Remove metal debris from fuel transfer station
Frozen Core Plant 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	2012 Recommendations	2013 Recommendations
North Dam	• Continue with 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 2013 geotechnical inspection	• Increase frequency of surveying North Dam monitoring points in accordance with the recommendations by the Engineer-of-Record in Section 7 of the North Dam As-built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures Report (SRK 2013b). This needs to be implemented immediately. • Survey and monitor the two depressions on the upstream face of the dam in conjunction with the instrumentation monitoring program • Backfill the erosion around Deep Settling Monitoring Point ND-DSP-100 • Repair the contact thermistor bead on the North #2 thermosyphon and test the functionality of the thermosyphon and re-charge the thermosyphon if required
Shoreline Erosion	• Implement measures to maintain the water level in Tail Lake at 28.3 masl to prevent onset of permafrost degradation	• Continue to implement measures to maintain the water level in Tail Lake at 28.2 masl to prevent onset of permafrost degradation
Doris North Diversion Berm	• No recommendations made	• Repair area of exposed liner next to where the water line passes over the berm
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 • Implement inspection protocol to monitor shoulder cracks and potholes	• 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 • Backfill the dip in the road by the Helipad
Doris-Windy All Weather Road Stream Crossings	• Monitor thermistor strings in accordance with recommendations in Section 3.2	• Ensure the correct thermistor reader is used for each thermistor cable as listed on the Doris Thermistor Data Field Sheet. • Continue monitoring the thermistor strings in accordance with recommendations in Section 3.2 • Install additional railings between the two bridge superstructures • The depressions and ponded water against the thermal pad abutments should be covered with rock fill to prevent thermal degradation of the permafrost
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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Appendices

1 Introduction

1.1 Inspection Requirements

The Doris North Project (Project) is a mining and milling undertaking of TMAC Resources Inc. (TMAC). TMAC acquired the property from Newmont Mining Corporation (NMC) in 2013. 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. In 2012, Hope Bay Mining Limited (HBML), a wholly owned subsidiary of Newmont Mining Corporation (NMC), temporarily 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 was expected to continue through to 2013. Mine development started in the summer of 2010; however, ore processing was not scheduled until 2013 at the earliest. In addition to supporting construction activities (Figure 4), the site was used to carry out regional exploration. In February 2012, HBML announced the Project was placed under Care & Maintenance. In March 2013, the property and project was sold to TMAC. The Doris North camp was re-opened, to a limited extent, to permit exploration activities.

Site operations are conducted under the Type "A" Nunavut Water Board (NWB) License 2AM-DOH1323 (the License), dated August 16, 2013, which entitles TMAC (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. A description of geophysical and permafrost conditions at the project site;*
> *d. Tailings Impoundment Area shoreline and erosion strip survey monitoring results;*
> *e. Emergency Dump Catch Basins;*
> *f. All weather access roads;*
> *g. Roberts Bay Jetty;*
> *h. Landfill;*
> *i. Landfarm;*
> *j. Fuel Storage and Containment Facilities at the Plant Site and Roberts Bay site;*
> *k. Sedimentation Pond;*
> *l. Pollution control Pond;*
> *m. Sumps;*
> *n. Underground mine openings;*
> *o. Groundwater conditions underground;*
> *p. Rock temperature measurements and groundwater inflow in the underground mine workings;*
> *q. Sedimentation control berm at the overburden dump; and*
> *r. Doris North Camp Area Diversion Berm.*
>
> *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) for NMC, requested that SRK conduct the 2013 geotechnical site inspection. This report provides a summary of the conditions observed and the resulting mitigation recommendations. This is the fifth formal annual geotechnical inspection carried out for this site in fulfillment of the stipulated Water License Condition. Inspections completed in 2009, 2010, 2011, and 2012 were also completed by SRK (SRK 2009e, SRK 2011a, SRK 2012a, and SRK 2013a).

A 10 km all-weather road linking the Doris Camp and the Windy Camp has been constructed. This road does not fall under the Doris North Water License; however, the water management plans for the three rock quarries (Quarry A, B, and D) along the road is administered through the NWB. TMAC therefore requested that the geotechnical inspection include the all-weather road.

It should be noted that up until February 2012, most of the site was still under construction, and as a result, many of the elements listed for inspection under the Water License had not yet been constructed and are therefore not reported on. This is illustrated in Figures 2 and 3. In February 2012, HBML announced the Doris North Project would be placed under Care & Maintenance and, as such, all site activity was stopped and HBML embarked on a major demobilization campaign of all salvageable equipment and supplies. With TMAC taking over the project in March 2013, the Doris North camp was re-opened with limited site operations, to support exploration activities but no construction activities.

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 in the enclosed figures, which includes detailed site photographs. Details pertaining to the site thermistors and the North Dam monitoring are presented in the Appendices. The annual Jetty inspection report, submitted under separate cover to the Nunavut Impact Review Board (NIRB), is not repeated here.

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.
1987	Abermin Corporation stake claims in the vicinity of Aimaokatalok 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 km^2 from Abermin Corporation.
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 License 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.
2012	In February 2012 the Doris North Project is placed under Care & Maintenance. Salvageable equipment and supplies were demobilized in the summer of 2012. By mid-October the camp was temporarily shut down.
2013	In March TMAC acquires the Hope Bay Gold Project with the financial backing of NMC. The Doris North Camp is re-opened with limited site services to support exploration activities.

2.2 Site Infrastructure

The Doris North Project area trends north to south and is 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 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 Doris North 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 (*aka* Jetty Road) connects these facilities to the Roberts Bay laydown area and the two tank farms (the 5 Million Litre (ML) fuel tank farm constructed in the disused Quarry #1 and the 20 ML fuel tank farm which has been constructed in a bedrock outcrop to the southeast of Quarry #1). To the east of Quarry #1 is an Overburden Stockpile which is contained by an all-weather road known as the Roberts Bay Access Road.

From the Roberts Bay Laydown, an all-weather road continues south (*aka* Primary Road), for about 4 km, towards the Doris North Camp. Part of this road has been widened for use as an all-weather airstrip (with a partially constructed expanded 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 was 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 another spur road servicing a rock quarry used for a source of construction material (Quarry #2). This spur road also serves as an access to the construction crusher complex and stockpile area, the Quarry #2 overburden stockpile, the landfarm, and core box storage area.

The Doris Camp area, also known as Quarry #4, consists of multiple tiered foundation pads, cut partially into bedrock. The westernmost pad (Pad X) contains the two camps, sewage treatment plant, fire water tank and temporary site power plant. The lower west pads (Pads E/P and Y) houses the old Cementation Shop (now called the Nuna Shop), warehousing, exploration support facilities, and other miscellaneous camp services.

The 7.5 ML Doris North Camp Fuel Tank Farm is located immediately northeast of the camp, on bedrock outcrop (Pad R) and the pad immediately south (Pad B) houses the permanent power station. Immediately to the east of the permanent power station pad is the mill pad (Pad D) which has been blasted into a bedrock. At the time of the inspection, this pad hosted the lined Temporary Pond which was removed later in the year. Moving further east the ore stockpile pad (Pads Q and H/J) is located between the mill pad (Pad D) and the portal (Pad L). Immediately downslope of these facilities are additional mine area laydown pads (Pads F and G) as well as the waste rock pile (Pad I).

All of the site water management is facilitated by the Sedimentation and Pollution Control Ponds. The Sedimentation Control Pond collects non-contact surface water runoff from Pads X, Y, E/P, R, B, and C. The Pollution Control Pond collects contact surface water runoff from Pads D, I, Q, H/J, and L. The all-weather road running along the south of the site (*aka* Float Plane Dock Access Road) acts as the downstream walls of the Sedimentation and Pollution Control Ponds. This road links the camp area to Doris Lake, where the fresh water intake is located for the camp potable water supply.

An all-weather road (*aka* Secondary Road) connects to the Float Plane Access Road , at Pad G, and follows the western shore of Doris Lake before crossing Doris Creek and on to the Frozen Core Plant pad and the North Dam. The primary vent raise pad is located along this road just before the Doris Creek Bridge. A small spur road extends from the Frozen Core Plant pad to Tail Lake (*aka* Tail Lake Access Road).

A helicopter support base is located due south of Pads Y and E/P, at the junction of the Primary Road, the Float Plane Dock Access Road, and the Doris-Windy All-Weather Road. The Doris-Windy All-Weather Road meanders due south along high ground, passing by three construction quarries (Quarry A, B, and D) as illustrated in Figure 3 and provides an all-weather link between Doris North Camp and the old Windy Camp.

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 Geomorphology

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 subjected to coastal processes. 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 weathering, 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 confirms the average surface ground temperature is about -9°C. 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, PhD, PEng, a Principal Consultant with SRK, conducted the geotechnical inspection from August 20th to 23rd, 2013. The detailed site inspection was carried out using a pickup truck with frequent stops for actual physical inspections, followed by a reconnaissance fly-over of the site via helicopter. Ms. Léa-Marie Bowes-Lyon, the TMAC's Tenure and Permitting Manage was on-site and available for questioning but did not accompany SRK during the inspection.

Weather conditions during the inspection were cool, overcast with light wind, and no precipitation. A photo log of the inspection is presented in the figures accompanying this report.

3.2 Thermistors

Figures 3 and 5 presents location maps of all 74 Project area thermistors installed between 2002 and 2012. Forty-four of these strings are still active (Appendix A, E and F), 26 are inactive (Appendix B), and ones that have not been recorded since 2010 are listed as status unknown (Appendix C and D). Appendix G provides a complete summary listing reconciling these strings to the Water License conditions and to the requirements under Care & Maintenance. In addition to the listed thermistor strings, there are also a number of historic thermistor installations dating back to the 1990s (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 200 m, 08TDD632 at 350 m and TDD-242 at 70 m).

Based on approximately 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°C.

Two thermistors were installed through the jetty into submarine permafrost in 2009 (SRK 2009b). One of the thermistor strings was damaged and had to be replaced in 2012 but was damaged again in 2013. Data from these strings supports an observation that the submarine permafrost has similar trends to onshore conditions.

The thermistors installed within the North Dam suggest the temperatures are trending towards the design temperatures.

Except for the data loggers installed at the North Dam, there are no data loggers connected to any of the project thermistors. TMAC's 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

- 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 for the collection of baseline data.
- Inspect and evaluate if the thermistors marked as "Status Unknown" are active.
- Include the Westbay Well thermistors as part of the monitoring program.
- The thermistor monitoring frequency was reduced under Care & Maintenance with a couple sets readings taken around the maximum thermal activity expected in the area, i.e., in July or August (maximum thaw depth). This should continue until the project is started up again.
- North Dam thermistor data must continue to be collected in accordance with the monitoring recommendations provided in Section 7 of the North Dam As-Built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures Report (2013b).

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. This facility is useful for the offloading of heavier items which exceed the design capacity of the Roberts Bay jetty for any future plans for the Project.

During the 2007 to 2012 construction seasons, this site was primarily used for storage of construction explosives, in five self-contained Type-4 magazines. At the time of the inspection, these magazines were still located at this site, although they were scheduled for demobilization (see Figure 4). During winter time, explosives were transported to their intended areas of use via an explosives truck on an ice road, and during the summer period, explosives were 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 1990s.

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.

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

- Relocate two of the explosives magazines to an area where they are on the sandy beach as opposed to partially on the tundra vegetation.

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, 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. During construction, the front section of the jetty slumped due to very weak foundation conditions in the deep water. 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 and 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. No further work was done on the jetty prior to the 2011 sealift. In preparation for the 2012 sealift, the jetty was raised, extended by a few metres and an earthen ramp constructed to facilitate demobilization activities that were underway during the time of inspection. No surveys or quantities of fill used were available. In 2013, the jetty was damaged due to a severe storm at the beginning of August. Large waves washed the rock fill at the end of the jetty out into Roberts Bay. PND Engineers Canada Inc. (PND) supervised the jetty reconstruction with large rock fill armouring covered with surfacing material and became the Engineers of Record for the Jetty (PND 2013). As part of the reconstruction activities two survey monitoring points were installed at the end of the jetty (Figure 7).

A significant portion of the jetty has been constructed on submarine permafrost, and 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). During snow clearing operations, in late 2011, the thermistor SRK-JT2-09 was severed. A replacement thermistor string was installed early in 2012 (SRK-JT2-12) (SRK 2013c). This replacement thermistor string was severed again, in August 2013, during reconstruction activities.

The 2013 geotechnical inspection of this structure revealed no cause for concern (Figure 7). There were no obvious signs of distress anywhere on the structure. SRK's design and operational limitations, for the jetty, are now superseded by the new requirements stipulated by PND (2013).

A more comprehensive stand-alone summary of the jetty inspection was submitted under separate cover to the NIRB (SRK 2014a).

Recommendations

- Continue monitoring the jetty thermistor in accordance with the protocols stipulated in Section 3.2.
- If the project moves beyond Care & Maintenance, repair or replace the damaged thermistor SRK-JT2-12.
- Follow the recommendations for construction and monitoring provided by PND (2013).

3.5 Shoreline Laydown Area

A small laydown area has been constructed adjacent to the jetty as illustrated in Figure 7. This area was initially used for the construction office facilities, but is currently used to stage equipment, supplies and waste to be backhauled via the annual sealift return barges. 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, which has not been 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 2008 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 2008. 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 inspections 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 enough to not impede drainage.

Recommendations

- Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent 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 8) 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. Quality control and quality assurance were carried out during construction of the secondary containment facility (SRK 2009c and 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 Quarry #1. Thaw settlement of this drainage channel has occurred, and as a result the amount of ponding increased. HBML subsequently in-filled this area with rock to construct a road access to the radio tower at the apex of Quarry #1 which completely remediated this area of concern.

At the time of the inspection there was no ponded water inside the containment area, and SRK understands that the low spots observed in previous years had been remediated through installation of secondary sumps and re-grading. These sumps need to be cleaned out to make then functional again.

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 pending the repair to the liner to meet design capacity. At the time of the inspection, the containment area had still not been repaired but the 5 ML fuel tank had been emptied and the piping as well as the Fuel Transfer Station had been removed.

As part of the investigation to confirm the secondary containment volume, the liner was exposed along the west side of the bunded facility through careful hand excavation. These trenches have not been backfilled.

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 if the facility is re-commissioned to contain fuel.

Recommendations

- Backfill the trenches excavated to confirm liner elevation.
- Should the facility be re-commissioned, the liner repairs should be completed to ensure design capacity and consider the 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 fuel tank farm was completed in late 2011 (Figure 9). 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 in areas, permanent slope stabilization had been installed in accordance with design recommendations. During the 2013 inspection, it was noted the grout around some of the rock bolts had crumbled. The IFC (SRK 2011c) drawings show 2.4 m long rock-bolts were to be installed but no as-built drawings were produced to confirm this. The remaining areas, of exposed high wall are undergoing significant spalling. Consideration should be given to expanding the rock mesh and implementing a management and safety protocol for falling rock. Rock debris within the containment area should be removed. There are indications that run-off from the high wall is being concentrated and running into the containment area at the north end of the facility. The containment facility was designed for this but erosion may cause silt loading or wash gravel off the liner. It is recommended to monitor and take remedial measures should this become worse.

The presence of high water marks along the interior slopes of the secondary containment area was observed during the 2012 inspection. The high standing water level has also resulted in erosion of the crushed rock tank pedestals and containment perimeter. This suggested that appropriate snow and water management practices were not in place for the facility leading to prolonged periods of ponding. Ponded water, within the facility must be prevented. Although the ponded water does not impact the facility design capacity (due to the fact that all the tanks have not yet been constructed) it is not considered best practice and TMAC implemented proper water management protocols. Prior to refilling the fuel tanks, the pedestals would have to be repaired.

In 2012, wheel and grader damage was observed along the interior slopes of the secondary containment area suggesting that due care was not taken during snow clearing activities. No new wheel and grader damage was observed during the 2013 inspection. Externally there does not appear to be any permanent damage to the liner; however, the damaged areas should be carefully excavated and the integrity of the liner confirmed prior to storing fuel in this fuel tank farm.

Recommendations

- In the areas were there has been potential for the liner to be compromised, it should be exposed and evaluated by a qualified person to confirm the integrity of the bunded area before the facility is refilled.
- Prior to refilling the fuel tanks the pedestals and areas of the bunded area need to be reconstructed. Under Care & Maintenance no action is required (unless further erosion continues).
- Maintain improved water management practices to prevent the ponding of water and further erosion of the interior of the containment facility.
- Additional high wall stabilization and management practices should be considered.

3.8 Roberts Bay Laydown Area

The laydown area at Roberts Bay (Figure 10) 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. Prior to being placed under Care & Maintenance this site was 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 these 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 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

- 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.

3.9 Quarry #1 Overburden Dump

A temporary Overburden Dump was constructed north of Quarry #1 during its initial development (Figure 11); 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 as well as oversize material from the quarry development of the 20 ML Fuel Tank Farm was deposited in this Overburden Dump as shown in Figure 11. Poor dumping practices resulted in no separation between the sedimentation control berm and the toe of the Overburden Dump and therefore surface runoff can flow unimpeded directly onto the tundra. The sedimentation control berm was later extended, in 2011, and turned into the Roberts Bay Access Road.

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. During the 2011 inspection, the surface had several large sinkholes, located at the entrance, 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. At the time of the 2013 inspection, the entire laydown had been cleaned up with only a small pile of wood debris left to be picked up by the excavator and placed into the waste bin. Should this area be used as laydown area, in the future, careful monitoring of the surface will be required along with regular maintenance. It is also possible that equipment or supplies stored on this pile could be damaged if potholes develop under them.

Recommendations

- Monitor surface runoff and consider requirement for alternate sedimentation control measures.
- 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 12). 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 partially completed in 2011 which would increase the airstrip length to 1,900 m and its width to 45 m. The north airstrip apron extension was also completed in 2011.

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 windsock. 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 has required a significant amount of maintenance since its completion in 2008, which according to the staff was mostly 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 small tension cracks along the west side of the airstrip while no tension cracks were observed along the east side at the time of the inspection, which supports the observation that minor settlement is still 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 was decreased in 2011 and minimal maintenance was carried out in 2012 and 2013, 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, in turn leading to increased runway settlement. It is 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.

Significant erosion gullies along the edges of both aprons were observed. The erosion gullies behind the control tower and jet fuel drums should be monitored as these erosion gullies could undermine the control tower and jet fuel drums which could create a fuel spill.

Recommendations

- 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 inspections of the airstrip shoulder and aprons to monitor the tension cracks prior to each use.

3.11 All-Weather Roads (Doris Site)

The following all-weather roads have been constructed on site, as illustrated in Figures 2 and 3:

- The Roberts Bay Access Road, a 120 m long, 8.3 m wide single lane link between Quarry #1 Overburden Dump and shoreline in support of the fuel offloading barges;
- The Jetty Road, a 250 m long, 10 m wide single lane link between the Jetty and Roberts Bay laydown area;
- The North Primary Road, a 600 m long, 8.3 m wide single lane link between Roberts Bay laydown area and the north airstrip apron;
- The South Primary Road, a 2.6 km long, 8.3 m wide single lane link between the south airstrip apron and Doris North Camp;
- The ANFO Mixing Plant, a 75 m long, 8.3 m wide single lane spur from the South Primary Road to the wash bay;
- The Quarry #2 Access Road, a 300 m long, 8.3 m wide single lane spur from the South Primary Road to Quarry #2;
- The Float Plane Dock Access Road, a 870 m long, 8.3 m wide single lane link between Doris North Camp and Doris Lake;
- The Secondary Road, a 1,570 m long, 8.3 m wide single lane link between Doris North Camp and North Dam and Frozen Core Plant pad (also called the Tail Lake Road); and
- The Tail Lake Access Road, a 260 m 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 up to 3 m. The roads have been constructed with run-of-quarry material with a surfacing layer of 1 ½” minus crush rock. 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 exists along the toe of the roads, 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 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 22). 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 buttress was not constructed; however, no further movement in the road shoulder was observed during the 2012 or 2013 inspections.

Recommendations

- 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.
- 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 (Figure 22) via a single span prefabricated bridge constructed on two thermal pad abutments. The bridge was constructed in 2010. Two thermistor cables were installed in 2011 (one at each abutment) to monitor the integrity of permafrost conditions. In 2013, readings from these thermistor cables were taken at the end of July and August. Although the correct instrument was used to collect the readings, it appears the instrument was set to the wrong thermistor bead resistivity as the recorded temperature values are not consistent with the previous sets of data. As a result, the 2013 readings have not been included with the data provided in Appendix A.

Visual inspection revealed no issues of concern other than the poorly constructed rock gabions. The deformation of the gabions does not appear to have become worse since the 2012 inspection but the gabions should be monitored, and replaced when appropriate.

Recommendations

- Ensure the correct thermistor reader, set to the correct thermistor bead resistivity, is used for each thermistor cable as listed on the Doris Thermistor Data Field Sheet.
- Continue monitoring thermistor strings in accordance with the recommendations set out in Section 3.2.
- Monitor and ultimately replace the rock gabions.

3.13 Wash Bay/Explosives Mixing Plant

The wash bay pad houses a large modular building with a smaller adjoining modular building; a wooden shack, stored behind the large modular building; and a Weatherhaven located on the other side of the pad. The double walled fuel tank, associated with the Weatherhaven has been removed (Figure 12). The large modular building was used for the ANFO emulsion plant. Only the bunded area on the ground and electrical panels remain. 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. Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water 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 13). These areas, which are at two different elevations, are called the Upper and Lower Reagent Pads. Prior to the site being placed under Care & Maintenance the Lower Pad was used as the primary sea can storage and warehousing area. The Upper Reagent pad was used for sea can storage as well as a general laydown yard for equipment and construction supplies. These pads became the general staging area for demobilization during the 2012 sealift. These pads were constructed to cover and mitigate an area of permafrost degradation which was inadvertently caused as part of the 2008 construction activities. The pads range between 1 to 3 m thick, and there are no concerns associated with them based on the visual inspection.

Recommendations

- Inspect pad perimeter during freshet, and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion.

3.15 Quarry #2 and Crusher Area

At the time of the inspection Quarry #2 was inactive, but was continuously used as the primary source of construction materials for the project. The quarry was developed using two benches, each about 6 m high, as illustrated in Figure 14. 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 east of the quarry. Some of this overburden was relocated to an area northeast of the quarry; spread out and levelled; covered with crushed rock; and is used as a core storage area, the burn pit for approved combustible construction materials, and the landfarm site (Figure 14). At the north end of Quarry #2 and across from the landfarm next to the gate, drill cuttings have been dumped. This practice should not be allowed to continue as it could result in permafrost degradation in an area of already susceptible to thaw settlement.

The construction crusher was relocated, from the old Crusher Pad (new Batch Plant Pad), to a disused part in the north end of the quarry in late 2010 but had been dismantled and removed from site by the time of the 2012 inspection. At the time of the 2013 inspection, multiple stockpiles of various crusher products were stockpiled in this area of Quarry #2.

Recommendations

- Continue to follow the Quarry Management Plan.
- A barricade at the Quarry #2 entrance is recommended.

3.16 Batch Plant Pad (Previously Crusher Pad)

At the junction between the South Primary Road to the camp and the Quarry #2 Access Road (Figure 2) a 1 m thick run-of-quarry pad measuring about 125 m x 125 m has been constructed (Figure 13), linking up with the Lower Reagent pad. This thermal pad originally 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 contained 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-in crush product remains on part of the pad along with some sea cans.

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

- Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion.

3.17 Upper Reagent Pad AN Storage

At the south end of the Upper Reagent Pad (Figure 13) a lined bulk ammonium nitrate (AN) storage area was constructed by HBML, in 2012. No formal design for this facility was prepared and construction was carried out with no designated quality control or quality assurance. No as-built drawings exist. Visually the facility shows no concern; however, without knowing the appropriate design data, it is not apparent whether there is appropriate containment capacity and whether there is sufficient liner protection material.

Recommendations

- Should the facility be used to provide secondary containment, the design criteria must be confirmed and appropriate remedial measures must be implemented. Under Care & Maintenance no action is required.

3.18 Landfarm

A landfarm has been constructed immediately northeast of Quarry #2 as shown in Figure 14. The fully lined facility consists of three cells: a clean water pond which only contains water that is suitable for discharge to the tundra; a snow pond which contains treated water from the soil pond prior to being discharged onto the tundra once it meets discharge criteria; and one for remediating diesel contaminated soils. Contaminated soils that cannot be remediated within the landfarm are shipped off site. A Landfarm Management Plan was prepared by SRK (2014b) 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. During the 2013 inspection, the Soil Containment Pond's outside berm face, closest to the Primary Road, had a small sinkhole. The snow containment pond showed signs of significant ponding of water. There is a large pothole in the access ramp and the ramp appears to be heavily eroded as if water has been allowed to be discharged at this location.

Recommendations

- TMAC to continue to follow the designated Landfarm Management Plan.
- Conduct regular visual inspections to monitor for signs of settlement.
- Repair the sinkhole along the outside berm face of the Soil Containment Pond and the pothole in the access ramp into Snow Containment Pond.

3.19 Sewage Treatment Plant Outfall

The grey water (sewage treatment effluent) pipeline used to discharge directly onto the tundra is immediately south of the Crusher Pad (Figure 13). Visual inspection during 2010 and 2011 confirmed there was significant ponding of water; and tundra vegetation die back had started with associated erosion damage. In 2012, fill was placed within the depressions to prevent additional erosion and a new diffuser system was constructed and put into operation with a discharge location further to the west with the diffuser located on a bedrock outcrop. In 2013 permission was given to use the old outfall location when there are limited numbers of people on site. The new diffuser system has not been used since 2012 and requires repairs.

Recommendations

- Monitor for permafrost degradation at old outfall location.
- No action required at new outfall location.

3.20 Quarry #2 Overburden Dump

A permanent overburden dump has been constructed east of Quarry #2 as shown in Figure 14. Overburden stripped from Quarries # 2 and #4, and oversized quarry rock that was not suitable for construction is hauled to this location. Material was 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 the area was dry.

Recommendations

- No action required.

3.21 Doris North Camp Pads

The Doris North Camp area is also the designated Quarry #4 area as illustrated in Figures 15 through 18. 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 (Pad X). 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. Two lower fill pads (Pads E/P and Y) are about 2 m lower than the upper pad which provides additional space for camp facilities.

The upper camp pad (Pad X) 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 pads (Pads E/P and Y) houses the old Cementation Shop (now called the Nuna Shop), warehousing, exploration support facilities, and other miscellaneous camp services.

Immediately south of the lower camp pads is the Helipad, which houses four helicopter pads, a helicopter base station as well as other related support facilities. Towards the east, immediately below the portal, are two pads that were to serve as primary support for the mining activities (Pads F and G). At the time of the inspection, the underground drilling contractor's shop and warehousing facilities, as well as general mining supplies, had been removed and only a few sea cans and underground construction supplies remaining on Pad G. The empty contractor's shop, warehousing facilities are located on Pad F. On Pad L, there remains the underground air-supply, power generators, brine mixing facility and a few sea cans.

Immediately northeast of the camp, a rock excavation was completed which now houses the primary 7.5 ML Doris North Camp Fuel Tank Farm (Pad R). South of this facility, the permanent power house for the site has been constructed on a levelled rock fill pad (Pad B). Between these facilities and the portal, is another rock excavation which will form the foundation of the mill building (Pad D). At the time of the inspection, this area was occupied by a temporary lined facility which is used as part of the interim site water management plan. The Temporary Pond was nearly empty at the time of inspection and was removed at the end of the season.

Between the mill pad (Pad D) and the portal (Pad L) is an elevated ore storage pad (Pad Q/H/J), and immediately below the mill pad (Pad D) is the waste rock pile (Pad I). Downslope of the facilities, at the natural collection point for the site, are the Sedimentation and Pollution Control Ponds.

All the pads, mentioned above, range in thickness between at least 1 m and 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 (on Pad Y) and the old Cementation Shop (now called the Nuna Shop) (on Pad E/P) did not comply. These heat sources may lead to permafrost degradation, which in turn would lead to foundation settlement. There would be no short-term concerns; however, TMAC should closely monitor for signs of settlement and take appropriate remedial measures, if required.

Visual inspection of the camp pad perimeter showed no signs of ponding water, and there was no ponding water visible anywhere on any of the pad surfaces. The high wall behind the camp, on Pad X, has been scaled clean, and a catch berm has been constructed behind wooden cabins, immediately beneath the wall and along the base of the entire length of the high wall in case rocks loosen and fall from the highly fractured face. Appropriate barricades and signage have not been put in-place to keep people and equipment at a safe distance from the wall.

The high walls behind the 7.5 ML Doris North Camp Fuel Tank Farm (Pad R) and the mill pad (Pad D) were scaled clean, and were generally in good condition. Recommendations for permanent stabilization of these walls were provided in 2011 but have not been implemented (SRK 2011d). As a result, rocks have fallen from the high walls onto the pad surfaces.

Recommendations

- Inspect pad perimeter during freshet, and immediately after 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, along Pad D and install appropriate signage and barricades to warn people of the danger.
- High wall stabilization measures designed for the mill pad (Pad D) should be installed as planned if the project moves beyond Care & Maintenance
- Develop and implement a differential settlement monitoring protocol for heated buildings constructed directly onto the thermal rock fill pads.

3.22 7.5 ML Doris North Camp Tank Farm

The primary camp fuel supply is contained within the 7.5 ML Doris North Fuel Tank Farm constructed on a blasted rock foundation immediately north of the camp (Pad R, Figure 15). 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. Crushed rock pedestals have been constructed to support the piping between the fuel tanks. From the 2011 as-built drawings, the total minimum containment design requirement is 2,339 m^3 and there is an additional containment of 569 m^3 (SRK 2011e).

The high wall behind the tank farm was scaled and is in good condition; however, long term stabilization measures, which have been designed, should be implemented as rock debris has fallen from the high wall into the bunded area (SRK 2011d).

Recommendations

- High wall stabilization measures designed for the 7.5 ML Tank Farm should be installed as planned (SRK 2011d).

3.23 Power Generation Station (Pad B)

The main camp power plant has been constructed on Pad B immediately south of the 7.5 ML tank farm (Figure 15). This thick pad (up to 6 m in places) is founded on ice rich permafrost marine silt and clay, and is therefore subject to differential settlement. This pad houses the power plant which is a heated, large and heavy structure constructed on concrete footings located close to steep angle of repose rock fill slopes. This structure generates heat and vibrations and a failure could result in loss of life. There are also two 30 m tall exhaust stacks constructed on a concrete spread footing with no additional stabilization. At the time of inspection two monitoring points had been installed. A monitoring system needs to be put in place to provide advance warming of any deformation.

Recommendations

- Monitor the survey monuments on Pad B to allow for tracking and advance notice of any deformations as part of the annual survey.

3.24 Other Site Wide Fuel Storage

A number of other double-lined fuel tanks were scattered throughout the site during construction activities. All of these tanks had been placed in lined secondary containment. These double lined fuel tanks have been emptied and demobilized from site.

Recommendations

- No action required.

3.25 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 (Figure 18). Both ponds have been designed with downstream liners keyed and frozen into the permafrost, but without bottom liners. The ponds were constructed and commissioned in 2011. Both ponds leaked, and the primary mode of leakage was water bypassing the liner keyed into the permafrost. The most likely cause of this was due to the late season construction of the ponds, in May 2011, which meant 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 had its key trench and liner extended into the permafrost. In addition, two downstream sumps (Section 3.26) were constructed to allow collection of any water that does manage to bypass any of the reconstructed ponds.

At the time of inspection there was some water in the base of the Sedimentation Control Pond. The liner in the upper northeast corner of the Sedimentation Control Pond appears to have been cut at regular intervals, possibly due to handling. The overlap between two liners, at the north end of the Separator/Divider Berm, has not been sealed. Over liner material and a large rock, from the Separator/Diversion Berm, have washed down over the liner into the Sedimentation Control Pond. This is causing the liner to sag. Another large rock has fallen into the base of the Sedimentation Control Pond at the west corner.

Only a minor amount of standing water was observed in the southeast corner of the Pollution Control Pond. Evidence of water flowing from the toe of Pad I (the Waste Rock Pile) was evident. The 2012 inspection revealed the interior benches of the Pollution Control Pond showed signs differential settlement as observed by the tension cracks. During the 2013 inspection, these tension cracks have started healing over. A pump located within the Pollution Control Pond has been used to actively keep the water levels low.

Recommendations

- The Sedimentation and Pollution Control Ponds should be kept free of standing water, as this will lead to permafrost degradation.
- Remove the large rocks and over liner material from the exposed liner within the Sedimentation Control Pond.
- Keep a close watch on the Pollution Control Pond thermistor data as well as the sump water quality and flow.
- Carry out a comprehensive review of the ground conditions below the ponds to evaluate whether there is any further evidence of leakage.

3.26 Sumps #1 and #2

Two sumps (Figure 18) were constructed within the tundra to capture the water that manages to bypass the reconstructed Sedimentation and Pollution Control Ponds. Both sumps were full of water during the time of the inspection. Perimeter permafrost degradation was observed around Sump #1. This was to be expected, and the depression around the steel sump should be backfilled with the saved and stockpiled overburden material and covered with coconut matting. Sump #2 appeared to be in good condition.

Recommendation

- Both sumps should be kept free of standing water as this will lead to permafrost degradation.
- Inspect sump perimeter during freshet, and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion.
- The depression around Sump #1 must be backfilled with overburden to prevent further permafrost degradation.

3.27 Doris North Portal

Mine development started in 2010 and at the time of the inspection the portal had been backfilled with waste rock and covered with wire mesh bolted to the ceiling. A steel and wire gate with warning signs had been placed close to the portal entrance. 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

- No action required.

3.28 Waste Rock Pile

Waste rock from mine development was brought up via the portal and dumped on the waste rock dump (Pad I). A Waste Rock Management Plan (SRK 2010) outlines how waste was characterized, tested, and how segregated placement was carried out. During underground development, discussions with site staff indicated appropriate protocols were being followed. The majority of Pad I had been covered with waste rock and subsequent lifts of waste rock had started being placed.

Recommendations

- Once underground development resumes, TMAC should continue to follow the designated Waste Rock Management Plan.

3.29 Temporary Pond

A 6,000 m^3 total capacity lined Temporary Pond was constructed on the Mill Pad (Pad D) 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 (Figure 17). The pond is founded on bedrock and the liner is bedded in ¾-in gravel. At the time of the inspection the pond was empty with a few puddles of water. The Temporary Pond was removed at the end of the season in 2013.

Recommendations

- No action required

3.30 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. There appears to have been a rupture in the intake pipe as there are erosion gullies leading from the pump house down to the tundra sometime in the past

Recommendations

- Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion.

3.31 Doris Primary Vent Raise Pad

The Doris North primary vent raise is located along the Secondary Road (Figure 22). A rock fill pad had been constructed using a cut/fill method such that the vent raise could be collared on competent bedrock. The tiered pad houses the vent raise collar building on the upper platform, and a lined fuel containment area on the lower platform. A 2 to 3 m high wall exists around the collar, and is generally in good shape having been scaled during construction. Like the other rock high walls, rocks have fallen from the high wall onto the pad surfaces. A catch berm, like the one behind the Doris North Camp, should be constructed immediately beneath the wall and along the base of the entire length of the high wall in case rocks loosen and fall from the highly fractured face. Appropriate barricades and signage should be put in-place to keep people and equipment at a safe distance from the wall. Visual inspection shows no signs of ponding or permafrost damage.

The Primary Vent Raise was never commissioned so the fuel transfer station located within a lined facility was never filled. During the 2013 inspection, lots of metal debris was observed within the containment area. This should be removed to ensure liner integrity. The sump should be kept free of standing water.

Recommendations

- Install catch berm and appropriate signage along high wall.
- Inspect pad perimeter during freshet, and immediately after significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion.
- Remove metal debris from fuel transfer station.

3.32 Frozen Core Plant Pad

A 1 to 2 m thick thermal pad was constructed due north of the North Dam alignment along the Secondary Road to support construction of the North Dam (Figure 23). A prefabricated building was located on this pad that housed the asphalt plant used for mixing the saturated core material used in dam construction. The asphalt plant and prefabricated building has been removed, but a small 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

- Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion.

3.33 North Dam

Tail Lake is the designated Tailings Containment Area (TCA) for the project. Tailings deposition would have been 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°C during impoundment under normal operating conditions or colder than -1°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°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 was completed in 2012. Photos of the completed dam are shown in Figures 24 and 25.

The North Dam is instrumented with 11 vertical ground temperature cables (*aka* thermistors) and 13 horizontal ground temperature cables; 18 Surficial Survey Monitoring Points located throughout the downstream face; 14 Survey Monitoring Points located along the upstream and downstream crests of the dam; 3 Deep Settlement Points and 6 Inclinometers located within the downstream face. The data collected to-date is presented in the Appendices H to J.

The thermistors installed in the North Dam are connected to a series of dataloggers that record the ground temperatures and the contact surface temperature of the thermosyphons every six hours. The temperature data plotted in the Appendices E and F is for every 14 days for clarity.

The vertical thermistors cables installed in the base of the key trench show the thermosyphons influence the ground temperatures as far as 14 m below the base of the key trench as shown by the zero amplitude point in the trumpet curves. The original ground under the key trench has cooled to the design temperature of at least -8^{o}C.

The vertical thermistors installed along the upstream and downstream toes of the North Dam are showing the correct cooling trend with depth but will require another full year of data to determine the maximum temperatures of the trumpet curve, the depth of zero amplitude, or if other trends are apparent.

The horizontal thermistors have been installed at different elevations within the frozen core of the North Dam. These thermistor cables show the frozen core has cooled to the design temperature of being at least -2^{o}C.

The inclinometer data collected to-date is provided in Appendix H. Two sets of inclinometer readings were acquired during 2013 for a total of five sets of readings since the completion of the North Dam. The graphs show no clear trend that there is movement within the North Dam and the variability between the sets of readings appears to be instrument reading error.

Visual inspection of the completed structure showed no signs of concern. There are two large depressions on the downstream slope of the dam. Each measures approximately two meters in diameter and 0.3 m deep. These depressions should be monitored and re-surveyed every time the survey monuments are re-surveyed. These are shown on Figure 25. There is also significant erosion around the Deep Settlement Monitoring Point ND-DSP-100 (Figure 25). This should be repaired as it could become worse and damage the instrumentation.

Significant erosion around the radiator foundations was observed but the steel foundations are in good condition. No immediate action is required but the erosion should be monitored and repairs completed should this become worse. To determine the thermosyphons are functioning, the surface temperatures of the radiator pipes are measured and compared to the ambient air temperature. These measurements are being recorded by the North Dam dataloggers. If the thermosyphons are functioning, there should be a 5°C to 10°C temperature differential observed once the ambient air temperature drops below -20°C. It appears one of the contact thermistor bead, on the North #2 thermosyphon, has become detached from the radiator or that its protective cover damaged, as its recorded temperature is close to the ambient air temperature and not the temperature pattern shown by the other North Abutment thermosyphons (Appendix J). It is unlikely Thermosyphon North #2 is non-functional as those horizontal thermistor strings located on top of the liner indicate a uniform drop in ground temperatures over the winter season across all thermosypons. The South Abutment thermosyphons are functioning properly.

Evidence of increased surface water flow along the downstream toe of the North Dam was observed. Water flowing in the original Tail Lake outflow channel, was observed to have oily sheen and some evidence of iron staining. It is not evident this seepage is from the dam but more likely from within the active layer of the north abutment which naturally flows along the downstream toe of the dam and emerges along the original Tail Lake outflow channel. This is confirmed by the thermistor data.

There are no concerns with the upstream face of the north dam. The water level in Tail Lake has dropped since the 2012 inspection and pumping from Tail Lake was underway during the time of inspection. The Tail Lake water level should be monitored on a monthly basis. There are no signs of shoreline erosion but vegetation die-back has occurred. This needs to be closely monitored for water quality changes.

Recommendations

- Increase frequency of surveying North Dam monitoring points in accordance with the recommendations by the Engineer-of-Record in Section 7 of the North Dam As-built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures Report (SRK 2013b). This needs to be implemented immediately.
- Survey and monitor the two depressions on the upstream face of the dam in conjunction with the instrumentation monitoring program.
- Backfill the erosion around the Deep Settlement Monitoring Point ND-DSP-100.
- Repair the contact thermistor bead on the North #2 thermosyphon and test the functionality of the thermosyphon and re-charge the thermosyphon if required.

3.34 Shoreline Erosion

The normal water level in Tail Lake is 28.2 masl and the water level in Tail Lake was at elevation 28.9 masl during the time of the inspection. A large section of shoreline still remains flooded, which will result in irreversible vegetation die-back and ultimately will lead to permafrost damage (Figure 23). Such permafrost damage will result in thaw and erosion of the overburden soils, which will result in increased Total Suspended Solids (TDS) in Tail Lake. This was an expected consequence; however, with the Tailing Containment Area being under Care & Maintenance it would be prudent to continue to manage the water level in Tail Lake and to monitor the vegetation die back to prevent the onset of permafrost degradation and subsequent risk of increased TDS.

Recommendations

- Continue to implement measures to maintain the water level in Tail Lake at 28.2 masl to prevent onset of permafrost degradation.

3.35 Doris North Camp Diversion Berm

The diversion berm, north of Doris Camp diverts clean surface water runoff towards the Overburden Stockpile area via two culverts that pass under the Primary Road. This reduces the volume of water reporting to the Sedimentation and Pollution Control Ponds. The diversion berm is in good condition. Non-contact surface run off water is being pumped from where it ponds along the upstream edge of Pad Q/H/J over the diversion berm. The discharge of the pumped water has washed away the protective layer of over liner crushed material exposing the liner (Figure 17). The exposed liner should be recovered with crushed material.

Recommendations

- Repair area of exposed liner next to where the water line passes over the berm.

3.36 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 19). 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. In 2013, 2-inch crush was placed as a surfacing layer from 8+600 to the end of the alignment at 9+733. There is a large dip at the start of the Doris-Windy Road at the entrance to the Helipad. This should be backfilled and brought back up to grade.

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 material. 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 no signs of thermal erosion.

Some cracking along the shoulder of the road can be observed along sections which is most likely a result of settlement of the shoulders. A few potholes were also observed at the abutments of the stream crossings, and these are likely 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.

Two caribou crossings were constructed in 2011 along the route alignment based on recommended locations by the landowner.

Recommendations

- Inspect road toe lines during freshet, and immediately after 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.
- Backfill the dip in the road by the Helipad.

3.37 Doris-Windy All-Weather Road Stream Crossings

There are four designated Stream Crossings along the Doris-Windy All-Weather Road (Figure 20). The first Stream Crossing was installed in 2010 and consists of an arch culvert. The culvert is founded on add-freeze piles. The inspection revealed no major concerns. The web of the I-beam, on top of the fourth pile from the northwest corner of the culvert, has buckled. This deformation has not increased since it was first noticed during the 2012 inspection but should continue to be monitored. Structural repairs would be required if this deformation increases.

The bridges with thermal pad abutments have been installed over the remaining Stream Crossings. The abutment integrity is monitored using thermistor cables. In 2013, readings from these thermistor cables were taken at the end of July and August. Although the correct instrument was used to collect the readings, it appears the instrument was set to the wrong thermistor bead resistivity as the recorded temperature values are not consistent with the previous sets of data. As a result, the 2013 readings have not been included with the data provided in Appendix A.

The two bridges at Stream Crossings #2 and #3 have gaps between the bridge superstructure railings. Additional railings should be installed as the drop-off at the opening is greater than 3 m. During the 2013 inspection, depressions and ponded water was observed against the southwest abutment of Stream Crossing #3 as well as the west side of the central abutment of the two bridges. These area should be covered with rock fill to prevent thermal degradation of the permafrost.

There are no issues with the bridge crossing at the Stream Crossing #4.

Recommendations

- Ensure the correct thermistor reader, set to the correct thermistor bead resistivity, is used for each thermistor cable as listed on the Doris Thermistor Data Field Sheet.
- Continue monitoring thermistor strings in accordance with recommendations in Section 3.2.
- Install additional railings between the two bridge superstructures.
- The depressions and ponded water against the thermal pad abutments should be covered with rock fill to prevent thermal degradation of the permafrost.

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

Three rock quarries were designated and used to construct the Doris-Windy road as illustrated in Figure 21. At the time of the inspection, none of these quarries were in use; however, all three quarries may be used at some time in future. Currently Quarry A is used as a temporary explosives storage area and it housed an access road and two Type 4 magazines.

Quarry B was used during the demobilization stage to detonate all excess explosives on site and therefore contains a very large quality of fine rock dust laden with explosives residue. Ponded water was observed at the rock high wall at the south end of the quarry but the likelihood of drainage water leaving the quarry is low. This water should be closely monitored as any discharge is likely to exceed water quality criteria. Four wooden pallets and debris lay on the tundra south of the quarry which should be picked up

Quarry D was designed to ultimately become the new Windy Camp but it was never fully developed. An overburden dump was constructed across the access road and is being used to store core boxes from Windy Camp. Some core storage is also being done within the excavated quarry.

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

- Continue to follow the Quarry Management Plan.

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 August 20th to 23rd, 2013 and subsequent consultation with site staff. This is the fifth formal annual geotechnical inspection undertaken at this site. The site is currently under Care & Maintenance, with limited exploration activities, and therefore many of the remedial recommendations identified during this geotechnical investigation are likely to be addressed as part of Care & Maintenance operations.

Table 2 below provides a summary of the inspection components and the primary recommendations stemming from the inspection. The only issue that requires immediate action is a commitment to carry out the North Dam monitoring in accordance with the recommendations prescribed in Section 7 of the North Dam As-Built Report (SRK 2012b).

Table 2: Summary of Inspection Items and Associated Recommendations

Inspection Item	2012 Recommendations	2013 Recommendations
Thermistors	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site • Continue formal monitoring once a year in July or August • North Dam thermistors must be monitored in accordance with recommendations provided in the As-built Report (SRK 2012b)	• Re-evaluate thermistor requirements taking into considering the surface infrastructure elements currently on site. Where appropriate, inactive thermistors should be inspected and where practical they should be repaired and re-commissioned for the collection of baseline data • Inspect and evaluate if the thermistors marked as “Status Unknown” are active • Include Westbay Well thermistors in monitoring program • The thermistor monitoring frequency was reduced under Care & Maintenance with a couple sets of readings taken around the maximum thermal activity expected in the area, i.e. in July or August (maximum thaw depth). This should continue until the project is started up again • North Dam thermistor data must continue to be collected in accordance with the monitoring recommendations provided in Section 7 of the North Dam As-Built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures Report (2013b)
Old Beach Laydown Area	• Relocate the last two explosives magazines and the 11 sea cans from the tundra vegetation onto the beach • Remove any remaining debris	• Relocate two of the explosives magazines to an area where they are on the sandy beach as opposed to partially on the tundra vegetation

Inspection Item	2012 Recommendations	2013 Recommendations
Roberts Bay Jetty	• Continue formal monitoring once a year in July or August • Remind operational staff annually about the operational limitations of the jetty	• Continue monitoring the jetty thermistor in accordance with the protocols stipulated in Section 3.2. • If the project moves beyond Care & Maintenance, repair or replace the damaged thermistor SRK-JT2-12 • Follow the recommendations for construction and monitoring provided by PND (2013)
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
5 ML Roberts Bay Tank Farm	• Backfill test pits excavated to confirm liner elevation • Should the facility be re-commissioned, consider installation of settlement beacons along the fuel transfer station and on sections of the secondary containment facility not constructed on bedrock	• Backfill the trenches excavated to confirm liner elevation • Should the facility be re-commissioned, the liner repairs should be completed to ensure design capacity and consider the installation of settlement beacons along the fuel transfer station and on sections of the secondary containment facility not constructed on bedrock
20 ML Roberts Bay Tank Farm	• Areas within the bunded area along the berm's incline that have experienced disturbance should be evaluated for integrity of the liner system and repairs made, if required, by a qualified person • Reconstruct pedestals prior to re-commissioning tank farm	• In the areas were there has been potential for the liner to be compromised, it should be exposed and evaluated by a qualified person to confirm the integrity of the bunded area before the facility is refilled • Prior to refilling the fuel tanks the pedestals and area of the bunded area need to be reconstructed. Under Care & Maintenance, no action is required (unless further erosion continues) • Maintain improved water management practices to prevent the ponding of water and further erosion of the interior on the containment facility • Additional high wall stabilization and management practices should be considered
Roberts Bay 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 • 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

Inspection Item	2012 Recommendations	2013 Recommendations
Quarry #1 Overburden Dump	• 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	• Monitor surface runoff and consider requirement for alternate sedimentation control measures • 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
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	• 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 of the airstrip shoulder and aprons to monitor the tension cracks prior to each use
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 • Implement a monitoring protocol and erect warning signs at the site of the slope failure until the buttress have been installed	• 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 • 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
Doris Creek Bridge	• Monitor thermistor strings in accordance with the recommendations set out in Section 3.2 • Monitor and ultimately replace the rock gabions	• Ensure the correct thermistor reader, set to the correct thermistor bead resistivity, is used for each thermistor cable as listed on the Doris Thermistor Data Field Sheet. • Continue monitoring the thermistor strings with the recommendations set out in Section 3.2 • Monitor and ultimately replace the rock gabions
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

Inspection Item	2012 Recommendations	2013 Recommendations
Quarry #2 and Crusher Area	• No action required	• Continue to follow the Quarry Management Plan • A barricade at the Quarry entrance is recommended
Batch Plant Pad (Previously Crusher Pad)	• No action required	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion
Upper Reagent Pad AN Storage	• Confirm design criteria before re-commissioning	• Should the facility be used to provide secondary containment, the design criteria must be confirmed and appropriate remedial measures must be implemented. Under Care & Maintenance no action is required
Landfarm	• HBML to continue to follow the designated Landfarm Management Plan • Conduct regular visual inspections to monitor for signs of settlement	• TMAC to continue to follow the designated Landfarm Management Plan • Conduct regular visual inspections to monitor for signs of settlement • Repair the sinkhole along the outside berm face of the Soil Containment Pond and the pothole in the access ramp into snow containment pond
Sewage Treatment Plant Outfall	• Continue to monitor old sewage outfall location for signs of permafrost degradation	• Monitor for permafrost degradation at old outfall location • No action required at new outfall location
Quarry # 2 Overburden Dump	• No action required	• No action required
Doris North Camp Pads	• 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 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	• 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, along Pad D and install appropriate signage and barricades to warn people of the danger • High wall stabilization measures designed for the mill pad should be installed as planned if the project moves beyond Care & Maintenance • 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	• Remove crushed rock pedestal supports for the piping and replace with fabricated supports that do not reduce containment capacity (if the facility is to be re-commissioned) • High wall stabilization measures designed for the mill pad should be installed as planned	• High wall stabilization measures designed for the 7.5 ML Tank Farm should be installed as planned (SRK 2011d)

Inspection Item	2012 Recommendations	2013 Recommendations
Power Generation Station (Pad B)	• Install a monitoring system for tracking, and advance notice of any deformations of Pad B	• Monitor the survey monuments on Pad B to allow for tracking and advance notice of any deformations as part of the annual survey
Other Site Wide Fuel Storage	• No action required	• No action required
Sedimentation and Pollution Control Ponds	• Pump out ponded water to prevent onset of thermal erosion • Carefully track thermistors and sump water quality and flow data	• The Sedimentation and Pollution Control Ponds should be kept free of standing water, as this will lead to permafrost degradation • Remove the large rocks and over liner material from the exposed liner within the Sedimentation Pond • Keep a close watch on the Pollution Control Pond thermistor data as well as the sump water quality and flow • Carry out a comprehensive review of the ground conditions below the ponds to evaluate whether there is a further evidence of leakage
Sumps #1 and #2	• Pump out standing water to prevent thermal erosion • Inspect sump perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Both sumps should be kept free of standing water as this will lead to permafrost degradation • Inspect sump perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • The depression around Sump #1 must be backfilled with overburden to prevent further permafrost degradation
Doris North Portal	• No action required	• No action required
Waste Rock Pile	• HBML to continue to follow the designated Waste Rock Management Plan	• Once underground development resumes, TMAC should continue to follow the designated Waste Rock Management Plan
Temporary Pond	• Conduct daily visual inspections to check for obvious signs of distress (at times when it contains water)	• No action required
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
Doris Primary Vent Raise Pad	• Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion	• Install catch berm and appropriate signage along high wall • Inspect pad perimeter during freshet and immediately following significant or prolonged rainfall events. Pump out ponded water to prevent onset of thermal erosion • Remove metal debris from fuel transfer station

Inspection Item	2012 Recommendations	2013 Recommendations
Frozen Core Plant 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
North Dam	• Continue with 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 2013 geotechnical inspection	• Increase frequency of surveying North Dam monitoring points in accordance with the recommendations by the Engineer-of-Record in Section 7 of the North Dam As-built Report (SRK 2012b) and Section 3 of the North Dam Monitoring Standard Operating Procedures (SRK 2013b). This needs to be implemented immediately. • Survey and monitor the two depressions on the upstream face of the dam in conjunction with the instrumentation monitoring program • Backfill the erosion around Deep Settling Monitoring Point ND-DSP-100 • Repair the contact thermistor bead on the North #2 thermosyphon and test the functionality of the thermosyphon and re-charge the thermosyphon if required
Shoreline Erosion	• Implement measures to maintain the water level in Tail Lake at 28.3 masl to prevent onset of permafrost degradation	• Continue to implement measures to maintain the water level in Tail Lake at 28.2 masl to prevent onset of permafrost degradation
Doris North Diversion Berm	• No recommendations made	• Repair area of exposed liner next to where the water line passes over the berm
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 • Implement inspection protocol to monitor shoulder cracks and potholes	• 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 • Backfill the dip in the road by the Helipad
Doris-Windy All Weather Road Stream Crossings	• Monitor thermistor strings in accordance with recommendations in Section 3.2	• Ensure the correct thermistor reader is used for each thermistor cable as listed on the Doris Thermistor Data Field Sheet. • Continue monitoring the thermistor strings in accordance with recommendations in Section 3.2 • Install additional railings between the two bridge superstructures • The depressions and ponded water against the thermal pad abutments should be covered with rock fill to prevent thermal degradation of the permafrost

Inspection Item	2012 Recommendations	2013 Recommendations
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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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.

PND Engineers Inc., 2013. Construction Report – Rock Jetty Repairs Roberts Bay. Report prepared for Newmont North America and TMAC Resources Inc., September 2013.

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. Revision 0. Report Prepared for Hope Bay Mining Limited. Project Number: 1CH008.033.216. October.

SRK Consulting (Canada) Inc., 2011c. Engineering Drawings for the Roberts Bay Fuel Tank Farm Rock/Ground Support, Doris North Project, Nunavut, Canada – Revision 0. Engineering Drawings Prepared for Hope Bay Mining Limited. Project Number 1CH008.033. November

SRK Consulting (Canada) Inc., 2011d. Engineering Drawings for the Pad R and Pad D Rock/Ground Support, Doris North Project, Nunavut, Canada – Revision 0. Engineering Drawings Prepared for Hope Bay Mining Limited. Project Number: 1CH008.033. August

SRK Consulting (Canada) Inc., 2011e. Engineering Drawings for the Doris North Fuel Tank Farm, Doris North Project, Nunavut, Canada – Revision AB. Engineering Drawings Prepared for Hope Bay Mining Limited. Project Number: 1CH008.027/033. December

SRK Consulting (Canada) Inc. 2012a. 2011a Annual Geotechnical Inspection, Doris North Project, Hope Bay, Nunavut. Report prepared for Hope Bay Mining Limited, Report No. 1CH008.046, March.

SRK Consulting (Canada) Inc. 2012b. Hope Bay Project – North Dam As-Built Report. Report prepared for Hope Bay Mining Limited. Report No. 1CH008.058, October.

SRK Consulting (Canada) Inc., 2013a. 2012 Annual Geotechnical Inspection, Doris North Project, Hope Bay, Nunavut. Report prepared for Hope Bay Mining Limited, Report No. 1CH008.066, March.

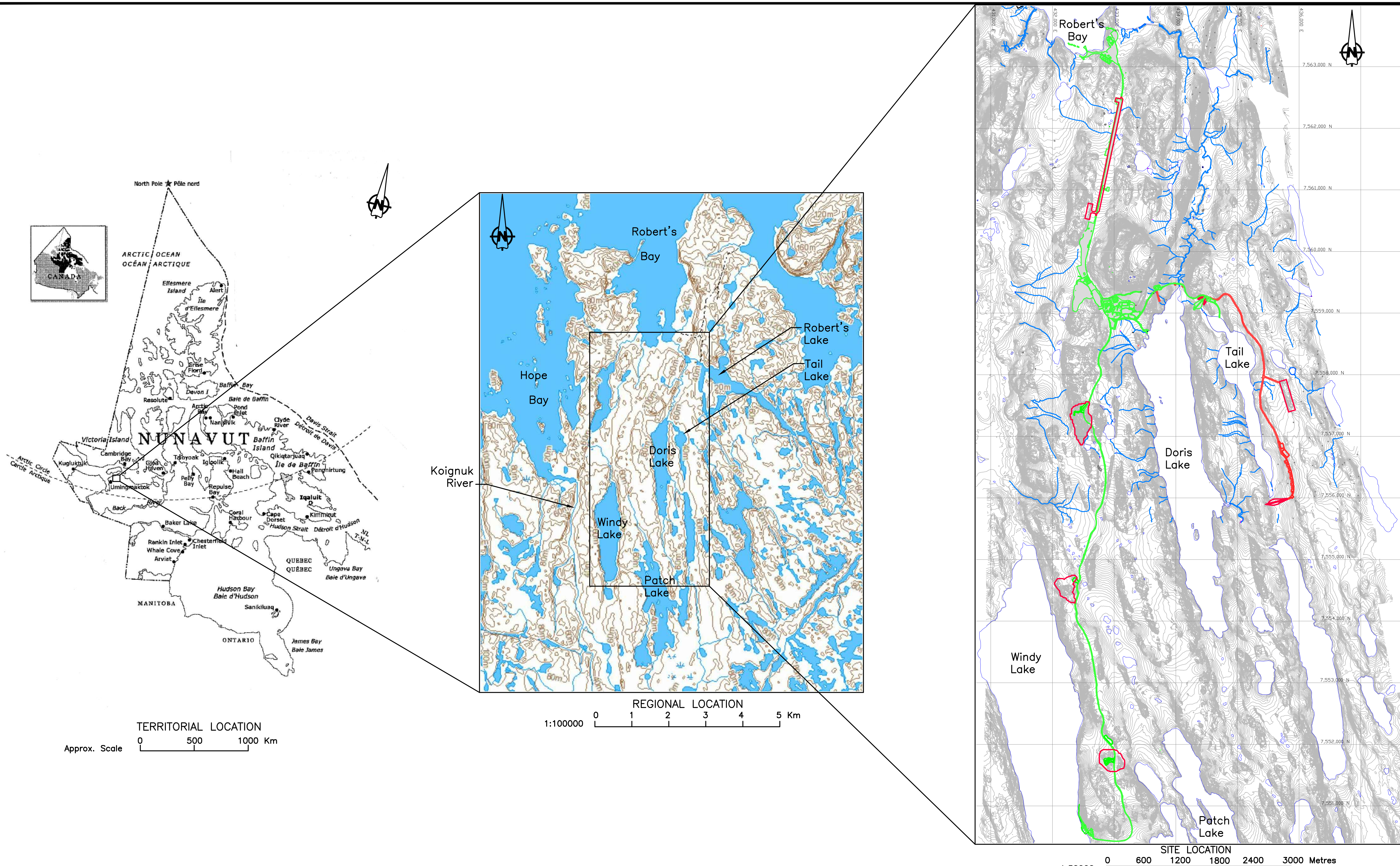
SRK Consulting (Canada) Inc., 2013b. Hope Bay Project, North Dam Monitoring: Standard Operating Procedures – Revision 1. Report prepared for TMAC Resources Inc., Report no. 1CT022.000, September.

SRK Consulting (Canada) Inc., 2013c. Doris North Project: 2012 Annual Roberts Bay Jetty Inspection. Technical Memorandum prepared for Hope Bay Mining Limited, Project No. 1CH008.066, February.

SRK Consulting (Canada) Inc. 2014a. Doris North Project: 2013 Annual Roberts Bay Jetty Inspection. Memo prepared for TMAC Resources, Project No. 1CT022.000, March.

SRK Consulting (Canada) Inc. 2014b. Doris North Landfarm Management and Monitoring Plan. Report Prepared for TMAC Resources Inc., Project Number: 1CT022.001. March.

Figures



LEGEND

- Asbuilt
- Licenced but not yet constructed

srk consulting	TMAC RESOURCES	2013 Geotechnical Inspection
SRK JOB NO.: 1CT022.000	HOPE BAY MINING LTD.	Location Map
FILE NAME: 1CT022.00_GT–2013.dwg		DATE: March 2014 / APPROVED: EMR / FIGURE: 1

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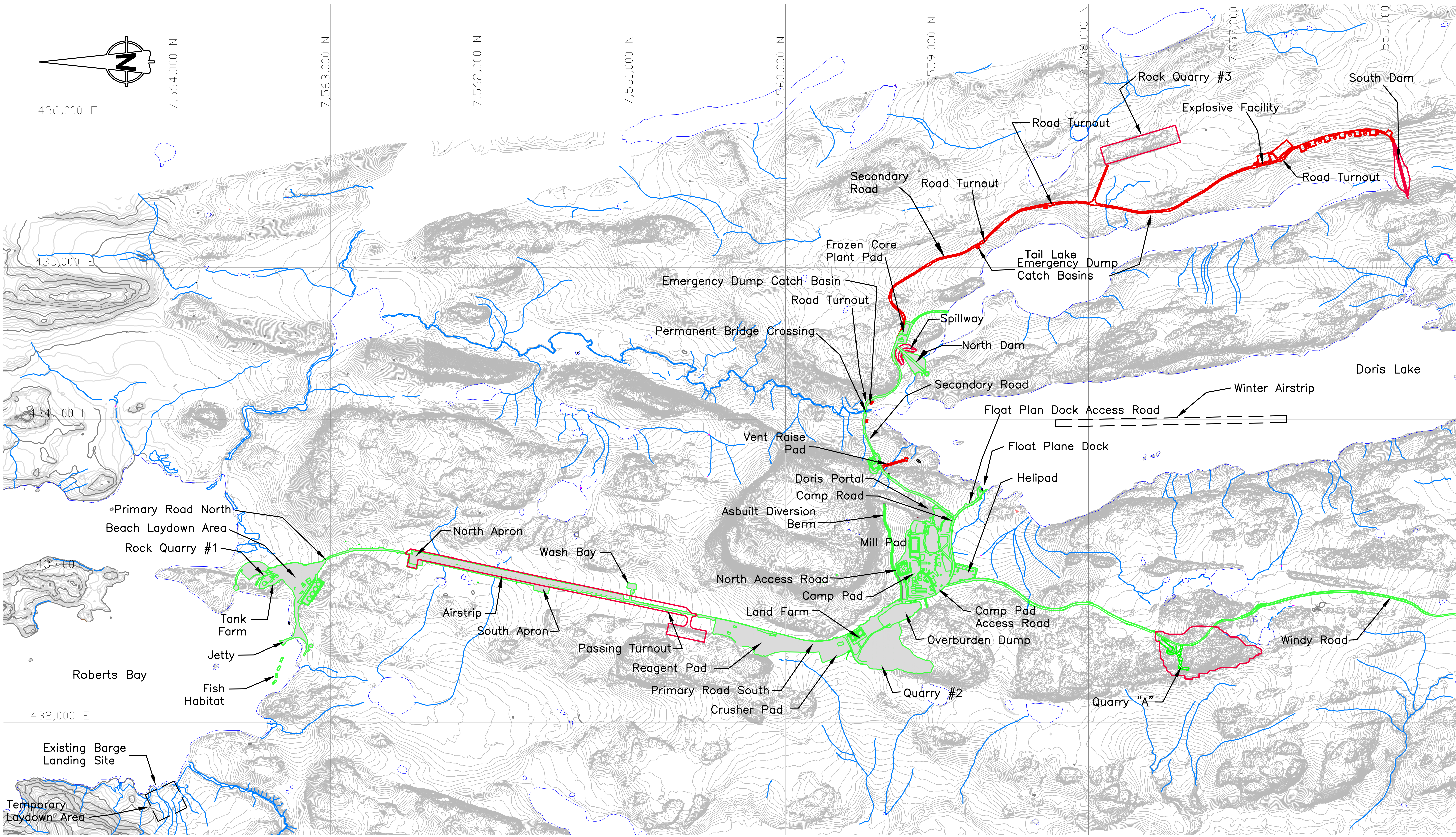

LEGEND

Asbuilt

Licenced but not yet constructed

srk consulting

SRK JOB NO.: 1CT022.000

FILE NAME: 1CT022.00_GT-2013.dwg

TMAC RESOURCES

HOPE BAY MINING LTD.

2013 Geotechnical Inspection

Overall Site Layout
(Sheet 1)

DATE:	APPROVED:	FIGURE:
March 2014	EMR	2

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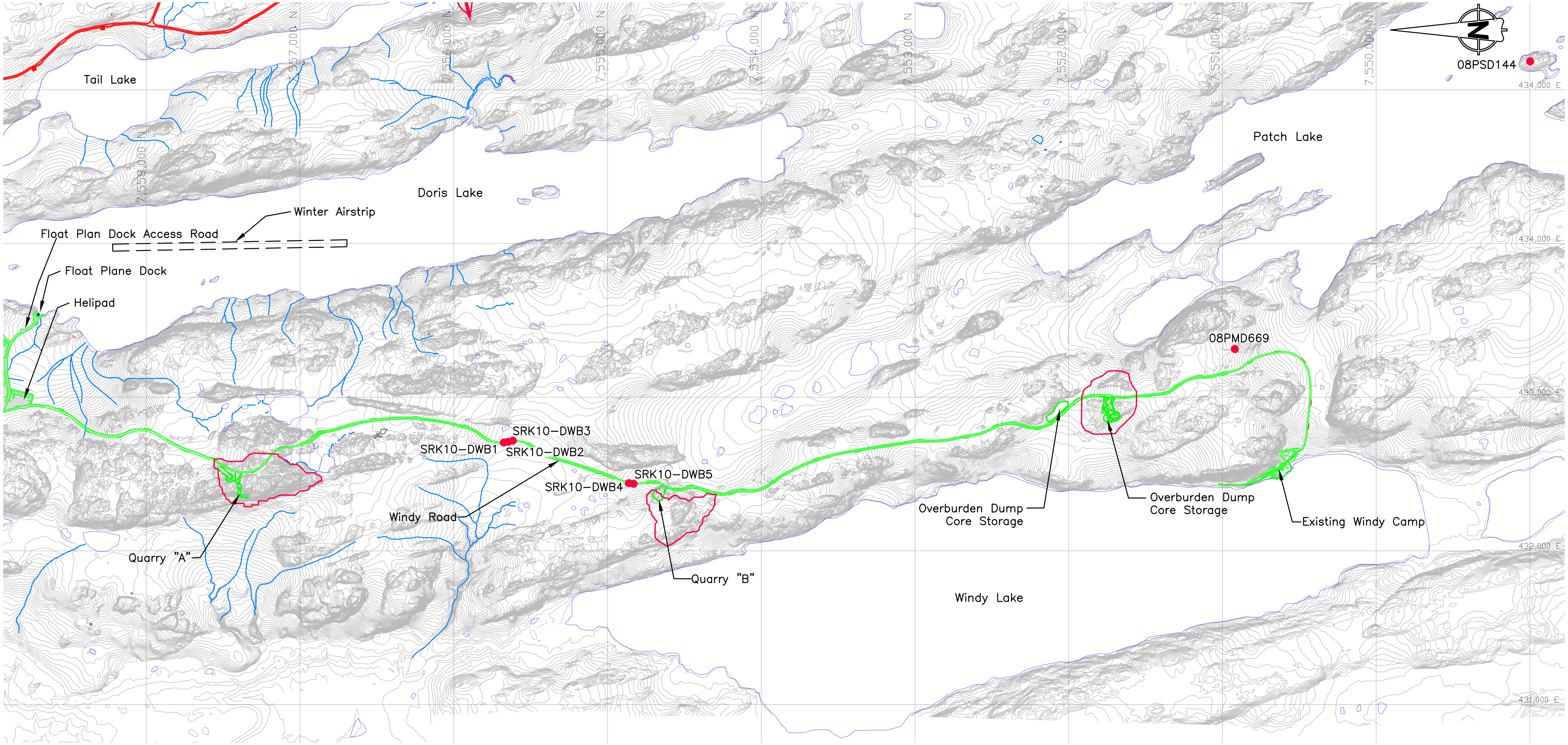


LEGEND

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

srk consulting

MAC RESOURCES

HOPE BAY MINING LTD.

2013 Geotechnical Inspection

Overall Site Layout (Sheet 2)

SRK JOB NO.:	1CT022.000
FILE NAME:	1CT022.00_GT-2013.dwg

DATE:	APPROVED:	FIGURE:
March 2014	EMR	3

c:\01_SITES\Hope Bay\1CT022.000.320_2014_Doris_Annual_Inspection\1CT022.00_GT-2013.dwg

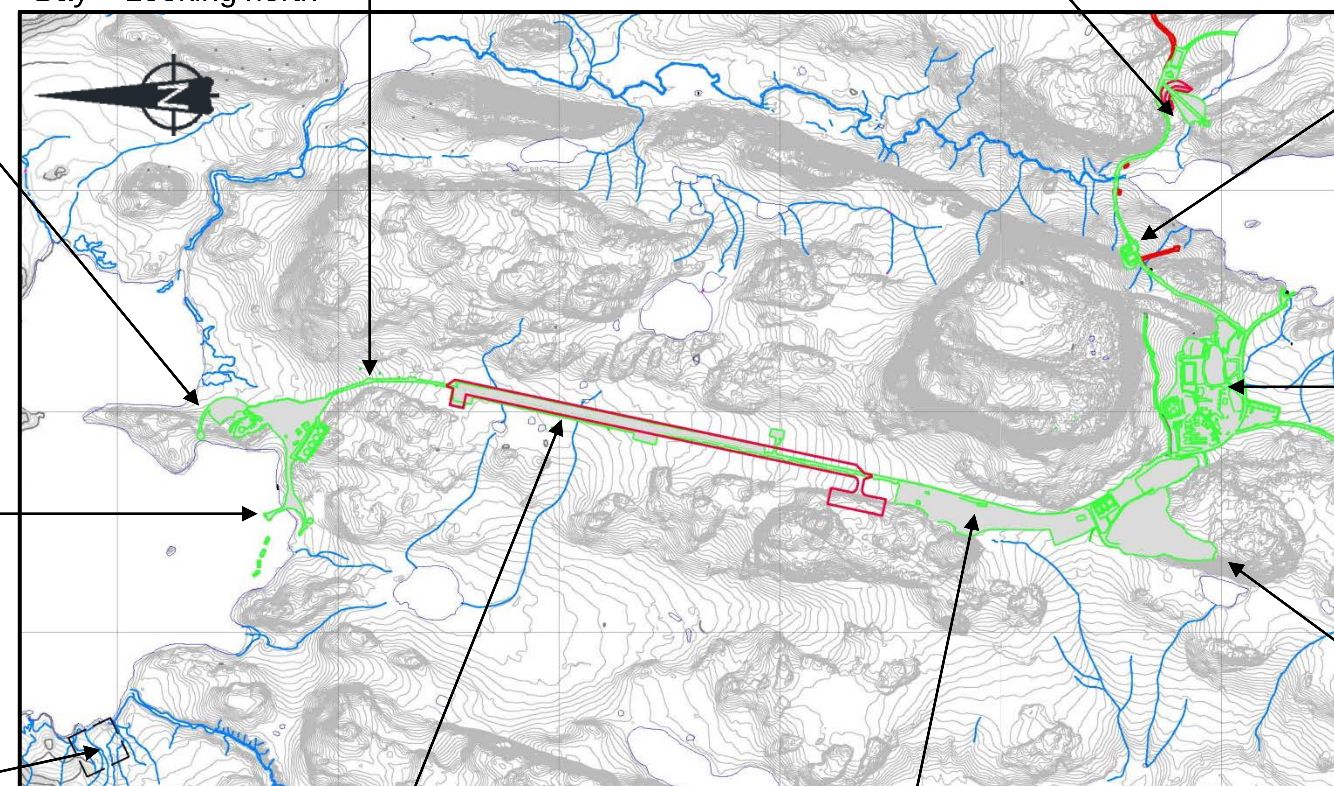
View of Roberts Bay Fuel Tank Farm, Jetty and Laydown area – looking south

Primary Road from the Airstrip to Roberts Bay – Looking north

Aerial view of the North Dam - looking southeast

Primary Vent Raise along the secondary road – looking west

View of Roberts Bay Fuel Tank Farm, Jetty and Laydown area – looking east



Aerial view of camp – looking southeast

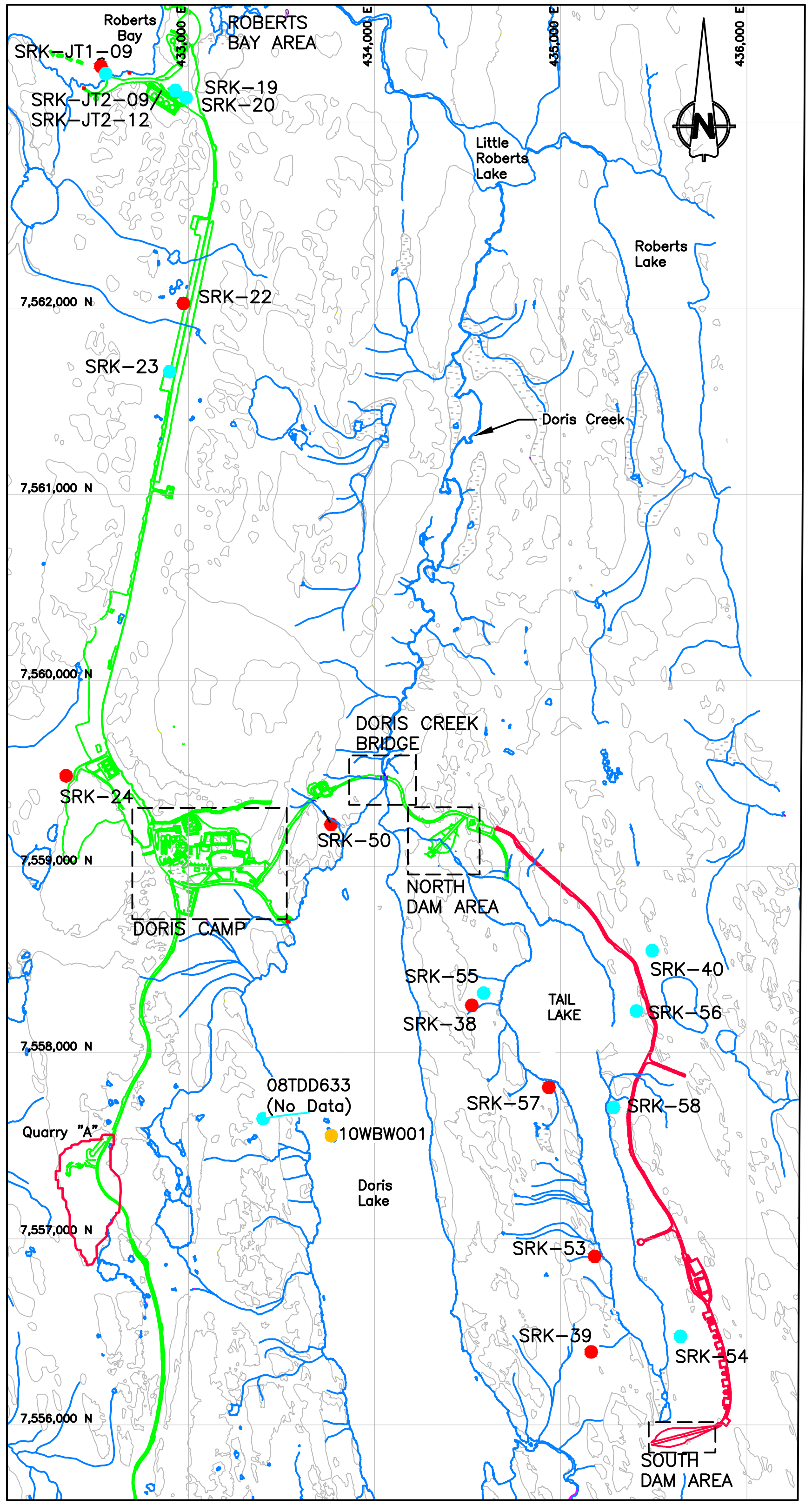
Aerial view of old beach laydown area with the type 4 magazine – looking east

Airstrip -- looking north towards Roberts Bay

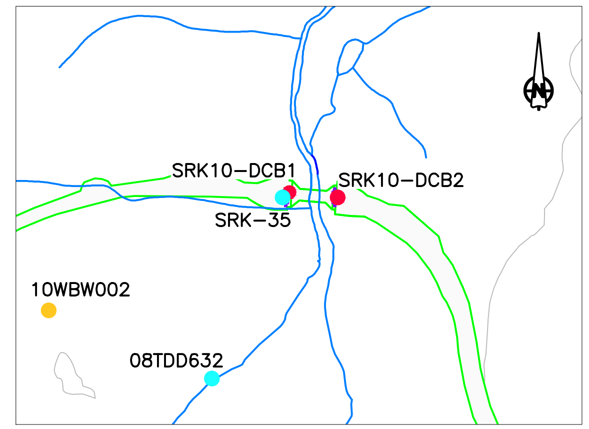
Upper and Lower Reagent Pads – looking south

Quarry 2 with the Lower Reagent Pad in the background – looking north

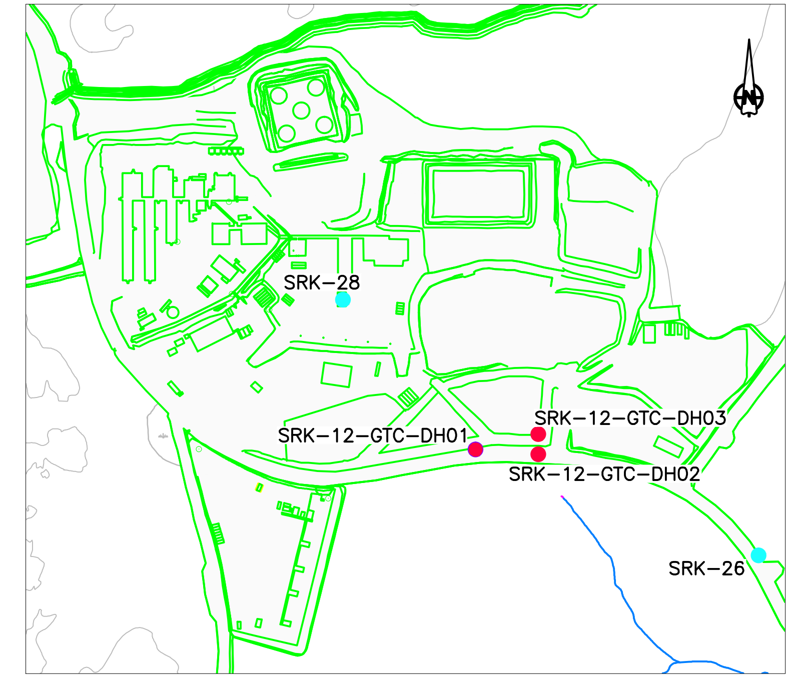
srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
Job No: 1CT022.000	HOPE BAY MINING LTD.	**Current Site Layout**
Filename: 2013GeotechInsp_rev02_sw		Date: March 2014 · Approved: LW · Figure: 4



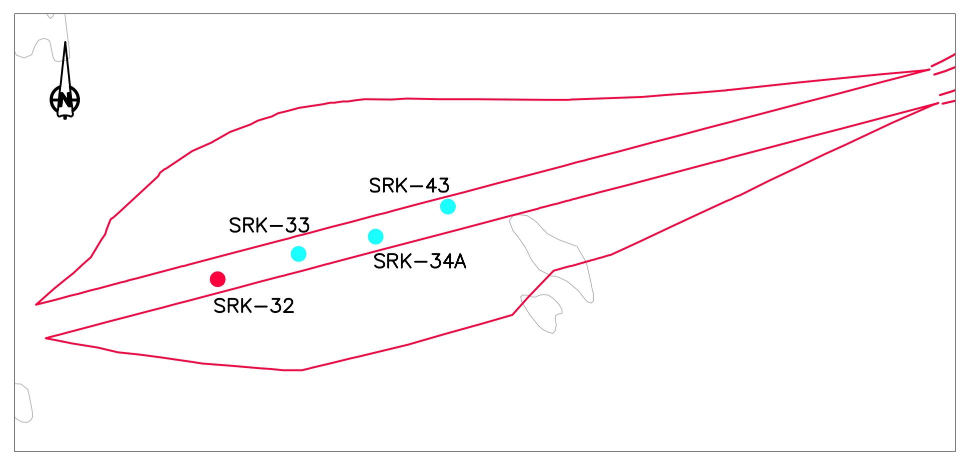
DORIS NORTH OVERVIEW



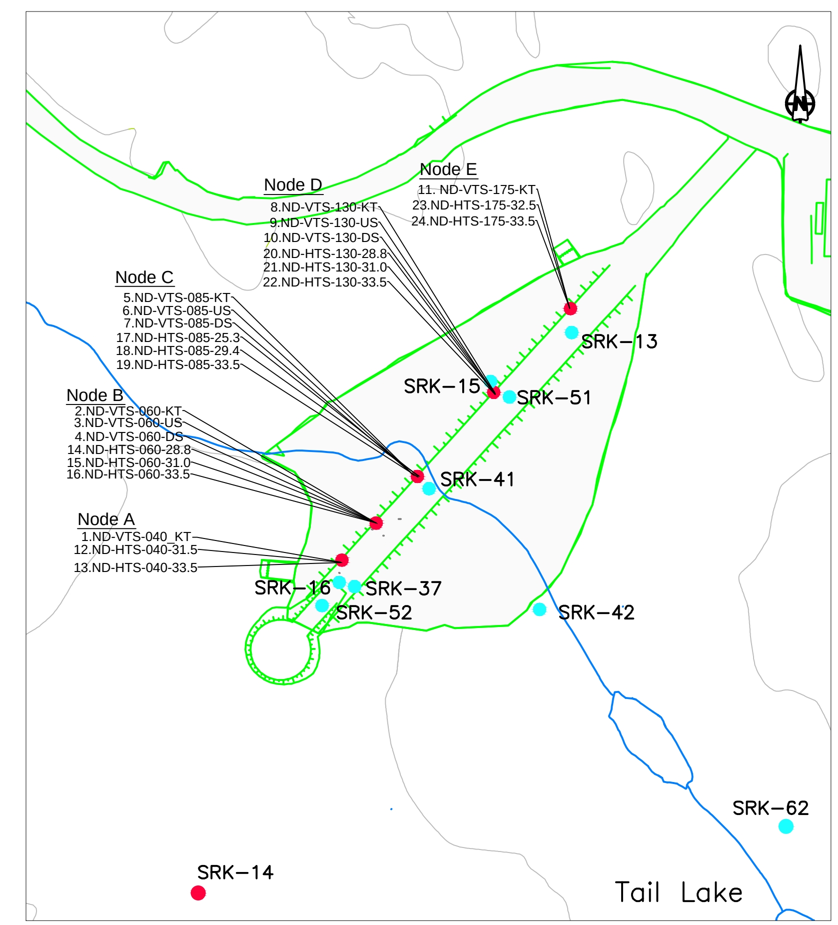
DORIS CREEK BRIDGE



DORIS CAMP



SOUTH DAM AREA



NORTH DAM AREA

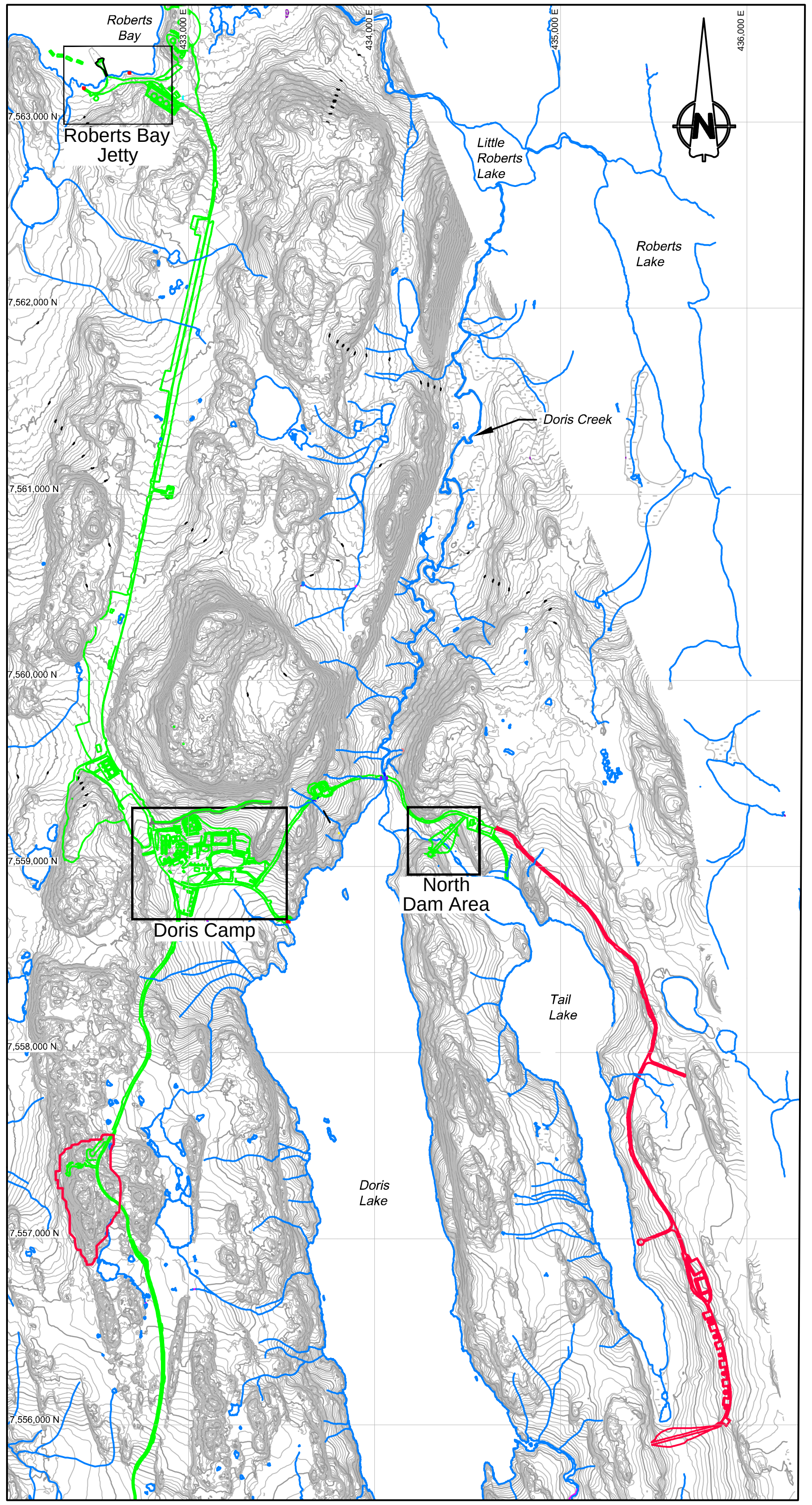
LEGEND

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

srk consulting

TMAC RESOURCES

SRK JOB NO.: 1CT022.000	HOPE BAY MINING LTD.	2013 Geotechnical Inspection
FILE NAME: 1CH008_066–GT09–3–Figure 5.dwg		Thermistor Locations
		DATE: March 2014 · APPROVED: EMR · FIGURE: 5



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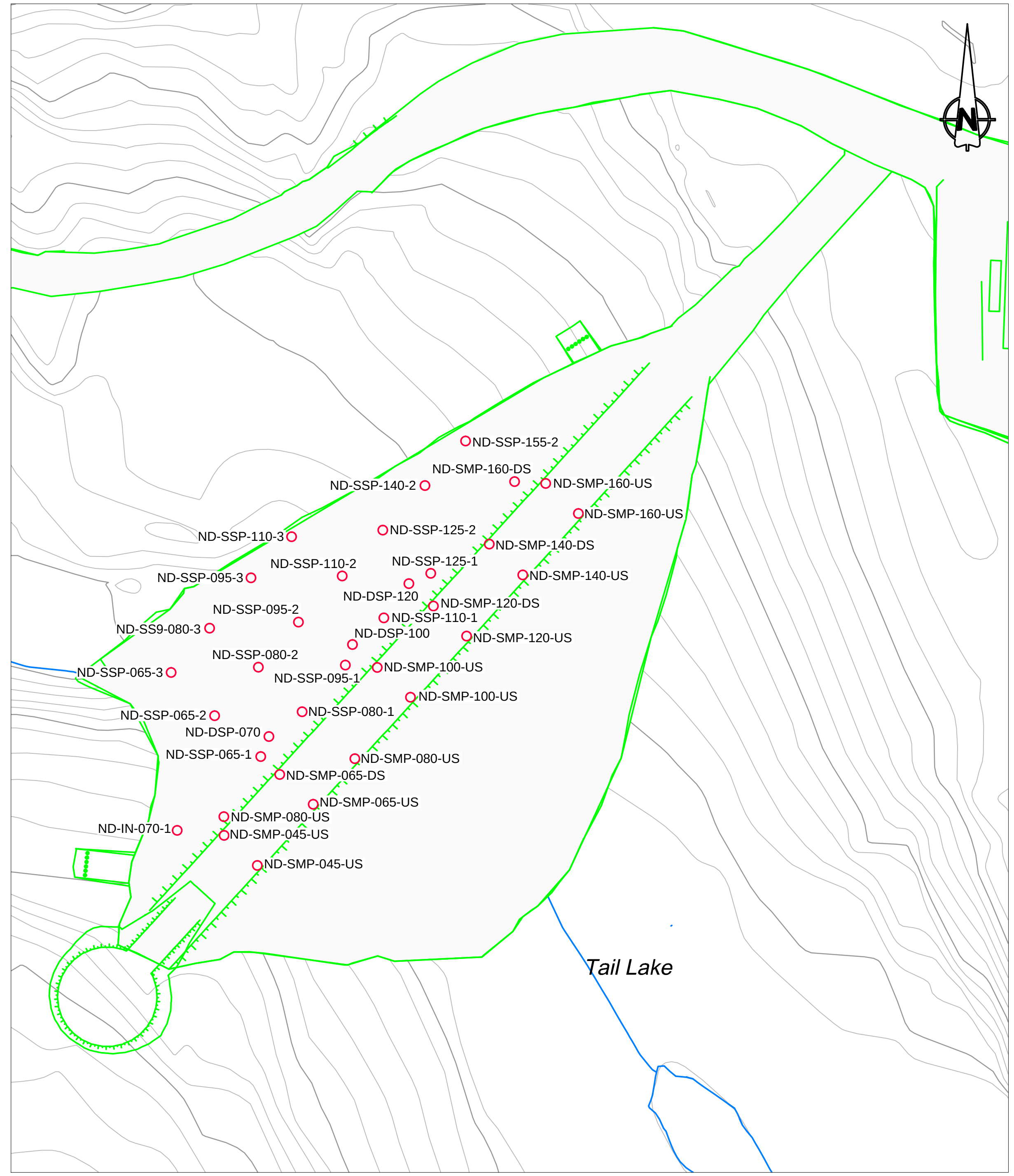
Scale in Metres

DORIS NORTH OVERVIEW



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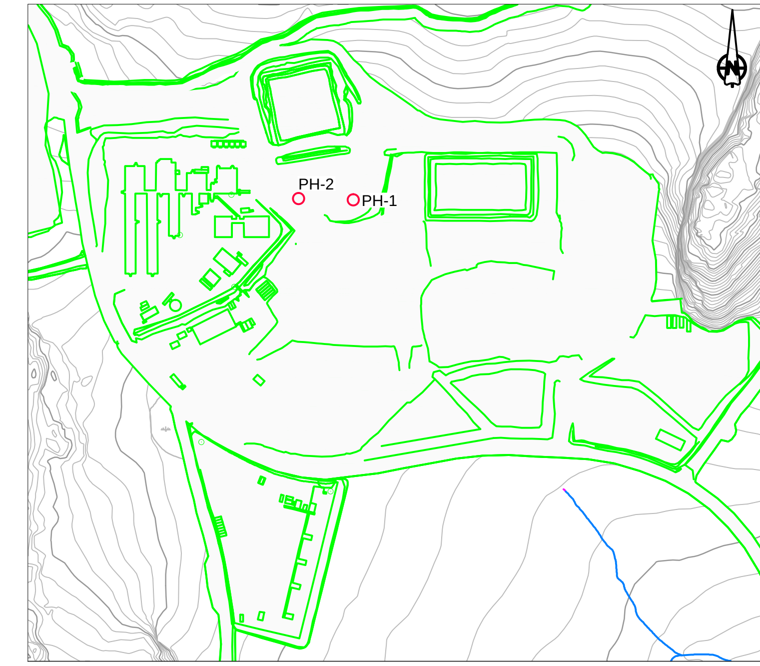
Scale in Metres

NORTH DAM AREA



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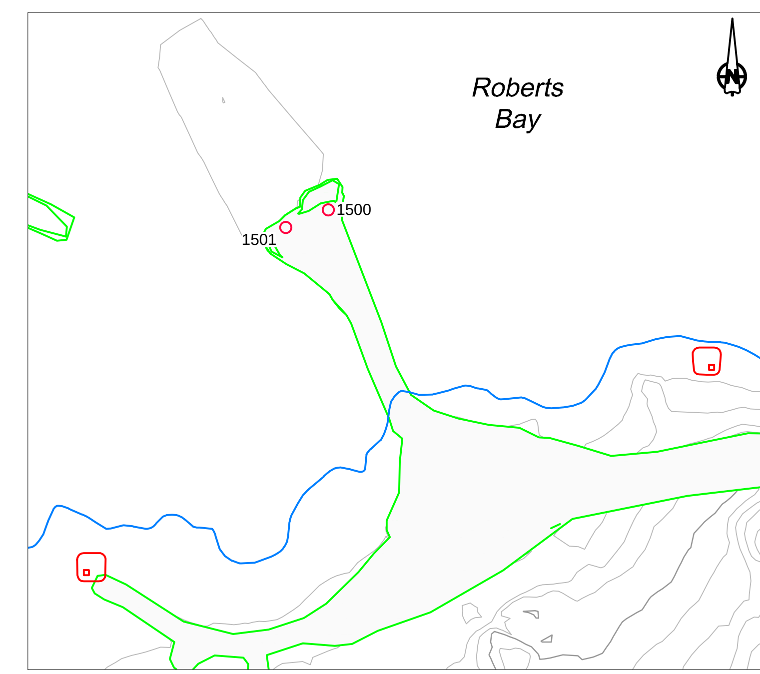
Scale in Metres

DORIS CAMP



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Scale in Metres

ROBERTS BAY JETTY

LEGEND

- Survey Monitoring Point
- Asbuilt
- Licensed but not yet Constructed

srk consulting

SRK JOB NO.: 1CT022.000

FILE NAME: 1CT022.00_GT2013_Figure 6.dwg

MAC RESOURCES

HOPE BAY MINING LTD.

2013 Geotechnical Inspection

Survey Monitoring Points

DATE:	APPROVED:	FIGURE:
March 2014	EMR	6

O:\01_SITES\Hope Bay\1CT022.000320_2014_Doris_Annual_Inspection\1CT022.00_GT2013_Figure 6.dwg

Survey monument 1500 on east end of jetty

Eastern shoreline of jetty – looking south

Eastern shoreline of Robert's Bay and jetty – looking west

Survey monument 1501 on west end of the jetty

Western shoreline of Robert's Bay and jetty showing the ground temperature cables – looking north

Condition of thermistor cable SRK-JT1-09 – looking south

Condition of thermistor cable SRK-JT2-12 – looking north

srk consulting	TMAC RESOURCES	2013 Geotechnical Inspection
		Jetty and Shoreline Laydown Area
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 · Approved: LW · Figure: 7

The sump by the access ramp into the Quarry #1 Tank Farm

Aerial view of the Quarry #1 Tank Farm – looking east

West high wall of the Quarry #1 Tank Farm with the fuel transfer pipes disconnected – looking southwest

Fuel drum storage and the exposed liner along the back of the fuel transfer station

North end of Quarry #1 Tank Farm – looking south from the radio tower

Panoramic view of 5 ML fuel tank farm from the access ramp into the containment berm

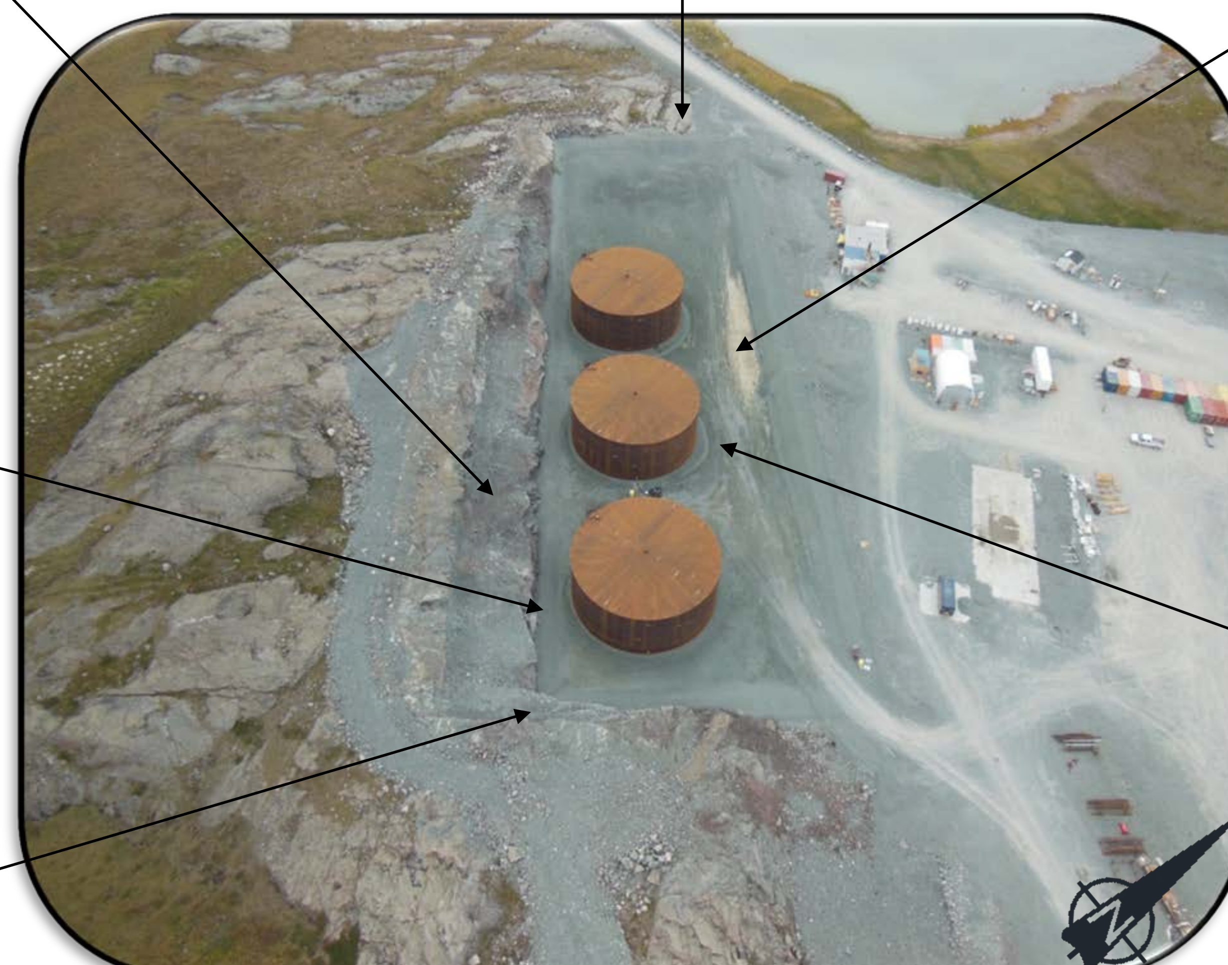
srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	HOPE BAY MINING LTD.	**Quarry #1 Tank Farm** Date: March 2014 · Approved: LW · Figure: 8

Condition of the west high wall

Condition of the berm at the north end of the 20 ML fuel tank farm – looking east from the high wall

Interior berm along the east side of the 20 ML Tank Farm. Evidence of wheeled traffic along the toe of the berm and high water levels – looking north from Tank #2

Interior berm along the western high wall showing where the liner has been exposed.



Condition of the Tank #2 pedestal

Condition of the south high wall

srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
		Roberts Bay 20 ML Tank Farm
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 | Approved: LW | Figure: 9

Aerial view of the Quarry #1 Tank Farm and remaining containers – looking northwest

The eastern edge of the Roberts Bay Laydown Area by the drill shop – looking north

Aerial view of Primary Road leading into Roberts Bay – looking northwest

Aerial view of the Roberts Bay laydown area – looking southeast

Aerial view of the 20 ML Tank Farm at Roberts Bay

Looking north towards the Quarry #1 Fuel Tank Farm from the south end of the 20 ML Tank Farm

srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
		Roberts Bay Laydown Area
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 | Approved: LW | Figure: **10**

Aerial view of the Overburden Dump and the Robert's Bay Access Road – looking west

Aerial view of the overburden dump and the Roberts Bay Access Road to the eastern shore of Roberts Bay. The 20 ML Tank Farm is in the background – looking southeast

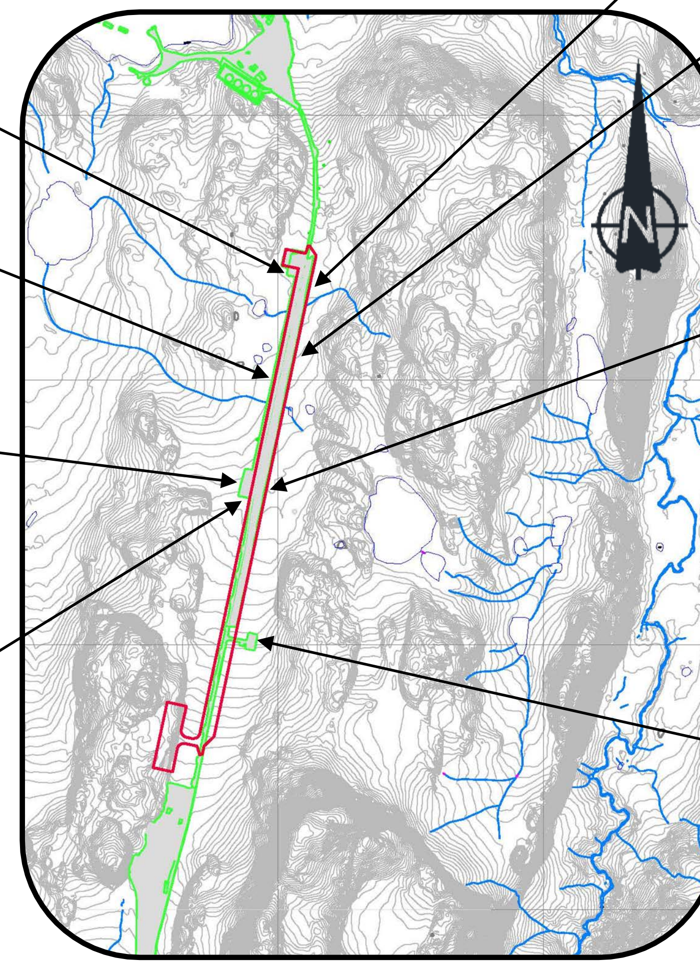
srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
		Roberts Bay Overburden Dump Area
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 | Approved: LW | Figure: 11

Aerial view of the north apron – looking east

Aerial view of the airstrip and partially completed expansion – looking north to Roberts Bay

East side of existing airstrip with partially completed expansion – looking north

Tension cracks along west side of run-way



Sink holes and an erosion gully on the north edge of the south apron

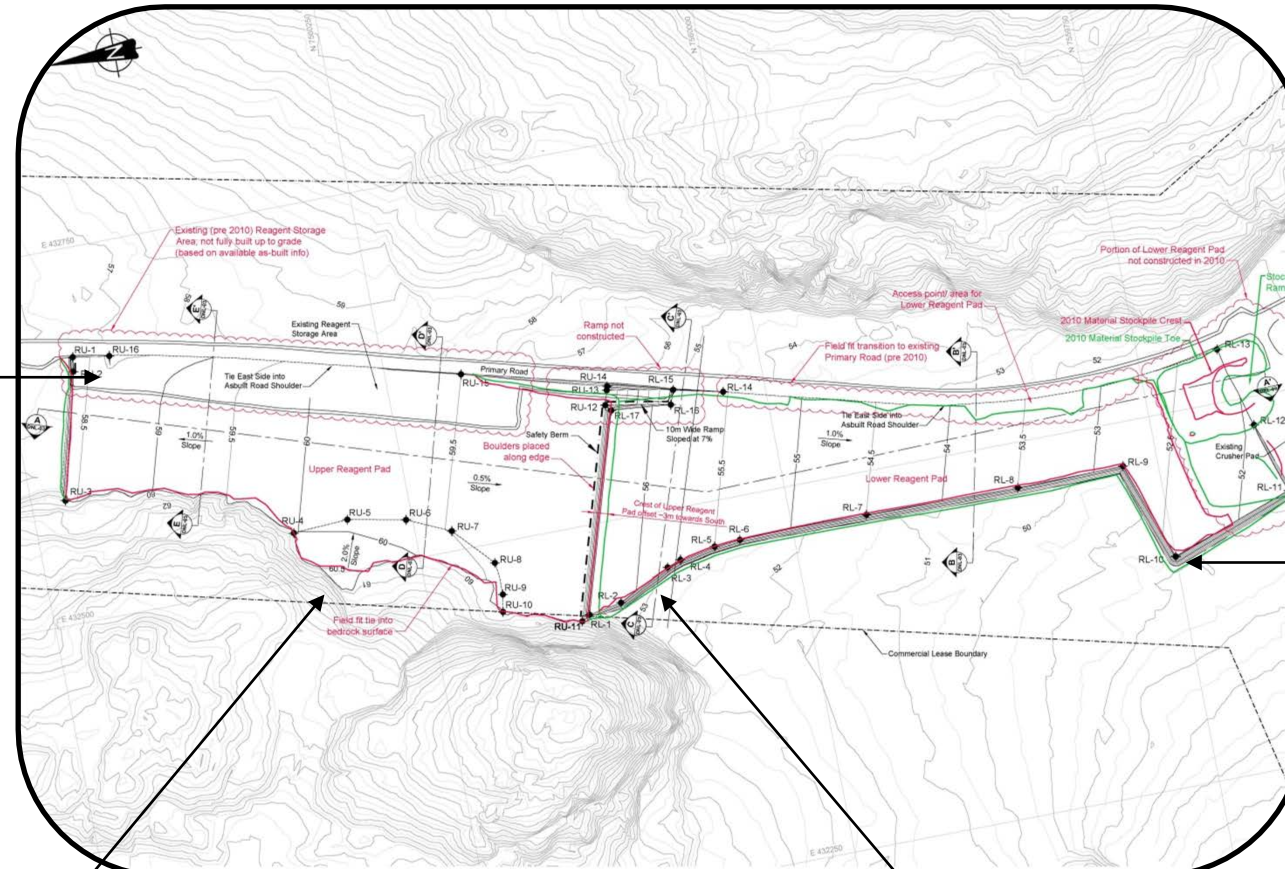
Aerial view of the south apron – looking east

Explosives AN/FO Mixing Facility with the Primary Road in the background – looking west

Tension cracks along the south end of the south apron

srk consulting	MAC RESOURCES	2013 Geotechnical Inspection **Airstrip**
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 / Approved: LW / Figure: **12**

Aerial view of the north end of the Upper Reagent Pad – looking south



Aerial view of Crusher Pad and Landfarm – looking south

Aerial view of the Upper and Lower Reagent Pads – looking south. The AN storage area is in the middle of the photo

Aerial view of Lower and Upper Reagent Pads – looking northeast

srk consulting

TMAC RESOURCES

2013 Geotechnical Inspection

Primary Road, Reagent Pads, and AN Storage

Job No: 1CT022.000

Filename: 2013GeotechInsp_rev02_sw.pptx

HOPE BAY MINING LTD.

Date: March 2014

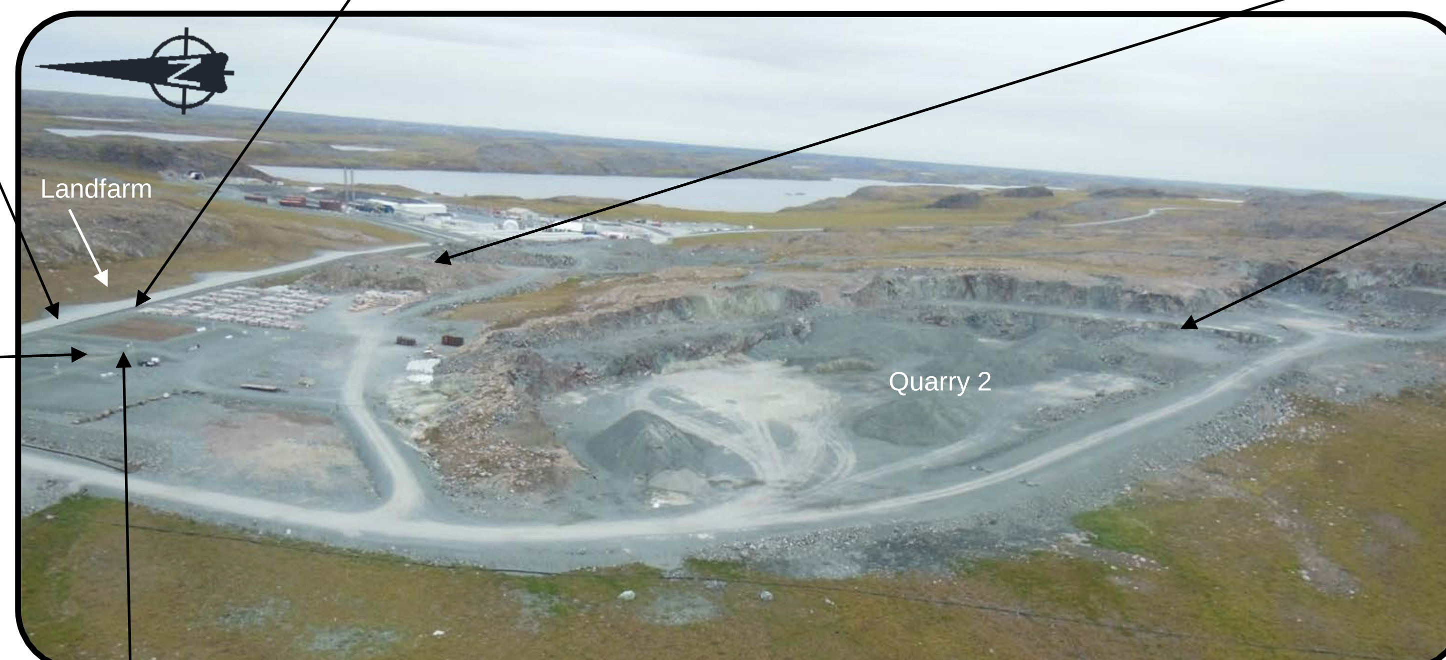
Approved: LW

Figure: 13

Aerial view of the Doris North Landfarm – looking east

Condition of the Soil Pond

Aerial view of the north end of the Overburden Dump – looking west



The condition of the eastern berm of the Water Pond – looking south

Aerial view of Quarry #2 – looking north

Large depression in the access ramp and condition of the sump in the Snow Pond – looking north

srk consulting	TMAC RESOURCES	2013 Geotechnical Inspection
Job No: 1CT022.000	HOPE BAY MINING LTD.	**Quarry #2, Crusher and Landfarm**
Filename: 2013GeotechInsp_rev02_sw.pptx		Date: March 2014 / Approved: LW / Figure: 14

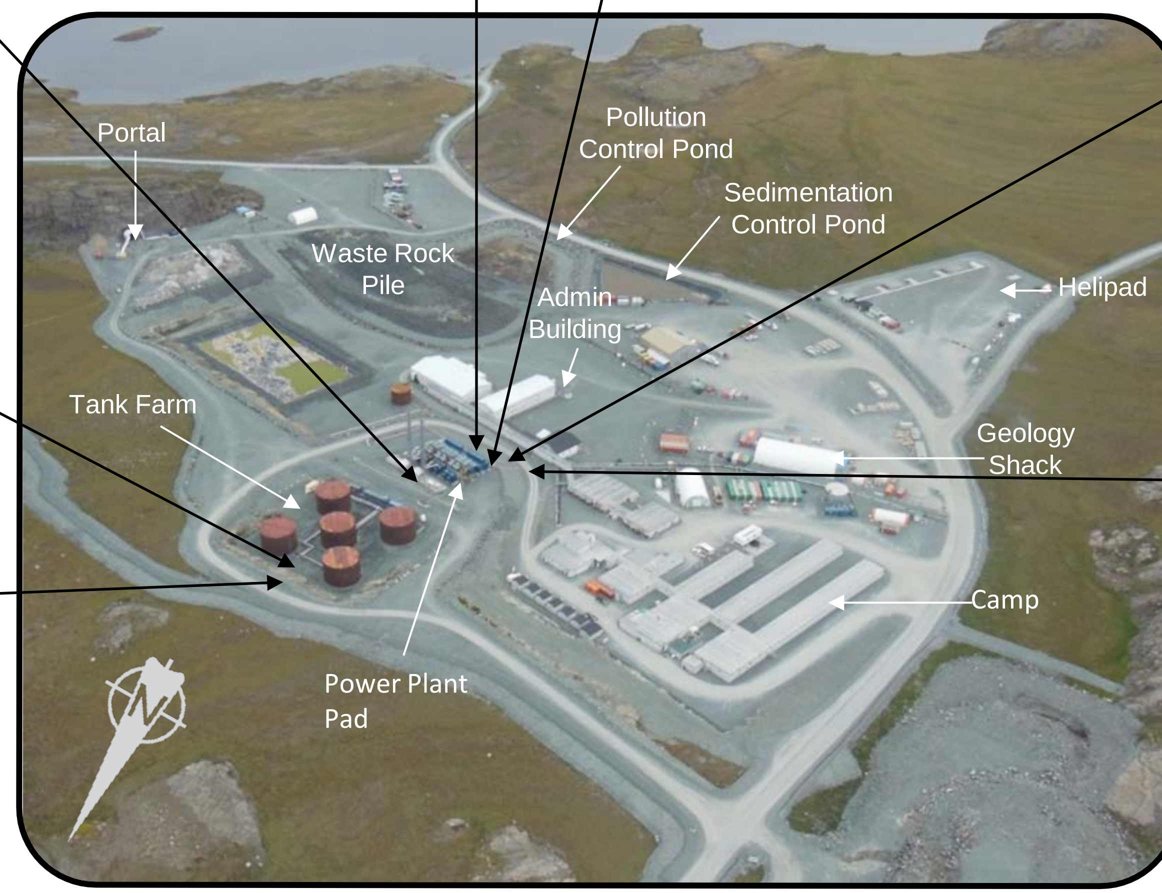
Doris 5 ML Tank Farm – looking south towards the fuel transfer station

Power Plant on Pad B – looking north from Pad C

A large erosion gulley on the crest of Pad B which can lead to erosion issues

The Power Plant on Pad B – looking northeast from Pad X

Condition of the 7.5 ML Doris North Camp Tank Farm north high wall – looking west



Conduit from the power plant running down to the toe of Pad B and under the Access Road to Doris North Camp

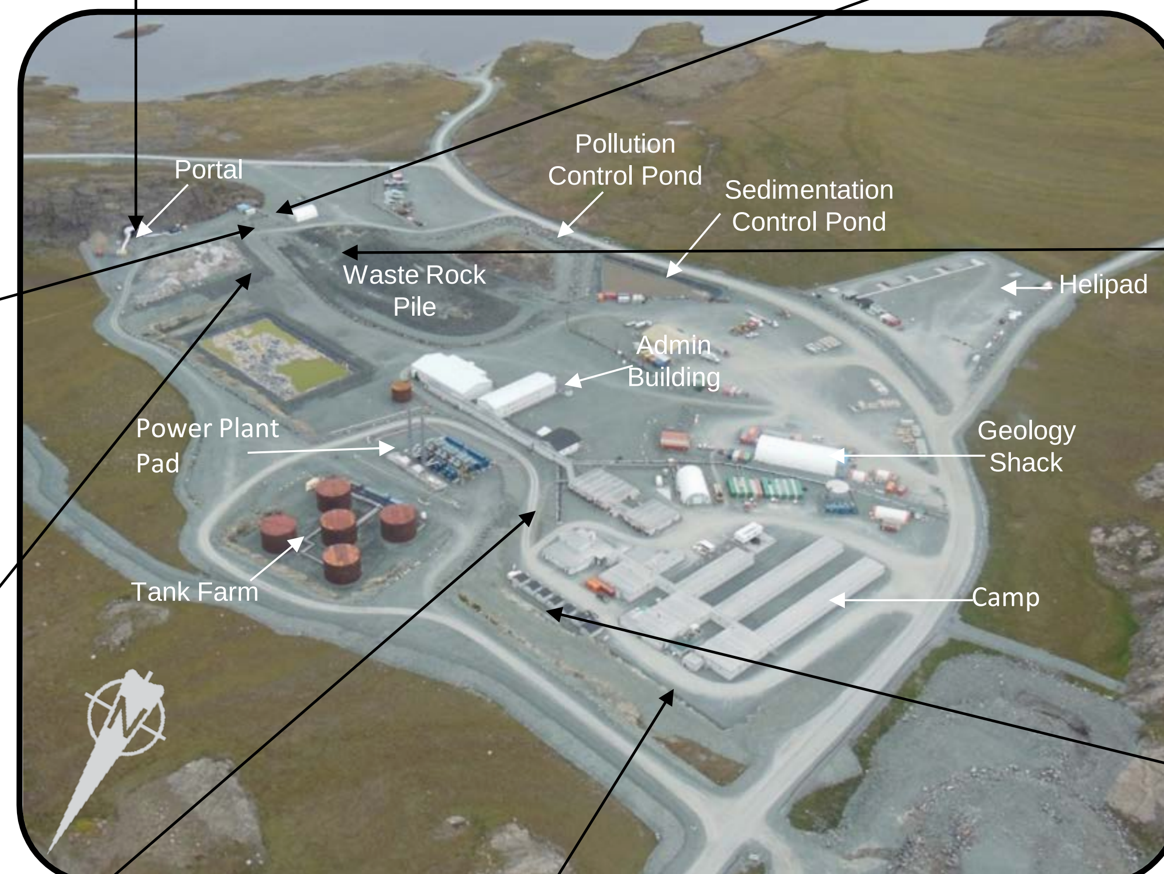
7.5 ML Doris North Camp Tank Farm north high wall looking down from the North Access Road

srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
Job No: 1CT022.000	HOPE BAY MINING LTD.	7.5 ML Doris North Camp Tank Farm and Pad B
Filename: 2013GeotechInsp_rev02_sw.pptx		Date: March 2014 / Approved: LW / Figure: 15

Portal entrance - looking east from Pad Q/H/J

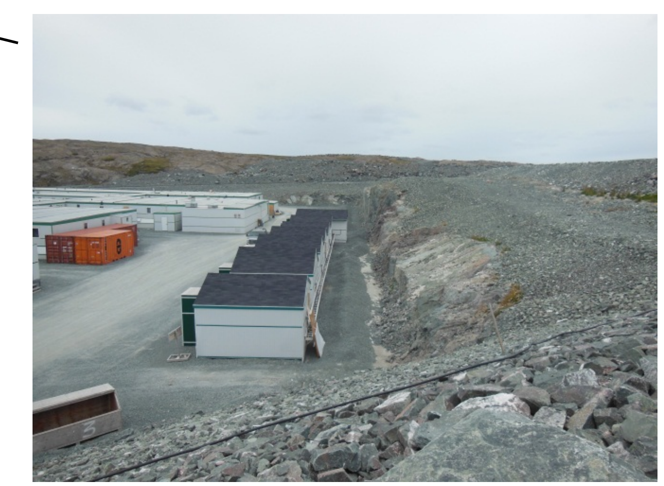
Pad L - looking east from the ramp to the entrance of the waste rock pile on Pad I

Conduit running down from Pad L and under the access ramps



The waste rock pile on Pad I – looking down from Pad L

Pad Q Expansion over pads H/J waste rock looking north from Pad F



The north high wall of Pad X – looking west from Pad B

Doris Camp – looking south from Pad R

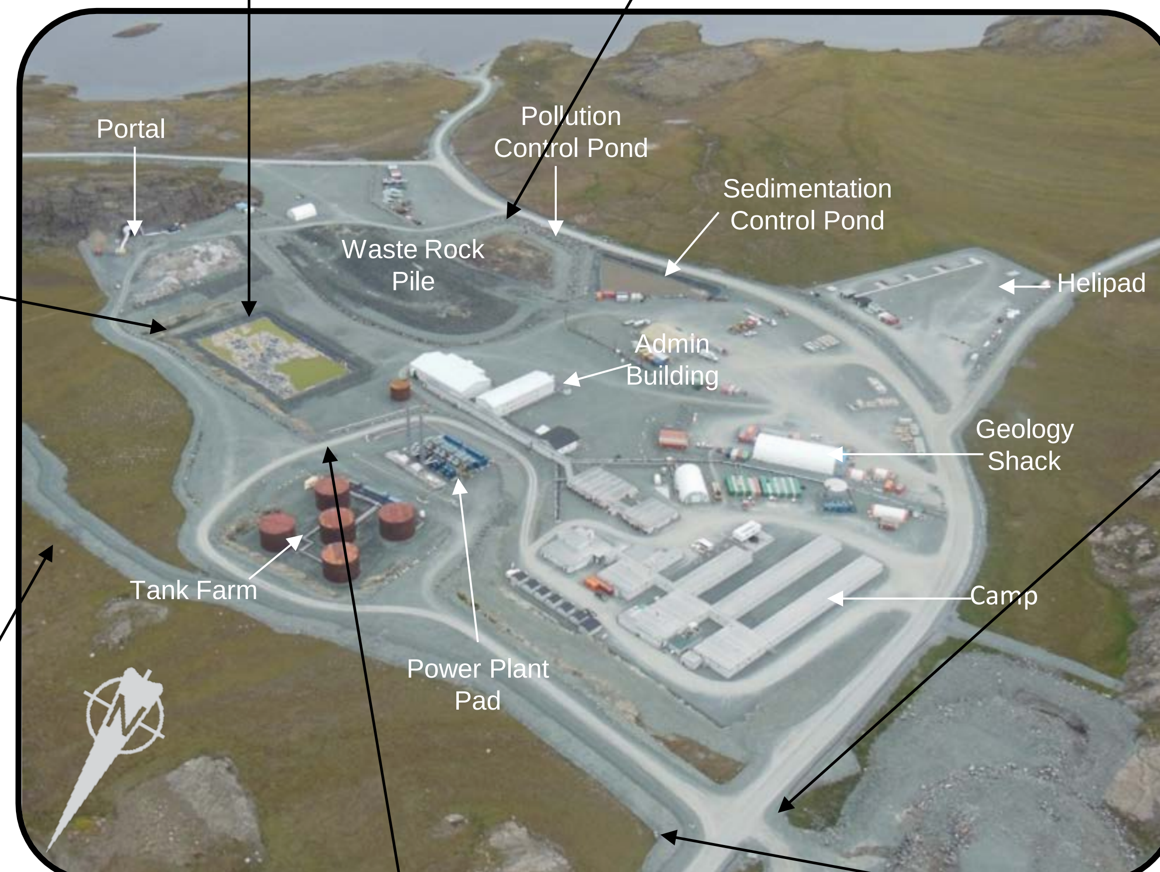
The north high wall of Pad X – looking east from the Primary Road

srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
		Portal, Helipad and Other Pads
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 · Approved: LW · Figure: **16**

Panoramic view of the temporary pond on Pad D - looking northwest

Panoramic view of the Pollution Control Pond - looking west from the Float Plane Dock Access Road and the ramp to Pad G

The condition of the east high wall of Pad D. There is water ponding against the high wall.



The culverts coming out from the Primary Road to the overburden stockpile area

The culverts going under the Primary Road at the junction of the Primary Road and the North Access Road and Doris North Diversion Berm

Exposed liner along the crest of the Doris North Diversion Berm

The Temporary Pond – looking east from the North Access Road by Pad B

srk consulting

MAC RESOURCES

2013 Geotechnical Inspection

Temporary Pond and Diversion Berm

Job No: 1CT022.000

Filename: 2013GeotechInsp_rev02_sw.pptx

HOPE BAY MINING LTD.

Date: March 2014

Approved: LW

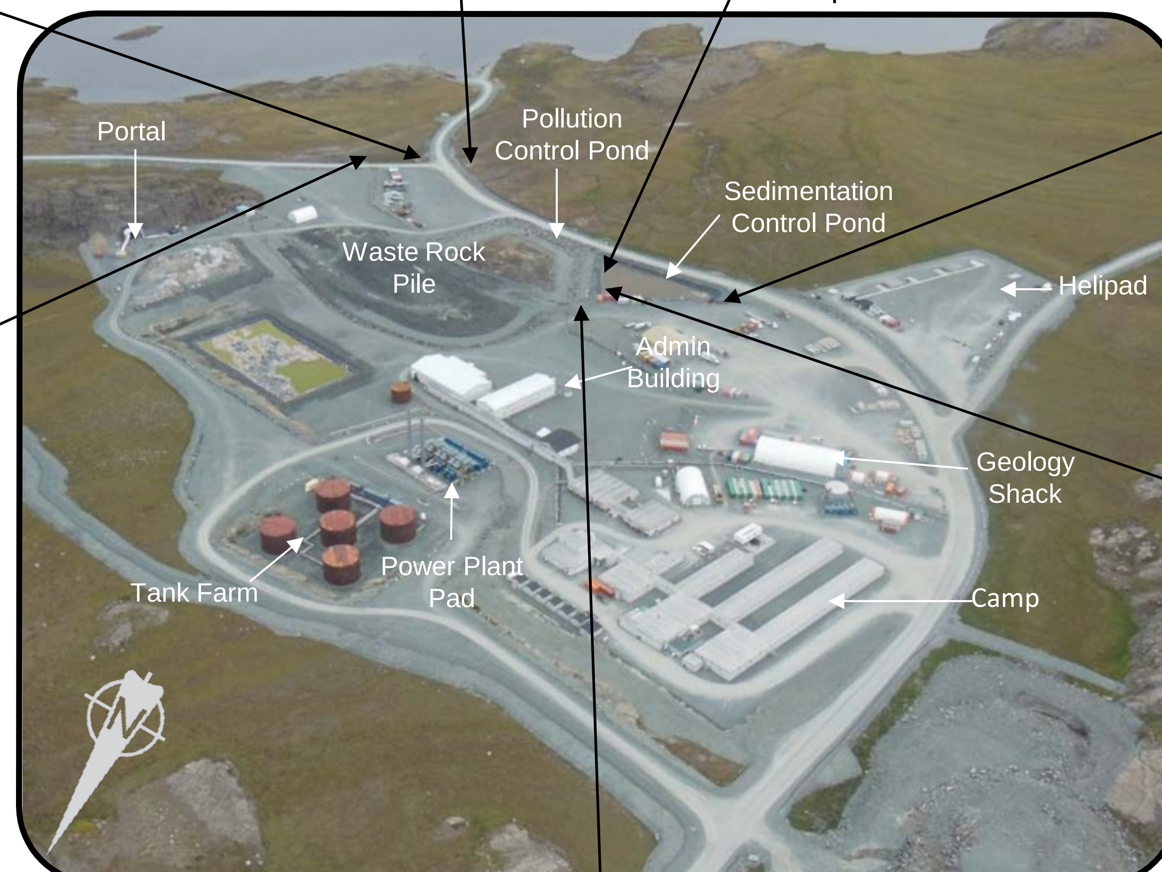
Figure: 17

Sump #2 - looking north towards Doris Camp

Sump #1 – looking southeast

The east side of the Sediment Control Pond. Overliner material from the Divider Berm has washed down on to the exposed liner

An overview of the Sediment Control Pond looking east from Pad E/P. There is a large rock at the bottom of the pond in the foreground



Salt burn along the east side of the Secondary Road with Sump #2 in the background

A large rock on the exposed liner at the north corner of the Sediment Control Pond

Panoramic view of the pollution and sediment control ponds from the north end of the divider berm

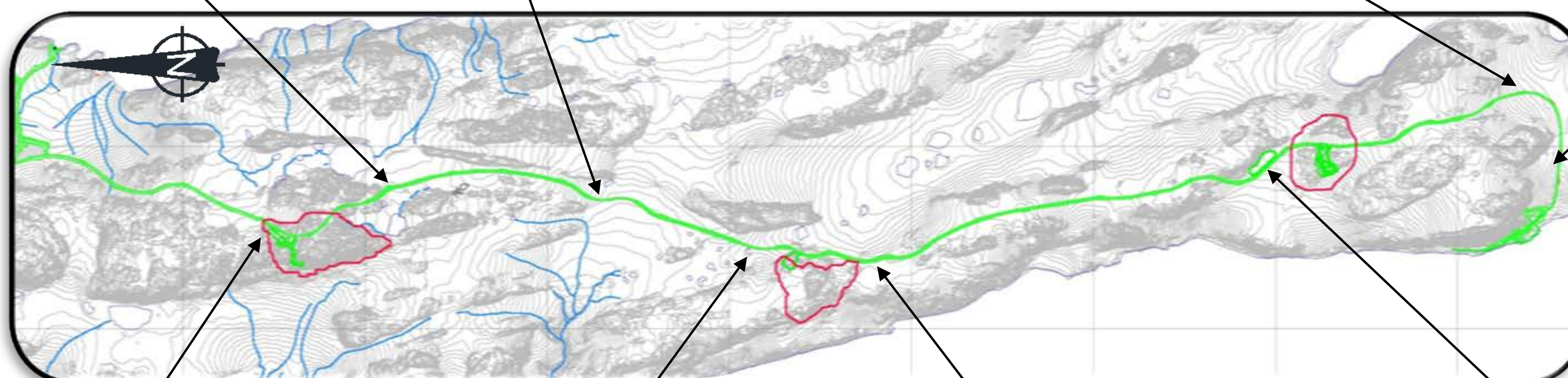
srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	HOPE BAY MINING LTD.	**Sedimentation and Pollution Control Ponds**
		Date: March 2014 · Approved: LW · Figure: 18

Aerial view of the arched culvert at Stream Crossing #1 – looking east

Aerial view of the two bridges at Stream Crossings #2 and #3

Doris-Windy Road leading to Windy Camp. Surface material has been placed to the end of the road alignment

Aerial view of the Core Storage Area and old Drill Cutting Sump



Looking south along the Doris-Windy Road towards Quarry A

Aerial view of the single bridge at Stream Crossing #4 – looking east

The Doris-Windy Road just past Quarry B – looking south towards Windy Camp

Core boxes being stored on Overburden Dump at Quarry D

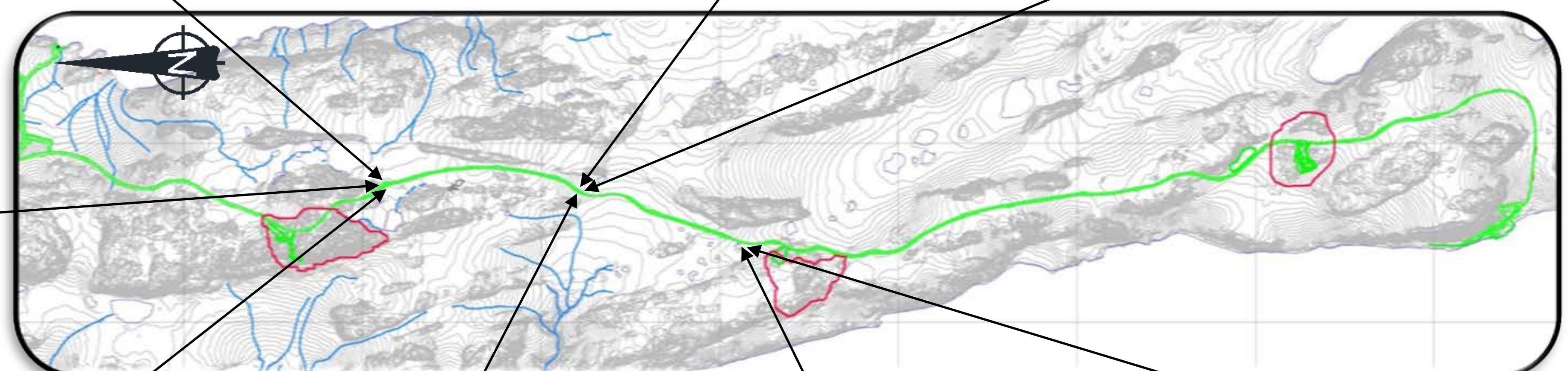
srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
		Doris-Windy All Weather Road
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 · Approved: LW · Figure: **19**

Condition of the battered and straight piles along the north and south sides of Arched Culvert #1

The condition of the north abutment of the bridge over Stream Crossing #2

Ponded water against the south abutment of the bridge over Stream Crossing #3

Arched Culvert #1 – looking east



Water running against the north side of Arched Culvert #1

The abutments between the two bridges over Stream Crossings #2 and #3. Water is ponded against the abutment at the toe.

The north abutment of the bridge over Stream Crossing #4

The south abutment of the bridge over Stream Crossing #4

srk consulting

Job No: 1CT022.000

Filename: 2013GeotechInsp_rev02_sw.pptx

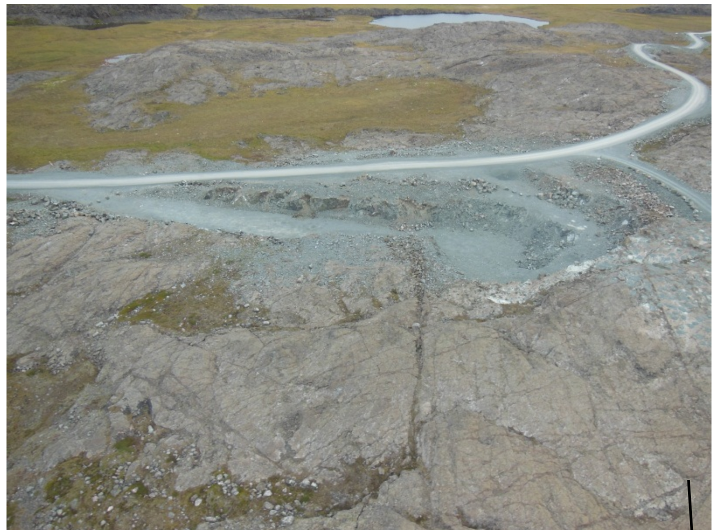
TMAC RESOURCES

HOPE BAY MINING LTD.

2013 Geotechnical Inspection

Doris-Windy All Weather Road Stream Crossings

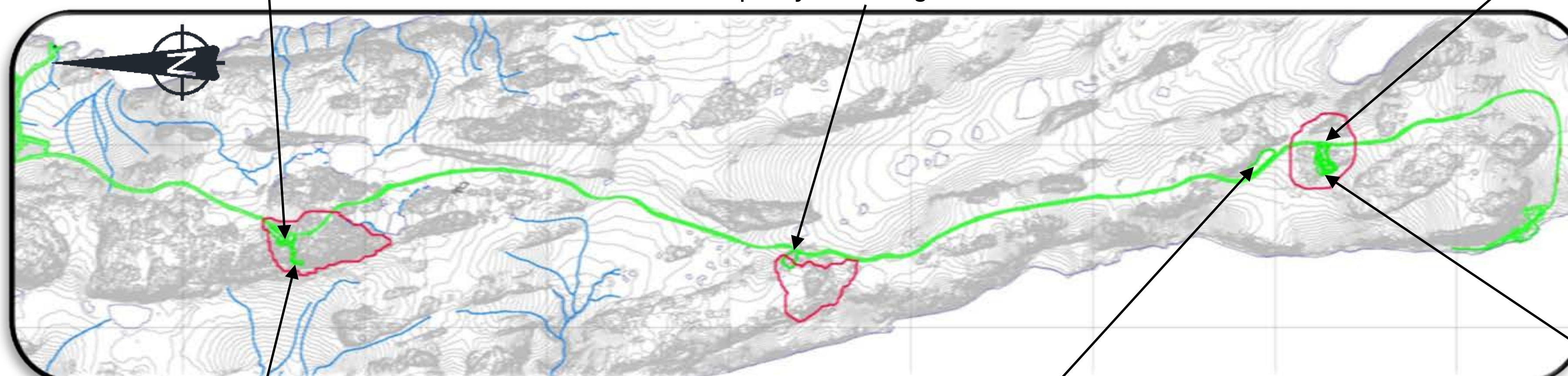
Date:	Approved:	Figure:
March 2014	LW	20



Aerial view of Quarry A and the Doris-Windy Road – Looking east

Quarry B with seismic monitoring stations. There is water against the high wall at the back of the quarry – looking north

Aerial view of Quarry D with core box storage – looking west



Aerial view of the south end of Quarry A with two type 4 Explosive Magazines – looking east

Quarry D Overburden Stockpile with core box storage – looking north

Aerial view of Quarry D with core box storage – looking south

srk consulting

TMAC RESOURCES

2013 Geotechnical Inspection

Doris-Windy All Weather Road Quarries

Job No: 1CT022.000

Filename: 2013GeotechInsp_rev02_sw.pptx

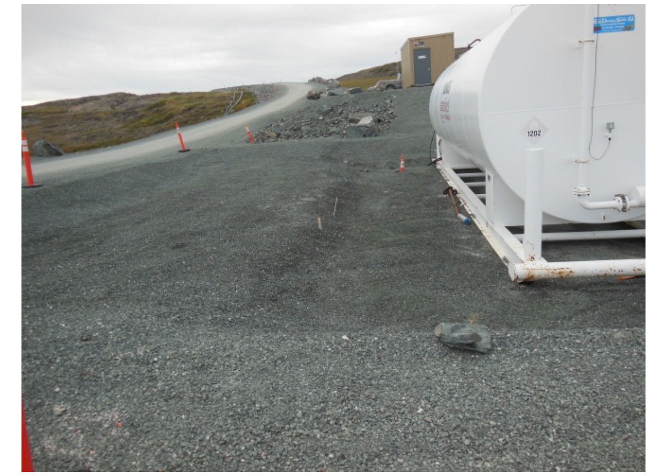
HOPE BAY MINING LTD.

Date: March 2014

Approved: LW

Figure: 21

The condition of the rock gabions on the southwest side of the Doris Creek Bridge west abutment



Primary Vent Raise Fuel Transfer Station – looking west

Aerial view of the Secondary Road slope failure

The condition of the rock gabions on the northeast side of the Doris Creek Bridge east abutment

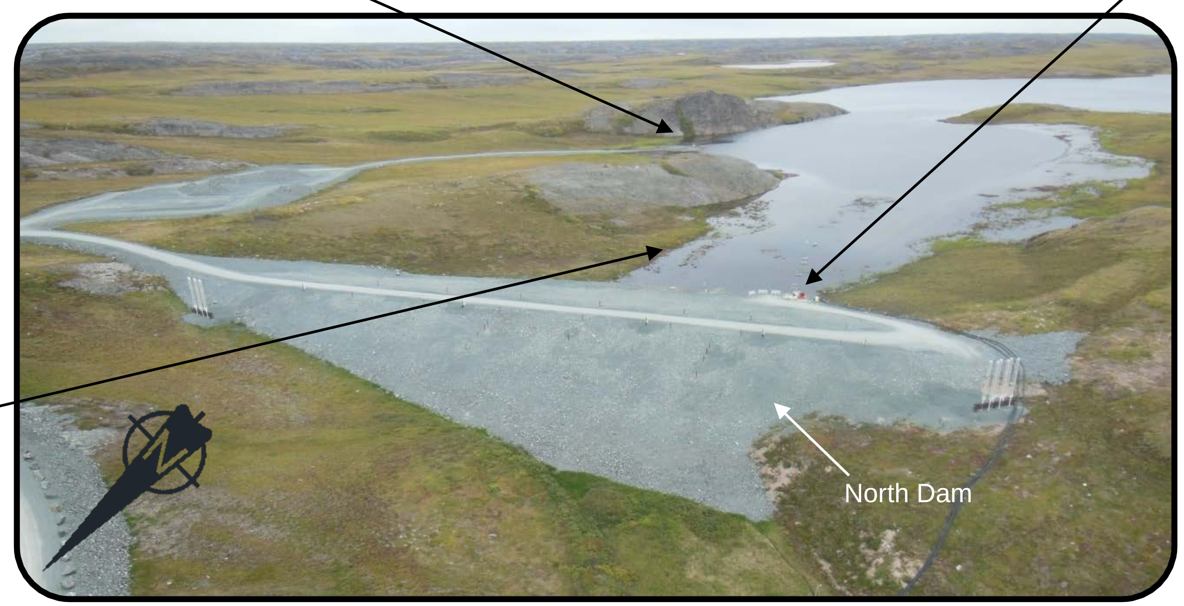
Panoramic view of the high wall at the north end of the Primary Vent Raise

srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
		Secondary Road and Doris Creek Bridge
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 / Approved: LW / Figure: 22

Aerial view of Tail Lake Access Road – looking northwest towards Doris North Camp

Aerial view of the south end of Tail Lake – looking south east

Pump station and water intake line located along the upstream toe at the west side of the North Dam. The condition of the Tail Lake Shoreline is in the background



The west side of Tail Lake along the upstream toe of the North Dam – looking south

Aerial view of the south end of Tail Lake – looking southwest

srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
		Tail Lake Access Road and Shoreline Erosion
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014 · Approved: LW · Figure: 23

Pump station and water intake line located along the upstream toe at the west side of the North Dam

Upstream face of the North Dam – looking west

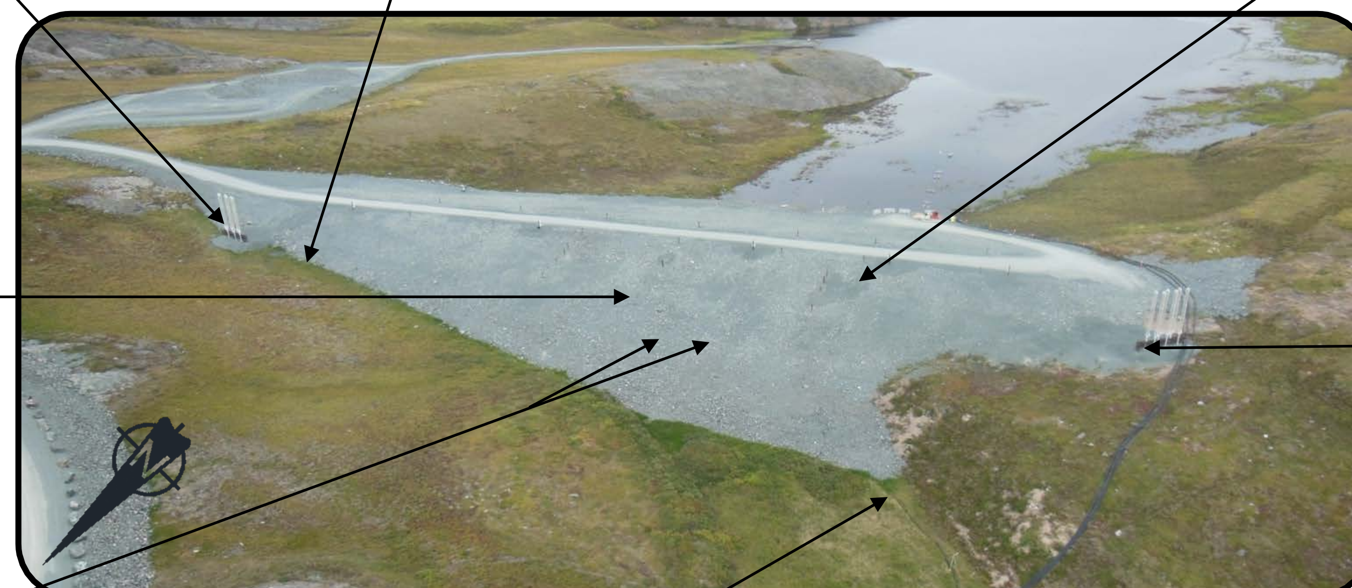
srk consulting	MAC RESOURCES	2013 Geotechnical Inspection
Job No: 1CT022.000	HOPE BAY MINING LTD.	**North Dam Upstream**
Filename: 2013GeotechInsp_rev02_sw.pptx		Date: March 2014 / Approved: LW / Figure: 24

Condition of north radiator foundation. The surface contact thermistor bead appears to be exposed.

A roll of coconut matting along the down stream toe of the North Dam

Downstream face and instrumentation of the North Dam – looking east

Erosion around instrumentation casing ND-DSP-100



Condition of south radiator foundation – looking northwest with Doris Creek Bridge in the background

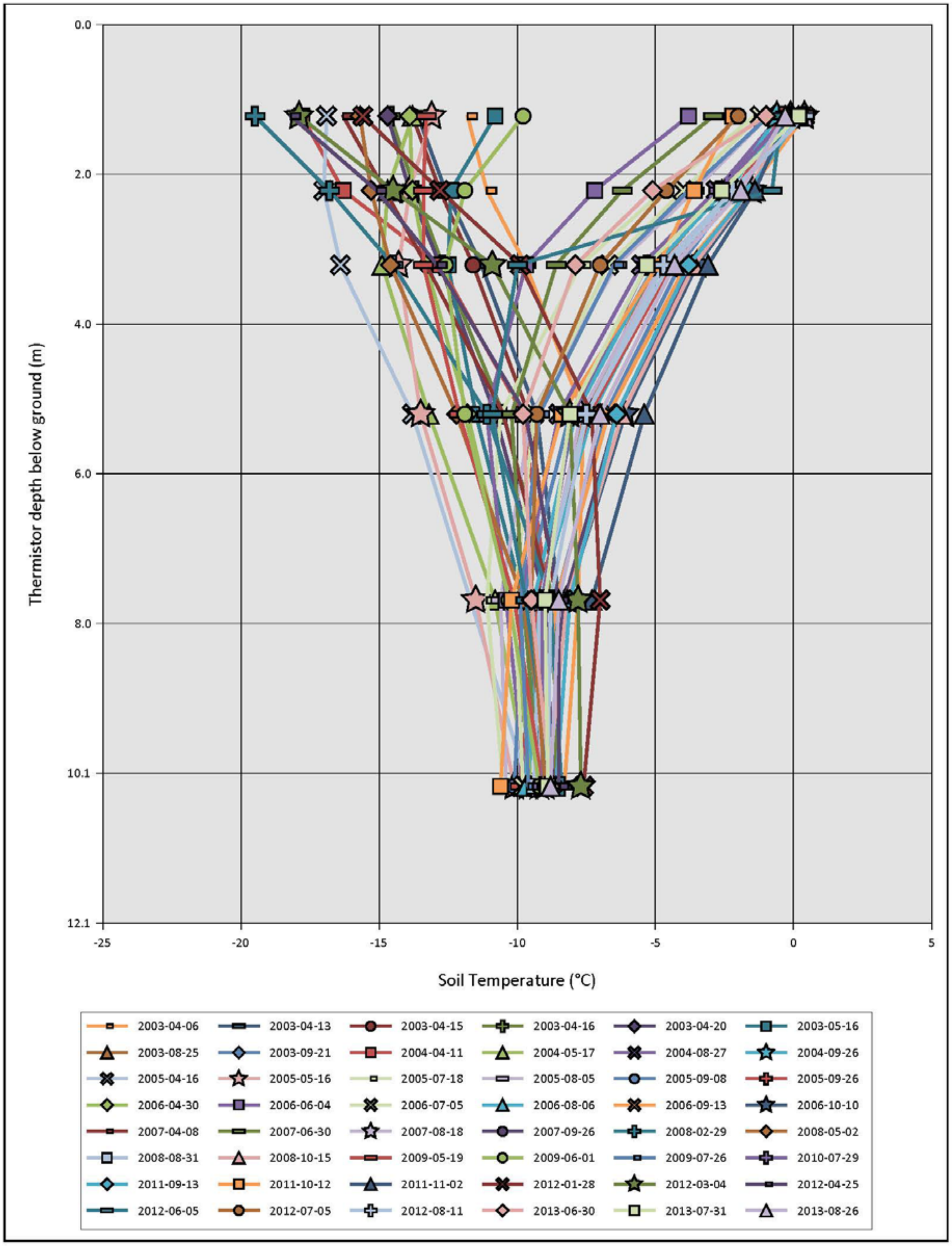
Sink holes in the downstream face of the North Dam

Tail Lake Creek downstream of the North Dam

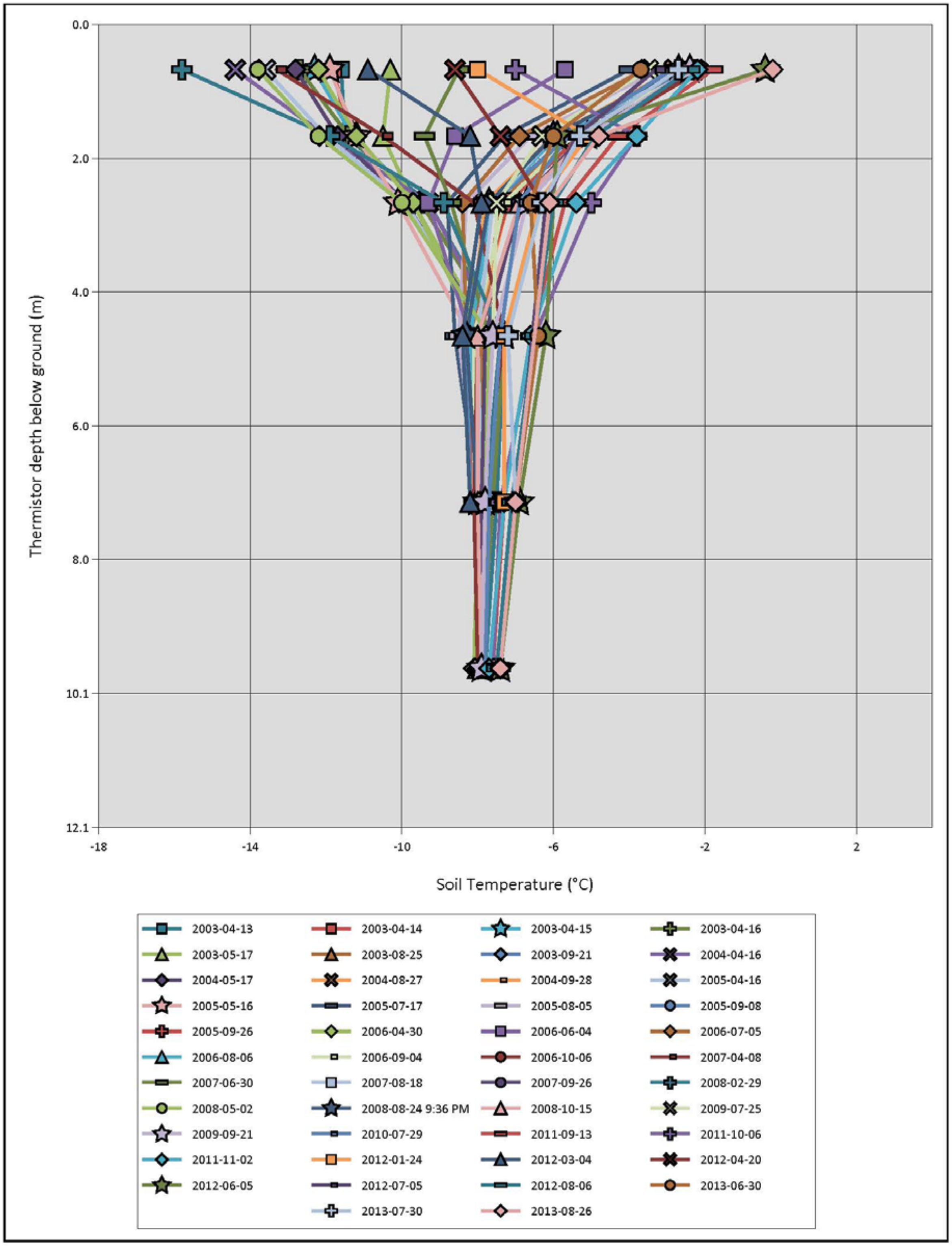
srk consulting	MAC RESOURCES	2013 Geotechnical Inspection		
		North Dam Downstream		
Job No: 1CT022.000 Filename: 2013GeotechInsp_rev02_sw.pptx	**HOPE BAY MINING LTD.**	Date: March 2014	Approved: LW	Figure: 25

Appendix A Active Thermistor Profiles

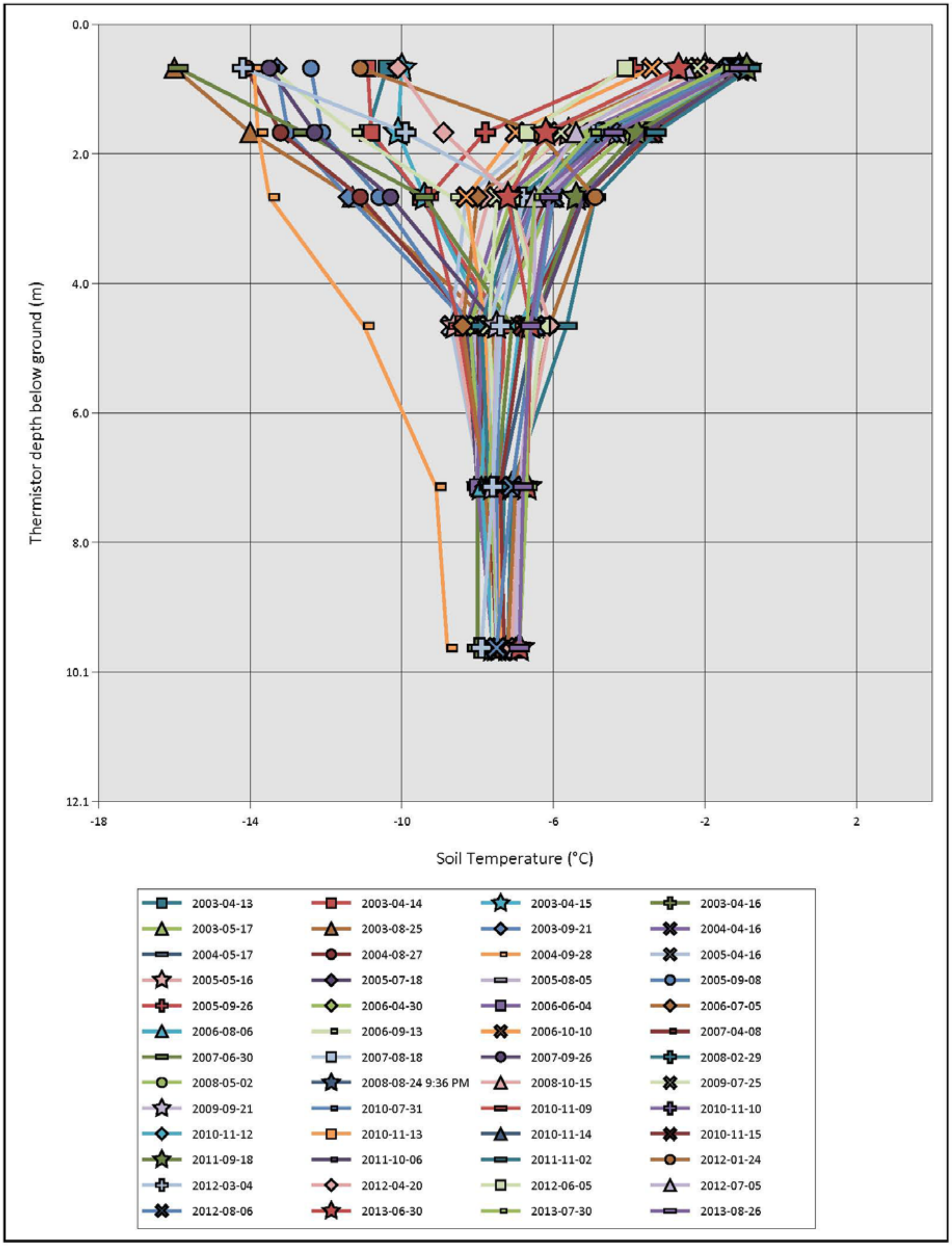
Thermistor Data (SRK-14)



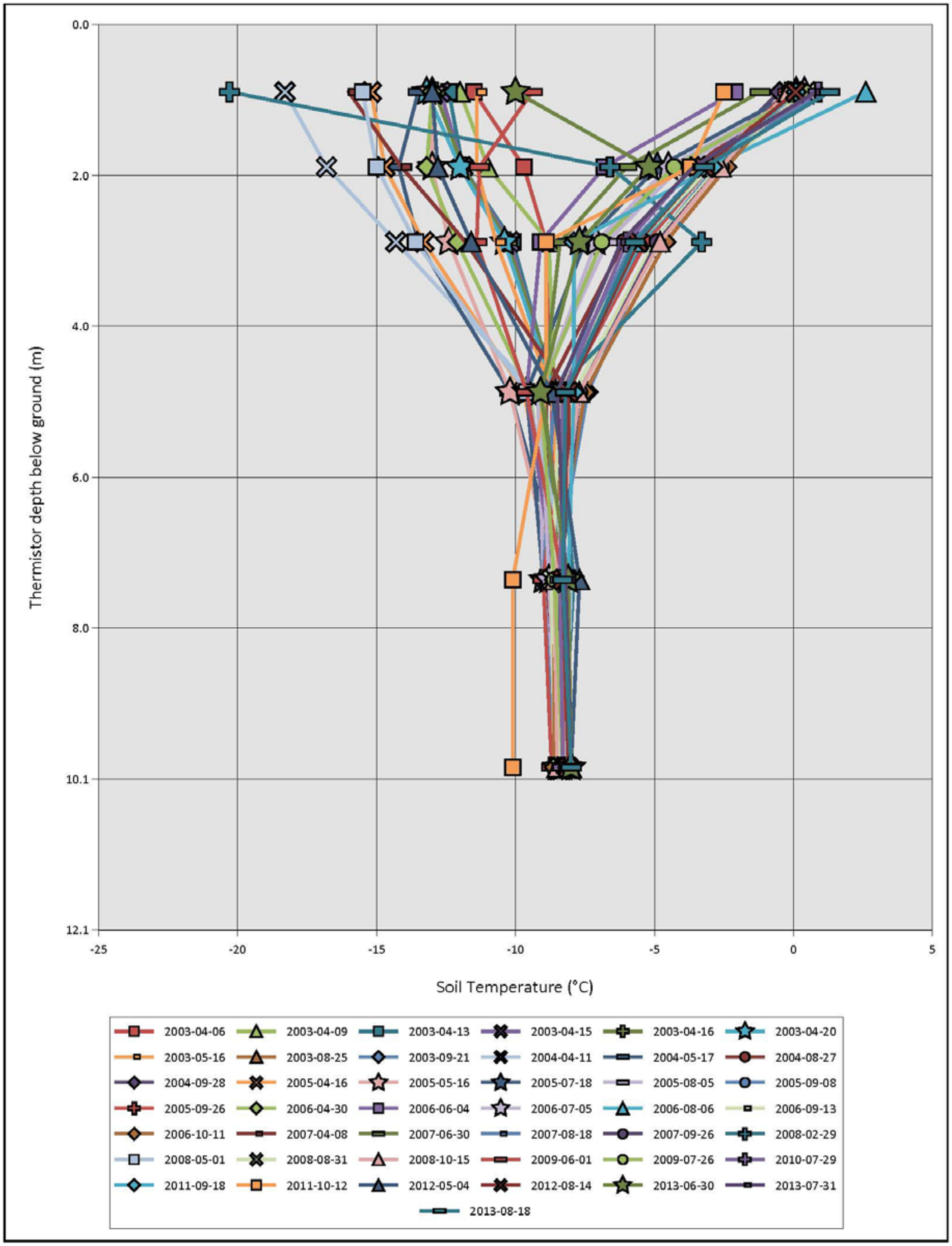
Thermistor Data (SRK-22)



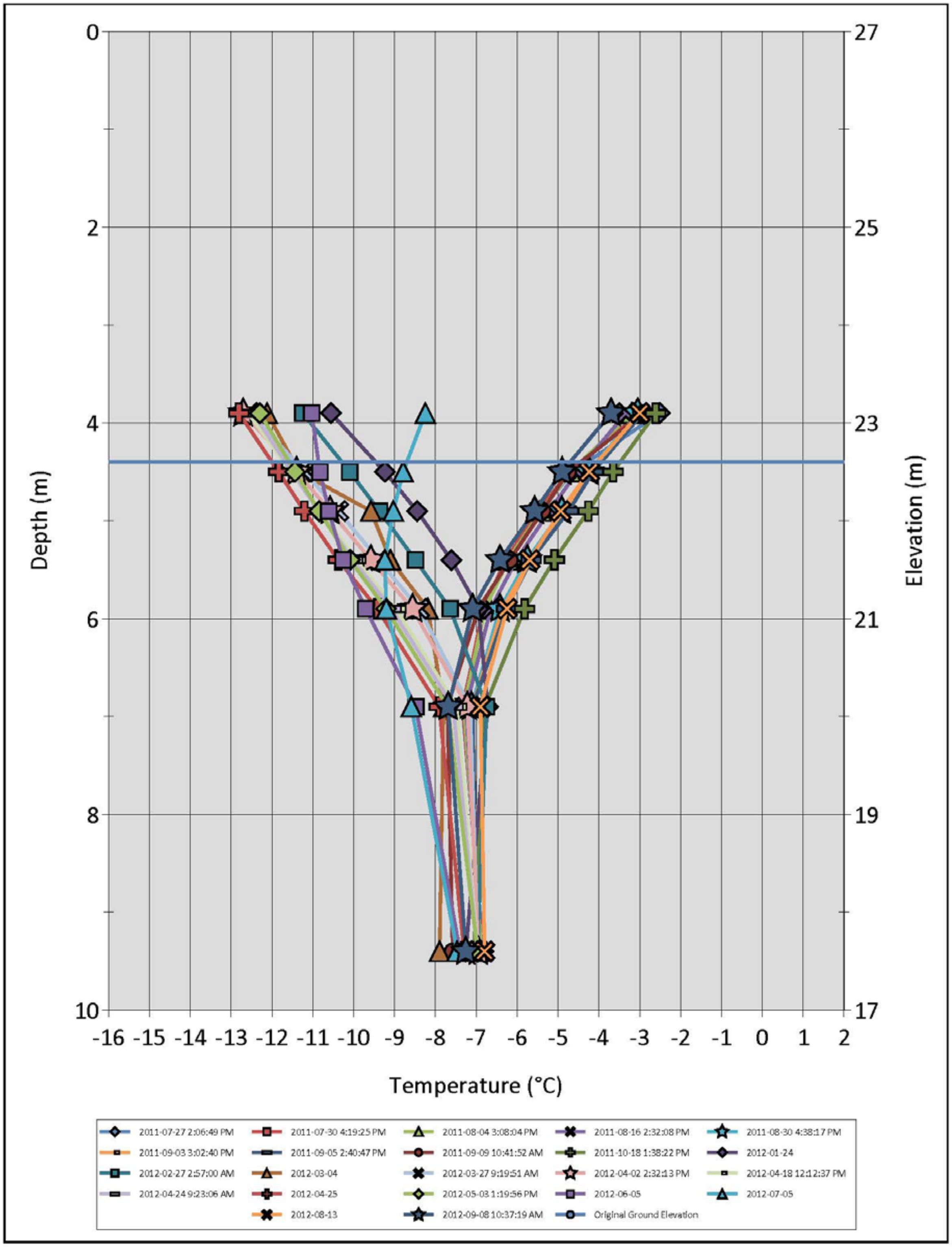
Thermistor Data (SRK-24)



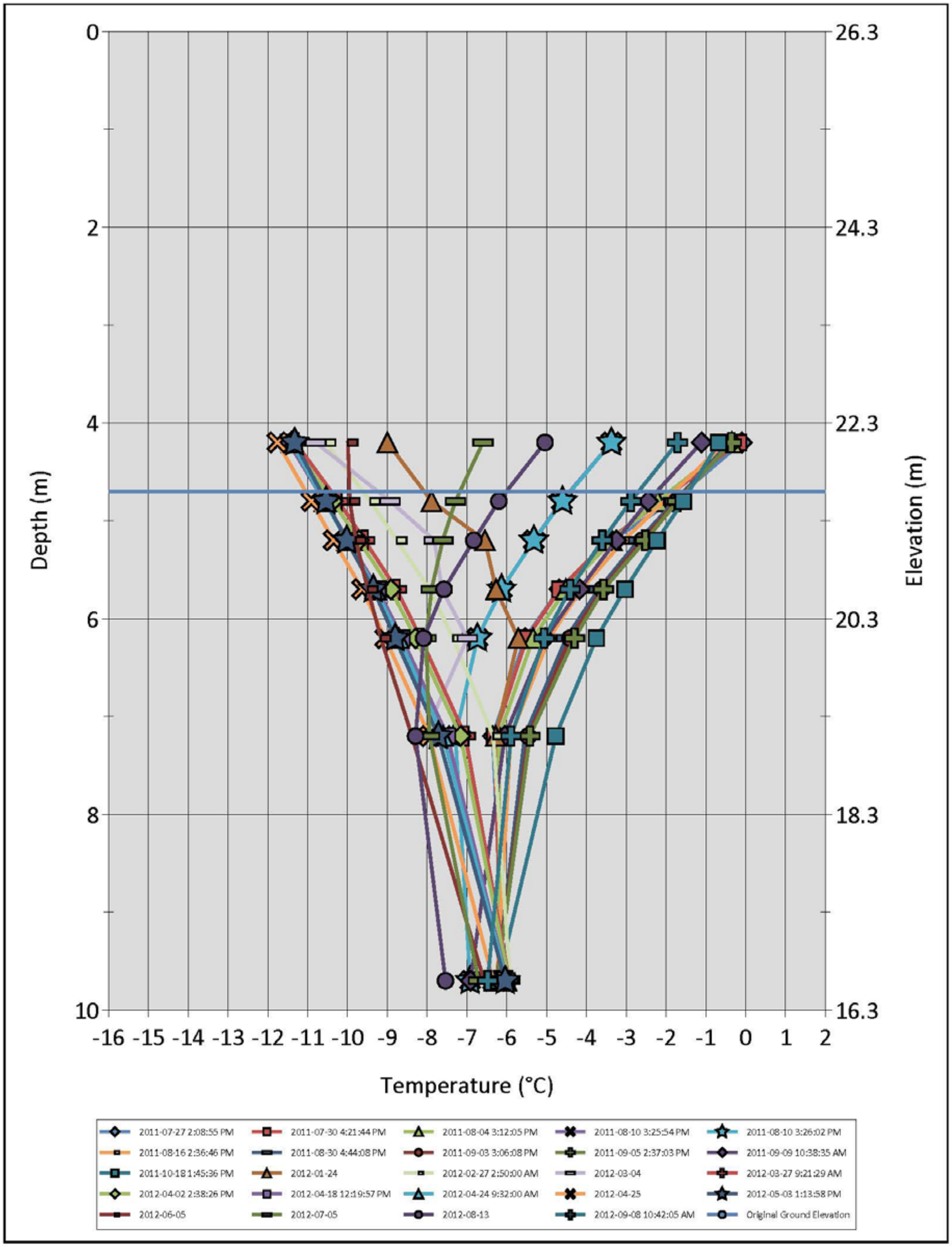
Thermistor Data (SRK-32)



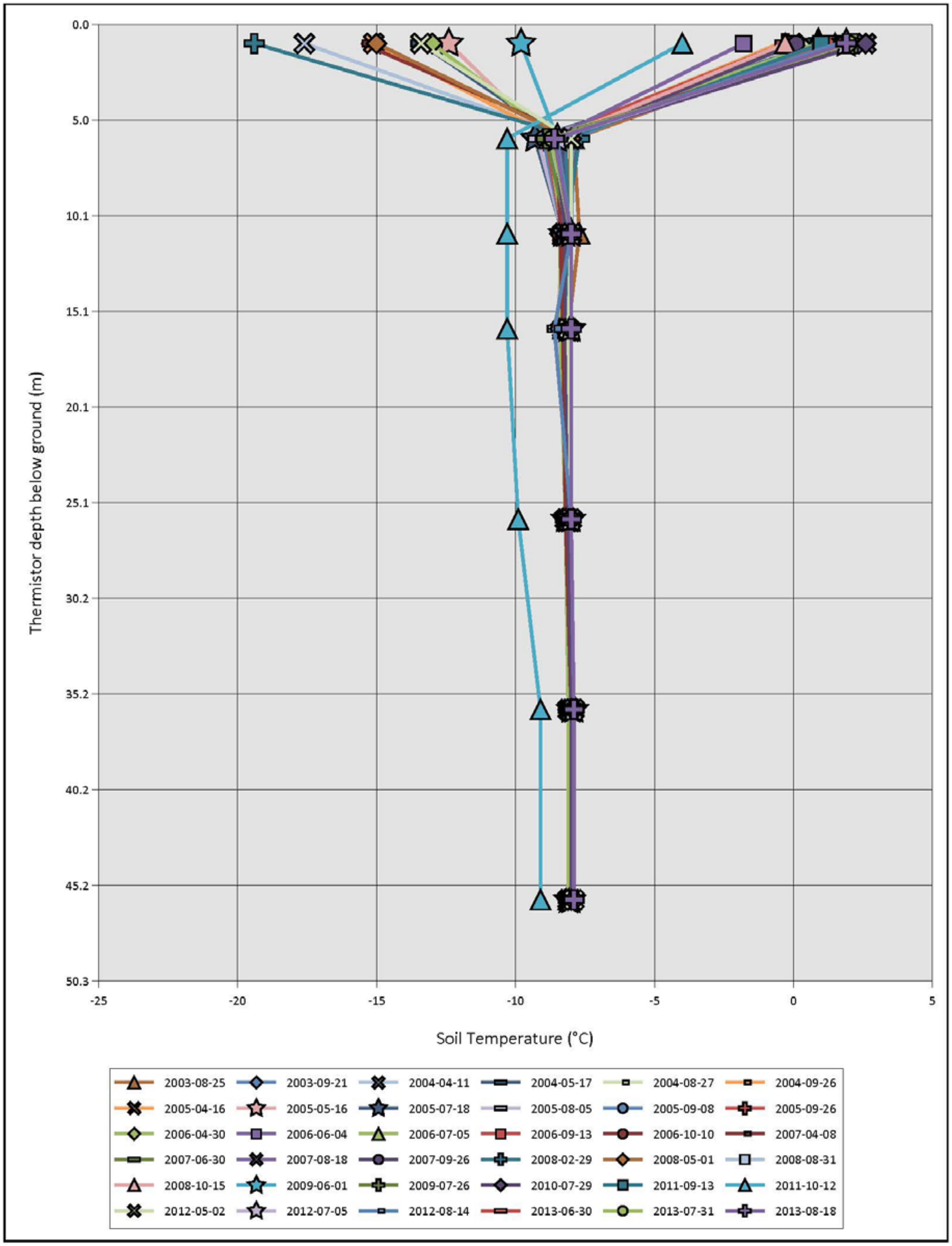
Thermistor Data (SRK 10-DCB2 / Doris Creek Bridge East)



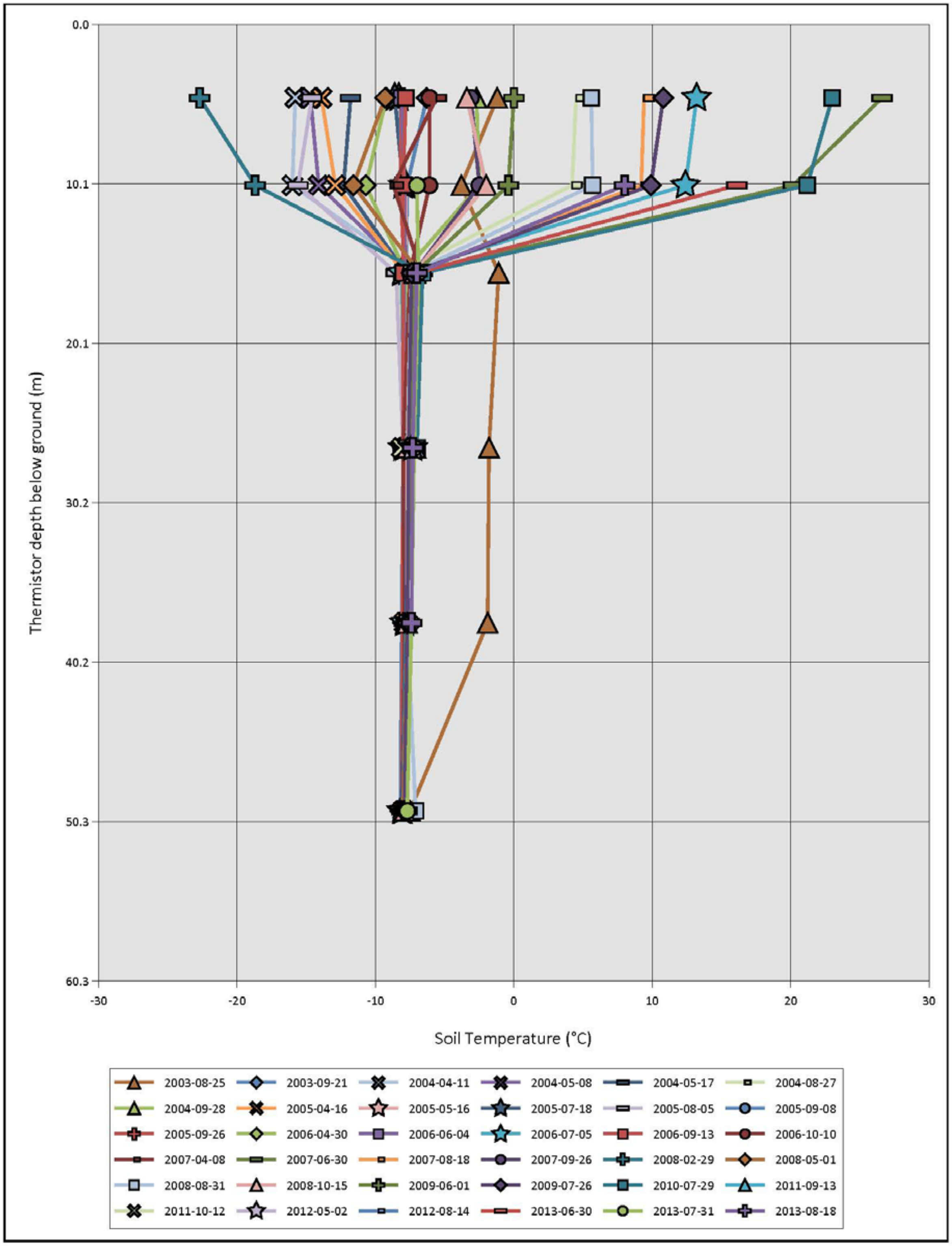
Thermistor Data (SRK 10-DCB1 / Doris Creek Bridge West)



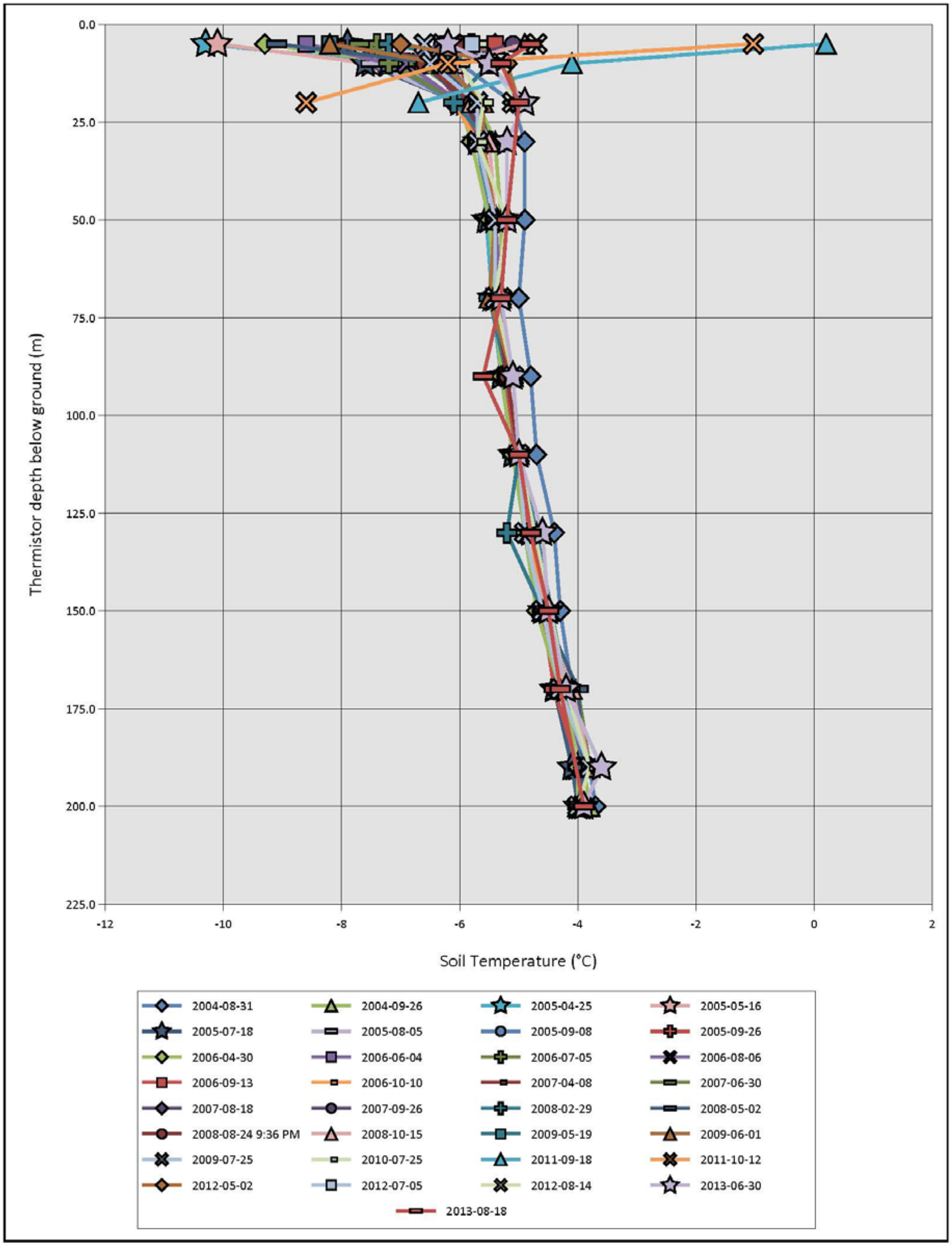
Thermistor Data (SRK-38)



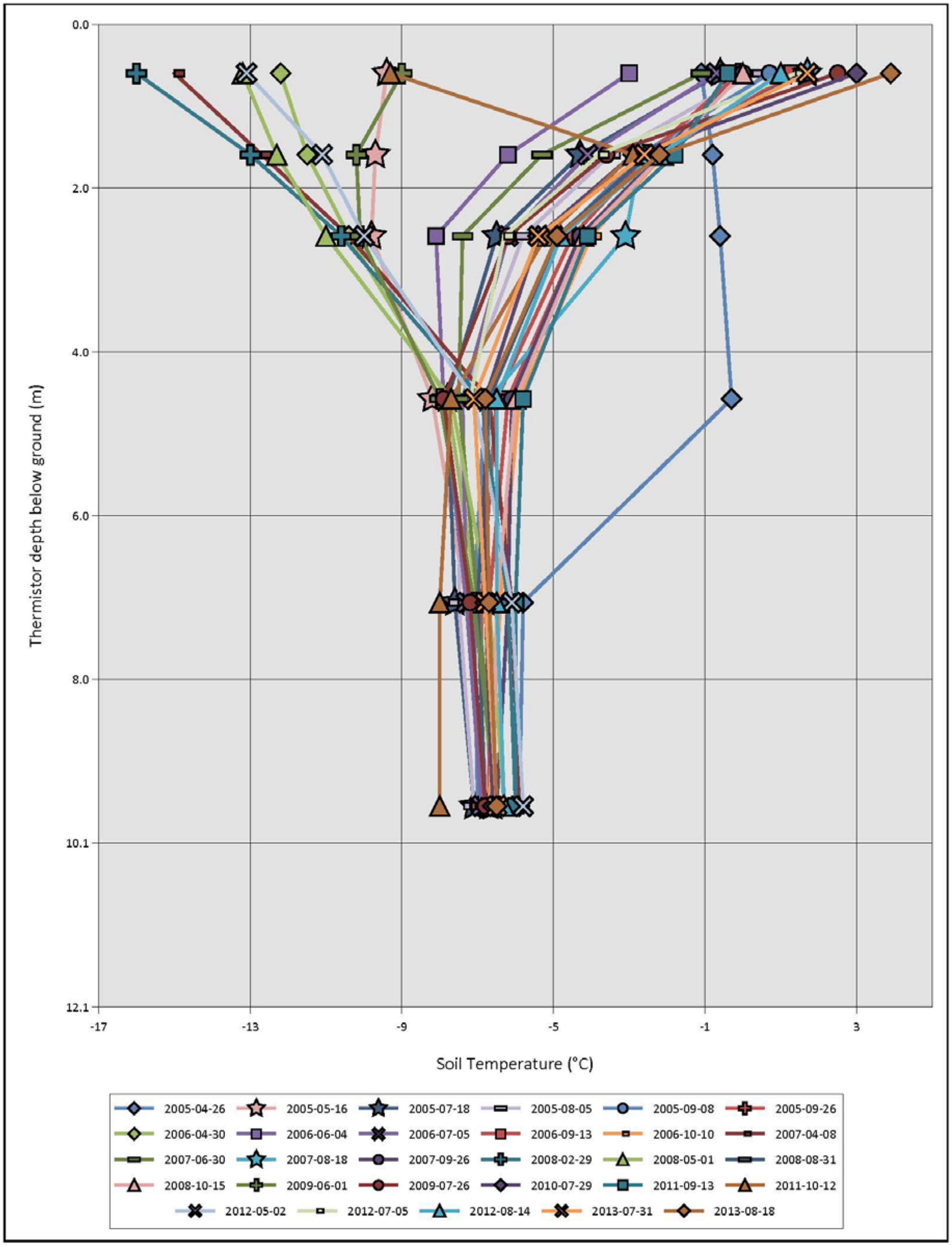
Thermistor Data (SRK-39)



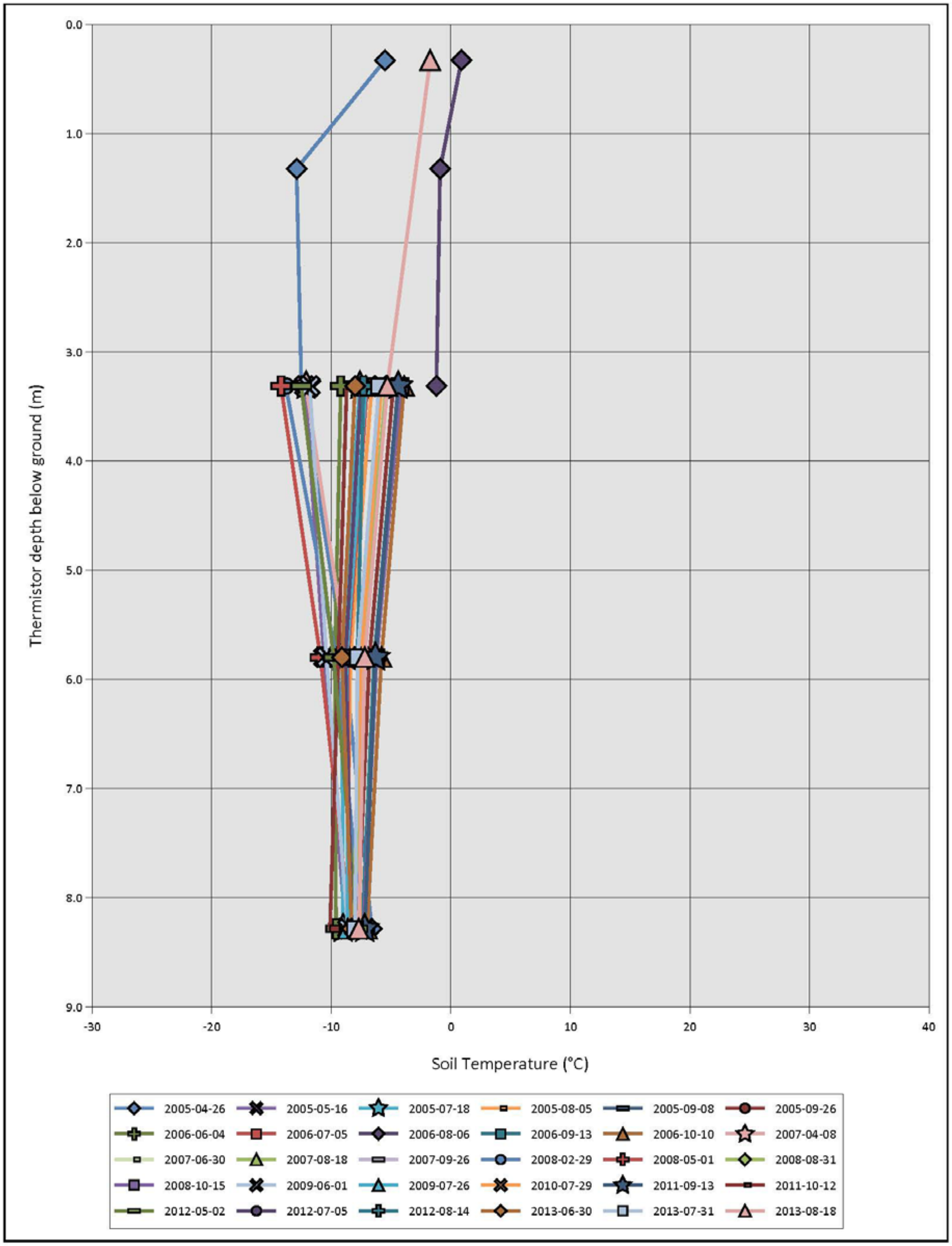
Thermistor Data (SRK-50)



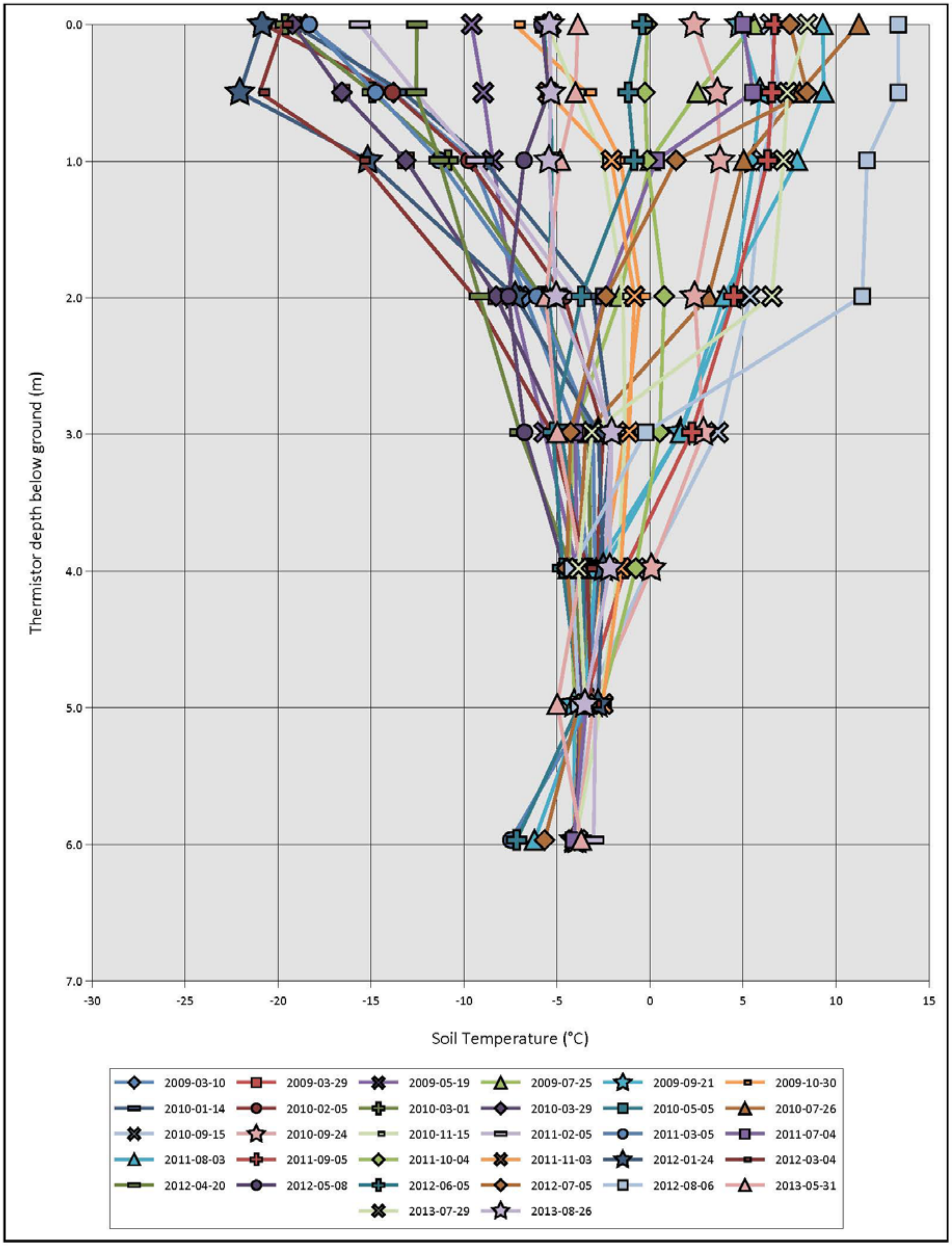
Thermistor Data (SRK-53)



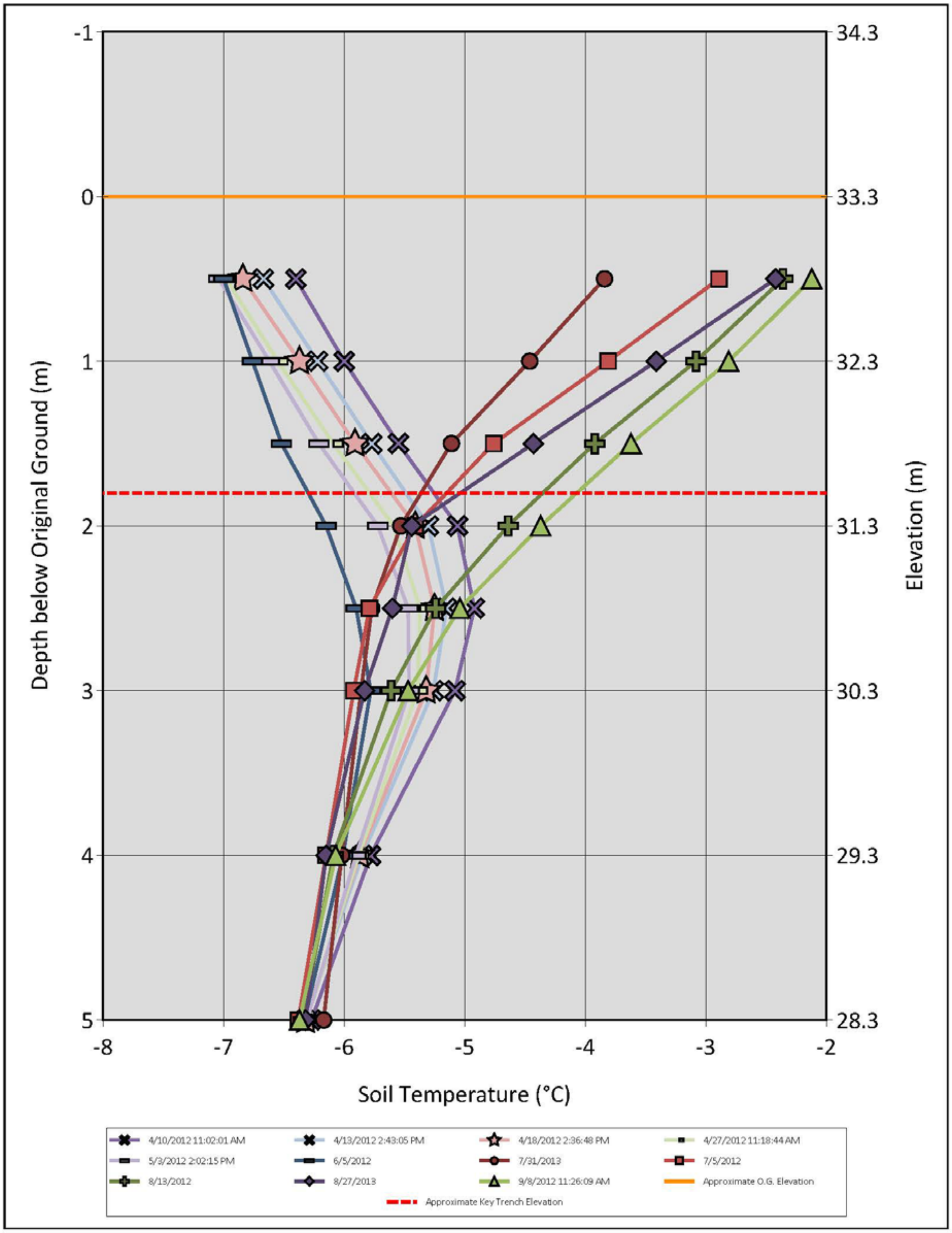
Thermistor Data (SRK-57)



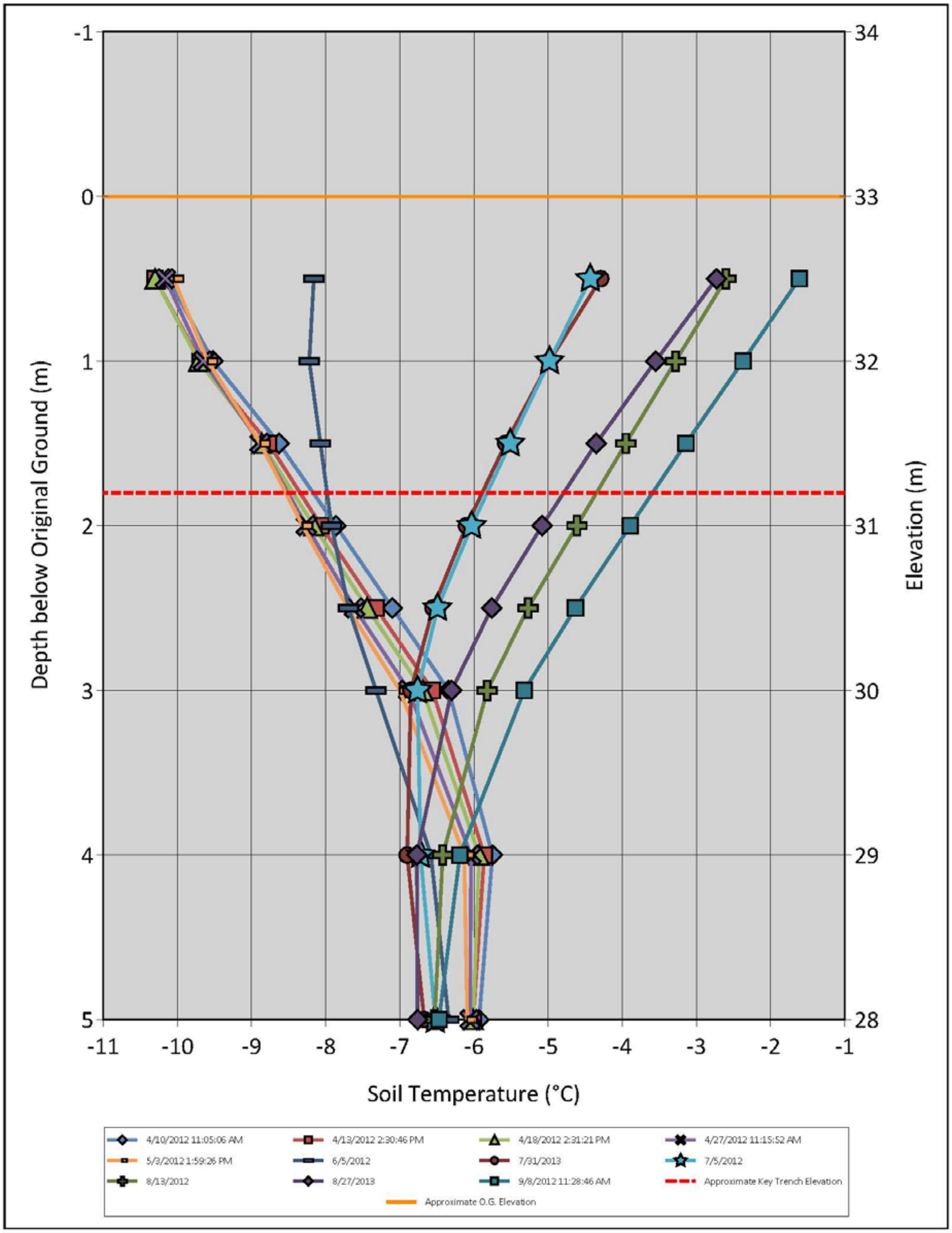
Thermistor Data (SRK-JT1-09)



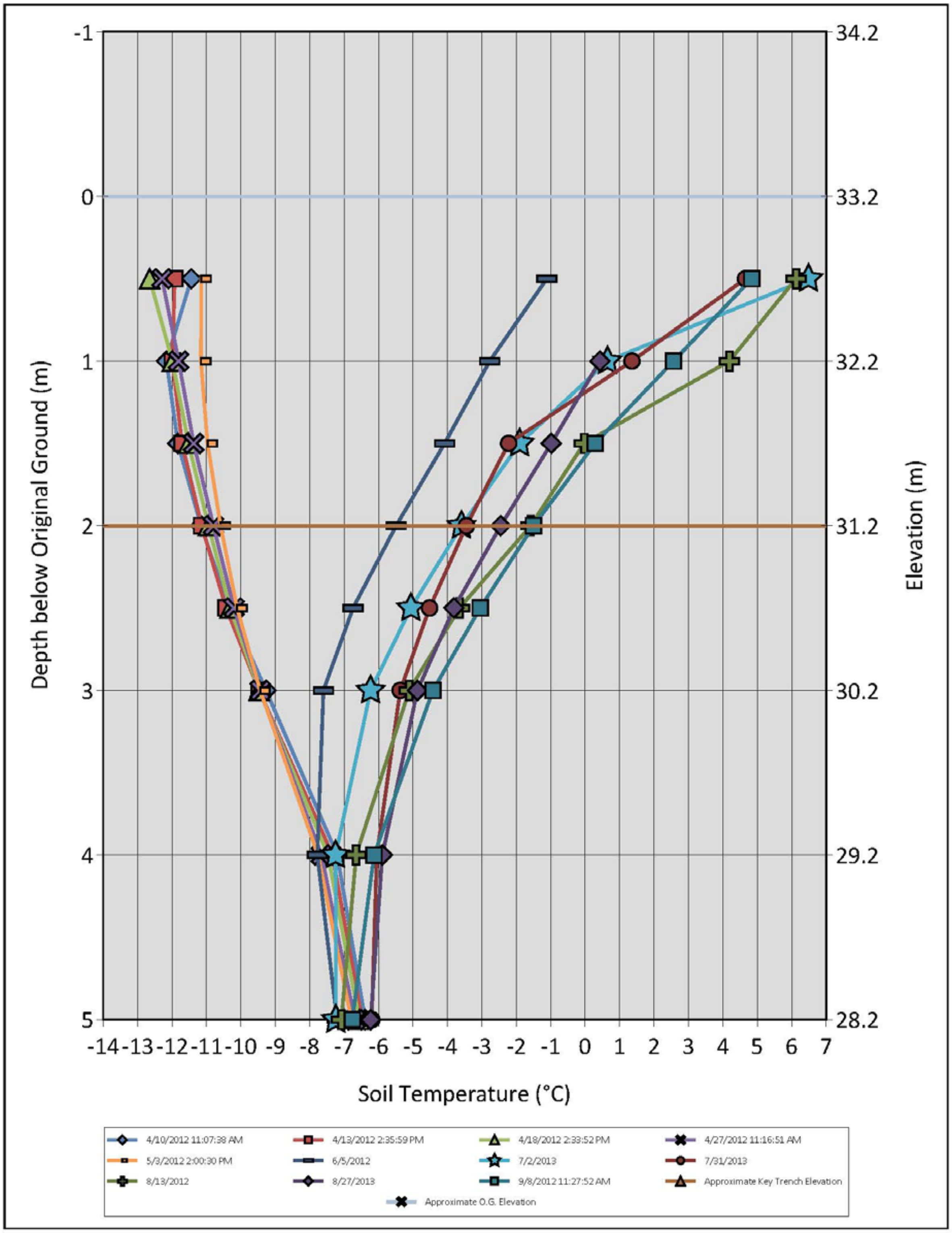
Thermistor Data (SRK-12-GTC-DH01)



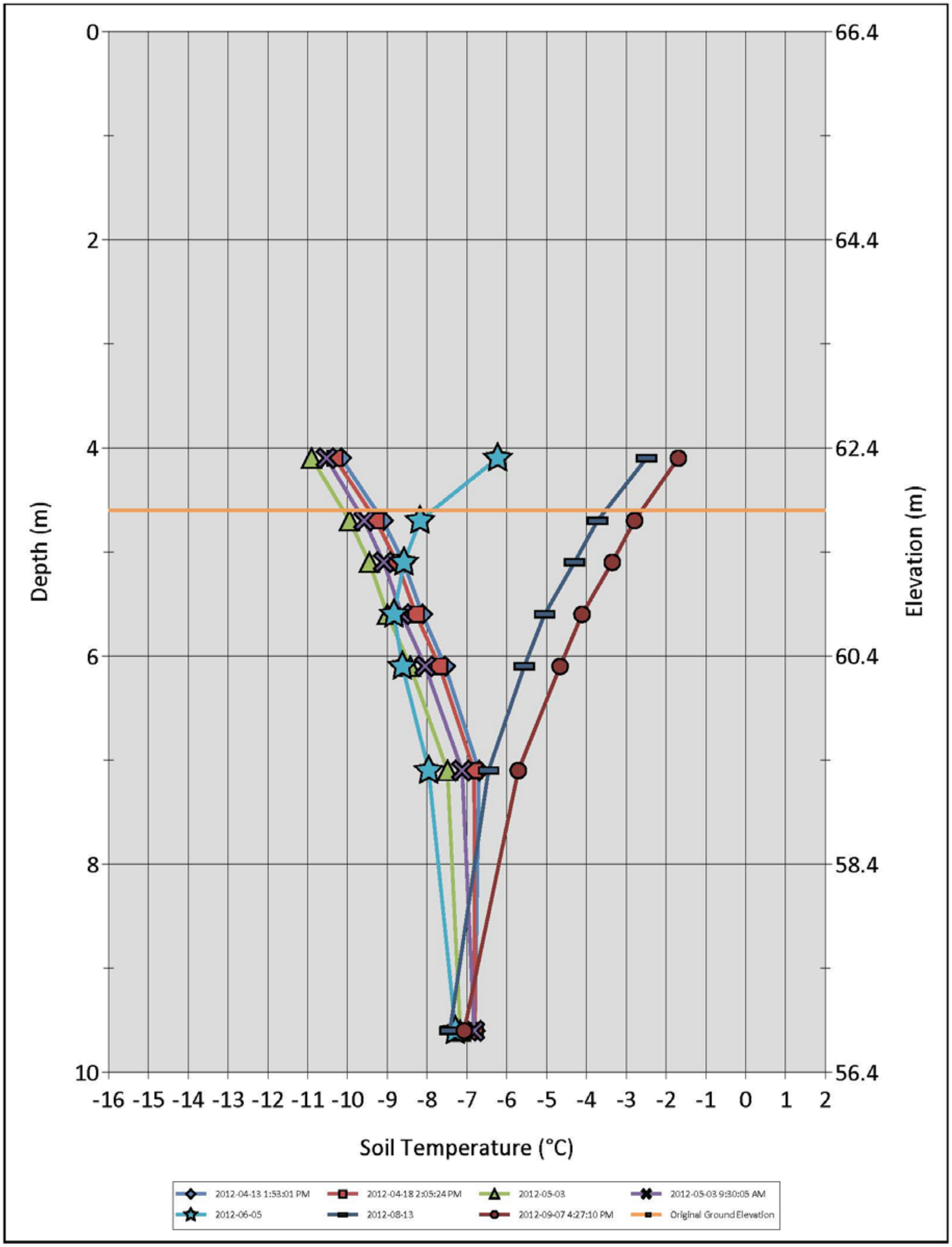
Thermistor Data (SRK-12-GTC-DH02)



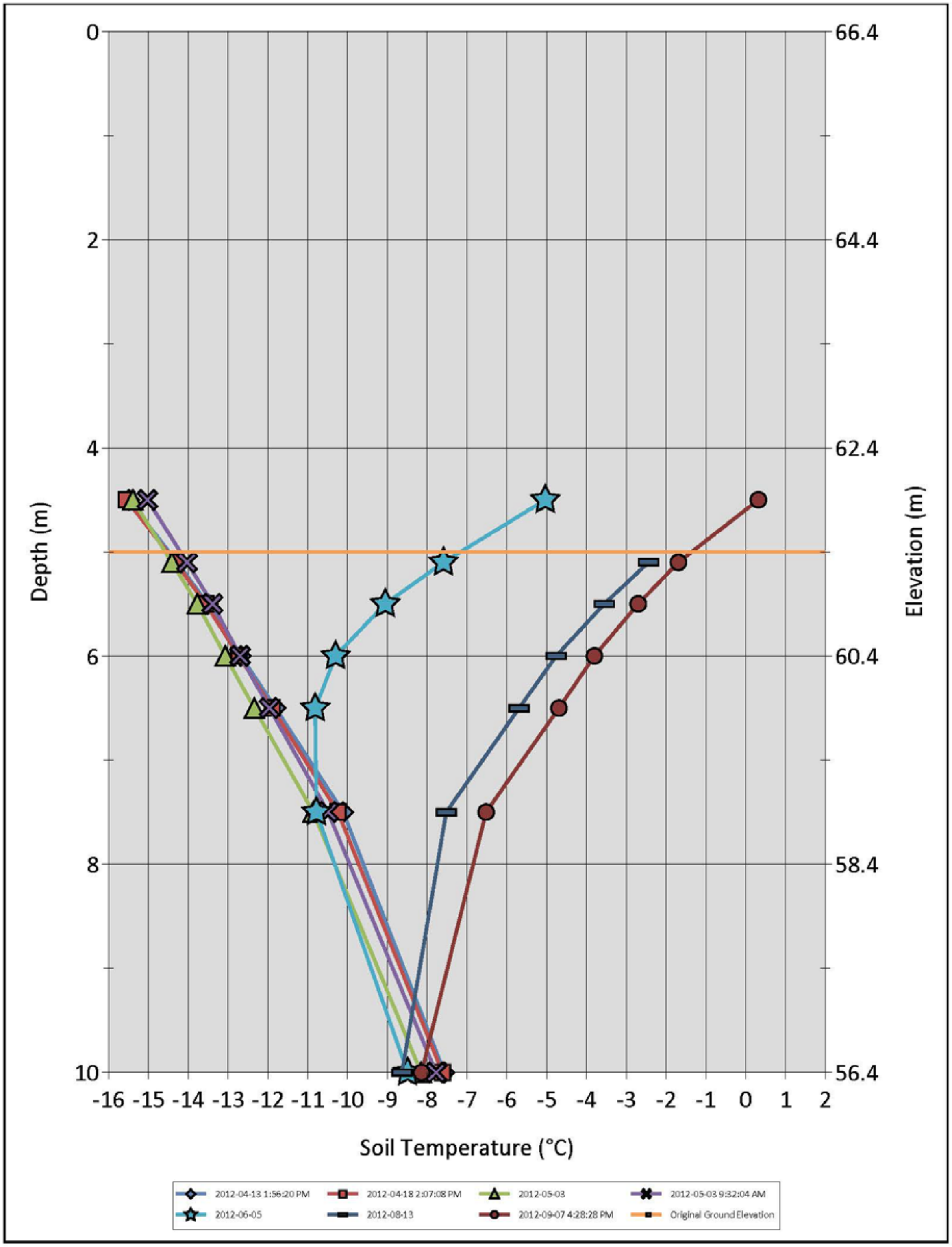
Thermistor Data (SRK-12-GTC-DH03)



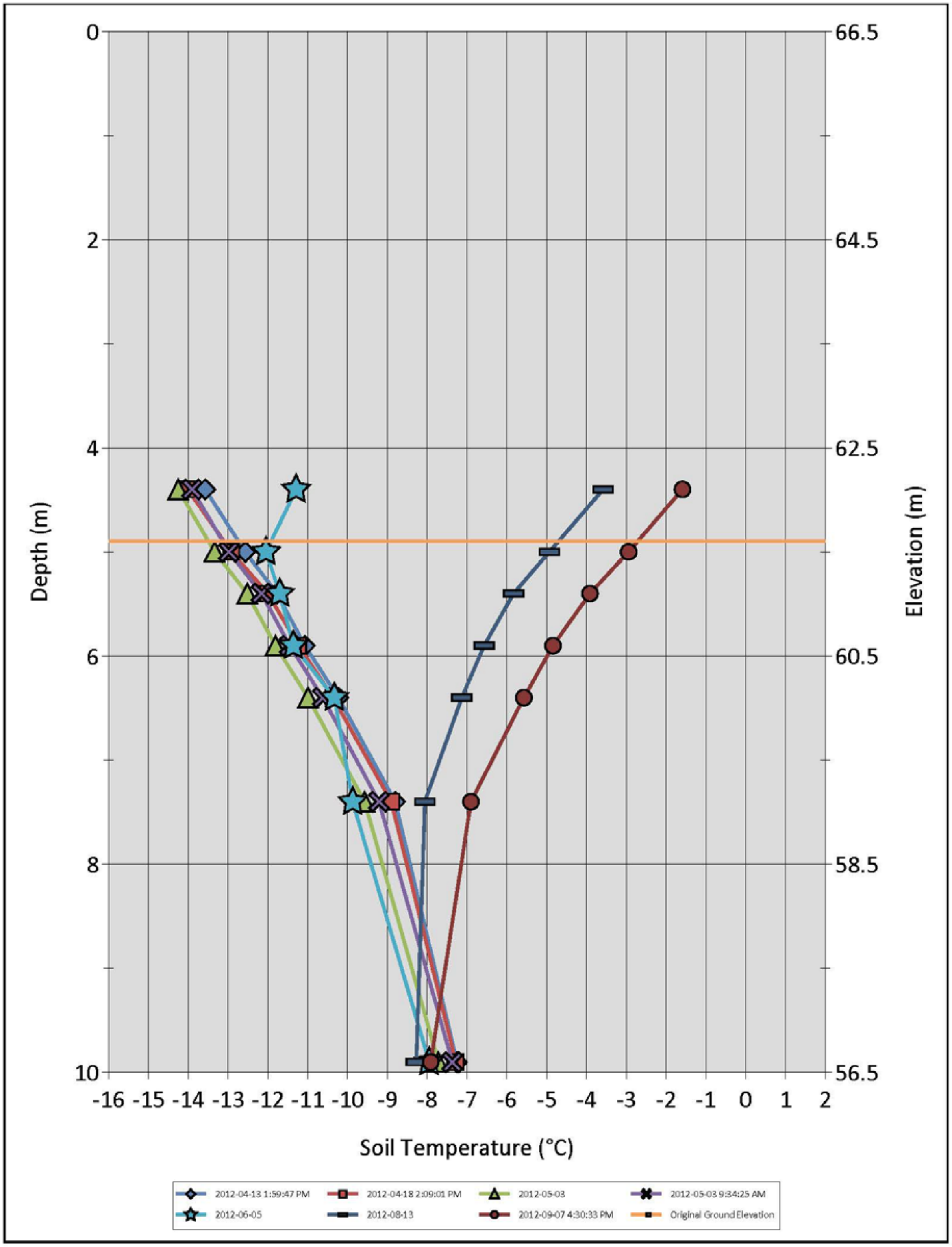
Thermistor Data (SRK10-DWB1)



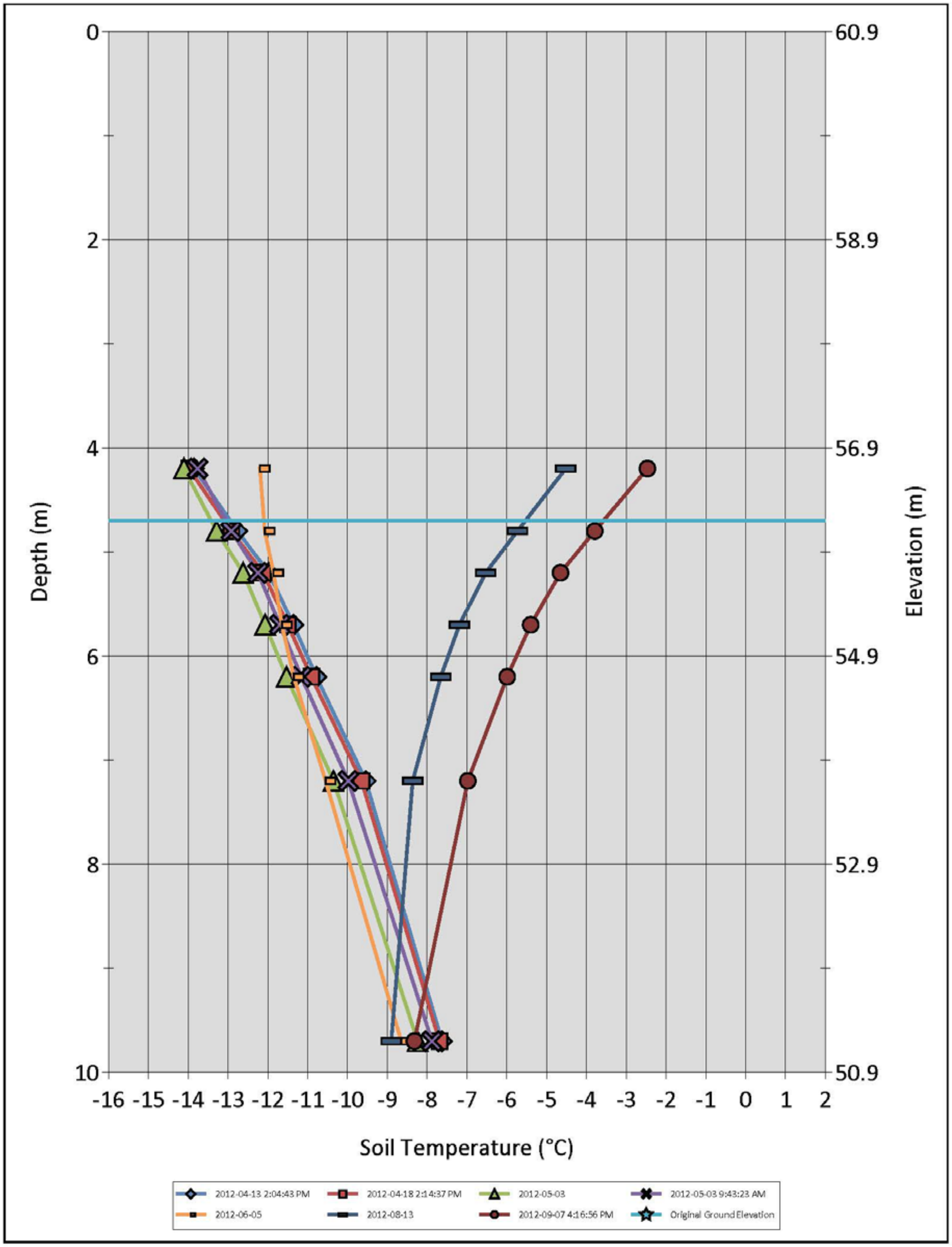
Thermistor Data (SRK10-DWB2)



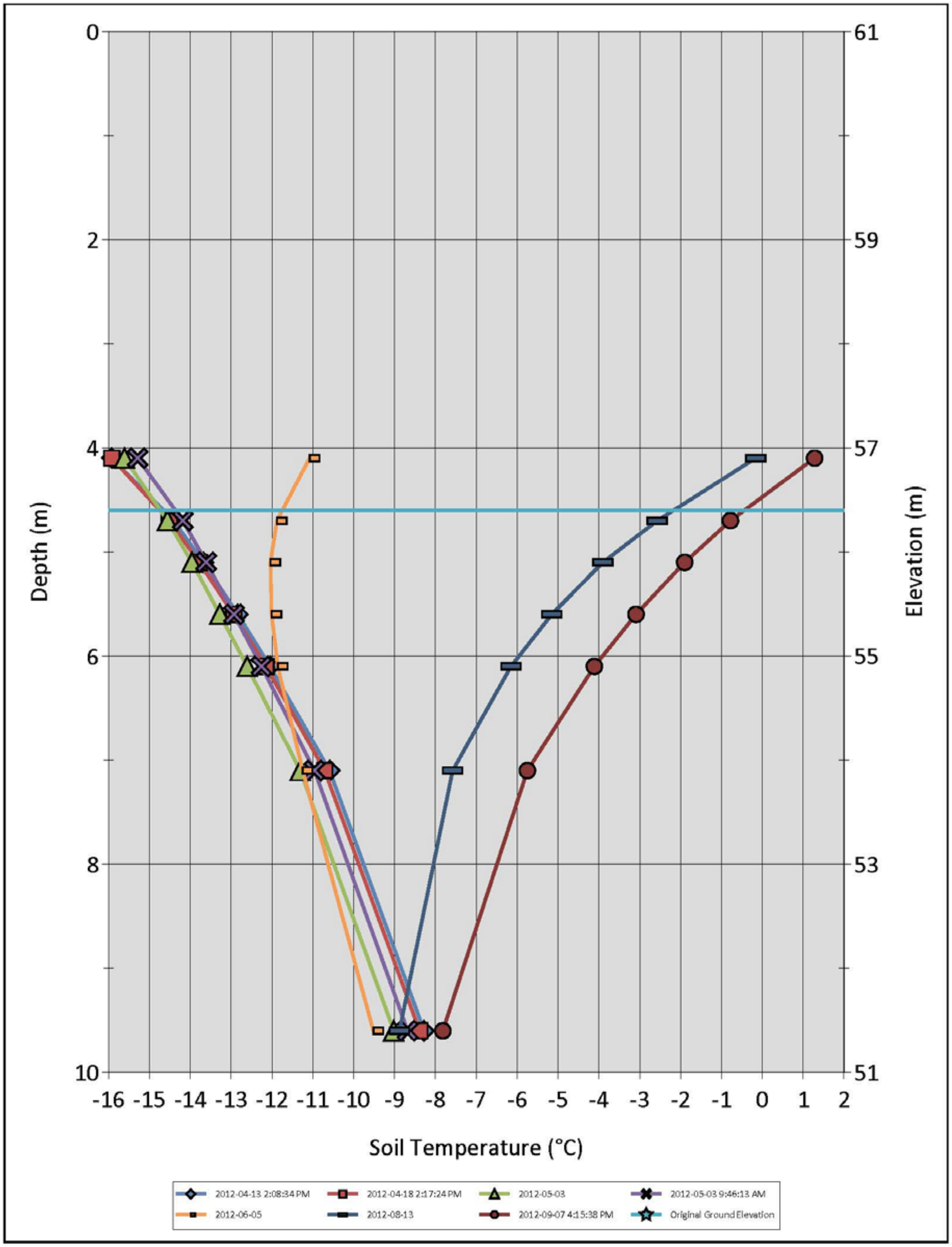
Thermistor Data (SRK10-DWB3)



Thermistor Data (SRK10-DWB4)

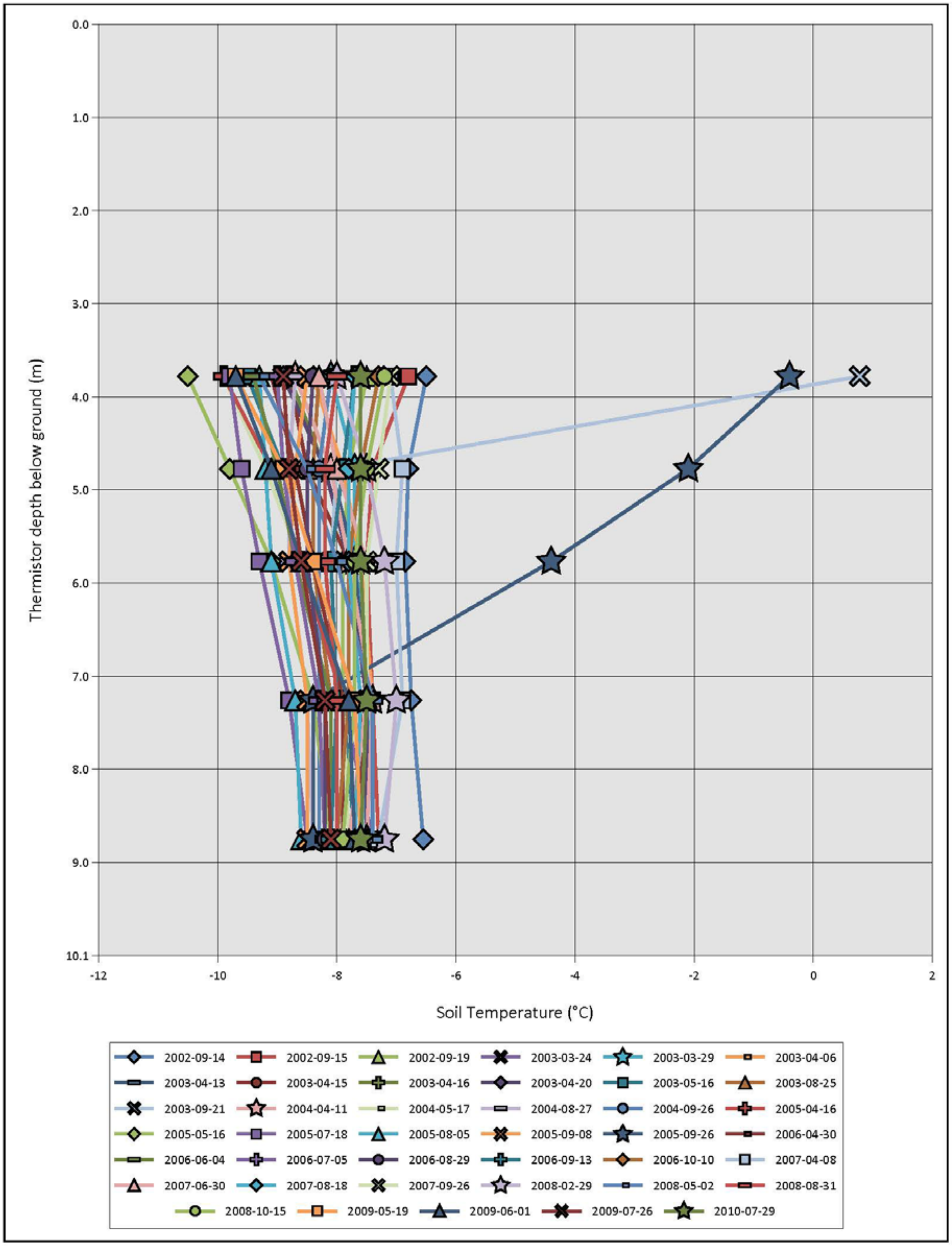


Thermistor Data (SRK10-DWB5)

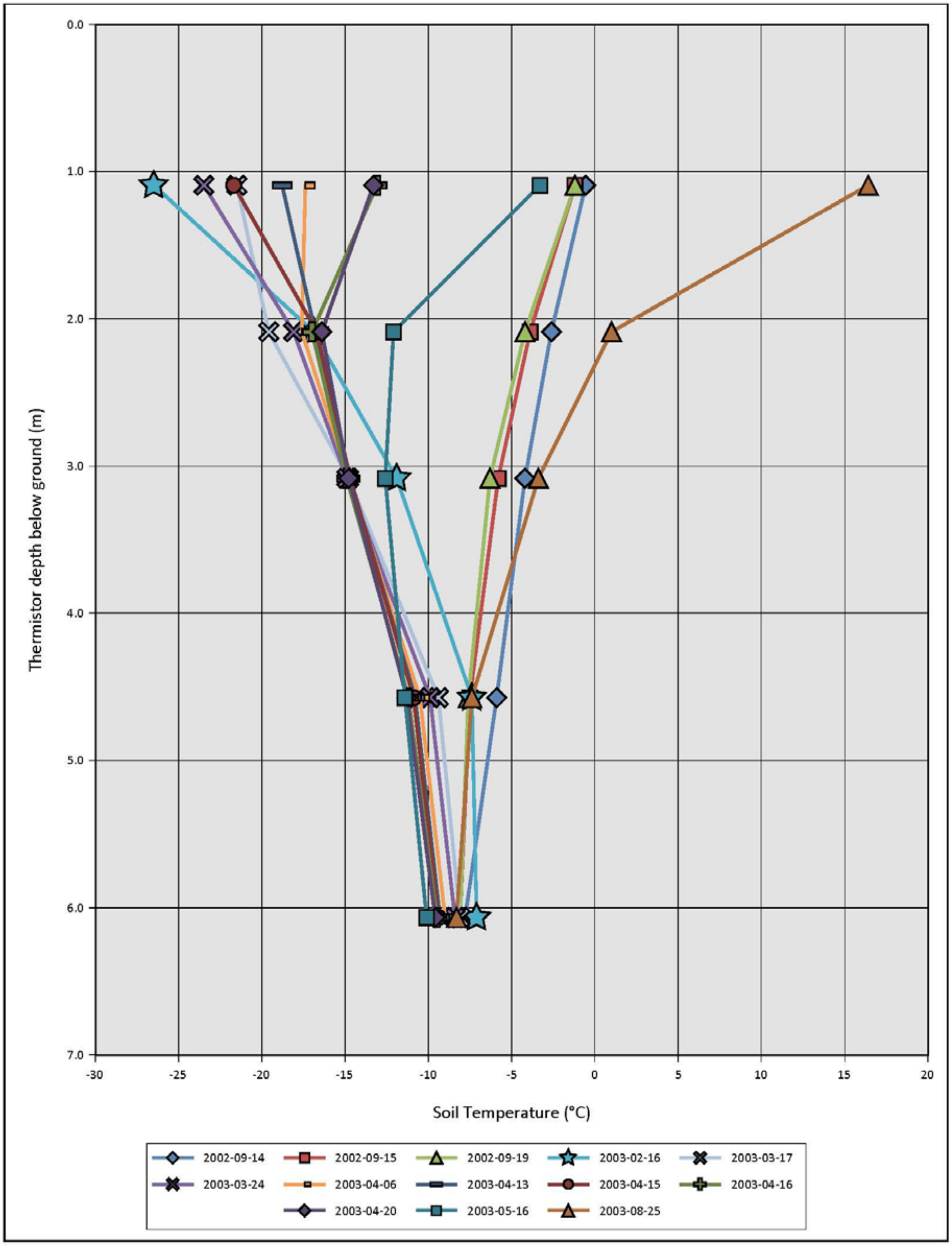


Appendix B Inactive Thermistor Profiles

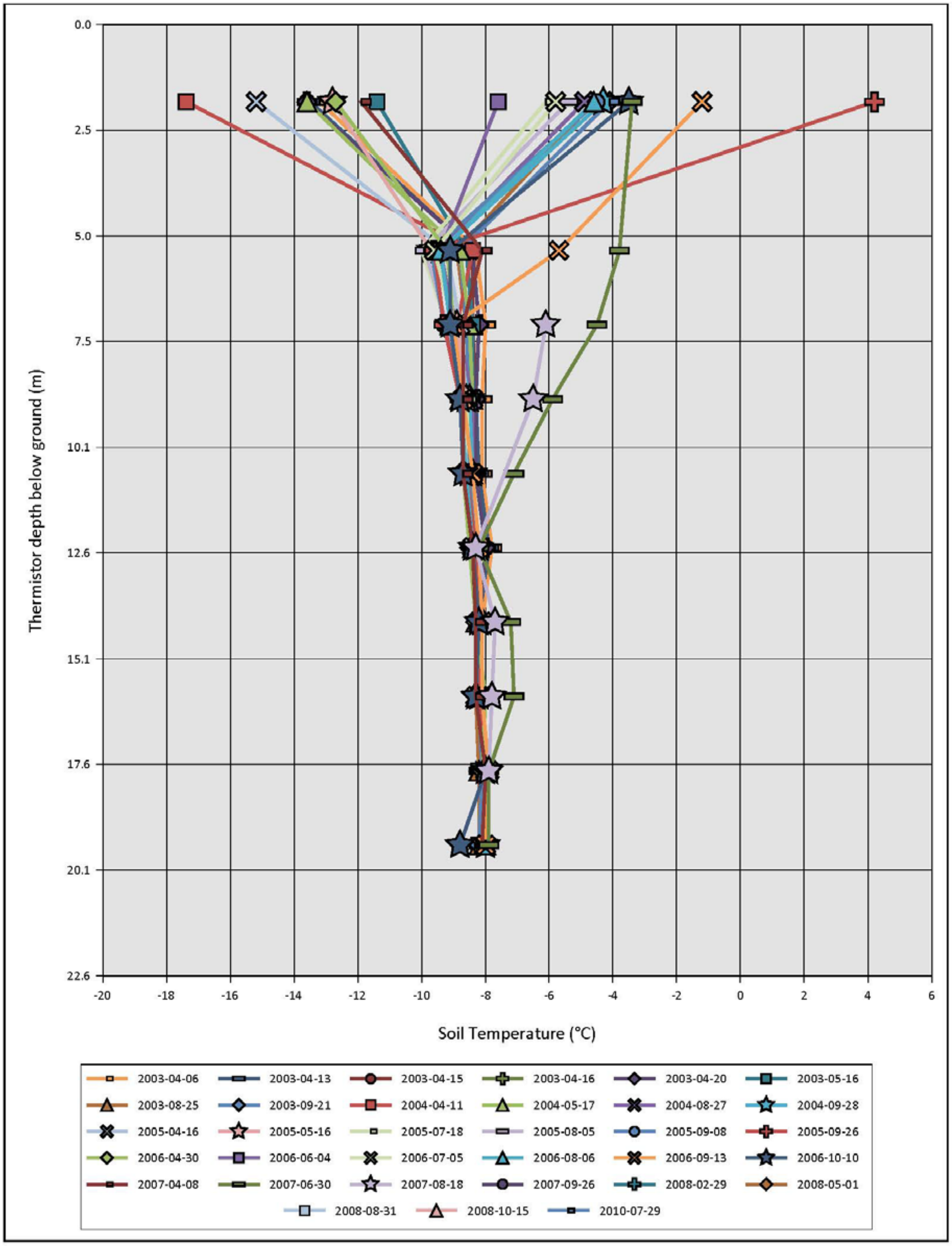
Thermistor Data (SRK-11)



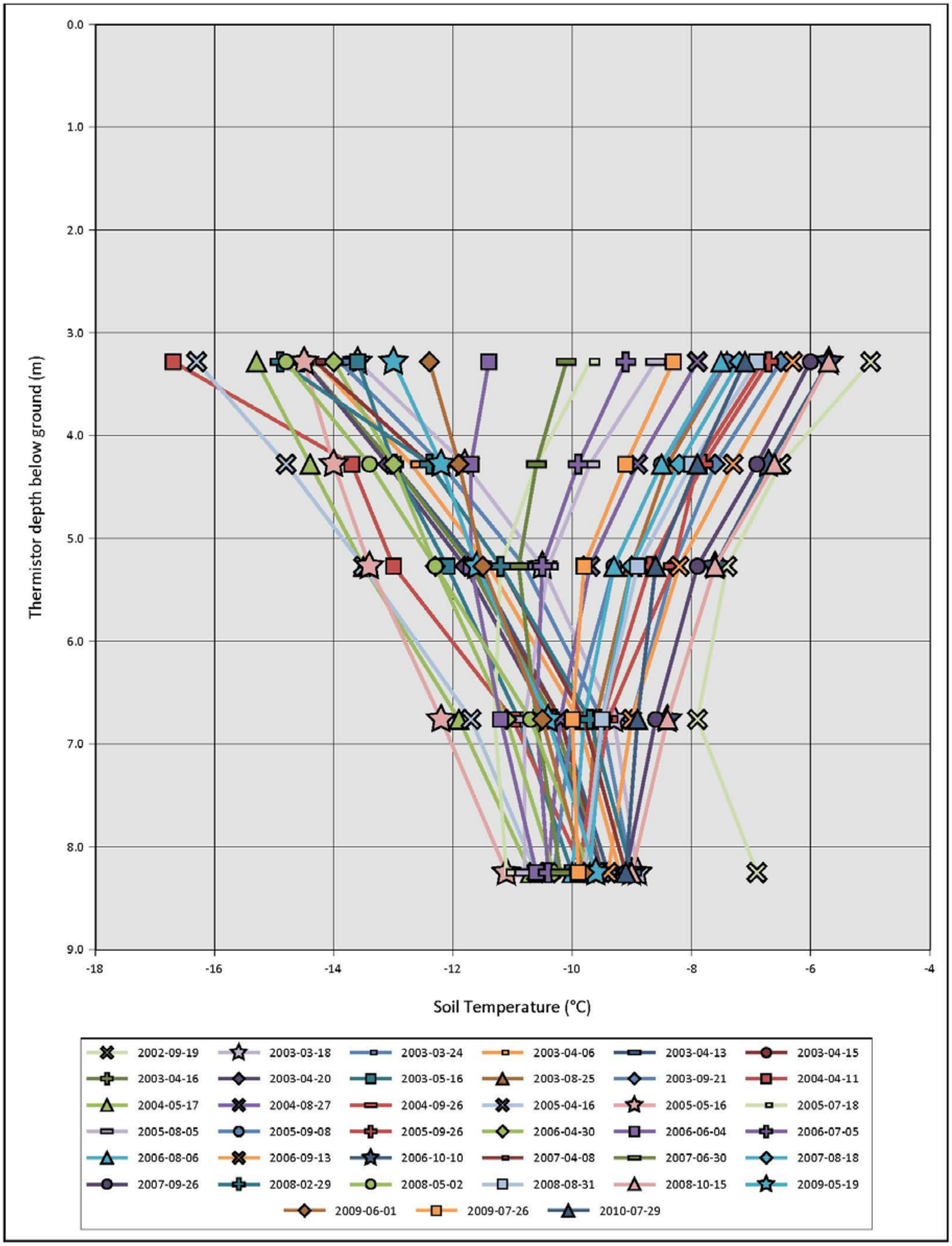
Thermistor Data (SRK-13)



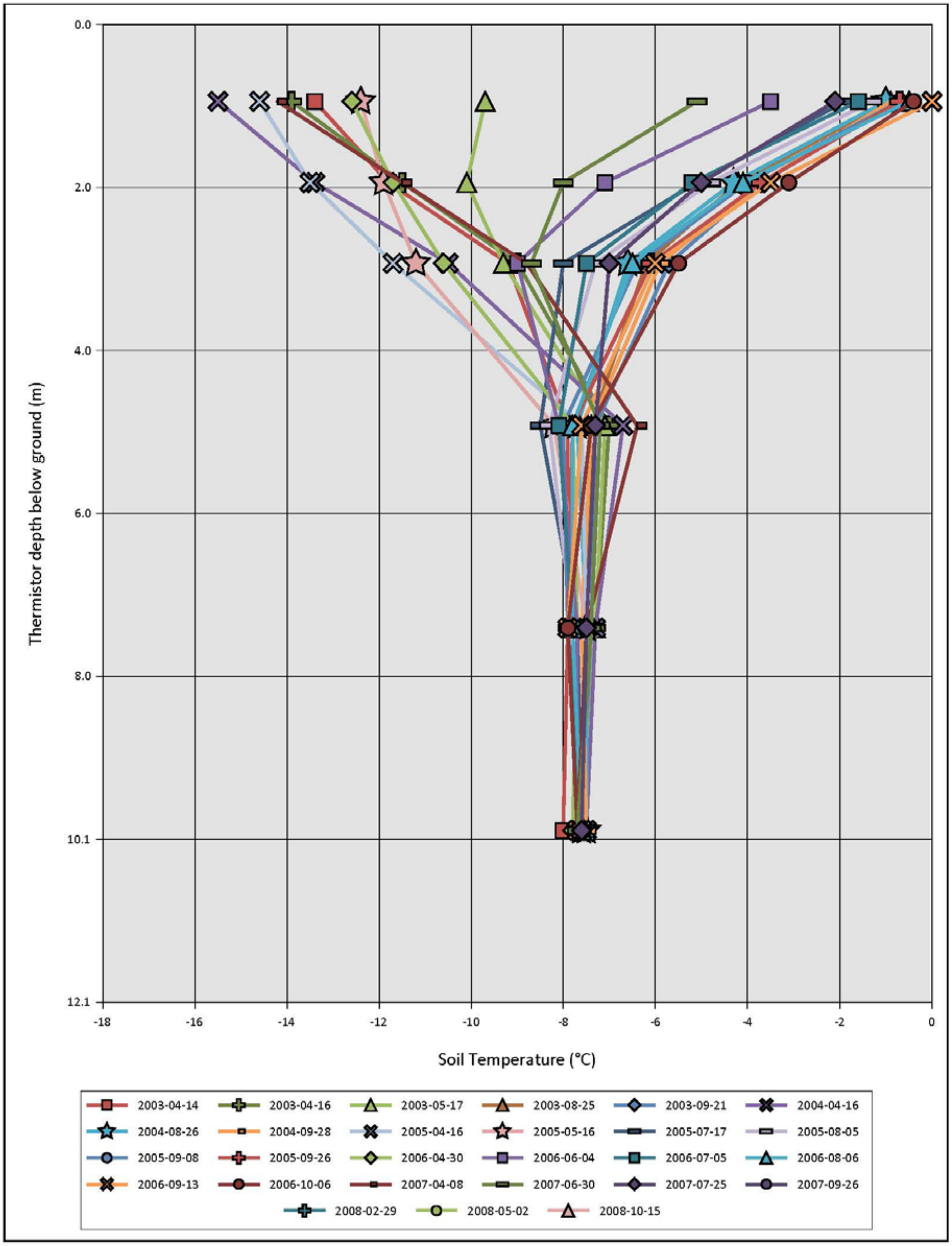
Thermistor Data (SRK-15)



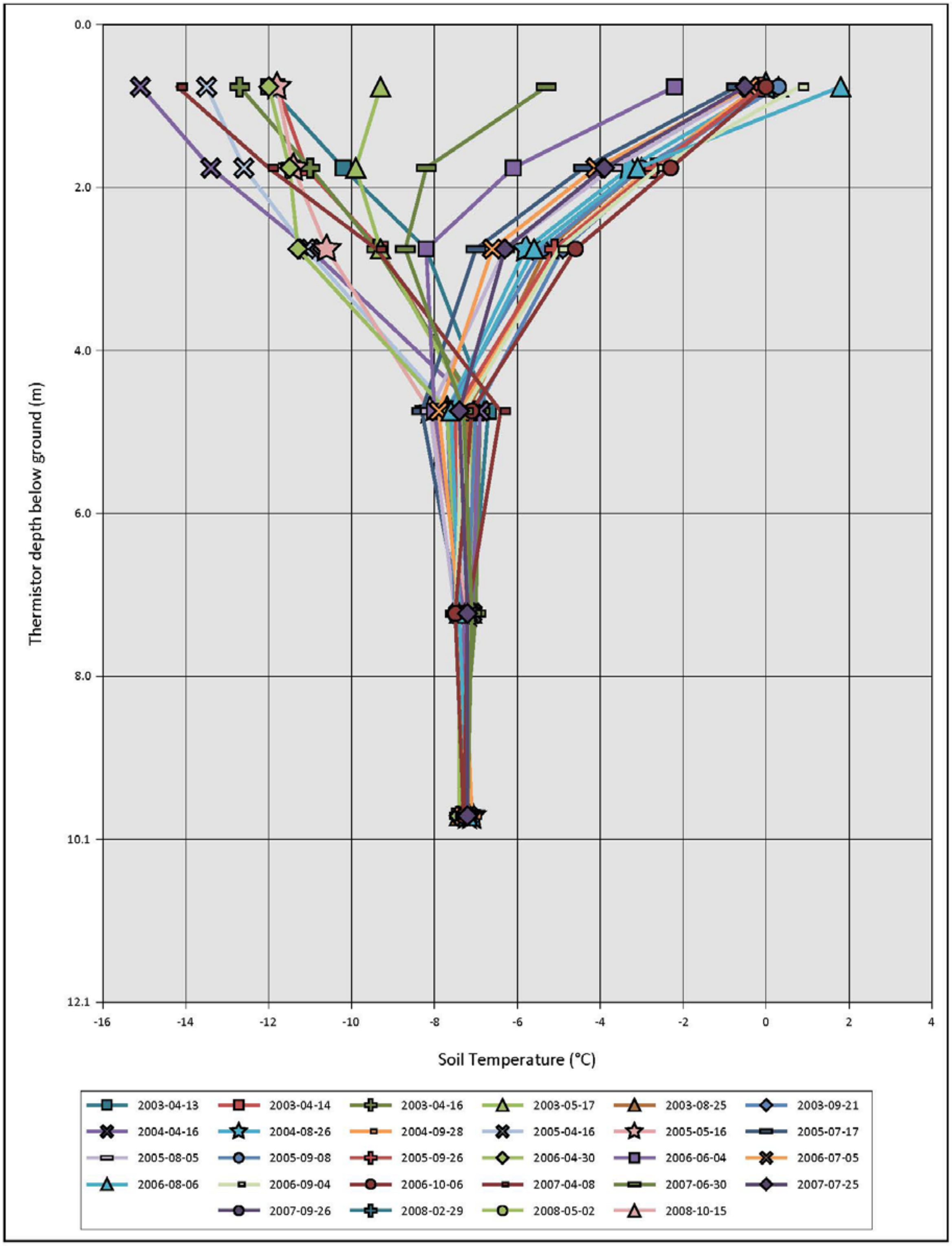
Thermistor Data (SRK-16)



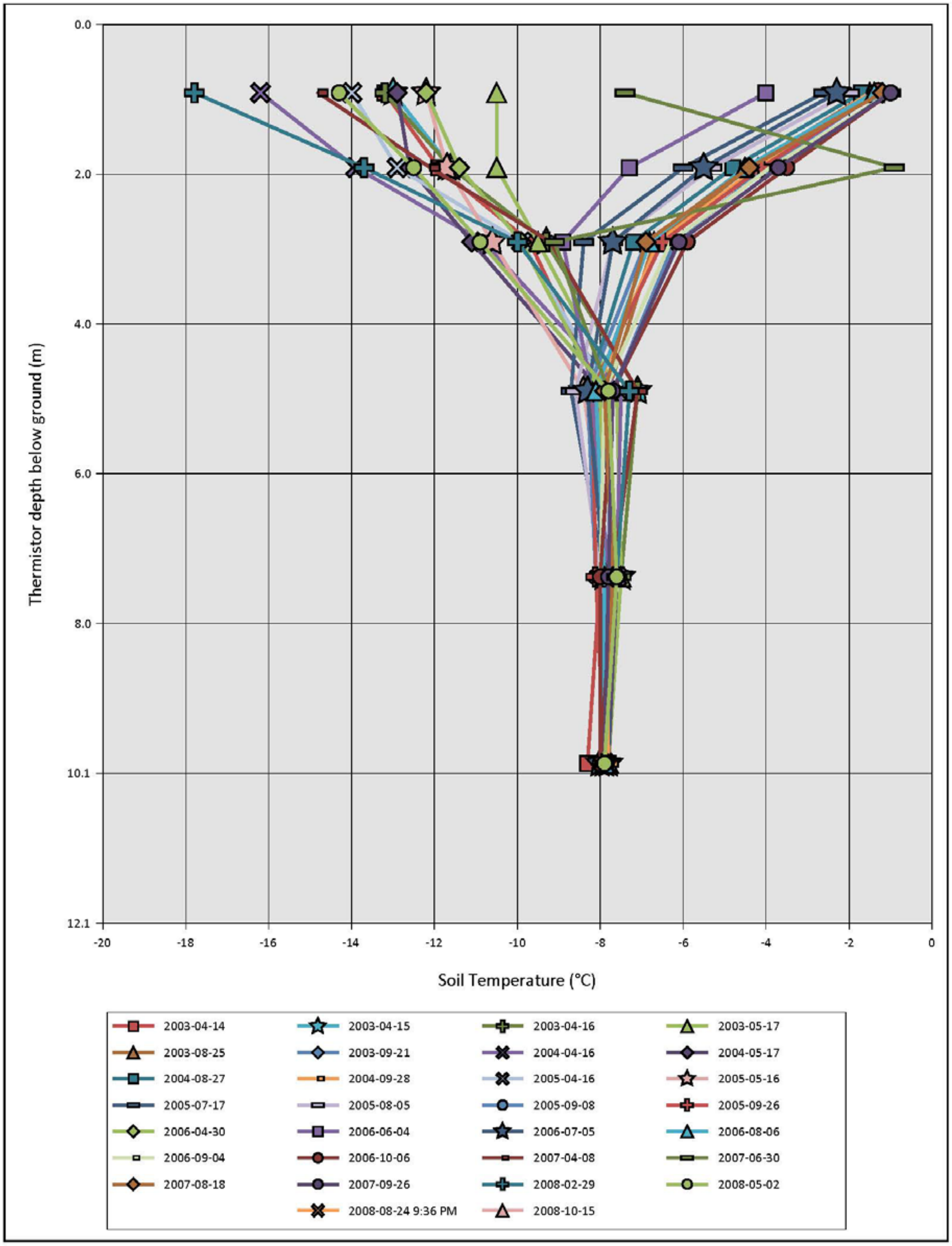
Thermistor Data (SRK-19)



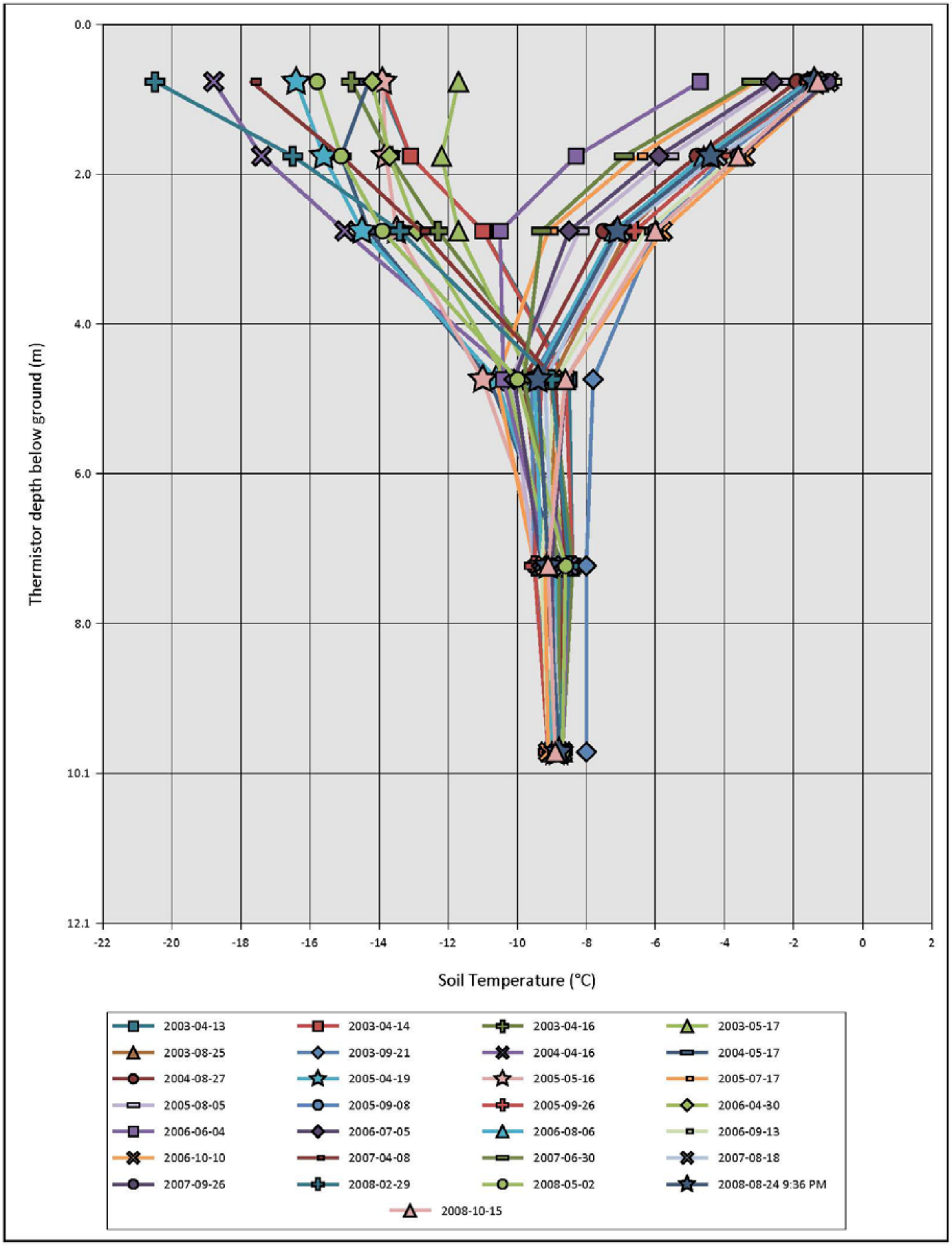
Thermistor Data (SRK-20)



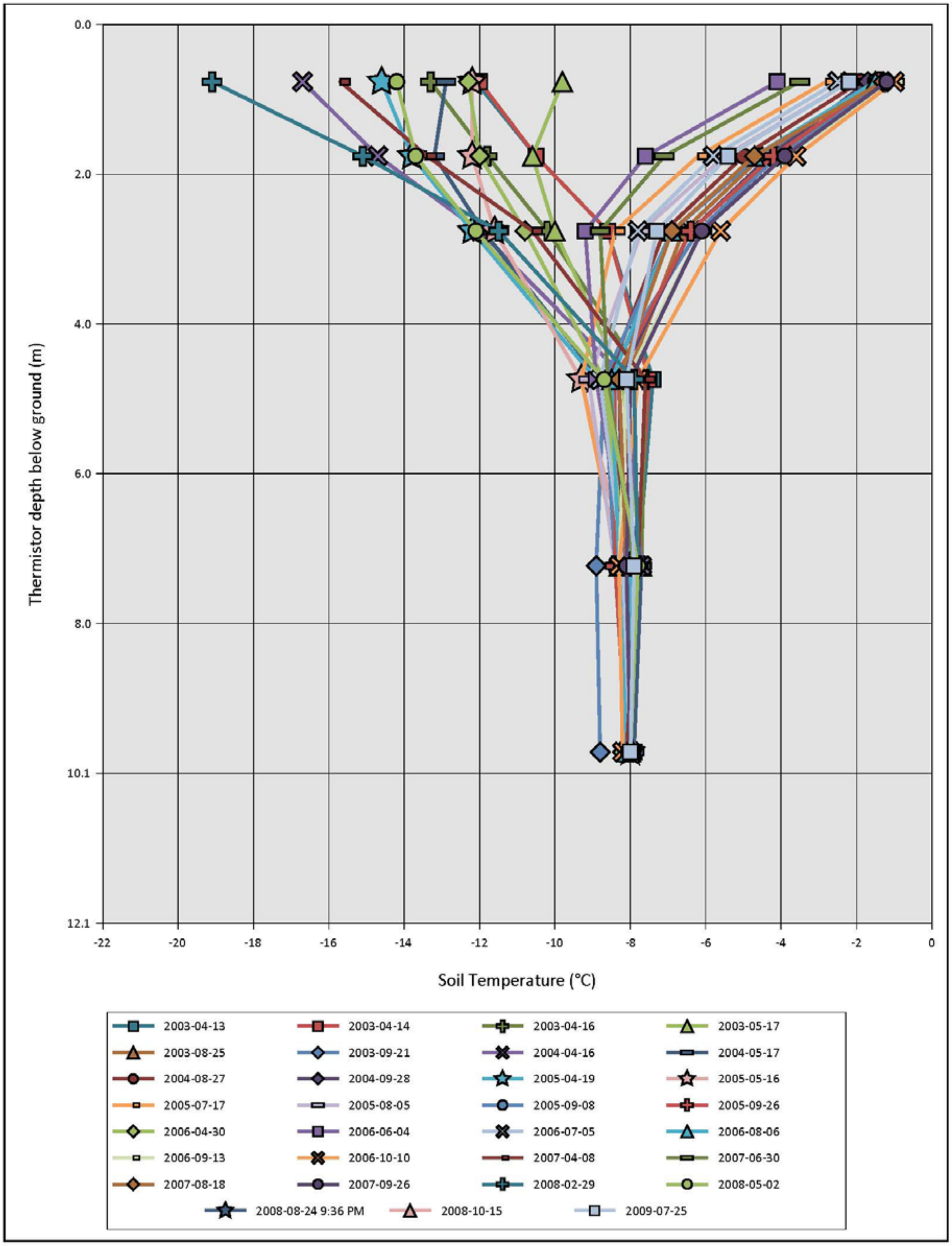
Thermistor Data (SRK-23)



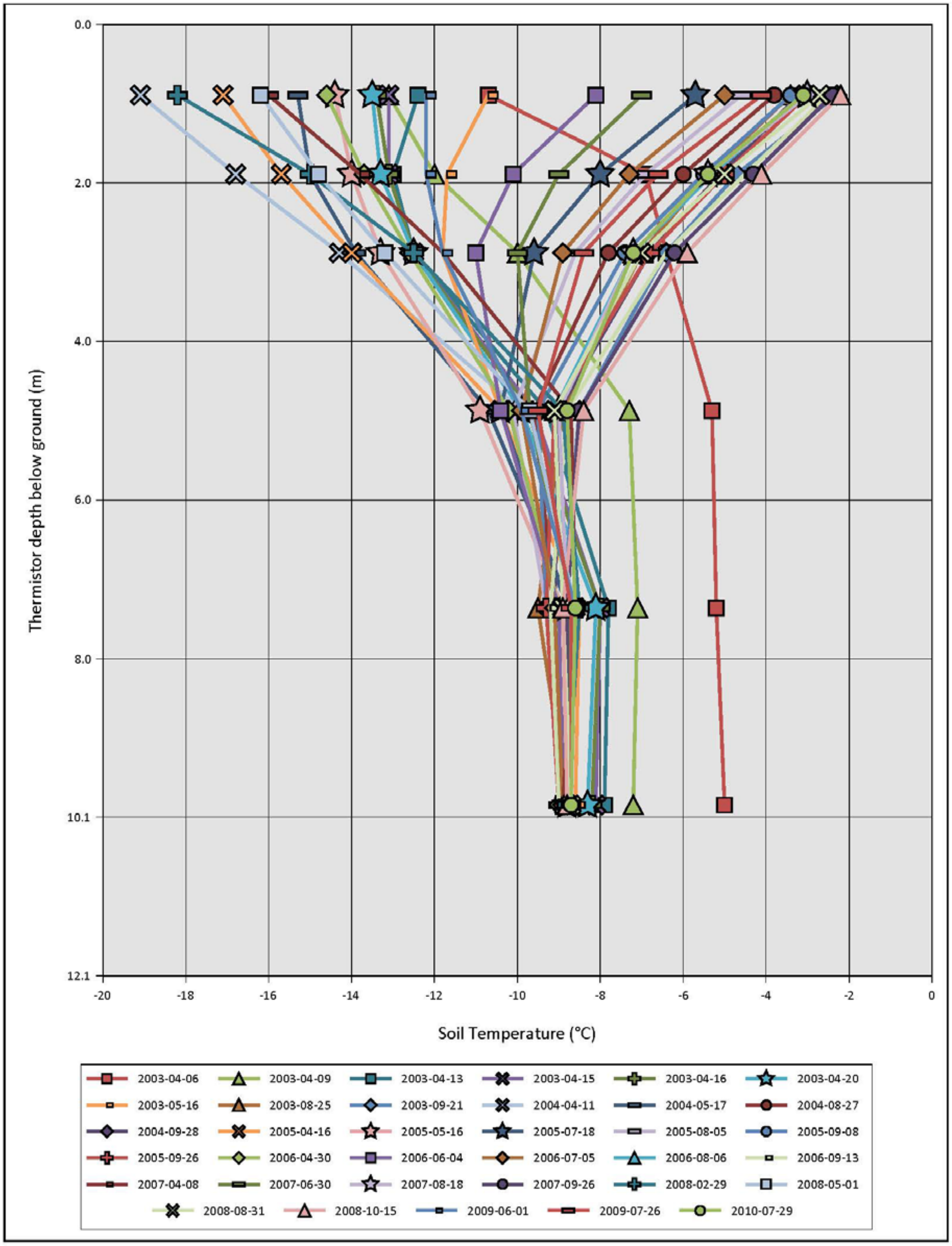
Thermistor Data (SRK-26)



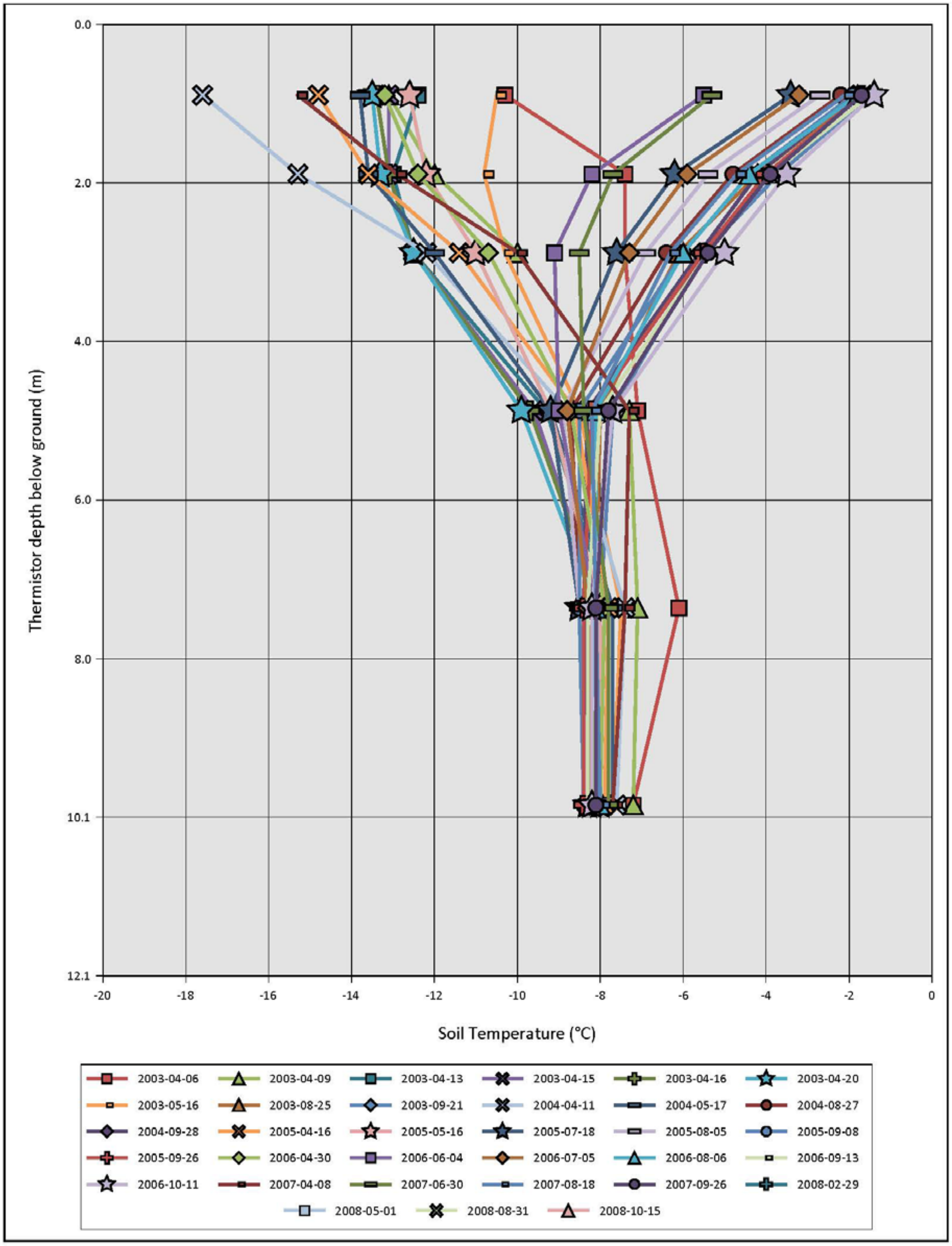
Thermistor Data (SRK-28)



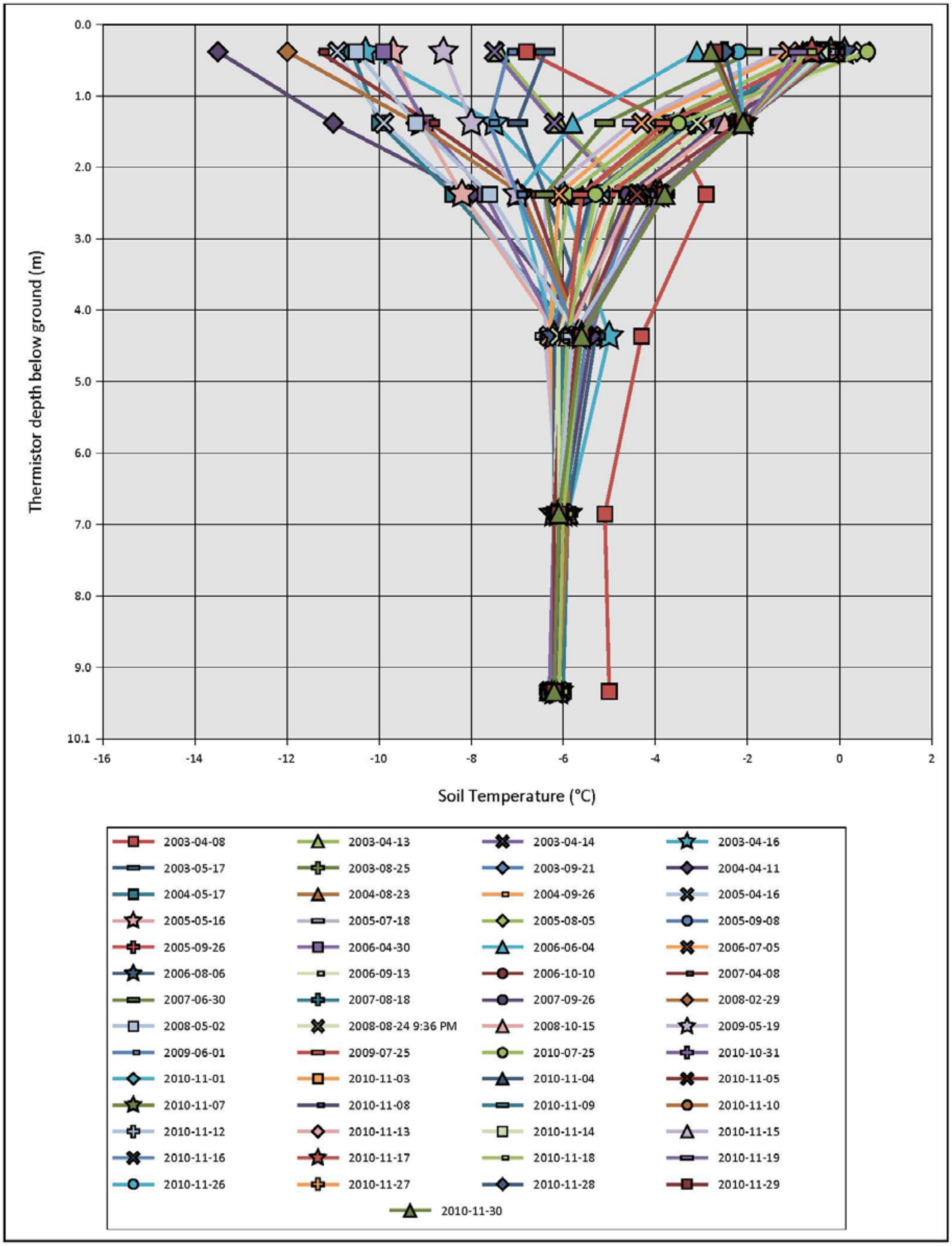
Thermistor Data (SRK-33)



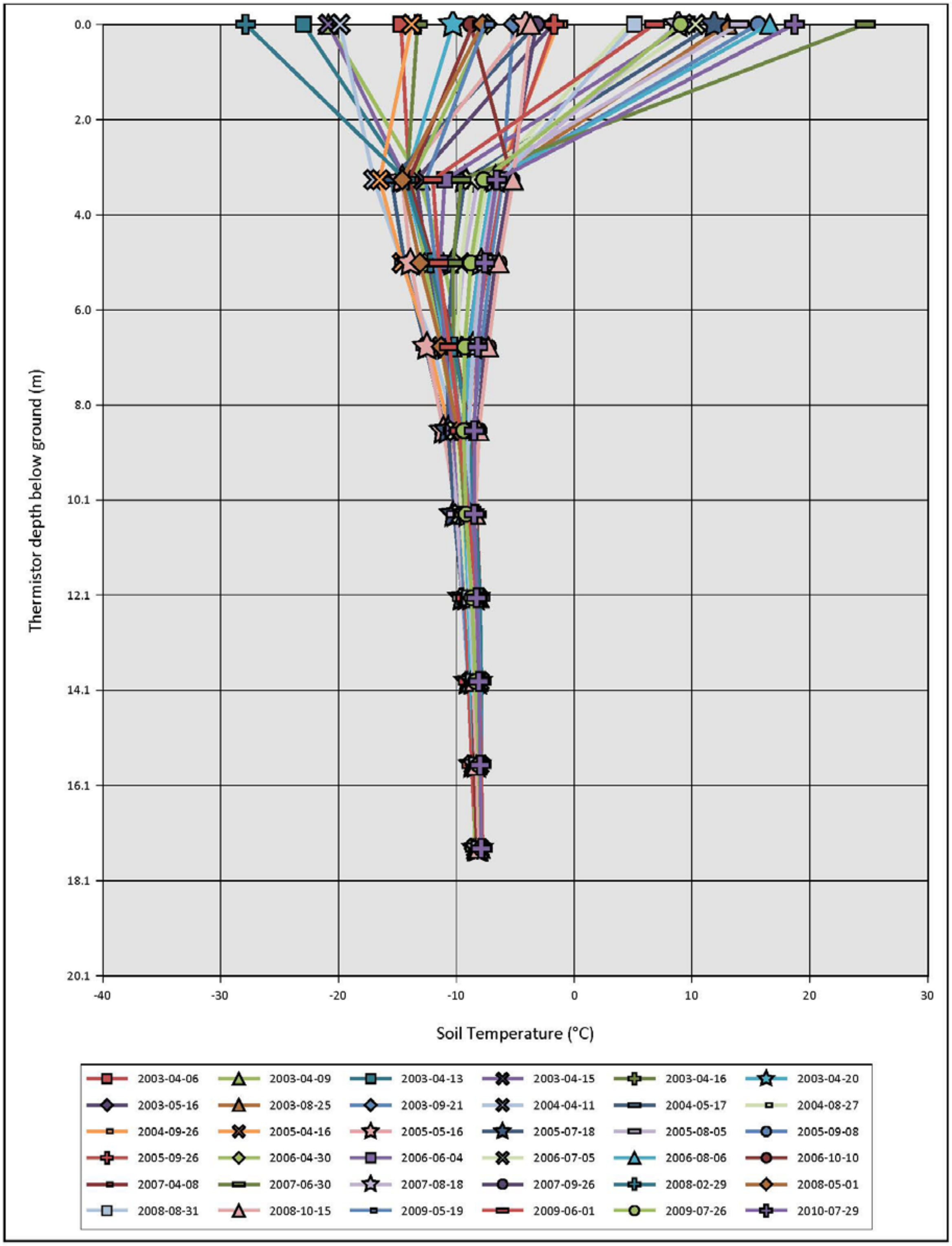
Thermistor Data (SRK-34A)



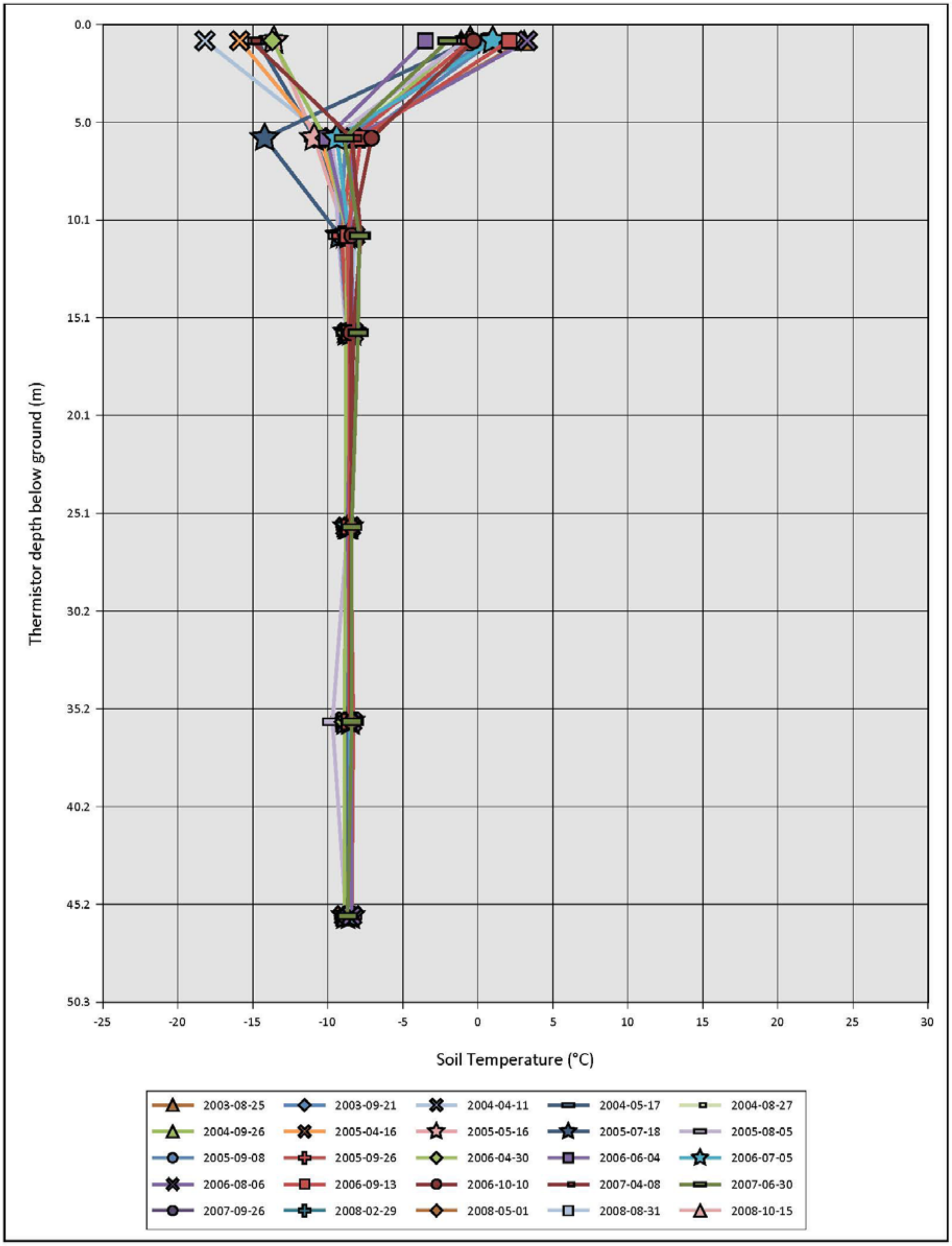
Thermistor Data (SRK-35)



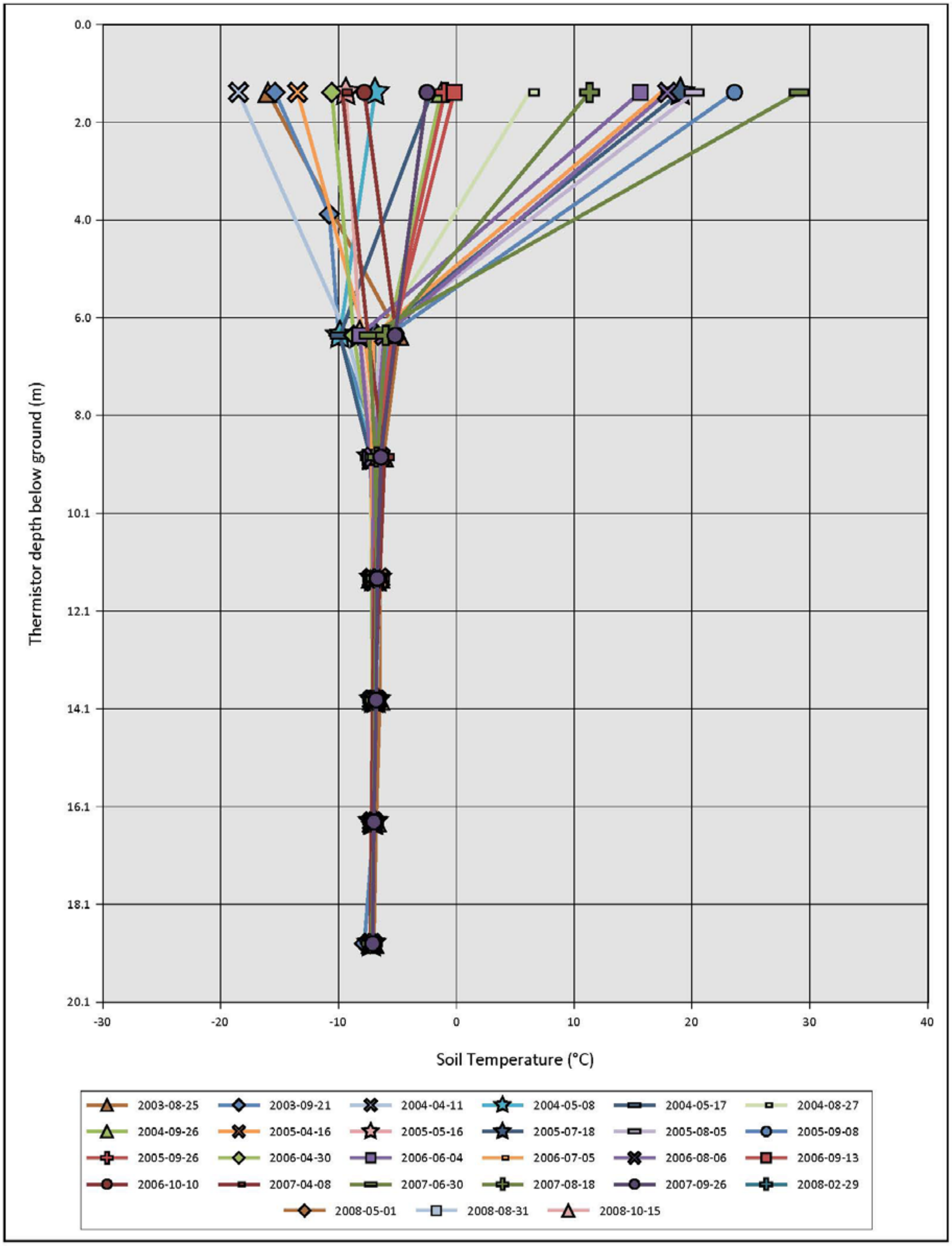
Thermistor Data (SRK-37)



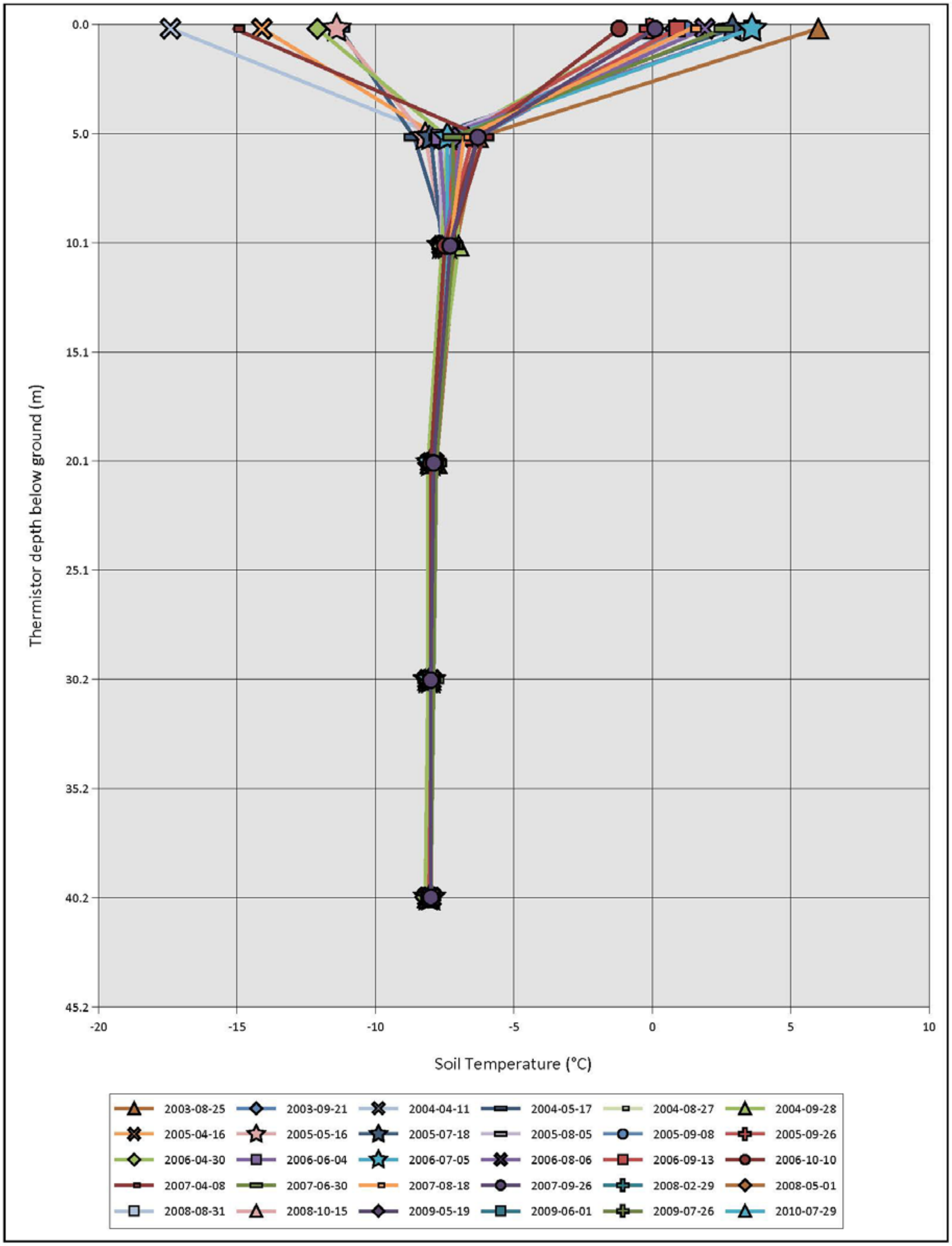
Thermistor Data (SRK-40)



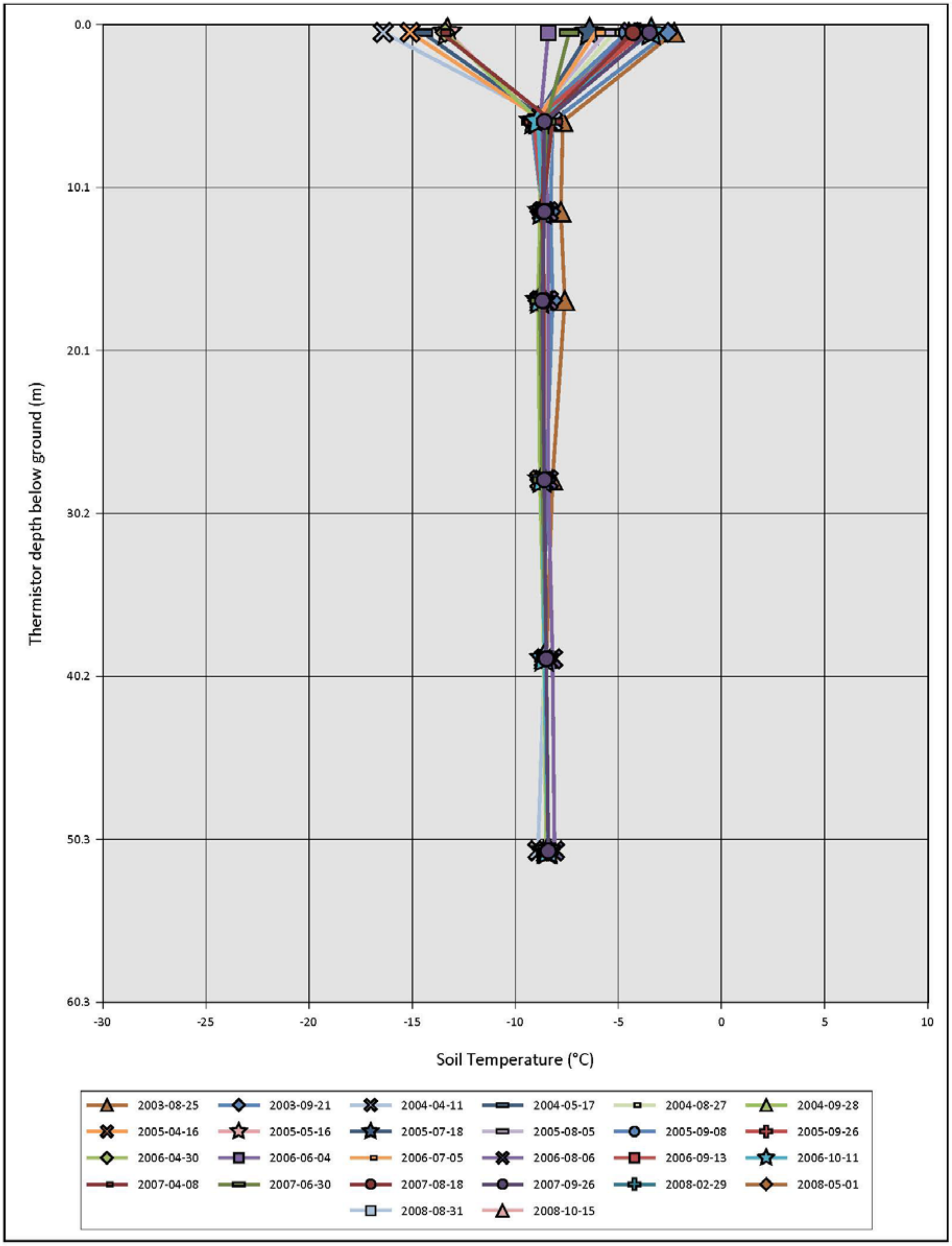
Thermistor Data (SRK-41)



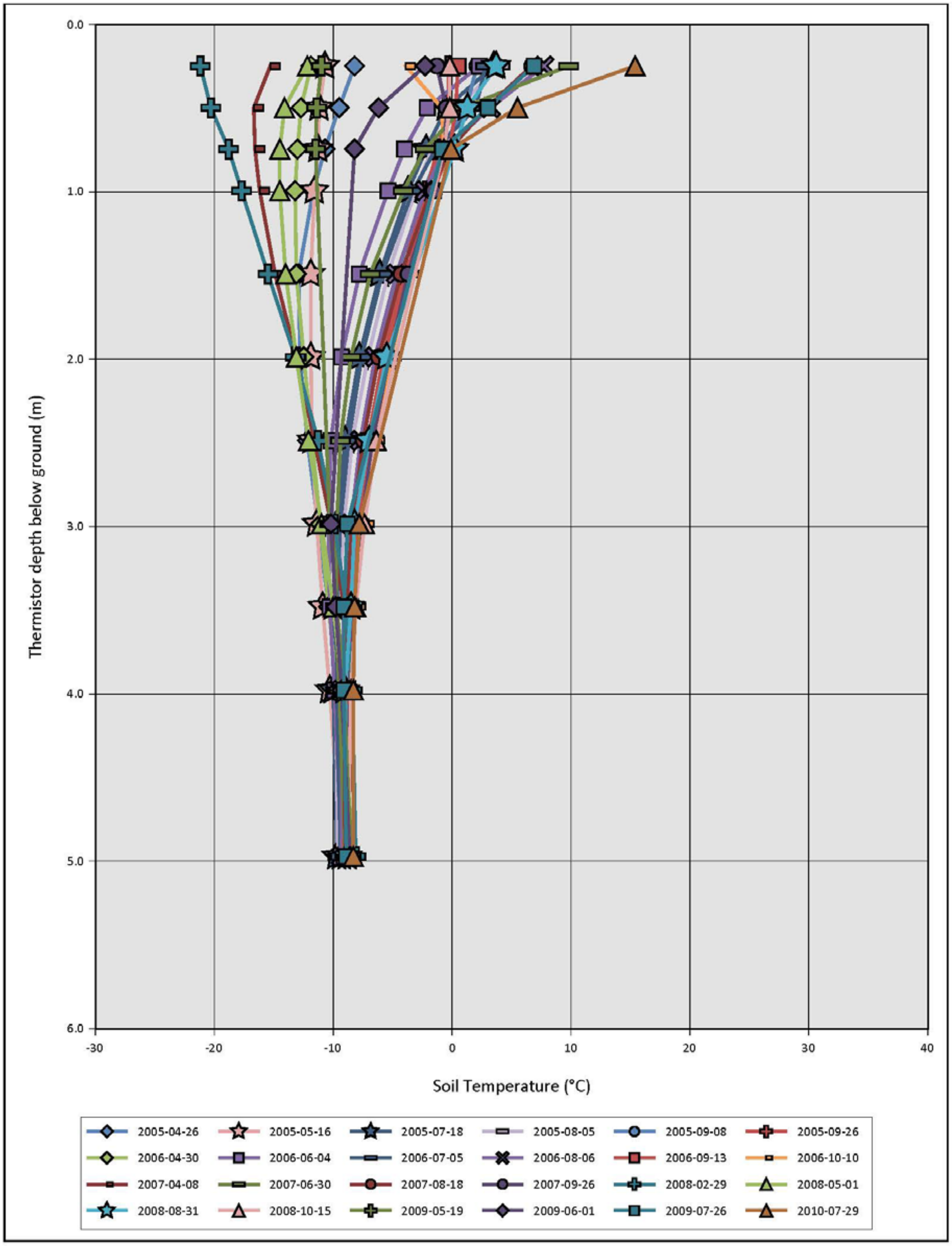
Thermistor Data (SRK-42)



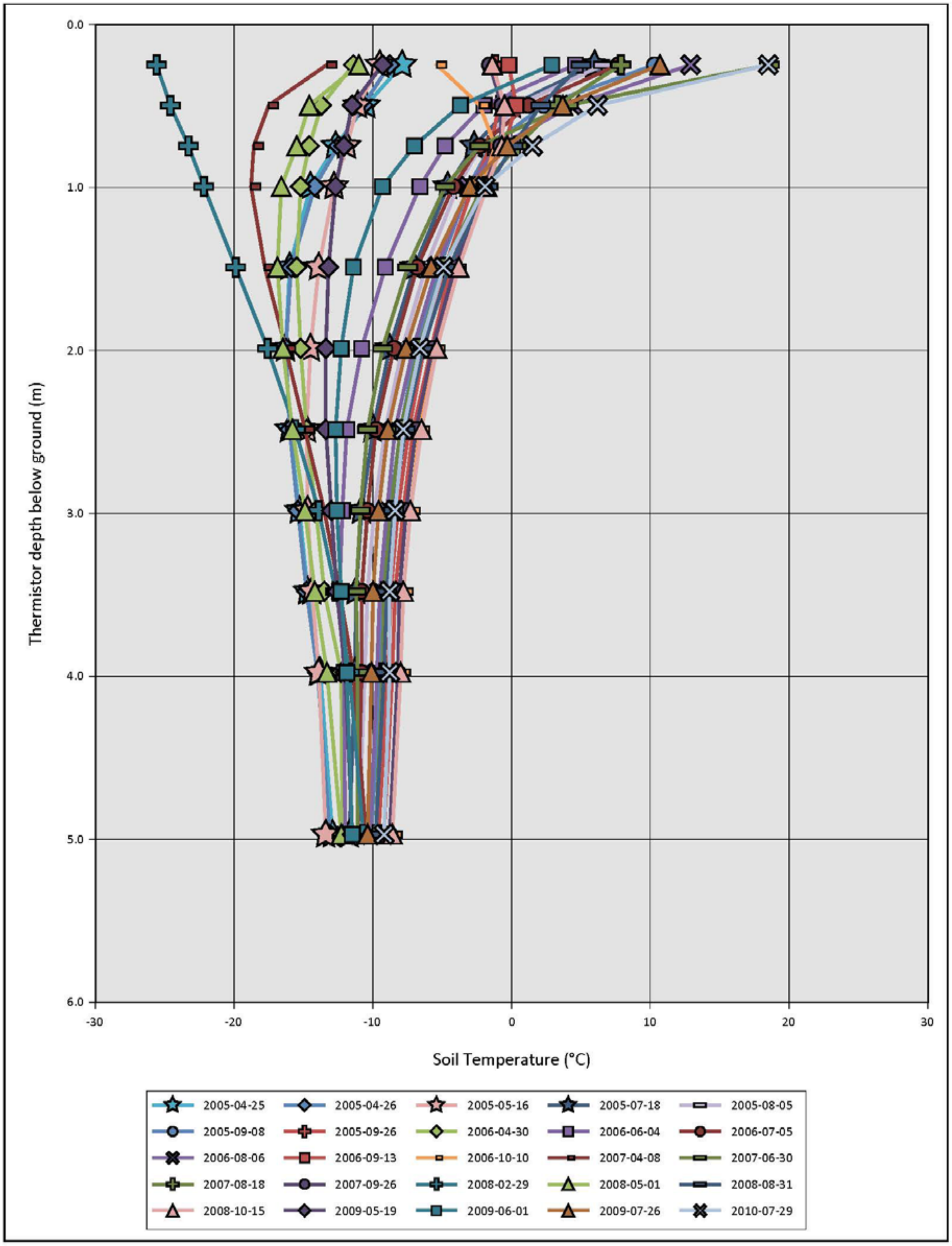
Thermistor Data (SRK-43)



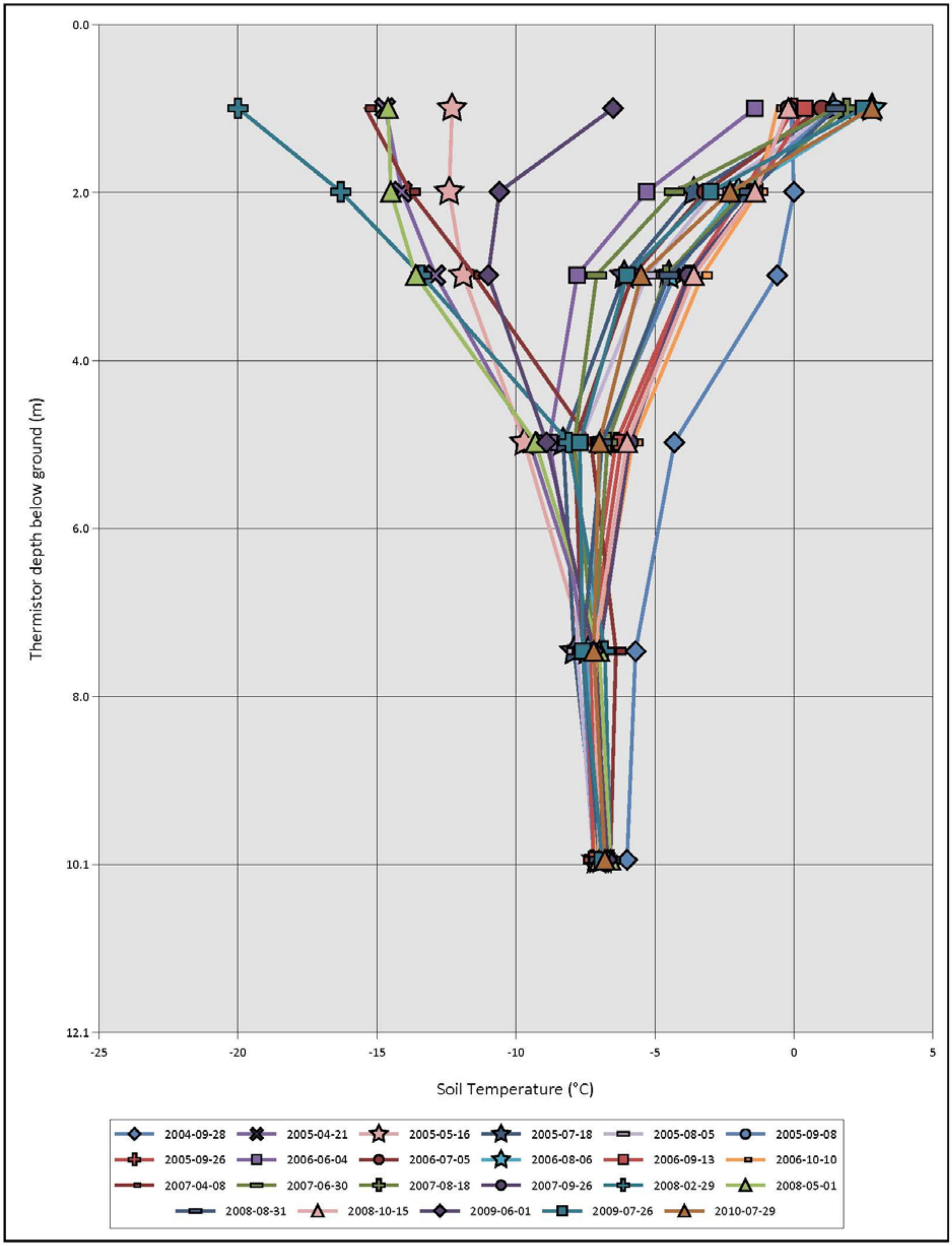
Thermistor Data (SRK-51)



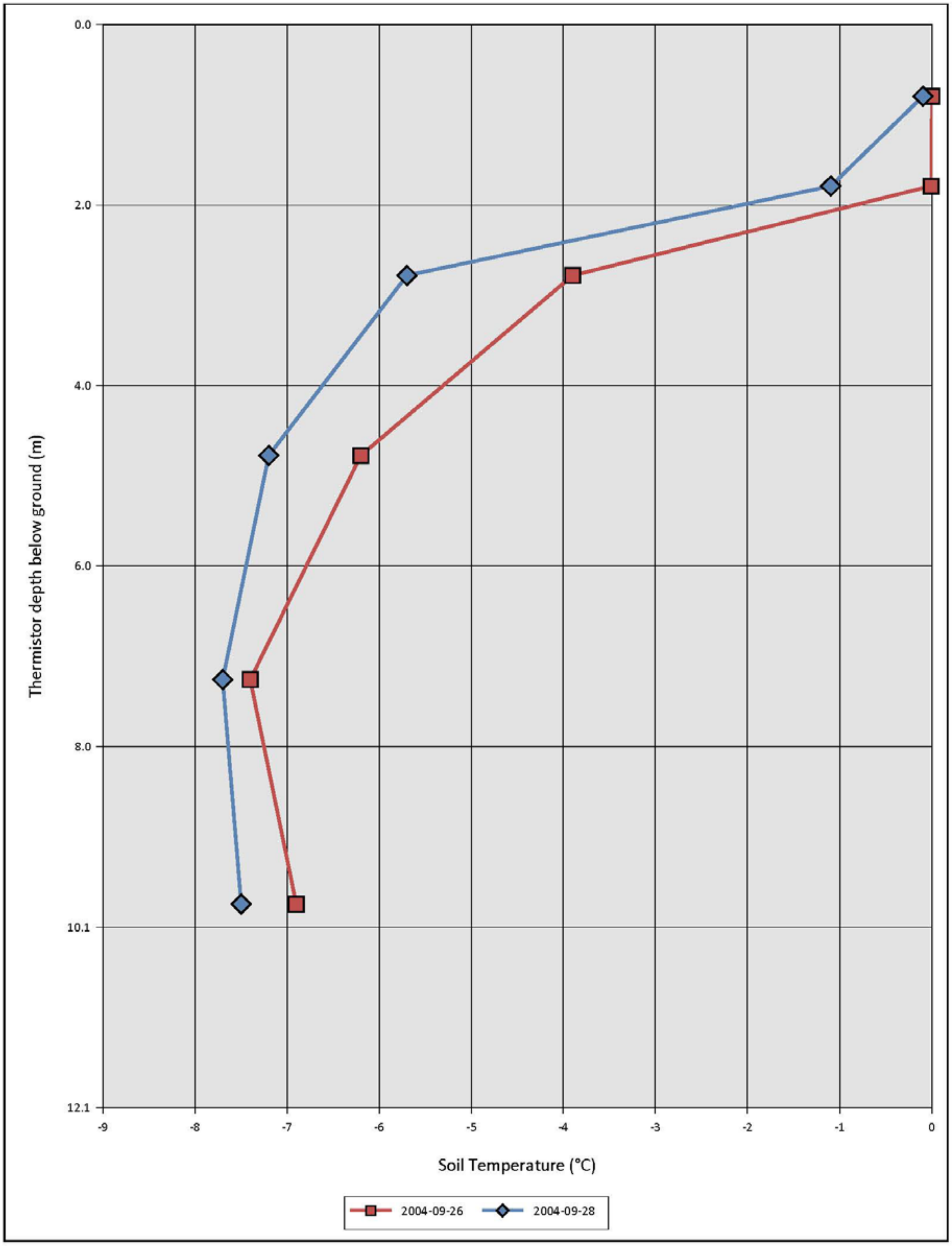
Thermistor Data (SRK-52)



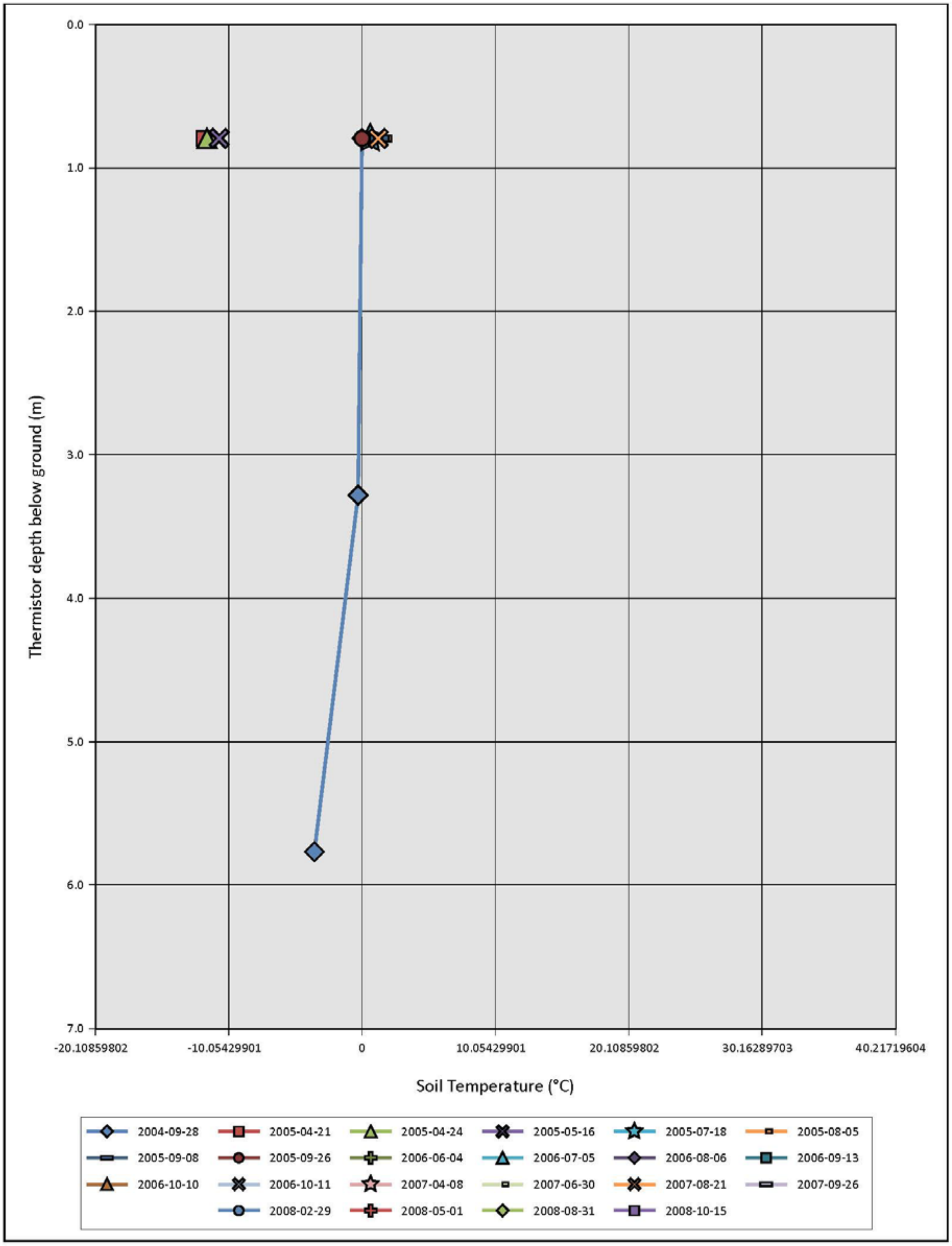
Thermistor Data (SRK-54)



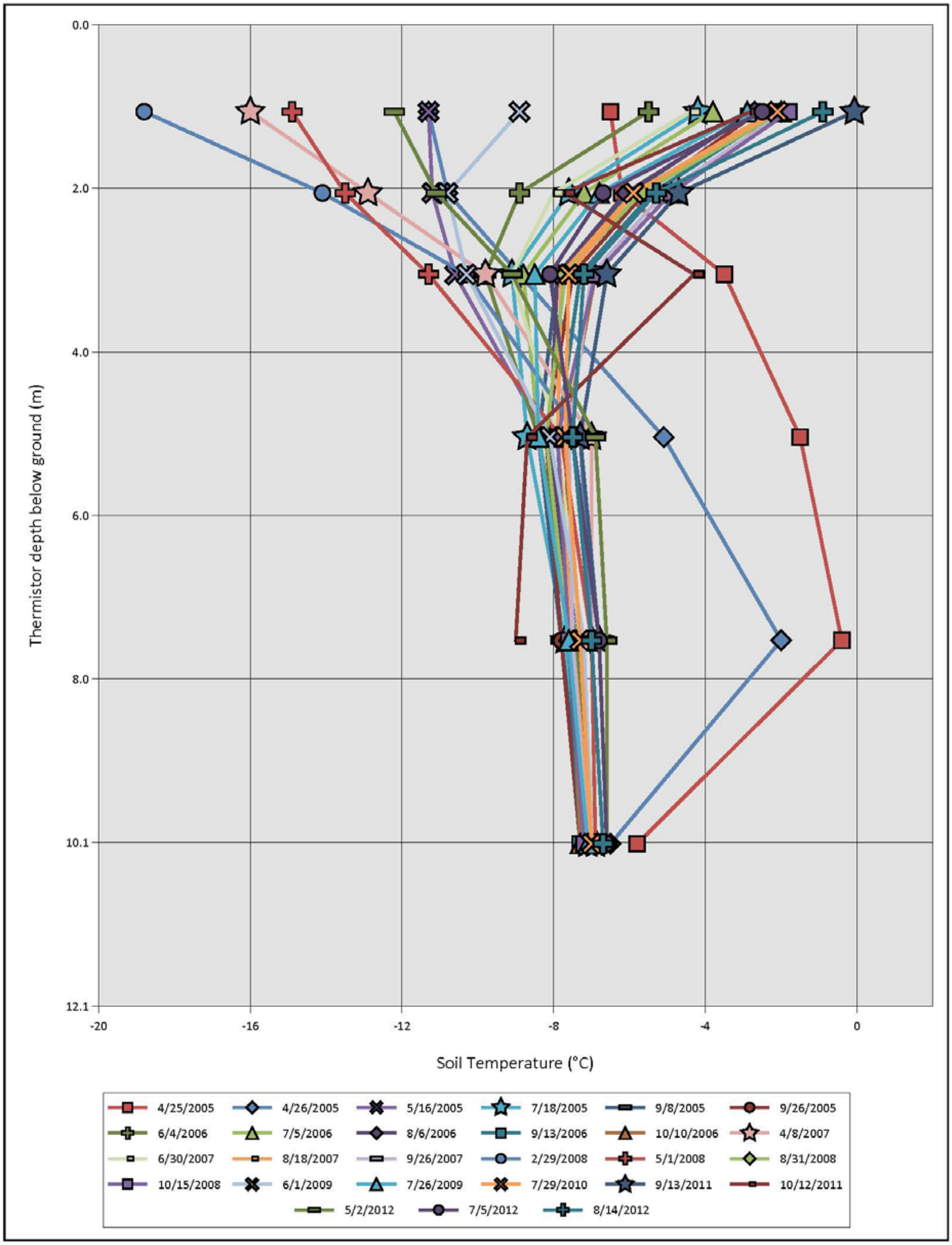
Thermistor Data (SRK-55)



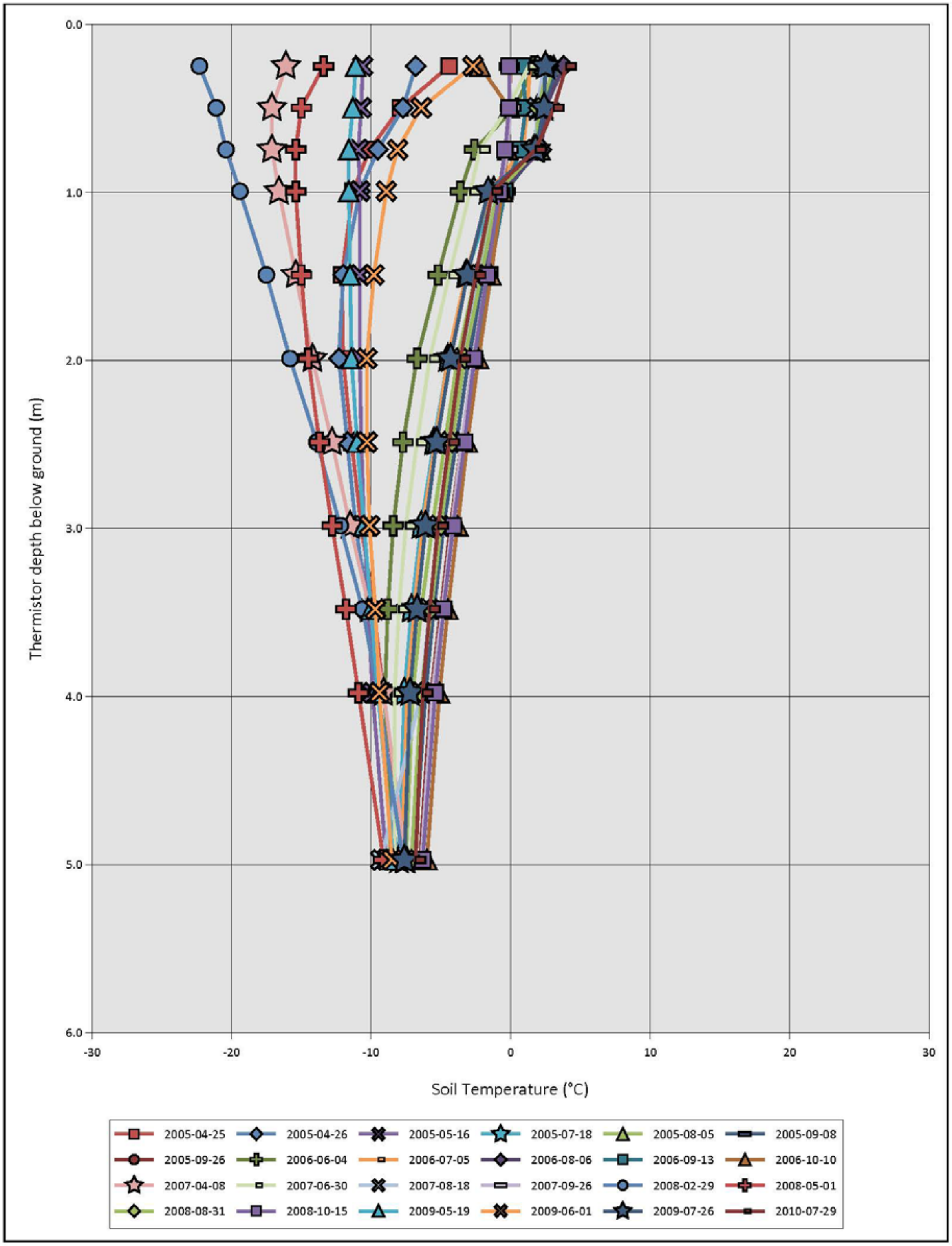
Thermistor Data (SRK-56)



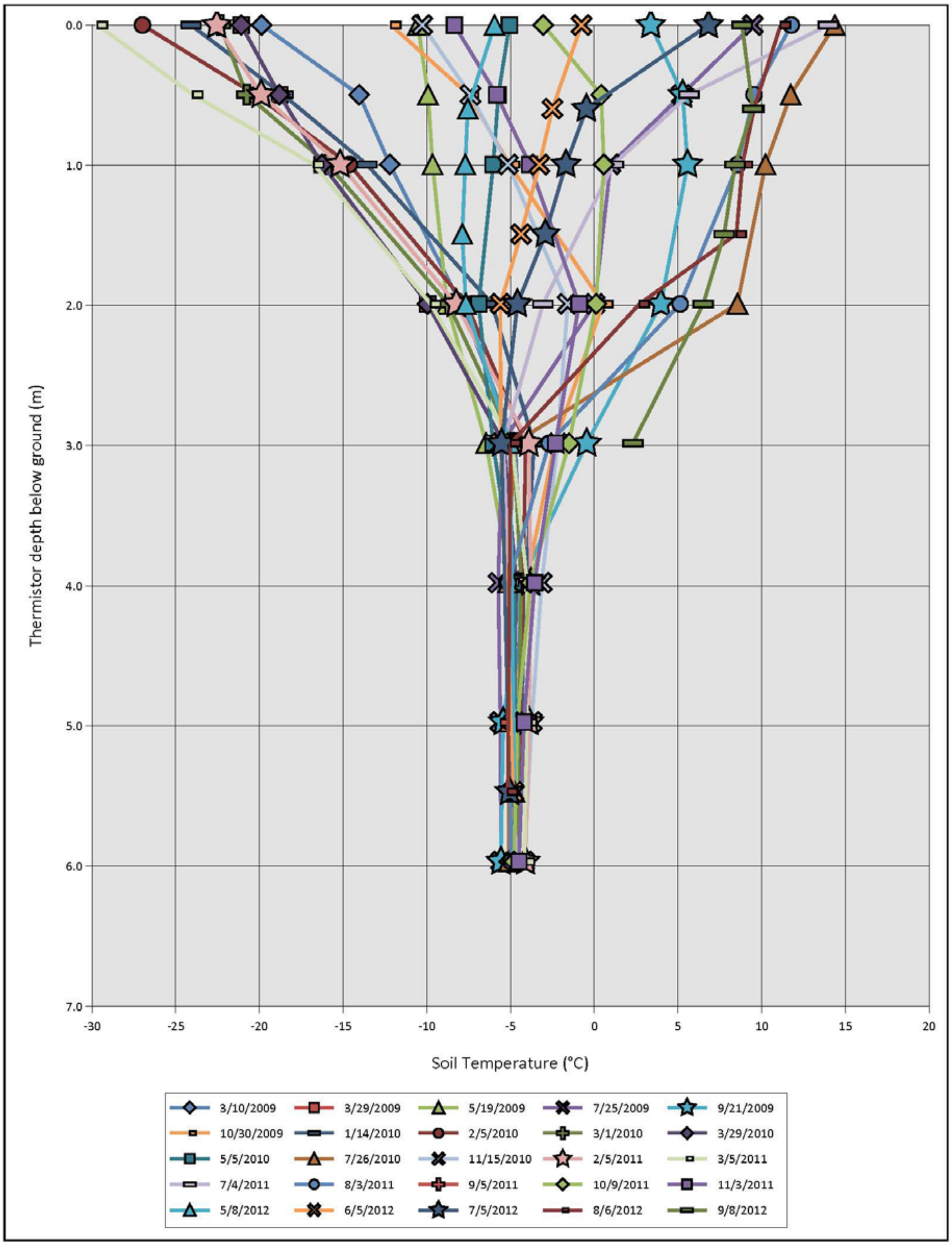
Thermistor Data (SRK-58)



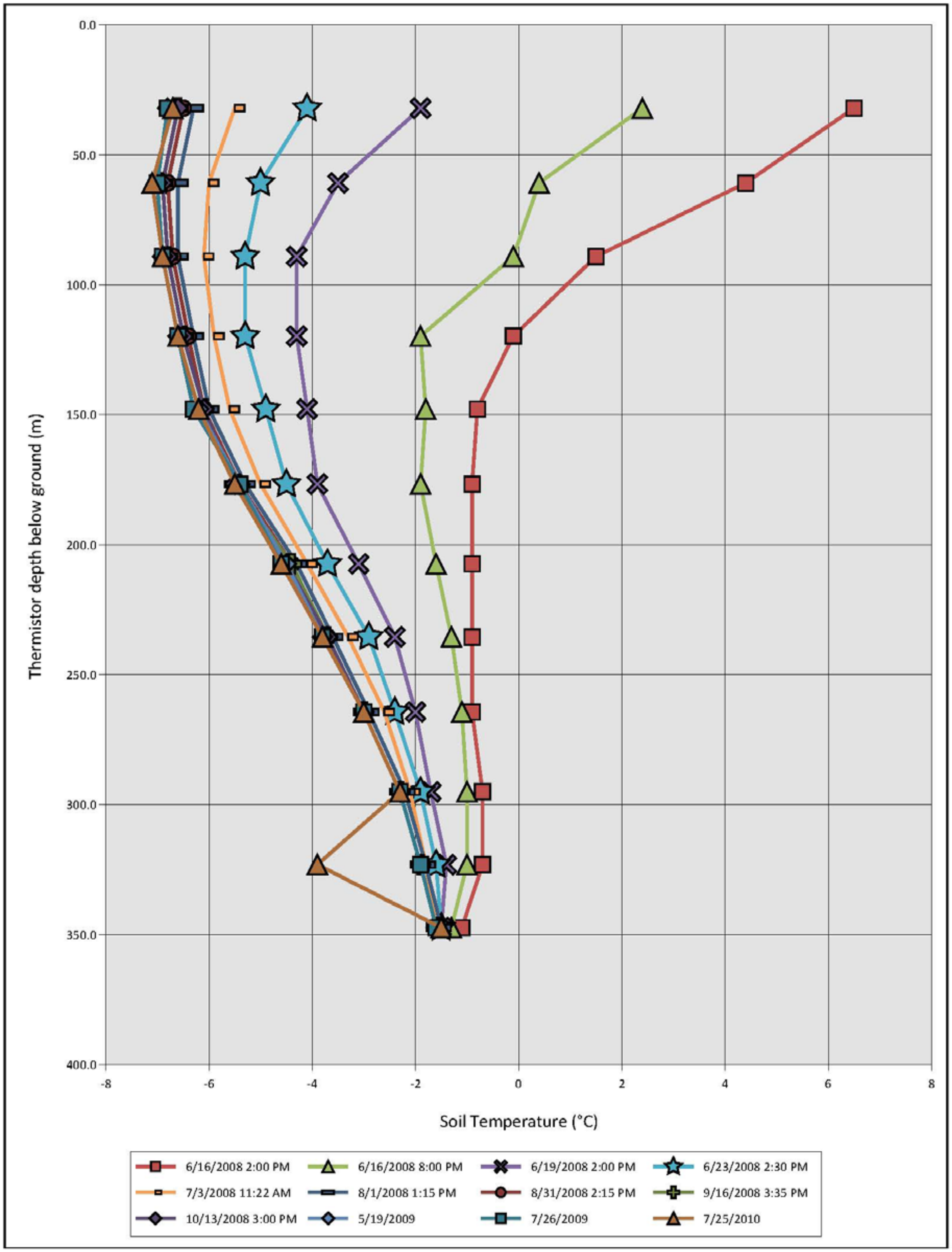
Thermistor Data (SRK-62)



Thermistor Data (SRK-JT2-12) (Replaces SRK-JT2-09)

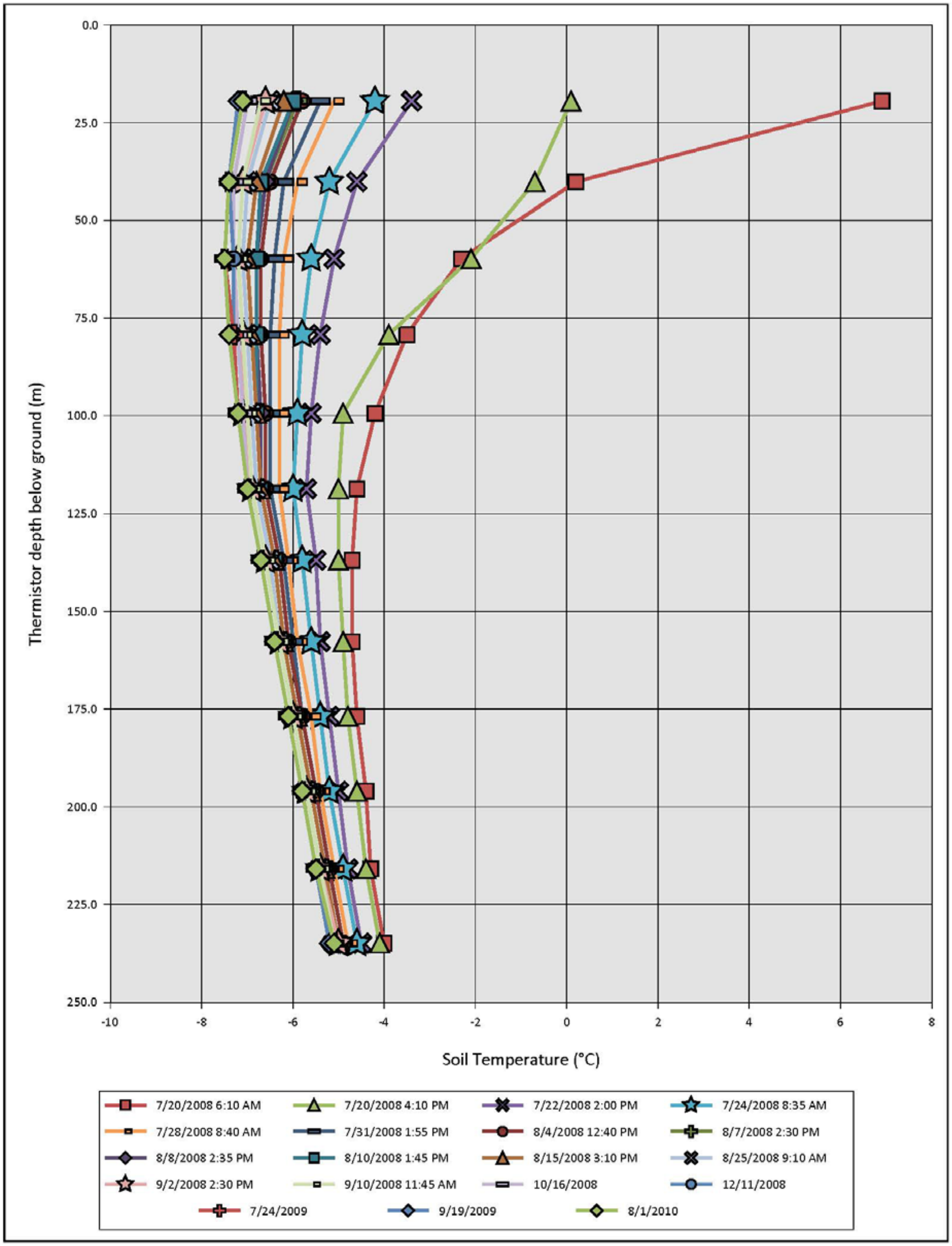


Thermistor Data (08TDD632)

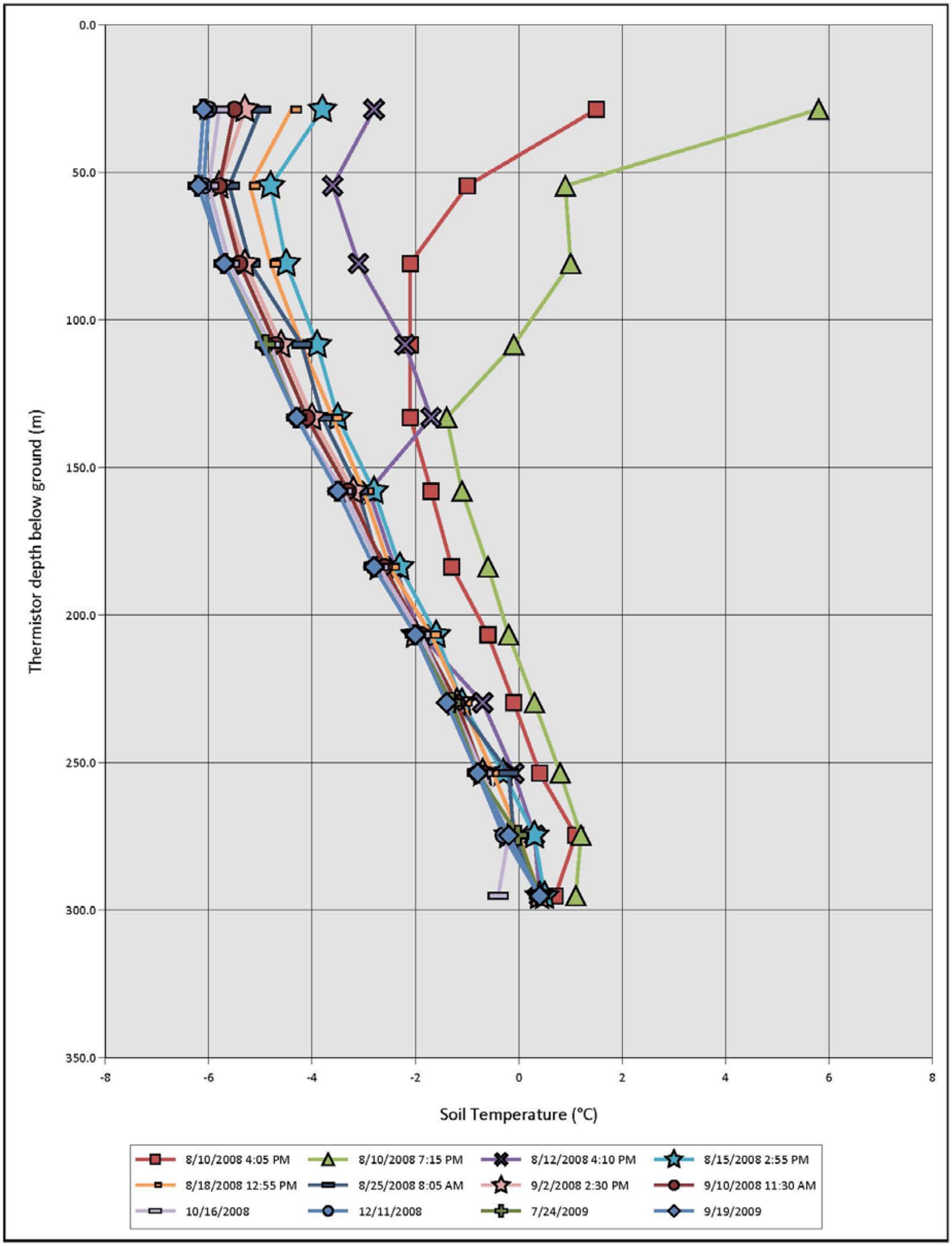


Appendix C Status Unknown Thermistor Profiles

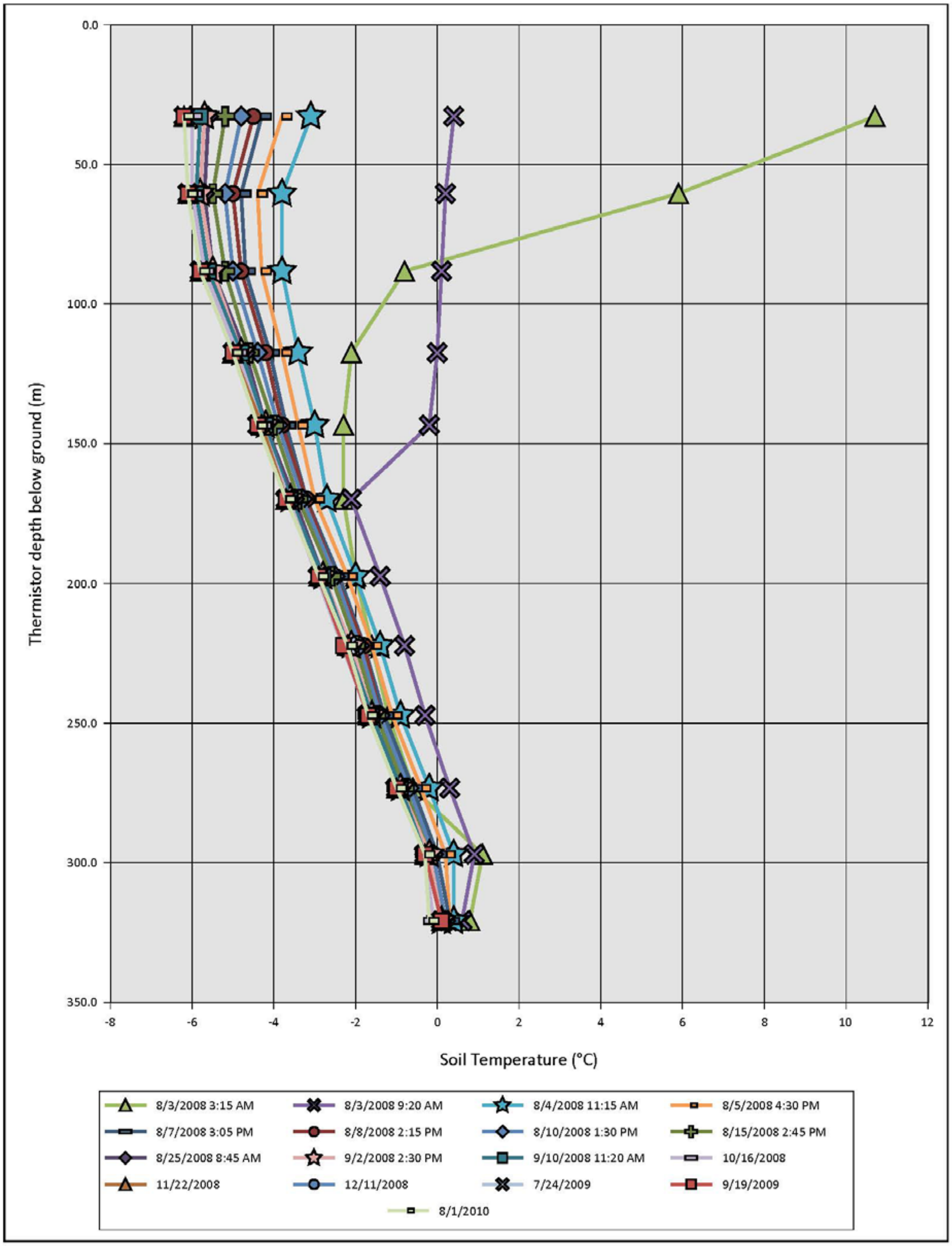
Thermistor Data (08SBD380)



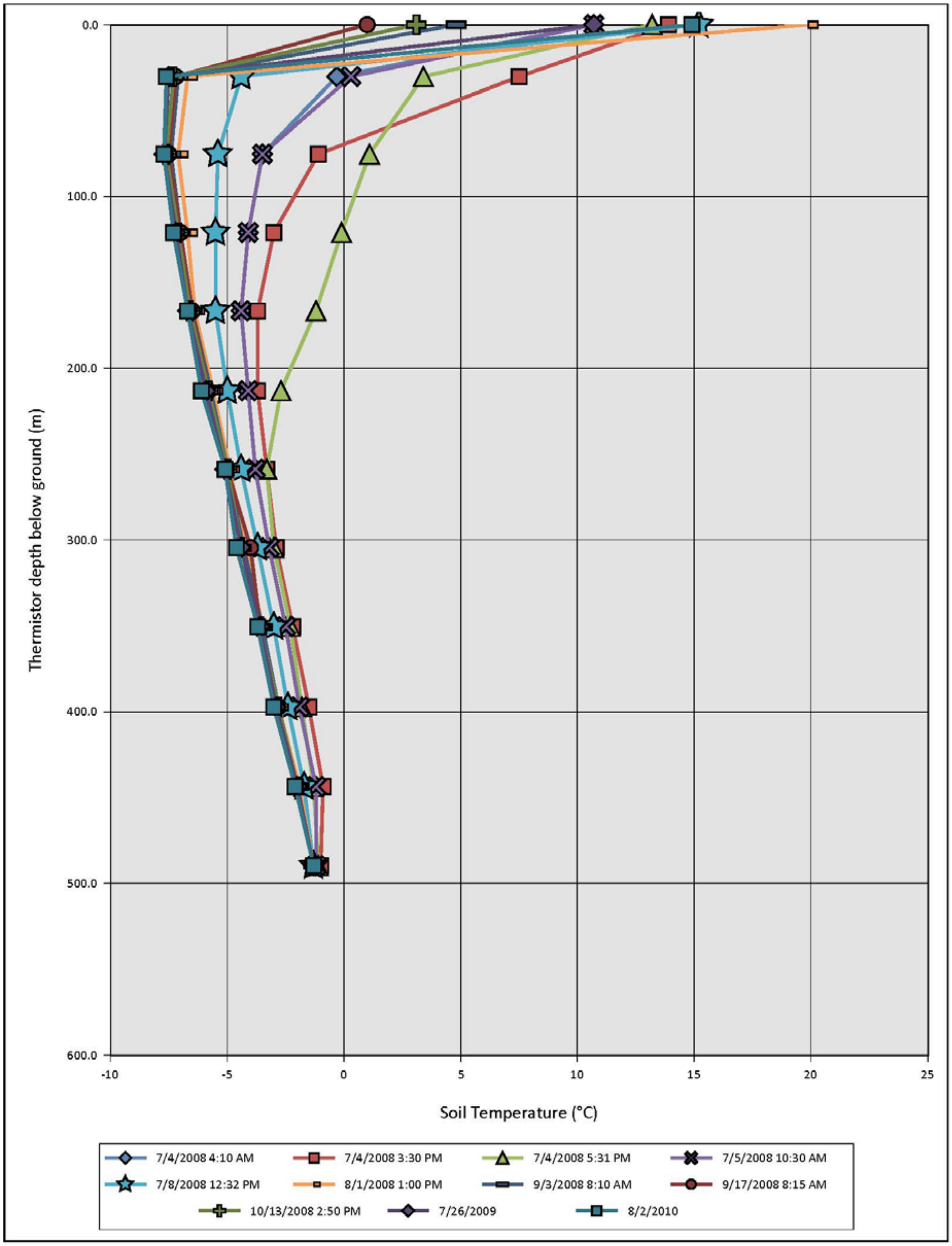
Thermistor Data (08SBD381A)



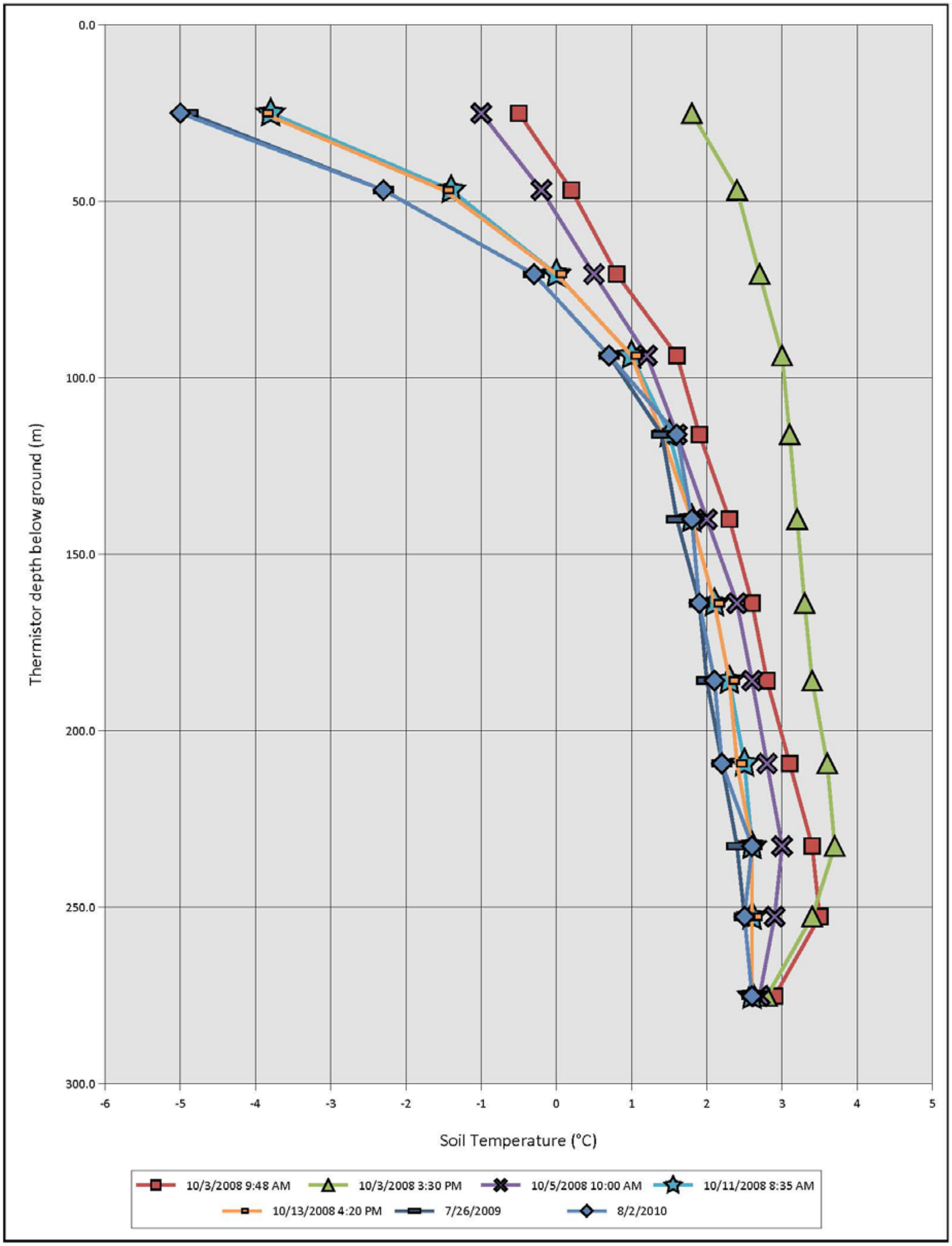
Thermistor Data (08SBD832)



Thermistor Data (08PMD669)

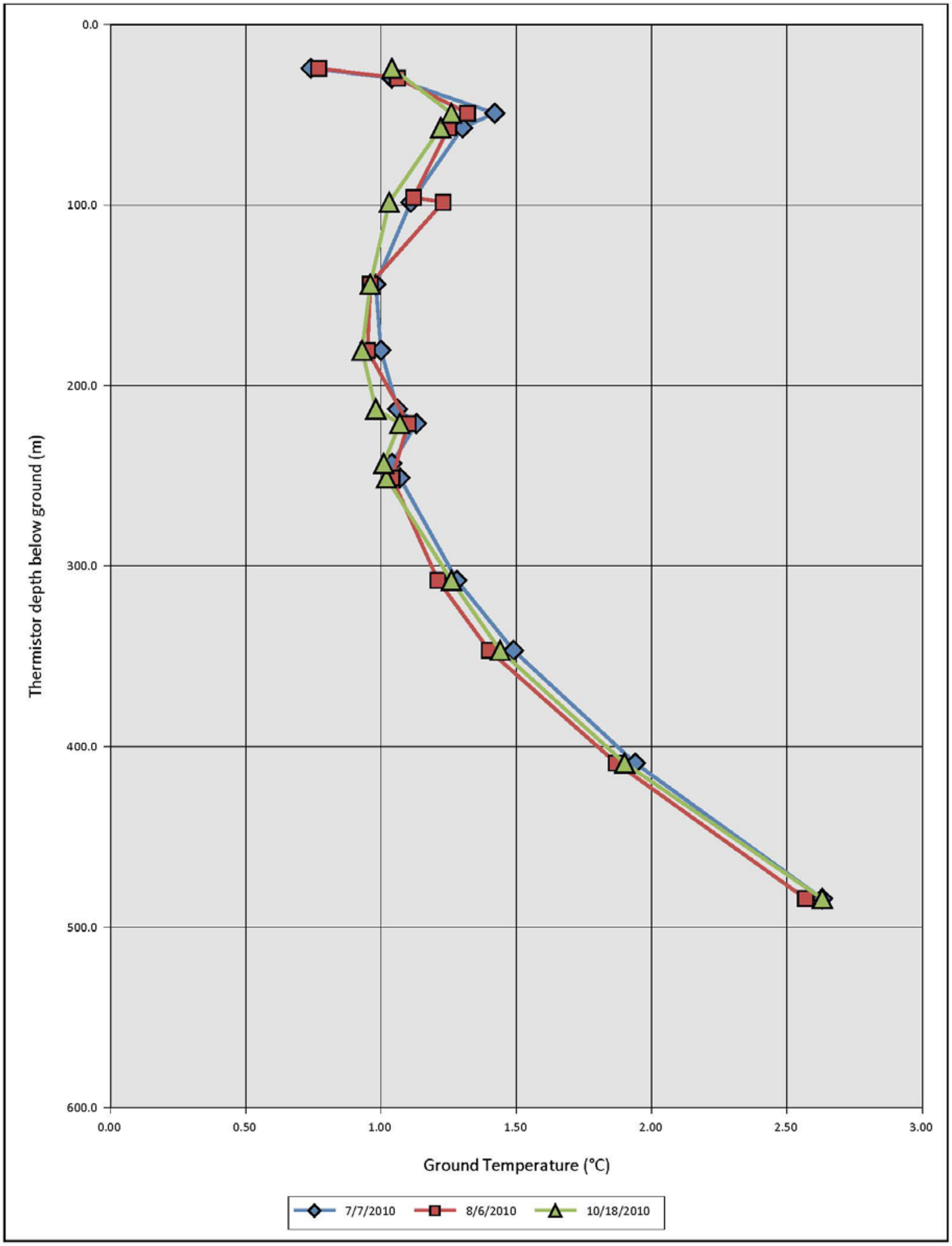


Thermistor Data (08PSD144)

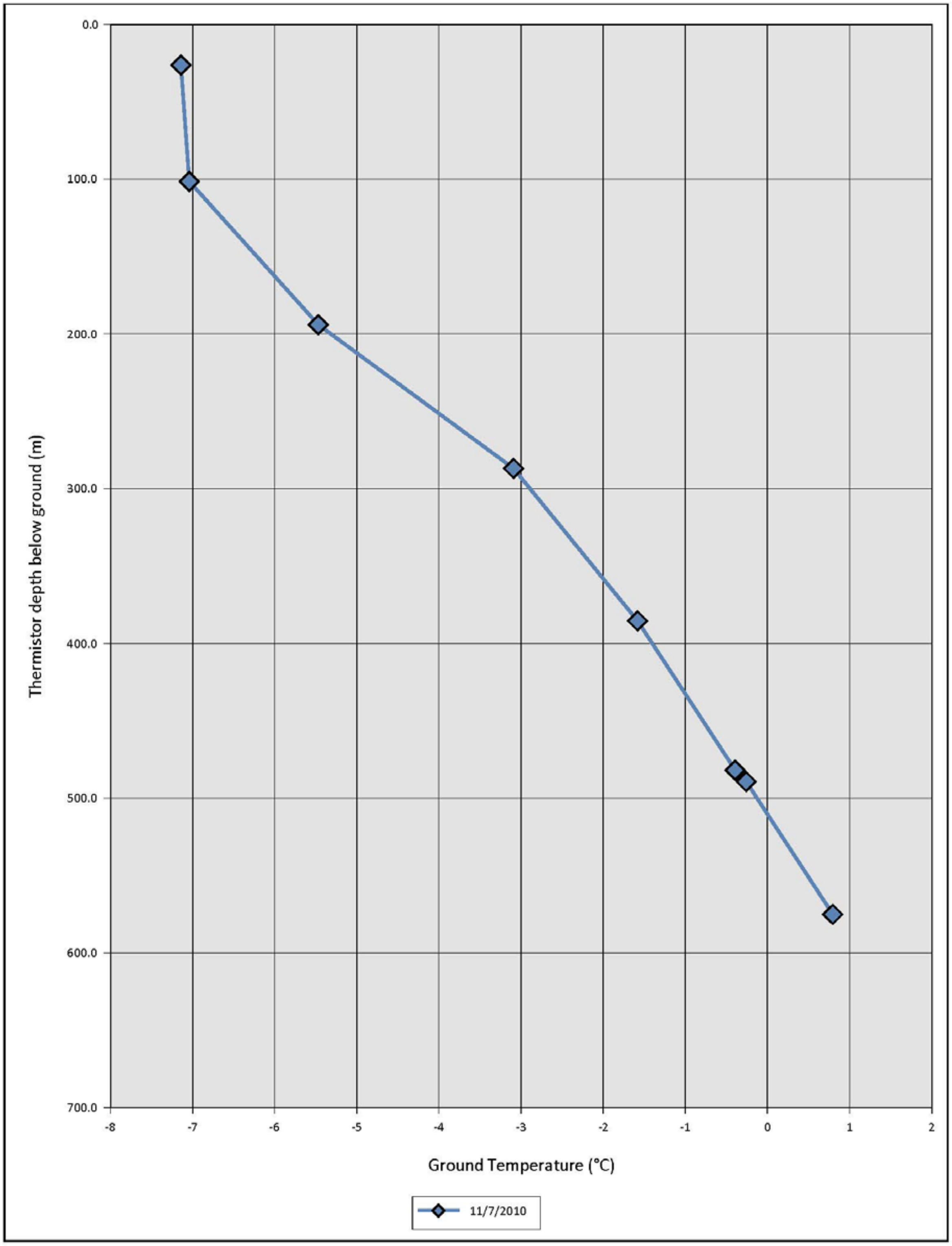


Appendix D Westbay Well Thermistor Profiles

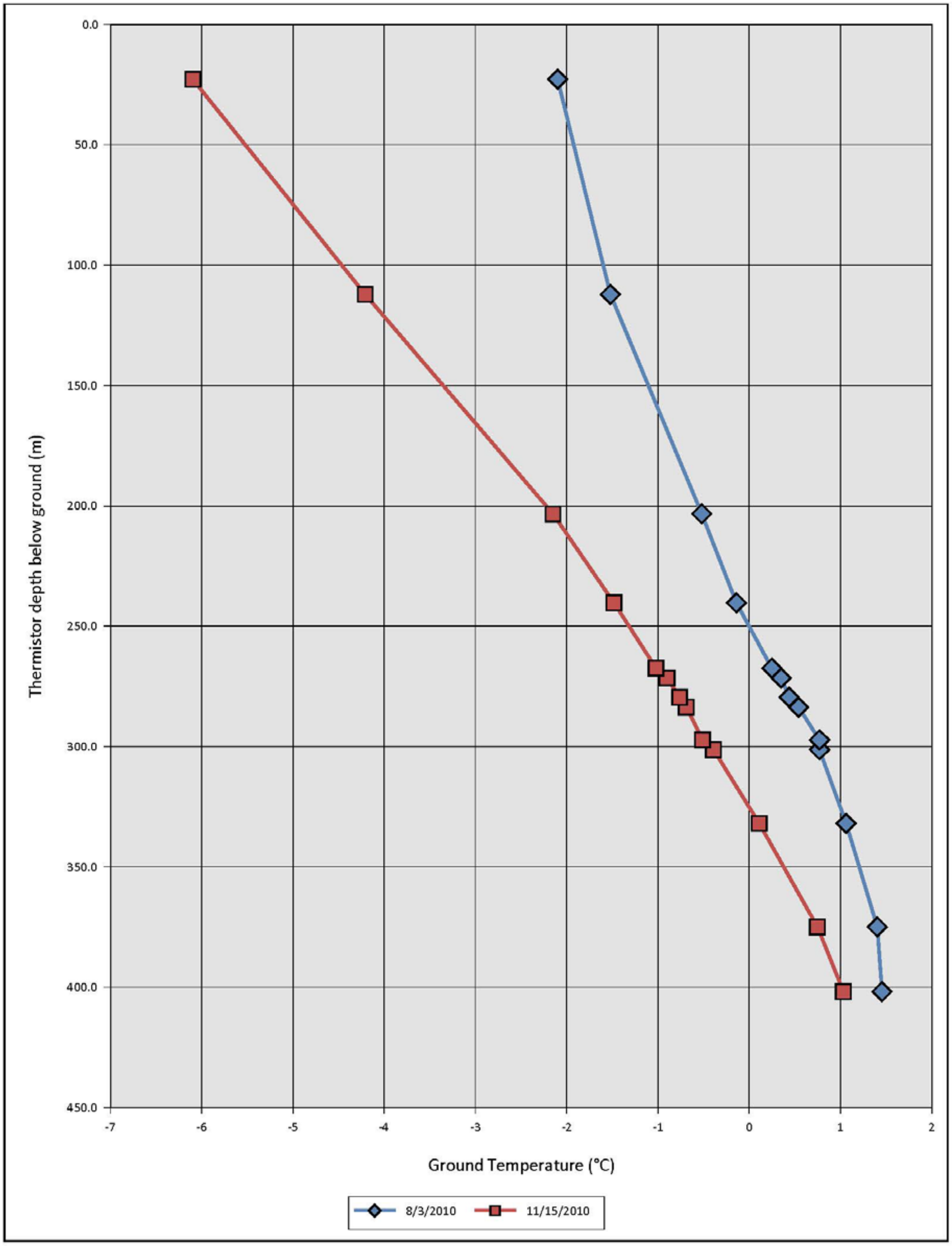
Thermistor Data (10WBW001)



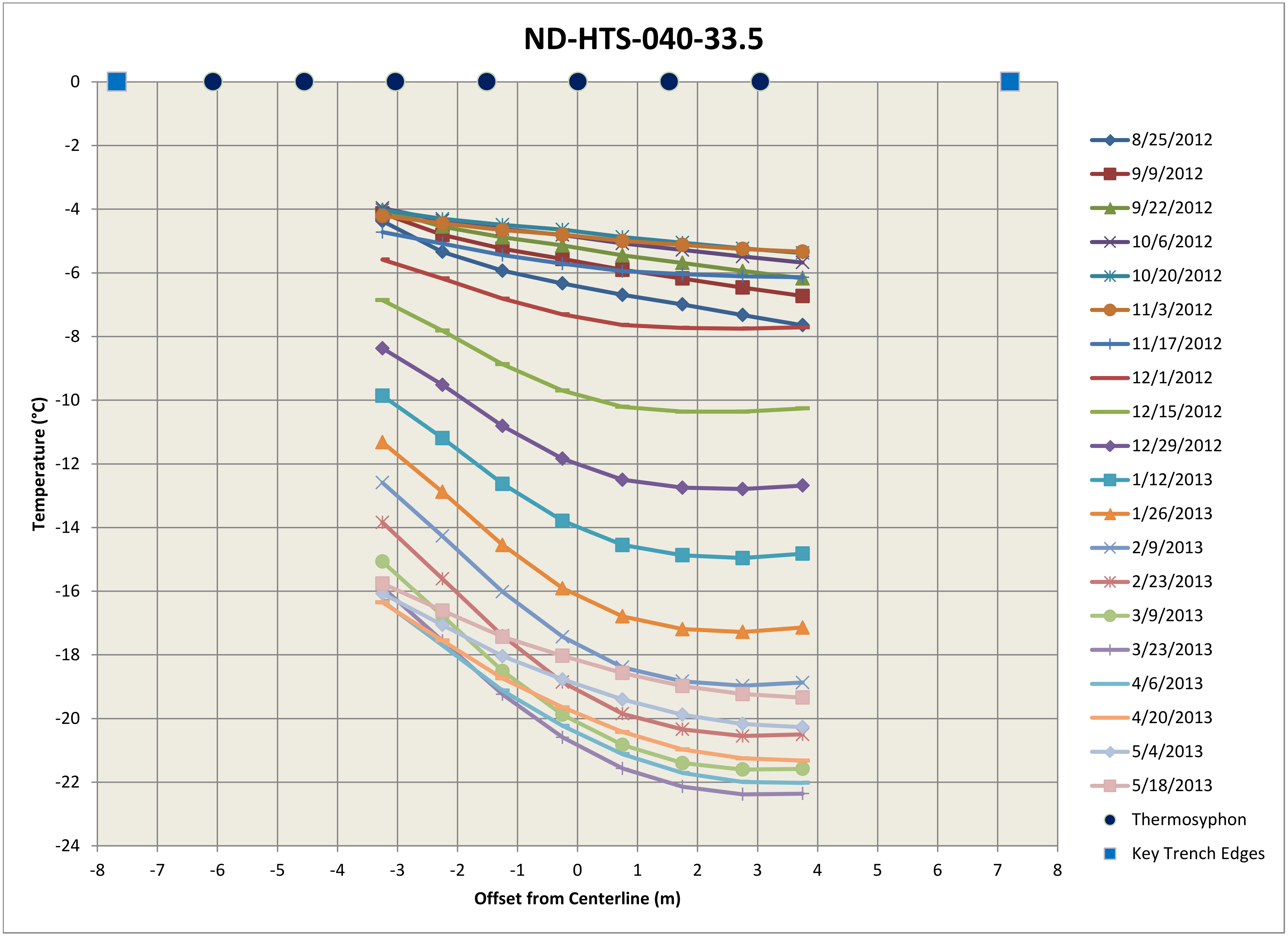
Thermistor Data (10WBW002)

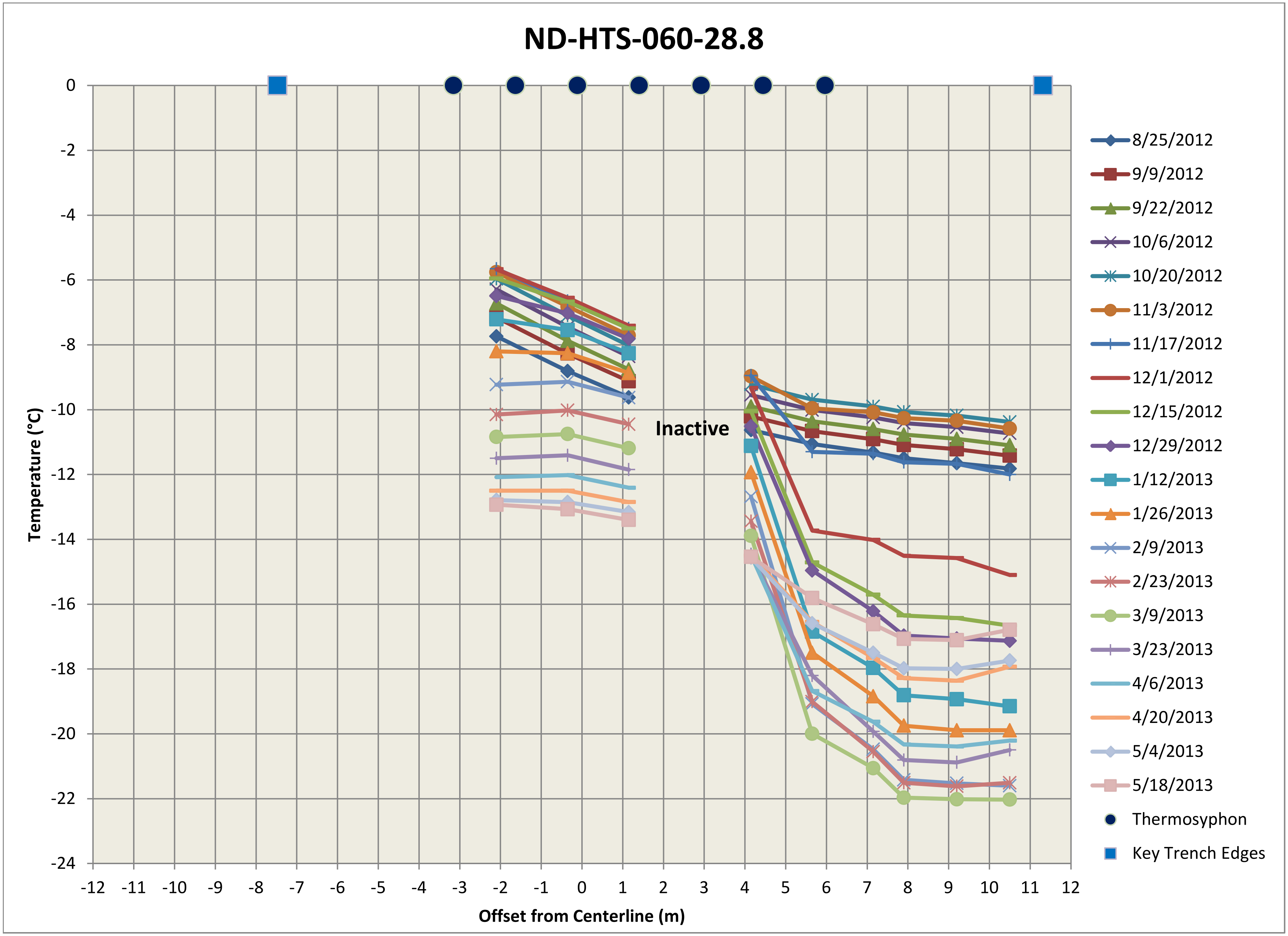


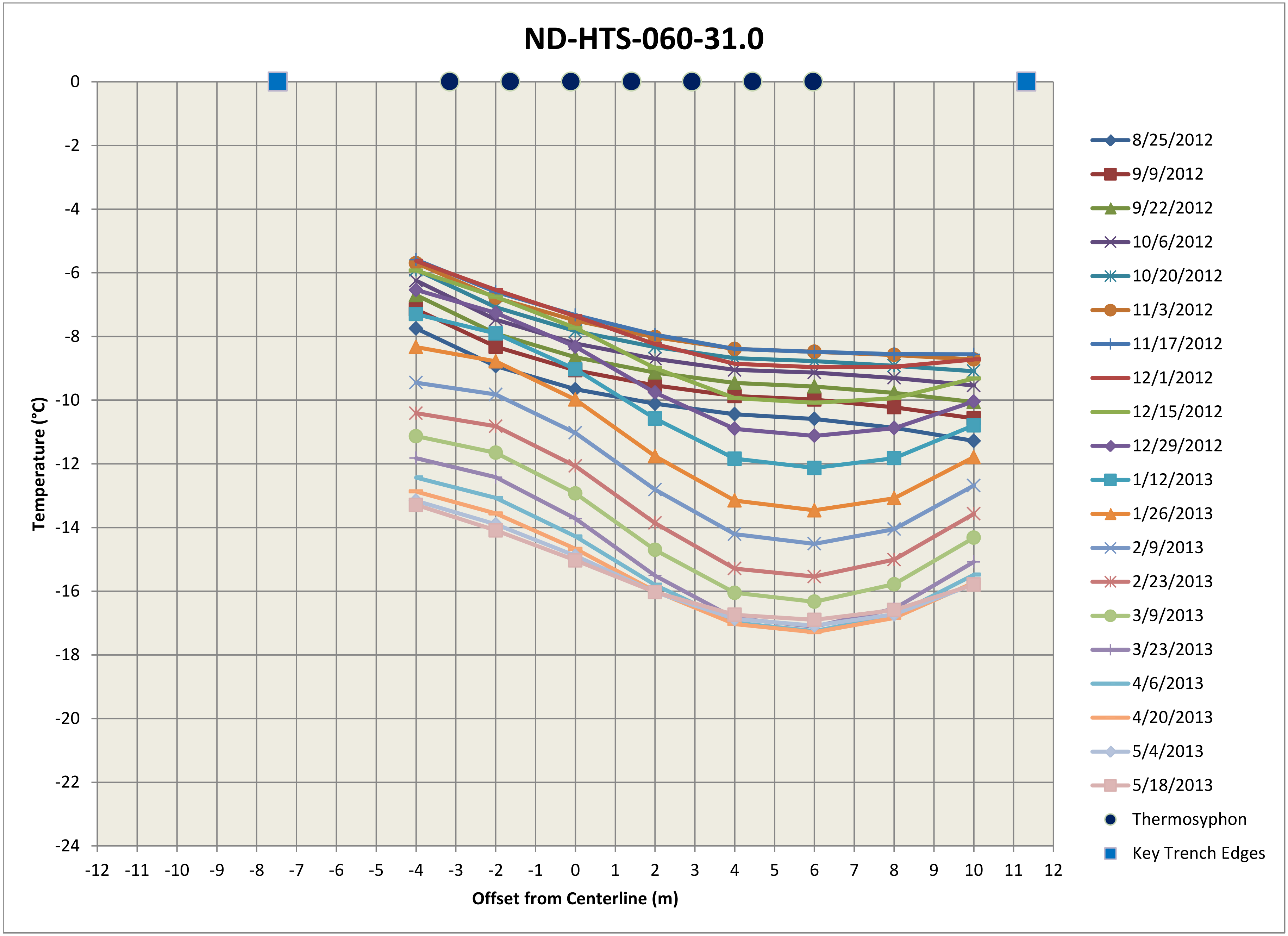
Thermistor Data (10WBW004)

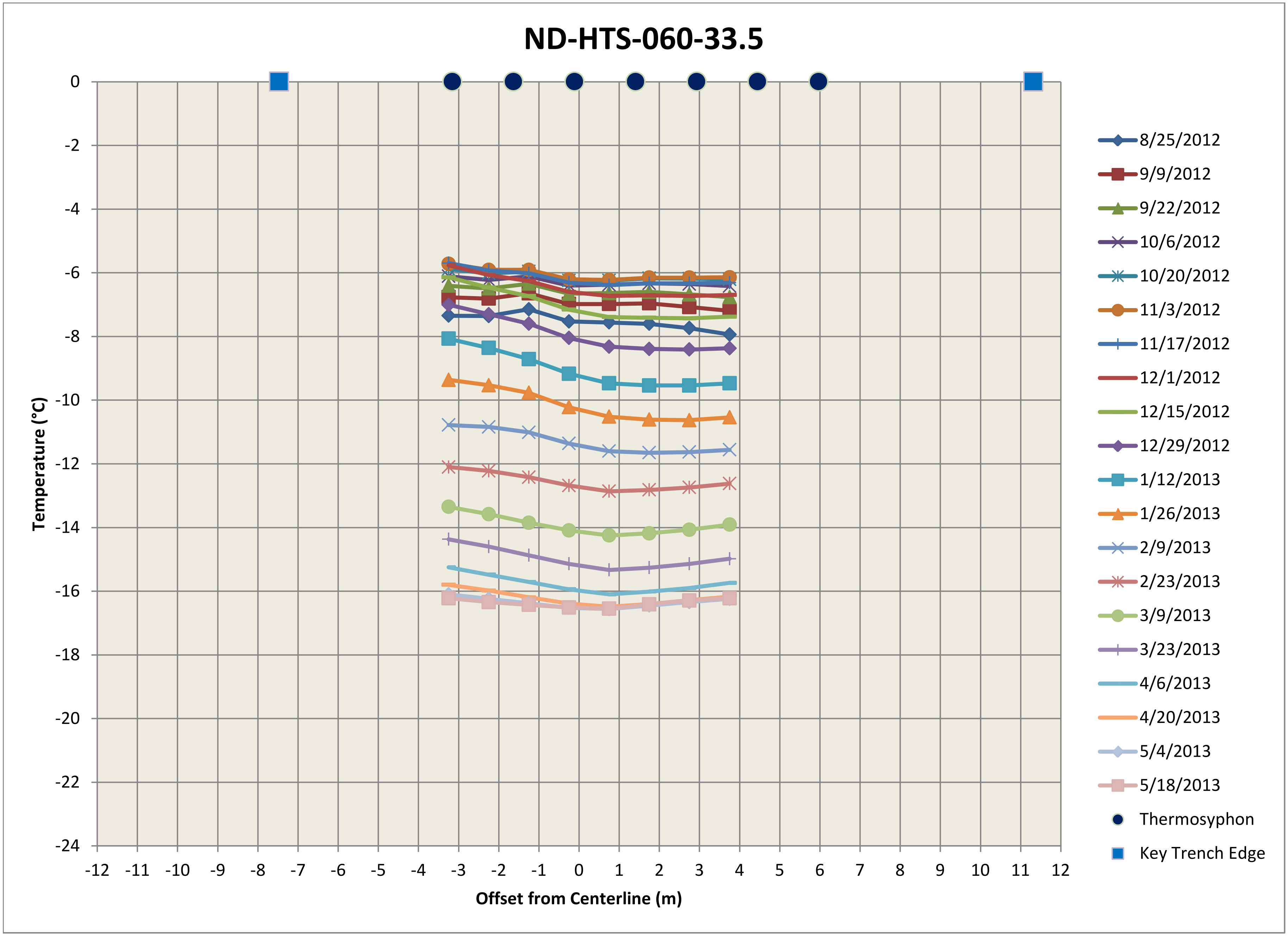


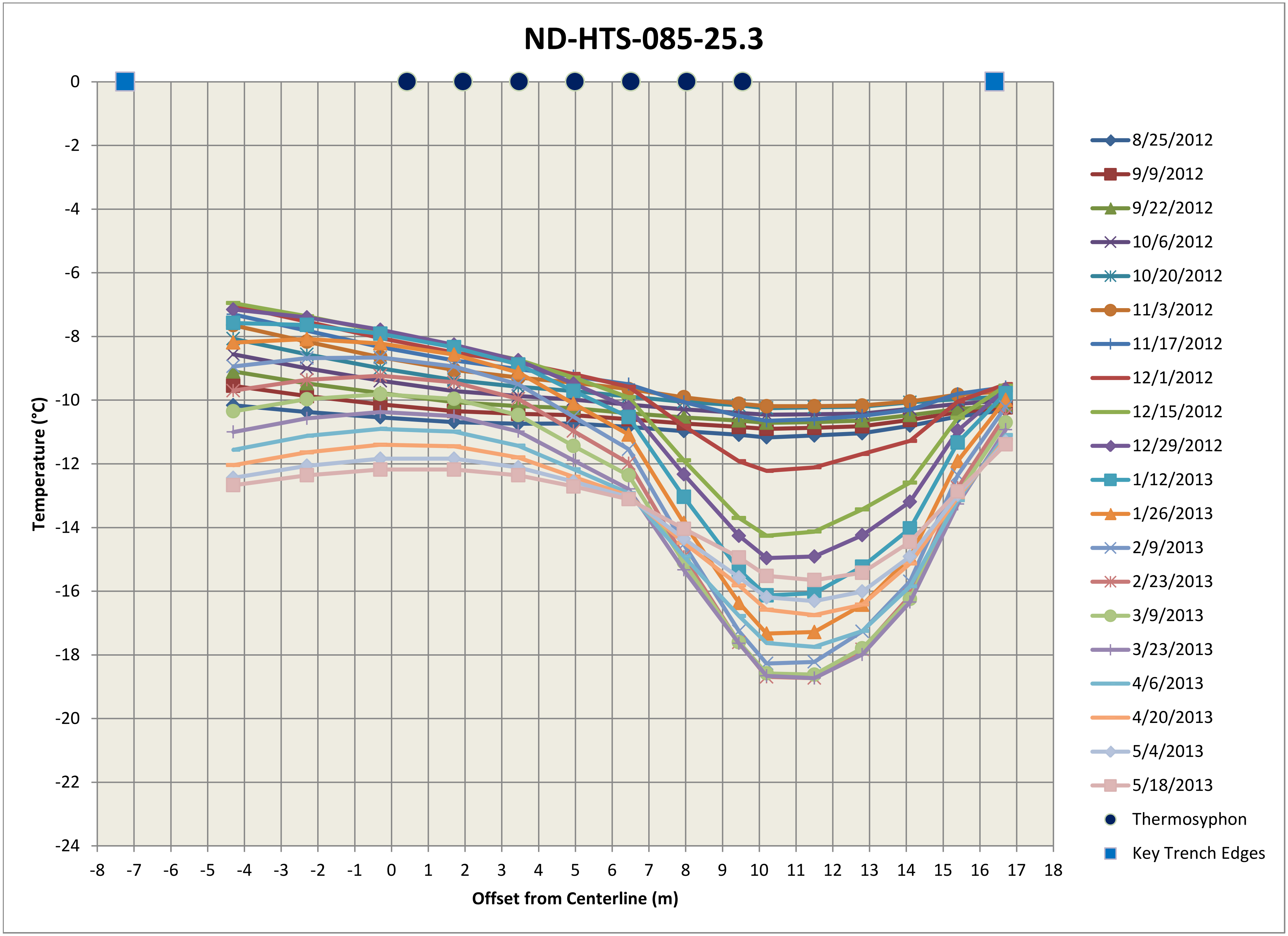
Appendix E North Dam Horizontal Thermistor Profiles

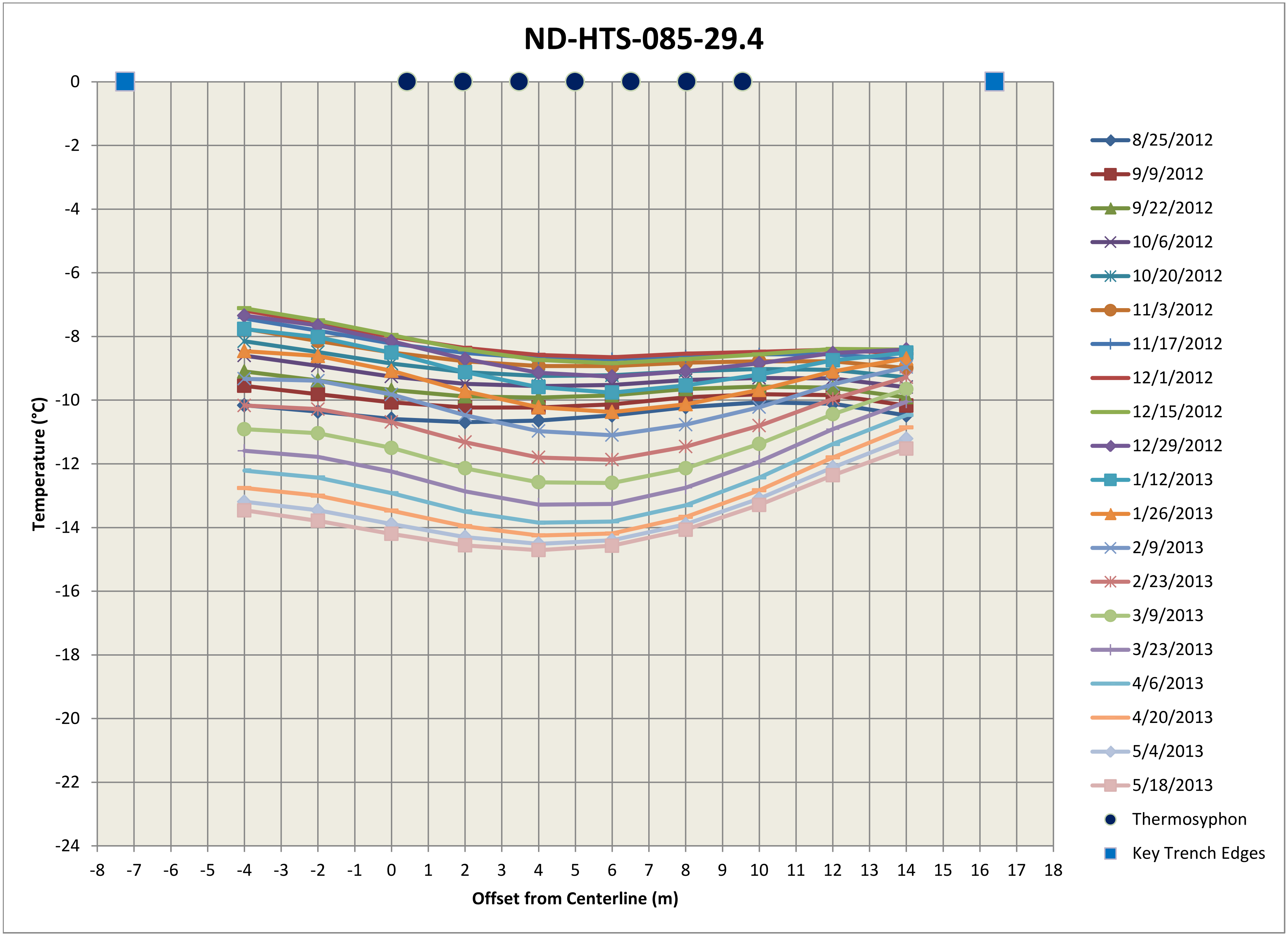

ND-HTS-040-33.5
Temperature (°C)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
Offset from Centerline (m)
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

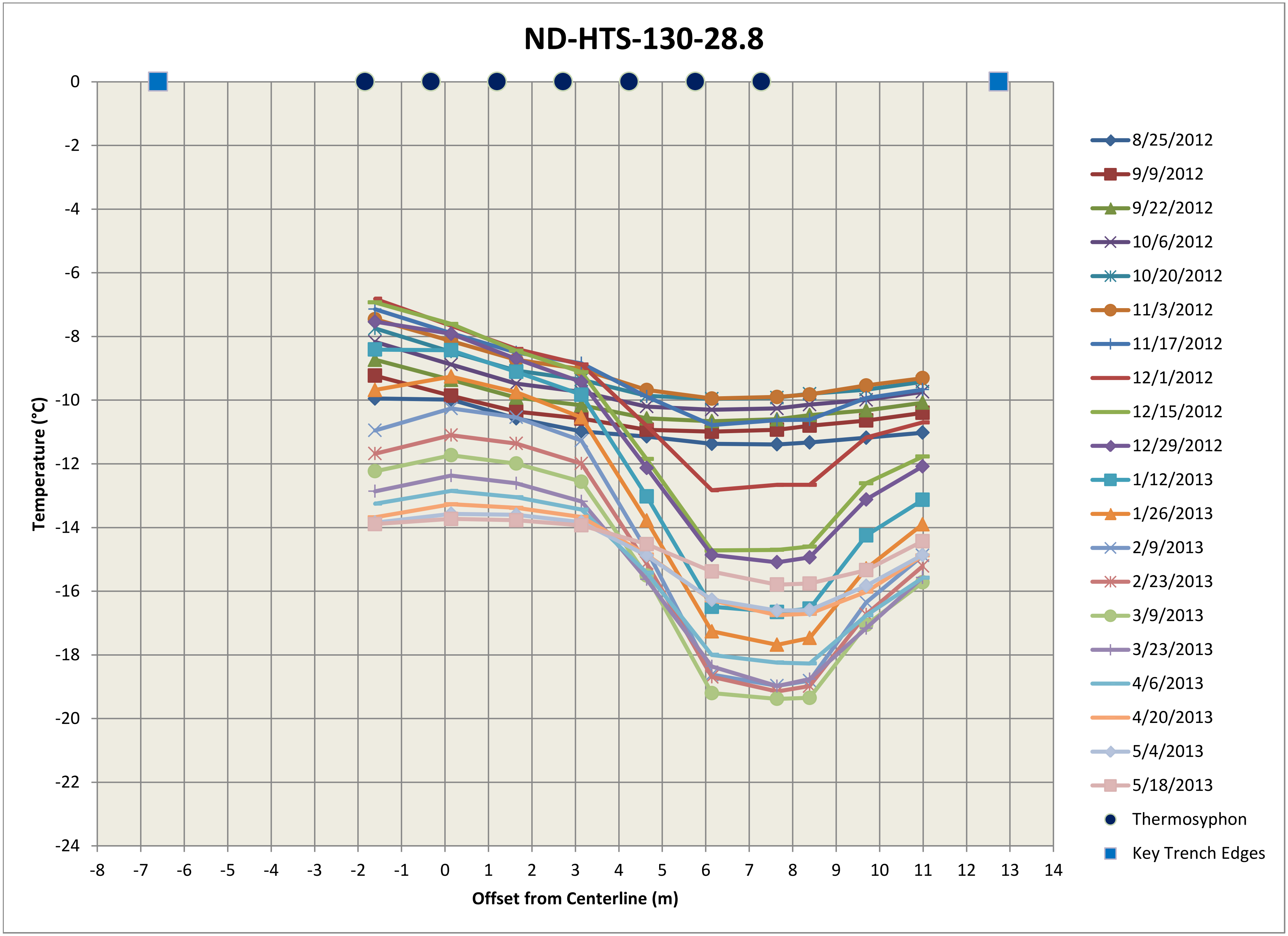

ND-HTS-060-28.8
Inactive
Temperature (°C)
Offset from Centerline (m)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

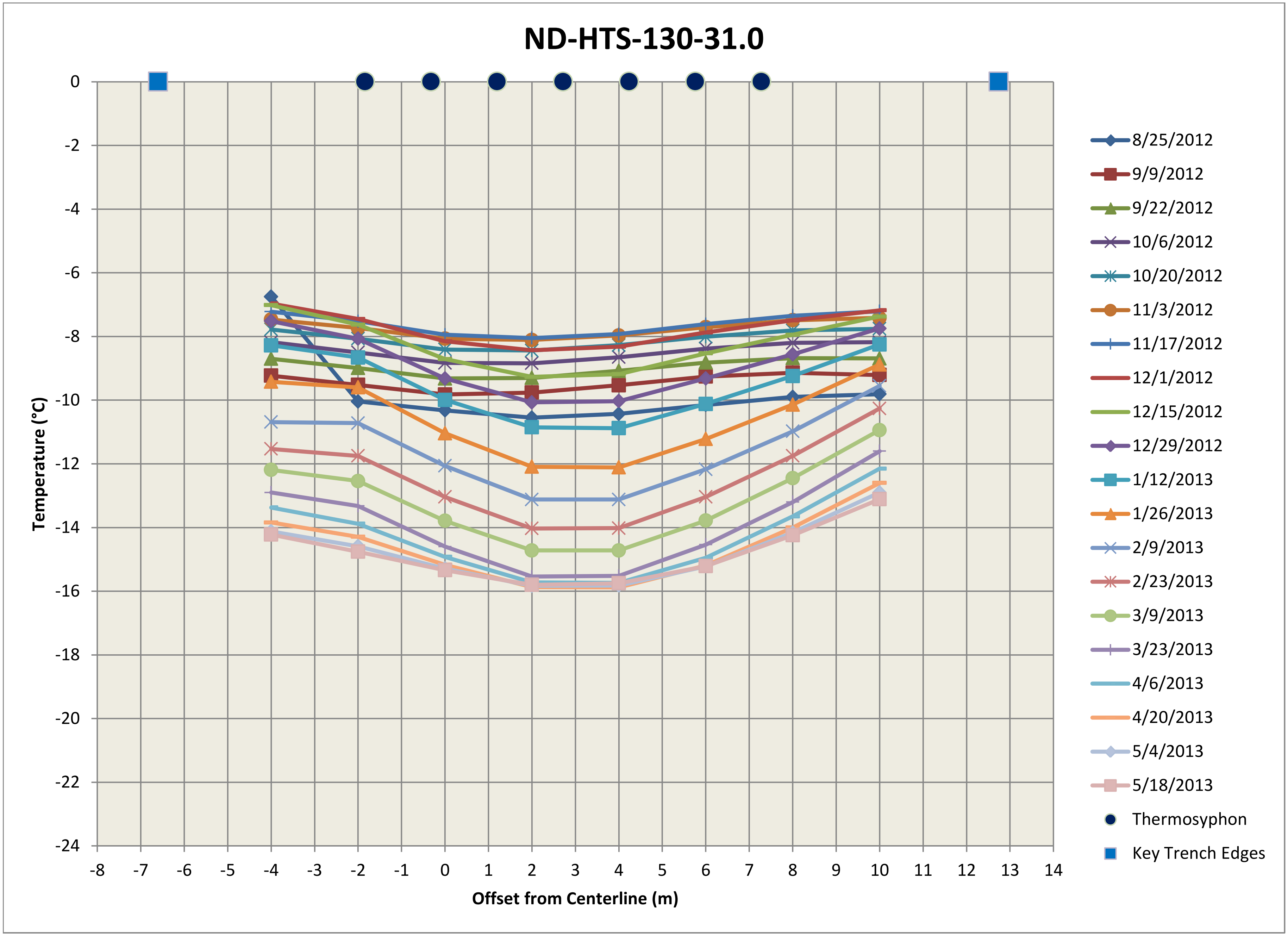

ND-HTS-060-31.0
Temperature (°C)
Offset from Centerline (m)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

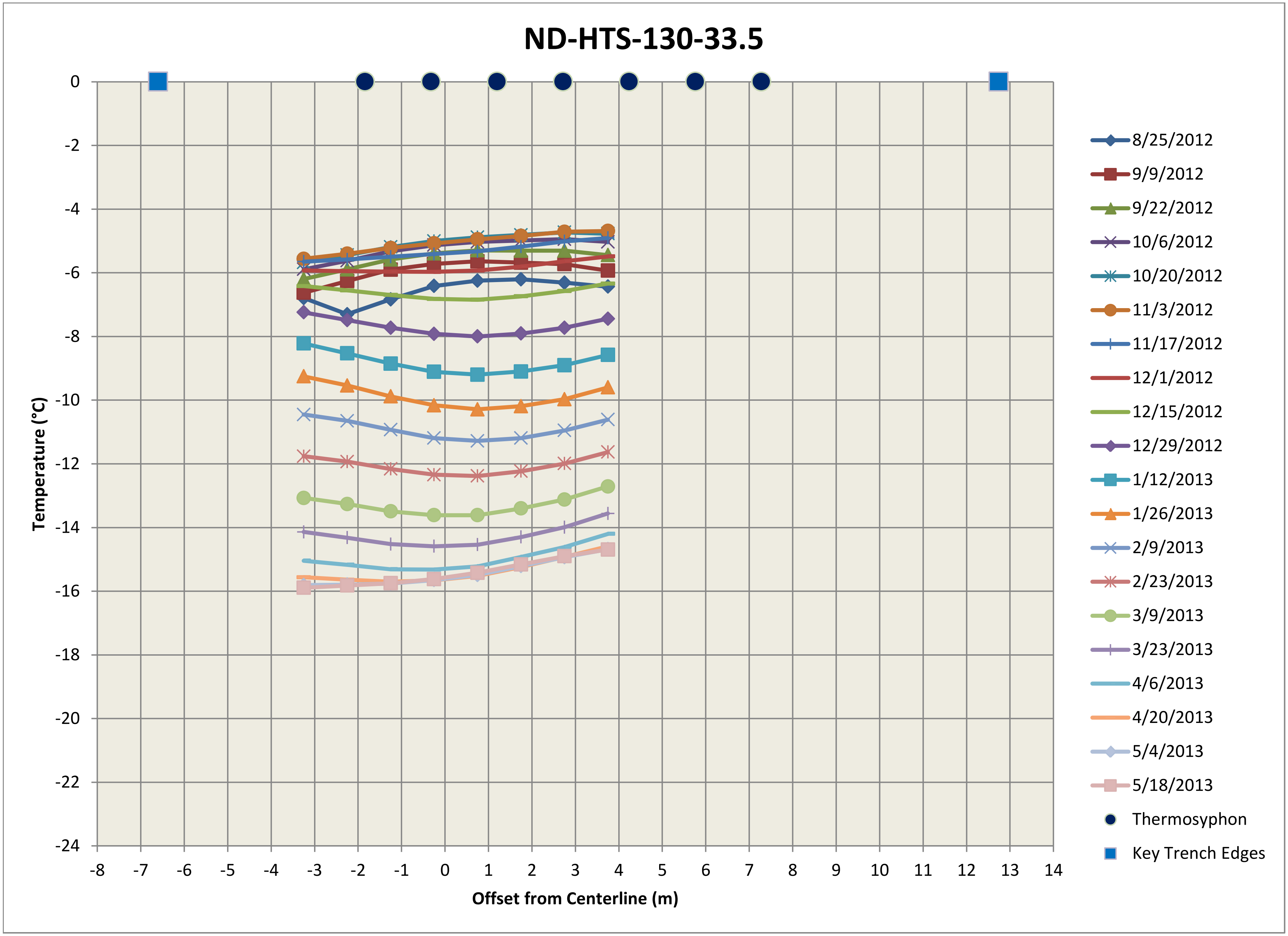

ND-HTS-060-33.5
Temperature (°C)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
Offset from Centerline (m)
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edge

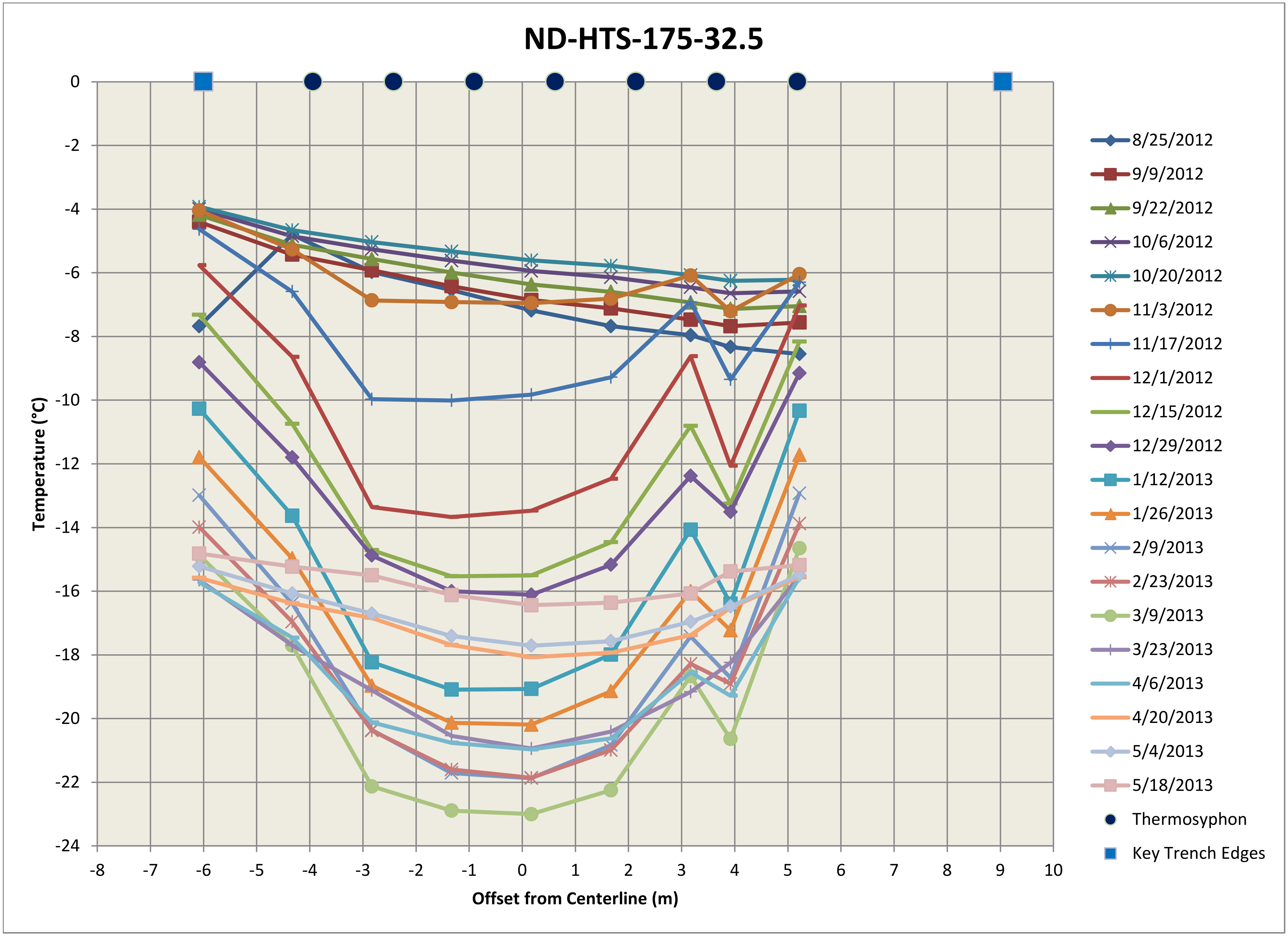

ND-HTS-085-25.3
Temperature (°C)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Offset from Centerline (m)
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

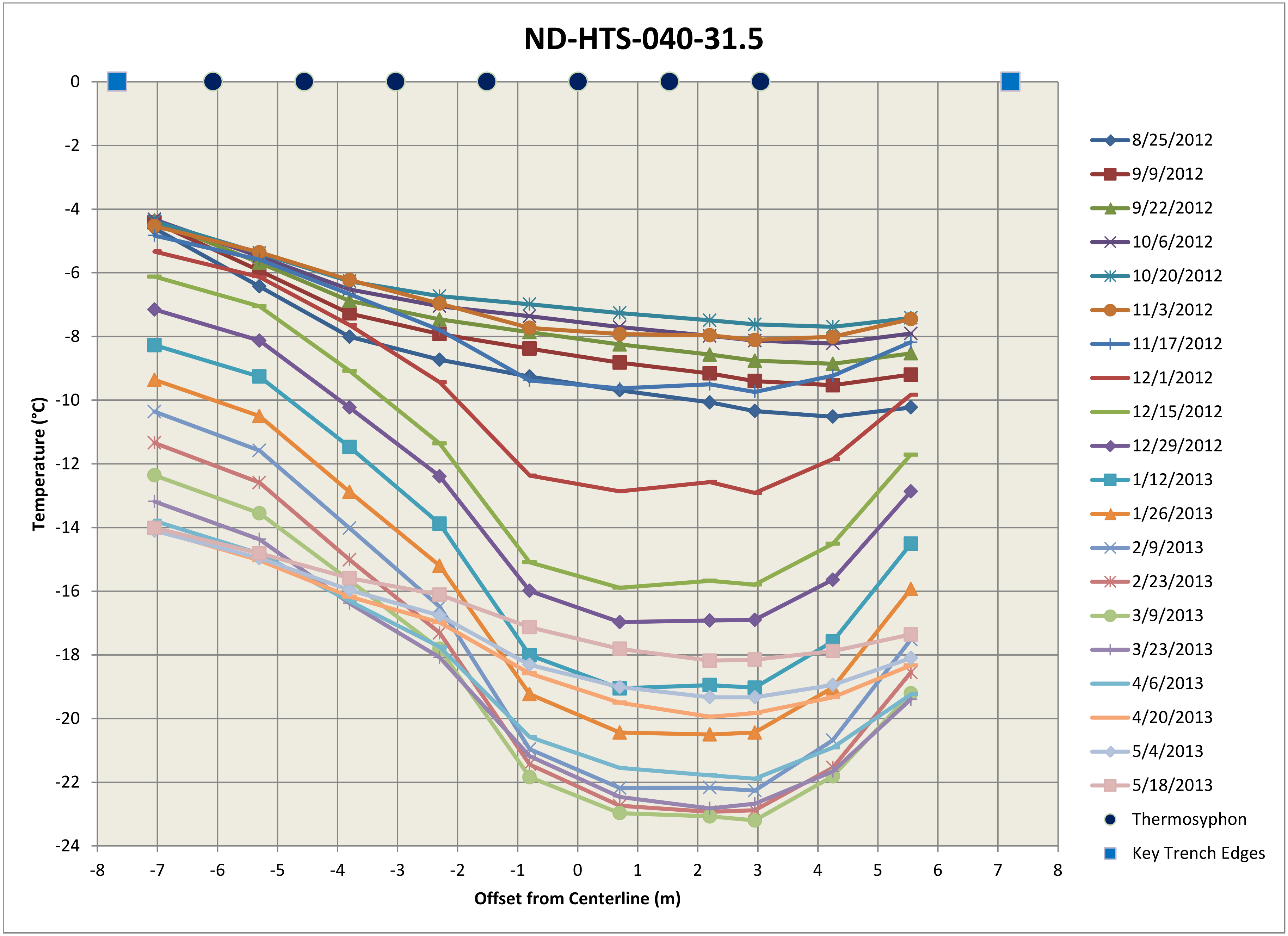

ND-HTS-085-29.4
Temperature (°C)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
Offset from Centerline (m)
-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

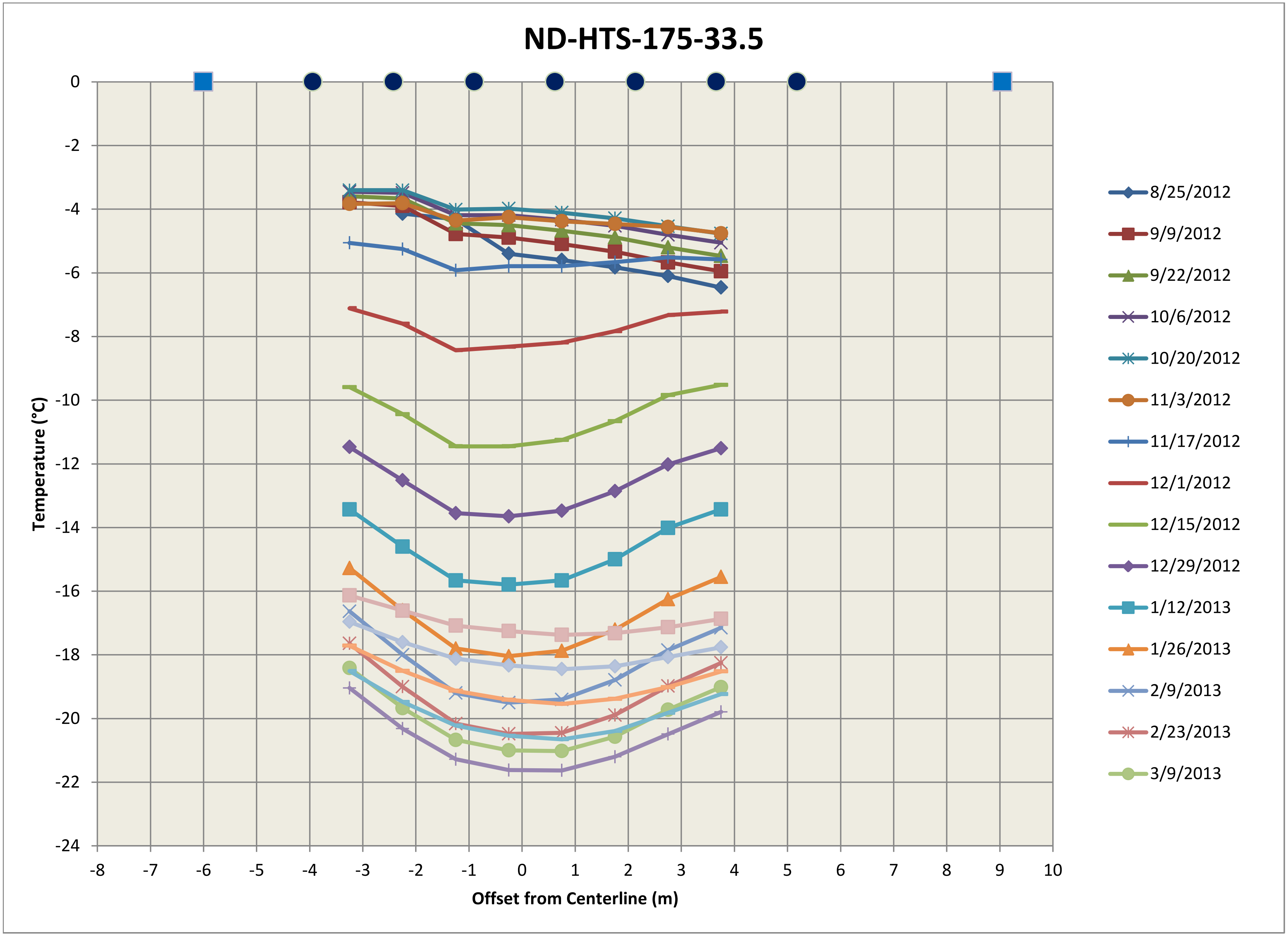

ND-HTS-130-28.8
Temperature (°C)
Offset from Centerline (m)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges


ND-HTS-130-31.0
Temperature (°C)
Offset from Centerline (m)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

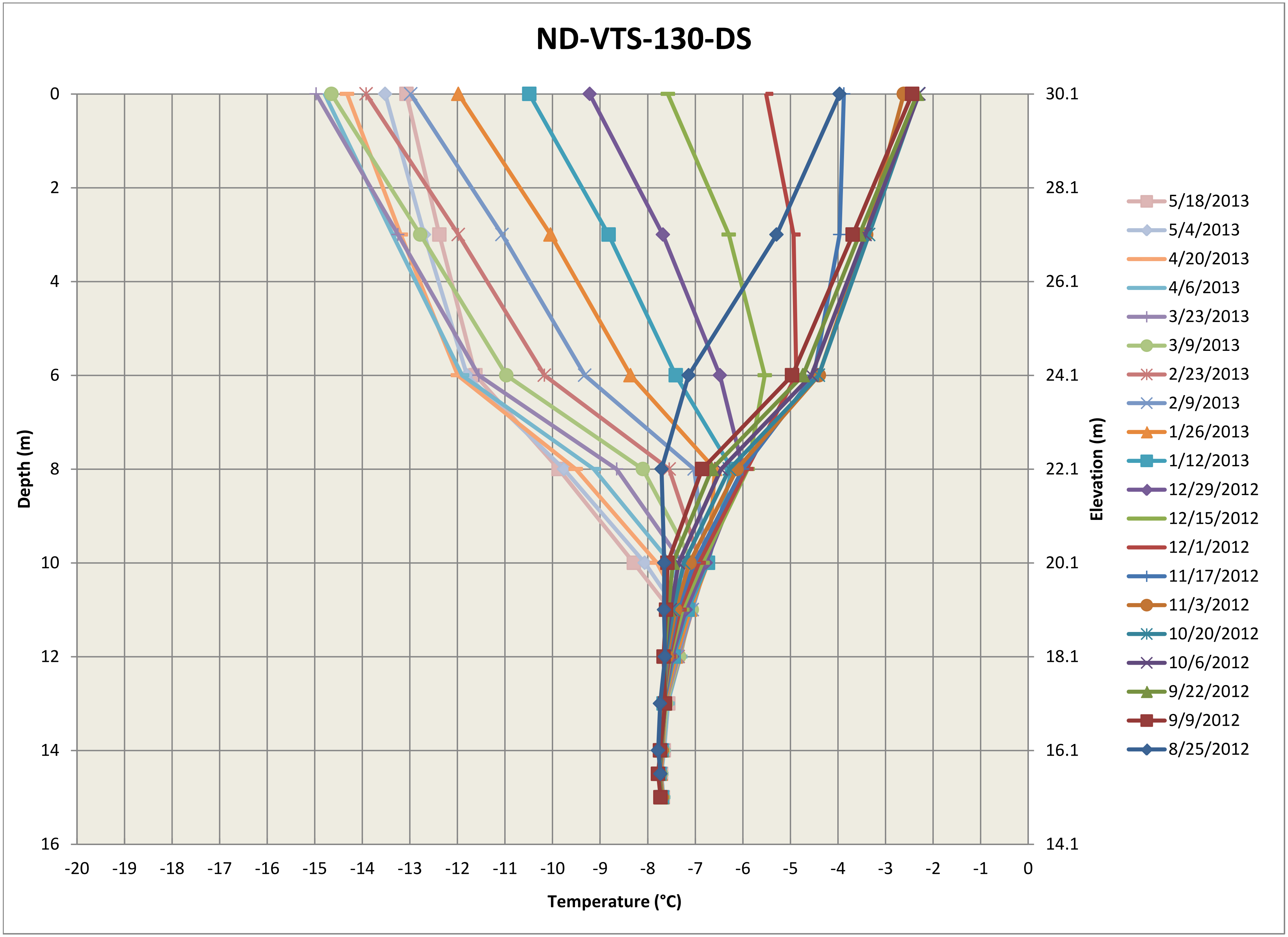

ND-HTS-130-33.5
Temperature (°C)
Offset from Centerline (m)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

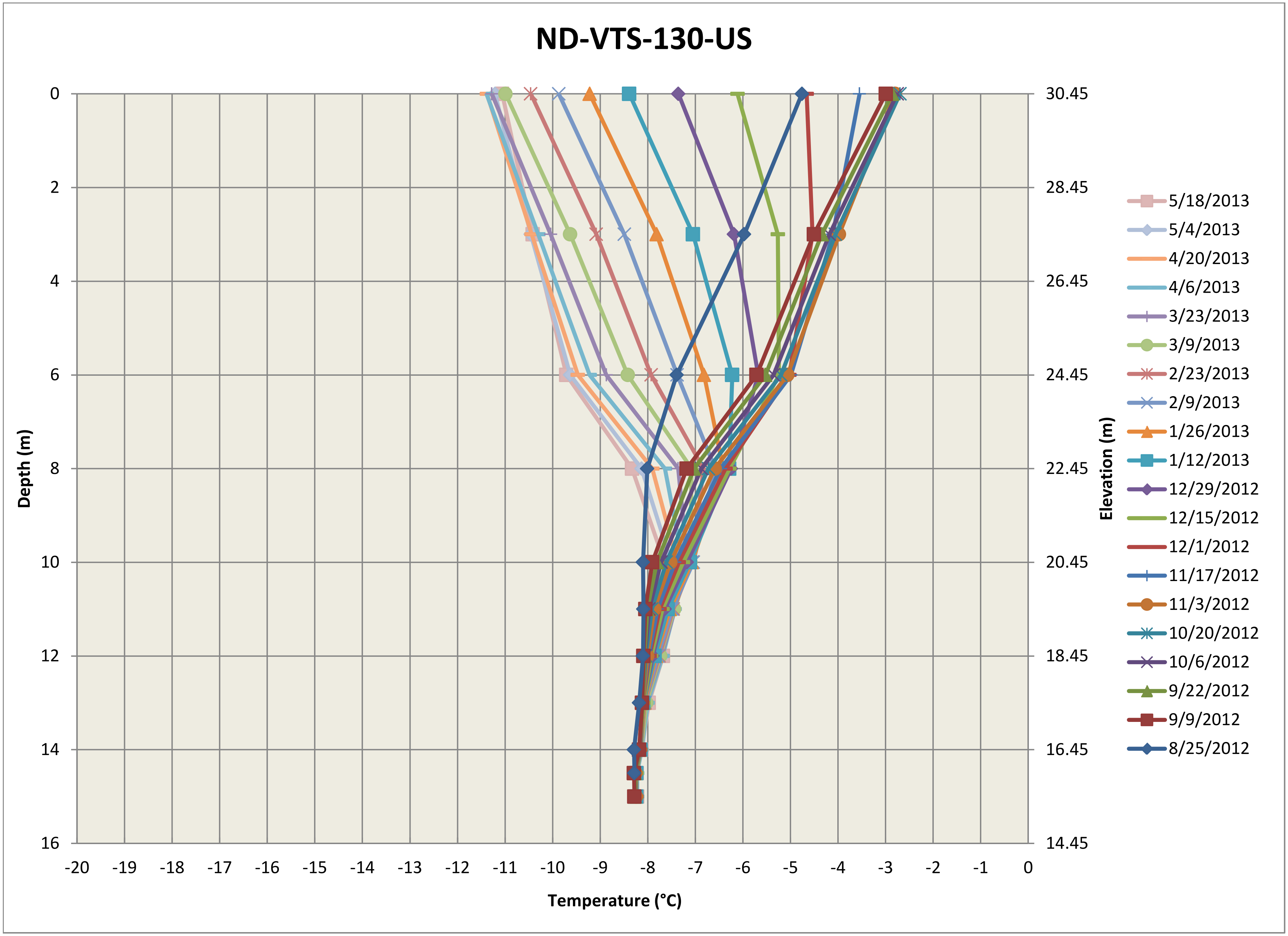

ND-HTS-175-32.5
Temperature (°C)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
Offset from Centerline (m)
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

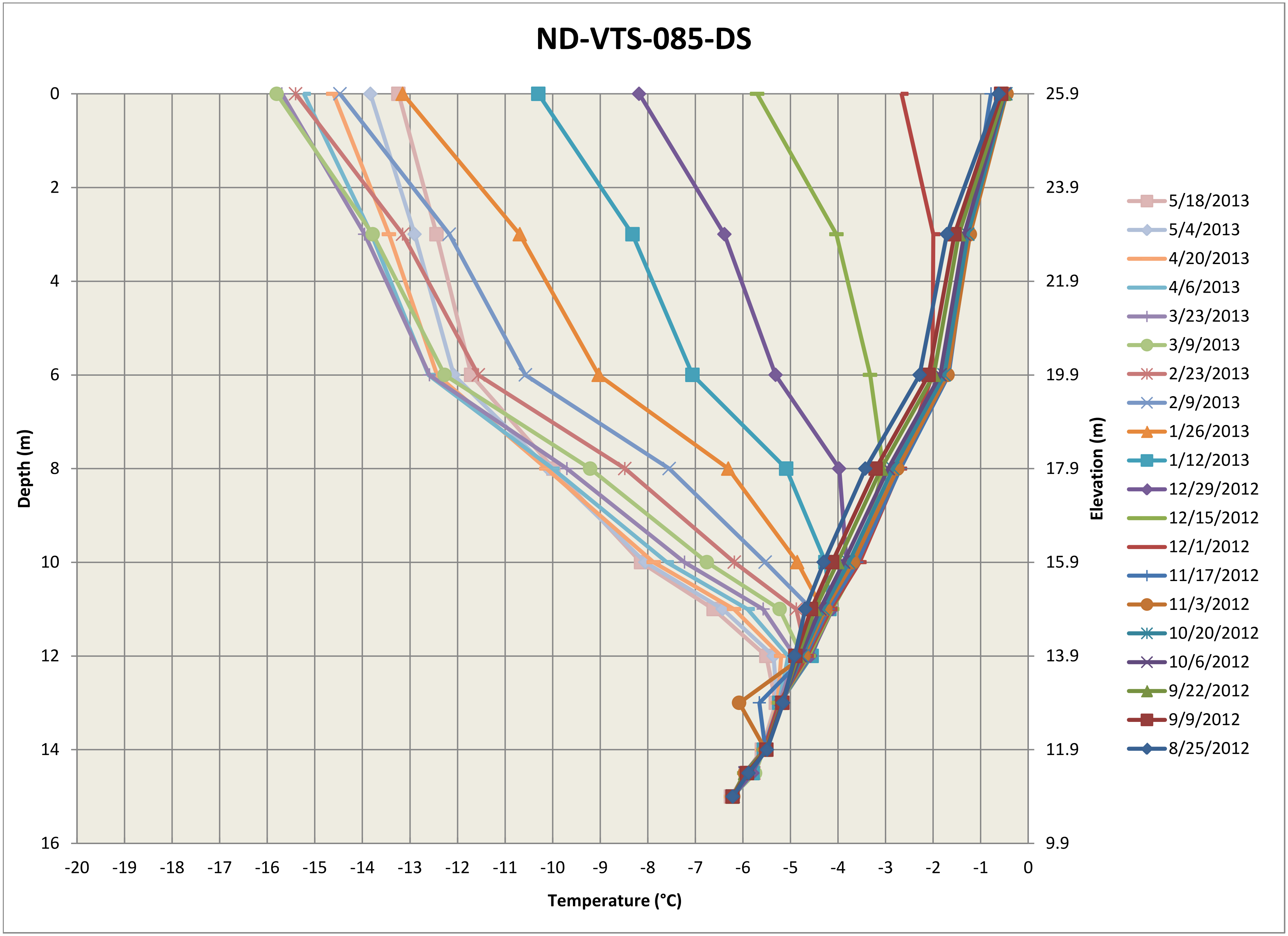

ND-HTS-040-31.5
Temperature (°C)
Offset from Centerline (m)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013
3/23/2013
4/6/2013
4/20/2013
5/4/2013
5/18/2013
Thermosyphon
Key Trench Edges

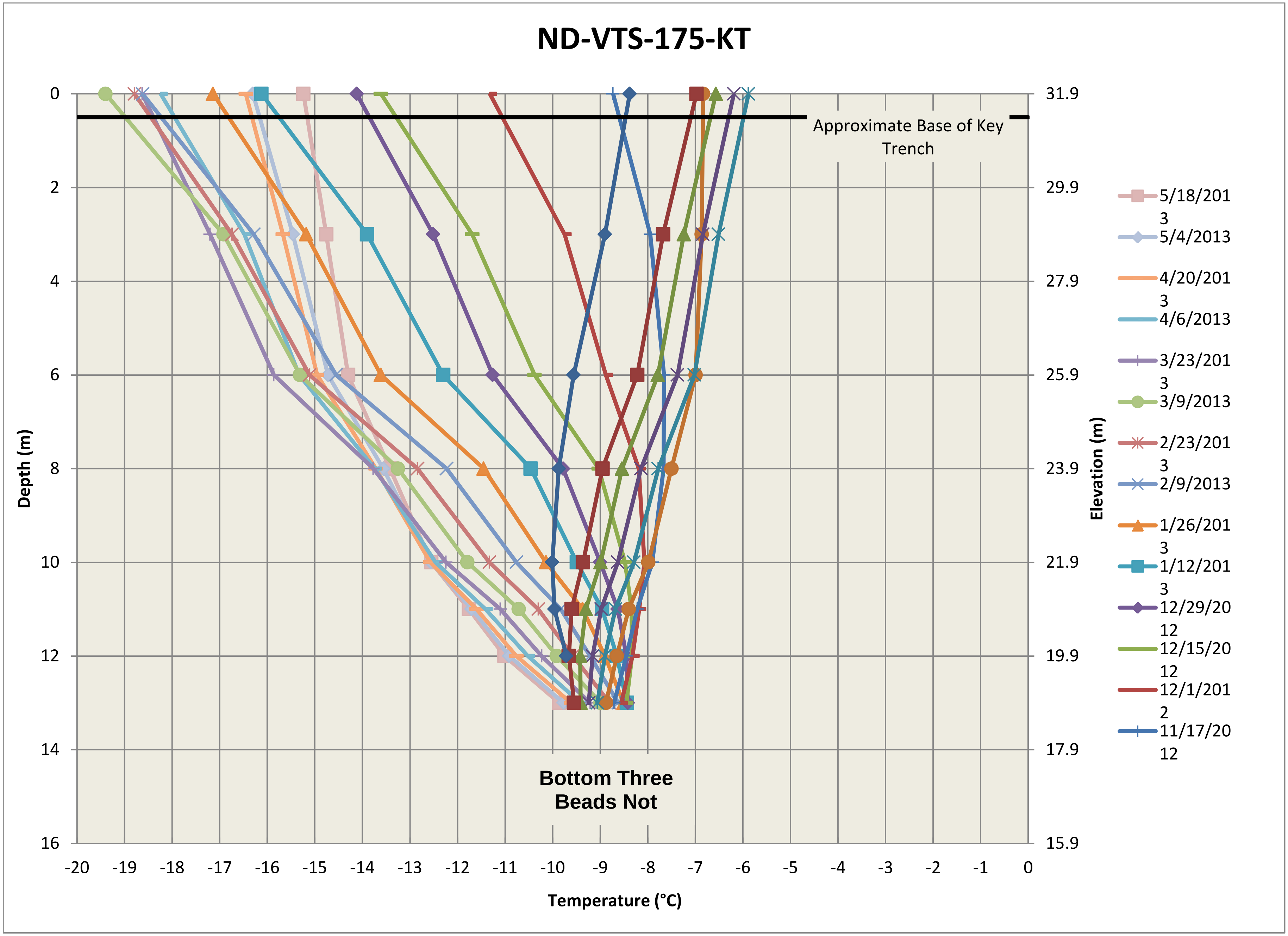

ND-HTS-175-33.5
Temperature (°C)
Offset from Centerline (m)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
8/25/2012
9/9/2012
9/22/2012
10/6/2012
10/20/2012
11/3/2012
11/17/2012
12/1/2012
12/15/2012
12/29/2012
1/12/2013
1/26/2013
2/9/2013
2/23/2013
3/9/2013

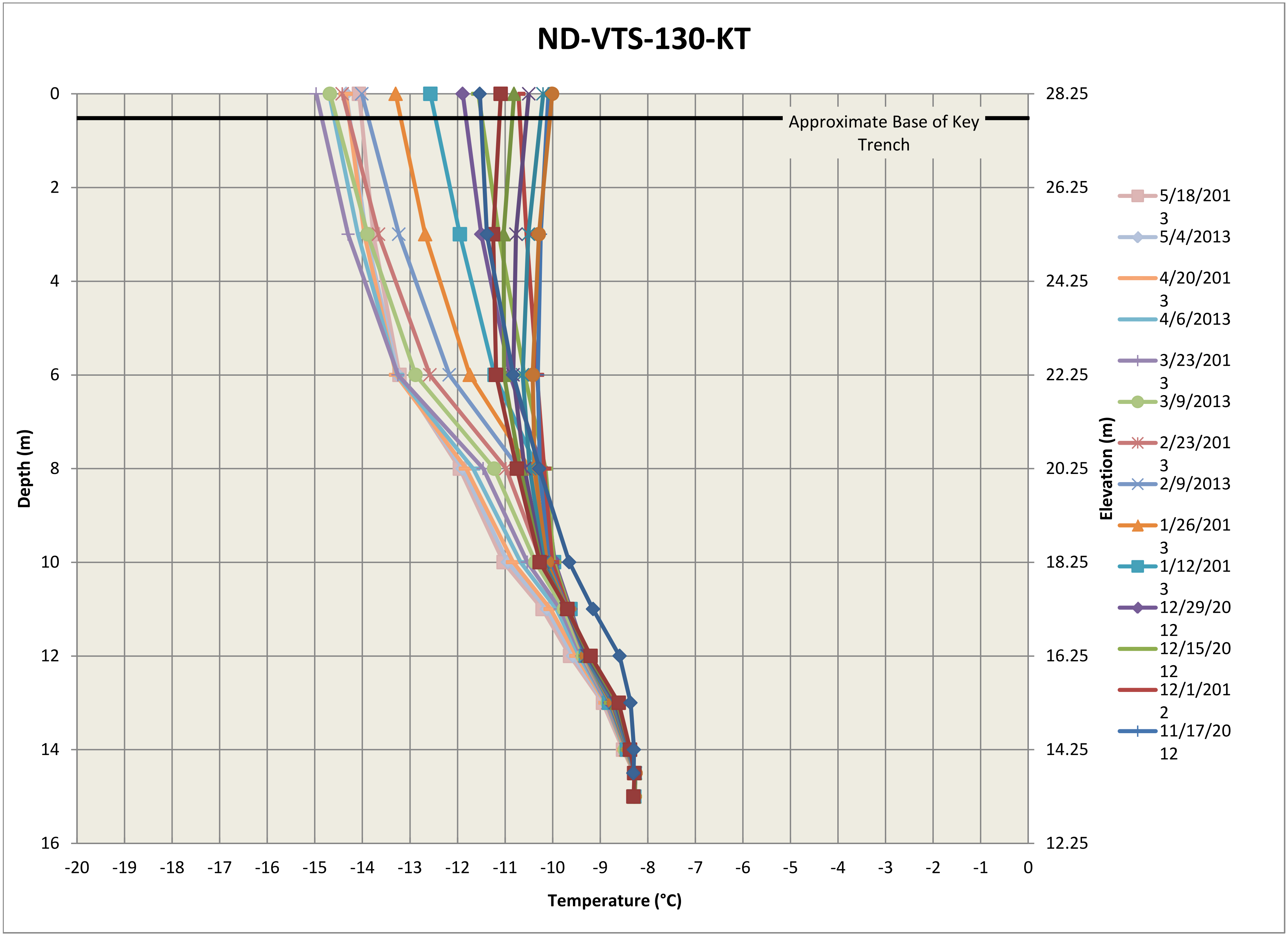
Appendix F North Dam Vertical Thermistor Profiles

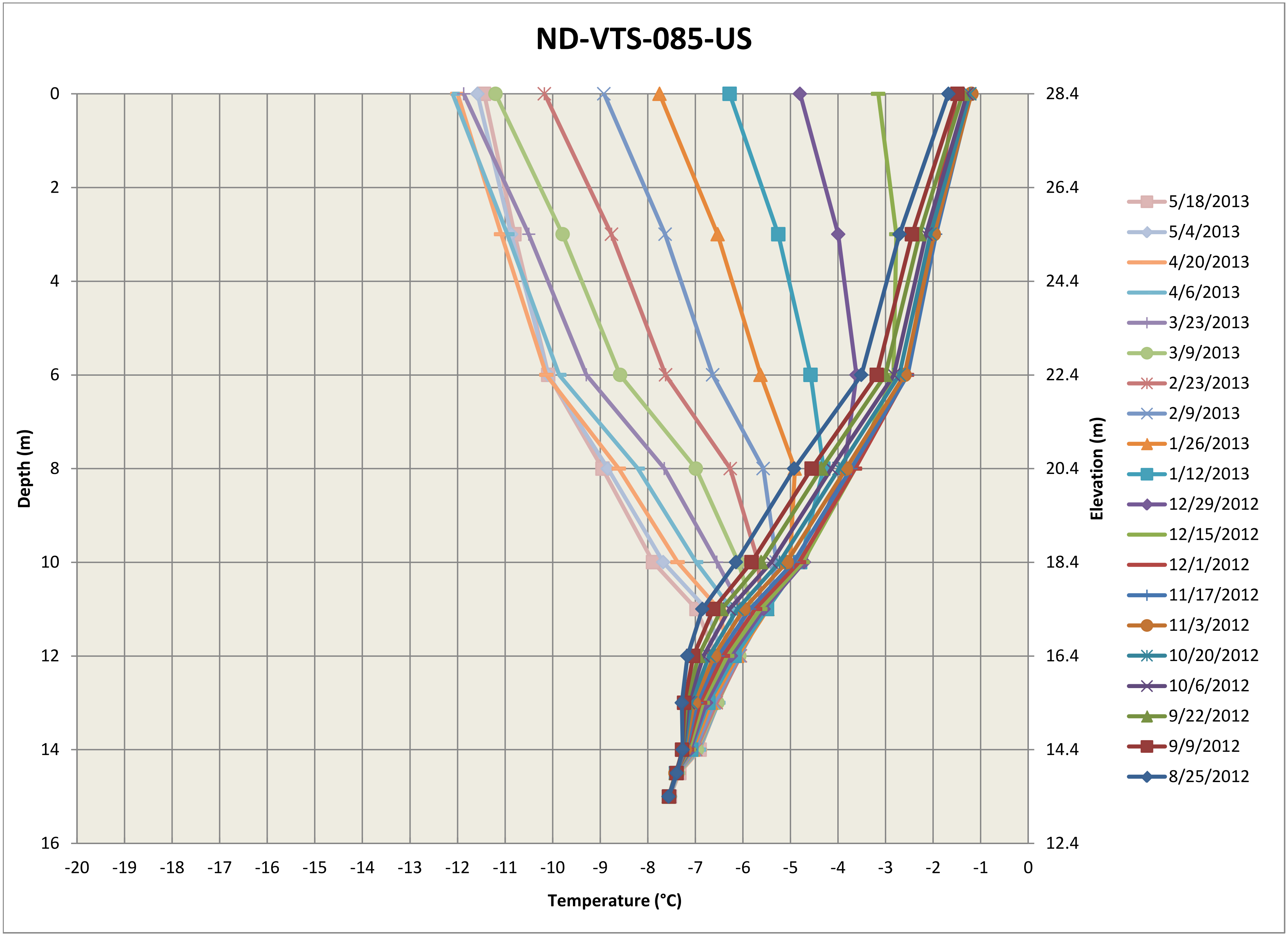

ND-VTS-130-DS
Depth (m)
0
2
4
6
8
10
12
14
16
Elevation (m)
30.1
28.1
26.1
24.1
22.1
20.1
18.1
16.1
14.1
-20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0
Temperature (°C)
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012
11/3/2012
10/20/2012
10/6/2012
9/22/2012
9/9/2012
8/25/2012

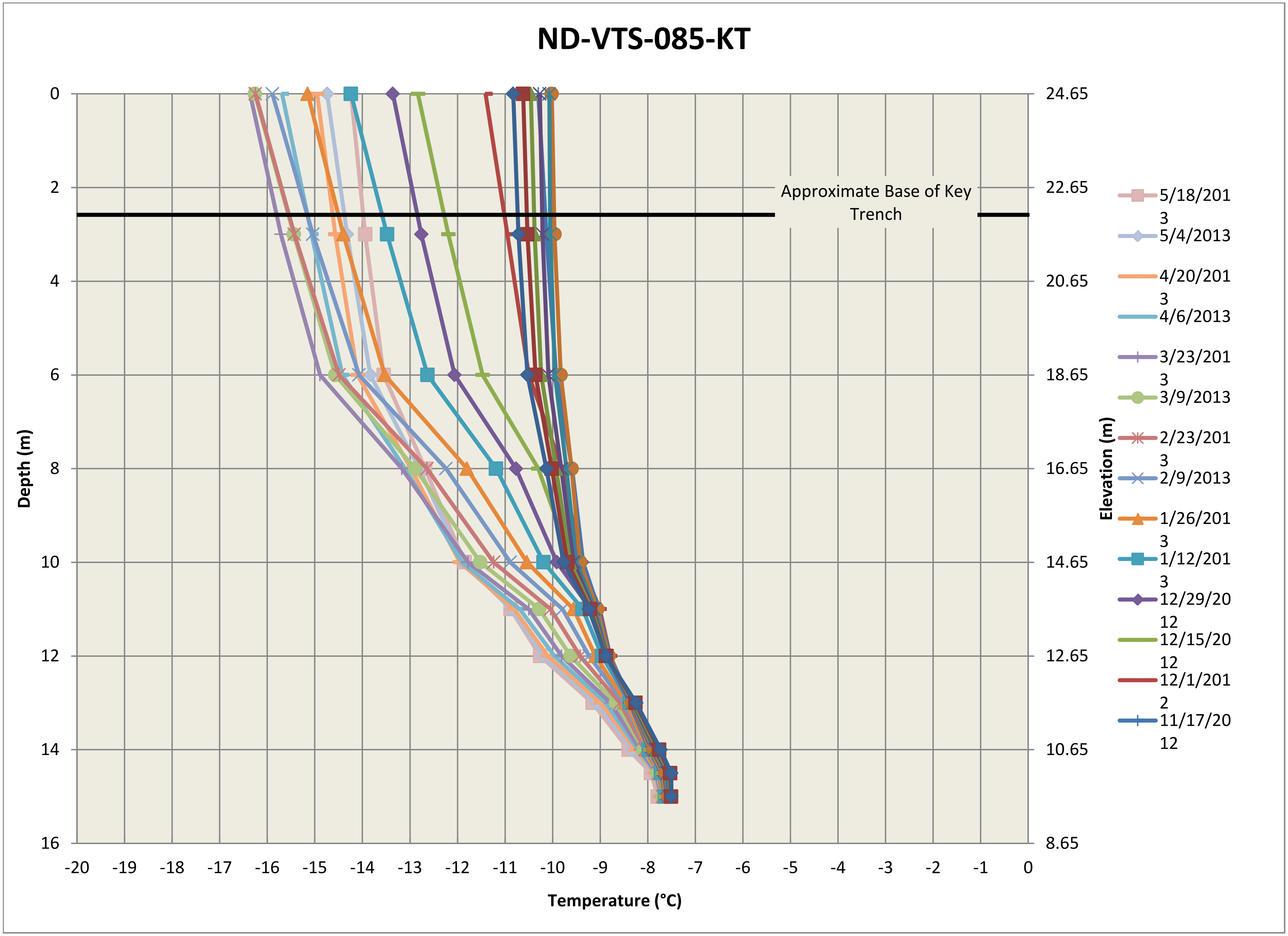

ND-VTS-130-US
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
30.45
28.45
26.45
24.45
22.45
20.45
18.45
16.45
14.45
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012
11/3/2012
10/20/2012
10/6/2012
9/22/2012
9/9/2012
8/25/2012

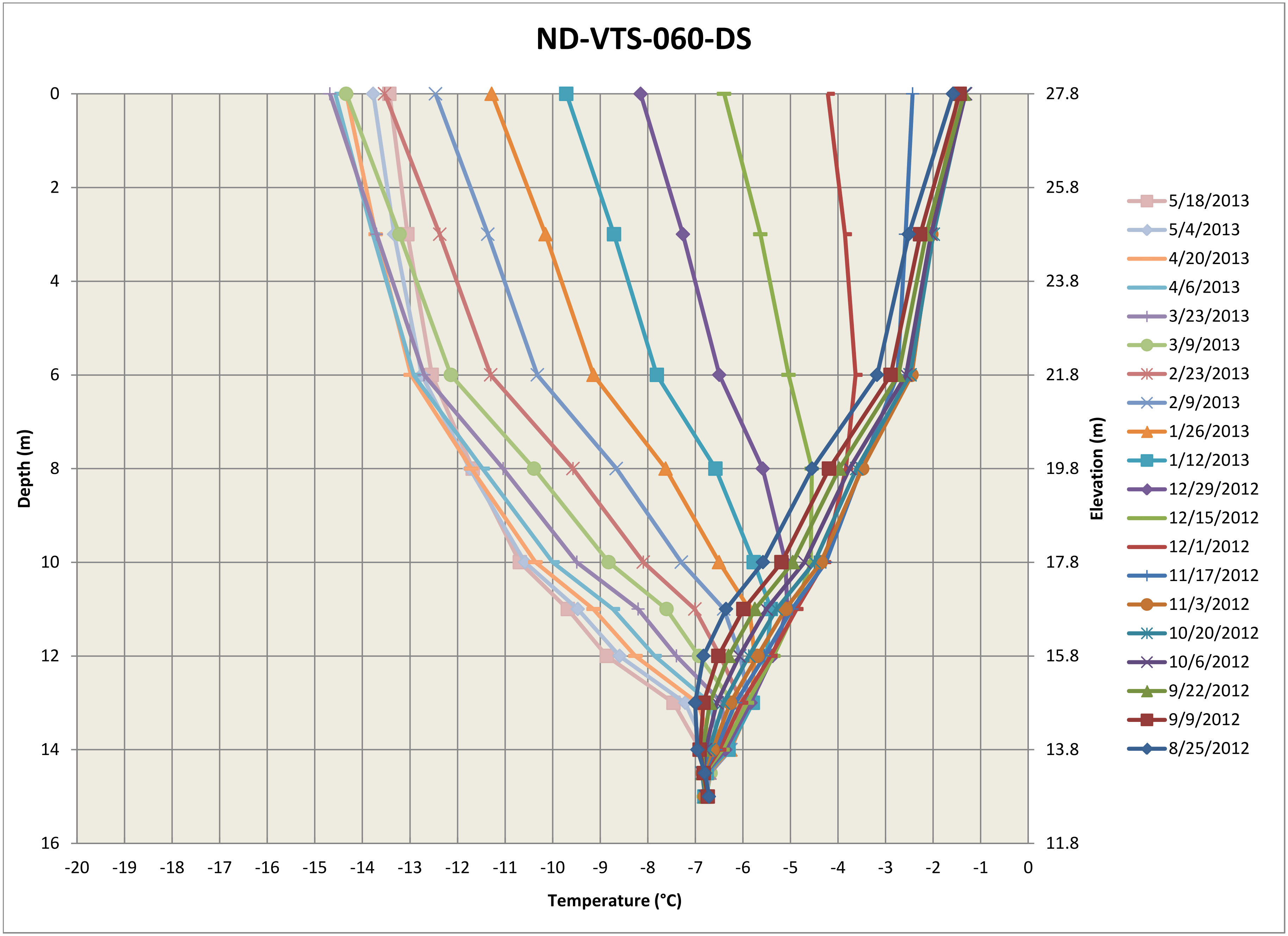

ND-VTS-085-DS
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
25.9
23.9
21.9
19.9
17.9
15.9
13.9
11.9
9.9
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012
11/3/2012
10/20/2012
10/6/2012
9/22/2012
9/9/2012
8/25/2012

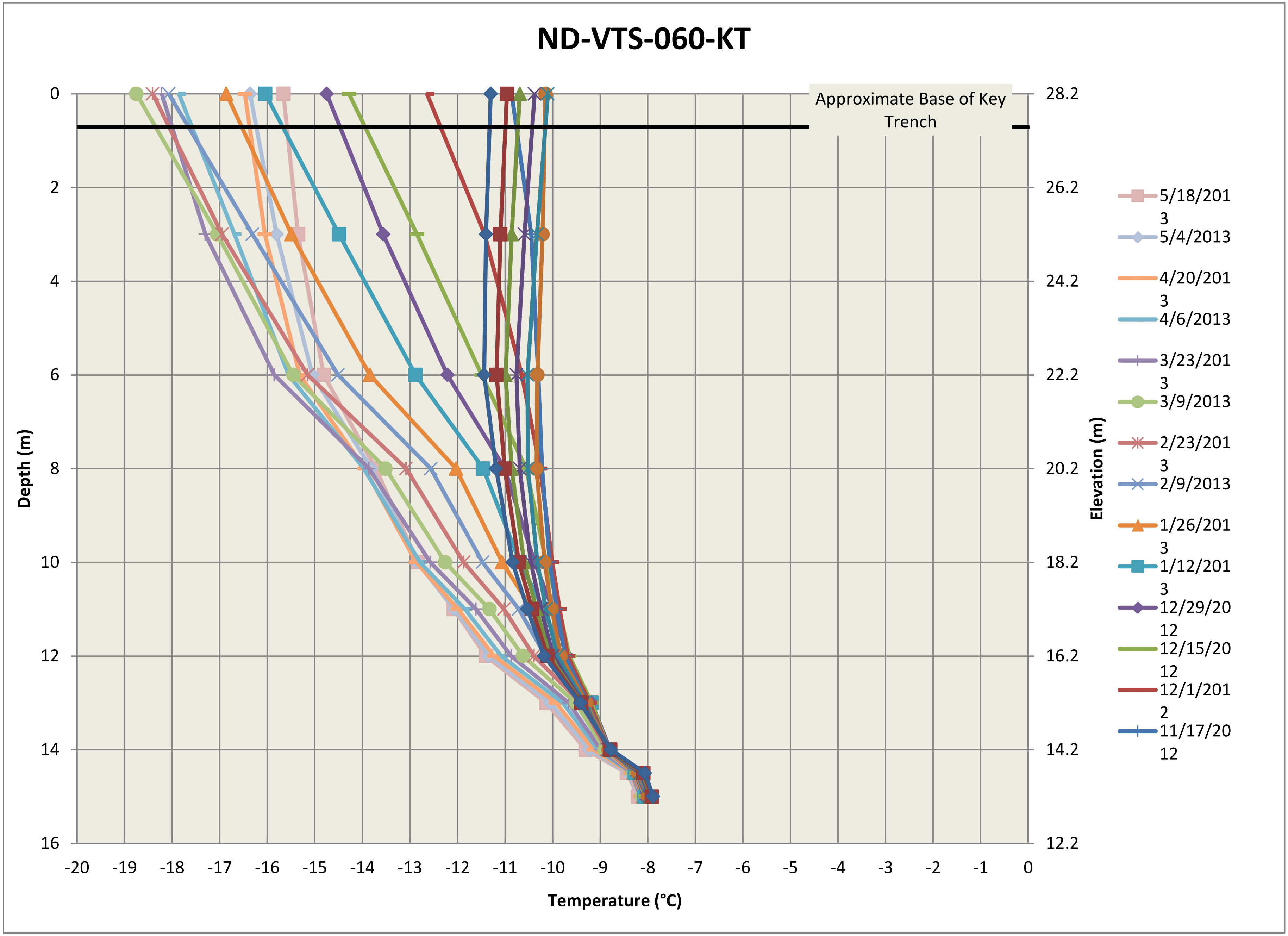

ND-VTS-175-KT
Approximate Base of Key Trench
Bottom Three Beads Not
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
31.9
29.9
27.9
25.9
23.9
21.9
19.9
17.9
15.9
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012

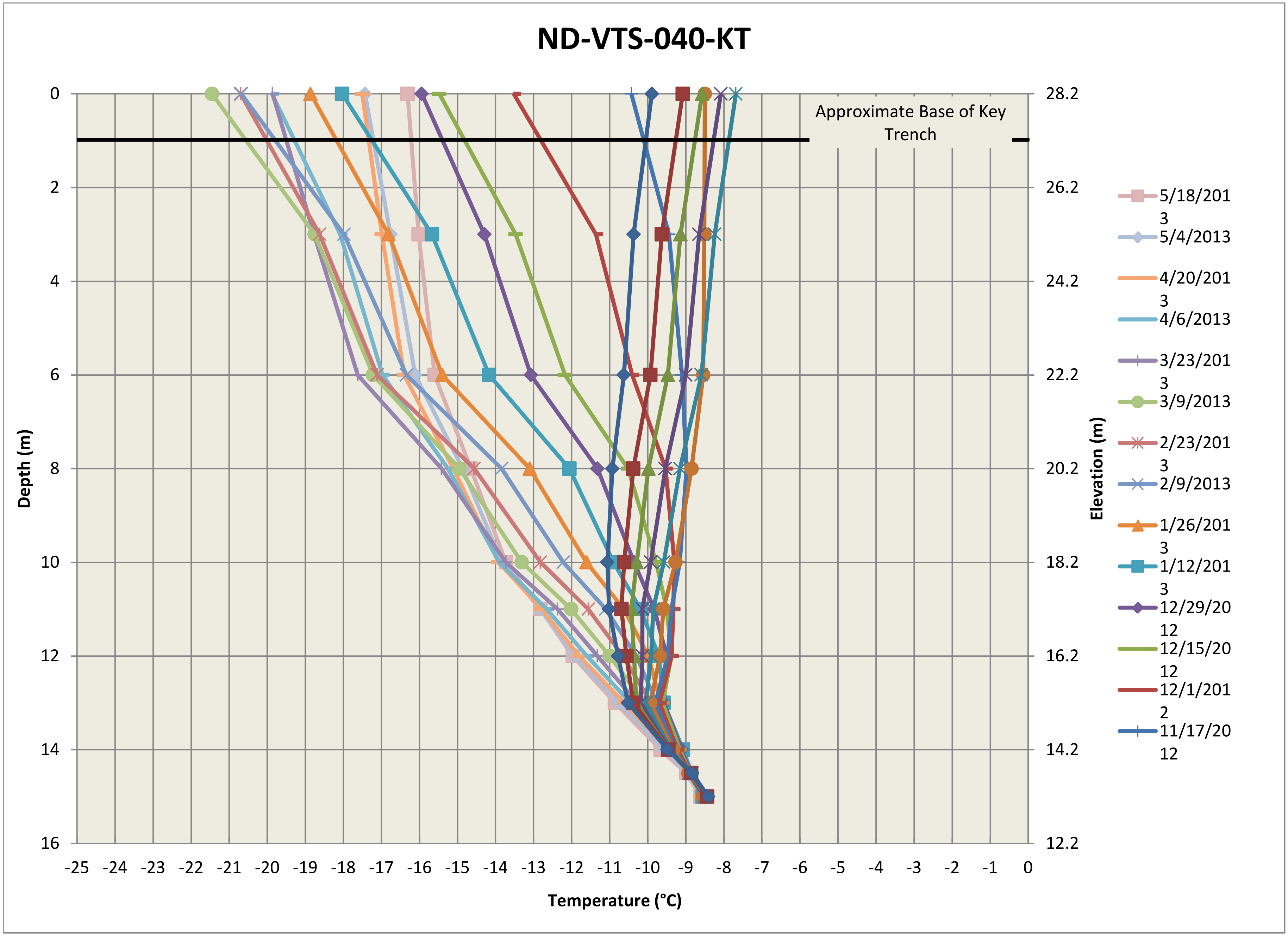

ND-VTS-130-KT
Approximate Base of Key Trench
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
28.25
26.25
24.25
22.25
20.25
18.25
16.25
14.25
12.25
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012


ND-VTS-085-US
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
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
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012
11/3/2012
10/20/2012
10/6/2012
9/22/2012
9/9/2012
8/25/2012


ND-VTS-085-KT
Approximate Base of Key Trench
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
24.65
22.65
20.65
18.65
16.65
14.65
12.65
10.65
8.65
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012


ND-VTS-060-DS
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
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
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012
11/3/2012
10/20/2012
10/6/2012
9/22/2012
9/9/2012
8/25/2012


ND-VTS-060-KT
Approximate Base of Key Trench
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
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
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012


ND-VTS-040-KT
Approximate Base of Key Trench
Depth (m)
Elevation (m)
Temperature (°C)
0
2
4
6
8
10
12
14
16
28.2
26.2
24.2
22.2
20.2
18.2
16.2
14.2
12.2
-25 -24 -23 -22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0
5/18/2013
5/4/2013
4/20/2013
4/6/2013
3/23/2013
3/9/2013
2/23/2013
2/9/2013
1/26/2013
1/12/2013
12/29/2012
12/15/2012
12/1/2012
11/17/2012

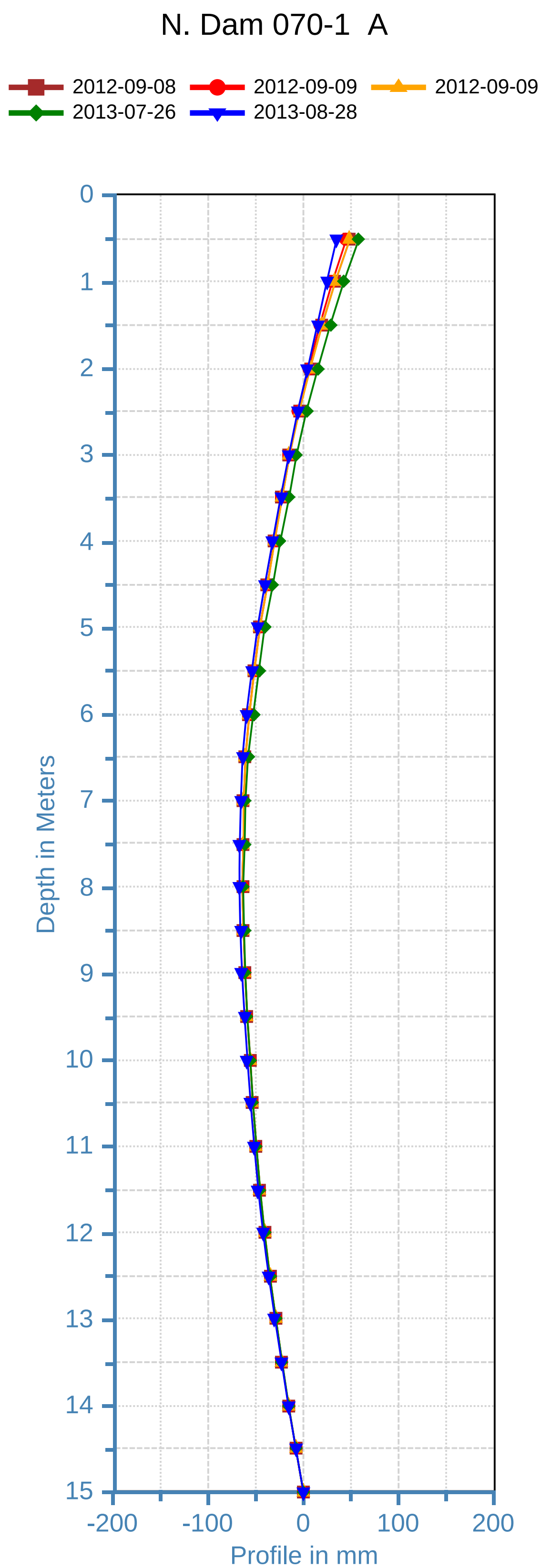
Appendix G Reconciliation of SRK and Water License Thermistor Station IDs

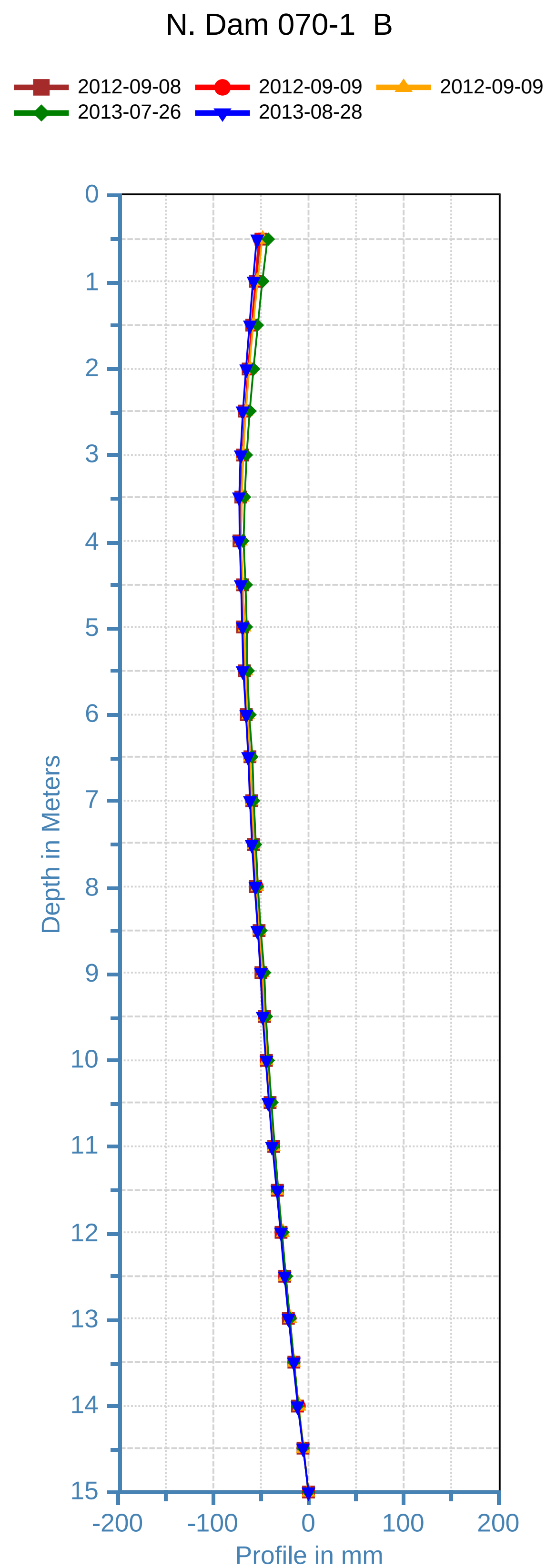
Station ID		Northing	Easting	Status	Location	Area	Comments
Water License 2AM-DOH0713	SRK						
n/a	SRK-11	7559117.00	434347.00	Inactive	North Dam	Doris Mining Area	Replaced by NI1 to NI24 series
n/a	SRK-13	7559171.72	434383.32	Inactive	North Dam	Doris Mining Area	Replaced by NI1 to NI24 series
n/a	SRK-14	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-DCB2/Doris Bridge East	7559478.35	434036.99	Active	Doris Creek Bridge Abutment East	Doris Mining Area	Doris Water License
T2	SRK10-DCB1/Doris Bridge West	7559475.15	434067.76	Active	Doris Creek Bridge Abutment West	Doris Mining Area	Doris Water License
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 - Top bead not functioning
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 (Repairs Needed)	Doris Lake North End	Doris Mining Area	Baseline data - Malfunctioning (readings suspect/incorrect)
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	Inactive	Tail Lake East Side	Doris Mining Area	Baseline data - Surrounded by Water - No longer functioning
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	Inactive (Repairs Needed)	Tail Lake East Side	Doris Mining Area	Baseline data - No longer functioning (could be repaired?)
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	Doris Water License - Bottom bead not functioning
T2	SRK-JT2-09	7563264.00	432550.00	Inactive	Jetty	Roberts Bay Jetty	Replaced with SRK-JT2-12

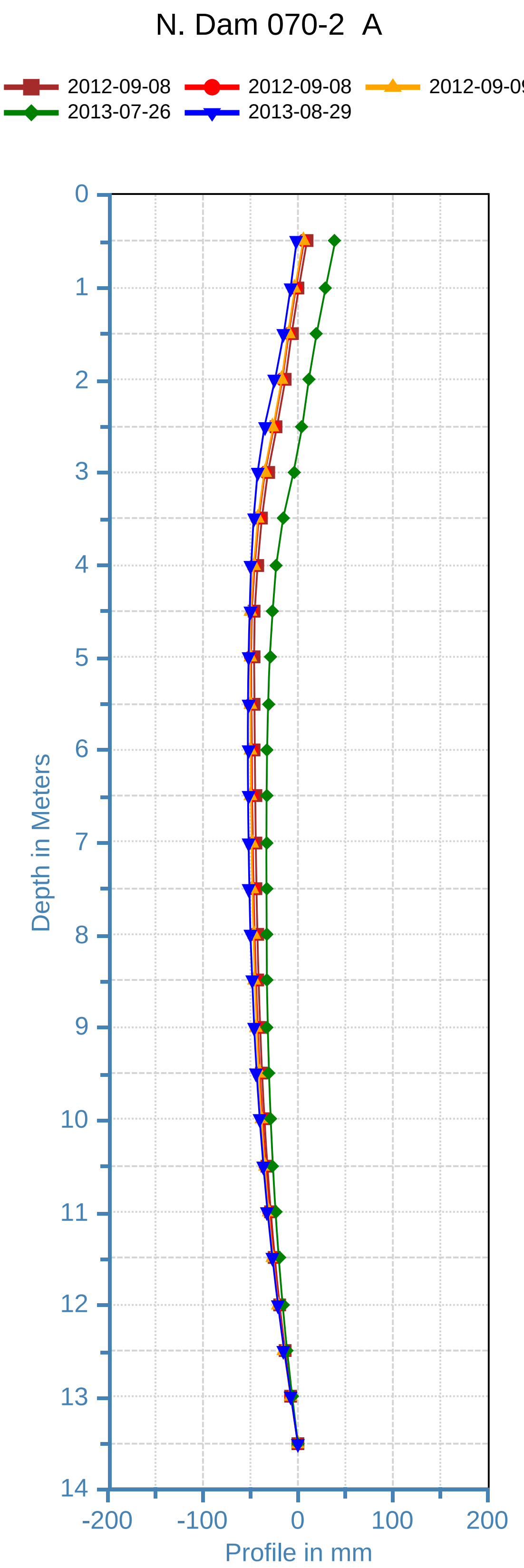
Station ID		Northing	Easting	Status	Location	Area	Comments
Water License 2AM-DOH0713	SRK						
T2	SRK-JT2-12	7563264.00	432550.00	Inactive	Jetty	Roberts Bay Jetty	Doris Water License - No Longer Functioning
n/a	08SBD380	7504780.24	441079.71	Unknown	South of Boston Camp	Boston Mining Area	Baseline data - 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	Inactive	West Side Doris Lake N	Doris Mining Area	Baseline data - No longer functioning (July 2013)
n/a	08TDD633	7557646.05	433402.21	Inactive	West Side Doris Lake	Doris Mining Area	Baseline data - No longer functioning - Never read / no data
n/a	SRK-12-GTC-DH01	7558917.20	433169.18	Active	Pollution Control Pond	Doris Mining Area	Doris Water License
n/a	SRK-12-GTC-DH02	7558912.96	433225.25	Active	Pollution Control Pond	Doris Mining Area	Doris Water License
n/a	SRK-12-GTC-DH03	7558930.81	433225.25	Active	Pollution Control Pond	Doris Mining Area	Doris Water License
DOR-6	SRK10-DWB1	7555673.50	432703.40	Active	Doris-Windy Road Bridge #2	Madrid Mining Area	Doris Water License
DOR-7	SRK10-DWB2	7555644.40	432708.20	Active	Doris-Windy Road Bridge #2 / #3	Madrid Mining Area	Doris Water License
DOR-8	SRK10-DWB3	755615.00	432712.80	Active	Doris-Windy Road Bridge #3	Madrid Mining Area	Doris Water License
DOR-9	SRK10-DWB4	7554860.30	432444.00	Active	Doris-Windy Road Bridge #4	Madrid Mining Area	Doris Water License
DOR-10	SRK10-DWB5	7554831.30	732437.00	Active	Doris-Windy Road Bridge #4	Madrid Mining Area	Doris Water License
NI1	ND-HTS-040-31.5	7559100.71	434324.01	Active	North Dam	Doris Mining Area	Doris Water License
NI2	ND-HTS-040-33.5	7559100.71	434324.01	Active	North Dam	Doris Mining Area	Doris Water License
NI3	ND-VTS-040-KT	7559100.71	434324.01	Active	North Dam	Doris Mining Area	Doris Water License
NI4	ND-VTS-060-DS	7559115.28	434337.72	Active	North Dam	Doris Mining Area	Doris Water License
NI5	ND-HTS-060-33.5	7559115.28	434337.72	Active	North Dam	Doris Mining Area	Doris Water License
NI6	ND-HTS-060-31.0	7559115.28	434337.72	Active	North Dam	Doris Mining Area	Doris Water License
NI7	ND-HTS-060-28.8	7559115.28	434337.72	Active	North Dam	Doris Mining Area	Water License. One bead not working.
NI8	ND-VTS-060-KT	7559115.28	434337.72	Active	North Dam	Doris Mining Area	Doris Water License
NI9	ND-VTS-060-US	7559106.54	434346.46	Active	North Dam	Doris Mining Area	Doris Water License
NI10	ND-VTS-085-DS	7559133.96	434353.91	Active	North Dam	Doris Mining Area	Doris Water License
NI11	ND-HTS-085-25.3	7559133.96	434353.91	Active	North Dam	Doris Mining Area	Doris Water License
NI12	ND-HTS-085-29.4	7559133.96	434353.91	Active	North Dam	Doris Mining Area	Doris Water License
NI13	ND-HTS-085-33.5	7559133.96	434353.91	Inactive	North Dam	Doris Mining Area	Cut during construction, end could not be found to be spliced.
NI14	ND-VTS-085-KT	7559133.96	434353.91	Active	North Dam	Doris Mining Area	Doris Water License

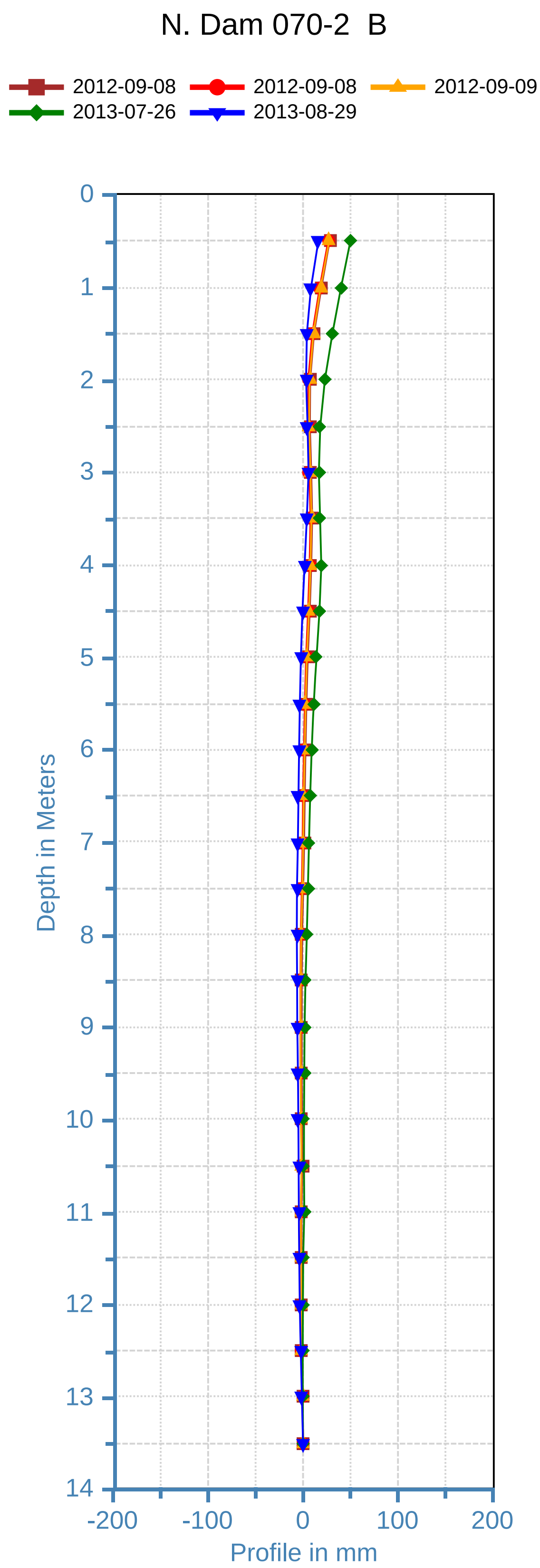
Station ID		Northing	Easting	Status	Location	Area	Comments
Water License 2AM-DOH0713	SRK						
NI15	ND-VTS-085-US	7559125.08	434363.23	Active	North Dam	Doris Mining Area	Doris Water License
NI16	ND-VTS-130-DS	7559167.23	434384.47	Active	North Dam	Doris Mining Area	Doris Water License
NI17	ND-HTS-130-28.8	7559167.23	434384.47	Active	North Dam	Doris Mining Area	Doris Water License
NI18	ND-HTS-130-31.0	7559167.23	434384.47	Active	North Dam	Doris Mining Area	Doris Water License
NI19	ND-HTS-130-33.5	7559167.23	434384.47	Active	North Dam	Doris Mining Area	Doris Water License
NI20	ND-VTS-130-KT	7559167.23	434384.47	Active	North Dam	Doris Mining Area	Doris Water License
NI21	ND-VTS-130-US	7559158.49	434393.93	Active	North Dam	Doris Mining Area	Doris Water License
NI22	ND-HTS-175-32.5	7559200.63	434414.72	Active	North Dam	Doris Mining Area	Doris Water License
NI23	ND-HTS-175.33.5	7559200.63	434414.72	Active	North Dam	Doris Mining Area	Doris Water License - Incorrectly attached to datalogger as ND-VTS-175-KT.
NI24	ND-VTS-175-KT	7559200.63	434414.72	Active	North Dam	Doris Mining Area	Doris Water License - Incorrectly attached to datalogger as ND-HTS-175.33.5 - Bottom 3 beads are not being recorded.

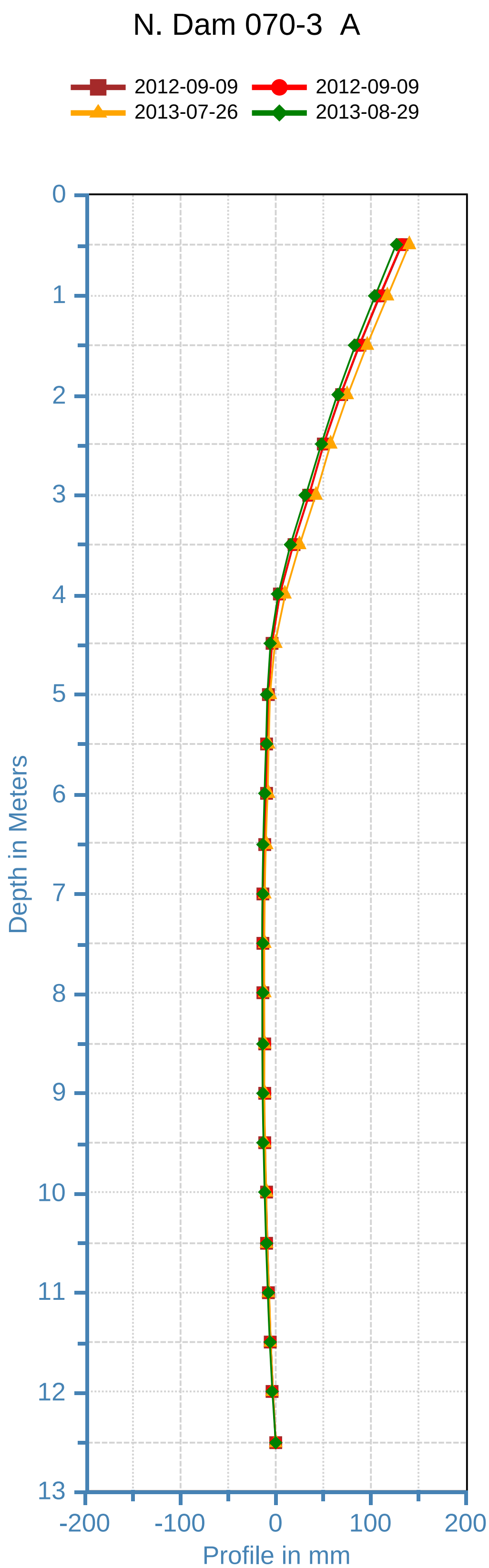
Appendix H North Dam Slope Inclinometer Readings

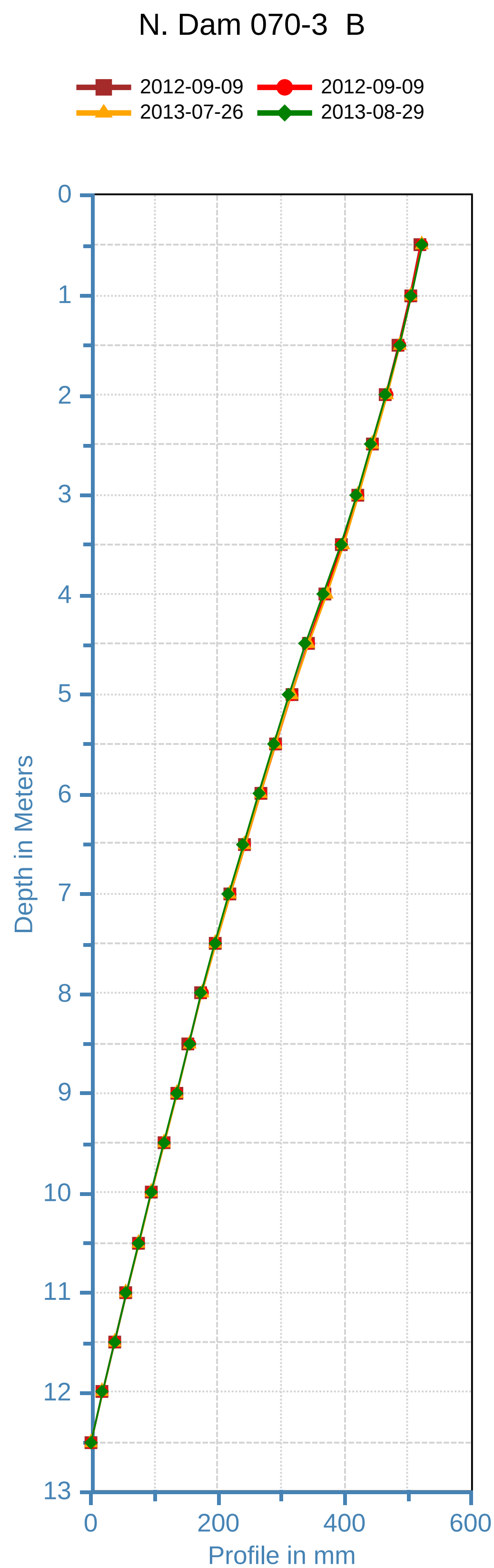

N. Dam 070-1 A
2012-09-08
2012-09-09
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
Profile in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
-200
-100
0
100
200

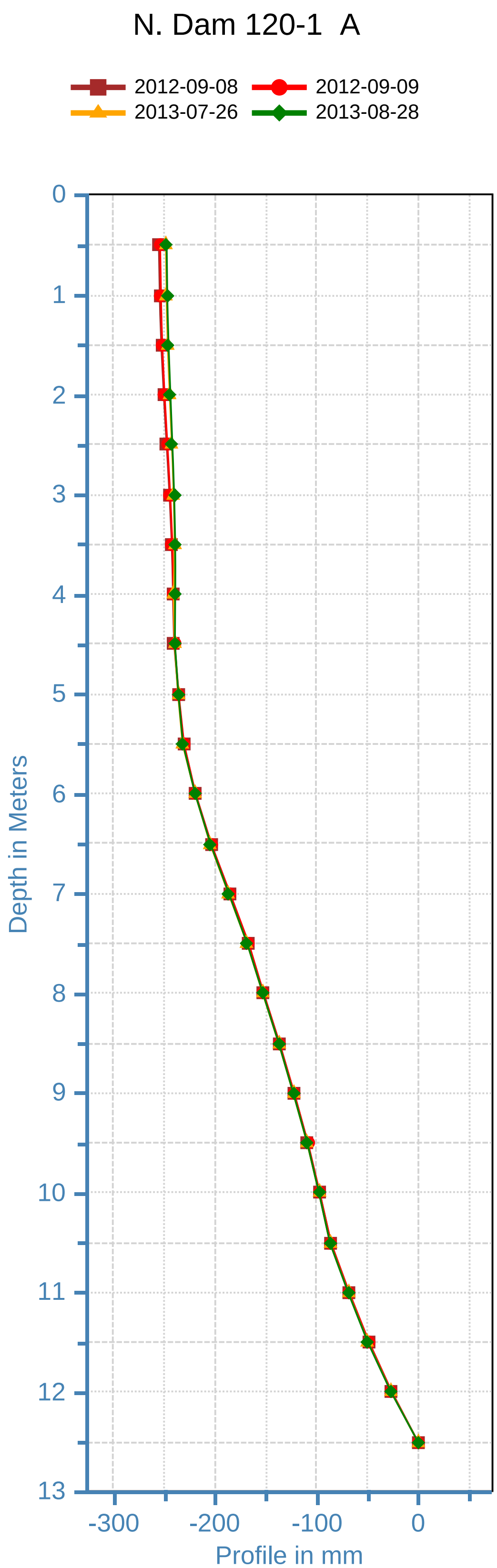

N. Dam 070-1 B
2012-09-08
2012-09-09
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
Profile in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
-200
-100
0
100
200


N. Dam 070-2 A
2012-09-08
2012-09-08
2012-09-09
2013-07-26
2013-08-29
Depth in Meters
Profile in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
-200
-100
0
100
200

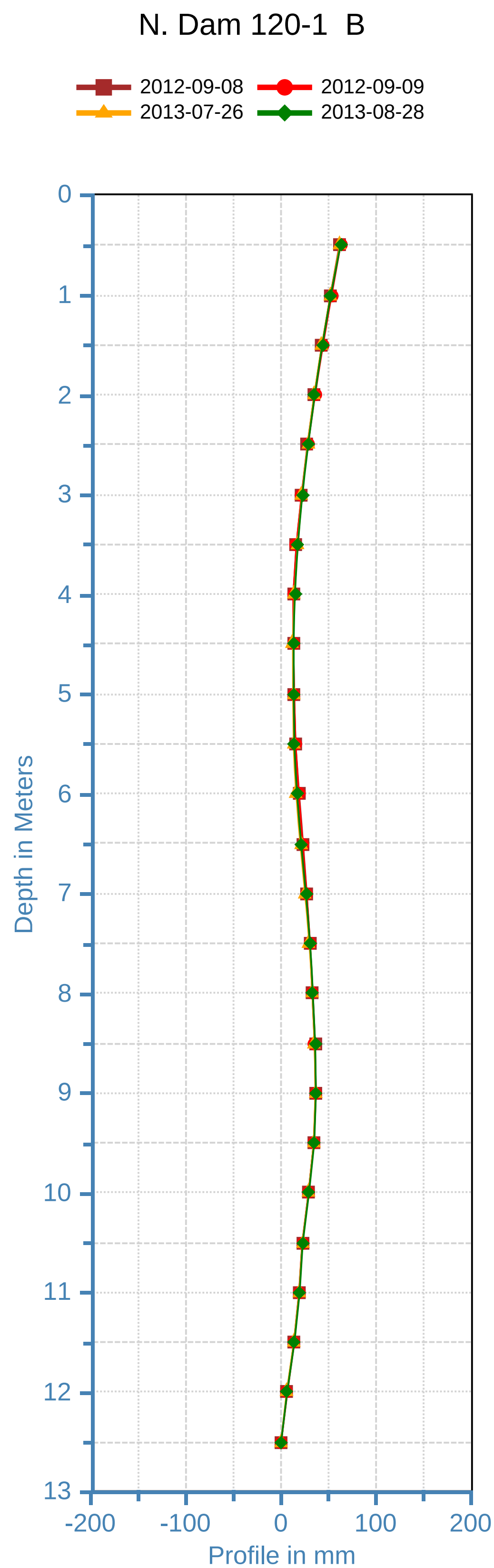

N. Dam 070-2 B
2012-09-08
2012-09-08
2012-09-09
2013-07-26
2013-08-29
Depth in Meters
Profile in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
-200
-100
0
100
200


N. Dam 070-3 A
2012-09-09
2012-09-09
2013-07-26
2013-08-29
Depth in Meters
Profile in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
-200
-100
0
100
200

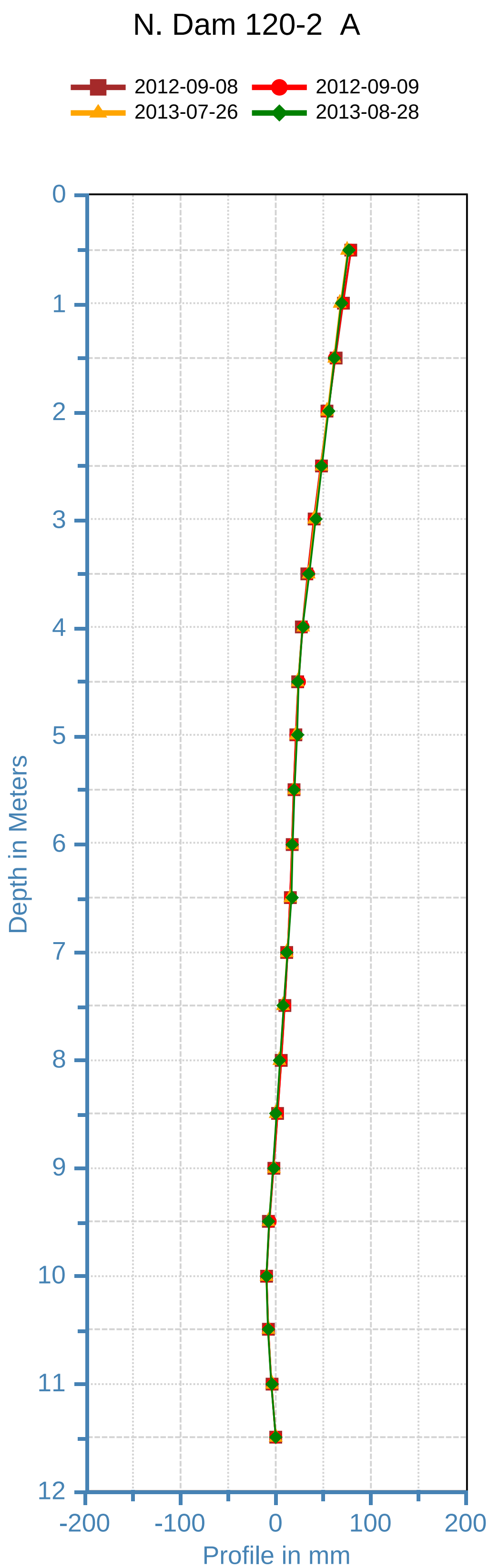

N. Dam 070-3 B
2012-09-09
2012-09-09
2013-07-26
2013-08-29
Depth in Meters
Profile in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0
200
400
600

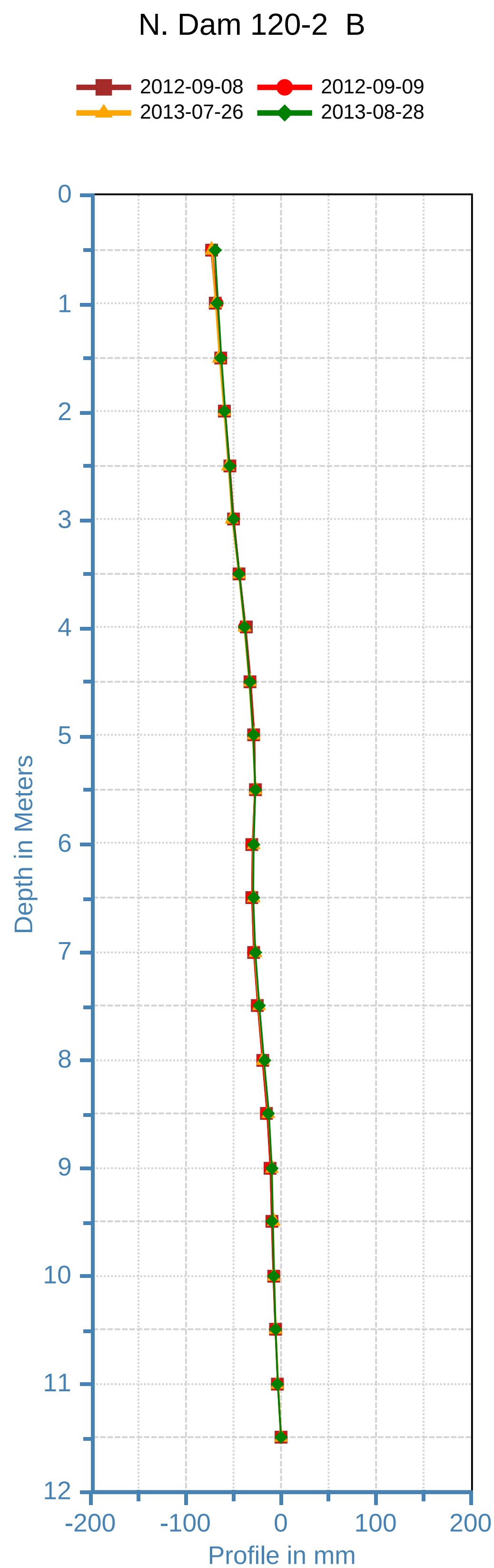


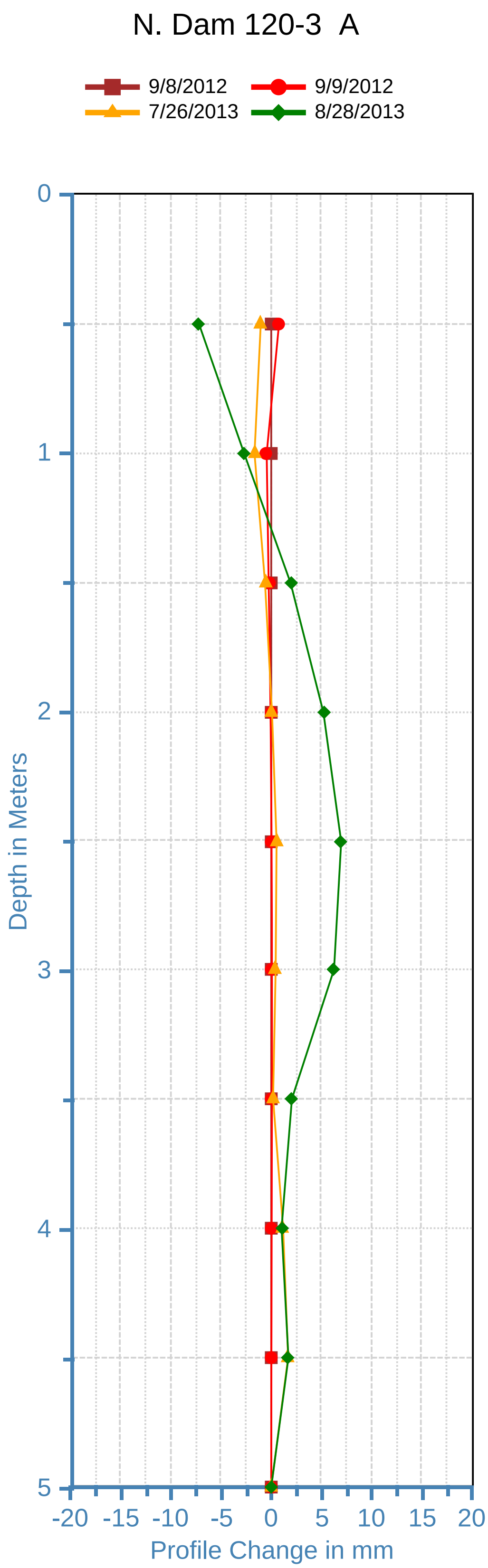
N. Dam 120-1 A
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
Profile in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
-300
-200
-100
0



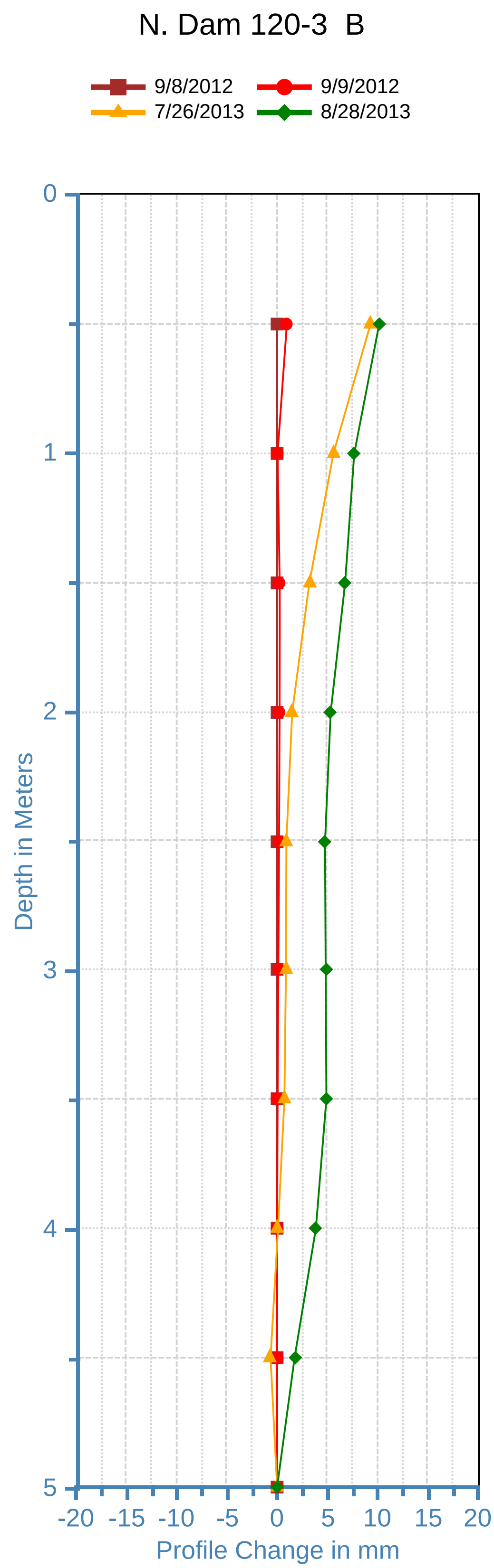
N. Dam 120-1 B
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
Profile in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
-200
-100
0
100
200


N. Dam 120-2 A
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
0
1
2
3
4
5
6
7
8
9
10
11
12
-200
-100
0
100
200
Profile in mm

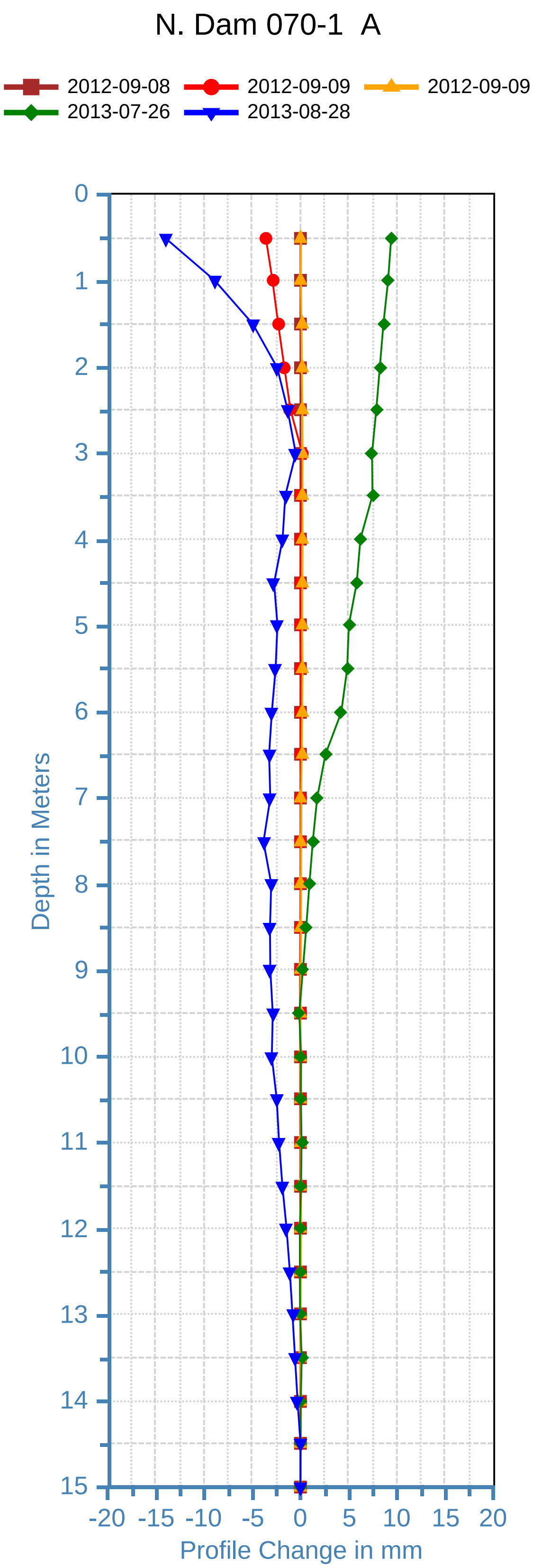

N. Dam 120-2 B
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
0
1
2
3
4
5
6
7
8
9
10
11
12
-200
-100
0
100
200
Profile in mm

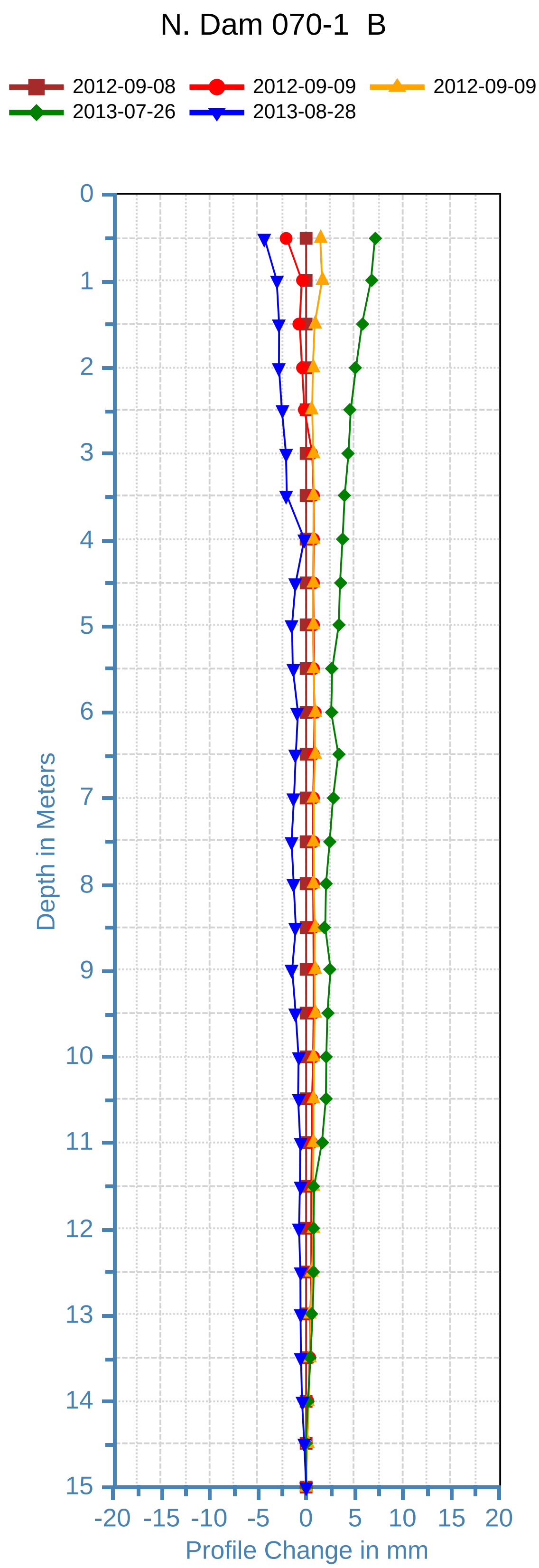


N. Dam 120-3 A
9/8/2012
9/9/2012
7/26/2013
8/28/2013
Depth in Meters
Profile Change in mm
0
1
2
3
4
5
-20 -15 -10 -5 0 5 10 15 20



N. Dam 120-3 B
9/8/2012
9/9/2012
7/26/2013
8/28/2013
Depth in Meters
Profile Change in mm
0
1
2
3
4
5
-20 -15 -10 -5 0 5 10 15 20


N. Dam 070-1 A
2012-09-08
2012-09-09
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
Profile Change in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
-20 -15 -10 -5 0 5 10 15 20


N. Dam 070-1 B
2012-09-08
2012-09-09
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
Profile Change in mm
0
1
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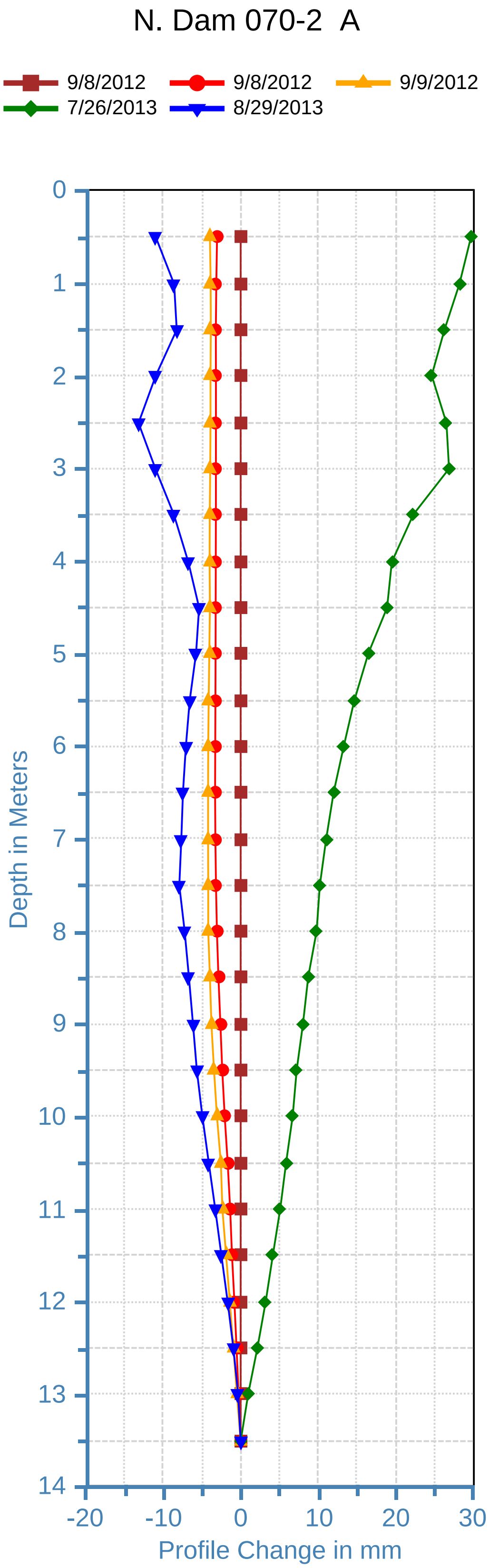
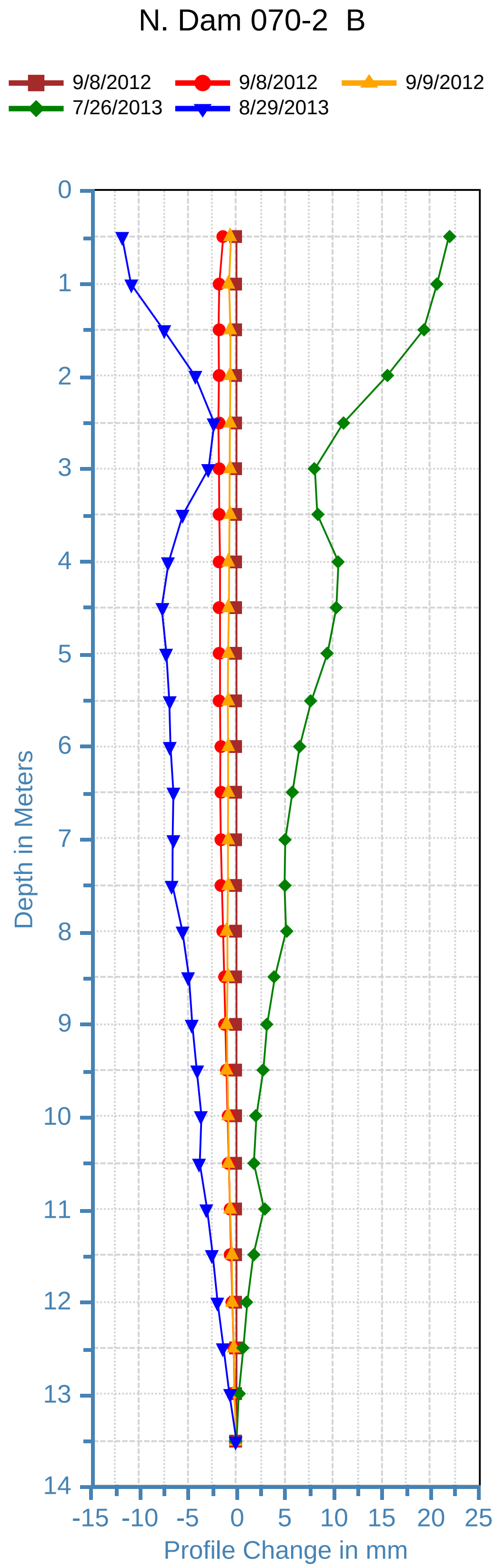
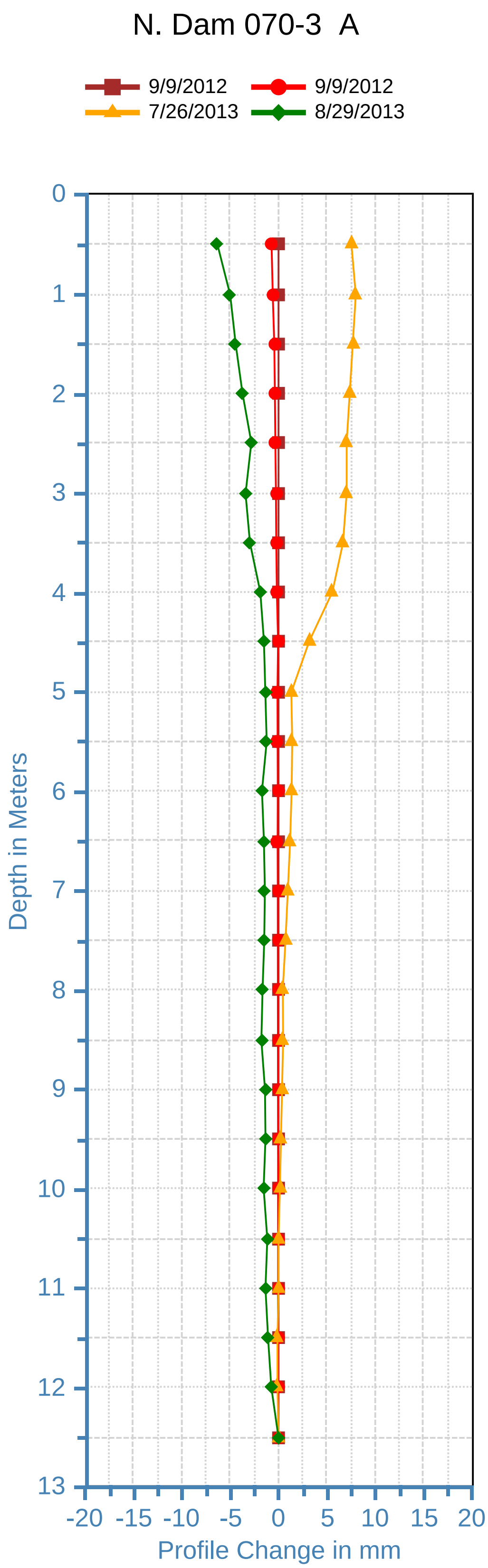
10
11
12
13
14
15
-20 -15 -10 -5 0 5 10 15 20



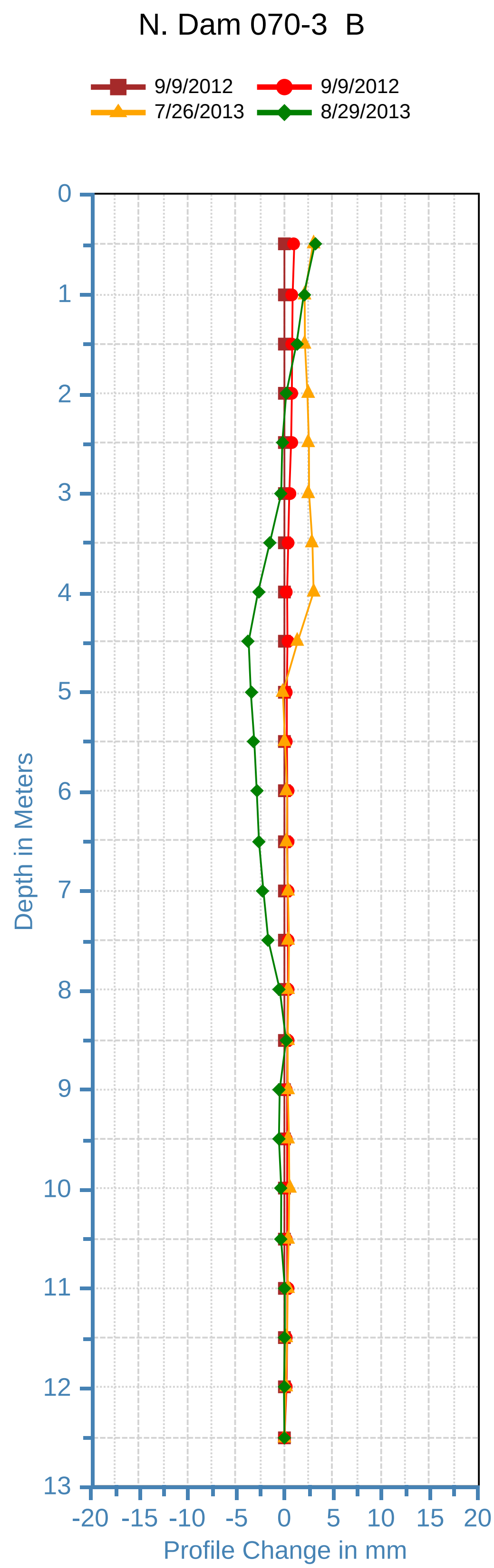
N. Dam 070-2 A
9/8/2012
9/8/2012
9/9/2012
7/26/2013
8/29/2013
Depth in Meters
Profile Change in mm



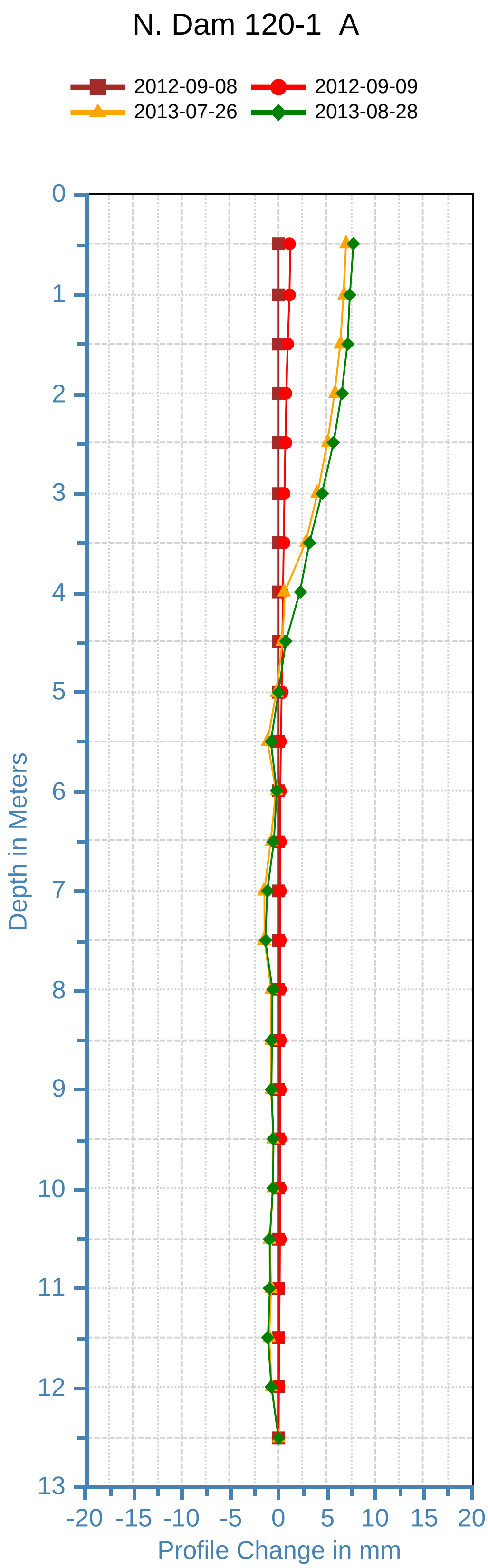
N. Dam 070-2 B
9/8/2012
9/8/2012
9/9/2012
7/26/2013
8/29/2013
Depth in Meters
Profile Change in mm

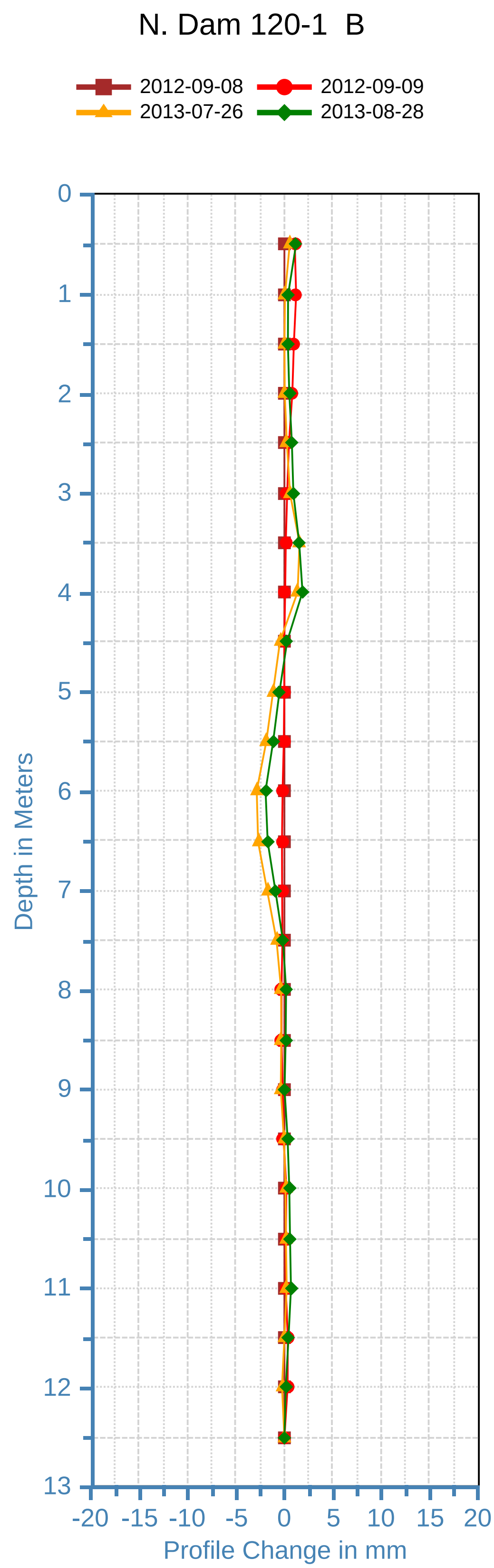


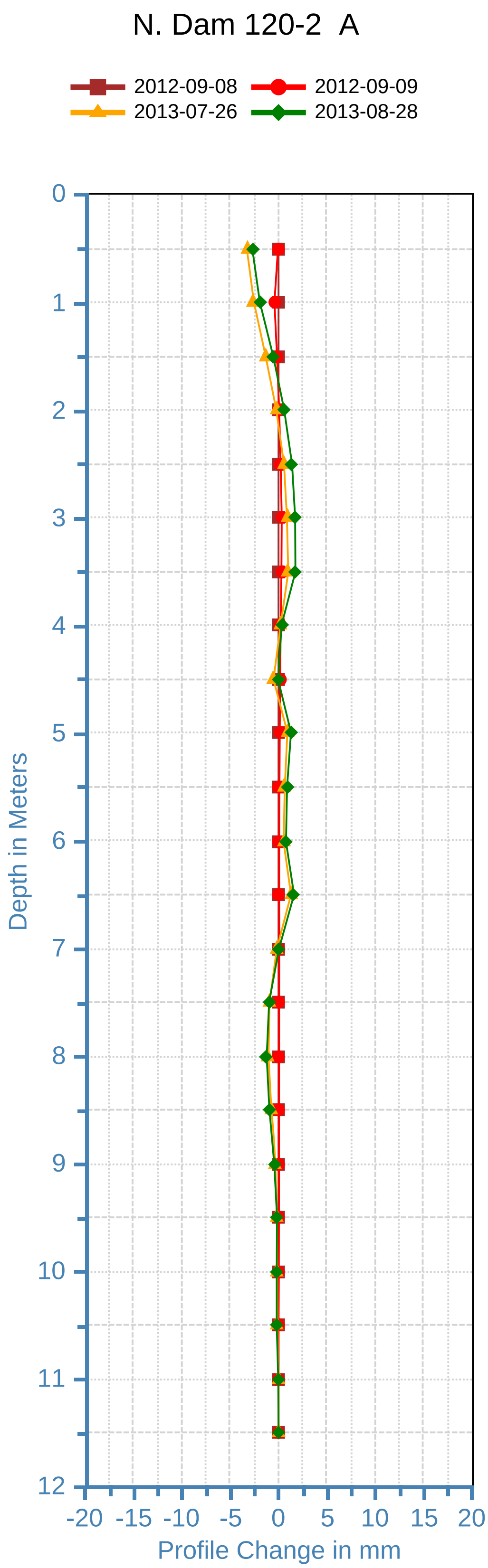
N. Dam 070-3 A
9/9/2012
9/9/2012
7/26/2013
8/29/2013
Depth in Meters
Profile Change in mm

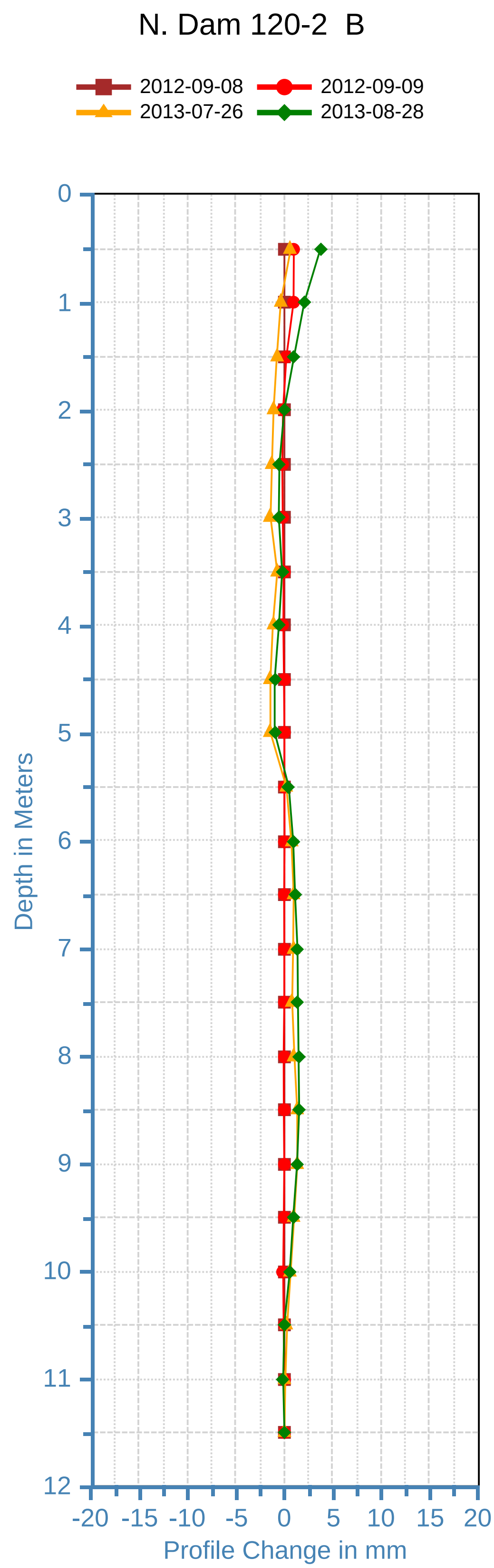


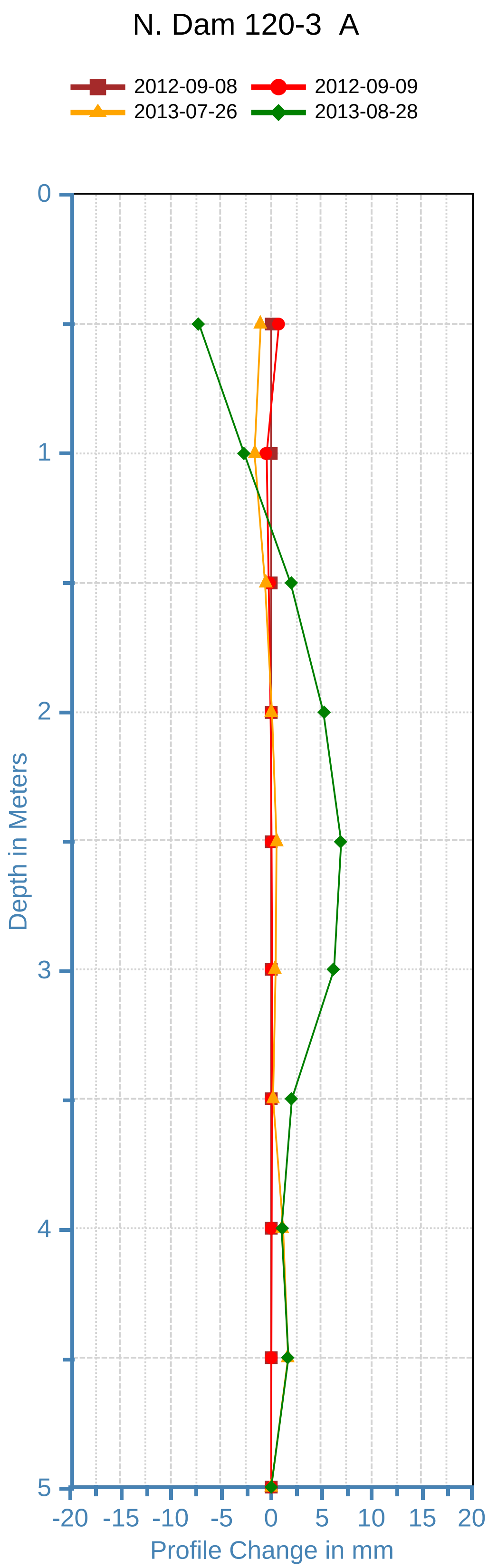
N. Dam 070-3 B
9/9/2012
9/9/2012
7/26/2013
8/29/2013
Depth in Meters
Profile Change in mm

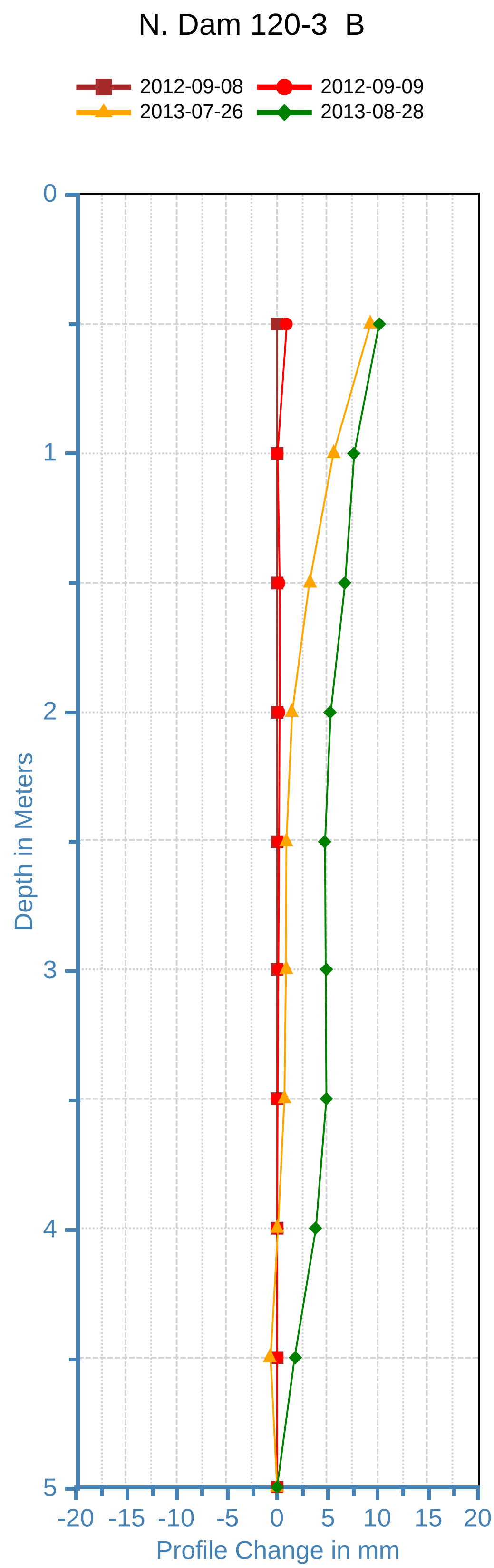

N. Dam 120-1 A
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
Profile Change in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
-20 -15 -10 -5 0 5 10 15 20


N. Dam 120-1 B
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
Profile Change in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
-20 -15 -10 -5 0 5 10 15 20


N. Dam 120-2 A
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
0
1
2
3
4
5
6
7
8
9
10
11
12
-20 -15 -10 -5 0 5 10 15 20
Profile Change in mm


N. Dam 120-2 B
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
0
1
2
3
4
5
6
7
8
9
10
11
12
-20 -15 -10 -5 0 5 10 15 20
Profile Change in mm

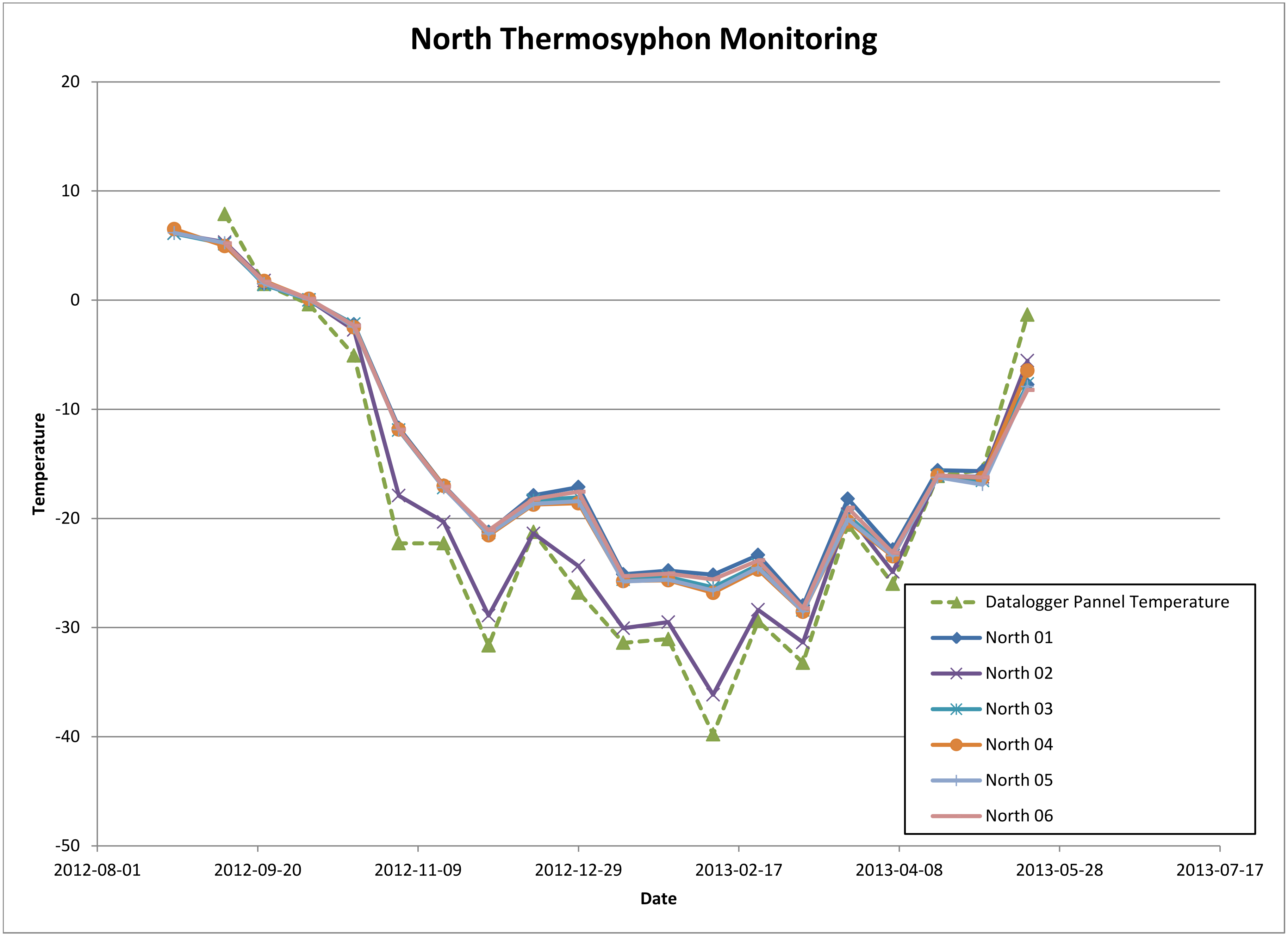

N. Dam 120-3 A
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
0
1
2
3
4
5
-20 -15 -10 -5 0 5 10 15 20
Profile Change in mm

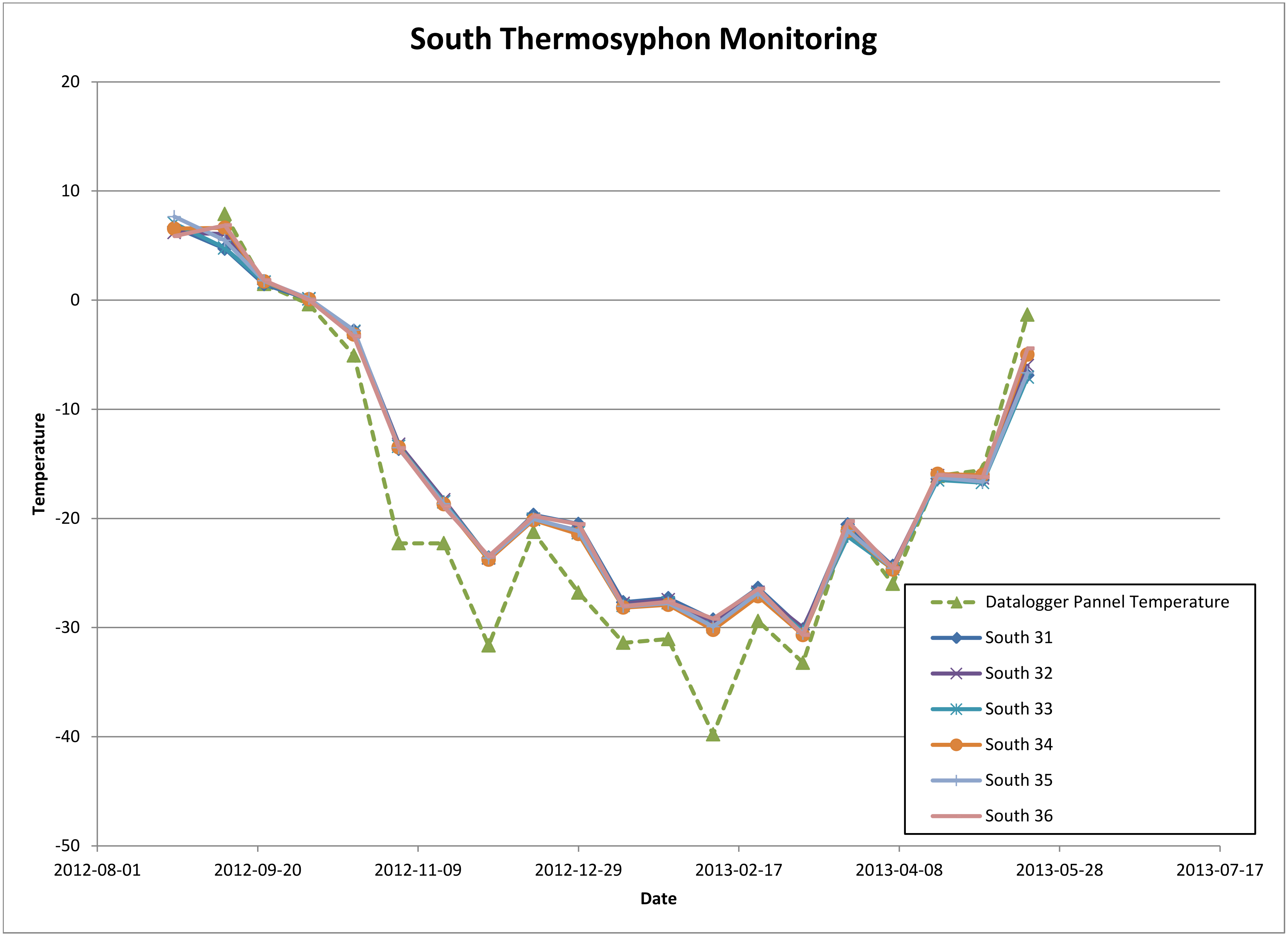

N. Dam 120-3 B
2012-09-08
2012-09-09
2013-07-26
2013-08-28
Depth in Meters
0
1
2
3
4
5
-20 -15 -10 -5 0 5 10 15 20
Profile Change in mm

Appendix I North Dam Survey Monitoring Data

	Vertical Displacement (m)	Absolute Horizontal Displacement (m)	Absolute Total Displacement (m)
ND-DSP-070	-0.021	0.006	0.022
ND-DSP-100	-0.007	0.071	0.071
ND-DSP-120	-0.032	0.050	0.060
ND-SMP-045-DS	-0.041	0.017	0.045
ND-SMP-045-US	-0.017	0.022	0.028
ND-SMP-065-DS	-0.042	0.010	0.043
ND-SMP-065-US	-0.029	0.027	0.040
ND-SMP-080-DS	-0.050	0.056	0.075
ND-SMP-080-US	-0.022	0.018	0.029
ND-SMP-100-DS	-0.057	0.055	0.079
ND-SMP-100-US	-0.030	0.037	0.048
ND-SMP-120-DS	-0.059	0.035	0.069
ND-SMP-120-US	-0.026	0.060	0.065
ND-SMP-140-DS	-0.044	0.008	0.045
ND-SMP-140-US	-0.036	0.031	0.048
ND-SMP-160-DS	-0.031	0.008	0.032
ND-SMP-160-US	-0.032	0.057	0.065
ND-SSP-065-1	-0.070	0.034	0.078
ND-SSP-065-2	-0.199	0.097	0.221
ND-SSP-065-3	-0.027	0.007	0.028
ND-SSP-080-1	-0.077	0.035	0.085
ND-SSP-080-2	-0.129	0.025	0.131
ND-SSP-080-3	-0.021	0.012	0.024
ND-SSP-095-1	-0.098	0.038	0.105
ND-SSP-095-2	-0.082	0.020	0.084
ND-SSP-095-3	-0.024	0.024	0.034
ND-SSP-110-1	-0.092	0.037	0.099
ND-SSP-110-2	-0.112	0.063	0.128
ND-SSP-110-3	-0.122	0.126	0.175
ND-SSP-125-1	-0.134	0.063	0.148
ND-SSP-125-2	-0.091	0.036	0.098
ND-SSP-140-1	-0.125	0.043	0.132
ND-SSP-140-2	-0.047	0.040	0.062
ND-SSP-155-1	-0.077	0.022	0.080
ND-SSP-155-2	-0.154	0.082	0.175

Appendix J North Dam Thermosyphon Monitoring Data


North Thermosyphon Monitoring
20
10
0
-10
-20
-30
-40
-50
Temperature
2012-08-01
2012-09-20
2012-11-09
2012-12-29
2013-02-17
2013-04-08
2013-05-28
2013-07-17
Date
Datalogger Pannel Temperature
North 01
North 02
North 03
North 04
North 05
North 06


South Thermosyphon Monitoring
20
10
0
-10
-20
-30
-40
-50
Temperature
2012-08-01
2012-09-20
2012-11-09
2012-12-29
2013-02-17
2013-04-08
2013-05-28
2013-07-17
Date
Datalogger Pannel Temperature
South 31
South 32
South 33
South 34
South 35
South 36