April, 2014

REPORT

SD 6-1 Permafrost Thermal Regime Baseline Studies - Meliadine Gold Project, Nunavut

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REPORT

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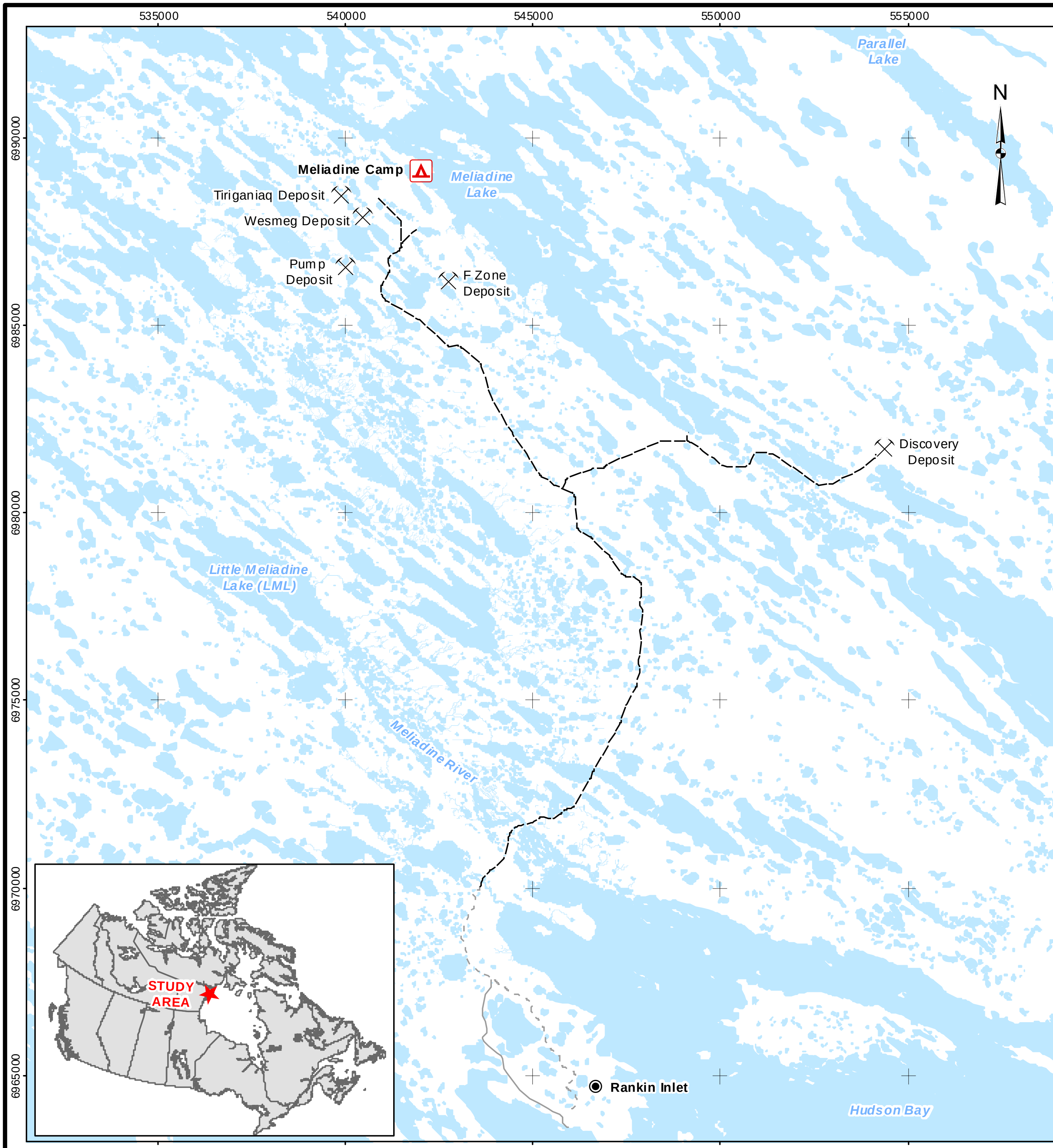
1.0 INTRODUCTION

Agnico Eagle Mines Limited (AEM) is evaluating the development of the Meliadine Gold Project (the Project), located approximately 25 km North of Rankin Inlet, Nunavut (Figure 1). The Project is centred at approximately 63° 01' N latitude and 92° 12' W longitude. The mine plan includes mining of a series of gold deposits, including:

- Tiriganiaq Deposit;
- Pump Deposit;
- Wesmeg Deposit;
- F Zone Deposit; and
- Discovery Deposit.

The locations of the main deposit areas are shown on Figure 1. Proposed mining facilities in the area include a plant site, an ore stockpile site, a tailings storage facility (TSF), waste rock piles and dewatering dykes. Development of the Project will include an all-weather road from Rankin Inlet to the project site during the predevelopment phase of the Project.

This report presents permafrost baseline conditions at the Project site. The baseline conditions are based on studies that have included geotechnical drilling investigations, the installation of thermistor instrumentation, and geomorphological mapping of the periglacial environment.



LEGEND

- Camp
- Proposed Mine Site
- All-weather Access Road (AWAR)
- Road - New
- Road - Existing
- Watercourse
- Waterbody

3000 0 3000

METRES

REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

LOCATION PLAN

Golder Associates

PROJECT		10-1373-0076	FILE No.	
DESIGN	JC	26 July 2011	SCALE AS SHOWN	REV. 1
GIS	AL	26 July 2011		
CHECK	JC	28 Jun. 2012	FIGURE 1	
REVIEW	CJC	28 Jun. 2012		

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_6\SD_6-1_Permafrost\Figure_1_Location_Plan_Rev1.mxd

2.0 GENERAL SITE CONDITIONS

The following sections describe the general site conditions of the Meliadine Gold Project.

2.1 Topography and Lake Bathymetry

The Tiriganiaq, F Zone, Pump and Wesmeg Deposits are located on a large peninsula separating the east and west basins of Meliadine Lake. The Discovery Deposit is located south and east of Meliadine Lake (Figure 1).

The dominant terrain in the Project area comprises glacial landforms such as drumlins (glacial till), eskers (gravel and sand) and lakes. A series of low relief ridges are composed of glacial deposits oriented in a northwest-southeast direction, and control the regional surface drainage patterns (Golder, 2008).

The surveyed lake surface elevations in the Meliadine Gold Project area range from about 51 meters above sea level (masl) at Meliadine Lake to about 74 masl for local small perched lakes. Kettle lakes, and other lakes formed by glacio-fluvial processes or glacial processes, are common throughout the Project area. Locations of these lakes are shown in Figure 2. Several of the lakes will be affected by development of the Project components including the open pits, waste rock piles, and the tailings storage facility (TSF). Therefore, understanding the thermal regime beneath these lakes is important for development of the Project.

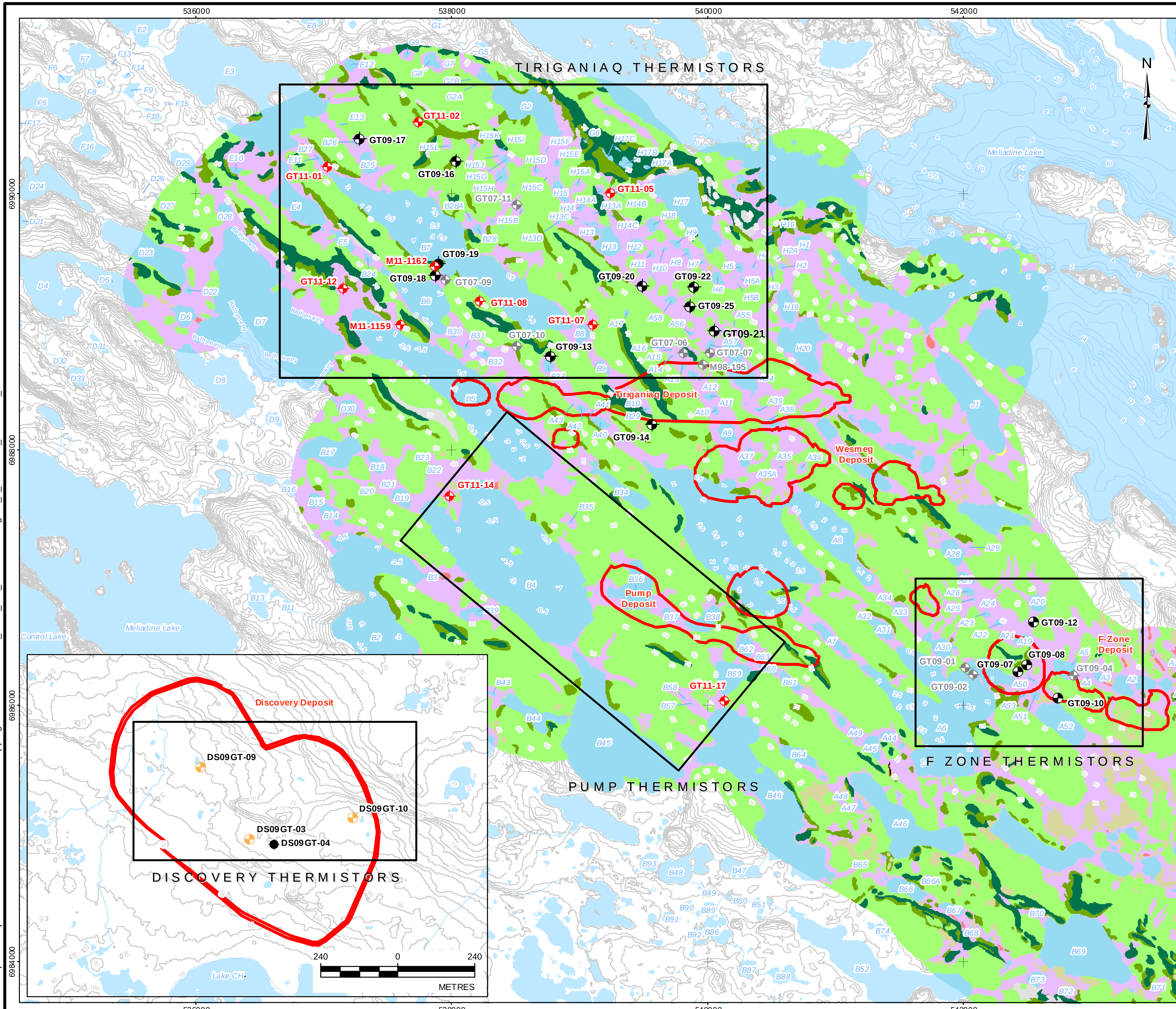
Table 1 presents naming codes for waterbodies in the Project site area, according to Golder (2009b).

Table 1: Naming System for Watersheds and Water Bodies in the Meliadine Project Area

Naming Code	Description
A, B, C, D, E, F, G, H, I, J	Watersheds within Peninsula on Meliadine Lake*
CH	Chickenhead Lake
CON	Control Lake
DR	Diana River
HB	Hudson Bay
HSL	Horseshoe Lake (part of LML drainage)
LML	Little Meliadine Lake
ML	Meliadine Lake
ML-C	Meliadine Lake (Central Basin)
ML-E	Meliadine Lake (East Basin)
ML-MR	Meliadine Lake outlet to Meliadine River
ML-PL	Meliadine Lake outlet to Peter Lake
ML-S	Meliadine Lake (South Basin)
ML-SE	Meliadine Lake (Southeast portion of South Basin)
ML-W	Meliadine Lake (West Basin)
MR	Meliadine River
MR-L	Lower Meliadine River (downstream of LML)
MR-U	Upper Meliadine River (between LML and ML)
PAR	Parallel Lake
PB	Prairie Bay (part of Hudson Bay)
PL	Peter Lake

Ref: Golder (2009b).

* Lakes numbered relative to their position in the drainage; lake numbers see Figure 2.



LEGEND

- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2011)
- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)
- HYDROGEOLOGICAL TESTING BOREHOLE WITH THERMISTOR (2009)
- HISTORIC GEOTECHNICAL BOREHOLE WITH THERMISTOR
- F ZONE GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)
- DISCOVERY GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)
- TOPOGRAPHIC CONTOUR (1.0 m INTERVAL ABOVE SEA LEVEL)
- BATHYMETRIC CONTOUR (0.5 m INTERVAL AS DEPTH)
- WATERCOURSE
- WATERBODY

Plant Community Classification

- Birch Seep
- Disturbed
- Heath Tundra Community
- Lichen-Heath (Cetraria Lichen)
- Lichen-Heath (Hair Lichen)
- Lichen-Rock Community
- Riparian Willow or Birch
- Sedge Community
- Unvegetated (Sand)
- Water

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED (AEM).
DATUM: NAD 83 PROJECTION: UTM ZONE 15

500 0 500
METRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
LOCATIONS OF BOREHOLES WITH THERMISTORS

Golder Associates

PROJECT NO. 10-1373-0076			PHASE No. 3000	
DESIGN	JC	28 Sep. 2011	SCALE AS SHOWN	REV. 1
GIS	AL	21 Oct. 2011	**FIGURE 2**	
CHECK	JC	28 Jun. 2012		
REVIEW	CJC	28 Jun. 2012		

Bathymetric maps for many of the lakes in the project area are presented individually in Golder (2008, 2009b). Figure 2 includes the bathymetric contour data for selected lakes. Table 2 presents a summary of mean and maximum depths for lakes in the Meliadine River Watershed area.

Table 2: Mean and Maximum Lake Depths in the Meliadine River Watershed Area

Water-body	Depth (m)	
	Mean	Max
A1	n.d.	2
A6	1.5	4.3
A8	1.6	4.2
A54	0.6	1.3
B2	1.6	3.4
B4	0.9	2.4
B5	1.6	3.4
B6	1.4	4
B7	1.5	5.1
B9	0.8	1.3
B10	0.3	0.8
D1	1.2	2.5
D3	n.d.	2.3
D4	n.d.	2.5[a]
D5	n.d.	2
D7	1.6	2.8
G2	n.d.	2.5
Control	n.d.	>4.3
ML	n.d.	n.d.
ML-E	4.5	21.2
ML-S	4.3	22.2
PL	n.d.	23.5[b]
LML	n.d.	>14.8

Ref: 2009b
a From Hubert and Associates Ltd. (1996)
b Maximum encountered depth in Peter Lake (Kidd et al., 1998)

2.2 Surface Geomorphology and Bedrock Geology

The local overburden typically consists of silt, sand and gravel deposits of various thicknesses overlying till with cobbles and boulders. A thin layer of organics covers much of the area. The results of laboratory grain size analysis have been presented in Golder (2009a, 2010a, 2010b, 2011a, and 2012b).

Bedrock in the project area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite, and mafic volcanic flows (Snowden, 2008; Golder, 2009c). Bedrock types consisting of metavolcanics, gabbro, greywacke, iron formation, siltstone and argillite were encountered during geotechnical field investigations (Golder, 2010a and b; 2011a; 2012b).

2.3 Climate

The Meliadine Gold Project is located in the Kivalliq Region of Nunavut, near the northern borders of the Southern Arctic terrestrial ecozone, and within the Arctic tundra climate region. Within this region daylight reaches a minimum of 4 hours per day in winter, and a maximum of 20 hours in summer. The climate is extreme with long, cold winters and very short cool summers. Temperatures are cool, with mean temperatures of 12°C in July and -31°C in January. The mean annual air temperature of the site is approximately -10°C.

Climate data were collected on site from April 1997 to September 2001, and reported by Hubert (2001). The following data were collected during this period:

- Air temperature (daily maximum and minimum);
- Ground temperature at 5 cm depth;
- Precipitation (June to September only); and
- Wind speed and direction.

A review of the on-site wind speed and directional data was presented by Golder ((2012a). The document concluded that the lack of available hourly electronic data and possible inconsistencies with the on-site wind speed observations leaves the reliability of the on-site data as questionable. Consequently, wind speed and direction from the Rankin Inlet A climate station are summarized.

The Meteorological Service of Canada (MSC) operates climate stations across the Canadian Provinces and Territories. Long term climate data are available from the regional climate station at Rankin Inlet, which is considered to be relevant and representative of the project climate conditions given its close proximity to the project. The reporting of detailed meteorological data is beyond the scope of this study. Table 3 summarizes regional MSC climate stations within 90 km of the Project.

Table 3: Regional MSC Climate Stations within 90 km of Meliadine Gold Project

Station Name	MSC Station Number	Period of Record	Latitude	Longitude	Distance from Project
Rankin Inlet*	2303400	1954 to 1962	92° 04.0’	62° 48.0’	30 km South
Rankin Inlet A	2303401	1981 to 2009	92° 07.2’	62° 49.2’	30 km South
Rankin Inlet ARTC*	2303403	1976	92° 05.0’	62° 49.0’	30 km South
Chesterfield*	2300700	1930 to 1981	90° 43.0’	63° 20.0’	80 km North
Chesterfield Inlet*	2300705	1921 to 1931	90° 50.0’	63° 45.0’	80 km North
Chesterfield Inlet A	2300707	1985 to 2007	90° 43.8’	63° 21.0’	80 km North
Whale Cove*	2303985	1974 to 1984	92° 36.0’	62° 11.0’	90 km South
Whale Cove A	2303986	1985 – 2007	92° 36.0’	62° 14.4’	90 km South

Ref: Golder (2009b).
* incomplete records; and not used in analysis.

2.3.1 Temperatures

Table 4 presents a summary of site climate data for air temperature, ground temperature at 5 cm depth and precipitation (rainfall) from the site weather station as reported by Hubert (2001).

Table 4: Summary of Meliadine Gold Project Site Climate Data

Air Temperature				Ground Temperature at 5 cm Depth
Month	Average Monthly		Mean	Mean (May 1997 to Aug. 2001)
	Max (°C)	Min (°C)	(°C)	(°C)
January	-28.5	-35.3	-31.4	-25.3
February	-23.1	-32.2	-27.8	-24.3
March	-18.0	-26.9	-21.7	-19.5
April	-9.3	-19.8	-14.0	-14.5
May	-0.3	-7.9	-3.8	-6.9
June	10.6	0.3	5.0	2.5
July	17.0	7.3	12.1	8.4
August	14.6	7.2	10.7	7.9
September	7.0	1.9	4.3	4.0
October	-2.2	-7.0	-5.0	-1.3
November	-11.4	-19.2	-15.1	-8.2
December	-21.7	-29.0	-24.9	-17.9
Annual Average			**-9.3**	**-7.9**

Ref: Hubert (2001).

Monthly air temperatures from 1981 to 2009 are presented in Table 5 for Rankin Inlet A climate station, which is the MSC climate station closest to the Project site.

Table 5: Summary of Rankin Inlet A Mean Monthly Air Temperature, 1981 to 2009

Month	Warmest and Coldest Day in the Month (°C)		Daily (°C)		Monthly Means (°C)
	Extremes		Means		
	Maximum	Minimum	Maximum	Minimum	
January	0.0	-46.1	-19.8	-37.2	-30.9
February	-4.4	-49.8	-24	-35.3	-30.1
March	1.3	-43.4	-18.8	-30.8	-25.1
April	3.4	-35.7	-10.4	-20.2	-15.7
May	14.1	-23.8	-1.2	-10.8	-5.9
June	26.1	-9.4	6.7	0.1	4.1
July	28.9	-1.9	14.9	6.9	10.5

Month	Warmest and Coldest Day in the Month (°C)		Daily (°C)		Monthly Means (°C)
	Extremes		Means		
	Maximum	Minimum	Maximum	Minimum	
August	30.5	-1.4	11.2	7.7	9.7
September	20.6	-9.0	6.8	1.3	3.8
October*	9.3	-27.4	1.7	-9.9	-4.6
November*	0.9	-36.5	-10.2	-23.6	-17.2
December*	-2.0	-43.6	-19.4	-33.3	-25.9
Annual Extremes	**30.5**	**-49.8**	**14.9**	**-37.2**	**-10.4**

Ref: Golder (2009b).
Note: * = 2009 data not available

2.3.2 Precipitation

Table 6 presents the mean monthly rainfall, snowfall and precipitation at the Rankin Inlet A climate station recorded from 1981 to 2009 (Golder, 2009b), and mean monthly rainfall at the Meliadine Gold Project site recorded in the summer months from 1997 to 2001 (Hubert, 2001).

Table 6: Summary of Mean Monthly and Annual Precipitation

Month	Rankin Inlet A Climate Station (1981 to 2009)[1]			Meliadine Project Site (1997 to 2001)[2]
	Rainfall (mm)	Snowfall (cm)	Precipitation (mm)	Rainfall (mm)
January	0.0	8.6	8.4	-
February	0.0	8.7	8.4	-
March	0.0	12.4	12.2	-
April	1.2	19.2	20	-
May	6.8	12.8	19.1	-
June	23.4	4.7	28.0	30.9
July	38.7	0.1	38.8	34.9
August	56.4	0.2	56.5	52.9
September	40.0	3.8	43.8	36.3
October*	13.7	24.6	37.9	-
November*	0.3	22.2	21.6	-
December*	0.0	12.6	12.0	-
Annual Total	**180.6**	**128.8**	**305.5**	**-**

Ref: Hubert (2001); Golder (2009b).
Notes: 1. *= 2009 data not available; and
2. - Denotes not reported; and snowfall not recorded.

2.3.3 Wind Speed and Direction

A detailed summary of the wind speed and direction at the Rankin Inlet A climate station is presented in Golder (2009b). The recorded prevailing winds are from north-northwest and north, as shown in the following Plate 1. The values for wind speed frequency are presented in Table 7.

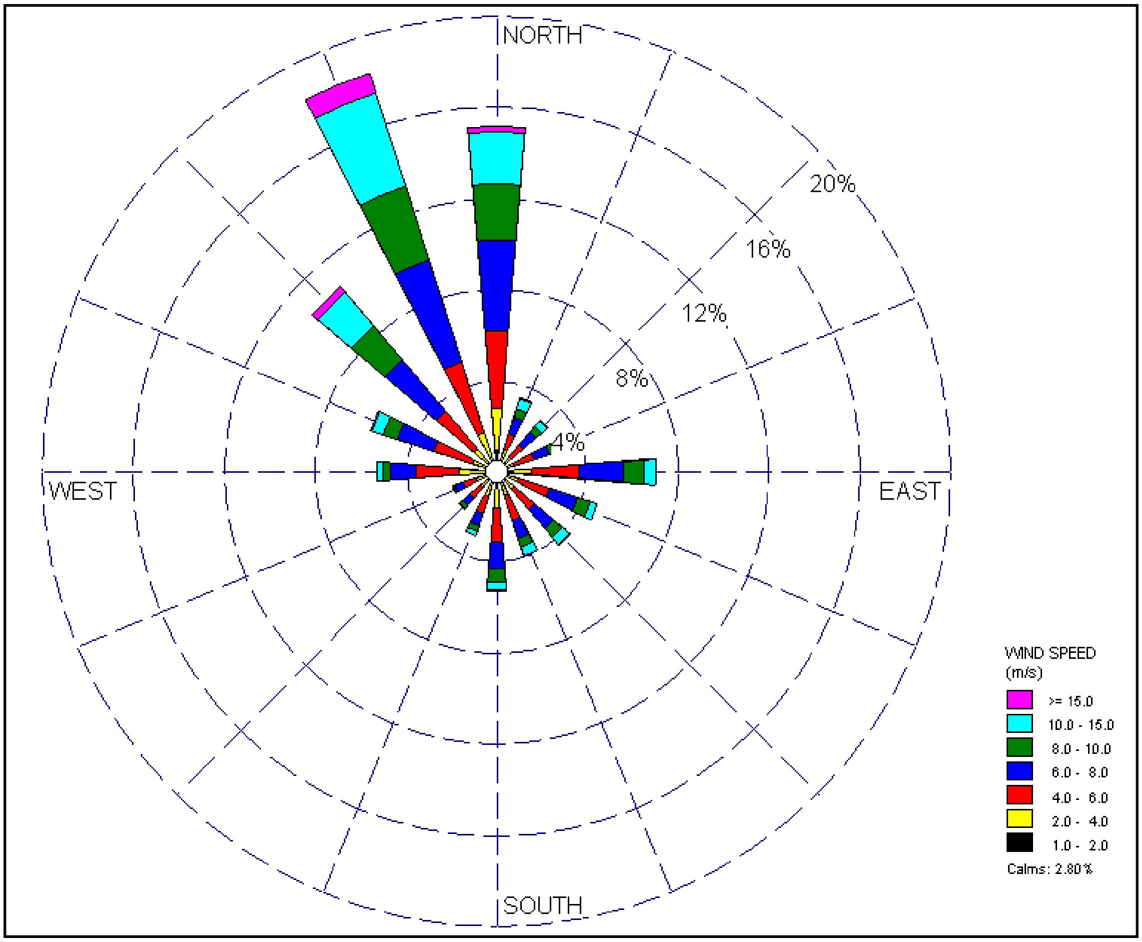


Plate 1: Rankin Inlet A Mean Wind Speed and Direction - Frequency Rose

Table 7: Rankin Inlet A Wind Rose Speed and Direction Frequencies, 1981 to 2008

Direction		Wind Classes (m/s)							
Cardinal or Intermediate	Sector Midpoint (°)	1.0 - 2.0	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	8.0 - 10.0	10.0 - 15.0	>= 15.0	Total (%)
N	0	0.99	1.81	3.40	3.96	2.45	2.25	0.28	15.14
NNE	22.5	0.48	0.56	0.72	0.75	0.43	0.44	0.07	3.45
NE	45	0.35	0.49	0.72	0.71	0.34	0.33	0.06	3.00
ENE	67.5	0.33	0.54	0.86	0.75	0.34	0.29	0.06	3.17
E	90	0.49	1.05	2.11	1.95	0.85	0.52	0.04	7.01
ESE	112.5	0.29	0.73	1.44	1.31	0.56	0.33	0.02	4.68
SE	135	0.32	0.69	1.21	1.12	0.47	0.43	0.02	4.26
SSE	157.5	0.35	0.77	1.17	0.82	0.40	0.35	0.02	3.88
S	180	0.58	1.04	1.47	1.18	0.57	0.38	0.02	5.24
SSW	202.5	0.43	0.73	0.78	0.59	0.28	0.18	0.01	3.00
SW	225	0.39	0.59	0.59	0.38	0.16	0.09	0.01	2.21
WSW	247.5	0.36	0.61	0.61	0.33	0.10	0.06	0.00	2.07
W	270	0.54	1.18	1.87	1.09	0.33	0.24	0.02	5.27
WNW	292.5	0.33	0.78	1.79	1.69	0.67	0.51	0.09	5.86
NW	315	0.36	0.94	2.19	2.96	1.92	1.94	0.31	10.62
NNW	337.5	0.53	1.29	3.25	4.68	3.34	4.32	0.89	18.30
	Sub-Total	**7.12**	**13.80**	**24.18**	**24.27**	**13.21**	**12.66**	**1.92**	**97.16**
								Calms	**2.52**
								Missing/Incomplete	**0.32**
								Total	**100.00**

Ref: Golder (2009b).
Note: °= degrees; m/s= metres per second.

2.3.4 Relative Humidity

Rankin Inlet A climate station is humid throughout the year, with peaks typically occurring during the months of May and October and lows during January and February. Table 8 provides a summary of the mean relative humidity values recorded at the site and Rankin Inlet A climate stations for the period of 1981 to 2008 (Golder, 2009b).

Table 8: Mean Relative Humidity Recorded at Rankin Inlet A and Meliadine Camp, 1981 to 2008

Month	Mean Monthly Relative Humidity [%]				
	Meliadine Camp				**Rankin Inlet A**
	1997	**1998**	**1999**	**2000**	**1981 to 2008**
January	Not recorded	70.8	78.3	Not recorded	66.6
February	Not recorded	78.4	83.9	Not recorded	67.0
March	Not recorded	77.9	84.3	Not recorded	70.2
April	88.5	88.5	91.2	Not recorded	78.9
May	85.7	91.4	93.1	Not recorded	86.1
June	80.1	85.6	84.8	86.8	80.8
July	74.2	81.3	81.2	78.2	77.2
August	81.0	89.5	85.7	85.5	81.2
September	Not recorded	94.2	89.3	89.6	84.0
October	93.5	94.5	Not recorded	Not recorded	86.7
November	89.6	95.4	Not recorded	Not recorded	77.9
December	84.4	83.6	Not recorded	Not recorded	70.2
Annual*	**84.6**	**85.9**	**85.8**	**85.0**	**77.3**

Ref: Golder (2009b).
Note: *= based on recorded data
%= percent

2.3.5 Solar Radiation

The intensity of solar radiation is related to the length of the day in the north. Net solar radiation (the difference between the incoming solar radiation and the reflected radiation) data were collected at the climate station installed at Meliadine Camp and is reported for the years of 1997, 1999 and 2000, in the following table.

Table 9: Mean Net Solar Radiation at Meliadine Camp, 1997, 1999, and 2000

Month	Monthly Mean Net Radiation ($MJ/m^2/d$)		
	1997	**1999**	**2000**
June	13.5	14.3	10.4
July	12.1	11.0	13.5
August	8.6	7.4	7.2
September	Not recorded	3.9	3.8

Ref: Golder (2009b).
Note: $MJ/m^2/d$ = megajoules per square metre per day.

2.4 Lake Water Temperature and Lake Ice Thickness

Comprehensive lake water temperature measurements are summarized in Golder (2008, 2009b). Lake water temperature data were collected from 1997 through to 2000, including lake water temperature profiles recorded in the spring and summer of 1997, 1998 and 1999.

The monthly means, ranges, and mean diurnal fluctuations of lake water temperatures measured in summer months from 1998 to 2000 are summarized in Table 10 (Golder, 2009b).

Table 10: Summer Lake Water Temperatures, June to September of 1998 to 2000

Lake	Jun-98			Jul-98			Aug-98			Sep-98		
	Mean	**Range**	**Fluct.***	**Mean**	**Range**	**Fluct.**	**Mean**	**Range**	**Fluct.**	**Mean**	**Range**	**Fluct.**
A8	7.9	4.0-13.0	3.5	13.3	8.6-18.1	2.4	12.6	7.8-18.3	1.9	6.9	2.5-10.8	1.1
B2	7.4	3.7-13.3	2.8	13.6	8.6-19.7	2.7	12.9	8.6-19.1	2.1	7.1	2.6-11.2	1.3
B5	6.3	2.2-12.3	3.5	13.4	8.9-18.9	2.3	12.8	8.4-18.8	1.9	7.1	2.8-10.9	1.1
ML-SE	9.1	5.3-12.9	3.6	13.4	8.0-18.8	2.8	12.6	6.8-18.8	2.3	6.8	2.2-11.1	1.3
ML-E	4.7	4.0-6.1	1.2	10.6	3.5-15.2	1.4	13.1	9.6-16.2	1.0	8	4.1-10.9	1.2
PL	4.5	2.2-6.1	1.8	9.0	1.7-14.2	2.0	13.1	9.8-16.3	1.0	8.8	4.7-11.7	0.9
Lake	**Jun-99**			**Jul-99**			**Aug-99**			**Sep-99**		
	Mean	**Range**	**Fluct.**	**Mean**	**Range**	**Fluct.**	**Mean**	**Range**	**Fluct.**	**Mean**	**Range**	**Fluct.**
A6	5.4	0.8-12.1	2.6	12.8	8.9-17.8	2.1	11.4	6.1-15.9	1.8	5.4	4.7-6.5	1.0
B2	4.8	0.4-11.2	2.4	12.9	9.0-17.8	2.2	11.6	5.9-16.2	1.8	5.5	4.9-6.1	1.1
ML-SE	6.4	1.4-12.1	3.6	12.5	8.6-17.2	2.6	11.5	5.9-16.6	1.9	5.3	4.9-5.9	0.8
Con	4.4	1.0-9.8	2.1	12.7	7.7-16.8	1.6	11.9	7.1-15.7	1.4	6.6	6.1-7.3	0.9
Lake	**Jun-00**			**Jul-00**			**Aug-00**			**Sep-00**		
	Mean	**Range**	**Fluct.**	**Mean**	**Range**	**Fluct.**	**Mean**	**Range**	**Fluct.**	**Mean**	**Range**	**Fluct.**
A6	2.4	0.7-4.9	1.9	12.1	2.9-21.3	2.6	13.0	4.4-21.4	1.9	4.8	-0.1-9.2	1.4
B2	1.8	0.6-4.6	1.5	12.4	2.4-20.8	2.9	13.1	4.6-21.1	1.8	5.4	0.0-8.7	1.4
ML-SE	3.0	1.3-7.1	2.6	12.4	3.4-21.1	3.8	13.1	5.2-20.5	2.2	5.6	-9.8	1.6
Con	4.8	3.8-5.9	1.1	11.8	3.7-21.1	2.1	13.5	5.1-20.3	1.3	5.6	-8.8	1.0

Ref: Golder (2009b).
* Mean daily temperature fluctuation (daily maximum - daily minimum).

Table 11 summarizes the temperature ranges for the temperature profiles measured during the open water period for a number of lakes in the project site area (Golder, 2009b).

Table 11: Temperature Range in the Water Column of Lakes in the Meliadine Study Area, 1997 to 1999

Lake	Maximum Depth (m)	Jul-97		Aug-97		Apr-98		Jul-98		Aug/Sep-98		Jul-99	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
ML-E	14.7	13.2	13.9	11.2	15.3	-0.2	2.8	9.9	9.9	9.7	9.7		
ML-S	6.3	14.3	14.6	11.4	13.2	-0.2	1.6	12.6	13.1				
ML-SE	3.1					-0.2	1.2	11.0	11.4			11.2	11.7
ML-W	8.5	13.9	14.3	11.4	13.6	0.1	1.2	12.4	12.9				
LML	14.8					0.0	2.0	12.2	14.0	10.2	10.5		
PL	18.8					0.4	2.7	9.5	11.9				
A1	1.8			14.7	14.9								
A6	4.0	18.2	19.0	15.1	15.7	0.0	2.1	14.3	15.1			9.8	9.9
A8	3.6	16.4	17.7	14.2	14.3	-0.2	1.8	12.3	12.7				
B2	3.0	16.0	17.4	14.8	15.3	-0.2	0.8	9.7	9.8	8.9	8.9	10.9	11.1
B5	2.7	15.1	15.1	15.1	15.1	-0.2	0.0	9.9	10.0	8.9	8.9	10.2	10.5
B7	3.8	14.3	14.3	14.3	15.1	-0.1	1.7	9.7	9.7	9.6	10.3		
D1	2.2			15.7	16.7	-0.2	-0.2						
D7	2.3	13.5	14.0	15.2	15.8	-0.2	0.3						
G2	2.3	17.3	17.4	16.0	16.0								
Con	4.3							14.5	14.7			11.9	12.6

Ref: Golder (2009b).

The lake water temperature readings collected for the lakes in the Project area do not include direct measurements of lake bottom temperatures, which are useful for assessing the presence of a talik below a lake and can provide input for thermal analyses related to engineering design. For lakes with water present through the winters (*i.e.,* ice does not freeze to the lakebed), shallower lakes have lower mean annual lake bottom temperatures than deeper lakes.

Late-winter ice thicknesses on freshwater lakes in the Meliadine Gold Project area over the period of record are presented in Table 12, based on information reported in Golder (2009b). The ice thickness ranged from 1 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appeared by the end of October and were completely formed in early November. The spring ice melt typically began in mid-June and was complete by early July (Golder, 2009b).

Table 12: Lake Ice Thicknesses and Depths Measured for the Meliadine Gold Project Site Area

Area	Site ID or Water Body[1]	Surface Area[2] (ha)	Date Sampled	UTM Zone 15, NAD83[3]		Source[4]	Ice Thickness (m)	Lake Depth including Ice at Sampling Location (m)
				Easting	Northing			
Meliadine Lake	ML-E	10 689	Apr-98	543253	6988595	RL&L 1999	1.8	11.5
	ML-E		Apr-09	543184	6987869	Golder 2009b	1.7	5.4
	ML-A		Apr-09	544654	6986157	Golder 2009b	1.8	5.1
	BOOT-2		Apr-09	542070	6989338	Golder 2009b	1.9	10.1
	ML-W		Apr-98	524265	7001352	RL&L 1999	2.3	4.2
	ML-S		Apr-98	532241	6989347	RL&L 1999	1.8	5.0
	ML-L		May-98	530573	6995553	AEE 1998b	2.0	-
			May-00	530573	6995553	AMEC 2000	2.0	-
	ML-SE		Apr-98	535954	6986565	RL&L 1999	1.8	3.0
			Apr-09	535824	6986364	Golder 2009b	1.7	3.1
Tiriganiaq, Wesmeg and Pump Deposits	Lake A8	90.5	Apr-98	540084	6987478	RL&L 1999	1.8	3.0
			Apr-09	540181	6987142	Golder 2009b	1.6	2.7
	Lake B2	49.4	Apr-98	537412	6986604	RL&L 1999	1.8	2.5
			May-98	-	-	AEE 1998b	1.9	-
			May-99	-	-	AEE 1999	1.3	-
			May-00	-	-	AMEC 2000	1.4	-
	Lake B4	85.8	May-98	-	-	AEE 1998b	1.0	-
			May-99	-	-	AEE 1999	1.3	-
	Lake B5	56.7	Apr-98	537989	6988649	RL&L 1999	1.8	2.2
			May-98	-	-	AEE 1998b	2.1	-
			May-99	-	-	AEE 1999	1.3	-
			Apr-09	538281	6988153	Golder 2009b	1.6	2.6
	Lake B6	11.8	Apr-09	537758	6989218	Golder 2009b	1.7	3.5
	Lake B7	57.9	Apr-98	537731	6989737	RL&L 1999	1.8	3.2
			May-98	-	-	AEE 1998b	2.0	-
			May-99	-	-	AEE 1999	1.2	-
			Apr-09	537811	6989603	Golder 2009b	1.8	3.8
			May-00	-	-	AMEC 2000	2.0	-
F Zone Deposit	Lake A1	16.4	May-98	-	-	AEE 1998b	1.8	-
			May-00	-	-	AMEC 2000	1.8	-
	Lake A6	55.3	Apr-98	541998	6986004	RL&L 1999	1.7	3.8
			May-98	-	-	AEE 1998b	1.6	-
			Apr-09	541777	6985645	Golder 2009b	1.7	4.2
Discovery Deposit	Lake CH	135	Apr-09	555108	6980408	Golder 2009b	1.7	9.0

Ref: Golder (2009b).
Notes: - data not available.
1. Lake locations shown in Figure 2, and detailed measurement site ID shown in Golder (2009b).
2. Surface area for Meliadine Lake includes the entire lake.
3. UTM coordinates from RL&L 1998 were converted from NAD27.
4. RL&L is RL&L Environmental Services Ltd.; AEE is Amec Earth and Environmental Ltd.

Additional data on ice thickness in the Peninsula lakes and ponds (in basins B, D and E) were collected in April 2011 and were included in Appendix B2 of SD 7-2 (2011 Aquatic Baseline Studies). These data are summarized in Table 13. Typically, smaller lakes have thicker accumulations of snow than do larger lakes, which have an increased surface area exposed to wind sweeping and sunlight. The data in Table 13 and Plate 2 below suggest there is no significant correlation between lake size, and hence snow thickness, and ice thickness at the time the data were collected.

Table 13: Lake Ice Thickness and Depth Measured for the Meliadine Gold Project Site Area in April 2011

Area	Site ID or Water Body	Surface Area[2] (ha)	Date Sampled	UTM Zone 15, NAD83		Ice Thickness[3] (m)	Lake Depth[3] (m)
				Easting	Northing		
Tiriganiaq, Wesmeg and Pump Deposits	Lake B2	49.4	11-Apr-2011	537262	6986682	1.65	3.16
	Lake B4	85.8	11-Apr-2011	538698	6986905	1.68	1.95
	Lake B5	56.7	9-Apr-2011	538288	6988171	1.62	2.75
	Lake B6	11.8	9-Apr-2011	537753	6989226	1.68	3.00
	Lake B7	57.9	9-Apr-2011	537738	6989793	1.66	2.25
	Lake B45	47.4	11-Apr-2011	539092	6985496	1.51	1.62
	Lake E3	56.8	9-Apr-2011	536450	6990898	1.71	4.22
	Lake E4	8.5	9-Apr-2011	536836	6989878	1.63	2.80
Other[1]	Lake B52	33.4	11-Apr-2011	541472	6983741	1.52	2.73
	Lake B53	15.7	11-Apr-2011	541432	6983365	1.58	2.01
	Lake B69	25.0	11-Apr-2011	542844	6984060	1.55	3.64
	Lake D7	73.5	9-Apr-2011	536638	6988797	1.35	2.65

Notes:
1. Lakes on the Peninsula, but not directly affected by the Project.
2. Surface area values are from Table 7.5-10 on page 7-320 of Volume 7 (Freshwater Environment).
3. Ice thickness and lake depth data are from Appendix B2 of SD7-2 (2011 Aquatic Baseline Studies). Lake depths were measured at the sampling station and include the ice cover.

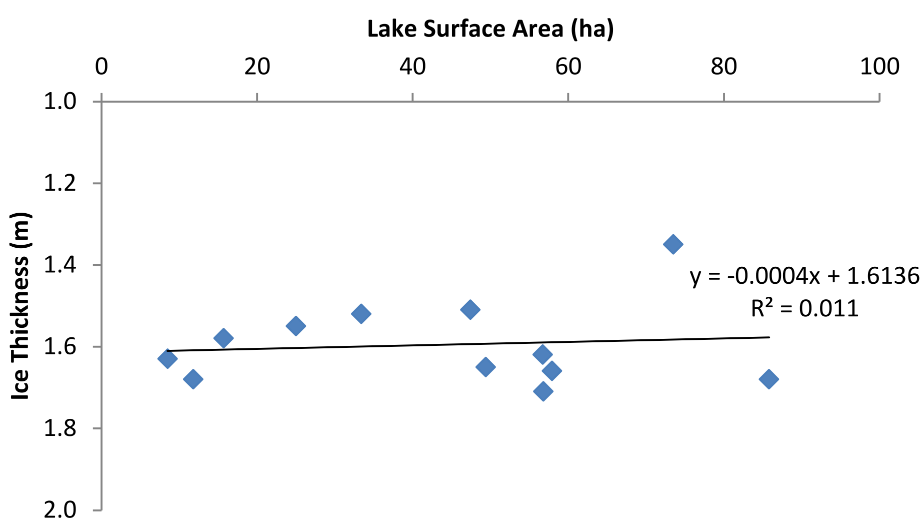


Plate 2: Relationship between Lake Area and Ice Thickness for Lakes in Table 13

2.5 Permafrost Setting and Regional Permafrost Conditions

The Meliadine Gold Project is located within the zone of continuous permafrost (Figure 3), and has an annual average air temperature of -10.4 ºC based on climate data from Rankin Inlet. The project area is underlain by permafrost, with intervening taliks and thaw bulbs induced by lakes.

Published data regarding permafrost were used to recreate the permafrost map of Canada shown in Figure 3. This map indicates that the ground ice content in the region is expected to be between 0% and 10% (dry permafrost) based on regional scale compilation data. Ice lenses and ice wedges are likely locally present on land, as indicated by ground conductivity, and by permafrost features such as palsas. These areas of local ground ice are generally associated with low lying areas of poor drainage.

Regionally, the closest long term permafrost monitoring station is located at Baker Lake as part of the Circumpolar Active Layer Monitoring program (CALM). The location of the CALM station is summarized in Table 14.

Table 14: Baker Lake CALM Location

Site Number	Latitude	Longitude	Elevation (m)	Location
C20	64°19.6'N	95°2.5'W	50	230 km Northwest of Meliadine

Ref: CALM website.

The information from the Baker Lake CALM site is presented in a regional background context as it is the only CALM site in relatively close proximity to the Meliadine Project. The presentation of the data is to provide a regional frame of reference for the potential range in active layer depth encountered at the site; the data have not been used for any analysis or design. The range indicated by the thermistor at the CALM site is not absolute, and any reliance upon the CALM site data as being representative of the specific conditions at Meliadine would not be appropriate. The following general description of the site and soil conditions at the Baker Lake CALM site is provided by the Circumpolar Active Layer Monitoring (CALM) Network.

Table 15: General Description of Site Conditions at Baker Lake CALM Site

Landscape Description	**Raised degraded beach ridges over granite bedrock**
Vegetation /Classification	Heath lichen, dwarf shrub
Soils (or Material)	Pergelic Cryochrept (1)
soil temp. measurements (year started)	1997
soil moisture measurements (year started)	No
general description of soil moisture (dry, moist, wet, saturated)	N/A
soil texture: if non organic describe texture, if organic indicate thickness of organic layer (cm)	Coarse gravels and sands (0 Ð 15cm peat layer on top)

Reference: http://www.gwu.edu/~calm/

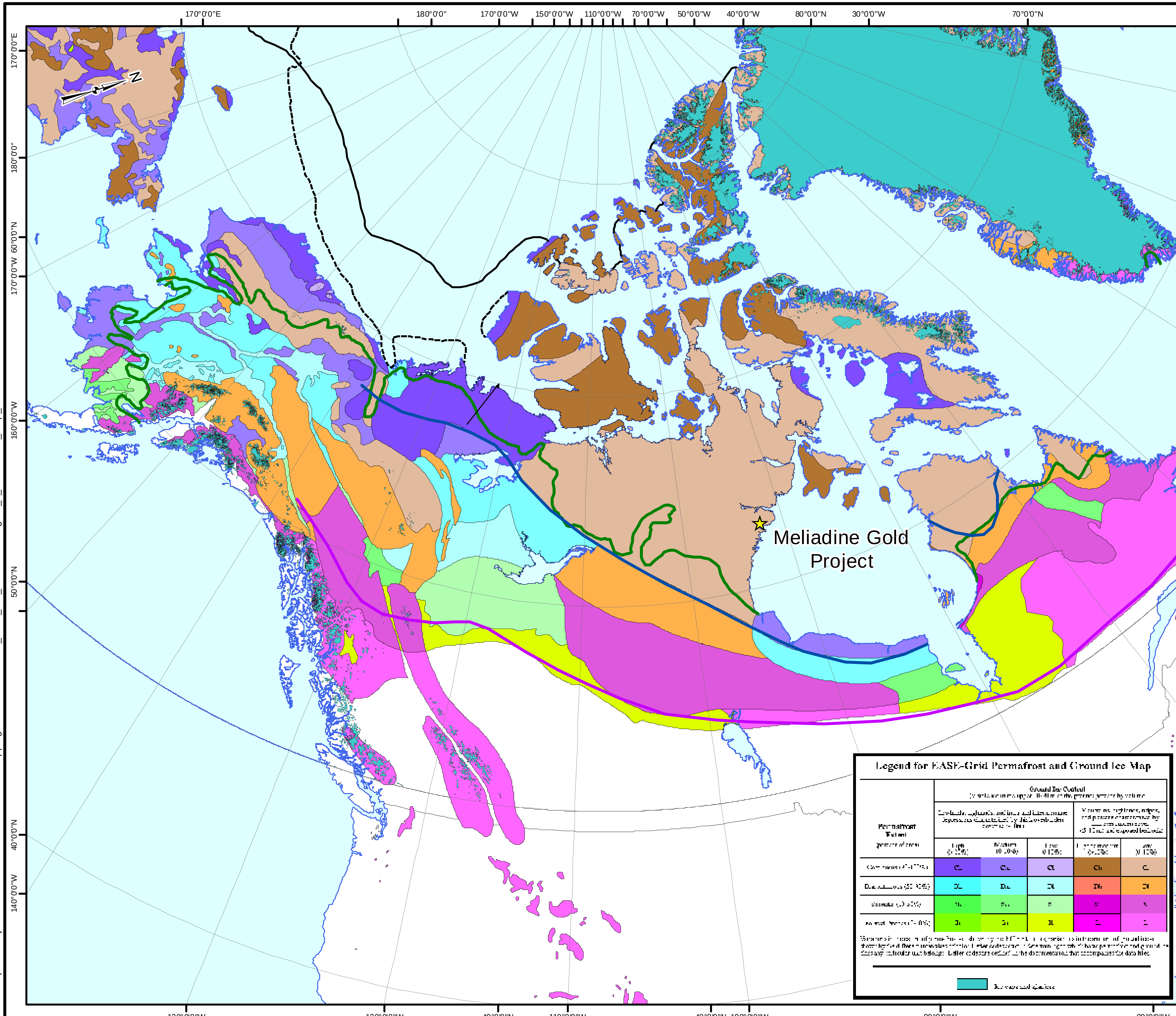
Ground temperatures have been monitored at Baker Lake since 1997. Mean annual ground temperatures at a depth of 2 m (near top of permafrost) range from -6.6°C to -8.4°C from 1998 to 2001. Annual active layer thaw depths measured from 1997 to 2004 are presented in Table 15. The average thaw depth at the Baker Lake CALM site is calculated to be about 1.7 m. This is presented to provide a reference for the range of active layer depths to be expected at the Meliadine site. It should be noted the active layer depth will likely vary with location due to factors such as topography, climate, hydrology and ground conditions. Site specific information regarding the active layer at the Meliadine project site has been collected and is discussed in Section 4.0.

Table 16: Annual Thaw Depth at Baker Lake CALM Site

Thaw Depth (cm)													
Site	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Average
Baker Lake C20	120	170	174	189	193	-	-	178	-	-	-	-	171

Ref: CALM website.
Notes: - denotes not reported; data downloaded from CALM website.

The data from the Baker Lake CALM site is provided because it is the closest long term permafrost monitoring station to the Meliadine Site. The tabulated annual thaw depths are presented only to provide general information on thaw depth in a regional context. The Baker Lake data have not been used for analysis or design purposes for Meliadine because they are incomplete in terms of on-going monitoring (the last measurements were in 2004), and cannot provide any additional relevant information relating to thermal gradient, permafrost thickness, mean annual surface temperature, or depth of zero annual amplitude. Any direct use of the Baker Lake CALM data for characterizing the permafrost at Meliadine would be inappropriate because more relevant, recent, and reliable data are available directly from the site thermistors. Other than a general comparison of thaw depths that show reasonable consistency in a regional sense, the use of data from the CALM site provides no additional value to the characterization of the permafrost.



LEGEND

- ★ MELIADINE GOLD PROJECT
- SOUTHERN BOUNDARY OF CONTINUOUS PERMAFROST - PRESENT
- SOUTHERN BOUNDARY OF DISCONTINUOUS PERMAFROST - PRESENT
- TREELINE
- SEA-ICE EDGE LIMIT
- SUBSEA PERMAFROST LIMIT

REFERENCE

BROWN, J., O.J. FERRIANS JR., J.A. HEGINBOTTOM, AND E.S. MELNIKOV. 1998. CIRCUM-ARCTIC MAP OF PERMAFROST AND GROUND-ICE CONDITIONS. BOULDER, CO: NATIONAL SNOWN AND ICE DATA CENTRE/WORLD DATA CENTER FOR GLACIOLOGY. DIGITAL MEDIA. PREDICTED PERMAFROSTBOUNDARIES BASED ON WOO ET AL., 1992. DATUM: NAD83 PROJECTION: UTM ZONE 15

500 0 500
KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

PERMAFROST MAP OF CANADA

Golder Associates

PROJECT		10-1373-0076	FILE No.	
DESIGN	JC	27 July 2011	SCALE AS SHOWN	REV. 1
GIS	AL	27 July 2011	FIGURE 3	
CHECK	JC	28 Jun. 2012		
REVIEW	CJC	28 Jun. 2012		

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3.0 FIELD INVESTIGATIONS

This section presents a summary of the geotechnical and geothermal investigations, including thermistor installations, at the Meliadine Gold Project site. Studies of the geothermal regime at the Meliadine Project began in 1998 with the installation of one thermistor. These studies continued with the installation of additional thermistor cables during geotechnical drilling investigations in 2007, 2009, and 2011. To date, a total of 37 thermistor cables have been installed at the site to characterize and monitor the thermal conditions and permafrost. Figure 2 shows the locations of boreholes with installed thermistors.

3.1 1998 Investigation

A single thermistor was installed by EBA in borehole M98-195 in 1998 to a vertical depth below ground surface of 437 m. A summary of the installation is presented by Hubert (2001) and is also included in Appendix E. The temperature profiles for this thermistor are available between October 1998 and September 2000. The thermistor is no longer functional, despite efforts to repair it in 2009. Details of the thermistor types used for this thermistor cable are not available.

In addition, a series of boreholes were drilled during 1998 to investigate the depth to bedrock, and overburden conditions in the area of the Tiriganiaq deposit. Stratified ice was noted in 3 of the boreholes: M98-316, M98-320, and M98-322. No thermistors were installed in these boreholes.

3.2 1999 Investigation

A series of boreholes that were drilled during 1999 did not note ground ice. No thermistors were installed.

3.3 2007 Investigation

This field investigation was conducted by SRK (2007) and the installed thermistor cables were supplied by EBA.

Six boreholes were completed in April to May 2007 at preliminary locations for the mill site, waste rock piles and TSF dams.

The boreholes were logged and sampled and then five of the boreholes were immediately instrumented with thermistor strings using 1-inch diameter PVC pipes. Excess ground ice in the form of stratified ice lenses and ice coatings, on gravel and sand particles were identified in three of the boreholes. A brief summary of the thermistor installations included in SRK (2007) are presented below:

- The thermistor strings were installed immediately following the completion of drilling. PVC piping with 1” diameter was installed in the drillholes before the drill rods were pulled. The thermistors were installed inside the PVC following the removal of the rods from the drillhole, but prior to the drill rig moving off the setup.

- All thermistor strings installed in April/May 2007 were completed at surface as follows; the PVC pipe was cut 1.0 m above ground surface and the thermistor inserted into the pipe with the military connector resting on the top of the pipe. The PVC was then secured to wooden 2x4's with wire to provide a stable completion for the instrument.

Details of the thermistor types used for these thermistor cables are not available.

3.4 2008 Investigation

Four oriented geotechnical boreholes were drilled in 2008. No thermistors were installed in these boreholes.

3.5 2009 Investigation

Field investigations were carried out by Golder for the Tiriganiaq, F Zone and Discovery Deposits between May and September 2009 (Golder, 2009a, 2010a and 2010b). Thermistor cables were installed by Golder in select boreholes to evaluate the ground thermal conditions in the areas of proposed open pits, waste rock piles, and certain infrastructures, as shown in Figure 2. Most thermistor cables installed in 2009 were manufactured by M-Squared Instruments in Calgary, Alberta. Thermistor types include YSI 44034 and YSI 44007/34 (5000 Ohms @ 25 ºC and 16325 Ohms @ 0 ºC), which are typically accurate to 0.2 ºC. The thermistor cable installed in borehole DS09GT-04 near the Discovery Deposit was installed with a datalogger which is programmed to record temperatures on an interval of 12 hours.

Golder (2010a and b) report the procedures used for installation of the thermistors, which are summarized below:

- Thermistor installations in inclined holes greater than 25 m in length were completed through 1-inch diameter schedule 80 PVC pipe. A capped PVC pipe was lowered down each hole, the thermistor was inserted into the pipe, and both PVC pipe and thermistor were secured at the surface. The borehole was allowed to freeze in place prior to being backfilled with sand and gravel;
- Thermistors installed in vertical boreholes of less than 25 m depth were installed directly into the open borehole without PVC pipe and allowed to freeze in place;
- Surface protection for the thermistors was constructed; and
- Completed thermistor installations were flagged and labelled with the borehole number and the thermistor serial number.

3.6 2011 Investigation

Two thermistor cables, GT11-A and GT11-B, were installed in two deep boreholes near Lakes B5 and B7 in June 2011 to study the thermal regime beneath the larger lakes in the project area. The thermistor cables were manufactured by M-Squared Instruments using YSI 44007 resistors and were connected to dataloggers. The boreholes were drilled for the purpose of installing the thermistors. No detailed borehole logging was carried out.

In addition, a geotechnical investigation was completed for the proposed TSF and proposed waste rock piles (Figure 2). The program included the installation of an additional 8 thermistors. The thermistor cables were manufactured by M-Squared Instruments using YSI 44007/34 resistors. The boreholes were drilled using HQ3 wireline methods and recovered samples of permafrost soils. The permafrost soils were logged and classified according to National Research Council Canada (1979). The geotechnical and permafrost logs are included in Golder (2012b).

3.7 Summary of Thermistor Installations

The following table summarizes the details of the thermistor installations at the Meliadine Gold Project site (Figure 2).

Table 17: Summary of Completion Details for Boreholes with Thermistors

No.	Deposit Area	Borehole Number	Completion Date	Collar Coordinates UTM Zone 15, NAD83 Datum Northing (m)	Easting (m)	EL. (m)	INCL. (deg)	AZ. (deg)	Length Drilled (m)	Maximum Vertical Thermistor Depth Below Ground Surface (m)
1	Tiriganiaq	M98-195	27-Jun-98	6988660	539968	69.3	80.0	180.0	518.0	437.1
2	Tiriganiaq	GT07-06	23-Apr-07	6988750	539814	67.9	90.0	N/A	10.5	8.5
3	Tiriganiaq	GT07-07	1-May-07	6988750	540020	66.4	90.0	N/A	10.5	8.5
4	Tiriganiaq	GT07-09	4-May-07	6989323	537952	62.6	90.0	N/A	8.8	8.5
5	Tiriganiaq	GT07-10	10-May-07	6988805	538506	69.3	90.0	N/A	45.0	44.0
6	Tiriganiaq	GT07-11	16-May-07	6989910	538507	68.6	90.0	N/A	45.0	44.0
7	F Zone	GT09-01	7-May-09	6986289	542012	59.7	90.0	N/A	21.0	19.5
8	F Zone	GT09-02	10-May-09	6986236	542078	59.4*	90.0	N/A	20.0	8.0
9	F Zone	GT09-04	13-May-09	6986230	542861	55.0	90.0	N/A	21.2	19.5
10	F Zone	GT09-07	15-Aug-09	6986260	542429	59.6	60.4	204	151.3	130
11	F Zone	GT09-08	17-Aug-09	6986317	542494	59.6	70.8	206.7	151.2	139
12	F Zone	GT09-10	23-Aug-09	6986059	542740	58.4	90.0	N/A	20.0	20.0
13	F Zone	GT09-12	26-Aug-09	6986651	542546	61.4	90.0	N/A	20.0	20.0
14	Tiriganiaq	GT09-13	27-Aug-09	6988731	538775	65.5	90.0	N/A	20.2	20.0
15	Tiriganiaq	GT09-14	28-Aug-09	6988198	539572	72.3	90.0	N/A	25.8	25.5
16	Tiriganiaq	GT09-16	3-Sep-09	6990252	538034	71.8	90.0	N/A	22.0	20.6
17	Tiriganiaq	GT09-17	4-Sep-09	6990417	537293	64.0	90.0	N/A	20.5	20.5
18	Tiriganiaq	GT09-18	5-Sep-09	6989363	537875	62.1	90.0	N/A	20.1	20.0
19	Tiriganiaq	GT09-19	13-Sep-09	6989458	537899	63.1	51.0	325	199.5	151.8
20	Tiriganiaq	GT09-20	7-Sep-09	6989280	539492	67.5	90.0	N/A	21.1	20.0
21	Tiriganiaq	GT09-21	8-Sep-09	6988927	540059	65.7	90.0	N/A	21.3	20.0
22	Tiriganiaq	GT09-22	10-Sep-09	6989273	539898	66.2	90.0	N/A	25.0	25.0
23	Tiriganiaq	GT09-25	12-Sep-09	6989118	539868	67.1	90.0	N/A	25.1	25.0
24	Discovery	DS09GT-03	6-Aug-09	6981625	554379	71.6	67.2	179.5	140.0	128.8
25	Discovery	DS09GT-04	9-Aug-09	6981611	554453	73.8	70.5	87.2	141.5	128.0
26	Discovery	DS09GT-09	19-Aug-09	6981850	554226	70.7	90.0	N/A	20.0	20.0
27	Discovery	DS09GT-10	22-Aug-09	6981687	554692	73.6	90.0	N/A	20.0	20.0
28	Tiriganiaq	M11-1159	26-Jun-11	6988978	537600	60.3**	73.5	179.7	600.0	580.5
29	Tiriganiaq	M11-1162	27-Jun-11	6989428	537872	62.5**	74.3	347.0	600.0	574.9

No.	Deposit Area	Borehole Number	Completion Date	Collar Coordinates UTM Zone 15, NAD83 Datum					Length Drilled (m)	Maximum Vertical Thermistor Depth Below Ground Surface (m)
				Northing (m)	Easting (m)	EL. (m)	INCL. (deg)	AZ. (deg)		
30	Tiriganiaq	GT11-01	5-Sep-11	6990207	537031	63.0	90.0	N/A	25.0	19.2
31	Tiriganiaq	GT11-02	4-Sep-11	6990558	537737	73.6	90.0	N/A	25.0	20.0
32	Tiriganiaq	GT11-05	30-Aug-11	6990003	539243	69.3	90.0	N/A	24.7	24.6
33	Tiriganiaq	GT11-07	28-Aug-11	6988978	539106	64.8	90.0	N/A	25.0	25.0
34	Tiriganiaq	GT11-08	8-Sep-11	6989155	538223	70.6	90.0	N/A	25.5	20.0
35	Tiriganiaq	GT11-12	12-Sep-11	6989258	537152	63.5	90.0	N/A	21.6	20.0
36	Pump	GT11-14	14-Sep-11	6987633	537984	56.7	90.0	N/A	20.6	19.6
37	Pump	GT11-17	18-Sep-11	6986035	540134	59.4	90.0	N/A	26.3	25.0

Notes: *refer to ice surface elevation
** estimated from topography

The physical characteristics of each thermistor site are described in the following table.

Table 18: Summary of Thermistor Site Descriptions

No.	Borehole Number	Ground Slope	Aspect	Offset from Nearest Water Body (m)	Nearest Water Body	Drilling Direction (with respect to shoreline of nearest water body)	Comments
1	M98-195	~3%	SW	71	A12	Parallel	Northeast of Tiriganiaq Pit
2	GT07-06	~4%	NE	29	A57	Vertical	Northeast of Tiriganiaq Pit
3	GT07-07	~2%	S	60	A14	Vertical	North of Tiriganiaq Pit
4	GT07-09	~1%	SW	40	B7	Vertical	Flat area between Lakes B7 and B6
5	GT07-10	~5%	SW	156	B7	Vertical	Northwest of Tiriganiaq Pit
6	GT07-11	<1%	S	42	H15B	Vertical	About 445 m northeast of Lake B7
7	GT09-01	~3%	SE	31	A6	Vertical	North shore of Lake A6
8	GT09-02	N/A	N/A	0	A6	Vertical	At northeast narrows of Lake A6
9	GT09-04	~2%	N	2	A5	Vertical	Southeast shore of Lake A5
10	GT09-07	~2%	S	32	A6	Towards	F Zone pit, northeast of Lake A6
11	GT09-08	~7%	NE	119	A6	Towards	Near crest of F Zone pit, northeast of Lake A6
12	GT09-10	~4%	S	28	A52	Vertical	Near crest F Zone pit, north of Lake A52
13	GT09-12	~6%	SW	89	A20	Vertical	Between Lakes A19 and A20
14	GT09-13	~4%	SW	26	B33	Vertical	South of Lake B7 (SE end); west of Tiriganiaq Pit
15	GT09-14	~4%	S	105	B29	Vertical	South crest of Tiriganiaq Pit
16	GT09-16	~3%	SE	120	H15L	Vertical	About 340 m northeast of Lake B7
17	GT09-17	~2%	SW	18	B26	Vertical	About 305 m north of Lake B7 (north end)
18	GT09-18	~1%	SE	57	B7	Vertical	Flat area between Lakes B7 and B6
19	GT09-19	<1%	E	32	B7	Towards	South shore of Lake B7, towards deepest area
20	GT09-20	<1%	NE	198	A58	Vertical	West toe area of proposed Ore Stockpile, north of Tiriganiaq Pit
21	GT09-21	<1%	SE	5	A55	Vertical	North shore of Lake A54, north of Tiriganiaq Pit
22	GT09-22	~2%	NE	144	H6	Vertical	Ore Stockpile area, 500 m east of Plant site
23	GT09-25	<1%	SE	120	A58	Vertical	Ore Stockpile area, 500 m north of Tiriganiaq Pit
24	DS09GT-03	~1%	S	355	DI1	Towards	Discovery Pit

No.	Borehole Number	Ground Slope	Aspect	Offset from Nearest Water Body (m)	Nearest Water Body	Drilling Direction (with respect to shoreline of nearest water body)	Comments
25	DS09GT-04	~1%	S	350	DI1	Parallel	Discovery Pit
26	DS09GT-09	~2%	SW	586	DI1	Vertical	Discovery Pit, southwest toe area of proposed stockpile
27	DS09GT-10	~7%	SW	465	DI1	Vertical	Discovery Pit, southeast slope of proposed stockpile
28	M11-1159	~5%	S	45	B5	Towards	North shore of Lake B5
29	M11-1162	<1%	E	53	B7	Towards	South shore of Lake B7, towards deepest area
30	GT11-01	<1%	SE	39	B7	Vertical	Near northwest end of Lake B7
31	GT11-02	~2%	SW	260	H15L	Vertical	About 530 m north of Lake B7
32	GT11-05	~1.3%	SW	48	H14A	Vertical	About 830 m north of proposed ore stockpiles near Plant site
33	GT11-07	~4.5%	E	47	B8	Vertical	Near southeast end of Lake B7
34	GT11-08	~8%	NE	73	B7	Vertical	Southwest shoreline of Lake B7
35	GT11-12	~4%	SE	189	B5	Vertical	Near northwest end of Lake B5
36	GT11-14	<1%	SE	80	B4	Vertical	Near northwest end of Lake B4
37	GT11-17	~1.8%	SW	36	B49	Vertical	Between Lakes B49 and B46

Manufacturing details for the thermistors at the Meliadine Gold Project site are presented in the following table.

Table 19: Summary of Thermistor Manufacturing Details

No.	Borehole Number	Thermistor Serial No.	Nodes	Type	Manufacturer / Supplier	Calibrated	Notes
1	M98-195	EBA #1146	16	N/A	EBA	N/A	Not Operational
2	GT07-06	EBA #1993	8	N/A	EBA	Yes	Not Operational
3	GT07-07	EBA #1991	8	N/A	EBA	Yes	Not Operational
4	GT07-09	EBA #1992	8	N/A	EBA	Yes	Operational
5	GT07-10	EBA #1995	12	N/A	EBA	Yes	Not Operational
6	GT07-11	EBA #1994	12	N/A	EBA	Yes	Operational
7	GT09-01	21.5-02	10	YSI 44034	M^2 Instruments	Yes	Not Operational
8	GT09-02	12101017	10	N/A	N/A	Yes	Current Condition Unknown; Latest Reading in May 2010
9	GT09-04	21.5-01	10	YSI 44034	M^2 Instruments	Yes	Current Condition Unknown; Latest Reading in May 2010
10	GT09-07	TW09-16	10	YSI 44007/34	M^2 Instruments	Yes	Operational
11	GT09-08	TW09-15	10	YSI 44007/34	M^2 Instruments	Yes	Operational
12	GT09-10	TW09-01	10	YSI 44007/34	M^2 Instruments	Yes	Operational
13	GT09-12	TW09-02	10	YSI 44007/34	M^2 Instruments	Yes	Operational
14	GT09-13	TW09-03	10	YSI 44007/34	M^2 Instruments	Yes	Operational
15	GT09-14	TW09-05	10	YSI 44007/34	M^2 Instruments	Yes	Operational
16	GT09-16	TW09-08	10	YSI 44007/34	M^2 Instruments	Yes	Partially Operational*
17	GT09-17	TW09-07	10	YSI 44007/34	M^2 Instruments	Yes	Operational
18	GT09-18	TW09-04	10	YSI 44007/34	M^2 Instruments	Yes	Partially Operational*
19	GT09-19	200-1	12	YSI 44007/34	M^2 Instruments	Yes	Operational
20	GT09-20	TW09-12	10	YSI 44007/34	M^2 Instruments	Yes	Partially Operational*
21	GT09-21	TW09-14	10	YSI 44007/34	M^2 Instruments	Yes	Operational
22	GT09-22	TW09-10	10	YSI 44007/34	M^2 Instruments	Yes	Operational
23	GT09-25	TW09-09	10	YSI 44007/34	M^2 Instruments	Yes	Operational

No.	Borehole Number	Thermistor Serial No.	Nodes	Type	Manufacturer / Supplier	Calibrated	Notes
24	DS09GT-03	TE09-01	10	YSI 44007/34	M^2 Instruments	Yes	Operational
25	DS09GT-04	TE09-02 (Datalogger)	10	YSI 44007/34	M^2 Instruments	Yes	Operational
26	DS09GT-09	TE09-03	10	YSI 44007/34	M^2 Instruments	Yes	Operational
27	DS09GT-10	TE09-04	10	YSI 44007/34	M^2 Instruments	Yes	Operational
28	M11-1159	GT11-A (Datalogger)	13	YSI 44007	M^2 Instruments	Yes	Operational
29	M11-1162	GT11-B (Datalogger)	13	YSI 44007	M^2 Instruments	Yes	Operational
30	GT11-01	26-5	10	YSI 44007/34	M^2 Instruments	Yes	Operational
31	GT11-02	26-2	10	YSI 44007/34	M^2 Instruments	Yes	Operational
32	GT11-05	26-3	10	YSI 44007/34	M^2 Instruments	Yes	Operational
33	GT11-07	26-1	10	YSI 44007/34	M^2 Instruments	Yes	Operational
34	GT11-08	26-4	10	YSI 44007/34	M^2 Instruments	Yes	Operational
35	GT11-12	TW09-13	10	YSI 44007/34	M^2 Instruments	Yes	Partially Operational*
36	GT11-14	TE09-11	10	YSI 44007/34	M^2 Instruments	Yes	Operational
37	GT11-17	TW09-6	10	YSI 44007/34	M^2 Instruments	Yes	Operational

Notes: N/A= information not available; *a portion of thermistor nodes are operational.

At the time of reporting, 5 of the 37 thermistors are not operational; 30 of the thermistors are operational or partially operational due to failure of one or more of the thermistor nodes; and the conditions of 2 of the thermistors are unknown. The conditions of the 2 thermistors are unknown because they can only be accessed during the winter due to their locations in lakes and readings have not been obtained recently.

4.0 SITE PERMAFROST CONDITIONS

The following sections present general permafrost terminology, thermistor data collection and a summary of specific site permafrost conditions in the Meliadine Gold Project site area.

4.1 Permafrost Terminology

Permafrost refers to subsurface soil or rock where temperatures remain at or below 0ºC for at least two consecutive years. This is synonymous with perennially cryotic ground, which may be frozen, partially frozen, or non-frozen depending on the ice/water content of the ground, and the salinity of the included water. For descriptive purposes, a typical ground temperature profile in permafrost terrain is shown on Figure 5. Permafrost is typically described by the following terminology which relates to the ground temperature profile:

- Active Layer: The active layer is the layer of ground subject to annual freezing and thawing in areas underlain by permafrost. The depth of the active layer can vary based on material type and water content, presence or absence of vegetation, proximity to water, and general topographic aspect (the direction the slope faces, either north, south, east, or west).
- Permafrost Table: The permafrost table is the upper boundary of permafrost, at the base of the active layer. The ground temperature above the permafrost table is above 0 ºC for at least a portion of each year and below the permafrost table is less than 0 ºC year round. The ground temperature varies with depth.
- Permafrost Base: The permafrost base is the lower boundary of permafrost, and is an undulating and uneven surface. The ground temperature above the permafrost base is less than 0 ºC and below the permafrost base is above 0 ºC. The depth of the permafrost base varies with latitude, elevation, and with proximity to large bodies of water. The depth of the permafrost base also depends on the thermal history of an area.
- Depth of Zero Annual Amplitude: The depth of zero annual amplitude is the depth below ground surface at which there is practically no variability in ground temperature due to the influence of surface air temperature. It is the depth at which the minimum monthly mean temperature and maximum monthly mean temperatures are equivalent.
- Zero Annual Amplitude Temperature: The temperature at the depth of zero annual amplitude, where the minimum monthly temperature and the maximum monthly temperatures are equivalent.
- Geothermal Gradient: The geothermal gradient is the increase in ground temperature with depth, below the depth of zero annual amplitude. This is typically a linear relationship. The permafrost base can be estimated if the geothermal gradient is known at a given temperature by projecting the linear relationship down until it crosses from negative ground temperature to positive ground temperature.
- Mean Annual Temperature: The mean annual temperature is the temperature at the ground surface based on a projection upward of the geothermal gradient to intersect the ground surface.
- Sub-permafrost Aquifer: The sub-permafrost aquifer is the deep-permafrost groundwater flow regime near or below the base of permafrost. The top of the sub-permafrost aquifer may or may not coincide with the base of permafrost; if the sub-permafrost aquifer is saline, it is possible that groundwater occurs as a fluid within the permafrost due to freezing point depression.
- Basal Cryopeg: The layer of perennially cryotic (T<0 °C) but unfrozen ground that forms the base of permafrost. The thickness of this layer is related to the salinity of the groundwater regime which can result in depression of the freezing point several degrees below zero.
- A Talik is defined as a layer or body of unfrozen ground in a permafrost area and includes several types based on the relationship to the permafrost and the mechanism related to the unfrozen conditions (Harris et al., 1988). Definitions for the three most common types of talik are presented here and are shown schematically in Figure 5:

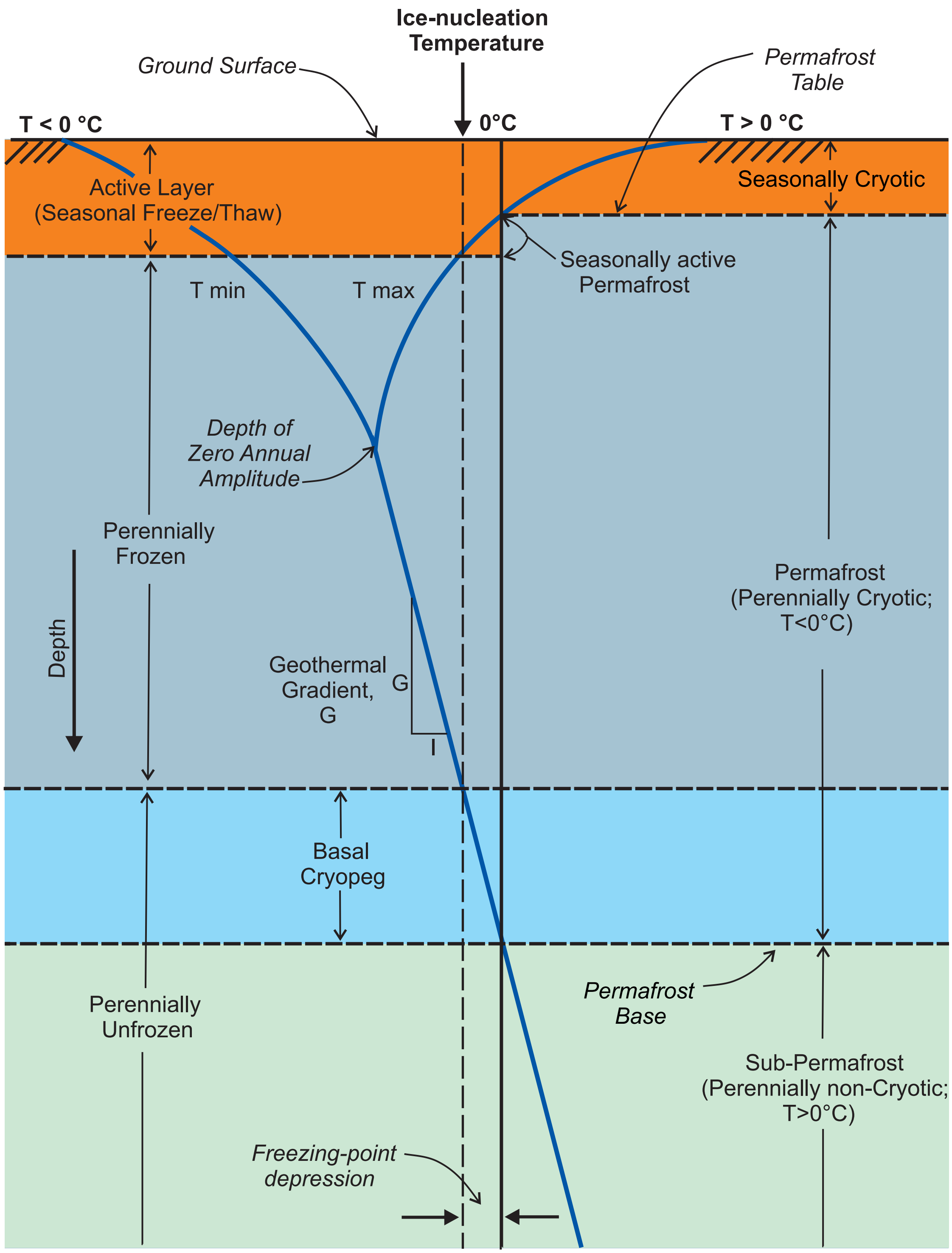
- Closed talik: a talik occupying a depression in the permafrost table below a lake or river (also called "lake talik" and "river talik"); its temperature remains above 0ºC because of the heat storage effect of the surface water.
- Open talik: a talik that penetrates the permafrost completely, connecting a water body above permafrost to the sub-permafrost aquifer (*e.g.,* below large rivers and lakes).
- Isolated talik: a talik entirely surrounded by perennially frozen ground.

4.2 Thermistor Data Collection

The thermistors at the project site are referenced as follows:

- Tiriganiaq Thermistors refer to thermistors installed around the Tiriganiaq Deposit area including the proposed open pit, Lake B7 (proposed TSF area) and footprint areas of potential waste rock and ore stockpiles.
- F Zone Thermistors refer to thermistors installed around the F Zone Deposit including the proposed open pit, proposed dewatering dyke, and footprint areas of potential waste rock piles.
- Pump Thermistors refer to thermistors installed in the Pump Deposit area, or in areas within the proposed footprint of waste rock piles.
- Discovery Thermistors refer to thermistors installed around the Discovery Deposit including the open pit and potential waste rock piles.

In addition, the thermistor M98-195 installed in 1998 was used as a background thermistor to provide an overall understanding of site permafrost conditions with little to no disturbances from adjacent water bodies.



REFERENCE:

French, H.M. The Periglacial Environment. Third Edition. England: John Wiley and Sons, Ltd; 2007

DRAWING DATE: 30-Aug-11 COREL FILE: N:\Bur-Graphics\Projects\2010\1373\10-1373-0076\Drafting\3000\1013730076-3000-02.cdr

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

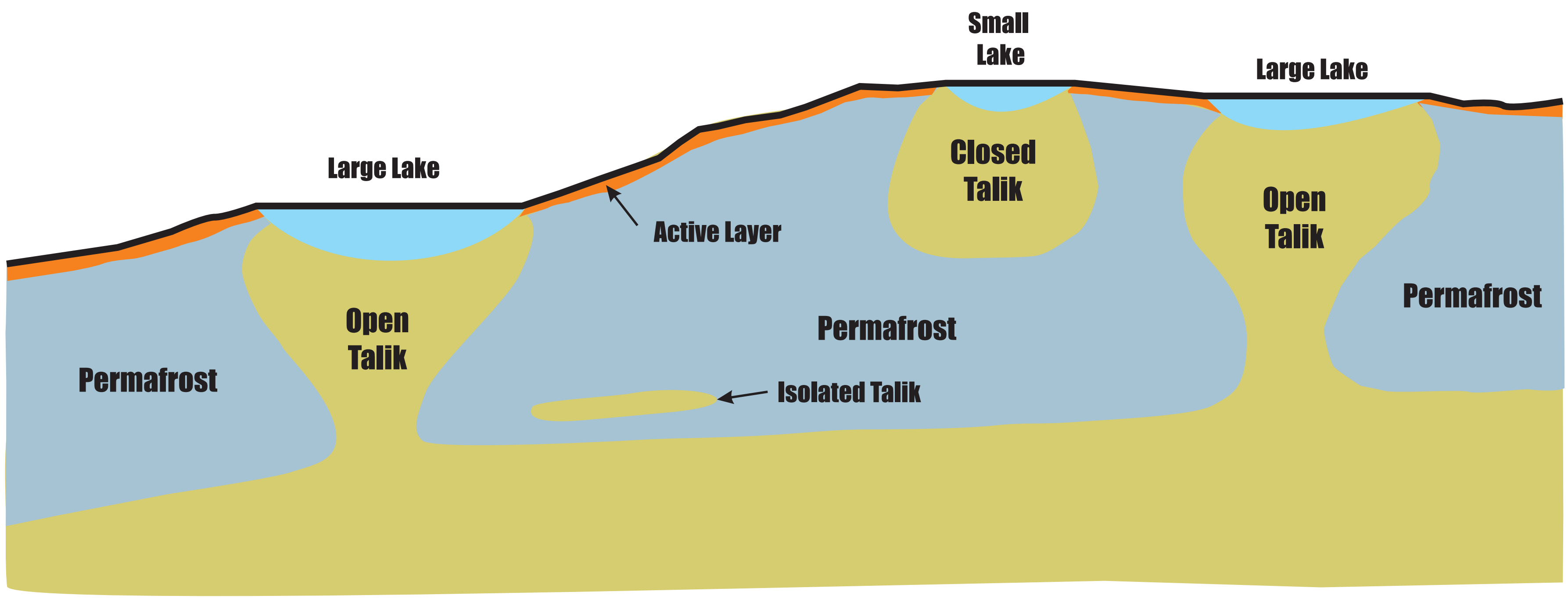
TITLE

TYPICAL GROUND THERMAL PROFILE IN PERMAFROST

Golder Associates

PROJECT No.	10-1373-0076		PHASE No. 3000	
DESIGN	CJC	31AUG11	SCALE NTS	REV.
CADD	GG	31AUG11	**FIGURE 4**	
CHECK	JG	20SEP11		
REVIEW	GRA	20SEP11		

DRAWING DATE: 14-Jul-11 COREL FILE: N:\Bur-Graphics\Projects\2010\1373\10-1373-0076\Drafting\3000\1013730076-3000-01.cdr



PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
SCHEMATIC
PERMAFROST THERMAL REGIME

Golder Associates

PROJECT No.	10-1373-0076		PHASE No. 3000/2200	
DESIGN	JC	14JUL11	SCALE NTS	REV.
CADD	GG	14JUL11	FIGURE 5	
CHECK	DW	14JAN13		
REVIEW	DW	14JAN13		

The tables presented in the following sections summarize estimates of geothermal properties based on data collected from the thermistors installed at the various locations in the project area. The vertical depth of permafrost is estimated using the geothermal gradient from the thermistor plots. Where thermistor installations have been drilled from land and terminated beneath water, certain properties may not be comparable to others that were not below water. In some cases insufficient data have been collected to estimate certain properties.

Figure 6 presents the thermistor locations relative to terrain descriptions and soil drainage conditions. Figure 7 presents the thermistor locations relative to plant community classification. Figure 8 presents the thermistor locations and summaries of important geothermal characteristics for each thermistor. Figure 9 summarizes the thermistor locations and summaries of the National Research Council of Canada (1979) permafrost soil classification and excess water or ice content for selected boreholes where this information was logged.

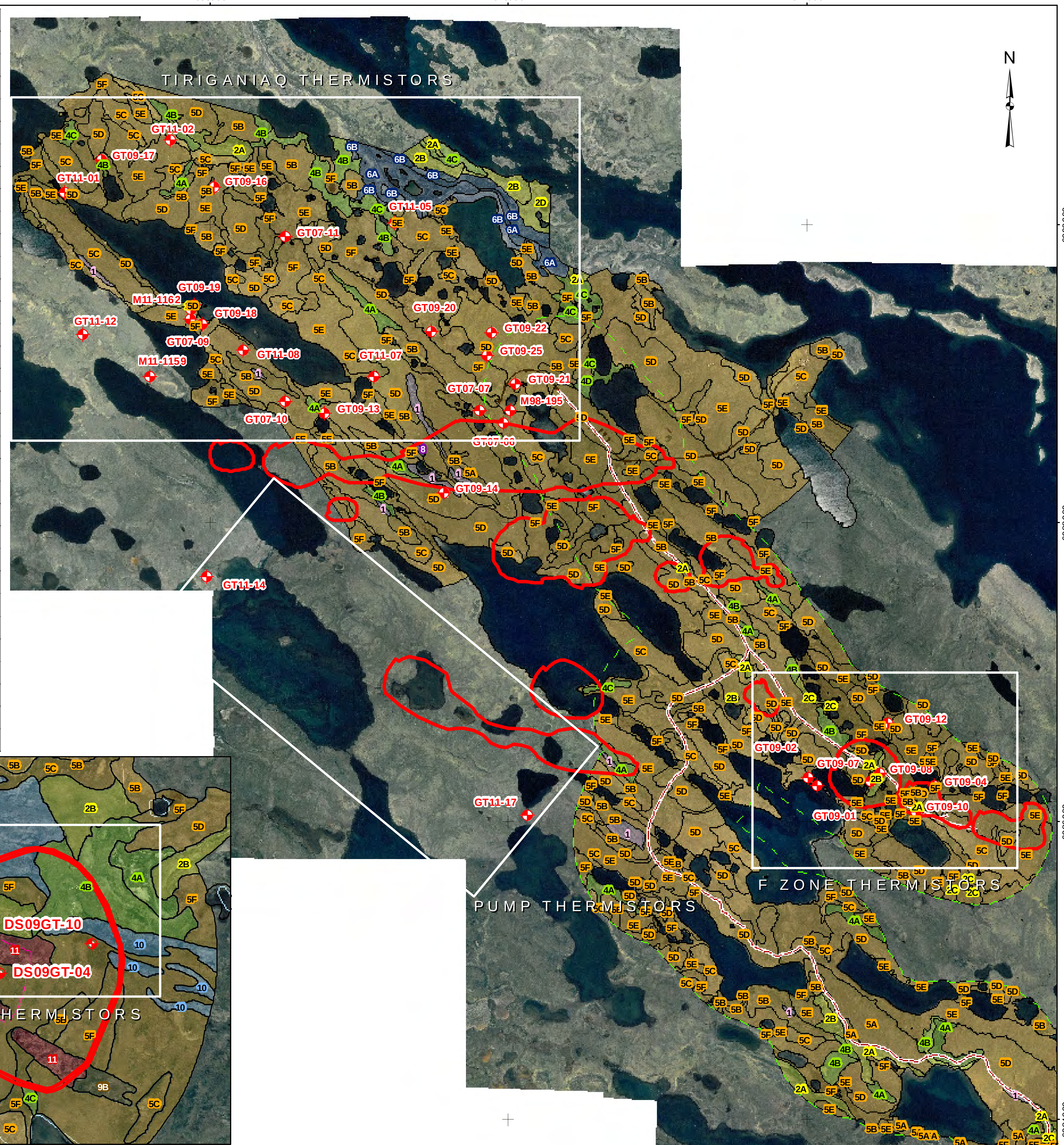
Temperature readings for each thermistor cable have been plotted against vertical depth. These plots are contained within Appendices A to E, along with relevant calibration sheets.

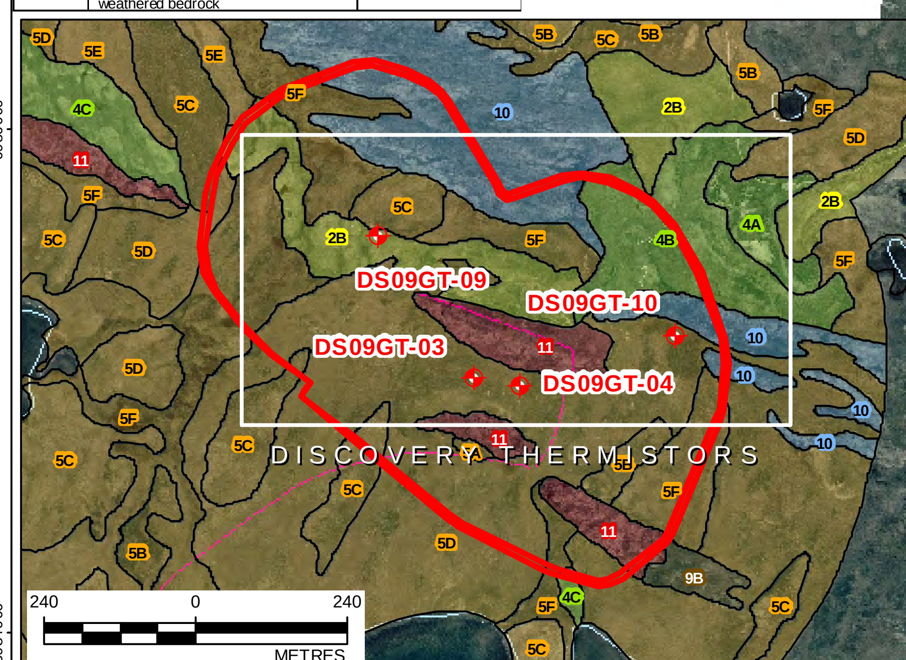
4.2.1 Tiriganiaq Thermistors

The Tiriganiaq thermistors are clustered around the main Tiriganiaq Deposit area, as well as around the perimeter of Lake B7 and Lake B5, and between Lake B7 and Lakes G2 and H17. The purpose of installing the thermistors in the Tiriganiaq area is to characterize the near surface and deep permafrost conditions in the main deposit area.

The following table summarizes the geothermal properties estimated from the thermistor data obtained from the Tiriganiaq Deposit area.

Terrain Code	Simplified Terrain Description	Soil Drainage
1	Beach ridges	Well
2A	Beach deposits	Well to moderately well
2B	Beach deposits	Moderately well to imperfectly
2C	Beach deposits	Imperfectly to poorly
2D	Beach deposits	Poorly to imperfectly
2E	Beach deposits	Poorly to very poorly
3A	Deltaic terraces and/or ridges	Well
3B	Deltaic levels and/or plains	Well to moderately well-
3C	Deltaic levels and/or plains	Imperfectly to poorly
3D	Deltaic levels and/or plains	Poorly drained
4A	Marine sediments and washed till	Well to moderately well
4B	Marine sediments and washed till	Moderately well to imperfectly
4C	Marine sediments and washed till	Imperfectly to poorly
4D	Marine sediments and washed till	Poorly to very poorly
5A	Blankets and veneers of washed till	Well to moderately well
5B	Blankets and veneers of washed till	Moderately well to imperfectly
5C	Blankets and veneers of washed till	Imperfectly to poorly
5D	Blankets and veneers of washed till	Poorly to imperfectly
5E	Blankets and veneers of washed till	Poorly
5F	Blankets and veneers of washed till, minor organic veneers	Poorly to very poorly
6A	Glaciofluvial ridges	Well
6B	Glaciofluvial slopes	Well to moderately well
7A	Fluvial levels and or terraces	Well to moderately well
7B	Fluvial levels and or terraces	Imperfectly to poorly
8	Weathered bedrock	Well drained
9A	Weathered bedrock and washed till or marine sediments, lesser bedrock	Well to moderately well
9B	Weathered bedrock and washed till or marine sediments, lesser bedrock	Moderately well to imperfectly to poorly
10	Weathered bedrock, washed till or marine sediments, minor bedrock	Well to moderately well
11	Bedrock and weathered bedrock.	Rapidly to well
12A	Washed till and/or marine sediments, weathered bedrock	Well to moderately well
12B	Washed till and/or marine sediments, weathered bedrock	Moderately well to imperfectly
12C	Washed till and/or marine sediments, weathered bedrock	Imperfectly to poorly





LEGEND

- BOREHOLE WITH THERMISTOR
- DEPOSIT OUTLINE
- PROPOSED SERVICE ROAD
- AS BUILT ROAD (APRIL 2007)
- 500m STUDY BUFFER

TERRAIN CODE *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
PROJECTION: UTM ZONE 15 DATUM: NAD 83

600 0 600
METRES

PROJECT

AGNICO EAGLE

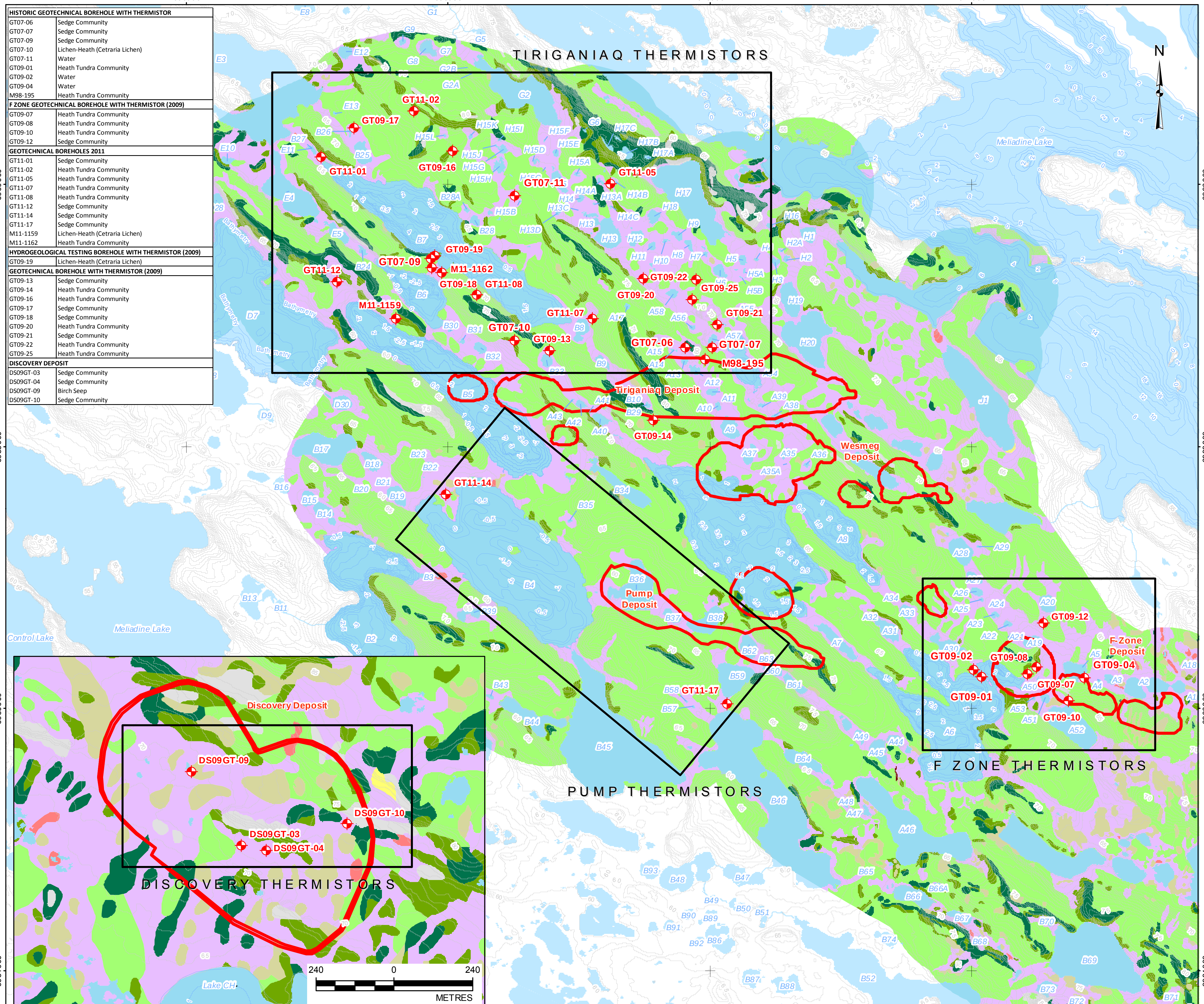
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

THERMISTOR BOREHOLES AND TERRAIN CLASSIFICATION

Golder Associates

PROJECT NO. 13-1428-0007			PHASE No. 7000/7300	
DESIGN	CC	28 Jun. 2013	SCALE AS SHOWN	REV. 1
GIS	MM	03 Jul. 2013		
CHECK	CC	03 Jul. 2013	FIGURE 6	
REVIEW	DRW	03 Jul. 2013		



HISTORIC GEOTECHNICAL BOREHOLE WITH THERMISTOR	
GT07-06	Sedge Community
GT07-07	Sedge Community
GT07-09	Sedge Community
GT07-10	Lichen-Heath (Cetraria Lichen)
GT07-11	Water
GT09-01	Heath Tundra Community
GT09-02	Water
GT09-04	Water
M98-195	Heath Tundra Community
F ZONE GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)	
GT09-07	Heath Tundra Community
GT09-08	Heath Tundra Community
GT09-10	Heath Tundra Community
GT09-12	Sedge Community
GEOTECHNICAL BOREHOLES 2011	
GT11-01	Sedge Community
GT11-02	Heath Tundra Community
GT11-05	Heath Tundra Community
GT11-07	Heath Tundra Community
GT11-08	Heath Tundra Community
GT11-12	Sedge Community
GT11-14	Sedge Community
GT11-17	Sedge Community
M11-1159	Lichen-Heath (Cetraria Lichen)
M11-1162	Heath Tundra Community
HYDROGEOLOGICAL TESTING BOREHOLE WITH THERMISTOR (2009)	
GT09-19	Lichen-Heath (Cetraria Lichen)
GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)	
GT09-13	Sedge Community
GT09-14	Heath Tundra Community
GT09-16	Heath Tundra Community
GT09-17	Sedge Community
GT09-18	Sedge Community
GT09-20	Heath Tundra Community
GT09-21	Sedge Community
GT09-22	Heath Tundra Community
GT09-25	Heath Tundra Community
DISCOVERY DEPOSIT	
DS09GT-03	Sedge Community
DS09GT-04	Sedge Community
DS09GT-09	Birch Seep
DS09GT-10	Sedge Community

LEGEND

- BOREHOLE WITH THERMISTOR
- DEPOSIT OUTLINE
- TOPOGRAPHIC CONTOUR (1.0 m INTERVAL ABOVE SEA LEVEL)
- BATHYMETRIC CONTOUR (0.5 m INTERVAL AS DEPTH)
- WATERCOURSE
- WATERBODY

PLANT COMMUNITY CLASSIFICATION

- BIRCH SEEP
- DISTURBED
- HEATH TUNDRA COMMUNITY
- LICHEN-HEATH (CETRARIA LICHEN)
- LICHEN-HEATH (HAIR LICHEN)
- LICHEN-ROCK COMMUNITY
- RIPARIAN WILLOW OR BIRCH
- SEDGE COMMUNITY
- UNVEGETATED (SAND)
- WATER

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED (AEM).
DATUM: NAD 83 PROJECTION: UTM ZONE 15
VOLUME 6.0 TERRESTRIAL ENVIRONMENT AND IMPACT ASSESSMENT – DRAFT ENVIRONMENTAL IMPACT STATEMENT – MELIADINE GOLD PROJECT, NUNAVUT FIGURES 6.5-3A AND 6.5-3B, MARCH 2013

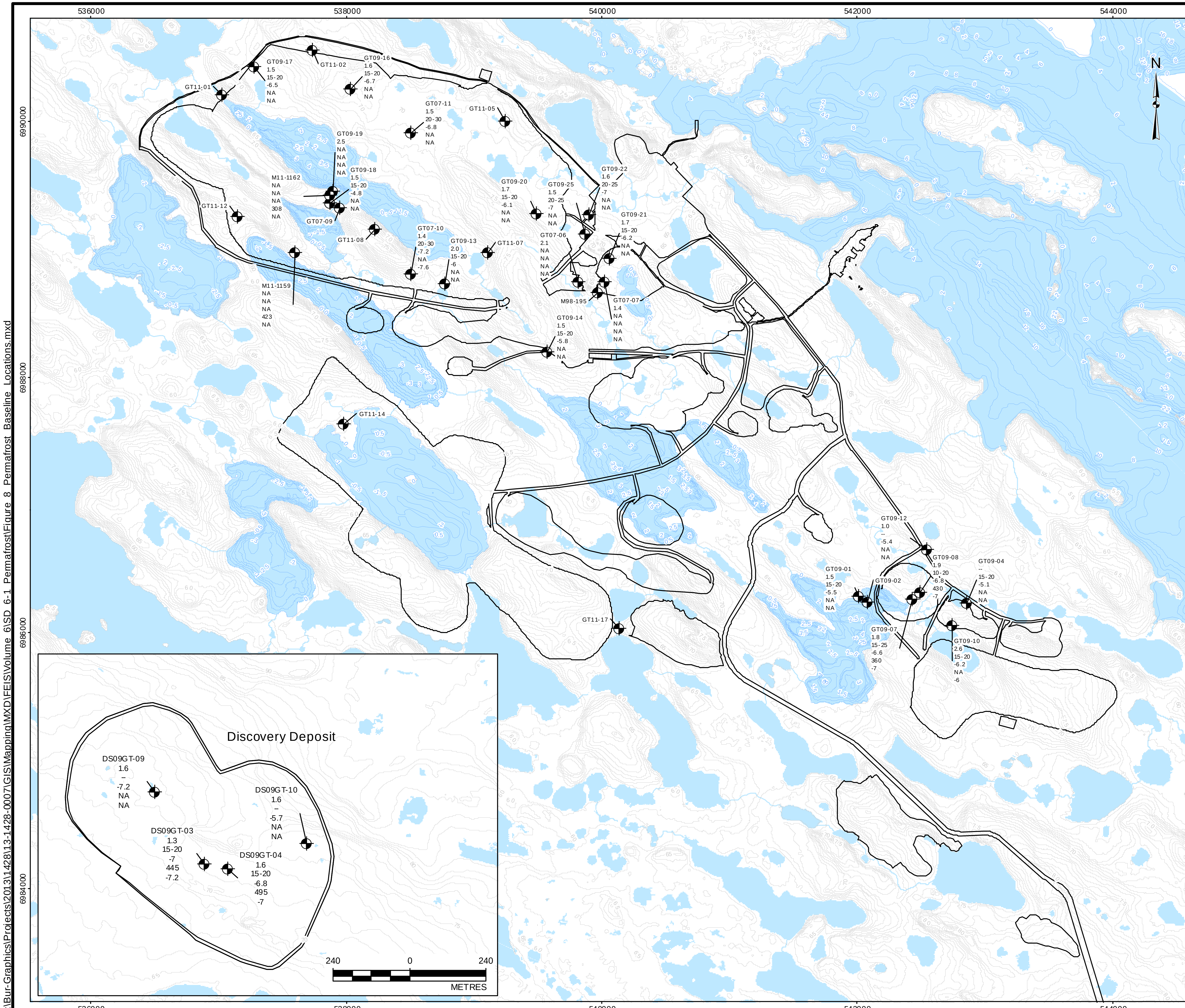
600 0 600
METRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
THERMISTOR BOREHOLE LOCATIONS AND PLANT COMMUNITY CLASSIFICATION

		PROJECT NO. 13-1428-0007	PHASE No. 7000/7300	
DESIGN	CC	28 Jun. 2013	SCALE AS SHOWN	REV. 1
GIS	MM	03 Jul. 2013		
CHECK	CC	03 Jul. 2013	FIGURE 7	
REVIEW	DRW	03 Jul. 2013		

Golder Associates



N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume 6\SD 6-1 Permafrost\Figure 8 Permafrost Baseline Locations.mxd

LEGEND

- BOREHOLE WITH THERMISTOR
- PROPOSED PROJECT INFRASTRUCTURE
- TOPOGRAPHIC CONTOUR (1.0 m INTERVAL ABOVE SEA LEVEL)
- BATHYMETRIC CONTOUR (0.5 m INTERVAL AS DEPTH)
- WATERCOURSE
- WATERBODY

LABELS

GT11-01	BOREHOLE ID WITH THERMISTOR
1.6	ACTIVE LAYER VERTICAL DEPTH (m)
20-25	ZERO ANNUAL AMPLITUDE DEPTH (m)
-7	ZERO ANNUAL AMPLITUDE TEMPERATURE (°C)
423	ESTIMATED VERTICAL DEPTH OF PERMAFROST (m)
-7.6	ESTIMATED MEAN ANNUAL SURFACE TEMPERATURE (°C)

NOTES

1. PERMAFROST BASELINE CONDITIONS SUMMARIZED FROM SUPPORTING DOCUMENT SD 6-1 DOC 225, PERMAFROST THERMAL REGIME BASELINE STUDIES, MELIADINE GOLD PROJECT, 25 SEPTEMBER 2012, SECTION 4.2, TABLES 18, 19, AND 20.
2. A DASH IN A FIELD INDICATES NO AVAILABLE DATA.

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED (AEM).
DATUM: NAD 83 PROJECTION: UTM ZONE 15

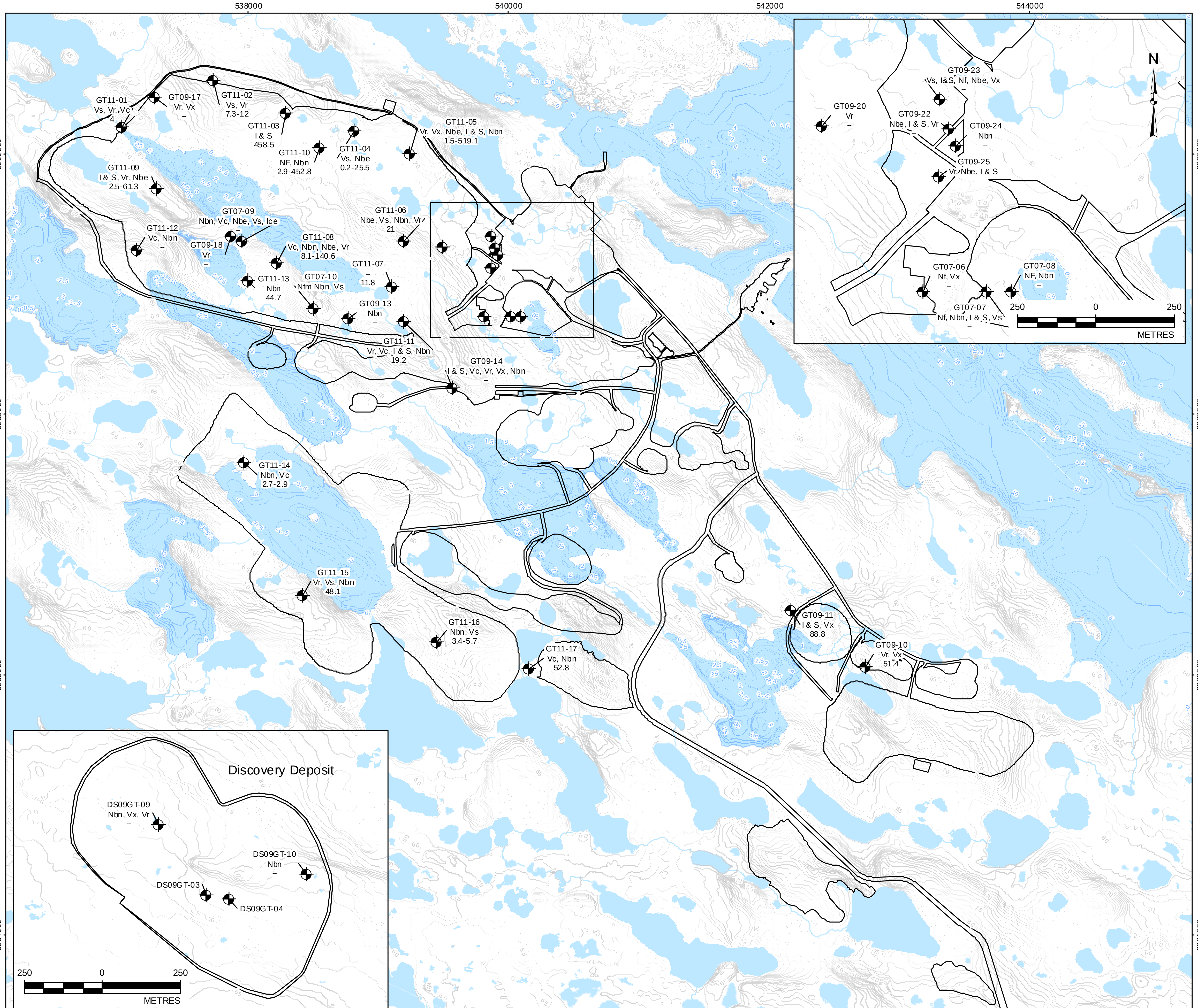
600 0 600
METRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
SUMMARY OF PERMAFROST BASELINE CONDITIONS

Golder Associates

PROJECT NO. 13-1428-0007			PHASE No. 7000/7300	
DESIGN	FA	21 Jun. 2013	SCALE AS SHOWN	REV.
GIS	KI	21 Jun. 2013		
CHECK	LY	21 Jun. 2013	FIGURE 8	
REVIEW	DRW	21 Jun. 2013		



LEGEND

- BOREHOLE WITH THERMISTOR
- PROPOSED PROJECT INFRASTRUCTURE
- TOPOGRAPHIC CONTOUR (1.0 m INTERVAL ABOVE SEA LEVEL)
- BATHYMETRIC CONTOUR (0.5 M INTERVAL AS DEPTH)
- WATERCOURSE
- WATERBODY

LABELS

GT11-01	BOREHOLE ID
Vs, Vr	NATIONAL RESEARCH COUNCIL FIELD DESCRIPTION OF PERMAFROST
7.3-12	RANGE IN EXCESS WATER CONTENT (ICE CONTENT, %)

NOTES

1. REFERENCE: NATIONAL RESEARCH COUNCIL OF CANADA, 1979. GUIDE TO A FIELD DESCRIPTION OF PERMAFROST FOR ENGINEERING PURPOSES.
2. A DASH IN A FIELD INDICATES NO AVAILABLE DATA.
3. PERMAFROST SOIL DESCRIPTIONS SUMMARIZED FROM SUPPORTING DOCUMENT SD 6-1 DOC 225, PERMAFROST THERMAL REGIME BASELINE STUDIES, MELIADINE GOLD PROJECT, 25 SEPTEMBER 2012, SECTION 4.3, TABLES 24, 25, AND 26.
4. EXCESS WATER (ICE) CONTENT SUMMARIZED FROM SUPPORTING DOCUMENT 2-4A DOC 273, FACTUAL REPORT ON 2011 GEOTECHNICAL DRILLING PROGRAM, VERSION 0, 07 JUNE 2012.

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED (AEM).
DATUM: NAD 83 PROJECTION: UTM ZONE 15

600 0 600
METRES

PROJECT

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

AGNICO EAGLE

TITLE

SUMMARY OF NRC (1979) PERMAFROST SOIL CLASSIFICATION AND EXCESS WATER (ICE) CONTENT FROM SELECTED BOREHOLES

Golder Associates

		PROJECT NO. 13-1428-0007	PHASE No. 7000/7300
DESIGN	FA	21 Jun. 2013	SCALE AS SHOWN
GIS	KI	21 Jun. 2013	REV.
CHECK	LY	21 Jun. 2013	
REVIEW	DRW	21 Jun. 2013	

FIGURE 9

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_6\SD_6-1_Permafrost\Figure_9_Soil_Classification_Excess_Water_Content.mxd

Table 20: Summary of Geothermal Properties and Terrain Types for Tiriganiaq Thermistors

Borehole Number	Maximum Vertical Thermistor Depth Below Ground Surface (m)	Estimated Depth of Zero Annual Amplitude (m)	Zero Amplitude Temperature (ºC)	Geothermal Gradient (ºC/m)	Estimated Mean Annual Surface Temperature (ºC)	Estimated Vertical Depth of Active Layer (m)	Estimated Vertical Depth of Permafrost (m)	Terrain Type (Ref. Volume 6 FEIS, Appendix 6.3)	Vegetation (Ref. Volume 6 FEIS Figures 6.5-3a, 6.5-3b)	Comments
GT07-06	8.5	N/A	N/A	N/A	N/A	2.1	N/A	Mbv-W and/or Mb-W	Sedge	See Note 2a
GT07-07	8.5	N/A	N/A	N/A	N/A	1.4	N/A	Mbv-W and/or MbW	Sedge	See Note 2a
GT07-09	8.5	N/A	N/A	N/A	N/A	N/A	N/A	Mbv-W and/or Mb-W	Sedge	See Note 2a
GT07-10	44.0	20-30	-7.2	N/A	-7.6	1.4	N/A	Mbv-W and/or Mb-W	Licehn-Heath (Cetraria Lichen)	Geothermal gradient not clear, and may vary in deeper ground; See Note 2
GT07-11	44.0	20-30	-6.8	N/A	-7.0	1.5	N/A	Mbv-W and/or Mb-W	Water	Geothermal gradient not clear, and may vary in deeper ground; See Note 2a
GT09-13	20.0	15-20	-6.0	N/A	N/A	2.0	N/A	Mbv-W and/or Mb-W	Sedge	See Note 2a
GT09-14	25.5	15-20	-5.8	N/A	N/A	1.5	N/A	Mbv-W and/or Mb-W	Heath Tundra	See Note 2a
GT09-16	20.6	15-20	-6.7	N/A	N/A	1.6	N/A	Mbv-W and/or Mb-W	Heath Tundra	See Note 2a
GT09-17	20.5	15-20	-6.5	N/A	N/A	1.5	N/A	Wbv/Mbv-W to Mbv/Wbv-W	Sedge	See Note 2a
GT09-18	20.0	15-20	-4.8	N/A	N/A	1.5	N/A	Mbv-W and/or Mb-W	Sedge	See Note 2a
GT09-19	151.8	N/A	N/A	N/A	N/A	2.5	N/A	Mbv-W and/or Mb-W	Licehn-Heath (Cetraria Lichen)	Below Lake B7, See Note 2b
GT09-20	20.0	15-20	-6.1	N/A	N/A	1.7	N/A	Mbv-W and/or Mb-W	Heath Tundra	See Note 2a
GT09-21	20.0	15-20	-6.2	N/A	N/A	1.7	N/A	Mbv-W and/or Mb-W	Sedge	See Note 2a
GT09-22	25.0	20-25	-7.0	N/A	N/A	1.6	N/A	Mbv-W and/or Mb-W	Heath Tundra	See Note 2a
GT09-25	25.0	20-25	-7.0	N/A	N/A	1.5	N/A	Mbv-W and/or Mb-W	Heath Tundra	See Note 2a
M11-1159	521.7	N/A	N/A	0.012	N/A	N/A	423	Outside of terrain mapping	Licehn-Heath (Cetraria Lichen)	Top node installed approximately 60 m depth; installed

Borehole Number	Maximum Vertical Thermistor Depth Below Ground Surface (m)	Estimated Depth of Zero Annual Amplitude (m)	Zero Amplitude Temperature (ºC)	Geothermal Gradient (ºC/m)	Estimated Mean Annual Surface Temperature (ºC)	Estimated Vertical Depth of Active Layer (m)	Estimated Vertical Depth of Permafrost (m)	Terrain Type (Ref. Volume 6 FEIS, Appendix 6.3)	Vegetation (Ref. Volume 6 FEIS Figures 6.5-3a, 6.5-3b)	Comments
								area		towards lake; see Note 2b.
M11-1162	553.5	N/A	N/A	0.013	N/A	N/A	308	Mbv-W and/or Mb-W	Heath Tundra	Top node installed approximately 15 m depth; installed towards lake; see Note 2b.
GT11-01	19.2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Mbv-W and/or Mb-W	Sedge	See Note 3.
GT11-02	20.0	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Mbv-W and/or Mb-W	Heath Tundra	See Note 3.
GT11-05	24.6	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Wbv/Mbv-W to Mbv/Wbv-W	Heath Tundra	See Note 3.
GT11-07	25.0	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Mbv-W and/or Mb-W	Heath Tundra	See Note 3.
GT11-08	20.0	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Mbv-W and/or Mb-W	Heath Tundra	See Note 3.
GT11-12	20.0	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Outside of terrain mapping area	Sedge	See Note 3.

Notes:

1. Properties obtained from thermistor plots, where shown.
2. “N/A” indicates the estimations of certain geothermal properties are not applicable due to (a) insufficient depth of the thermistor cable; (b) proximity of installation to lake body.
3. Insufficient data have been collected to estimate certain geothermal properties, and may indicate that equilibrium conditions have not been reached.
4. Permafrost depth estimated by projecting the temperatures of the lower portion of the thermistor to 0 ºC using a best fit line and the estimated geothermal gradient.
5. Mean annual surface temperature estimated by projection of geothermal gradient to ground surface.

4.2.2 F Zone Thermistors

Three of the thermistors are installed at a proposed location for a dewatering dyke (Golder, 2010d). Two thermistors are installed in the potential footprint area for the proposed open pit, and one thermistor is installed in the potential footprint area of proposed waste rock piles.

The following table summarizes the geothermal properties estimated from the thermistor data obtained from the F Zone Deposit area.

Table 21: Summary of Geothermal Properties for F Zone Thermistors

Borehole Number	Maximum Vertical Thermistor Depth Below Ground Surface (m)	Estimated Depth of Zero Annual Amplitude (m)	Zero Amplitude Temperature (ºC)	Geothermal Gradient (ºC/m)	Estimated Mean Annual Surface Temperature (ºC)	Estimated Vertical Depth of Active Layer (m)	Estimated Vertical Depth of Permafrost[4] (m)	Terrain Type	Vegetation (Ref. Volume 6 FEIS Figures 6.5-3a, 6.5-3b)	Comments
GT09-01	19.5	15-20	-5.5	N/A	N/A	1.5	N/A	Mbv-W and/or Mb-W	Heath Tundra	Near Lake A6; see Note 2b
GT09-02	8.0	N/A	N/A	N/A	N/A	Insufficient Data	N/A	Mbv-W and/or Mb-W	Water	In Lake A6 and too shallow; see Note 2a and b
GT09-04	19.5	15-20	-5.1	N/A	N/A	Insufficient Data	N/A	Mbv-W and/or Mb-W	Water	Near Lake A5; see Note 2b
GT09-07	130.0	15-25	-6.6	0.02	-7.0	1.8	360	sWrbvt to gWrbvt likely over Mb	Sedge	
GT09-08	139.0	10-20	-6.8	0.017	-7.0	1.9	430	sWrbvt to gWrbvt likely over Mb	Heath Tundra	
GT09-10	20.0	15-20	-6.2	N/A	-6.0	2.6	N/A	Mbv-W and/or Mb-W	Licehn-Heath (Cetraria Lichen)	See Note 2a
GT09-12	20.0	Insufficient Data	-5.4	N/A	N/A	1.0	N/A	Mbv-W and/or Mb-W	Sedge	See Note 2a

Notes:

1. Properties obtained from thermistor plots, where shown.
2. "N/A" indicates the estimations of certain geothermal properties are not applicable due to (a) insufficient depth of the thermistor cable; (b) proximity of installation to lake body.
3. Insufficient data have been collected to estimate certain geothermal properties, and may indicate that equilibrium conditions have not been reached.
4. Permafrost depth estimated by projecting the temperatures of the lower portion of the thermistor to 0 ºC using a best fit line and the estimated geothermal gradient.
5. Mean annual surface temperature estimated by projection of geothermal gradient to ground surface.

4.2.3 Discovery Thermistors

Two of the thermistors are installed in the potential footprint area of the proposed open pit. The other two thermistors are installed in the potential footprint area of the proposed waste rock pile.

The following table summarizes the geothermal properties estimated from the thermistor data obtained from the Discovery Deposit area.

Table 22: Summary of Geothermal Properties for Discovery Thermistors

Borehole Number	Maximum Vertical Thermistor Depth Below Ground Surface (m)	Estimated Depth of Zero Annual Amplitude (m)	Zero Amplitude Temperature (ºC)	Geothermal Gradient (ºC/m)	Estimated Mean Annual Surface Temperature (ºC)	Estimated Vertical Depth of Active Layer (m)	Estimated Vertical Depth of Permafrost [3](m)	Terrain Type	Vegetation (Ref. Volume 6 FEIS Figures 6.5-3a, 6.5-3b)	Comments
DS09GT-03	128.8	15-20	-7.0	0.017	-7.2	1.3	445	Mbv-W and/or Mb-W	Sedge	
DS09GT-04	128.0	15-20	-6.8	0.015	-7.0	1.6	495	Mbv-W and/or Mb-W	Sedge	Thermistor with datalogger
DS09GT-09	20.0	Insufficient Data	-7.2	N/A	N/A	1.6	N/A	sWbvt to gWbvt likely over Mb	Birch Seep	See Note 2a
DS09GT-10	20.0	Insufficient Data	-5.1	N/A	N/A	1.6	N/A	Mbv-W and/or Mb-W	Sedge	See Note 2a

Notes:

1. Properties obtained from thermistor plots, where shown.
2. "N/A" indicates the estimations of certain geothermal properties are not applicable due to (a) insufficient depth of the thermistor cable; (b) proximity of installation to lake body.
3. Permafrost depth estimated by projecting the temperatures of the lower portion of the thermistor to 0 ºC using a best fit line and the estimated geothermal gradient.
4. Mean annual surface temperature estimated by projection of geothermal gradient to ground surface.

The readings for the thermistor TE09-02, which is connected with a datalogger, are recorded with an interval of 12 hours. Temperature variation with time for each thermistor node is included in Appendix C. The data gap shown in the plot for this thermistor may be due to depletion of the datalogger battery. For the thermal profile plots, the data have been reduced to an interval of 10 days in general (Appendix C).

4.2.4 Pump Thermistors

Pump thermistors installed in 2011 include GT11-14 and GT11-17 as shown in Figure 2. The following table summarizes geothermal properties for the Pump thermistors based on the currently available data.

Table 23: Summary of Geothermal Properties for Pump Thermistors

Borehole Number	Maximum Vertical Thermistor Depth Below Ground Surface (m)	Estimated Depth of Zero Annual Amplitude (m)	Zero Amplitude Temperature (ºC)	Ground Temperature Gradient (ºC/m)	Estimated Mean Annual Surface Temperature (ºC)	Estimated Vertical Depth of Active Layer (m)	Estimated Vertical Depth of Permafrost [4] (m)	Terrain Type (Ref. Volume 6 FEIS, Appendix 6.3)	Vegetation (Ref. Volume 6 FEIS Figures 6.5-3a, 6.5-3b)	Comments
GT11-14	19.6	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	No data	Sedge	See Note 3.
GT11-17	25.0	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	No data	Sedge	See Note 3.

Notes:

1. Properties obtained from thermistor plots, where shown.
2. “N/A” indicates the estimations of certain geothermal properties are not applicable due to (a) insufficient depth of the thermistor cable; (b) proximity of installation to lake body.
3. Insufficient data have been collected to estimate certain geothermal properties, and may indicate that equilibrium conditions have not been reached.
4. Permafrost depth estimated by projecting the temperatures of the lower portion of the thermistor to 0 ºC using a best fit line and the estimated geothermal gradient.
5. Mean annual surface temperature estimated by projection of geothermal gradient to ground surface.

4.2.5 Background Thermistor

A 16-point thermistor cable was installed in exploration Borehole M98-195 to a depth of approximately 437.1 m below ground surface by EBA in 1998. Thermistor M98-195 is located to the northeast of the Tiriganiaq Deposit (see Figure 2). This thermistor is more than 800 m away from any relatively large or deep lakes in the area, and therefore is considered as a background thermistor for this baseline study. The following table summarizes the depth below ground surface of the thermistor sensors, as reported by Hubert (2001).

Table 24: As-Built Sensor Depths in Metres (Vertically) Below Ground Surface in Borehole M98-195

Sensor Number	Vertical Depth Below Ground Surface (m)
1	-4.1
2	-5.1
3	-6.1
4	-7.1
5	-8.0
6	-13.0
7	-21.5
8	-42.4
9	-71.8
10	-120.5
11	-171.0
12	-219.7
13	-268.2
14	-316.7
15	-365.0
16	-437.1

The ground temperature profile of this thermistor is shown in Appendix E. Temperature data were recorded from 1998 to 2000. No new data are available from this thermistor since it is no longer functional.

The following table presents a summary of permafrost information estimated using the data from this thermistor.

Table 25: Summary of Permafrost Conditions at Borehole M98-195

Borehole Number	Thermistor		Depth of Zero Annual Amplitude (m)	Zero Amplitude Temperature (m)	Geothermal Gradient[1] (ºC/m)	Estimated Mean Annual Surface Temperature[2] (ºC)	Vertical Depth of Active Layer (m)	Estimated Vertical Depth of Permafrost[3] (m)
	Number	Maximum Vertical Depth Below Ground Surface (m)						
M98-195	EBA #1146	437.1	22	-7.5	0.018	-8.7	3	470

Note:
1. Based on thermistor data below approximately 120 m depth.
2. Estimated by projecting the best fit line of the geothermal gradient to surface.
3. Estimated by projecting the thermistor temperatures below 120 m depth to 0^{o}C using a best fit line and the estimated geothermal gradient.

4.3 Description of Permafrost Soils

Frozen soil samples collected during site investigations were visually described in terms of conditions of ice formation. A National Research Council Canada (1979) guide for the field descriptions of permafrost soil samples was used as the basis for sample description. This section summarizes the field descriptions of the 2007 and 2009 investigations.

The following presents a summary of field descriptions for permafrost soils according to the borehole logs shown in SRK (2007).

Table 26: Summary of 2007 Site Investigation of Permafrost Soils

Borehole*	Depth (m)		National Research Council Field Description of Permafrost**	Comments
	From	To		
GT07-06	0	0.08	Nf	
GT07-06	0.35	0.85	Vx	
GT07-07	0	0.07	Nf	
GT07-07	0.07	0.5	Nbn	
GT07-07	0.6	0.75	Nbn	
GT07-07	0.75	0.85	Vs	Stratified ice lenses average 1 mm thick, spaced 3 mm apart
GT07-07	0.85	1.4	ICE+SILTY SAND	75% ice with soil inclusions
GT07-07	1.8	2.4	Vs	~40% ice with ice lenses 2 mm thick spaced 4 mm apart
GT07-08	0	0.2	Nf	
GT07-08	0.27	0.57	Nbn	
GT07-08	0.57	1.5	Nbn	
GT07-08	2.05	2.2	Nbn	
GT07-08	2.2	4.1		No Visible Ice
GT07-09	0	0.2	Nbn	
GT07-09	0.2	0.54	Nbn	
GT07-09	0.54	1.02	Vc	
GT07-09	1.02	1.34	Vc	
GT07-09	1.34	1.5	Nbn	
GT07-09	1.5	1.6	Nbe	<1% excess ice
GT07-09	1.6	2.2	Vs	30% ice, stratified ice with irregular spacing (avg 1.5 mm) and thickness (avg. 1 mm)
GT07-09	5.2	5.4	Nbn	
GT07-09	5.68	5.72	ICE	4 cm joint in the bedrock filled with ice
GT07-10	0.1	0.4	Nf	
GT07-10	6	7	Nbn	
GT07-10	7.9	8.6	Nbn	
GT07-10	8.9	9.4	Vs	1 mm thick with an average spacing of 1 mm
GT07-10	9.9	10.9	Nbn	
GT07-10	10.9	11.5	Nbn	

Ref: SRK (2007)

*Refer to SRK (2007) for complete borehole locations.

**Notes:

1. Ice thickness equals or less than 1 inch: Vr - visible, random or irregularly oriented ice formations; Vs - visible, stratified or distinctly oriented ice formations; Vx –visible, individual ice crystals or inclusions.
2. Ice not visible: Nf-poorly bonded or friable; Nbn – ice not visible by eye, well bonded and no excess ice; Nbe – ice not visible by eye, well bonded excess ice.
3. Ice thickness greater than 1 inch: ICE+ soil type – ice with soil inclusions; ICE – ice without soil inclusions.

A summary of field descriptions for permafrost soils encountered during the 2009 summer geotechnical investigations is presented in the following table (Golder, 2010a and b).

Table 27: Summary of 2009 Site Investigation of Permafrost Soils

Borehole*	Depth (m)		National Research Council Field Description of Permafrost**	Comments
	From	To		
GT09-10	1.3	1.8	Vr	Ice to 1 cm thick
GT09-10	2.25	2.5	Vx	
GT09-11	0.95	1.3	ICE +SAND	Granular structure and colourless ice
GT09-11	1.3	1.53	Vx	
GT09-11	1.53	2.08	ICE +SAND	Granular structure and colourless ice
GT09-13	5.15	5.8	Nbn	
GT09-14	1.15	1.45	ICE +SAND	Grey to colourless, clear to cloudy. 85%-90% of sample is visible ice
GT09-14	1.45	1.75	ICE +SILT	Hard, grey cloudy
GT09-14	1.75	1.92	Vc	
GT09-14	1.92	2.2	Vr	
GT09-14	2.25	2.79	Vx	
GT09-14	7.92	8.24	Nbn	
GT09-17	0.3	0.85	Vr	Two ice inclusions >2.5 cm
GT09-17	0.85	1.2	Vr	
GT09-17	1.2	1.65	Vx	
GT09-18	1.35	1.66	Vr	Approaching soil limit, clear crystals
GT09-20	0.9	1.35	Vr	
GT09-22	0.84	1.09	Nbe	
GT09-22	1.09	1.19	ICE +SAND AND GRAVEL	
GT09-22	1.19	1.34	Vr	Ice crystals with sand
GT09-22	1.42	1.52	ICE +SAND	
GT09-23	0.9	0.95	Vs	
GT09-23	0.95	1.25	ICE +SAND to Nbe	
GT09-23	1.25	1.35	ICE	Milky to clear
GT09-23	1.45	1.8	Nf, Nbe, Vx	
GT09-24	0.35	0.71	Nbn	
GT09-25	0.35	1.3	Vr	
GT09-25	1.3	1.57	Nbe	
GT09-25	1.57	1.71	ICE +SAND	Hard, grey cloudy
GT09-25	1.71	2.04	Vr	
DS09GT-06	0.53	0.54	Nbn	
DS09GT-07	0.91	1.19	Nbn & Nf	
DS09GT-08	0.61	1.22	Nbn	
DS09GT-09	0.46	0.55	Nbn & Vx	
DS09GT-09	0.55	0.65	Vr	
DS09GT-10	1.26	1.3	Nbn	

Ref: Golder (2010a and b).
*Refer to Golder (2010a and b) for complete borehole locations.
**Notes:
1. Ice thickness equals or less than 1 inch: Vr - visible, random or irregularly oriented ice formations; Vs - visible, stratified or distinctly oriented ice formations; Vx –visible, individual ice crystals or inclusions.
2. Ice not visible: Nf-poorly bonded or friable; Nbn – ice not visible by eye, well bonded and no excess ice; Nbe – ice not visible by eye, well bonded excess ice.
3. Ice thickness greater than 1 inch: ICE+ soil type – ice with soil inclusions; ICE – ice without soil inclusions.

A summary of field descriptions for permafrost soils encountered during the 2011 summer geotechnical investigations is presented in the following table (Golder, 2012b).

Table 28: Summary of 2011 Site Investigation of Permafrost Soils

Borehole Number	Depth (m)		National Research Council Field Description of Permafrost*	Comments
	From	To		
GT11-01	2	4.44	Vs	
GT11-01	4.44	7.44	Vr	
GT11-01	7.44	9.13	Vc	
GT11-02	3	3.7	Vs	
GT11-02	3.7	5.4	Vr	
GT11-02	5.4	6.2	Vs	
GT11-02	6.2	7.1	Vr	
GT11-03	1.26	1.5	ICE+SILT inclusions	
GT11-03	1.5	3.1	ICE and SILT	
GT11-04	1.5	3.79	Vs/Nbe	
GT11-04	3.79	5.29	Vs	
GT11-05	0.71	1	Vr,Vx	
GT11-05	1	1.17	Nbe	
GT11-05	2.21	2.7	ICE with minor amounts of SAND	
GT11-05	2.7	2.8	Nbe	
GT11-05	2.8	4.25	Nbn	
GT11-05	4.25	7.5	Nbn	
GT11-05	7.5	8.95	Vr	
GT11-05	10.34	10.85	Nbe	
GT11-06	2.25	2.5	Nbe	
GT11-06	2.5	2.75	Vs	
GT11-06	2.75	10.5	Nbn	
GT11-06	10.5	10.8	Vr	
GT11-06	10.8	13.62	Nbn	
GT11-08	1.1	1.8	Vc	
GT11-08	3.5	4.84	Nbn	
GT11-08	4.84	9.76	Nbe	
GT11-08	9.76	10.65	Nbe to Vr	
GT11-08	10.65	11	Vr	
GT11-08	11	12.4	Nbe to Vr	
GT11-09	1.1	2.75	ICE and sandy silty GRAVEL	Suspended cryostructures
GT11-09	2.75	9.6	Vr	
GT11-09	9.6	17.74	Nbe	ICE filled fracture at 12.30m
GT11-10	0.75	2.5	Nf	
GT11-10	2.5	6.28	Nbn	
GT11-11	1.23	1.65	Vr	
GT11-11	1.89	2.25	Vc	
GT11-11	2.25	3.75	Vc, ICE and silty SAND	
GT11-11	5.25	8.35	Nbn	
GT11-12	1.89	3.01	Vc	
GT11-12	3.01	3.21	Nbn	
GT11-12	3.21	10.16	Nbn	
GT11-13	1.85	2.1	Nbn	
GT11-14	0.79	1.75	Vc	
GT11-14	1.75	5.59	Nbn	

Borehole Number	Depth (m)		National Research Council Field Description of Permafrost*	Comments
	From	To		
GT11-14	5.59	5.92	Vc	
GT11-15	0.81	1.56	Vr	
GT11-15	1.56	2.31	Vs	
GT11-15	3.69	17.01	Nbn	
GT11-16	1.6	2.33	Nbn	
GT11-16	2.33	3.08	Vs	
GT11-16	3.08	10.3	Nbn	
GT11-16	10.3	11.58	Vs	With approx. 1cm thick layers of ice
GT11-16	11.58	13.1	Nbn	
GT11-17	0.99	1.28	Vc	
GT11-17	1.28	2.33	Vc	One ice vein (approx. 2.5cm thick)
GT11-17	2.85	6.83	Nbn	

Ref: Golder (2012b).

*Refer to Golder (2012b) for complete borehole locations.

**Notations:

1. Ice thickness equals or less than 1 inch: Vr - visible, random or irregularly oriented ice formations; Vs - visible, stratified or distinctly oriented ice formations; Vx –visible, individual ice crystals or inclusions.
2. Ice not visible: Nf-poorly bonded or friable; Nbn – ice not visible by eye, well bonded and no excess ice; Nbe – ice not visible by eye, well bonded excess ice.
3. Ice thickness greater than 1 inch: ICE + soil type – ice with soil inclusions; ICE – ice without soil inclusions.

4.4 Calculated Depth of Zero Annual Amplitude

The annual fluctuation of surface temperature creates a ground surface temperature wave. This oscillating temperature wave has the same frequency as the surface temperature, but the amplitude attenuates with depth. Likewise, the phase lag increases with depth. The amplitude of the temperature wave decreases to a point where the temperature remains practically constant apart from long-term drift in response to climate change or other climate related factors. This point is termed the depth of zero annual amplitude and is the depth below ground surface at which there is practically no annual fluctuation in the ground temperature.

The depth of zero annual amplitude can be estimated directly from measurement of ground temperature data from thermistors, where such data are available. Tables 20, 21, 22, 23, and 25 present the zero annual amplitude temperatures estimated from the thermistor data collected at the Meliadine Project.

If thermistor data are insufficient, the depth of zero annual amplitude can be estimated from heat conduction theory, with certain simplifying assumptions that the rock is a homogeneous medium, and heat flows by conduction only.

Thermal properties for bedrock were estimated for the Meliadine Project based on past project experience and literature review (Golder, 2010c, d). Using a thermal conductivity of 2.9 W/(m ºC), and a heat capacity of 2.4 MJ/(m^3 ºC), the thermal diffusivity (α) of the rock is estimated to be 1.2 x 10^{-6} m^2/s.

According to Williams and Smith (1989, Chapter 4) the general features of the ground thermal regime within the depth of annual fluctuation can be described using heat conduction theory. The heat balance equation can be written as:

$$\frac{dT}{dt} = \left(\frac{K}{C}\right) \times \left(\frac{1}{dz}\right) \times \left[\left(\frac{dT}{dz}\right)_0 - \left(\frac{dT}{dz}\right)_i\right] \quad [1]$$

where T is temperature (K^{-1}), C is the volumetric heat capacity ($J\ m^{-3}\ K^{-1}$), K is the thermal conductivity ($W\ m^{-1}\ K^{-1}$), t is time and z is depth below ground surface (Williams and Smith 1989).

In its differential form, the heat conduction equation is written as follows:

$$\frac{\partial T}{\partial t} = \propto \times \frac{\partial^2 T}{\partial z^2} \qquad [2]$$

where the ratio of the thermal conductivity to heat capacity, or α, is the thermal diffusivity (m^2/s).

The temperature at a given depth, z, can be determined from (Ingersoll, Zobel and Ingersoll 1954, pp. 45-57):

$$T(z,t) = \bar{T}_z + A_S e^{-z\left(\frac{\omega}{2\alpha}\right)^{1/2}} \sin\left[\omega t - \left(\frac{\omega}{2\alpha}\right)^{1/2} \times z\right] \qquad [3]$$

where ω is the period of the temperature wave (2×10^{-7} radians s^{-1} for period of one year), and A_s is the surface temperature wave amplitude (or ½ of the temperature range).

The amplitude, A_z, of the temperature wave at any given depth, z, is given by (Williams and Smith, 1989, Chapter 4):

$$A_z = A_s e^{-Z\sqrt{\frac{\omega}{2\alpha}}} \qquad [4]$$

The depth of zero annual amplitude can then be estimated at the depth where the annual amplitude is small (almost zero). An operational definition of the depth of 'zero' annual amplitude is the depth at which the change in amplitude is less than 0.1ºC (Williams and Smith, 1989). If there is no surface node, or the readings at the surface node are not sufficient to estimate the temperature range near surface (As), then the temperature range of the node nearest the base of the active layer is used for As and the depth of this node is added in the equation.

By re-arranging Equation 4, the depth of zero annual amplitude can be estimated by:

$$Z = -\left[\frac{\ln\left(\frac{A_Z}{A_S}\right)}{\sqrt{\frac{\omega}{2\alpha}}}\right] + Z_{NodeDepth} \qquad [5]$$

where $Z_{NodeDepth}$ is the depth of the thermistor node used to obtain the annual temperature range A_s.

For practical purposes the temperature range at the depth of zero annual amplitude has been assumed to be 0.05 ºC. By substituting these values in Equation 5, the depth of zero annual amplitude at selected thermistors in the Meliadine Project area can be estimated for thermistors that are shallower than this depth.

The following table presents results of calculations for zero annual amplitude depths for selected thermistors at different locations on the Project site that did not extend below this depth.

Table 29: Depth of Zero Amplitude Calculated for Selected Thermistors

Parameter	Symbol	Unit	Borehole									
			GT07-06	GT07-09	GT07-07	GT09-18	GT09-16	GT09-12	GT09-07	GT07-11	DS09GT-4	DS09GT-10
Min. Temperature at Node Depth closest to Base of Active Layer		ºC	-13.5	-7	-17.5	-8.6	-13	-11	-13.5	-19	-9.6	-8.2
Max. Temperature at Node Depth closest to Base of Active Layer		ºC	-3.1	0.3	-1	2.5	0	5.8	0.8	0.5	-3.4	-4
(Surface) Temperature Range	Ts	ºC	10.4	7.3	16.5	11.1	13	16.8	14.3	19.5	6.2	4.2
Vertical Node Depth Closest to Base of Active Layer	$T_{NodeDepth}$	M	4	3	1.5	1	2	1	1	1.5	5	5
Temperature Wave Amplitude at Depth Z (Depth of Zero Annual Amplitude)	Az	ºC	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Temperature Wave Amplitude (Node closest to base of Active Layer)	As	ºC	5.2	3.65	8.25	5.55	6.5	8.4	7.15	9.75	3.1	2.1
Angular Velocity	ω	radians/s	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07
Thermal Diffusivity	$\propto$	m^2/s	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06
Zero Amplitude Depth	z	M	20.1	17.9	19.2	17.4	18.9	18.8	18.3	19.8	19.3	18.0

The calculated results indicate the average depth of zero annual amplitude to be 18.8 m, and within a range of 17.4 m to 20.1 m. This is consistent with the estimates of zero annual amplitude depth determined from ground temperature measurement by thermistors installed at the site and presented previously in Tables 20, 21, 22, 23, and 25. .

5.0 FORMATION OF OPEN-TALIKS UNDER LARGE LAKES

The land surface at the Meliadine Project site is underlain by continuous permafrost, with the exception of a number of water bodies in the area which are too deep to freeze to the bottom. Taliks (areas of unfrozen ground) are expected beneath a water body where the water depth is greater than the ice thickness. Formation of open taliks that penetrate through the permafrost may be expected for relatively deeper and larger lakes in the project area. The permafrost thermal regime at the Meliadine Project site area is shown schematically in Figure 5. This section presents theoretical estimates of potential open talik formation below lakes in the Meliadine Project site area.

5.1 Three-Dimensional Heat Conduction Beneath Circular Lakes

Lachenbruch (1959) applied theoretical aspects of three-dimensional heat conduction in permafrost beneath heated buildings to lakes. For steady state or equilibrium conditions the effects of latent heat are neglected.

The following summary discussion is based on work by Lachenbruch (1959), Mackay (1962), Smith (1976), Williams and Smith (1989), and Burn (2002). This is not intended to be a detailed summary, but to provide the background theory of the methods used to estimate open or closed taliks beneath tundra lakes. Additional information can be obtained by referencing the original authors indicated. The methods used are standard accepted peer reviewed methods that have been used by northern practitioners for decades.

A thermal disturbance is induced by placing a circular lake of radius R on semi-infinite horizontal terrain; the lake depth is considered to be negligible compared to the radius so that the lake bottom can be considered to be flush with the adjacent ground (Mackay 1962; Lachenbruch 1959). For steady state conditions a constant temperature difference (B) exists between a point inside the disturbed lake area (T_L) and the mean annual temperature of the undisturbed area outside of the lake (T_G).

$$B = T_L - T_G \qquad [6]$$

The temperature difference is the principal disturbance (θ) and is given by:

$$\theta\,(x, y, z, t) = \left(\frac{B}{2\pi}\right) \iint \left\{ \frac{r}{\sqrt{\pi \alpha t}} \times e^{\frac{-r^2}{4\alpha t}} + erfc\,\frac{r}{2\sqrt{\alpha t}} \right\} d\Omega \qquad [7]$$

Where t is time, $d\Omega$ is the element of solid angle subtended by dx'dy' at the field point (x, y, z) (Mackay 1962) and α is the thermal diffusivity (m^2/s).

Integrating this equation provides the principal disturbance under the centre of a lake with radius R, for a circular region as follows:

$$\theta\,(0,0,z,t) = (B)\left[erfc\,\frac{z}{2\sqrt{\propto t}} - \frac{z}{\sqrt{z^2+R^2}}\,erfc\,\frac{\sqrt{z^2+R^2}}{2\sqrt{\propto t}}\right] \quad [8]$$

For steady state conditions the principal disturbance beneath the centre of a circular lake becomes:

$$\underset{t\to\infty}{\theta\,(0,0,z,t)} = (B)\left[1-\frac{z}{\sqrt{z^2+R^2}}\right] = (T_L - T_G)\left[1-\frac{z}{\sqrt{z^2+R^2}}\right] \quad [9]$$

The temperature (T) beneath the centre of a circular lake is therefore calculated as the sum of the ground temperature (T_G), the principal thermal disturbance (Equation 9), and the increase in ground temperature due to geothermal effects:

$$T = T_G + (T_L - T_G)\left[1-\frac{z}{\sqrt{z^2+R^2}}\right] + \frac{z}{I} \quad [10]$$

where z is depth in metres and I is the inverse of the ground temperature gradient in m/^{o}C.

For lakes with terraces which freeze to the lake bottom during winter, the above Equation 10 can be written to account for an outer annulus of ice which adheres to the lake bottom with an outer radius of R_2, and an inner pool of water with radius R_1. The width of the frozen annulus is given by R_2-R_1. The ground temperature under the lake centre is given by:

$$T = T_G + \frac{(T_L - T_G)}{2}\left[2-\frac{z}{\sqrt{z^2+R_1^2}}-\frac{z}{\sqrt{z^2+R_2^2}}\right] + \frac{z}{I} \quad [11]$$

Burn (2002) presents the equivalent form of the above equation for a lake of arbitrary shape with terraces as follows:

$$T_z = T_g + \frac{z}{I} + (T_p - T_g)\left[1-\frac{z}{\sqrt{z^2+R_p^2}}\right] + (T_t - T_g)\left[\frac{z}{\sqrt{z^2+R_p^2}}-\frac{z}{\sqrt{z^2+R_{p+t}^2}}\right] \quad [12]$$

- Where T_p is the mean annual lake bottom temperature, in ^{o}C, equivalent to T_L;
- T_g is the mean annual temperature of the undisturbed ground, in ^{o}C, equivalent to T_G;
- T_t is the mean annual temperature of the lake terrace, in ^{o}C;
- R_p is the radius of the central pool, in metres; and
- R_{p+t} is the radius of the lake (pool plus terrace), in metres.

5.1.1 Equivalent Solution Using Polar Coordinates and the Laplace Equation

The relationship described by Equation 9 can also be derived using cylindrical polar coordinates and the Laplace equation, assuming steady state conditions. For a lake of arbitrary shape the steady-state temperature at a point within the thermal disturbance can be described in terms of ρ, φ, and z; ρ is the distance from the z-axis (radius), φ is the angle from the positive xz-plane to a point, and z is the depth below ground surface.

As with the solution presented by Mackay, B is the constant temperature difference between the temperature at a point inside the thermally disturbed region in the plane z = 0, and the mean annual ground temperature of the undisturbed region outside the lake, described above in Equation 6. T_L is the steady-state mean annual temperature of lake bottom sediments, and T_G is the steady-state ground temperature at depth z=0 m.

For a lake of arbitrary shape, the three-dimensional Laplace equation for the semi-infinite solid area is (Balobaev et al, 2009):

$$\frac{\partial^2 T}{\partial \rho^2} + \frac{1}{\rho}\frac{\partial T}{\partial \rho} + \frac{1}{\rho^2}\frac{\partial^2 T}{\partial \varphi^2} + \frac{\partial^2 T}{\partial z^2} = 0 \qquad [13]$$

with the following boundary conditions:

$$T(\rho, \varphi, z = 0) = T_L \qquad [14]$$

$$T(\rho, \varphi, z = 0) = T_G \qquad [15]$$

$$T(\rho = \infty, \varphi, z) = T_G + Gg * z \qquad [16]$$

where Gg is the geothermal gradient (^{o}C/m) and z is depth below ground surface (m).

For a cylindrical lake, with a radius R_i = ρ_{max} the third term of the Laplace equation is zero since there is no variation in temperature with angle around the z-axis ($\frac{\partial T}{\partial \varphi} = 0$). The Laplace equation can be written as:

$$\frac{\partial^2 T}{\partial \rho^2} + \frac{1}{\rho}\frac{\partial T}{\partial \rho} + \frac{\partial^2 T}{\partial z^2} = 0 \qquad [17]$$

with the following boundary conditions:

$$T(\rho, z = 0) = T_L \quad for\ \rho \le R_i \qquad [18]$$

$$T(\rho, z = 0) = T_G \quad for\ \rho > R_i \qquad [19]$$

$$T(\rho = \infty, z) = T_G + Gg * z \qquad [20]$$

The solution is:

$$T(\rho, z) = T_G + Gg * z + \phi(T_L - T_G) = \quad T_G + \frac{z}{I} + \phi(z)(T_L - T_G) \quad [21]$$

where $\Phi(z)$ is the steady-state thermal disturbance beneath the centre of the circular lake, and I is the inverse of the regional geothermal gradient.

For a circular lake, of radius R, the steady-state thermal disturbance is beneath the centre can be calculated from (Williams and Smith, 1989):

$$\phi(z) = \left[1 - \frac{z}{(z^2 + R^2)^{1/2}}\right] \quad [22]$$

Substituting Equation 22 in Equation 21 yields:

$$T(\rho, z) = T_G + (T_L - T_G)\left[1 - \frac{z}{(z^2 + R^2)^{1/2}}\right] + \frac{z}{I} \quad [23]$$

Equation 23 is equivalent to Equation 11 above as derived by Mackay (1962 Equation 7), and by Burn (2002 Equation 3).

5.2 Critical Lake Radius

The temperature of undisturbed ground, T_U, at depth z can be determined in ^{o}C by:

$$T_U = T_G + \frac{z}{I} \quad [24]$$

where T_G is ground surface temperature. The bottom of permafrost can be estimated setting T_U to 0^{o}C.

$$z = -T_G \times I \quad [25]$$

If permafrost exists beneath the centre of a circular lake, then there is an upper and a lower surface where the ground temperature is 0^{o}C. The depth z where the sum of the undisturbed temperature (equation 24) and the principal disturbance induced by the lake (equation 9) are zero can be estimated from the following:

$$T_G + (B)\left[1 - \frac{z}{\sqrt{z^2 + R^2}}\right] + \frac{z}{I} = 0 \quad [26]$$

Since this is not a single valued function of z, it cannot provide direct determination of top and bottom of permafrost. It can, however, be used to estimate the critical lake radius beyond which no permafrost will be present beneath the lake centre. By rearranging equation 26, the lake radius with a permafrost top and bottom at a specified z is given by:

$$R = \left[\frac{(IBz)^2}{IB + IT_G + z^2} - z^2\right]^{\frac{1}{2}} \quad [27]$$

As the lake radius is increased a critical radius is reached when the permafrost beneath the lake centre 'opens up' so that all the ground directly beneath the lake centre is above 0°C. This occurs when dR/dz for equation 27 is equal to zero:

$$\frac{z}{R}\left[\frac{I^3B^2(B+T_G)-(IB+IT_G+z)^3}{(IB+IT_G+z^3)}\right]=0 \qquad [28]$$

Solving for z gives the following:

$$z=I\left[(B^2T_L)^{\frac{1}{3}}-T_L\right] \qquad [29]$$

where:

- z is the maximum depth to permafrost, in metres, at the critical lake radius where permafrost 'opens' beneath the centre of the lake;

Once the value of z is determined it can be substituted into equation 27 to determine the critical lake radius of the lake under steady state conditions.

5.3 Formation of Open-Taliks under Elongate Lakes

In the case of elongate lakes, the analogous equation of temperature profiles under lakes without terraces is presented by Smith (1976):

$$T_z=T_g+\frac{Z}{I}+\frac{(T_l-T_g)}{\pi}\left(2tan^{-1}\frac{H_l}{Z}\right) \qquad [30]$$

where H_l is the half-width of the lake in meters. The critical depth from Equation 1 can be used to estimate the critical width for an elongate lake to have an open talik beneath it. Any elongate lakes with widths greater than the critical width are likely to have an open talik below.

Burn (2002) models elongate lakes with terraces as two thermal disturbances superimposed on each other, or more simply a central pool embedded in a terrace. Equation 30 presents the calculation to estimate the temperature profile under the center of the elongated lake.

$$T_z=T_g+\frac{Z}{I}+\frac{(T_t-T_g)}{\pi}\left(2tan^{-1}\frac{H_{p+t}}{Z}\right)+\frac{(T_p-T_t)}{\pi}\left(2tan^{-1}\frac{H_p}{Z}\right) \qquad [31]$$

In the above equation:

- T_z is the temperature in °C at depth Z, in metres;
- T_g is the mean annual ground surface temperature, in °C;
- T_p is the mean annual temperature at the bottom of the central pool, in °C;
- T_t is the mean annual temperature of the terrace;

- H_p is the half-width of the central pool, in metres; and
- H_{p+t} is the half-width of the lake (pool and terrace), in metres.

The first two terms on the right represent the undisturbed temperature profile, while the third and fourth terms represent the thermal disturbance due to the terraces, and due to the central pool, respectively.

5.4 Critical Lake Sizes for Open-Talik Formation

The critical radius and critical half width for lakes with and without terraces were calculated for the Meliadine Gold Project based on the above equations. The following table presents the results from the calculations using the geothermal gradient and mean annual ground surface temperature obtained from the thermistor installed in borehole M98-195.

Table 30: Critical Radius and Critical Half Width for Lakes without Terraces

Geothermal Gradient [1]	Mean Annual Ground Surface Temperature[2]	Mean Annual Lake (or Central Pool) Bottom Temperature[3]	Critical Depth	Circular Lake Critical Radius	Elongate Lake Critical Half Width
I °C /m	T_g °C	T_l (or T_p) °C	Z m	R_l m	H_l m
0.018	-7.9	2	212	292	161
0.018	-7.9	1	183	332	194

Notes:
1. Geothermal gradient based on curve fitting to M98-185 data below a depth of approximately 120 m.
2. Average of the mean monthly measurements recorded at the site between 1997 and 2001, at a depth of 5 cm below ground surface.
3. Lake bottom temperature estimates based on site data and published temperatures by others (Burn, 2002 and 2005).

In the Meliadine Project area, lakes generally have terraces that have lower mean annual temperatures than the central pool. For the purpose of this analysis, terraces are assumed as the shallow lake areas where water can freeze to the ground in winter. The typical ice thickness can therefore be used as an indicator to define terraces within the lakes. As mentioned above, the average measured late winter ice thickness is about 1.7 m in the Meliadine Project area. As such, water bodies on terraces with depths less than 1.7 m will freeze to bottom in winter. Bathymetric data for a number of relatively large lakes in the Meliadine Project area indicate that widths of lake terraces with depths less than 1.7 m are approximately 25% to 75% of total lake widths or diameters. Mean annual lake bottom water temperatures on terrace surfaces were assumed to be in a range of -2 °C to -6 °C. This assumption was made based on lake temperature measurements in cold regions as presented by Burn (2002 and 2005), since there are few site specific data available for the Meliadine Project site for mean annual lake bottom water temperatures on terrace surfaces.

Using these mean temperatures and geometries of terraces, typical ranges of critical radius and critical half width for lakes with terraces were calculated for the Meliadine Project. These are summarized in the following table.

Table 31: Ranges of Critical Radius and Critical Half Width for Lakes with Terraces

Geothermal Gradient [1]	Mean Annual Ground Surface Temperature [2]	Mean Annual Lake (or Central Pool) Bottom Temperature	Calculated Critical Depth	Calculated Circular Lake Critical Radius		Calculated Elongate Lake Critical Half Width	
				25% Diameter Terrace with T_t= -2 °C	75% Diameter Terrace with T_t= -6 °C	25% Total Width Terrace with T_t= -2 °C	75% Total Width Terrace with T_t= -6 °C
I °C /m	T_g °C	T_l (or T_p) °C	Z m	R_l m		H_l m	
0.018	-7.9	2	212	308	392	170	227
0.018	-7.9	1	183	326	484	179	281

Notes:
1. Geothermal gradient based on curve fitting to M98-185 data below a depth of approximately 120 m.
2. Average of the mean monthly measurements recorded at the site between 1997 and 2001, at a depth of 5 cm below ground surface.

The results indicate that if the terrace areas cover a larger percentage of the lake and have a lower mean annual temperature than the central pool lake bottom, a larger critical lake size is required to have a potential open-talik formation.

The analytical solutions provide typical guidelines for quickly determining potential open-talik formation beneath lakes in the Meliadine Gold Project area.

5.5 Freezing Point Depression

A high salinity level in groundwater normally results in freezing point depression. For example, typical sea water with a salinity level of 30 parts per thousand (ppt) theoretically has a freezing point of about -1.8 °C.

For the Meliadine Gold Project, information about the salinity level of groundwater is currently limited. One groundwater sample was collected and tested, during a hydrogeologic investigation carried out in 2009 on borehole GT09-19 (beneath Lake B7). A groundwater sample was collected at a down hole depth between 70.9 m and 199.5 m (Golder, 2009d). Laboratory analytical certificates for this groundwater sample (Golder, 2009d) indicate a salinity level of approximately 4.2 ppt, which would cause a freezing point depression of about 0.25 °C. A thermistor installed into this borehole indicated down hole temperatures between about -0.6 °C and-0.2 °C over the interval from which the groundwater sample was taken.

A Westbay monitoring and sampling well (M11-1257) was installed in 2011 to a depth of 663 m below ground surface. Details of the installation, sampling procedures, and groundwater quality analytical results are presented in Golder (2012c). The Westbay well was installed with six sampling intervals. Following installation, only one sample interval (Interval 5) was developed fully and then sampled. The Interval 5 was at a depth of approximately 454 m below ground surface. The salinity of the sample was approximately 60.9 ppt corresponding to a freezing point depression of approximately 3.3 °C, suggesting the depth to the basal cryopeg is between about 350 m and 375 m below ground surface.

6.0 THERMAL STABILITY OF THE PERMAFROST

Site investigations involving permafrost studies for the Meliadine Gold Project have been carried out since 1998. Thermistor data were collected from M98-195 between 1998 and 2000. Following a monitoring gap from 2000 to 2006, investigations with more thermistor installations have been conducted since 2007.

Geothermal properties such as the depth of active layer, the zero annual amplitude depth and the geothermal gradient from M98-195 and from other thermistors have been compared. The monitoring period between 2007 and 2011 is considered to be short for evaluating thermal stability of permafrost and lake taliks in the project area. In general, the thermistor data to date do not suggest a significant change of the thermal condition of the permafrost in the Meliadine Gold Project area. Active layer depths were consistent year over year in the project area based on the thermistor data collected to date.

Permafrost is sometimes referred to as “warm” or “cold”. The actual temperature ranges associated with such naming varies depending on the source; however, Hammer et al. (1985) suggests that “warm” permafrost has a temperature range of 0 to -4 ºC, and ‘cold’ permafrost has a temperature range colder than -4 ºC. The balance between the frozen and thawed state for ‘warm’ permafrost is delicate, and minimal energy is required to change the state from a frozen to a thawed state. Therefore, “warm” permafrost is less stable. Based on the thermistor data from the Meliadine Gold Project, temperatures at depths of zero annual amplitude were about -5 to -7.5 ºC. Therefore, the permafrost in the project area is generally considered to be “cold”.

The Intergovernmental Panel on Climate Change (IPCC) issued the fourth assessment report on climate change in 2007. Under the worst scenario of the climate change model, IPCC (2007) projects an increase of the global mean surface air temperature of 2.4 to 6.4 ºC by 2090 to 2099 relative to 1980 to 1999. Following this projection, long term ground temperatures in the project area may also increase as a response to the warming of air temperatures, and as a consequence, the thickness of the active layer may gradually increase.

7.0 SUMMARY AND CONCLUSIONS

The Meliadine Gold Project is located in the zone of continuous permafrost. Based on thermistor data collection and interpretation, the permafrost conditions at the Meliadine Gold Project site are summarized below:

- The depth of permafrost in the project site is estimated to be on the order of 360 m to 495 m.
- The depth to the basal cryopeg is estimated to be between 350 m and 375 m below ground surface, due to freezing point depression as a result of highly saline groundwater.
- The depth of the active layer ranges from approximately 1.0 m to 3.0 m.
- The estimated mean annual surface temperature estimated from the geothermal profile is between -6 ºC and -9ºC.
- The estimated depths of zero annual amplitude from the temperature profiles range from 15 to 35 m.
- Theoretical calculations suggest average zero annual amplitude depth of about 19 m, which is within the range determined directly from thermistor profiles.
- The temperatures at the depths of zero annual amplitude are in the range of -5.0 to -7.5 ºC.
- The geothermal gradient is in a range of 0.012 to 0.02 ºC/m.

The base of the permafrost is expected to be an irregular surface, and so the actual depth to permafrost will be variable. In the local context of the Meliadine Gold Project site, the land surface is underlain by continuous permafrost, except under bodies of water too deep to freeze to the bottom during winter. Based on bathymetry data, maximum lake depth varies from 2.5 to 5 m (except Lake ML and Lake CH), and late winter ice thickness ranges from 1.0 m to 2.3 m averaging approximately 1.7 m. Therefore, lake ice freezes to the lake bottom at depths shallower than approximately 1.0 to 2.3 m. Taliks (areas of unfrozen ground) are to be expected where lake depths are greater than about 1.0 to 2.3 m. Formation of open taliks that penetrate through the permafrost may also be expected for relatively deeper and larger lakes in the project area.

Analytical solutions suggest that a critical depth beneath a lake to have open-talik formation is related to geothermal gradient, mean annual ground temperature and mean annual lake bottom temperature, but is independent of lake size. Using the critical depth, critical lake sizes for open-talik formation can be estimated. The analytical solutions for the Meliadine Gold Project area based on assumed mean lake bottom and terrace temperatures result in the following findings:

- Taliks extending through the permafrost will exist beneath circular lakes having a minimum radius of approximately 290 to 330 m, and beneath elongate lakes having a minimum half width of approximately 160 to 195 m, without considering lake terrace geometries.
- When terrace effects are included in the analyses, the critical radius for a circular lake increases to between approximately 305 and 485 m, and the critical half width for an elongate lake increases to between approximately 170 and 280 m. These are based on assumptions that the terrace is 25% to 75% of the total lake width or diameter, respectively.

Detailed analysis using site specific information should be completed as required to study talik formation for specific lakes.

The salinity level of the deep groundwater in the Meliadine Gold Project area is elevated which will result in freezing point depression so that the depth of frozen permafrost (depth to the basal cryopeg) is less than the depth of perennially cryotic ground (ground at a temperature less than 0 ^{o}C).

Based on thermal monitoring data available to date, permafrost conditions in the Meliadine Gold Project area are considered to be stable. No apparent changes of permafrost thermal stability were noted during the monitoring period of 1998 to present.

Data should continue to be collected on a regular basis from all thermistors installed at the site. The three thermistors installed with dataloggers have provided more continuous readings than the other thermistors. Consideration should be given to the installation of dataloggers at other key thermistor locations to collect data at regular intervals throughout the year.

8.0 CLOSURE

This report should be read in conjunction with the *"Study Limitations"* which is appended at the beginning of the report. The reader's attention is specifically drawn to this information, as it is essential that it be followed for the proper use and interpretation of this report.

We trust that this document meets your needs at this time. If you have any questions, please contact the undersigned.

Yours very truly,

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REFERENCES

Andersland, O. and Ladanyi, B. 2004. Frozen Ground Engineering. John Wiley & Sons.

AEE 1998a. WMC International Ltd. Meliadine West Gold Project Water Balance Study 1997 Data Report. AGRA Earth & Environmental, Report Prepared for WMC International Ltd. April 1998.

AEE 1998b. WMC International Ltd. Meliadine West Gold Project Water Balance Study 1998 Data Report. AGRA Earth & Environmental, Report Prepared for WMC International Ltd. December 1998.

AEE 1999. WMC International Ltd. Meliadine West Gold Project Water Balance Study 1999 Data Report. AGRA Earth & Environmental, Report Prepared for WMC International Ltd. December 1999.

AMEC (2000). WMC International Ltd. Meliadine West Gold Project Water Balance Study 2000 Data Report. AMEC Earth & Environmental Limited, Report Prepared for WMC International Ltd. December 2000.

Balobaeve, V.T., Kutasov, I.M., and Eppelbaum, L.V. 2009. The Maximum Effect of Deep Lakes on Temperature Profiles – Determination of the Geothermal Gradient, Earth Sciences Research Journal, Volume 13, No. 1 (June 2009): 54-63.

Burn, C.R. 2002. Tundra Lakes and Permafrost, Richards Island, Western Arctic Coast, Canada. Canadian Journal of Earth Sciences, 39: 1281-1298.

Burn, C.R. 2005. Lake-bottom Thermal Regimes, Western Arctic Coast, Canada. Permafrost and Periglacial. Processes 16: 355–367.

EBA 1997. Geotechnical Consideration for Site Development, Meliadine Project, Rankin Inlet, NWT. EBA Engineering Consultants Ltd., December 1997.

French, H.M. The Periglacial Environment. Third Edition. England: John Wiley and Sons, Ltd; 2007.

Hammer, T.A., Ryan, W.L., and Zirjacks, W.L. 1985. Ground Temperature Observations. In Thermal Design Considerations in Frozen Ground Engineering. Edited by T.G. Krzewinski and R.G. Tart. American Society of Civil Engineers, New York, N.Y.

Golder 1998. Overburden Slope Designs, Wesmeg Project. Golder Associates Ltd. Report, November 1998.

Golder 2000. Report on: Pre-feasibility Review of Open Pit Slope and Underground Mine Design Considerations. Golder Associates Ltd., December 2000.

Golder 2008. Final Report: Meliadine Project: Hydrology Baseline Studies 2008. Golder Associates Ltd., November 2008.

Golder 2009a. Report on F Zone Dyke Geotechnical Investigations 2009. Doc. 030, Golder Associates Ltd., September 10, 2009.

Golder 2009b. Meliadine Gold Project, Aquatics Baseline Synthesis Report. Final-Ver. 0, Golder Associates Ltd., October 2012.

Golder 2009c. Report on Assessment of the Completeness of Geotechnical Data for Feasibility Design of the Tiriganiaq Open Pit - Meliadine West Project. Doc. 008, Golder Associates Ltd., May 26, 2009.

Golder 2009d. Hydrogeologic Investigation Program – Meliadine Project. Doc. 039, Golder Associates Ltd., November 6, 2009.

Golder 2010a. Report on Discovery Deposit 2009 Geotechnical Field Investigations - Meliadine Gold Project. Doc. 061, Golder Associates Ltd., February 8, 2010.

Golder 2010b. Report on Tiriganiaq Deposit and F Zone Deposit Summer 2009 Geotechnical Field Investigations - Meliadine West Project. Doc. 053, Golder Associates Ltd., March 10, 2010.

Golder 2010c. Feasibility Study Level Thermal Analyses Summary - Meliadine Gold Project. Technical Memorandum, Doc. 056, Golder Associates Ltd., February 1, 2010.

Golder 2010d. Report on Meliadine Gold Project F Zone Dyke Feasibility Level Design. Technical Memorandum, Doc. 049, Golder Associates Ltd., February 19, 2010.

Golder 2012a. Technical Memorandum on Comparison of On-Site Climate Data to Observations from Rankin Inlet – Meliadine Gold Project, Nunavut, Doc. 265, Golder Associates Ltd, March 21, 2012.

Golder 2012b. Factual Report on 2011 Geotechnical Drilling Program – Meliadine Gold Project, Nunavut, Doc. 273, Golder Associates Ltd, March 2012.

Golder 2012c. Monitoring Well M11-1257 (Westbay Well) Groundwater Sampling Results – Meliadine Gold Project, Nunavut, Doc. 236, Golder Associates Ltd, January 31, 2012.

Harris, S.A., French, H.M., Heginbottom, J.A., Johnston, G.H., Ladanyi, B., Sego, D.C. and van Everdingen, R.O., 1988. Glossary of Permafrost and Related Ground-Ice Terms. Permafrost Subcommittee, Associate Committee on Geotechnical Research, National Research Council of Canada, Technical Memorandum No. 142.

Hubert and Associates Ltd. 1996. Preliminary Water Quality and Fish Habitat Investigations at the Meliadine West Gold Project. Prepared for WMC International Limited, Americas Division – Exploration. 15 p.

Hubert 2001. Climate studies at the Meliadine West Gold Project: 1997 - 2001 data report. Hubert and Associates Ltd., December 2001.

Hubert 2007. Overview Environmental Program 1995 – 2002, Meliadine West Gold Project. Hubert and Associates Ltd., April 2007.

Ingersoll, L.R.; Zobel, O.J.; Ingersoll, A.C. 1954. Heat Conduction with Engineering, Geological and other Applications. Madison, WI: The University of Wisconsin, Press.

Intergovernmental Panel on Climate Change (IPCC) 2007. Climate Change 2007: Woring Group I: The Physical Science Basis. IPCC Fourth Assessment Report.

Johansen, O., 1975. Thermal Conductivity of Soils. Ph.D. thesis. Trondheim, Norway. (CRREL Draft Translation 637, 1977), ADA044002.

Kidd, K.A., R.H. Hesslein, B.J. Ross, K. Koczanski, G.R. Stephens, and D.C.G. Muir. 1998. Bioaccumulation of organochlorines through a remote freshwater food web in the Canadian Arctic. Environmental Pollution (IN PRESS).

Lachenbruch, A.H. 1957. Three-Dimensional Heat Conduction in Permafrost Beneath Heated Buildings. Geological Survey Bulletin 1052-B, United States Government Printing Office, Washington: 1957.

Mackay, J.R. 1962. Pingos of the Pleistocene Mackenzie Delta Area. Geographical Bulletin, 18: 21-63.

National Research Council Canada 1979, Guide to a Field Description of Permafrost for Engineering Purposes. Associate Committee on Soil and Snow Mechanics, Technical Memorandum, Prepared by Pihlainen and Johnston, Ottawa.

R.L. &L. 1999. 1998 Data Report: Meliadine West Baseline Aquatic Studies. R.L. &L Environmental Services Ltd., February 1999.

Smith, M.W. 1976. Permafrost in the Mackenzie Delta, Northwest Territories. Geological Survey of Canada Paper, 75-28.

Snowden 2008. Comaplex Minerals Corp. report, Tiriganiaq Gold Deposit, Nunavut – Resource Update. January 2008.

SRK 2007. Winter 2007 Geotechnical Field Investigation at Meliadine West, Nunavut, Canada. SRK Consulting (Canada) Inc., October 2007.

USACE 2008. Coastal Engineering Manual, Meteorology and Wave Climate (Chapter 2). U.S. Army Corps of Engineers.

Williams, P.J. and Smith, M.W. 1989. The frozen earth, chapter 4: The ground thermal regime, Cambridge University Press [PDF]. Rykiel, E.J. 1996.

APPENDIX A

Tiriganiaq Thermistor Data

EBA Engineering Consultants Ltd.

THERMISTOR STRING CALIBRATION

Project: Mediadine West
Client:
Date: 07-04-19
Job No.: E12101017

EBA Thermistor String #: 1993
Client String number:
Location of Installation:
Calibration Temperature: 0.02

	Depth of Thermistor ☐ feet ■ meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms)			Temperature (deg C)	Calibration Factor (add deg C)
				Trial 1	Trial 2	Trial 3		
1	0.1	Black	A	16.41	16.42	16.42	-0.12	0.14
2	0.5	Purple	B	16.32	16.33	16.33	-0.01	0.03
3	1.0	Tan	C	16.31	16.32	16.32	0.00	0.02
4	1.5	Grey	D	16.31	16.31	16.31	0.02	0.00
5	2.5	Red	E	16.33	16.33	16.33	-0.01	0.03
6	4.0	Brown	F	16.31	16.31	16.31	0.02	0.00
7	6.0	Pink	G	16.31	16.31	16.31	0.02	0.00
8	8.5	Blue	H	16.31	16.31	16.31	0.02	0.00
9		Green	J					
10		Yellow	K					
11		Silver	L					
12		Orange	N					
13		Brown/White	P					
14		Black/White	R					
15		Orange/White	S					
16		Red/White	T					
	Common	White	M					

Lead Length: **1m**

Date Shipped:
Carrier:

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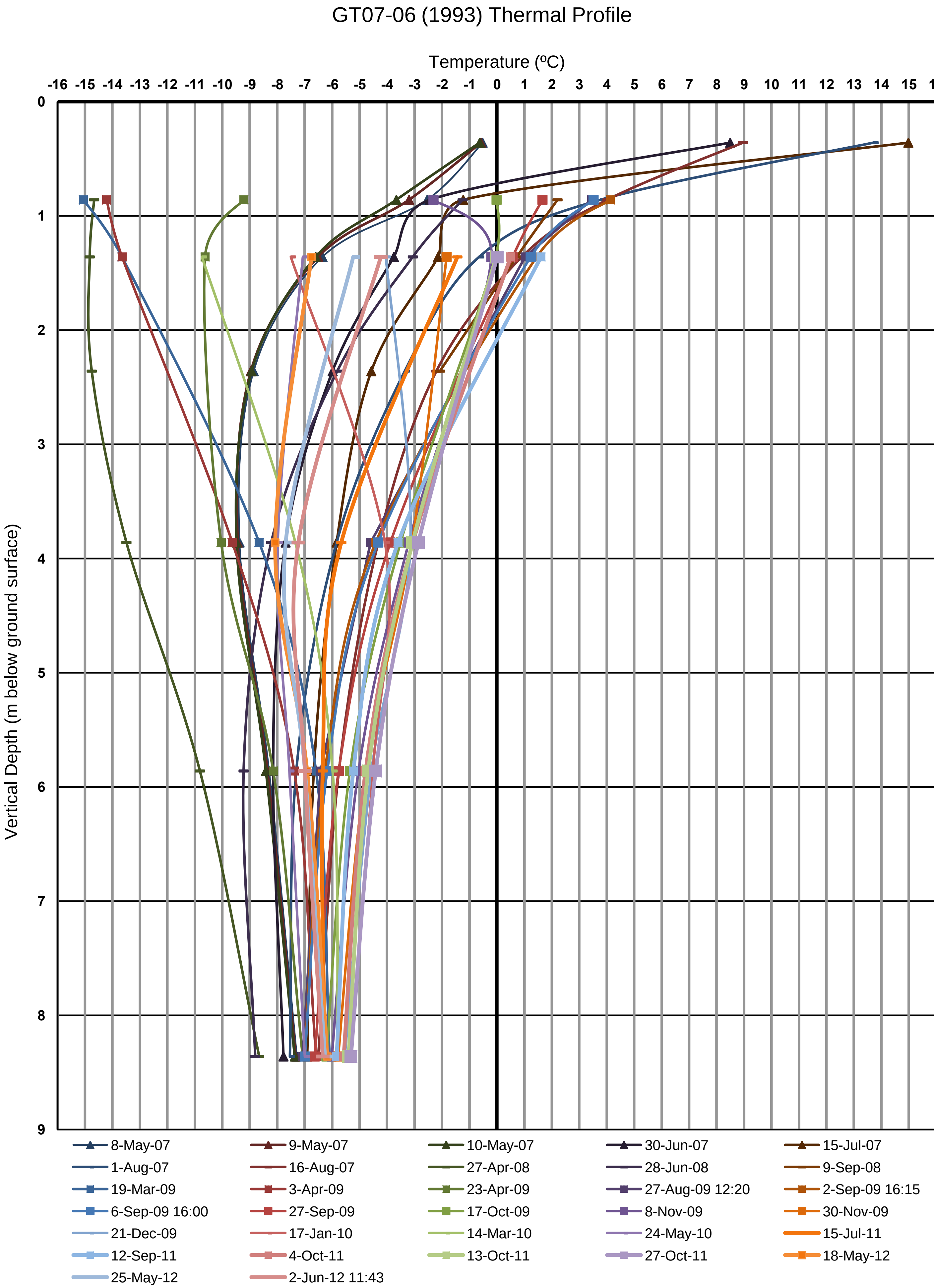
GT07-06 (1993) Thermal Profile
Temperature (ºC)
-16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
0 1 2 3 4 5 6 7 8 9
Vertical Depth (m below ground surface)
8-May-07
9-May-07
10-May-07
30-Jun-07
15-Jul-07
1-Aug-07
16-Aug-07
27-Apr-08
28-Jun-08
9-Sep-08
19-Mar-09
3-Apr-09
23-Apr-09
27-Aug-09 12:20
2-Sep-09 16:15
6-Sep-09 16:00
27-Sep-09
17-Oct-09
8-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
15-Jul-11
12-Sep-11
4-Oct-11
13-Oct-11
27-Oct-11
18-May-12
25-May-12
2-Jun-12 11:43

EBA Engineering Consultants Ltd.

THERMISTOR STRING CALIBRATION

Project: Mediadine West
Client:
Date: 07-04-19
Job No.: E12101017

EBA Thermistor String #: 1991
Client String number:
Location of Installation:
Calibration Temperature: 0.02

	Depth of Thermistor ☐ feet ■ meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms)			Temperature (deg C)	Calibration Factor (add deg C)
				Trial 1	Trial 2	Trial 3		
1	0.1	Black	A	16.32	16.33	16.33	-0.01	0.03
2	0.5	Purple	B	16.30	16.30	16.30	0.03	-0.01
3	1.0	Tan	C	16.33	16.34	16.34	-0.02	0.04
4	1.5	Grey	D	16.31	16.31	16.31	0.02	0.00
5	2.5	Red	E	16.34	16.35	16.35	-0.03	0.05
6	4.0	Brown	F	16.29	16.30	16.30	0.03	-0.01
7	6.0	Pink	G	16.31	16.31	16.31	0.02	0.00
8	8.5	Blue	H	16.32	16.32	16.32	0.00	0.02
9		Green	J					
10		Yellow	K					
11		Silver	L					
12		Orange	N					
13		Brown/White	P					
14		Black/White	R					
15		Orange/White	S					
16		Red/White	T					
	Common	White	M					

Lead Length: **1m**

Date Shipped:
Carrier:

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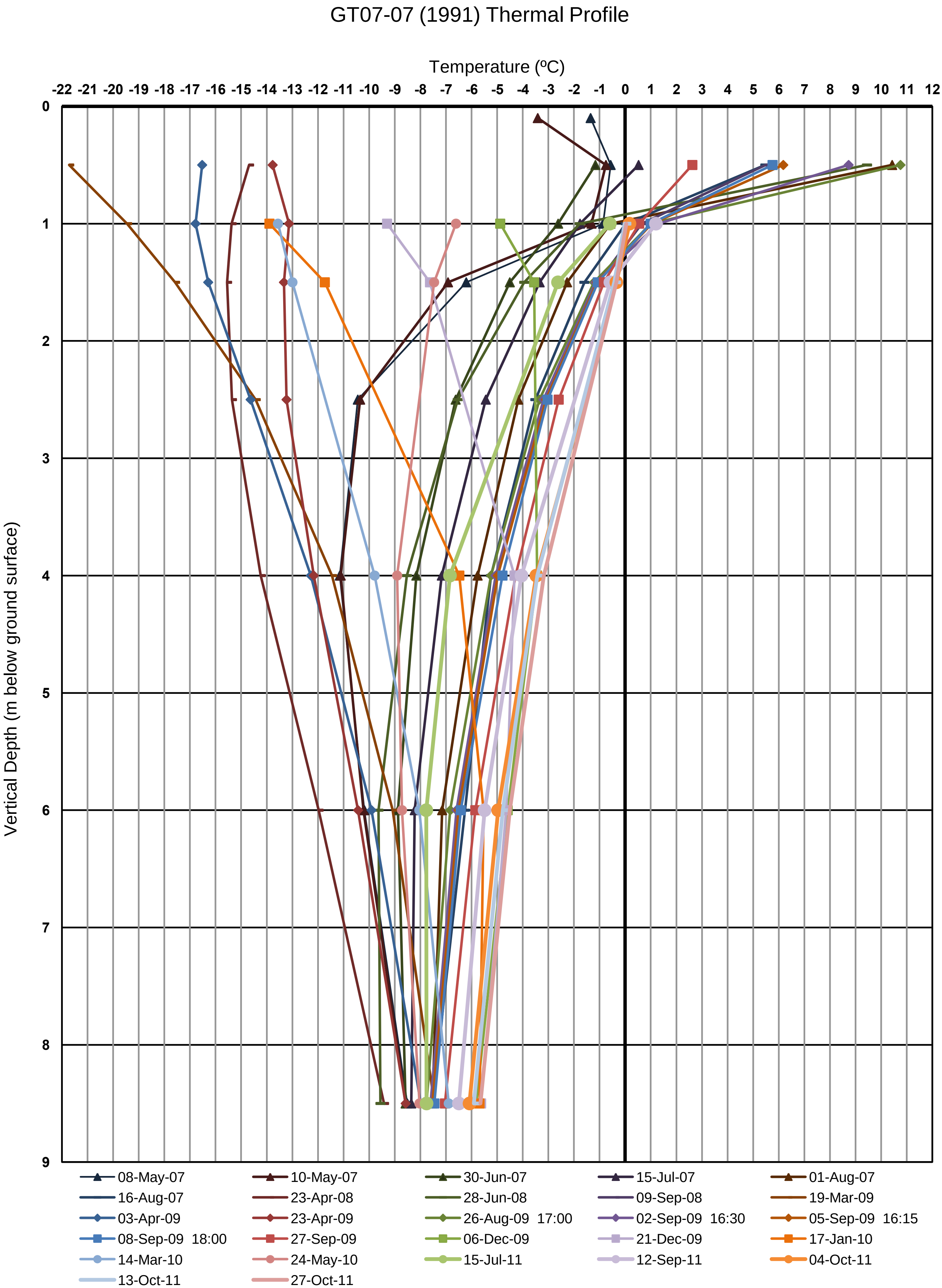

GT07-07 (1991) Thermal Profile
Temperature (ºC)
-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12
0 1 2 3 4 5 6 7 8 9
Vertical Depth (m below ground surface)
08-May-07
10-May-07
30-Jun-07
15-Jul-07
01-Aug-07
16-Aug-07
23-Apr-08
28-Jun-08
09-Sep-08
19-Mar-09
03-Apr-09
23-Apr-09
26-Aug-09 17:00
02-Sep-09 16:30
05-Sep-09 16:15
08-Sep-09 18:00
27-Sep-09
06-Dec-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
15-Jul-11
12-Sep-11
04-Oct-11
13-Oct-11
27-Oct-11

EBA Engineering Consultants Ltd.

THERMISTOR STRING CALIBRATION

Project: Mediadine West
Client:
Date: 07-04-19
Job No.: E12101017

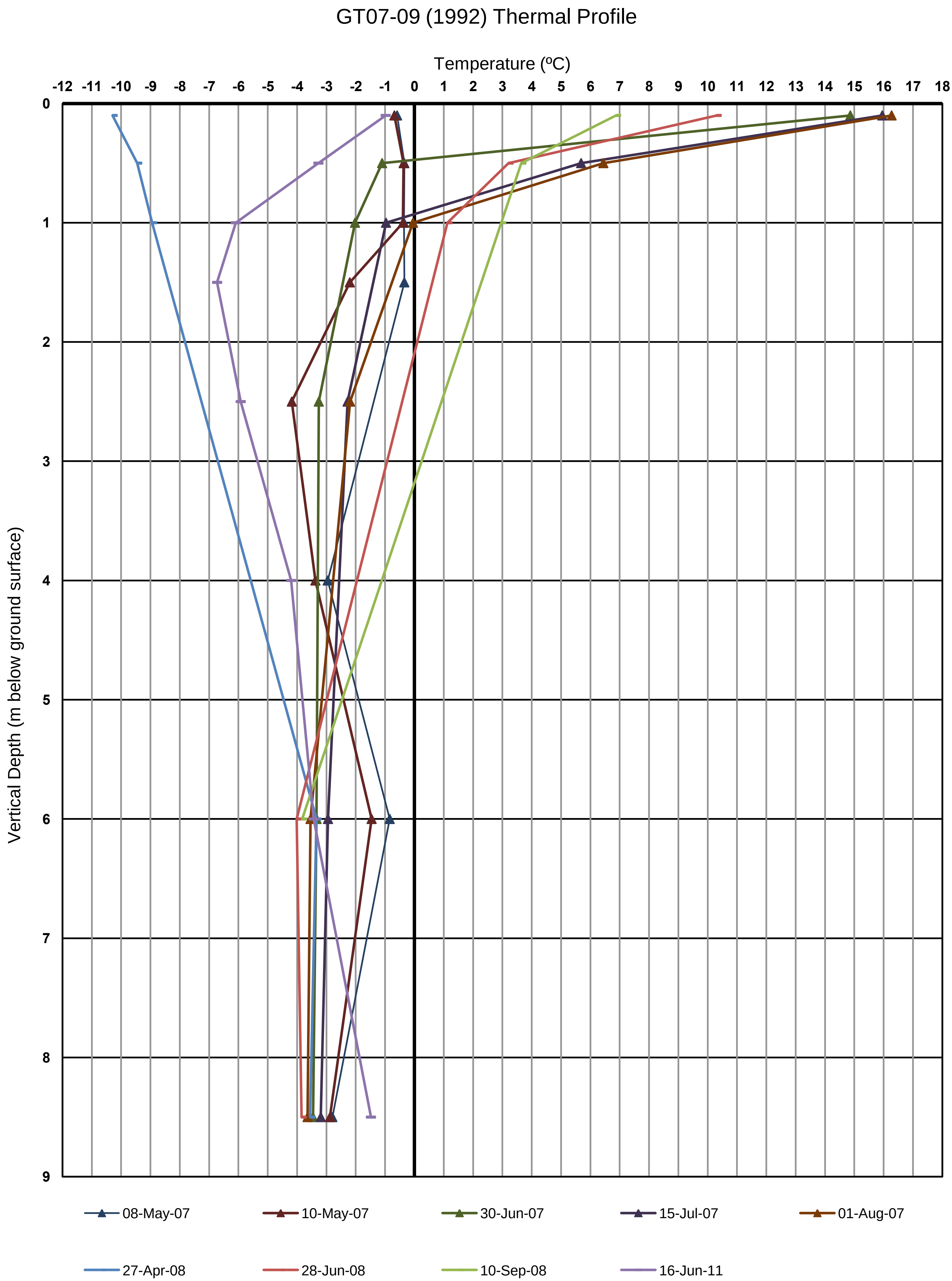
EBA Thermistor String #: 1992
Client String number:
Location of Installation:
Calibration Temperature: 0.02

	Depth of Thermistor ☐ feet ■ meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms)			Temperature (deg C)	Calibration Factor (add deg C)
				Trial 1	Trial 2	Trial 3		
1	0.1	Black	A	16.32	16.32	16.32	0.00	0.02
2	0.5	Purple	B	16.34	16.35	16.35	-0.03	0.05
3	1.0	Tan	C	16.31	16.31	16.31	0.02	0.00
4	1.5	Grey	D	16.33	16.33	16.33	-0.01	0.03
5	2.5	Red	E	16.31	16.31	16.31	0.02	0.00
6	4.0	Brown	F	16.33	16.33	16.33	-0.01	0.03
7	6.0	Pink	G	16.33	16.33	16.33	-0.01	0.03
8	8.5	Blue	H	16.31	16.31	16.31	0.02	0.00
9		Green	J					
10		Yellow	K					
11		Silver	L					
12		Orange	N					
13		Brown/White	P					
14		Black/White	R					
15		Orange/White	S					
16		Red/White	T					
	Common	White	M					

Lead Length: **1m**

Date Shipped:
Carrier:

eba


GT07-09 (1992) Thermal Profile
Temperature (ºC)
-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 13 14 15 16 17 18
0 1 2 3 4 5 6 7 8 9
Vertical Depth (m below ground surface)
08-May-07
10-May-07
30-Jun-07
15-Jul-07
01-Aug-07
27-Apr-08
28-Jun-08
10-Sep-08
16-Jun-11

EBA Engineering Consultants Ltd.

THERMISTOR STRING CALIBRATION

Project: Mediadine West
Client:
Date: 07-04-19
Job No.: E12101017

EBA Thermistor String #: 1995
Client String number:
Location of Installation:
Calibration Temperature: 0.02

	Depth of Thermistor ☐ feet ■ meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms)			Temperature (deg C)	Calibration Factor (add deg C)
				Trial 1	Trial 2	Trial 3		
1	0.1	Black	A	16.34	16.34	16.34	-0.02	0.04
2	0.5	Purple	B	16.31	16.31	16.31	0.02	0.00
3	1.0	Tan	C	16.32	16.32	16.32	0.00	0.02
4	1.5	Grey	D	16.32	16.32	16.32	0.00	0.02
5	2.5	Red	E	16.31	16.31	16.31	0.02	0.00
6	4.0	Brown	F	16.32	16.32	16.32	0.00	0.02
7	6.0	Pink	G	16.32	16.32	16.32	0.00	0.02
8	8.5	Blue	H	16.30	16.31	16.31	0.02	0.00
9	14.0	Green	J	16.30	16.30	16.30	0.03	-0.01
10	24.0	Yellow	K	16.32	16.32	16.32	0.00	0.02
11	34.0	Silver	L	16.32	16.32	16.32	0.00	0.02
12	44.0	Orange	N	16.31	16.32	16.32	0.00	0.02
13		Brown/White	P					
14		Black/White	R					
15		Orange/White	S					
16		Red/White	T					
	Common	White	M					

Lead Length: **1m**

Date Shipped:
Carrier:

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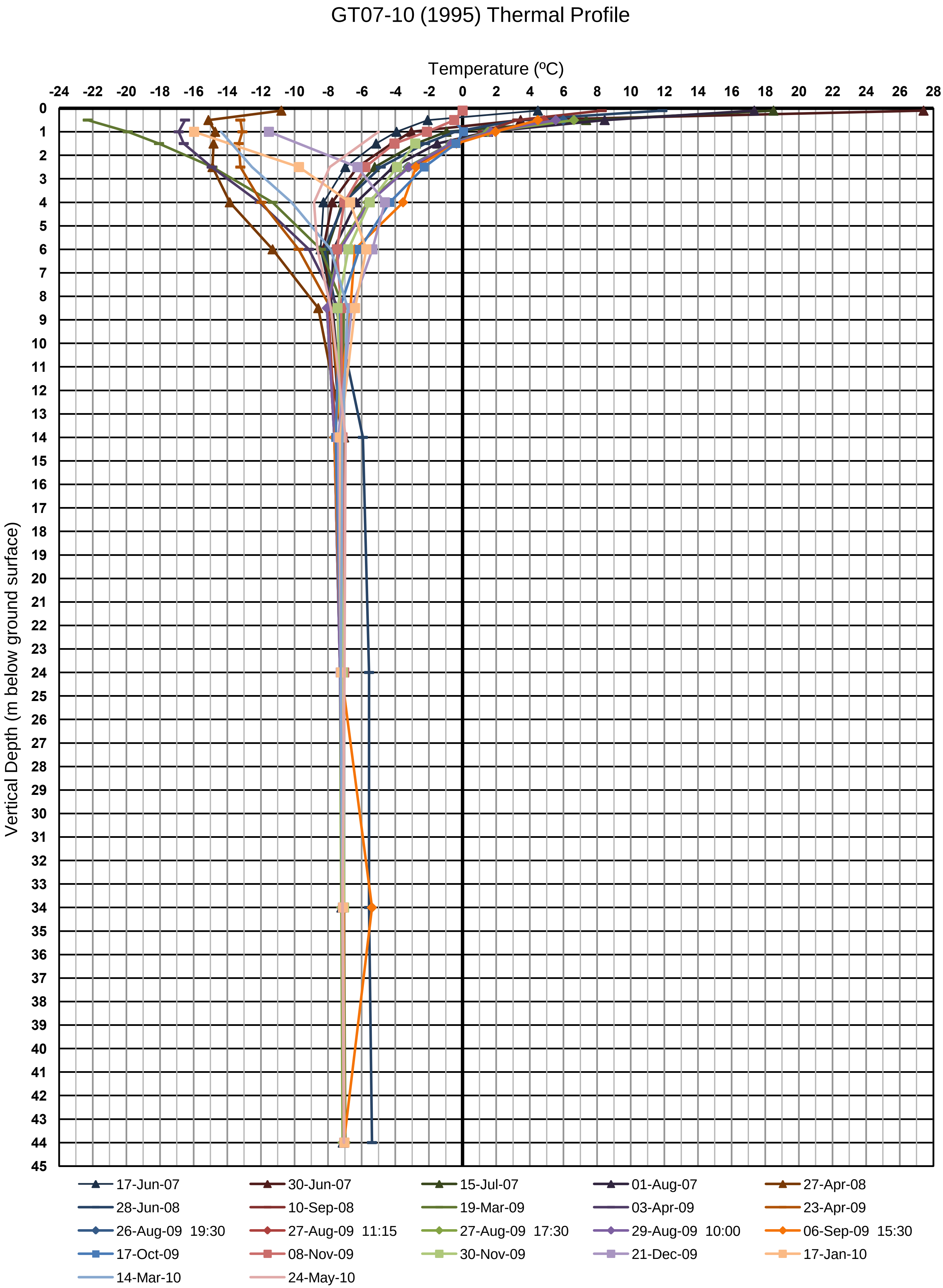

GT07-10 (1995) Thermal Profile
Temperature (ºC)
-24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45
17-Jun-07
30-Jun-07
15-Jul-07
01-Aug-07
27-Apr-08
28-Jun-08
10-Sep-08
19-Mar-09
03-Apr-09
23-Apr-09
26-Aug-09 19:30
27-Aug-09 11:15
27-Aug-09 17:30
29-Aug-09 10:00
06-Sep-09 15:30
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10

EBA Engineering Consultants Ltd.

THERMISTOR STRING CALIBRATION

Project: Mediadine West
Client:
Date: 07-04-19
Job No.: E12101017

EBA Thermistor String #: 1994
Client String number:
Location of Installation:
Calibration Temperature: 0.02

	Depth of Thermistor ☐ feet ■ meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms)			Temperature (deg C)	Calibration Factor (add deg C)
				Trial 1	Trial 2	Trial 3		
1	0.1	Black	A	16.31	16.32	16.32	0.00	0.02
2	0.5	Purple	B	16.32	16.32	16.32	0.00	0.02
3	1.0	Tan	C	16.30	16.30	16.30	0.03	-0.01
4	1.5	Grey	D	16.31	16.31	16.31	0.02	0.00
5	2.5	Red	E	16.33	16.33	16.33	-0.01	0.03
6	4.0	Brown	F	16.30	16.30	16.30	0.03	-0.01
7	6.0	Pink	G	16.33	16.33	16.33	-0.01	0.03
8	8.5	Blue	H	16.32	16.32	16.32	0.00	0.02
9	14.0	Green	J	16.31	16.31	16.31	0.02	0.00
10	24.0	Yellow	K	16.32	16.32	16.32	0.00	0.02
11	34.0	Silver	L	16.32	16.32	16.32	0.00	0.02
12	44.0	Orange	N	16.32	16.32	16.32	0.00	0.02
13		Brown/White	P					
14		Black/White	R					
15		Orange/White	S					
16		Red/White	T					
	Common	White	M					

Lead Length: **1m**

Date Shipped:
Carrier:

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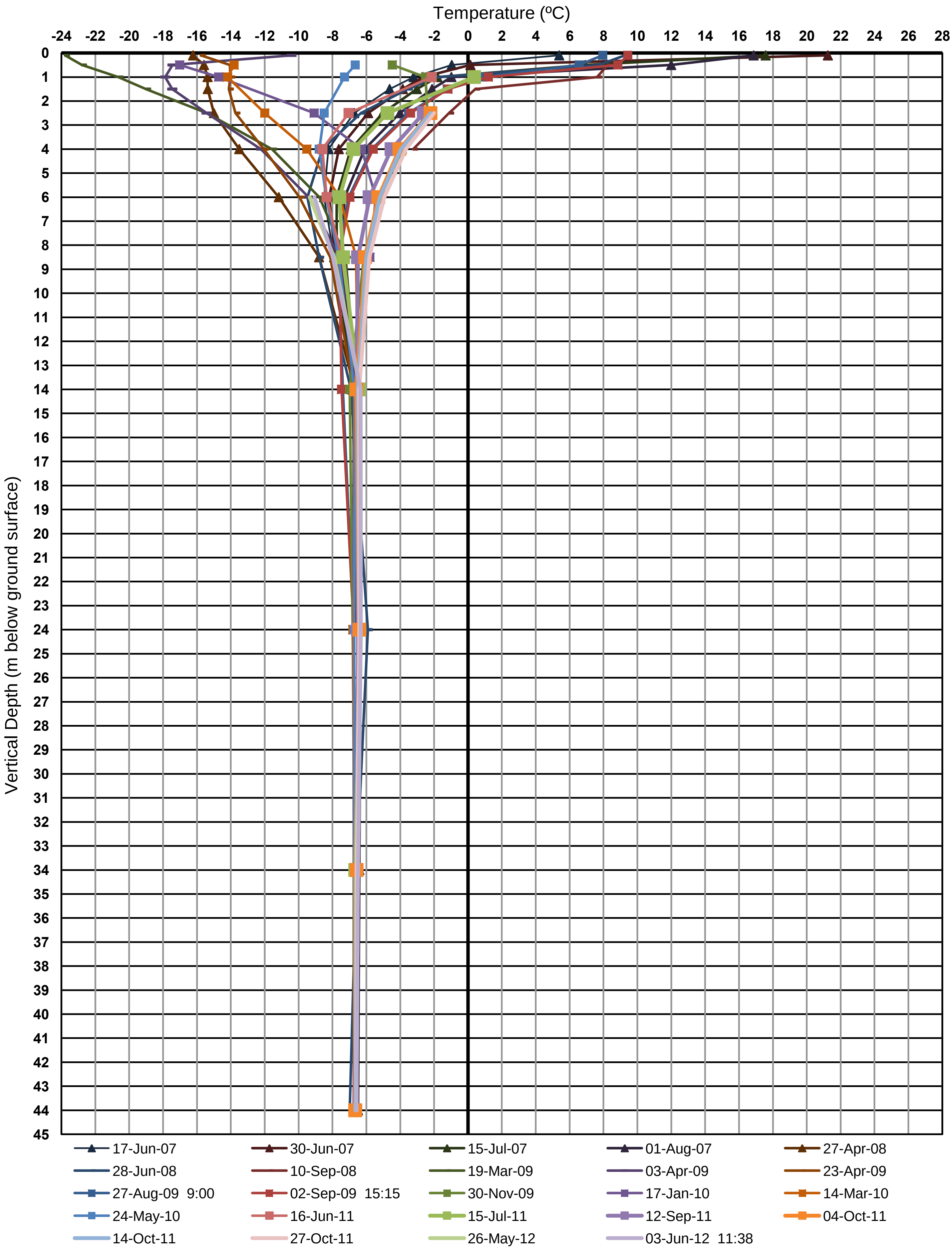
GT07-11 (1994) Thermal Profile



M-Squared Instruments
144 West Terrace Cres.
Cochrane, AB. T4C-1R3
Ph. 403-560-7079
msquared.instruments@gmail.com

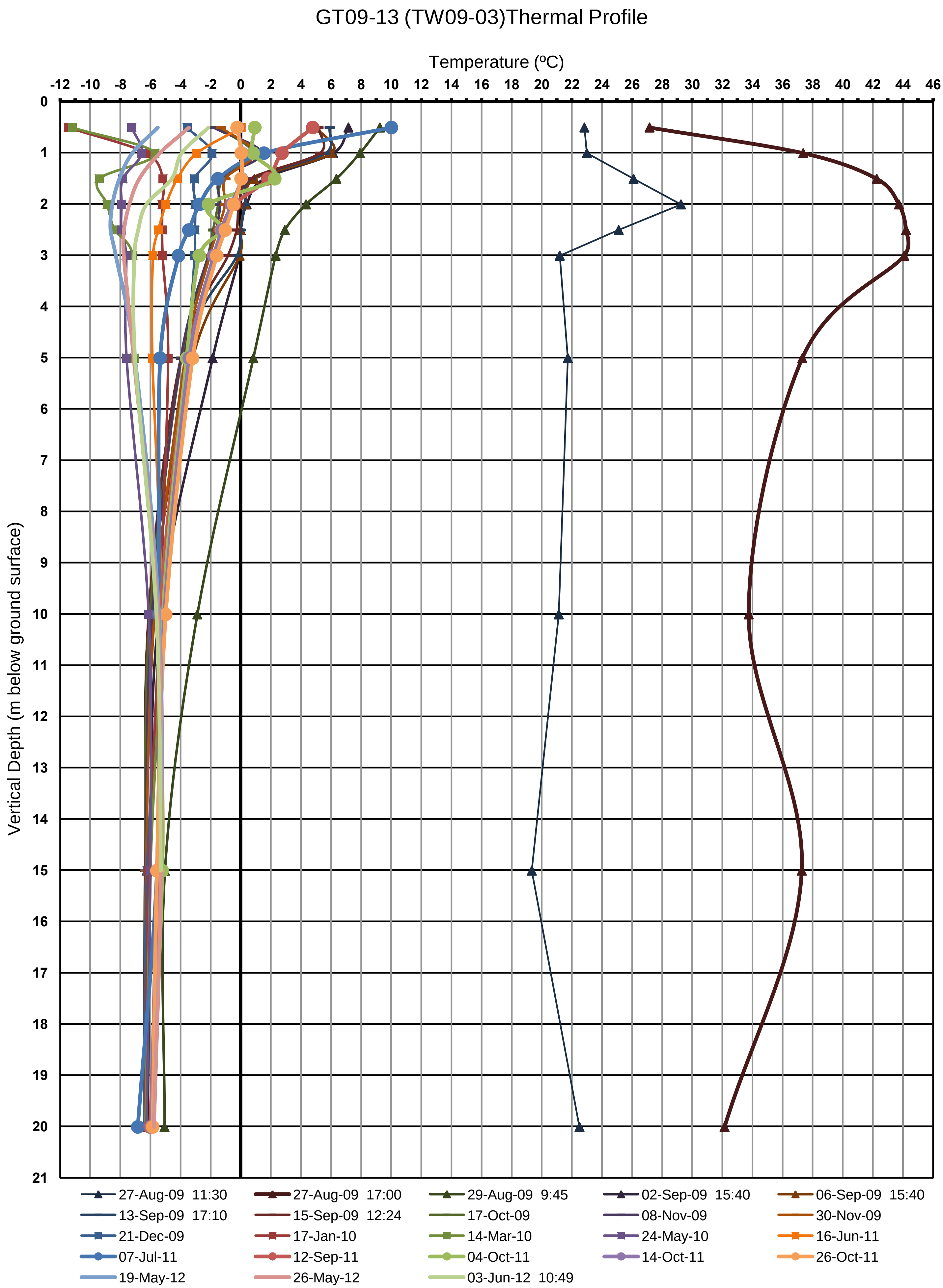
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3500

Serial No.: TW09-03
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.36
	WH		M	
2	BK	1.00	B	16.32
	WH		M	
3	BU	1.50	C	16.32
	WH		M	
4	GN	2.00	D	16.3
	WH		M	
5	RD	2.50	E	16.31
	WH		M	
6	GY	3.00	F	16.32
	WH		M	
7	BN	5.00	G	16.33
	WH		M	
8	PK	10.00	H	16.31
	WH		M	
9	OR	15.00	J	16.34
	WH		M	
10	PU	20.00	K	16.33
	WH		M	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Temperature (ºC)
-12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
27-Aug-09 11:30
27-Aug-09 17:00
29-Aug-09 9:45
02-Sep-09 15:40
06-Sep-09 15:40
13-Sep-09 17:10
15-Sep-09 12:24
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
12-Sep-11
04-Oct-11
14-Oct-11
26-Oct-11
19-May-12
26-May-12
03-Jun-12 10:49

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3610

Serial No.: TW09-05
Total Length (m.): 26.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.33
	WH		M	
2	BK	1.00	B	16.38
	WH		M	
3	BU	1.50	C	16.3
	WH		M	
4	GN	2.00	D	16.32
	WH		M	
5	RD	2.50	E	16.3
	WH		M	
6	GY	3.00	F	16.32
	WH		M	
7	BN	5.00	G	16.33
	WH		M	
8	PK	10.00	H	16.29
	WH		M	
9	OR	15.00	J	16.29
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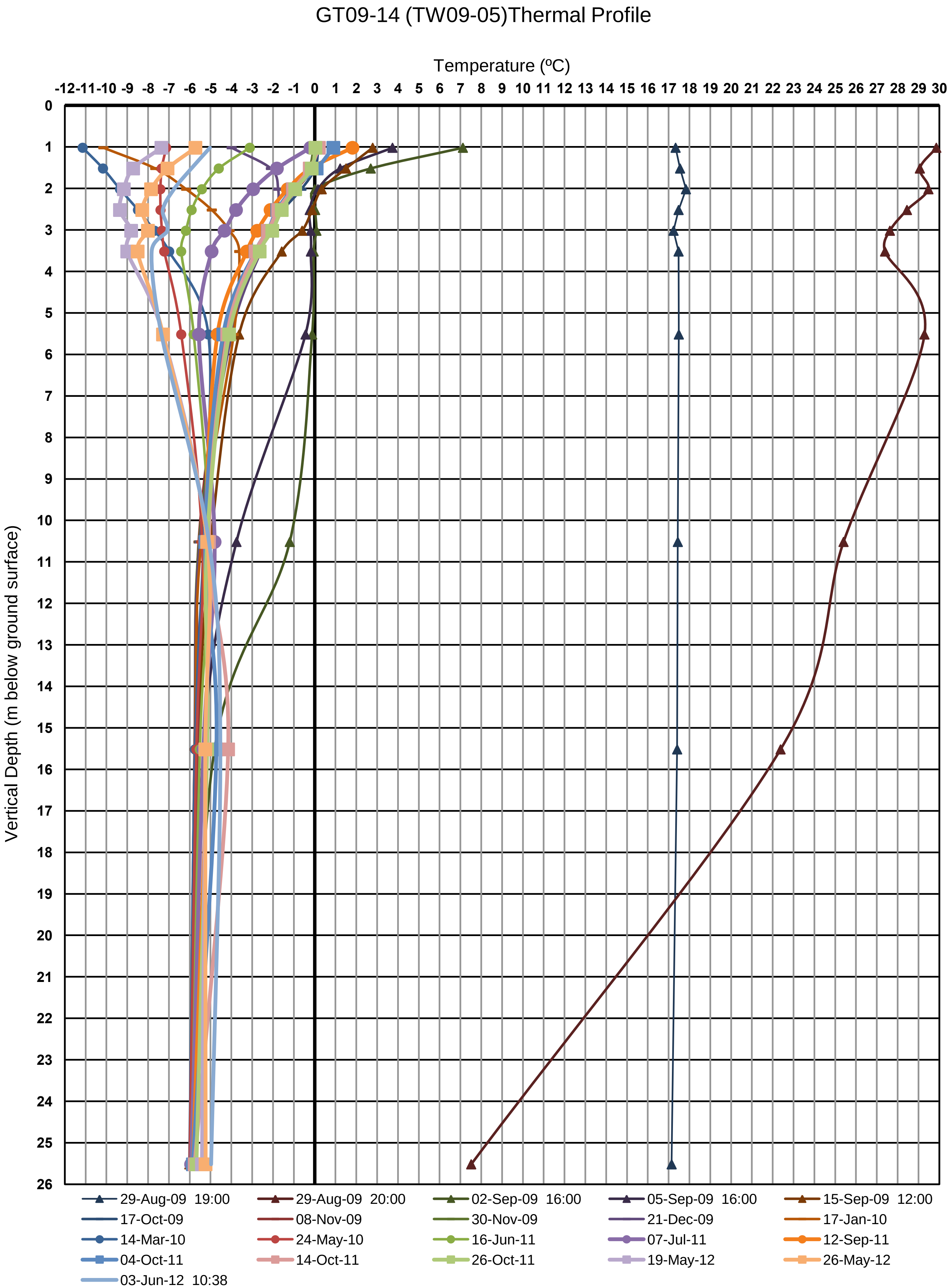
10	PU	25.00	K	16.3
	WH		M	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Temperature (ºC)
-12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
29-Aug-09 19:00
29-Aug-09 20:00
02-Sep-09 16:00
05-Sep-09 16:00
15-Sep-09 12:00
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
12-Sep-11
04-Oct-11
14-Oct-11
26-Oct-11
19-May-12
26-May-12
03-Jun-12 10:38

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

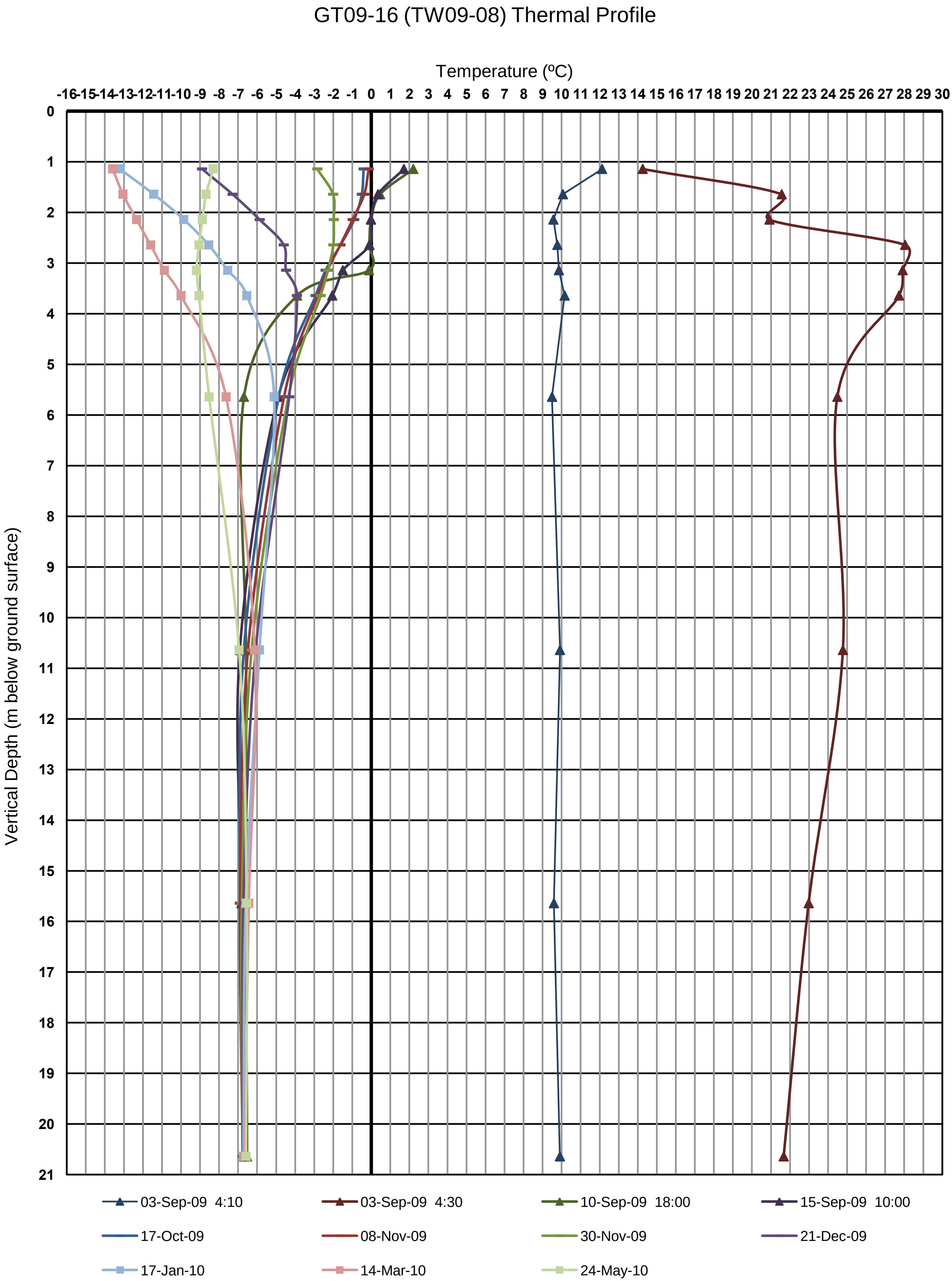
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3620

Serial No.: TW09-08
Total Length (m.): 21.5
Lead Length(m.): 1.5 Shielded No
Termination: MS3106E20-29P Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.31
	WH		M	
2	BK	1.00	B	16.31
	WH		M	
3	BU	1.50	C	16.32
	WH		M	
4	GN	2.00	D	16.32
	WH		M	
5	RD	2.50	E	16.34
	WH		M	
6	GY	3.00	F	16.32
	WH		M	
7	BN	5.00	G	16.32
	WH		M	
8	PK	10.00	H	16.33
	WH		M	
9	OR	15.00	J	16.34
	WH		M	
10	PU	20.00	K	16.3
	WH		M	



GT09-16 (TW09-08) Thermal Profile
Temperature (ºC)
-16 -15 -14 -13 -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 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
03-Sep-09 4:10
03-Sep-09 4:30
10-Sep-09 18:00
15-Sep-09 10:00
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

Thermistor Cable Data Sheet

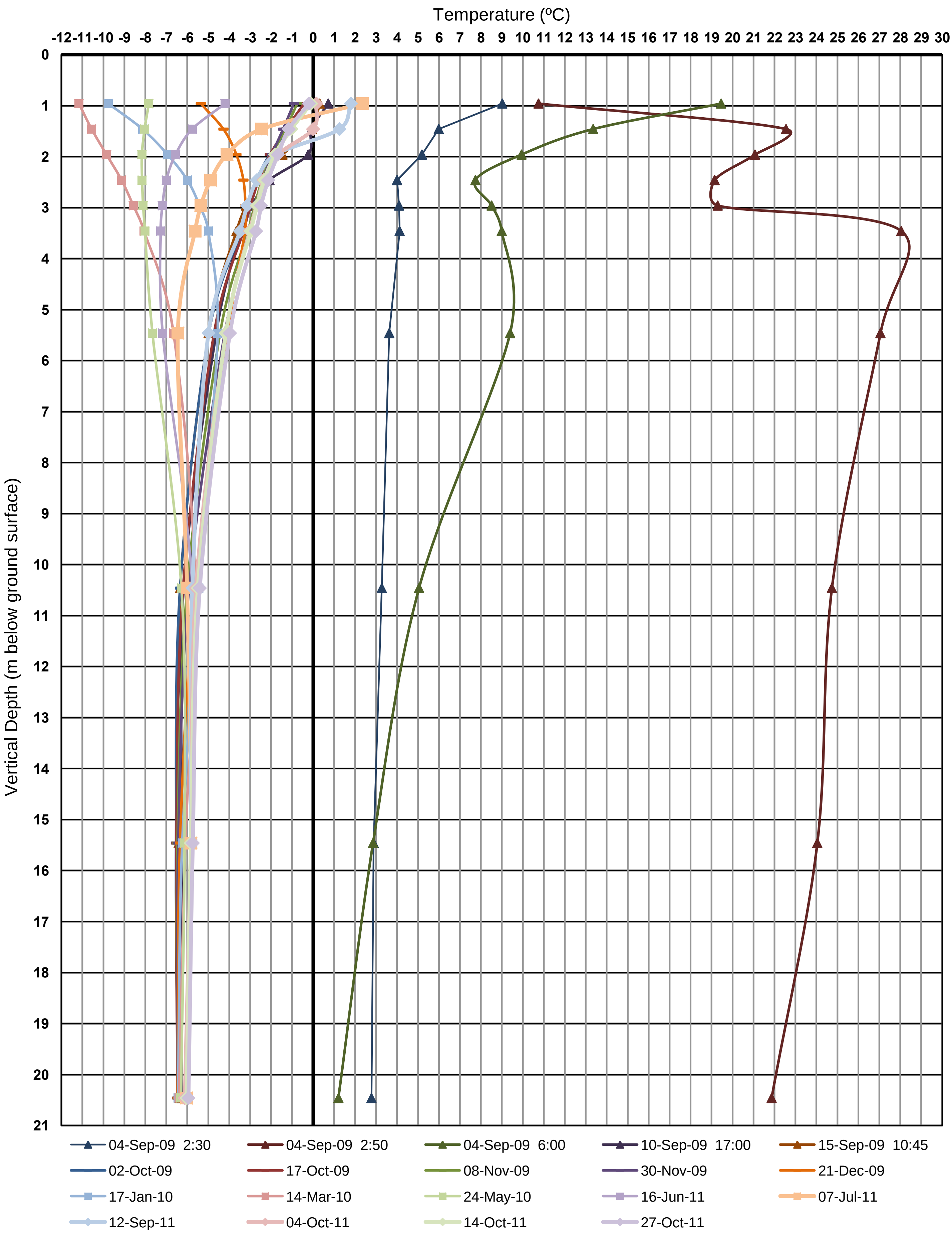
Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3620

Serial No.: TW09-07
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.31
	WH		M	
2	BK	1.00	B	16.31
	WH		M	
3	BU	1.50	C	16.35
	WH		M	
4	GN	2.00	D	16.32
	WH		M	
5	RD	2.50	E	16.3
	WH		M	
6	GY	3.00	F	16.32
	WH		M	
7	BN	5.00	G	16.36
	WH		M	
8	PK	10.00	H	16.3
	WH		M	
9	OR	15.00	J	16.35
	WH		M	
10	PU	20.00	K	16.32
	WH		M	

GT09-17 (TW09-07)Thermal Profile



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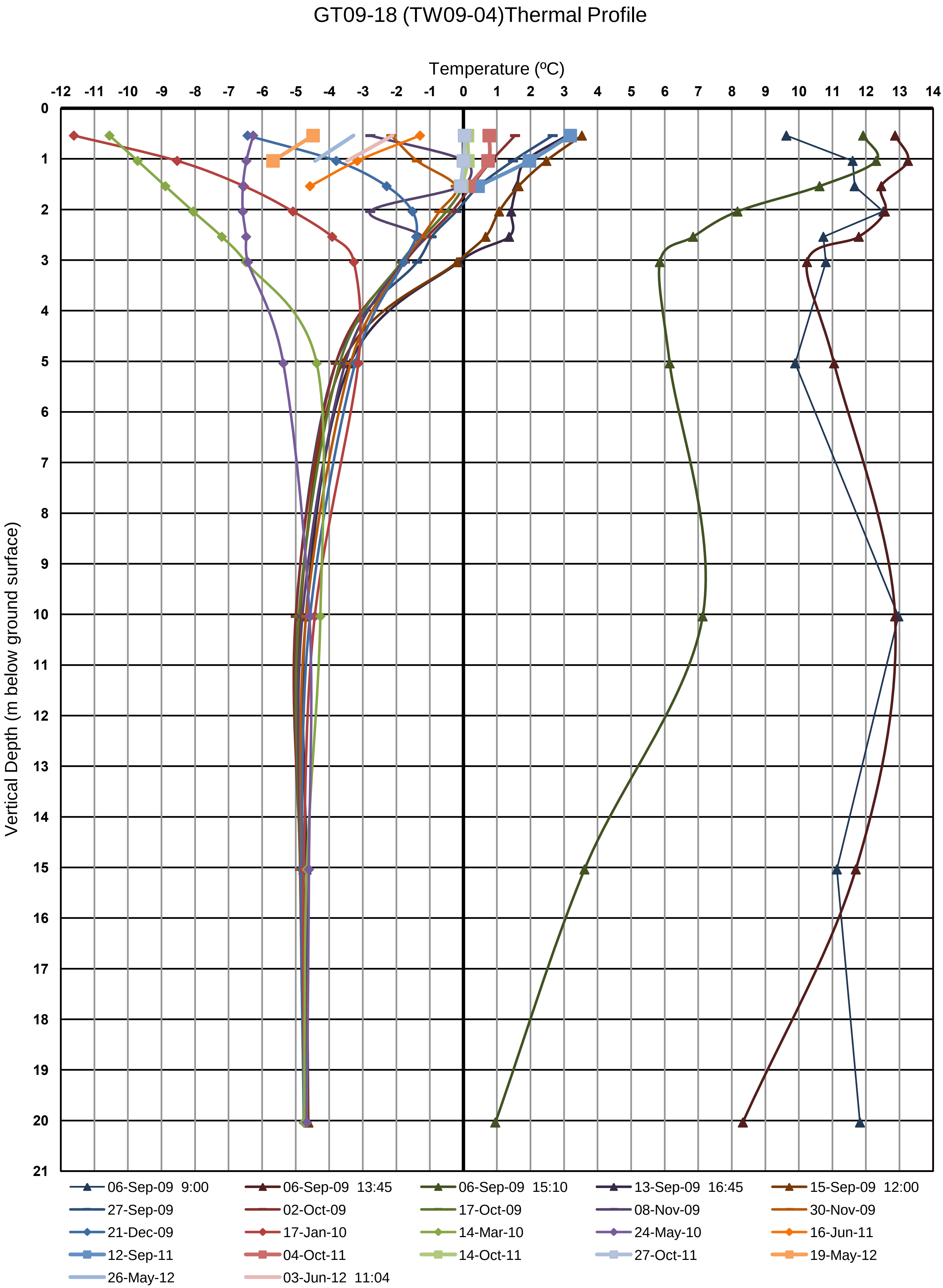
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3500

Serial No.: TW09-04
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.33
	WH		M	
2	BK	1.00	B	16.3
	WH		M	
3	BU	1.50	C	16.33
	WH		M	
4	GN	2.00	D	16.3
	WH		M	
5	RD	2.50	E	16.28
	WH		M	
6	GY	3.00	F	16.34
	WH		M	
7	BN	5.00	G	16.29
	WH		M	
8	PK	10.00	H	16.31
	WH		M	
9	OR	15.00	J	16.32
	WH		M	
10	PU	20.00	K	16.29
	WH		M	



GT09-18 (TW09-04)Thermal Profile
Temperature (ºC)
-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 13 14
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
06-Sep-09 9:00
06-Sep-09 13:45
06-Sep-09 15:10
13-Sep-09 16:45
15-Sep-09 12:00
27-Sep-09
02-Oct-09
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
12-Sep-11
04-Oct-11
14-Oct-11
27-Oct-11
19-May-12
26-May-12
03-Jun-12 11:04

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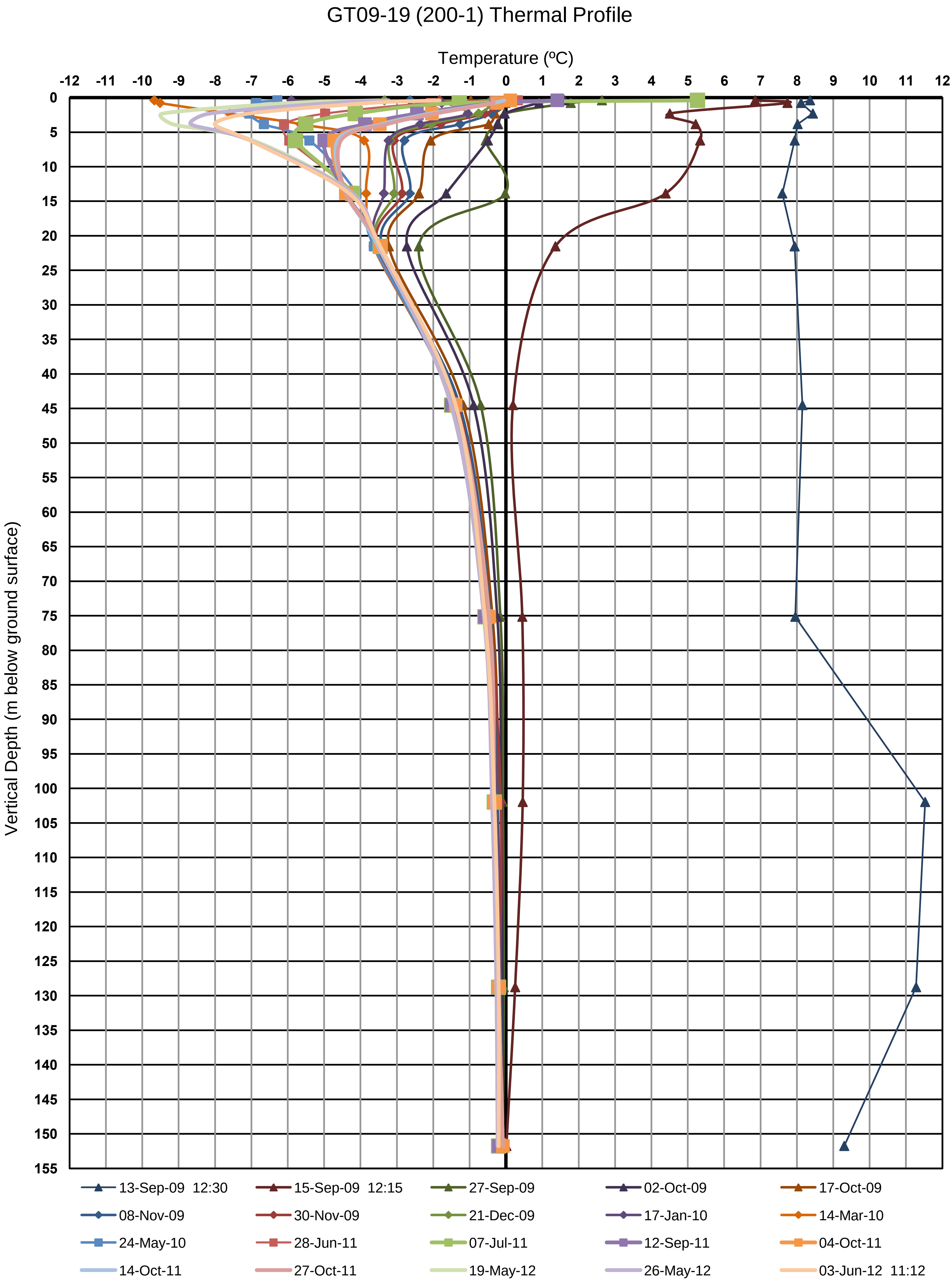
Thermistor Cable Data Sheet

Customer: Golder Associates
Vancouver, BC
Contact: Cameron Clayton
Project:
Date Ordered: Aug. 21, 2009
Purchase Order No.:

Serial No.: 200-1
Total Length (m.): 201.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 12

Number of Cables in Order: 1

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.3
	WH		M	
2	BK	1.00	B	16.3
	WH		M	
3	BU	3.00	C	16.3
	WH		M	
4	GN	5.00	D	16.3
	WH		M	
5	RD	10.00	E	16.28
	WH		M	
6	GY	20.00	F	16.32
	WH		M	
7	BN	30.00	G	16.31
	WH		M	
8	PK	60.00	H	16.3
	WH		M	
9	OR	100.00	J	16.31
	WH		M	
10	PU	135.00	K	16.33
	WH		M	
11	TN	170.00	L	16.32
	WH		M	
12	OR	200.00	N	16.32
	PU		M	


GT09-19 (200-1) Thermal Profile
Temperature (ºC)
-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
Vertical Depth (m below ground surface)
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155
13-Sep-09 12:30
15-Sep-09 12:15
27-Sep-09
02-Oct-09
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
28-Jun-11
07-Jul-11
12-Sep-11
04-Oct-11
14-Oct-11
27-Oct-11
19-May-12
26-May-12
03-Jun-12 11:12

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144 West Terrace Cres.
Cochrane, AB. T4C-1R3

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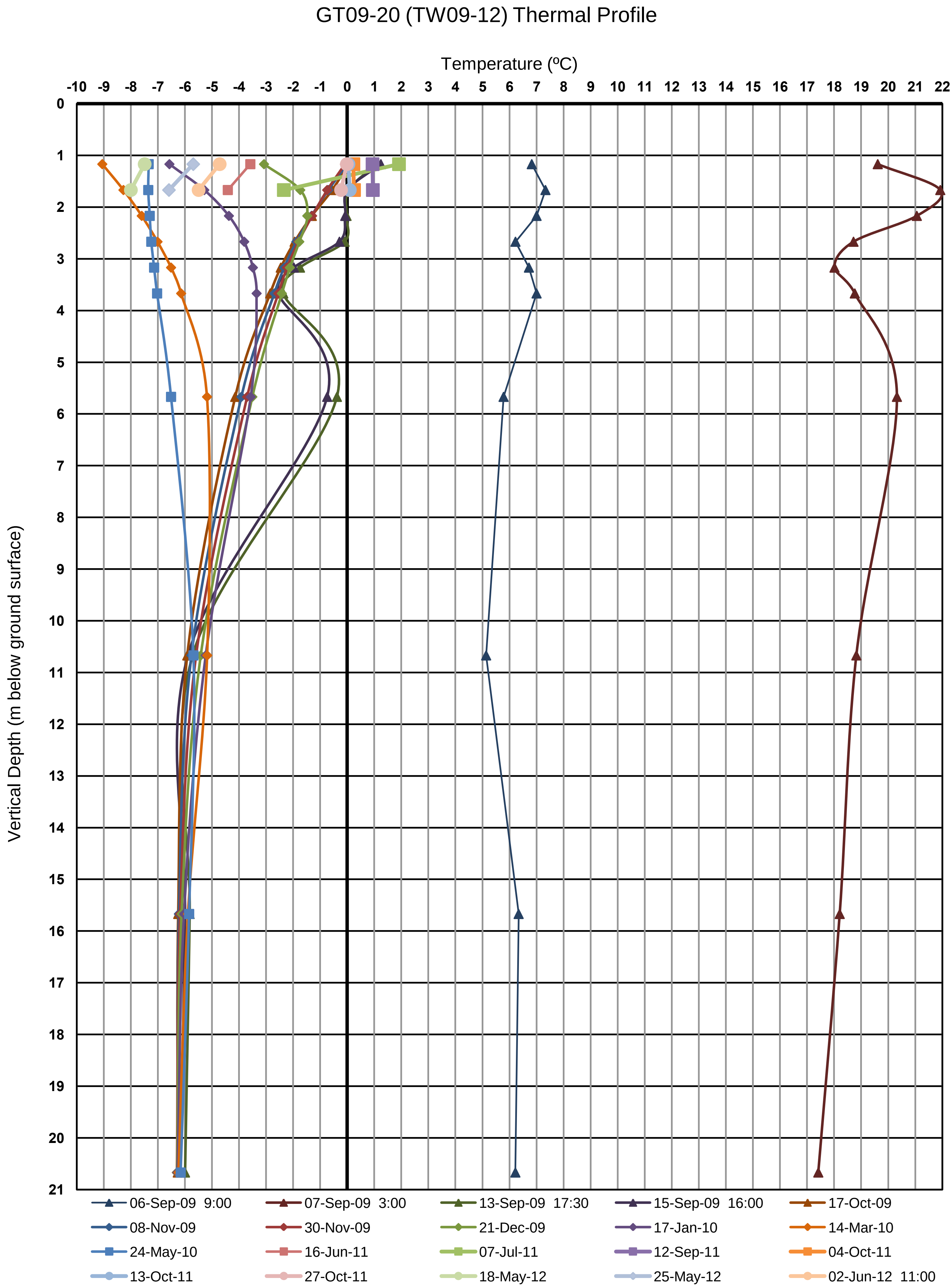
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3400

Serial No.: TW09-12
Total Length (m.): 21.5
Lead Length(m.): 1.5 Shielded No
Termination: MS3106E20-29P Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.29
	WH		M	
2	BK	1.00	B	16.31
	WH		M	
3	BU	1.50	C	16.29
	WH		M	
4	GN	2.00	D	16.28
	WH		M	
5	RD	2.50	E	16.32
	WH		M	
6	GY	3.00	F	16.32
	WH		M	
7	BN	5.00	G	16.32
	WH		M	
8	PK	10.00	H	16.34
	WH		M	
9	OR	15.00	J	16.32
	WH		M	
10	PU	20.00	K	16.32
	WH		M	



GT09-20 (TW09-12) Thermal Profile
Temperature (ºC)
-10 -9 -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 19 20 21 22
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Vertical Depth (m below ground surface)
06-Sep-09 9:00
07-Sep-09 3:00
13-Sep-09 17:30
15-Sep-09 16:00
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
12-Sep-11
04-Oct-11
13-Oct-11
27-Oct-11
18-May-12
25-May-12
02-Jun-12 11:00

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144 West Terrace Cres.
Cochrane, AB. T4C-1R3

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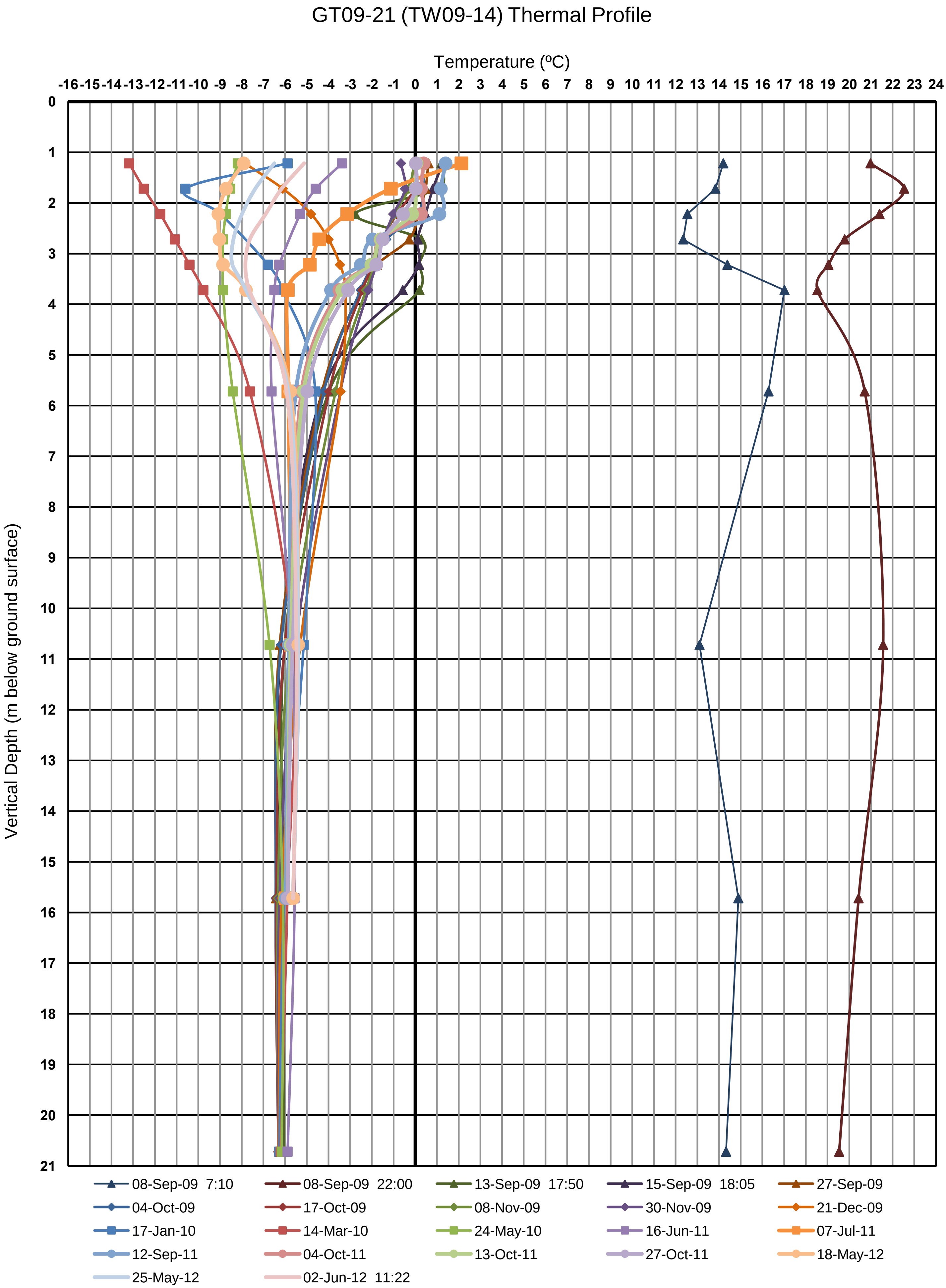
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3400

Serial No.: TW09-14
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.32
	WH		M	
2	BK	1.00	B	16.32
	WH		M	
3	BU	1.50	C	16.32
	WH		M	
4	GN	2.00	D	16.32
	WH		M	
5	RD	2.50	E	16.3
	WH		M	
6	GY	3.00	F	16.32
	WH		M	
7	BN	5.00	G	16.28
	WH		M	
8	PK	10.00	H	16.3
	WH		M	
9	OR	15.00	J	16.32
	WH		M	
10	PU	20.00	K	16.34
	WH		M	


GT09-21 (TW09-14) Thermal Profile
Temperature (ºC)
-16 -15 -14 -13 -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 13 14 15 16 17 18 19 20 21 22 23 24
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
08-Sep-09 7:10
08-Sep-09 22:00
13-Sep-09 17:50
15-Sep-09 18:05
27-Sep-09
04-Oct-09
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
12-Sep-11
04-Oct-11
13-Oct-11
27-Oct-11
18-May-12
25-May-12
02-Jun-12 11:22

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

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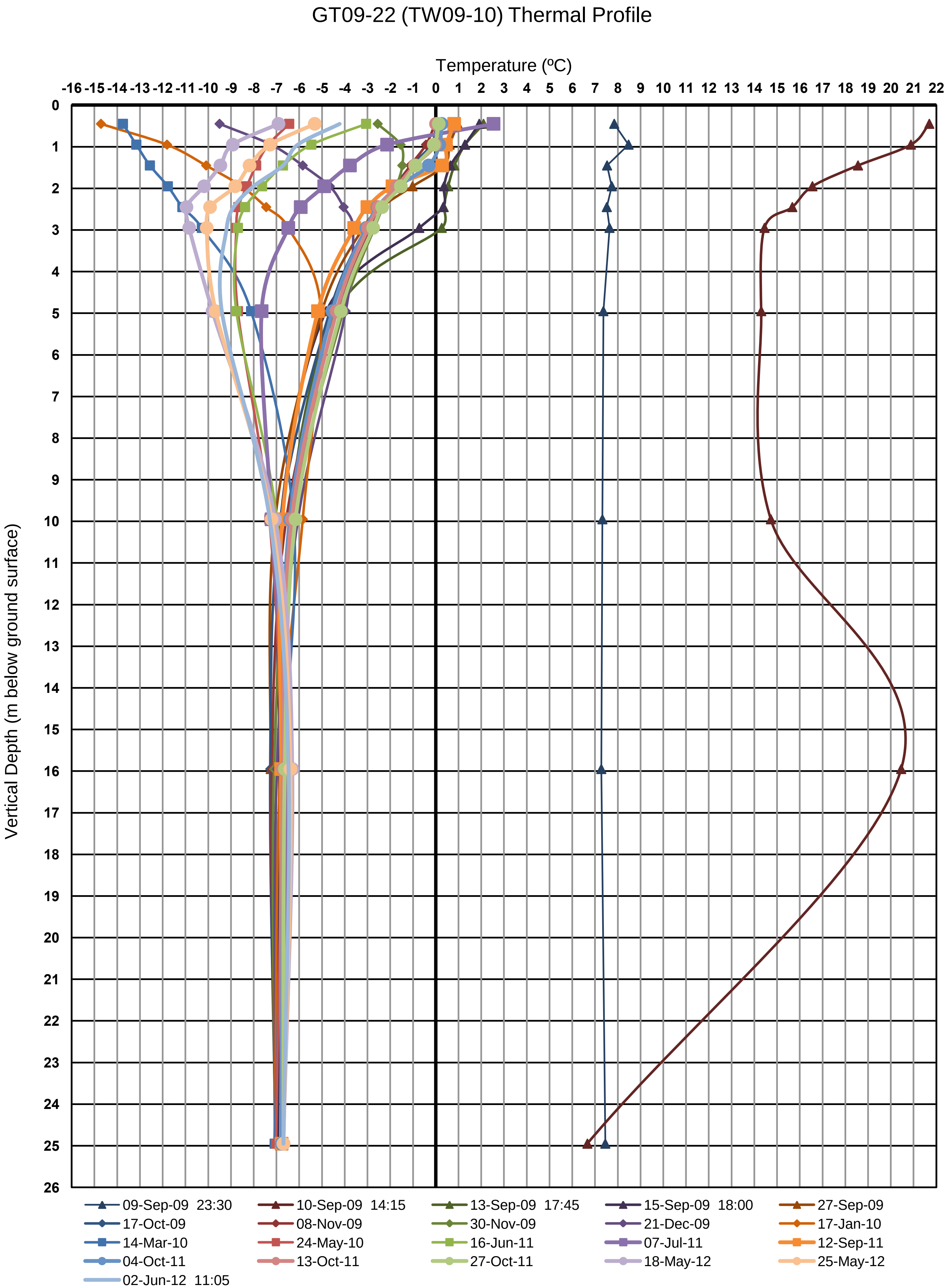
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3600

Serial No.: TW09-10
Total Length (m.): 26.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.31
	WH		M	
2	BK	1.00	B	16.33
	WH		M	
3	BU	1.50	C	16.34
	WH		M	
4	GN	2.00	D	16.36
	WH		M	
5	RD	2.50	E	16.3
	WH		M	
6	GY	3.00	F	16.4
	WH		M	
7	BN	5.00	G	16.28
	WH		M	
8	PK	10.00	H	16.32
	WH		M	
9	OR	15.00	J	16.34
	WH		M	
10	PU	25.00	K	16.29
	WH		M	


GT09-22 (TW09-10) Thermal Profile
Temperature (ºC)
Vertical Depth (m below ground surface)
09-Sep-09 23:30
10-Sep-09 14:15
13-Sep-09 17:45
15-Sep-09 18:00
27-Sep-09
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
12-Sep-11
04-Oct-11
13-Oct-11
27-Oct-11
18-May-12
25-May-12
02-Jun-12 11:05

M-Squared Instruments
144 West Terrace Cres.
Cochrane, AB. T4C-1R3
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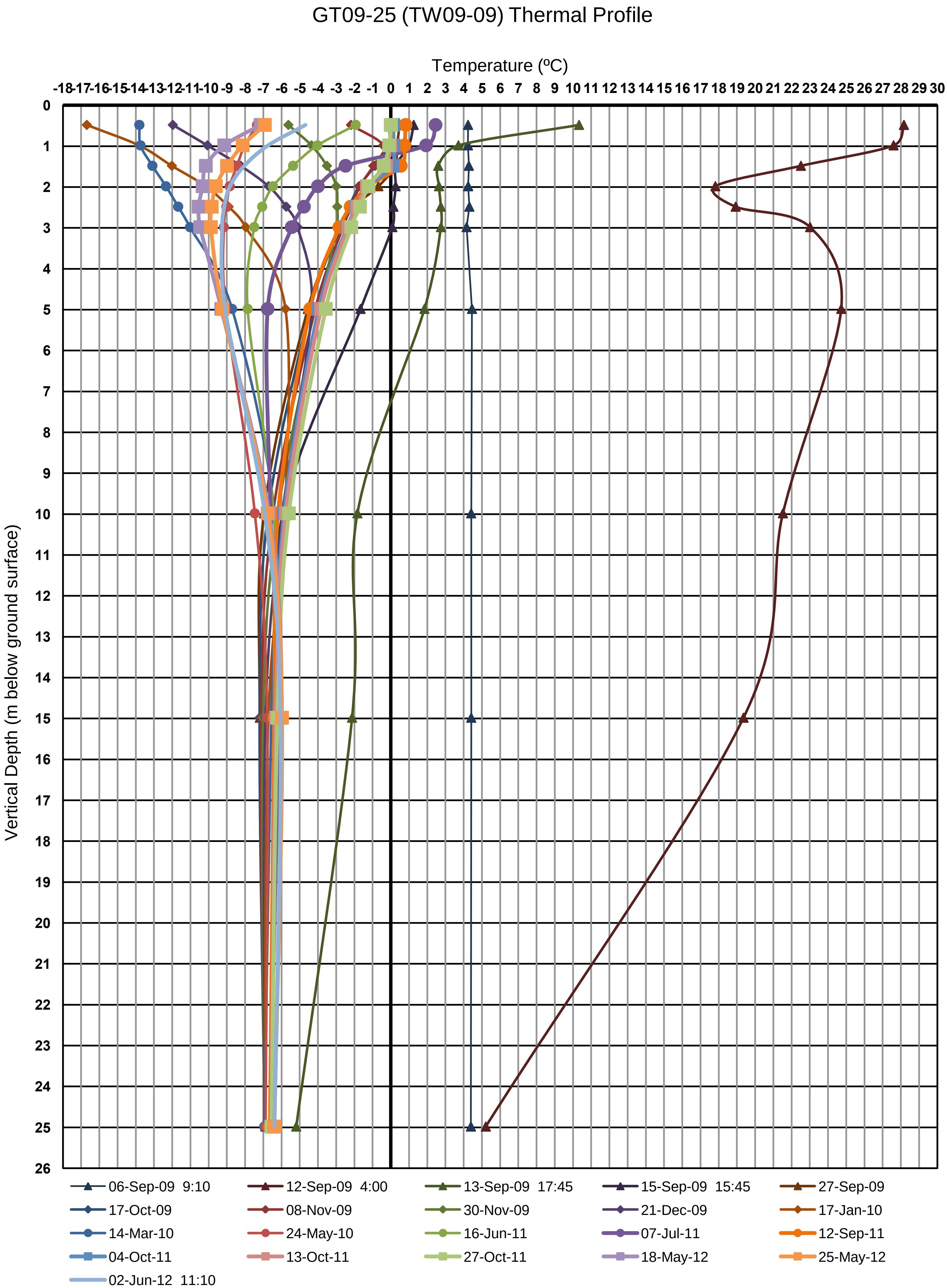
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3600

Serial No.: TW09-09
Total Length (m.): 26.5
Lead Length(m.): 1.5
Shielded: No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.31
	WH		M	
2	BK	1.00	B	16.32
	WH		M	
3	BU	1.50	C	16.27
	WH		M	
4	GN	2.00	D	16.34
	WH		M	
5	RD	2.50	E	16.32
	WH		M	
6	GY	3.00	F	16.28
	WH		M	
7	BN	5.00	G	16.3
	WH		M	
8	PK	10.00	H	16.3
	WH		M	
9	OR	15.00	J	16.34
	WH		M	
10	PU	25.00	K	16.34
	WH		M	


GT09-25 (TW09-09) Thermal Profile
Temperature (ºC)
-18 -17 -16 -15 -14 -13 -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 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
06-Sep-09 9:10
12-Sep-09 4:00
13-Sep-09 17:45
15-Sep-09 15:45
27-Sep-09
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
12-Sep-11
04-Oct-11
13-Oct-11
27-Oct-11
18-May-12
25-May-12
02-Jun-12 11:10

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Cochrane, AB. T4C-1R3

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Thermistor Cable Data Sheet

Customer: Golder

Contact:

Project: Meliadine

Date Ordered: 16-Mar-11

Purchase Order No.: 11-1428-0011

Serial No.: GT11-A

Total Length (m.): 600

Lead Length(m.): 20

Shielded

Termination: MS3106E20-29P

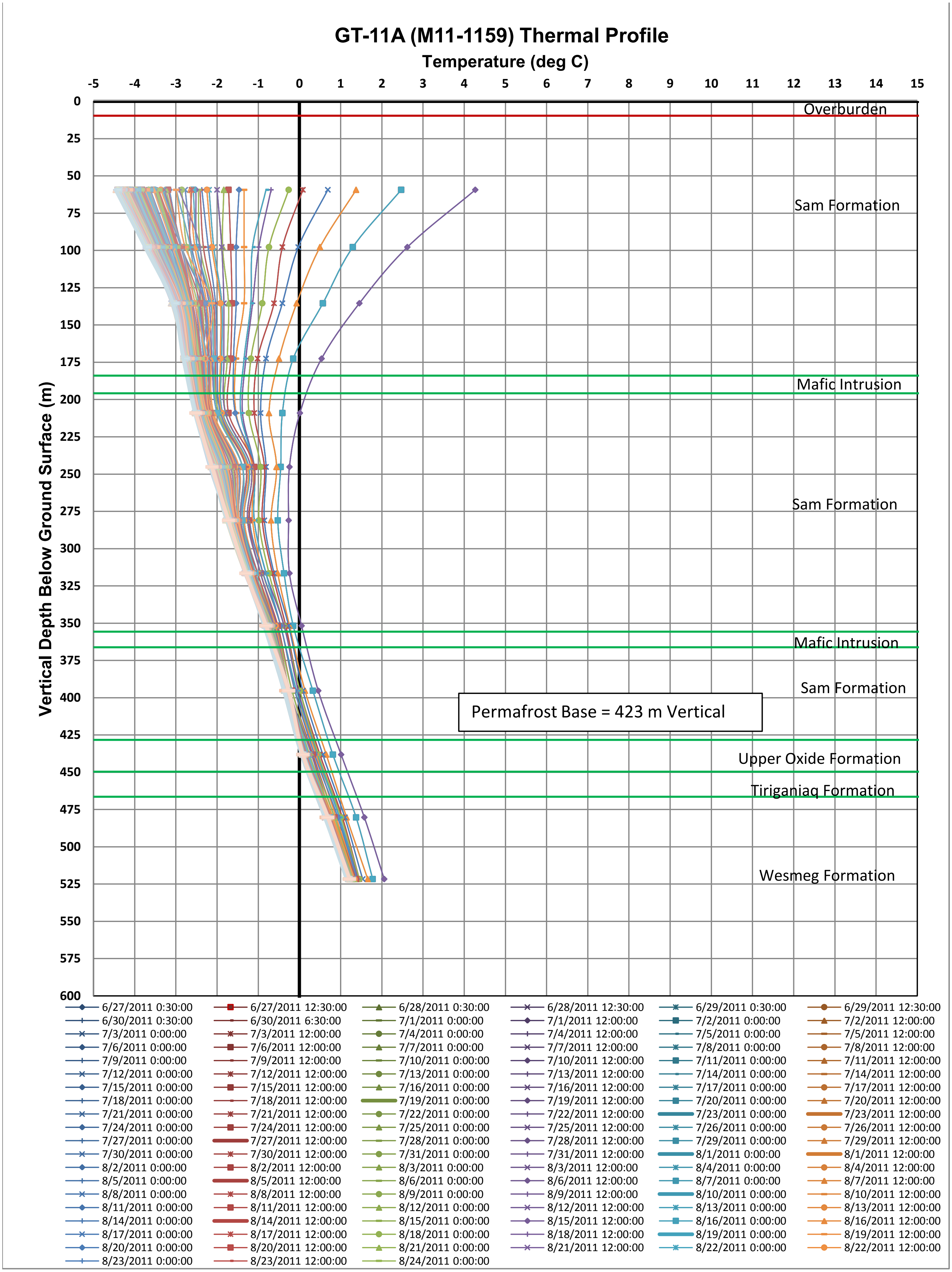
Molded:

Thermistor Type: 44007

No. of Thermistors: 13

Number of Cables in Order:

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	60.00	A	16.34
	WH	100.00	B	16.36
2	BK	140.00	C	16.3
	WH		M	
3	BU	180.00	D	16.34
	WH		M	
4	GN	220.00	E	16.4
	WH		M	
5	RD	260.00	F	16.36
	WH		M	
6	GY	300.00	G	16.31
	WH		M	
7	BN	340.00	H	16.3
	WH		M	
8	PK	380.00	J	16.29
	WH		M	
9	OR	430.00	K	16.3
	WH		M	
10	PU	480.00	L	16.37
	WH		M	
11	PU	530.00	N	16.4
	OR		M	
12	TN	580.00	P	16.41
	WH		M	


GT-11A (M11-1159) Thermal Profile
Temperature (deg C)
-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Vertical Depth Below Ground Surface (m)
0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600
Overburden
Sam Formation
Mafic Intrusion
Sam Formation
Mafic Intrusion
Sam Formation
Permafrost Base = 423 m Vertical
Upper Oxide Formation
Tiriganiaq Formation
Wesmeg Formation
6/27/2011 0:30:00
6/27/2011 12:30:00
6/28/2011 0:30:00
6/28/2011 12:30:00
6/29/2011 0:30:00
6/29/2011 12:30:00
6/30/2011 0:30:00
6/30/2011 6:30:00
7/1/2011 0:00:00
7/1/2011 12:00:00
7/2/2011 0:00:00
7/2/2011 12:00:00
7/3/2011 0:00:00
7/3/2011 12:00:00
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8/12/2011 0:00:00
8/12/2011 12:00:00
8/13/2011 0:00:00
8/13/2011 12:00:00
8/14/2011 0:00:00
8/14/2011 12:00:00
8/15/2011 0:00:00
8/15/2011 12:00:00
8/16/2011 0:00:00
8/16/2011 12:00:00
8/17/2011 0:00:00
8/17/2011 12:00:00
8/18/2011 0:00:00
8/18/2011 12:00:00
8/19/2011 0:00:00
8/19/2011 12:00:00
8/20/2011 0:00:00
8/20/2011 12:00:00
8/21/2011 0:00:00
8/21/2011 12:00:00
8/22/2011 0:00:00
8/22/2011 12:00:00
8/23/2011 0:00:00
8/23/2011 12:00:00
8/24/2011 0:00:00

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

Thermistor Cable Data Sheet

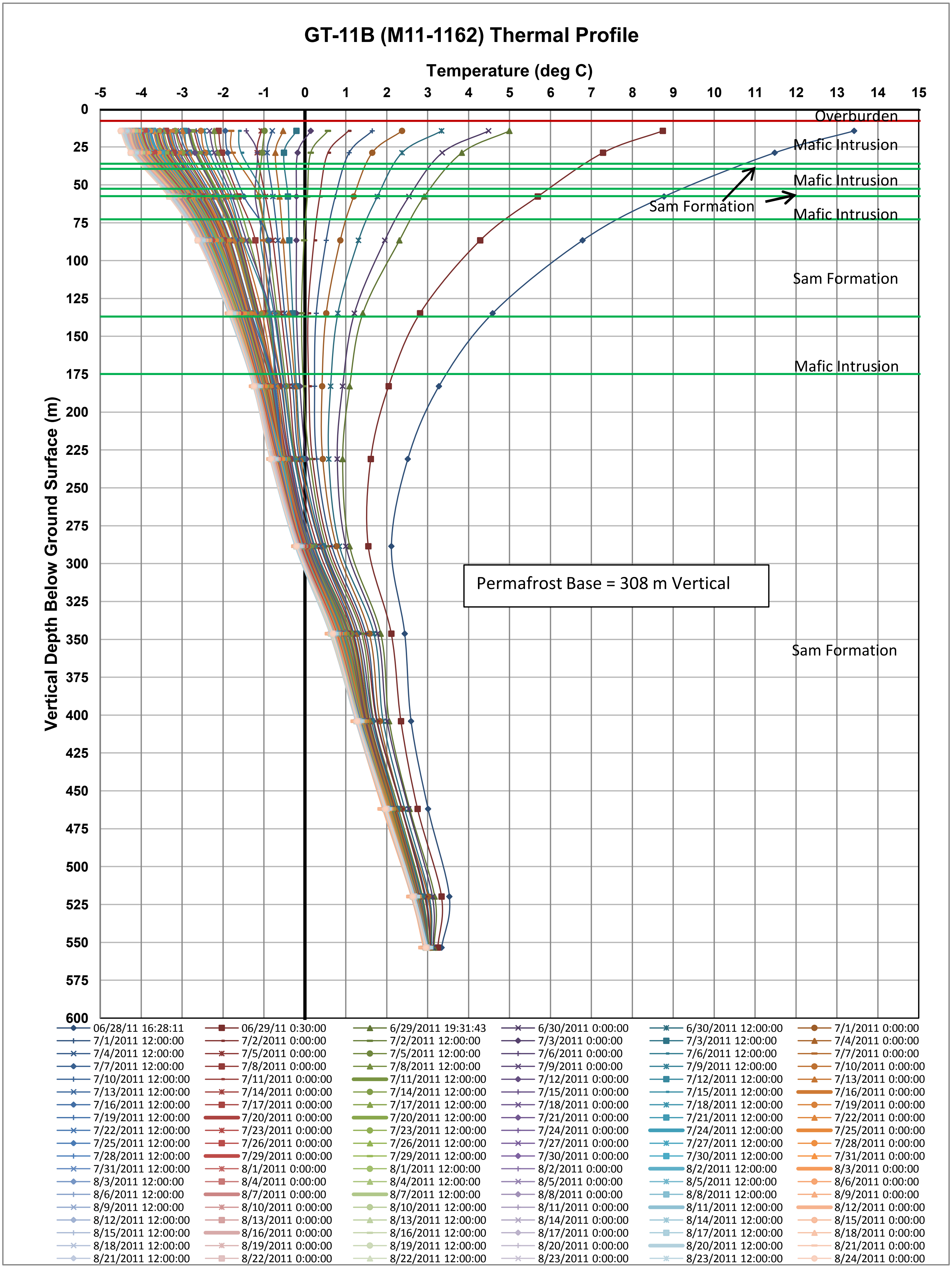
Customer: Golder

Contact:
Project: Meliadine
Date Ordered: 16-Mar-11
Purchase Order No.: 11-1428-0011

Serial No.: GT11-B
Total Length (m.): 600
Lead Length(m.): 20 Shielded
Termination: MS3106E20-29P Molded:
Thermistor Type: 44007
No. of Thermistors: 13

Number of Cables in Order:

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	15.00	A	16.3
	WH	30.00	B	16.33
2	BK	60.00	C	16.33
	WH		M	
3	BU	90.00	D	16.32
	WH		M	
4	GN	140.00	E	16.32
	WH		M	
5	RD	190.00	F	16.354
	WH		M	
6	GY	240.00	G	16.39
	WH		M	
7	BN	300.00	H	16.39
	WH		M	
8	PK	360.00	J	16.36
	WH		M	
9	OR	420.00	K	16.37
	WH		M	
10	PU	480.00	L	16.4
	WH		M	
11	PU	540.00	N	16.43
	OR		M	
12	TN	575.00	P	16.49
	WH		M	


GT-11B (M11-1162) Thermal Profile
Temperature (deg C)
Vertical Depth Below Ground Surface (m)
Overburden
Mafic Intrusion
Mafic Intrusion
Sam Formation
Mafic Intrusion
Sam Formation
Mafic Intrusion
Permafrost Base = 308 m Vertical
Sam Formation
06/28/11 16:28:11
06/29/11 0:30:00
6/29/2011 19:31:43
6/30/2011 0:00:00
6/30/2011 12:00:00
7/1/2011 0:00:00
7/1/2011 12:00:00
7/2/2011 0:00:00
7/2/2011 12:00:00
7/3/2011 0:00:00
7/3/2011 12:00:00
7/4/2011 0:00:00
7/4/2011 12:00:00
7/5/2011 0:00:00
7/5/2011 12:00:00
7/6/2011 0:00:00
7/6/2011 12:00:00
7/7/2011 0:00:00
7/7/2011 12:00:00
7/8/2011 0:00:00
7/8/2011 12:00:00
7/9/2011 0:00:00
7/9/2011 12:00:00
7/10/2011 0:00:00
7/10/2011 12:00:00
7/11/2011 0:00:00
7/11/2011 12:00:00
7/12/2011 0:00:00
7/12/2011 12:00:00
7/13/2011 0:00:00
7/13/2011 12:00:00
7/14/2011 0:00:00
7/14/2011 12:00:00
7/15/2011 0:00:00
7/15/2011 12:00:00
7/16/2011 0:00:00
7/16/2011 12:00:00
7/17/2011 0:00:00
7/17/2011 12:00:00
7/18/2011 0:00:00
7/18/2011 12:00:00
7/19/2011 0:00:00
7/19/2011 12:00:00
7/20/2011 0:00:00
7/20/2011 12:00:00
7/21/2011 0:00:00
7/21/2011 12:00:00
7/22/2011 0:00:00
7/22/2011 12:00:00
7/23/2011 0:00:00
7/23/2011 12:00:00
7/24/2011 0:00:00
7/24/2011 12:00:00
7/25/2011 0:00:00
7/25/2011 12:00:00
7/26/2011 0:00:00
7/26/2011 12:00:00
7/27/2011 0:00:00
7/27/2011 12:00:00
7/28/2011 0:00:00
7/28/2011 12:00:00
7/29/2011 0:00:00
7/29/2011 12:00:00
7/30/2011 0:00:00
7/30/2011 12:00:00
7/31/2011 0:00:00
7/31/2011 12:00:00
8/1/2011 0:00:00
8/1/2011 12:00:00
8/2/2011 0:00:00
8/2/2011 12:00:00
8/3/2011 0:00:00
8/3/2011 12:00:00
8/4/2011 0:00:00
8/4/2011 12:00:00
8/5/2011 0:00:00
8/5/2011 12:00:00
8/6/2011 0:00:00
8/6/2011 12:00:00
8/7/2011 0:00:00
8/7/2011 12:00:00
8/8/2011 0:00:00
8/8/2011 12:00:00
8/9/2011 0:00:00
8/9/2011 12:00:00
8/10/2011 0:00:00
8/10/2011 12:00:00
8/11/2011 0:00:00
8/11/2011 12:00:00
8/12/2011 0:00:00
8/12/2011 12:00:00
8/13/2011 0:00:00
8/13/2011 12:00:00
8/14/2011 0:00:00
8/14/2011 12:00:00
8/15/2011 0:00:00
8/15/2011 12:00:00
8/16/2011 0:00:00
8/16/2011 12:00:00
8/17/2011 0:00:00
8/17/2011 12:00:00
8/18/2011 0:00:00
8/18/2011 12:00:00
8/19/2011 0:00:00
8/19/2011 12:00:00
8/20/2011 0:00:00
8/20/2011 12:00:00
8/21/2011 0:00:00
8/21/2011 12:00:00
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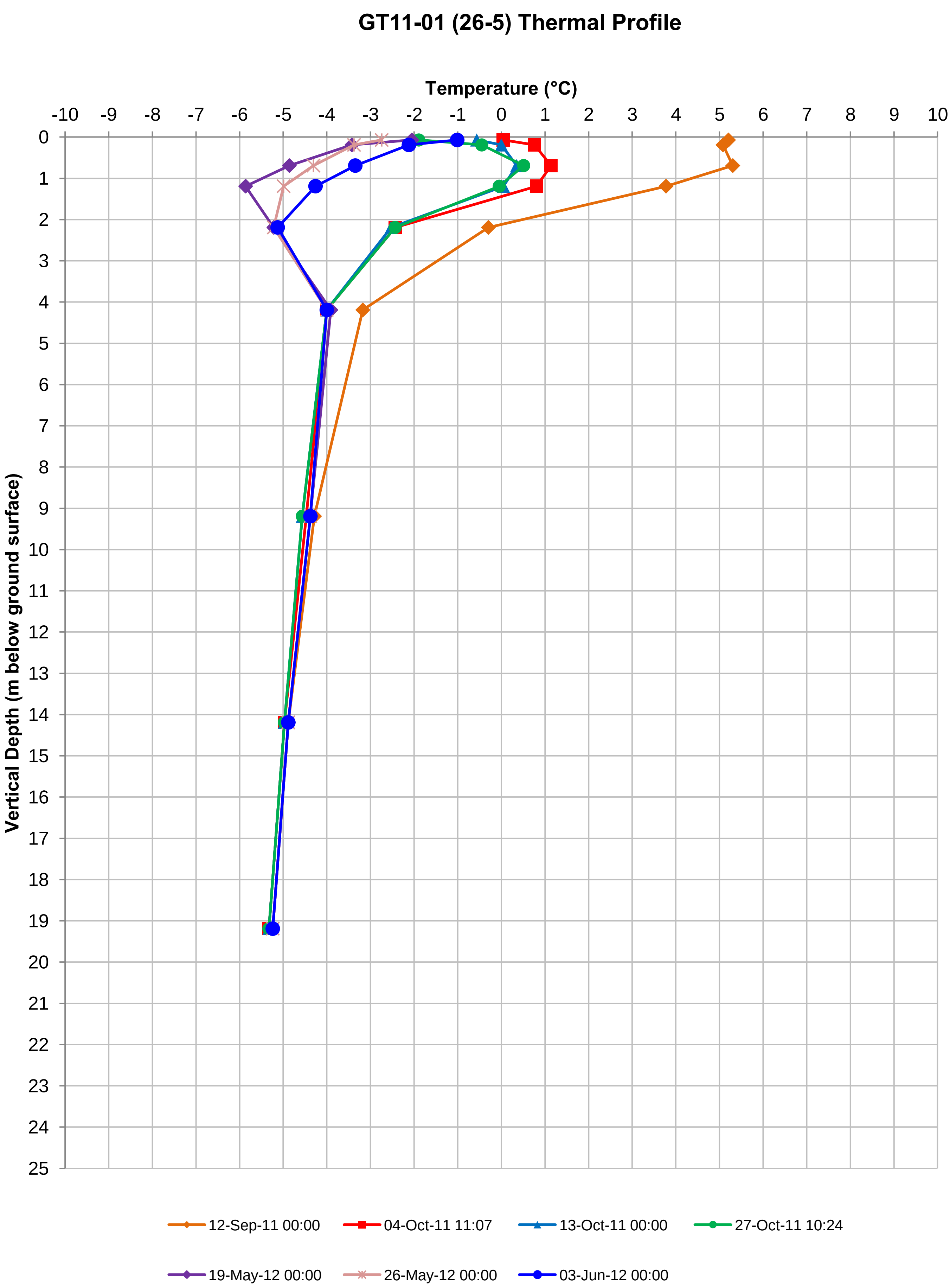
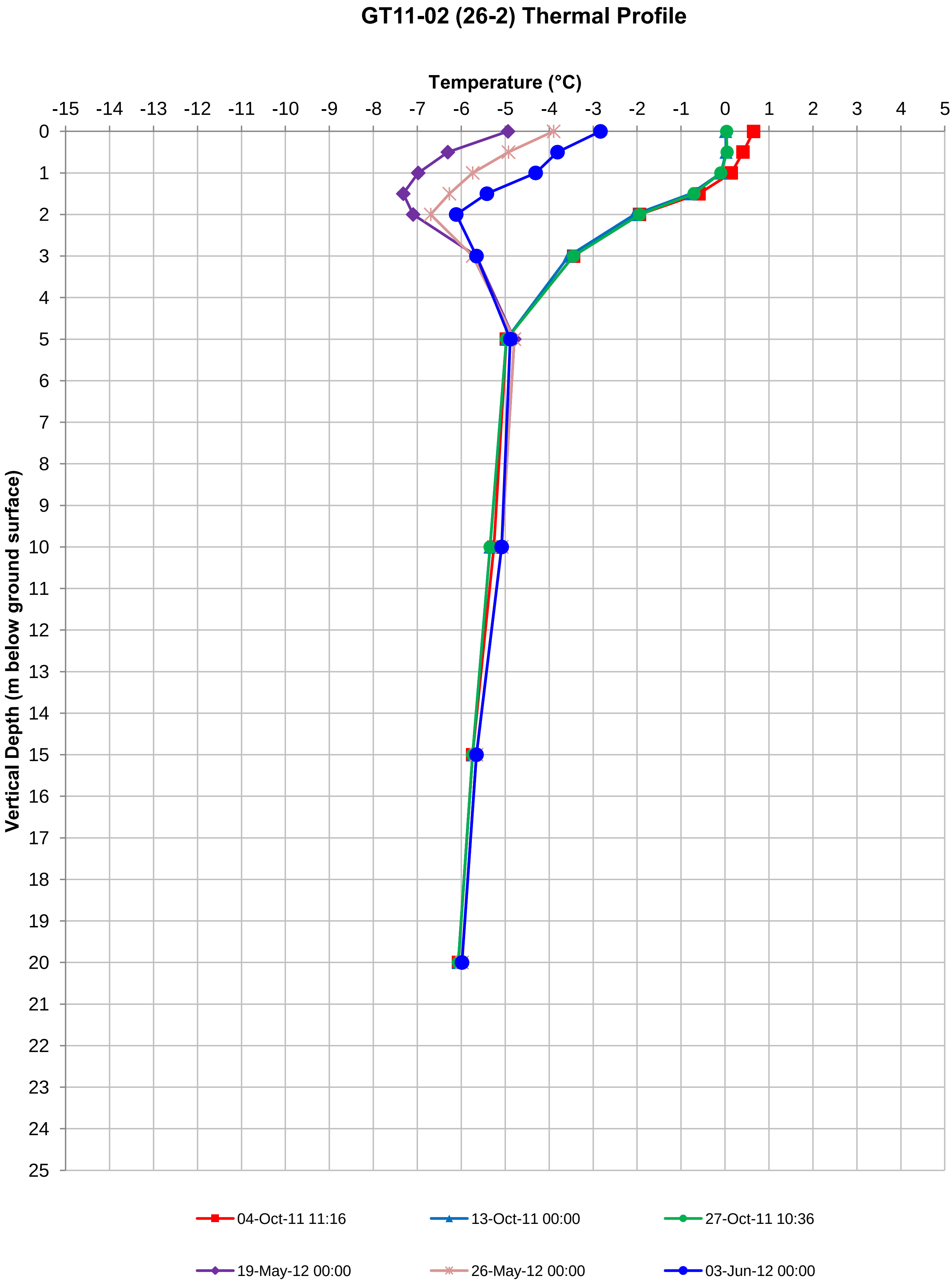
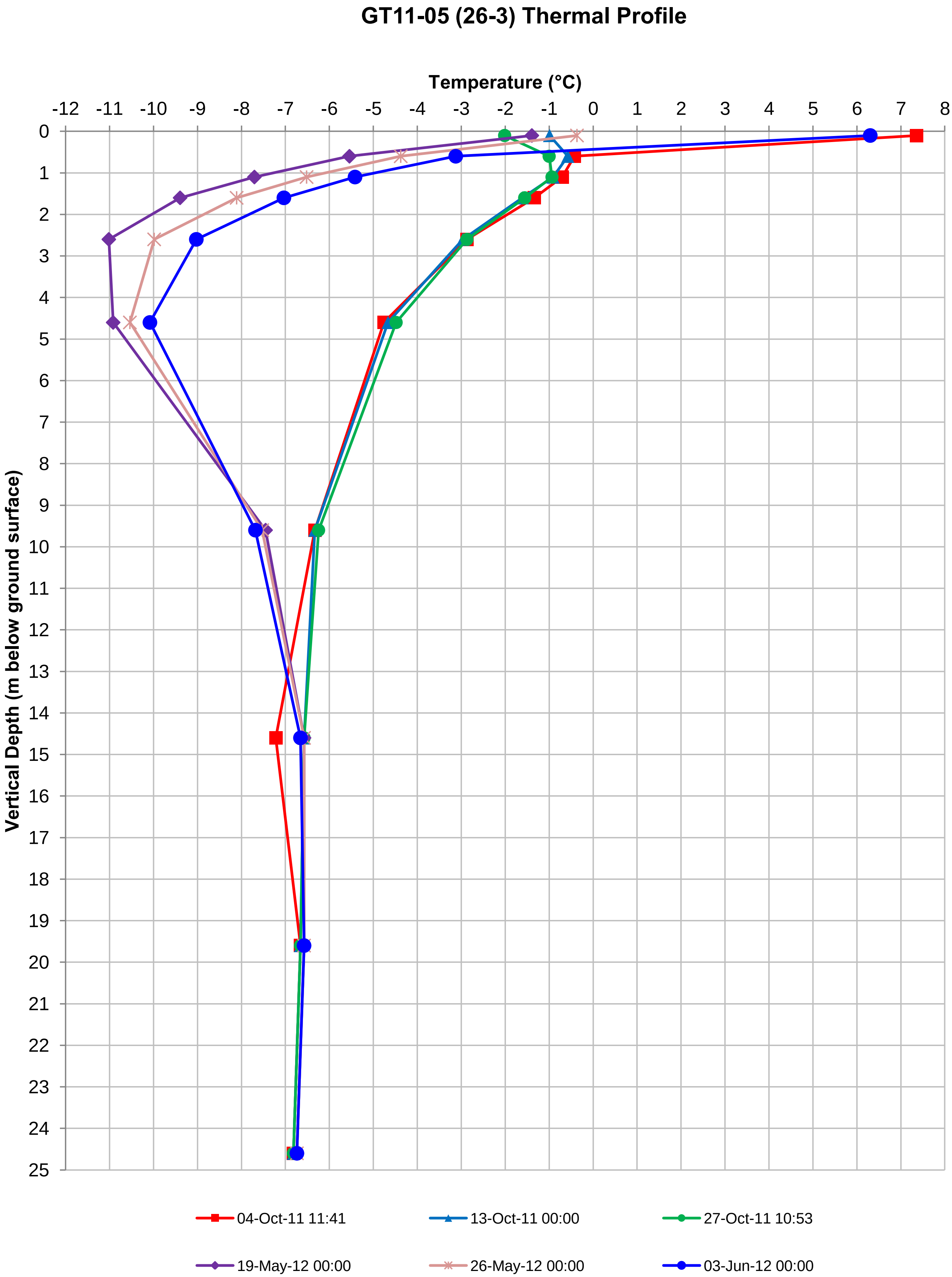
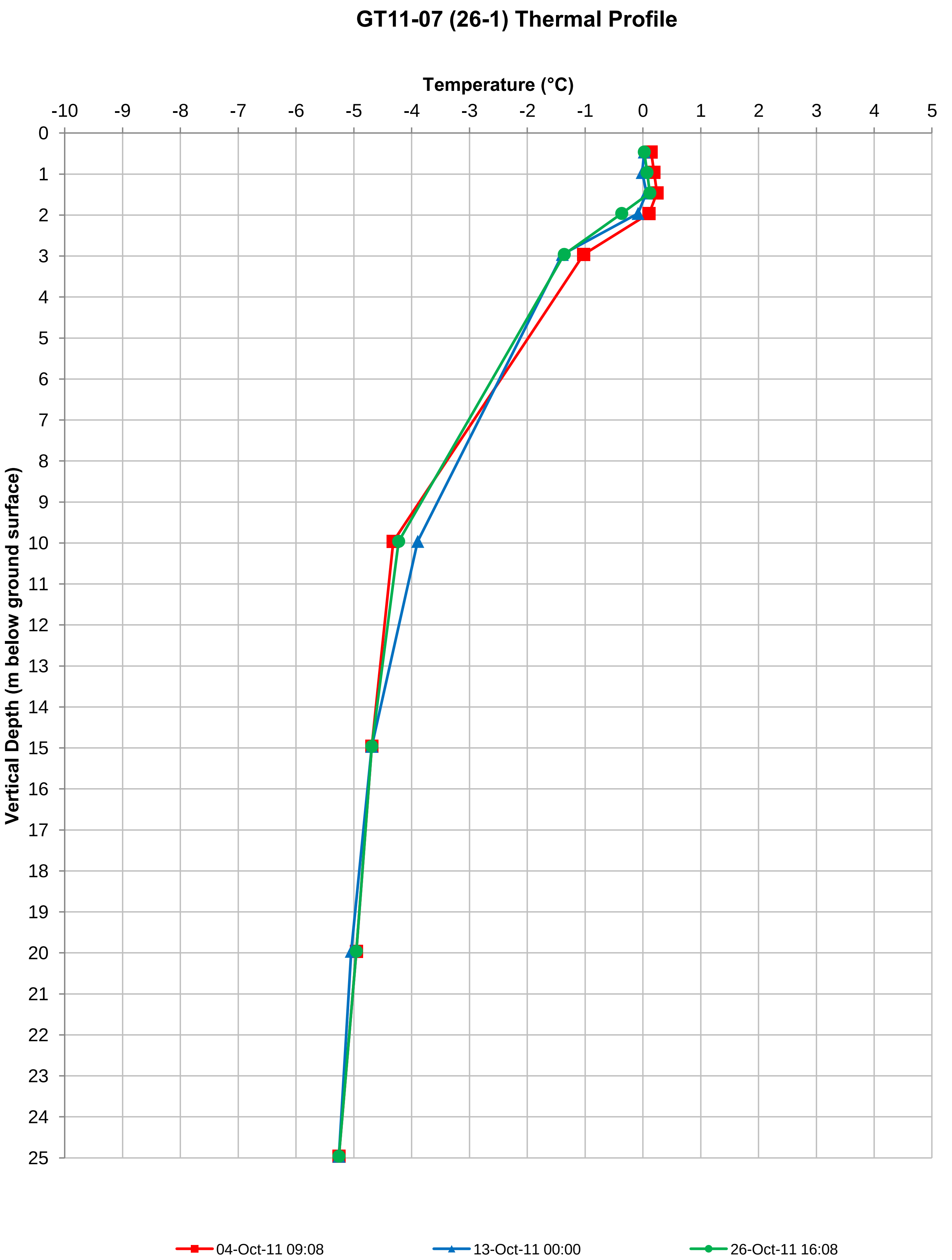
8/24/2011 0:00:00

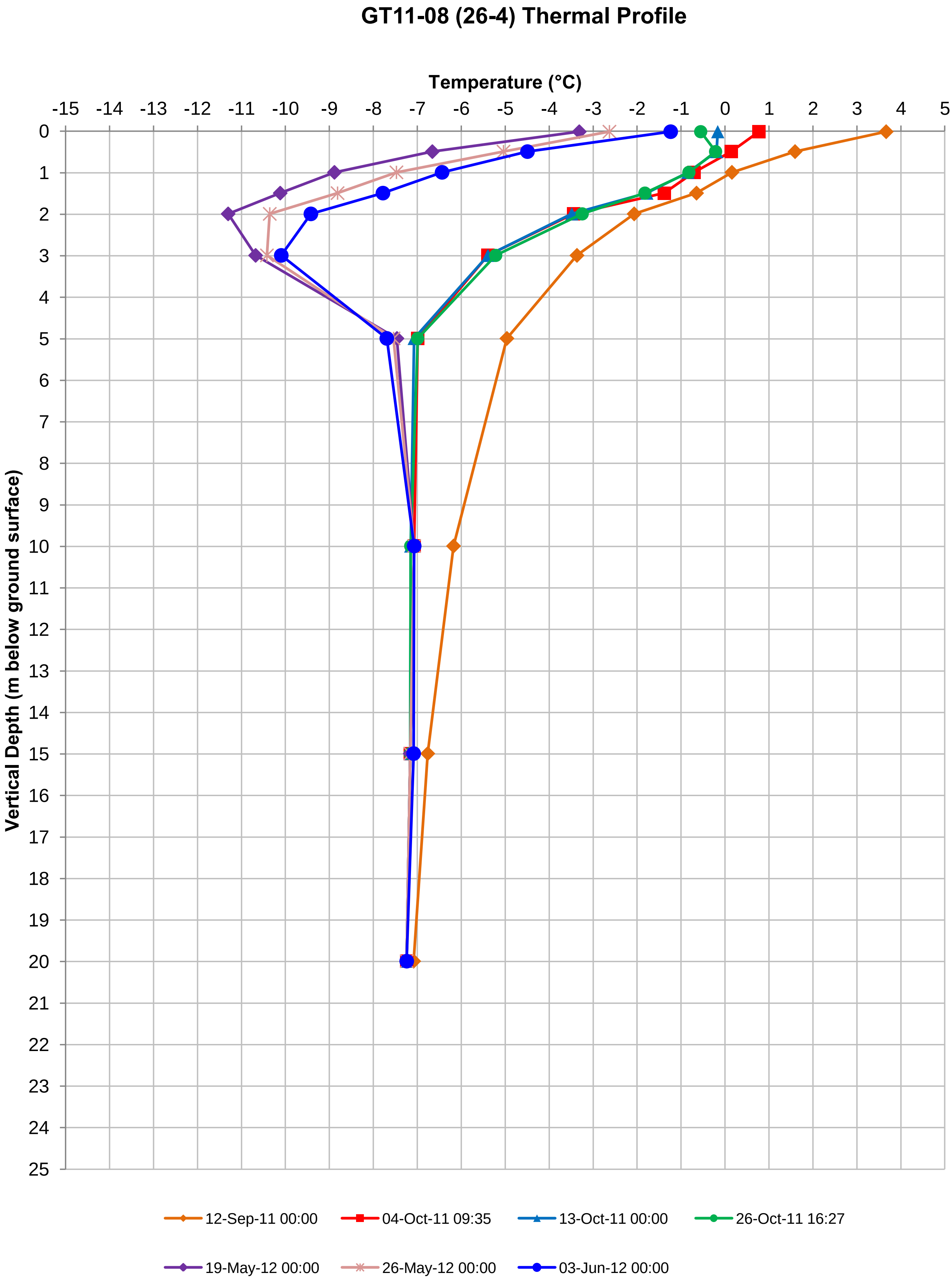


GT11-01 (26-5) Thermal Profile
Temperature (°C)
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
Vertical Depth (m below ground surface)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
12-Sep-11 00:00
04-Oct-11 11:07
13-Oct-11 00:00
27-Oct-11 10:24
19-May-12 00:00
26-May-12 00:00
03-Jun-12 00:00


GT11-02 (26-2) Thermal Profile
Temperature (°C)
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
04-Oct-11 11:16
13-Oct-11 00:00
27-Oct-11 10:36
19-May-12 00:00
26-May-12 00:00
03-Jun-12 00:00


GT11-05 (26-3) Thermal Profile
Temperature (°C)
-12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
04-Oct-11 11:41
13-Oct-11 00:00
27-Oct-11 10:53
19-May-12 00:00
26-May-12 00:00
03-Jun-12 00:00


GT11-07 (26-1) Thermal Profile
Temperature (°C)
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Vertical Depth (m below ground surface)
04-Oct-11 09:08
13-Oct-11 00:00
26-Oct-11 16:08



GT11-08 (26-4) Thermal Profile
Temperature (°C)
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
12-Sep-11 00:00
04-Oct-11 09:35
13-Oct-11 00:00
26-Oct-11 16:27
19-May-12 00:00
26-May-12 00:00
03-Jun-12 00:00

M-Squared Instruments
144 West Terrace Cres.
Cochrane, AB. T4C-1R3
Ph. 403-560-7079
msquared.instruments@gmail.com

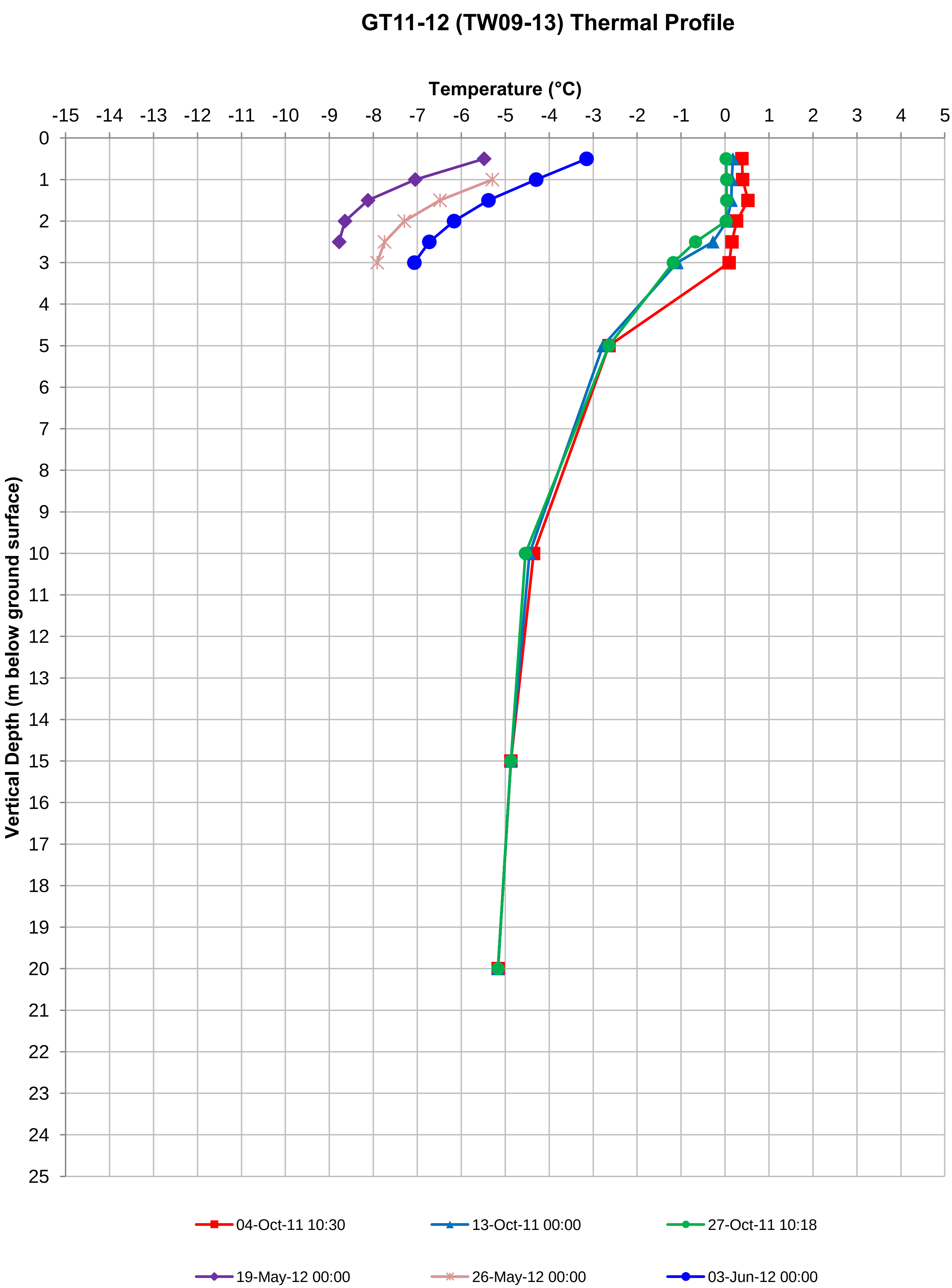
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 03-Jul-09
Purchase Order No.: 0914260015-3400

Serial No.: TW09-13
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.32
	WH		M	
2	BK	1.00	B	16.33
	WH		M	
3	BU	1.50	C	16.33
	WH		M	
4	GN	2.00	D	16.32
	WH		M	
5	RD	2.50	E	16.33
	WH		M	
6	GY	3.00	F	16.38
	WH		M	
7	BN	5.00	G	16.32
	WH		M	
8	PK	10.00	H	16.28
	WH		M	
9	OR	15.00	J	16.31
	WH		M	
10	PU	20.00	K	16.29
	WH		M	


GT11-12 (TW09-13) Thermal Profile
Temperature (°C)
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
04-Oct-11 10:30
13-Oct-11 00:00
27-Oct-11 10:18
19-May-12 00:00
26-May-12 00:00
03-Jun-12 00:00

APPENDIX B

F Zone Thermistor Data

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-932-3448
email: m-squared@canada.com

Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp. 901 - 1014 4 St. SW
Calgary, AB., T2R 1J4

Contact: Mark Balog / Doug Dumka

Project:

Date Ordered: Apr. 28, 2009

Purchase Order No.:

Serial No.: 21.5-1,2,3

Total Length (m.): 21.5

Lead Length(m.): 1.5

Shielded

Termination: MS3106A29-12

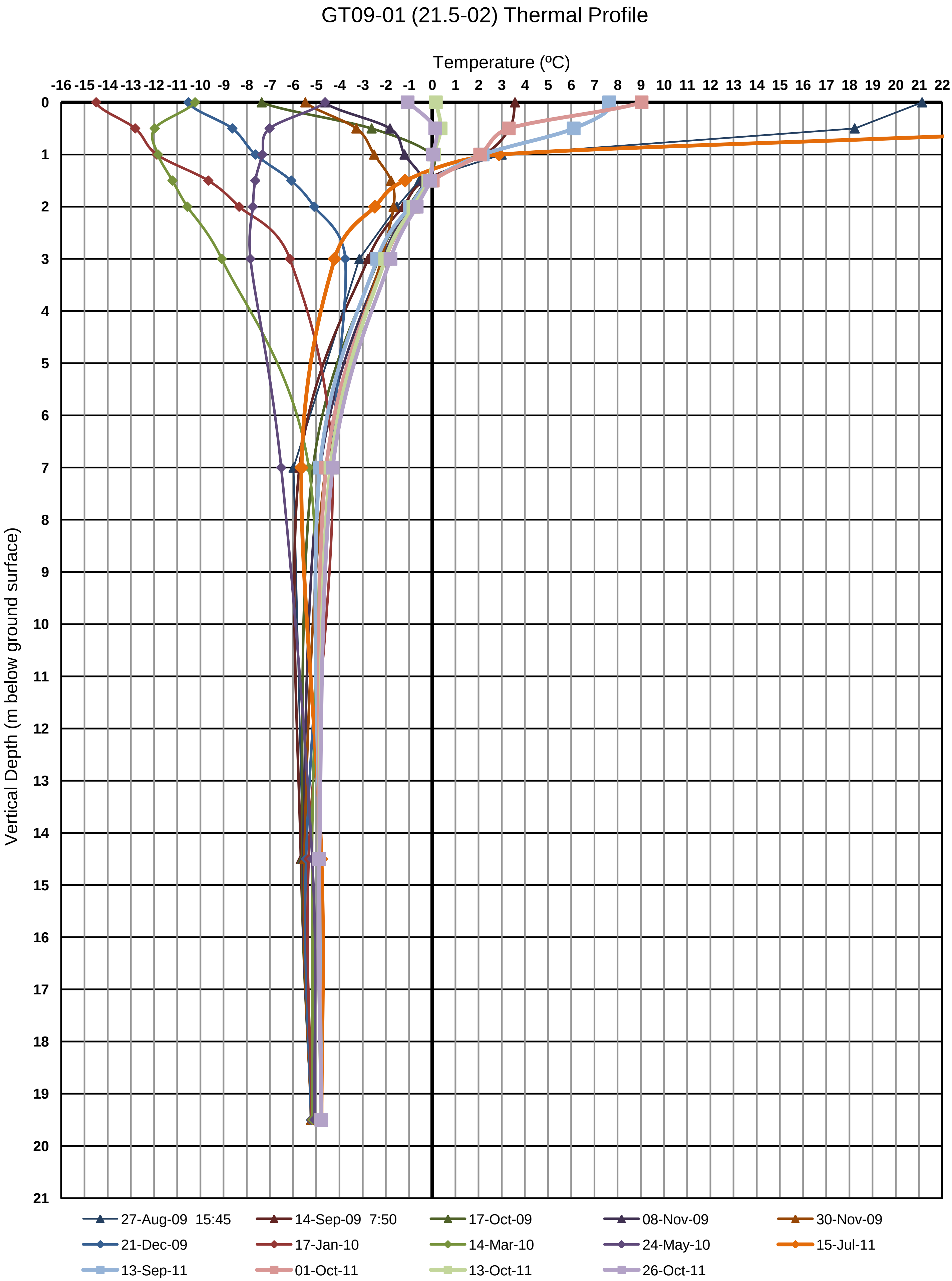
Molded:

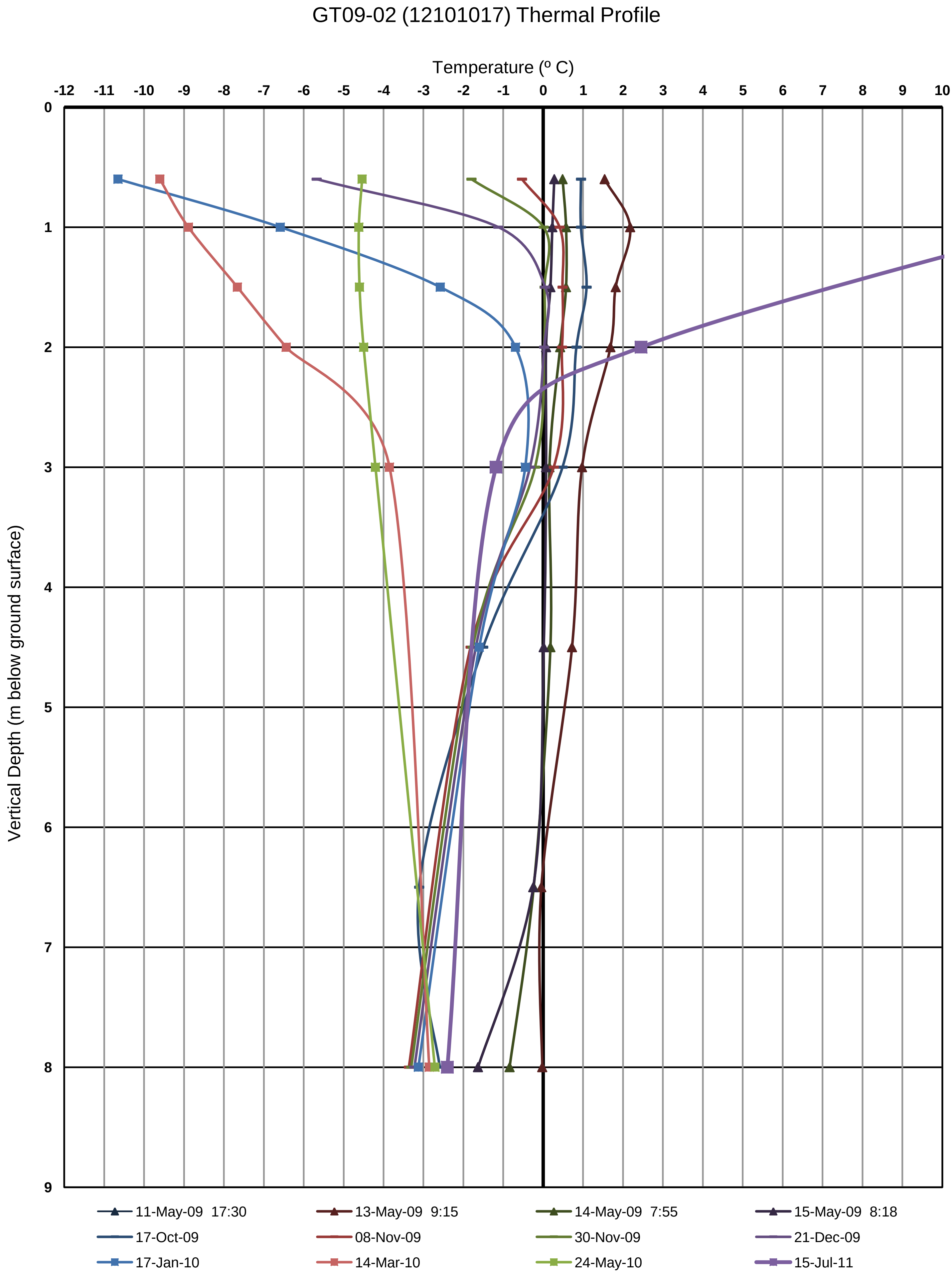
Thermistor Type: YSI 44034

No. of Thermistors: 10

Number of Cables in Order: 3

T. No.	Colour Code	Depth m.	Pin No.	kOhms @ 0 deg. C		
1	YW	0.0	A	16.32	16.29	16.29
	WH		M			
2	PU	0.5	B	16.31	16.29	16.3
	WH		M			
3	OR	1.0	C	16.3	16.31	16.3
	WH		M			
4	PK	1.5	D	16.32	16.33	16.32
	WH		M			
5	BN	2.0	E	16.32	16.32	16.31
	WH		M			
6	GY	2.5	F	16.31	16.33	16.31
	WH		M			
7	RD	3.5	G	16.32	16.32	16.33
	WH		M			
8	GN	7.5	H	16.33	16.33	16.31
	WH		M			
9	BU	15.0	J	16.33	16.31	16.32
	WH		M			
10	BK	20.0	K	16.33	16.31	16.33
	WH		M			


GT09-01 (21.5-02) Thermal Profile
Temperature (ºC)
-16 -15 -14 -13 -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 13 14 15 16 17 18 19 20 21 22
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
27-Aug-09 15:45
14-Sep-09 7:50
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
15-Jul-11
13-Sep-11
01-Oct-11
13-Oct-11
26-Oct-11


GT09-02 (12101017) Thermal Profile
Temperature (º C)
-12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10
0 1 2 3 4 5 6 7 8 9
Vertical Depth (m below ground surface)
11-May-09 17:30
13-May-09 9:15
14-May-09 7:55
15-May-09 8:18
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
15-Jul-11

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-932-3448
email: m-squared@canada.com

Thermistor Cable Data Sheet

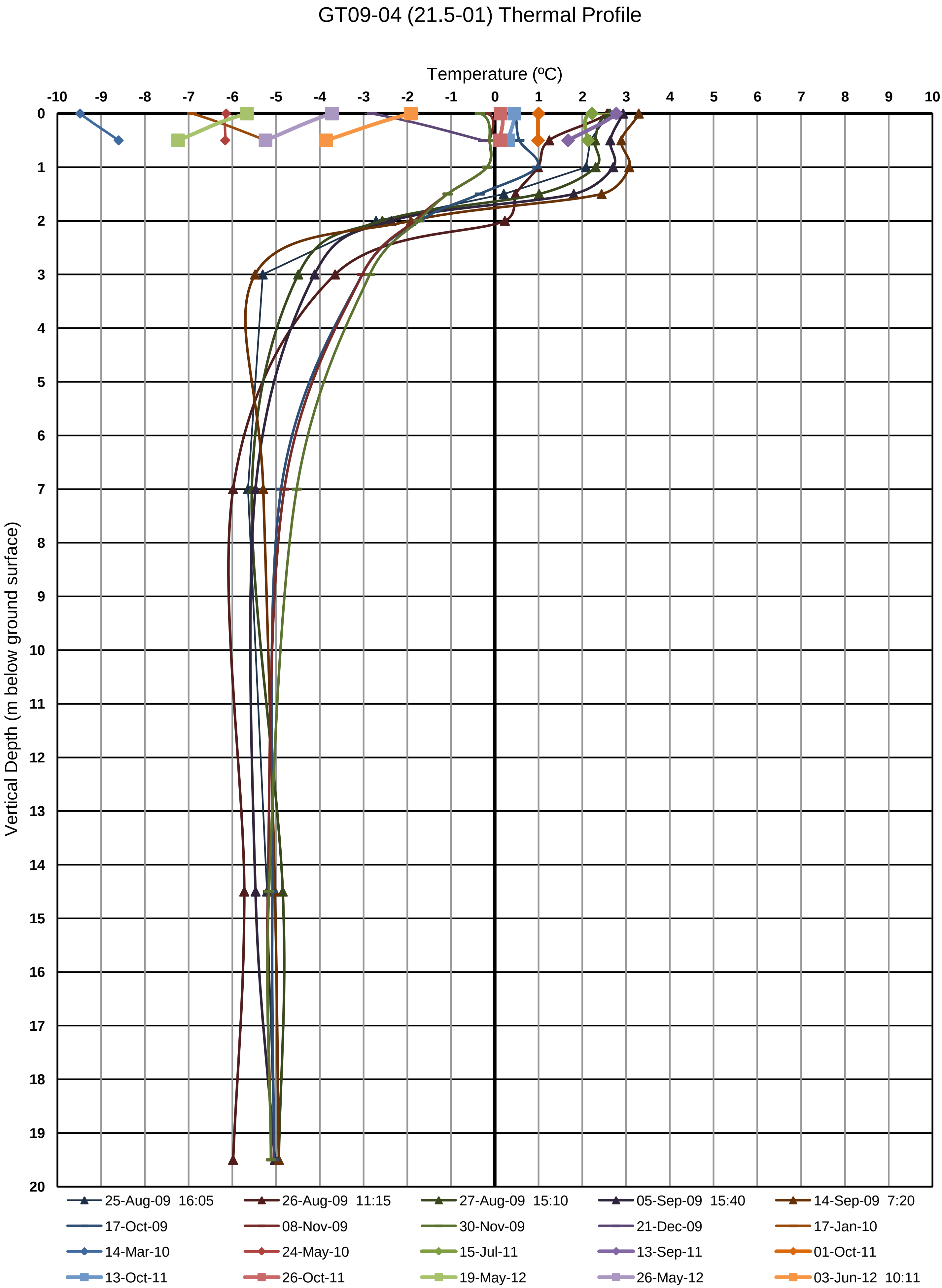
Customer: Comaplex Minerals Corp. 901 - 1014 4 St. SW
Calgary, AB., T2R 1J4
Contact: Mark Balog / Doug Dumka
Project:
Date Ordered: Apr. 28, 2009
Purchase Order No.:

Serial No.: 21.5-1,2,3
Total Length (m.): 21.5
Lead Length(m.): 1.5
Termination: MS3106A29-12
Thermistor Type: YSI 44034
No. of Thermistors: 10

Shielded
Molded:

Number of Cables in Order: 3

T. No.	Colour Code	Depth m.	Pin No.	kOhms @ 0 deg. C		
1	YW	0.0	A	16.32	16.29	16.29
	WH		M			
2	PU	0.5	B	16.31	16.29	16.3
	WH		M			
3	OR	1.0	C	16.3	16.31	16.3
	WH		M			
4	PK	1.5	D	16.32	16.33	16.32
	WH		M			
5	BN	2.0	E	16.32	16.32	16.31
	WH		M			
6	GY	2.5	F	16.31	16.33	16.31
	WH		M			
7	RD	3.5	G	16.32	16.32	16.33
	WH		M			
8	GN	7.5	H	16.33	16.33	16.31
	WH		M			
9	BU	15.0	J	16.33	16.31	16.32
	WH		M			
10	BK	20.0	K	16.33	16.31	16.33
	WH		M			



GT09-04 (21.5-01) Thermal Profile
Temperature (ºC)
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Vertical Depth (m below ground surface)
25-Aug-09 16:05
26-Aug-09 11:15
27-Aug-09 15:10
05-Sep-09 15:40
14-Sep-09 7:20
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
15-Jul-11
13-Sep-11
01-Oct-11
13-Oct-11
26-Oct-11
19-May-12
26-May-12
03-Jun-12 10:11

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

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msquared.instruments@gmail.com

Thermistor Cable Data Sheet

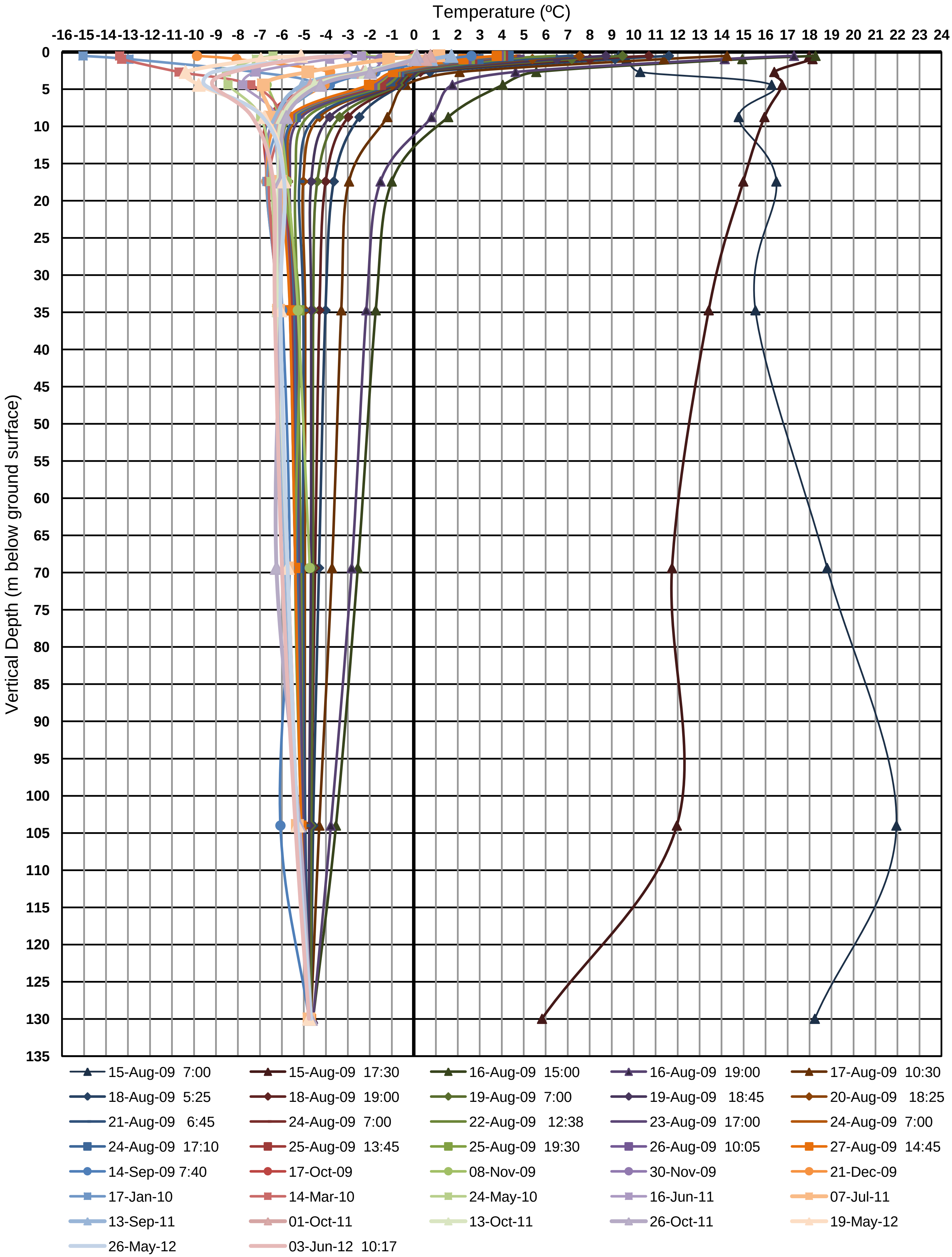
Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3220

Serial No.: TW09-16
Total Length (m.): 21.5
Lead Length(m.): 1.5 Shielded No
Termination: MS3106E20-29P Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.32
	WH		M	
2	BK	1.00	B	16.34
	WH		M	
3	BU	3.00	C	16.35
	WH		M	
4	GN	5.00	D	16.3
	WH		M	
5	RD	10.00	E	16.34
	WH		M	
6	GY	20.00	F	16.33
	WH		M	
7	BN	40.00	G	16.33
	WH		M	
8	PK	80.00	H	16.32
	WH		M	
9	OR	120.00	J	16.33
	WH		M	
10	PU	150.00	K	16.32
	WH		M	

GT09-07 (TW09-16) Thermal Profile



M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

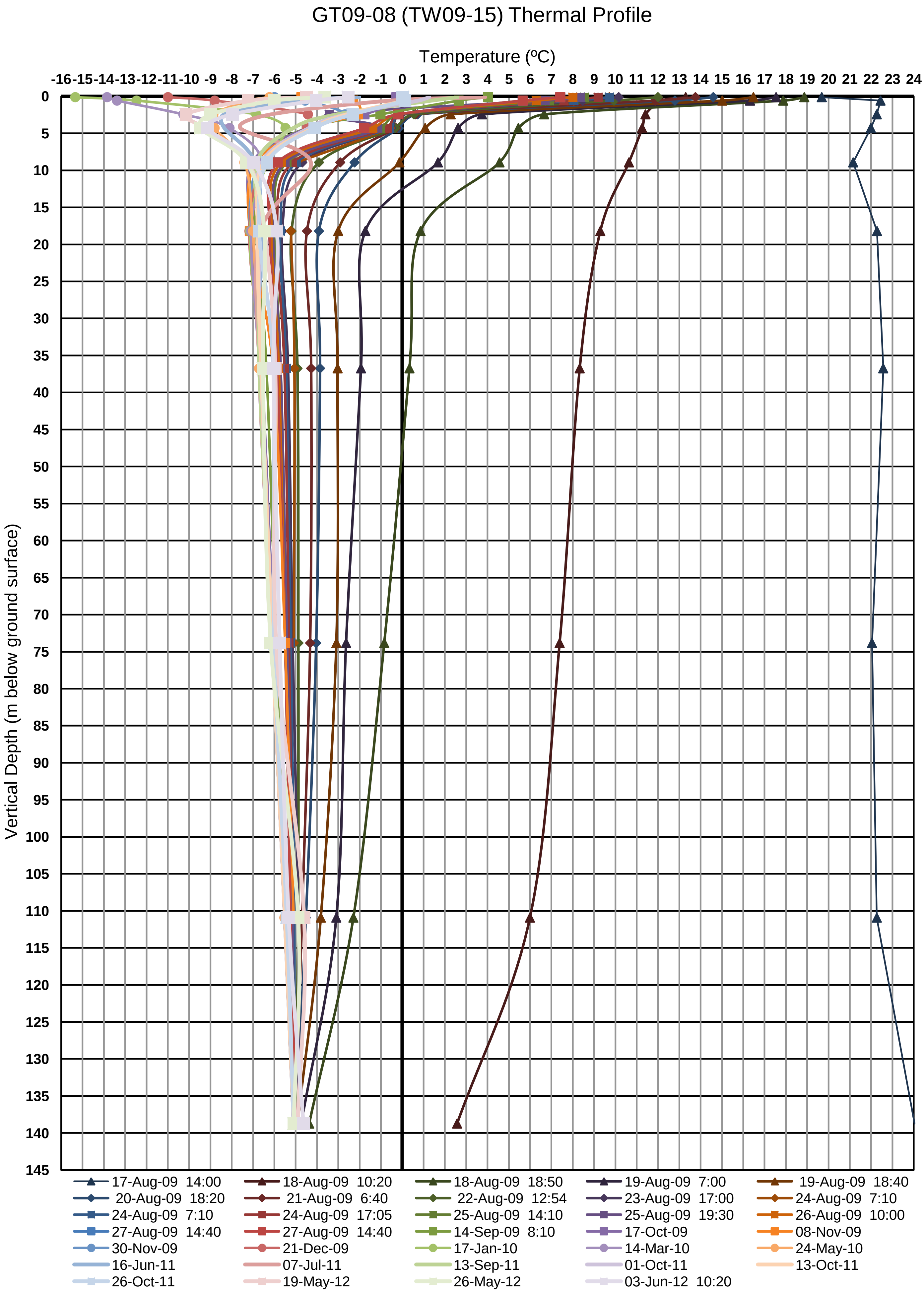
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3220

Serial No.: TW09-15
Total Length (m.): 21.5
Lead Length(m.): 1.5 Shielded No
Termination: MS3106E20-29P Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.32
	WH		M	
2	BK	1.00	B	16.31
	WH		M	
3	BU	3.00	C	16.33
	WH		M	
4	GN	5.00	D	16.33
	WH		M	
5	RD	10.00	E	16.31
	WH		M	
6	GY	20.00	F	16.34
	WH		M	
7	BN	40.00	G	16.35
	WH		M	
8	PK	80.00	H	16.31
	WH		M	
9	OR	120.00	J	16.3
	WH		M	
10	PU	150.00	K	16.35
	WH		M	


GT09-08 (TW09-15) Thermal Profile
Temperature (ºC)
-16 -15 -14 -13 -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 13 14 15 16 17 18 19 20 21 22 23 24
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145
Vertical Depth (m below ground surface)
17-Aug-09 14:00
18-Aug-09 10:20
18-Aug-09 18:50
19-Aug-09 7:00
19-Aug-09 18:40
20-Aug-09 18:20
21-Aug-09 6:40
22-Aug-09 12:54
23-Aug-09 17:00
24-Aug-09 7:10
24-Aug-09 7:10
24-Aug-09 17:05
25-Aug-09 14:10
25-Aug-09 19:30
26-Aug-09 10:00
27-Aug-09 14:40
27-Aug-09 14:40
14-Sep-09 8:10
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
13-Sep-11
01-Oct-11
13-Oct-11
26-Oct-11
19-May-12
26-May-12
03-Jun-12 10:20

M-Squared Instruments
144 West Terrace Cres.
Cochrane, AB. T4C-1R3
Ph. 403-560-7079
msquared.instruments@gmail.com

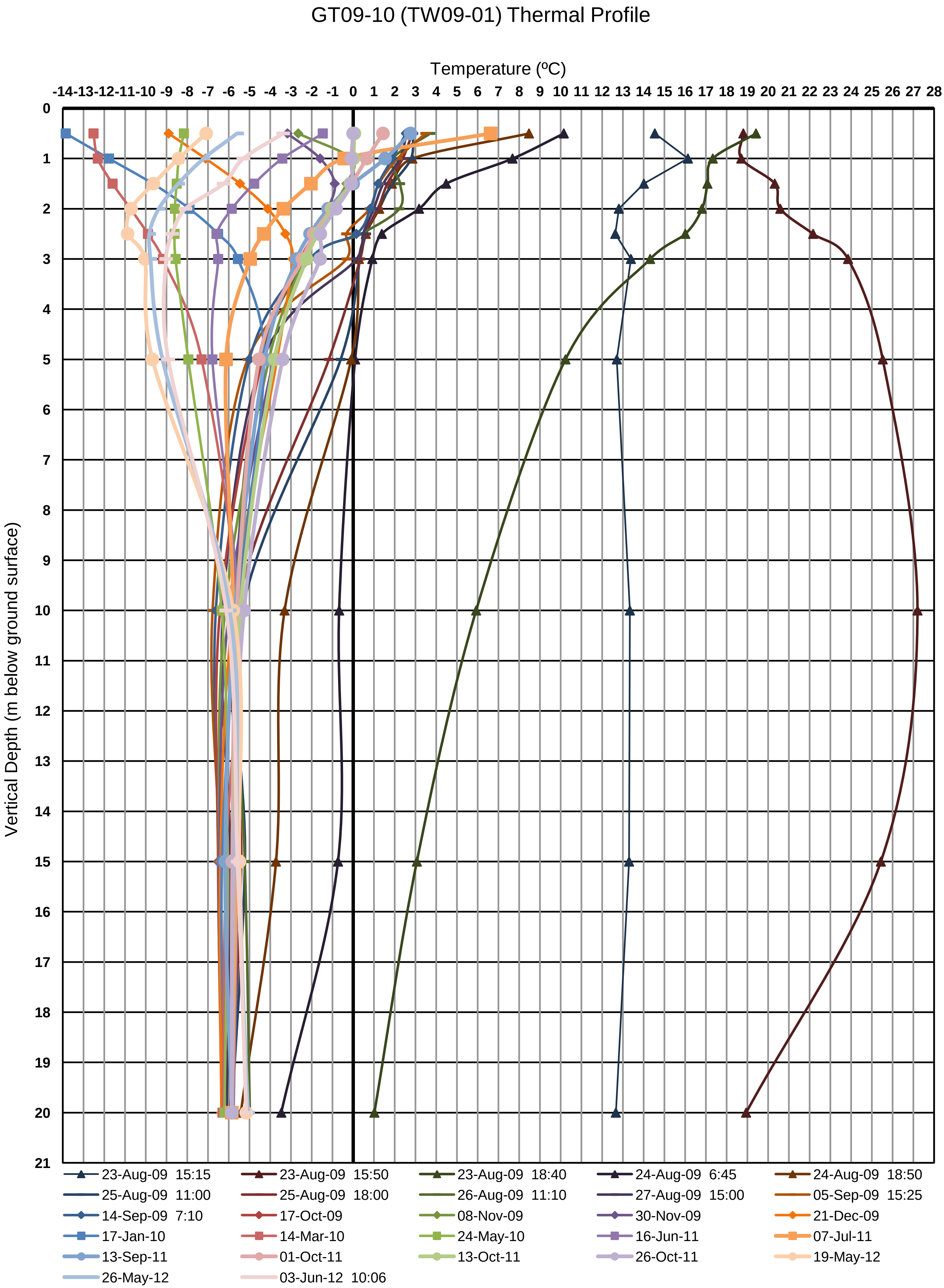
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3500

Serial No.: TW09-01
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.3
	WH		M	
2	BK	1.00	B	16.33
	WH		M	
3	BU	1.50	C	16.32
	WH		M	
4	GN	2.00	D	16.3
	WH		M	
5	RD	2.50	E	16.32
	WH		M	
6	GY	3.00	F	16.31
	WH		M	
7	BN	5.00	G	16.28
	WH		M	
8	PK	10.00	H	16.29
	WH		M	
9	OR	15.00	J	16.32
	WH		M	
10	PU	20.00	K	16.3
	WH		M	



GT09-10 (TW09-01) Thermal Profile
Temperature (ºC)
-14 -13 -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 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Vertical Depth (m below ground surface)
23-Aug-09 15:15
23-Aug-09 15:50
23-Aug-09 18:40
24-Aug-09 6:45
24-Aug-09 18:50
25-Aug-09 11:00
25-Aug-09 18:00
26-Aug-09 11:10
27-Aug-09 15:00
05-Sep-09 15:25
14-Sep-09 7:10
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
13-Sep-11
01-Oct-11
13-Oct-11
26-Oct-11
19-May-12
26-May-12
03-Jun-12 10:06

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3
Ph. 403-560-7079
msquared.instruments@gmail.com

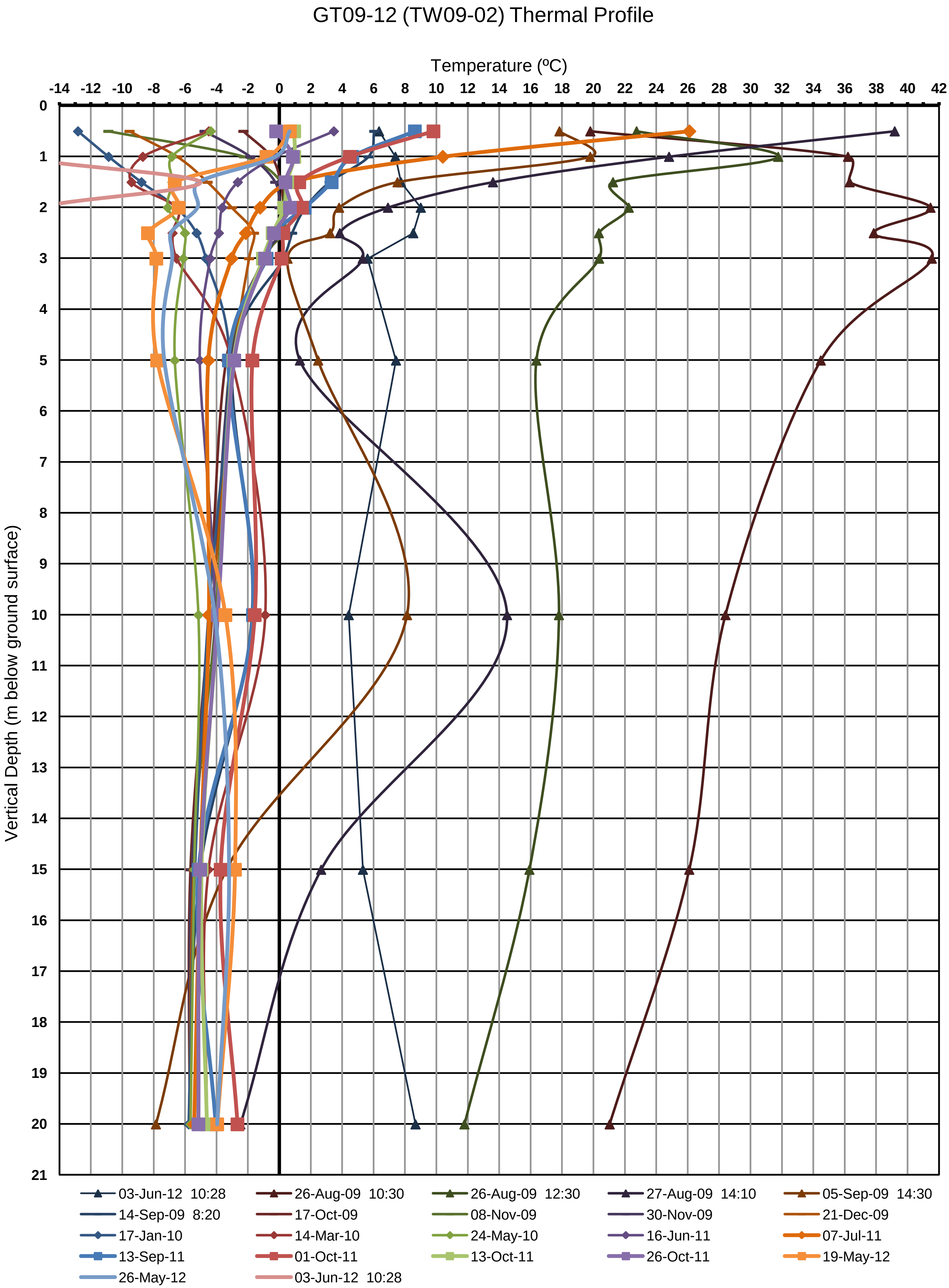
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 3-Jul-09
Purchase Order No.: 0914260015-3500

Serial No.: TW09-02
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.33
	WH		M	
2	BK	1.00	B	16.3
	WH		M	
3	BU	1.50	C	16.32
	WH		M	
4	GN	2.00	D	16.25
	WH		M	
5	RD	2.50	E	16.31
	WH		M	
6	GY	3.00	F	16.32
	WH		M	
7	BN	5.00	G	16.3
	WH		M	
8	PK	10.00	H	16.33
	WH		M	
9	OR	15.00	J	16.32
	WH		M	
10	PU	20.00	K	16.3
	WH		M	



GT09-12 (TW09-02) Thermal Profile
Temperature (ºC)
-14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Vertical Depth (m below ground surface)
03-Jun-12 10:28
26-Aug-09 10:30
26-Aug-09 12:30
27-Aug-09 14:10
05-Sep-09 14:30
14-Sep-09 8:20
17-Oct-09
08-Nov-09
30-Nov-09
21-Dec-09
17-Jan-10
14-Mar-10
24-May-10
16-Jun-11
07-Jul-11
13-Sep-11
01-Oct-11
13-Oct-11
26-Oct-11
19-May-12
26-May-12
03-Jun-12 10:28

APPENDIX C

Discovery Thermistor Data

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

Thermistor Cable Data Sheet

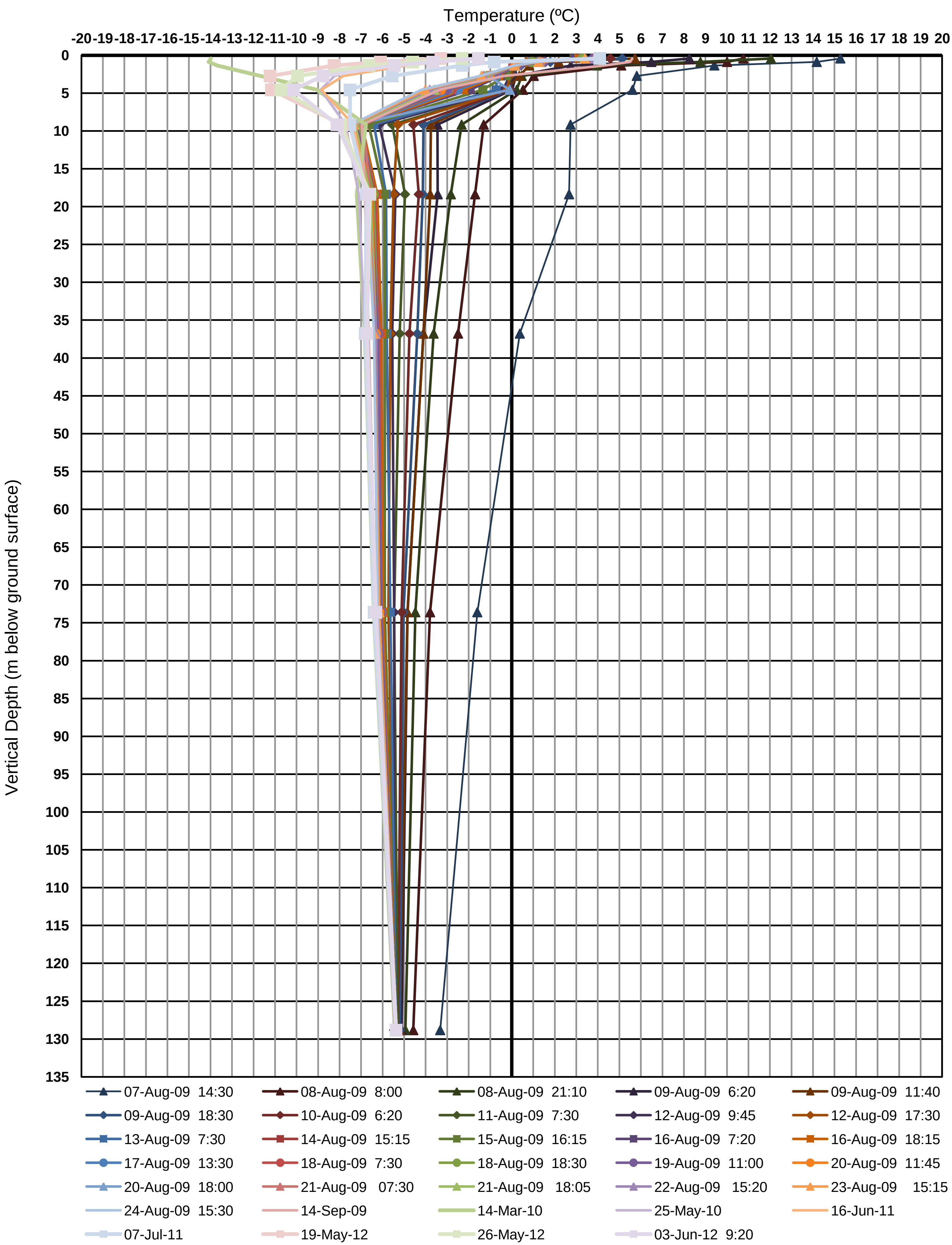
Customer: Meliadine Resources Ltd., 595 Burrard St. PO Box 49314
Suite 2600, 3 Bentall Centre, Vancouver, BC, V7X1L3
Contact: Roger March
Project: Meliadine
Date Ordered: 2-Jul-09
Purchase Order No.: 09-1426-0013/3300

Serial No.: TE09-01
Total Length (m.): 141.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.34
	WH		M	
2	BK	1.00	B	16.3
	WH		M	
3	BU	1.50	C	16.34
	WH		M	
4	GN	3.00	D	16.33
	WH		M	
5	RD	5.00	E	16.33
	WH		M	
6	GY	10.00	F	16.33
	WH		M	
7	BN	20.00	G	16.31
	WH		M	
8	PK	40.00	H	16.33
	WH		M	
9	OR	80.00	J	16.32
	WH		M	
10	PU	140.00	K	16.33
	WH		M	

DS09GT-03 (TE09-01) Thermal Profile



M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

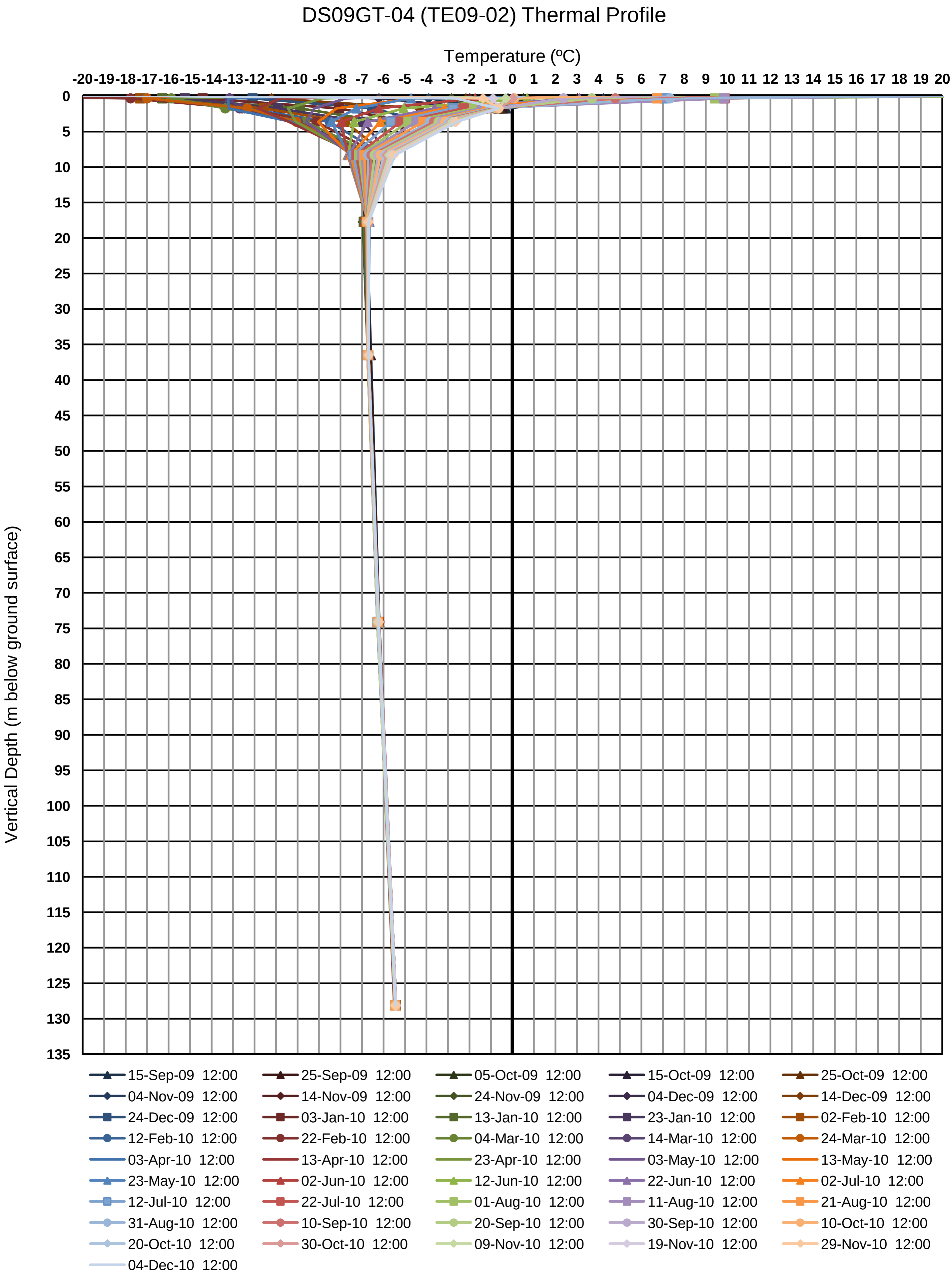
Thermistor Cable Data Sheet

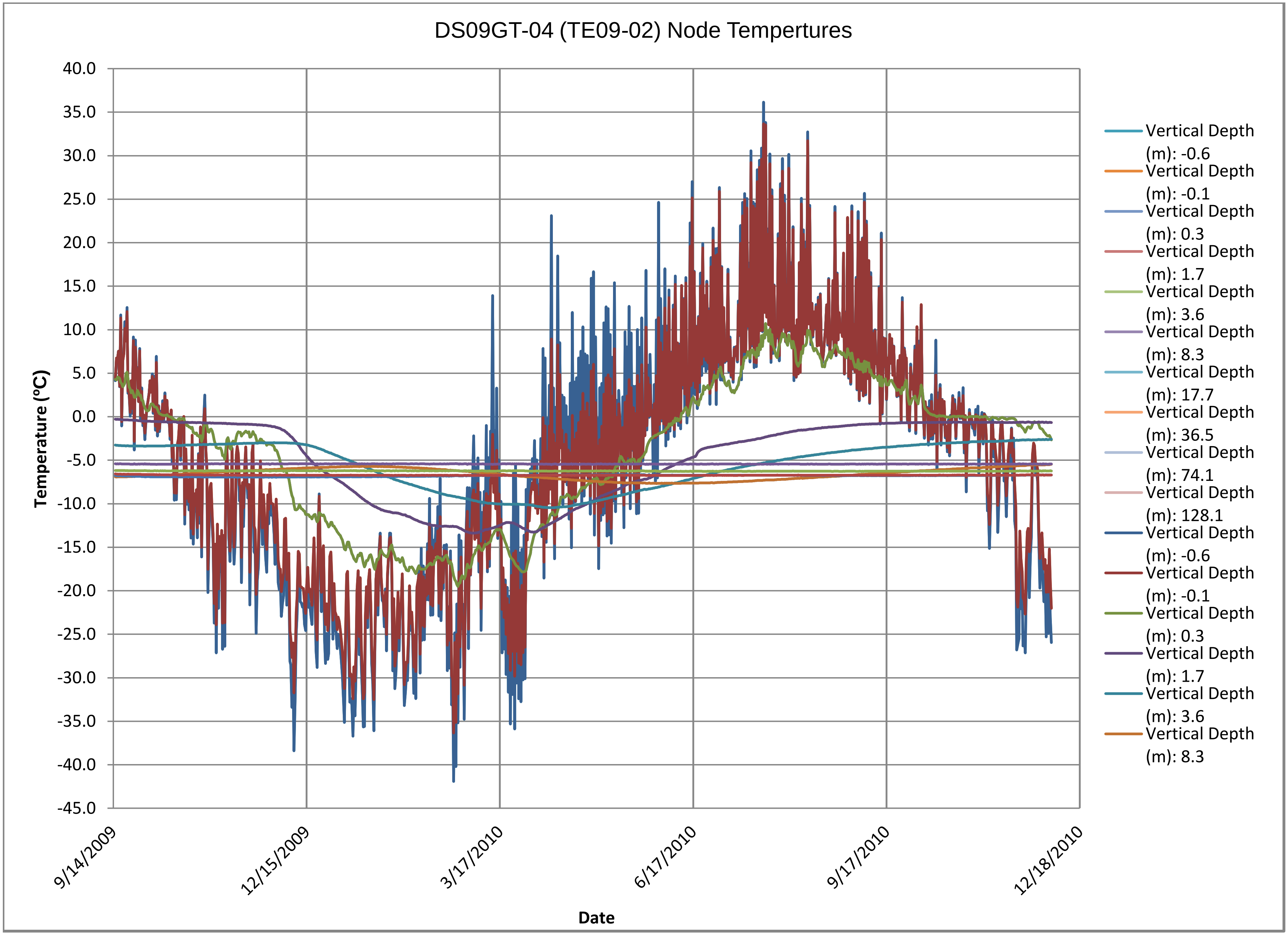
Customer: Meliadine Resources Ltd., 595 Burrard St. PO Box 49314
Suite 2600, 3 Bentall Centre, Vancouver, BC, V7X1L3
Contact: Roger March
Project: Meliadine
Date Ordered: 2-Jul-09
Purchase Order No.: 09-1426-0013/3300

Serial No.: TE09-02
Total Length (m.): 139
Lead Length(m.): 1.5
Shielded: No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.4
	WH		M	
2	BK	1.00	B	16.32
	WH		M	
3	BU	1.50	C	16.33
	WH		M	
4	GN	3.00	D	16.32
	WH		M	
5	RD	5.00	E	16.3
	WH		M	
6	GY	10.00	F	16.35
	WH		M	
7	BN	20.00	G	16.3
	WH		M	
8	PK	40.00	H	16.33
	WH		M	
9	OR	80.00	J	16.3
	WH		M	
10	PU	137.50	K	16.33
	WH		M	


DS09GT-04 (TE09-02) Thermal Profile
Temperature (ºC)
-20 -19 -18 -17 -16 -15 -14 -13 -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 13 14 15 16 17 18 19 20
Vertical Depth (m below ground surface)
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135
15-Sep-09 12:00
25-Sep-09 12:00
05-Oct-09 12:00
15-Oct-09 12:00
25-Oct-09 12:00
04-Nov-09 12:00
14-Nov-09 12:00
24-Nov-09 12:00
04-Dec-09 12:00
14-Dec-09 12:00
24-Dec-09 12:00
03-Jan-10 12:00
13-Jan-10 12:00
23-Jan-10 12:00
02-Feb-10 12:00
12-Feb-10 12:00
22-Feb-10 12:00
04-Mar-10 12:00
14-Mar-10 12:00
24-Mar-10 12:00
03-Apr-10 12:00
13-Apr-10 12:00
23-Apr-10 12:00
03-May-10 12:00
13-May-10 12:00
23-May-10 12:00
02-Jun-10 12:00
12-Jun-10 12:00
22-Jun-10 12:00
02-Jul-10 12:00
12-Jul-10 12:00
22-Jul-10 12:00
01-Aug-10 12:00
11-Aug-10 12:00
21-Aug-10 12:00
31-Aug-10 12:00
10-Sep-10 12:00
20-Sep-10 12:00
30-Sep-10 12:00
10-Oct-10 12:00
20-Oct-10 12:00
30-Oct-10 12:00
09-Nov-10 12:00
19-Nov-10 12:00
29-Nov-10 12:00
04-Dec-10 12:00


DS09GT-04 (TE09-02) Node Tempertures
Temperature (ºC)
Date
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
9/14/2009
12/15/2009
3/17/2010
6/17/2010
9/17/2010
12/18/2010
Vertical Depth (m): -0.6
Vertical Depth (m): -0.1
Vertical Depth (m): 0.3
Vertical Depth (m): 1.7
Vertical Depth (m): 3.6
Vertical Depth (m): 8.3
Vertical Depth (m): 17.7
Vertical Depth (m): 36.5
Vertical Depth (m): 74.1
Vertical Depth (m): 128.1
Vertical Depth (m): -0.6
Vertical Depth (m): -0.1
Vertical Depth (m): 0.3
Vertical Depth (m): 1.7
Vertical Depth (m): 3.6
Vertical Depth (m): 8.3

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

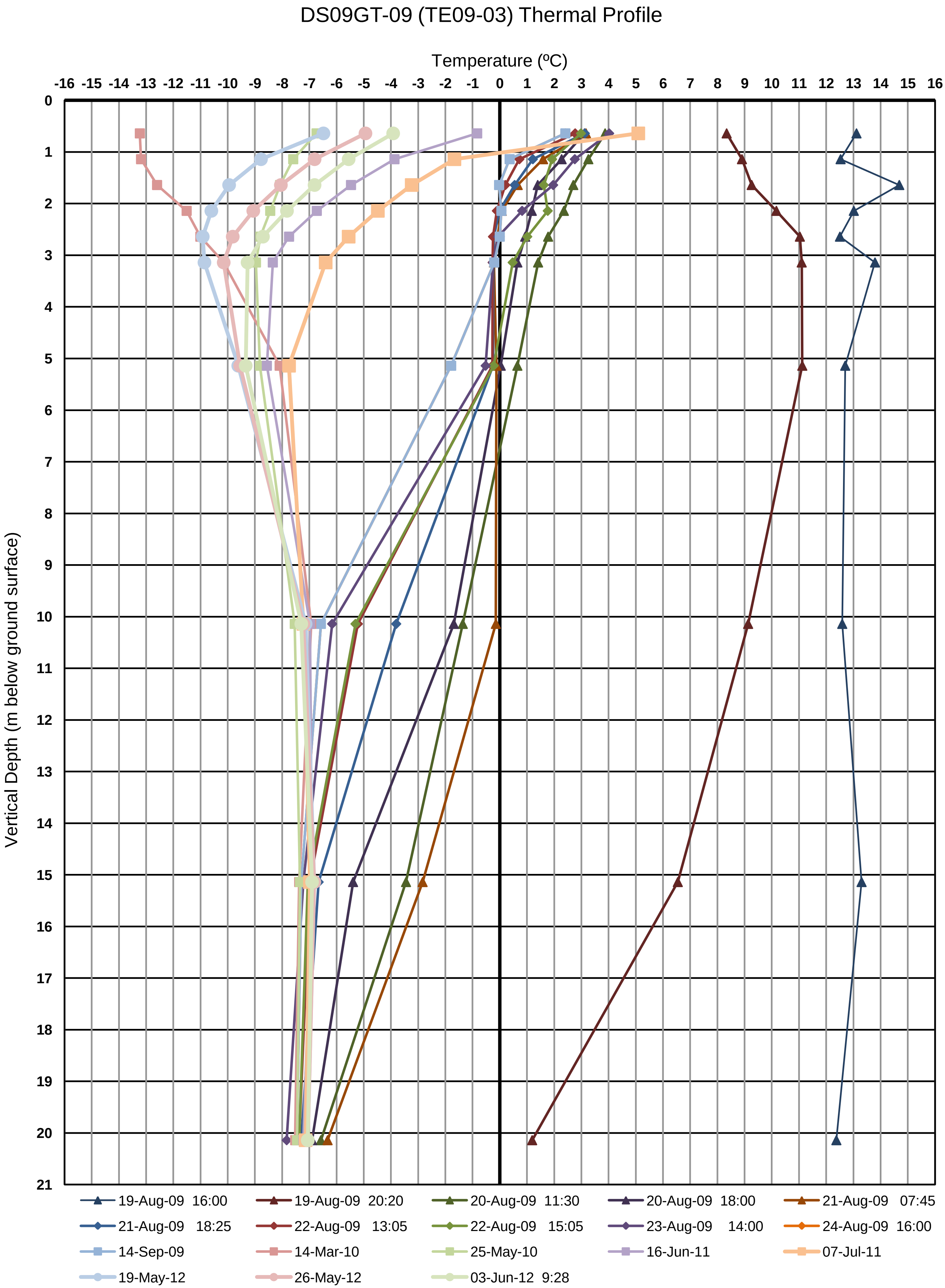
Thermistor Cable Data Sheet

Customer: Meliadine Resources Ltd., 595 Burrard St. PO Box 49314
Suite 2600, 3 Bentall Centre, Vancouver, BC, V7X1L3
Contact: Roger March
Project: Meliadine
Date Ordered: 2-Jul-09
Purchase Order No.: 09-1426-0013/3300

Serial No.: TE09-03
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.11
	WH		M	
2	BK	1.00	B	16.34
	WH		M	
3	BU	1.50	C	16.33
	WH		M	
4	GN	2.00	D	16.32
	WH		M	
5	RD	2.50	E	16.35
	WH		M	
6	GY	3.00	F	16.35
	WH		M	
7	BN	5.00	G	16.33
	WH		M	
8	PK	10.00	H	16.32
	WH		M	
9	OR	15.00	J	16.32
	WH		M	
10	PU	20.00	K	16.3
	WH		M	


DS09GT-09 (TE09-03) Thermal Profile
Temperature (ºC)
-16 -15 -14 -13 -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 13 14 15 16
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
19-Aug-09 16:00
19-Aug-09 20:20
20-Aug-09 11:30
20-Aug-09 18:00
21-Aug-09 07:45
21-Aug-09 18:25
22-Aug-09 13:05
22-Aug-09 15:05
23-Aug-09 14:00
24-Aug-09 16:00
14-Sep-09
14-Mar-10
25-May-10
16-Jun-11
07-Jul-11
19-May-12
26-May-12
03-Jun-12 9:28

M-Squared Instruments
144 West Terrace Cres.
Cochrane, AB. T4C-1R3
Ph. 403-560-7079
msquared.instruments@gmail.com

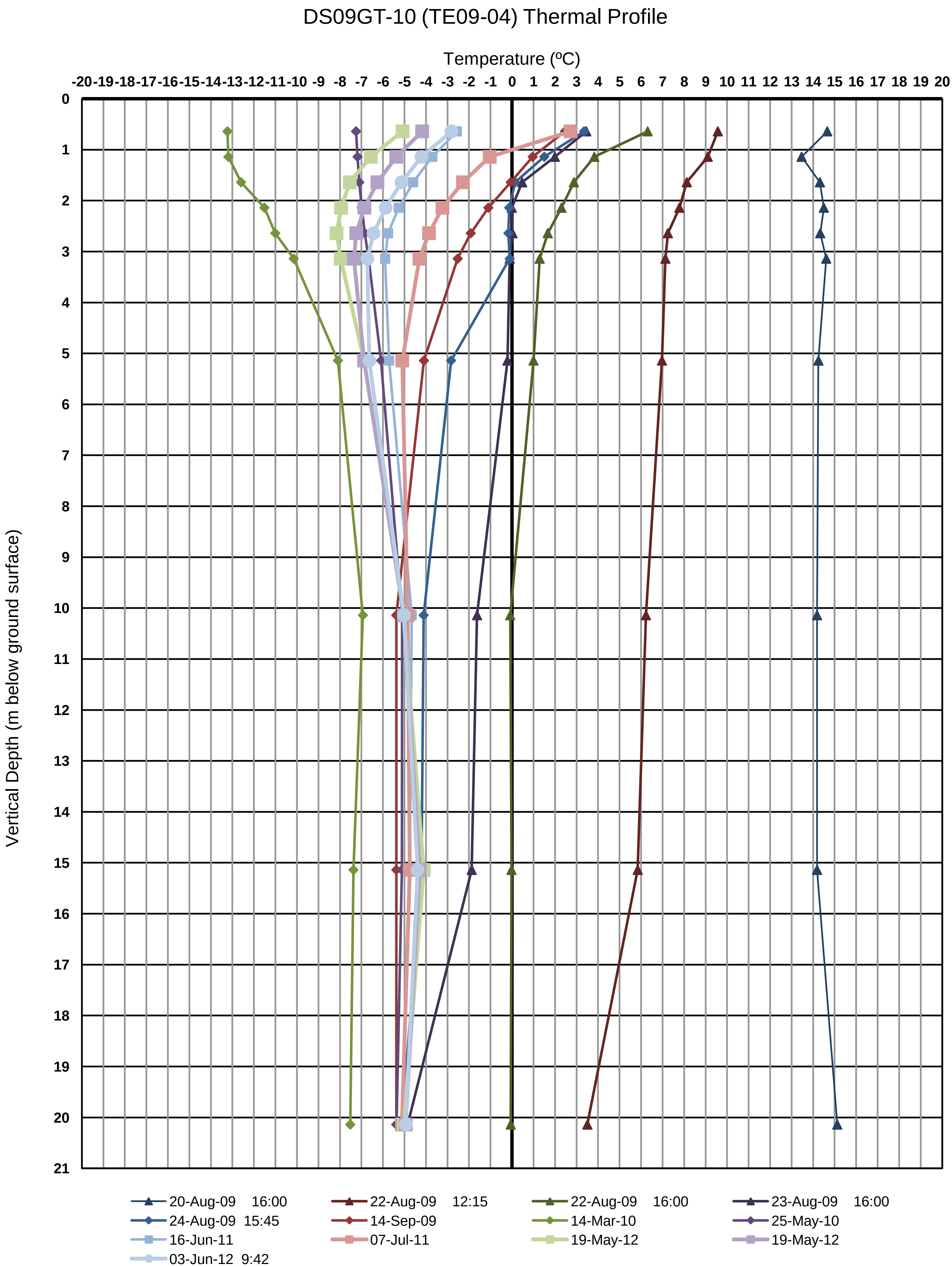
Thermistor Cable Data Sheet

Customer: Meliadine Resources Ltd., 595 Burrard St. PO Box 49314
Suite 2600, 3 Bentall Centre, Vancouver, BC, V7X1L3
Contact: Roger March
Project: Meliadine
Date Ordered: 2-Jul-09
Purchase Order No.: 09-1426-0013/3300

Serial No.: TE09-04
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.35
	WH		M	
2	BK	1.00	B	16.33
	WH		M	
3	BU	1.50	C	16.31
	WH		M	
4	GN	2.00	D	16.35
	WH		M	
5	RD	2.50	E	16.3
	WH		M	
6	GY	3.00	F	16.4
	WH		M	
7	BN	5.00	G	16.34
	WH		M	
8	PK	10.00	H	16.33
	WH		M	
9	OR	15.00	J	16.3
	WH		M	
10	PU	20.00	K	16.27
	WH		M	


DS09GT-10 (TE09-04) Thermal Profile
Temperature (ºC)
-20 -19 -18 -17 -16 -15 -14 -13 -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 13 14 15 16 17 18 19 20
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Vertical Depth (m below ground surface)
20-Aug-09 16:00
22-Aug-09 12:15
22-Aug-09 16:00
23-Aug-09 16:00
24-Aug-09 15:45
14-Sep-09
14-Mar-10
25-May-10
16-Jun-11
07-Jul-11
19-May-12
19-May-12
03-Jun-12 9:42

APPENDIX D

Pump Thermistor Data

M-Squared Instruments

144 West Terrace Cres.
Cochrane, AB. T4C-1R3

Ph. 403-560-7079
msquared.instruments@gmail.com

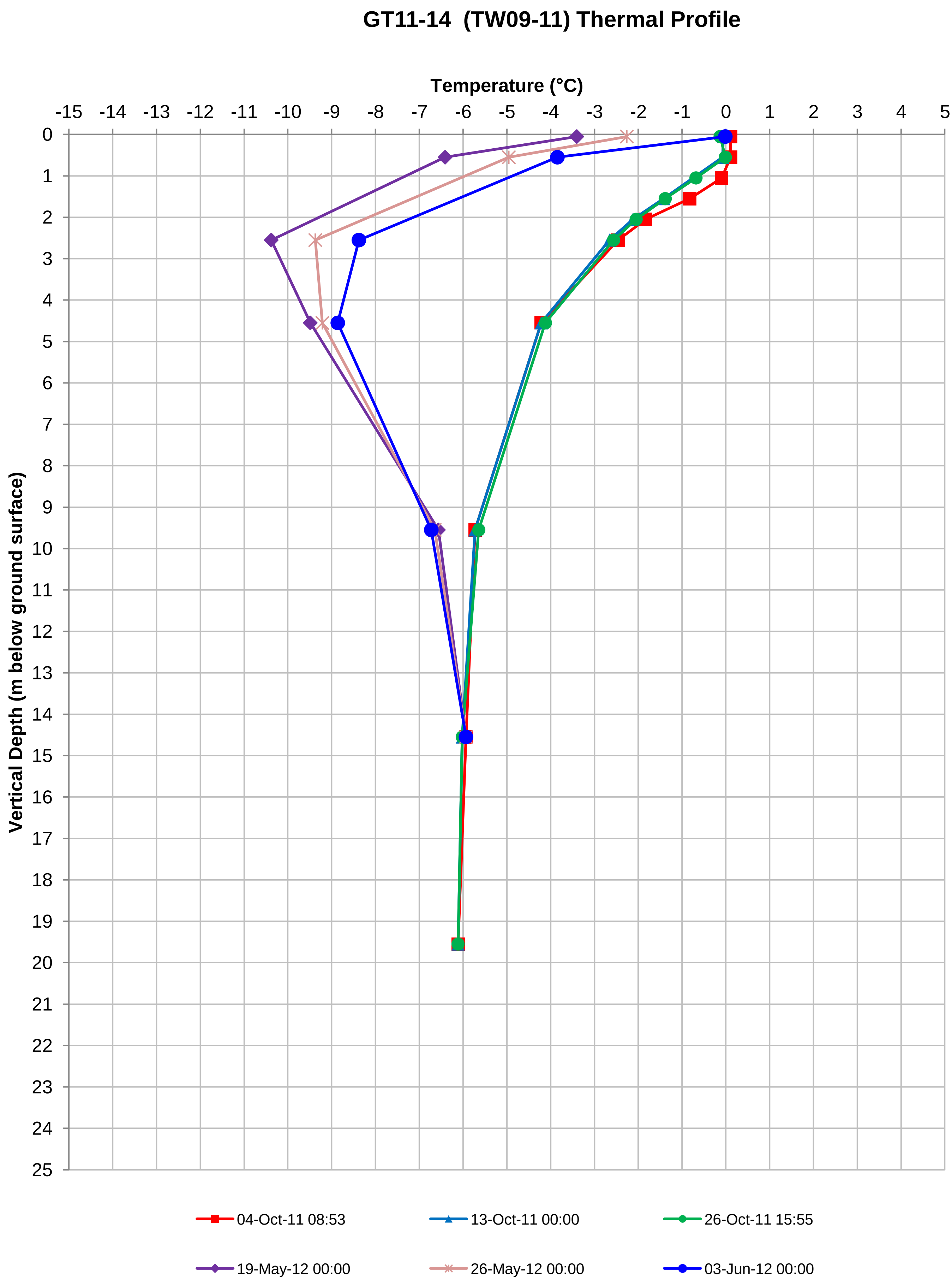
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 03-Jul-09
Purchase Order No.: 0914260015-3400

Serial No.: TW09-11
Total Length (m.): 21.5
Lead Length(m.): 1.5
Shielded No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.29
	WH		M	
2	BK	1.00	B	16.39
	WH		M	
3	BU	1.50	C	16.32
	WH		M	
4	GN	2.00	D	16.3
	WH		M	
5	RD	2.50	E	16.38
	WH		M	
6	GY	3.00	F	16.3
	WH		M	
7	BN	5.00	G	16.32
	WH		M	
8	PK	10.00	H	16.33
	WH		M	
9	OR	15.00	J	16.3
	WH		M	
10	PU	20.00	K	16.29
	WH		M	


GT11-14 (TW09-11) Thermal Profile
Temperature (°C)
-15
-14
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
Vertical Depth (m below ground surface)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
04-Oct-11 08:53
13-Oct-11 00:00
26-Oct-11 15:55
19-May-12 00:00
26-May-12 00:00
03-Jun-12 00:00

M-Squared Instruments
144 West Terrace Cres.
Cochrane, AB. T4C-1R3
Ph. 403-560-7079
msquared.instruments@gmail.com

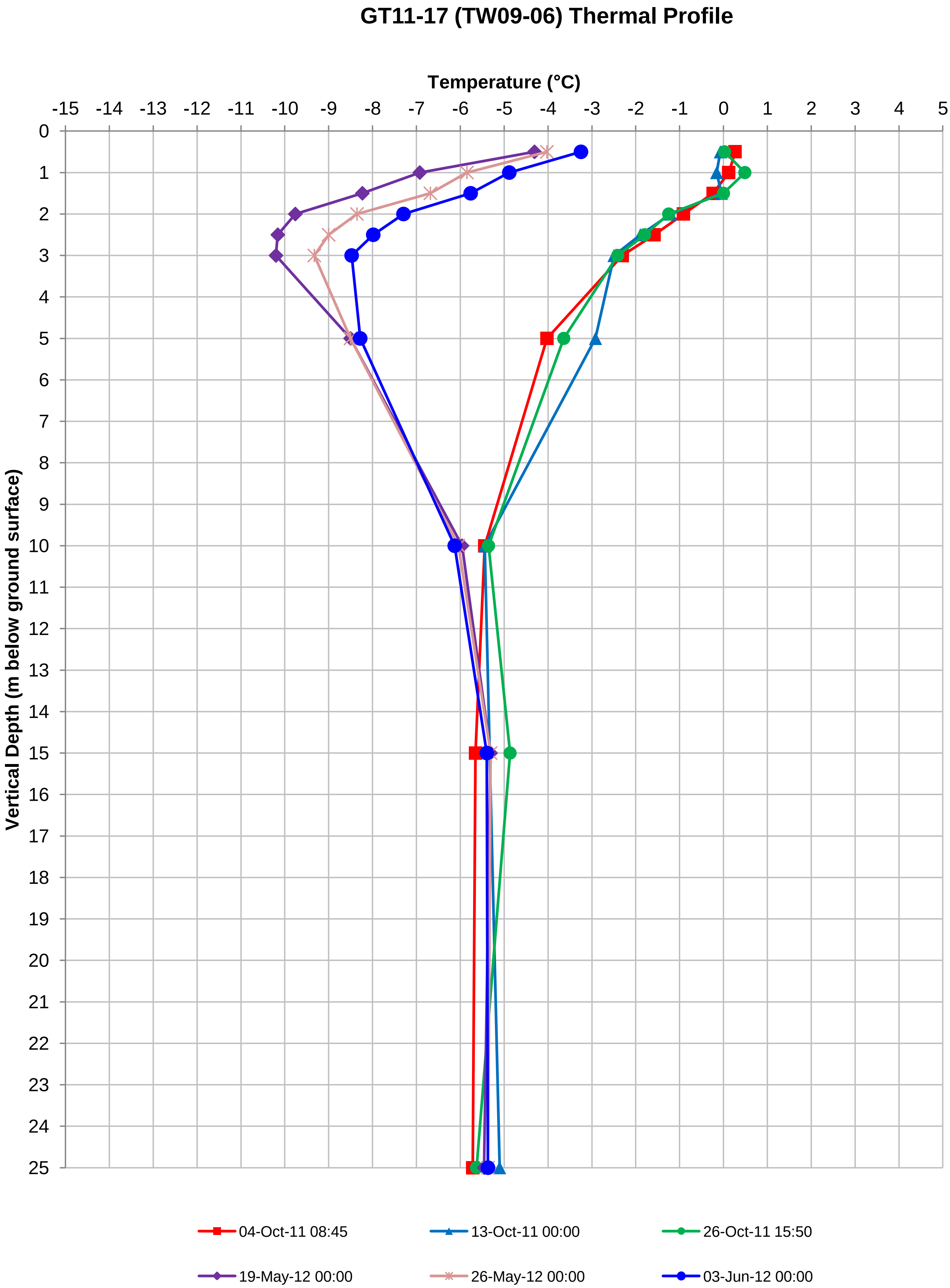
Thermistor Cable Data Sheet

Customer: Comaplex Minerals Corp., 901 - 1015 4 St. SW
Calgary, AB., T2R1J4
Contact: Mark Balog
Project: Meliadine
Date Ordered: 03-Jul-09
Purchase Order No.: 0914260015-3610

Serial No.: TW09-06
Total Length (m.): 26.5
Lead Length(m.): 1.5
Shielded: No
Termination: MS3106E20-29P
Molded: No
Thermistor Type: YSI 44007 / 34
No. of Thermistors: 10

Number of Cables in Order: 16

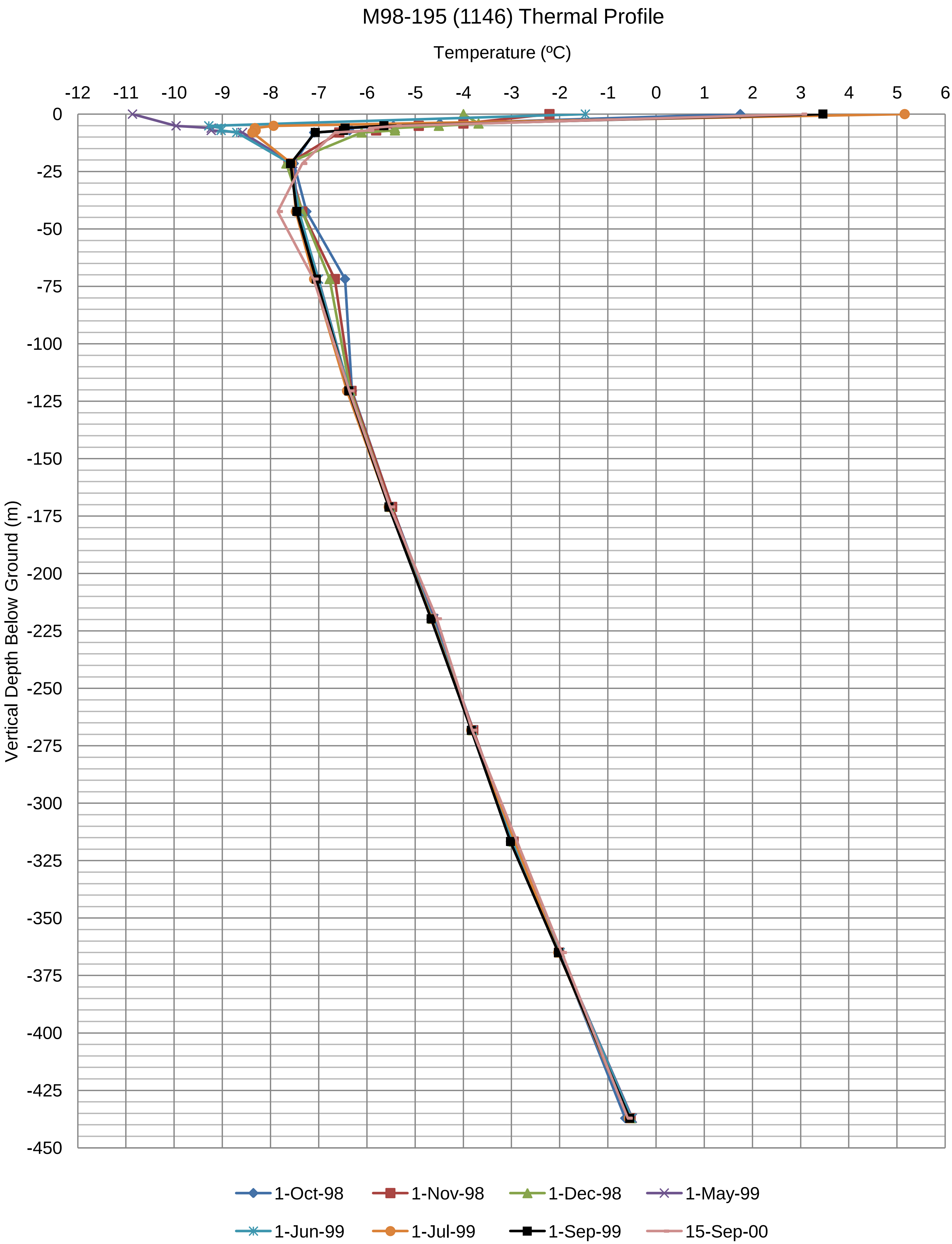
T. No.	Colour Code	Depth	Pin No.	kOhms@ 0 deg. C.
1	YW	0.50	A	16.32
	WH		M	
2	BK	1.00	B	16.3
	WH		M	
3	BU	1.50	C	16.3
	WH		M	
4	GN	2.00	D	16.32
	WH		M	
5	RD	2.50	E	16.32
	WH		M	
6	GY	3.00	F	16.34
	WH		M	
7	BN	5.00	G	16.32
	WH		M	
8	PK	10.00	H	16.35
	WH		M	
9	OR	15.00	J	16.39
	WH		M	
10	PU	25.00	K	16.34
	WH		M	



GT11-17 (TW09-06) Thermal Profile
Temperature (°C)
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5
Vertical Depth (m below ground surface)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
04-Oct-11 08:45
13-Oct-11 00:00
26-Oct-11 15:50
19-May-12 00:00
26-May-12 00:00
03-Jun-12 00:00

APPENDIX E

Background Thermistor Data


M98-195 (1146) Thermal Profile
Temperature (ºC)
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
Vertical Depth Below Ground (m)
0
-25
-50
-75
-100
-125
-150
-175
-200
-225
-250
-275
-300
-325
-350
-375
-400
-425
-450
1-Oct-98
1-Nov-98
1-Dec-98
1-May-99
1-Jun-99
1-Jul-99
1-Sep-99
15-Sep-00

EBA Engineering Consultants Ltd.

July 29, 1998

EBA file no.: 0701-98-12730

WMC International Ltd.
22 Gurdwara Road
Nepean, Ontario
K2E 8A2

Attention: Mr. Alan J. Sexton, District Geologist.

Dear Mr. Sexton

Subject: Thermistor cable installation, Meliadine project.

The following is an account of the installation of the thermistor cable in ddh M98-195. The hole was completed on June 27, 1998 and EBA thermistor cable #1146 was installed upon completion.

The installation was conducted as follows.

The drill string was pulled up and the core barrel removed. The empty drill string was lowered back down the hole to exactly 450 metres below original grade. A spring-loaded expanding plug was pumped down to the bottom of the drill string, and the thermistor cable was lowered down to the plug, encased in lengths of 25 mm pvc pipe, which were threaded together into a continuous string, with a mechanical metal anchor attached to the first piece. The drill string was then removed from the hole.

After removal of the drill string, it was found that the end of the thermistor cable was approximately 6 metres below the top of the pvc pipe. Several attempts were made to retrieve it to the surface using a home-made fishing tool, but with each attempt the cable fell off the fishing tool just before reaching the surface. Finally, the cable was secured at a point 0.5 metres below grade. The fishing tool was fastened securely into place and left while the drill rig was moved off site. It was not possible to grout the hole due to the danger of losing the cable down the hole.

After the drill rig was removed from the site, the area immediately surrounding the drill hole was drained and hand-excavated down to approximately one metre depth. The casing was cut off using an electric side grinder, and a small hole was cut in the pvc pipe. It was just possible to secure the top of the cable with a piece of wire, after which the pvc was cut off and the fishing tool removed. The pvc tube was held up in the casing by means of a steel clamp.

A slurry of Portland cement and water was poured down inside the pvc tube. Then a piece of cable about one metre in length was added by splicing the individual wires with butt connectors and a splicing tool. The splice was taped with electrical tape and coated with epoxy and a second layer of tape. After the epoxy hardened, it was coated with two more coats of epoxy.

A piece of ABS plastic tubing was installed over the spliced length and pushed down to cover the splice. The bottom of this tube was stuffed with silicone caulking. The installation was enclosed by lowering a plastic 20 litre pail (with the bottom removed) over the casing. The pail was then filled with a thick mixture of Portland cement and water. The hole around the pail was filled with the same mixture to an elevation just below original grade. The ABS plastic was supported by means of a piece of 2x2 lumber set into the cement and extending vertically up, where it was nailed to a piece of plank set across the hole. A plastic tool box with a round hole in one end was fitted over the ABS tubing and fastened to the 2x2 with screws.

A piece of steel rod was driven into the ground beside the casing, and a ground wire attached to it and to a piece of metal flashing inside the tool box. Grounding in this manner is necessary in order to prevent static build-up from discharging to ground through the cable. Manual readings were taken to ensure that the sensors were all responding. A data logger was connected to the cable and left in place inside the tool box. The initial temperatures are included herewith, along with a set of readings downloaded by Mr. Ben Hubert on July 22, 1998.

Due to the error in cable length, the actual depth of the sensors is approximately 3.2 metres deeper than their design depths. The as-built depths have been computed from the light log and are included with the temperature readings.

We trust that the above is sufficient to your present requirements. If you have any more questions or comments, please do not hesitate to contact our office.

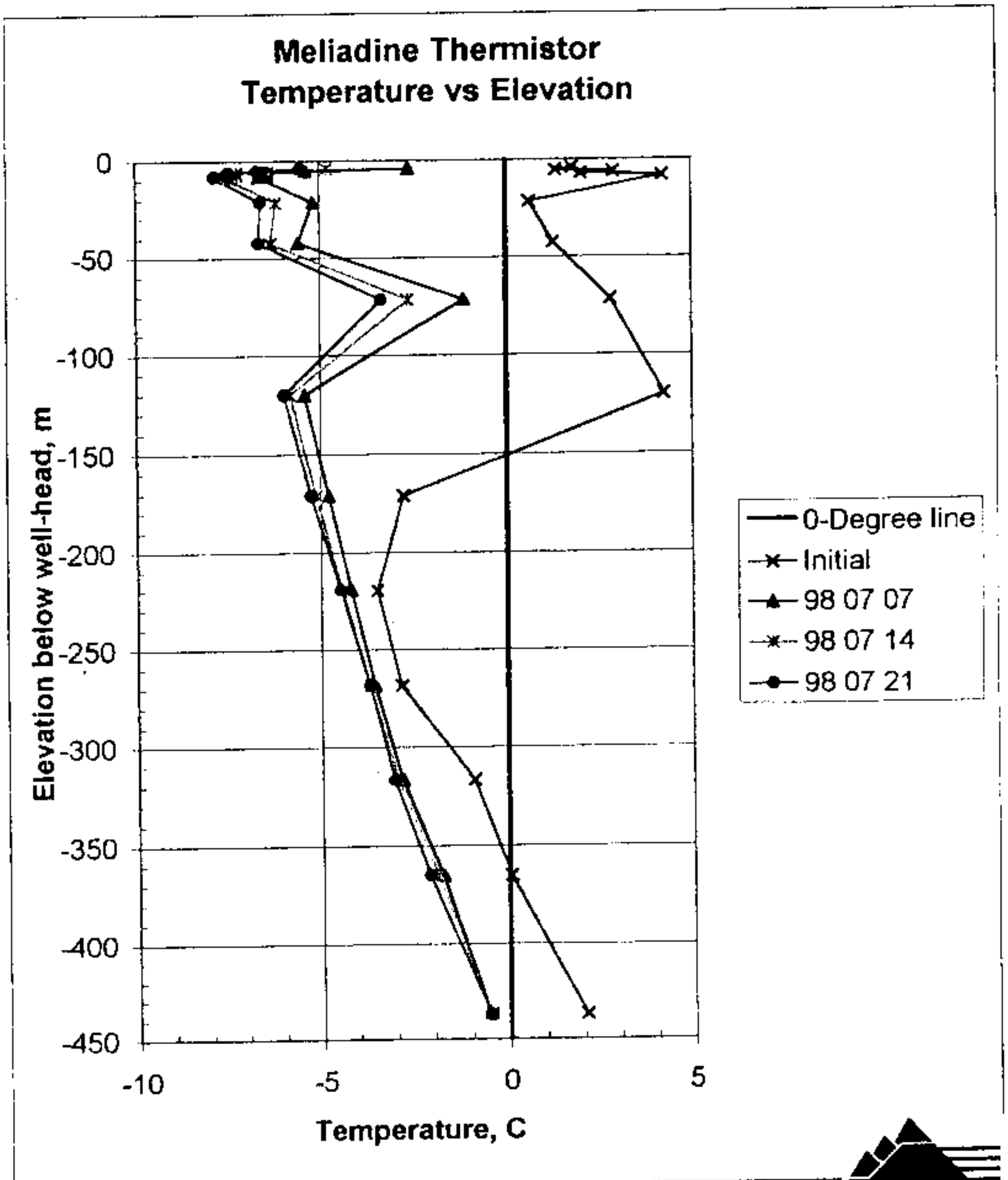
Yours truly

EBA Engineering Consultants Ltd.

Terrence L. Jordan
Senior Engineering Assistant.

Cc: Mr. Joe Campbell, WMC
✓Mr. Ben Hubert, Hubert & Associates

Attachments.


Meliadine Thermistor
Temperature vs Elevation
0
-50
-100
-150
-200
-250
-300
-350
-400
-450
Elevation below well-head, m
-10
-5
0
5
Temperature, C
0-Degree line
Initial
98 07 07
98 07 14
98 07 21

0701-98-12730
Meliadine thermistor - temperatures

Date/Time	Temperatures	(#### denotes no reading or defective sensor)														
"06/29/98","00:00:	####	####	####	####	####	####	####	####	####	####	####	####	####	####	####	####
"06/29/98","12:00:	####	####	####	####	####	####	####	####	####	####	####	####	####	####	####	####
"06/30/98","00:00:	0.31	-0.53	-0.83	-0.83	-1.01	-1.30	-0.74	-1.30	4.55	-3.86	-3.50	-3.40	-3.05	-2.46	-1.56	-0.27
"06/30/98","12:00:	0.04	-1.08	-1.46	-1.46	-1.78	-1.64	-1.22	-2.32	3.71	-4.11	-3.66	-3.54	-3.15	-2.52	-1.62	-0.31
"07/01/98","00:00:	-0.13	-2.36	-2.90	-2.90	-3.09	-2.45	-1.81	-2.96	3.22	-4.35	-3.93	-3.69	-3.19	-2.57	-1.64	-0.37
"07/01/98","12:00:	-0.25	-2.53	-3.69	-3.72	-3.93	####	-2.63	-3.53	2.43	-4.53	-4.09	-3.77	-3.28	-2.67	-1.70	-0.41
"07/02/98","00:00:	-0.40	-3.18	-4.21	-4.25	-4.44	####	-3.18	-3.92	1.96	-4.63	-4.29	-3.88	-3.33	-2.70	-1.77	-0.47
"07/02/98","12:00:	-0.49	-3.63	-4.65	-4.65	-4.89	####	-3.53	-4.29	1.46	-4.80	-4.33	-3.92	-3.38	-2.73	-1.78	-0.45
"07/03/98","00:00:	-0.69	-3.98	-4.97	-5.03	-5.21	####	-3.90	-4.59	1.00	-4.87	-4.41	-4.02	-3.43	-2.75	-1.79	-0.48
"07/03/98","12:00:	-0.69	-4.21	-5.26	-5.26	-5.46	####	-4.13	-4.76	0.56	-4.99	-4.33	-4.00	-3.48	-2.77	-1.81	-0.48
"07/04/98","00:00:	-0.87	-4.42	-5.50	-5.52	-5.72	####	-4.19	-4.92	0.27	-5.08	-4.49	-4.04	-3.43	-2.77	-1.79	-0.45
"07/04/98","12:00:	-1.18	-4.61	-5.72	-5.72	-5.94	####	-4.53	-5.11	-0.13	-5.16	-4.51	-4.09	-3.50	-2.86	-1.85	-0.53
"07/05/98","00:00:	-1.70	-4.84	-5.94	-5.92	-6.15	####	-4.63	-5.21	-0.41	-5.28	-4.61	-4.10	-3.52	-2.85	-1.83	-0.49
"07/05/98","12:00:	-1.66	-4.99	-6.09	-6.07	-6.31	####	-4.84	-5.35	-0.63	-5.28	-4.59	-4.09	-3.53	-2.98	-1.99	-0.51
"07/06/98","00:00:	-1.99	-5.12	-6.21	-6.19	-6.41	####	-5.01	-5.42	-0.89	-5.40	-4.72	-4.15	-3.56	-2.80	-1.81	-0.51
"07/06/98","12:00:	-2.41	-5.21	-6.31	-6.30	-6.56	####	-5.04	-5.58	-1.01	-5.40	-4.76	-4.11	-3.58	-2.77	-1.75	-0.48
"07/07/98","00:00:	-2.59	-5.37	-6.41	-6.41	-6.65	####	-5.18	-5.58	-1.14	-5.43	-4.78	-4.18	-3.56	-2.83	-1.77	-0.51
"07/07/98","12:00:	-2.73	-5.43	-6.50	-6.54	-6.82	####	-5.33	-5.72	-1.30	-5.50	-4.80	-4.15	-3.56	-2.83	-1.78	-0.49
"07/08/98","00:00:	-3.02	-5.54	-6.62	-6.64	-6.92	####	-5.45	-5.73	-1.50	-5.54	-4.87	-4.25	-3.61	-2.91	-1.89	-0.53
"07/08/98","12:00:	-3.17	-5.60	-6.71	-6.73	-7.01	####	-5.52	-5.81	-1.66	-5.62	-4.86	-4.25	-3.60	-2.91	-1.89	-0.53
"07/09/98","00:00:	-3.38	-5.72	-6.83	-6.82	-7.07	####	-5.62	-5.89	-1.70	-5.60	-4.92	-4.28	-3.61	-2.93	-1.89	-0.53
"07/09/98","12:00:	-3.54	-5.74	-6.84	-6.86	-7.18	####	-5.67	-5.92	-1.83	-5.63	-4.94	-4.26	-3.61	-2.91	-1.87	-0.51
"07/10/98","00:00:	-3.77	-5.80	-6.88	-6.93	-7.23	####	-5.72	-5.95	-1.96	-5.72	-4.97	-4.26	-3.61	-2.93	-1.87	-0.49
"07/10/98","12:00:	-3.85	-5.85	-6.95	-6.99	-7.30	####	-5.83	-6.09	-2.09	-5.72	-4.99	-4.29	-3.63	-2.94	-1.91	-0.51
"07/11/98","00:00:	-4.11	-5.98	-7.05	-7.03	-7.34	####	-5.85	-6.11	-2.16	-5.72	-5.01	-4.33	-3.65	-2.93	-1.87	-0.48

0701-98-12730
Meliadine thermistor - temperatures

Date/Time	Temperatures	(#### denotes no reading or defective sensor)														
"07/11/98","12:00:	-4.17	-6.04	-7.07	-7.05	-7.42	####	-5.95	-6.14	-2.24	-5.74	-5.03	-4.35	-3.65	-2.94	-1.89	-0.49
"07/12/98","00:00:	-4.35	-6.13	-7.11	-7.19	-7.46	####	-6.00	-6.24	-2.32	-5.79	-5.03	-4.35	-3.66	-2.94	-1.91	-0.48
"07/12/98","12:00:	-4.45	-6.15	-7.15	-7.15	-7.47	####	-6.02	-6.19	-2.39	-5.80	-5.04	-4.33	-3.65	-2.93	-1.89	-0.48
"07/13/98","00:00:	-4.59	-6.24	-7.21	-7.17	-7.56	####	-6.09	-6.28	-2.49	-5.80	-5.08	-4.39	-3.66	-2.93	-1.89	-0.48
"07/13/98","12:00:	-4.72	-6.28	-7.23	-7.25	-7.63	####	-6.13	-6.31	-2.55	-5.83	-5.10	-4.41	-3.66	-2.94	-1.91	-0.49
"07/14/98","00:00:	-4.80	-6.38	-7.25	-7.23	-7.60	####	-6.19	-6.34	-2.63	-5.83	-5.12	-4.42	-3.68	-2.93	-1.89	-0.49
"07/14/98","12:00:	-4.89	-6.40	-7.28	-7.28	-7.62	####	-6.21	-6.34	-2.67	-5.88	-5.18	-4.42	-3.68	-2.93	-1.89	-0.49
"07/15/98","00:00:	-4.97	-6.43	-7.30	-7.30	-7.69	####	-6.28	-6.41	-2.73	-5.87	-5.18	-4.41	-3.68	-2.93	-1.89	-0.49
"07/15/98","12:00:	-5.06	-6.45	-7.35	-7.35	-7.69	####	-6.28	-6.43	-2.80	-5.89	-5.19	-4.42	-3.69	-2.93	-1.91	-0.49
"07/16/98","00:00:	-5.10	-6.51	-7.36	-7.35	-7.69	####	-6.34	-6.43	-2.85	-5.92	-5.19	-4.44	-3.68	-2.93	-1.89	-0.49
"07/16/98","12:00:	-5.18	-6.56	-7.39	-7.39	-7.72	####	-6.31	-6.47	-2.94	-5.94	-5.21	-4.45	-3.72	-2.96	-1.93	-0.51
"07/17/98","00:00:	-5.25	-6.57	-7.42	-7.41	-7.70	####	-6.36	-6.54	-2.98	-5.89	-5.21	-4.42	-3.66	-2.93	-1.89	-0.49
"07/17/98","12:00:	-5.28	-6.58	-7.42	-7.41	-7.80	####	-6.41	-6.50	-3.02	-5.92	-5.23	-4.44	-3.65	-2.94	-1.91	-0.49
"07/18/98","00:00:	-5.31	-6.62	-7.46	-7.45	-7.78	####	-6.47	-6.56	-3.05	-5.98	-5.25	-4.45	-3.68	-2.96	-1.93	-0.51
"07/18/98","12:00:	-5.37	-6.62	-7.42	-7.47	-7.80	####	-6.47	-6.54	-3.10	-5.95	-5.25	-4.45	-3.66	-2.93	-1.91	-0.48
"07/19/98","00:00:	-5.40	-6.65	-7.50	-7.46	-7.85	####	-6.50	-6.64	-3.17	-5.98	-5.25	-4.44	-3.68	-2.94	-1.91	-0.48
"07/19/98","12:00:	-5.45	-6.67	-7.47	-7.50	-7.87	####	-6.50	-6.64	-3.17	-5.94	-5.25	-4.45	-3.66	-2.91	-1.87	-0.47
"07/20/98","00:00:	-5.46	-6.62	-7.53	-7.58	-7.87	####	-6.58	-6.60	-3.22	-6.06	-5.26	-4.49	-3.68	-2.94	-1.93	-0.49
"07/20/98","12:00:	-5.52	-6.69	-7.50	-7.52	-7.87	####	-6.56	-6.64	-3.28	-5.98	-5.28	-4.49	-3.68	-3.03	-2.09	-0.49
"07/21/98","00:00:	-5.54	-6.71	-7.50	-7.52	-7.87	####	-6.62	-6.67	-3.33	-6.00	-5.26	-4.46	-3.69	-3.05	-2.11	-0.51
"07/21/98","12:00:	-5.52	-6.69	-7.50	-7.52	-7.89	####	-6.56	-6.64	-3.42	-6.04	-5.29	-4.51	-3.72	-3.07	-2.12	-0.55
"07/22/98","00:00:	-5.58	-6.76	-7.50	-7.56	-7.94	####	-6.60	-6.67	-3.43	-6.06	-5.29	-4.46	-3.69	-3.00	-2.03	-0.51
"07/22/98","12:00:	-5.58	-6.75	-7.54	-7.54	-7.91	####	-6.64	-6.71	-3.46	-6.06	-5.29	-4.51	-3.72	-3.00	-2.01	-0.51

Meliadine Gold Mine

Table showing as-built depths of sensors as elevation in metres below grade at well-head.

Depths were calculated by interpolating between depth intervals from the light log.

Initial temperatures were taken by reading the pins on adaptor plug immediately after installation of the plug on June 30, 1998 at 14:45.

;ensor Nc	As-built depth, m	Initial temperature, C
1	-4.1	1.8
2	-5.1	1.3
3	-6.1	2.9
4	-7.1	2.0
5	-8.0	4.2
6	-13.0	3.2
7	-21.5	0.6
8	-42.4	1.3
9	-71.8	2.8
10	-120.5	4.2
11	-171.0	-2.8
12	-219.7	-3.5
13	-268.2	-2.8
14	-316.7	-0.9
15	-365.0	0.0
16	-437.1	2.1

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

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