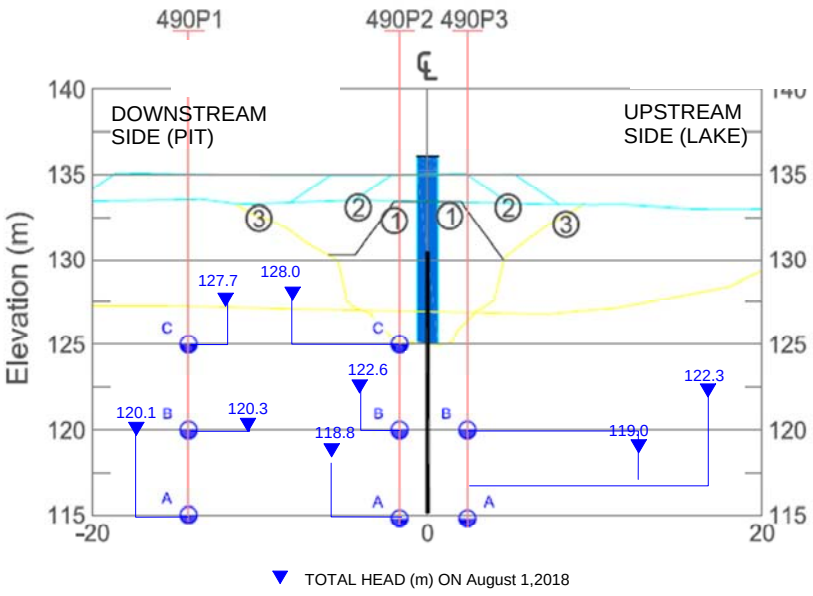
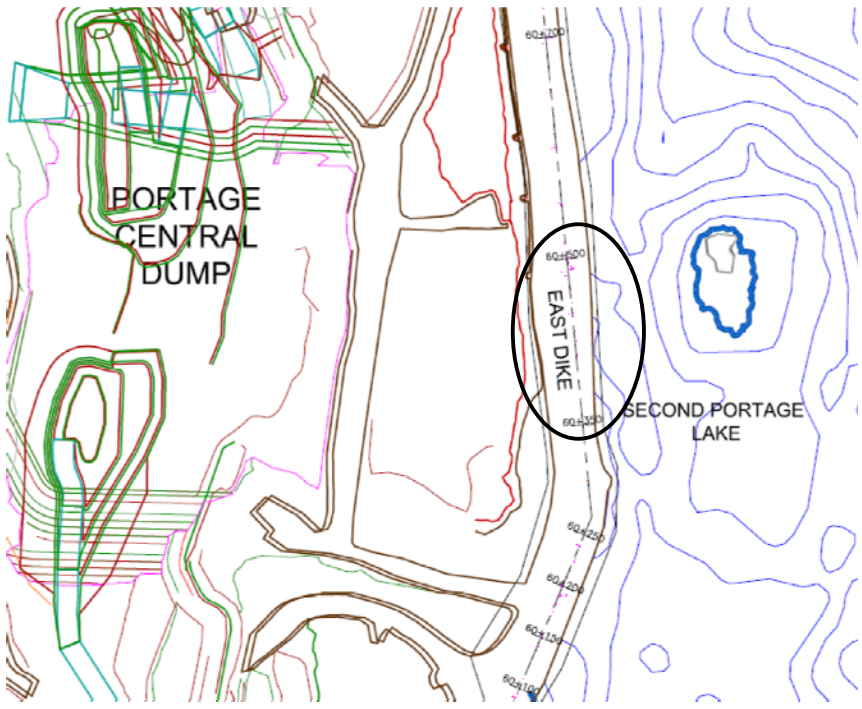
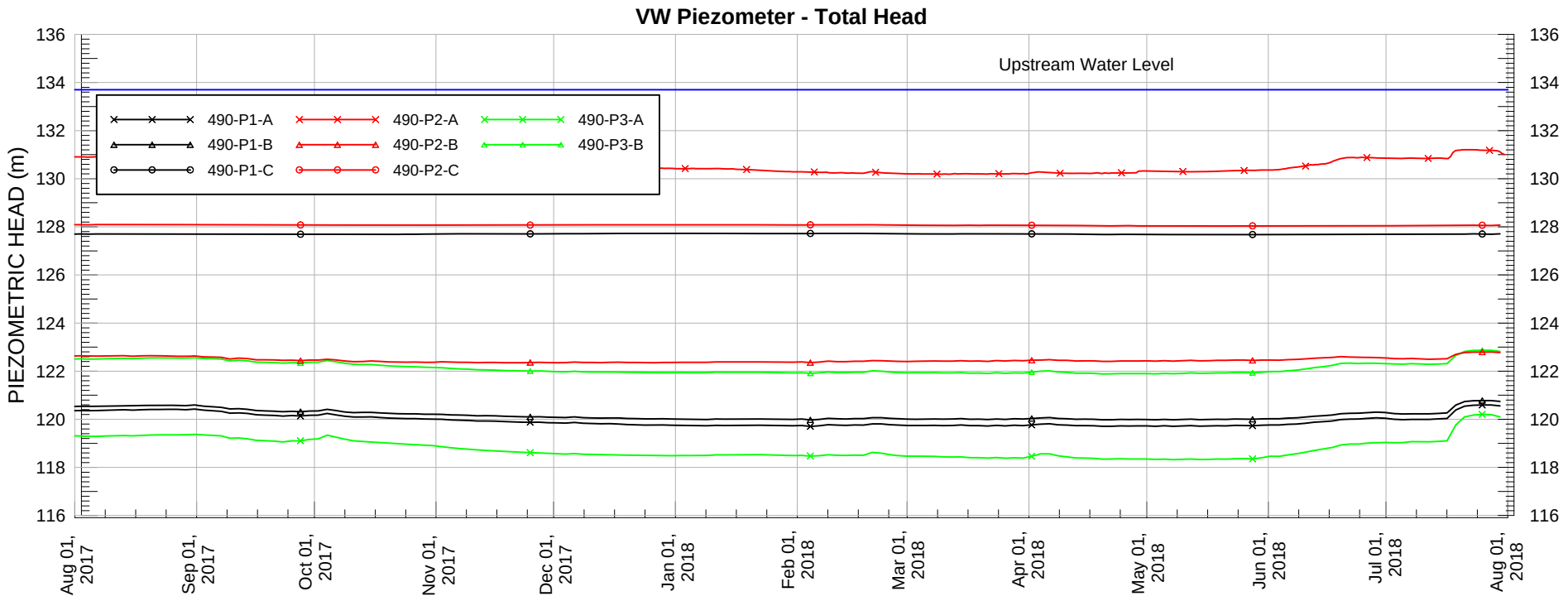
STATION 60+490

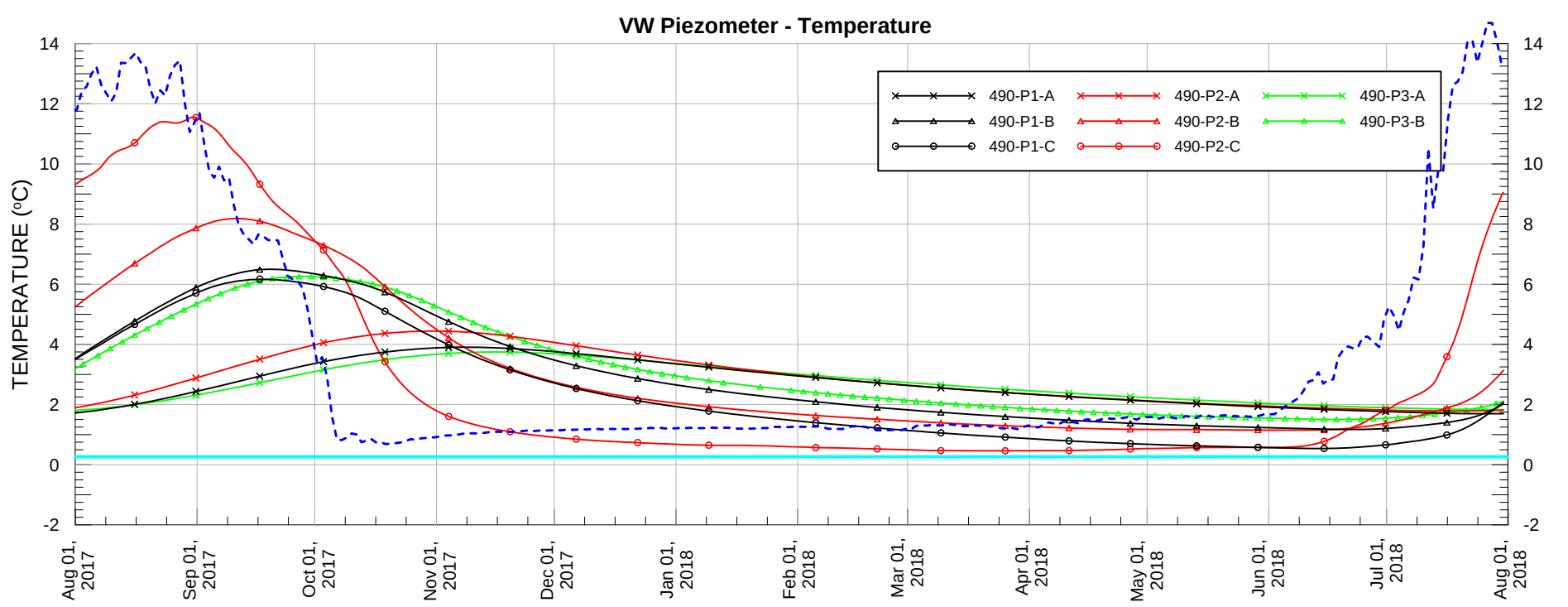




LEGEND

- CUTOFF (CSB)
- CUTOFF (SB)
- INITIAL ROCKFILL
- LAKEBED
- BEDROCK
- JET GROUT
- GROUT
- ① CORE BACKFILL (19 mm MINUS)
- ② COARSE BACKFILL (15mm MINUS)
- ③ ROCKFILL
- ④ FINE ROCKFILL



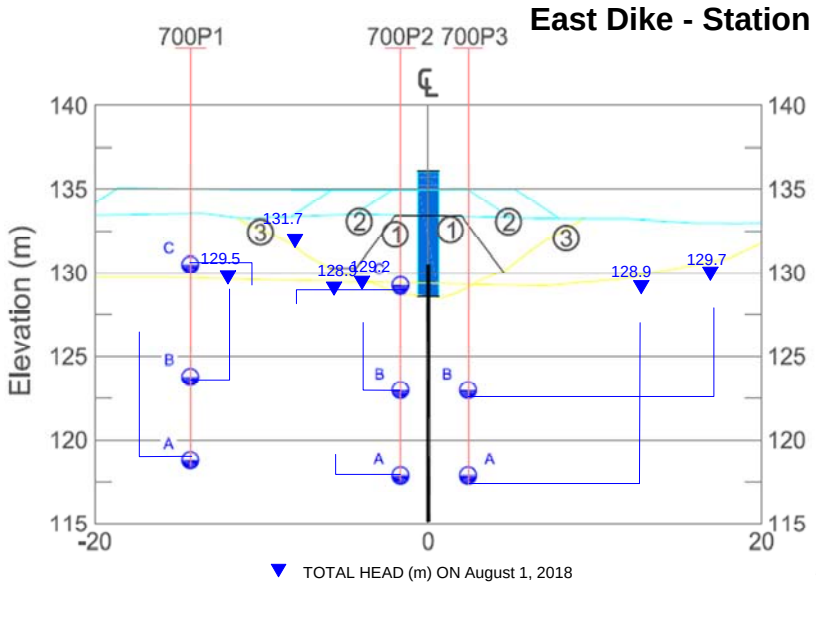


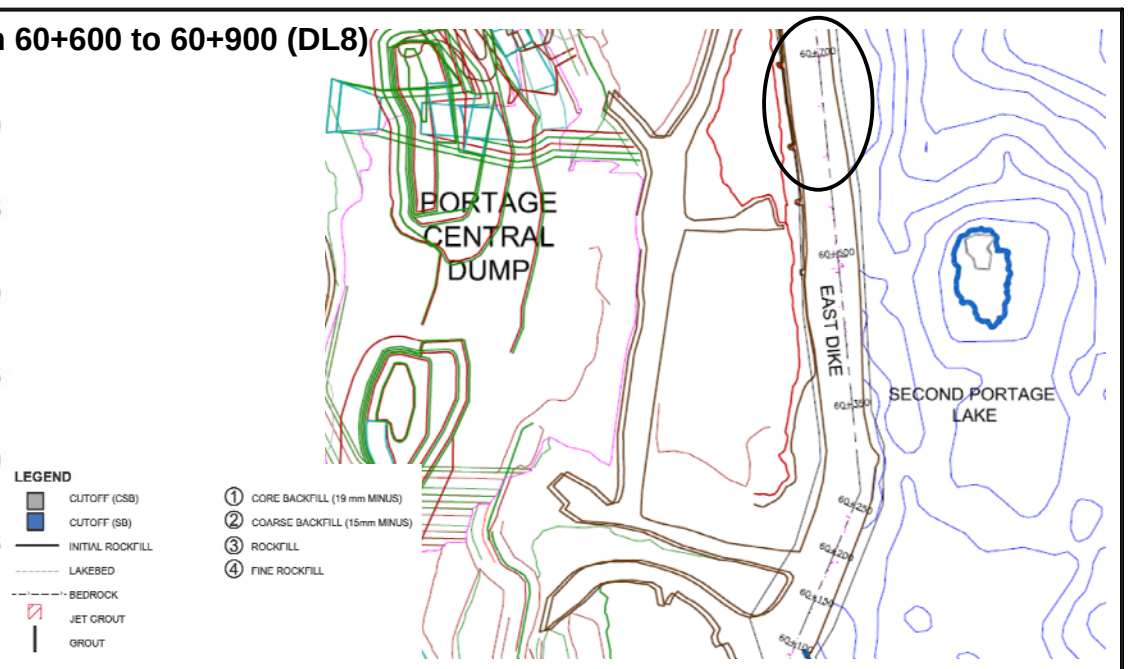
NOTES:

1. As seen in the graph on the side, the progression of the temperature in the Pz follows the lake temperature closely. Usually it takes approximately one to two weeks to see the trend following the lake temperature.

PROJECT	AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT			
TITLE	EAST DIKE - SECTION 60+490 PIEZOMETRIC DATA (Aug 1/17 to Aug 1/18)	PG 28AUG14		
AGNICO EAGLE MEADOWBANK	PROJECT No.			PHASE No.
	DESIGN	TD	28AUG14	SCALE AS SHOWN / REV.
	CADD	TD	28AUG14	FIGURE 49
	CHECK			
	REVIEW			

East Dike - Station 60+600 to 60+900 (DL8)

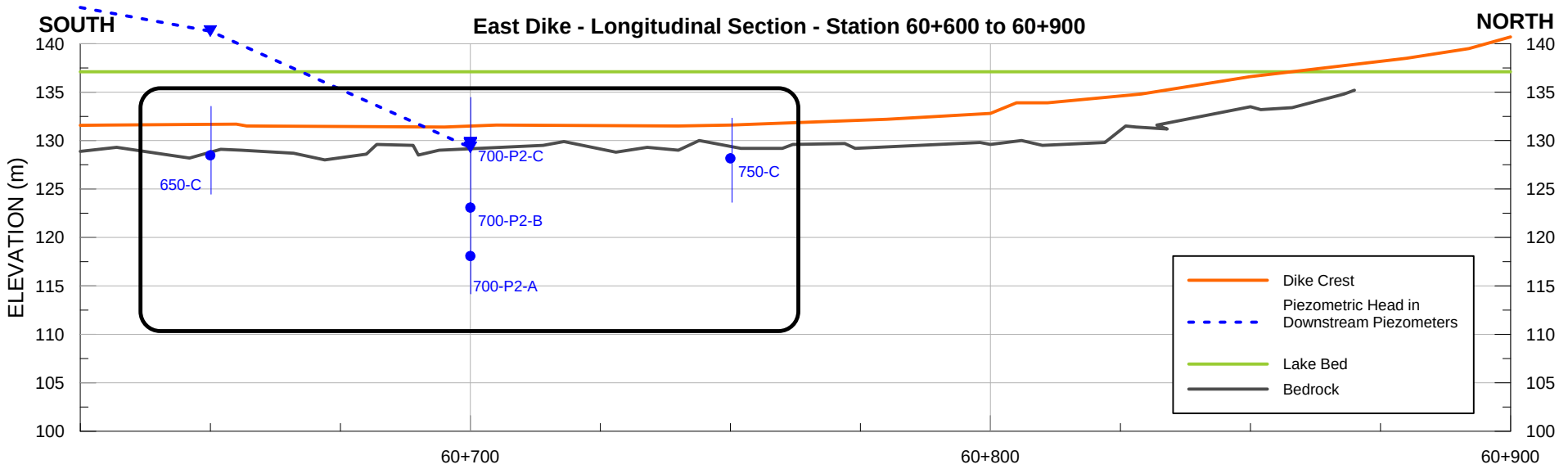




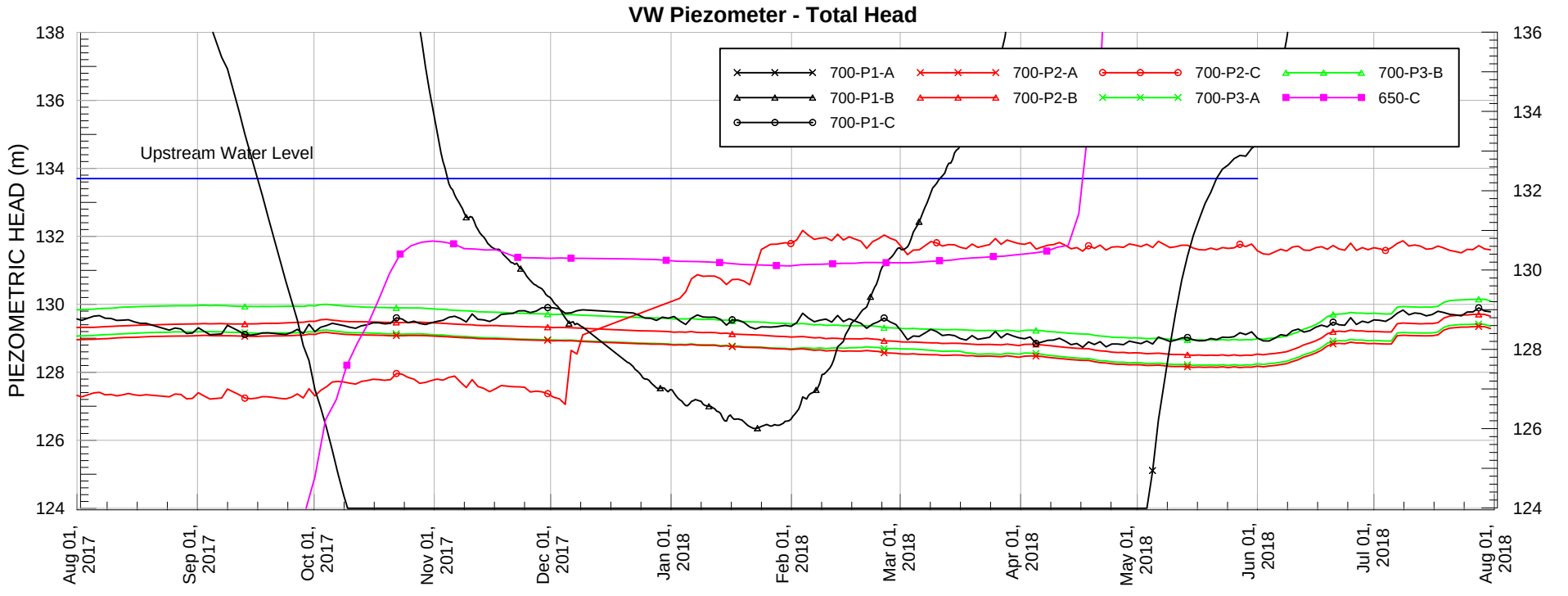
LEGEND
- CUTOFF (CSB)
- CUTOFF (SB)
- INITIAL ROCKFILL
- LAKEBED
- BEDROCK
- JET GROUT
- GROUT

① CORE BACKFILL (19 mm MINUS)
② COARSE BACKFILL (15mm MINUS)
③ ROCKFILL
④ FINE ROCKFILL

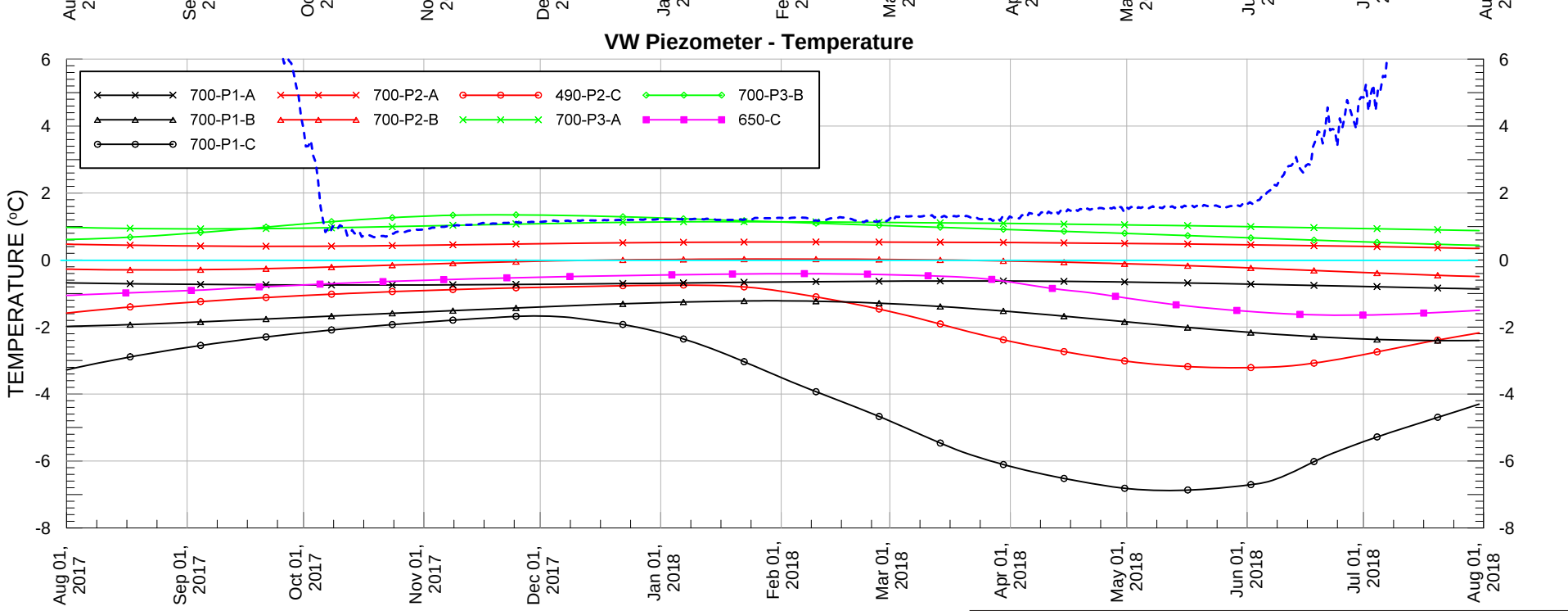
East Dike - Longitudinal Section - Station 60+600 to 60+900



VW Piezometer - Total Head



VW Piezometer - Temperature



NOTES:
1. 700-P1-B and 750-C are giving anomoly readings and with a negative temperature are assumed to be frozen.
2. There was no data from Dec 10 on as the battery had lost charge. The battery was changed on Dec 20.
3. PWP follows same trends as previous years.
4. There was a rise in PWP in June. Inspections found no correlation.

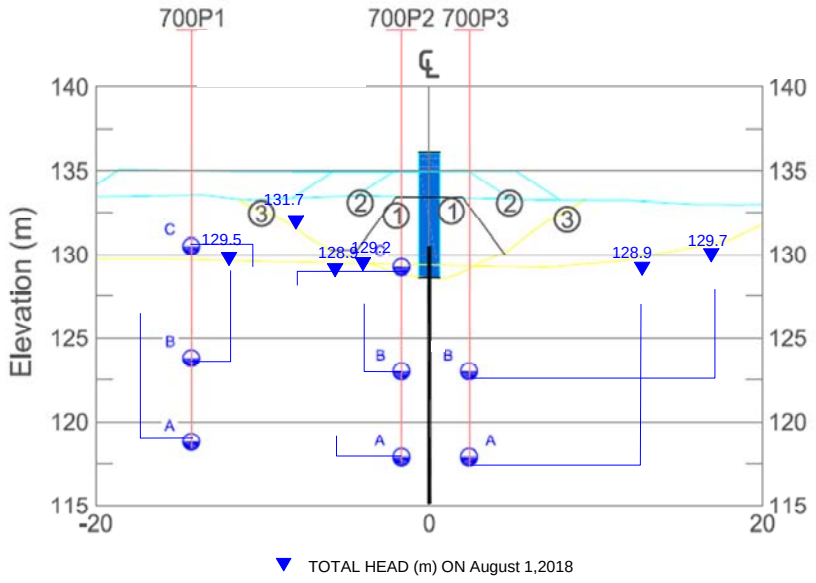
PROJECT: AGNICO EAGLE MINES LIMITED
MEADOWBANK GOLD PROJECT
NUNAVUT

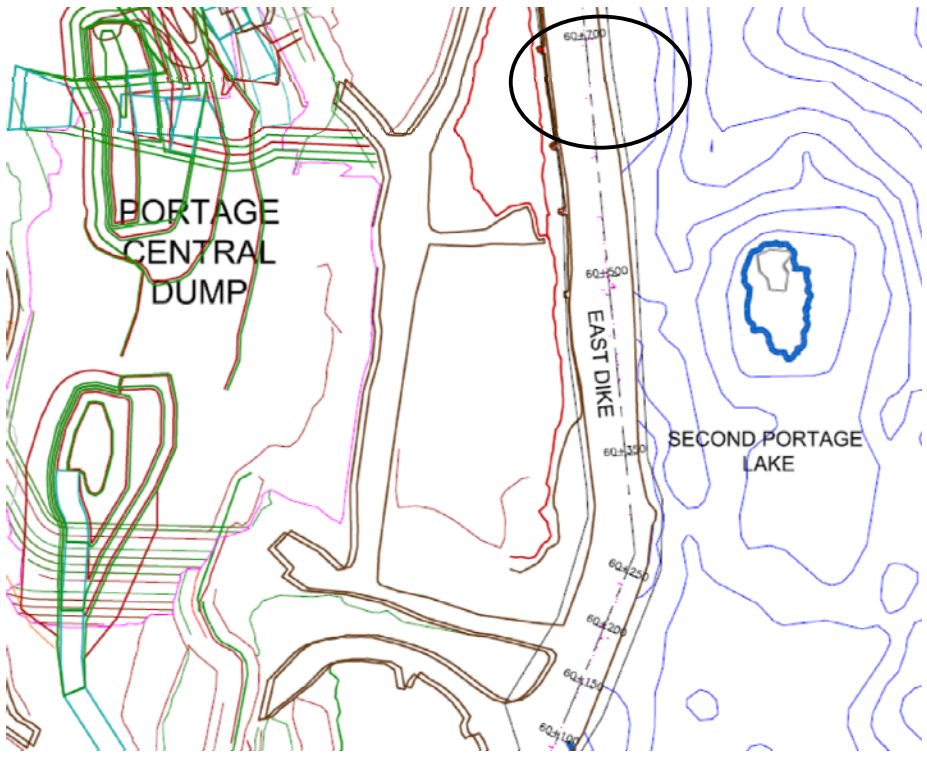
TITLE: EAST DIKE
Section 60+600 to 60+900 - PIEZOMETRIC DATA
(Aug 1/17 to Aug 1/18)

AGNICO EAGLE MEADOWBANK

PROJECT No.			PHASE No.	
DESIGN	TD	28AUG14	SCALE AS SHOWN	REV.
CADD	TD	28AUG14		
CHECK	PG	28AUG14	FIGURE 50	
REVIEW				

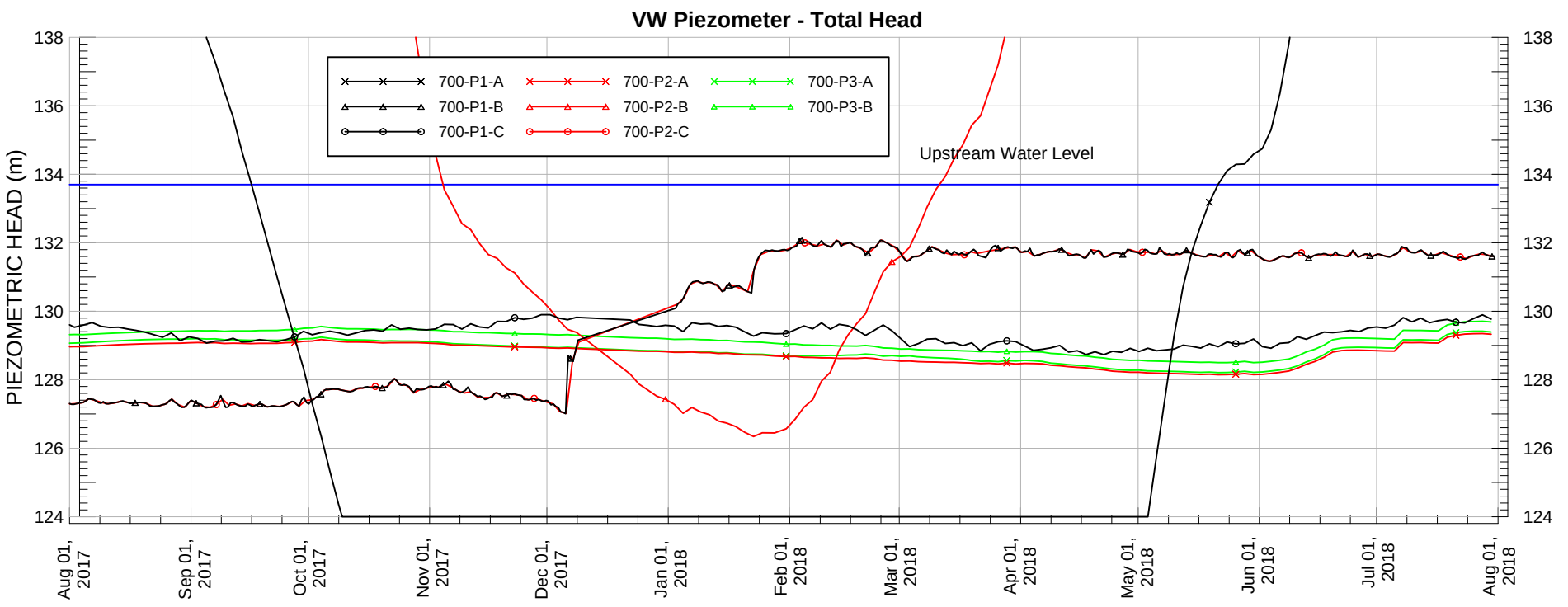
STATION 60+700

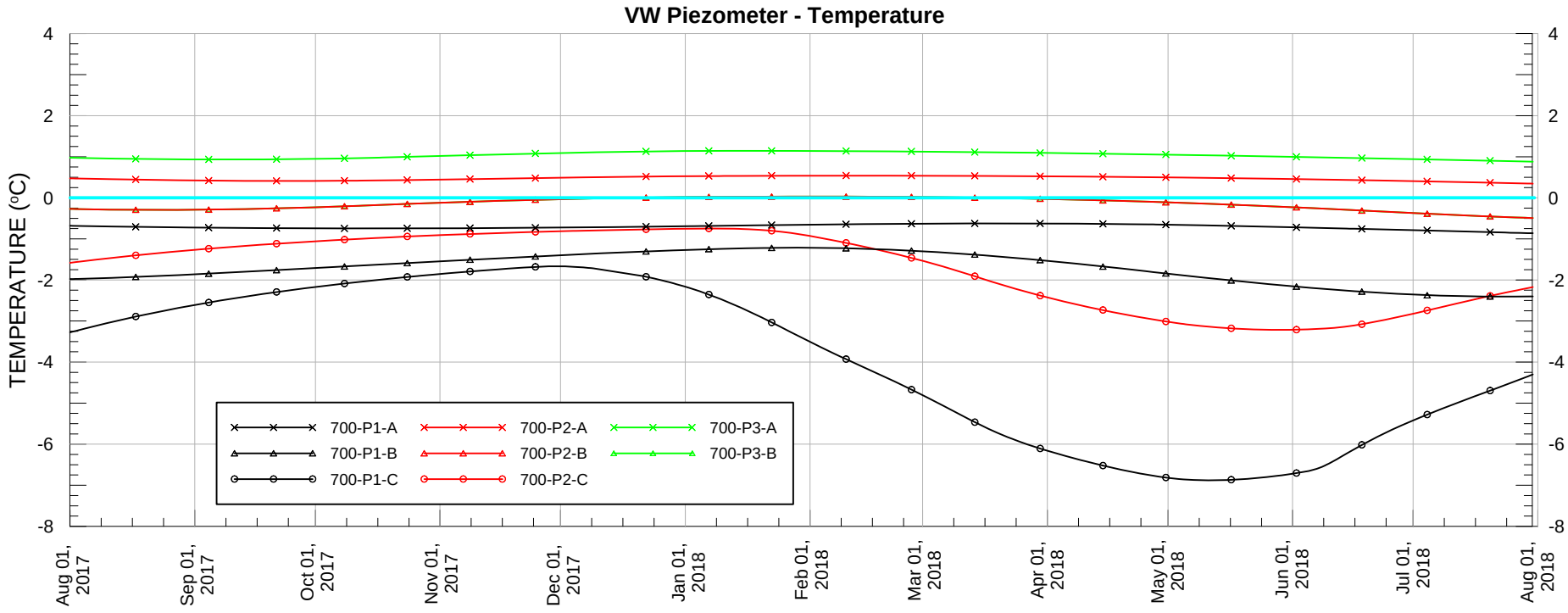




LEGEND

- CUTOFF (CSB)
- CUTOFF (SB)
- INITIAL ROCKFILL
- LAKEBED
- BEDROCK
- JET GROUT
- GROUT
- ① CORE BACKFILL (19 mm MINUS)
- ② COARSE BACKFILL (15mm MINUS)
- ③ ROCKFILL
- ④ FINE ROCKFILL





NOTES:
1: 700-P1-B and 750-C are giving anomoly readings and with a negative temperature are assumed to be frozen.

PROJECT	**AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT**
TITLE	**EAST DIKE - SECTION 60+700 PIEZOMETRIC DATA (Aug 1/17 to Aug 1/18)**

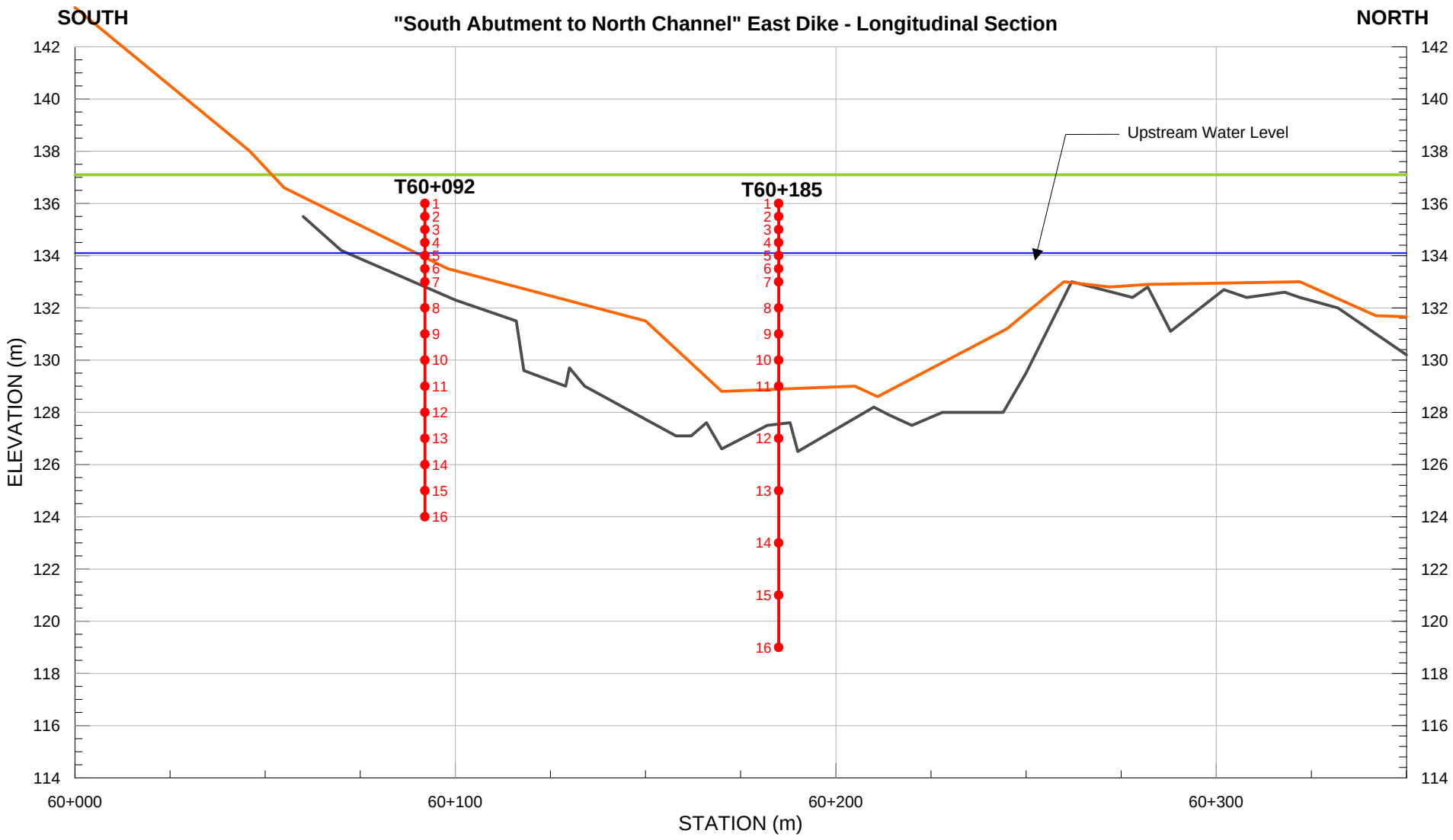
AGNICO EAGLE
MEADOWBANK

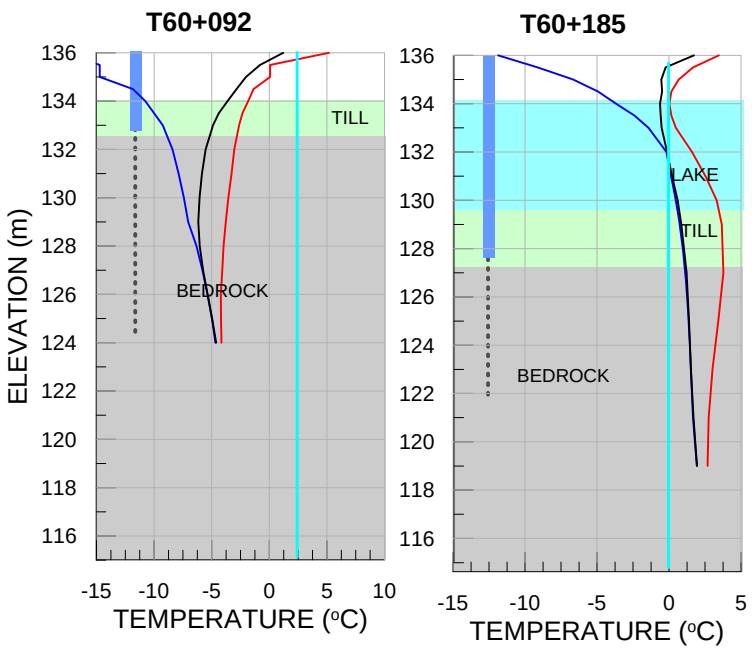
PROJECT No.			PHASE No.		
DESIGN	TD	28AUG14	SCALE AS SHOWN		REV.
CADD	TD	28AUG14	**FIGURE 51**		
CHECK	PG	28AUG14			
REVIEW					

SOUTH

"South Abutment to North Channel" East Dike - Longitudinal Section

NORTH





Current Temperature On August 1,2018

LEGEND

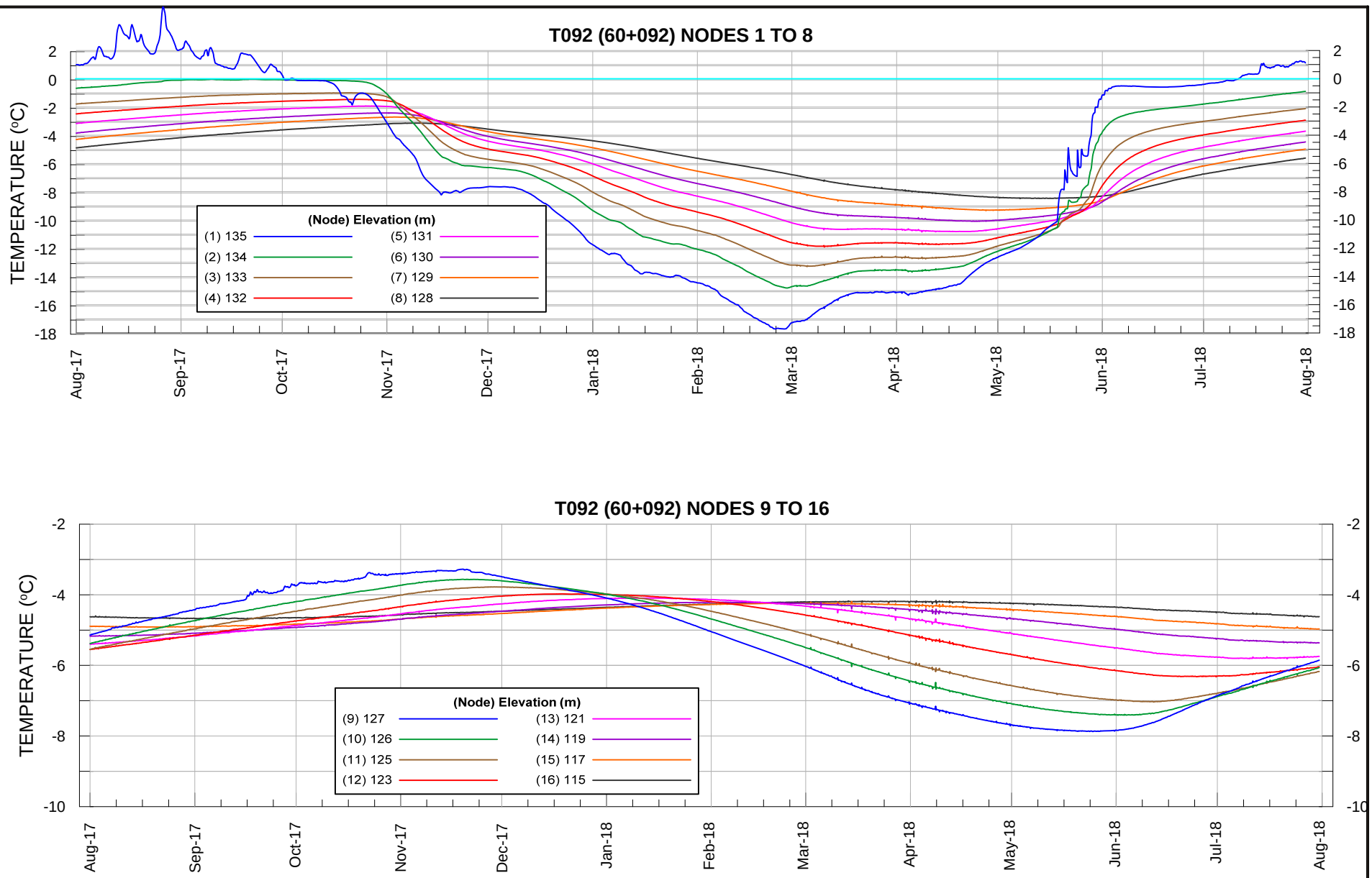
- Dike Crest
- Piezometric Head in Downstream Piezometers
- Lake Bed
- Bedrock
- Lake
- Till
- Bedrock
- 6 7 8 9 Thermistor with Bead Locations
- Vibrating Wire Piezometer Installation Level
- SB
- CSB
- Jet Grouting
- Grouting
- T min
- T current
- T max

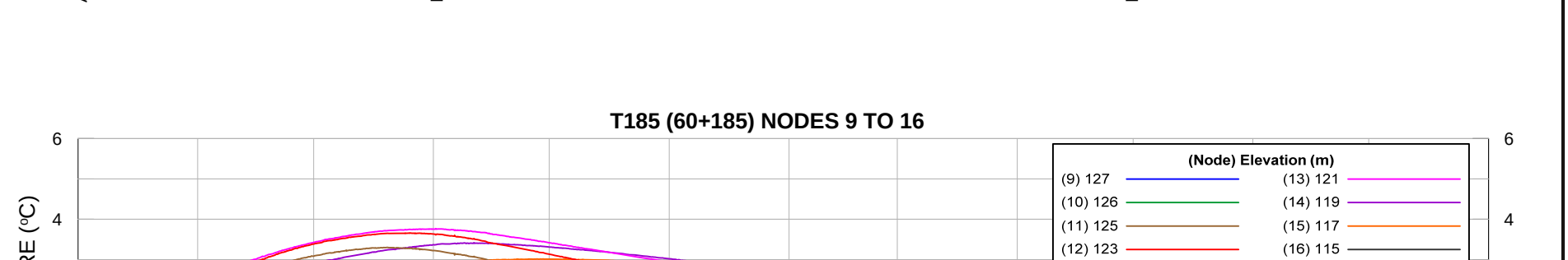
NOTES:
1.

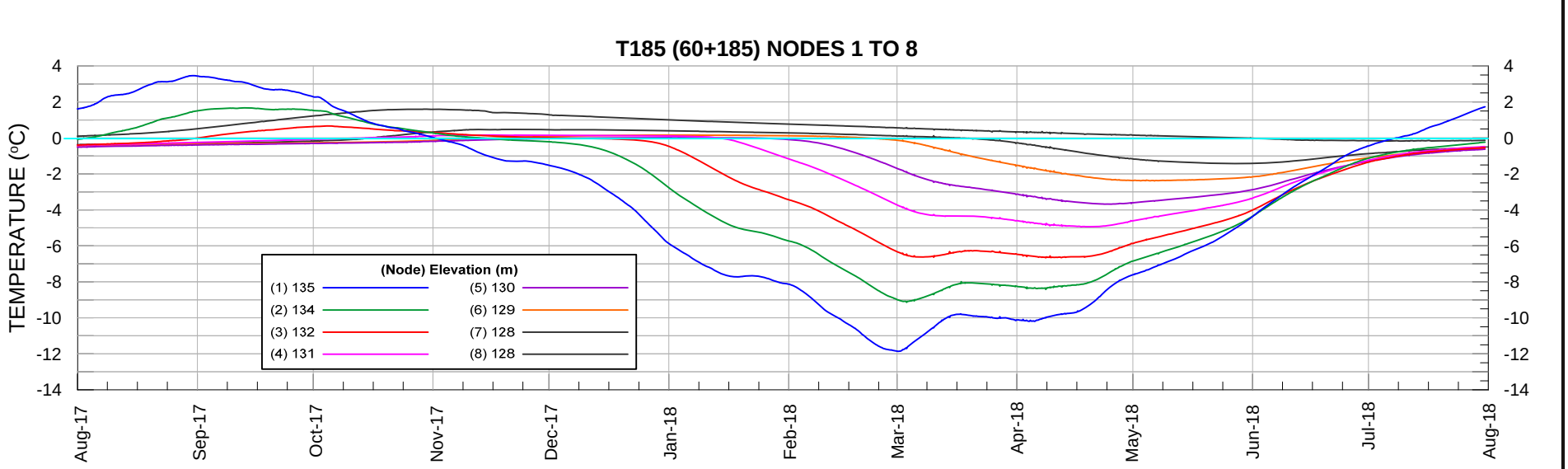
PROJECT	**AGNICO EAGLE MINES LIMITED** **MEADOWBANK GOLD PROJECT** **NUNAVUT**
TITLE	**EAST DIKE** **60+000 to 60+350 - TEMPERATURE DATA** **(Aug 1/17 to Aug 1/18)**

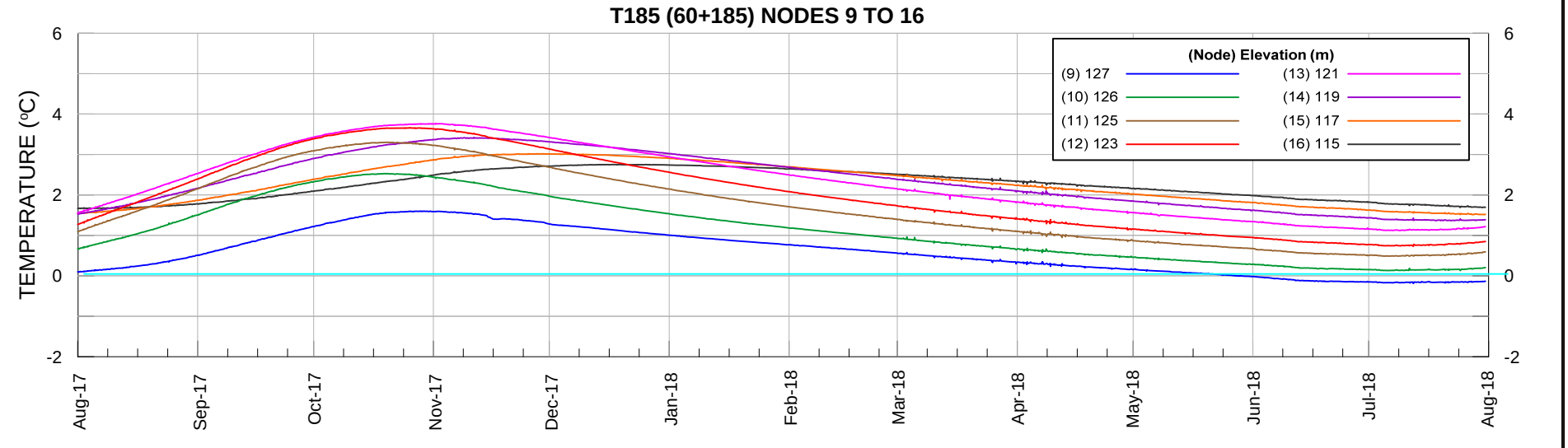
AGNICO EAGLE MEADOWBANK

PROJECT No.			PHASE No.		
DESIGN	TD	20JAN14	SCALE AS SHOWN	REV.	
CADD	TD	20JAN14	**FIGURE 57**		
CHECK					
REVIEW					







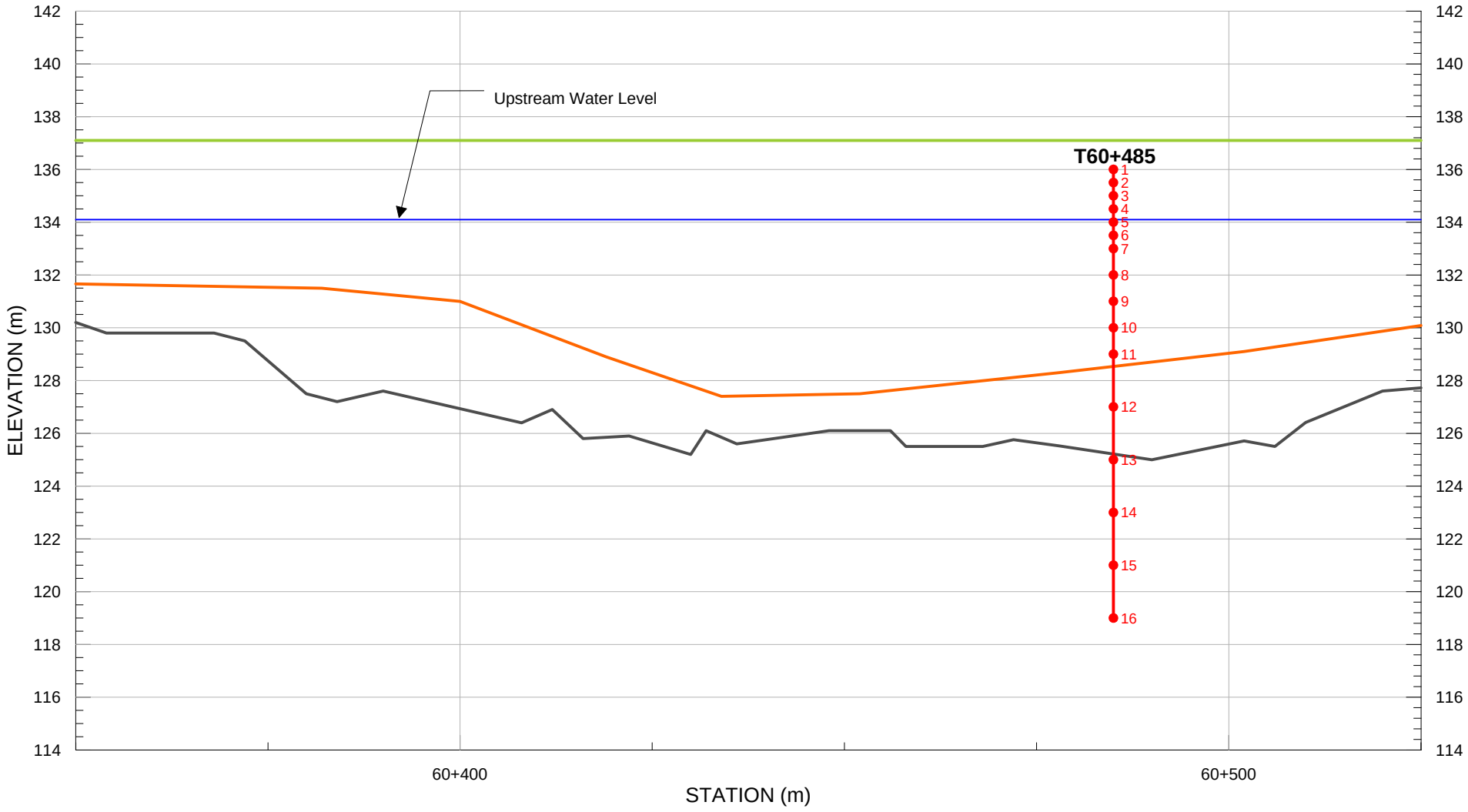


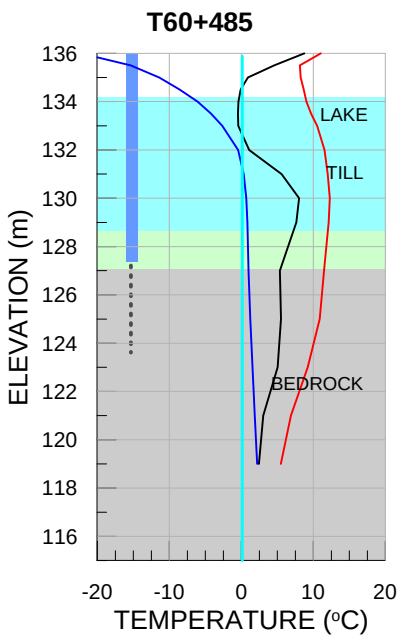
PROJECT	AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT				
TITLE	EAST DIKE NODAL THERMAL TIMELINES (Aug 1/17 to Aug 1/18)				
AGNICO EAGLE MEADOWBANK	PROJECT No.			PHASE No.	
	DESIGN	TD	20JAN14	SCALE AS SHOWN	REV.
	CADD	TD	20JAN14	FIGURE 58	
	CHECK				
	REVIEW				

SOUTH

"North Channel" East Dike - Longitudinal Section

NORTH





Current Temperature On August 1,2018

LEGEND

- Dike Crest
- Piezometric Head in Downstream Piezometers
- Lake Bed
- Bedrock
- Lake
- Till
- Bedrock
- 6 7 8 9 Thermistor with Bead Locations
- Vibrating Wire Piezometer Installation Level
- SB
- CSB
- Jet Grouting
- Grouting
- T min
- T current
- T max

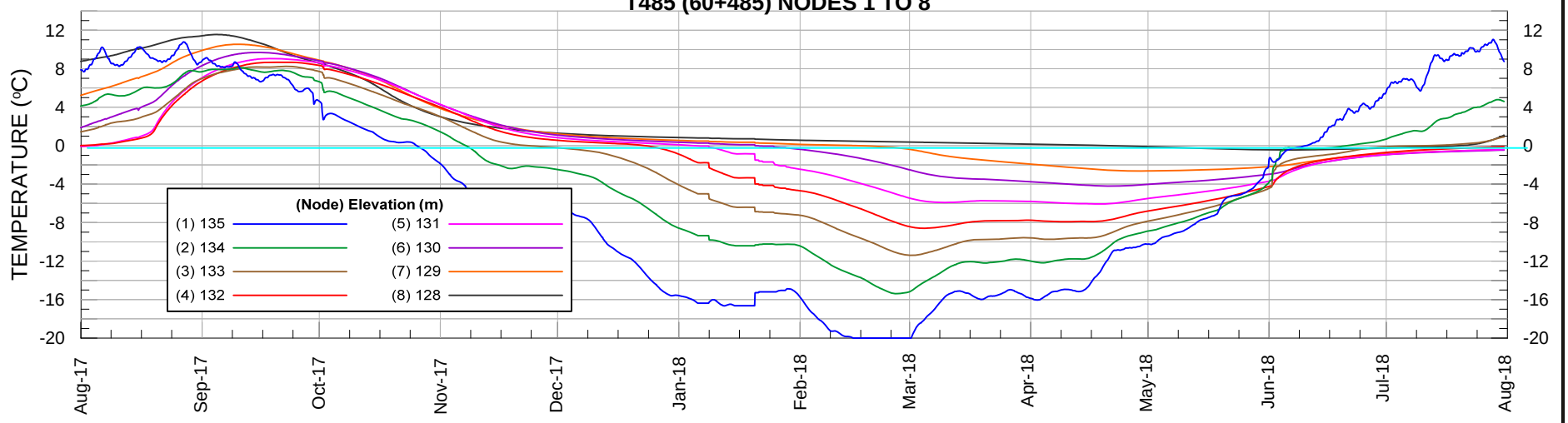
NOTES:
1.

PROJECT	**AGNICO EAGLE MINES LIMITED** **MEADOWBANK GOLD PROJECT** **NUNAVUT**
TITLE	**BAYGOOSE DIKE** **60+350 to 60+525 - TEMPERATURE DATA** **(Aug 1/17 to Aug 1/18)**

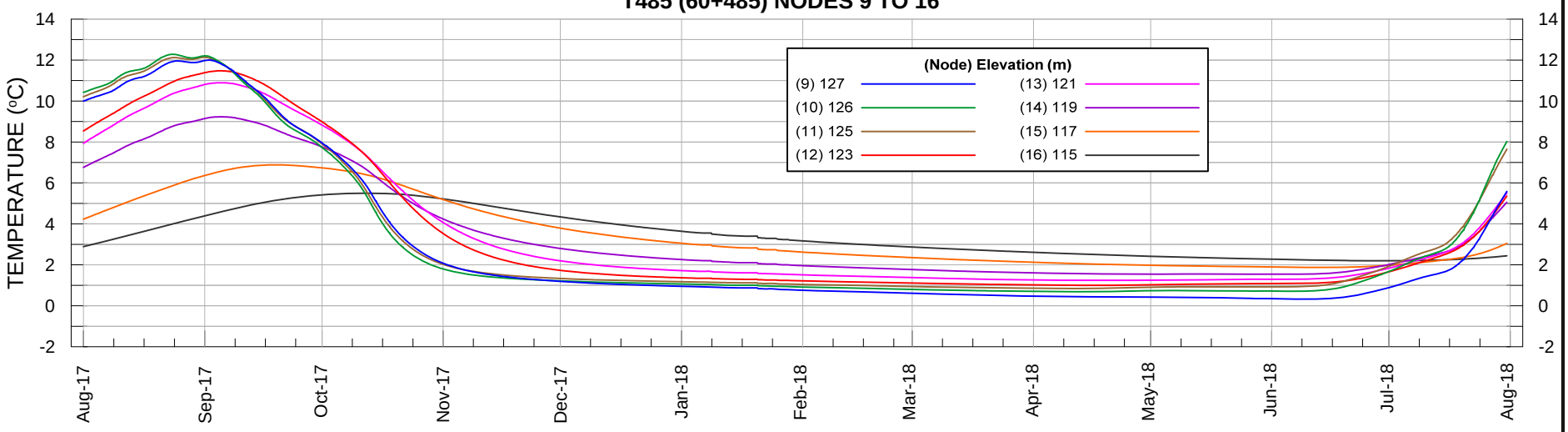
AGNICO EAGLE MEADOWBANK

PROJECT No.			PHASE No.		
DESIGN	TD	20JAN14	SCALE AS SHOWN		REV.
CADD	TD	20JAN14	**FIGURE 58**		
CHECK					
REVIEW					

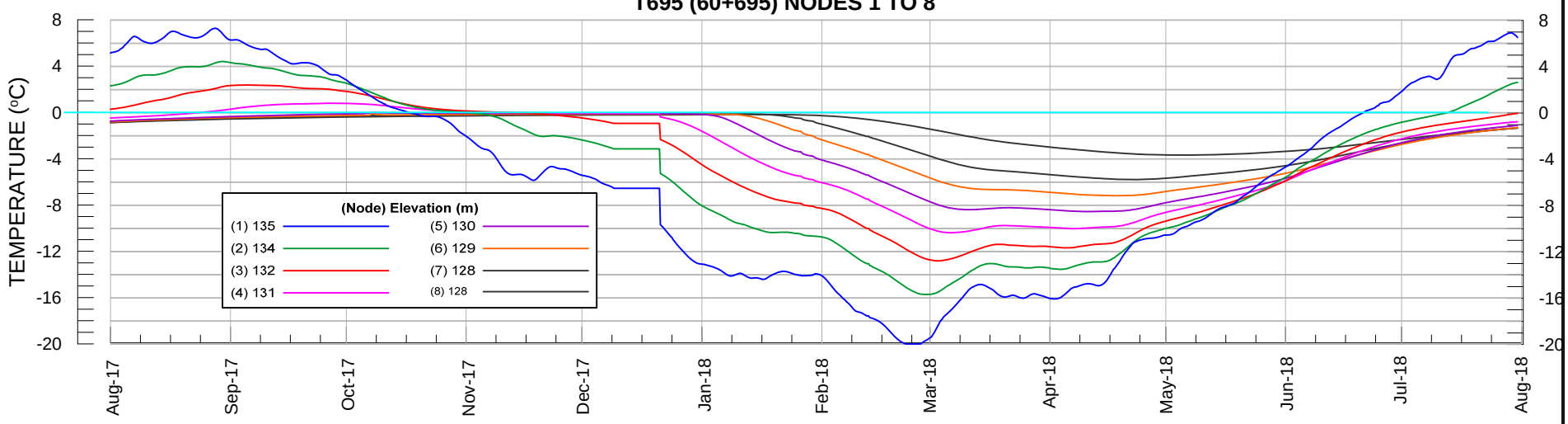
T485 (60+485) NODES 1 TO 8



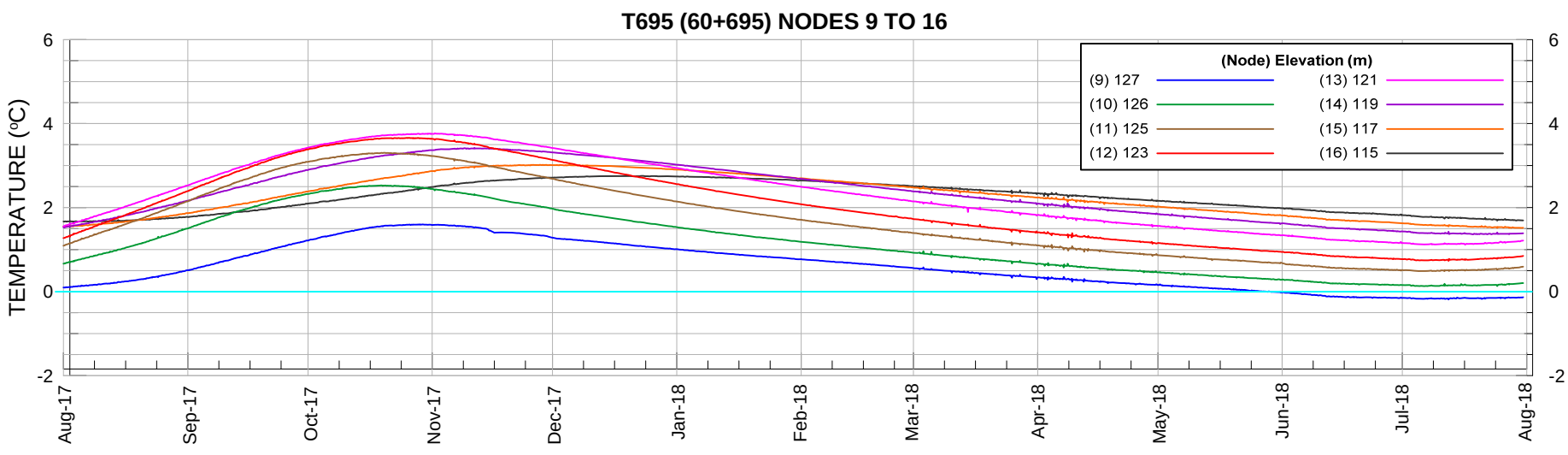
T485 (60+485) NODES 9 TO 16



T695 (60+695) NODES 1 TO 8



T695 (60+695) NODES 9 TO 16



PROJECT	AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT
TITLE	EAST DIKE NODAL THERMAL TIMELINES (Aug 1/17 to Aug 1/18)

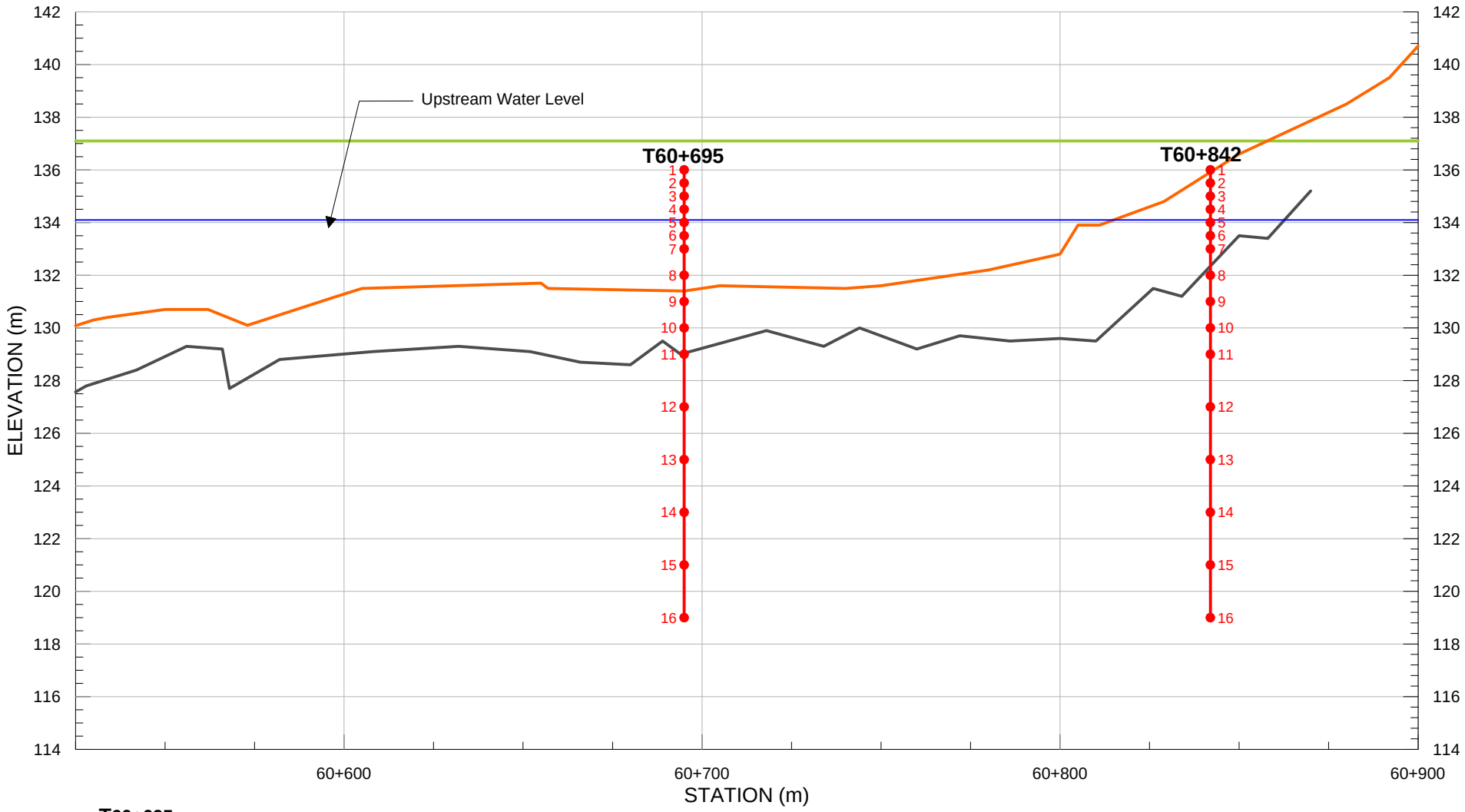
AGNICO EAGLE
MEADOWBANK

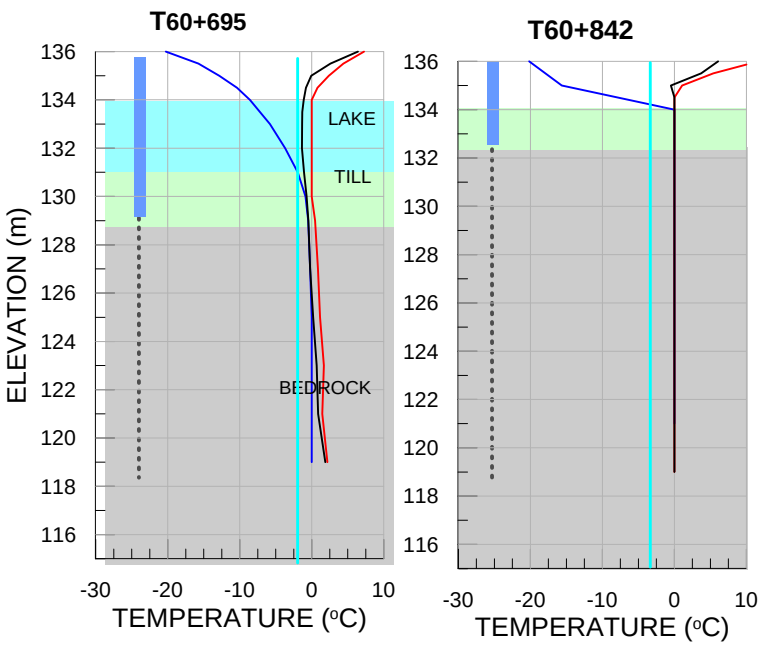
PROJECT No.			PHASE No.	
DESIGN	TD	20JAN14	SCALE AS SHOWN	REV.
CADD	TD	20JAN14	FIGURE 60	
CHECK				
REVIEW				

SOUTH

"North Channel to North Abutment" East Dike - Longitudinal Section

NORTH





Current Temperature On August 1,2018

LEGEND

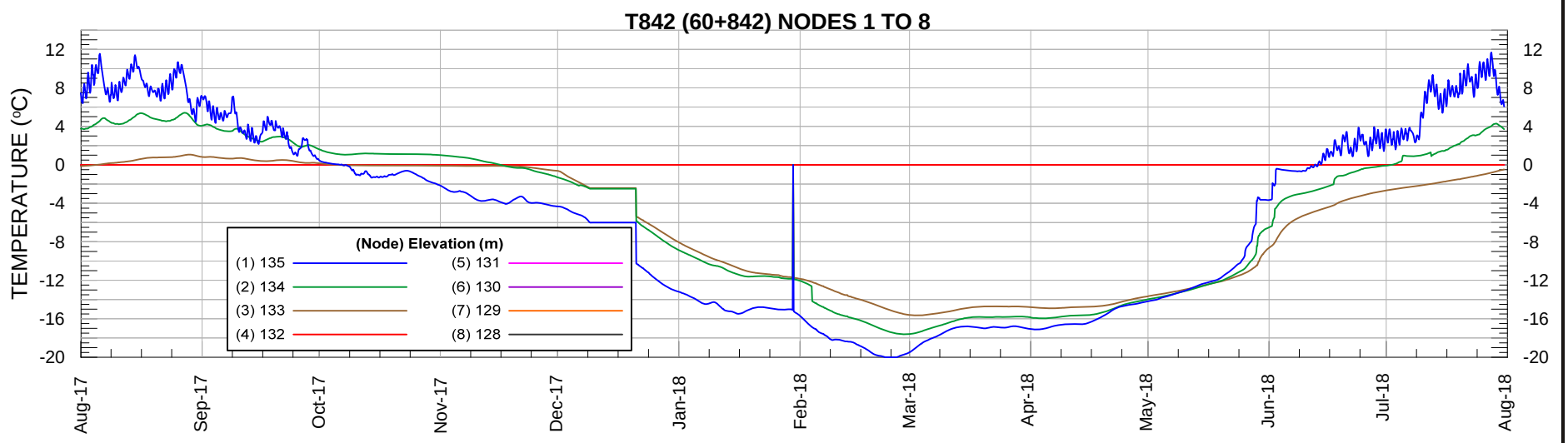
- Dike Crest
- Piezometric Head in Downstream Piezometers
- Lake Bed
- Bedrock
- Lake
- Till
- Bedrock
- 6 7 8 9 Thermistor with Bead Locations
- Vibrating Wire Piezometer Installation Level
- SB
- CSB
- Jet Grouting
- Grouting
- T min
- T current
- T max

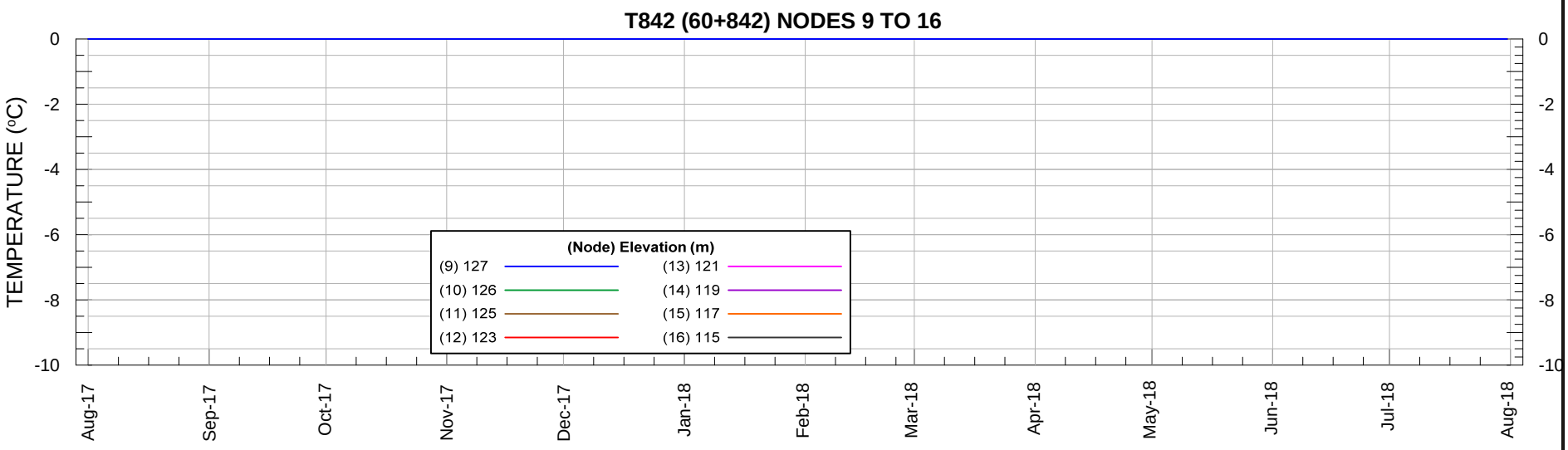
NOTES:
1. Beads on T60+842 do not seem to be working properly.

PROJECT	AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT
TITLE	BAYGOOSE DIKE 30+000 to 30+550 - TEMPERATURE DATA (Aug 1/17 to Aug 1/18)

AGNICO EAGLE MEADOWBANK

PROJECT No.			PHASE No.		
DESIGN	TD	20JAN14	SCALE AS SHOWN	REV.	
CADD	TD	20JAN14	FIGURE 61		
CHECK					
REVIEW					





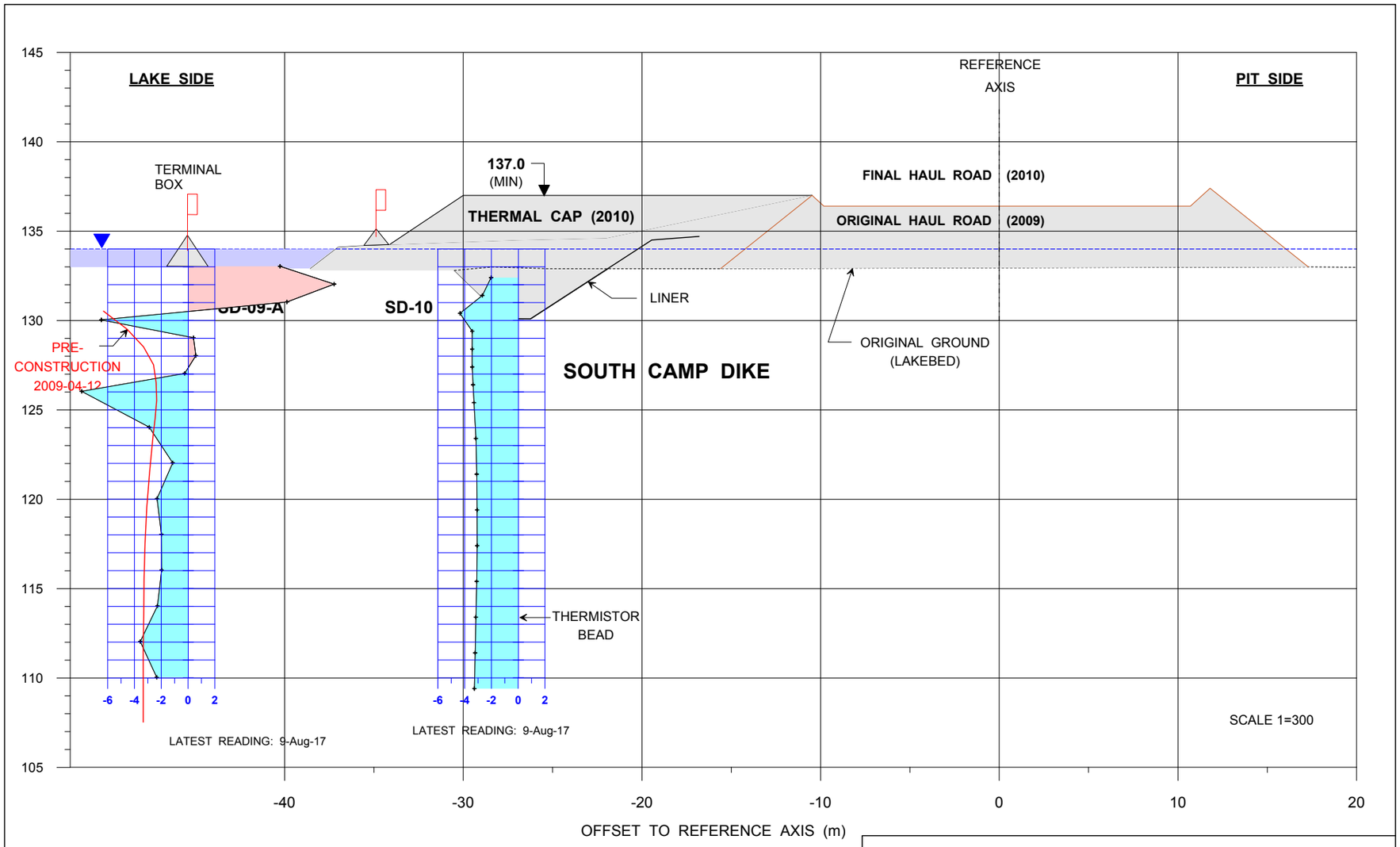
PROJECT
AGNICO EAGLE MINES LIMITED
MEADOWBANK GOLD PROJECT
NUNAVUT

TITLE
EAST DIKE
NODAL THERMAL TIMELINES
(Aug 1/17 to Aug 1/18)

AGNICO EAGLE
MEADOWBANK

PROJECT No.			PHASE No.		
DESIGN	TD	20JAN14	SCALE AS SHOWN	REV.	
CADD	TD	20JAN14			
CHECK					
REVIEW					

FIGURE 62



NOTE: COORDINATES FOR REFERENCE AXIS:
638,211 E 7,213,186 N
638,174 E 7,213,075 N

AGNICO-EAGLE MINES LIMITED - MEADOWBANK DIVISION

SOUTH CAMP DIKE CONSTRUCTION

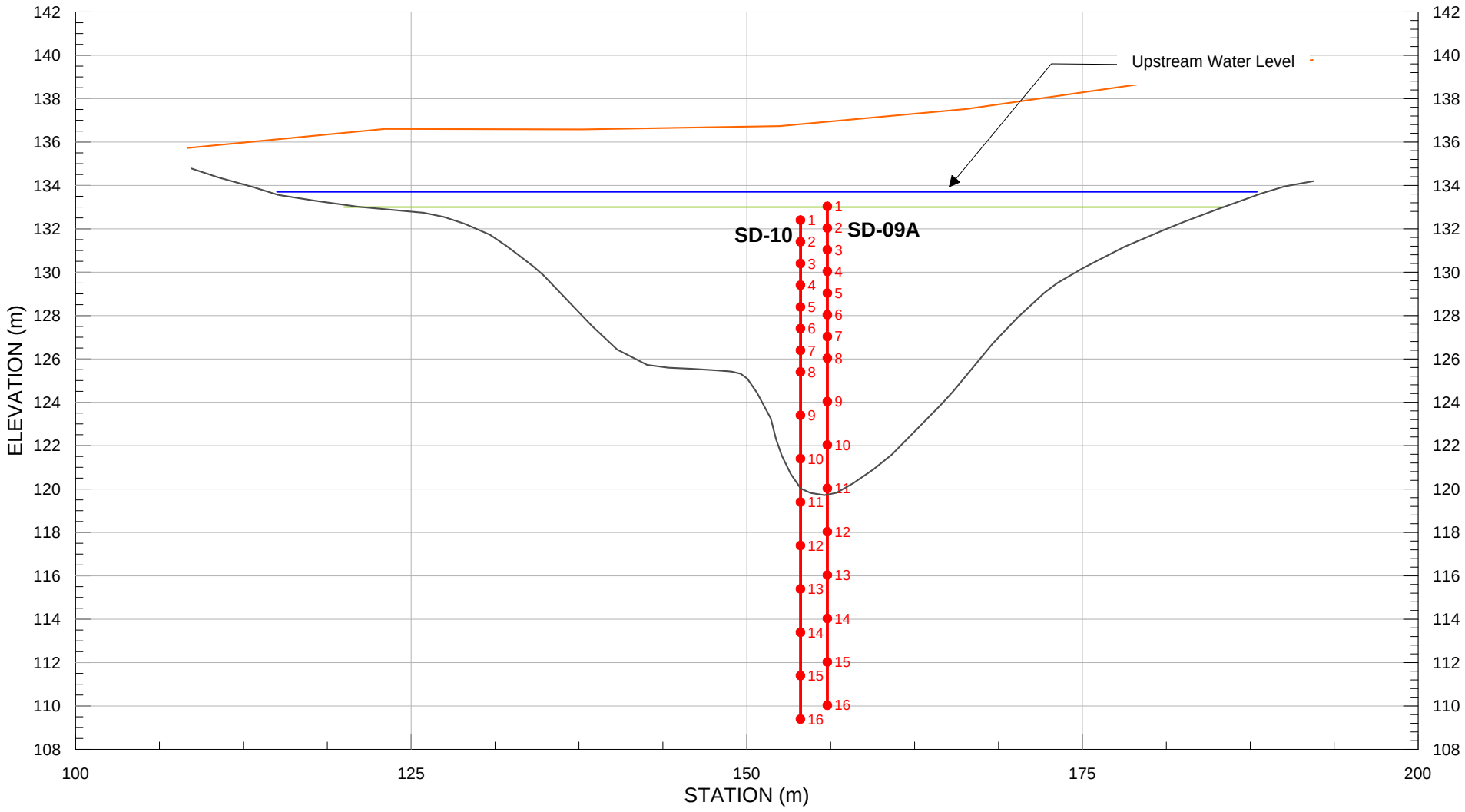
TEMPERATURE MONITORING IN DIKE FOUNDATION

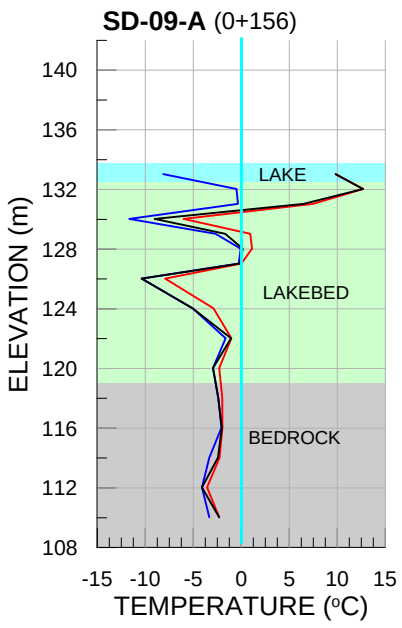
TEMPERATURE PROFILES AT SD1.GRF

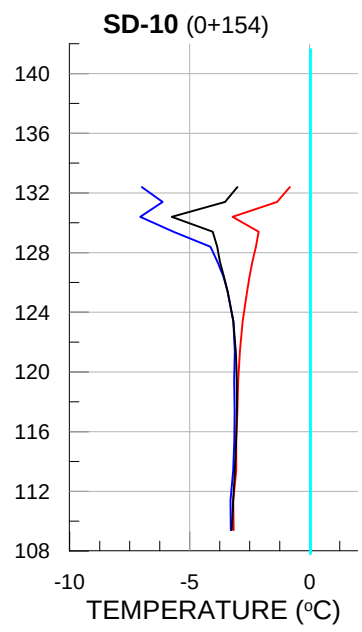
SOUTH

South Camp Dike

NORTH







Current Temperature on July 25th, 2018

LEGEND

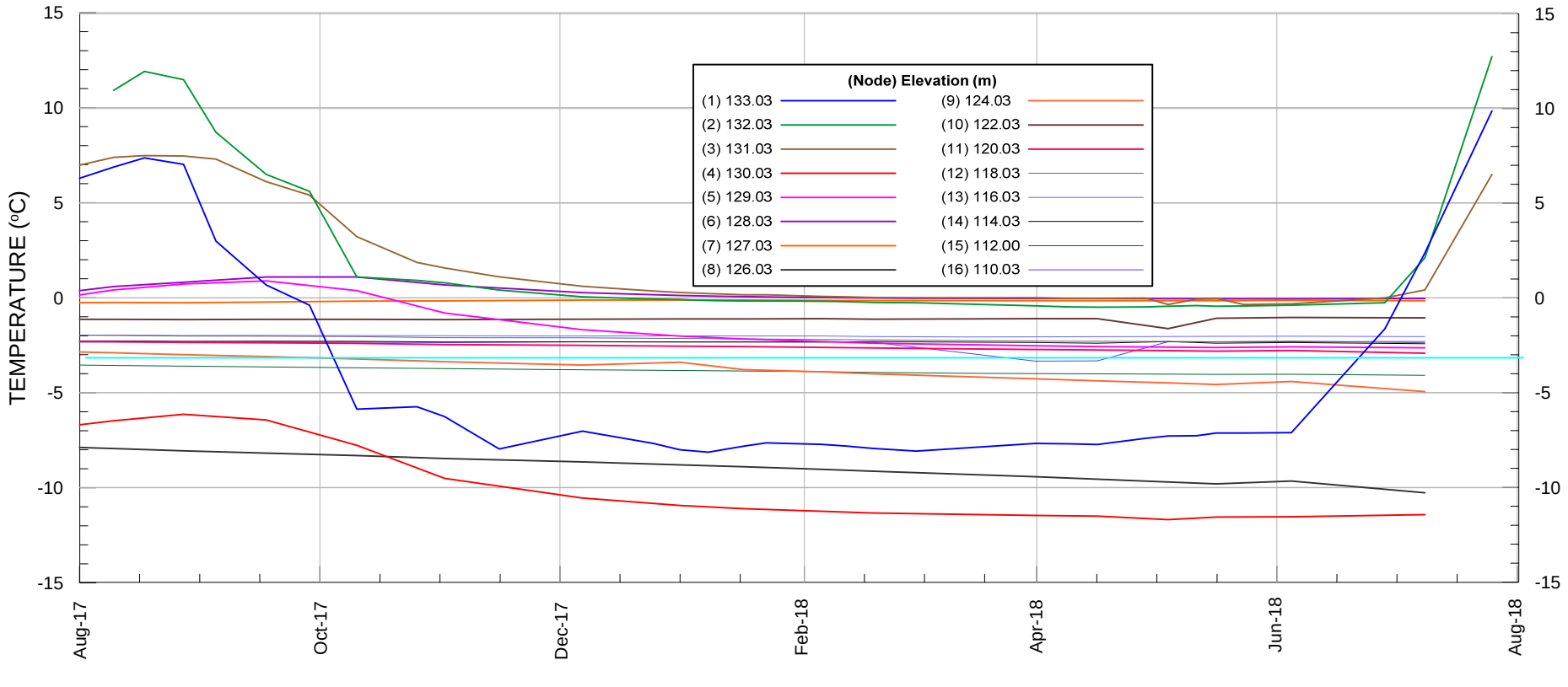
- Dike Crest
- Lake Bed
- Bedrock
- Lake
- Till
- Bedrock
- 6 / 7 / 8 / 9 — Thermistor with Bead Locations
- T min
- T current
- T max

PROJECT	AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT
TITLE	SOUTH CAMP DIKE TEMPERATURE DATA (Aug 1/17 to Aug 1/18)

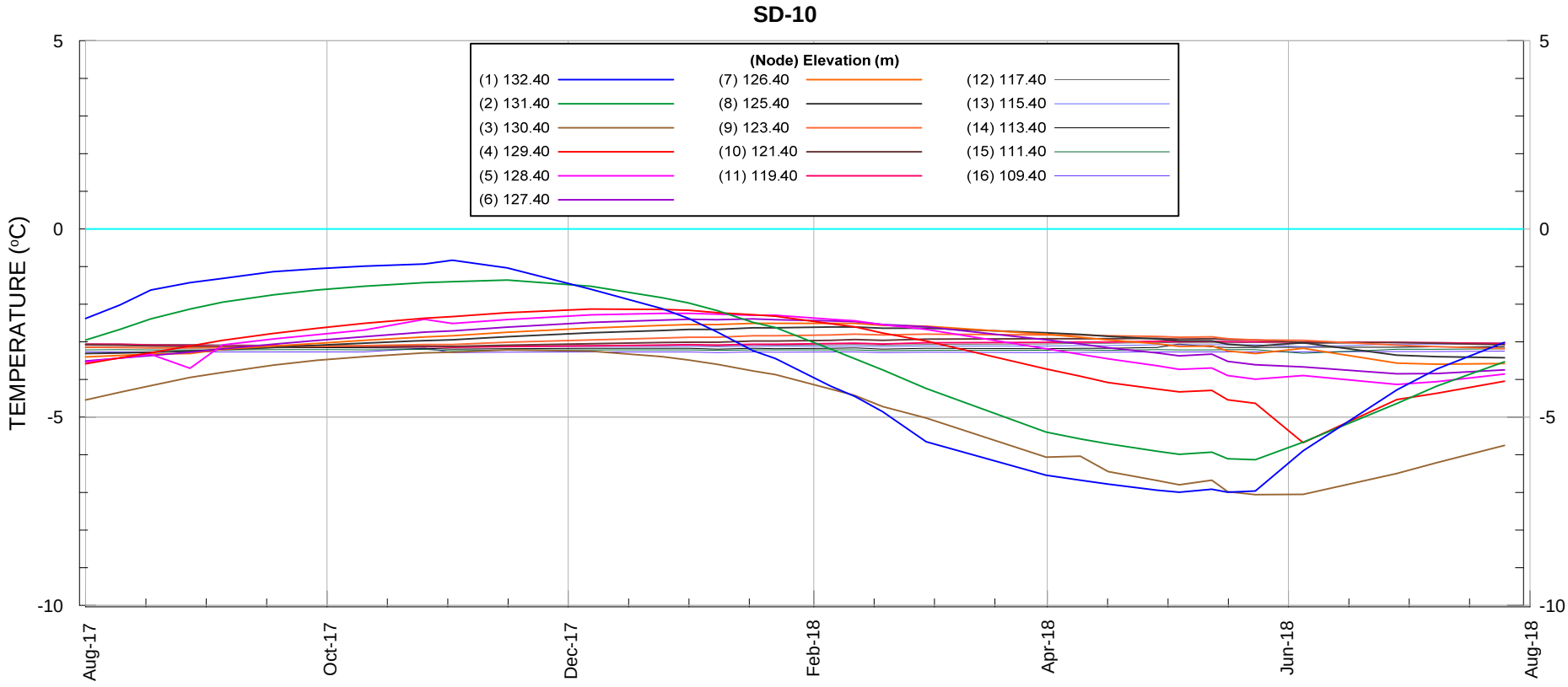
AGNICO EAGLE
MEADOWBANK

PROJECT No.			PHASE No.		
DESIGN	TD	28AUG14	SCALE AS SHOWN	REV.	
CADD	TD	28AUG14	FIGURE 52		
CHECK	PG	28AUG14			
REVIEW					

SD-09A



SD-10

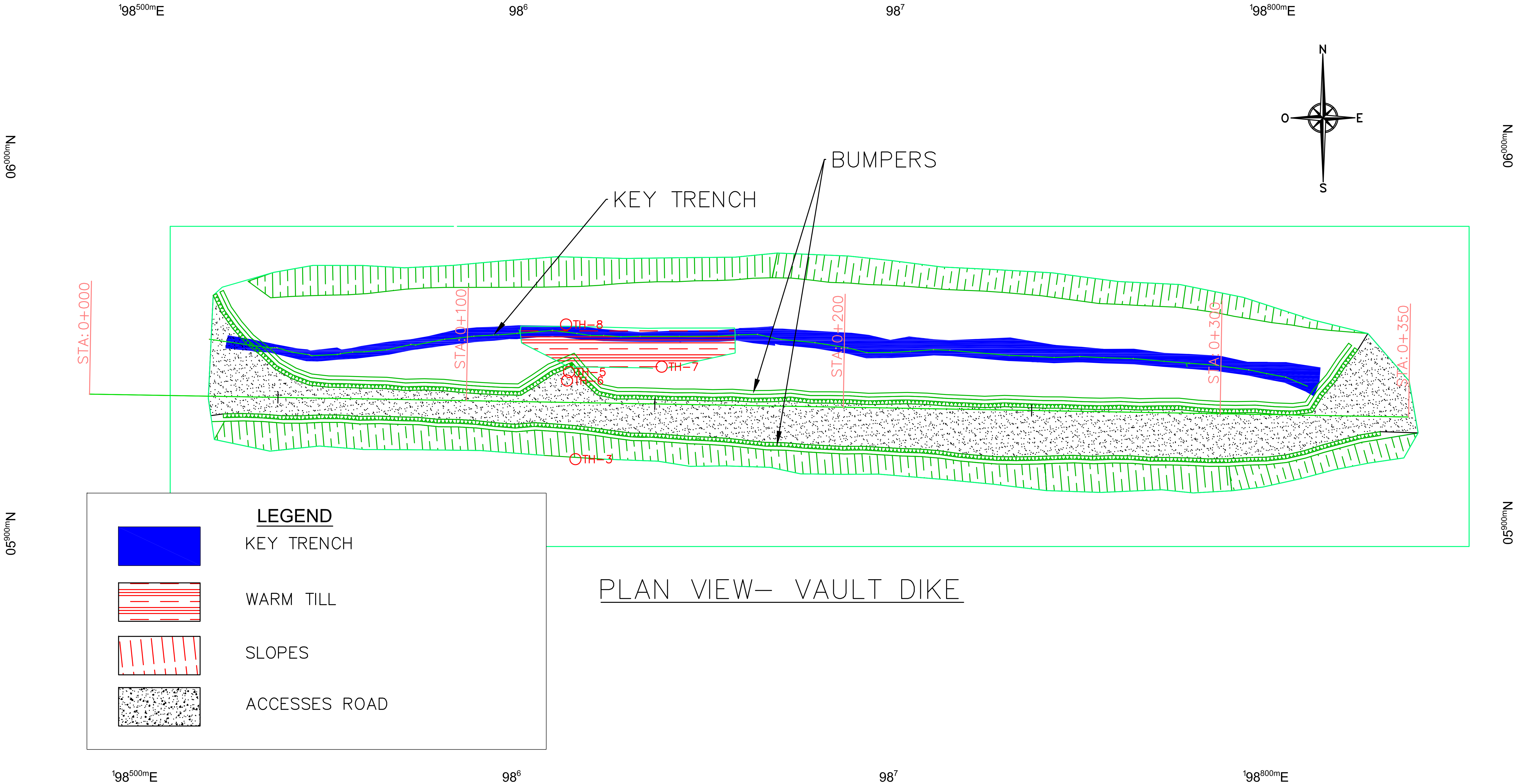


PROJECT	AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT
TITLE	SOUTH CAMP DIKE NODAL THERMAL TIMELINES (Aug 1/17 to Aug 1/18)

AGNICO EAGLE
MEADOWBANK

PROJECT No.			PHASE No.	
DESIGN	TD	28AUG14	SCALE AS SHOWN	REV.
CADD	TD	28AUG14		
CHECK	PG	28AUG14	FIGURE 53	
REVIEW				

FORMAT ANSI B – LANDSCAPE



TITLE	# DWG	REV	DESCRIPTION	DATE	BY	
REFERENCE DRAWINGS		REVISIONS				

AGNICO-EAGLE

DRAWN BY	ROBERT CLOUATRE	DATE 02–04–2013
CHECKED BY	E.V. – R.C	02–04–2013
APPROVED BY		
PROJECT NO.		
DATE		

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
VAULT DIKE
AS BUILT

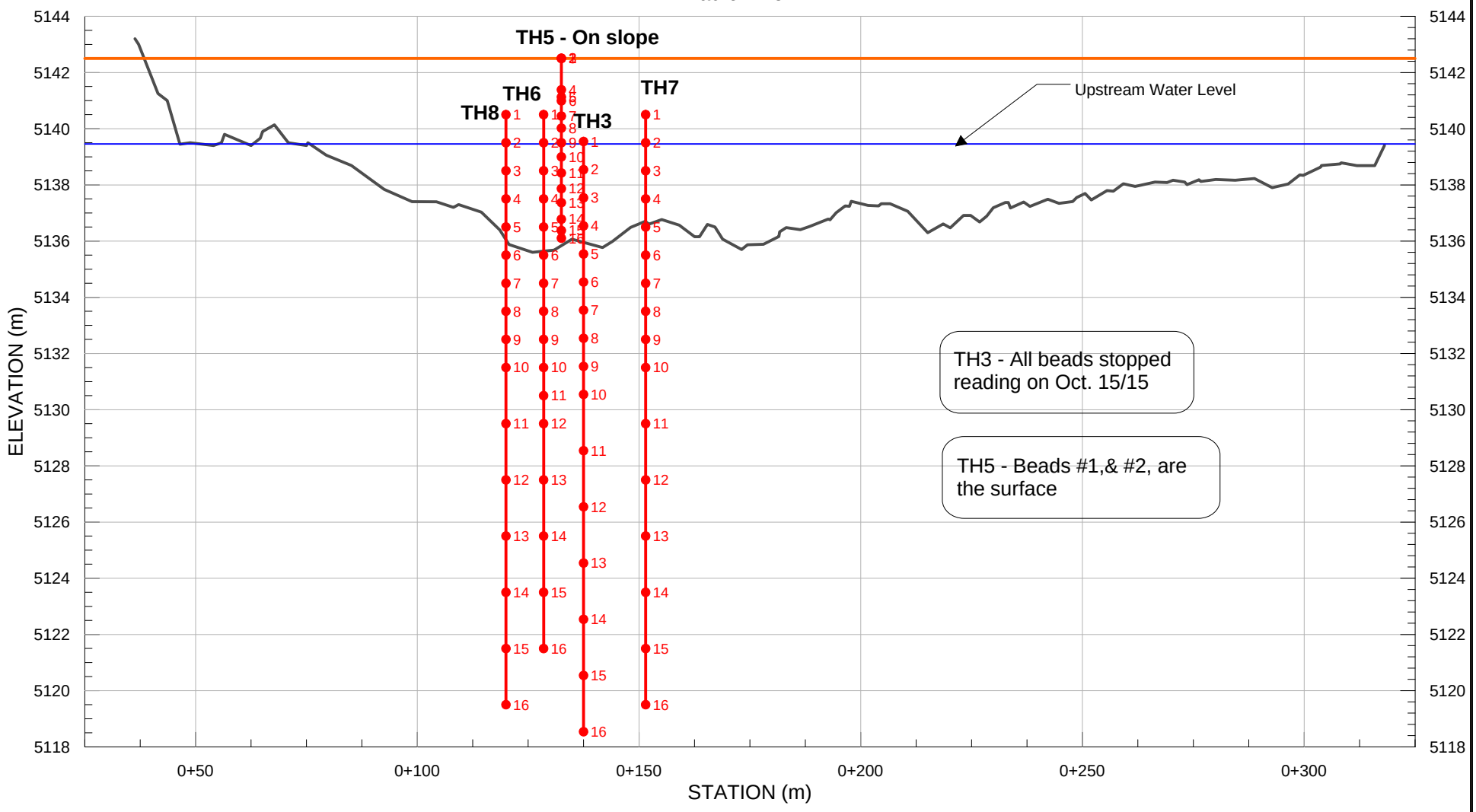
SCALE	FILE	
1:1000	.DWG	
DRAWING NO.	REVISION	SHEET 1 / 4

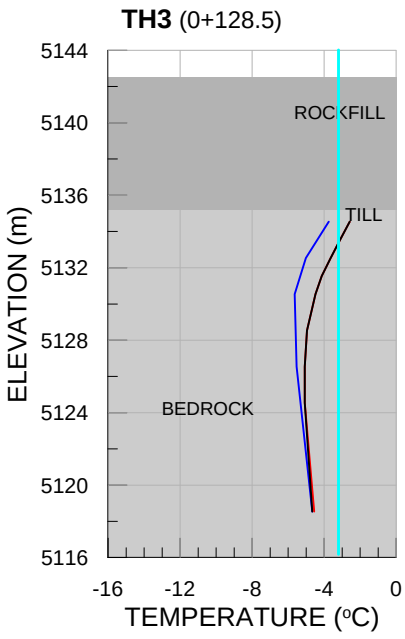
X:\Vault Dike\18– As–Built Report and Drawings\As–Built Drawings\ACAD–AS BUILT VAULT DIKE FINAL WITH ALL THERMISTORS LABELLED.dwg, 22 Aug 2013

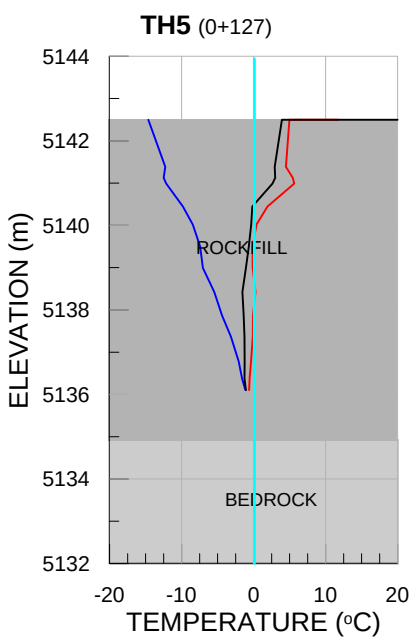
WEST

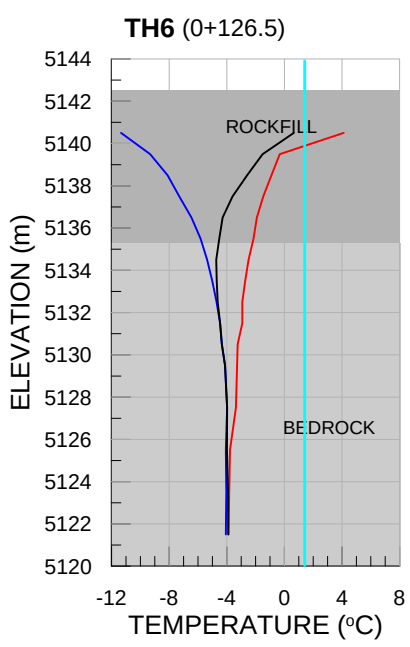
Vault Dike

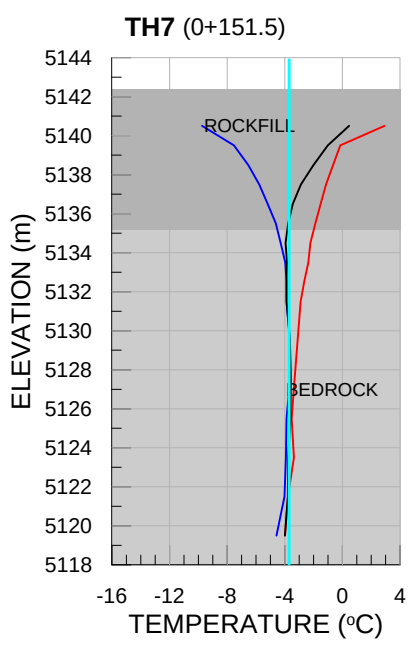
EAST

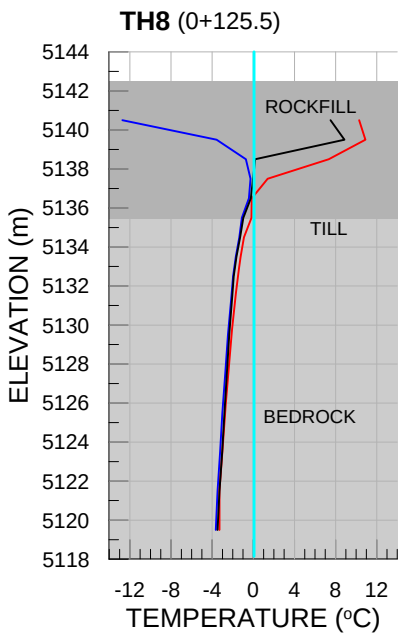












LEGEND

- Dike Crest
- Lake Bed
- Bedrock
- T min
- T current
- T max
- Lake
- Till
- Bedrock
- Thermistor with Bead Locations

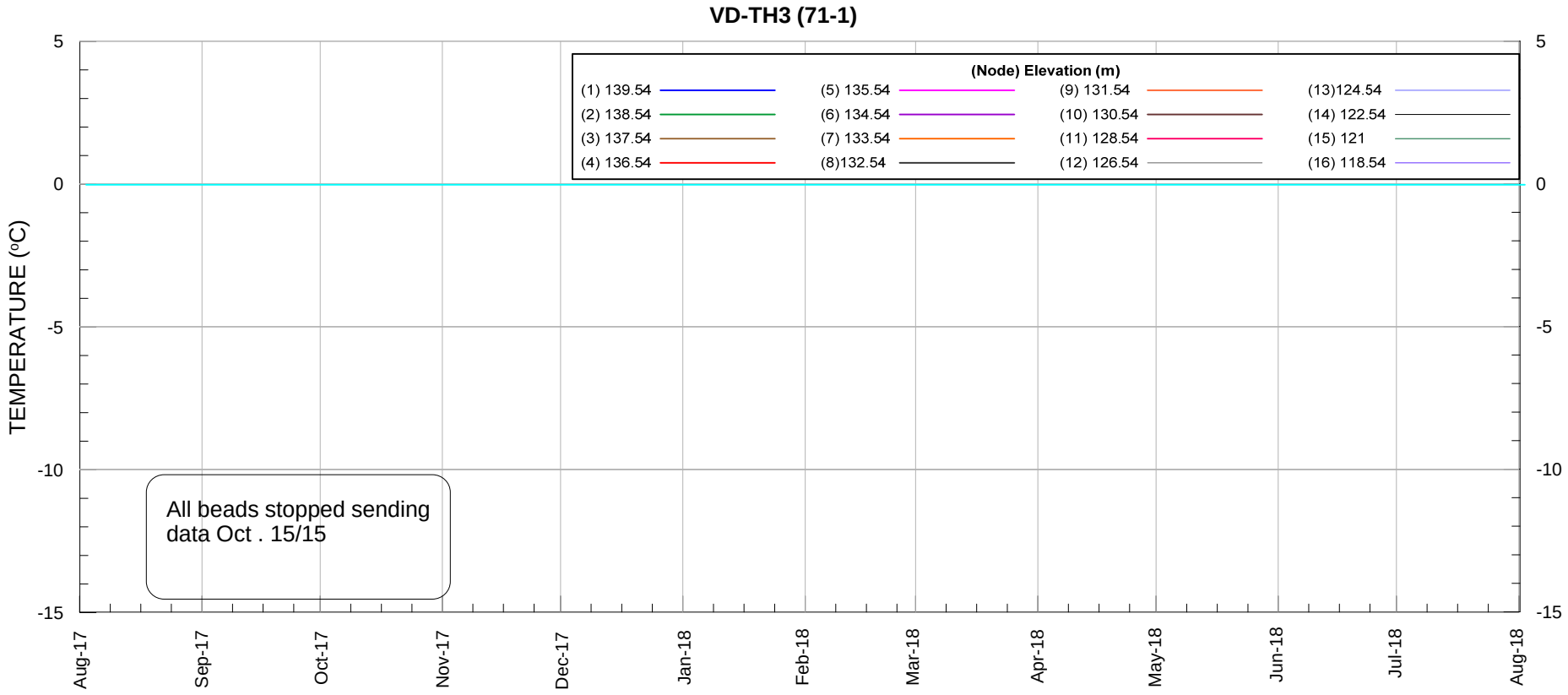
Current Temperature on July 25th, 2018

PROJECT	AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT
TITLE	VAULT DIKE TEMPERATURE DATA (Aug 1/17 to Aug 1/18)

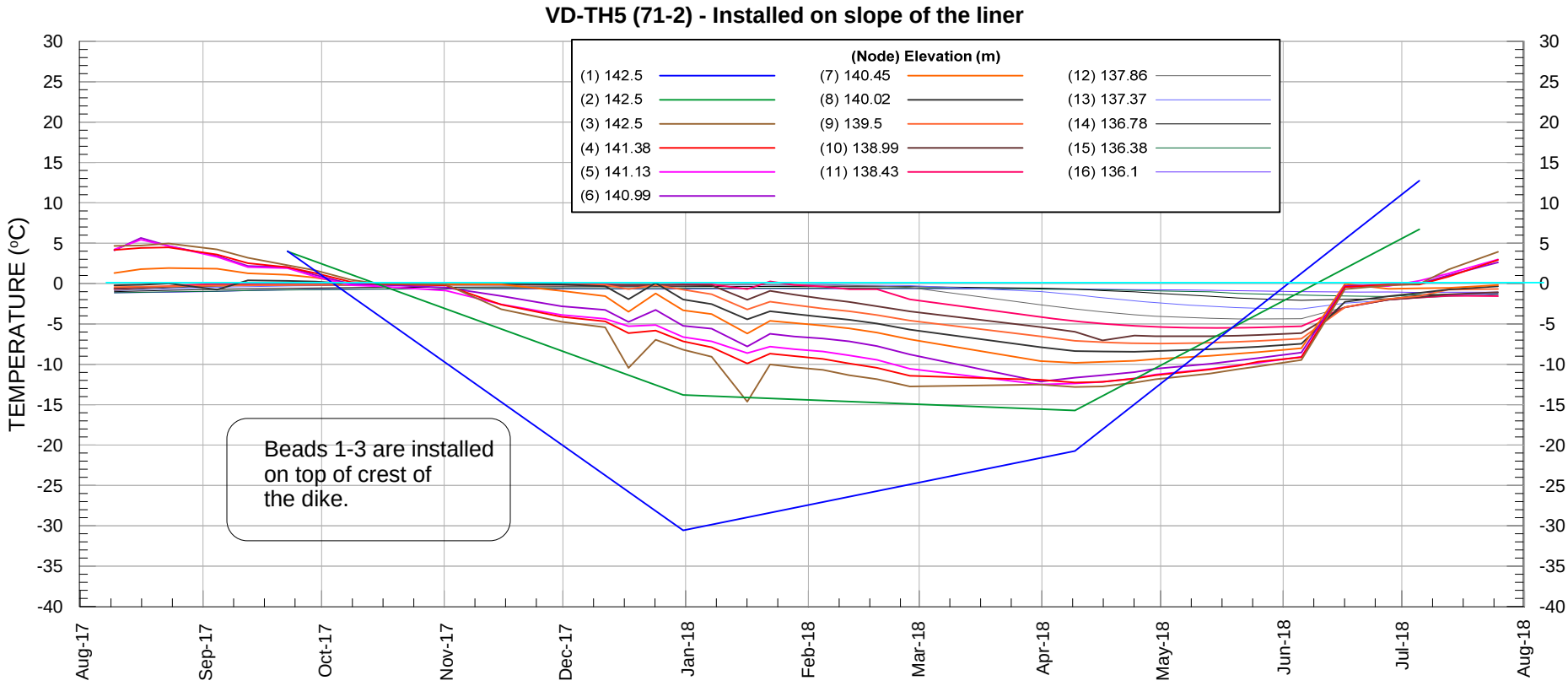
AGNICO EAGLE MEADOWBANK

PROJECT No.			PHASE No.	
DESIGN	TD	28AUG14	SCALE AS SHOWN	REV.
CADD	TD	28AUG14	FIGURE 54	
CHECK	PG	28AUG14		
REVIEW				

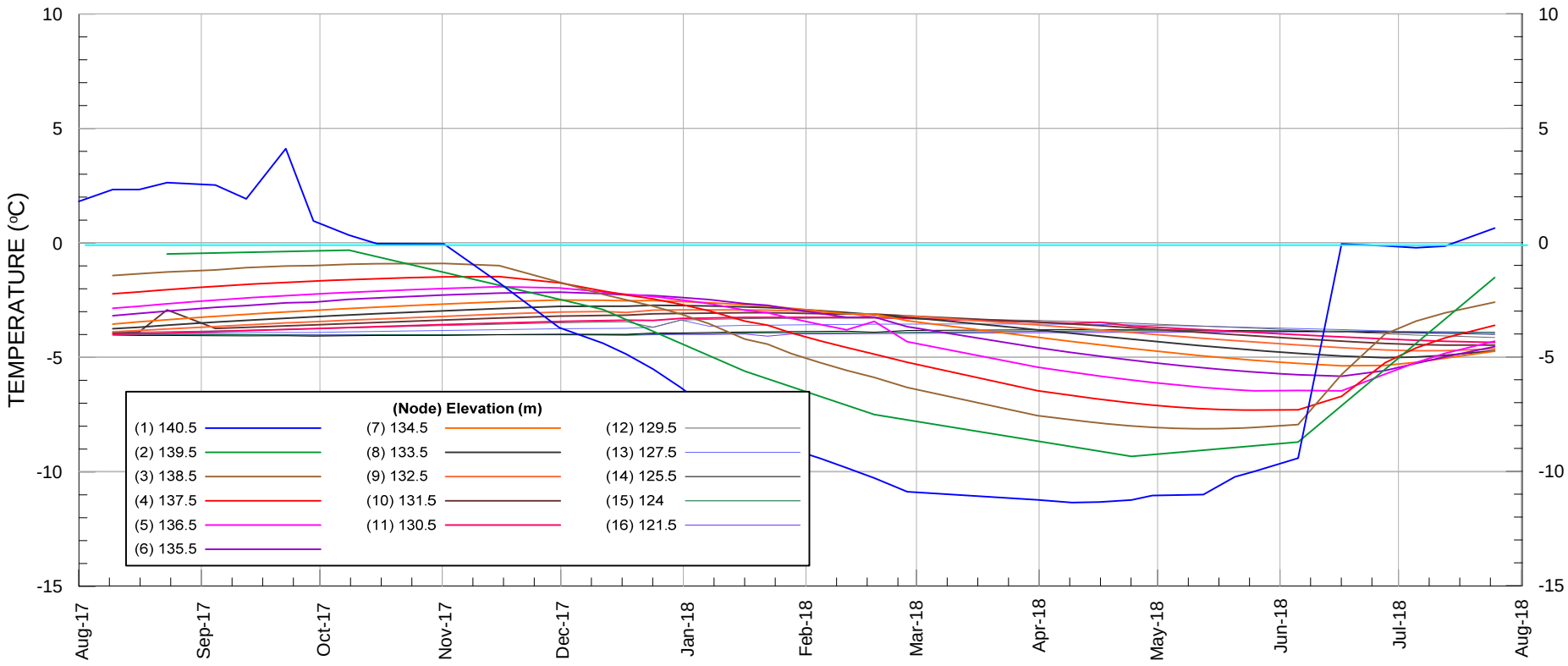
VD-TH3 (71-1)



VD-TH5 (71-2) - Installed on slope of the liner



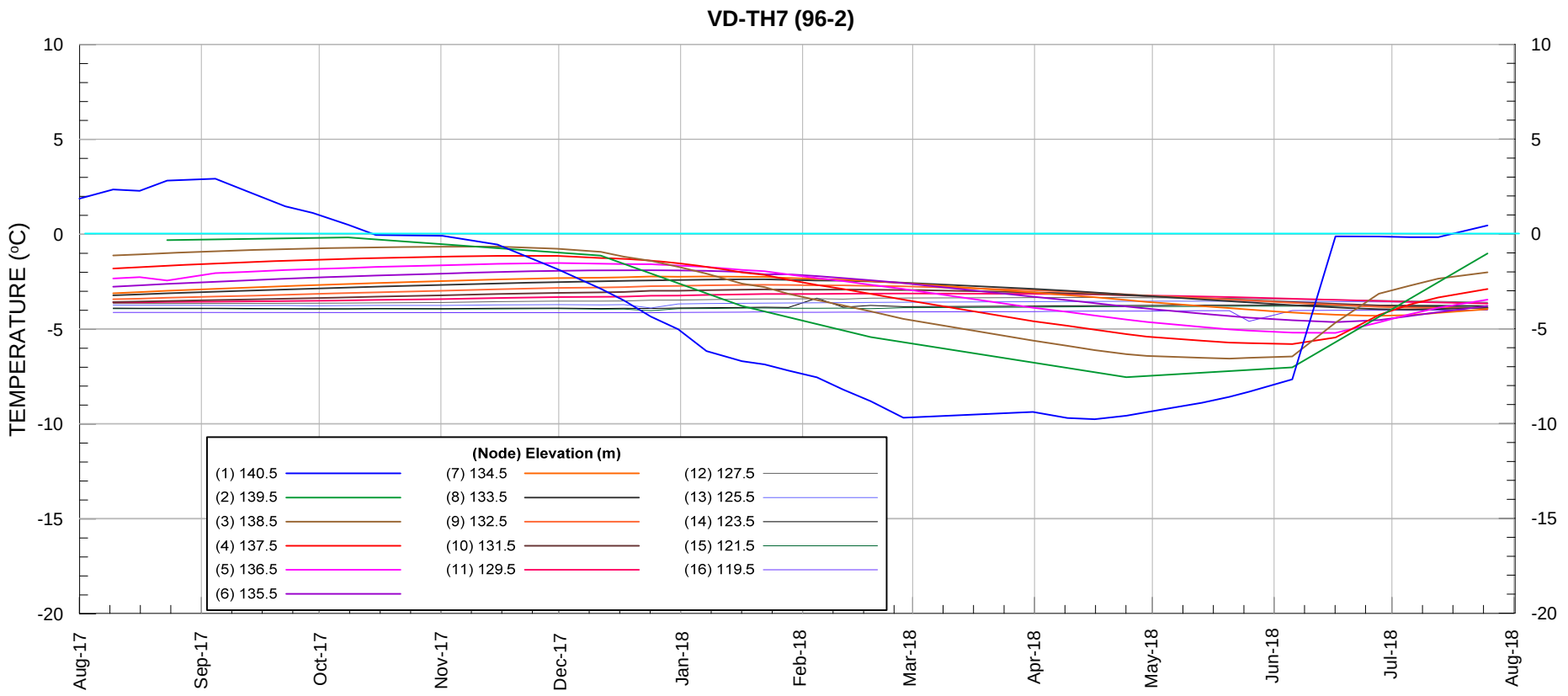
VD-TH6 (94-2)

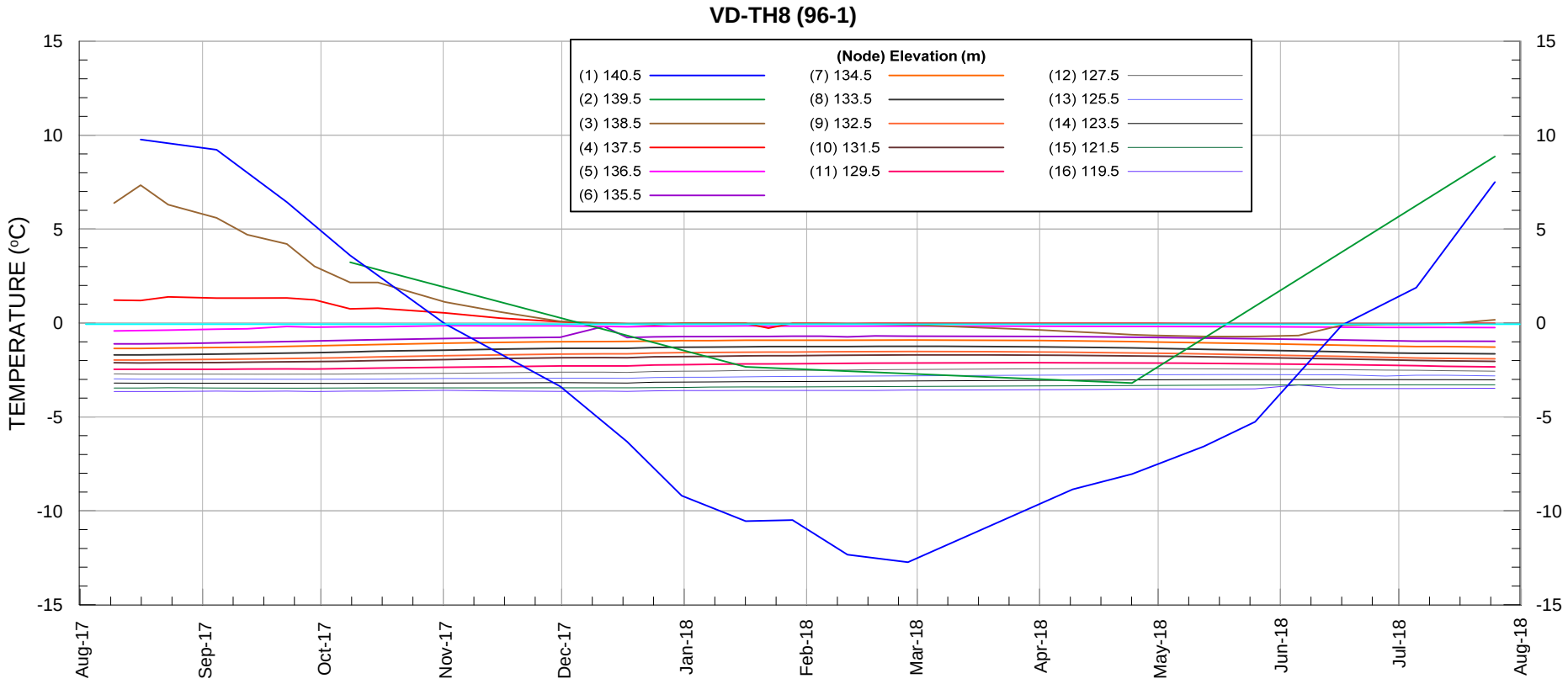


PROJECT	**AGNICO EAGLE MINES LIMITED** **MEADOWBANK GOLD PROJECT** **NUNAVUT**
TITLE	**VAULT DIKE** **NODAL THERMAL TIMELINES** **(Aug 1/17 to Aug 1/18)**

AGNICO EAGLE
MEADOWBANK

PROJECT No.			PHASE No.	
DESIGN	TD	28AUG14	SCALE AS SHOWN	REV.
CADD	TD	28AUG14		
CHECK	PG	28AUG14	**FIGURE 55**	
REVIEW				





PROJECT	AGNICO EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT NUNAVUT
TITLE	VAULT DIKE NODAL THERMAL TIMELINES (Aug 1/17 to Aug 1/18)

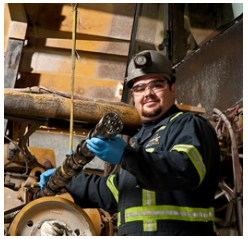
AGNICO EAGLE
MEADOWBANK

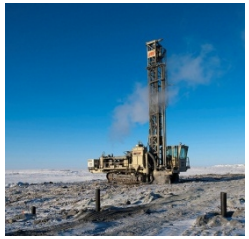
PROJECT No.			PHASE No.	
DESIGN	TD	28AUG14	SCALE AS SHOWN	REV.
CADD	TD	28AUG14	FIGURE 56	
CHECK	PG	28AUG14		
REVIEW				

APPENDIX C2

TSF South Cell Instrumentation Data

AGNICO EAGLE





MDRB # 24
P4– CENTRAL DIKE UPDATE

Frédérick L.Bolduc

September 24th 2018

PRESENTATION SECTIONS

Section 1 : **Dike Performance**

Section 2 : **Investigation and Sampling**

Section 3: **Instrumentation Review**

CENTRAL DIKE UPDATE 2018

HIGHLIGHTS

- TARP Level of Central Dike was decreased from Orange to Yellow on November 28, 2017
- 350 000 m3 of water were transfered out of the South Cell into Goose Pit in October 2017
- Progressive decline of seepage rate observed. From 567 m3/h on July 2017 to 350 m3/h on November 2017. Current seepage is stable in the 240-280 m3/hr range
- The TARP and ERP plan of Central Dike were updated and included in the 2018 revision of the OMS manual

CENTRAL DIKE UPDATE 2018

HIGHLIGHTS

- Complementary investigation performed in October 2017 to investigate potential void at 700-P1. No void encountered
- Water analysis program was resumed at freshet as per the action plan. Orange coloration of the downstream pond happened again in 2018 as expected.
- No more investigation program or modelling work planned for Central Dike

AGNICO EAGLE

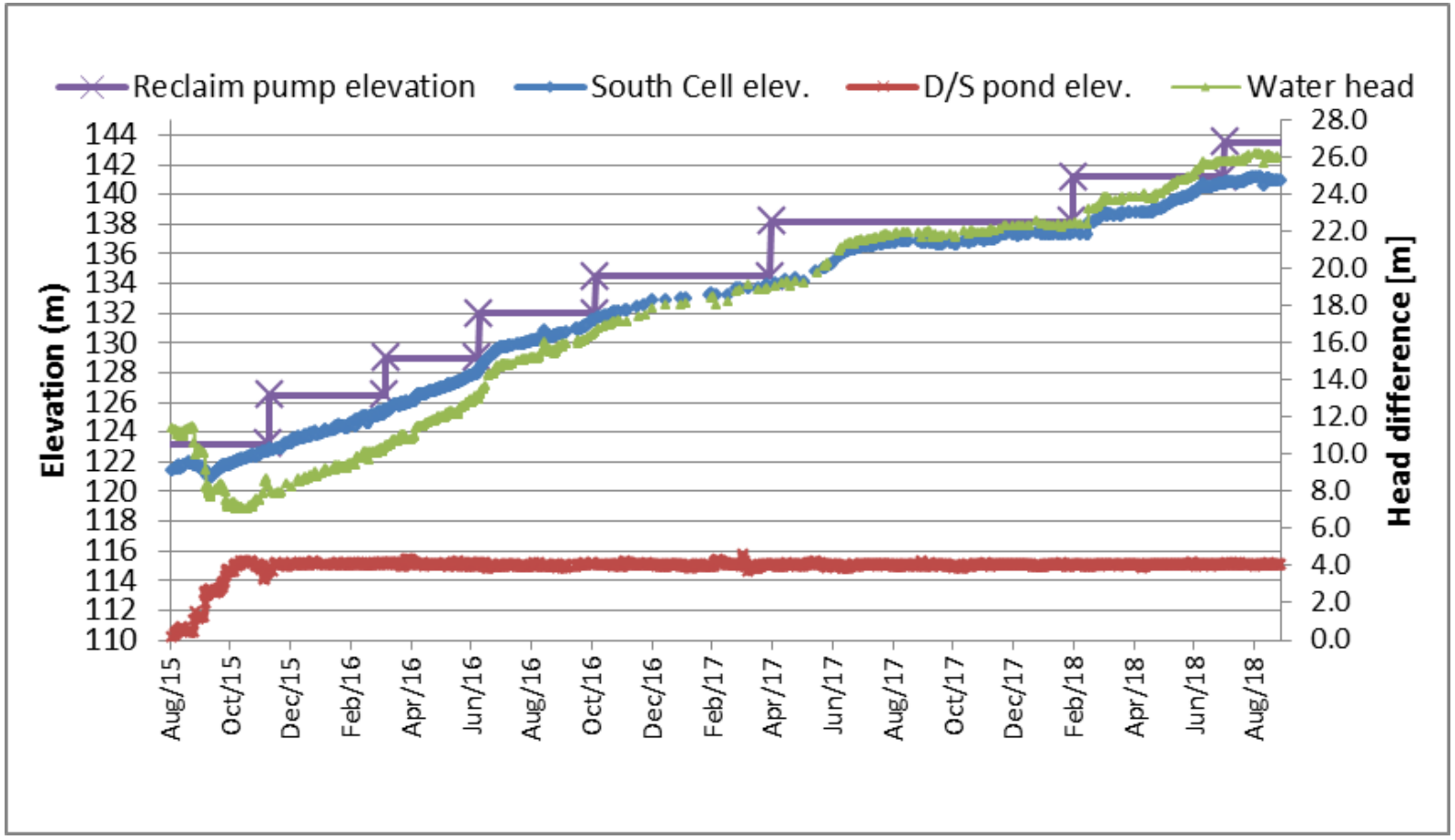
SECTION 1:
CD PERFORMANCE

CENTRAL DIKE UPDATE 2018

CURRENT INSPECTION FREQUENCY

- TARP level of structure at Yellow
- Formal inspection 1 each month
  - Frequent routine inspection
  - No geotechnical concern observed
- Review of instrumentation every 2 days by geotechnical team
- Instrumentation update and analysis included in each formal inspection report
  - Anomalous data are followed-up on
- TSF Inspection 1 each month
  - No tailings depression observed in the tailings surface in the last year

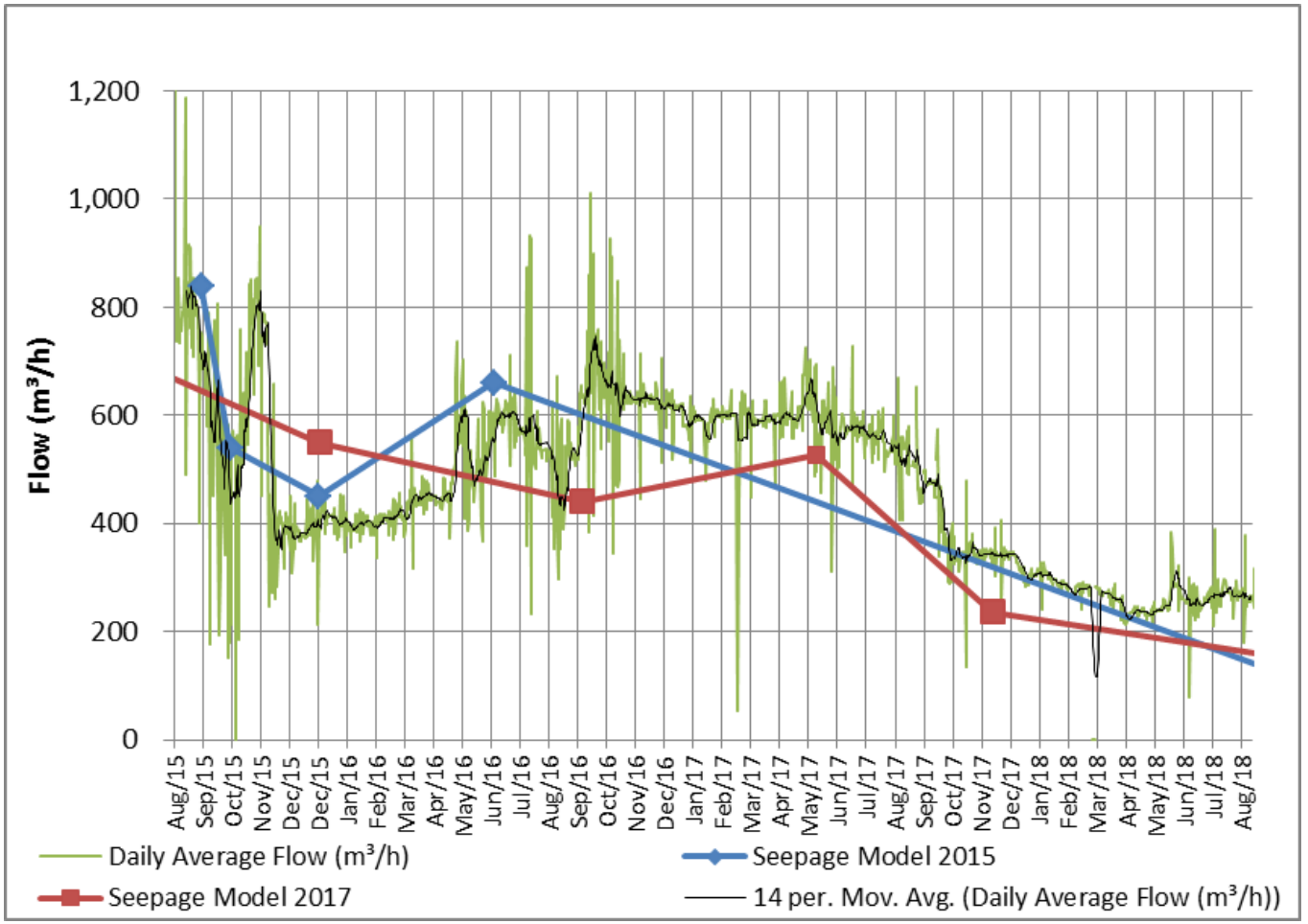
Water Elevation and Head Difference over Time



- The D/S pond is maintained around El. 114.9-115 m.
- Water is pumped back into the South Cell since September 2016.

1. CD PERFORMANCE

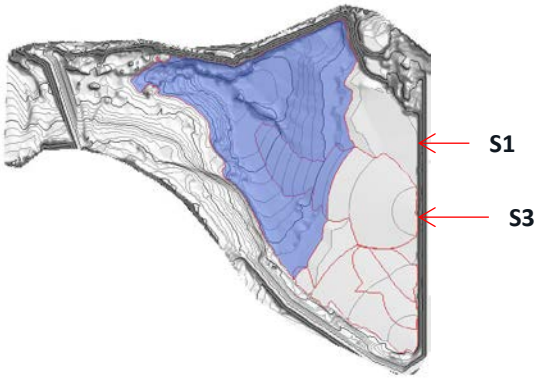
Seepage Flow (m³/h) over Time



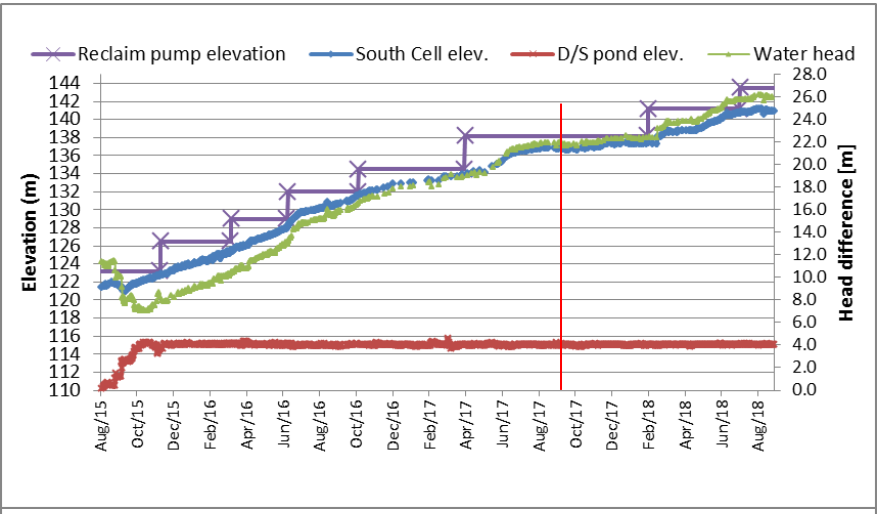
- Pump capacity of 455 m³/h Second pump installed in parallel for an additional capacity of 1183 m³/h

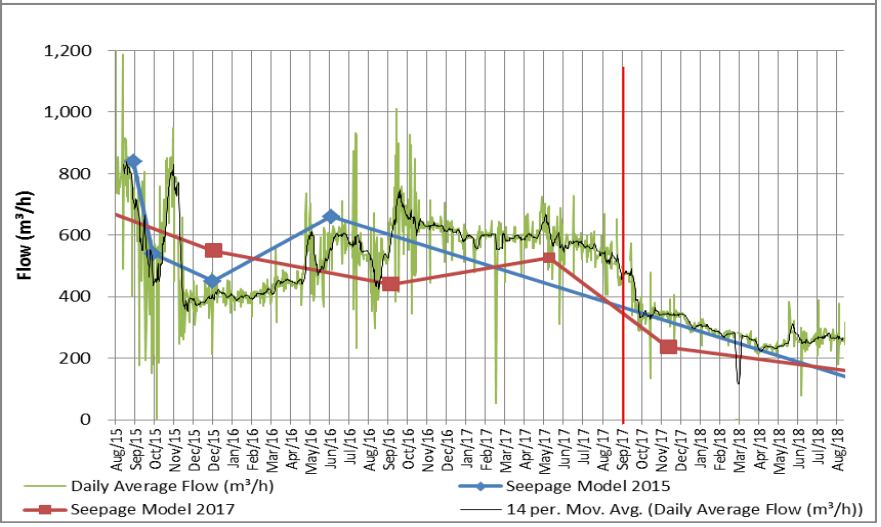
SEPTEMBER 2017

Average seepage flow	486 m³/h
EOM South Cell elevation	136.6 m
EOM CD D/S pond elevation	114.90 m
EOM Water head	21.7 m
EOM % Central Dike U/S toe cover	100 %



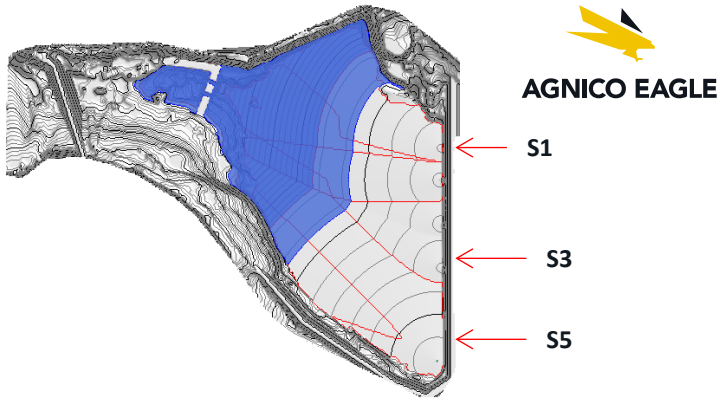
AGNICO EAGLE

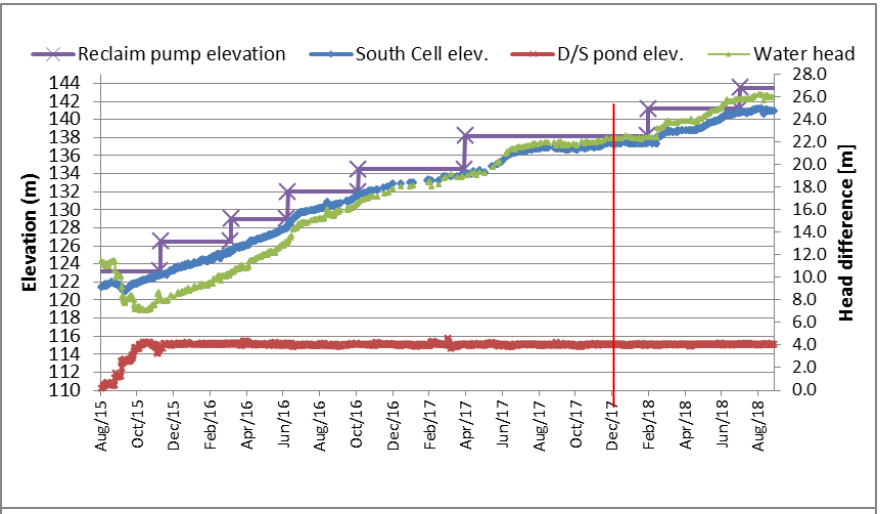


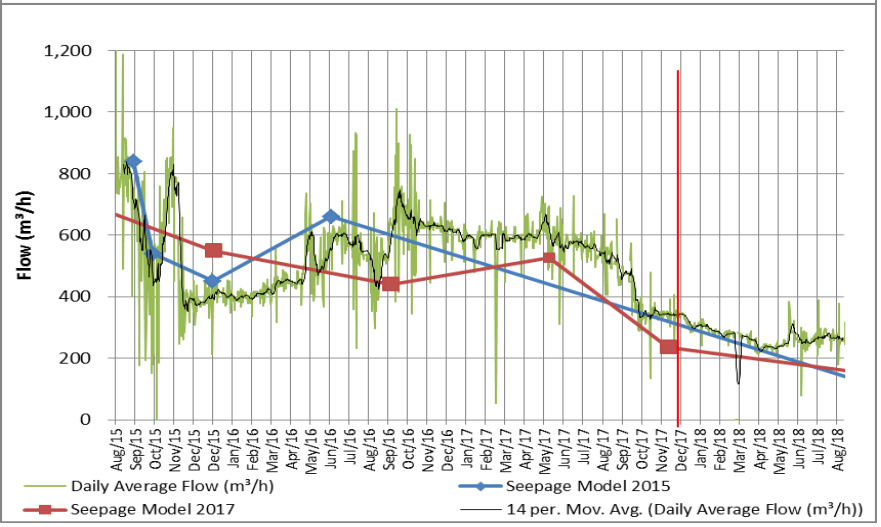


DECEMBER 2017

Average seepage flow	338 m³/h
EOM South Cell elevation	137.17 m
EOM CD D/S pond elevation	114.91 m
EOM Water head	22.26 m
EOM % Central Dike U/S toe cover	100 %

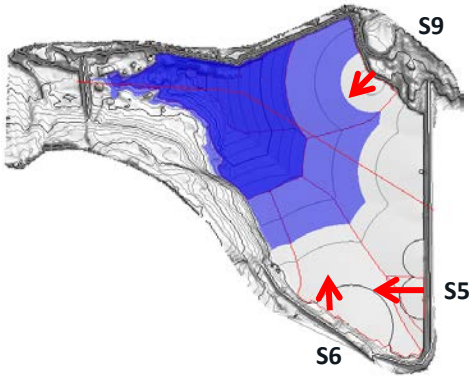


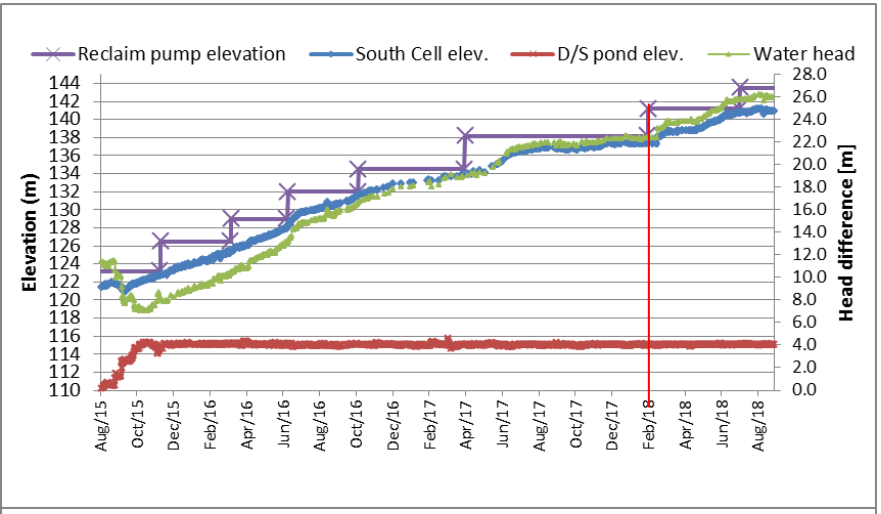


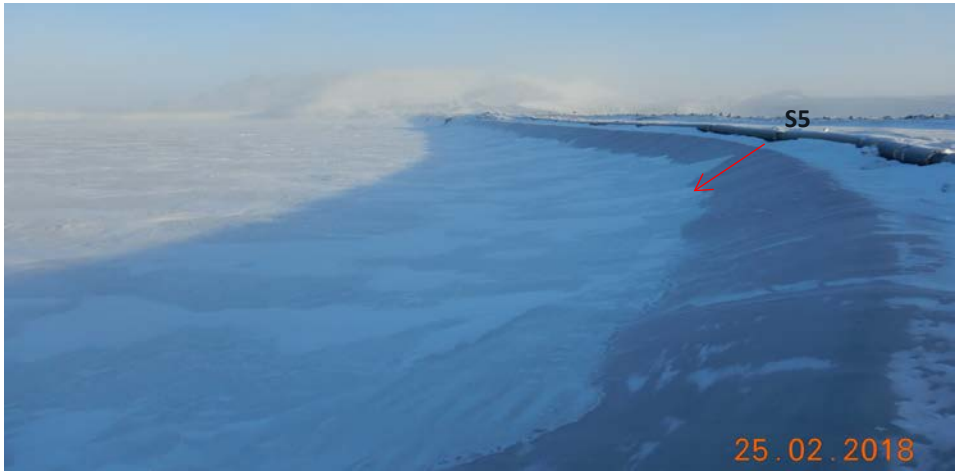


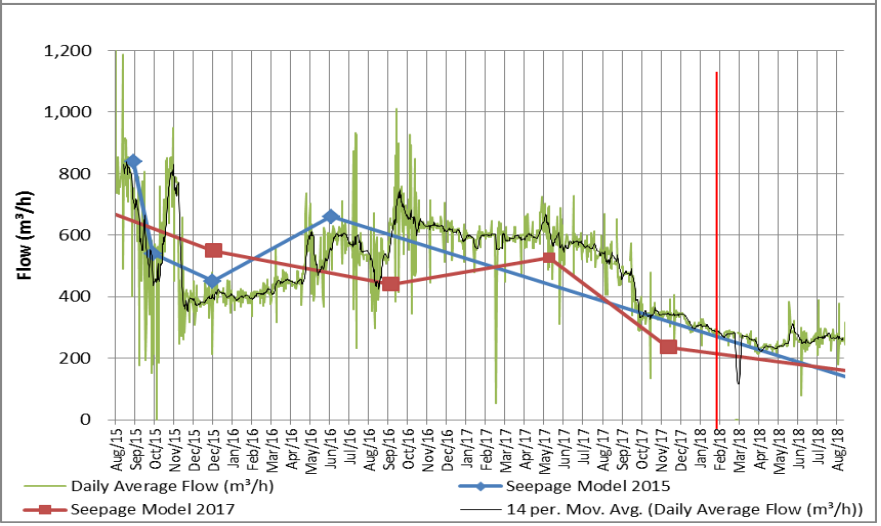
FEBRUARY 2018

Average seepage flow	281 m³/h
EOM South Cell elevation	137.69 m
EOM CD D/S pond elevation	114.9 m
EOM Water head	22.79 m
EOM % Central Dike U/S toe cover	100 %



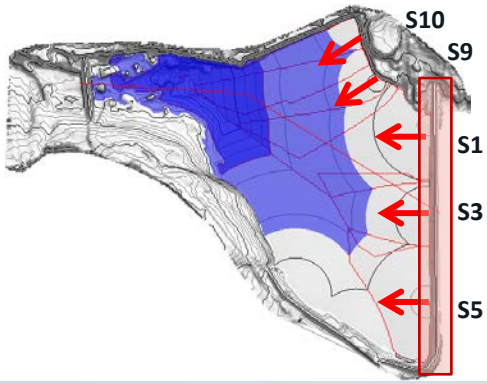




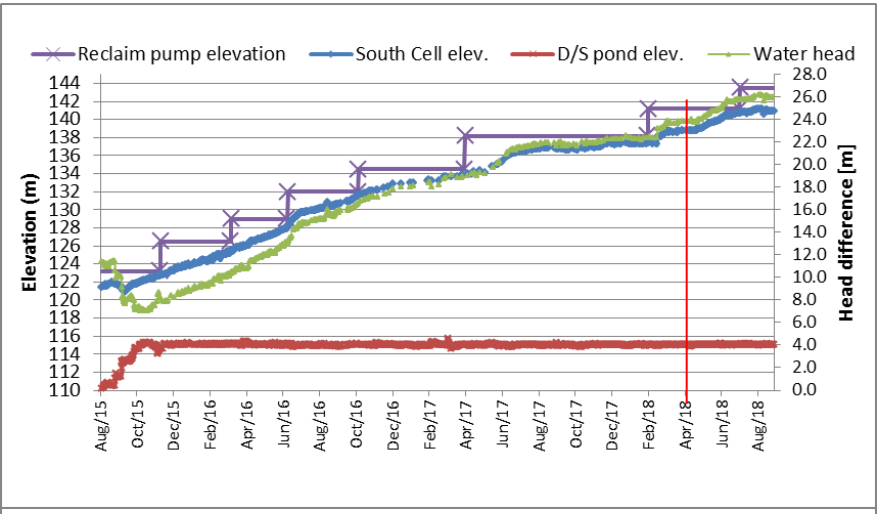


APRIL 2018

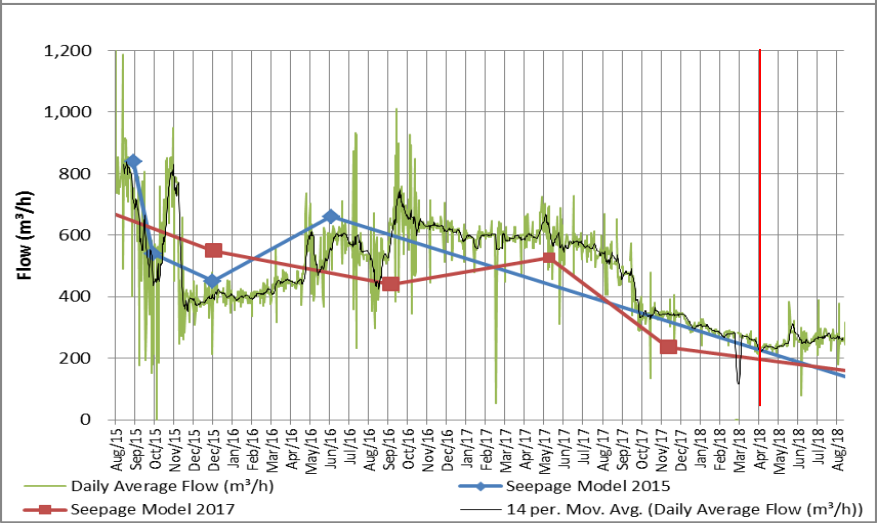
Average seepage flow	244 m³/h
EOM South Cell elevation	138.70 m
EOM CD D/S pond elevation	114.91 m
EOM Water head	23.79 m
EOM % Central Dike U/S toe cover	100 %



CD construction period

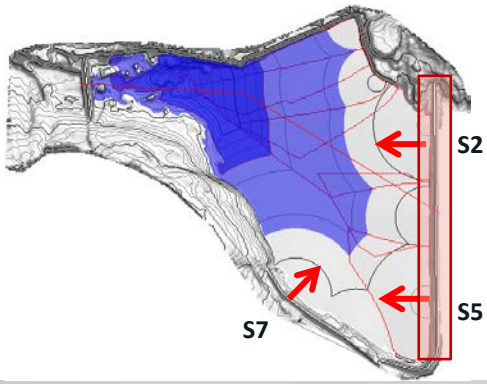


Construction started at the end of April, deposition points were removed

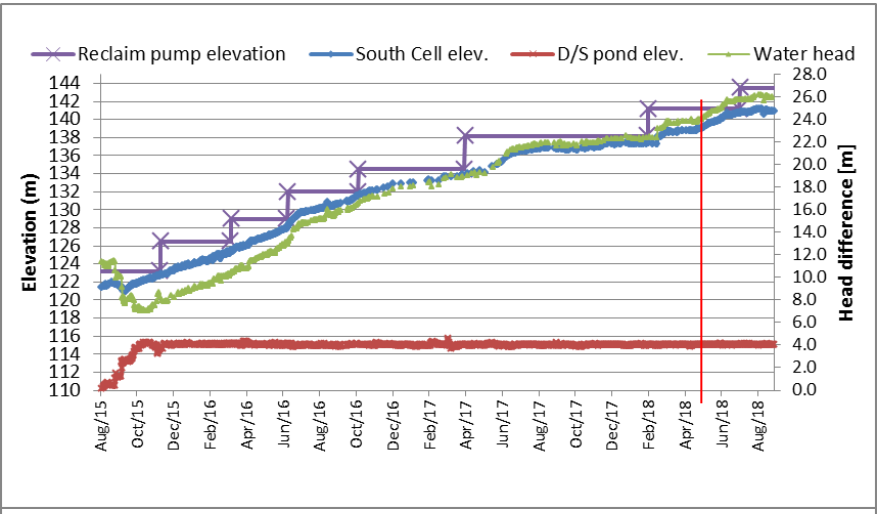


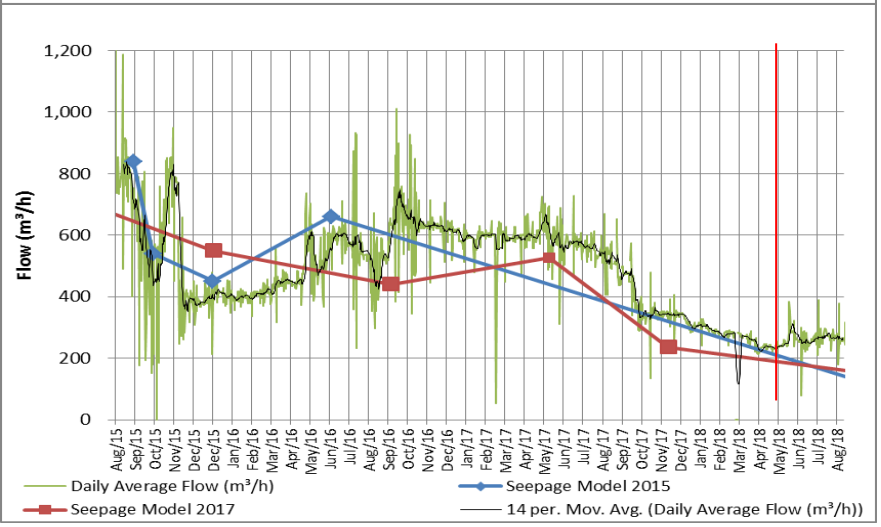
MAY 2018

Average seepage flow	239 m³/h
EOM South Cell elevation	139.45 m
EOM CD D/S pond elevation	114.95 m
EOM Water head	24.5 m
EOM % Central Dike U/S toe cover	100 %



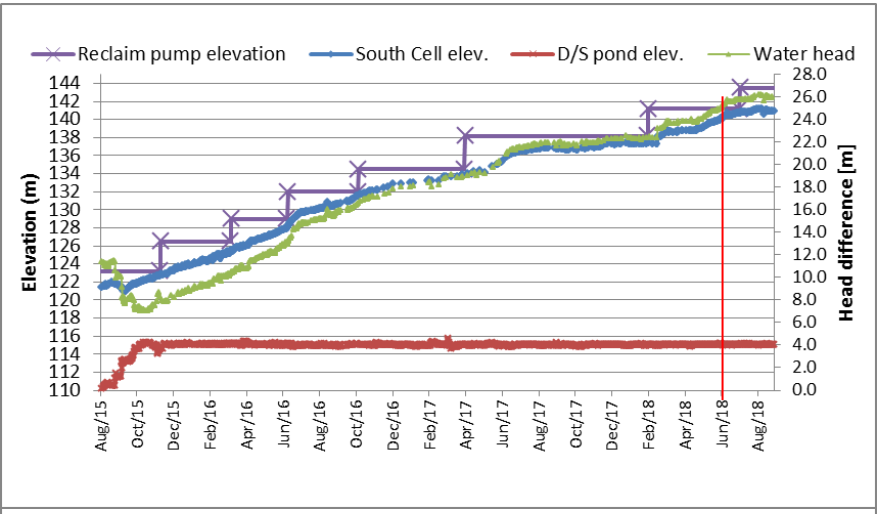
CD construction period

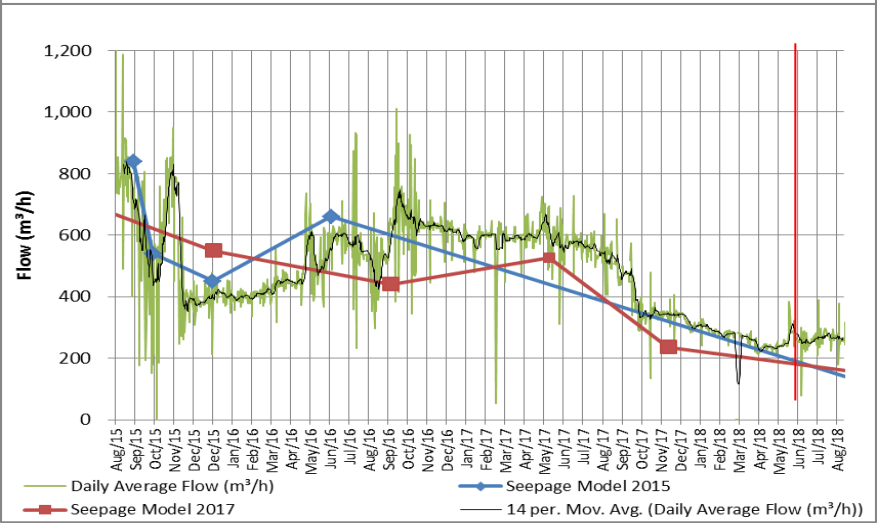


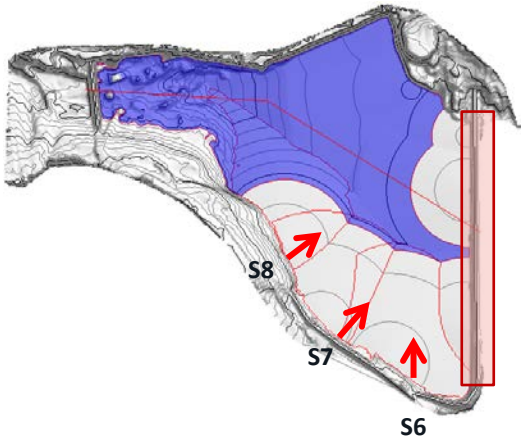


JUNE 2018

Average seepage flow	272 m³/h
EOM South Cell elevation	140.32 m
EOM CD D/S pond elevation	114.93 m
EOM Water head	25.39 m
EOM % Central Dike U/S toe cover	95 %





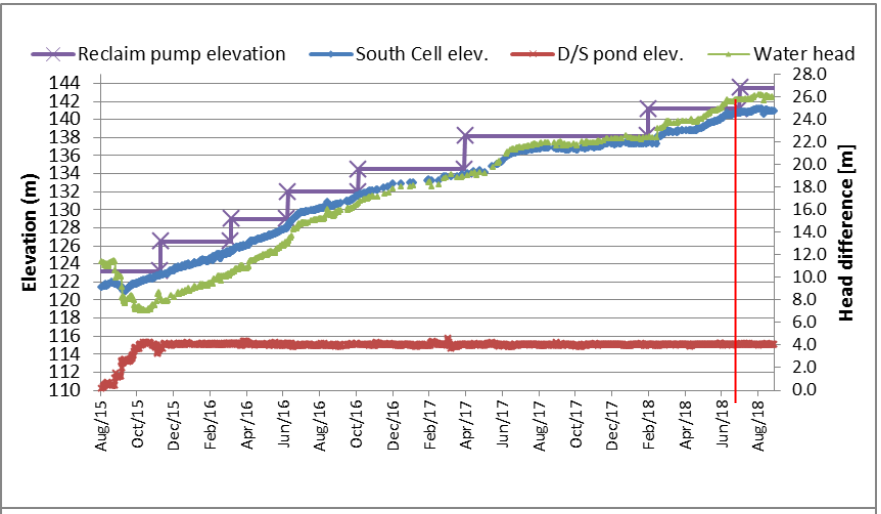


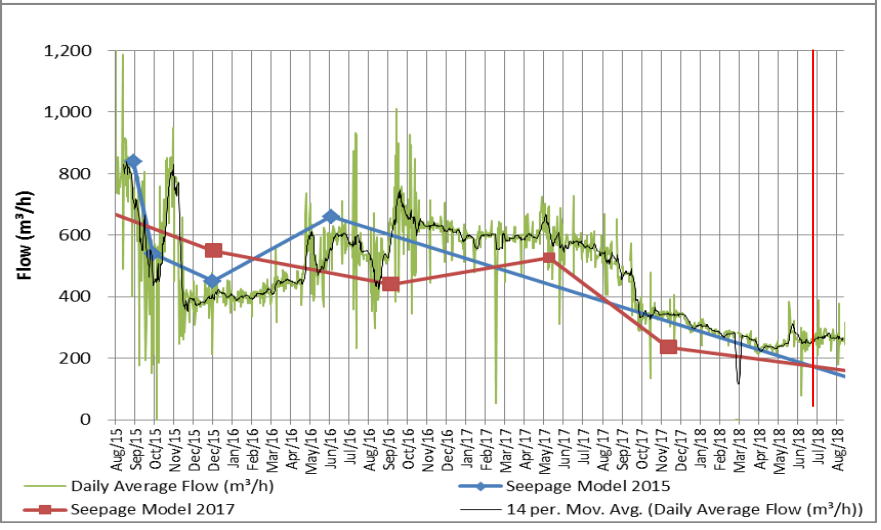
CD construction period

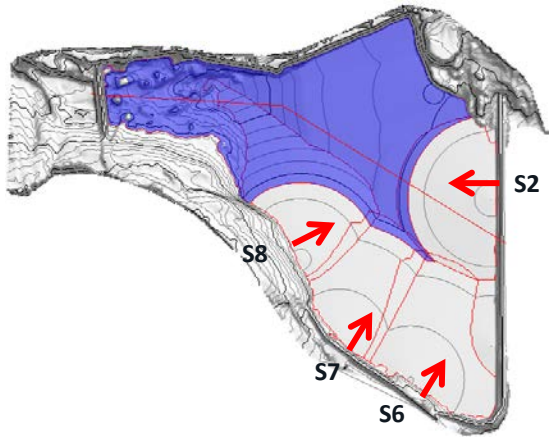
Deposition points were reinstalled

JULY 2018

Average seepage flow	263 m³/h
EOM South Cell elevation	140.71 m
EOM CD D/S pond elevation	114.97 m
EOM Water head	25.74 m
EOM % Central Dike U/S toe cover	100 %







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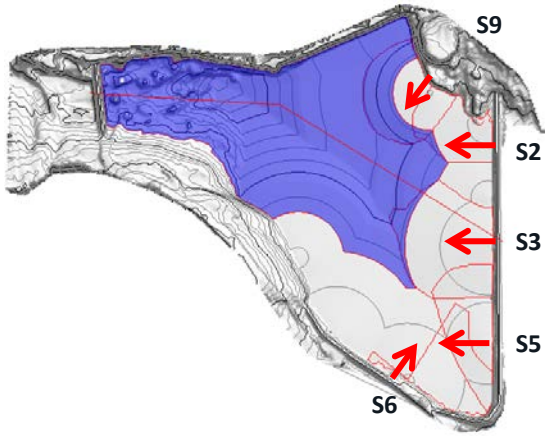
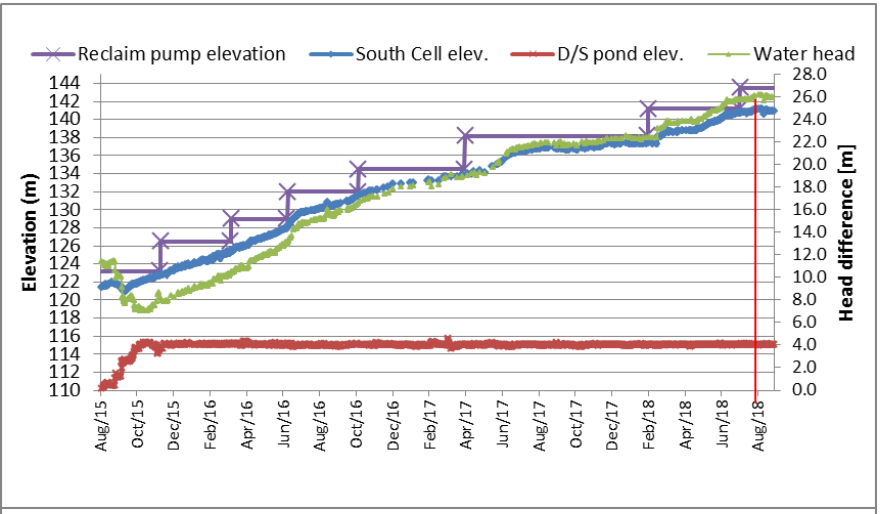
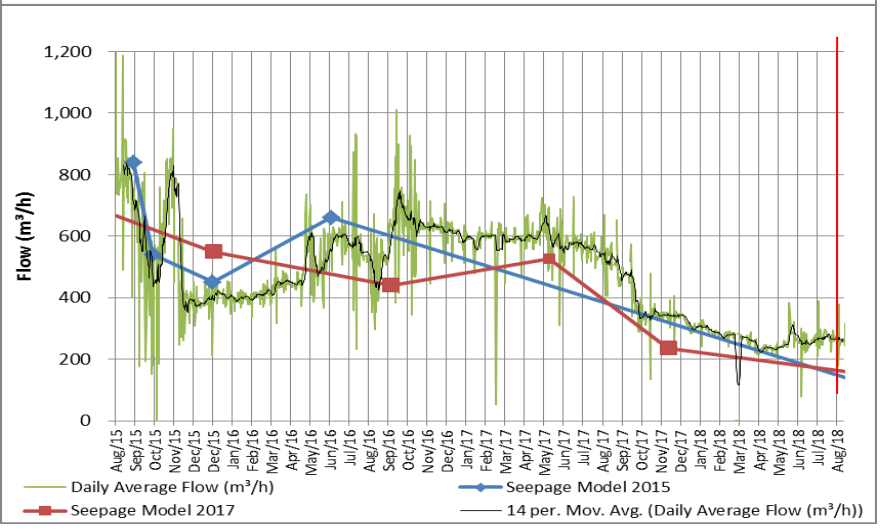
AUGUST 2018

Average seepage flow	273 m³/h
EOM South Cell elevation	140.92 m
EOM CD D/S pond elevation	114.92 m
EOM Water head	26 m
EOM % Central Dike U/S toe cover	100 %



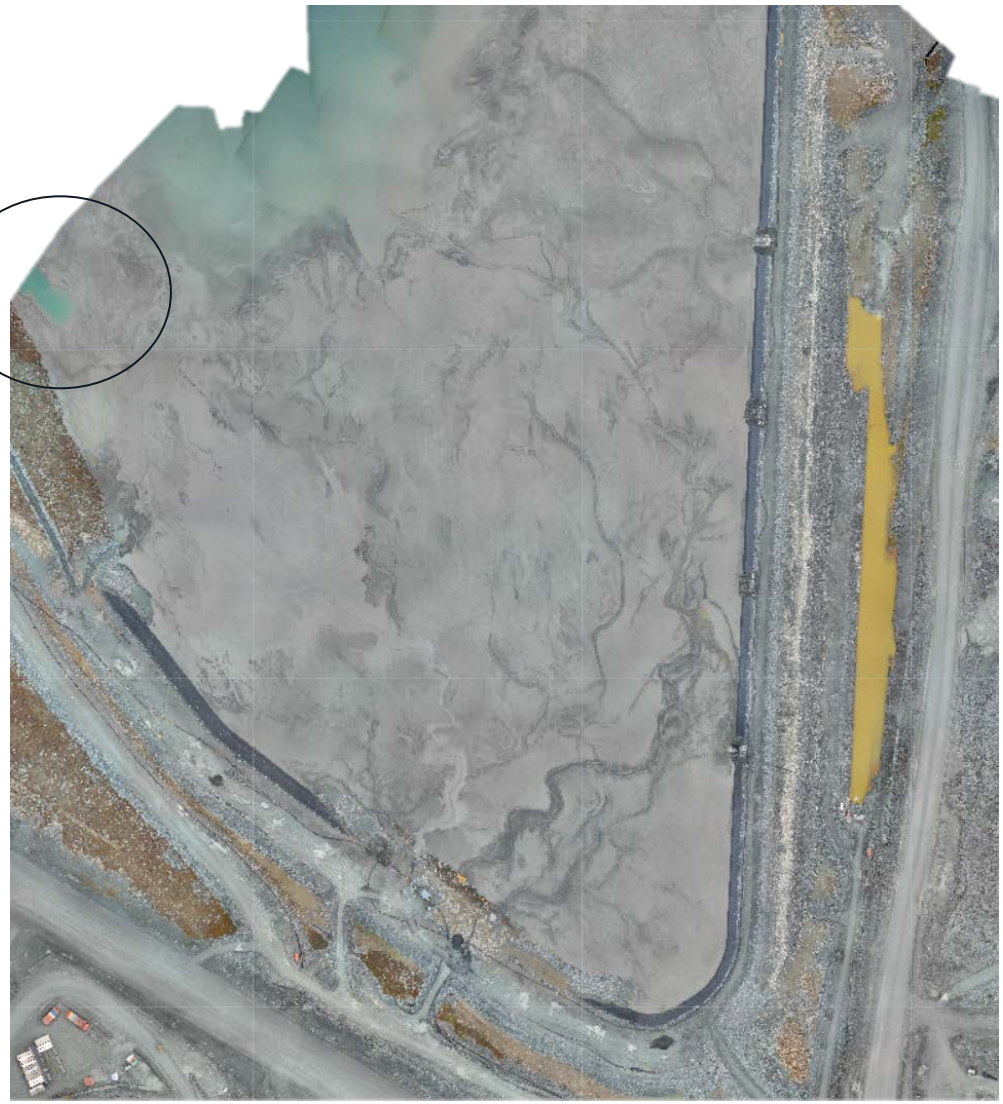
AGNICO EAGLE





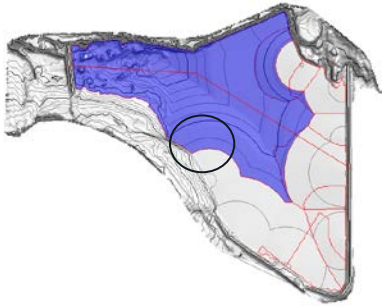
SEPTEMBER 2018

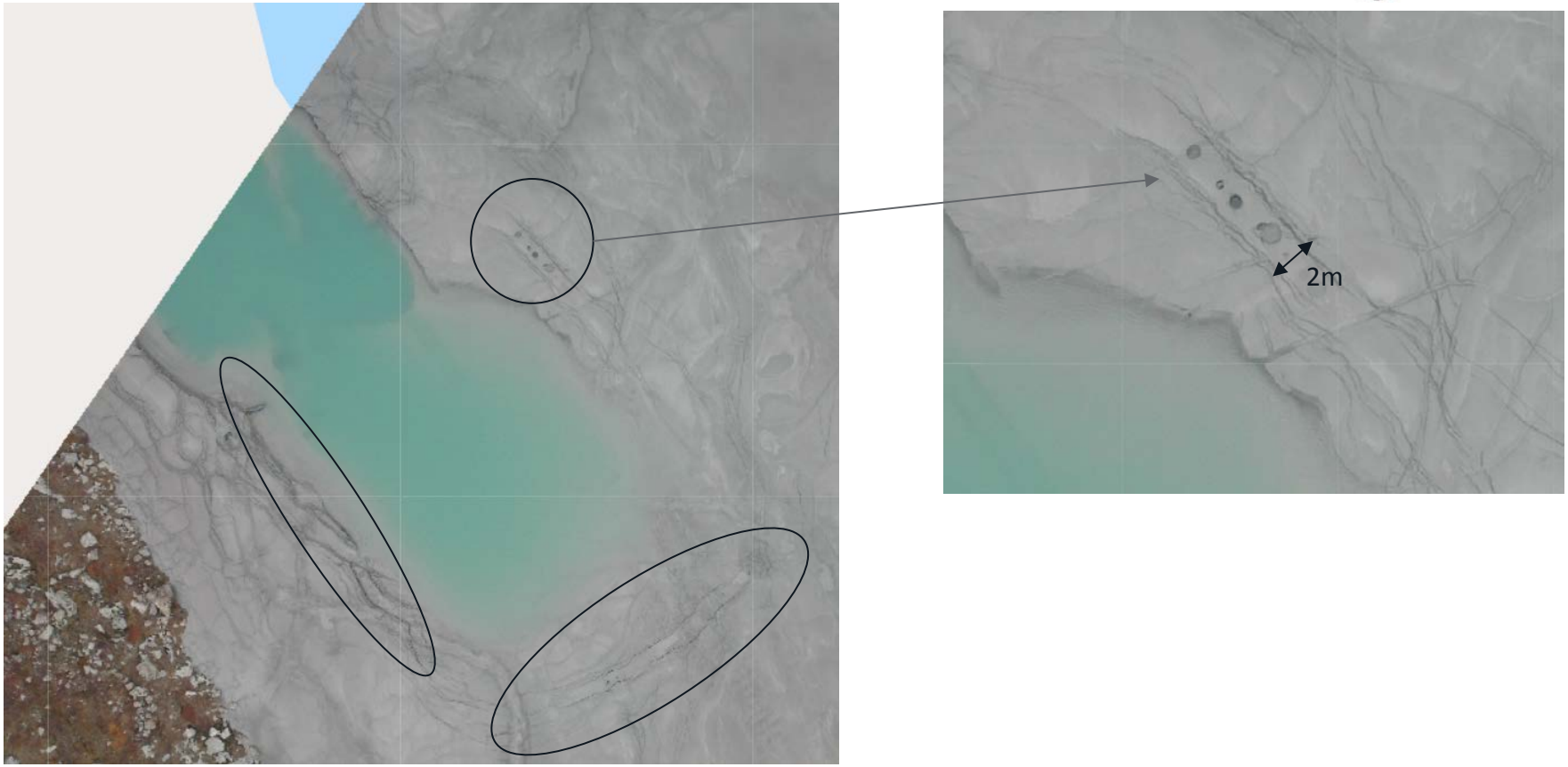
See Next Slide



Drone survey September 7th 2018

SEPTEMBER 2018





file:///P:/Engineering/11-Drone/Portage_2018-09-07/3_dsm_ortho/2_mosaic/google_tiles/Portage_2018-09-07_mosaic.html

AGNICO EAGLE

SECTION 3:
SITE INVESTIGATION

2.1 Coloration of Downstream pond

(2018)

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Monthly Photo of D/S Pond Coloration

May 17th, 2018

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Monthly Photo of D/S Pond Coloration

June 13th, 2018

AGNICO EAGLE

Monthly Photo of D/S Pond Coloration

July 12th, 2018

Monthly Photo of D/S Pond Coloration

August 14th, 2018

AGNICO EAGLE

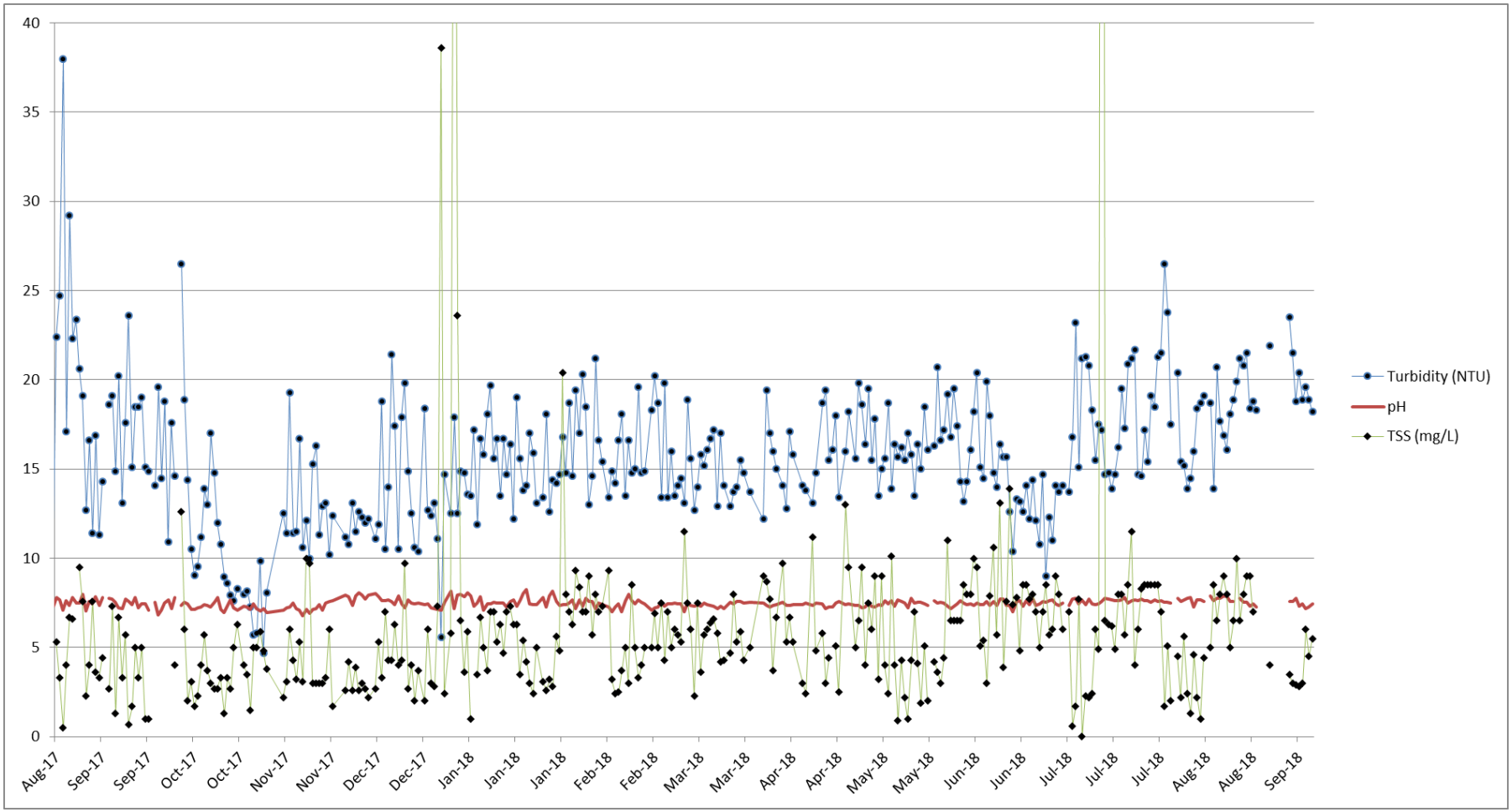
Monthly Photo of D/S Pond Coloration

September 5th, 2018

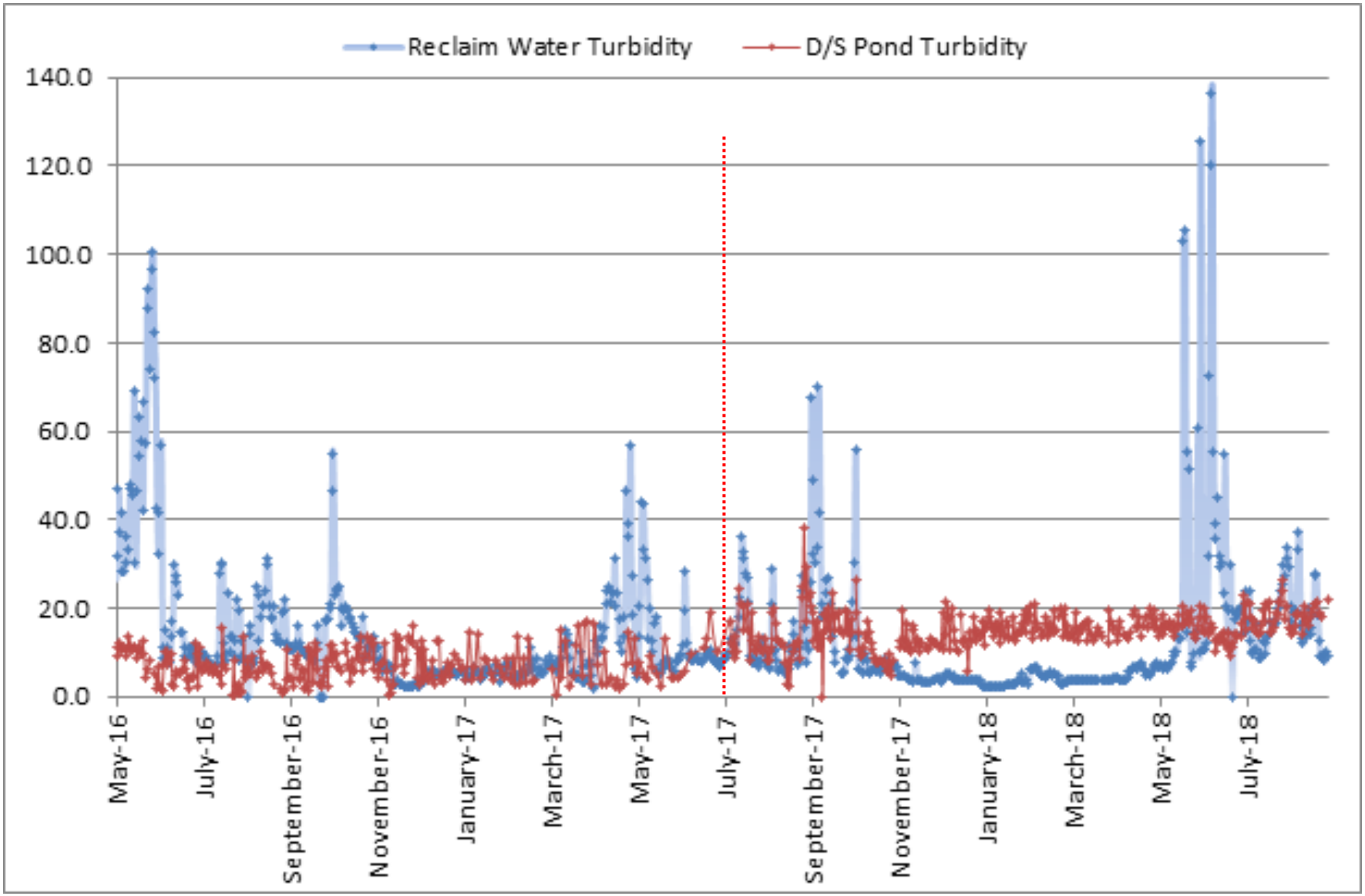
D/S POND TSS, PH, TURBIDITY

TSS = 70.4 mg/L

TSS = 144 mg/L

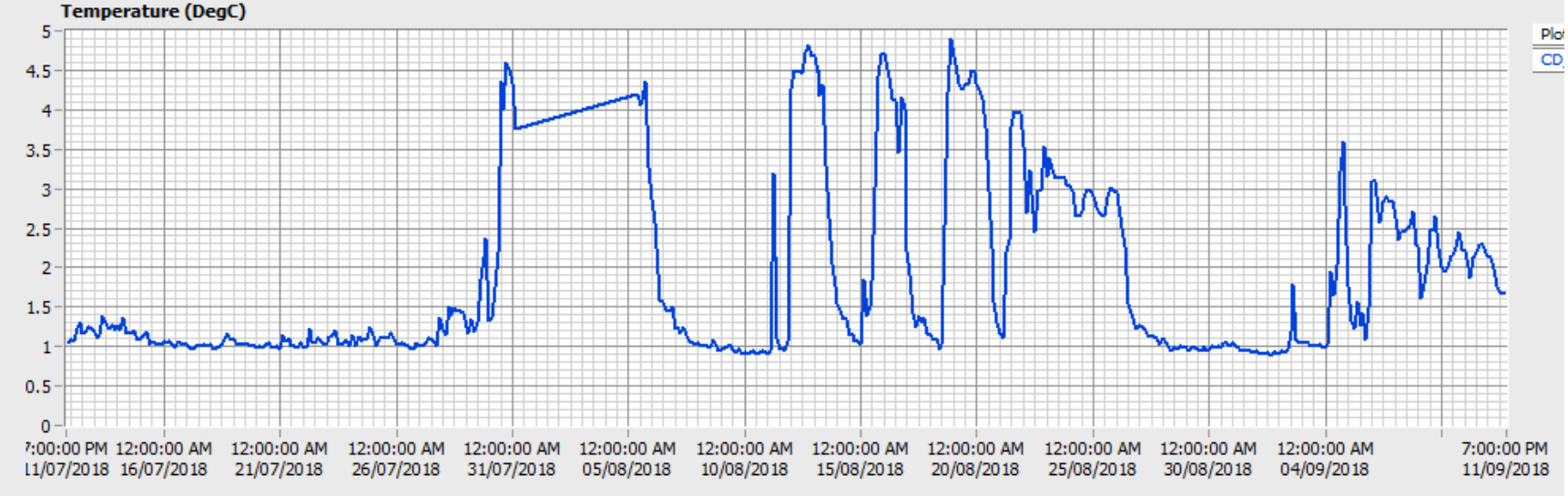


D/S POND TURBIDITY VS RECLAIM TURBIDITY

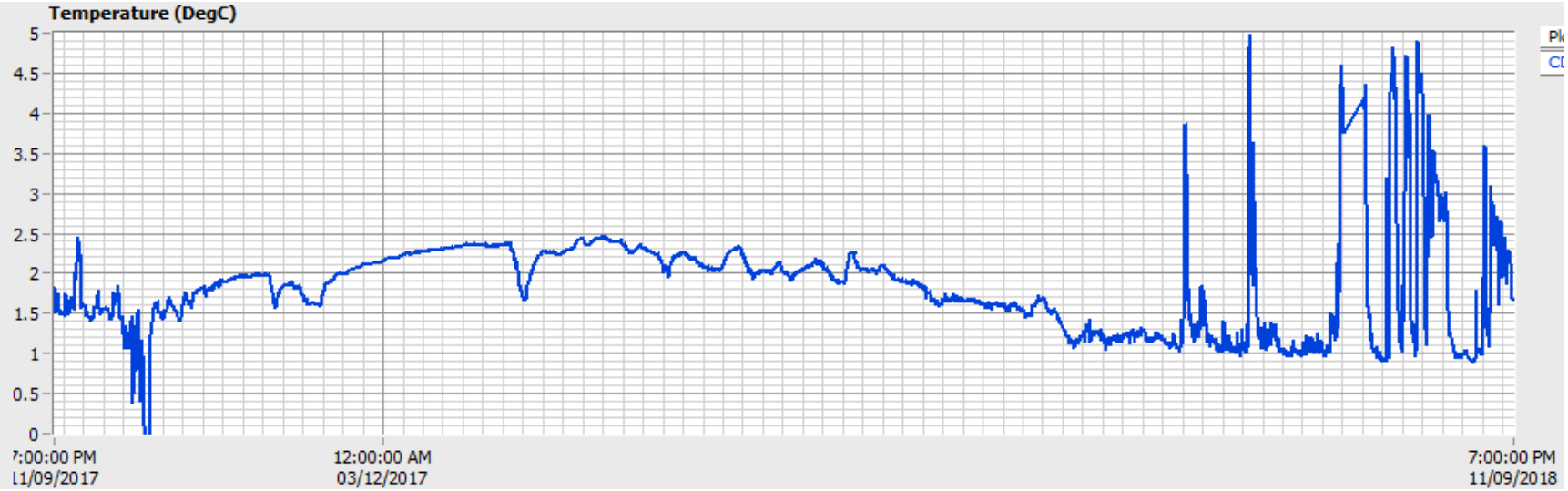


D/S POND TEMPERATURE

D/S Pond Temperature for Last Two Months



D/S Pond Temperature for Last Year



CENTRAL DIKE UPDATE 2018

COLORATION DOWNSTREAM POND

- Water sample analysis parameter are reviewed on a monthly basis by an AEM geochemist
- Expected trend ongoing and support the hypothesis of coloration change due to microbial metabolism resulting in a reduction of ferric iron
- The process will likely happen every year, but is not expected to worsen
- Water sampling will stop once the pond freeze and will resume in 2019

2.2 700P1 Area

(October 2017)

Introduction

- During the Central Dike investigation campaign performed in June 2017, an anomaly was detected during the drilling of the hole 700P1.

- An hypothesis for this anomalie was the presence of a void in the till layer.

- To investigate this hypothesis, AEM decided to perform additional drilling in the vicinity of the 700P1.

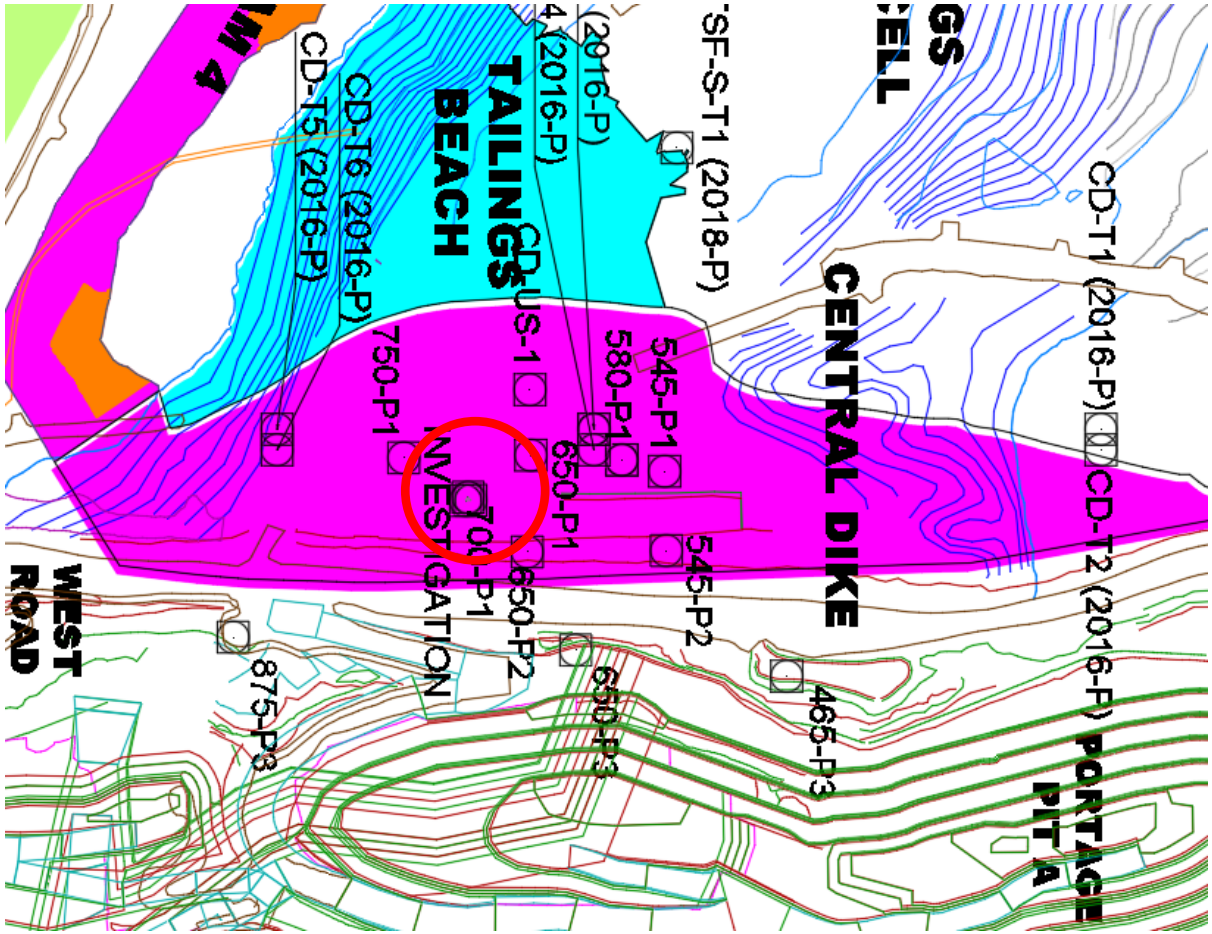
Methodology

- The campaign was performed between October 04th and October 07th, 2017.
- Three holes were drilled with TCG Rockmaster drill (percussion drilling) operated by an experimented driller.
- Steel casing was lowered as the drilling occurred.
- Geotechnical Technician was present during all the drilling of the holes and was collecting observation and measurements
- During the critical moment of the drilling, when the potential void was expected, the Geotechnical Eng was also present on the field

CENTRAL DIKE UPDATE 2018

2.2 SITE INVESTIGATION – 700P1 AREA

Location of the holes



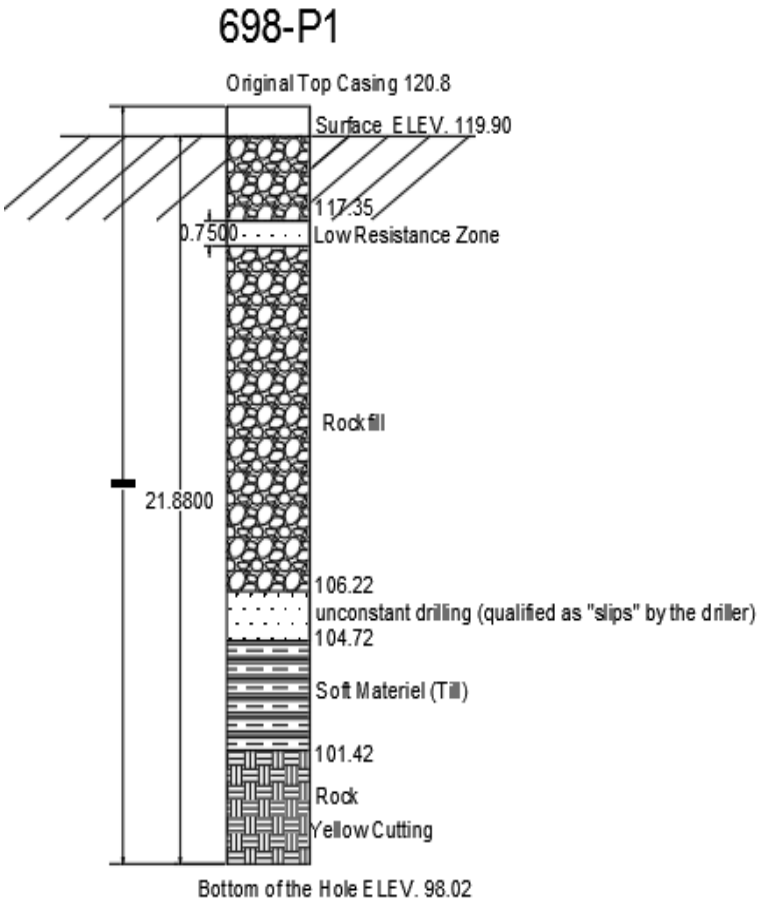
Results

Table 1 : Collar location (as-built)

Hole #	Easting UTMz14N	Northing UTMz14N	Elevation top casing (masl)	Elevation of ground surface (masl)	Elevation original Casing (masl)	Elevation of bottom of hole (masl)
698-P1	638713.378	7214592.298	120.132	119.90	120.800	98.02
702-P1	638713.614	7214588.111	120.355	119.99	120.300	101.83
700-P1W	638710.94	7214590.127	119.675	119.64	120.741	97.92

Results

First Drill Hole October 5, 2017



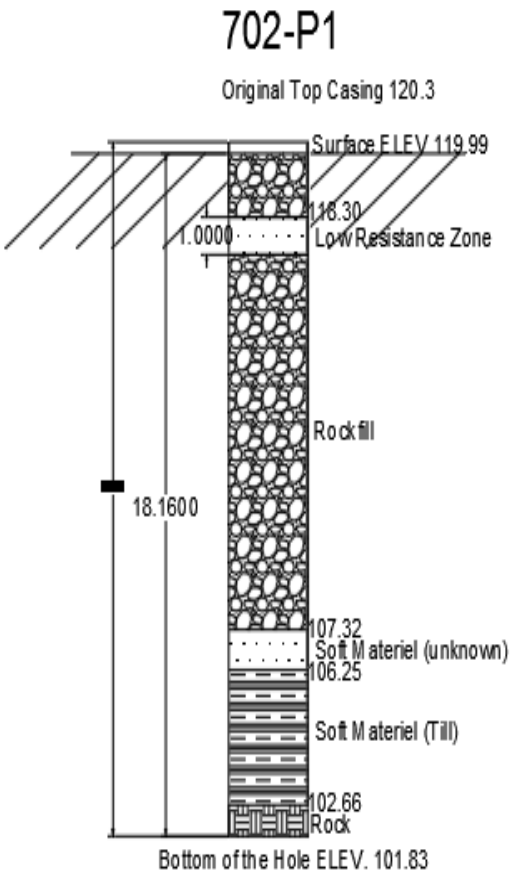
Hole 698-P1

- Started to be drilled at around 1:30 PM October 5, 2017.
- Starting at elevation 117.35, a small zone in the rockfill (0.75m) was encountered where there was not much resistance on the drill. It went back to the rockfill after that.
- The water started pouring out of the hole at elevation 115.
- At elevation 106.22, the driller mentioned that he was feeling some kind of slips in the material
- No void was encountered around the till zone.

2.2 SITE INVESTIGATION – 700P1 AREA POTENTIAL VOID

Results

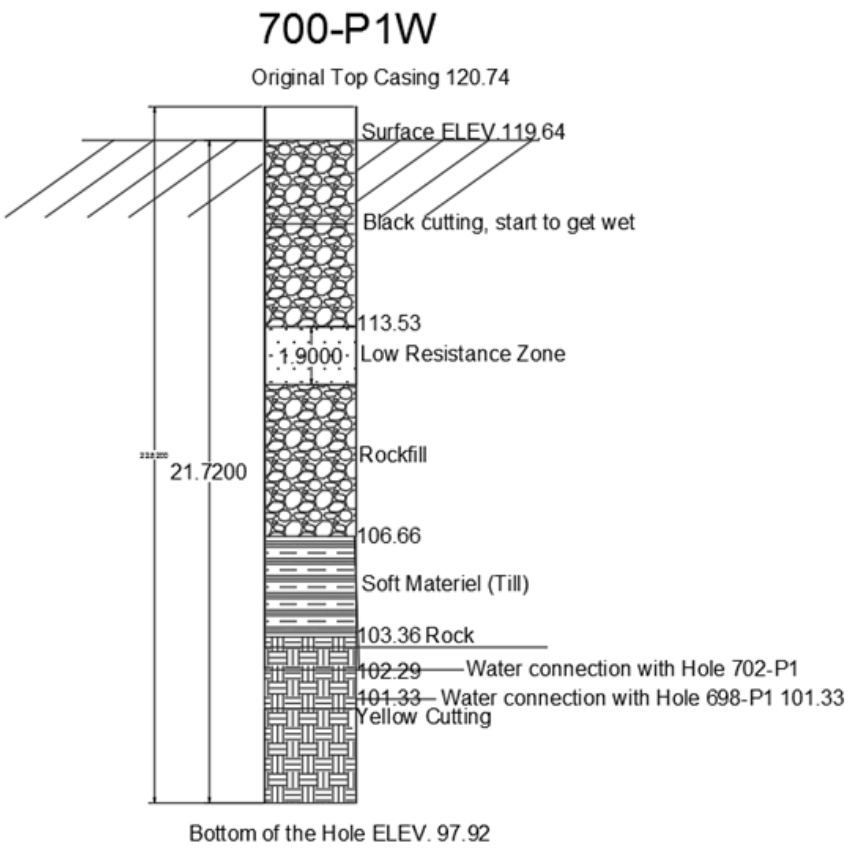
Second Drill Hole October 6, 2017



Hole 698-P1

- The hole 702-P1 started to be drilled at around 7:30 AM October 6, 2017.
- Starting at elevation 118.30, a small zone in the rockfill was encountered (1.0m) where there was not much resistance on the drill.
- The water started pouring out of the hole at elevation 115.
- At elevation 107.32, the driller mentioned that the materiel was very soft and shortly after that, the till zone was confirmed.
- No void was encountered around the till zone.

Results



Hole 698-P1

- The hole 700-PW started to be drilled at around 1:30 PM October 6, 2017.
- Starting at elevation 113.53, a zone in the rockfill (1.9m) was encountered where there was not much resistance on the drill. It went back to the rockfill after that.
- The water started pouring out of the hole at elevation 115. At elevation 106.66 the drill encountered the till. Around the same time and elevation, the water started to poured out of the second hole that was drilled (702-P1). No void was encountered around the till zone. At elevation 101.33 the water started pouring out of the first hole that was drilled (698-P1). Water resurgence was observed in nearby holes while drilling in the bedrock.

Conclusion

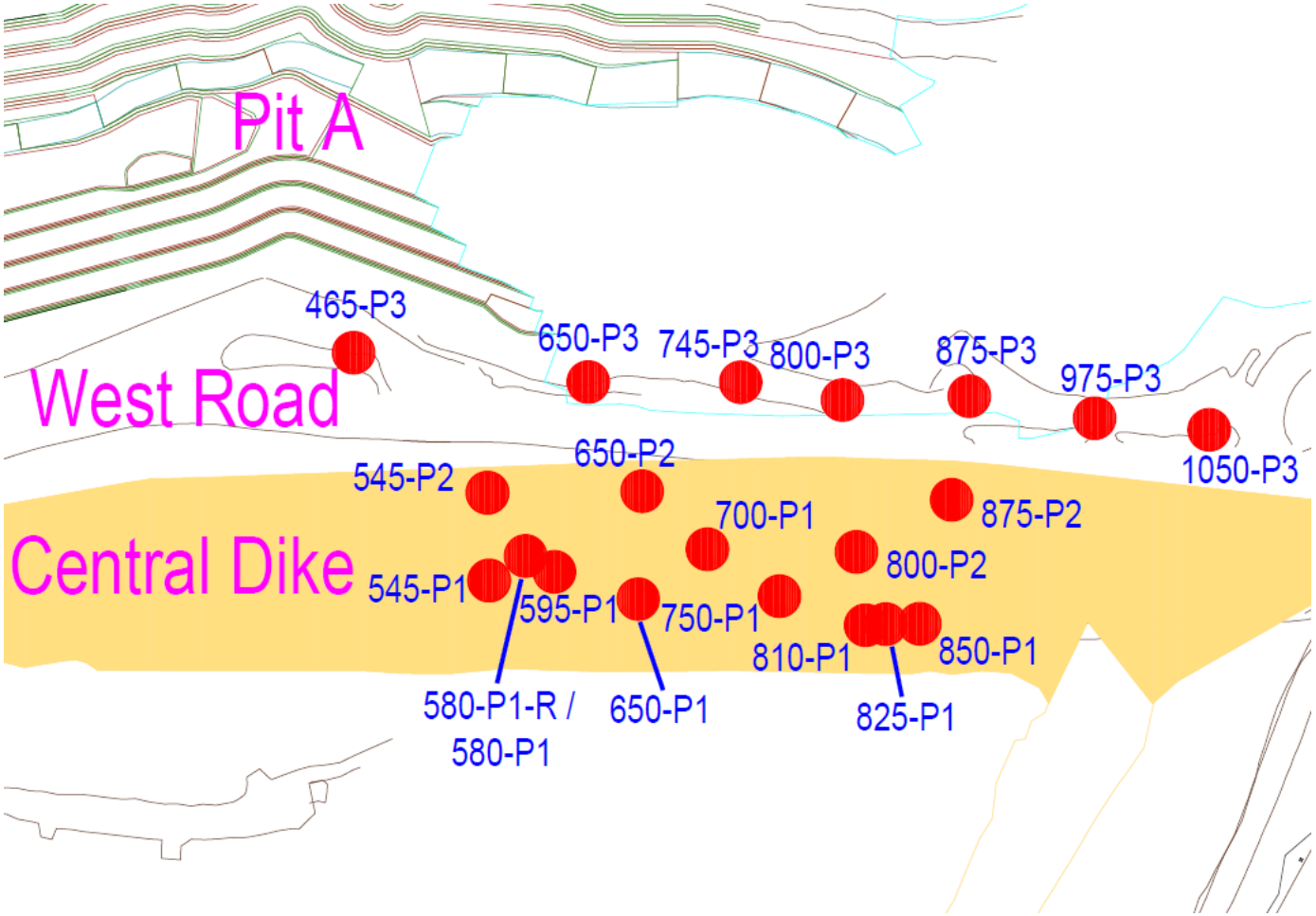
- No supporting evidence for the void in till theory

- It is highly likely that the perceived void in June 2017 is either a result of drilling issue, washing of till during during operation or a localised void with limited lateral extension

SECTION 4: INSTRUMENTATION REVIEW

Map of Central Dike instrumentation

69 Piezometers and 20 Thermistors Strings Installed in 20 Boreholes



AGNICO EAGLE

Central Dike instrumentation status

Hole #	Instrument ID	Type	Status
465-P3	465-P3-A	Piezo	Frozen
	465-P3-B	Piezo	Frozen
	465-TH-P3	Thermistor	✓
545-P1	545-P1-A	Piezo	✓
	545-P1-B	Piezo	✓
	545-P1-C	Piezo	✓
	545-P1-D	Piezo	✓
	545-TH-P1	Thermistor	✓
545-P2	545-P2-A	Piezo	Frozen
	545-P2-B	Piezo	Frozen
	545-P2-C	Piezo	Frozen
	545-P2-D	Piezo	Frozen
	545-TH-P2	Thermistor	✓
580-P1	580-P1-A	Piezo	× (since July 2016)
	580-P1-B	Piezo	× (since July 2016)
	580-P1-C	Piezo	× (since July 2016)
	580-P1-D	Piezo	× (since July 2016)
	580-P1-E	Piezo	× (since July 2016)
	580-TH-P1	Thermistor	× (since July 2016)
595-P1	595-P1-A	Piezo	✓
	595-P1-B	Piezo	✓
	595-P1-C	Piezo	✓
	595-P1-D	Piezo	× (June 2017)
	595-P1-E	Piezo	× (June 2017)
	595-TH	Thermistor	✓
650-P1	650-P1-A	Piezo	× (since February 2016)
	650-P1-B	Piezo	× (since September 2016)
	650-P1-C	Piezo	× (since September 2016)
	650-P1-D	Piezo	× (since September 2016)
	650-TH-P1	Thermistor	× (since August 2016)
650-P2	650-P2-A	Piezo	✓
	650-P2-B	Piezo	✓
	650-P2-C	Piezo	✓
	650-P2-D	Piezo	✓
	650-TH-P2	Thermistor	✓
650-P3	650-P3-A	Piezo	Frozen
	650-P3-B	Piezo	Frozen
	650-TH-P3	Thermistor	✓
750-P1	750-P1-A	Piezo	✓
	750-P1-B	Piezo	✓
	750-P1-C	Piezo	✓
	750-P1-D	Piezo	✓
	750-P1-E	Piezo	✓
	750-TH-P1	Thermistor	✓
810-P1	810-P1-A	Piezo	× (since Dec. 2017)
	810-P1-B	Piezo	× (since January 2017)
	810-P1-C	Piezo	✓
	810-P1-D	Piezo	× Elev. Working only
	810-TH	Thermistor	× (since February 2018)
825-P1	825-P1-A	Piezo	✓
	825-P1-B	Piezo	✓
	825-P1-E	Piezo	✓
	825-TH	Thermistor	✓
850-P1	850-P1-A	Piezo	✓
	850-P1-B	Piezo	✓
	850-P1-E	Piezo	✓
	850-TH	Thermistor	✓
875-P3	875-P3-A	Piezo	✓
	875-P3-B	Piezo	✓
	875-TH-P3	Thermistor	✓
875-P2	875-P2-A	Piezo	✓
	875-P2-B	Piezo	✓
	875-P2-C	Piezo	Frozen
	875-P2-D	Piezo	Frozen
	TH-875-P2	Thermistor	✓
800-P2	800-P2-A	Piezo	✓
	800-P2-B	Piezo	✓
	800-P2-C	Piezo	✓
	800-P2-D	Piezo	✓
	TH-800-P2	Thermistor	✓
700-P1	700-P1-A	Piezo	✓
	700-P1-B	Piezo	✓
	700-P1-C	Piezo	✓
	700-P1-D	Piezo	✓
	TH-700-P1	Thermistor	✓
580-P1 (R)	580-P1-R-A (R)	Piezo	✓
	580-P1-R-B (R)	Piezo	✓
	580-P1-R-C (R)	Piezo	✓
	TH-580-P1 (R)	Thermistor	✓
1050-P3	1050-P3-A	Piezo	Frozen
	1050-P3-B	Piezo	Frozen
	TH-1050-P3	Thermistor	✓
975-P3	975-P3-A	Piezo	✓
	975-P3-B	Piezo	✓
	TH-975-P3	Thermistor	✓
800-P3	800-P3-A	Piezo	✓
	800-P3-B	Piezo	✓
	800-P3-C	Piezo	✓
	TH-800-P3	Thermistor	✓
745-P3 (WR-P3)	TH-745-P3	Thermistor	✓
CD_US-0+650	CD-US-1	Thermistor	✓
	CD-US-2	Thermistor	✓
SD5	TH-02	Thermistor	✓
	TH-03	Thermistor	✓
	TH-04	Thermistor	✓

Thermistor with capacitance effect in the last year

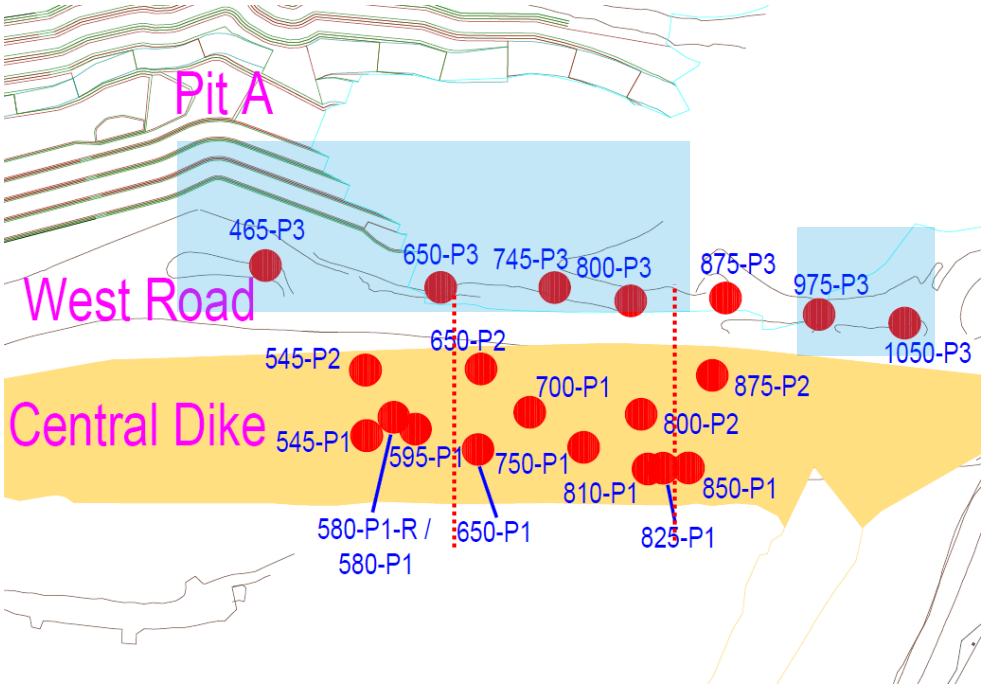
General Trend Observed

Thermistors

- Line P1 and P2 are unfrozen. Frozen instruments near Portage wall
- Zone near Portage between 875 and 975 with temperature profile above 0º
- Typical temperature in unfrozen holes varie from 0.5 º C to 2º C
- 2017 instruments are stabilized

Piezometers

- Most instruments are correlated with D/S pond elevation.
- Some instruments follow South Cell trend (generally the one deeper in bedrock).
- General piezometric trend is stable.



Presentation Summary

Thermistors

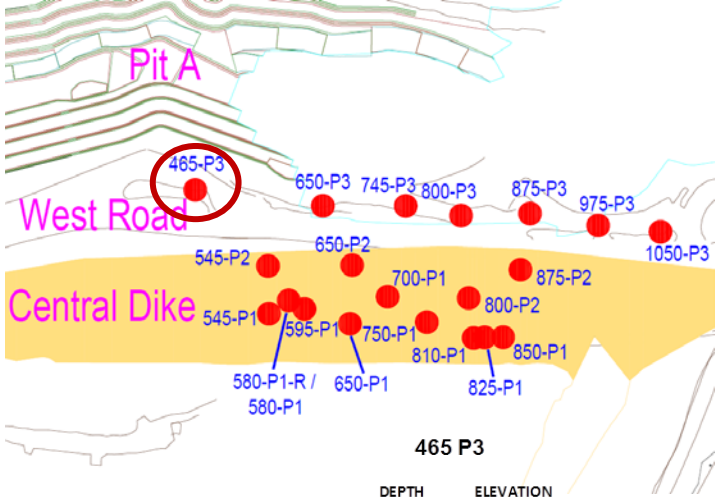
- Thermistor graphs show 12 plots with a 29 days interval
- Graph are produced with VDV – AEM updated the software in the last year and work on the presentation of the data in order to ease daily follow up of the structure.

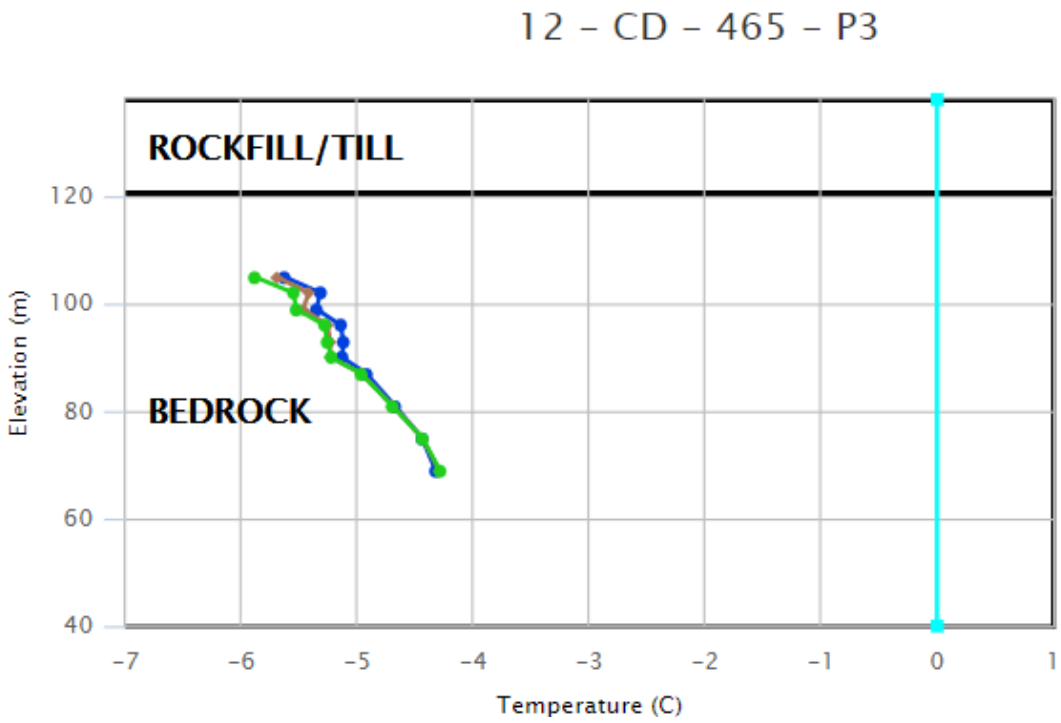
Piezometers

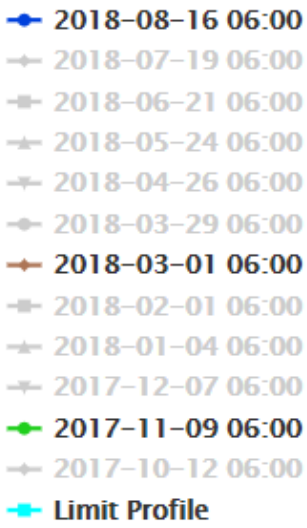
- Piezometer graph show pressure readings over time.
- Graph are produced with Excel. Migration of the data toward VDV is on going. Work is still needed to rework visual presentation.

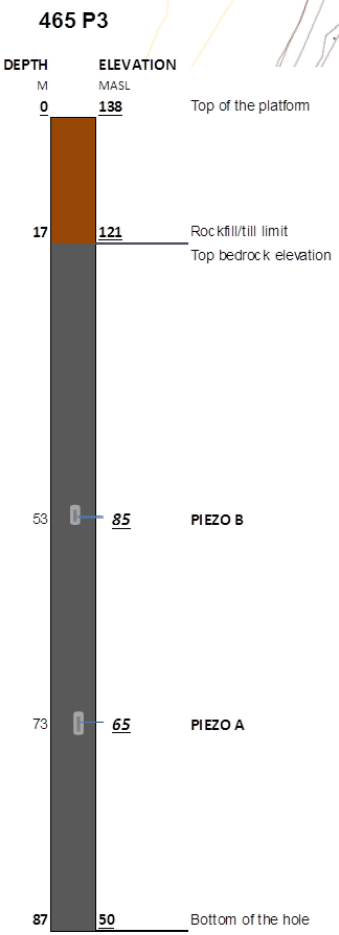
THERMISTOR 465 P3

- Bedrock Below 0º C at 465-P3 [-5.6 º C to -4.3º C]



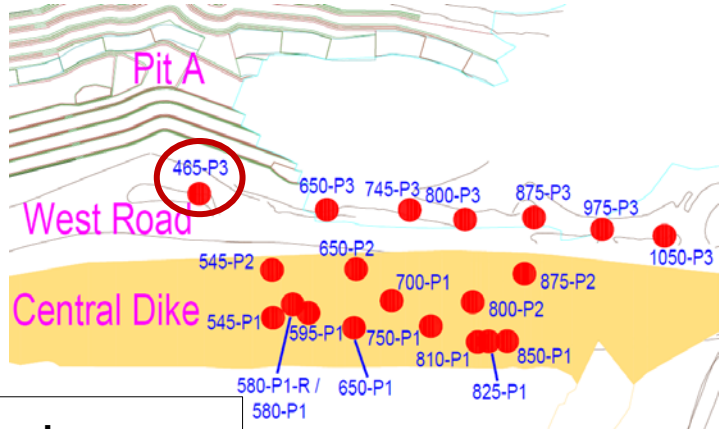


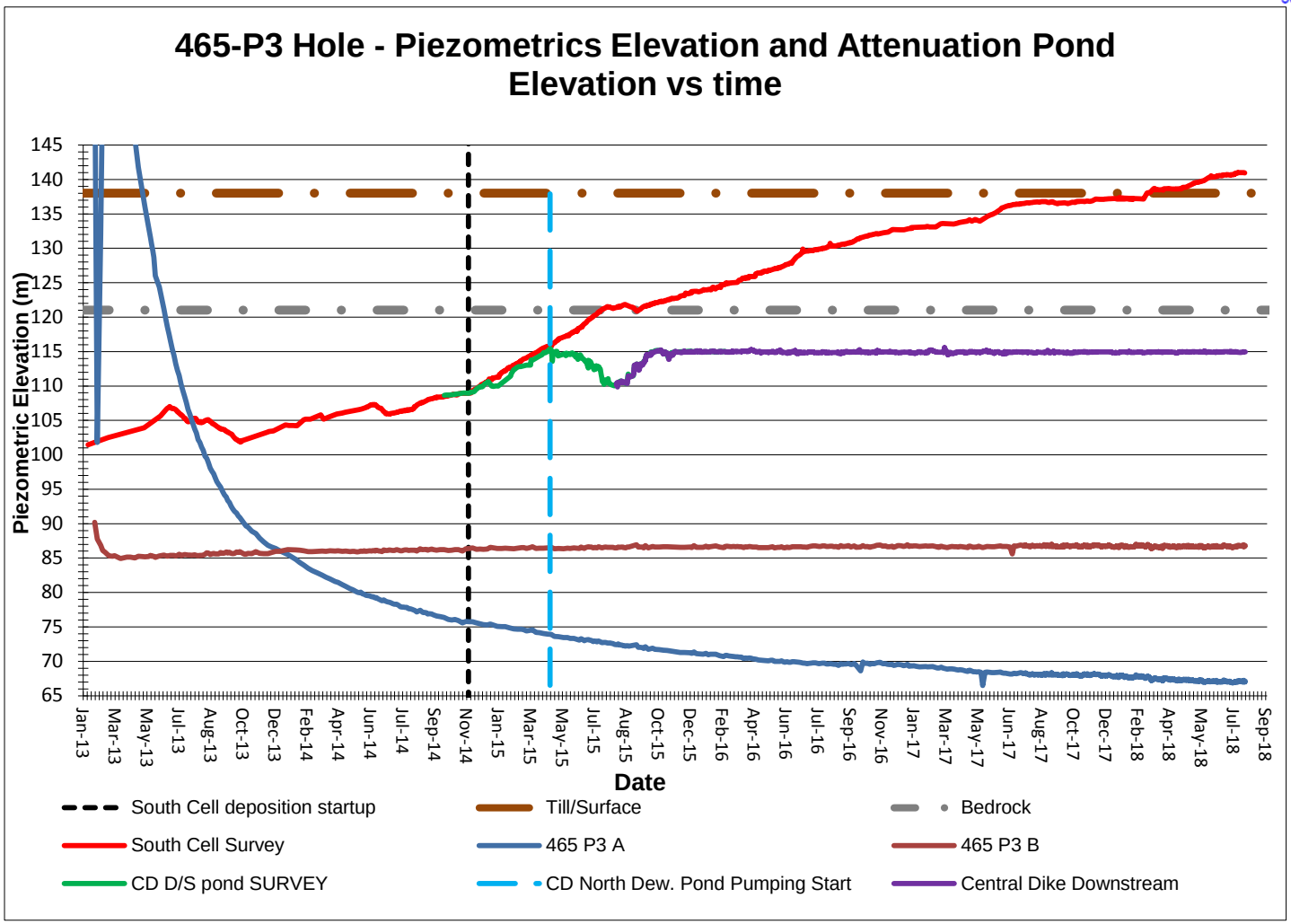


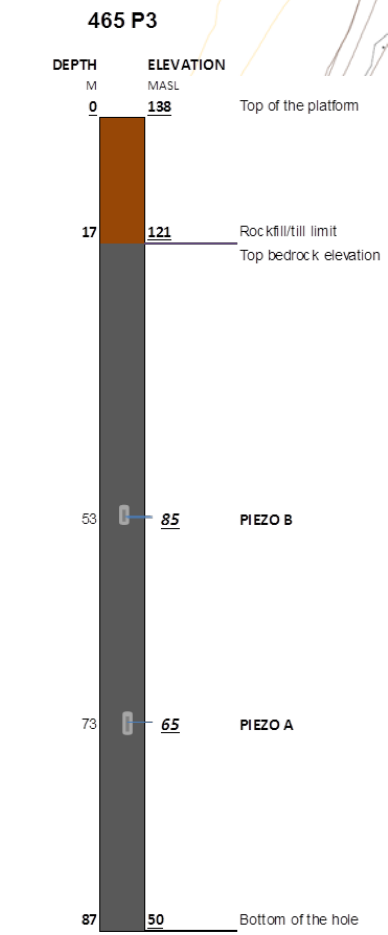


PIEZOMETERS 465-P3

- Both Piezo are showing temperature values under the freezing point

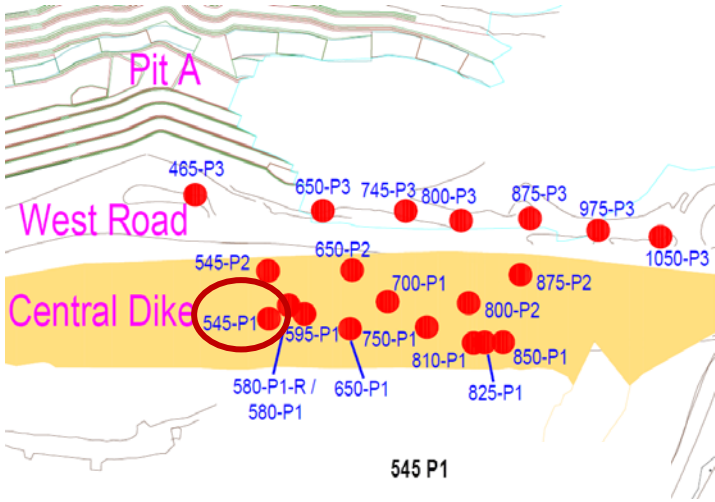


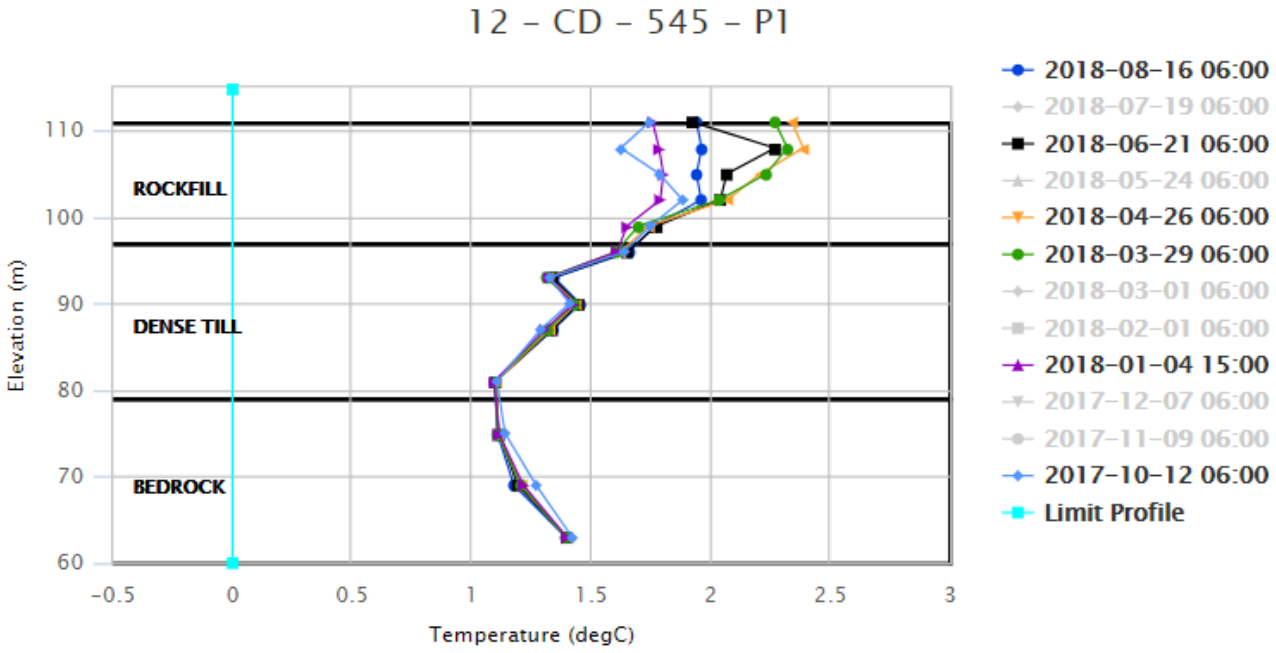


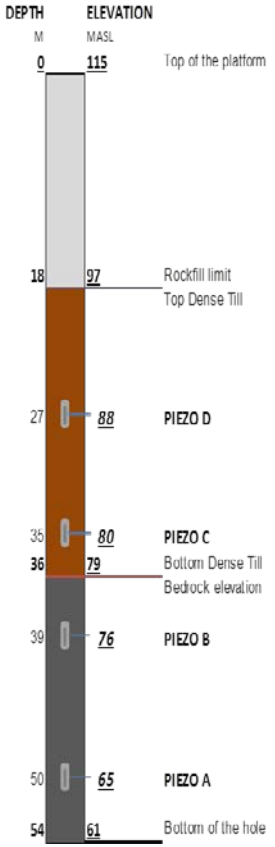


THERMISTOR 545-P1

- 545-P1 thermistor is showing the same temperature profile than last year. Warmer peak observed at elevation 81.
- Temperature in the bedrock/till unit is in between 1.1º C and 1.4º C.

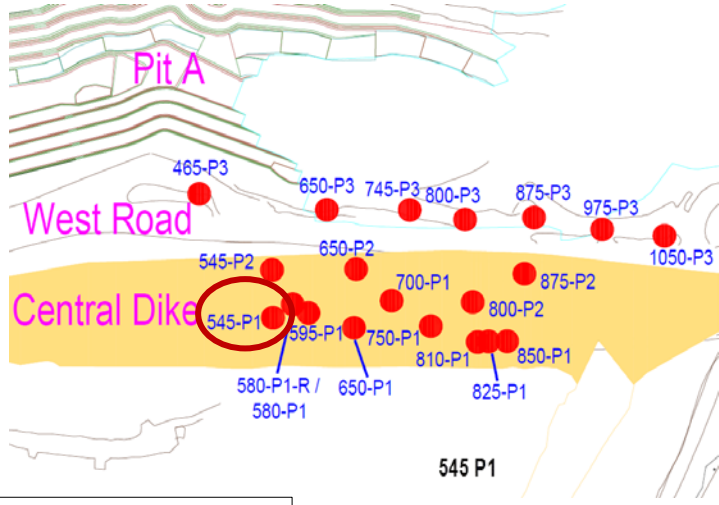


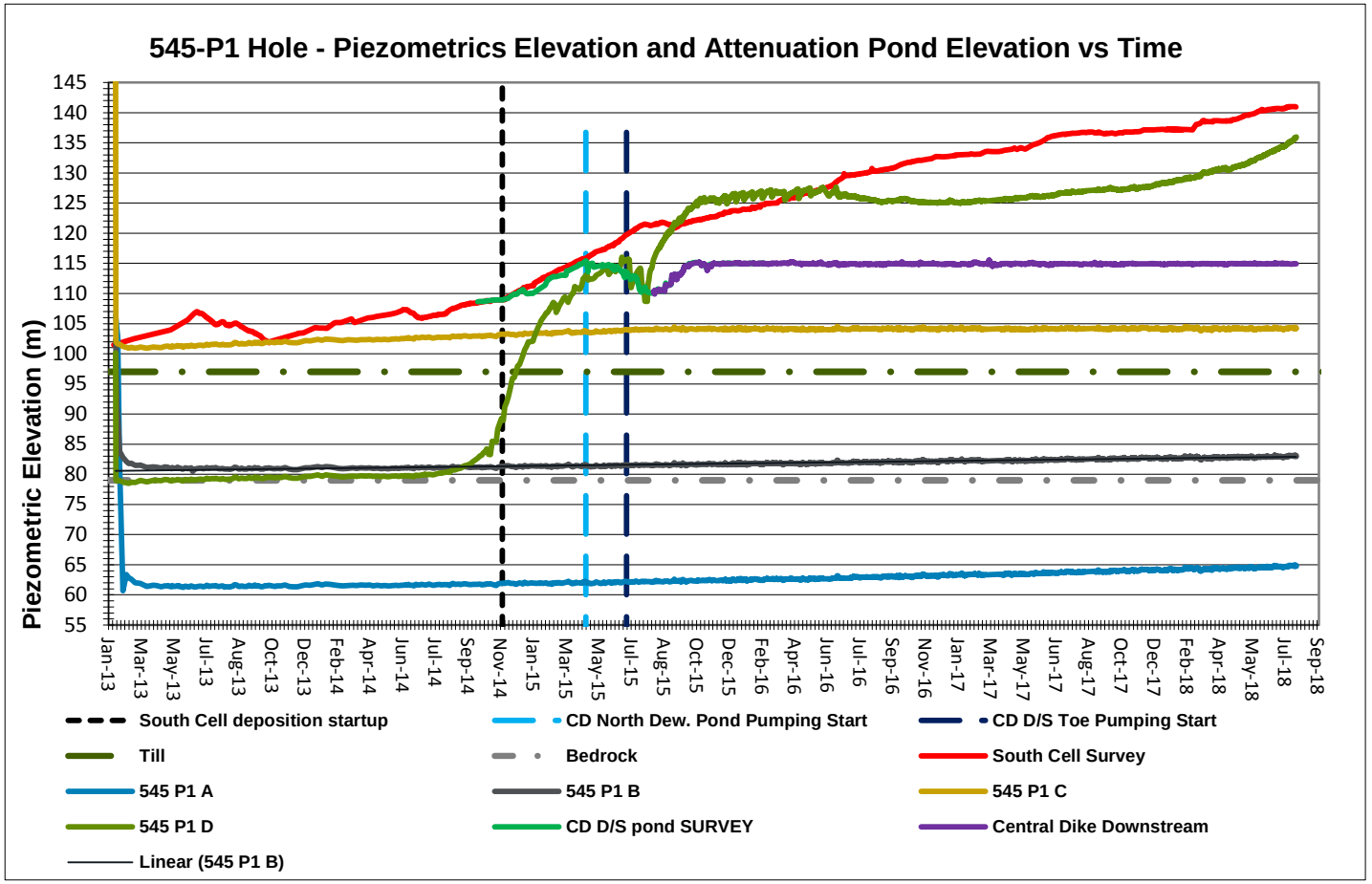


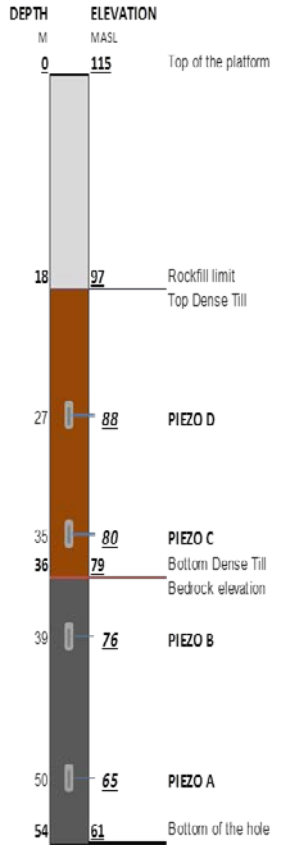


PIEZOMETER 545-P1

- Piezometer D is on a rising trend (approximatively the same rate than SC)
- Piezometer A, B & C are increasing at a very slow rate
- Piezometer A is recording suction since its installation

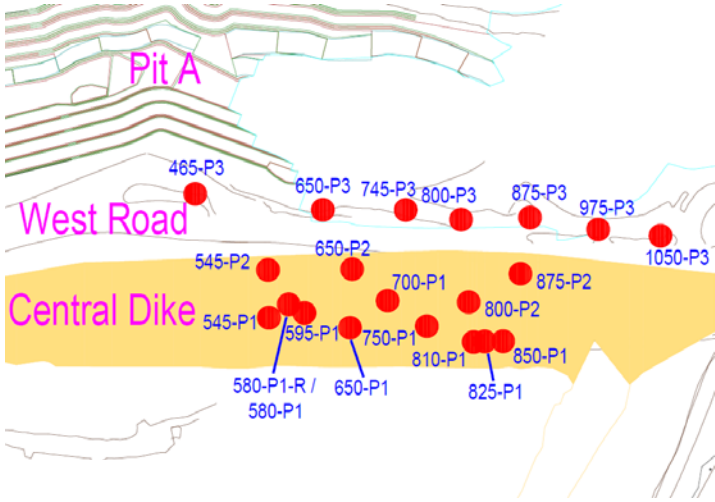


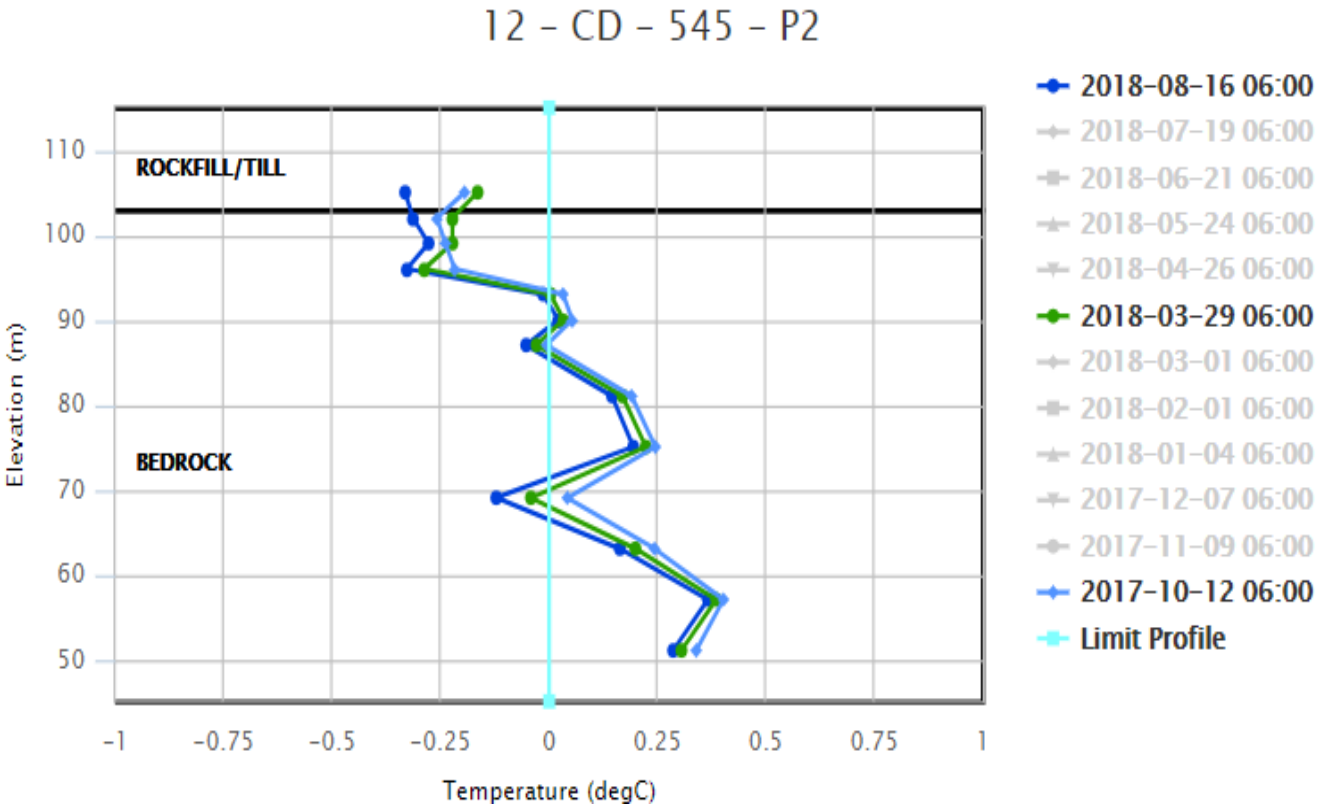


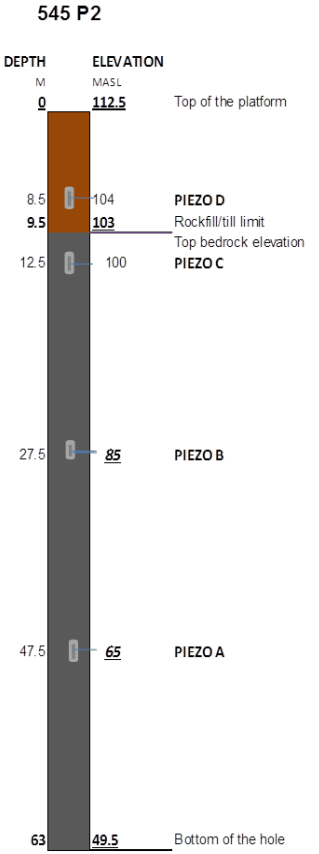


THERMISTOR 545-P2

- All data set are following the same trend
- Temperature at El.69 is slowly deacresing since the end of 2017

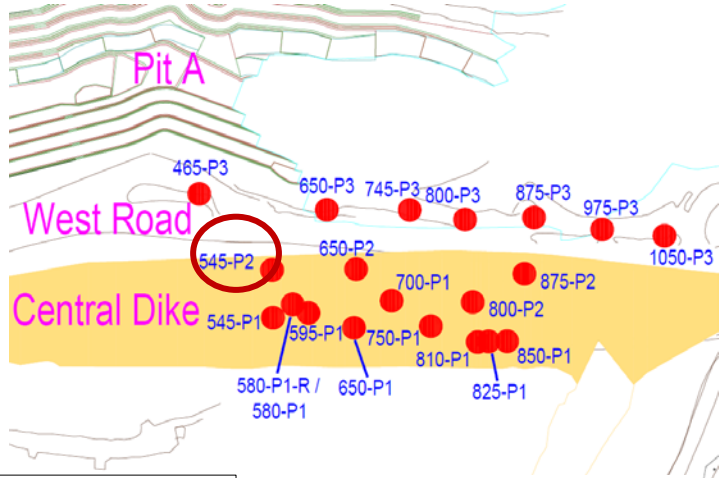


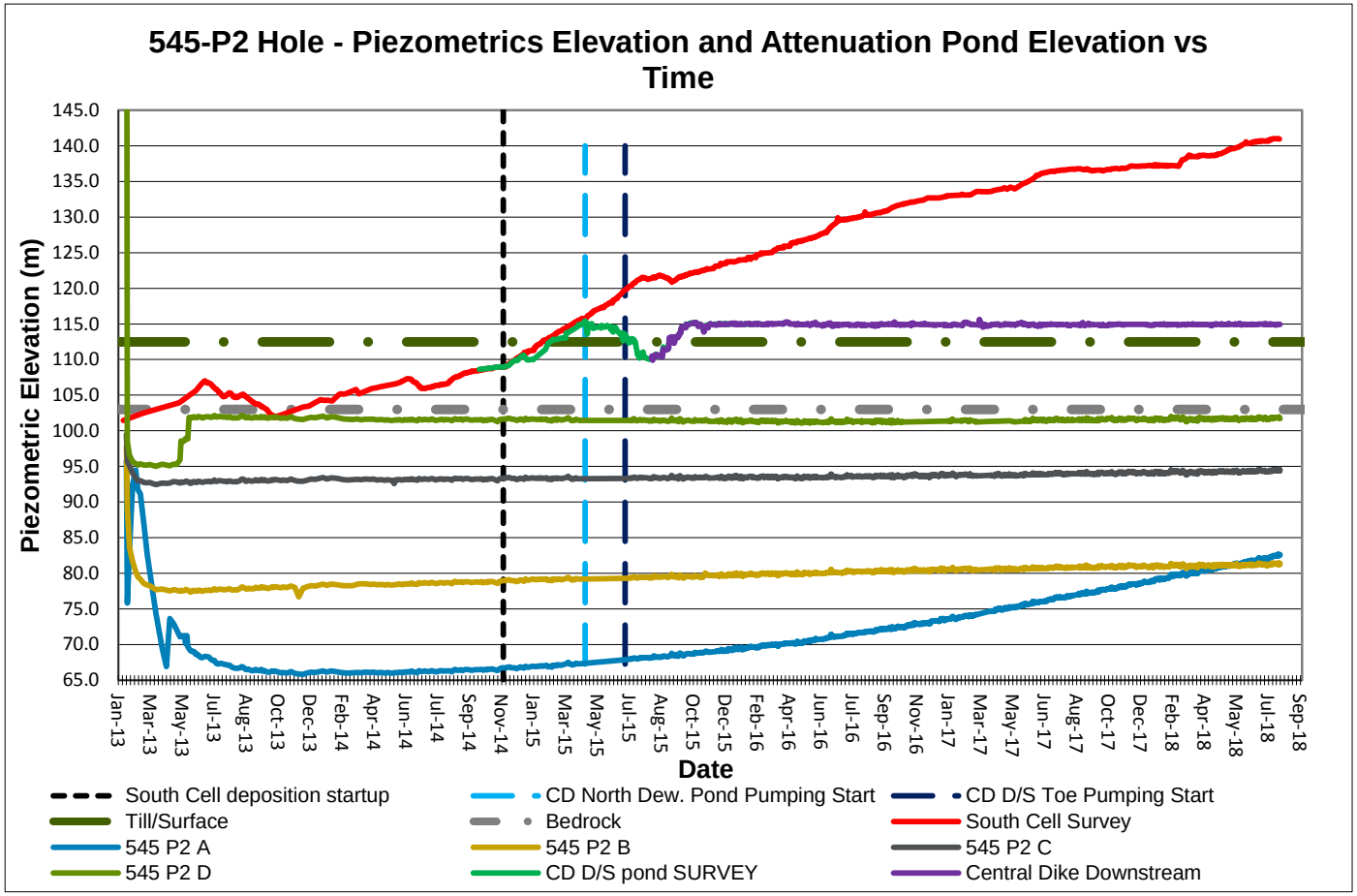


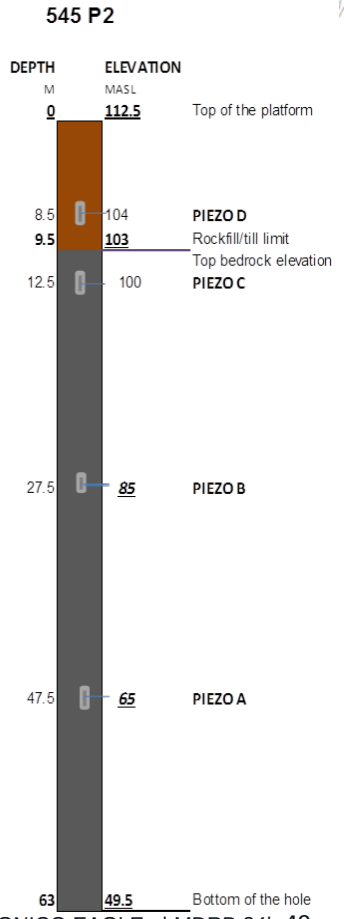


PIEZOMETER 545-P2

- Piezometer A reading is increasing with South Cell level
- Other piezometers are recording suction

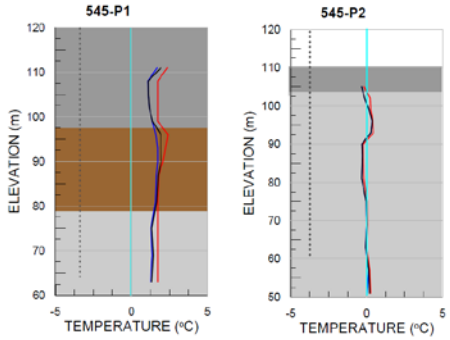


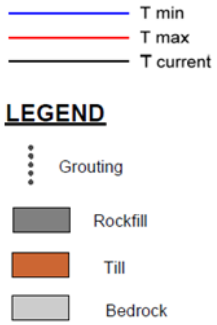


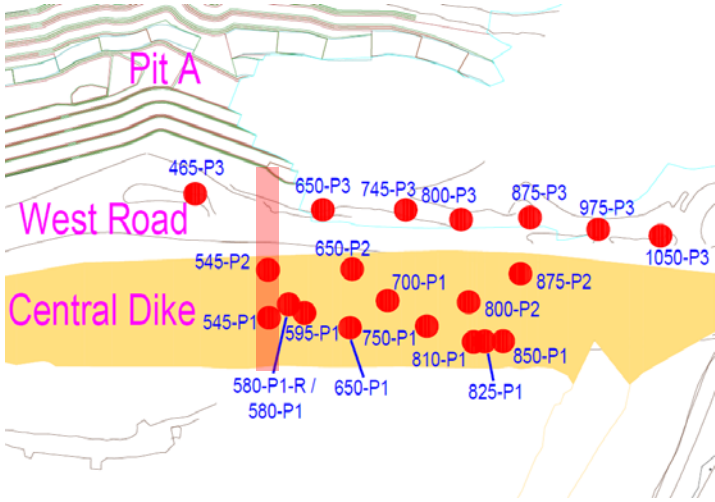


SECTION 545

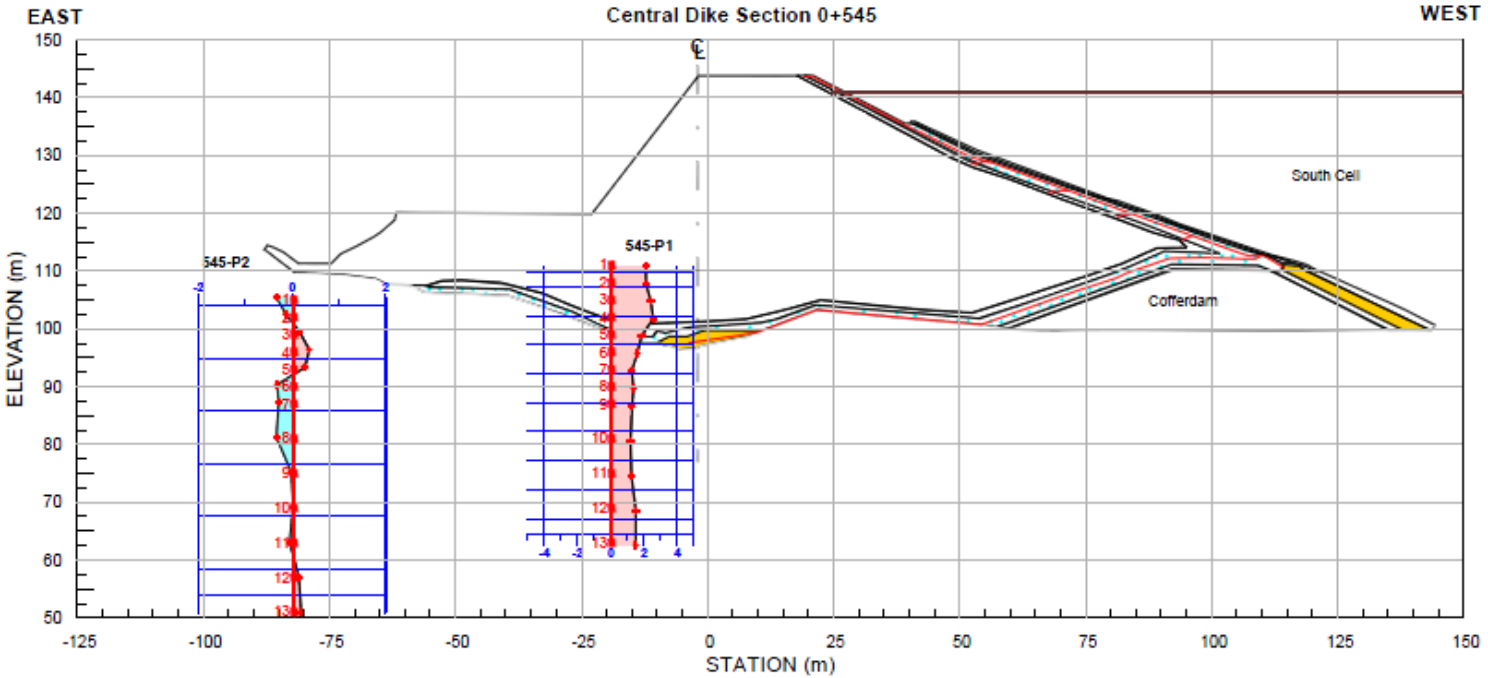
THERMISTOR READINGS FROM AUGUST 2017- 2018



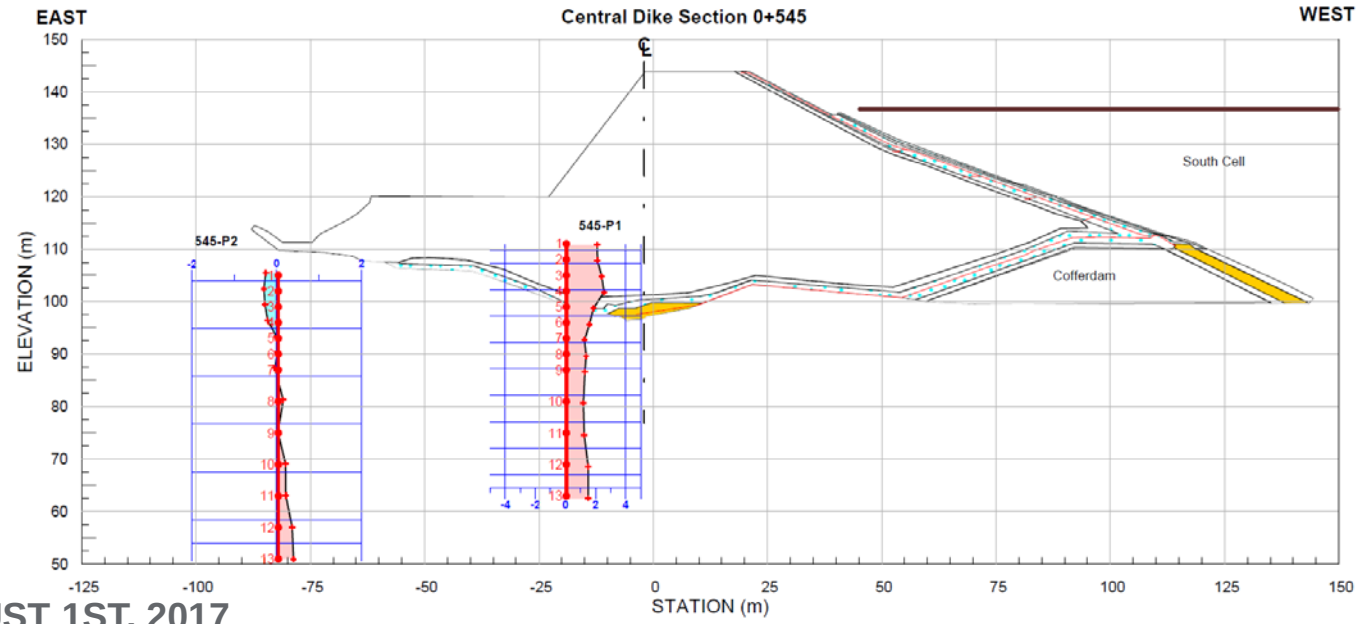




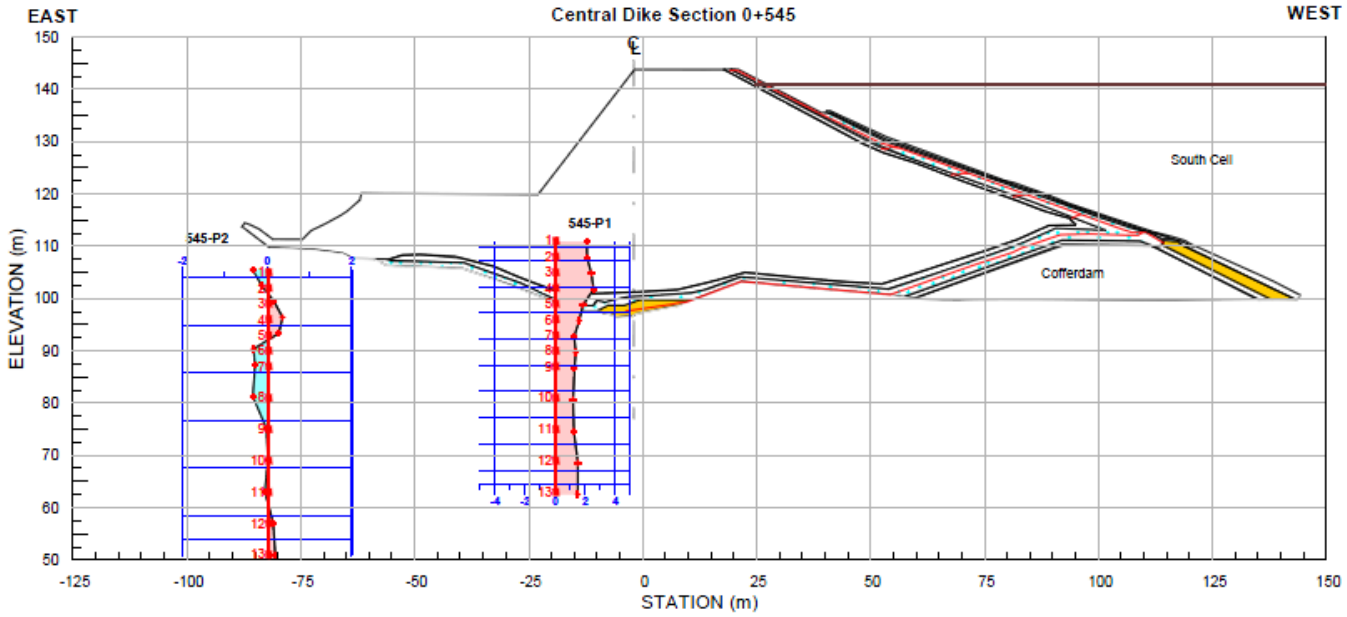
THERMISTOR READINGS AUGUST 15TH, 2018



SECTION 545



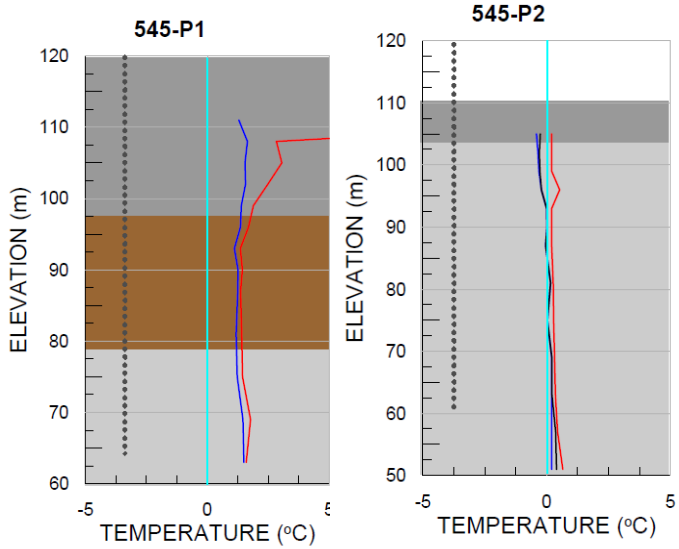
AUGUST 1ST, 2017

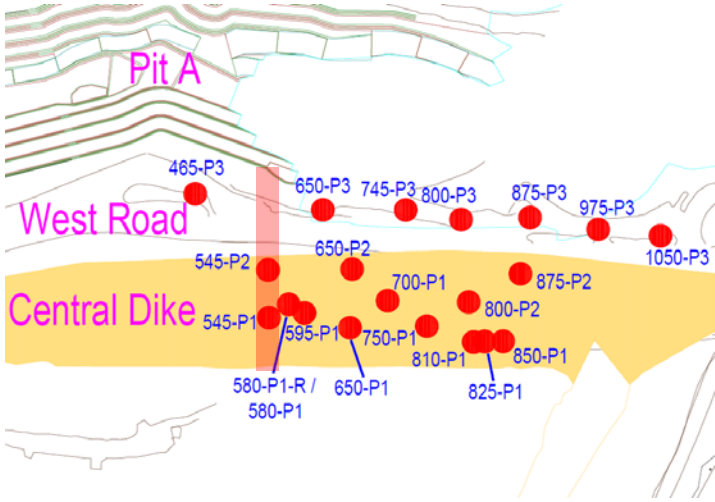


AUGUST 15TH, 2018

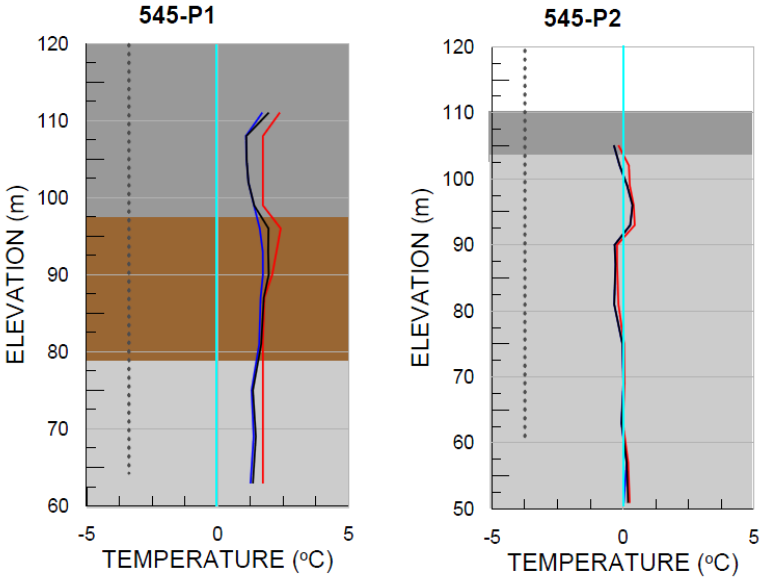
SECTION 545

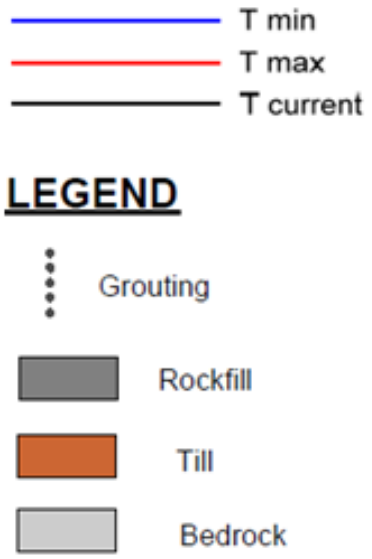
THERMISTOR READINGS FROM AUGUST 2017 - 2018





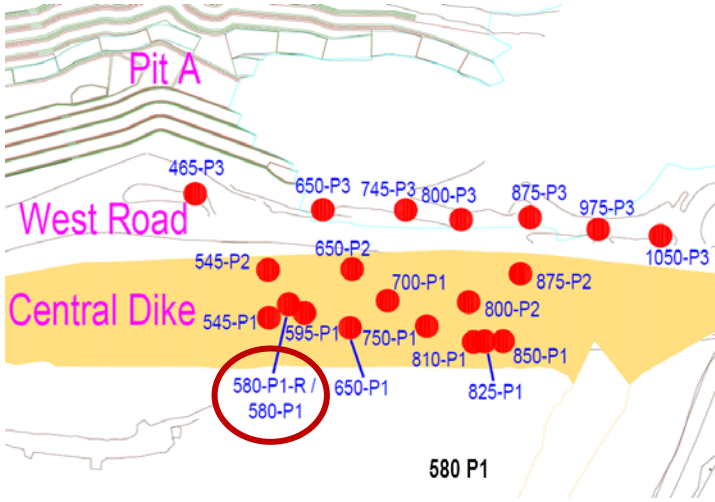
THERMISTOR READINGS FROM AUGUST 2017 - 2018

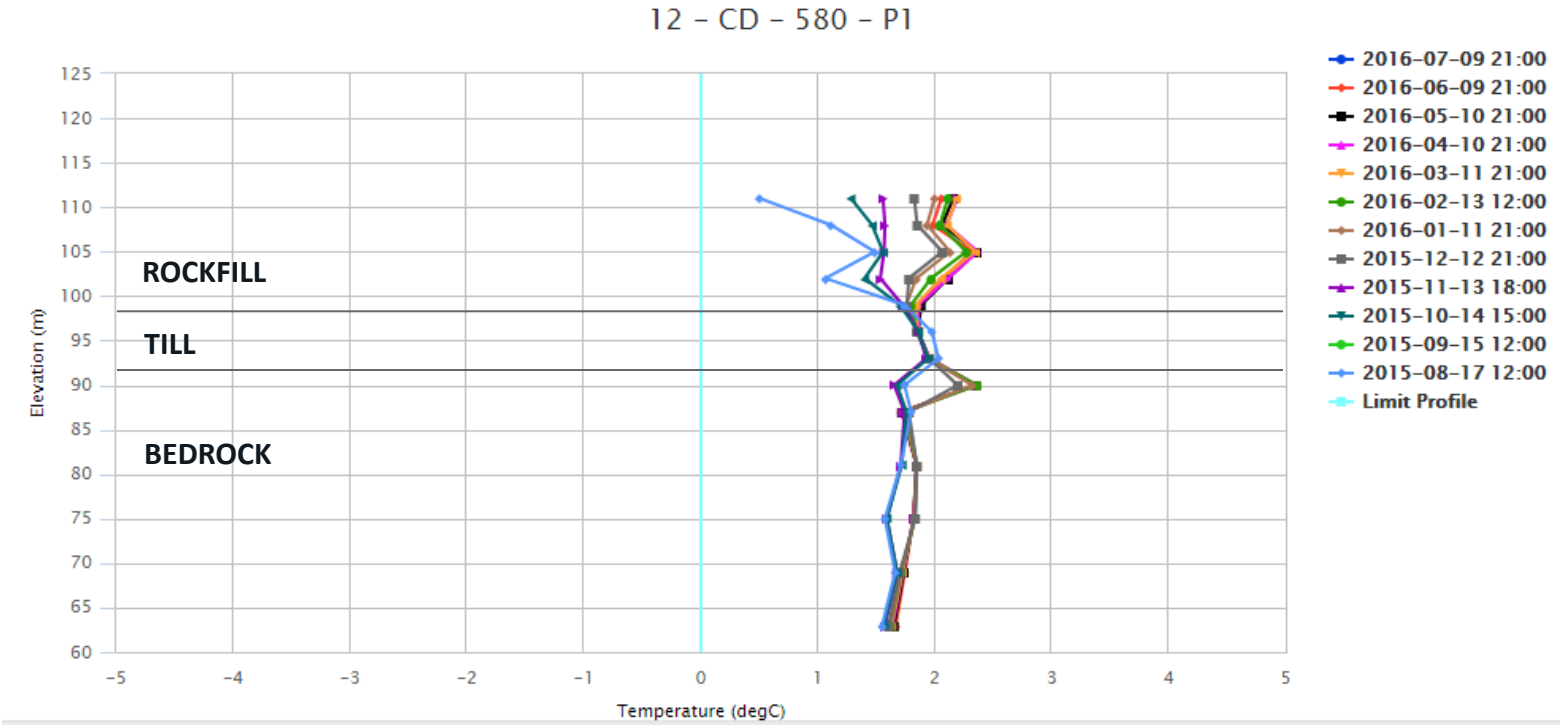


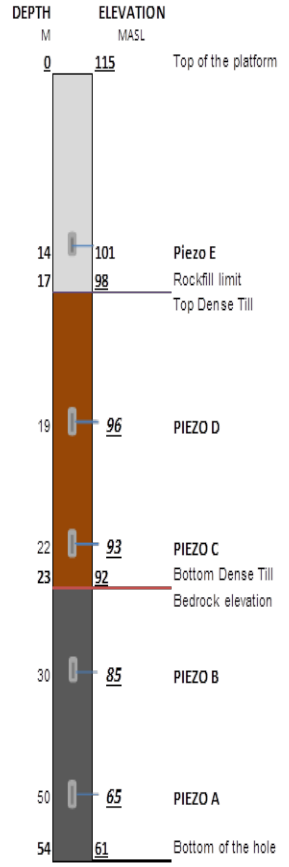


580-P1

- Piezometer and thermistance readings are not functional since July 2016
- Replacement hole 580-P1R drilled during 2017 campaign

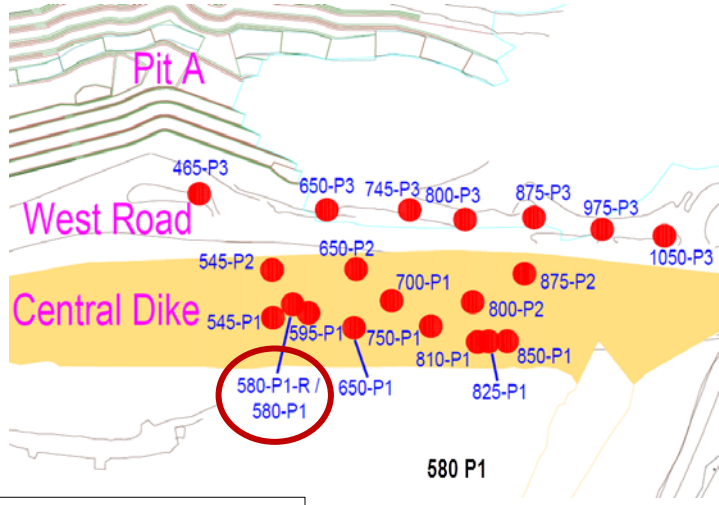


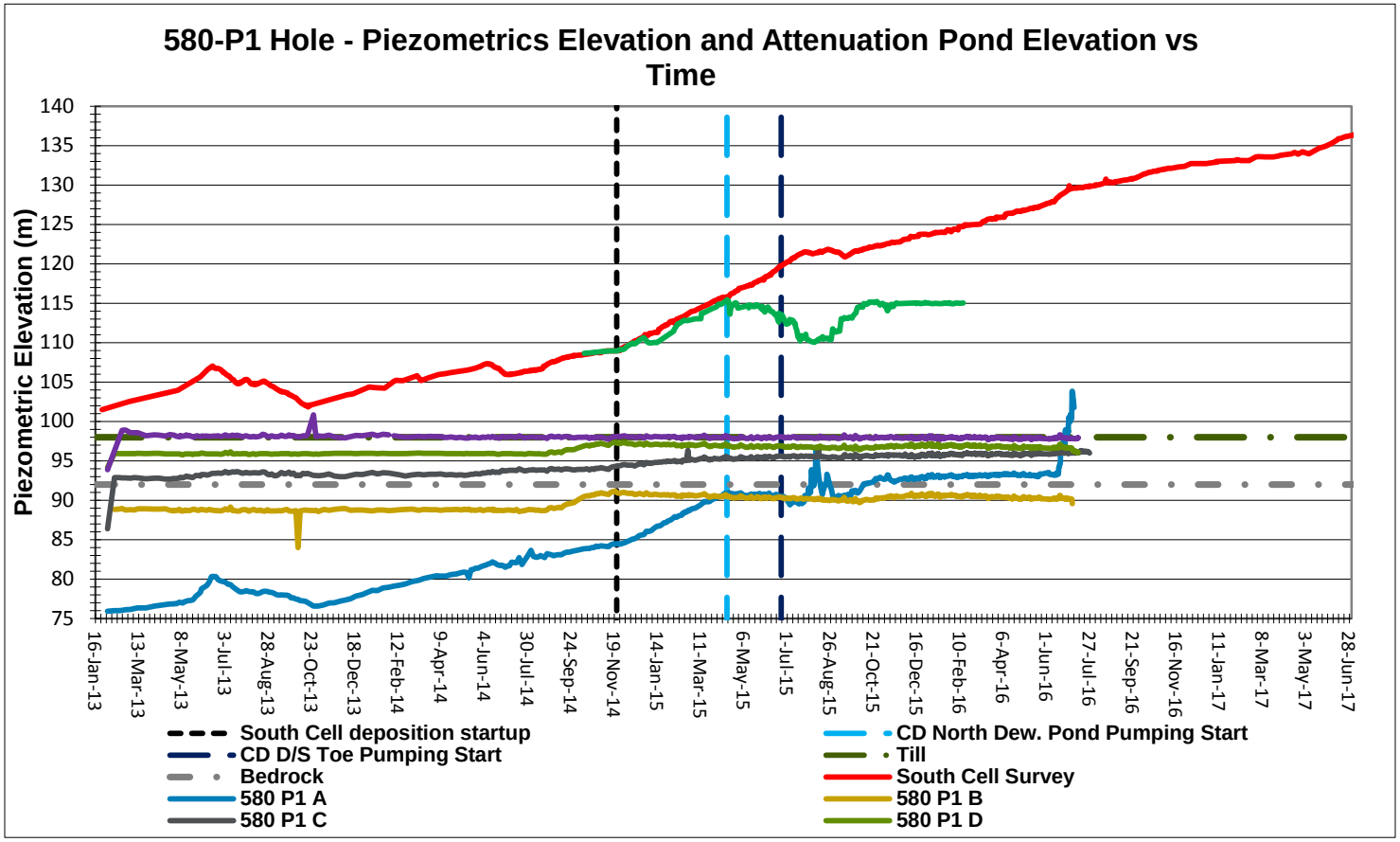


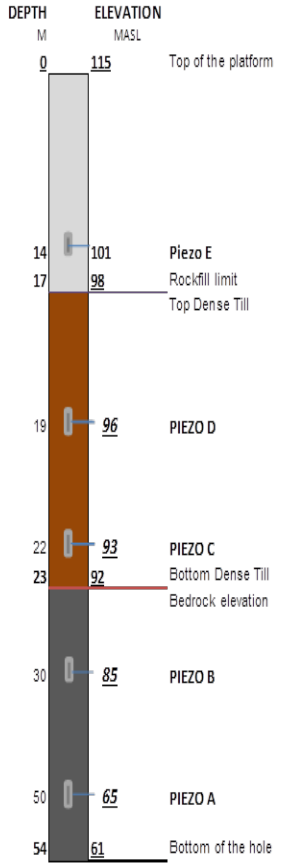


580-P1

- Piezometer and thermistor readings are not functional since July 2016
- Replacement hole 580-P1R drilled during 2017 campaign

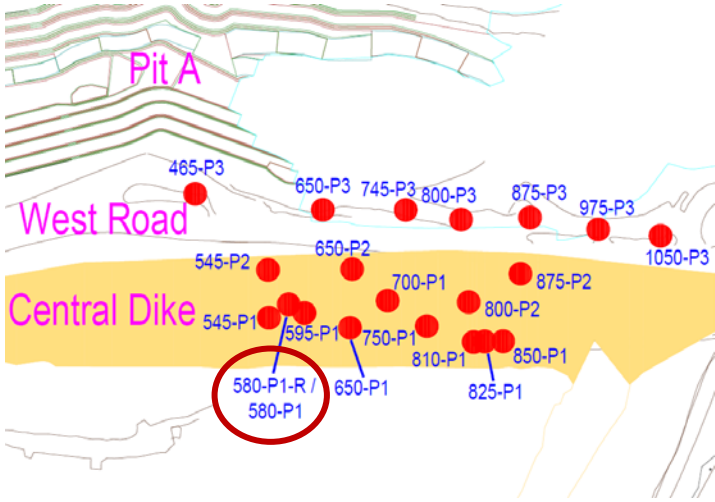


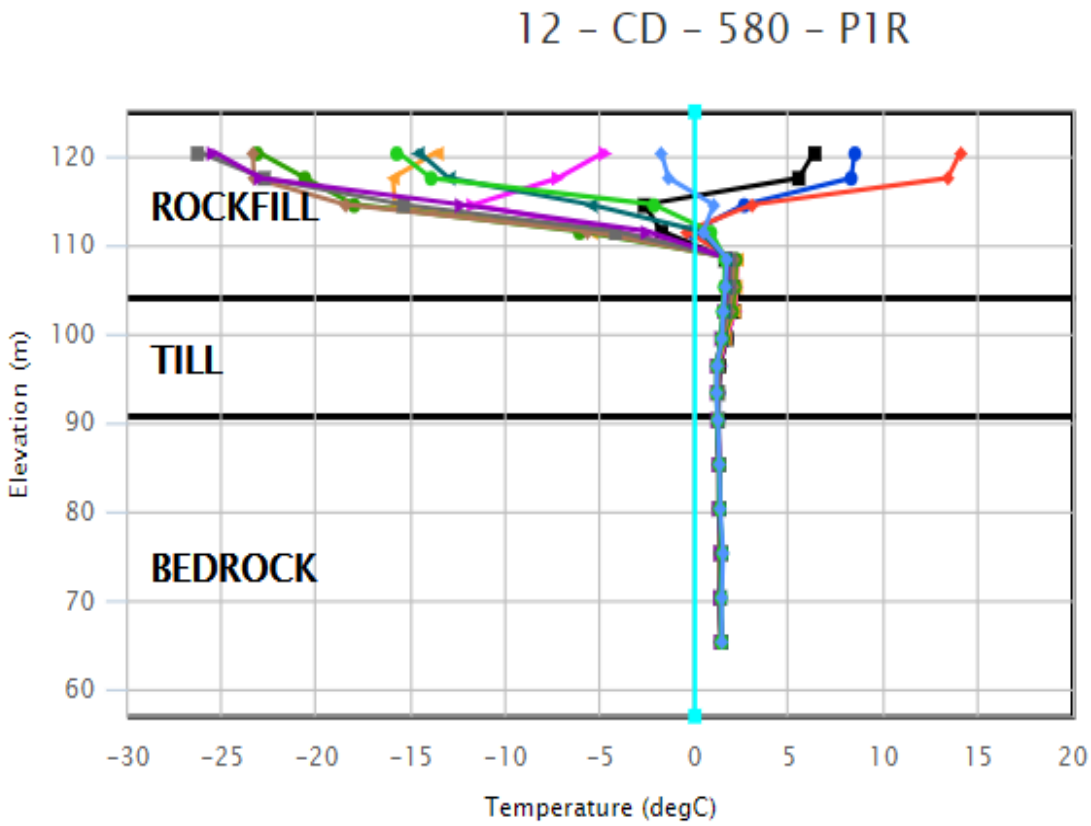


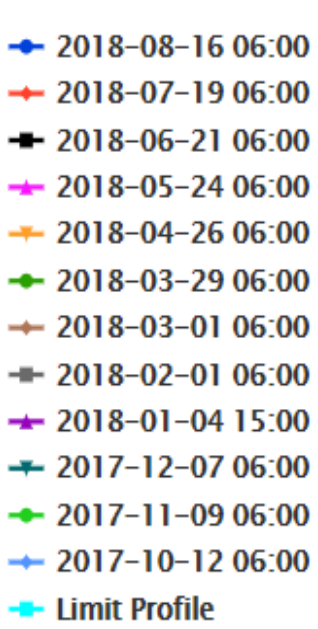


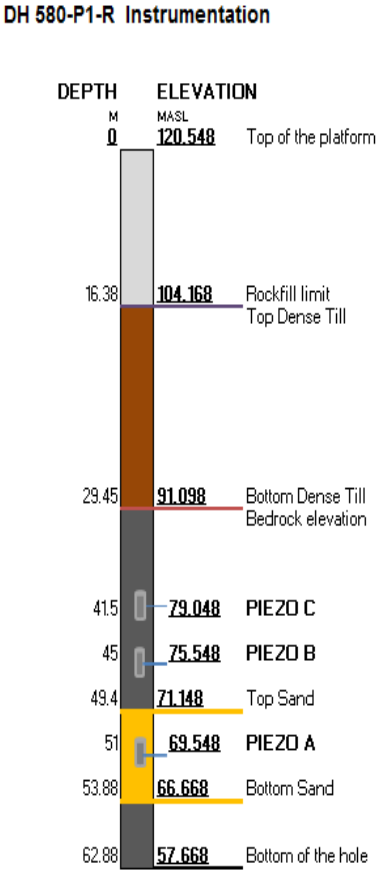
THERMISTOR 580-P1R

- Unfrozen thermal situation from elevation 110 MASL to the bottom of the hole at elevation 65 MASL



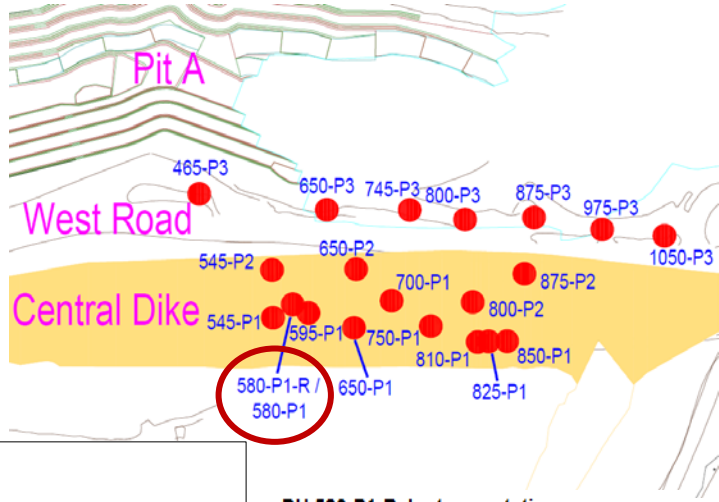


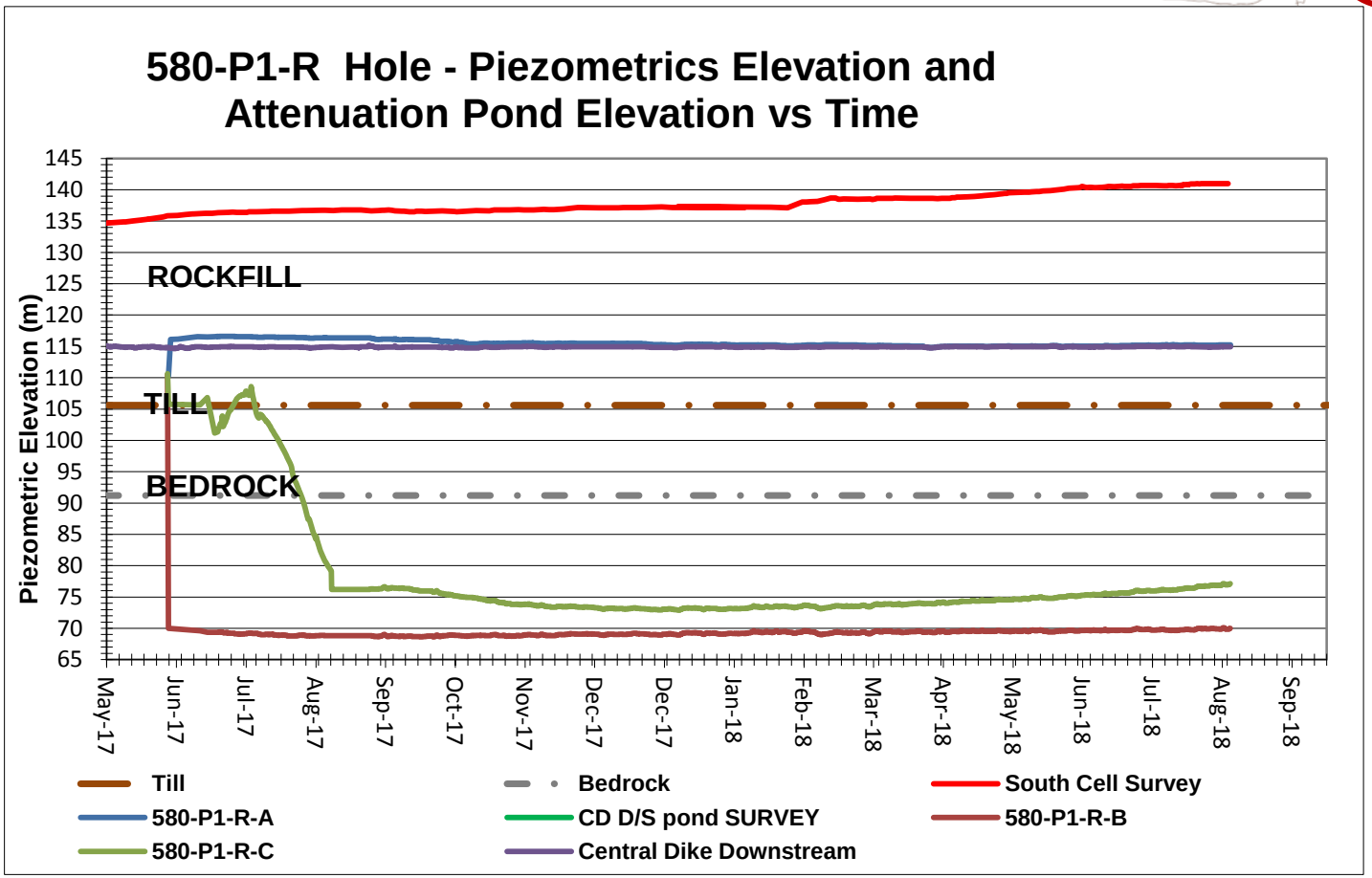


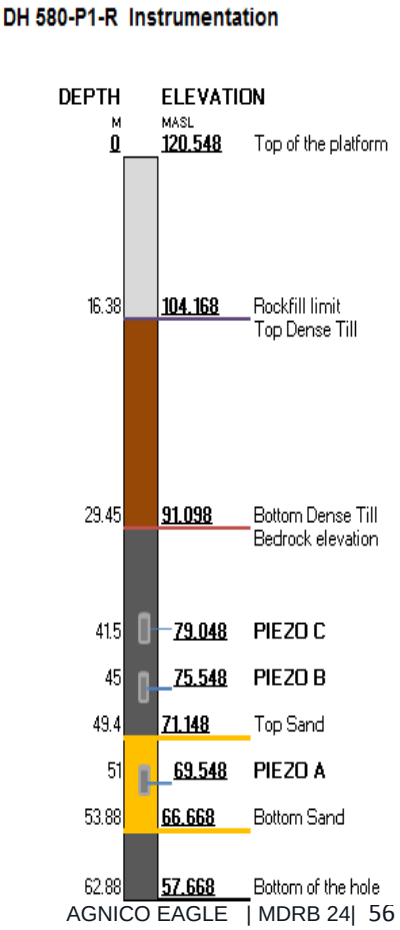


PIEZOMETER 580-P1R

- Piezo A is located in a sand layer and pressure readings are following the D/S pond regime
- Piezo A & C are increasing following a similar trend to the SC Survey

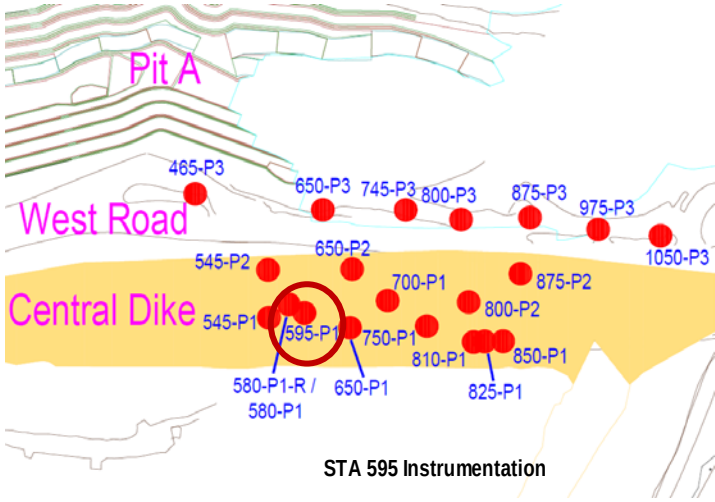




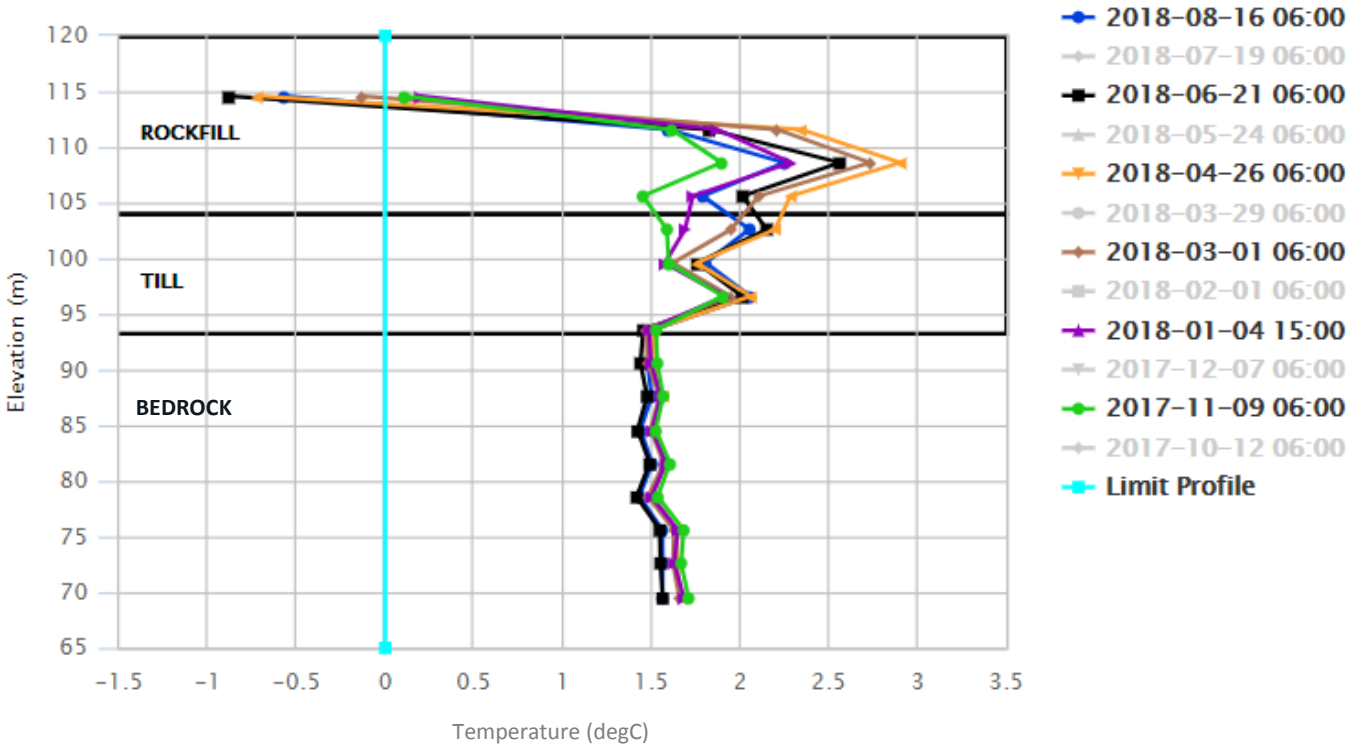


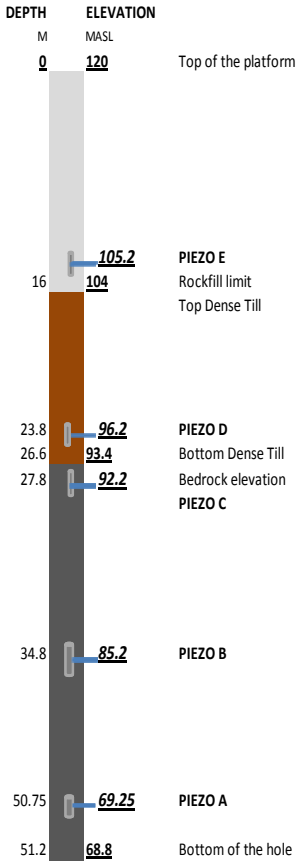
THERMISTOR 595-P1

- Temperature in the bedrock/till unit is in between 1.5º C and 2.0º C.
- Glitch of 0.25º C could be caused by the automatization works done in August 2017.



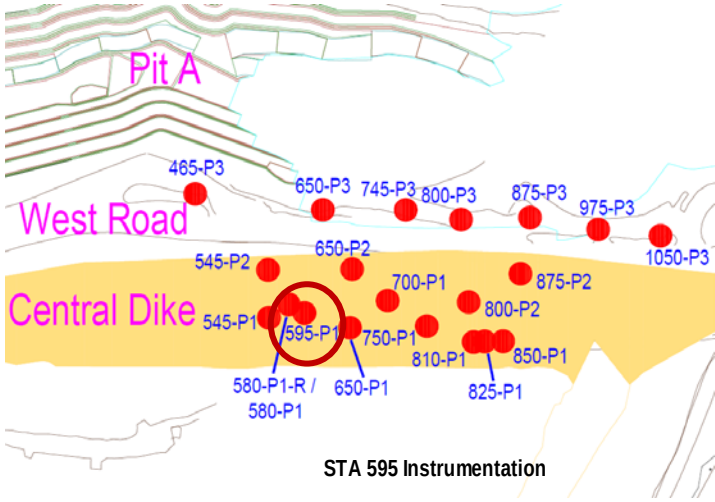
STA 595 Instrumentation



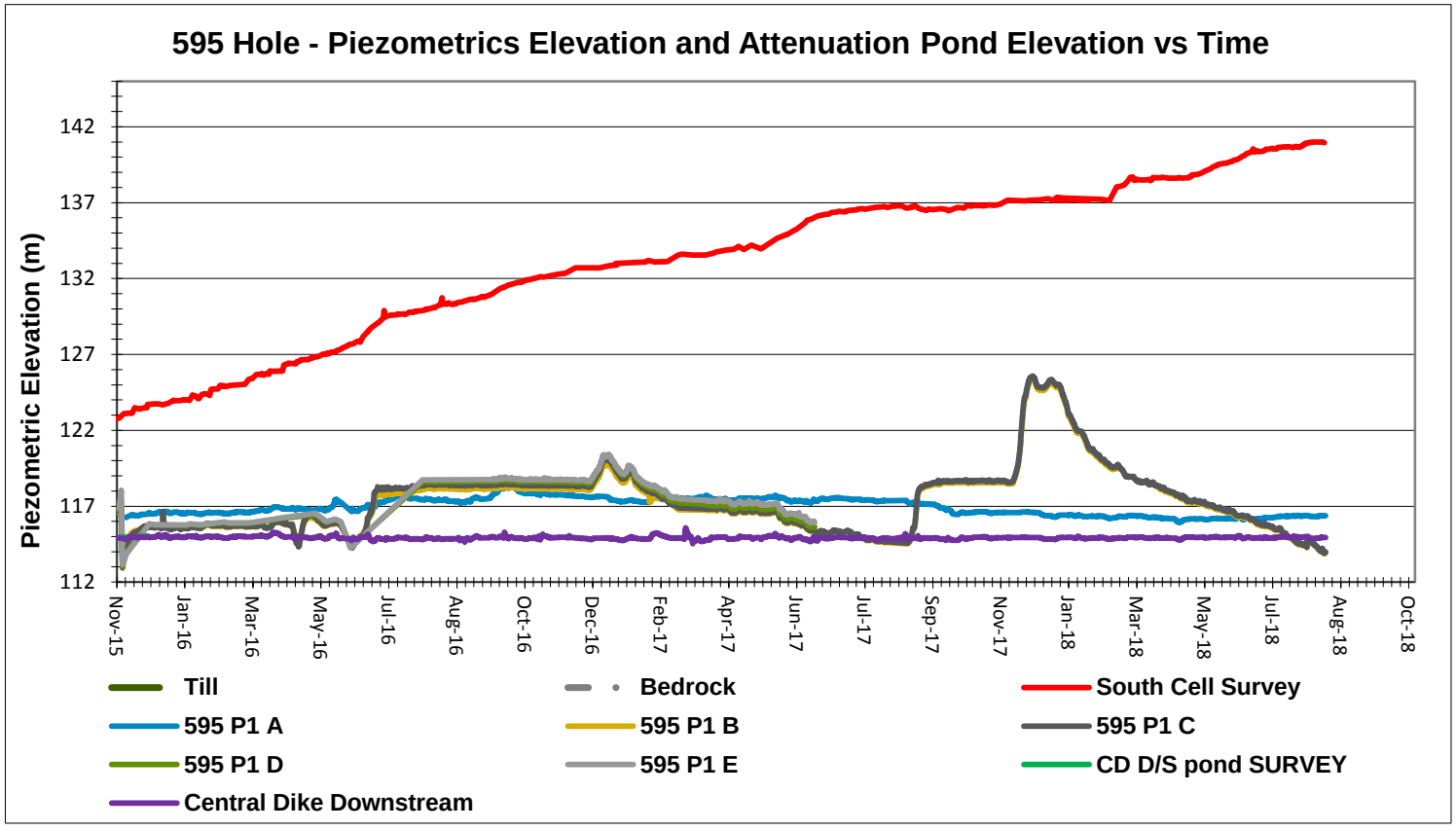


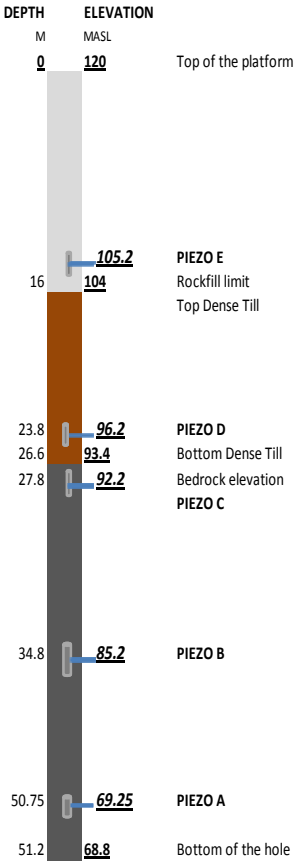
PIEZOMETER 595-P1

- Piezometric readings are fluctuating around D/S pond elevation since the installation.
- The drop trend adopted in the last couple months has softened lately for piezometer 595-P1 B & C. Piezo C to E was installed in casing
- Piezo D & E were removed from VDV in June 2017 since they are broken



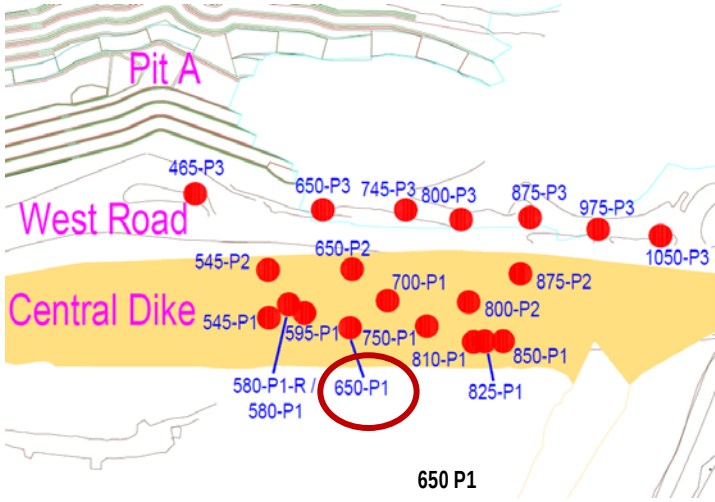
STA 595 Instrumentation

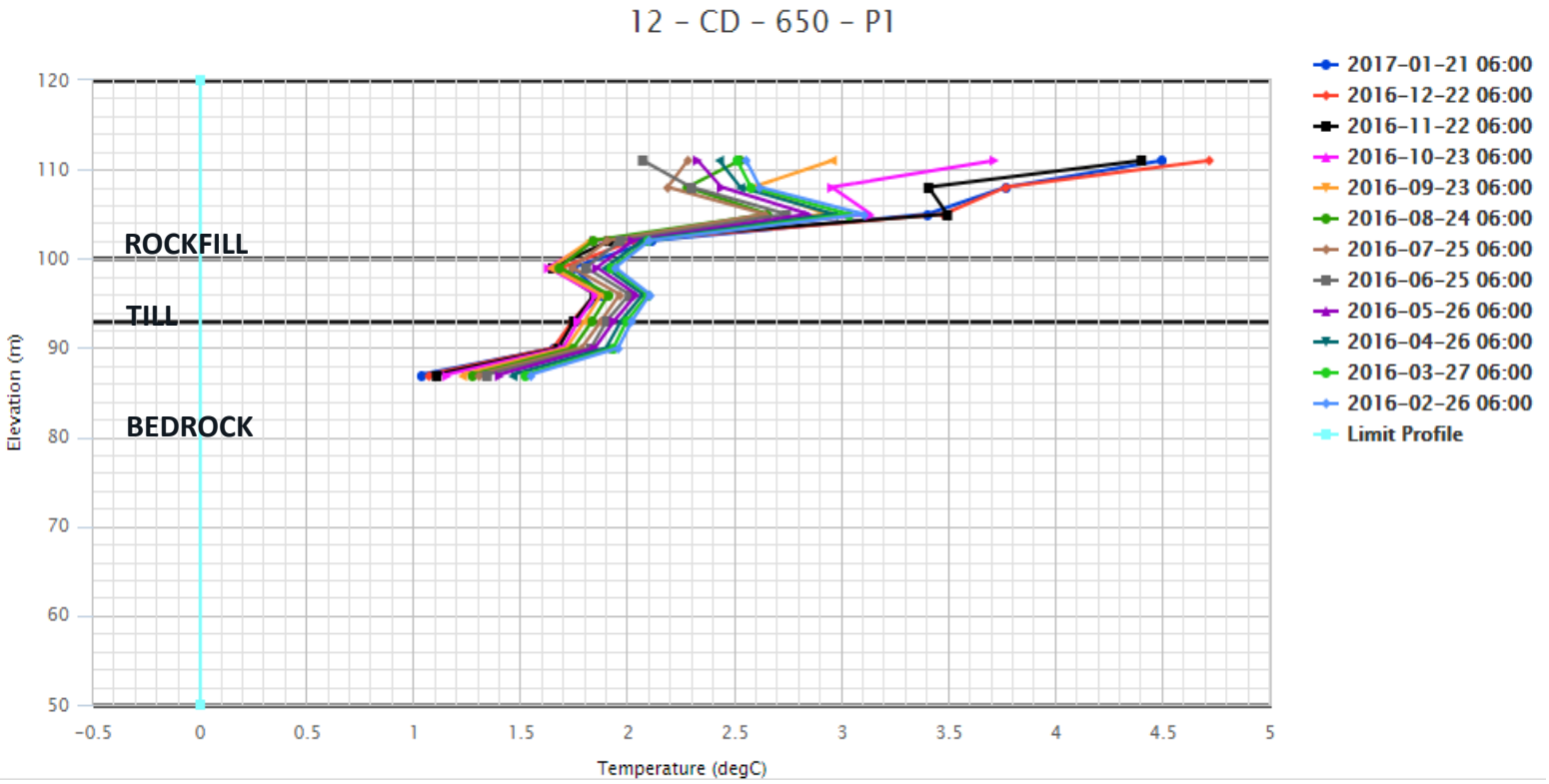


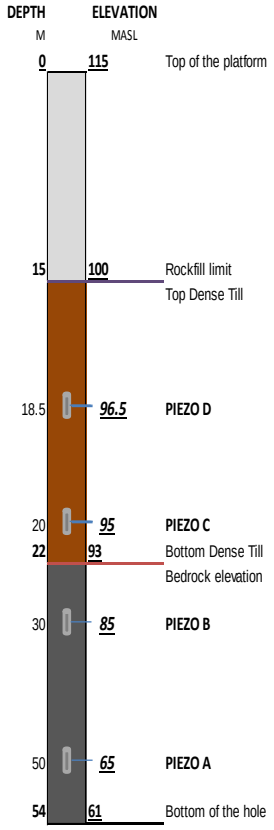


THERMISTOR 650-P1

- Thermistance reading not functional since January 2017
- Beads 10 to 12 are not functionning since August 2016
- Temperature of the bedrock/till units were in between 1.0 and 2.1º C.

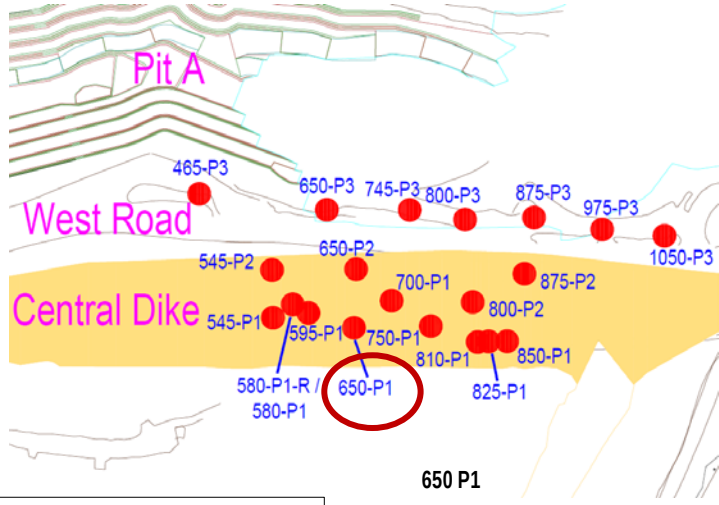




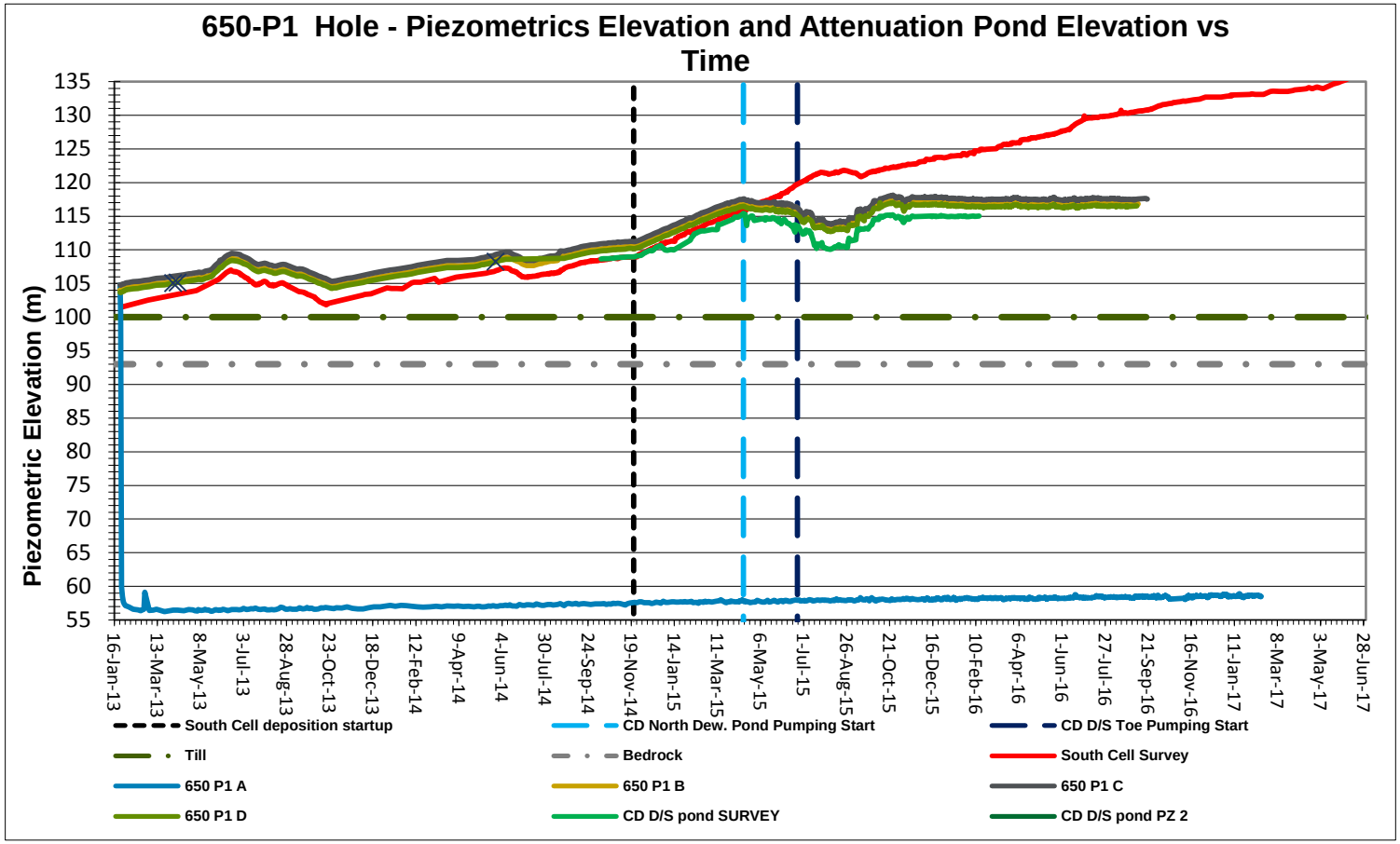


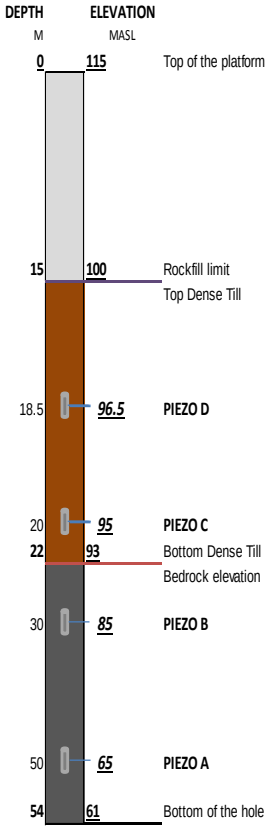
650-P1

- Piezometer reading not functional since February 2017
- Piezo A was in suction and piezo B to D were following D/S pond regime with readings around 117m.



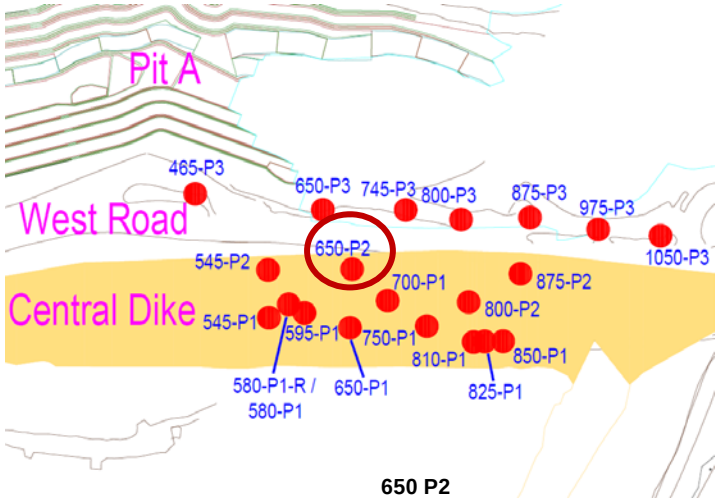
650 P1

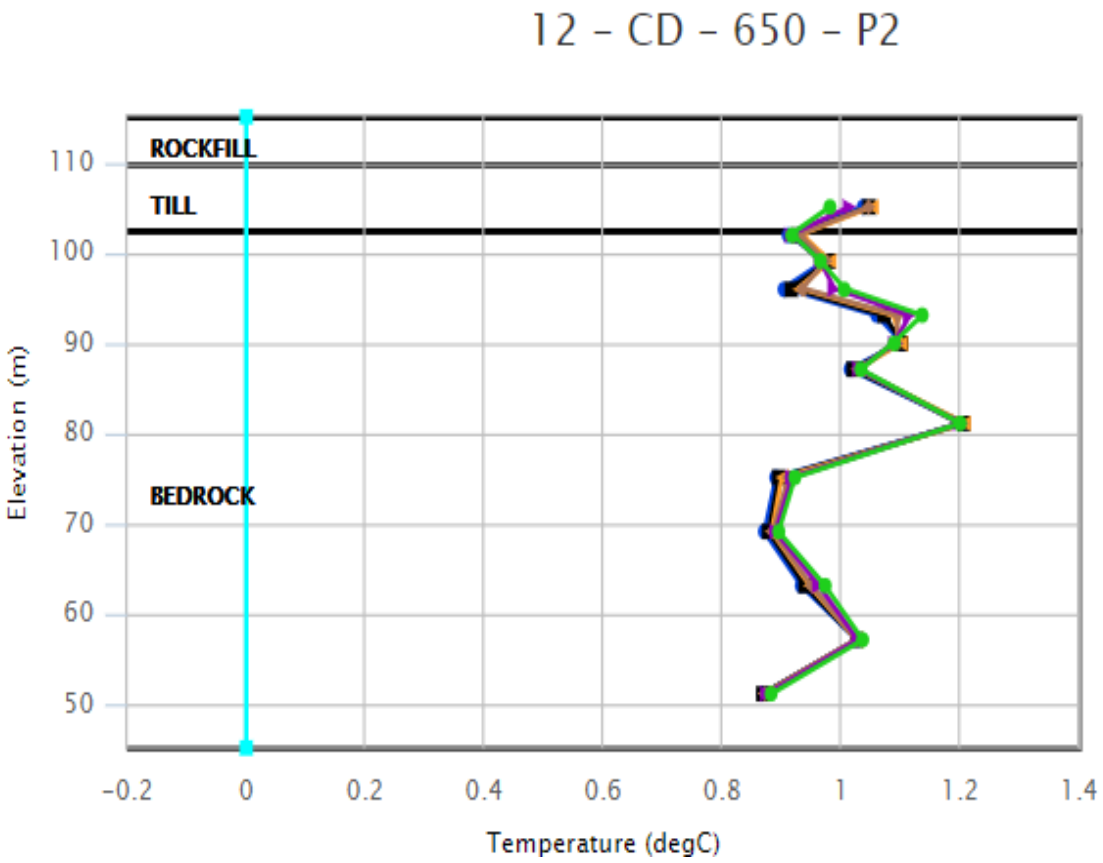


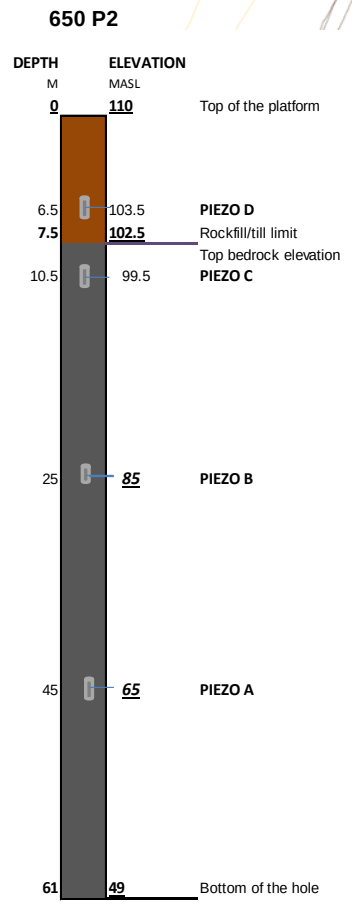


THERMISTOR 650-P2

- Cooling trend observed below El. 80 similar to 2016-2017 readings.
- Temperature peak of 1.2º C at El.81 MASL.

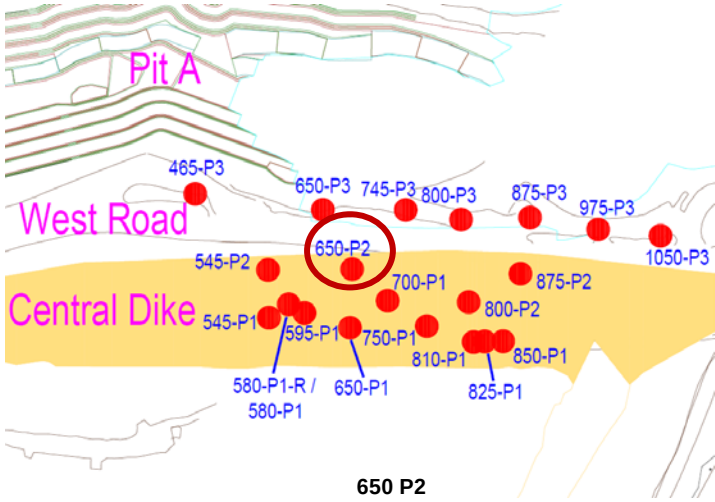


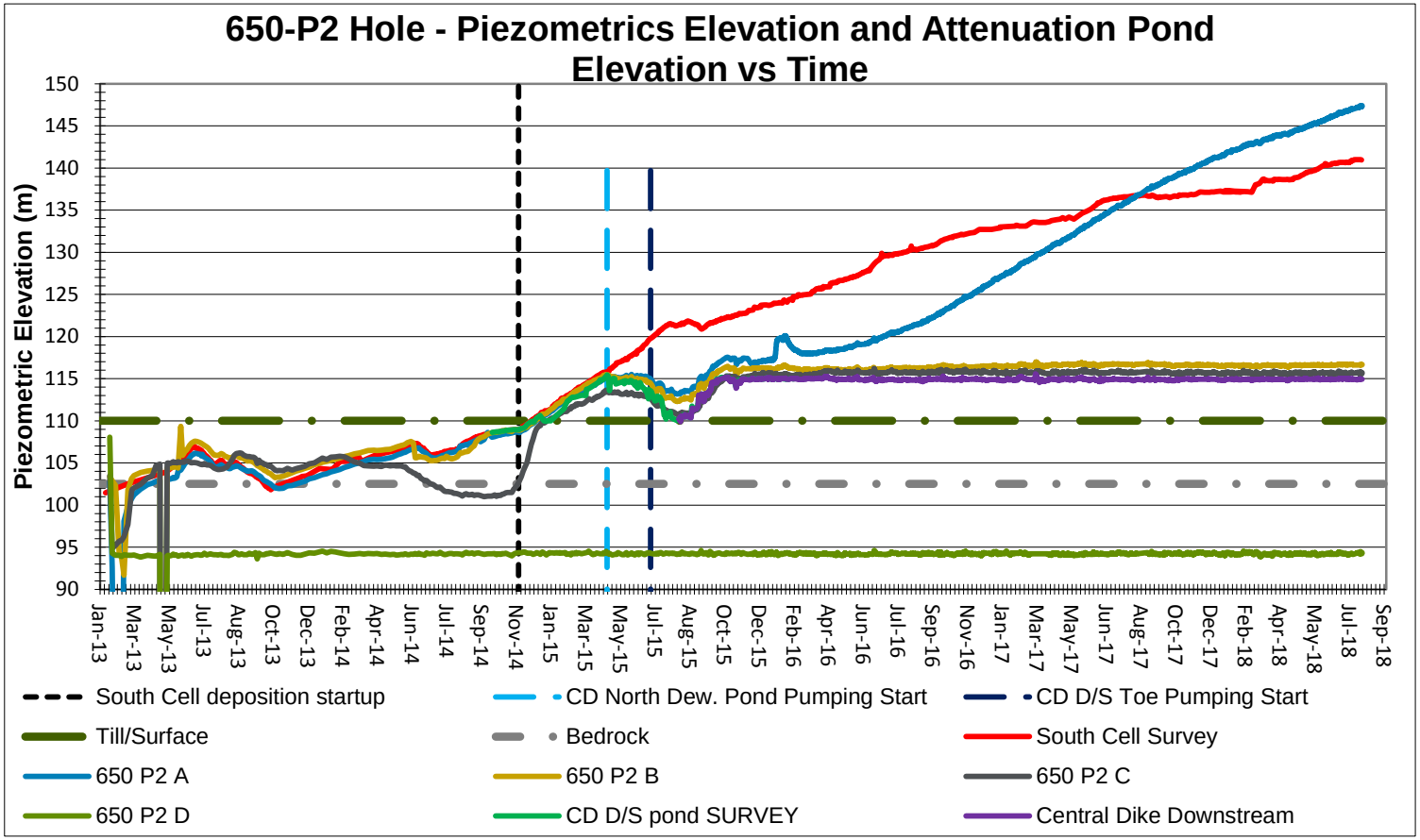


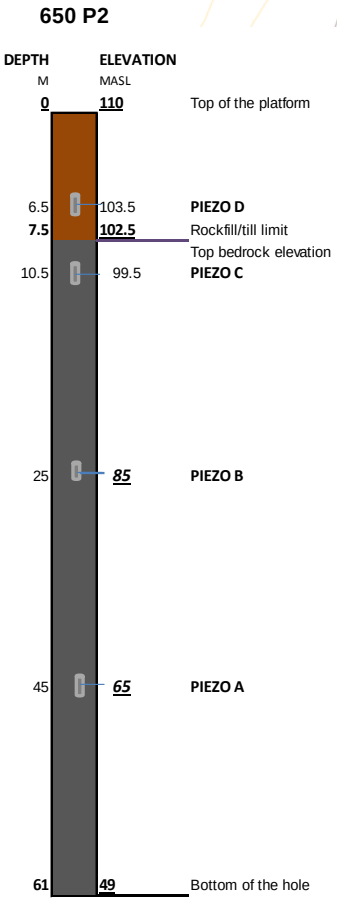


PIEZOMETER 650-P2

- Piezometer A in bedrock continue its rise and is now over the elevation of the South Cell
- Piezo B-C are following the piezometric regime of the D/S pond
- Piezo D is in suction

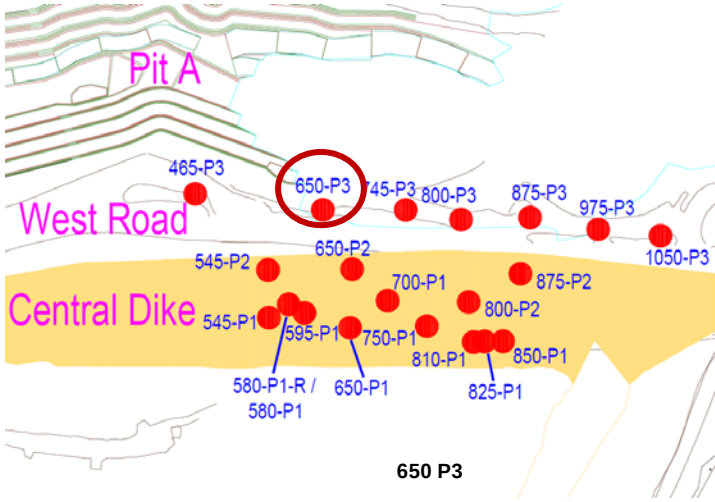


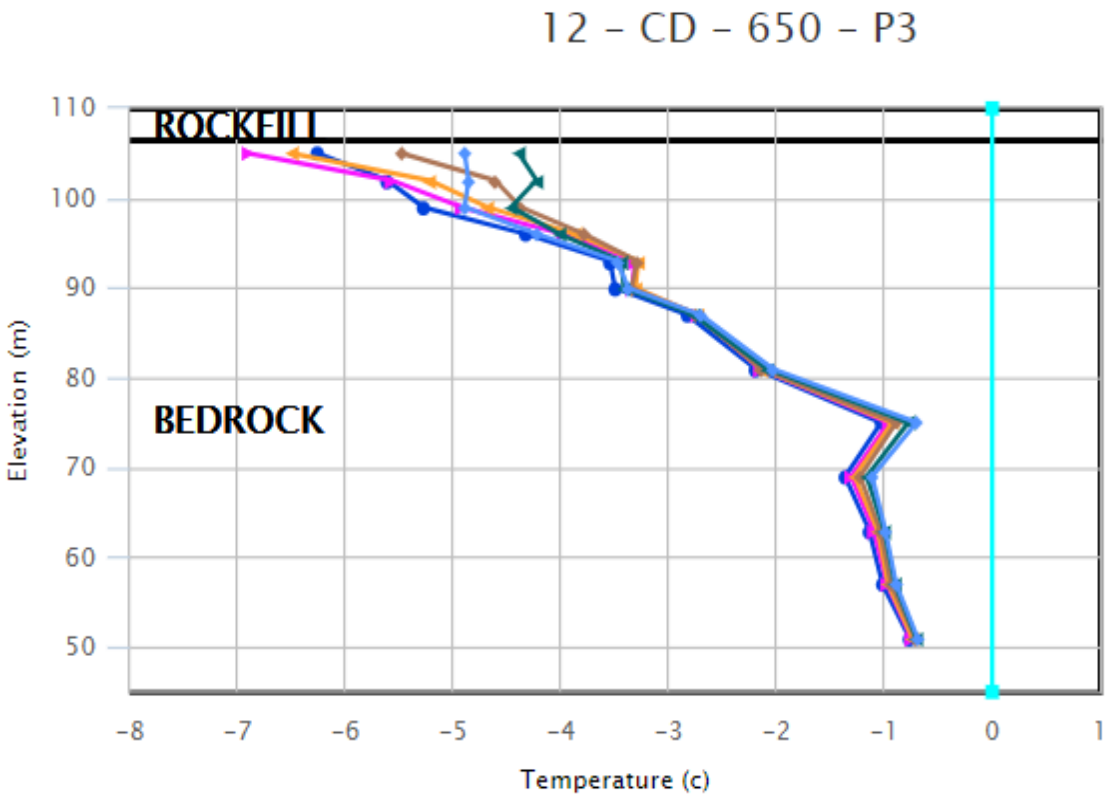


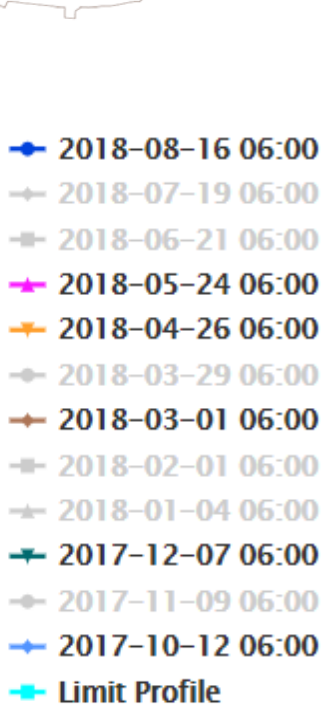


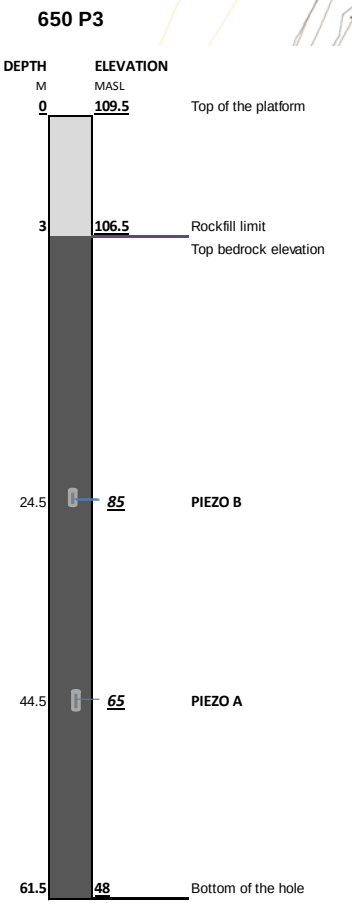
THERMISTOR 650-P3

- Bedrock Below 0º C at 650-P3
- Temperature spike at El. 75 m is related to capacitance effect on this specific bead.



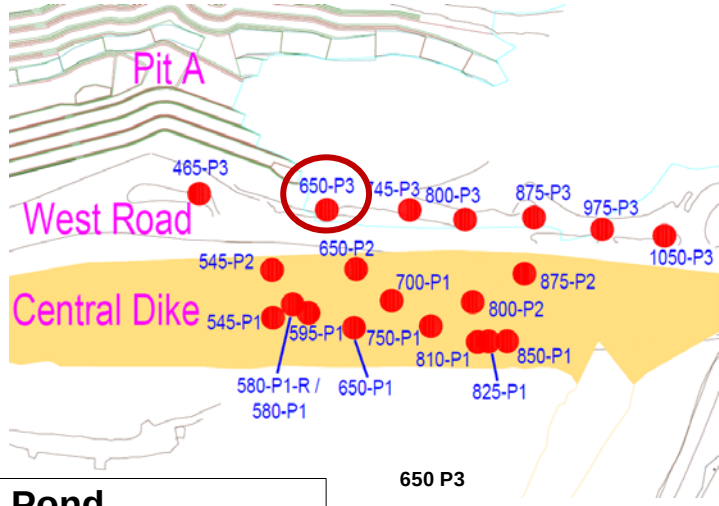


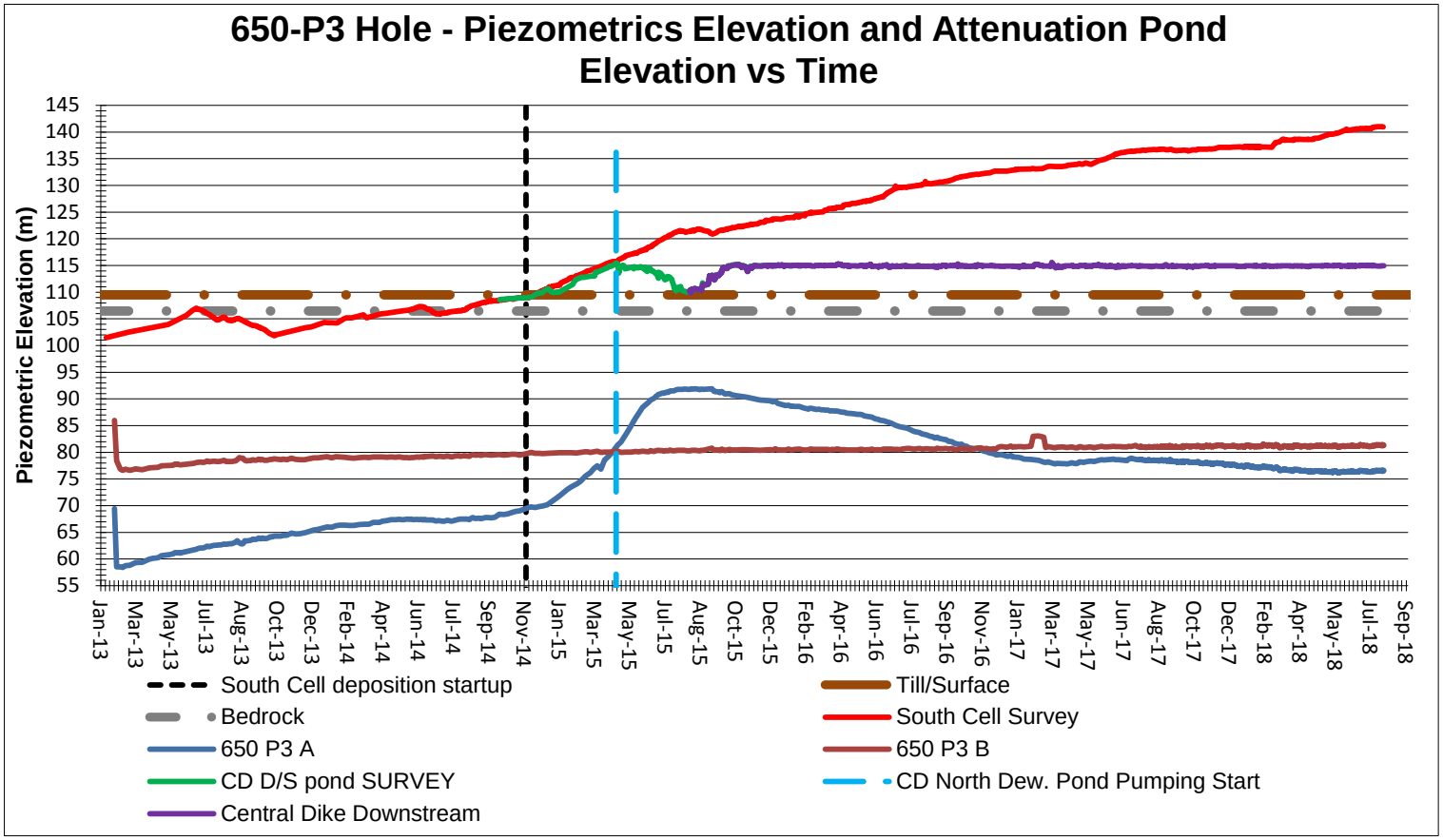


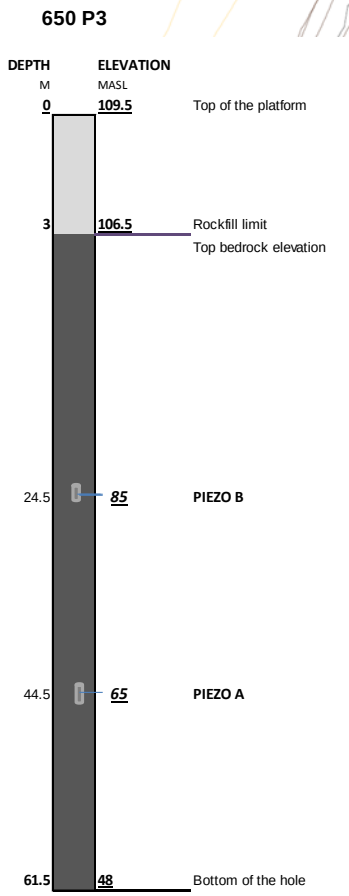


PIEZOMETERS 650-P3

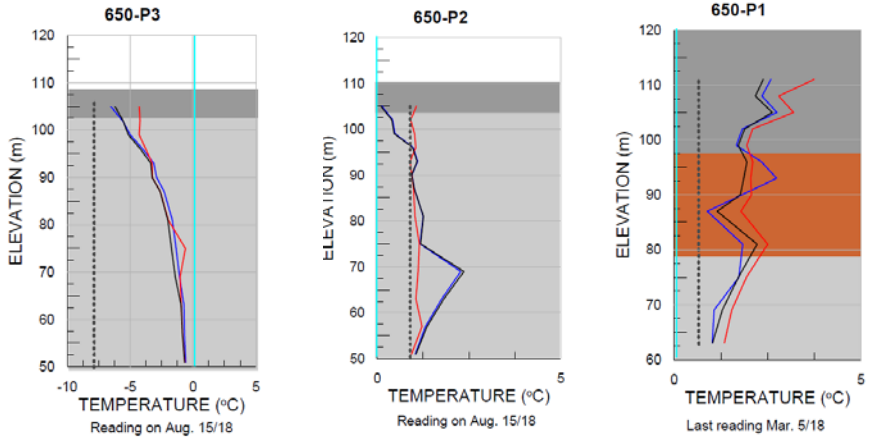
- Frozen Piezometers

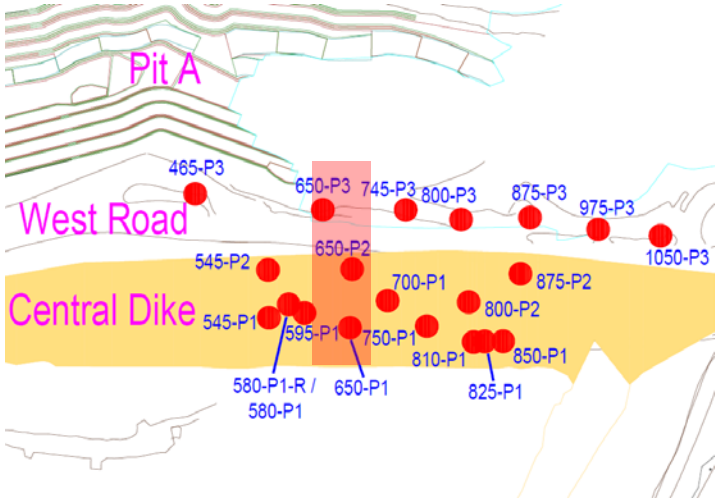


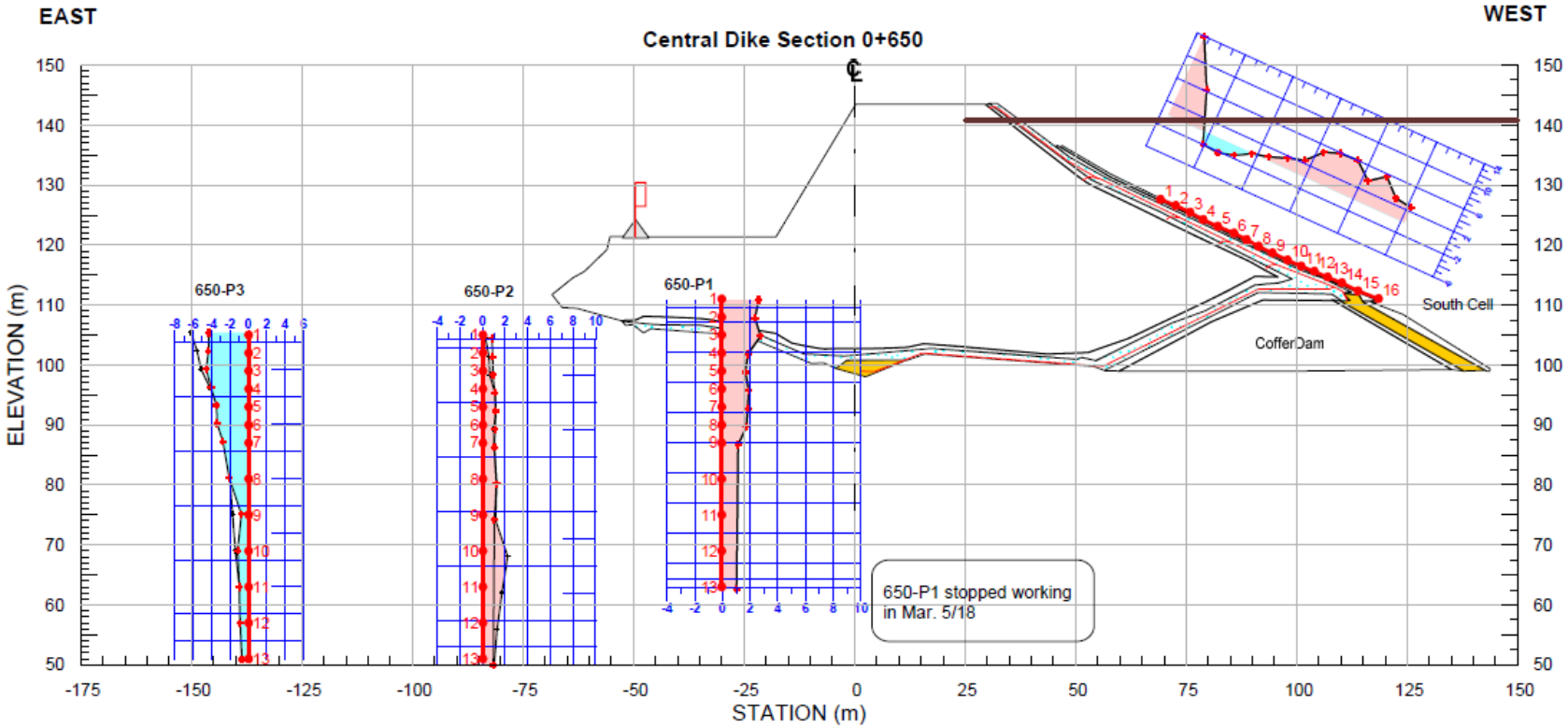




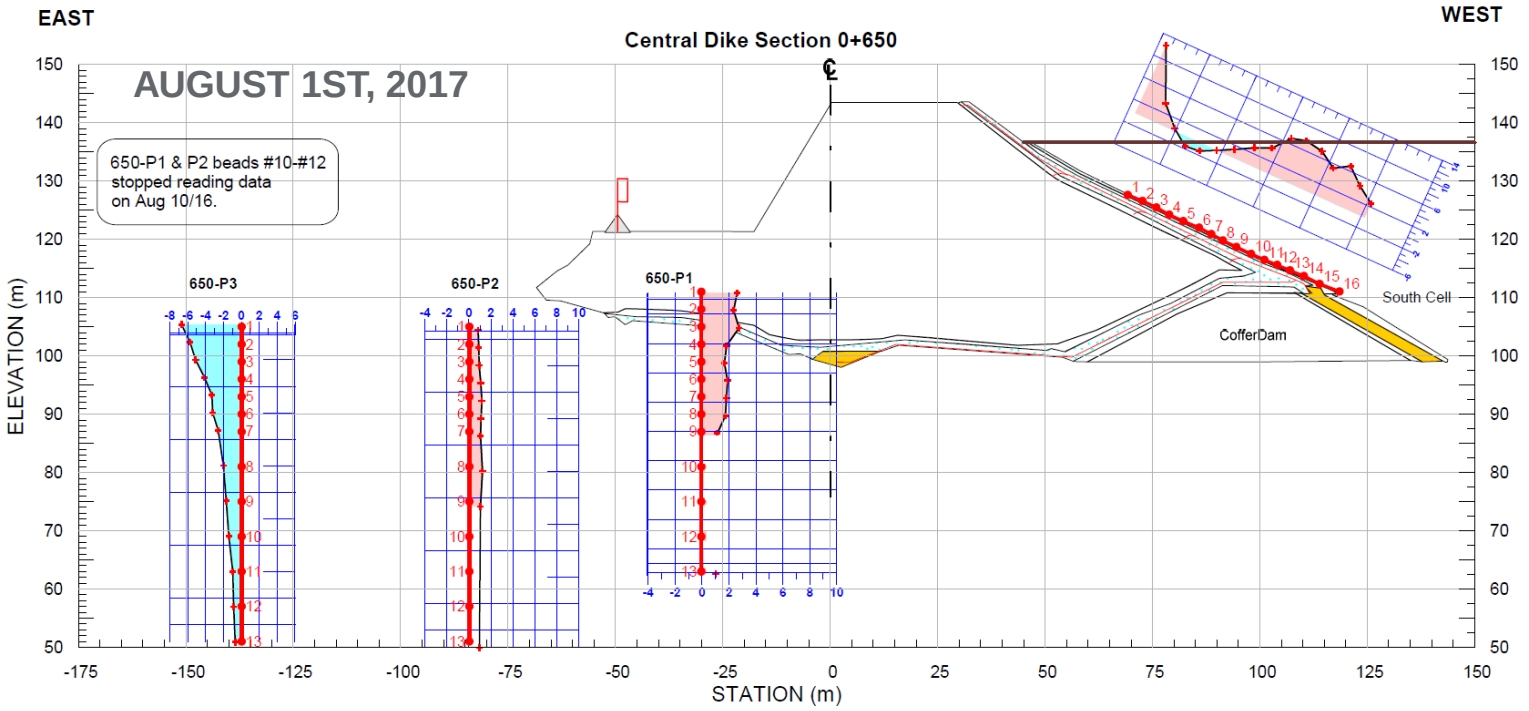
SECTION 650

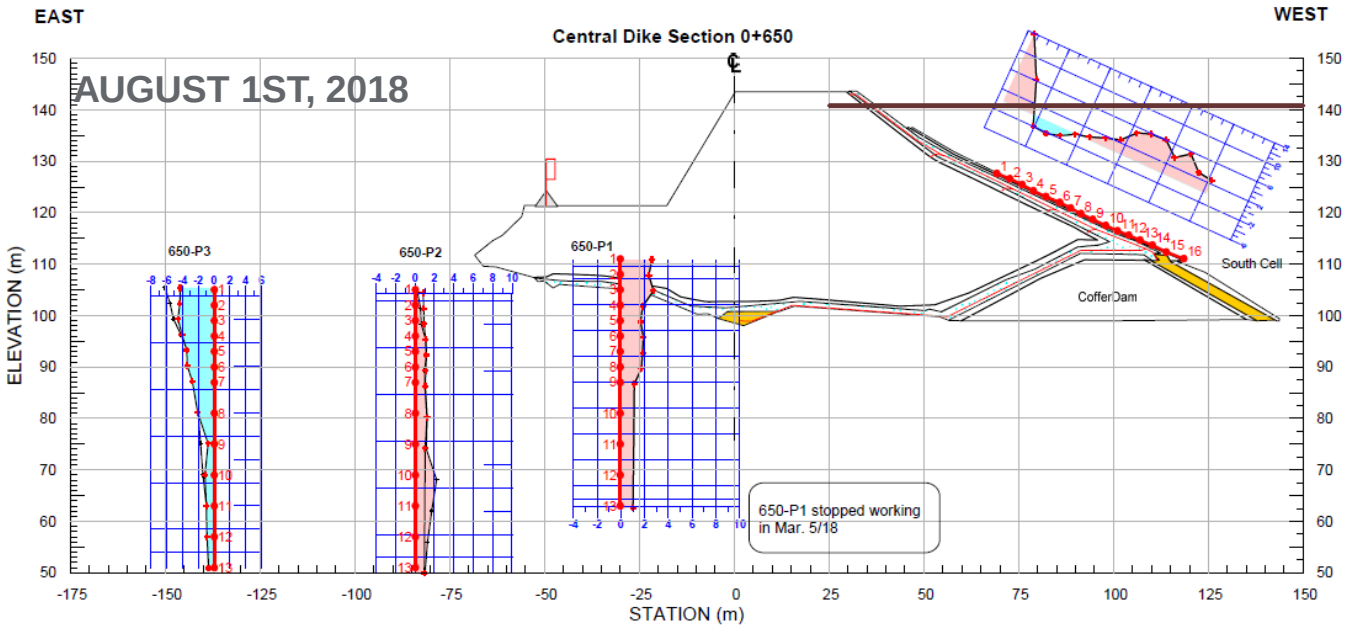

650-P3
ELEVATION (m)
TEMPERATURE (°C)
Reading on Aug. 15/18
650-P2
ELEVATION (m)
TEMPERATURE (°C)
Reading on Aug. 15/18
650-P1
ELEVATION (m)
TEMPERATURE (°C)
Last reading Mar. 5/18


Pit A
West Road
Central Dike
465-P3
650-P3
745-P3
800-P3
875-P3
975-P3
1050-P3
650-P2
545-P2
700-P1
875-P2
545-P1
595-P1
750-P1
800-P2
810-P1
850-P1
580-P1-R /
580-P1
650-P1
825-P1


EAST
WEST
Central Dike Section 0+650
℄
650-P3
650-P2
650-P1
South Cell
Coffer Dam
650-P1 stopped working
in Mar. 5/18
ELEVATION (m)
STATION (m)

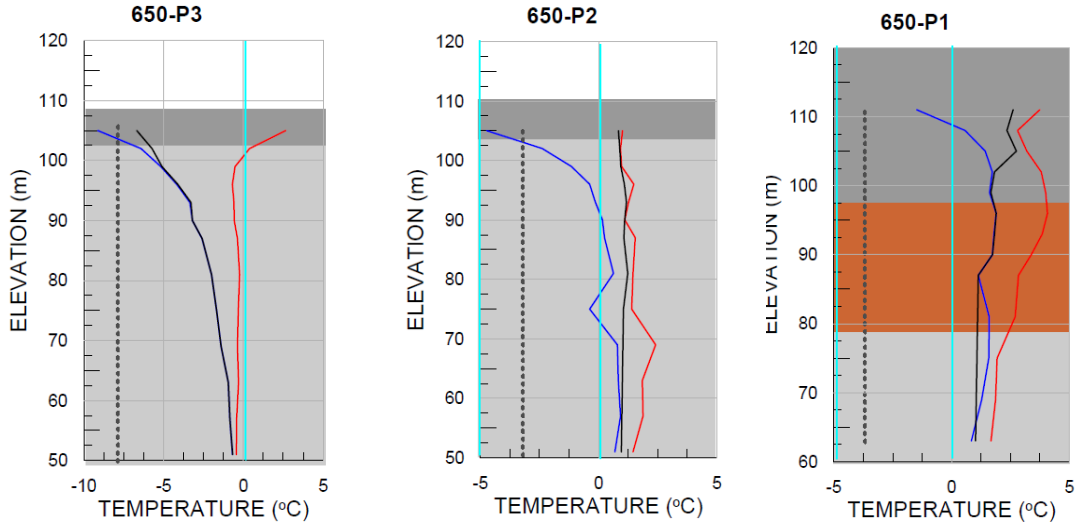
SECTION 650

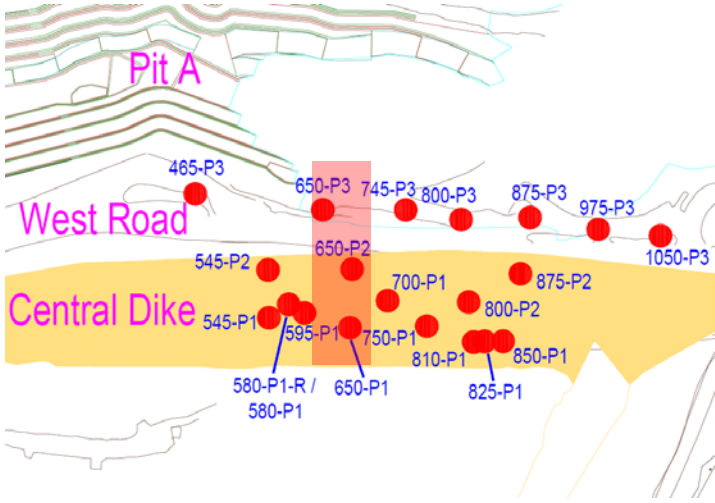

EAST
WEST
Central Dike Section 0+650
AUGUST 1ST, 2017
650-P1 & P2 beads #10-#12 stopped reading data on Aug 10/16.
650-P3
650-P2
650-P1
South Cell
CofferDam
ELEVATION (m)
STATION (m)

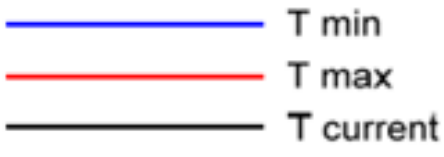

EAST
WEST
Central Dike Section 0+650
AUGUST 1ST, 2018
650-P3
650-P2
650-P1
South Cell
CofferDam
650-P1 stopped working in Mar. 5/18
ELEVATION (m)
STATION (m)

SECTION 650

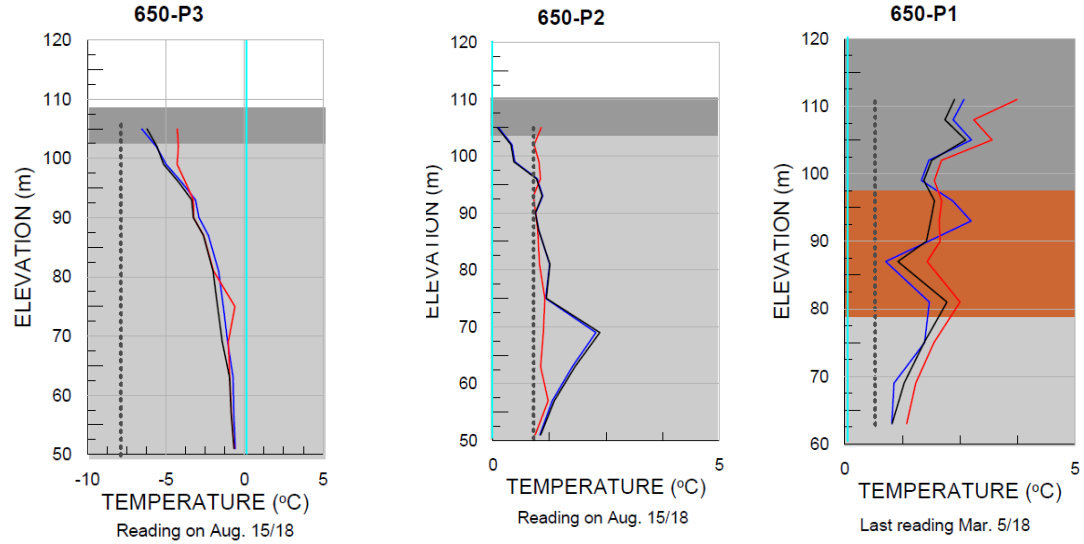
THERMISTOR READINGS FROM AUGUST 2016 - 2017

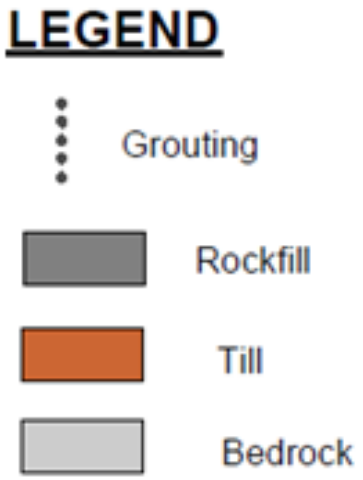






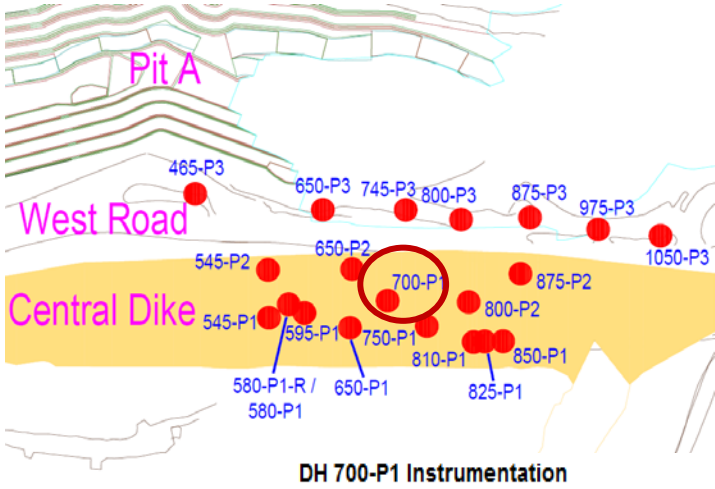
THERMISTOR READINGS FROM AUGUST 2017 - 2018



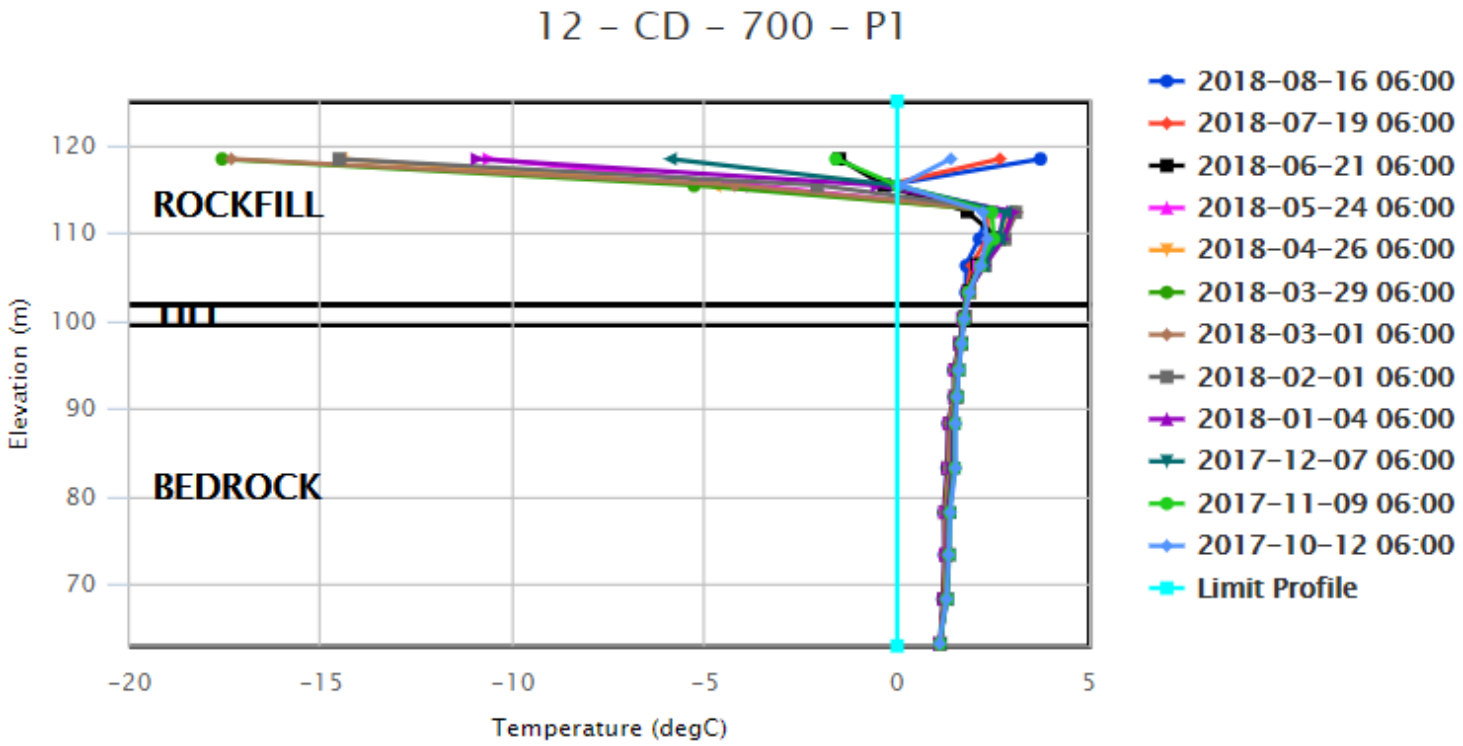


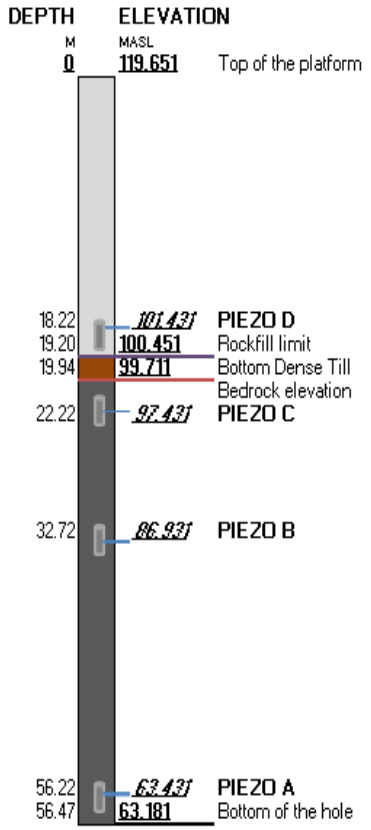
THERMISTOR 700-P1

- New instrument installed in 2017
- Till and bedrock temperature readings above 0º C



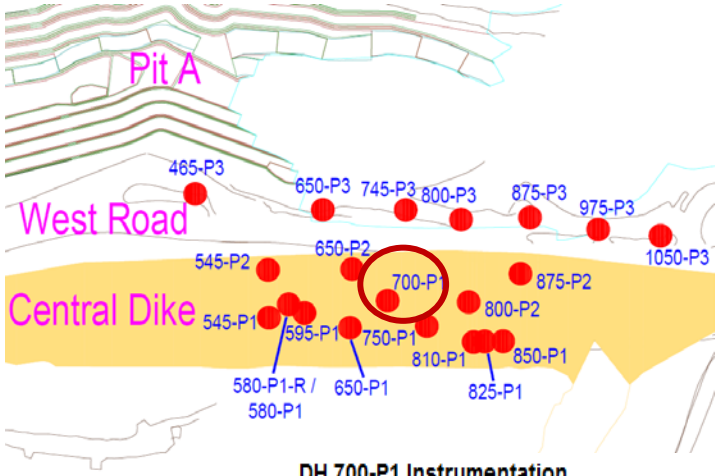
DH 700-P1 Instrumentation

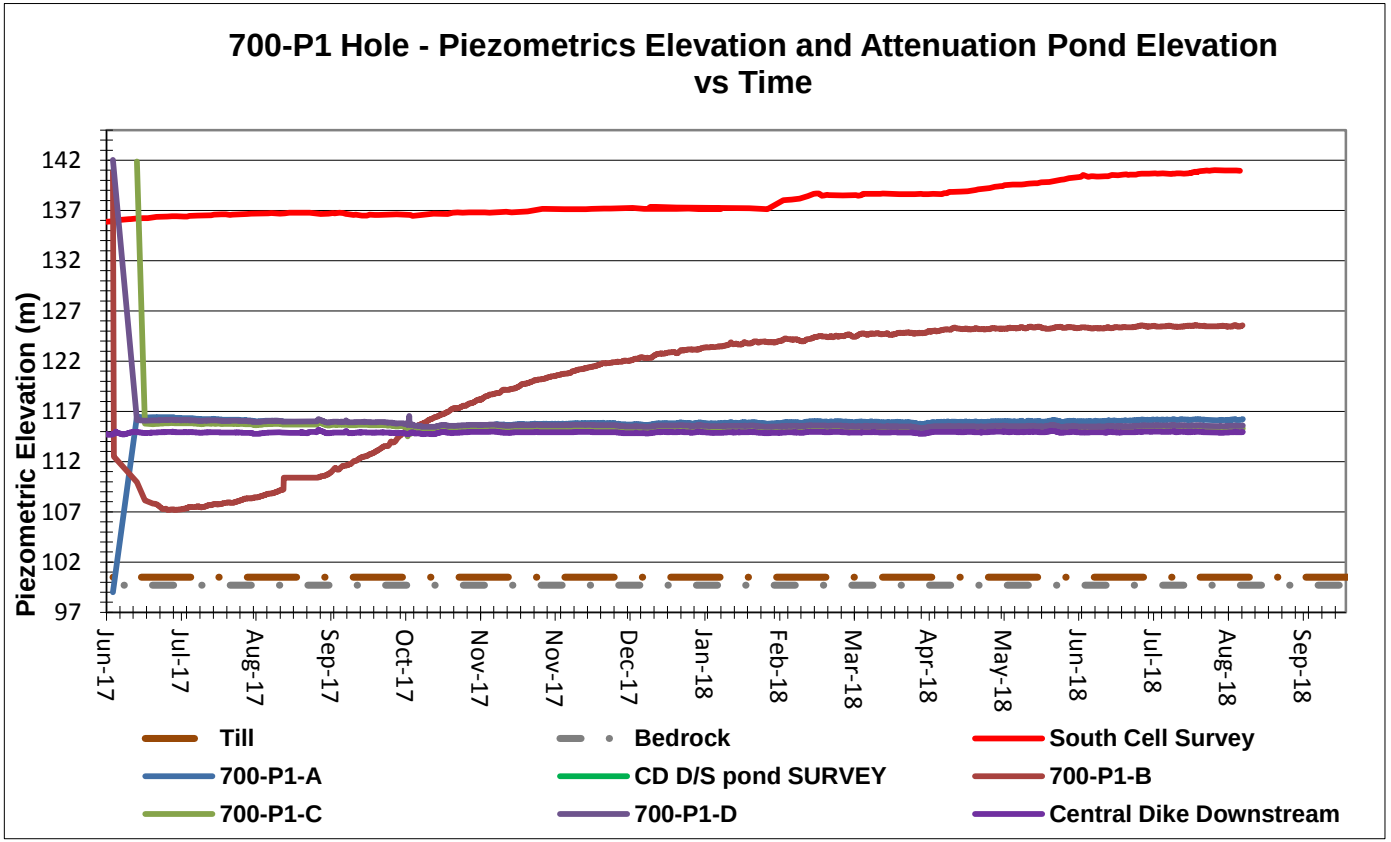


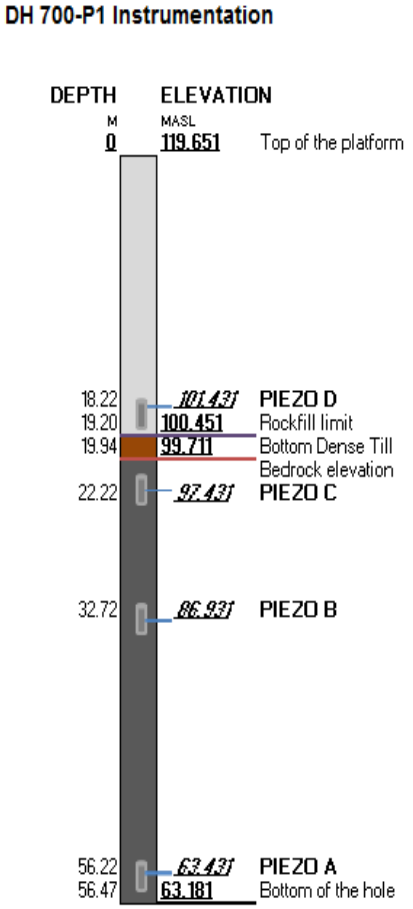


PIEZOMETER 700-P1

- New instrument installed in 2017
- Piezo B was on a rising trend but has stabilized
- Piezo A, C and D are showing reading similar to the D/S pond.

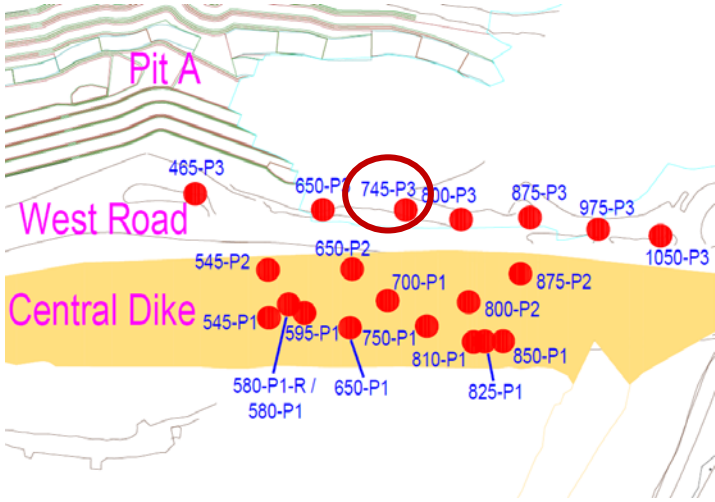


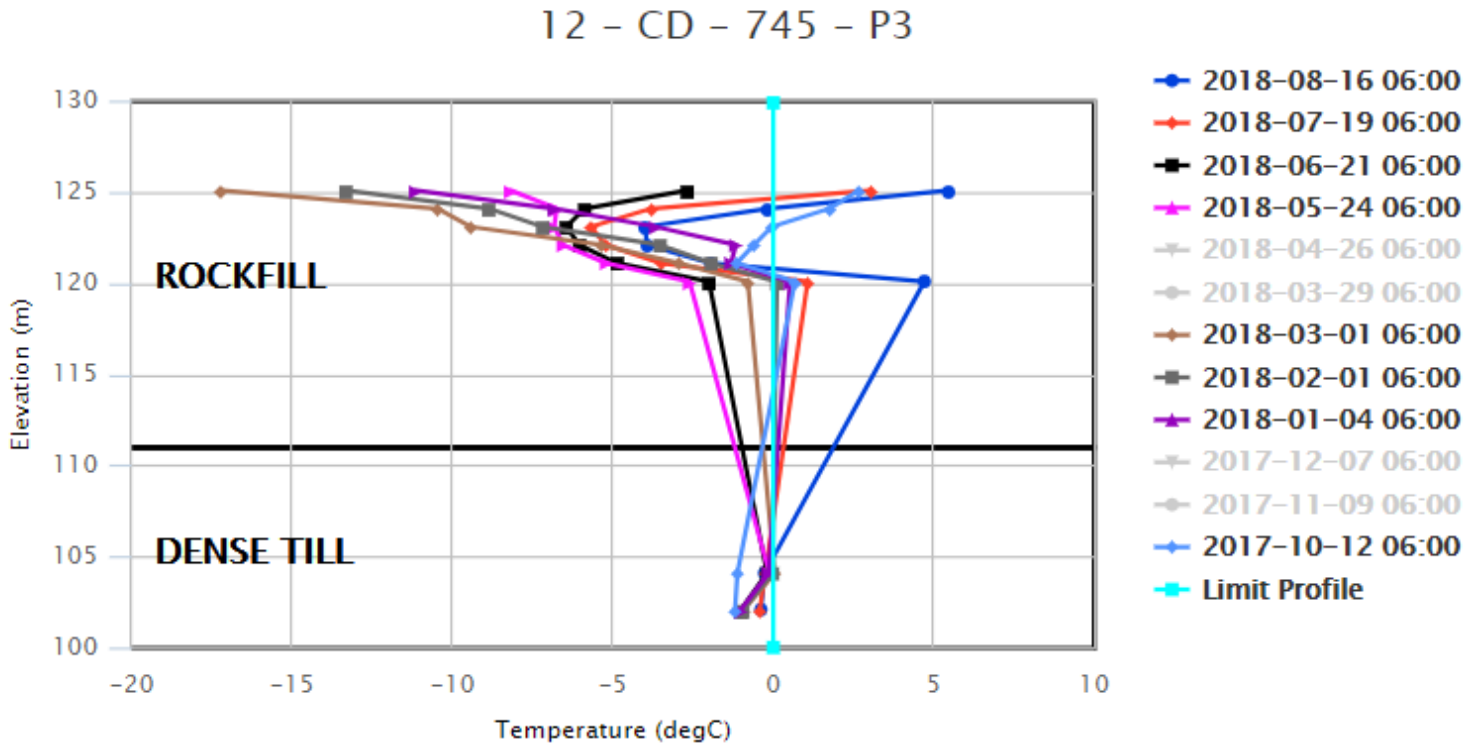




THERMISTOR 745-P3

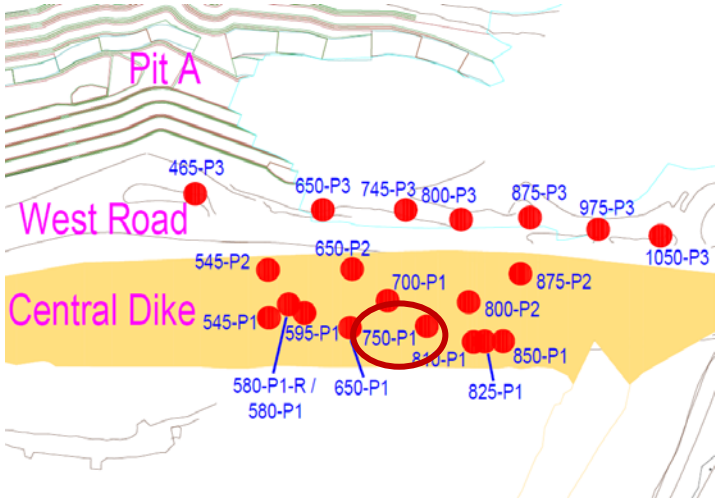
- Thermistor installed to monitor freeze back of the West Road. This thermistor do not reach bedrock
- Temperatures are above the freezing point for July & August, 2018
- Frozen limit of the northen section of the P3 line

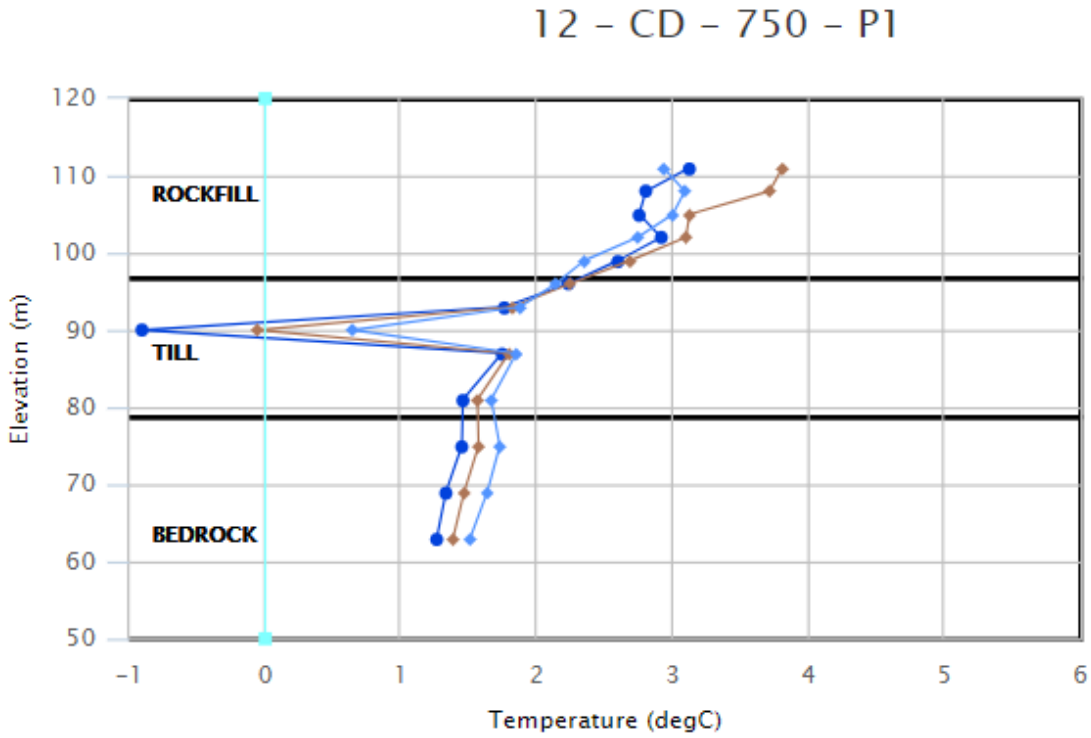


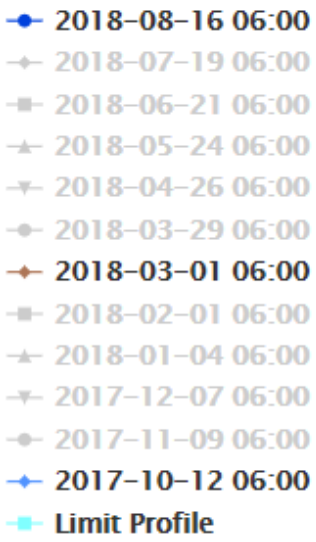


THERMISTOR 750-P1

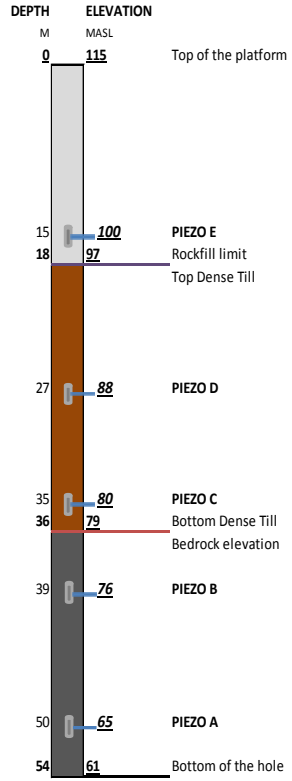
- Cooling trend in till layer. The bead located at elevation 90m is approximately 1° C cooler than in 2017.





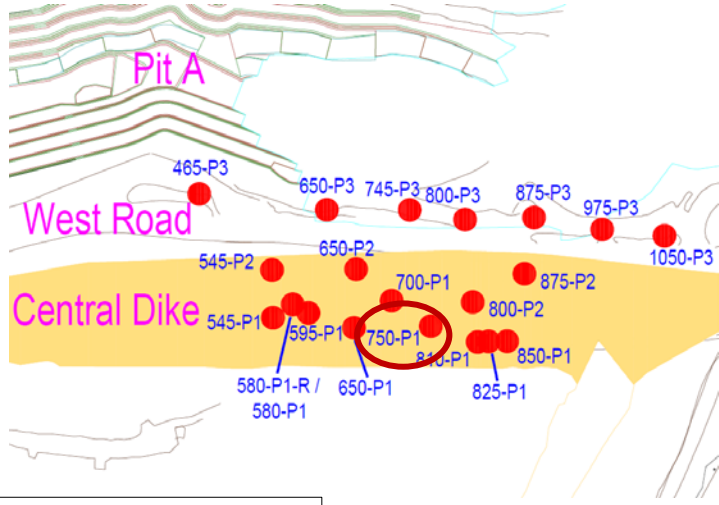


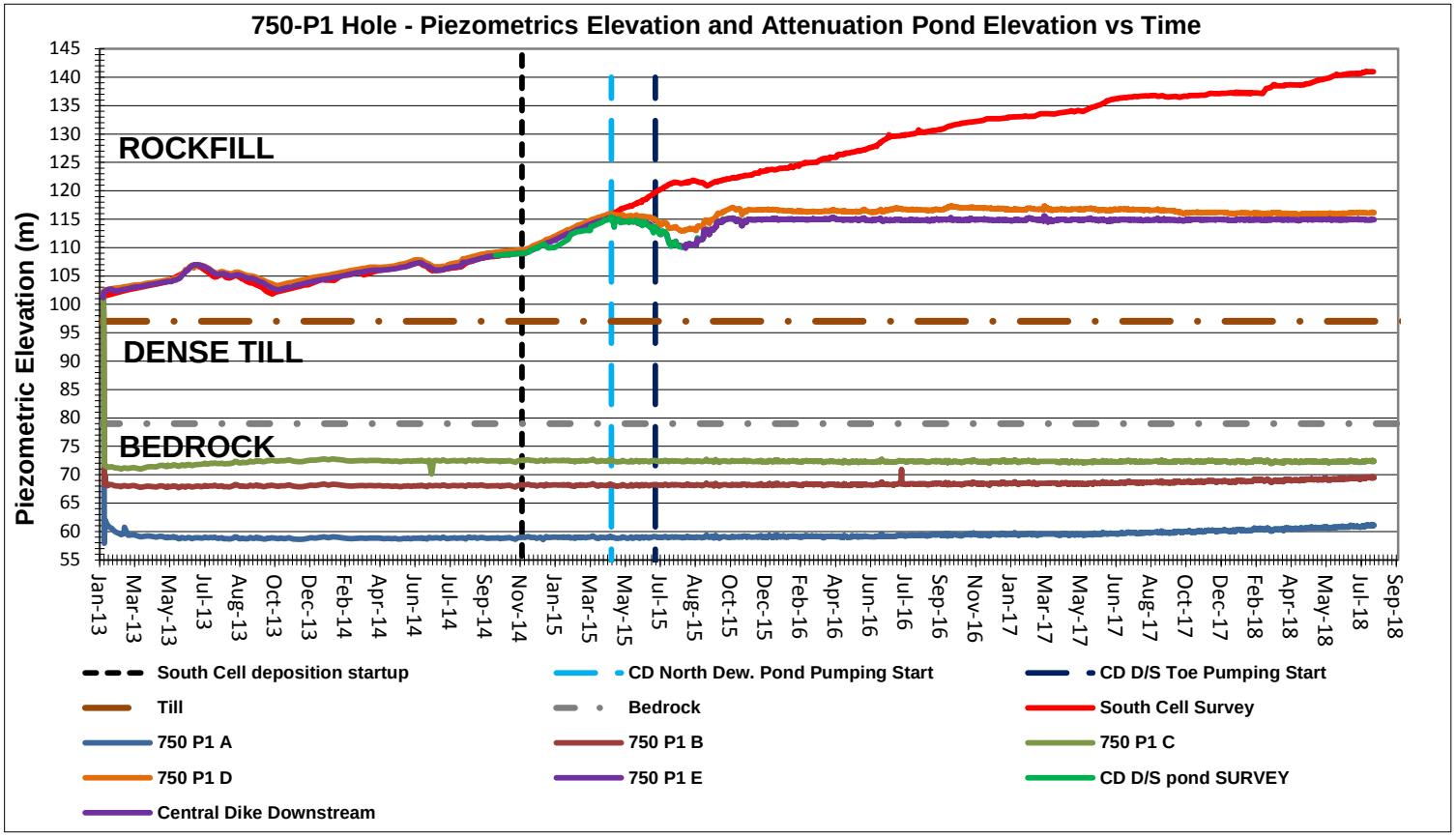
750 P1

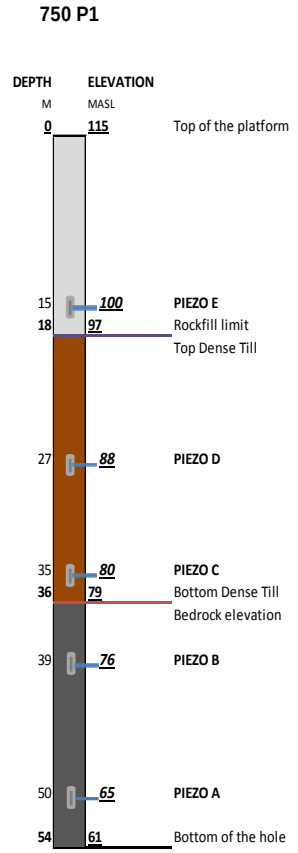


PIEZOMETER 750-P1

- Piezo A, B and C are in suction
- Piezo D is have a direct reaction to any variation in elevation observe in the D/S pond.

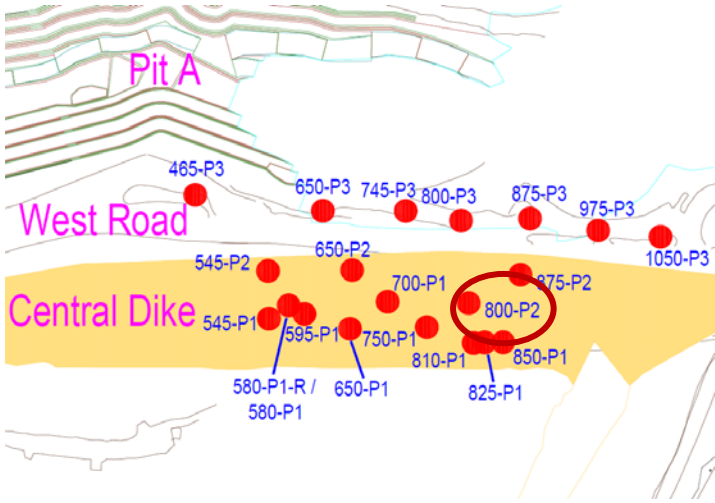


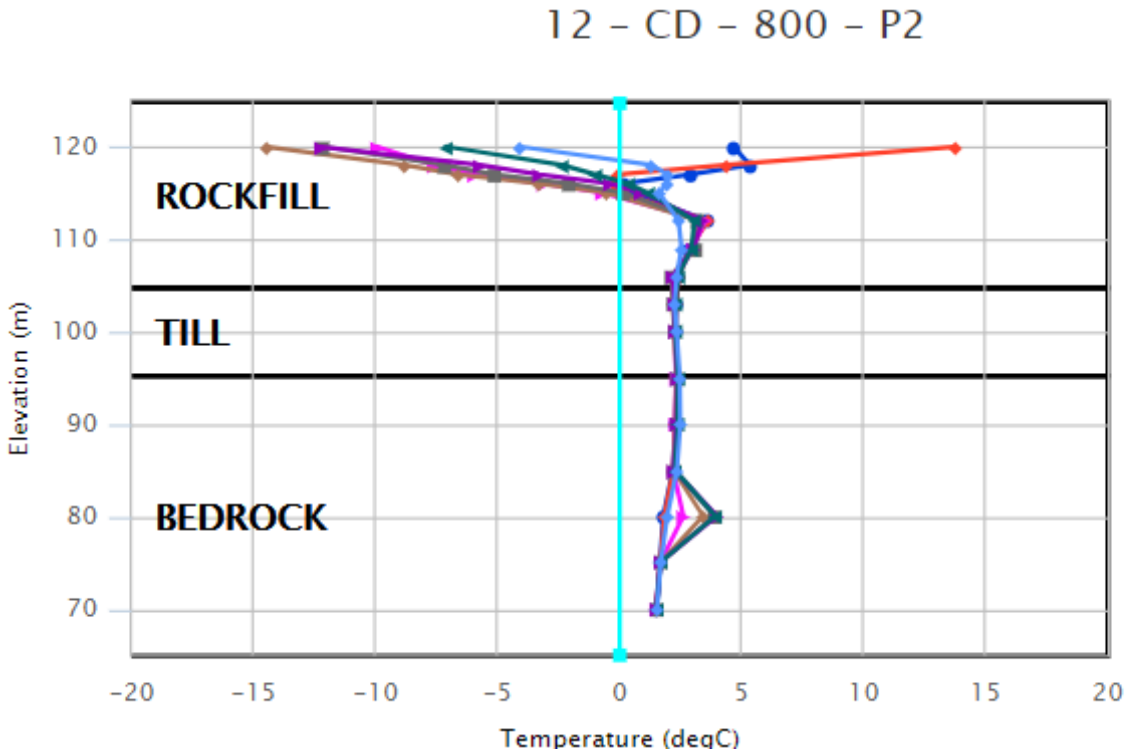


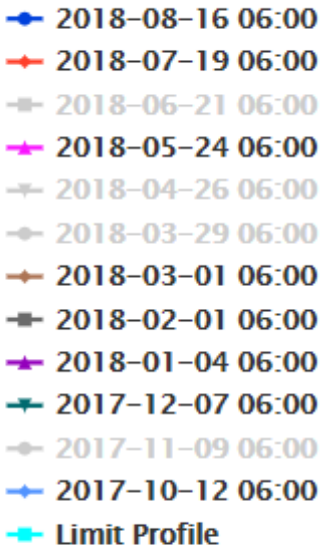


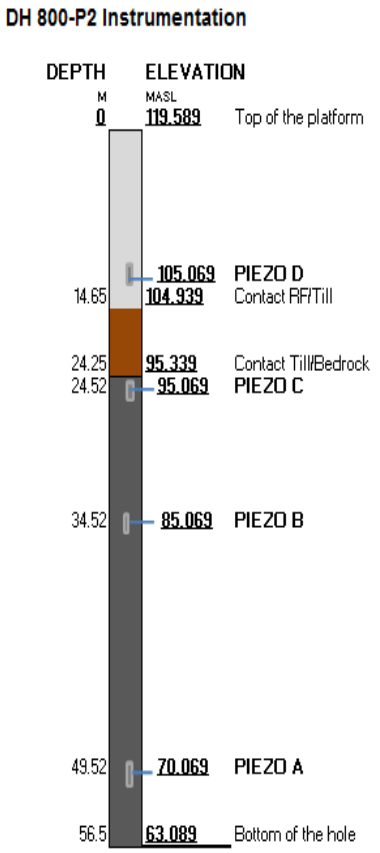
THERMISTOR 800-P2

- New instrument installed in 2017
- Capacitance effect was observed at the end of 2017/beginning 2018. Stabilized since June 2018.
- Temperature above 0 ºC



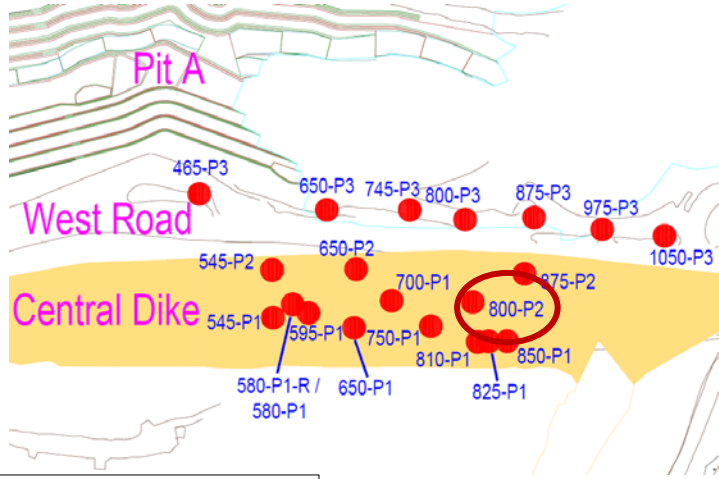


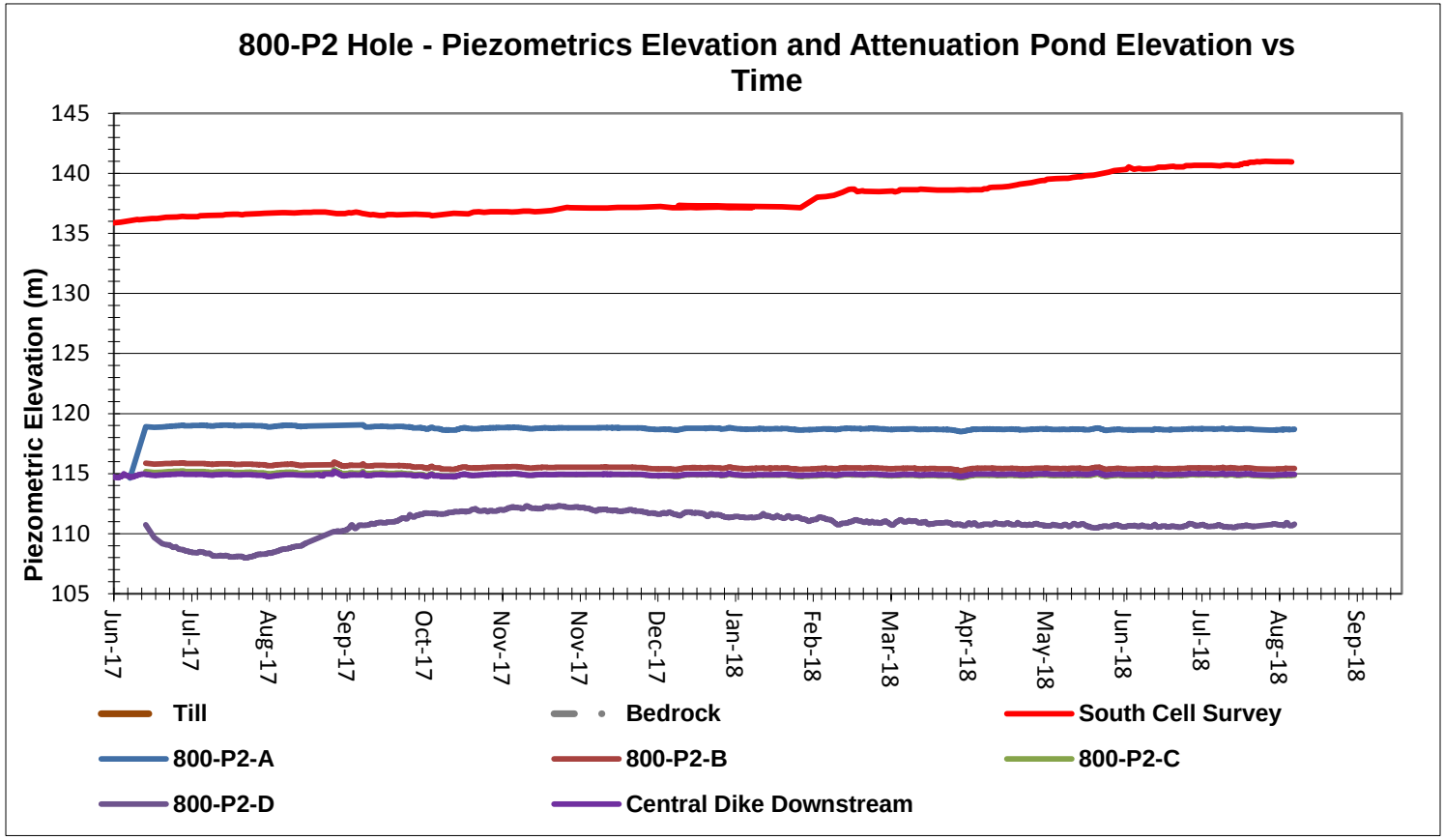


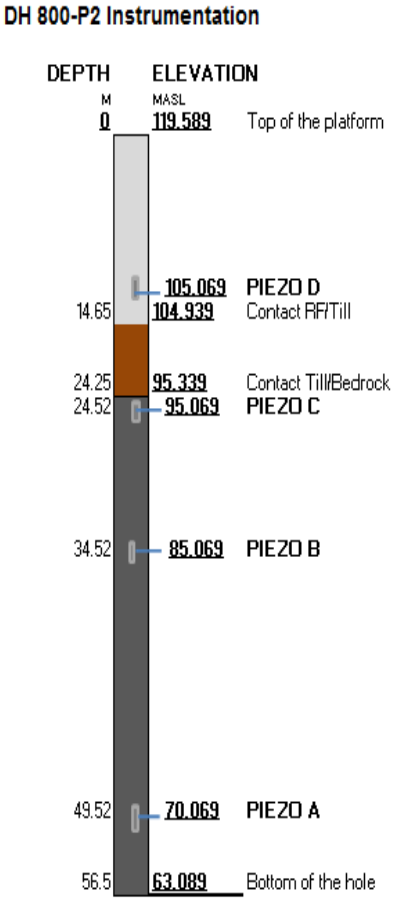


PIEZOMETER 800-P2

- New instrument installed in 2017
- All Piezo are stable
- Piezo A,B and C are showing pressure readings similar to the elevation of the D/S pond.

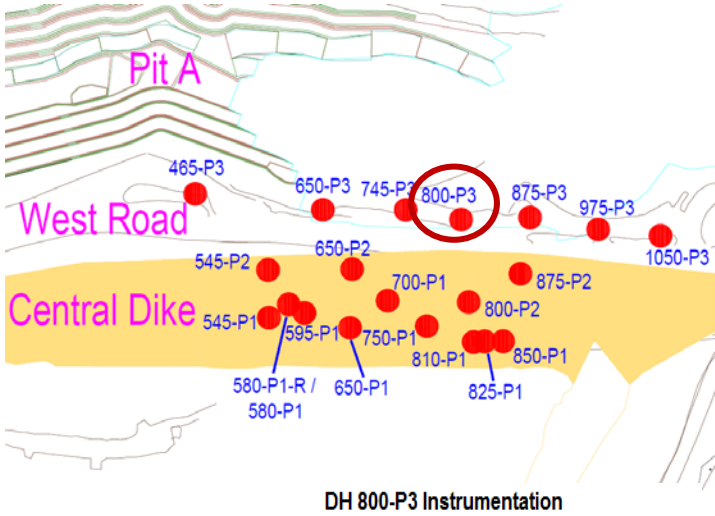




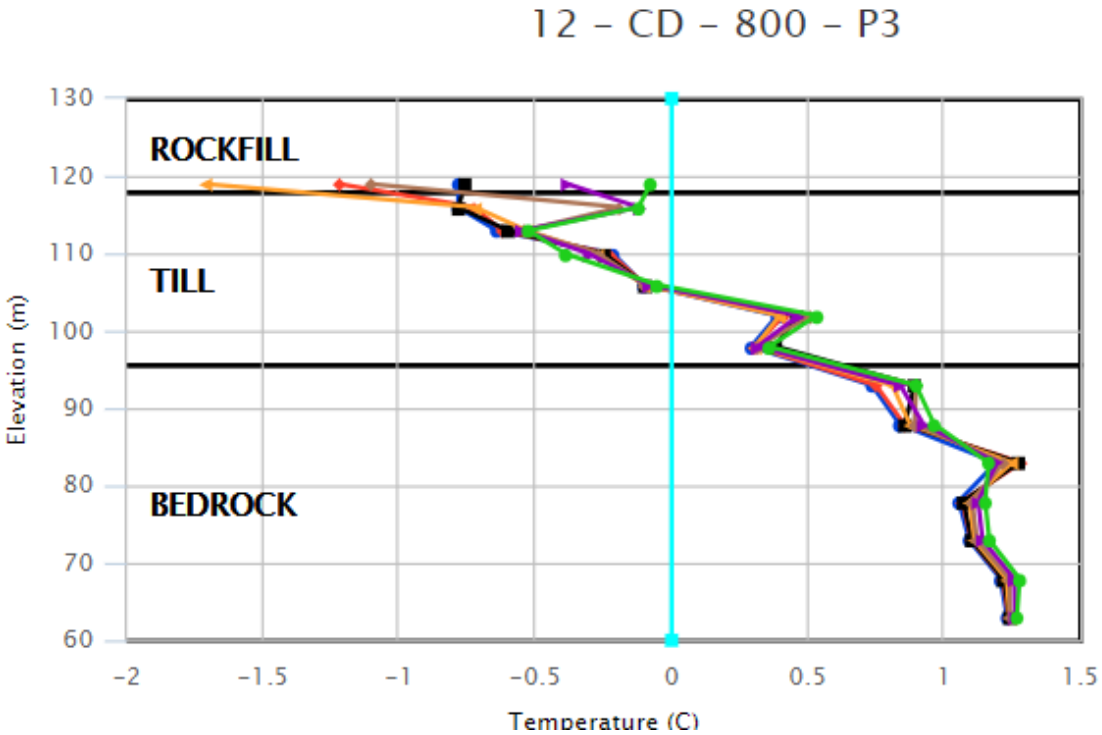


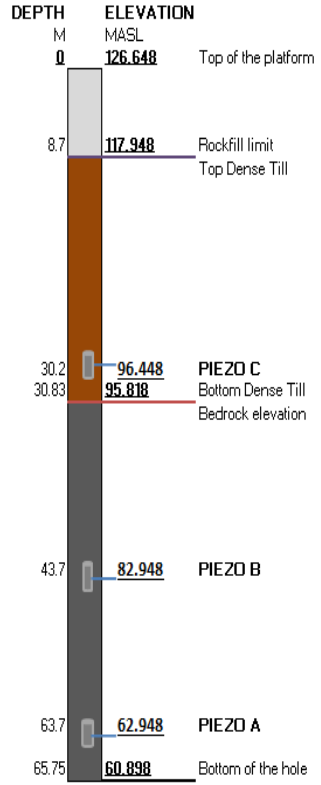
THERMISTOR 800-P3

- New instrument installed in 2017
- The unfreezing point occurs around elevation 103 MASL.
- From elevation 78 to the bottom of the hole, temperatures are stable at approximately 1.2 ˚C.



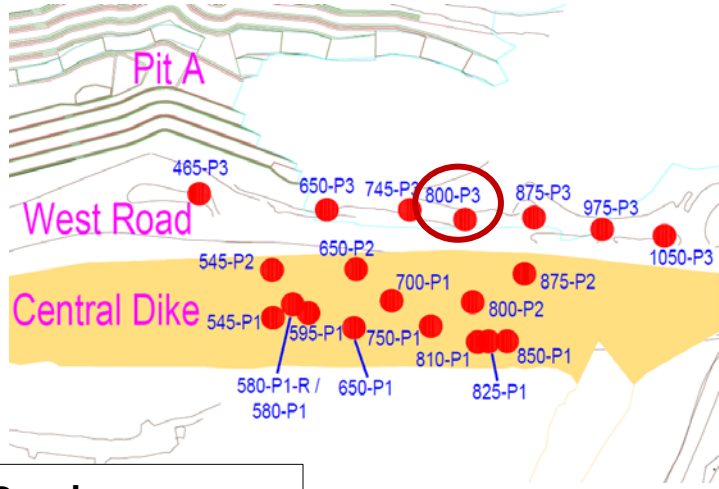
DH 800-P3 Instrumentation

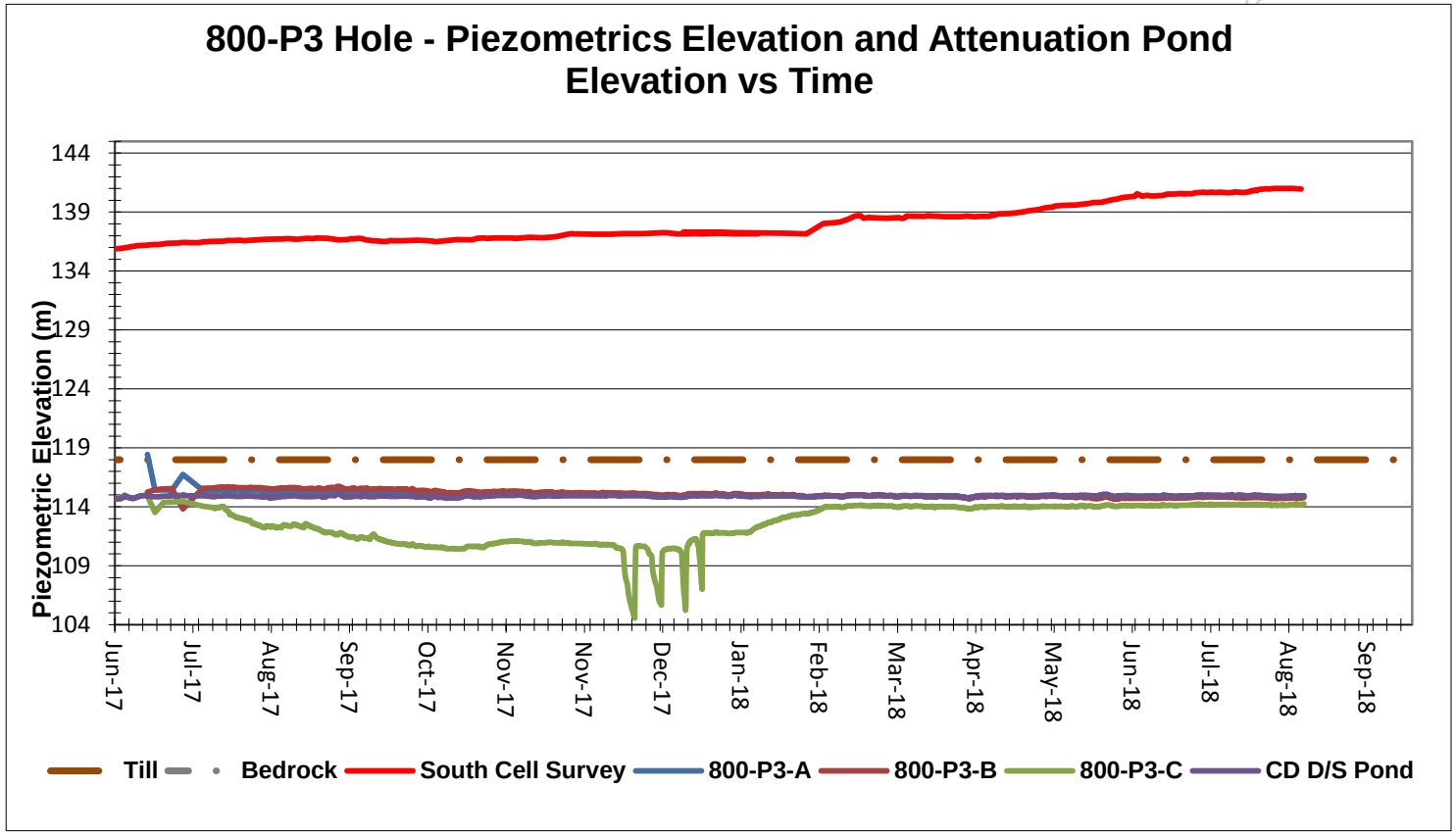


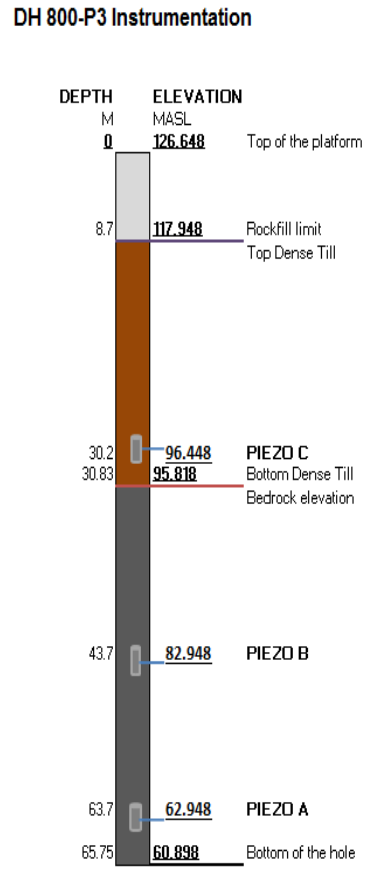


PIEZOMETERS 800-P3

- New instrument installed in 2017
- Piezo are stable
- Piezo A, B & C readings are similar to the D/S pond elevation readings

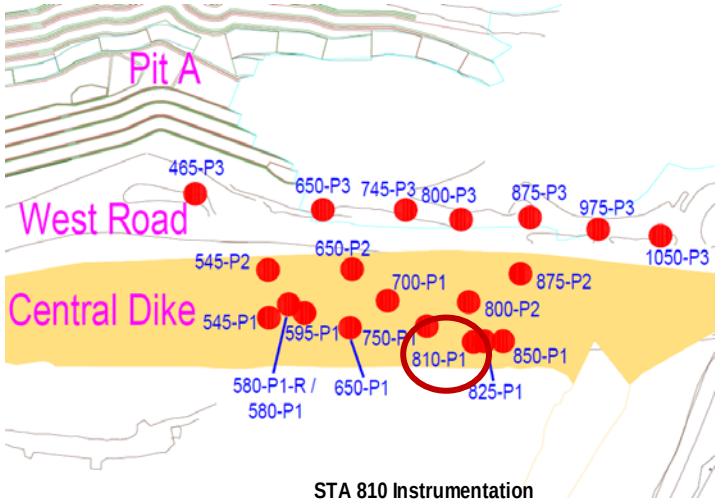




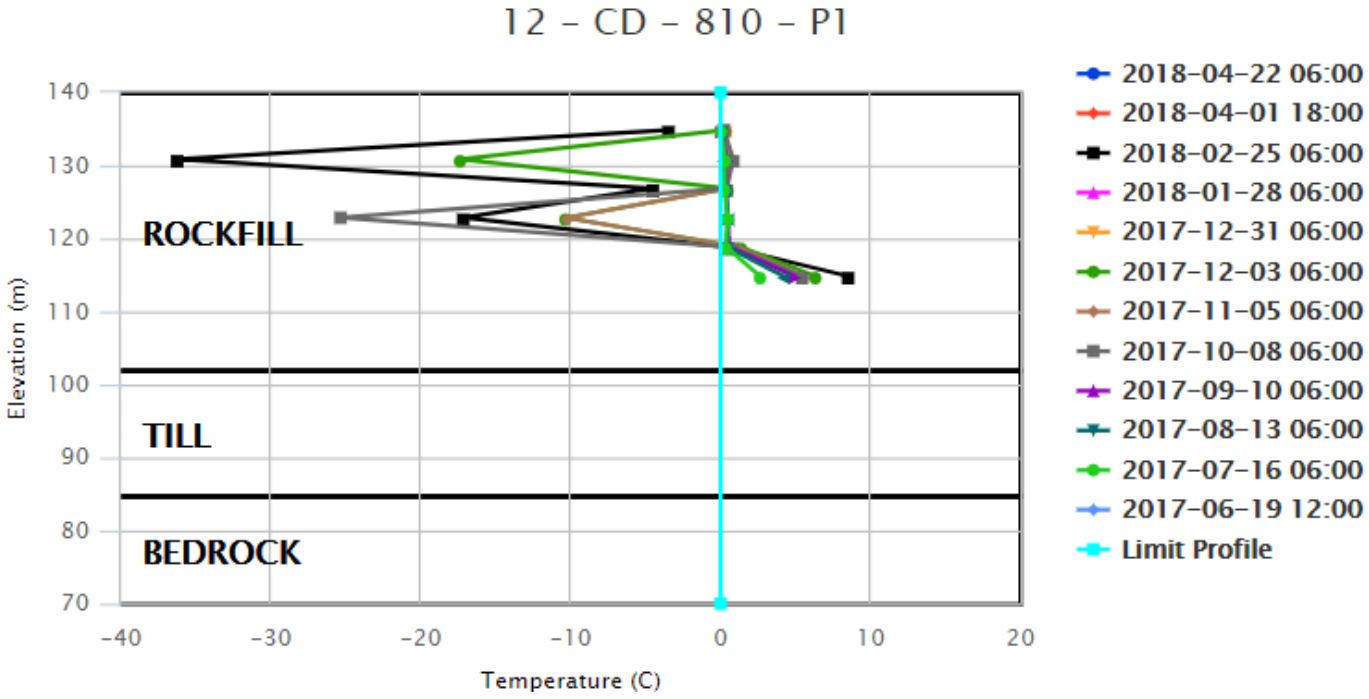


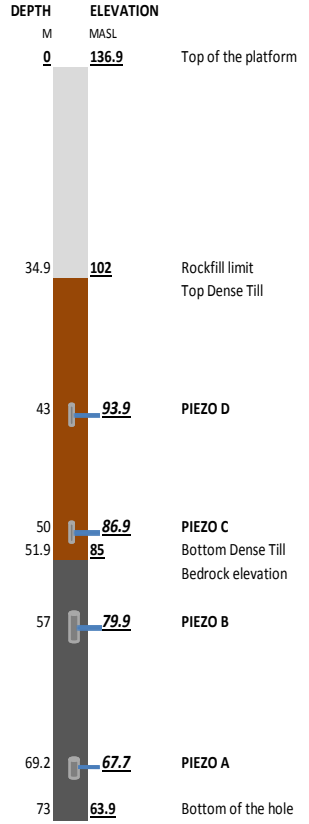
THERMISTOR 810-P1

- Bead below El. 114.84 m stop working in February 2017
- Higher temperature observed in this hole (might be the instrument progressively failing)



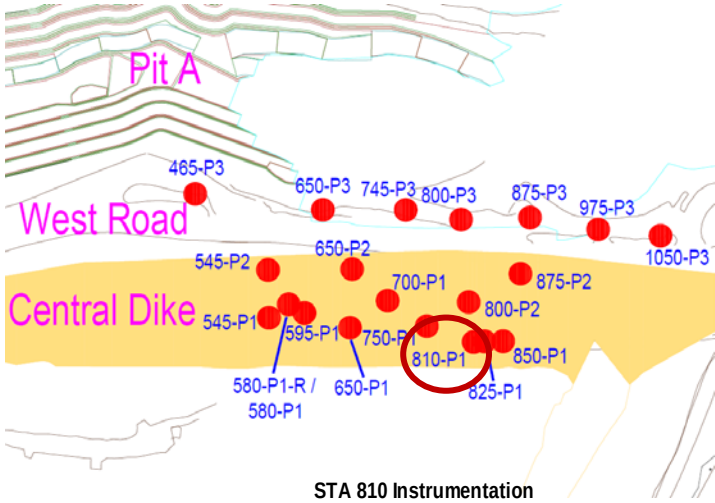
STA 810 Instrumentation



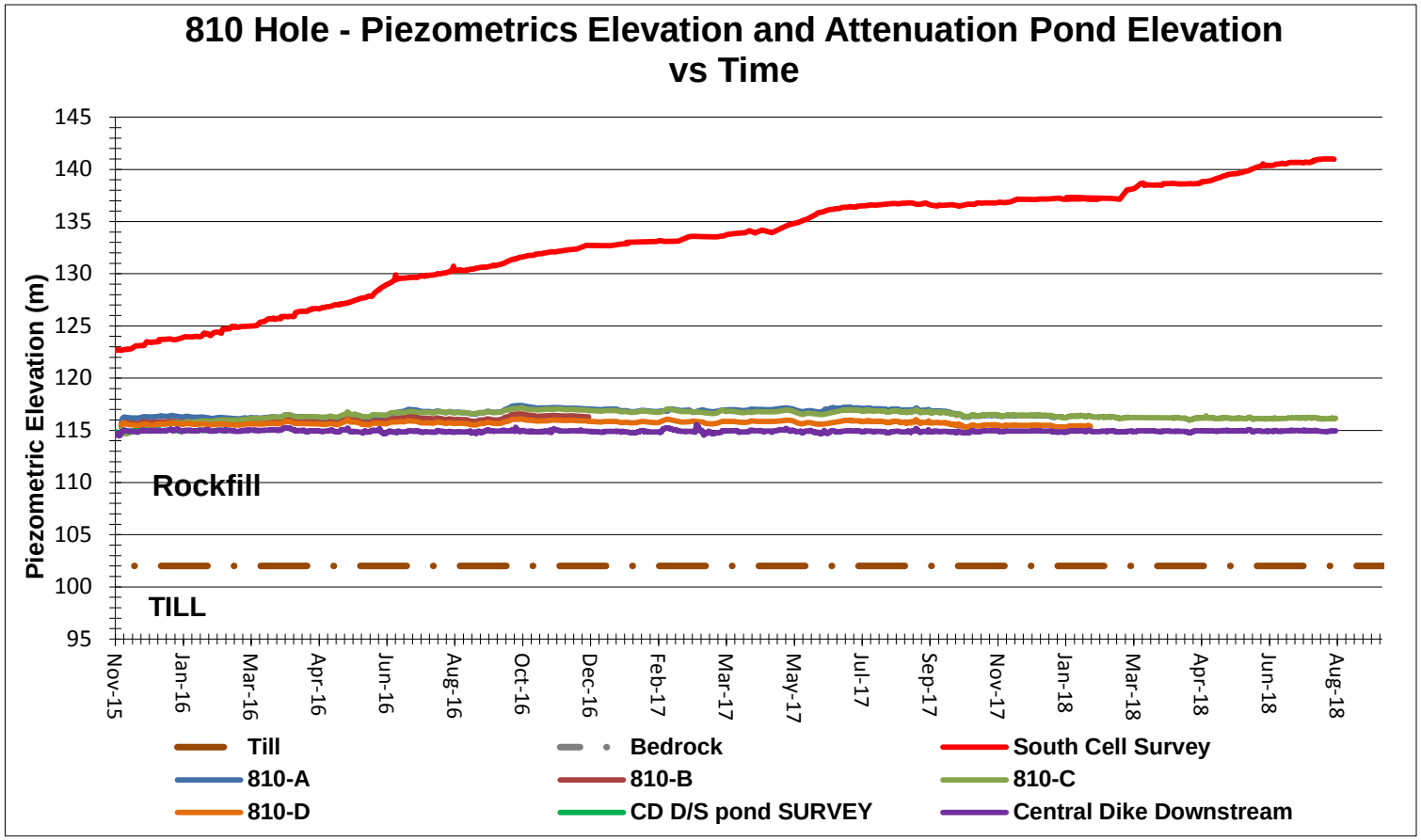


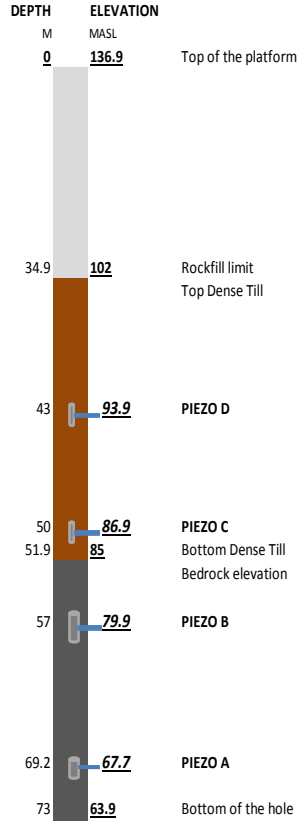
PIEZOMETER 810-P1

- Piezo B stop working in December 2016
- Piezo A stop working in December 2017
- Piezo D stop working in May 2018
- Piezo C is following the elevation change of the D/S pond



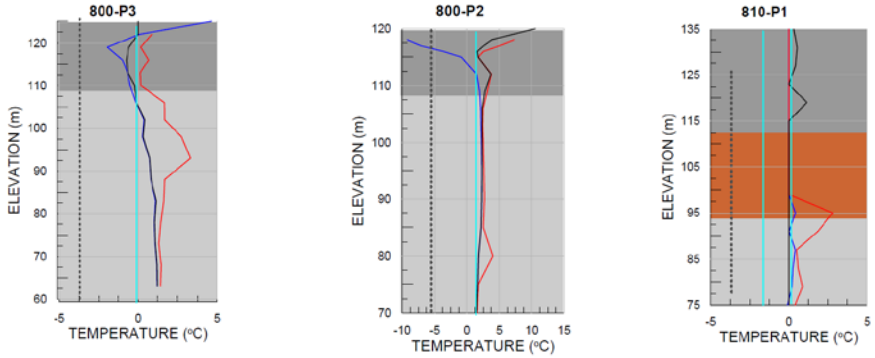
STA 810 Instrumentation

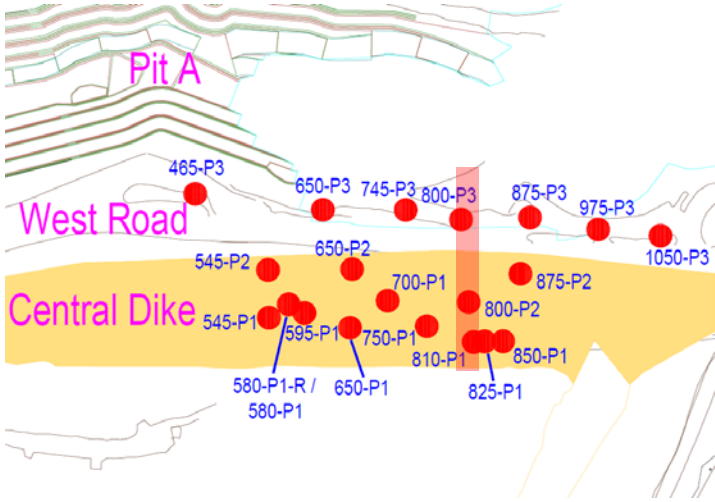




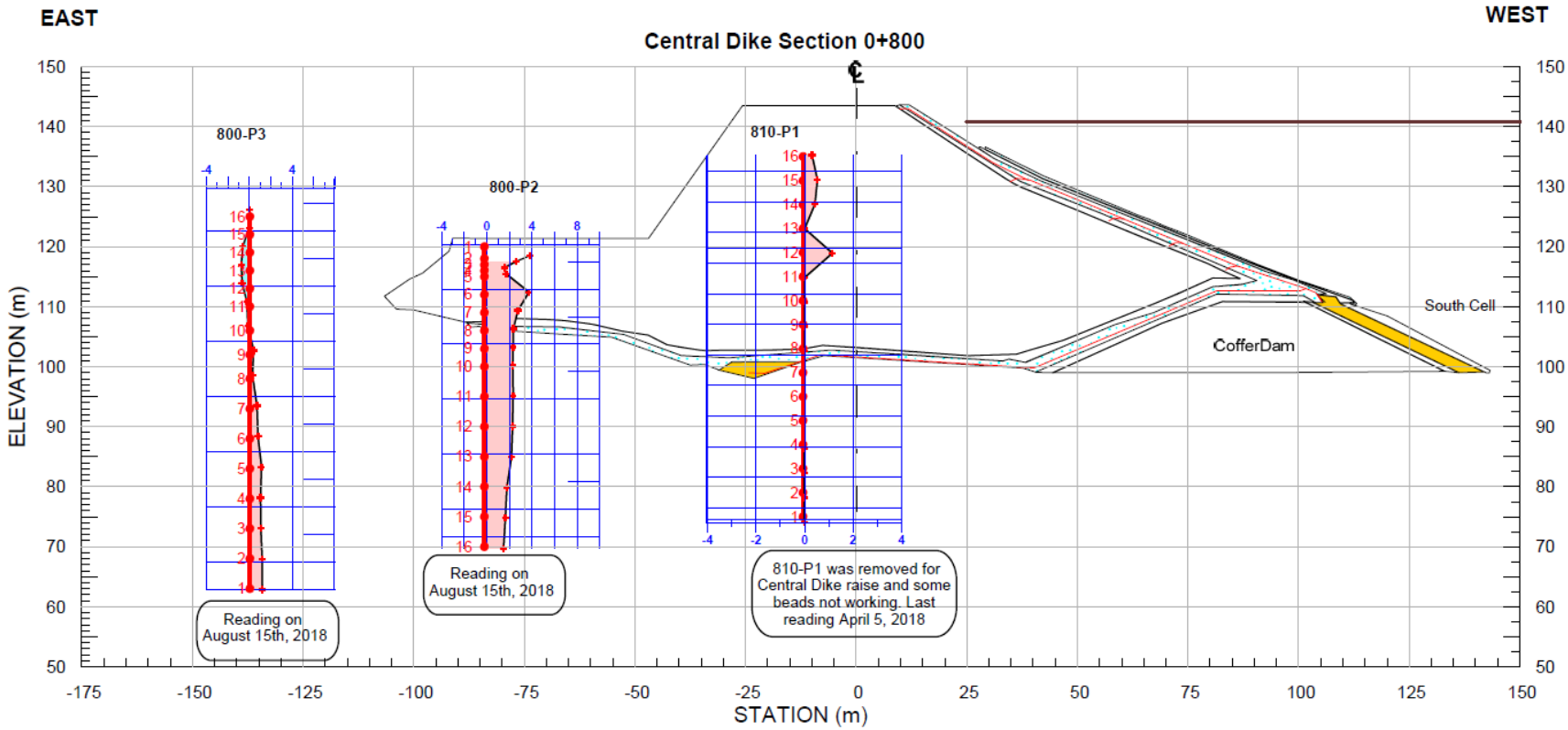
SECTION 800-810

THERMISTOR READINGS FROM AUGUST 2017 - 2018



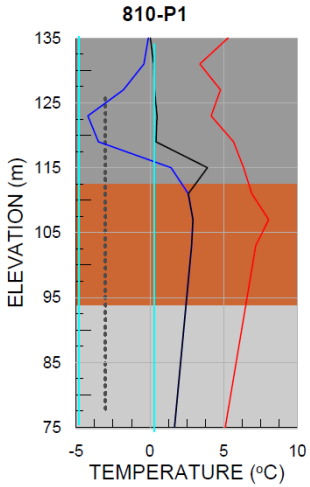


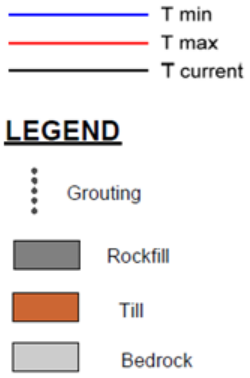
THERMISTOR READINGS AUGUST 15TH, 2018

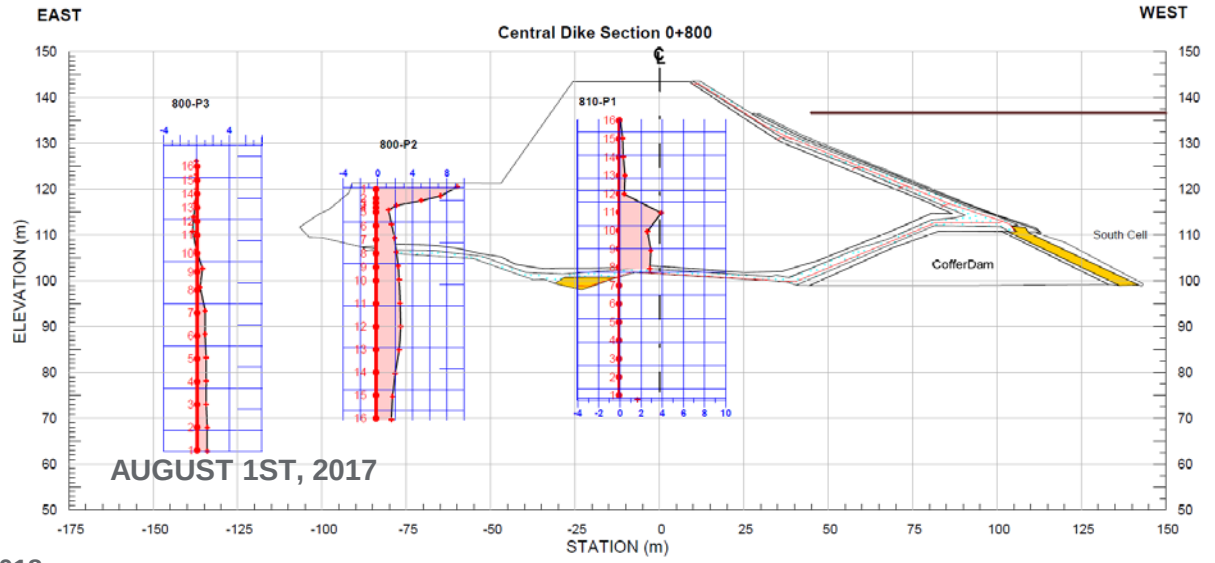


SECTION 800-810

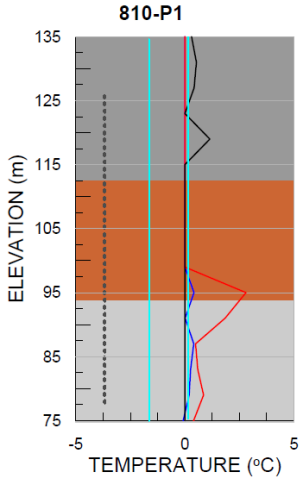
THERMISTOR READINGS FROM AUGUST 2016 - 2017

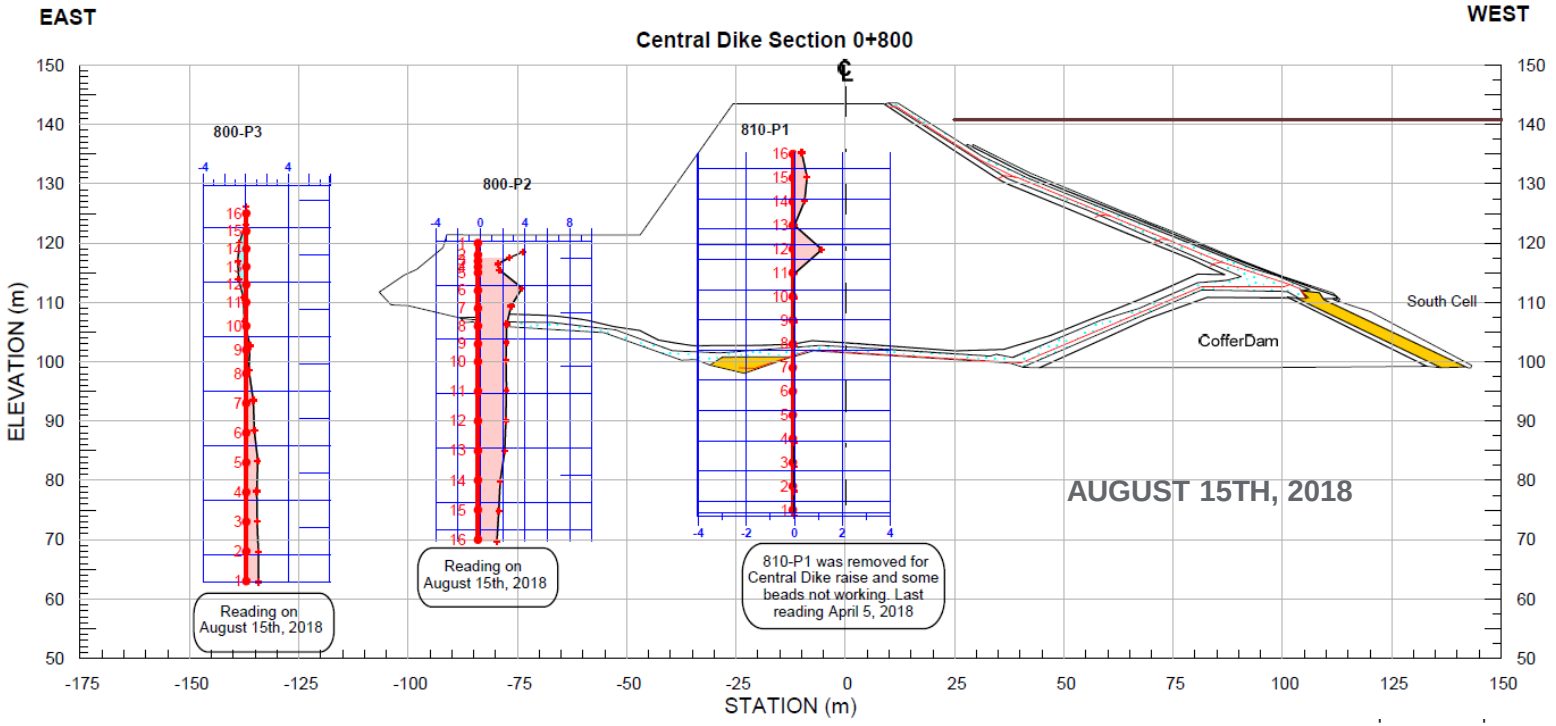






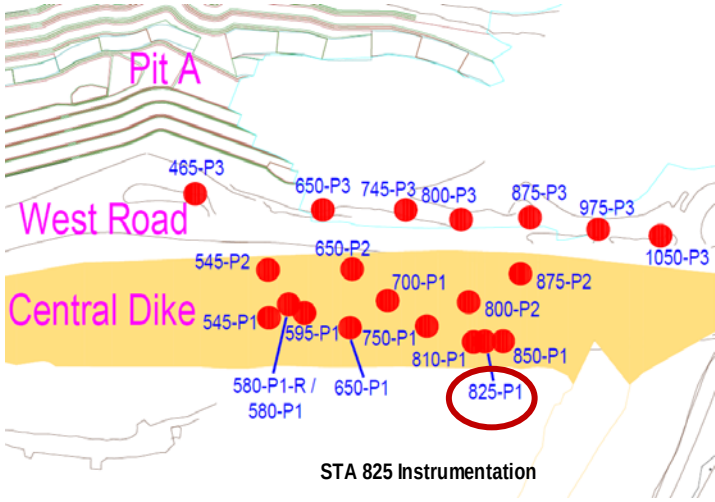
THERMISTOR READINGS FROM AUGUST 2017 - 2018



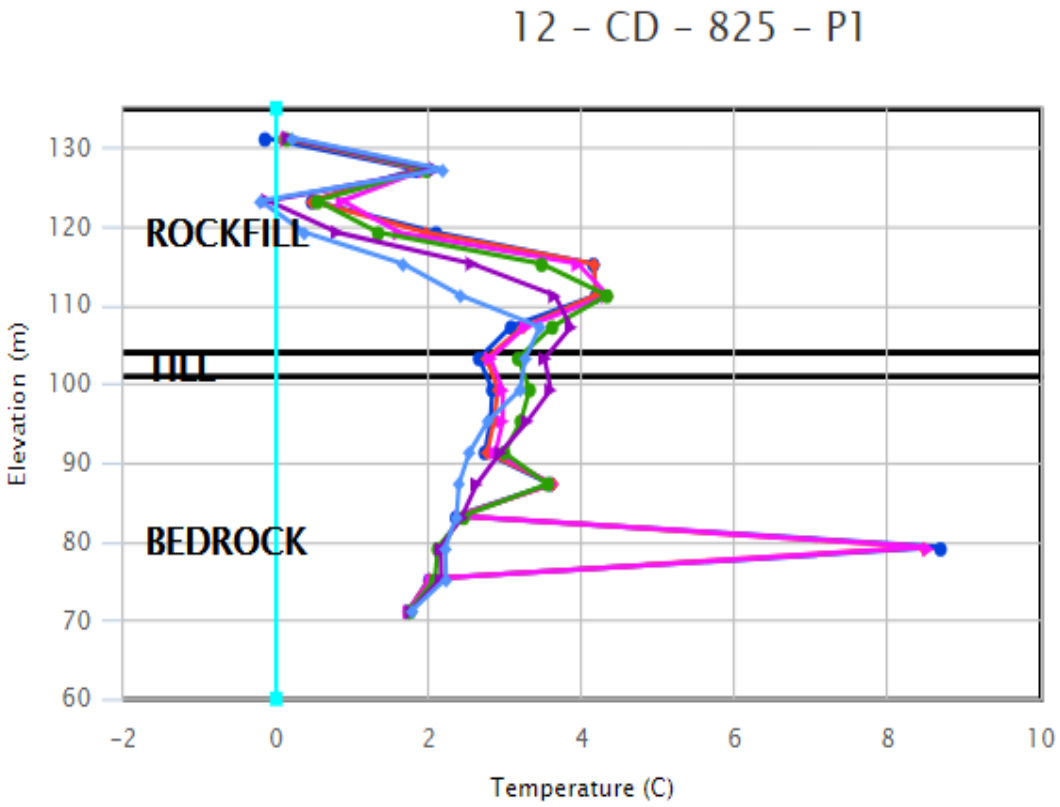


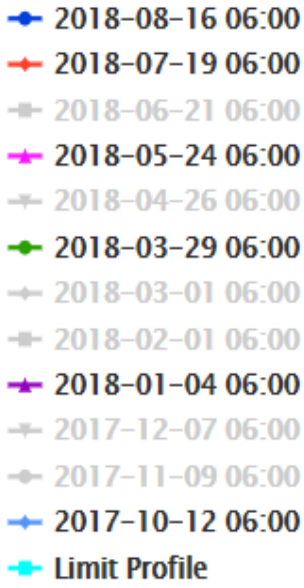
THERMISTOR 825-P1

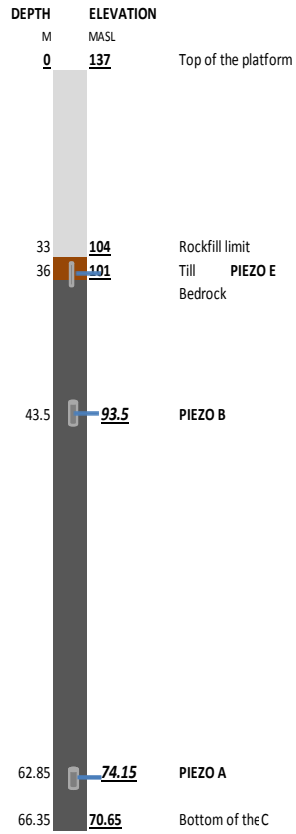
- Capacitance effect at elevation 79.25 MASL and 87.5 MASL.
- Peak of temperature at El.111 MASL (4.1 ˚C)



STA 825 Instrumentation

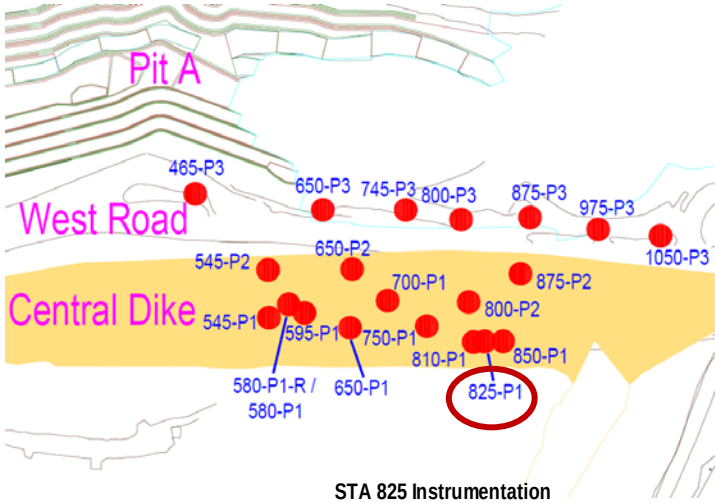




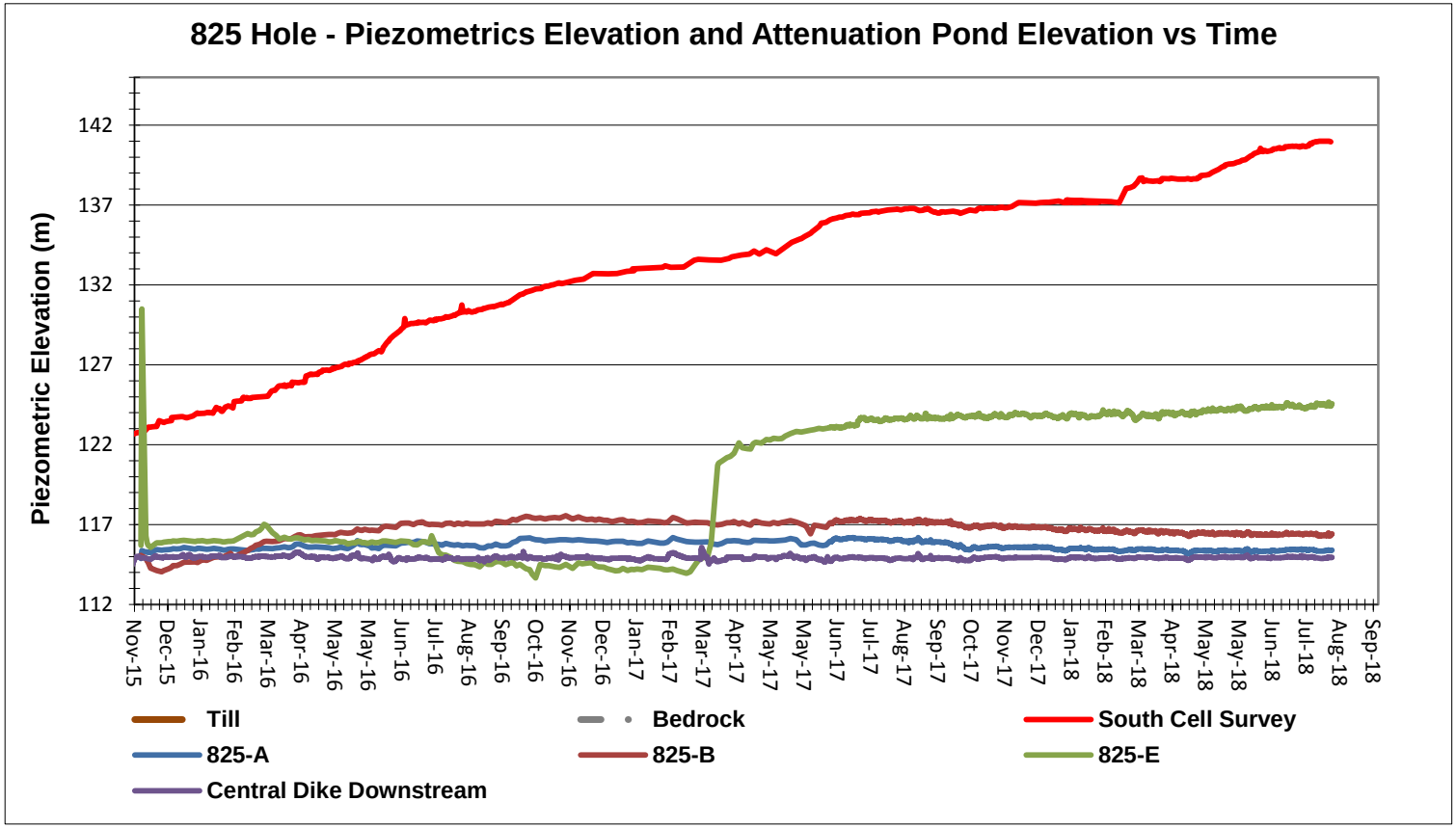


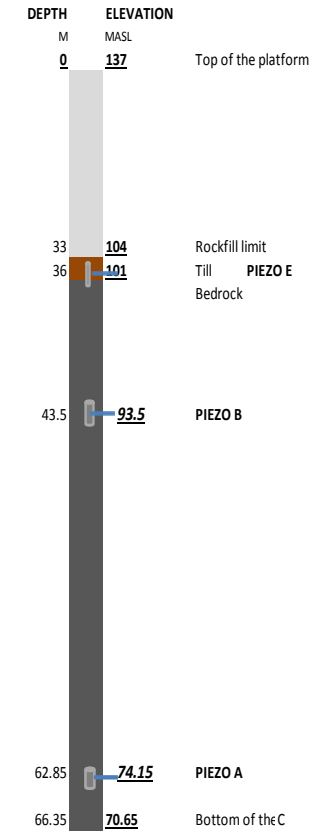
PIEZOMETER 825-P1

- Increased in piezometric elevation of Piezo E since April 2017. Seem to be connected now with South Cell.
- Piezo A and B showing readings similar to the D/S pond and are reacting directly with elevation change.



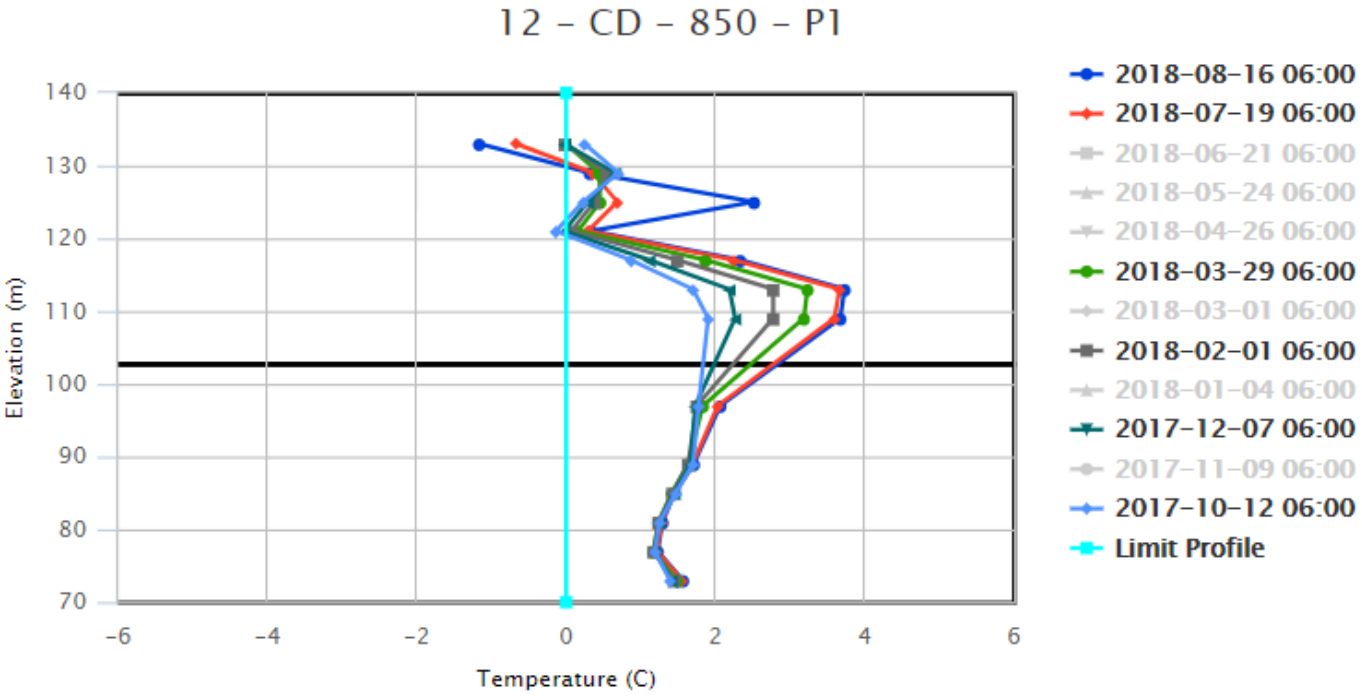
STA 825 Instrumentation

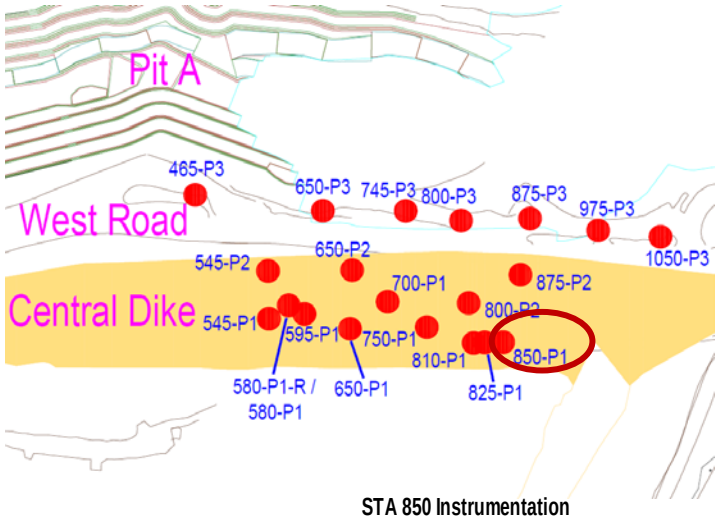




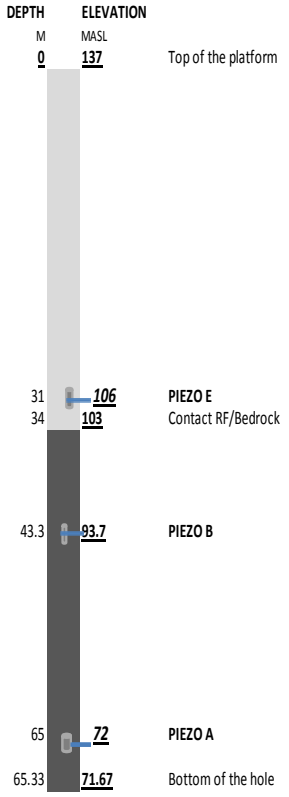
THERMISTOR 850-P1

- Temperature above 0º C in bedrock at 850-P1
- General temperature rising since the end of 2017
- Peak of temperature at El.125 MASL



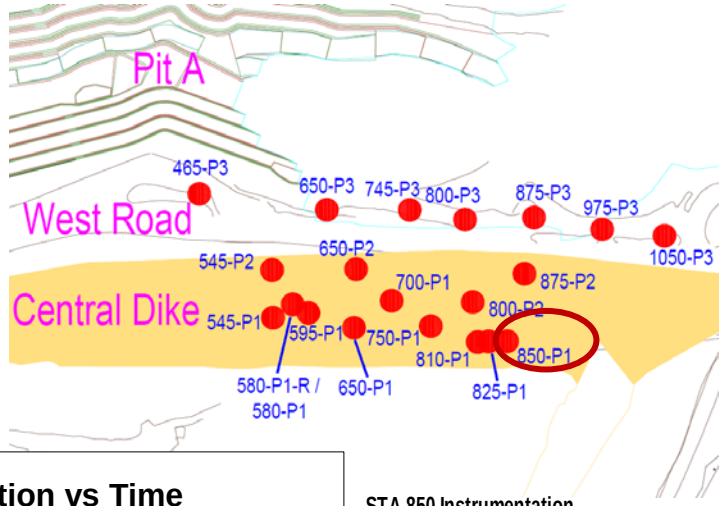


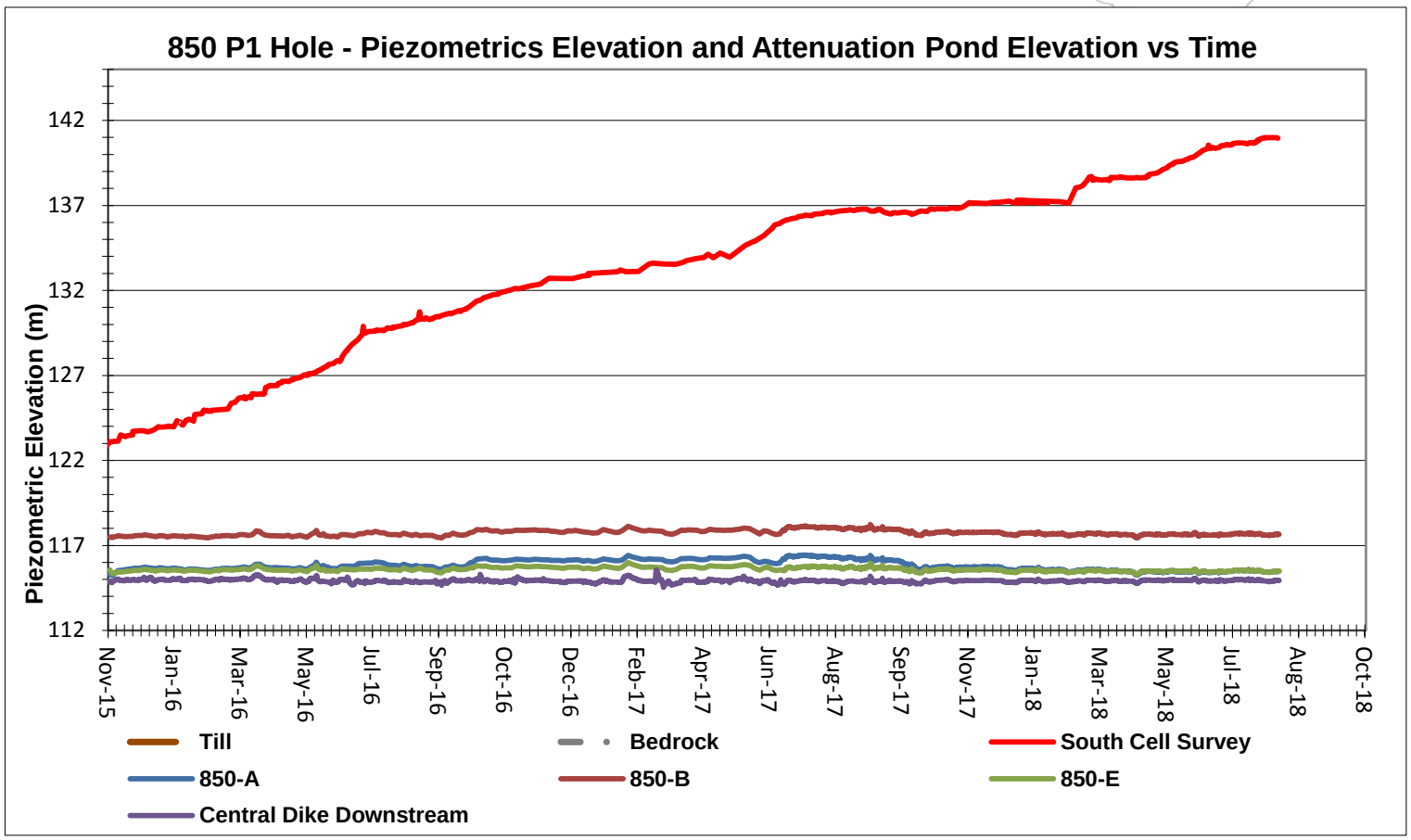
STA 850 Instrumentation

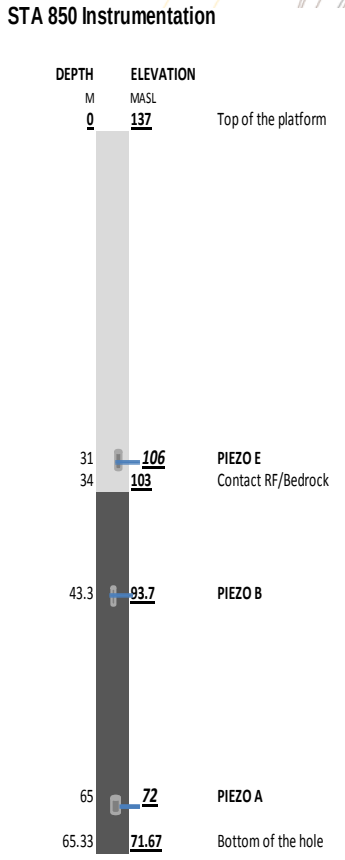


PIEZOMETER 850-P1

- All piezometer are following the trend of the D/S pond regime
- However piezo B is one of the highest in the piezometer readings that have stable reading (117.7m)

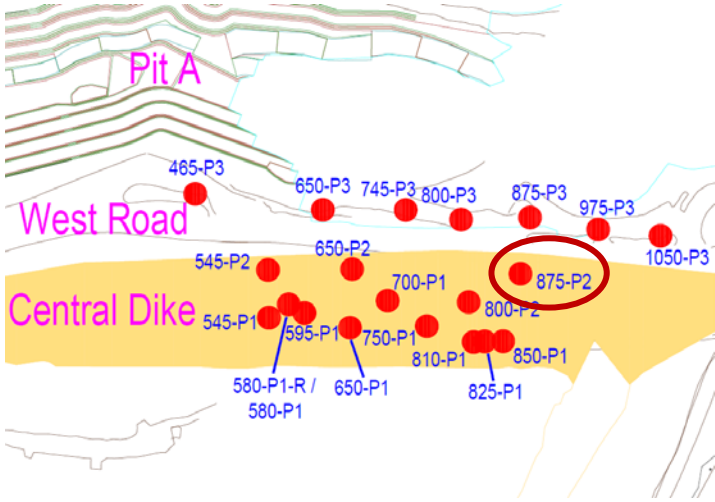


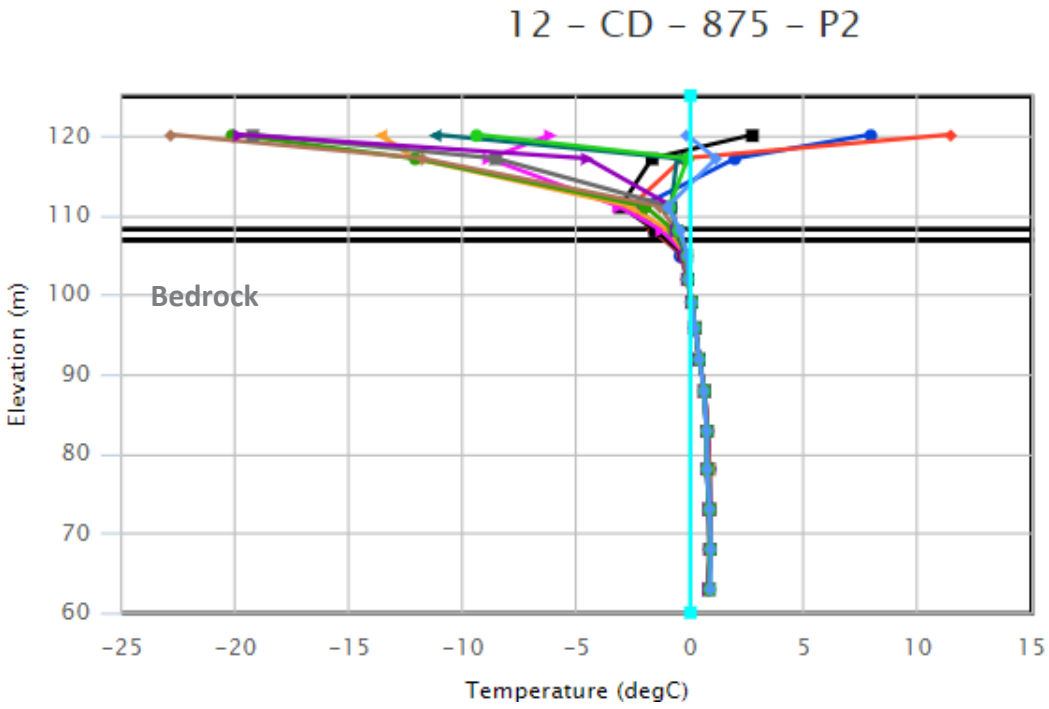


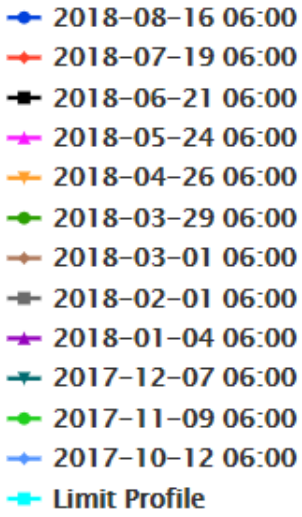


THERMISTOR 875-P2

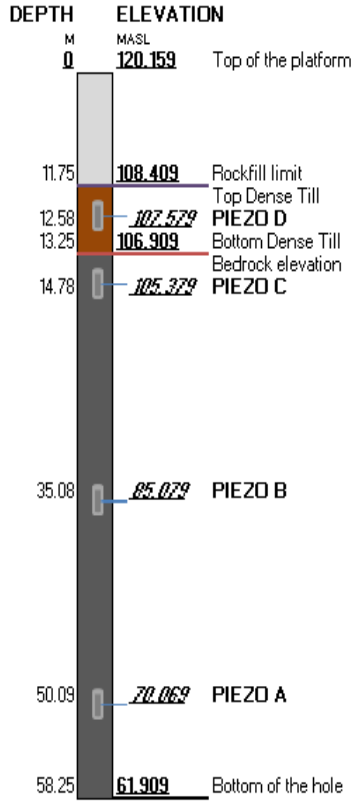
- New thermistor installed in 2017
- Bedrock temperature above 0º C





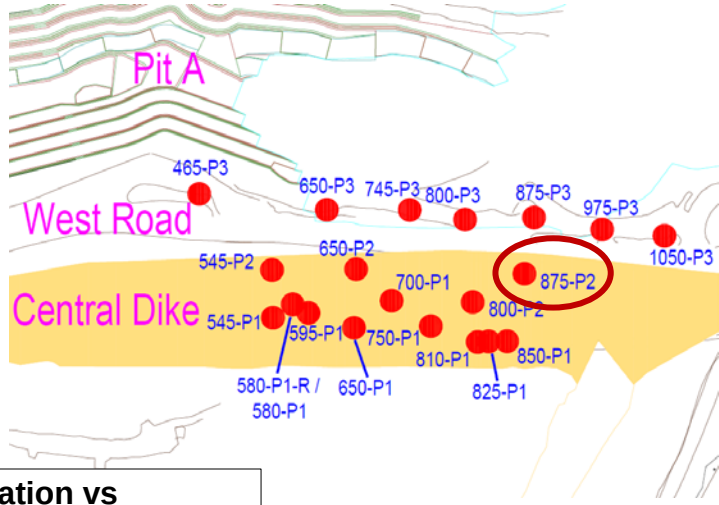


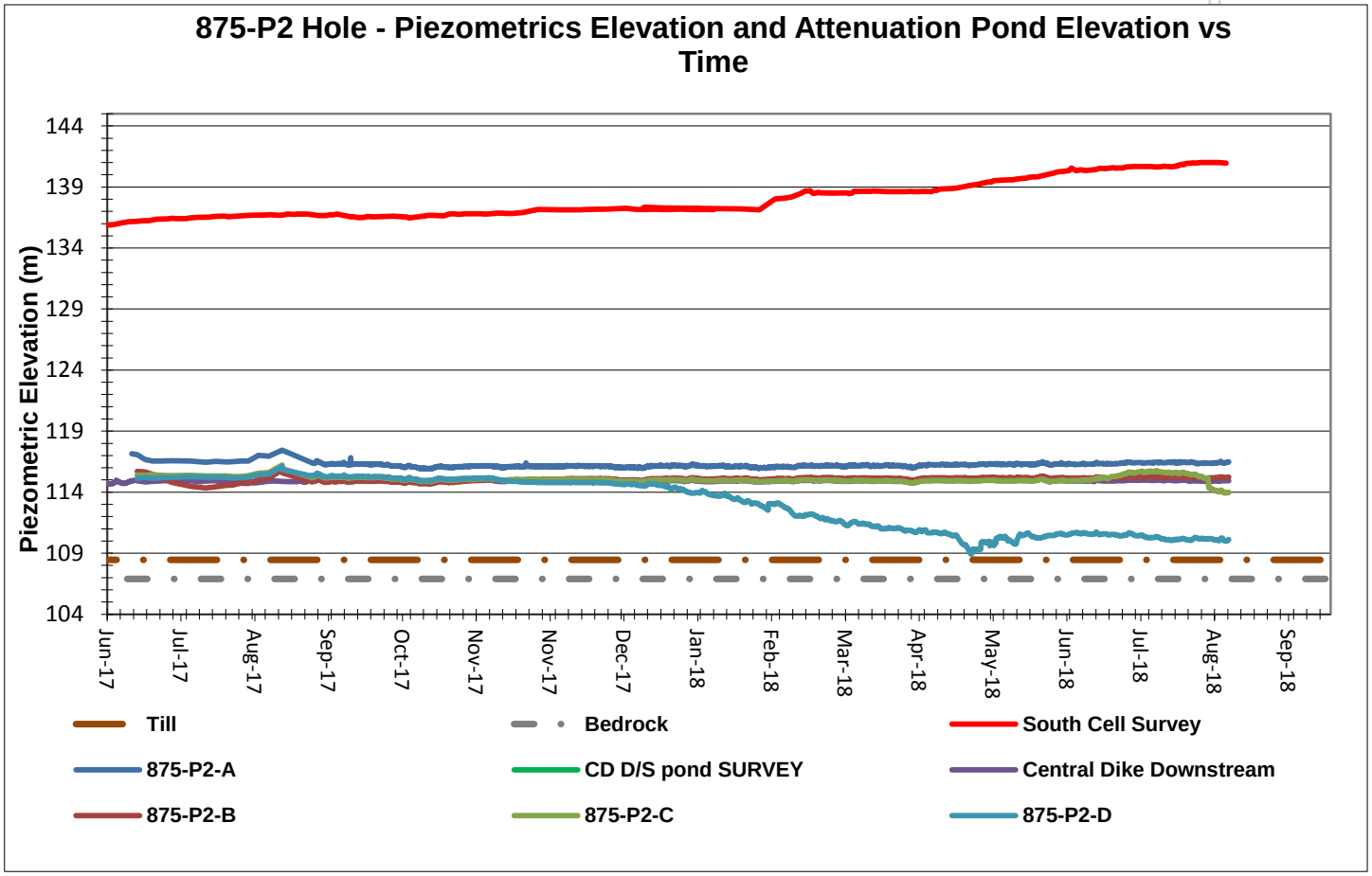
DH 875-P2 Instrumentation

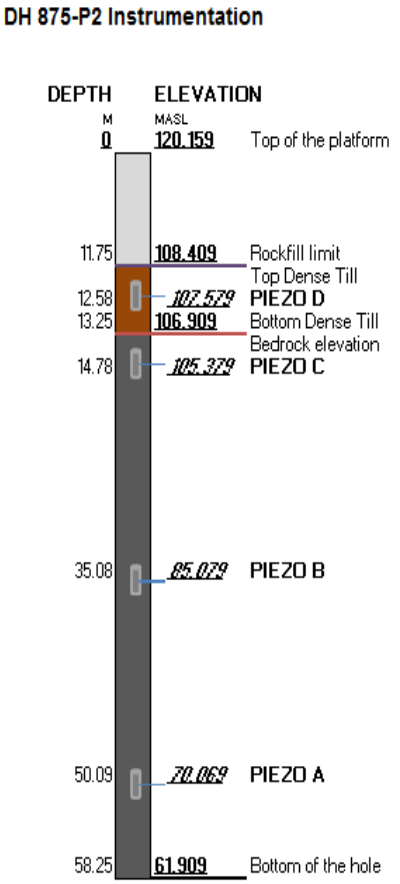


PIEZOMETER 875-P2

- All piezometer are following the trend of the D/S pond regime
- PZ-D show temperatures under the freezing point

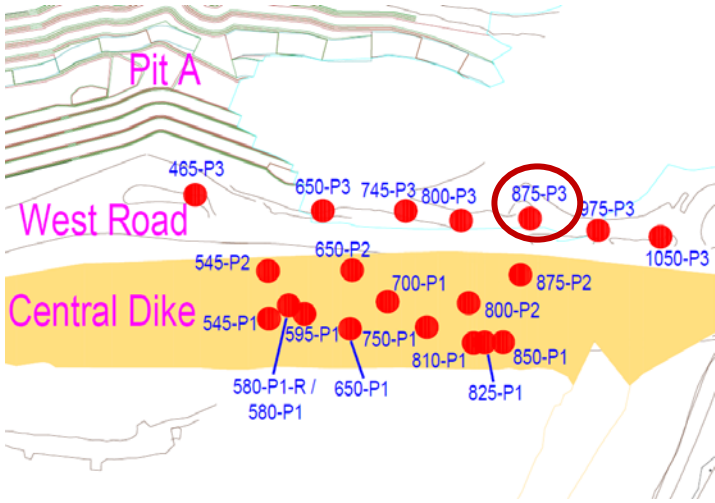


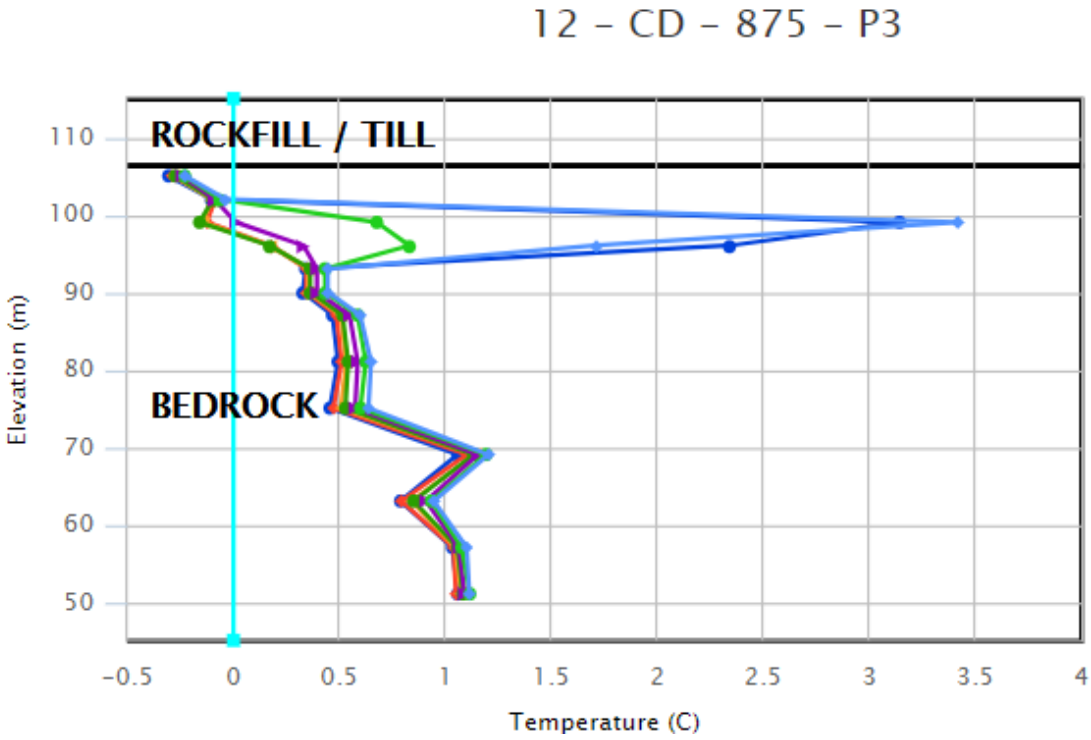


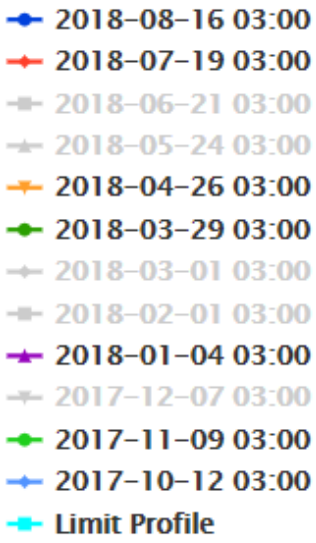


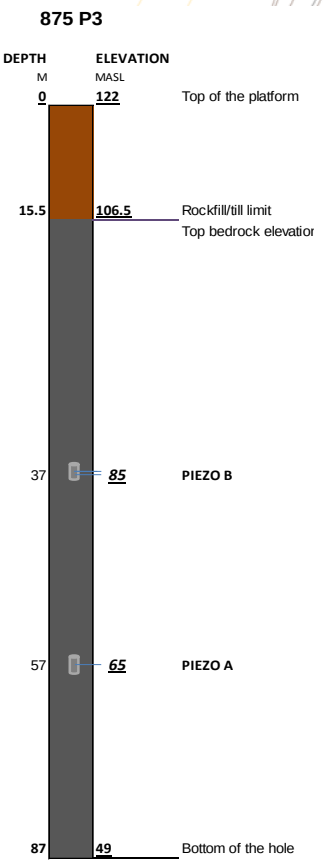
THERMISTOR 875-P3

- Temperature above 0º C in bedrock at 875-P3
- Temperature spike at El.96 m and 99 m are realted to capicitance effect.



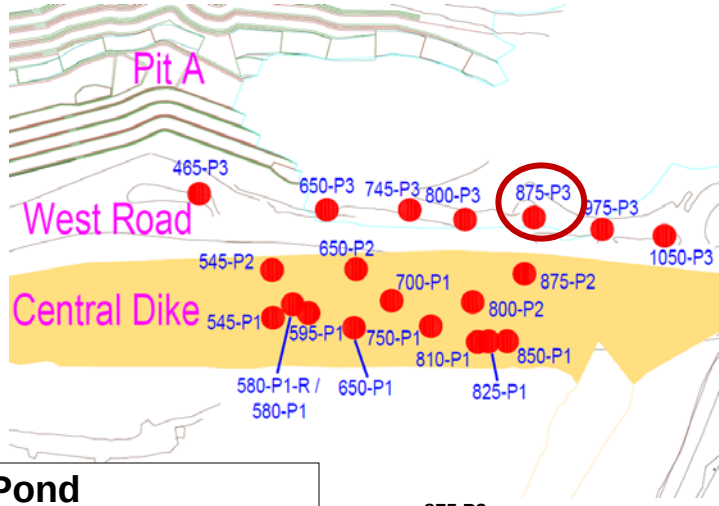


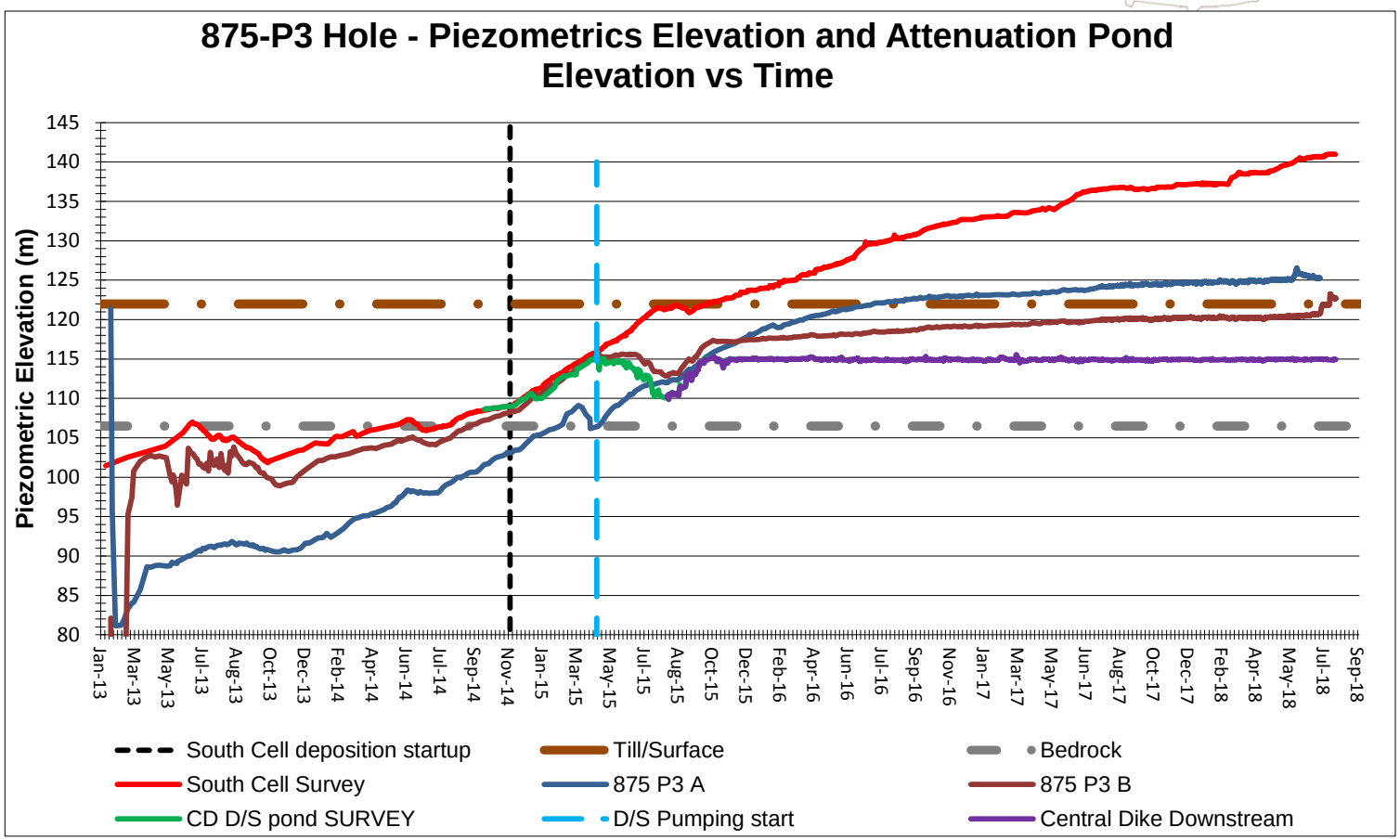


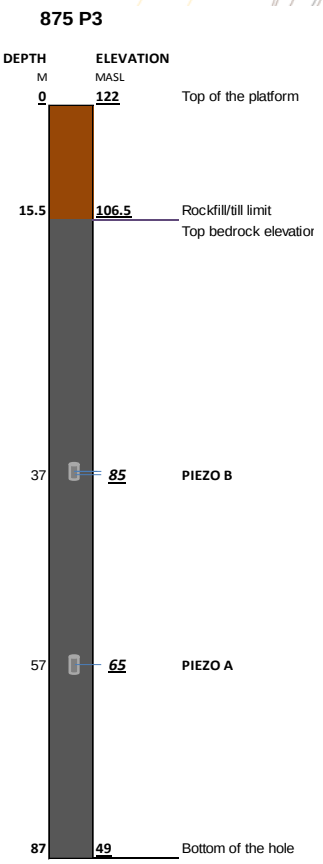


PIEZOMETER 875-P3

- Piezometer at 875-P3 are in bedrock and are impacted by increase in South Cell head

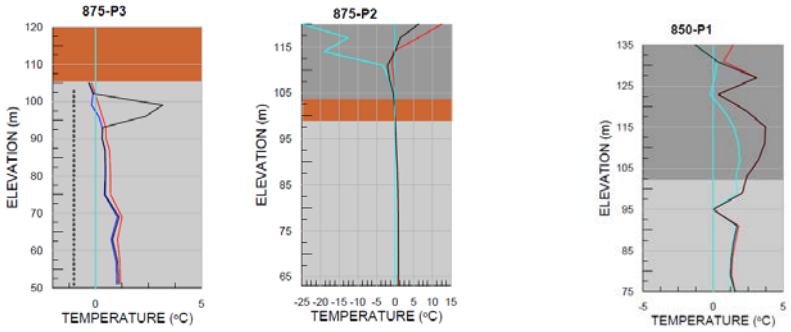


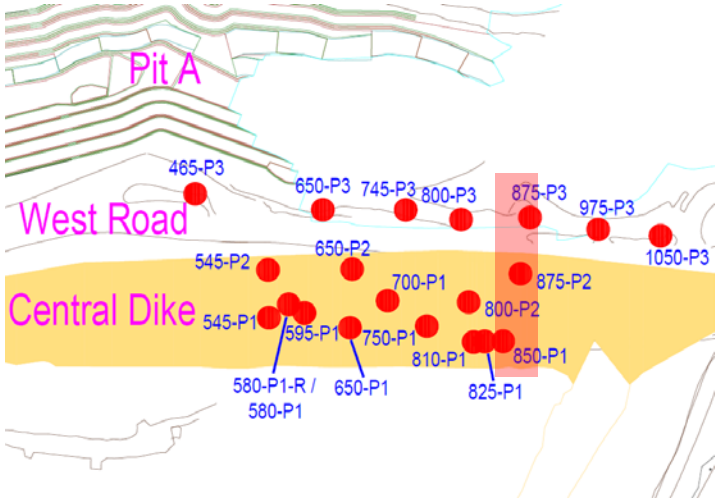




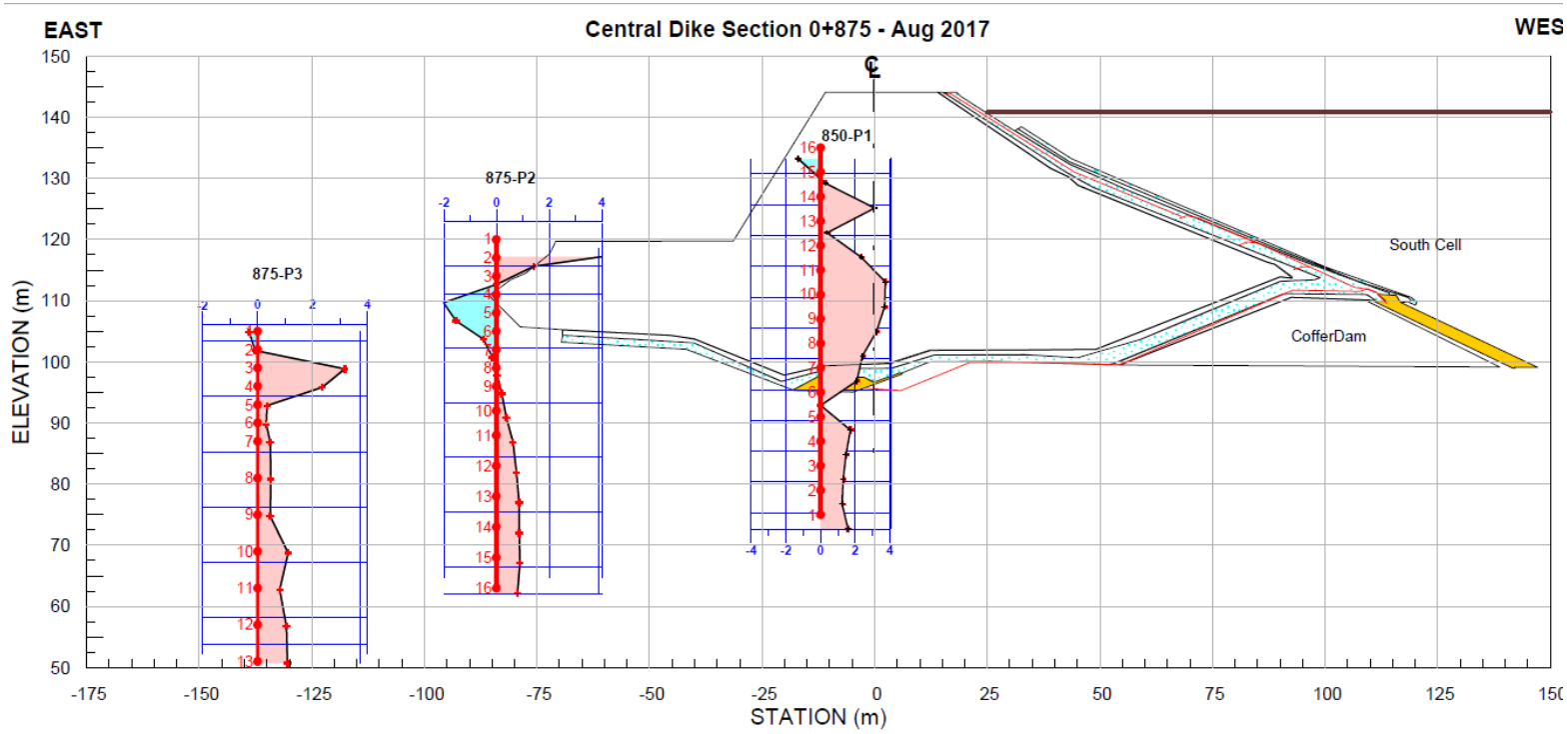
SECTION 850-875

THERMISTOR READINGS FROM AUGUST 2017 - 2018



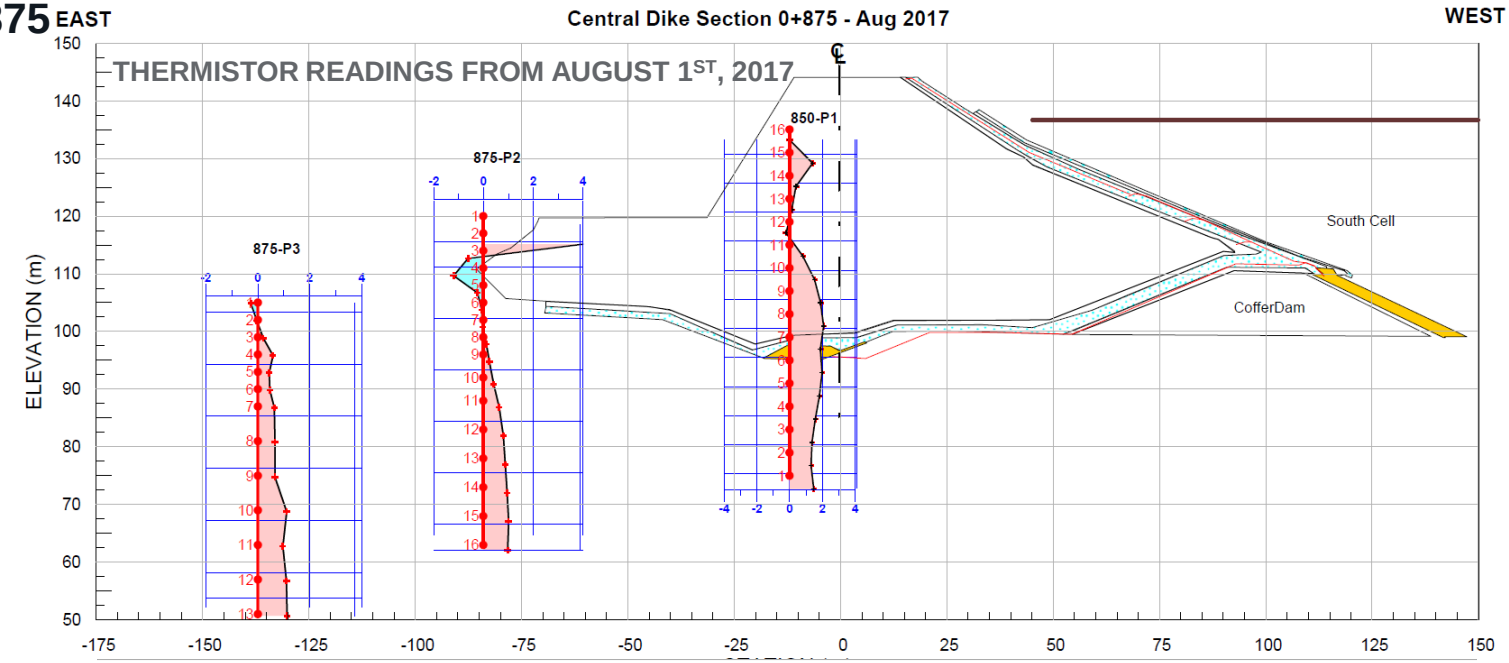


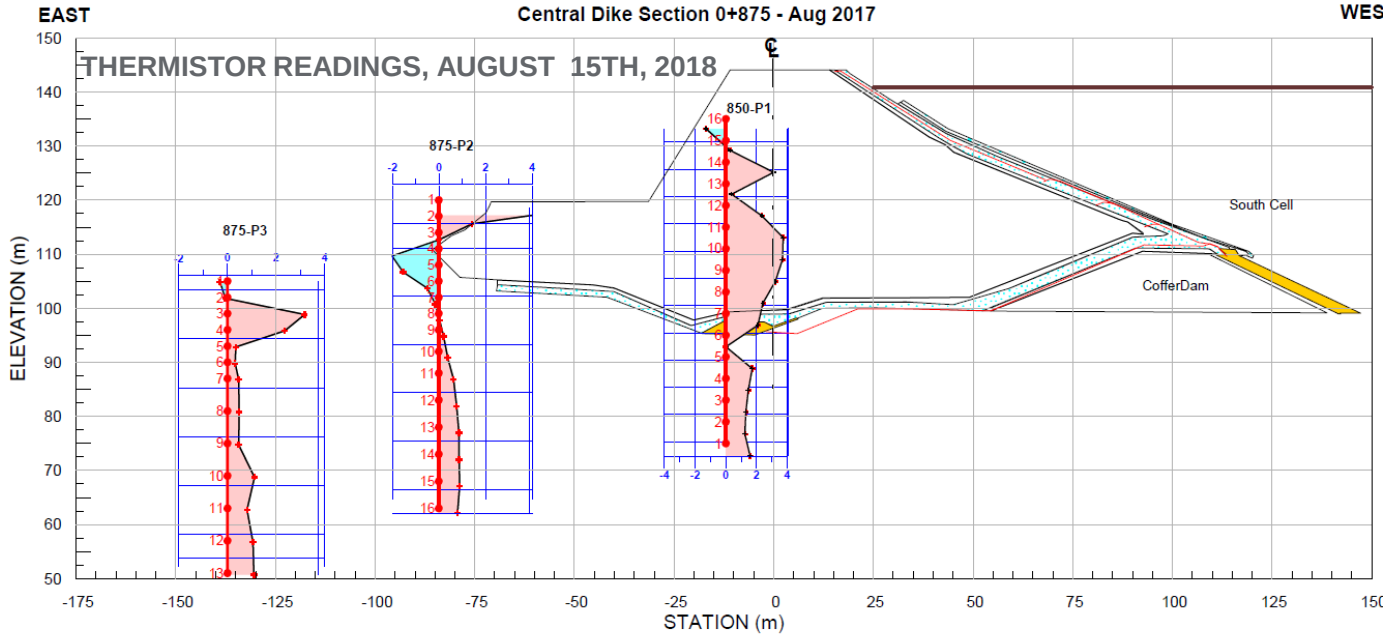
THERMISTOR READINGS AUGUST 15TH, 2018



Readings on August 15th, 2018

SECTION 850-875

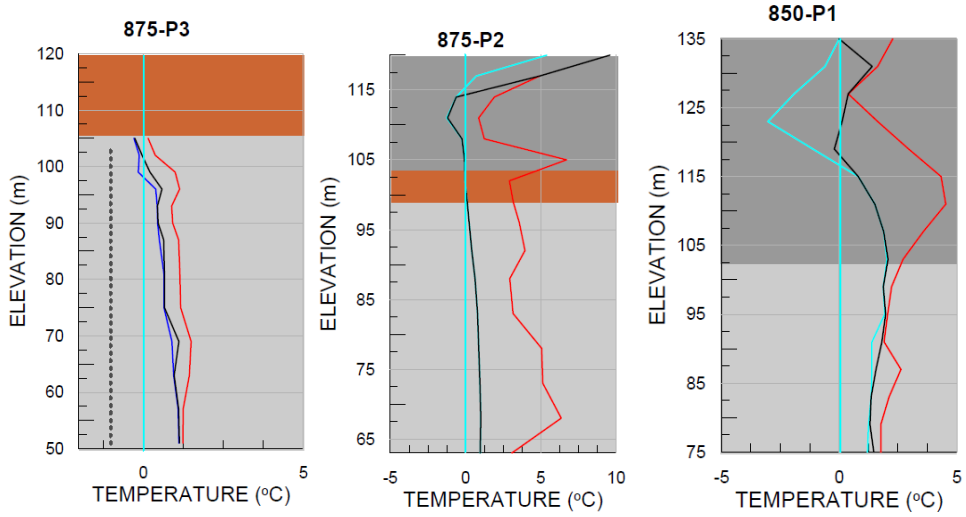




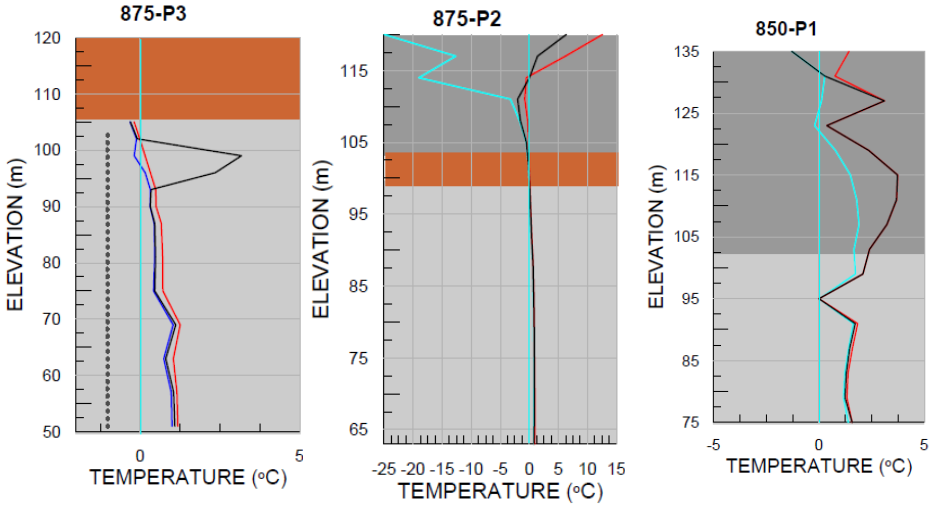
Readings on August 15th, 2018

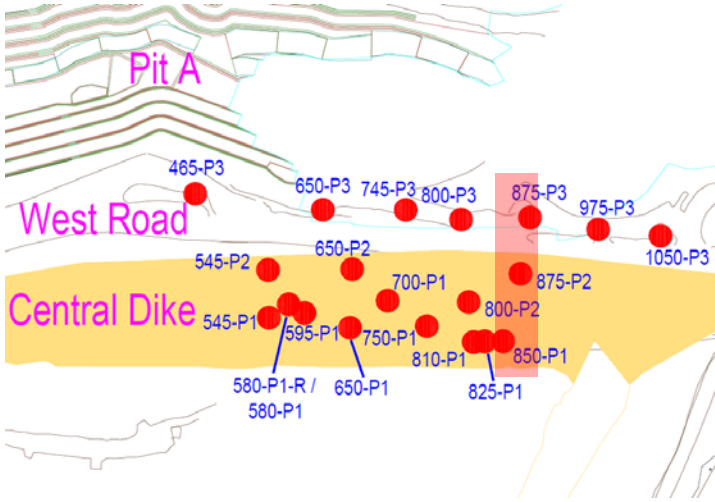
SECTION 850-875

THERMISTOR READINGS AUGUST 2016-2017



THERMISTOR READINGS AUGUST 2017-2018





T min
T max
T current

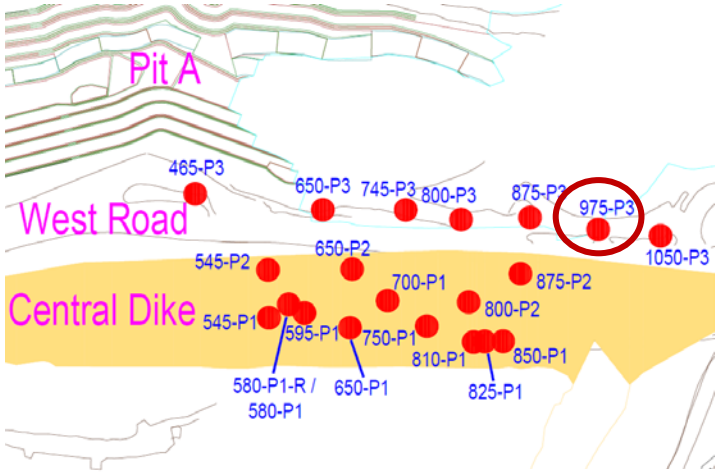
LEGEND

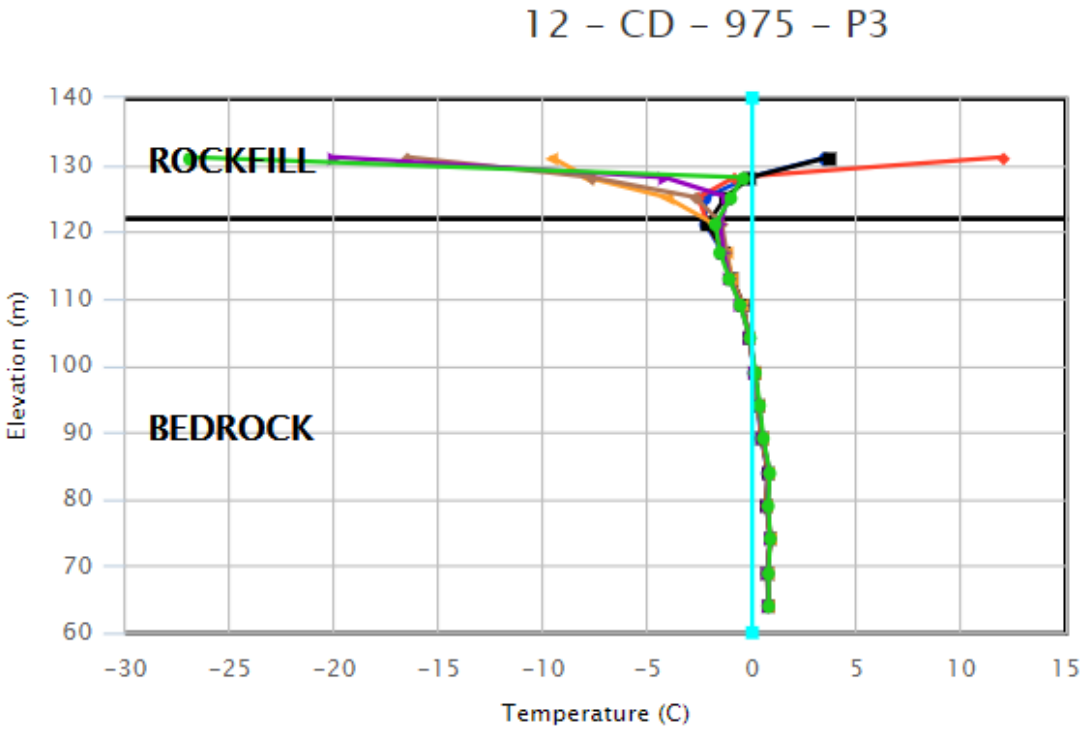
Grouting
Rockfill
Till
Bedrock

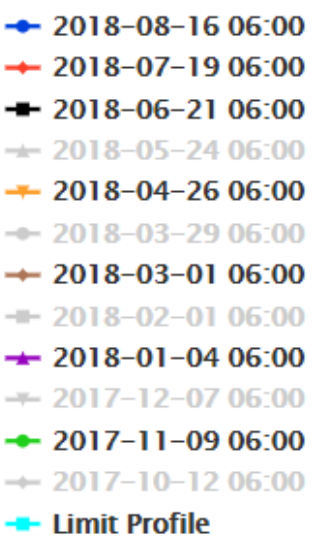
2018 graph are showing the good representation of the bedrock/till/rockfill units

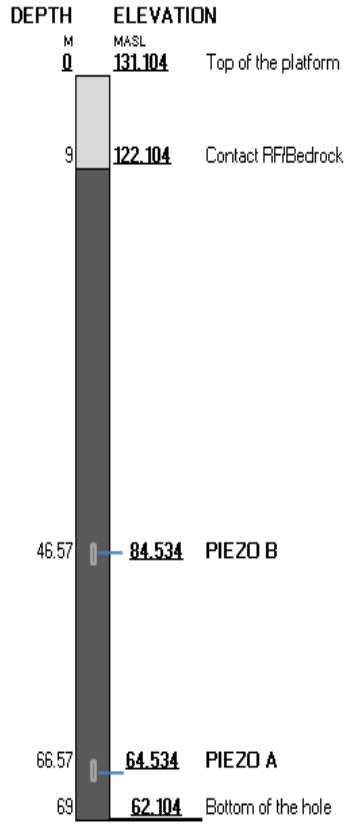
THERMISTOR 975-P3

- New instrument installed in 2017
- Temperature above 0º C in bedrock below El. 105 m



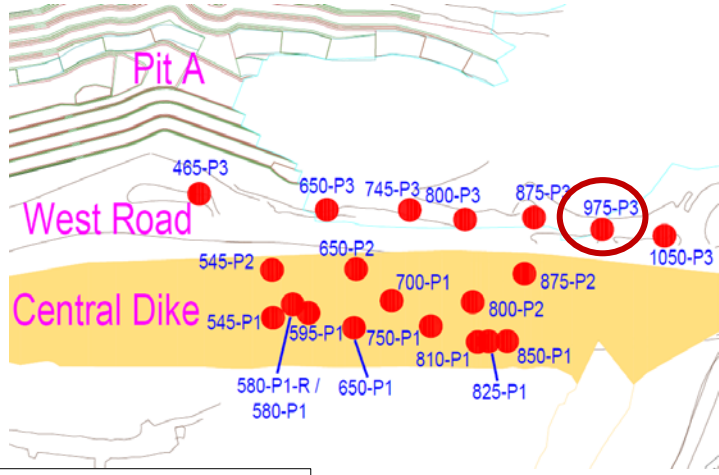


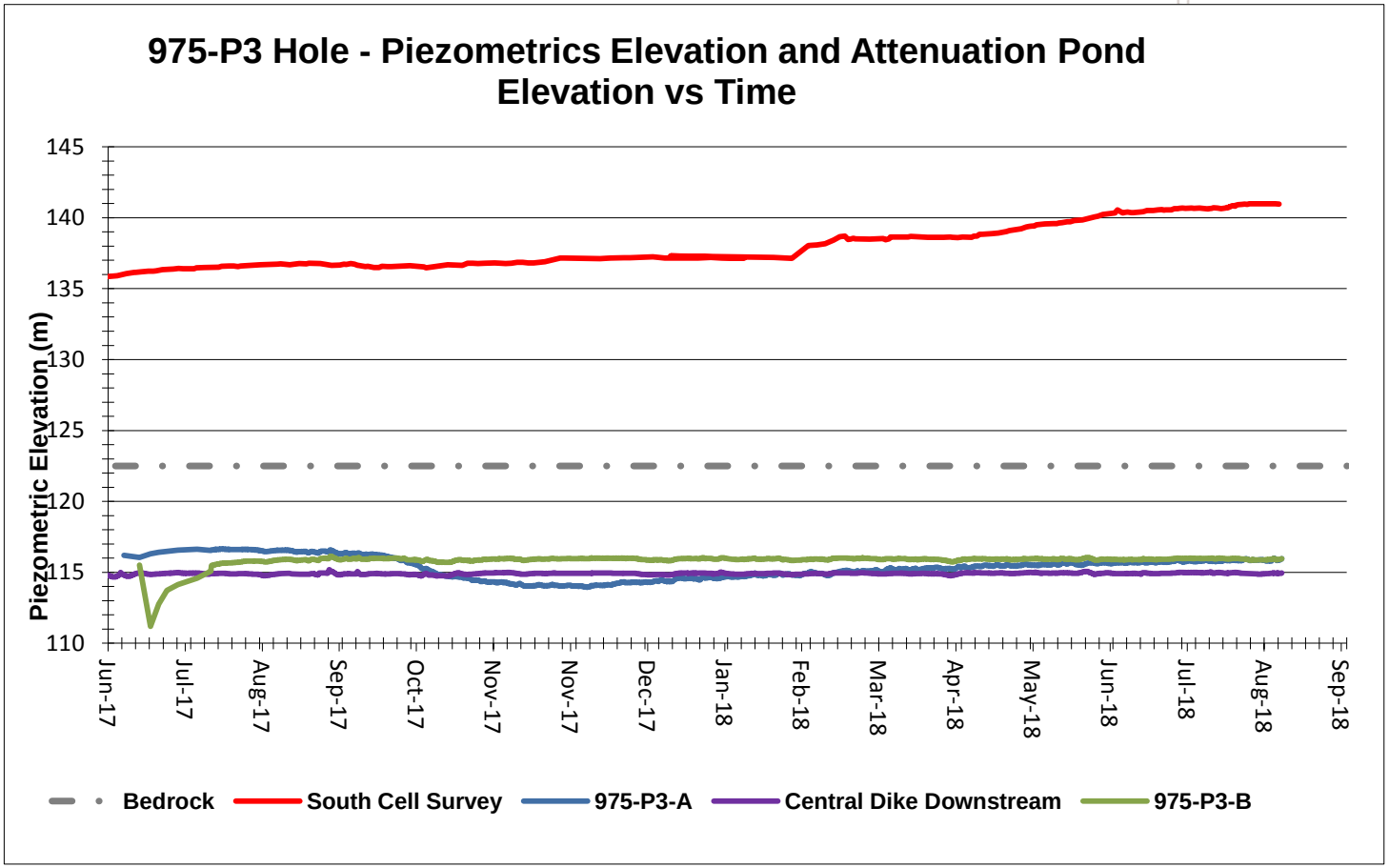


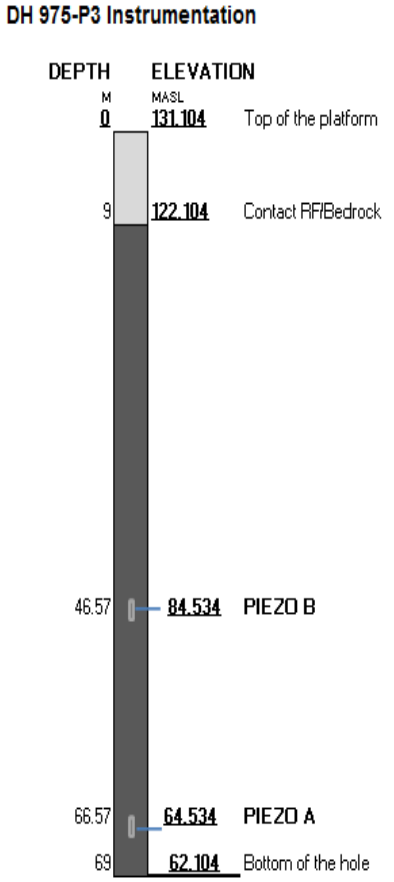


PIEZOMETER 975-P3

- New instrument installed in 2017
- Both piezometers are following the trend of the D/S pond regime

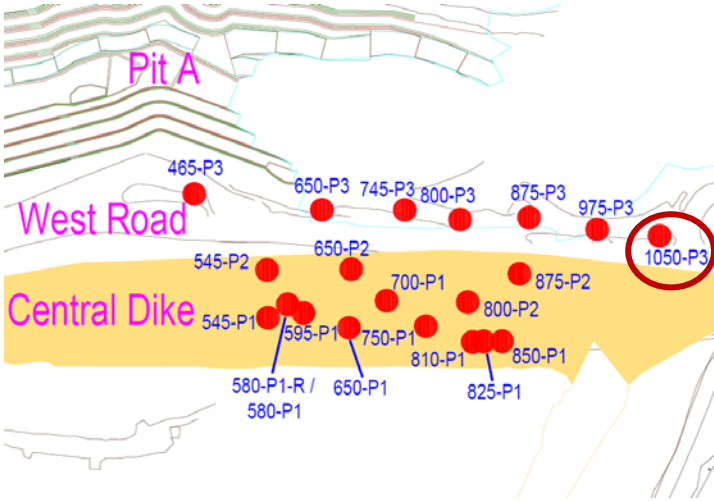


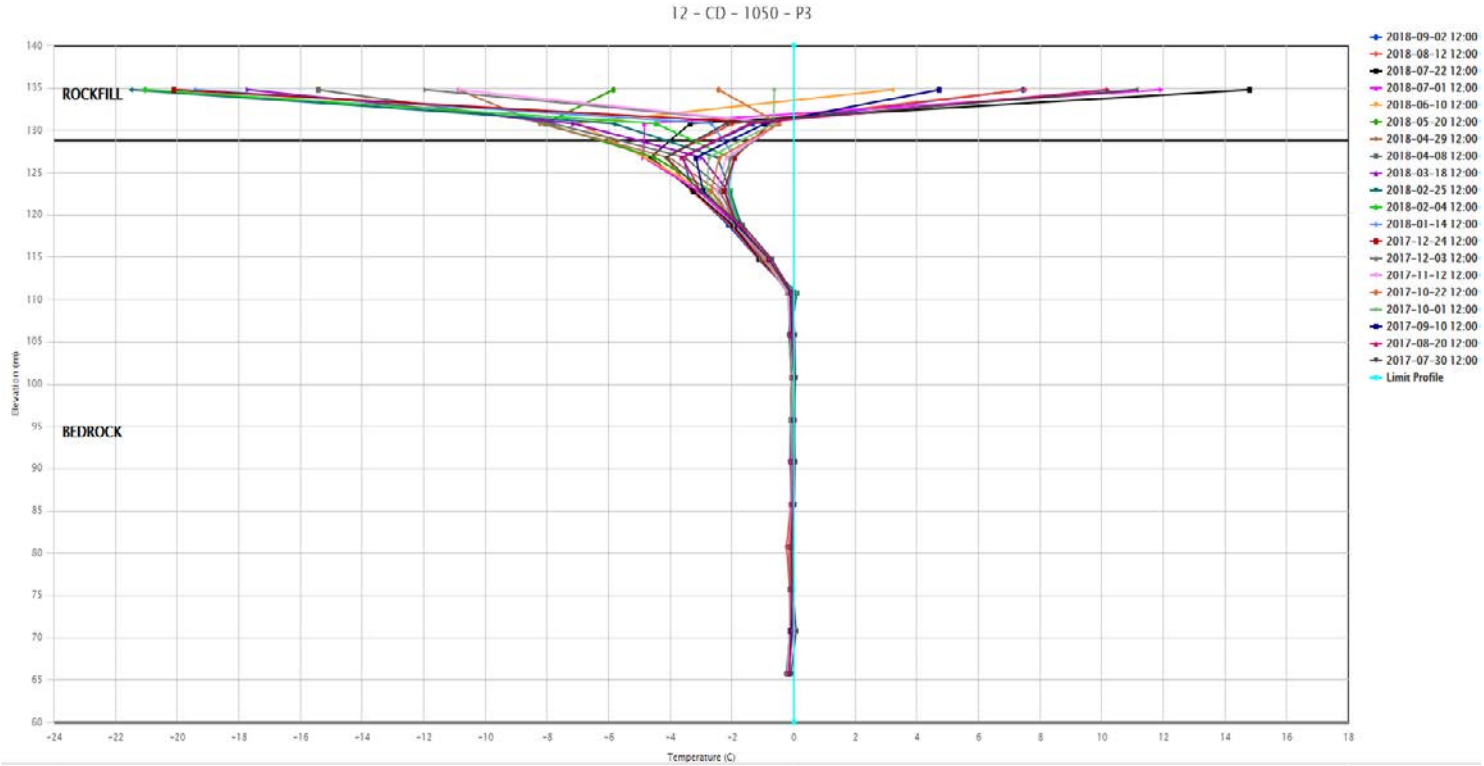


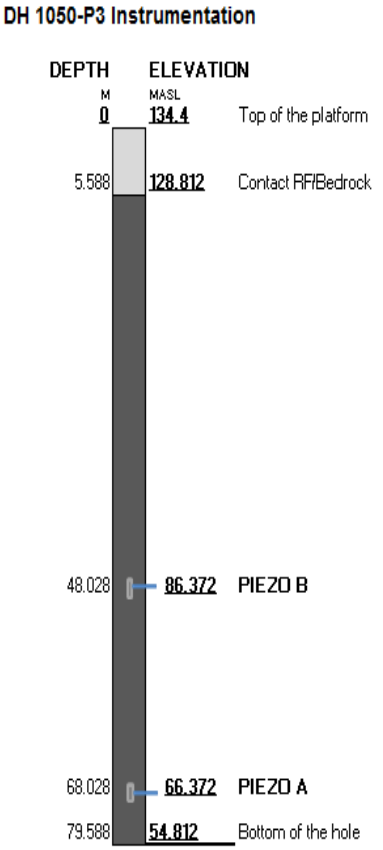


THERMISTOR 1050-P3

- Temperature at 0º C in bedrock

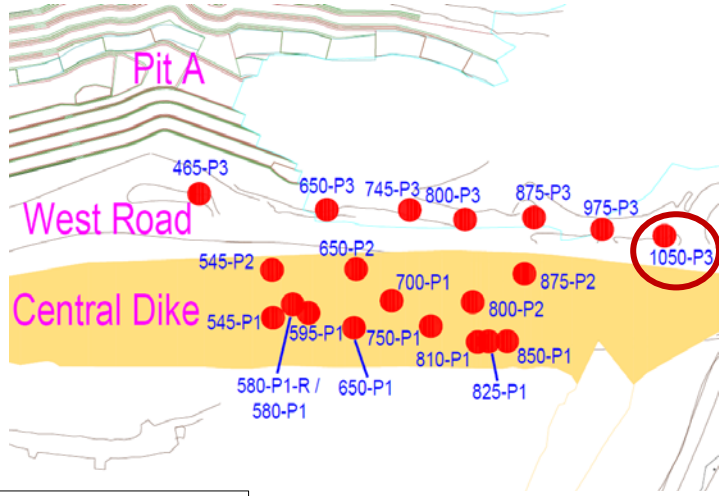


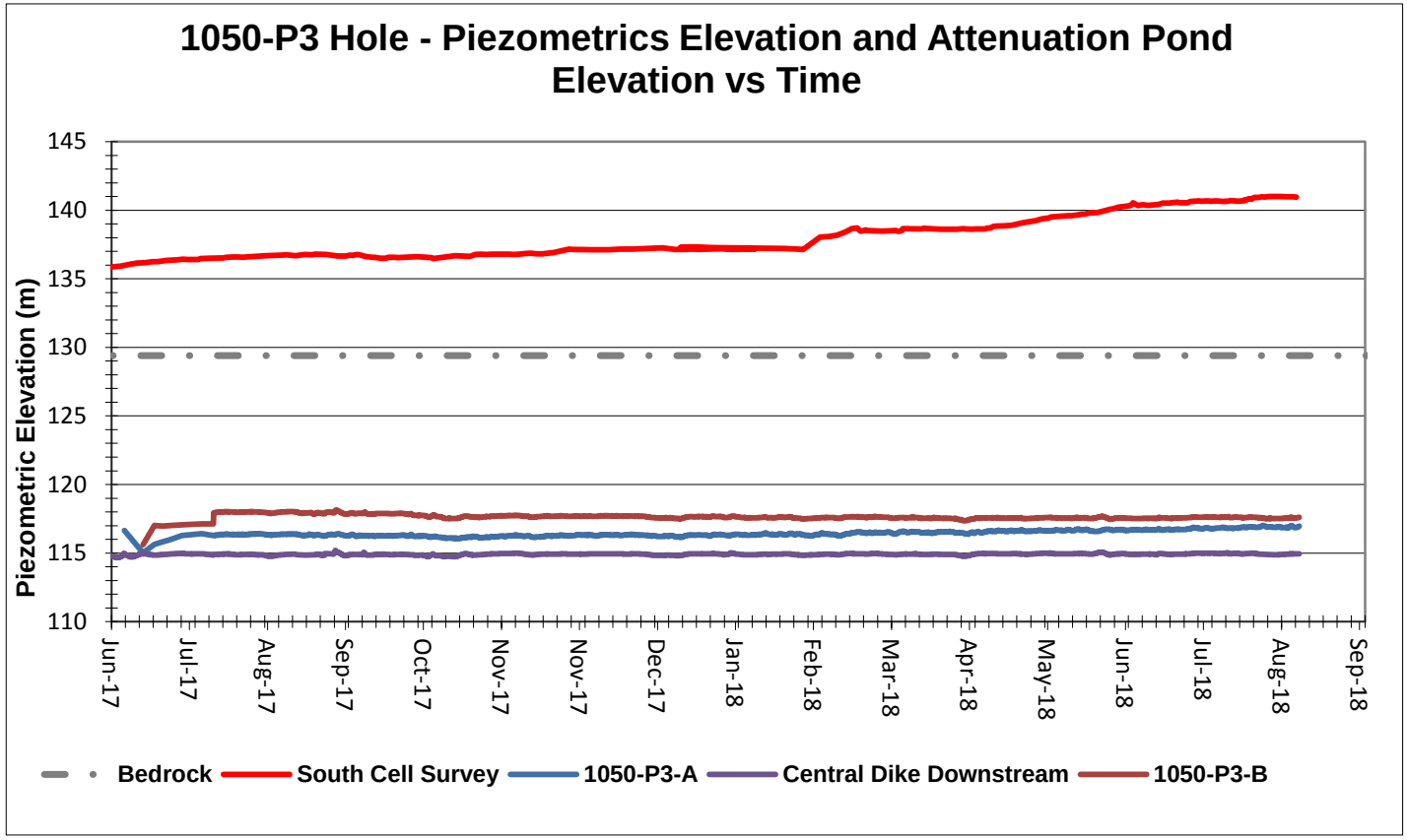


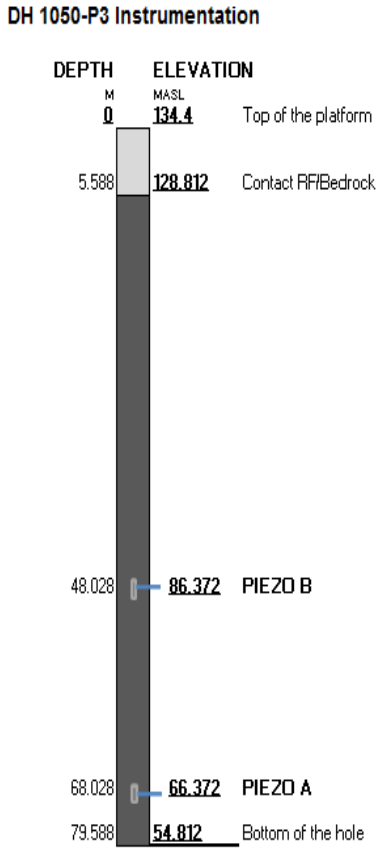


PIEZOMETER 1050-P3

- Piezometers temperature just below the freezing point
- Piezometers are following the trend of the D/S pond elevation.





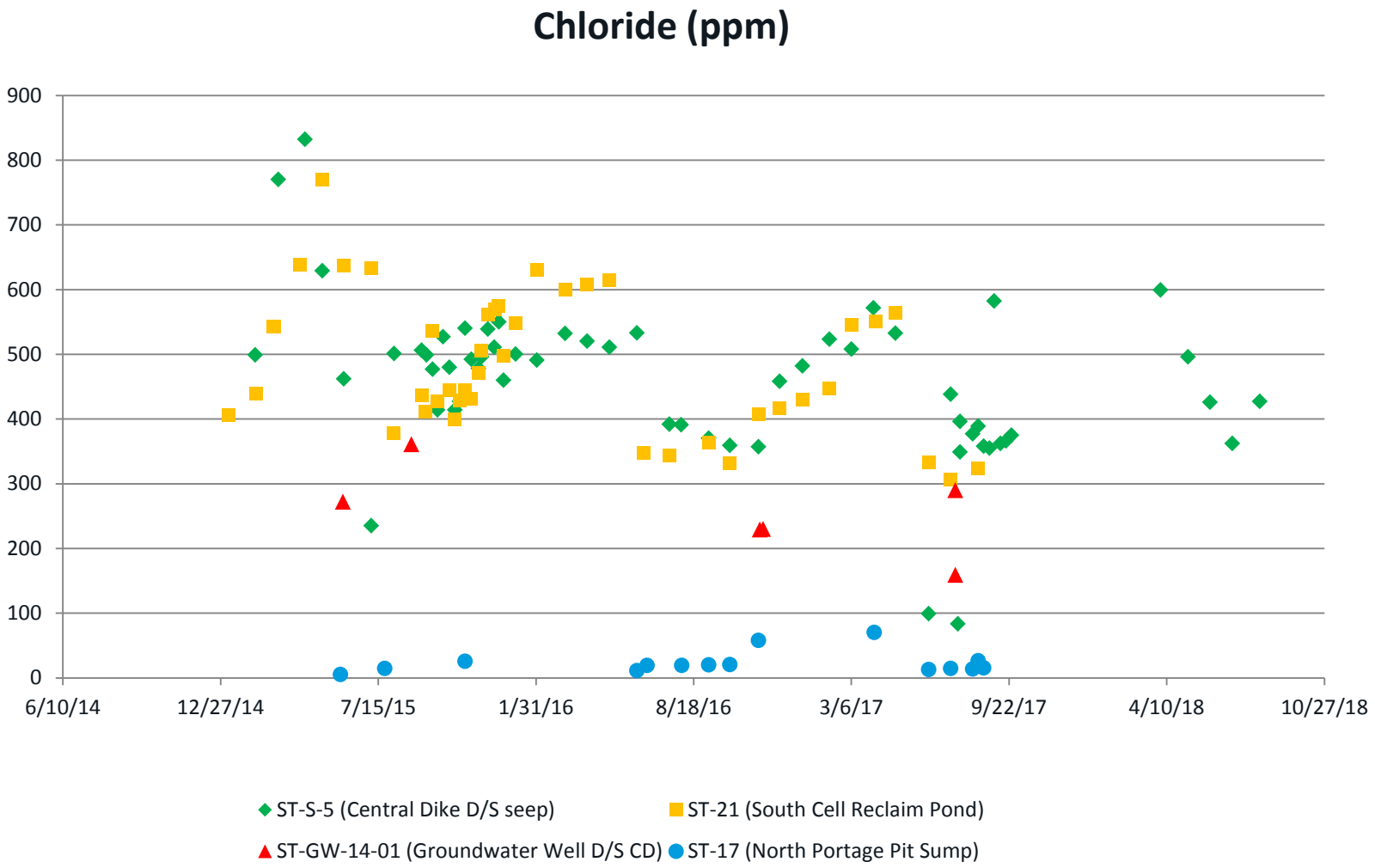


AGNICO EAGLE

THANK YOU

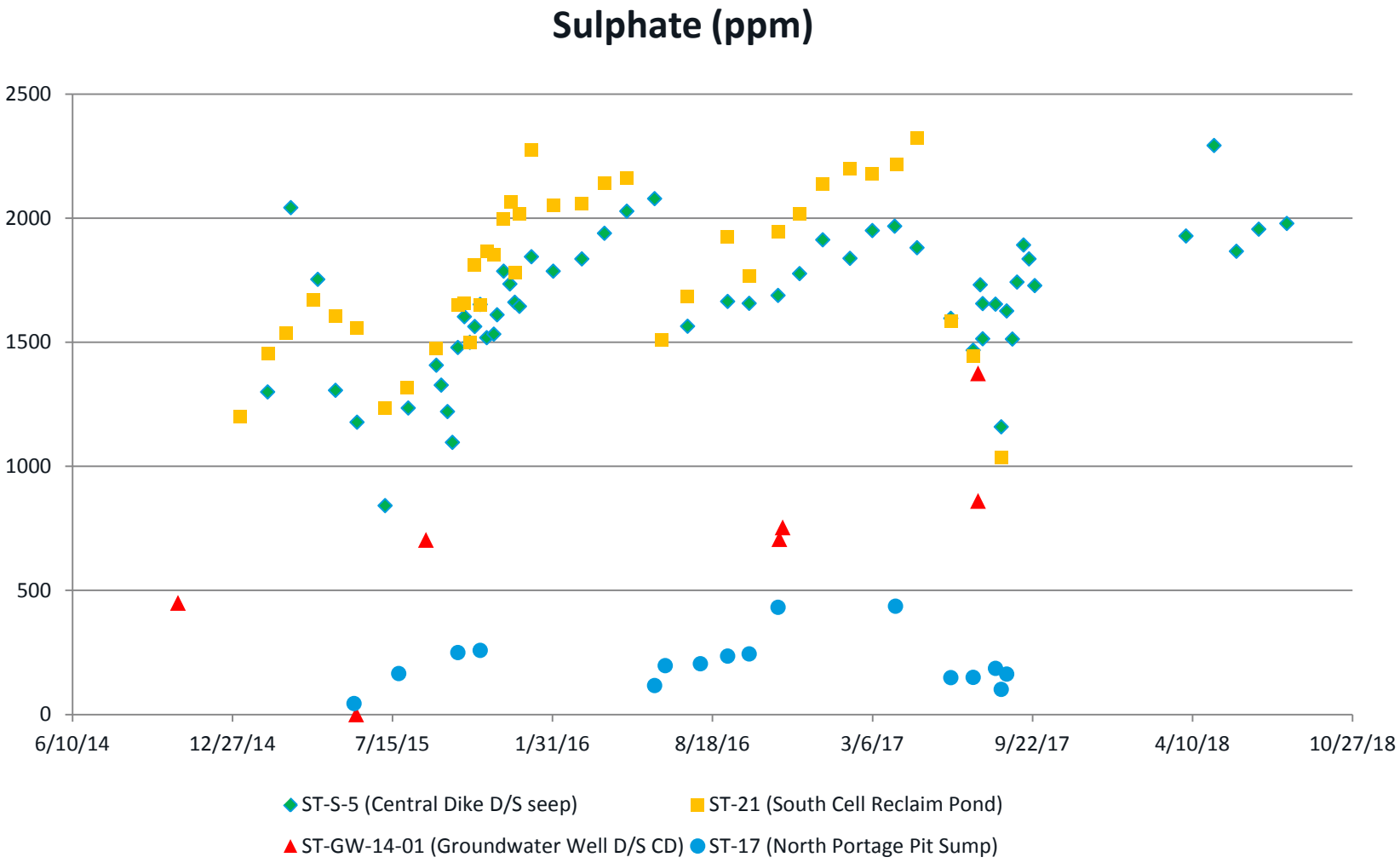
WATER ANALYSIS

CHLORIDE



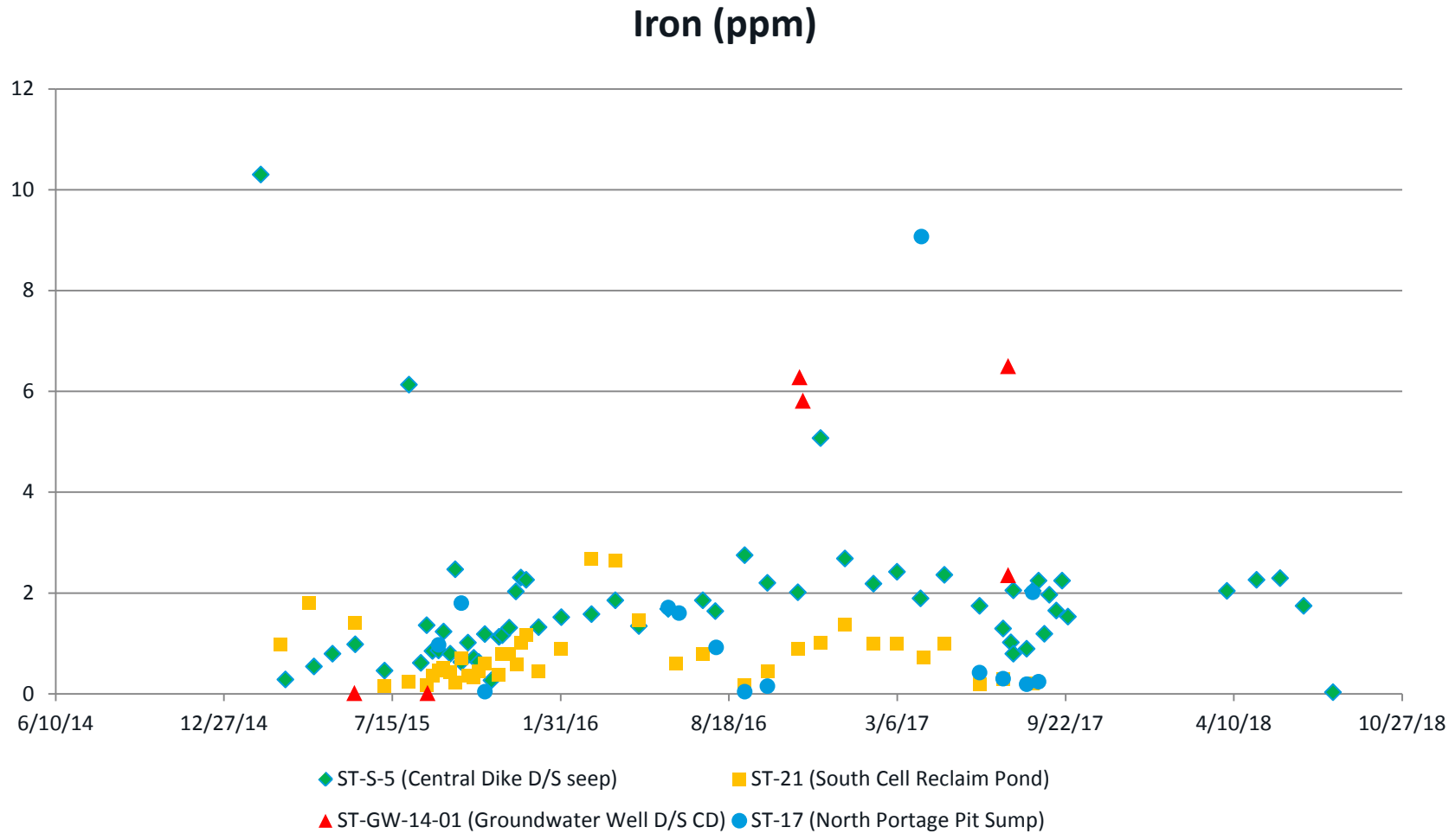
WATER ANALYSIS

SULFATE



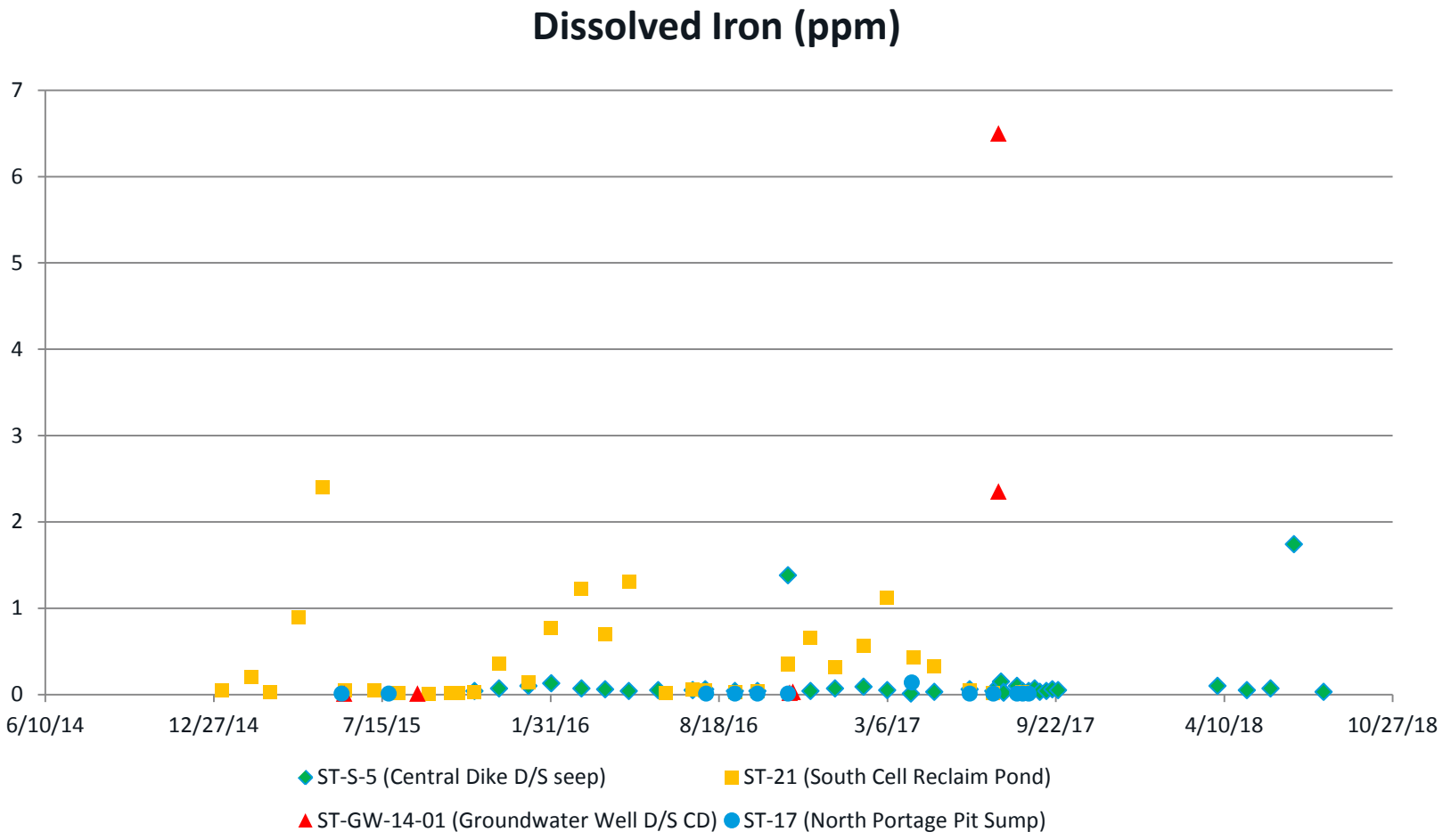
WATER ANALYSIS

IRON



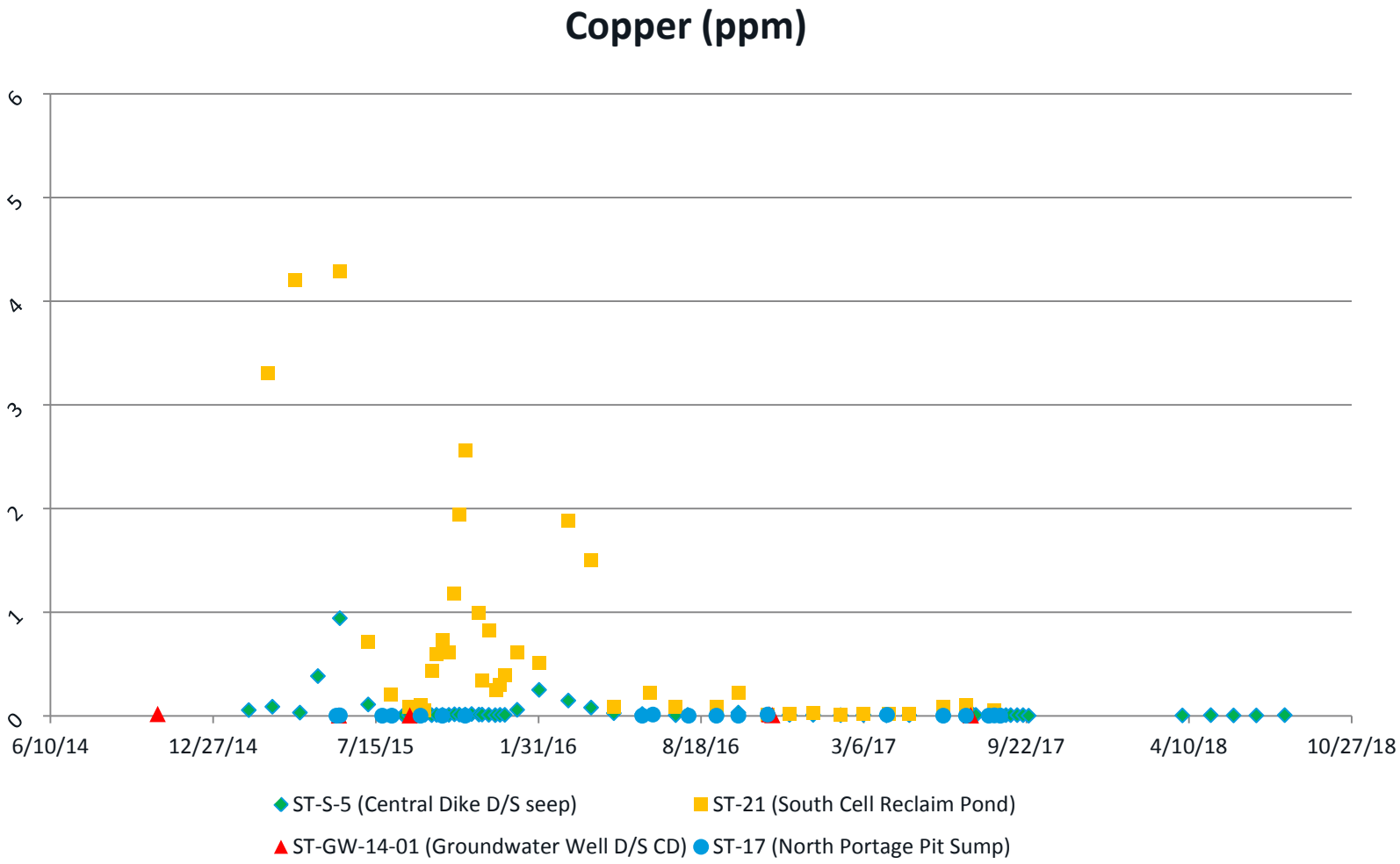
WATER ANALYSIS

DISSOLVED IRON



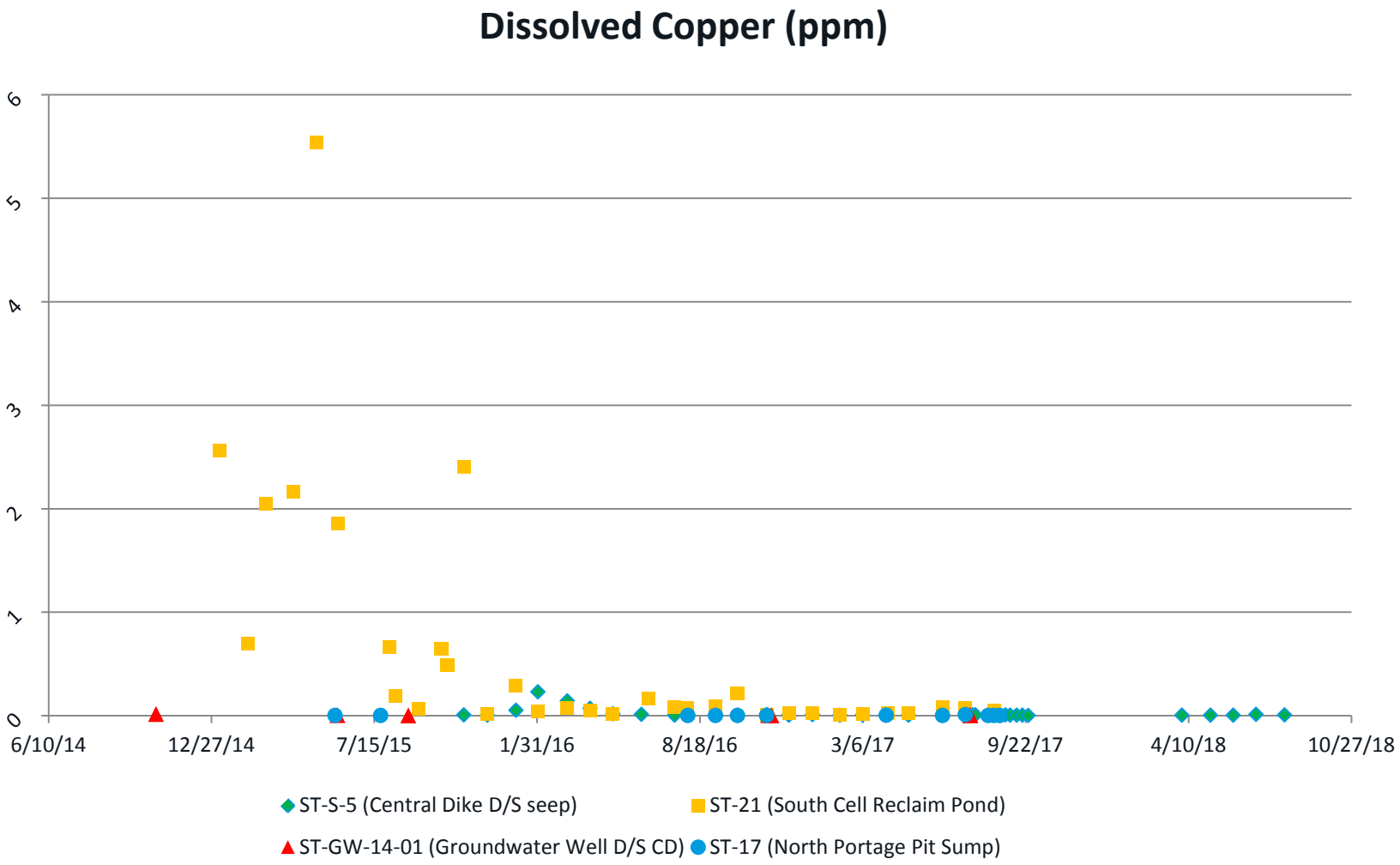
WATER ANALYSIS

COPPER



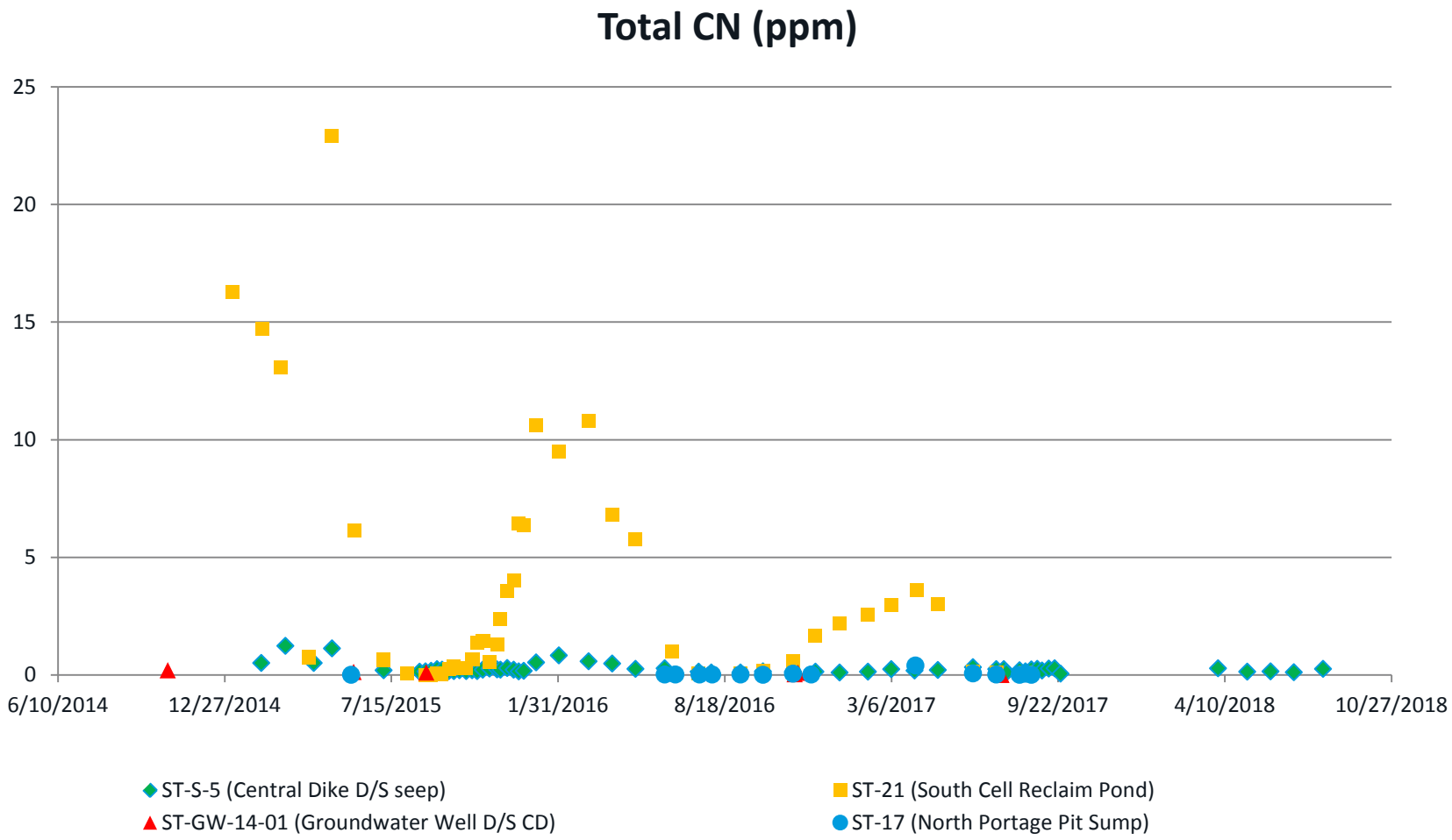
WATER ANALYSIS

DISSOLVED COPPER



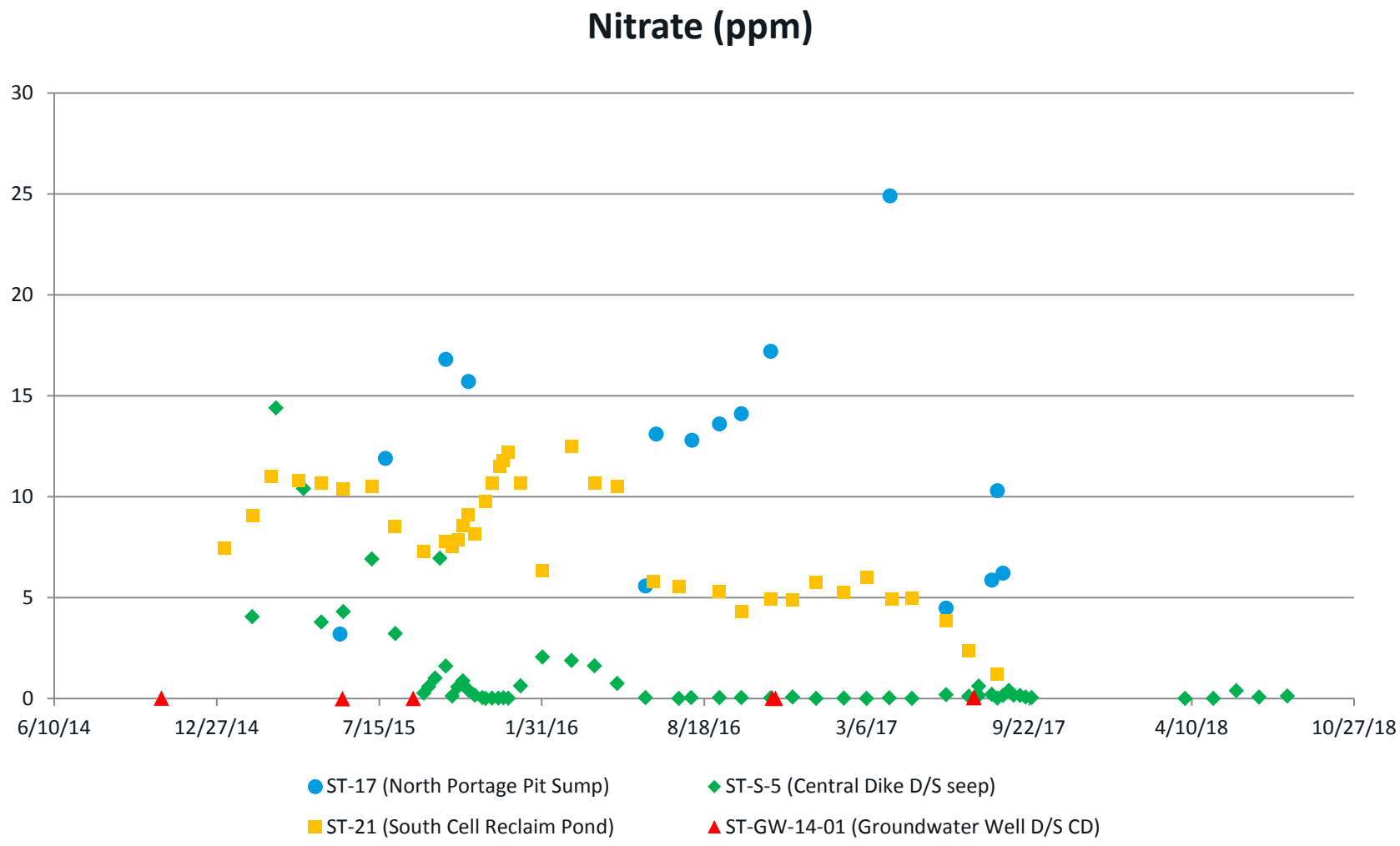
WATER ANALYSIS

CYANIDE



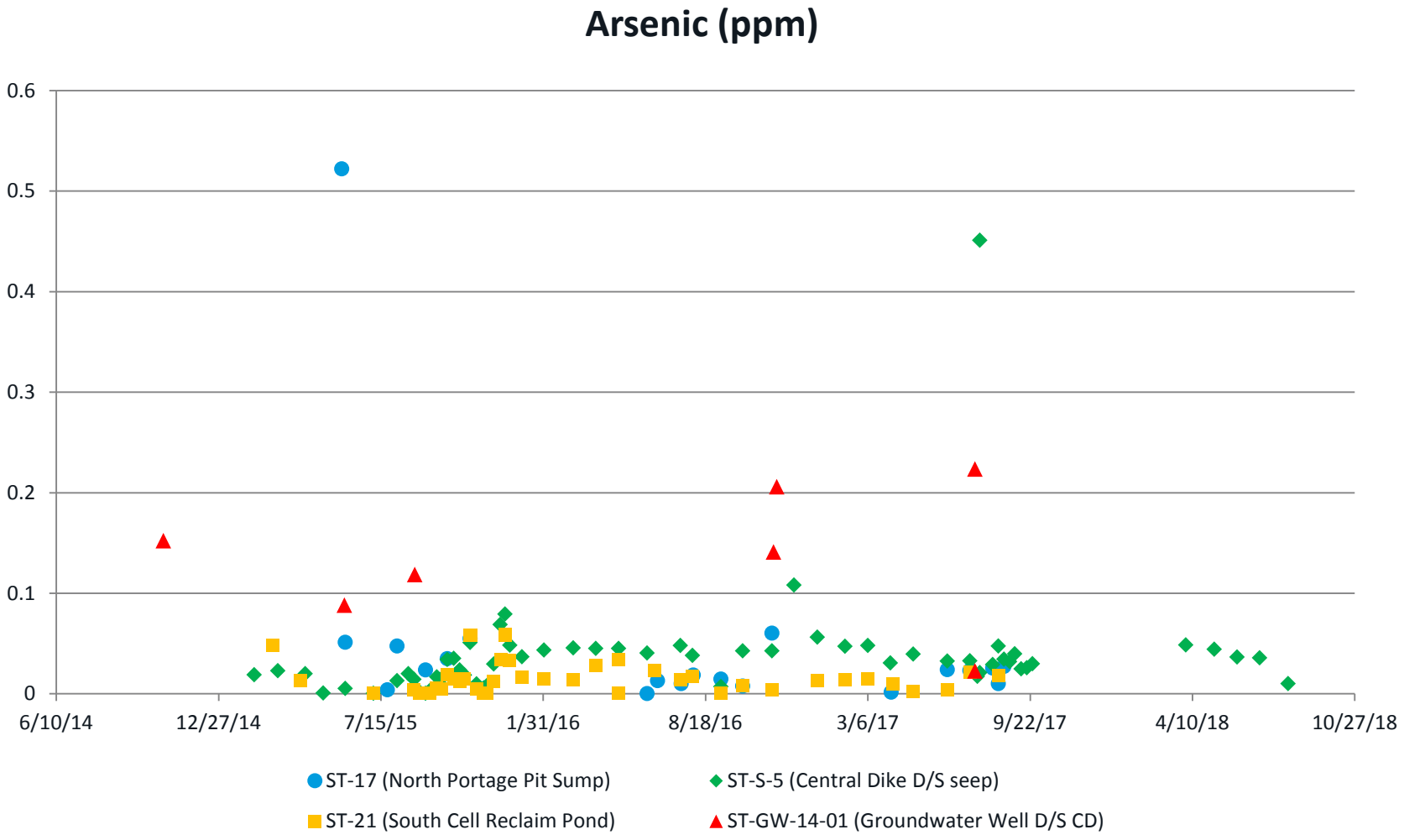
WATER ANALYSIS

NITRATE



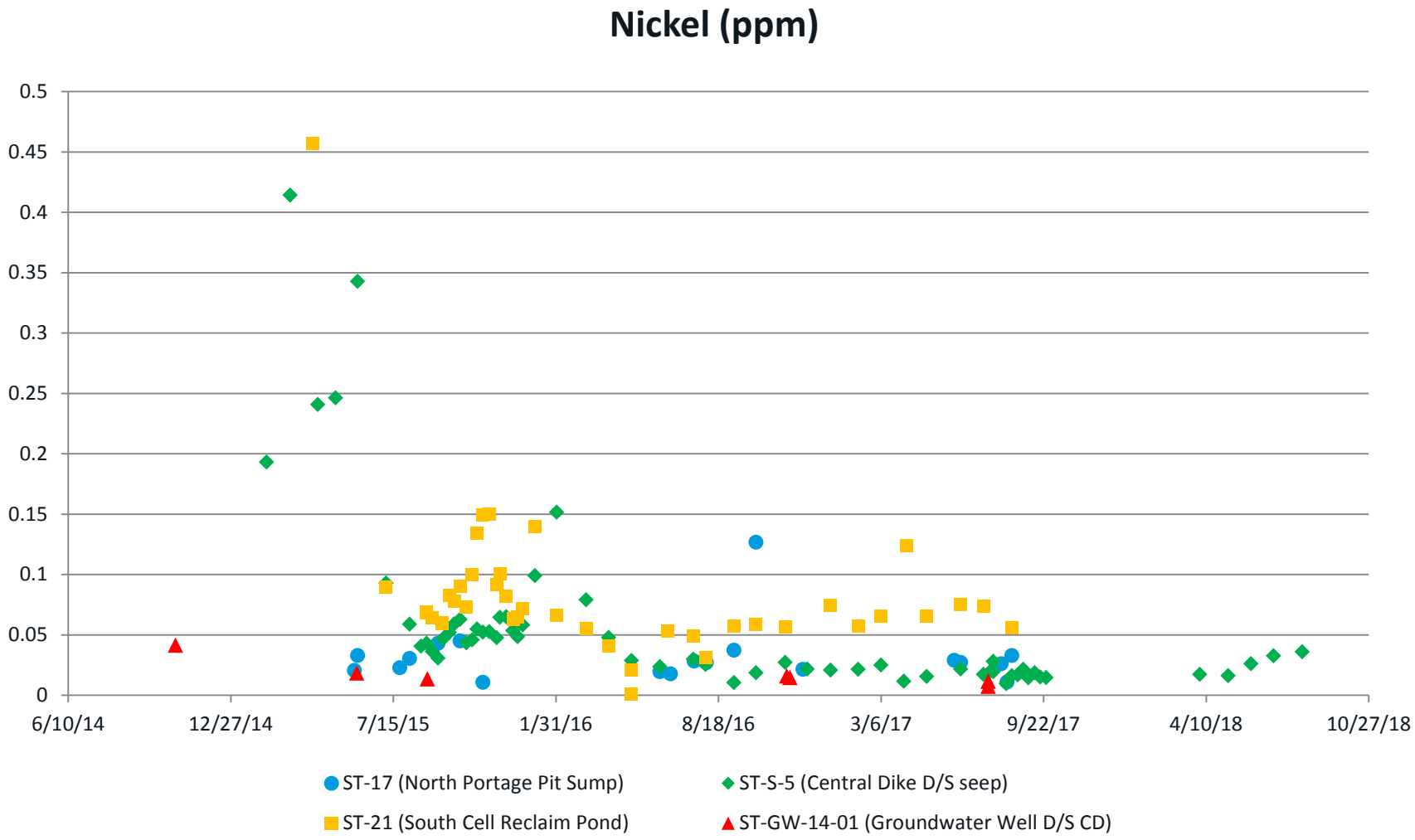
WATER ANALYSIS

ARSENIC



WATER ANALYSIS

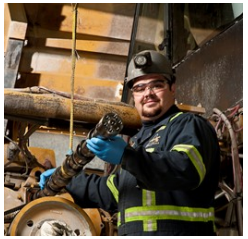
ARSENIC



APPENDIX C3

TSF North Cell Instrumentation Data

AGNICO EAGLE



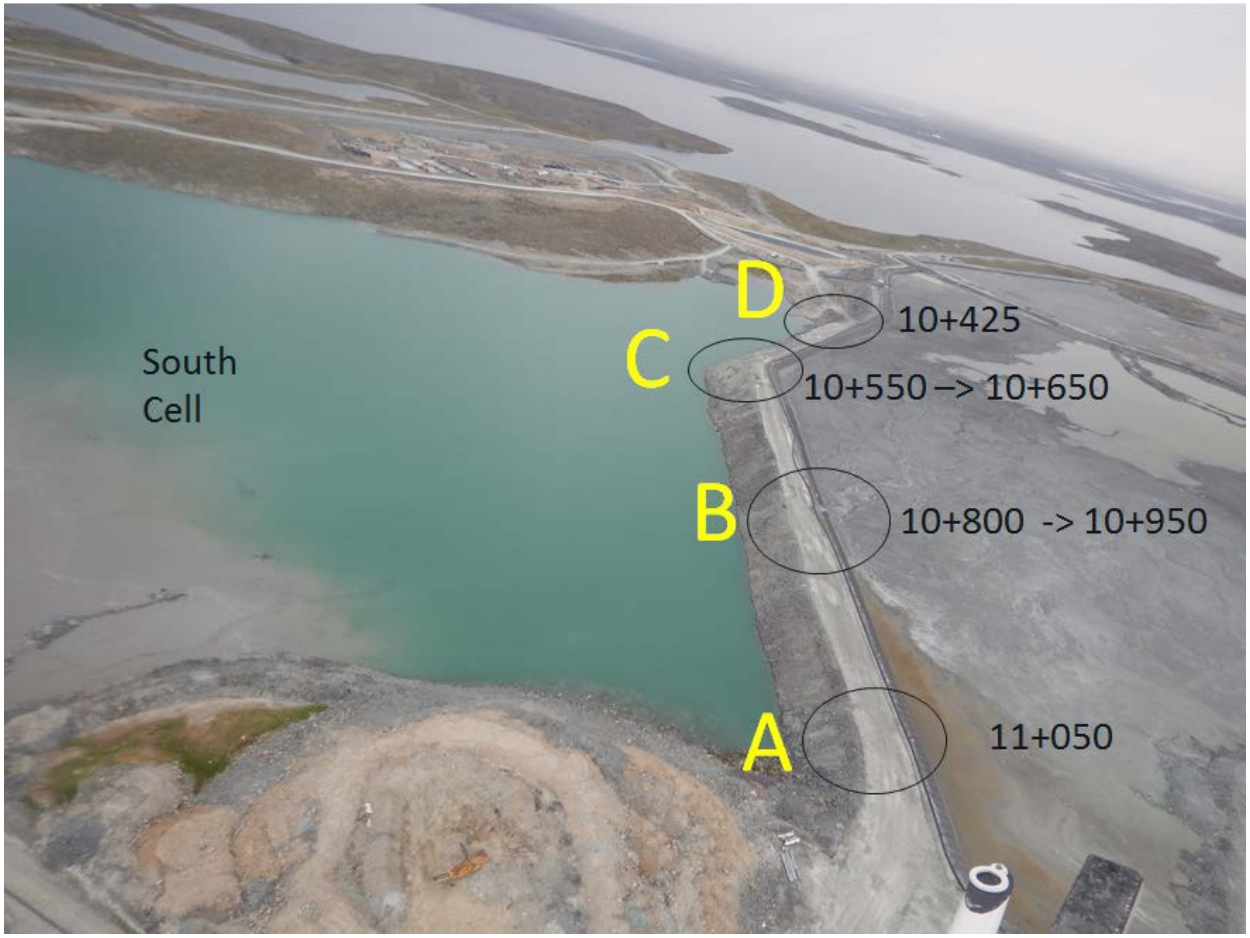
MDRB # 24
P3 – STORMWATER DIKE UPDATE

Pier-Éric McDonald

September 24th 2018

Stormwater Dike Highlights

(2018)



Sequence of Events

April 27 - New sign of movements (cracks) were detected on the crest of Stormwater Dike from Sta. 10+900 to 10+950.

May 5 - An additional prism (S119) was installed in the new crack area (S119) at station 10+925 (total 20).

May 6 - One (1) crackmeter was installed on the most developped crack to monitor its opening.

July 2 - Two (2) additional crackmeters were installed to increase movement monitoring in the new crack area (total of 3).

July 22 - New cracks observed in between prisms S114 and S115

July 23 - Cracks were filled with bentonite to prevent water infiltration

2018 action plan for movement monitoring

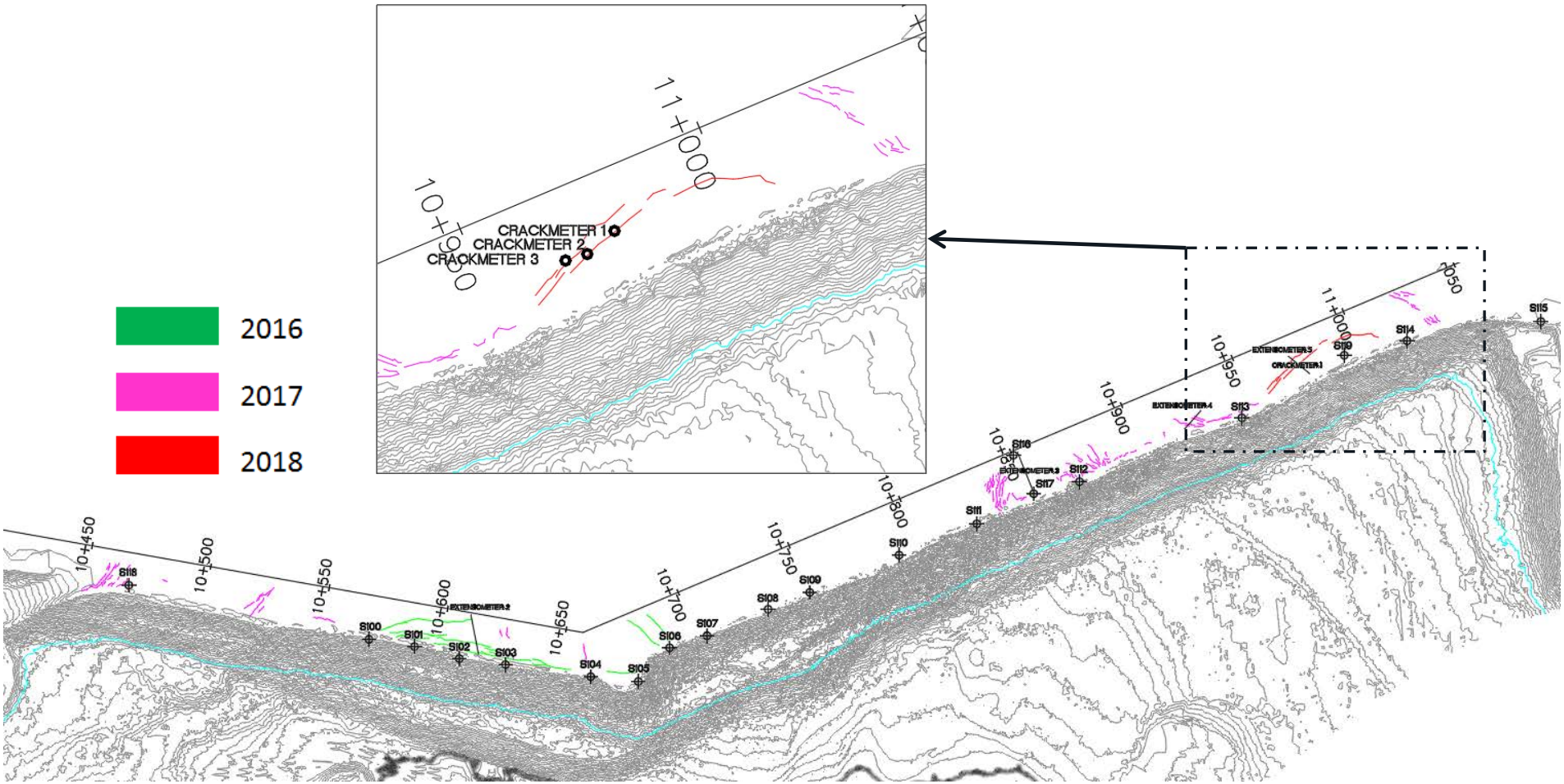
- Weekly visual inspection of Stormwater Dike increased to every 3 days.
- Prisms survey monitoring every 3 days.
- Extensometers and crackmeters reading every 3 days.
- Weekly/ bi-weekly update to AEM Management
- Instrumentation that is monitored

	Instruments	Operational	Damaged	Measurement Taken
☒	Piezometers (auto) (3)	☒	☐	☒ Every 3 hours
☒	Extensometer (0) 4	☐	☐	☐ Every 3 days
☐	Tension crack STA (0)	☐	☐	☐ Daily
☒	Survey Prisms (19) 20	☒	☐	☒ Every week
☒	Thermistors (auto) (3)	☒	☐	☒ Every 3 hours
☒	Crackmeters (auto) (3)	☒	☐	☒ Every hour

STORMWATER DIKE UPDATE 2018

1. HIGHLIGHTS

Cracks Evolution on Stormwater dike, from 2016 to 2018



STORMWATER DIKE UPDATE 2018

1. HIGHLIGHTS

New cracks formed between station 10+950 and 11+000

STORMWATER DIKE UPDATE 2018

1. HIGHLIGHTS

New cracks formed between station 10+950 and 11+000

STORMWATER DIKE UPDATE 2018

1. HIGHLIGHTS

New cracks formed between station 10+950 and 11+000

STORMWATER DIKE UPDATE 2018

1. HIGHLIGHTS

AGNICO EAGLE

New cracks formed between station 10+950 and 11+000

STORMWATER DIKE UPDATE 2018

1. HIGHLIGHTS

New cracks formed between station 10+950 and 11+000

Description of the new cracks area

- Observed initially on April 27th 2018
- Appeared at the end of the winter with warmer temperature
- Cracks width varying approximately from 1cm to 4 cm
- No significant visual changes since April 27th 2018

STORMWATER DIKE UPDATE 2018

1. HIGHLIGHTS

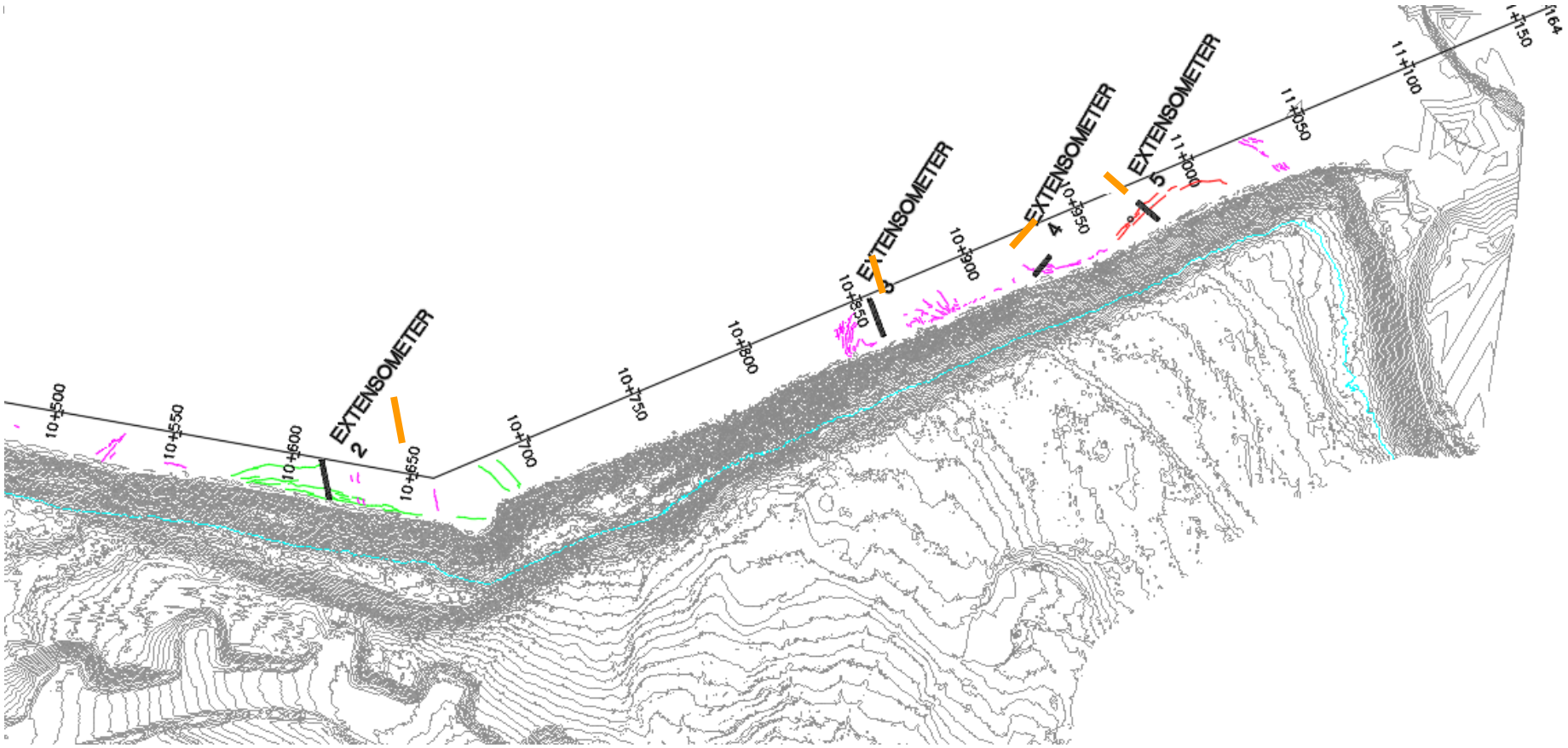
New cracks filled with bentonite; July 23rd and 29th, 2018

2. Instrumentation

(Wireline extensometer)

AGNICO EAGLE

Location of extensometers 2, 3, 4 & 5

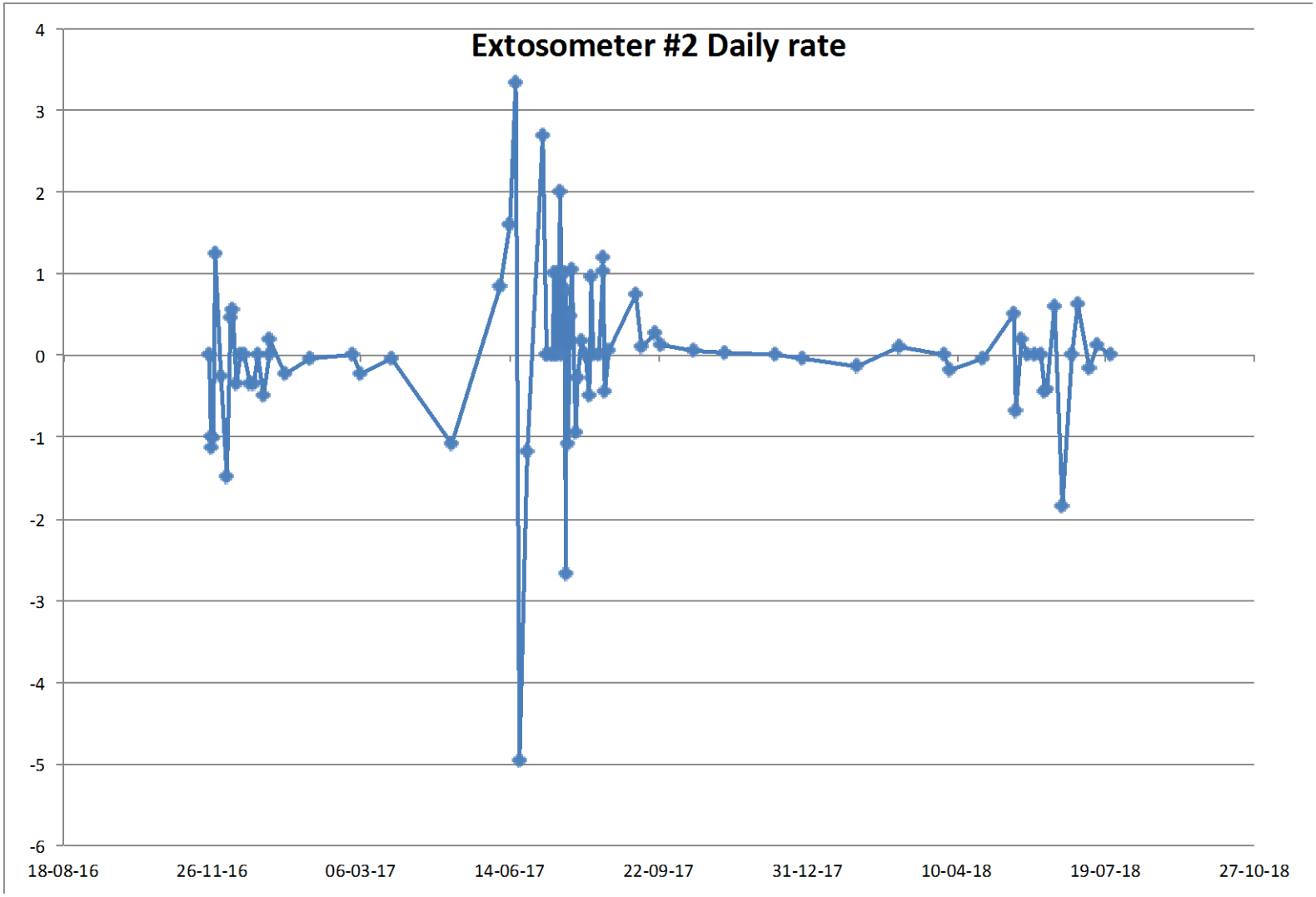


Data Monitoring and Interpretation

- Four wireline extensometers are installed on Stormwater Dike.
- Located at stations 10 + 620, 10+850, 10+925 and 10+975.
- Monitored every three days.
- The four extensometers have shown none or very little variations.

STORMWATER DIKE UPDATE 2018

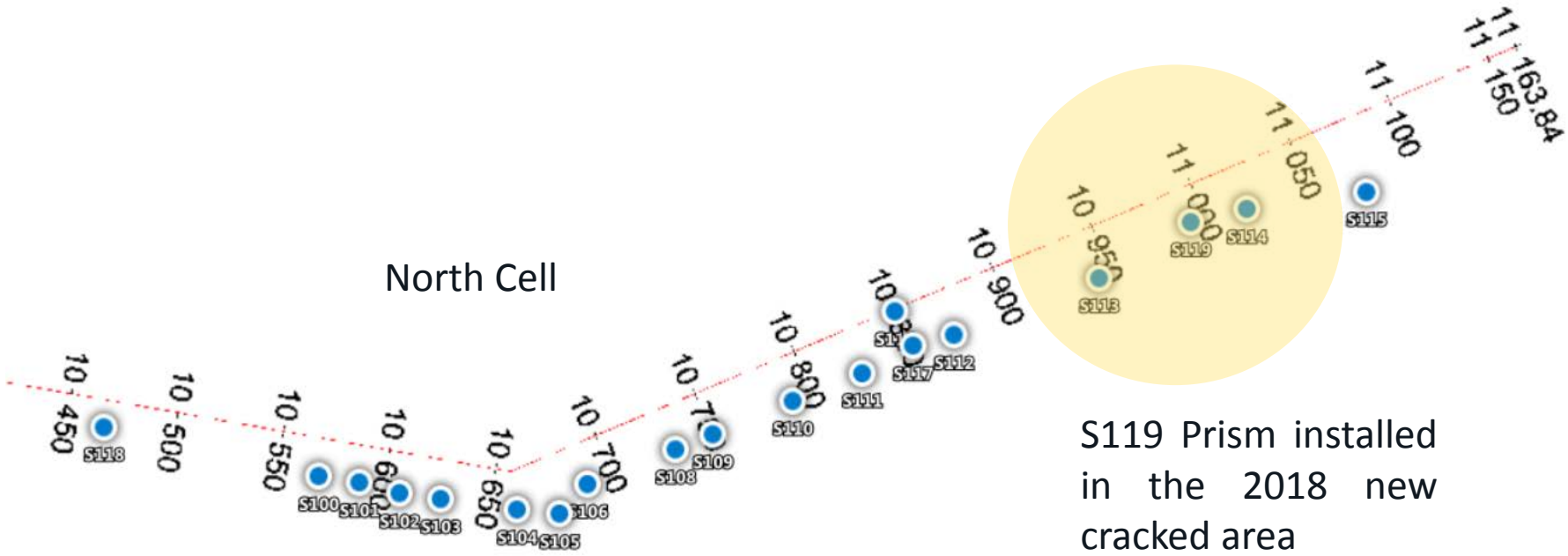
2. INSTRUMENTATION - EXTENSOMETER



3. Instrumentation

(Monitoring Prisms)

Location of the monitoring prisms



S119 Prism installed in the 2018 new cracked area

Data Monitoring

- 20 prisms are installed along the crest of Stromwater dike
- Prisms are surveyed every 3 days
- The prisms vertical displacement, 3D displacement and 3D velocity are computed and analysed.

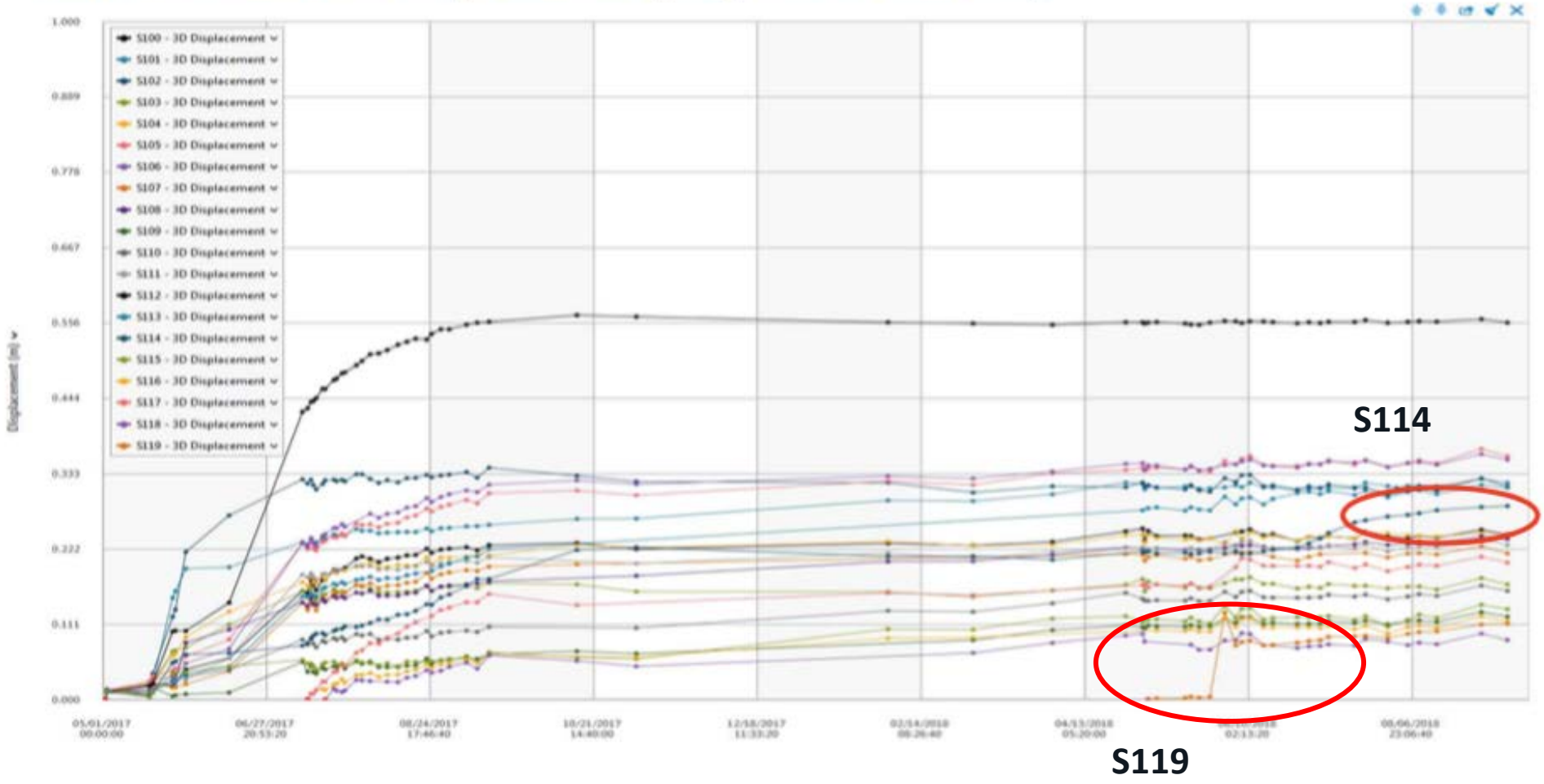
Data Interpretation

- The prisms S119 is located in the 2018 new crack area
- The prisms analysis shows that the prisms movement was fairly constant throughout season
- 3D displacement is in majority due to the vertical displacement
- Significant variations of velocity and vertical displacement recorded at S119 between June 1st and 5th. These displacements were probably due to the settling of the boulder installed during the winter.

STORMWATER DIKE UPDATE 2018

3. INSTRUMENTATION – MONITORING PRISMS

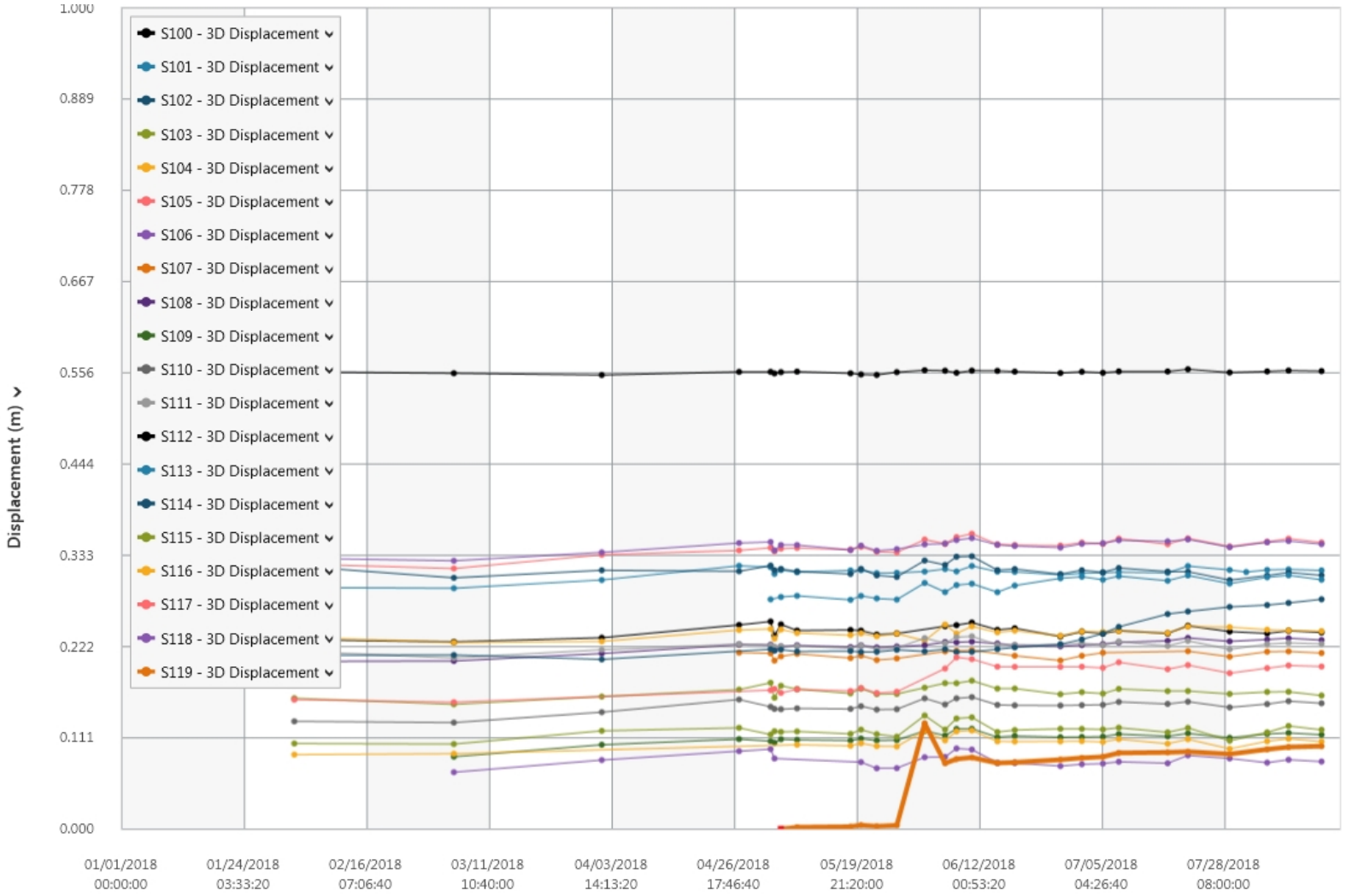
Prisms cumulative 3D displacement (May 2017-June 2018)



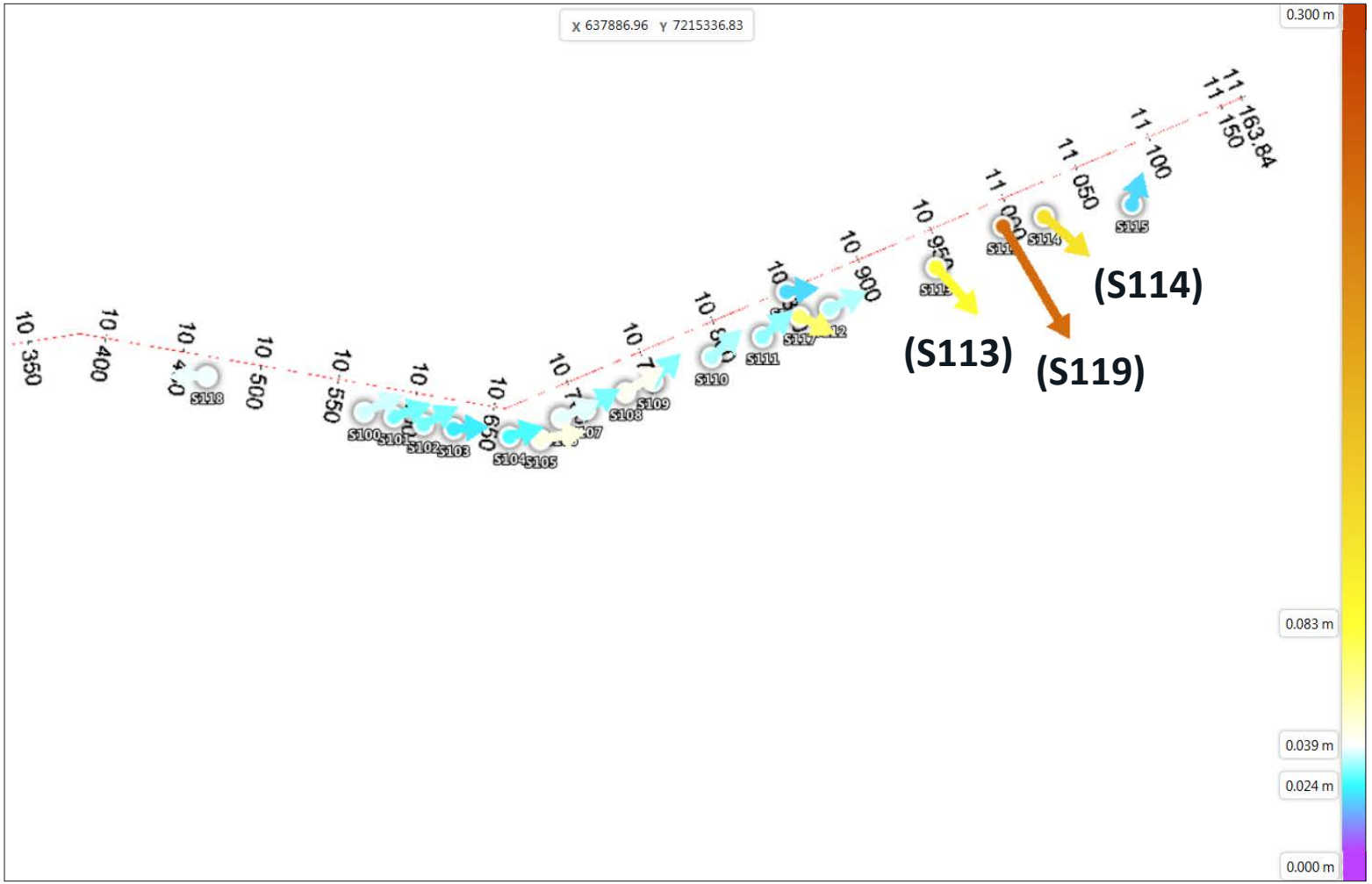
STORMWATER DIKE UPDATE 2018

3. INSTRUMENTATION – MONITORING PRISMS

Cumulative 3D Displacement (m) vs. Date – 2018 only

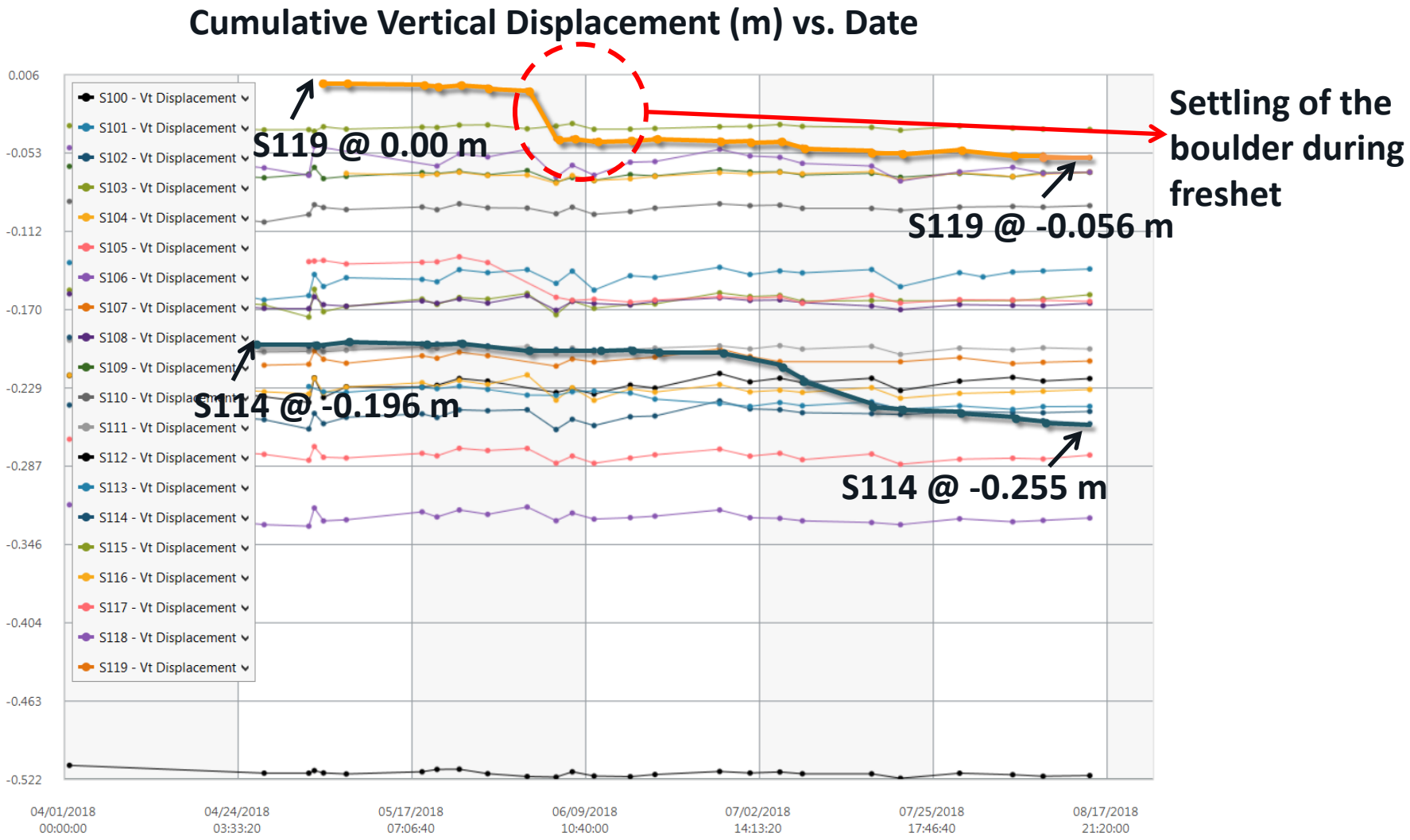


Prisms 3D Displacement Map (m), January 1st to July 23rd, 2018



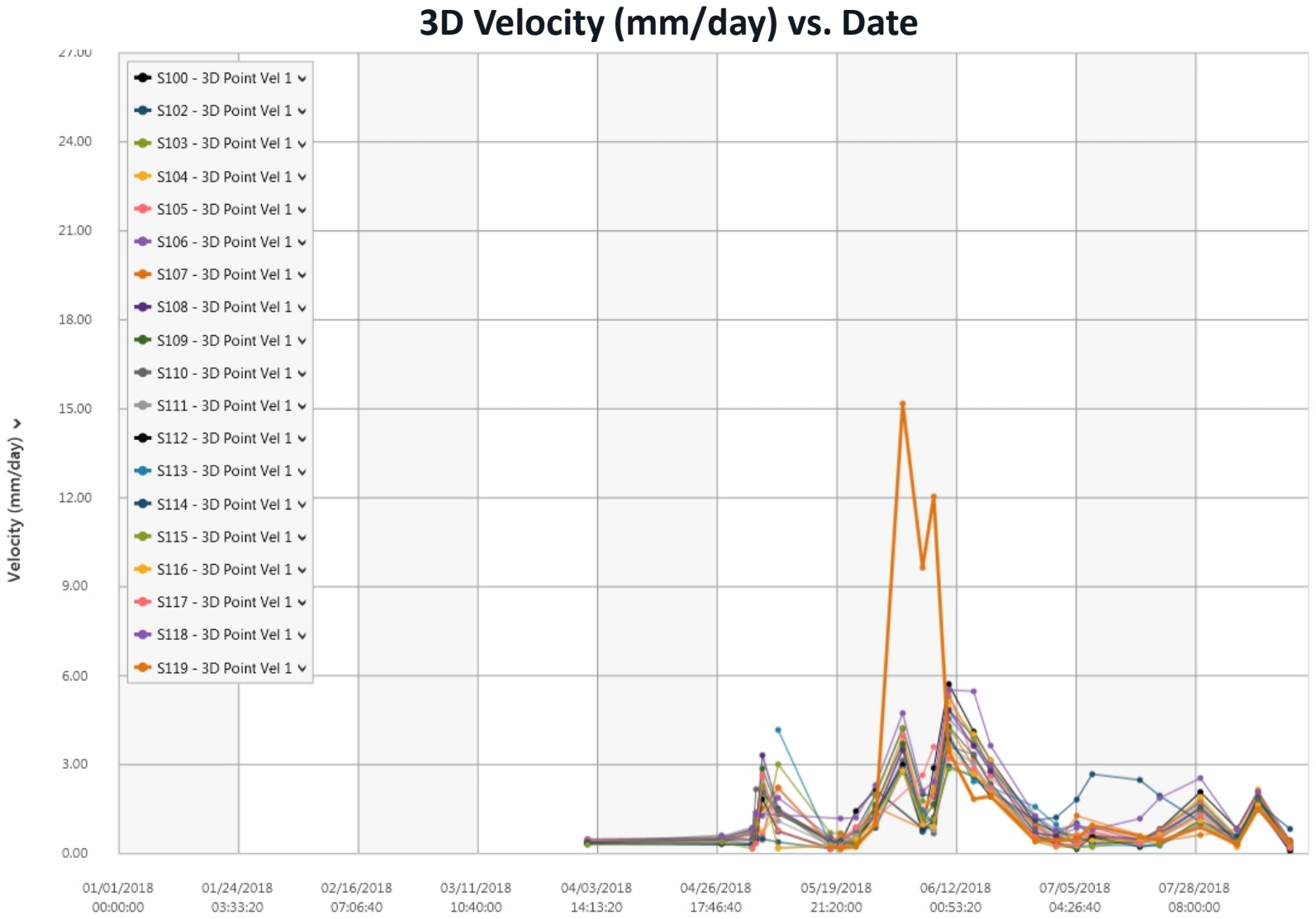
STORMWATER DIKE UPDATE 2018

3. INSTRUMENTATION – MONITORING PRISMS



STORMWATER DIKE UPDATE 2018

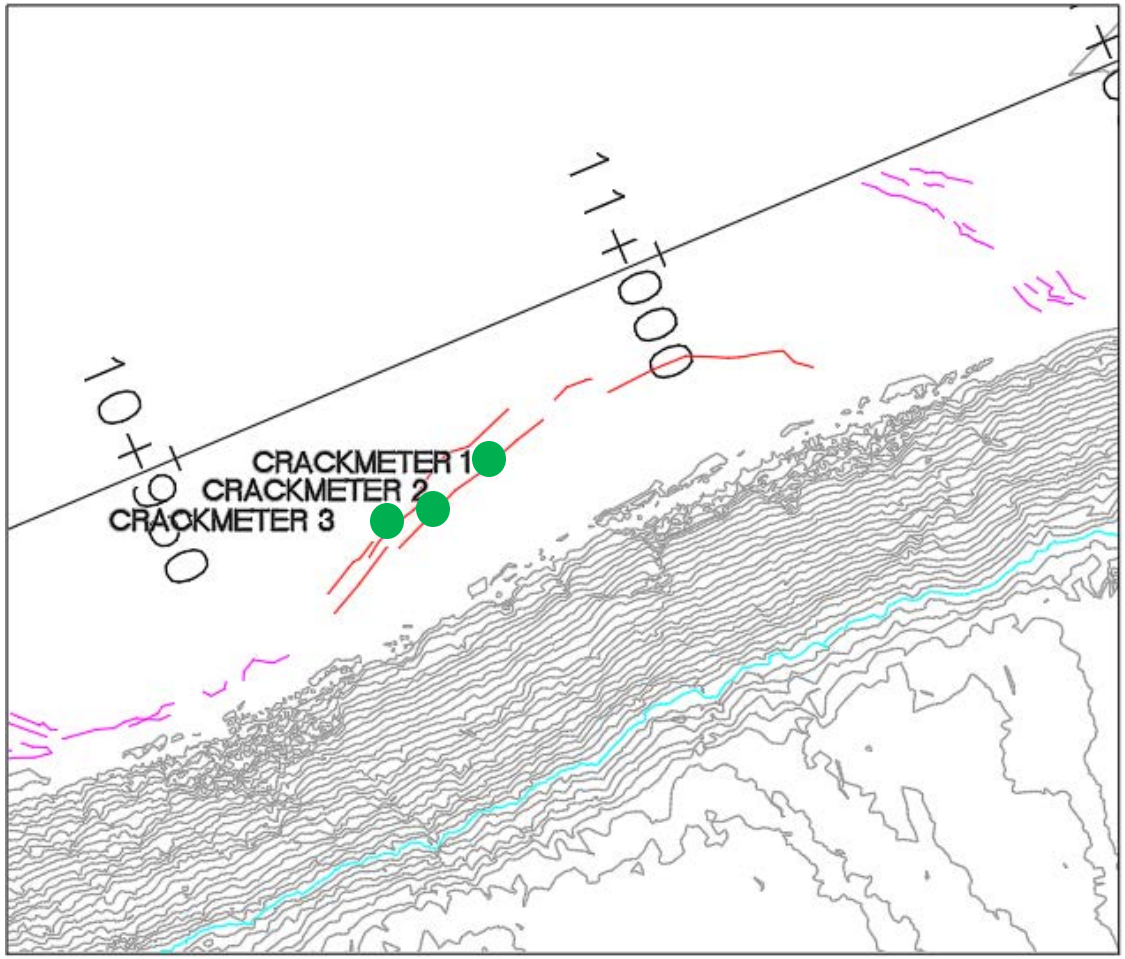
3. INSTRUMENTATION – MONITORING PRISMS



4. Instrumentation

(Crackmeters)

Location of the crackmeters

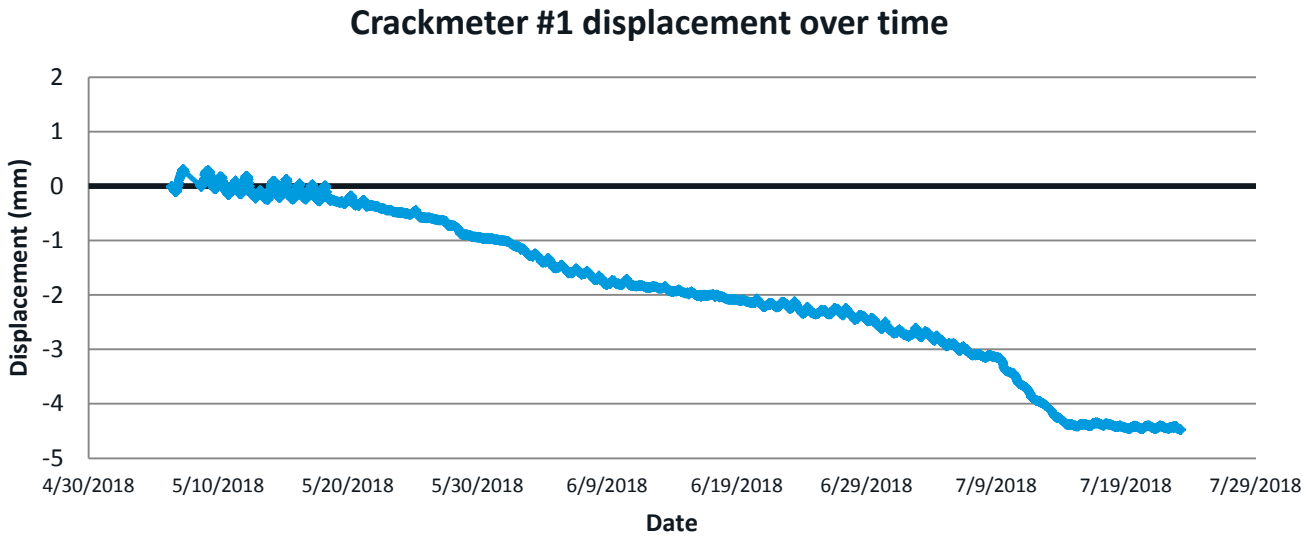


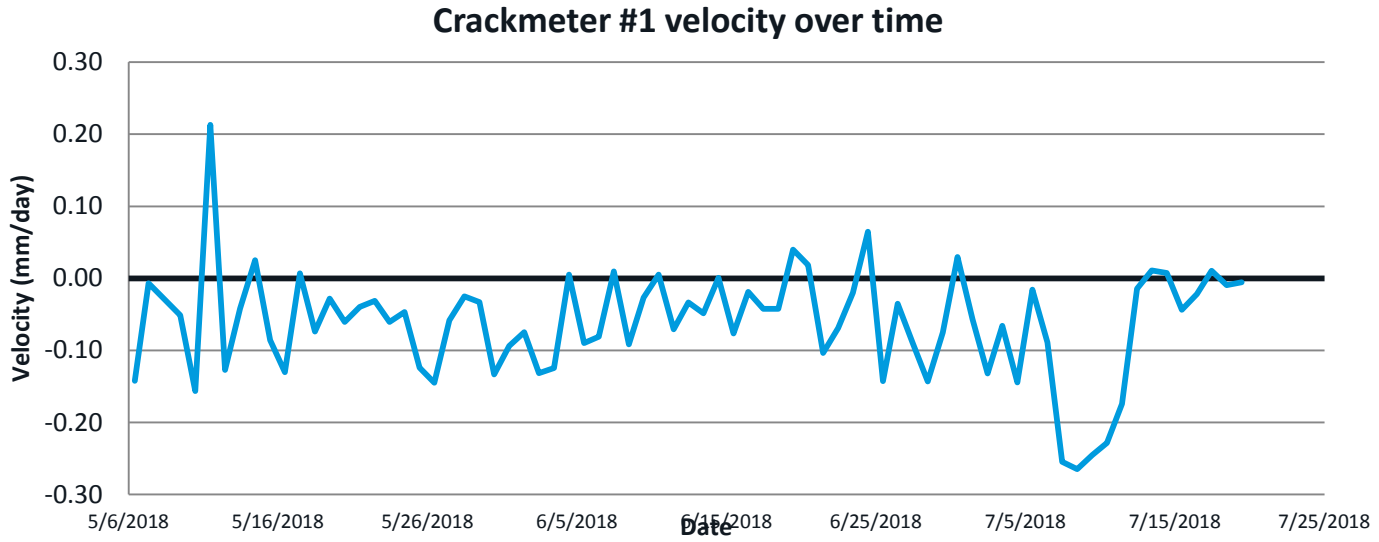
Data Monitoring

- Three (3) crackmeters are installed on SWD.
- Connected to datalogger and a reading is recorded every hour.
- Crackmeter #1 was installed on May 6th, 2018.
- Crackmeter #2 and #3 were installed on July 2nd, 2018
- Data are collected and analysed every 3 days

STORMWATER DIKE 2018 UPDATE

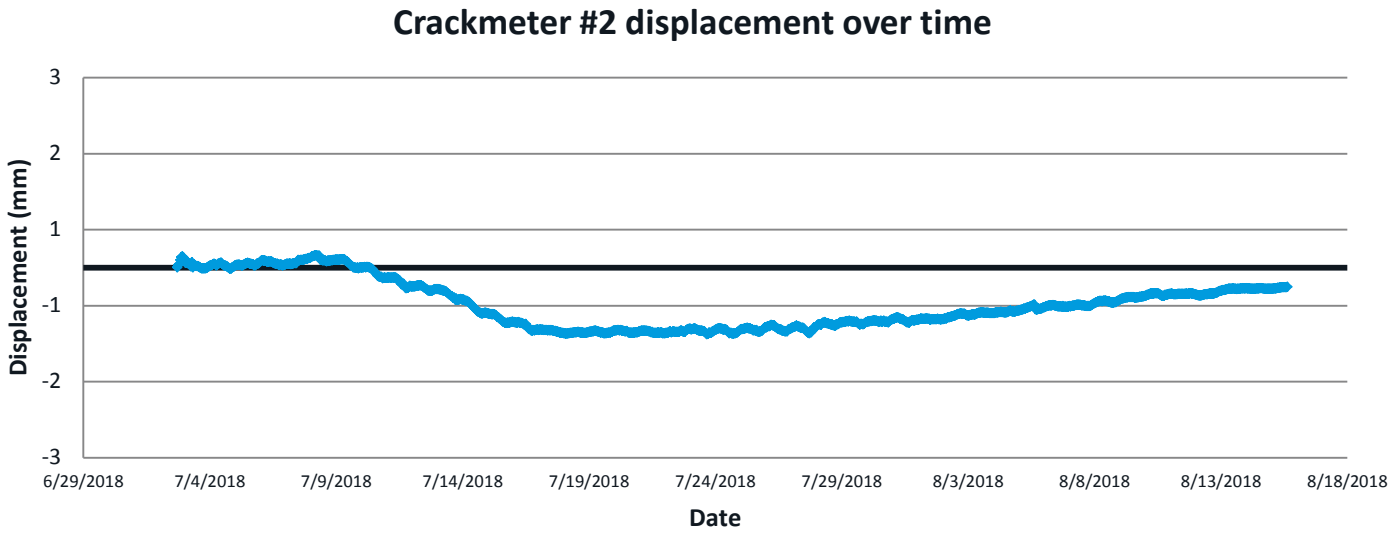
4. INSTRUMENTATION – CRACKMETERS

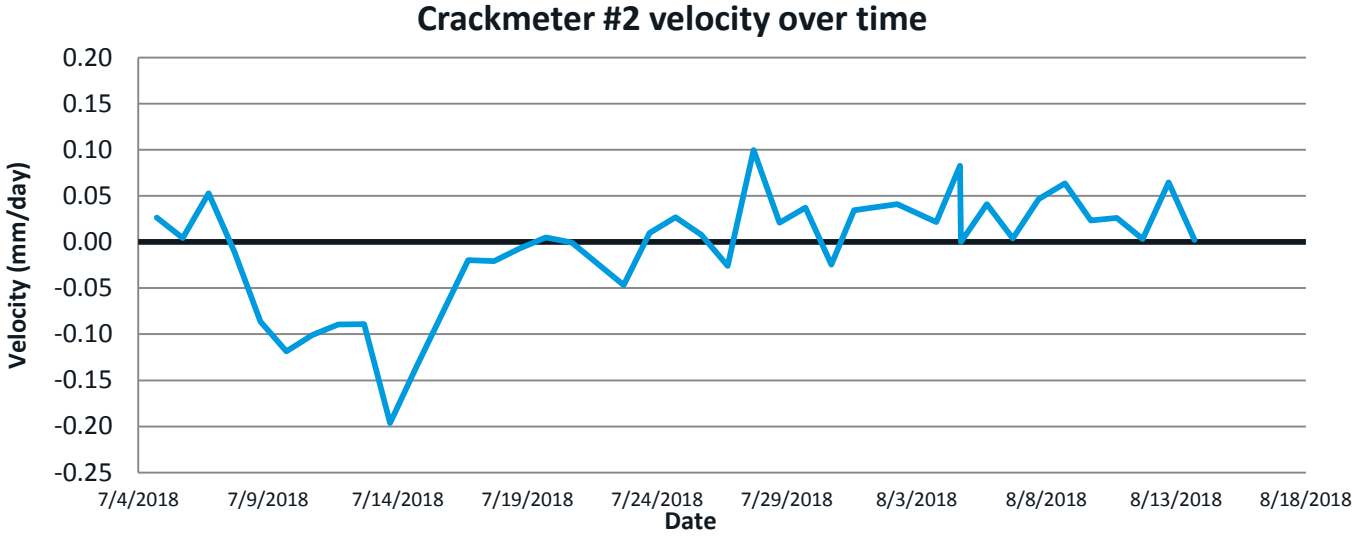




STORMWATER DIKE 2018 UPDATE

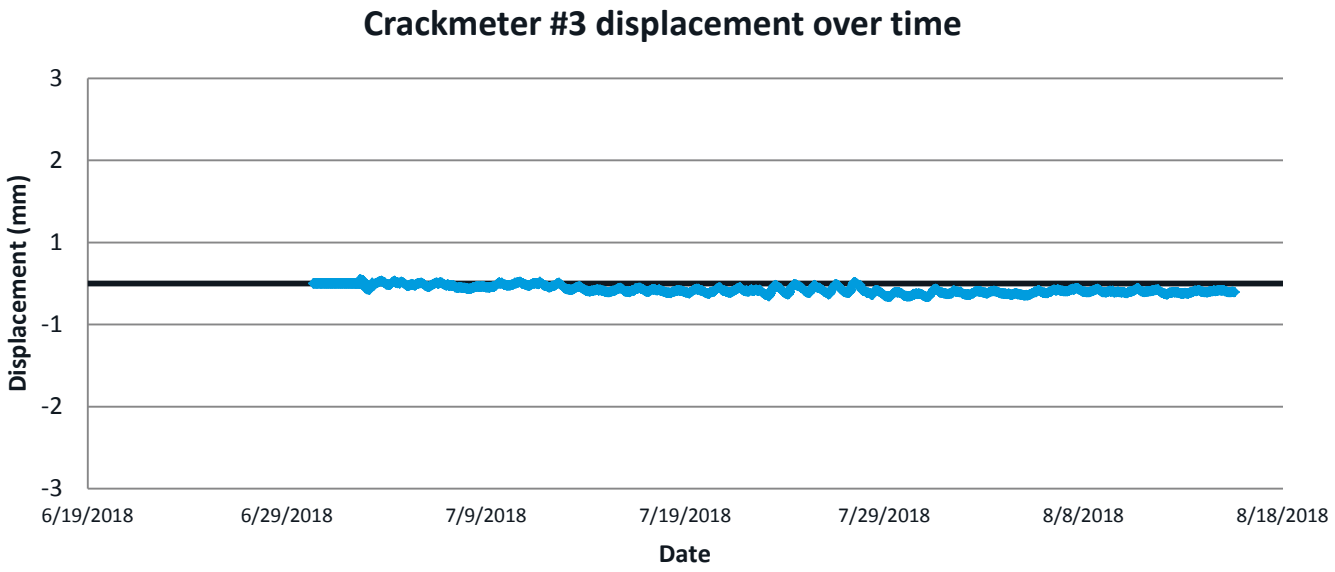
4. INSTRUMENTATION – CRACKMETERS

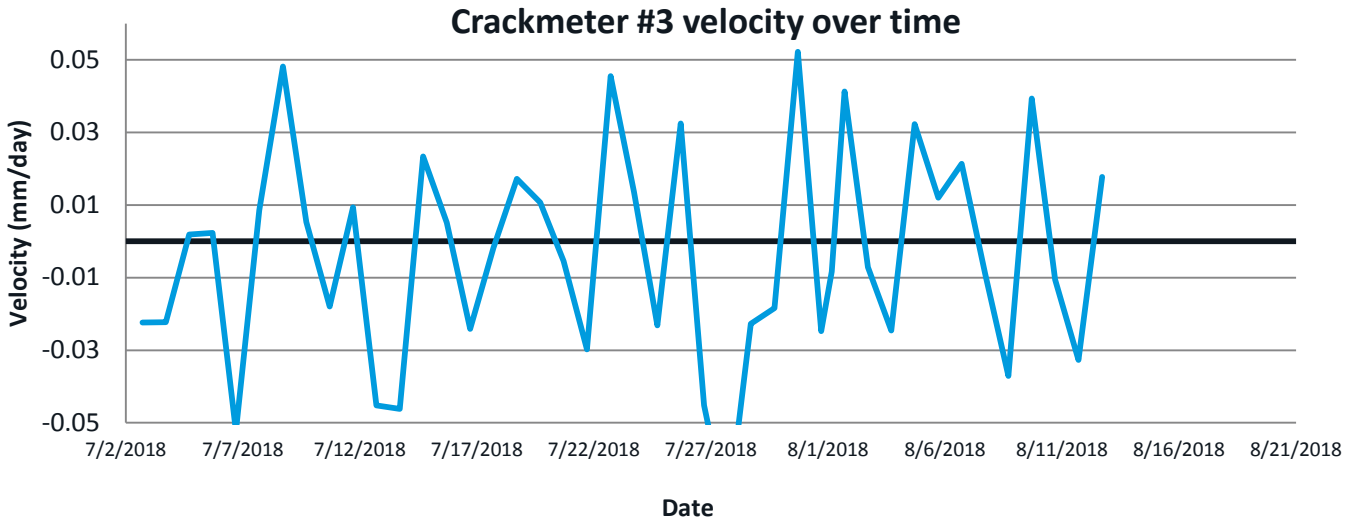




STORMWATER DIKE 2018 UPDATE

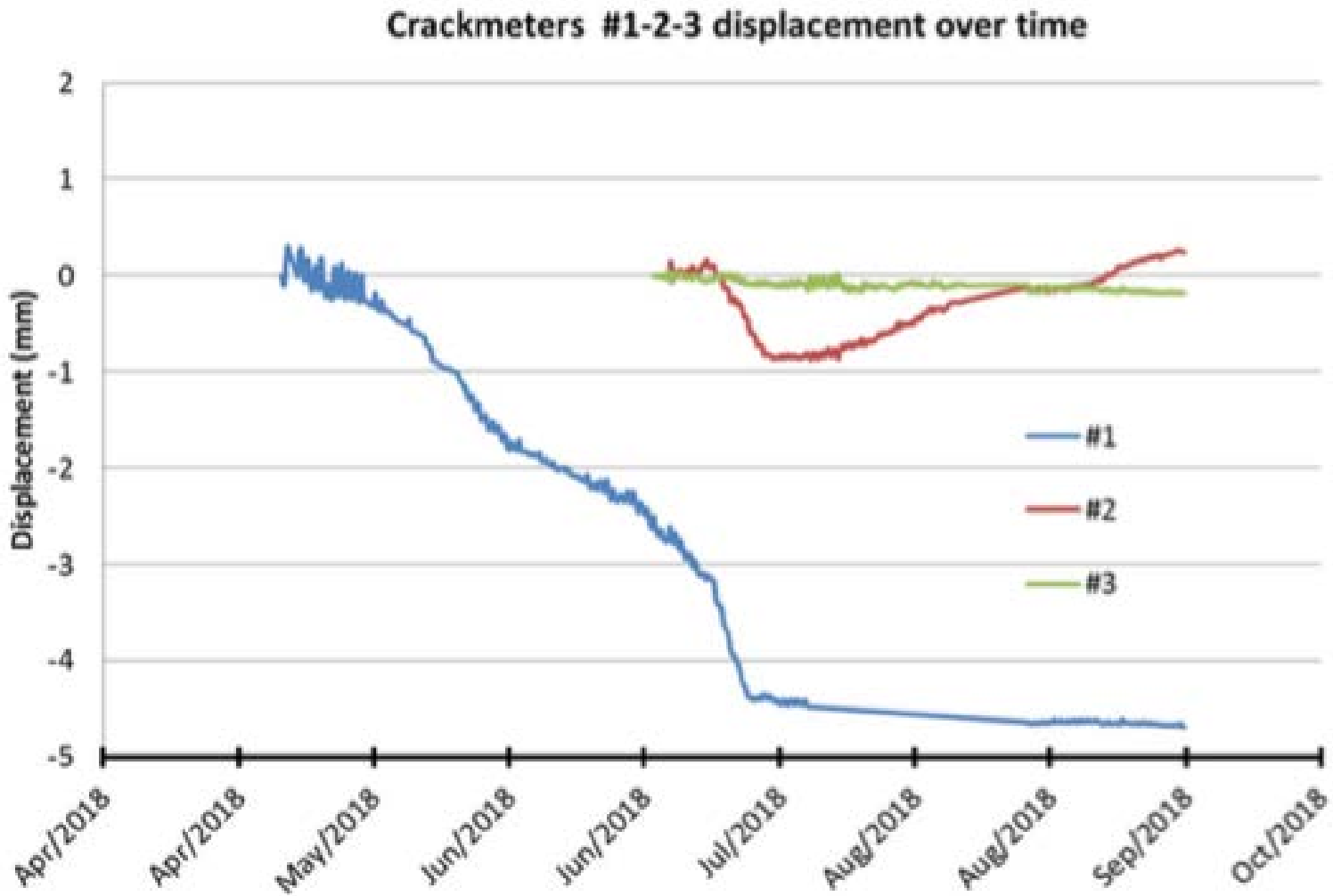
4. INSTRUMENTATION – CRACKMETERS





STORMWATER DIKE 2018 UPDATE

4. INSTRUMENTATION – CRACKMETERS



5. Instrumentation Holes

(Thermistors & Piezometers)

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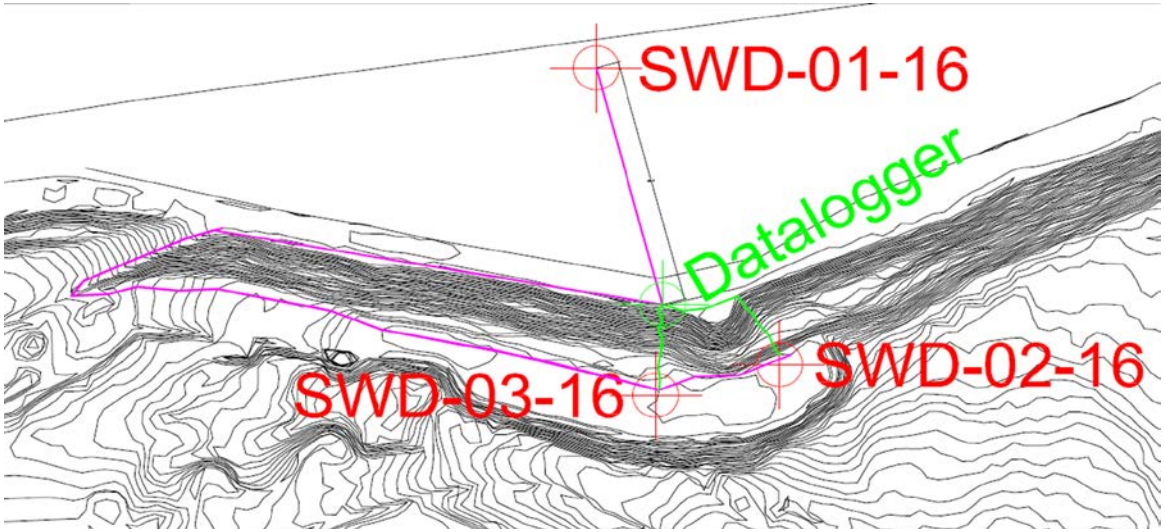
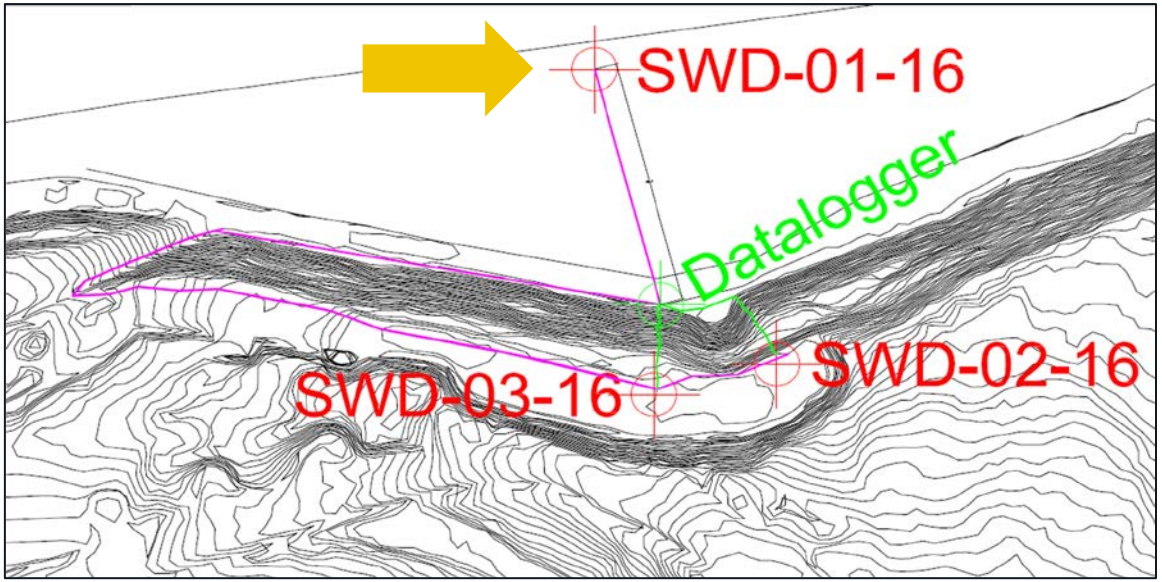
Instrumentation Holes Location:



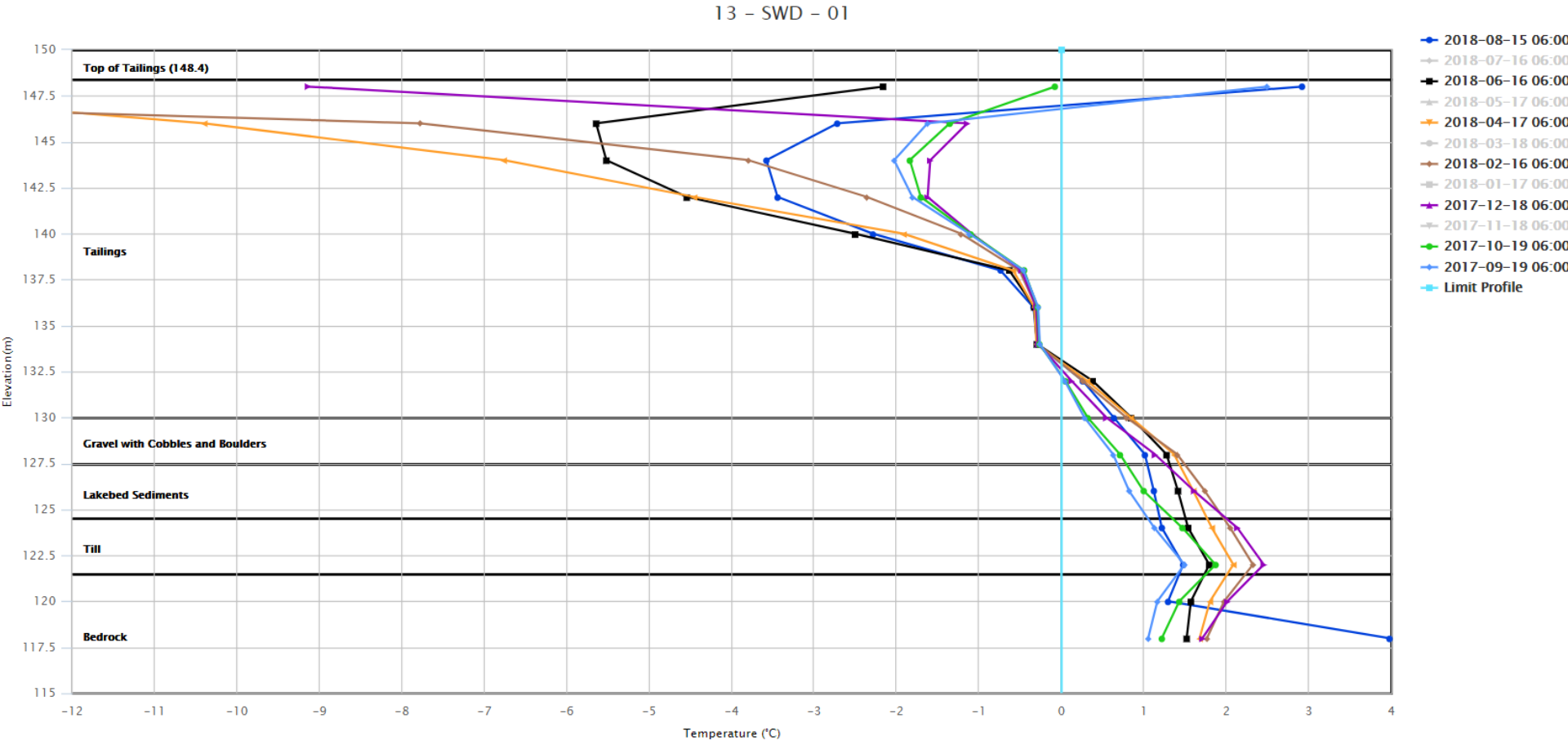
Hole	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
SWD-01	TH-SWD-01	Thermistor	✓	Automatic	-	-	16	148/118
SWD-02	PZ-SWD-02-A	Piezo	✓	Automatic	62	Bedrock	-	-
	TH-SWD-02	Thermistor	✓	Automatic	-	-	6	127/67
SWD-03	PZ-SWD-03-A	Piezo	✓	Automatic	110	Bedrock	-	-
	PZ-SWD-03-B	Piezo	✓	Automatic	122	Bedrock	-	-
	TH-SWD-03	Thermistor	✓	Automatic	-	-	14	125/111

SWD-01-16 Description:

- Located upstream (North Cell side)
- One (1) thermistor string with (16) beads
- No VW Piezometer

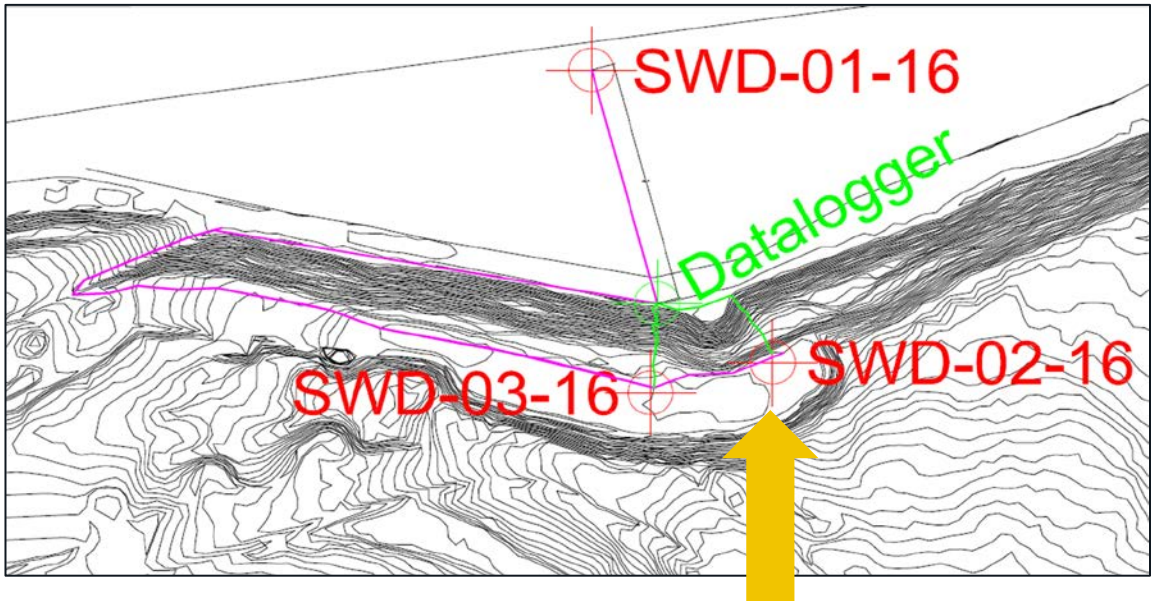


SWD-01-16 Temperature Monitoring:

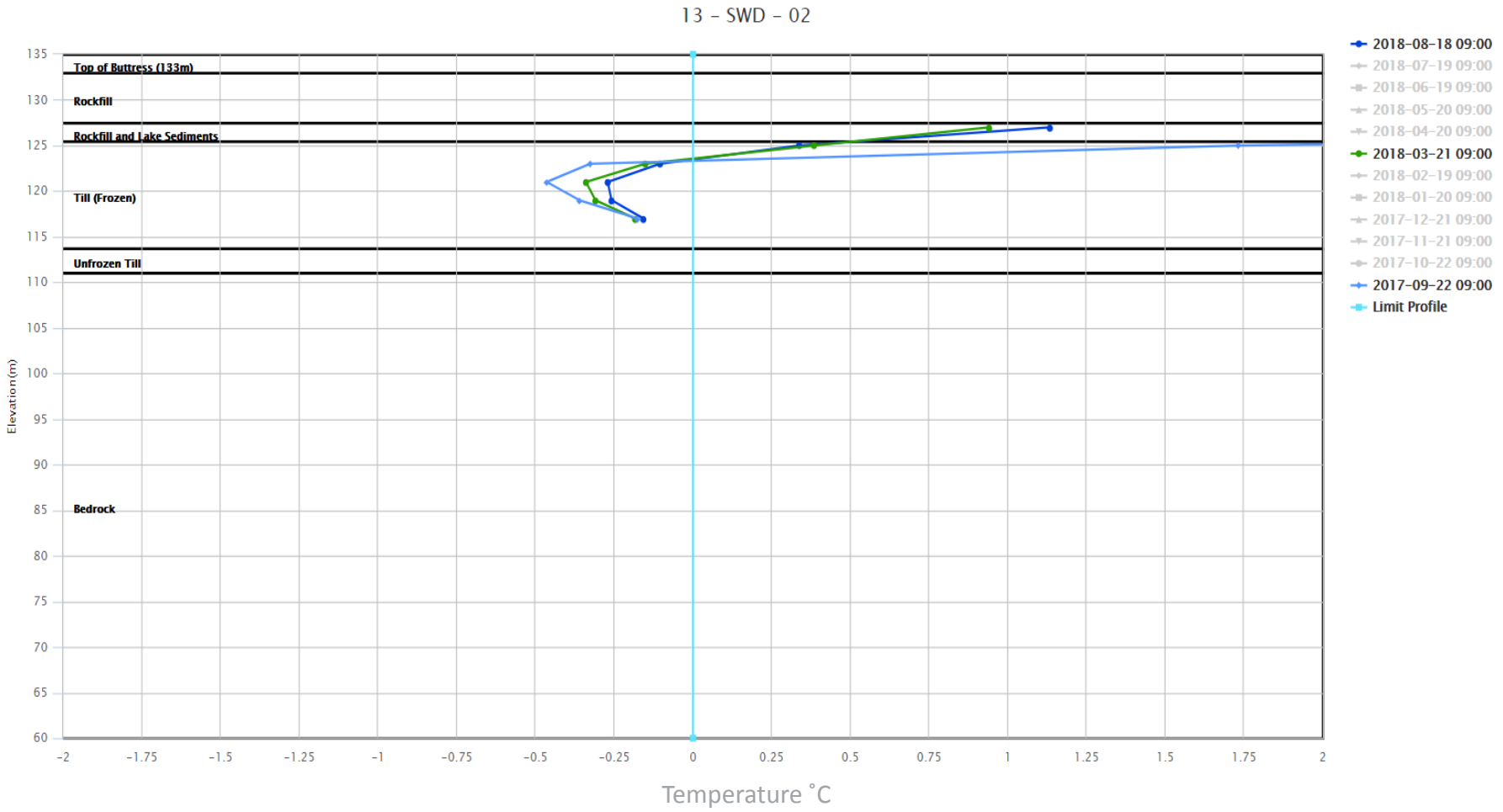


SWD-02-16 Description:

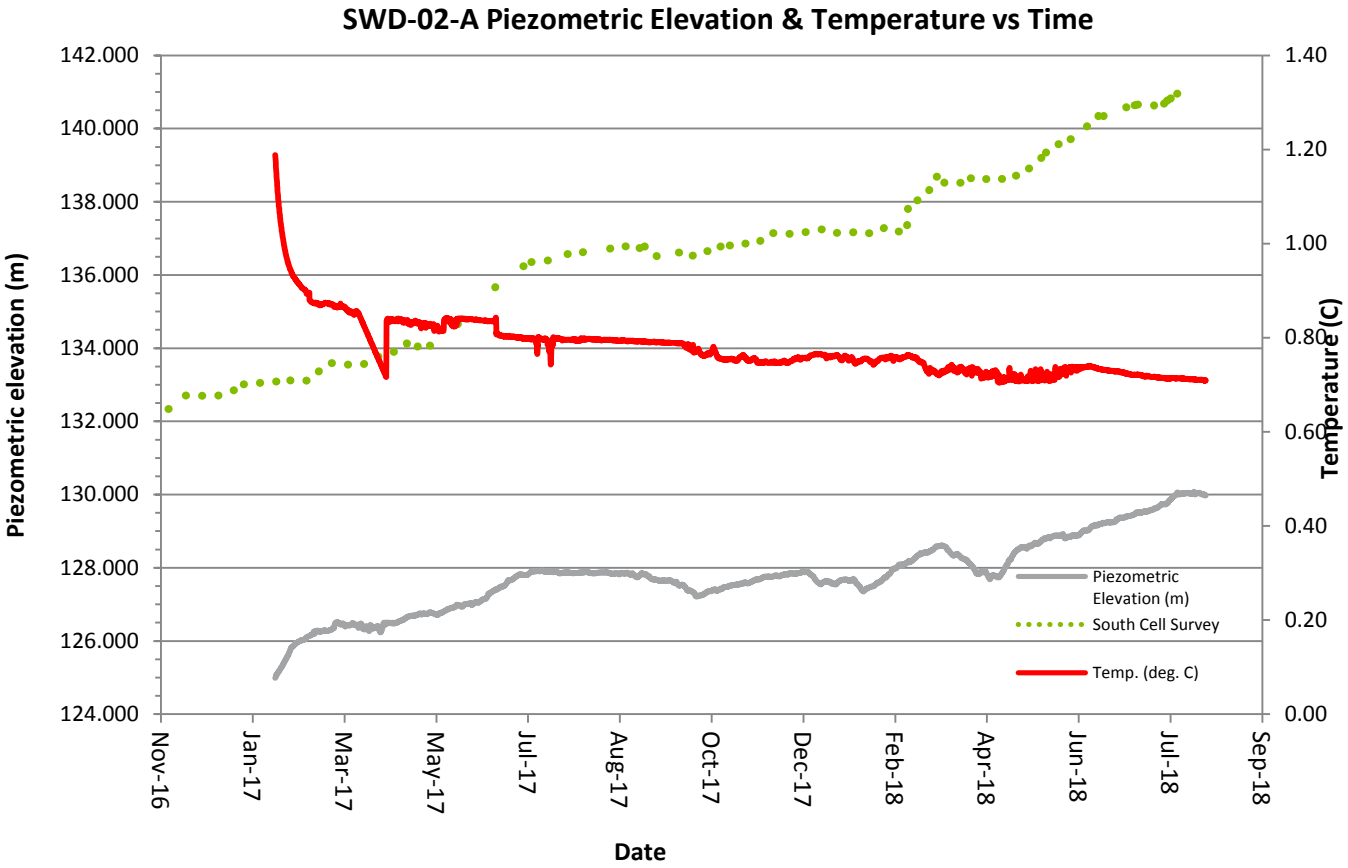
- Located downstream (South Cell side)
- One (1) thermitor string with (16) beads
- One (1) VW Piezometer at a depth of 71m

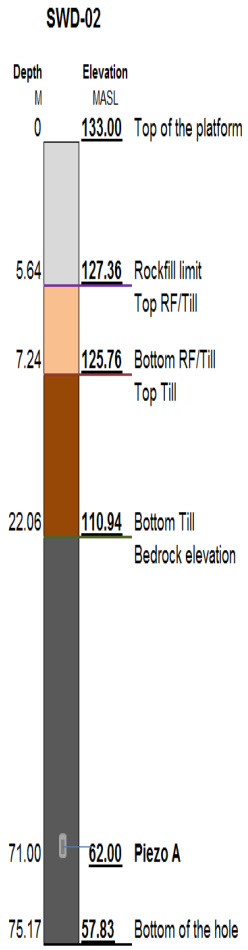


SWD-02-16 Temperature Monitoring:



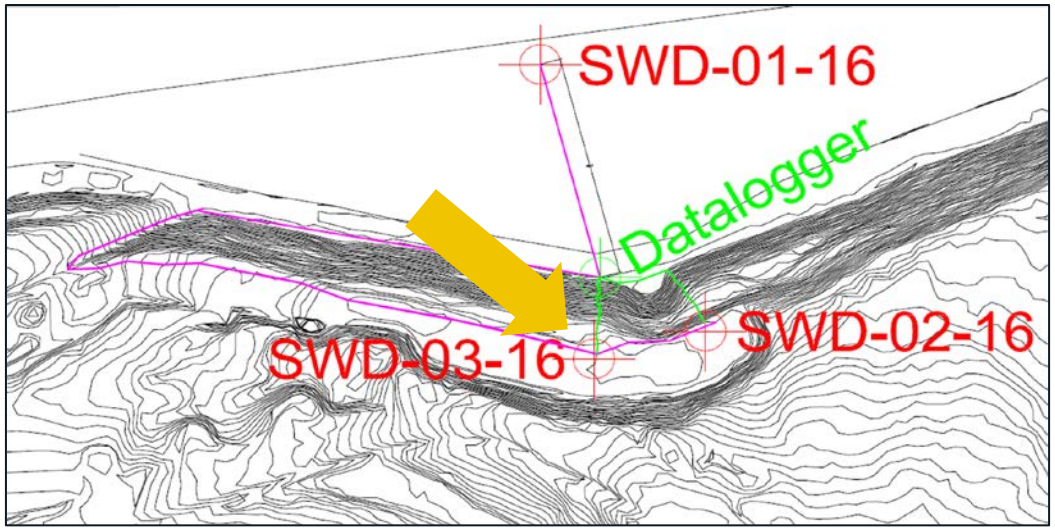
SWD-02-16 PZ Head Monitoring:



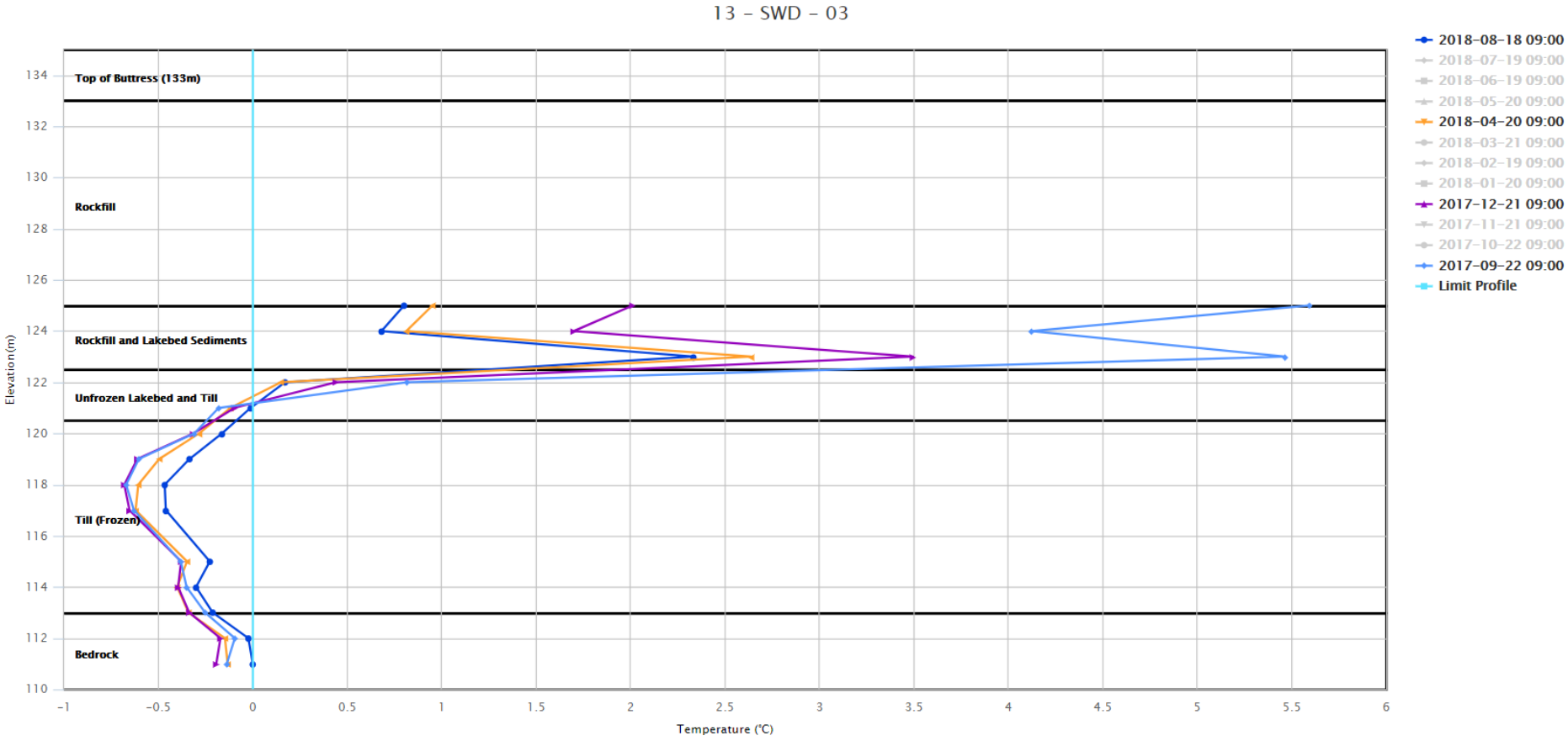


SWD-03-16 Description:

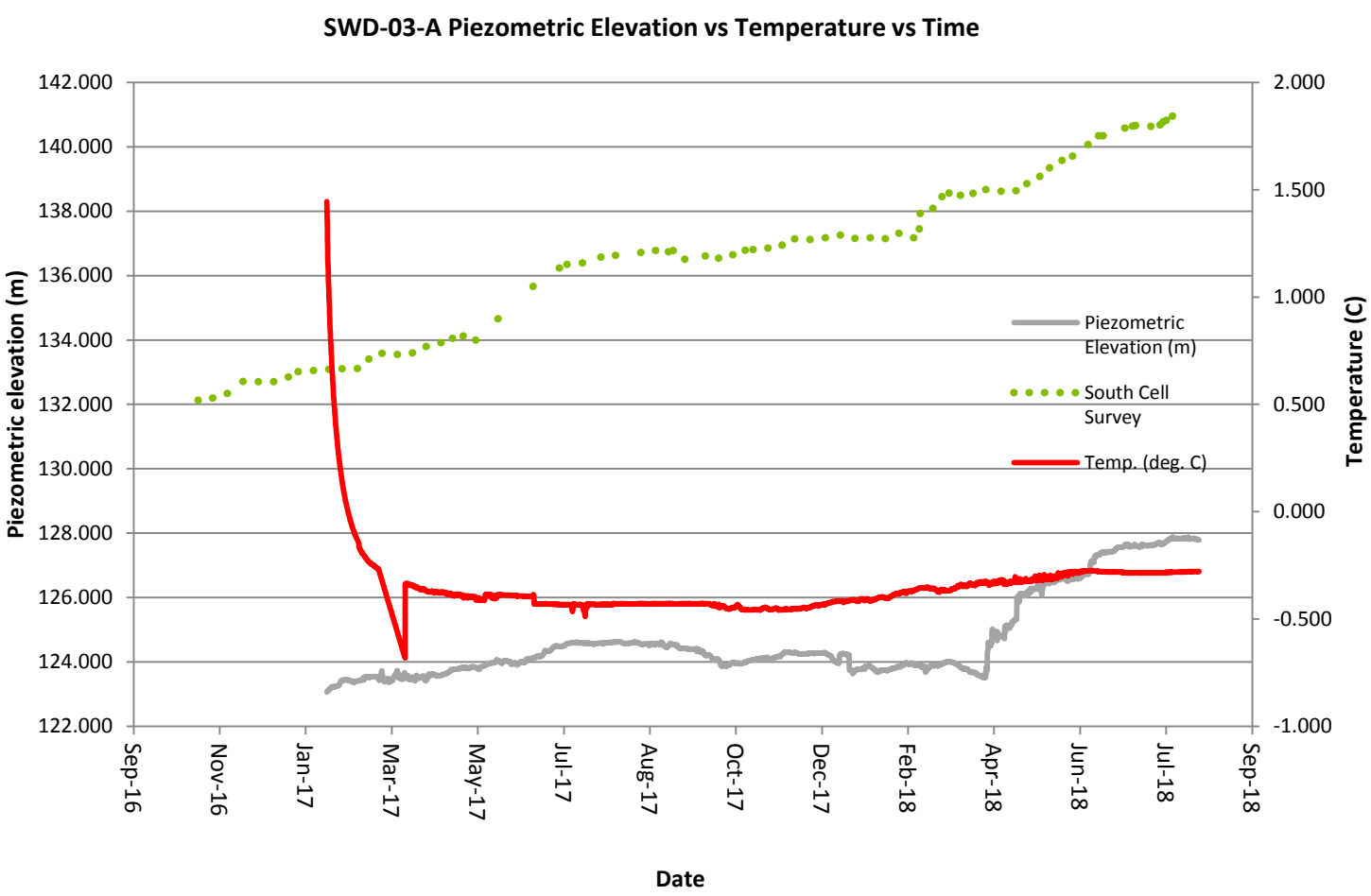
- Located downstream (South Cell side)
- One (1) thermistor string with (16) beads
- Two (2) VW Piezometers
  - PZ-SWD-03-A depth : 23m
  - PZ-SWD-03-B depth : 11m

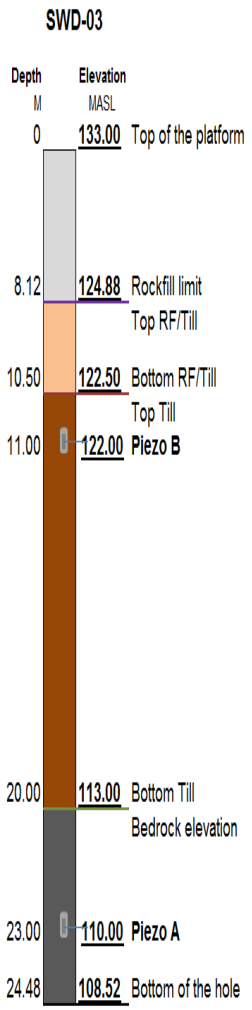


SWD-03-16 Temperature Monitoring:

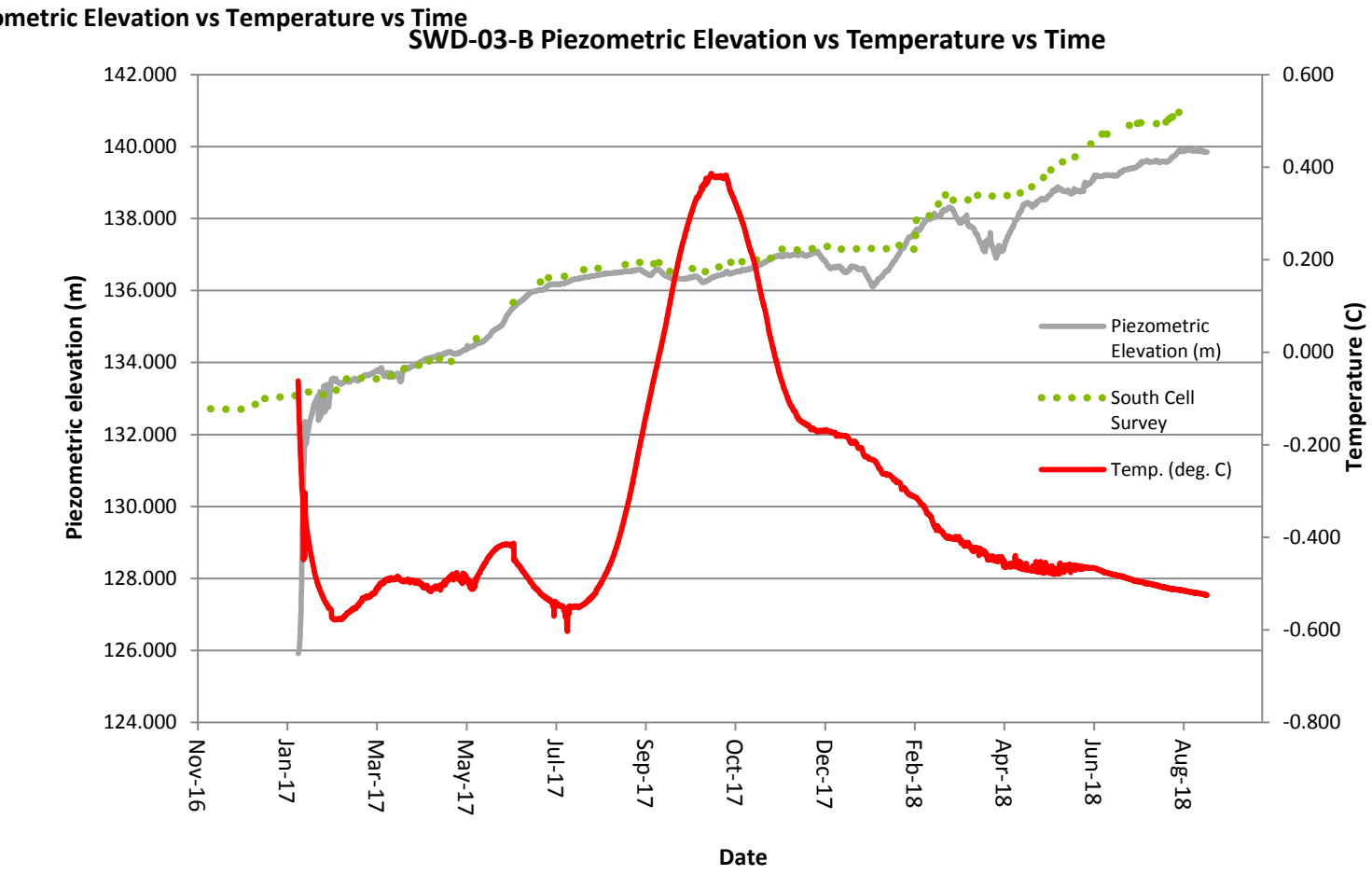


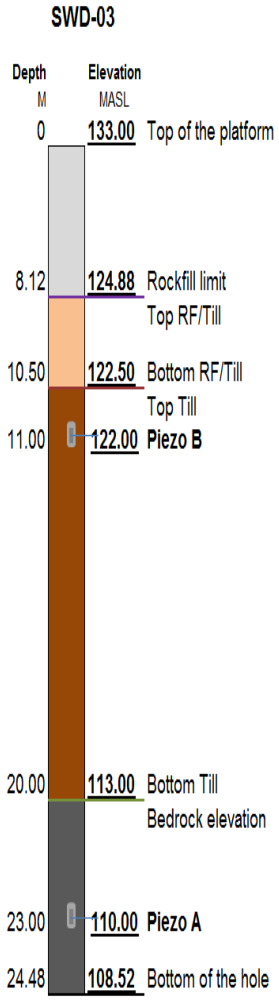
SWD-03-A PZ Head Monitoring:





SWD-03-B PZ Head Monitoring:





Summary of the situation:

- The Stormwater dike is still in the yellow category as per the OMS and the monitoring is ongoing.
- The instrumentation data still show movement but in a stabilizing trend since after freshet.
- The new cracks discovered in 2018 were filled with bentonite.
- Monitoring of the prisms will continue on weekly frequency.
- Frequent visual inspections of the structure are planned for freshet 2019.
- In front of SWD, tailings in the North Cell are frozen down to 18 m deep.

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THANK YOU

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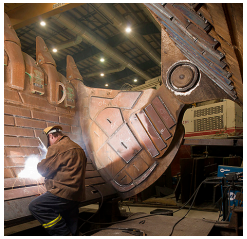
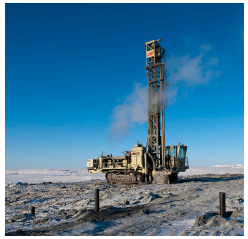




MDRB #24

TAILINGS STORAGE FACILITIES INSTRUMENTATION REVIEW

TAILING STORAGE FACILITIES (TSF) INSTRUMENTATION 2018

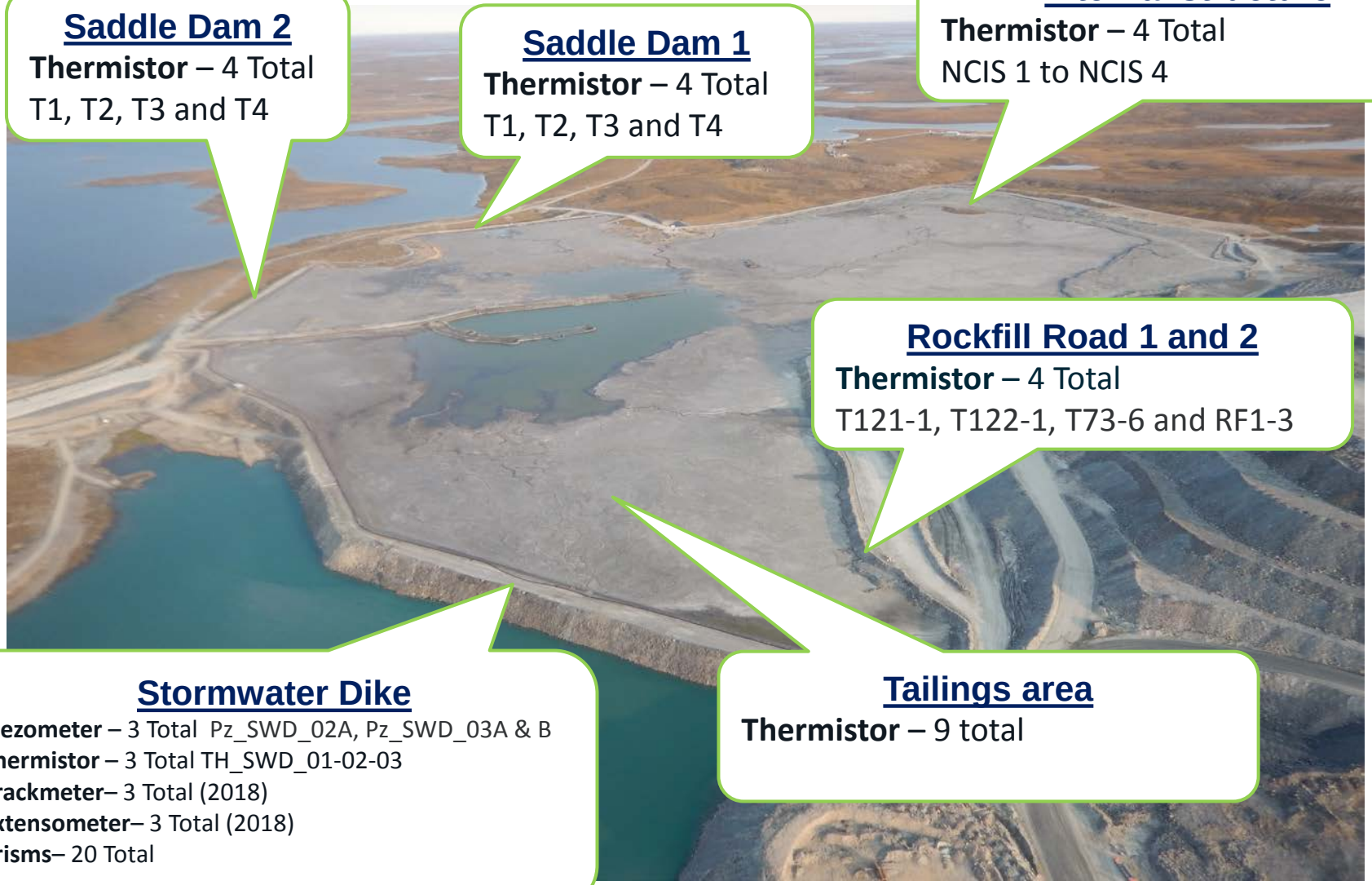
1. **NORTH CELL**
    1. Saddle Dam 1
    2. Saddle Dam 2
    3. Tailings area
    4. Rock Fill (RF1 & RF2)
    5. Internal structure (built in 2018)
2. **SOUTH CELL**
    1. Saddle Dam 3
    2. Saddle Dam 4
    3. Saddle Dam 5

THERMISTORS DATA REVIEW

- Thermistors graphs present 12 data sets with a monthly interval
- The objective is to present a review of the TSF year data
- Graphs are produced with VDV or Excel
- Stormwater and Central Dikes not presented here.

1. North Cell Operational Structures

(2018)



Saddle Dam 2
Thermistor – 4 Total
T1, T2, T3 and T4

Saddle Dam 1
Thermistor – 4 Total
T1, T2, T3 and T4

Internal structure
Thermistor – 4 Total
NCIS 1 to NCIS 4

Rockfill Road 1 and 2
Thermistor – 4 Total
T121-1, T122-1, T73-6 and RF1-3

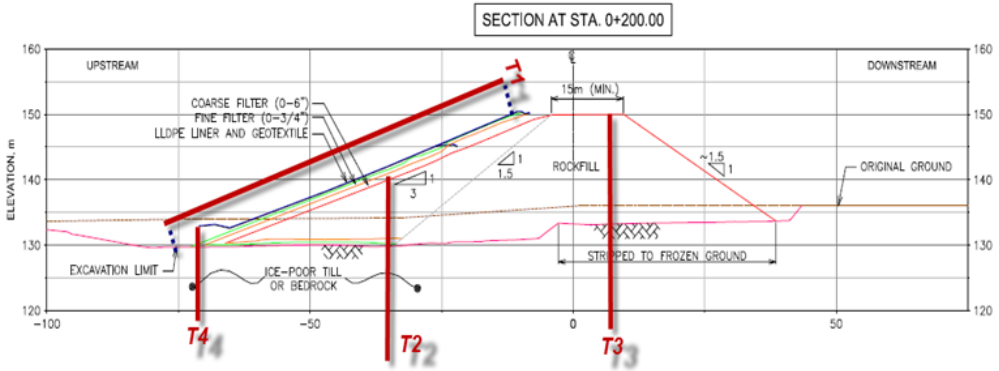
Stormwater Dike
Piezometer – 3 Total Pz_SWD_02A, Pz_SWD_03A & B
Thermistor – 3 Total TH_SWD_01-02-03
Crackmeter– 3 Total (2018)
Extensometer– 3 Total (2018)
Prisms– 20 Total

Tailings area
Thermistor – 9 total

TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1. NORTH CELL: SADDLE DAM 1

Thermistors Emplacement : T1, T2, T3 & T4

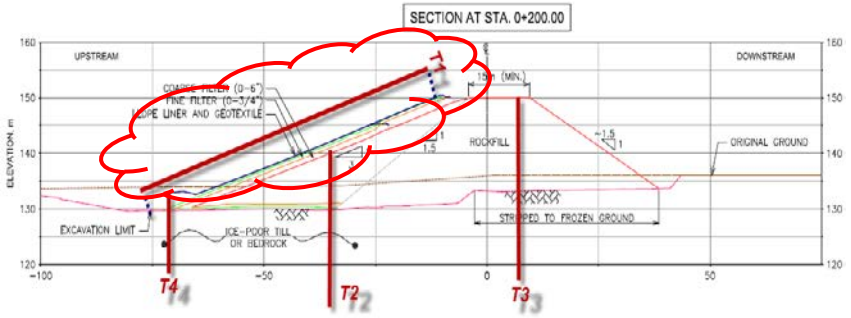


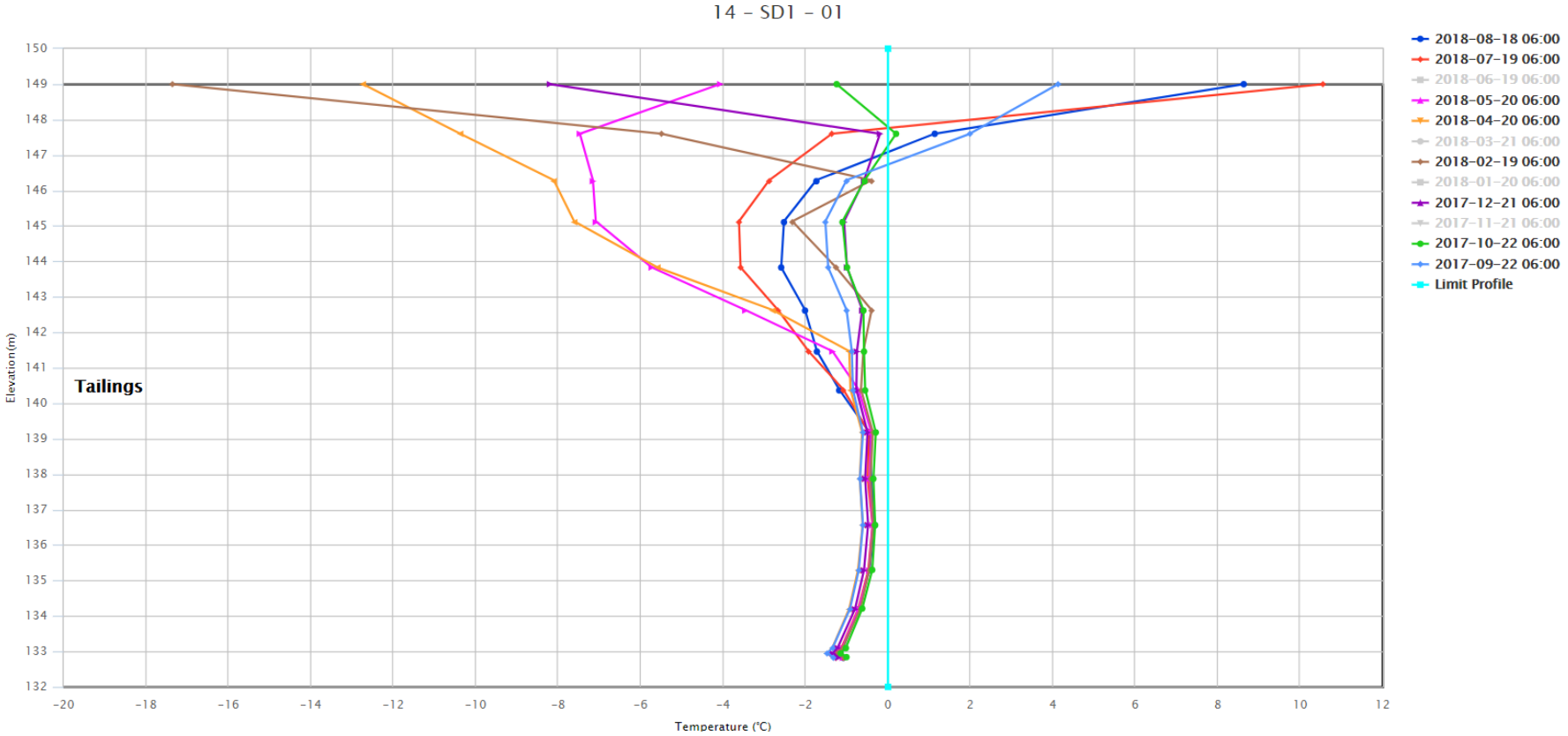
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.1 NORTH CELL: SADDLE DAM 1

Thermistors 1 (T1)

- From Sept 22th, 2017 to Aug 18th, 2018
- Tailings frozen all year long below elevation 146.5 (masl)



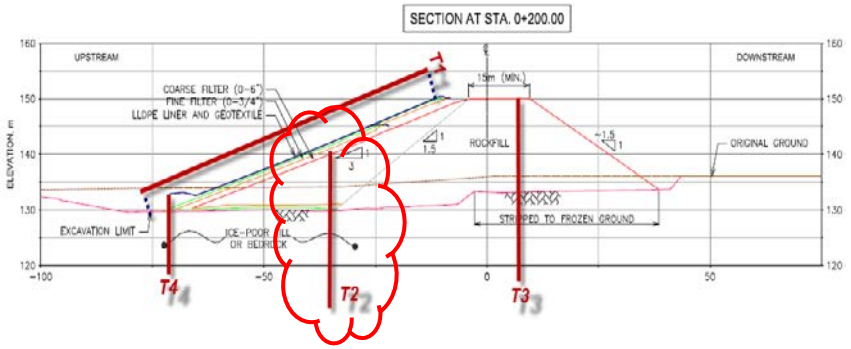


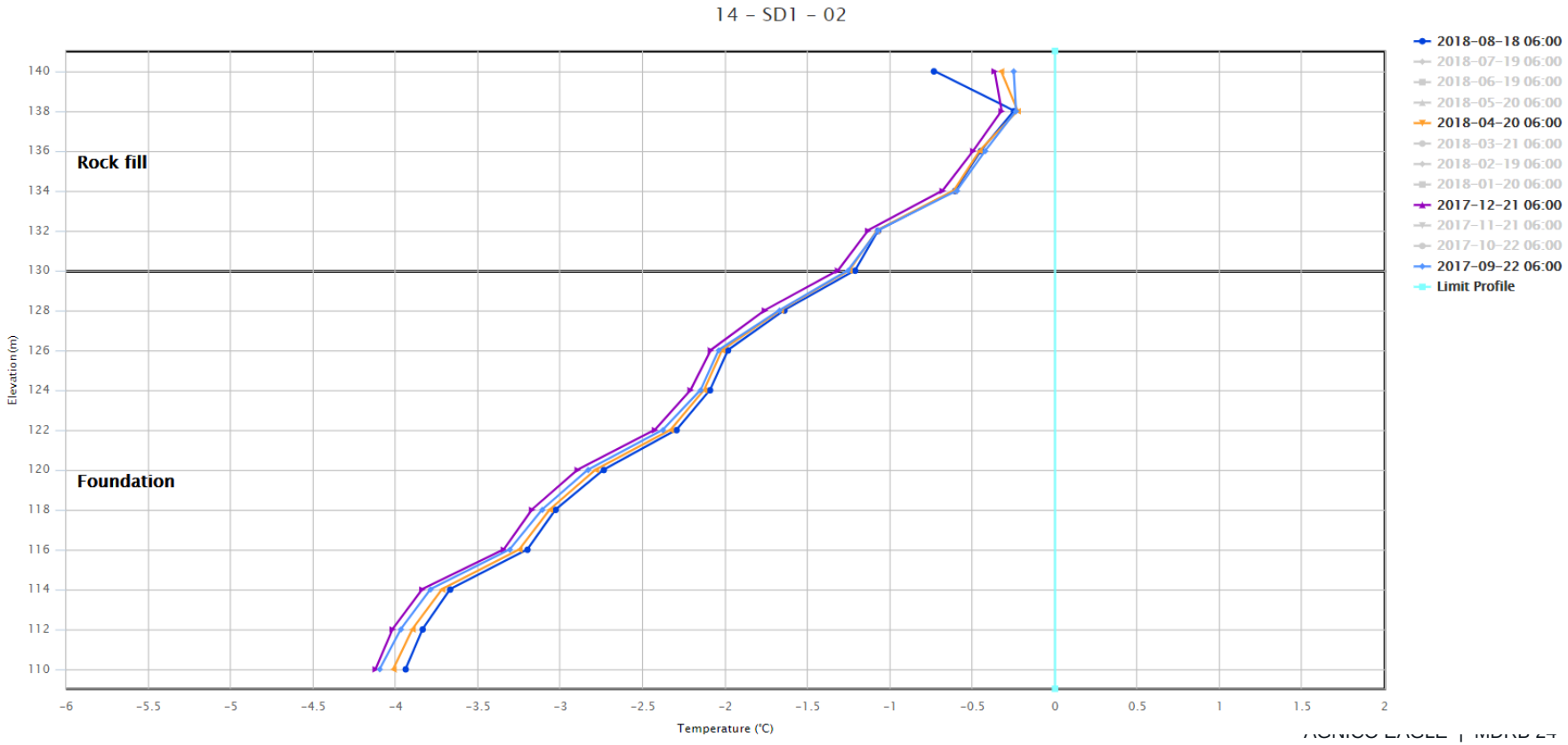
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.1 NORTH CELL: SADDLE DAM 1

Thermistors 2 (T2)

- From Sept 22th, 2017 to Aug 18th, 2018
- Rock fill (slope) and foundation frozen all year long below elevation 140.0 (masl)



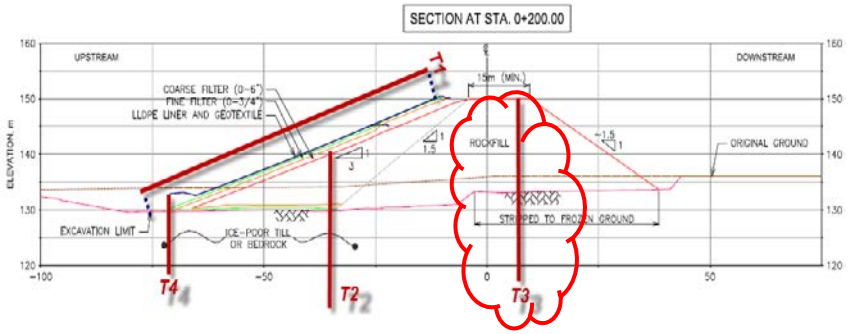


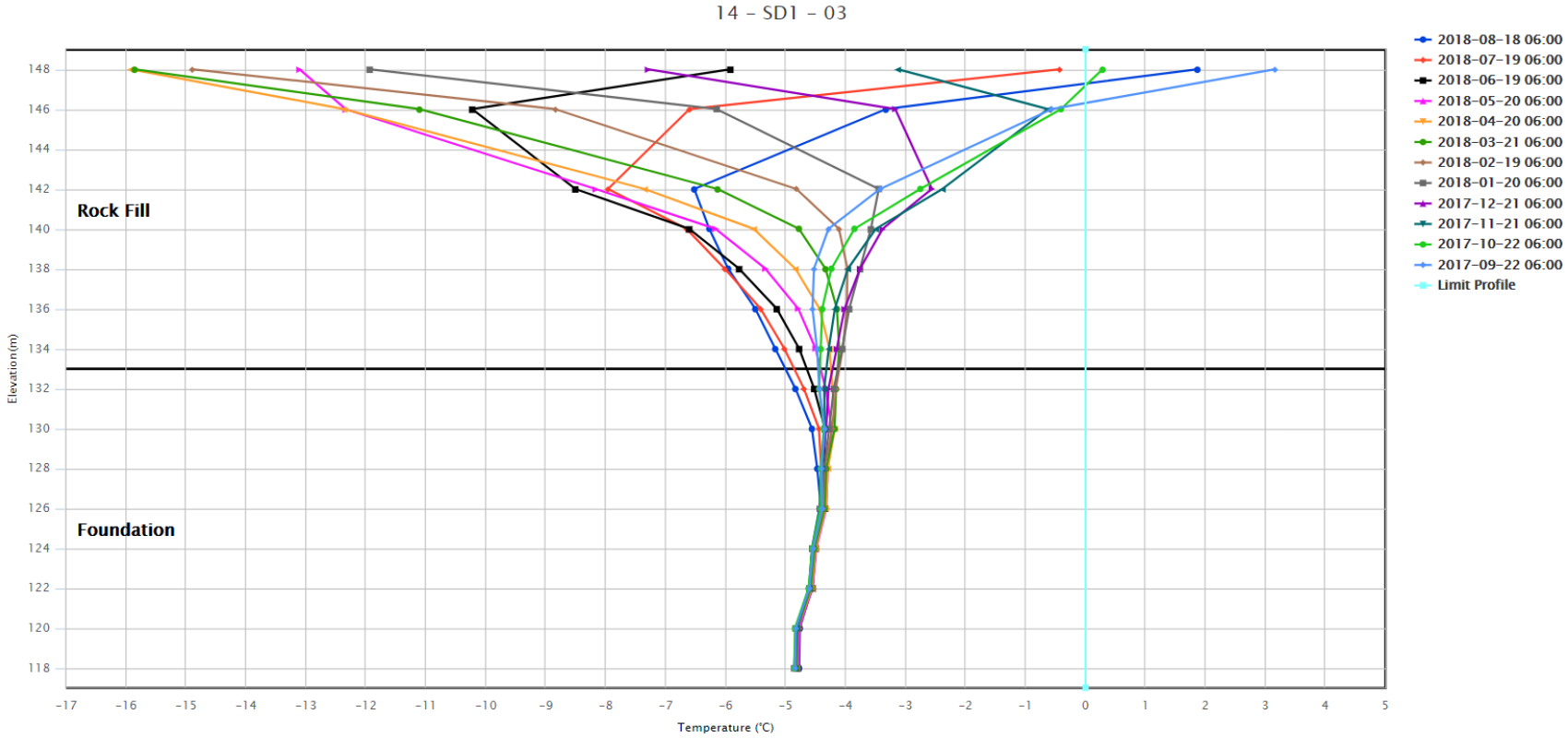
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.1 NORTH CELL: SADDLE DAM 1

Thermistors 3 (T3)

- From Sept 22th, 2017 to Aug 18th, 2018
- Rock fill and foundation frozen all year long below elevation 146.0 (masl)



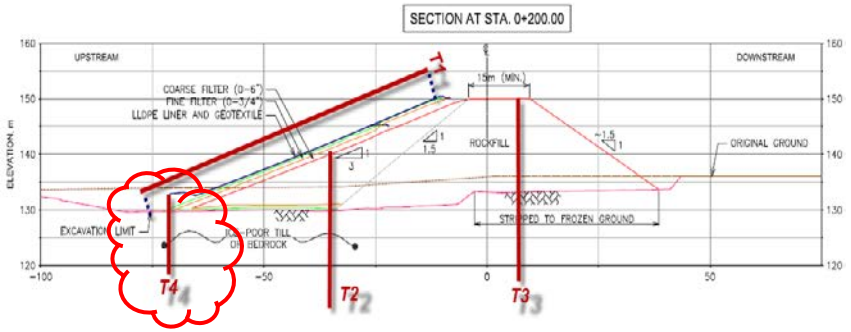


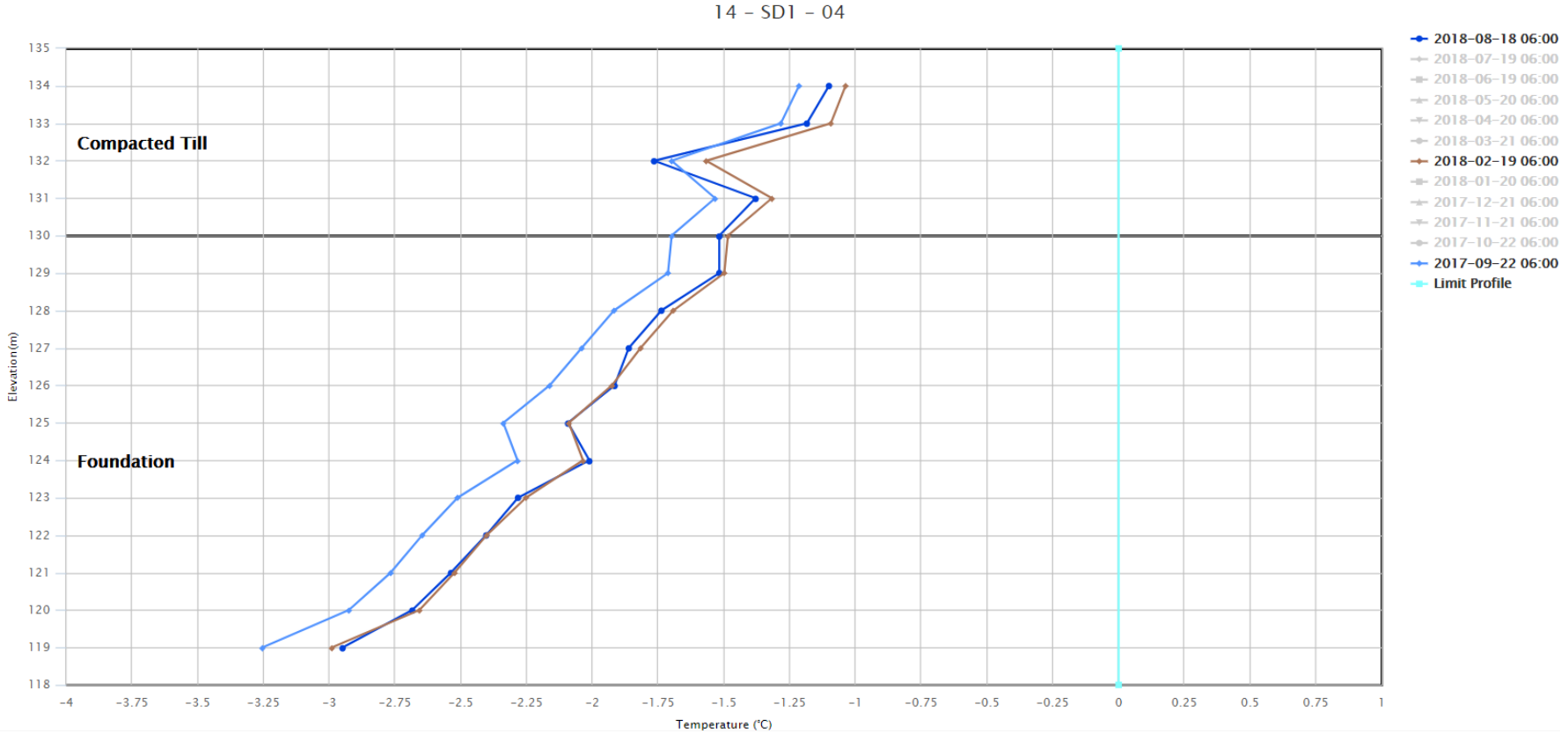
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.1 NORTH CELL: SADDLE DAM 1

Thermistors 4 (T4)

- From Sept 22th, 2017 to Aug 18th, 2018
- Compacted till and foundation frozen all year long below elevation 134.0 (masl)





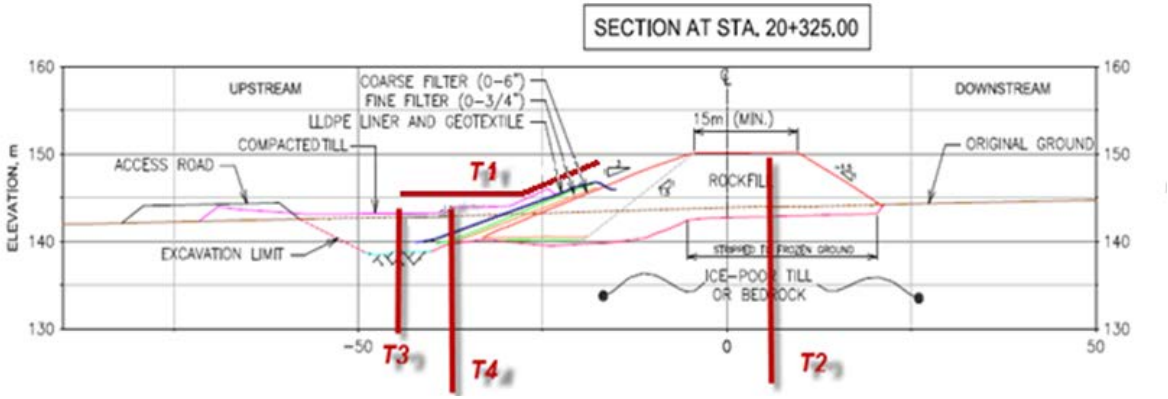
1. North Cell Operational Structures

(2018)

TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.2 NORTH CELL: SADDLE DAM 2

SD2 Thermistors Emplacement : T1, T2, T3 & T4

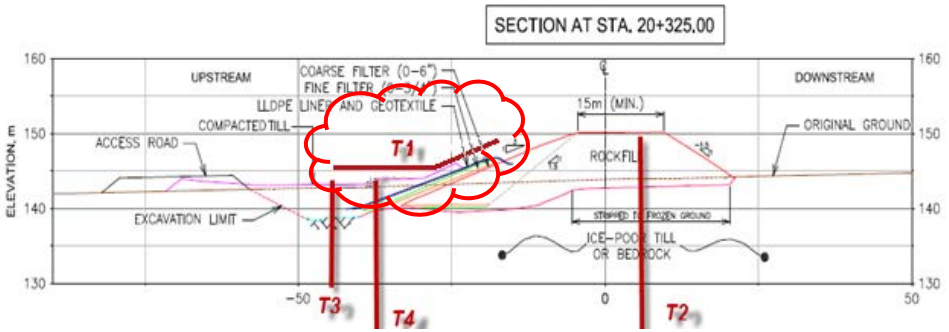


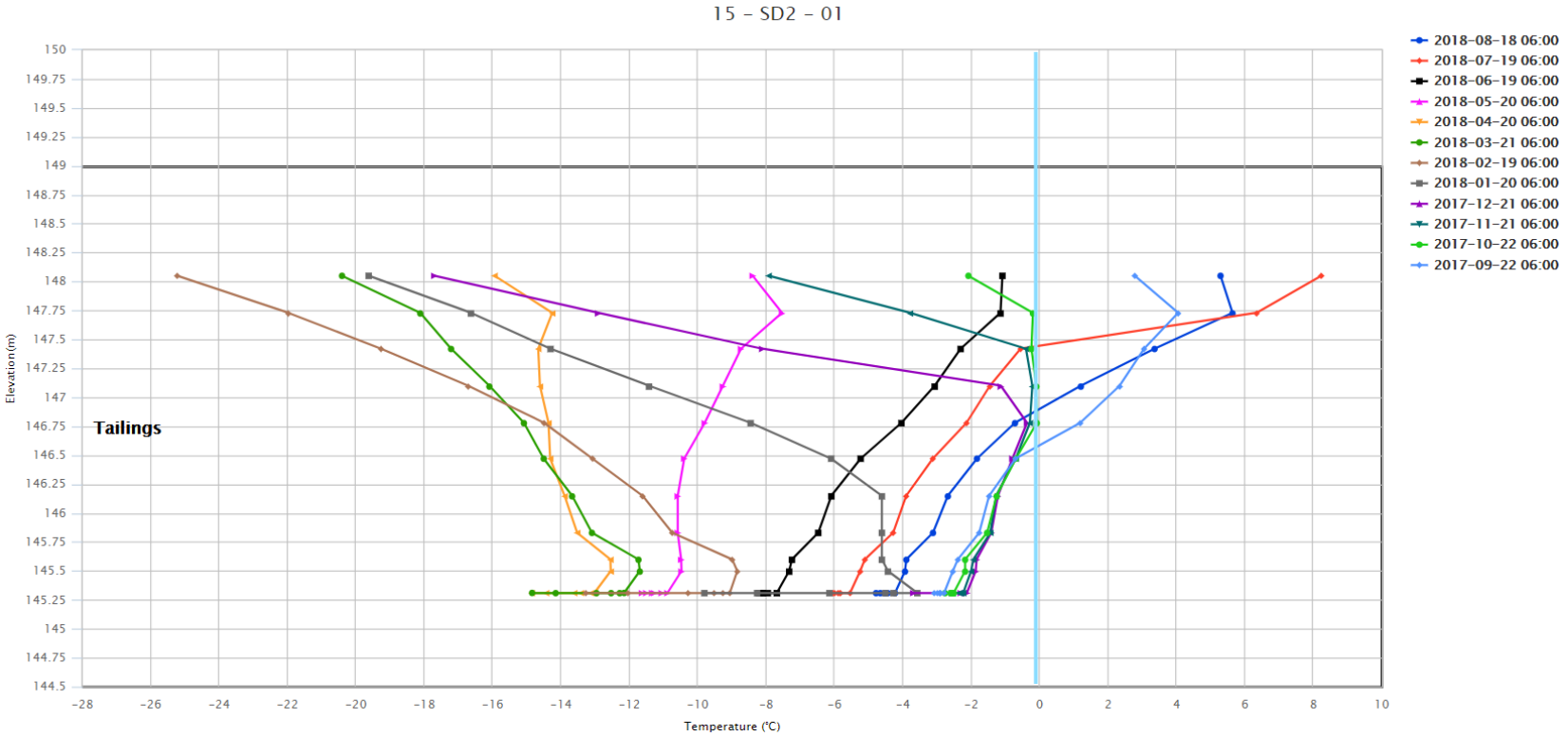
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.2 NORTH CELL: SADDLE DAM 2

Thermistors 1 (T1)

- From Sept 22th, 2017 to Aug 18th, 2018
- Compacted till and foundation frozen all year long below elevation 146.5 (masl)



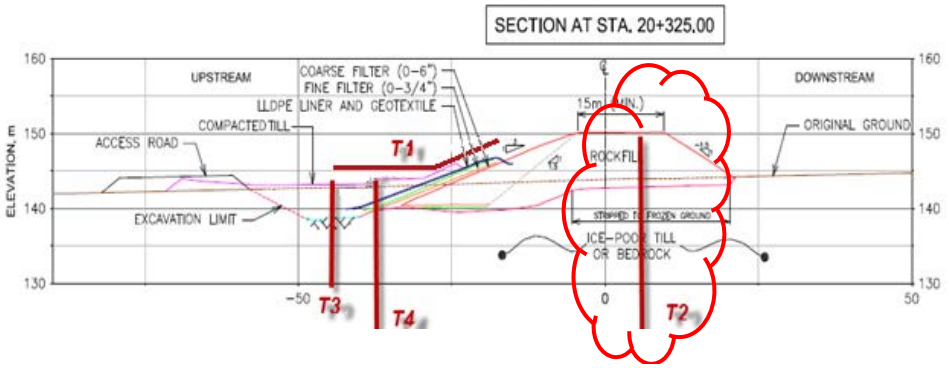


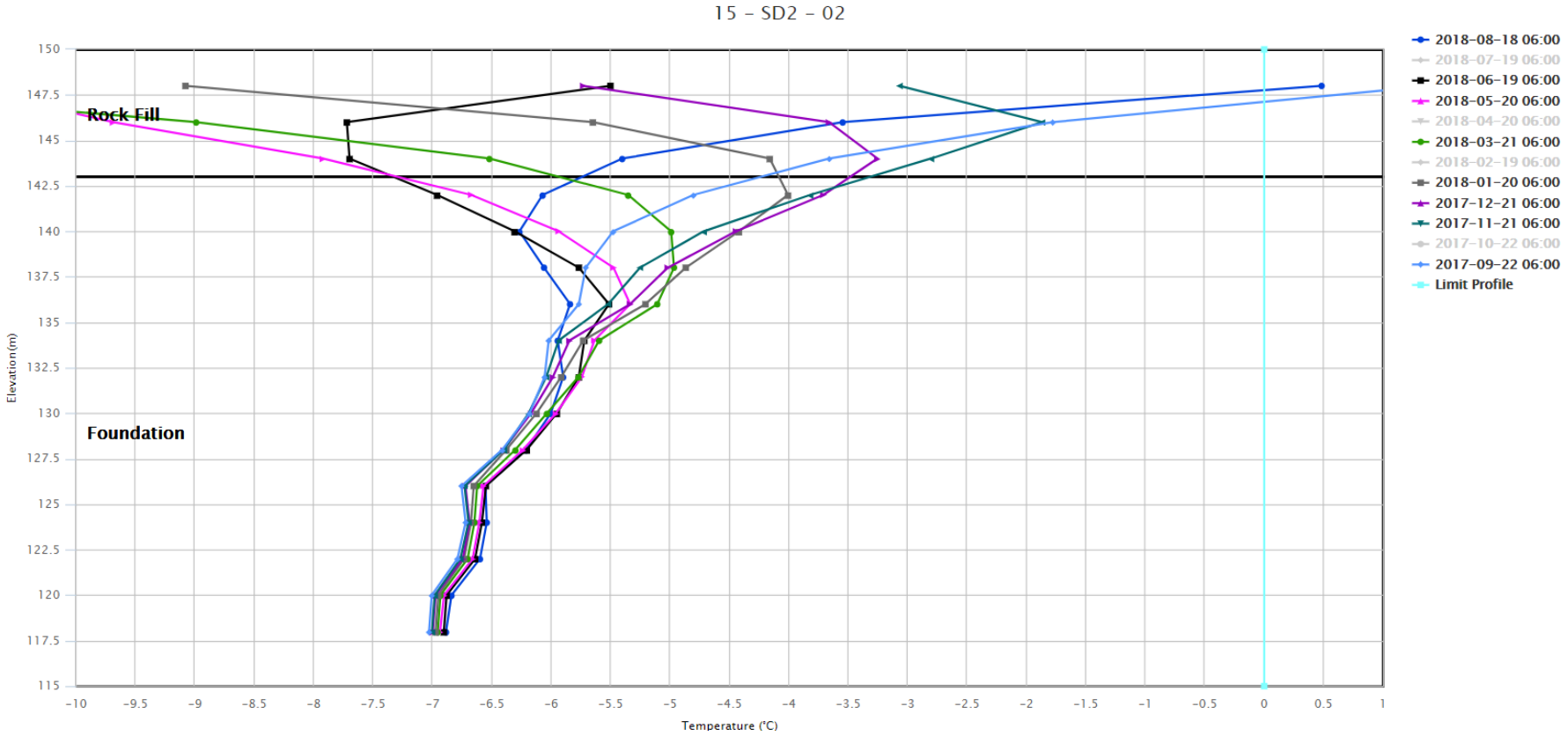
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.2 NORTH CELL: SADDLE DAM 2

Thermistors 2 (T2)

- From Sept 22th, 2017 to Aug 18th, 2018
- Compacted till and foundation frozen all year long below elevation 146 (masl)



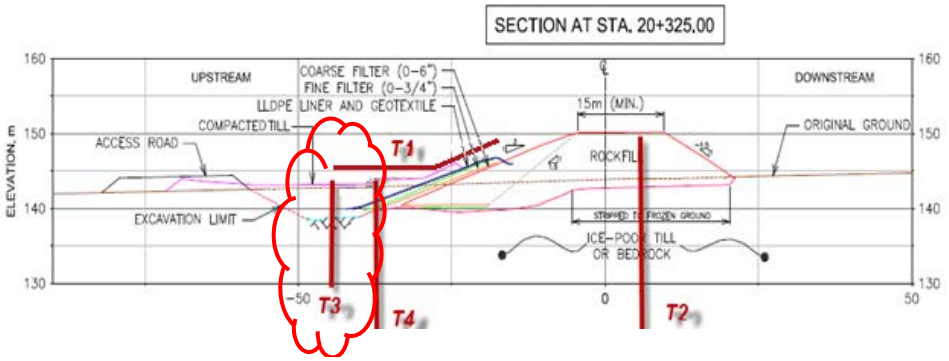


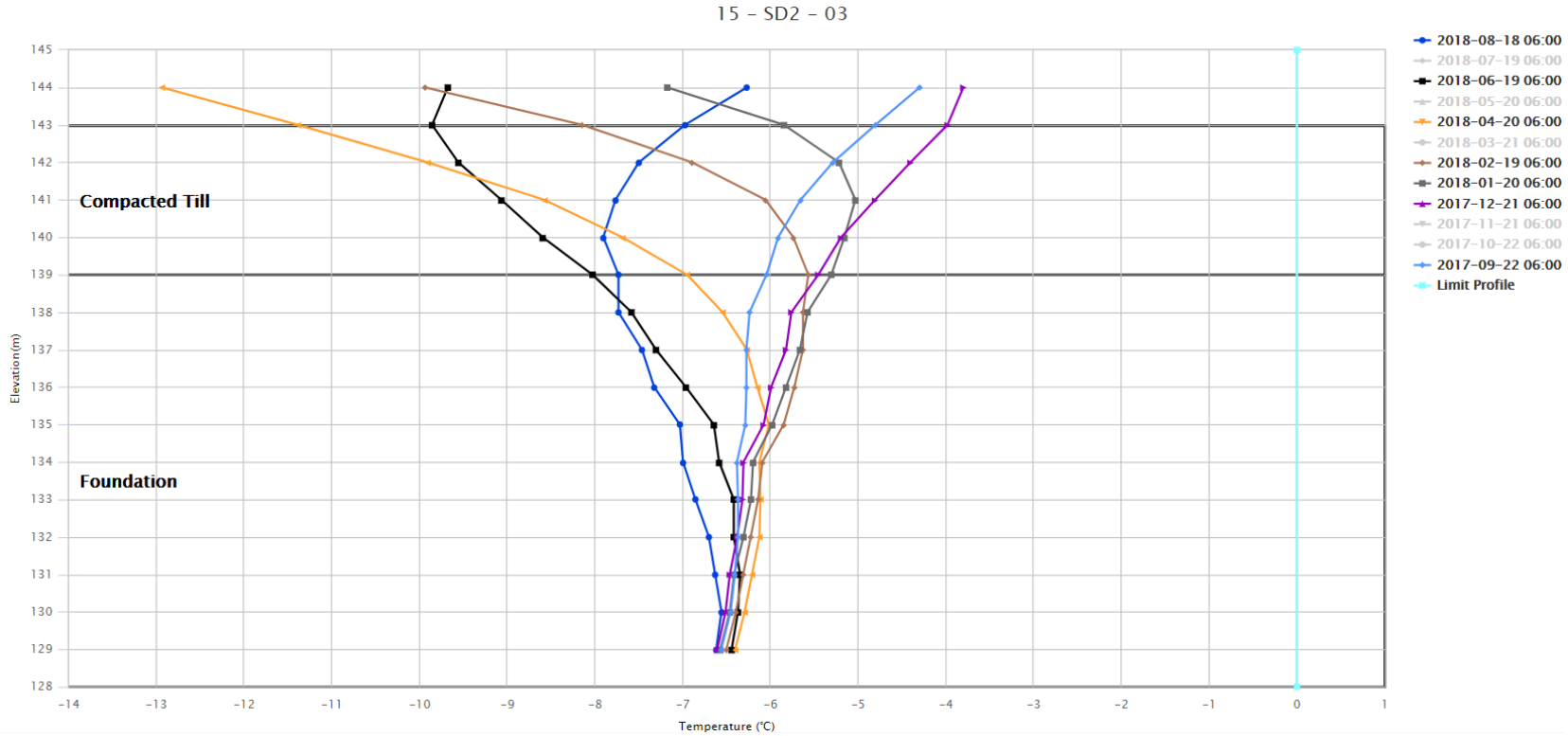
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.2 NORTH CELL: SADDLE DAM 2

Thermistors 3 (T3)

- From Sept 22th, 2017 to Aug 18th, 2018
- Compacted till and foundation frozen all year long below elevation 144 (masl)



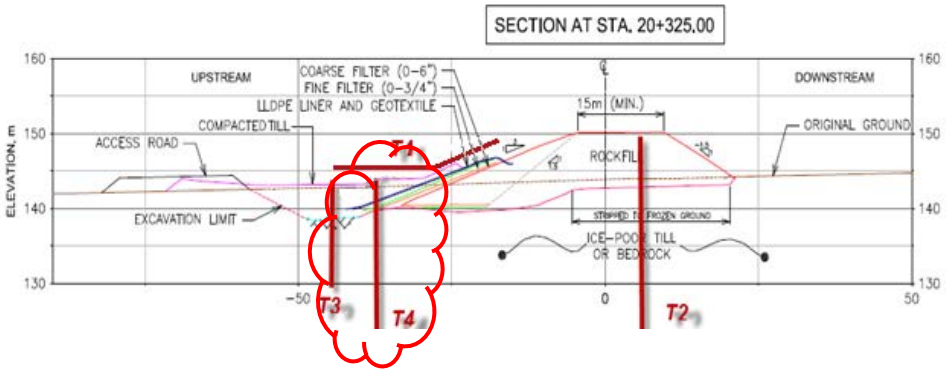


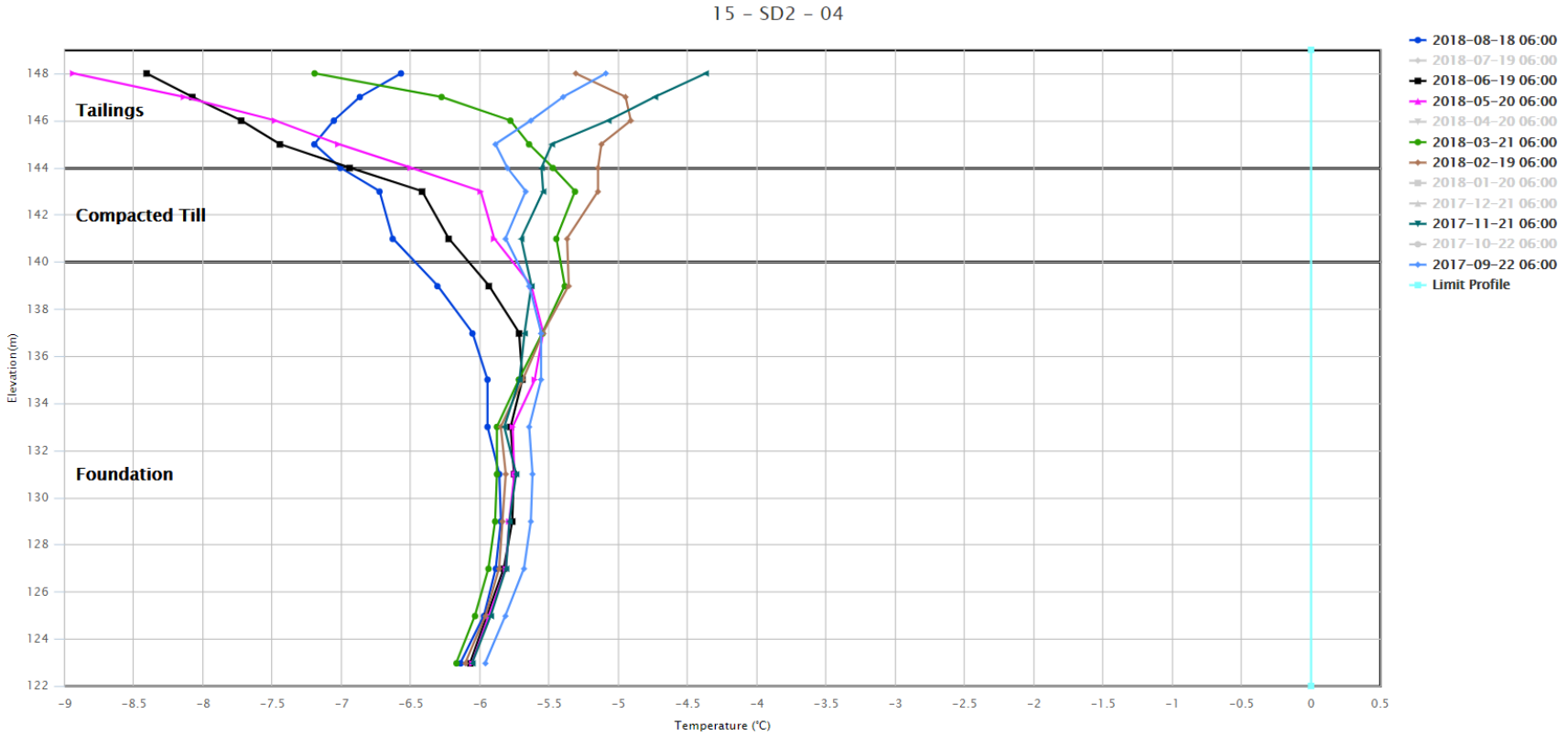
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.2 NORTH CELL: SADDLE DAM 2

Thermistors 4 (T4)

- From Sept 22th, 2017 to Aug 18th, 2018
- Compacted till and foundation frozen all year long below elevation 148 (masl)





1. North Cell Operational Structures

(2018)

TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistors installed inside the North Cell tailings storage facility during the 2017 instrumentation campaign

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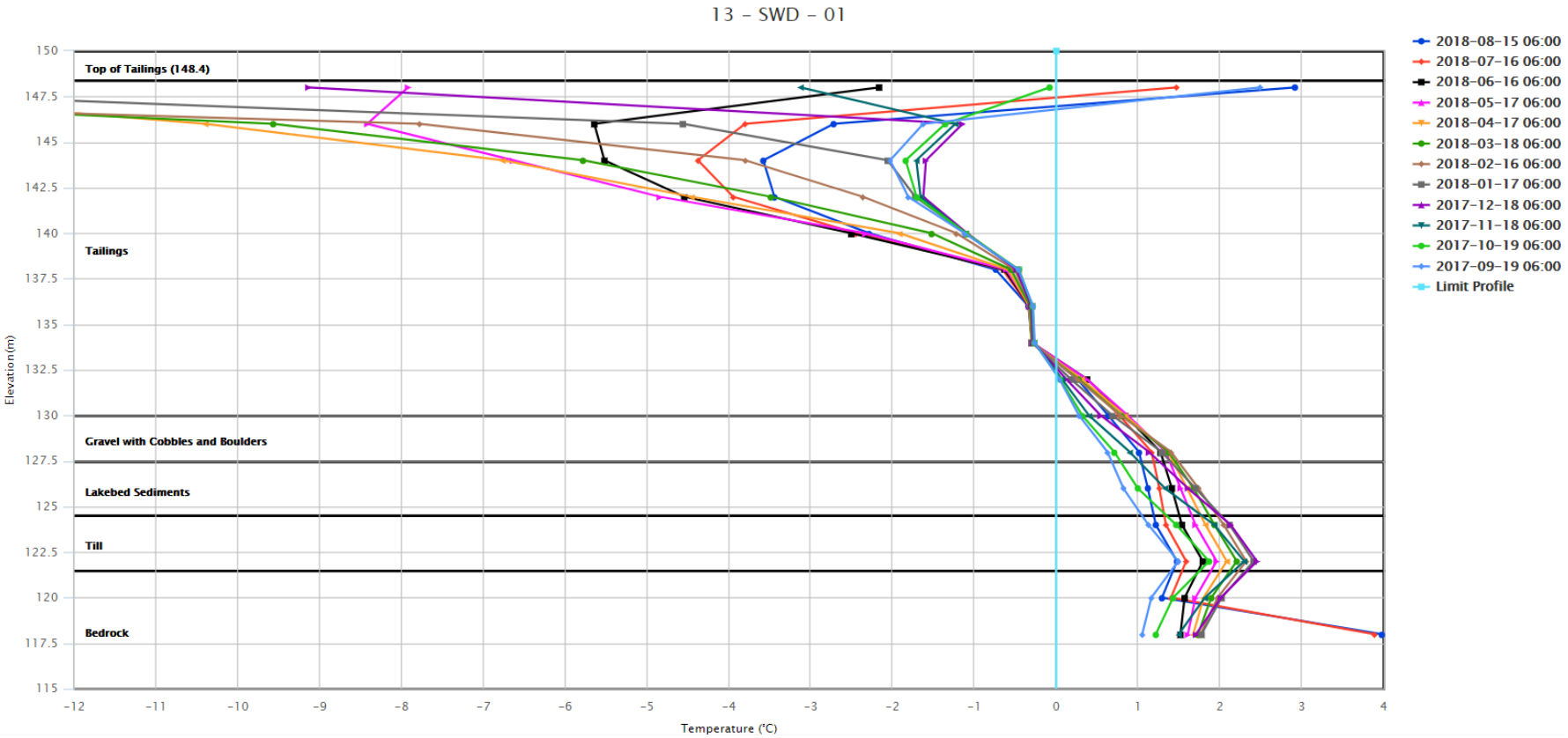
1.3 NORTH CELL TAILINGS

Thermistor SWD 01

- From Sept 19th, 2017 to Aug 18th, 2018
- Unfrozen below 132.5 m (Due to South Cell pond water)

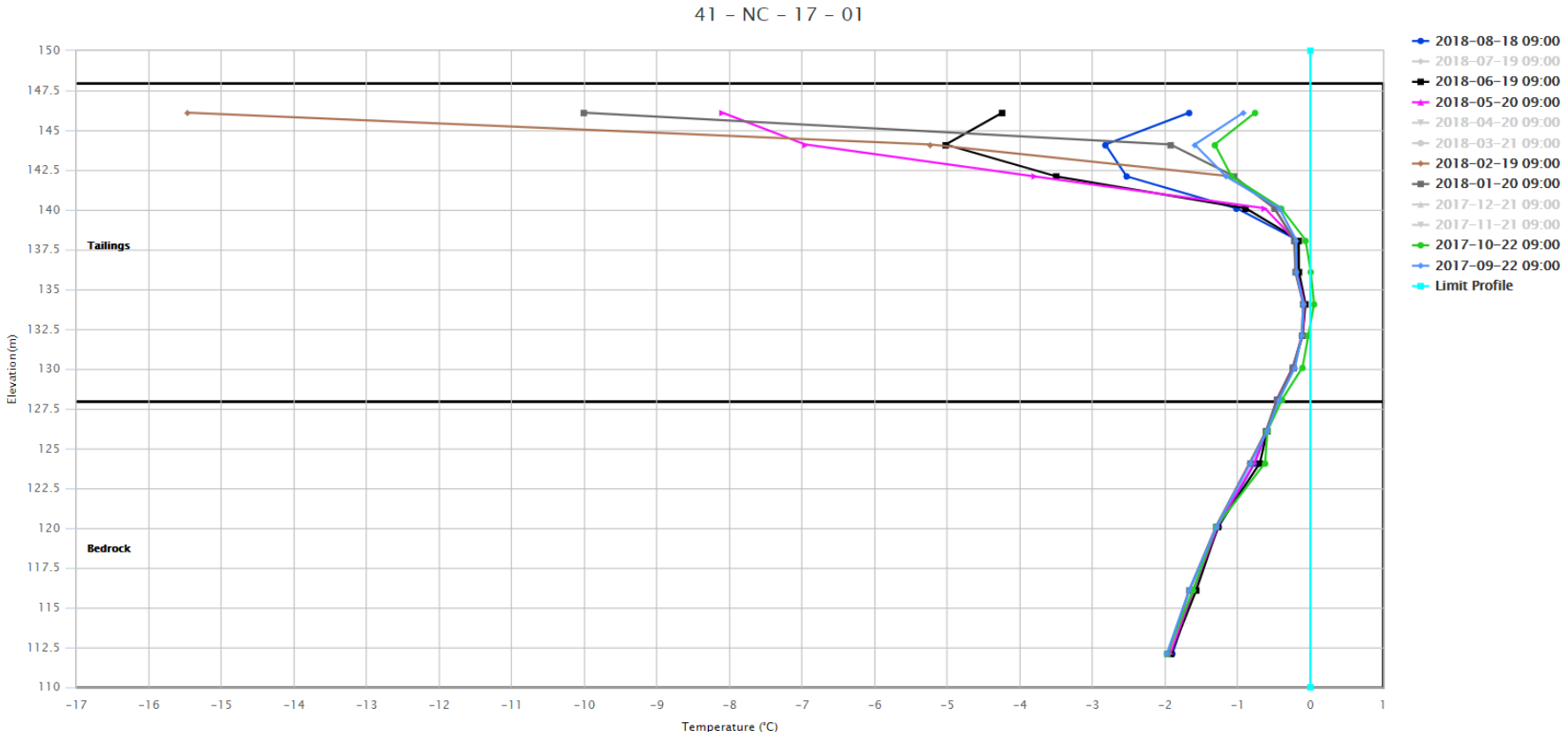


TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistor NC-17-01

- From Sept 22nd, 2017 to Aug 18th, 2018

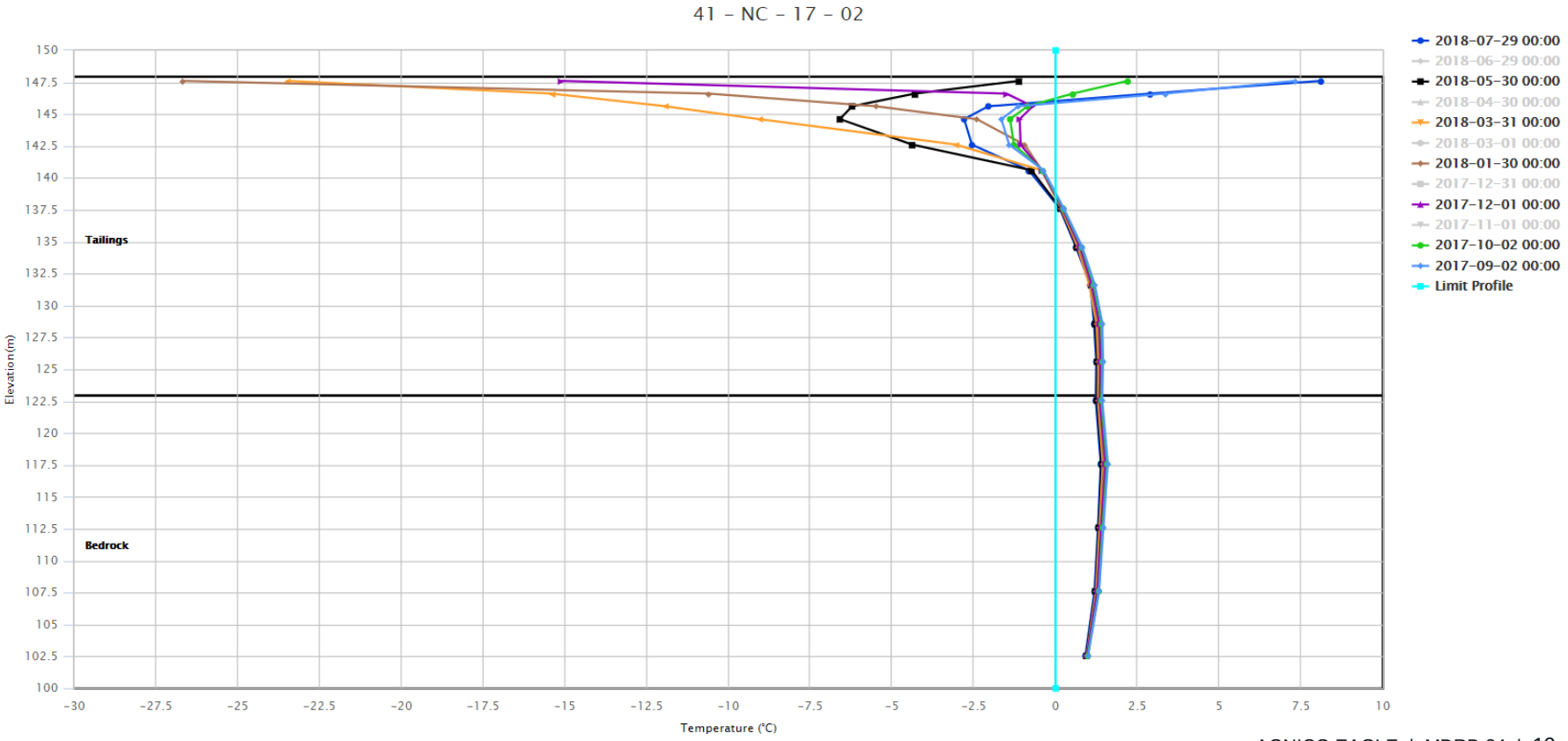


TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistor NC-17-02

- From Sept 2nd, 2017 to July 29th, 2018
- Unfrozen below 137.5 m (Due to North Cell pond water)

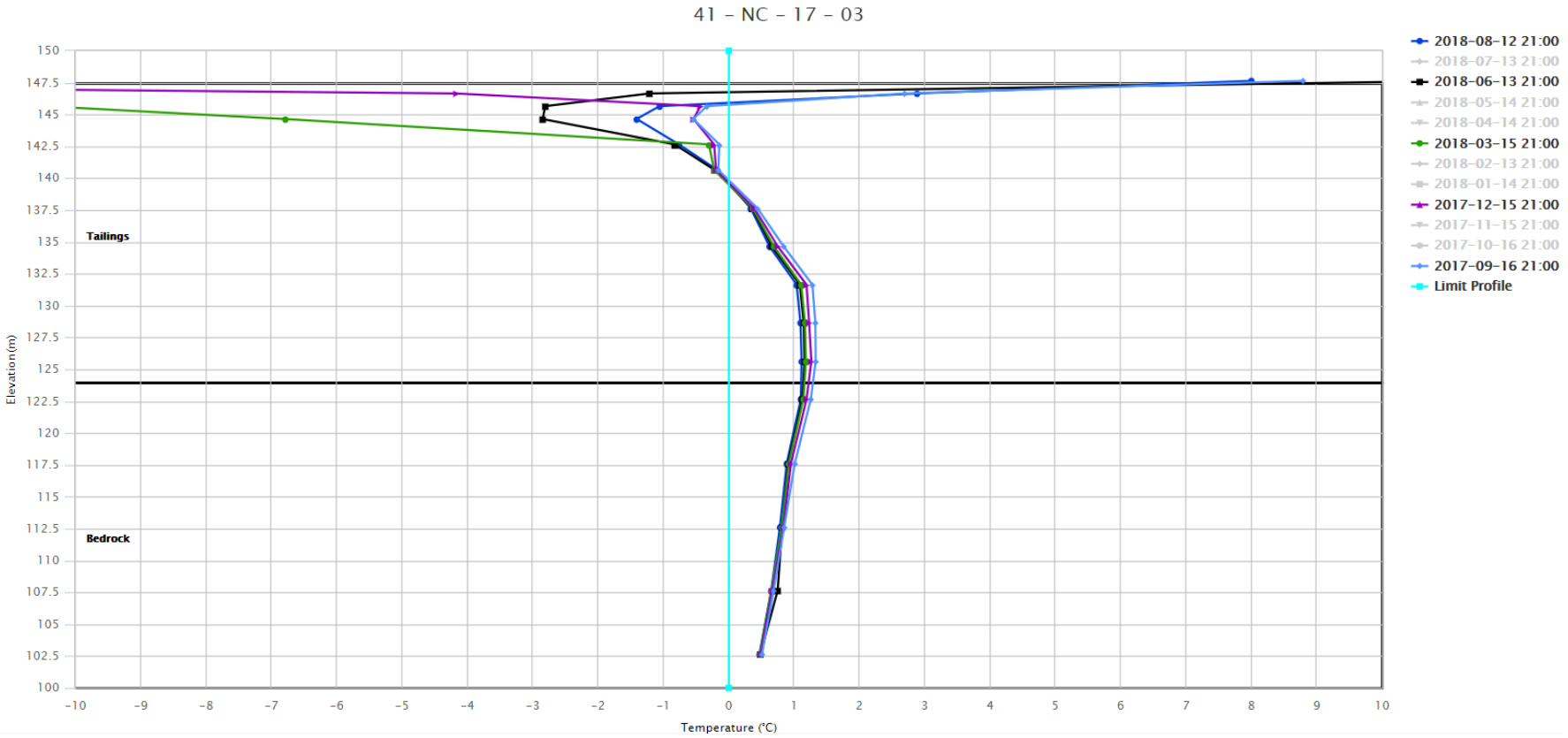


TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistor NC-17-03

- From Sept 16th, 2017 to Aug 12th, 2018
- Unfrozen below 140 m (Due to North Cell pond water)

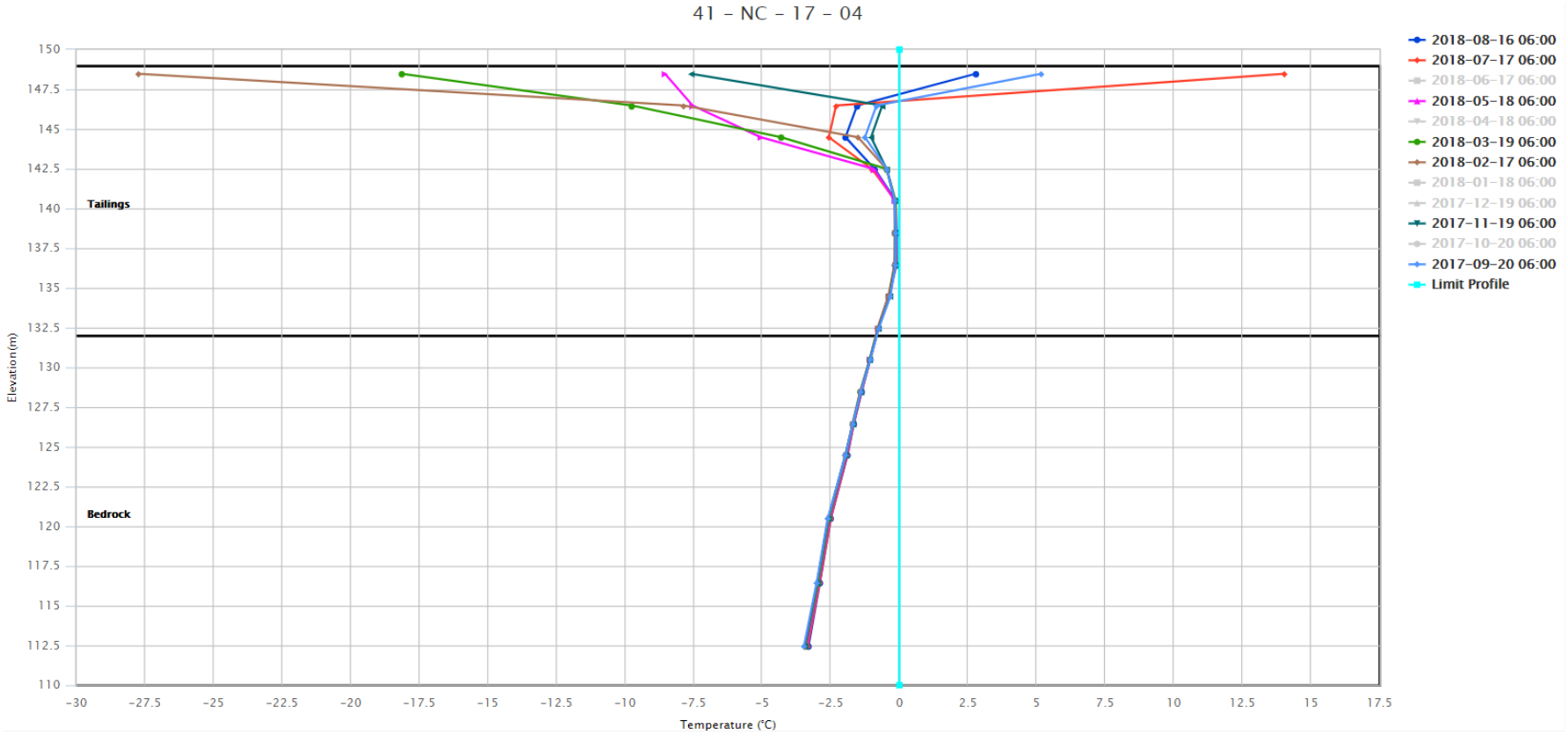


TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistor NC-17-04

- From Sept 20th, 2017 to Aug 16th, 2018
- Frozen below 147 m

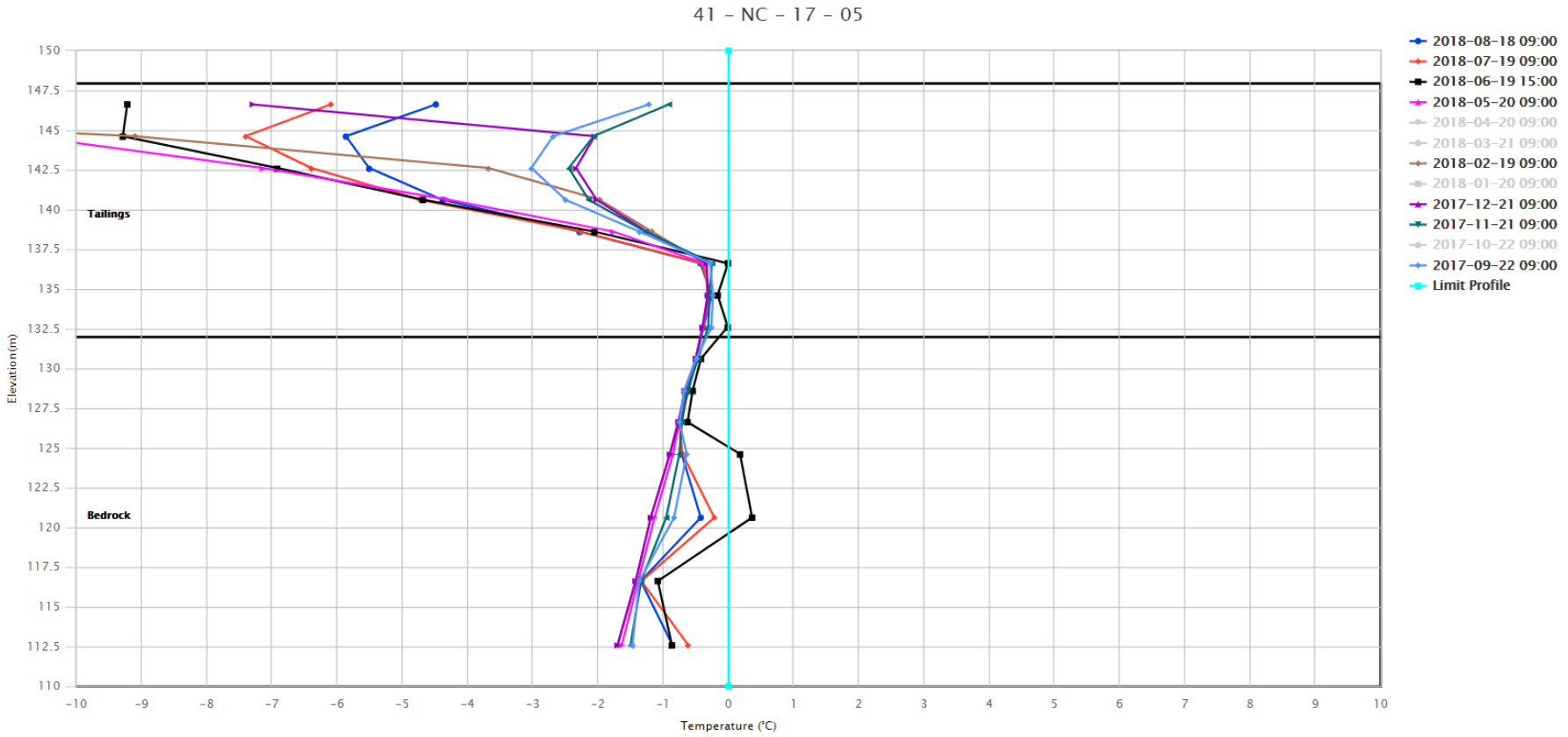


TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistor NC-17-05

- From Sept 22nd, 2017 to Aug 18th, 2018
- Frozen below 147 m

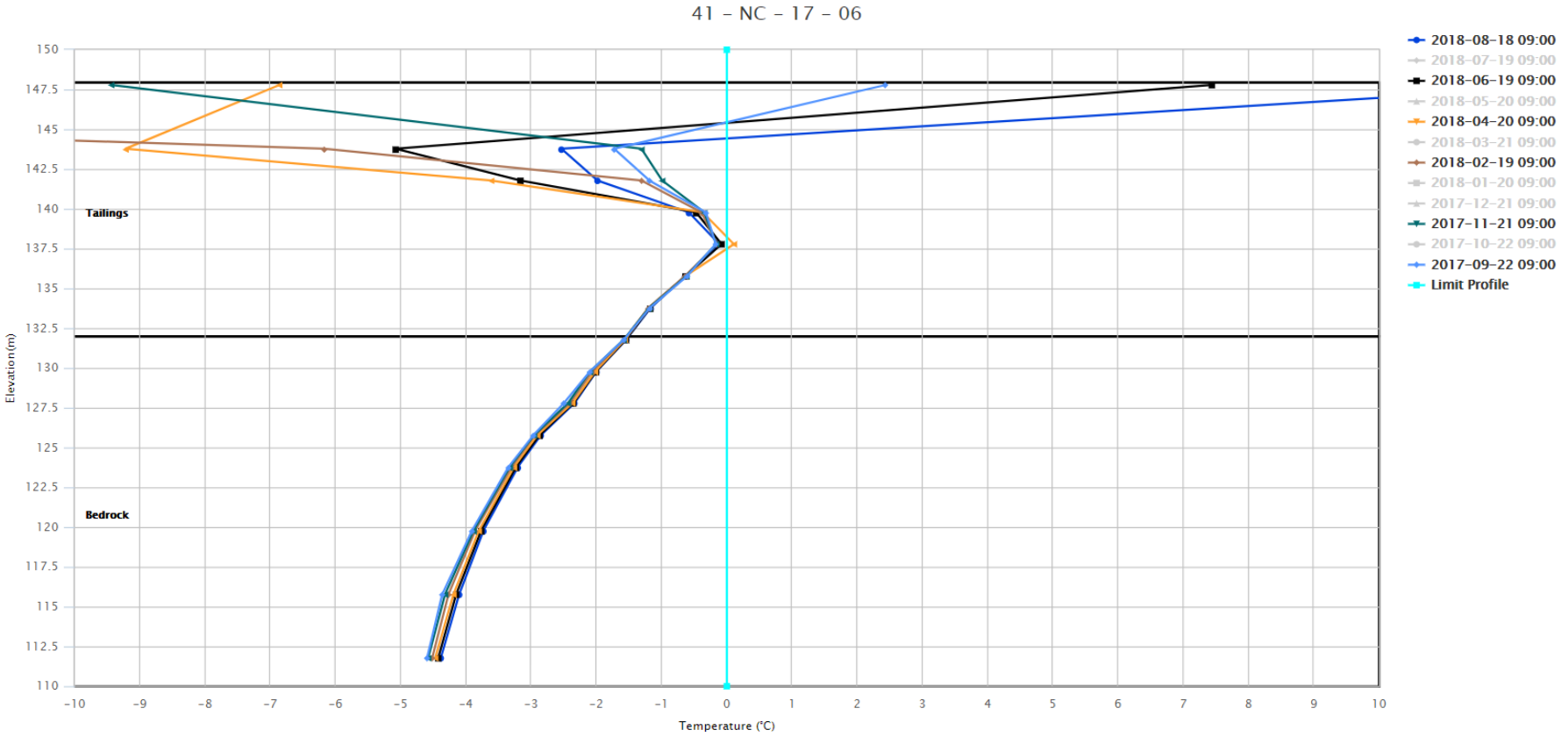


TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistor NC-17-06

- From Sept 22nd, 2017 to Aug 18th, 2018
- Frozen below 144 m

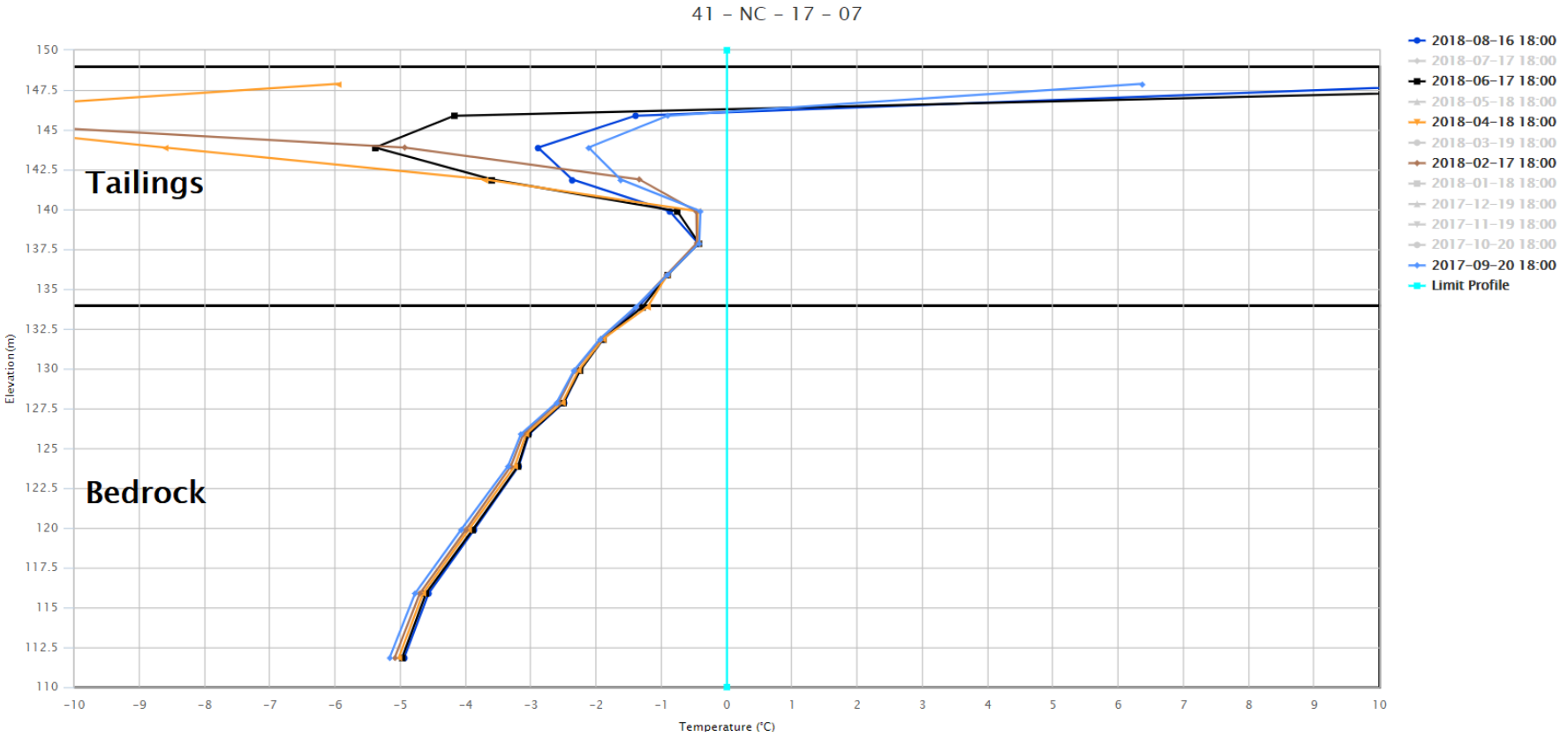


TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistor NC-17-07

- From Sept 20th, 2017 to Aug 16th, 2018
- Frozen below 146 m

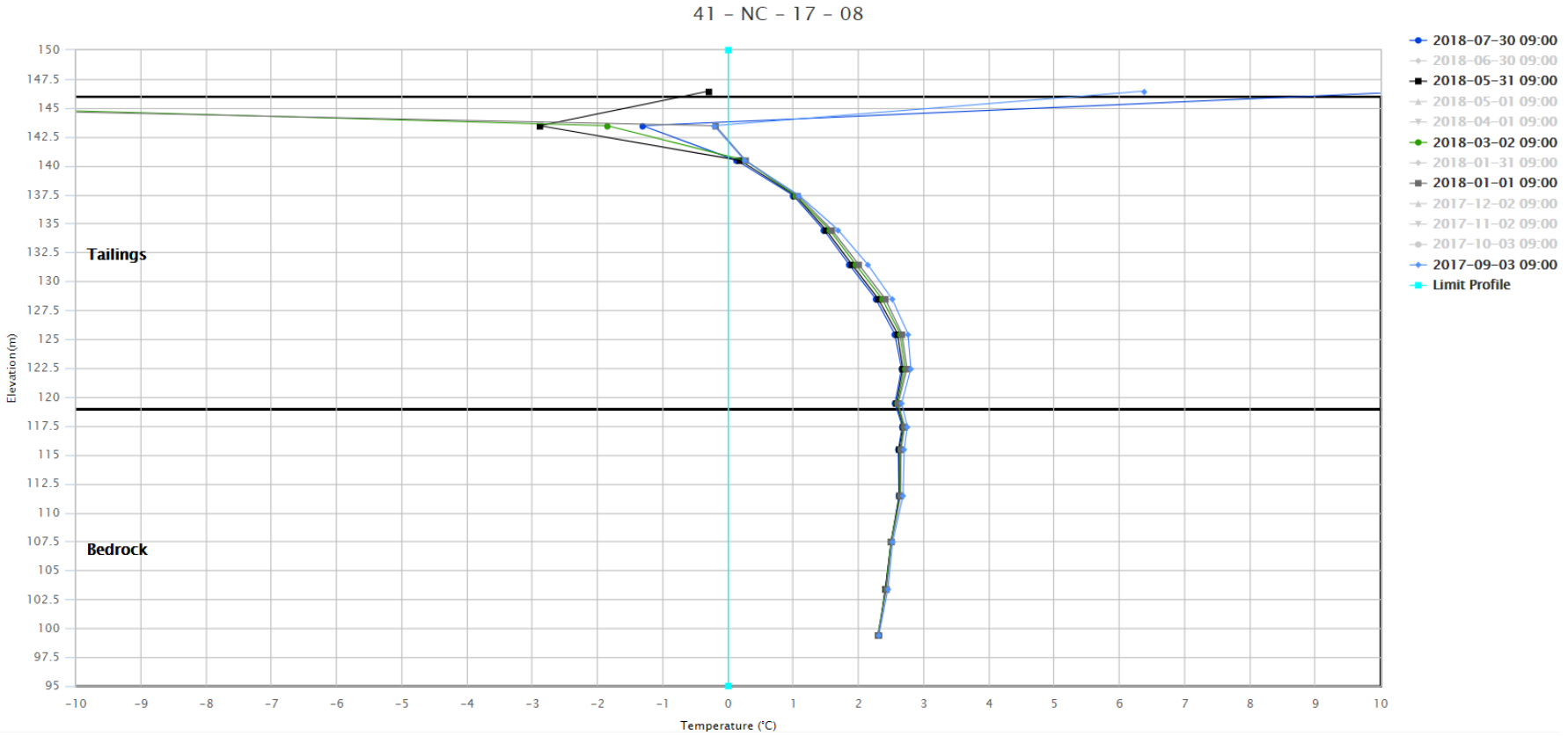


TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.3 NORTH CELL TAILINGS

Thermistor NC-17-08

- From Sept 3rd, 2017 to July 30th, 2018
- Unfrozen below 140 m (Due to North Cell pond water)



1. North Cell Operational Structures

(2018)

TAILING STORAGE FACILITIES INSTRUMENTATION 2018

1.4 NORTH CELL – ROCK FILL (RF1&RF2)

- **RF1 Thermistors** – 3 Total (T121-1, RF1-3 and T73-6)
- **RF2 Thermistors** – 1 Total (T122-1)

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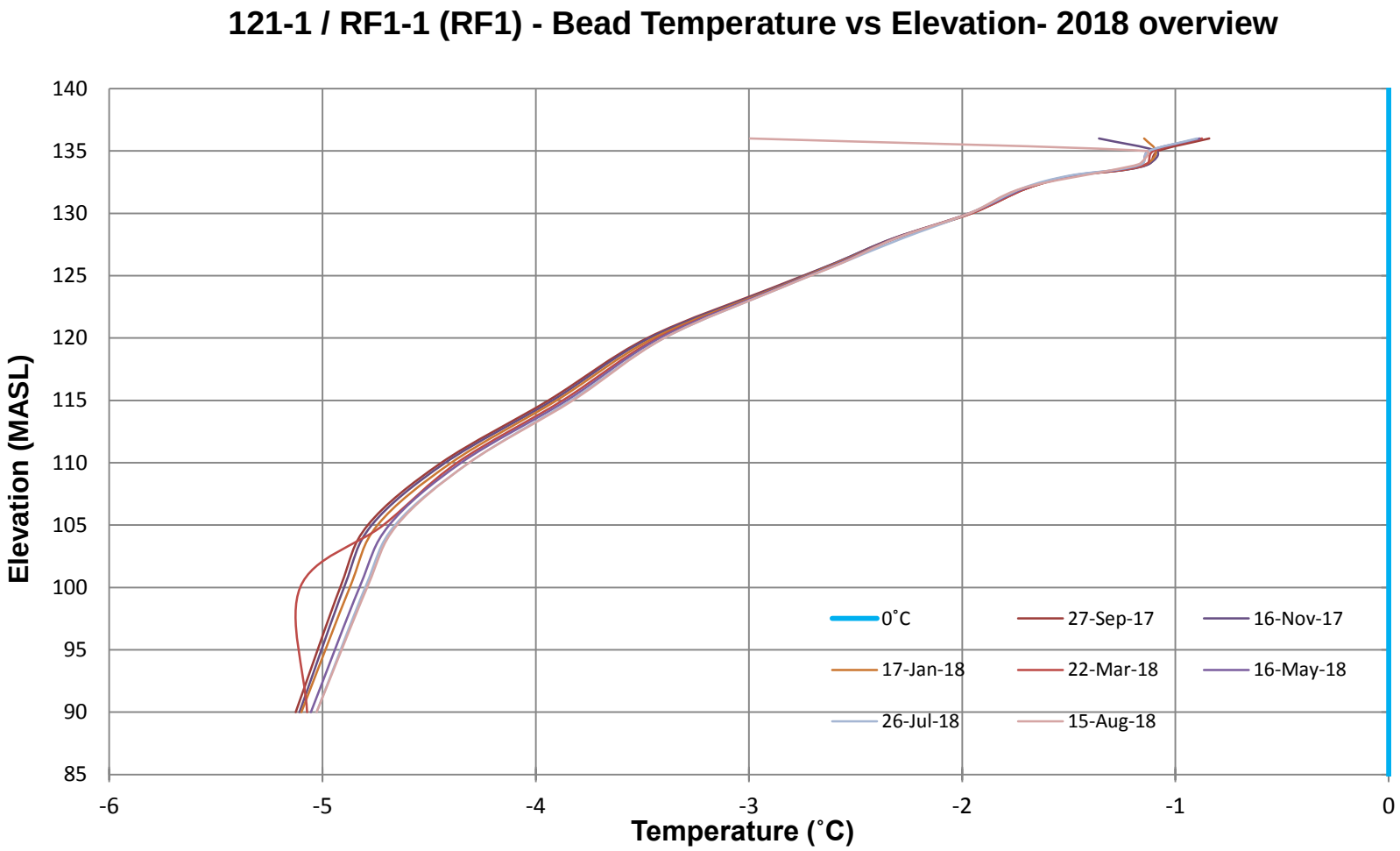
1.4 NORTH CELL – ROCK FILL

Thermistor RF1 - T121-1



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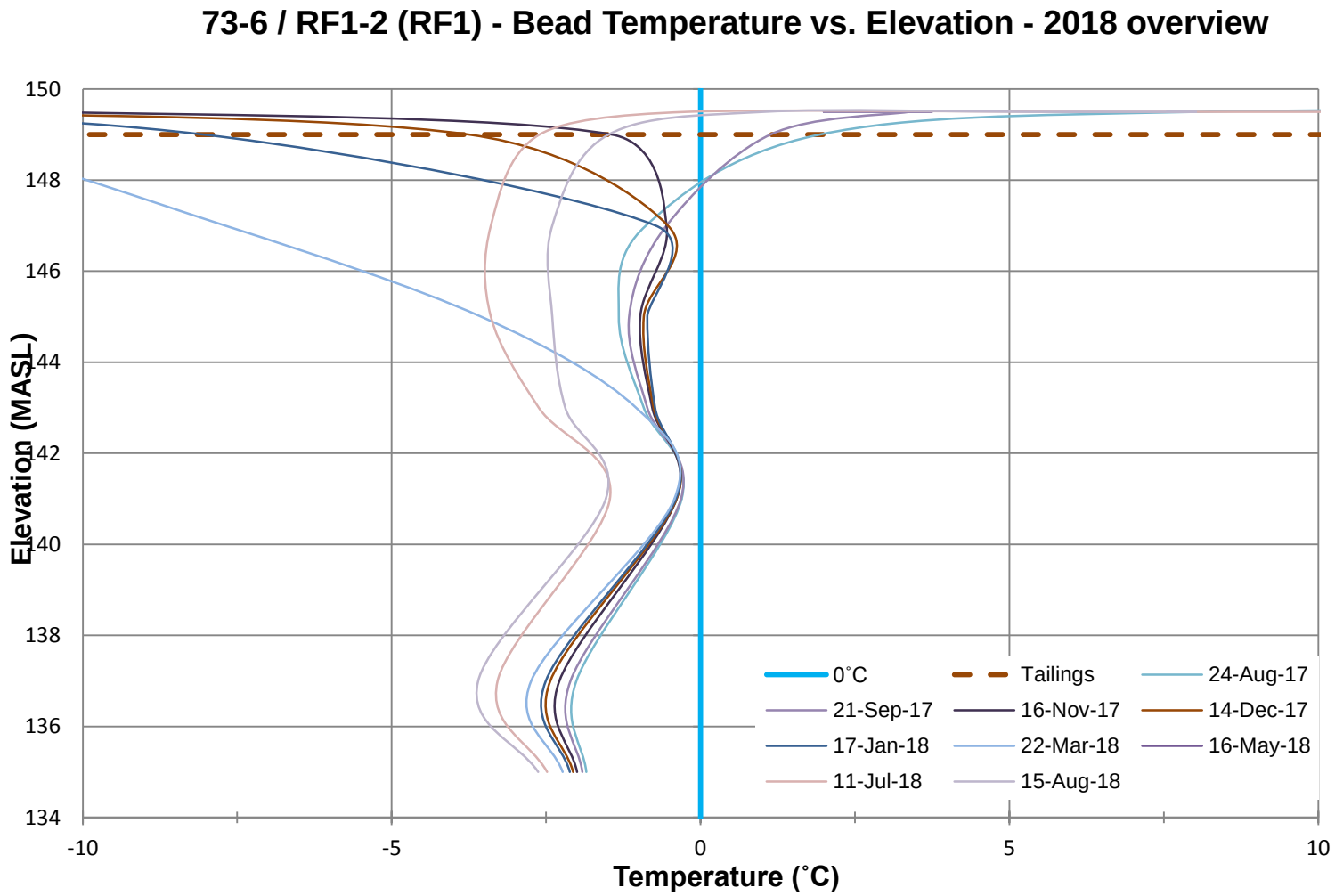
1.4 NORTH CELL – ROCK FILL

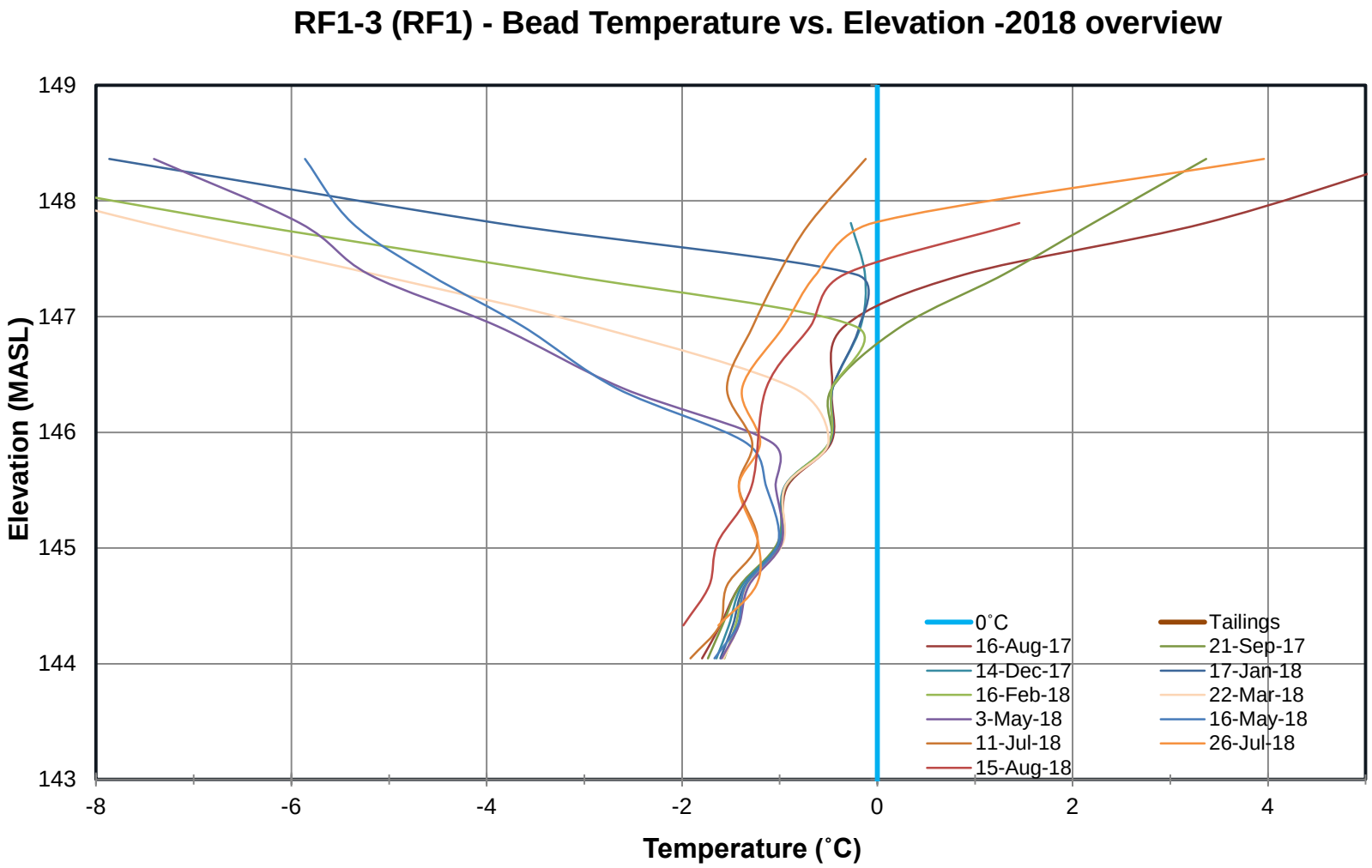
Thermistor RF1 – T73-6



AGNICO EAGLE

1.4 NORTH CELL – ROCK FILL

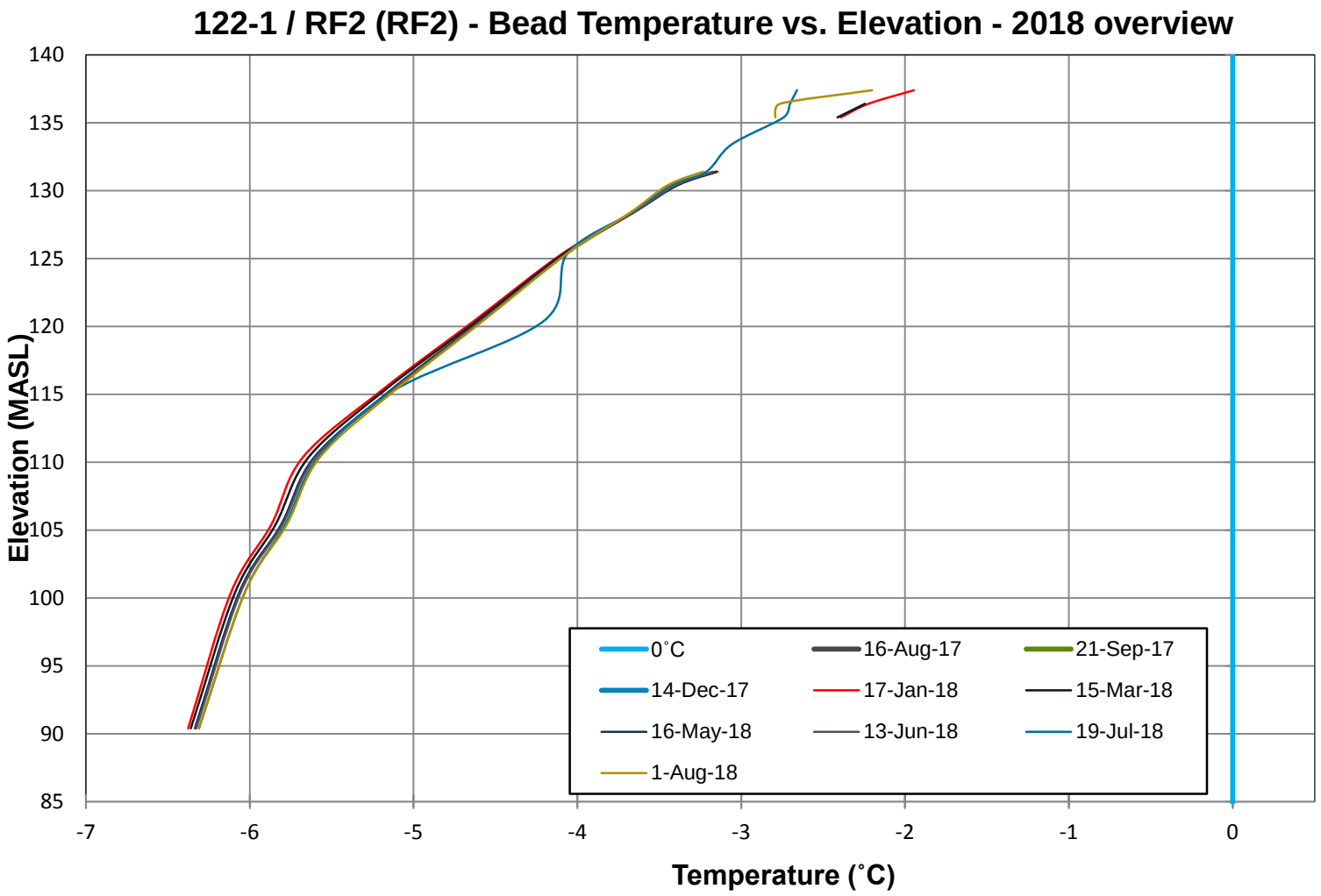
Thermistor RF1 – 3 (Along the slope)



AGNICO EAGLE

1.4 NORTH CELL – ROCK FILL

Thermistor RF2 – T122-1

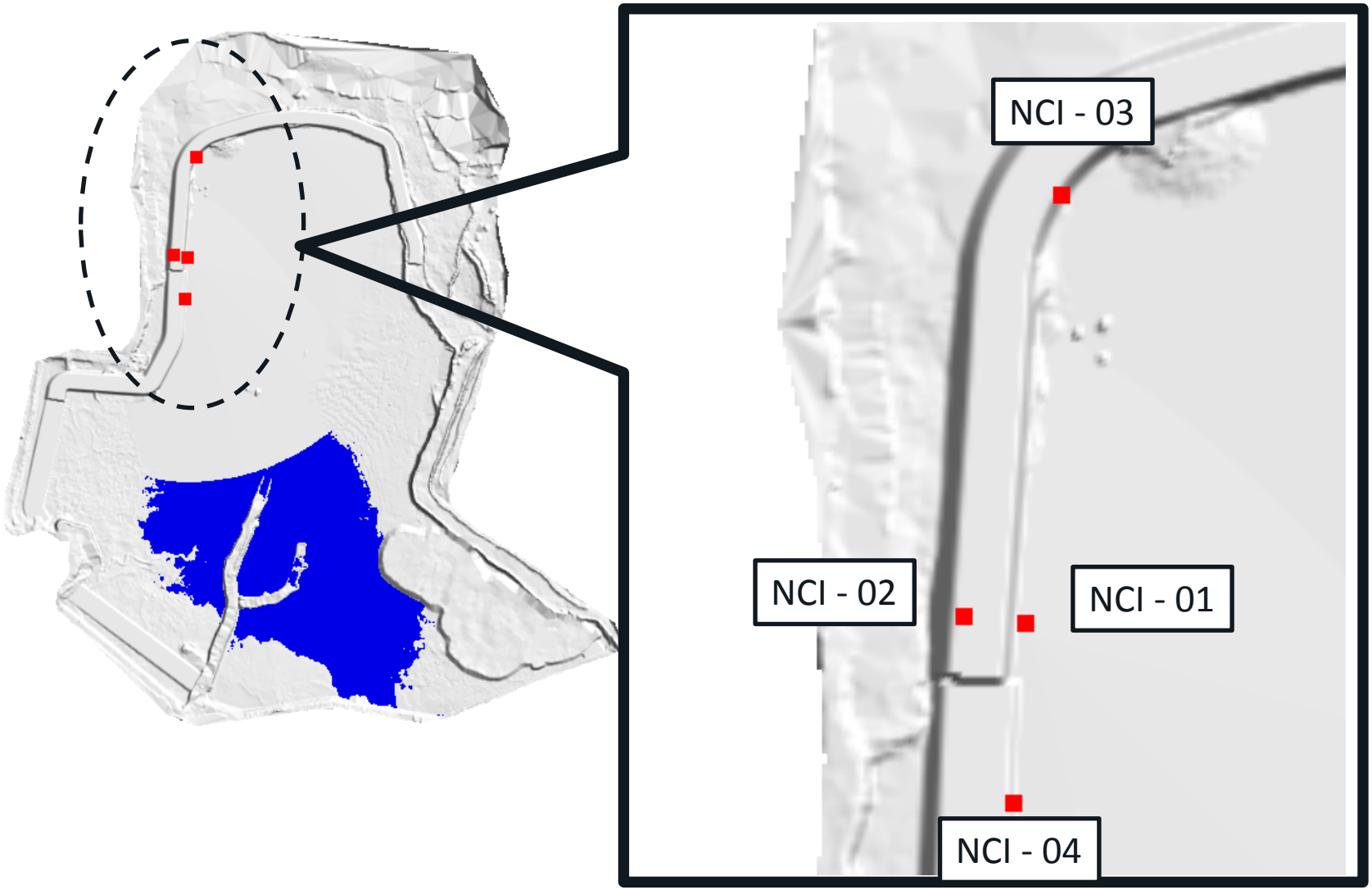


1. North Cell Operational Structures

(2018)

TAILING STORAGE FACILITIES INSTRUMENTATION 2018

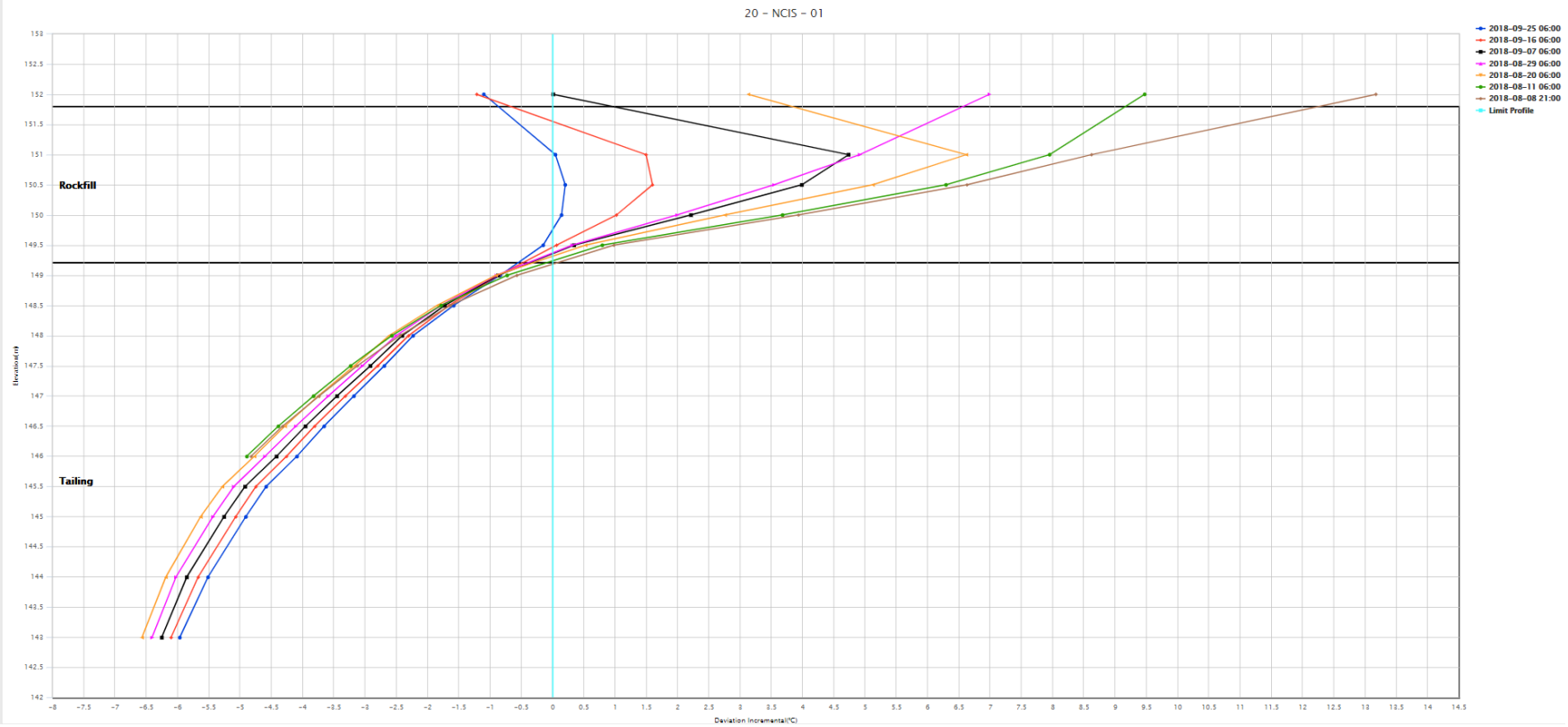
1.5 NORTH CELL – INTERNAL STRUCTURE



1.5 NORTH CELL – INTERNAL STRUCTURE

Thermistor NCIS-01

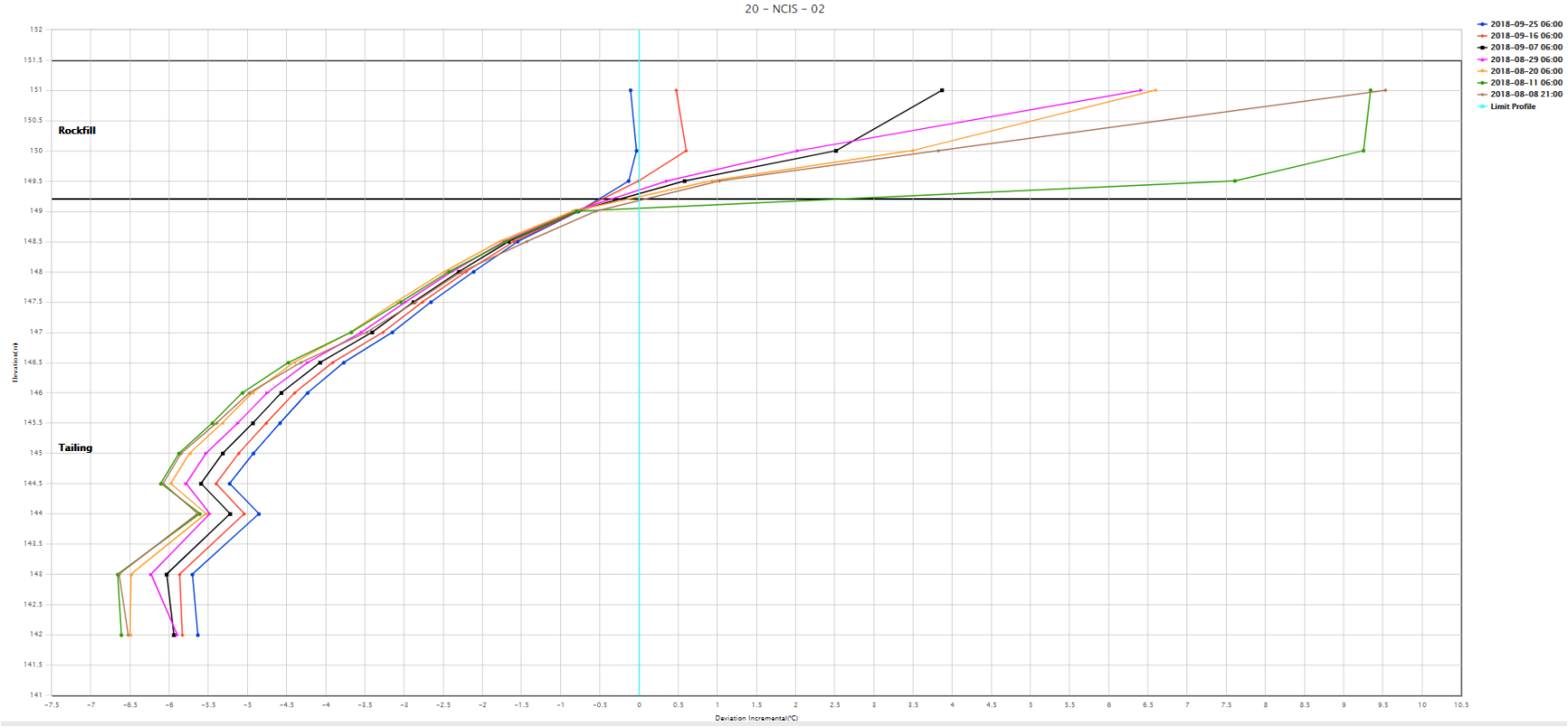
- From Aug 8 to Sept 25, 2018
- 2 days interval since it was installed during the August 2018 instrumentation campaign .



1.5 NORTH CELL – INTERNAL STRUCTURE

Thermistor NCIS-02

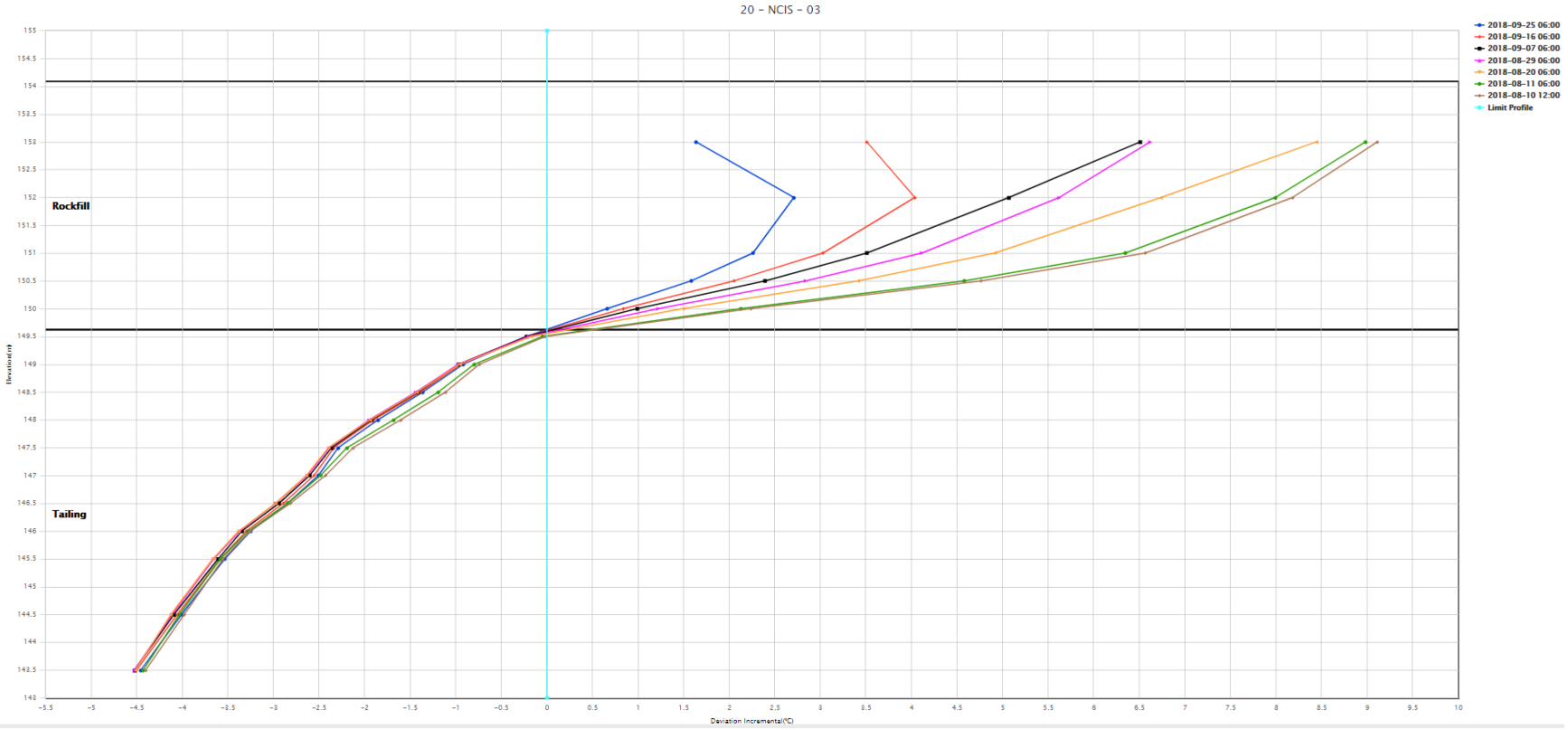
- From Aug 8 to Sept 25, 2018
- 2 days interval since it was installed during the August 2018 instrumentation campaign .



1.5 NORTH CELL – INTERNAL STRUCTURE

Thermistor NCIS-03

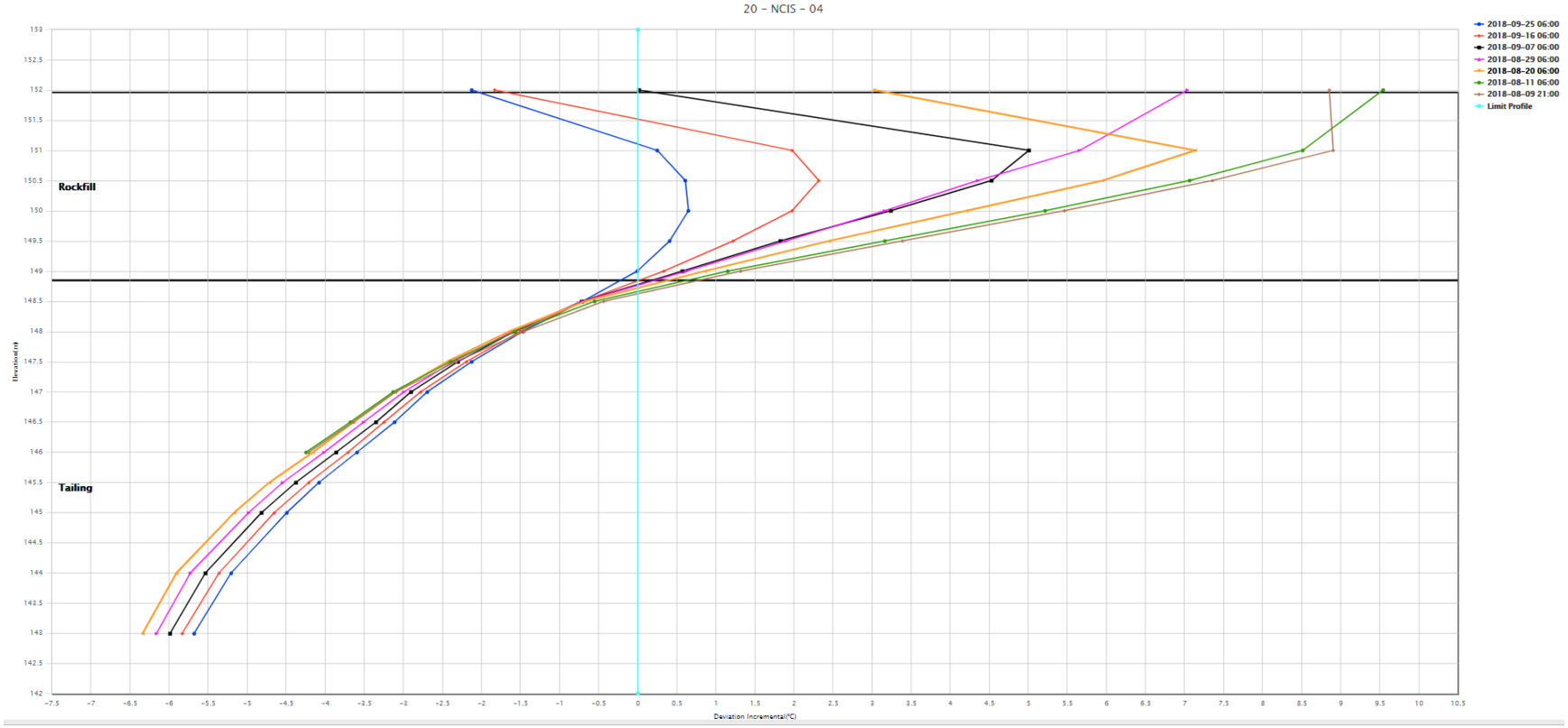
- From Aug 10 to Sept 25, 2018
- 2 days interval since it was installed during the August 2018 instrumentation campaign .



1.5 NORTH CELL – INTERNAL STRUCTURE

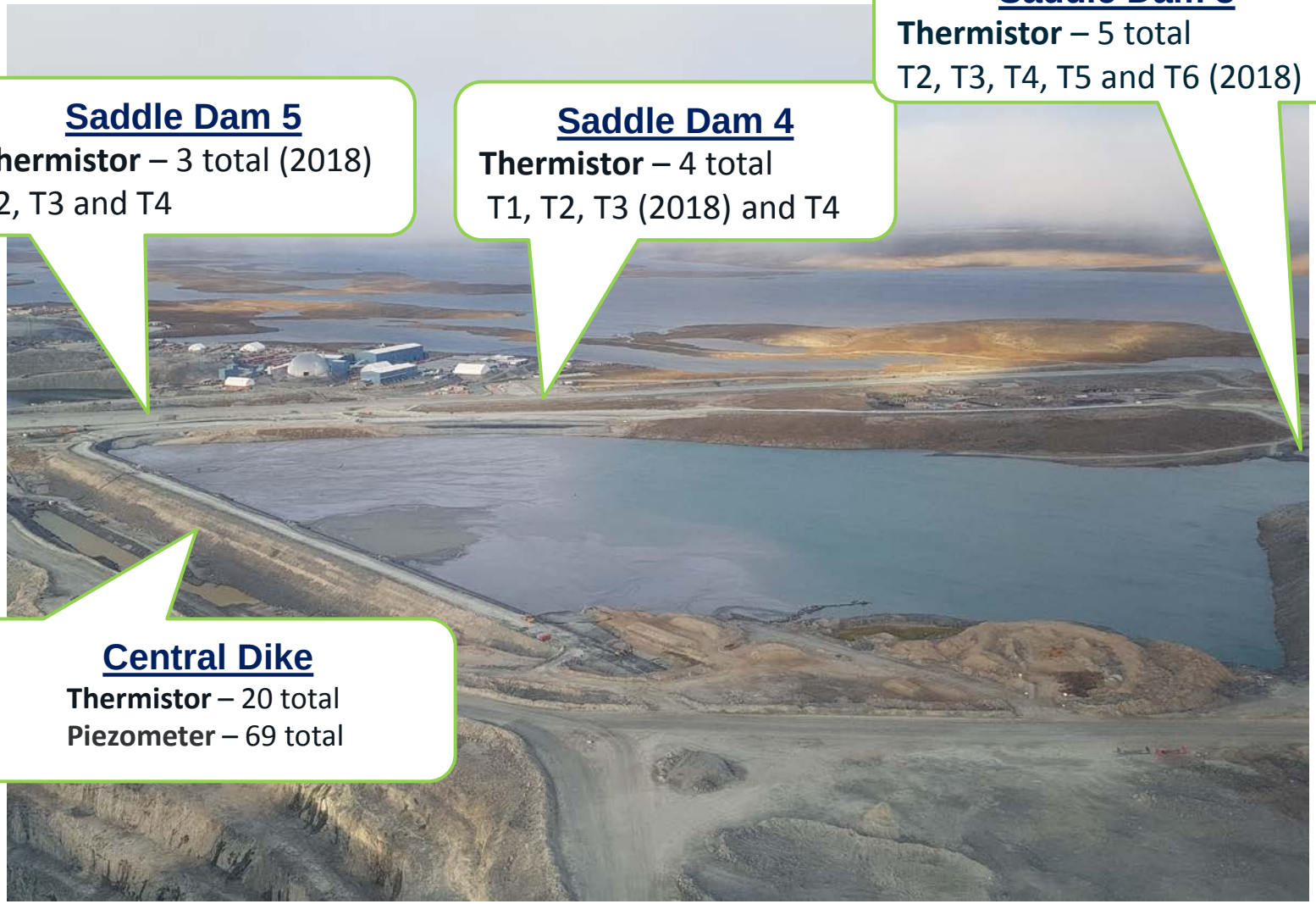
Thermistor NCIS-04

- From Aug 9 to Sept 25, 2018
- 2 days interval since it was installed during the August 2018 instrumentation campaign .



1. South Cell Operational Structures

(2018)



Saddle Dam 3
Thermistor – 5 total
T2, T3, T4, T5 and T6 (2018)

Saddle Dam 4
Thermistor – 4 total
T1, T2, T3 (2018) and T4

Saddle Dam 5
Thermistor – 3 total (2018)
T2, T3 and T4

Central Dike
Thermistor – 20 total
Piezometer – 69 total

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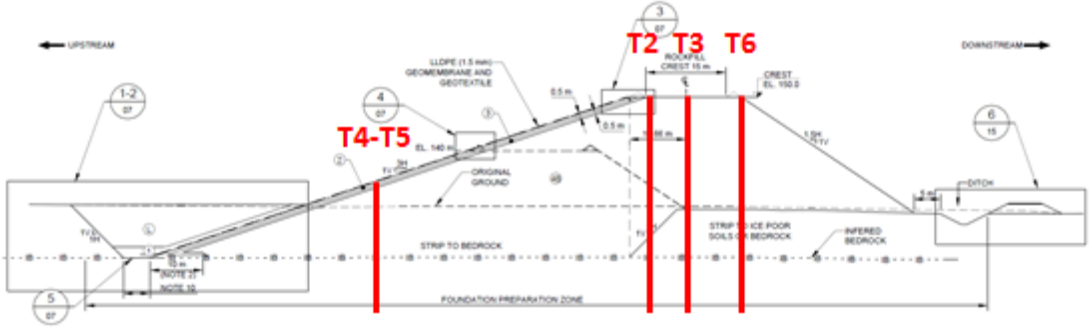
2.1 SOUTH CELL: SADDLE DAM 3

SD3 Thermistors Emplacement : T2, T3, T4, T5 & T6

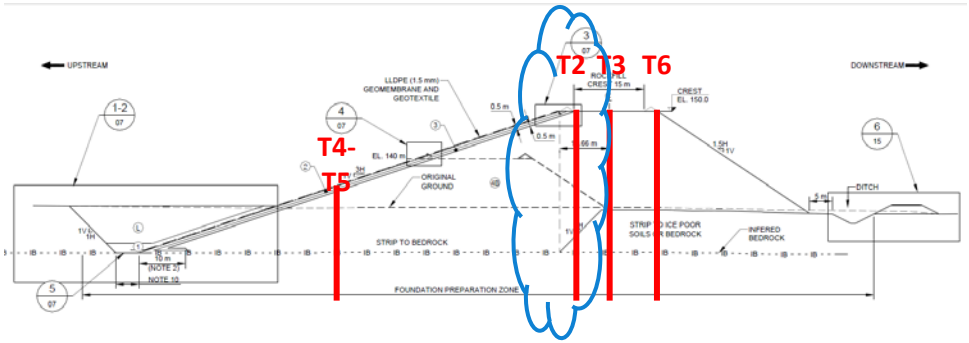


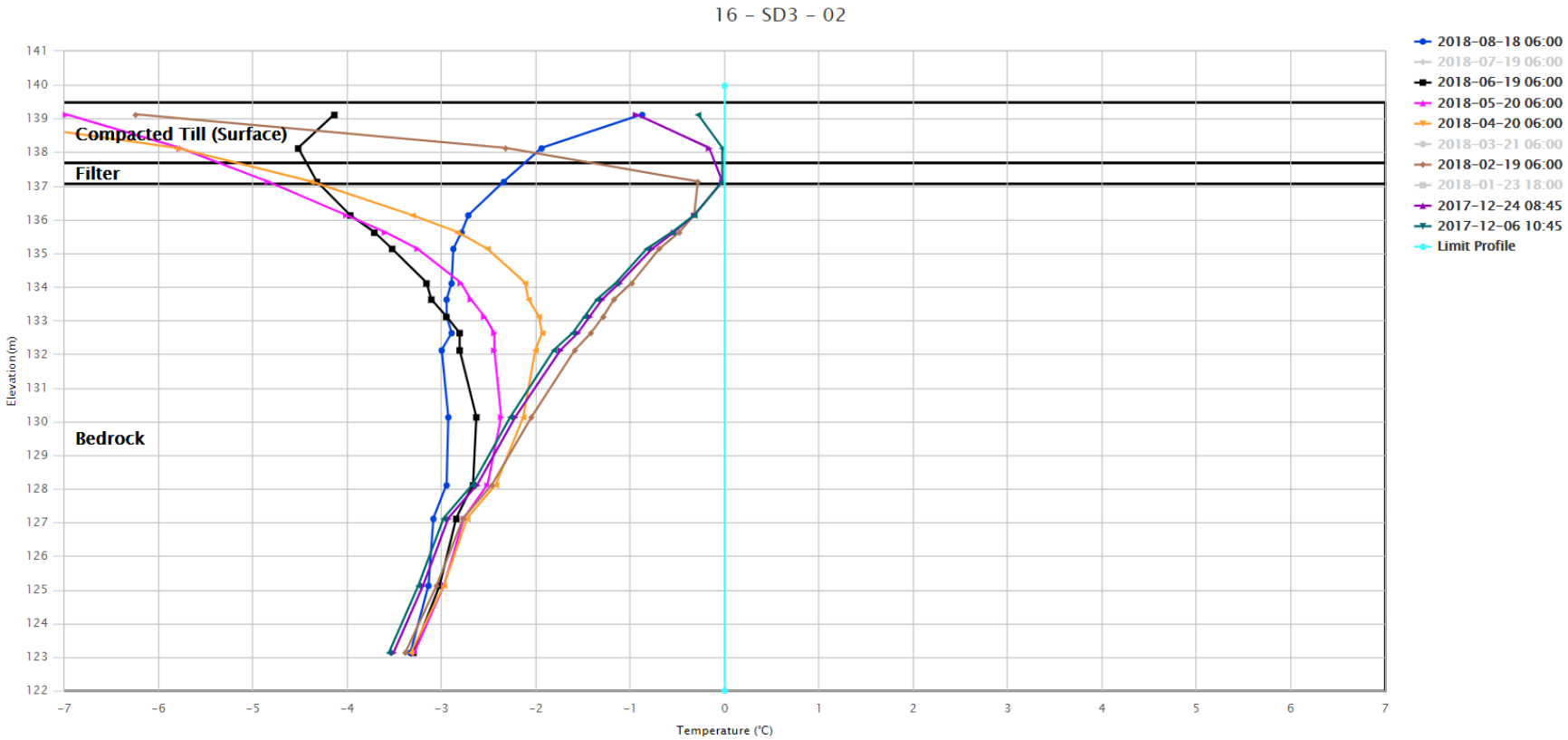
AGNICO EAGLE

2.1 SOUTH CELL: SADDLE DAM 3

SD3 Thermistors 2 (T2)

- From Dec 6th, 2017 to Aug 18th, 2018
- Compacted till, filters and bedrock frozen all year long below elevation 139 (masl)



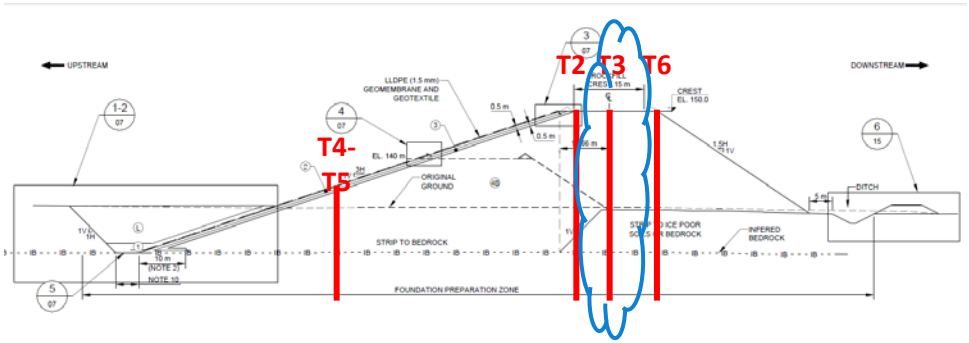


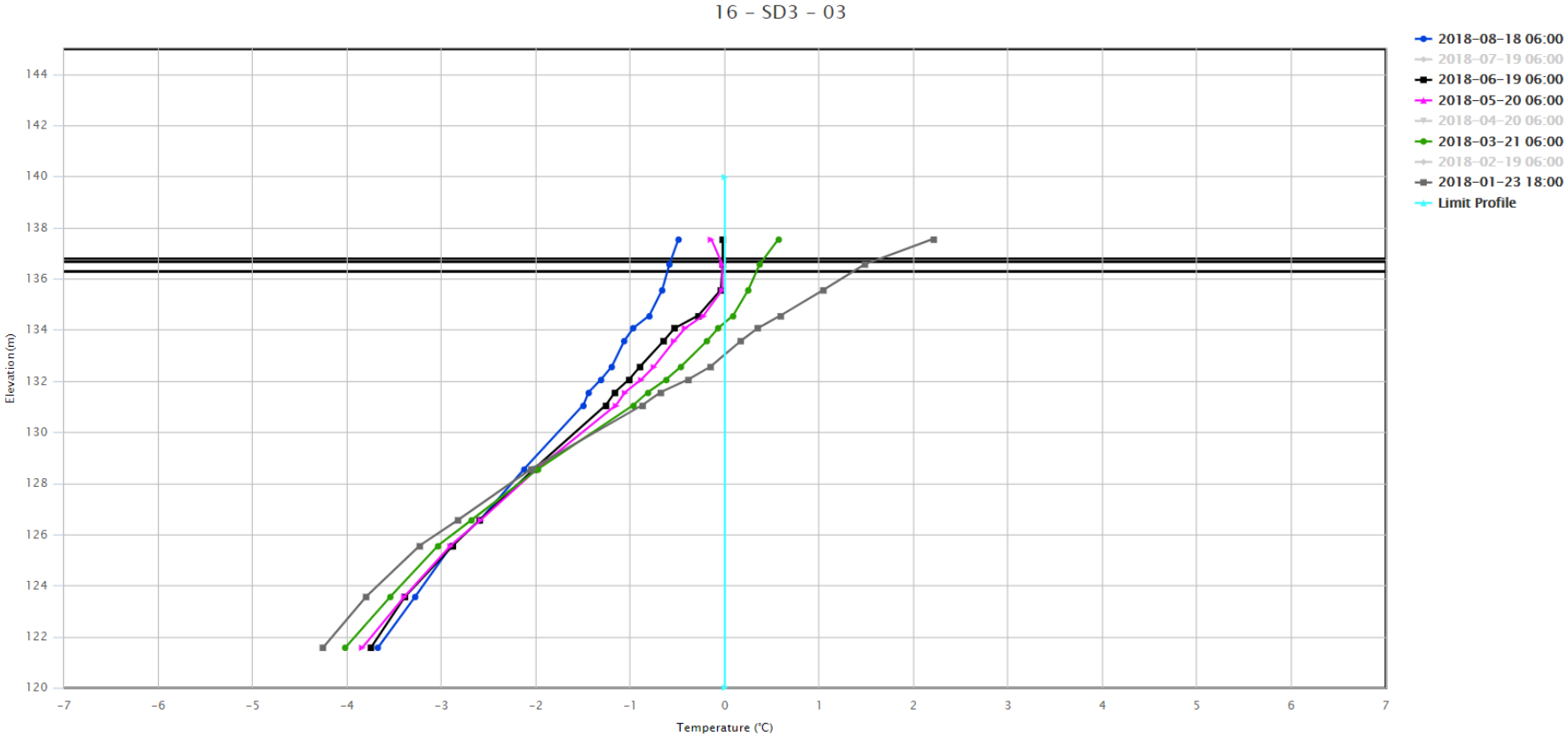
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

2.1 SOUTH CELL: SADDLE DAM 3

SD3 Thermistors 3 (T3)

- From Jan 23rd, 2018 to Aug 18th, 2018
- Frozen all year long below elevation 132.5 (masl)



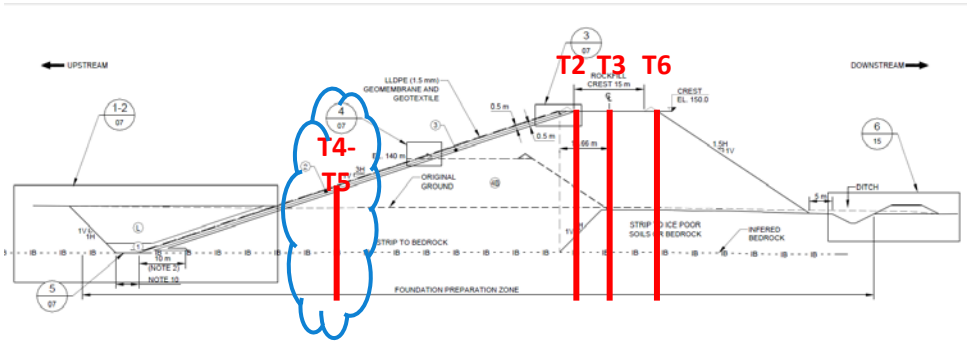


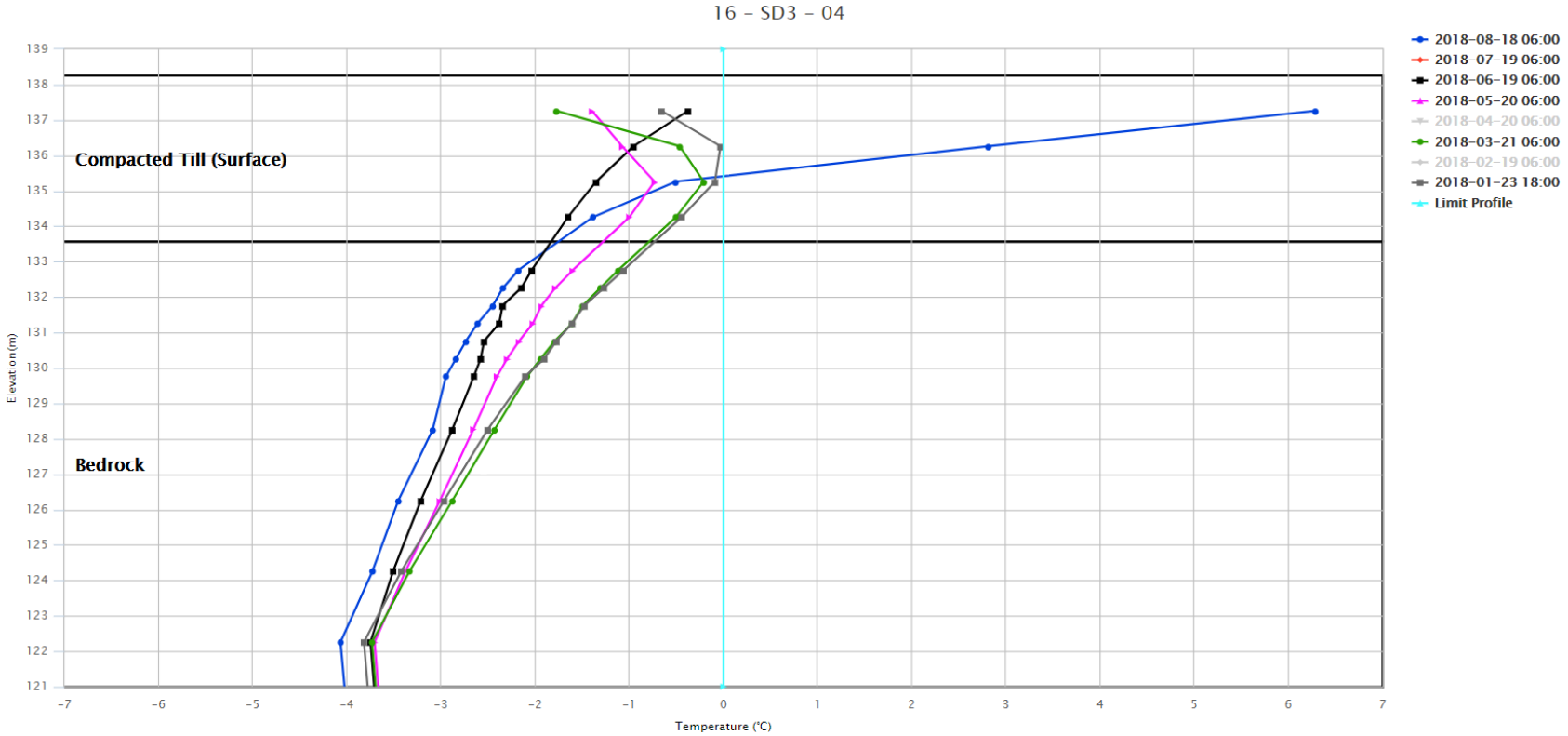
AGNICO EAGLE

2.1 SOUTH CELL: SADDLE DAM 3

SD3 Thermistors 4 (T4)

- From Jan 23rd, 2018 to Aug 18th, 2018
- Frozen all year long below elevation 135.5 (masl)



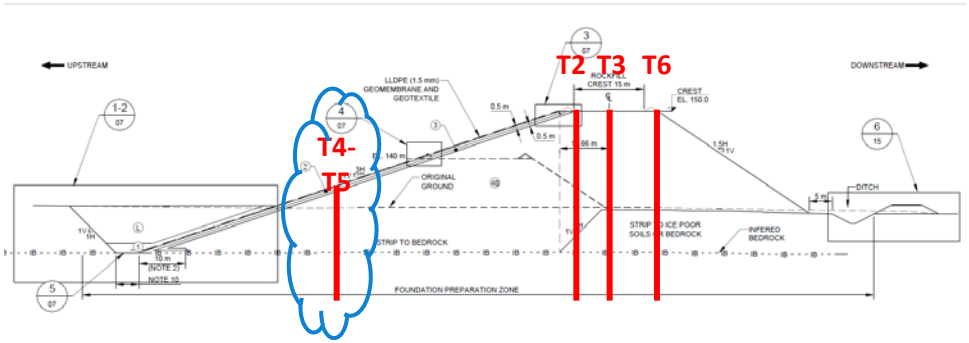


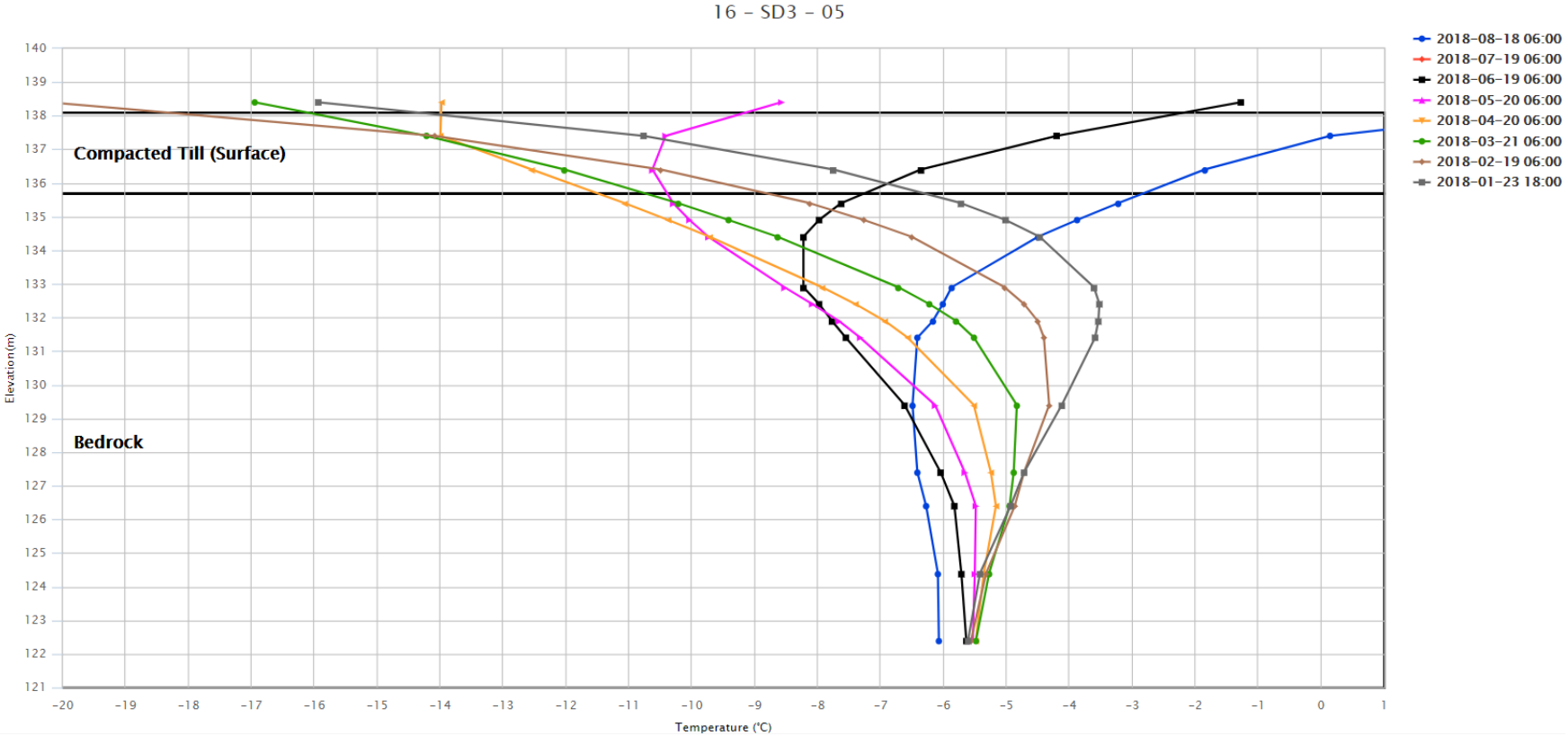
AGNICO EAGLE

2.1 SOUTH CELL: SADDLE DAM 3

SD3 Thermistors 5 (T5)

- From Jan 23rd, 2018 to Aug 18th, 2018
- Frozen all year long below elevation 137 (masl)



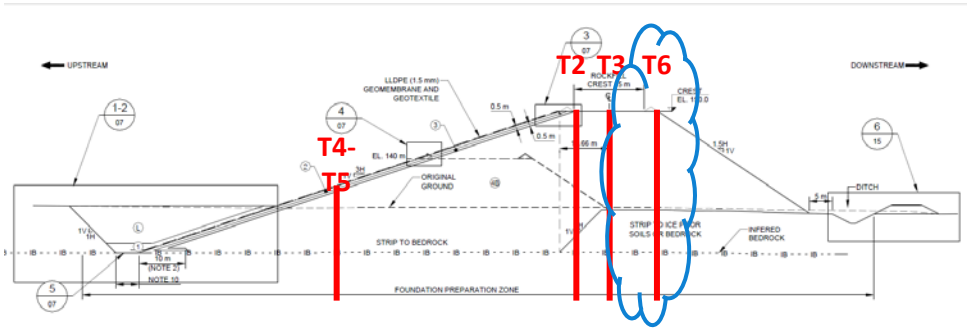


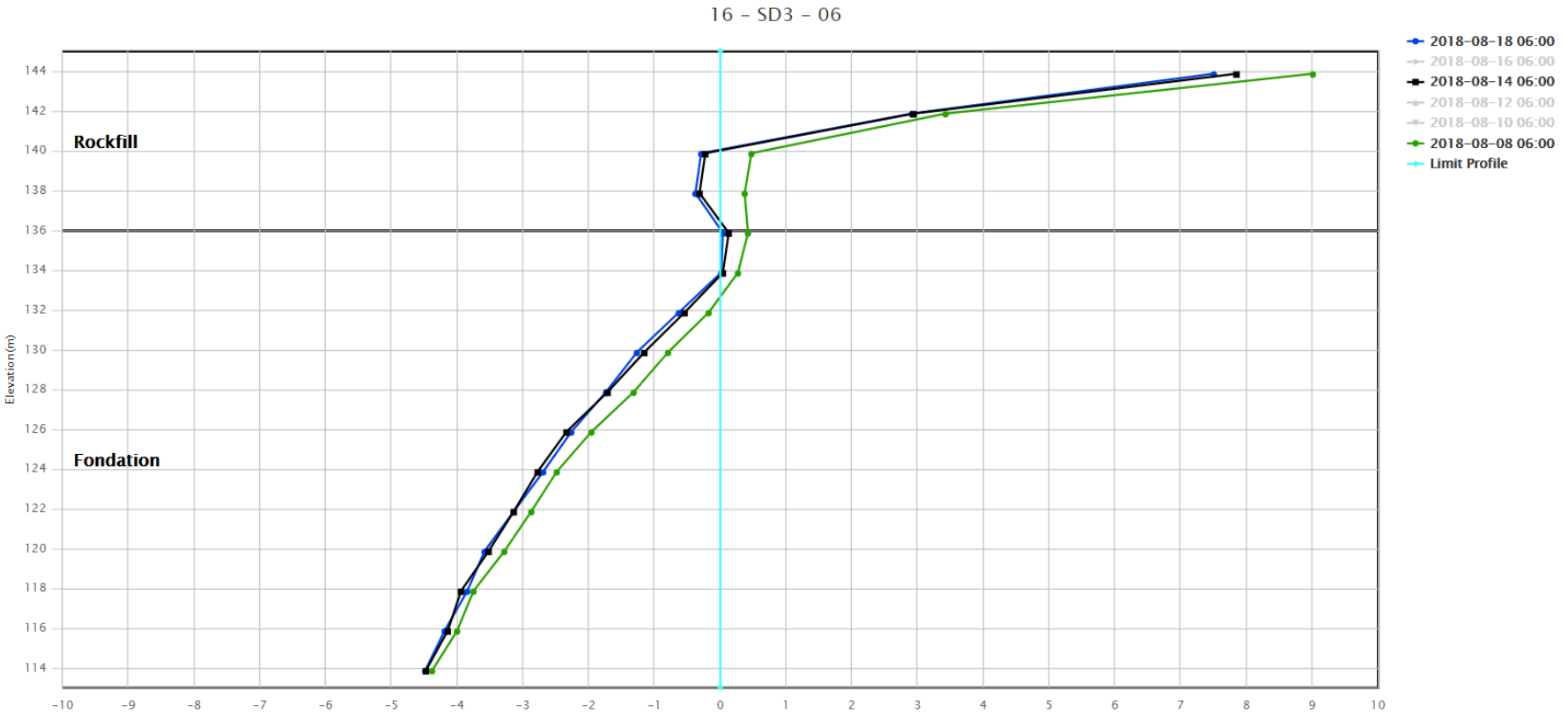
AGNICO EAGLE

2.1 SOUTH CELL: SADDLE DAM 3

SD3 Thermistors 6 (T6)

- From Aug 8th, 2018 to Aug 18th, 2018
- 2 days interval since SD3-T6 was installed during the August 2018 instrumentation campaign





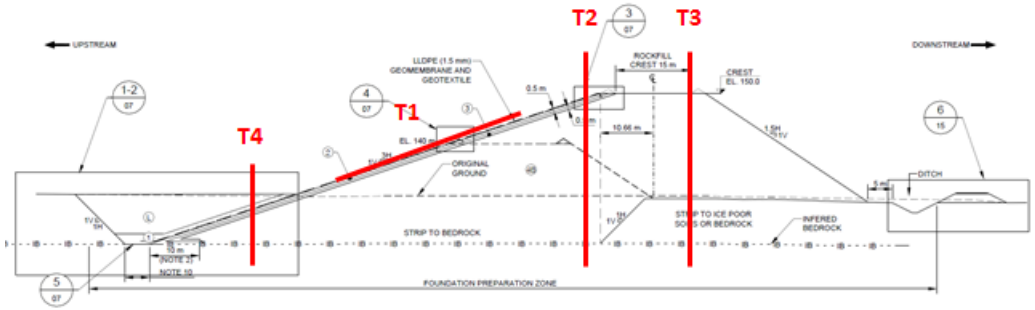
1. South Cell Operational Structures

(2018)

TAILING STORAGE FACILITIES INSTRUMENTATION 2018

2.2 SOUTH CELL: SADDLE DAM 4

Thermistors Emplacement : T1, T2, T3 & T4

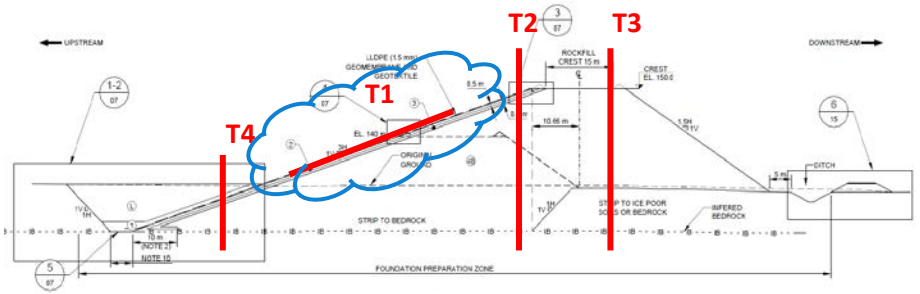


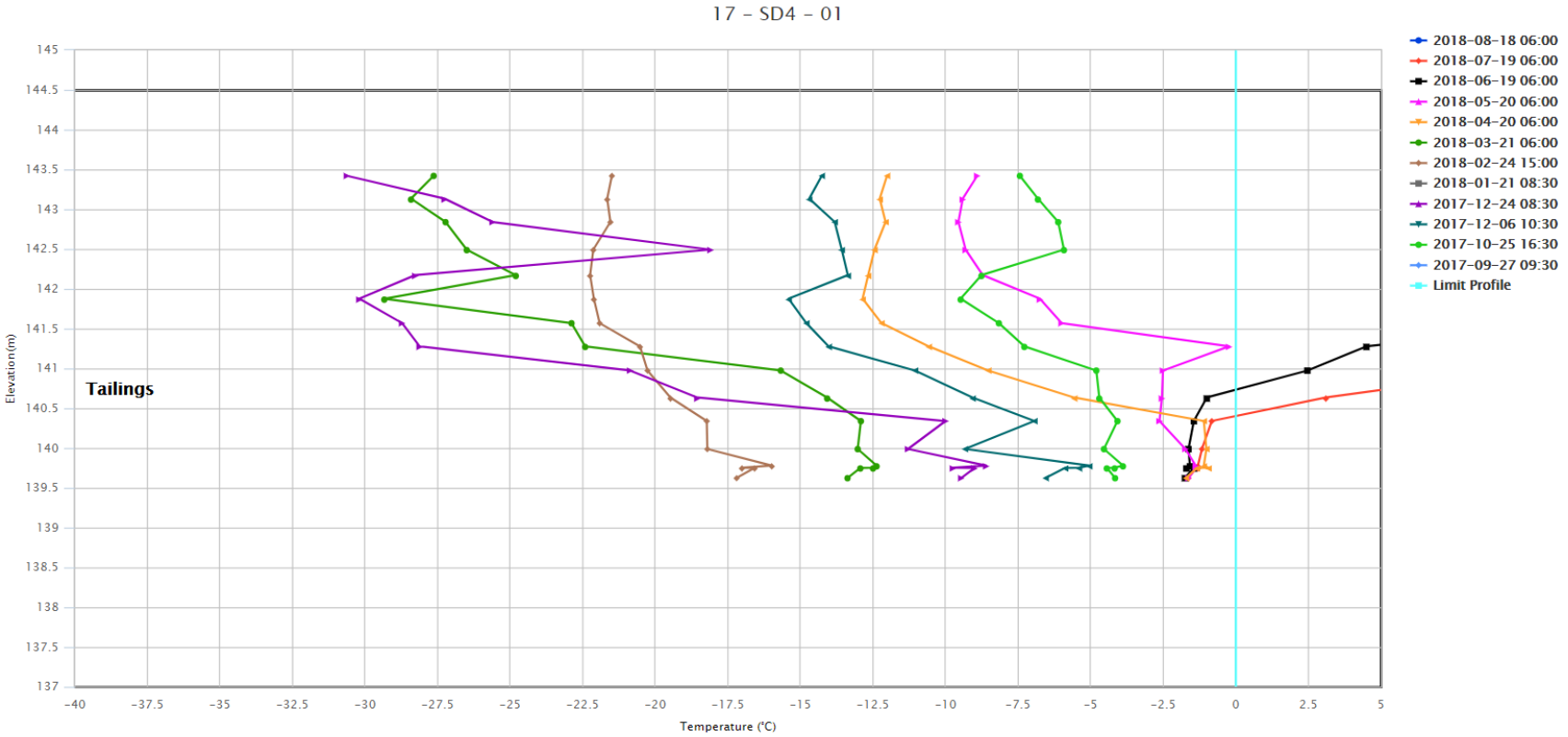
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

2.2 SOUTH CELL: SADDLE DAM 4

SD4 Thermistors 1 (T1)

- From Sept 27th, 2017 to Aug 18th, 2018
- Tailings frozen all year long below elevation 140 (masl)



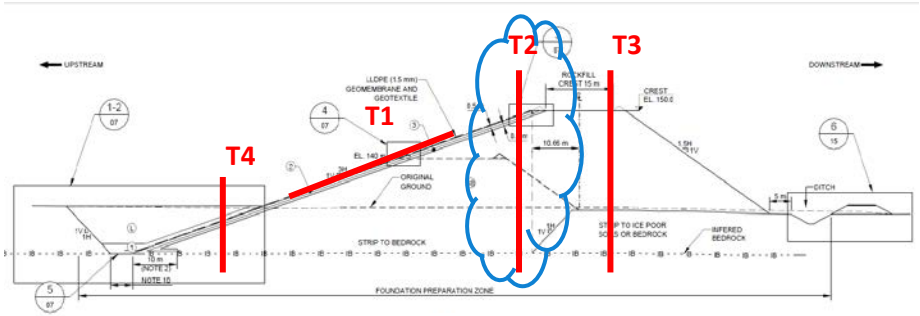


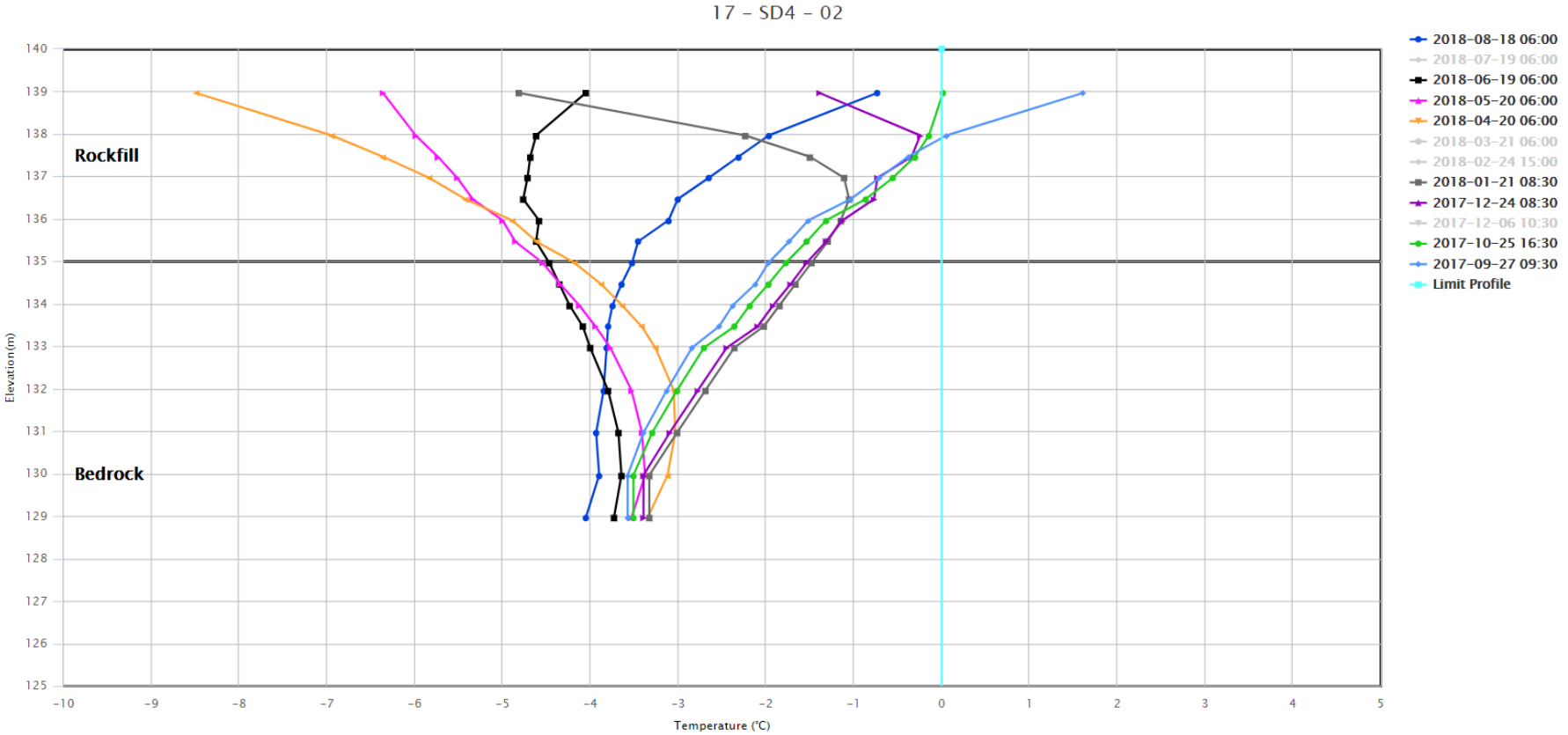
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

2.2 SOUTH CELL: SADDLE DAM 4

SD4 Thermistors 2 (T2)

- From Sept 22th, 2017 to Aug 18th, 2018
- Rockfill and foundation frozen all year long below elevation 13
  7.5 (masl)



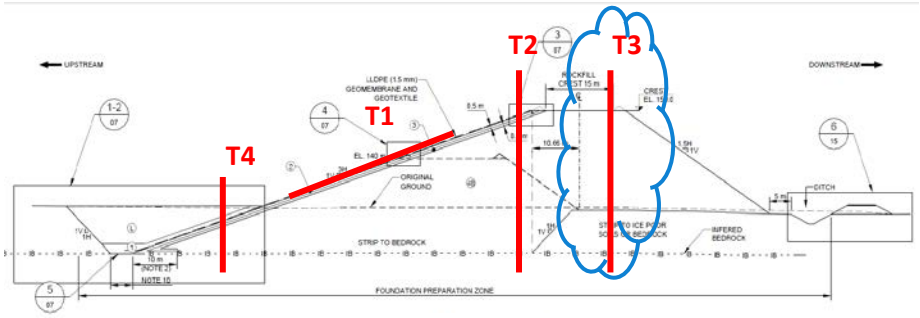


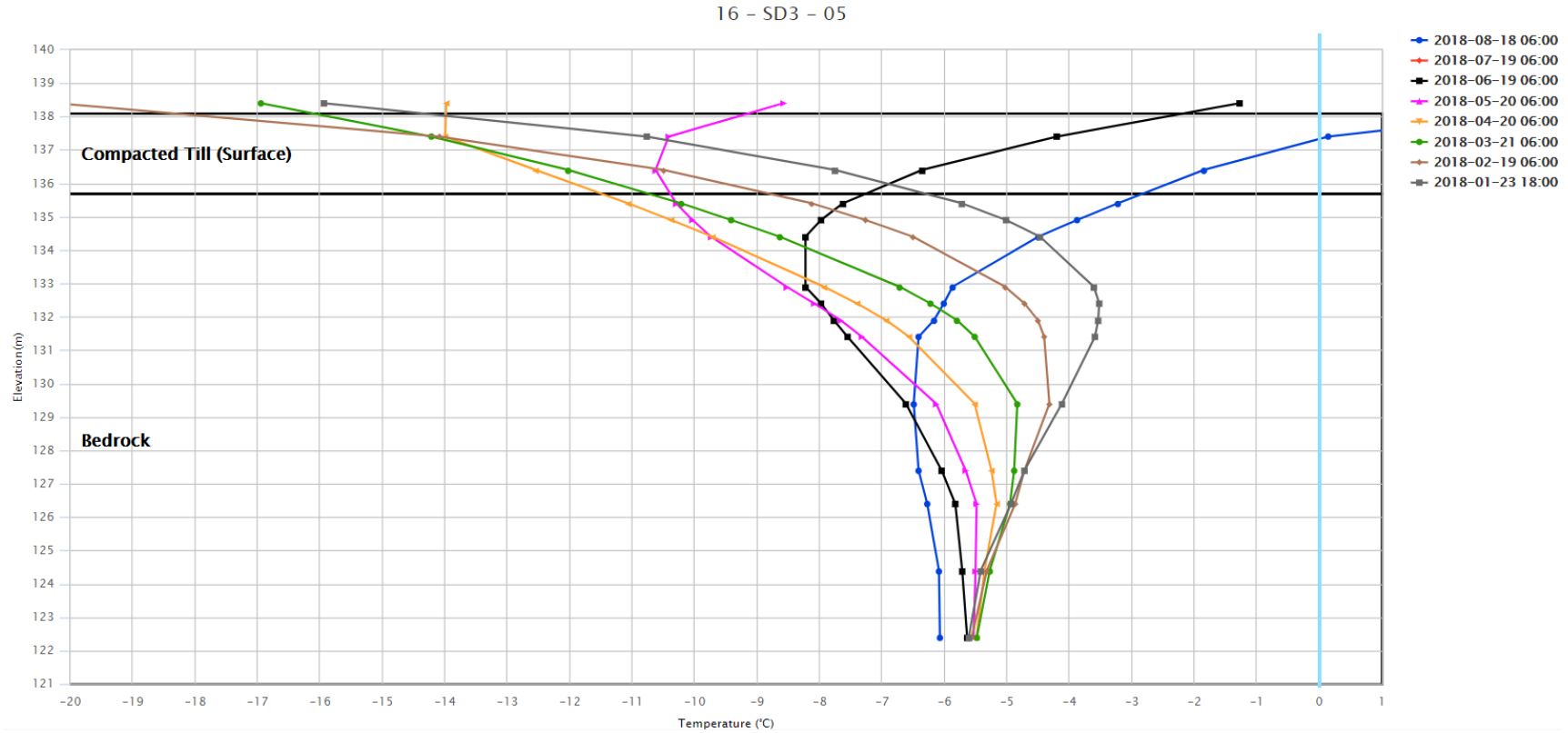
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

2.2 SOUTH CELL: SADDLE DAM 4

SD4 Thermistors 3 (T3)

- From Jan 23rd, 2018 to Aug 18th, 2018
- Compacted till and bedrock frozen all year long below elevation 136 .5 (masl)



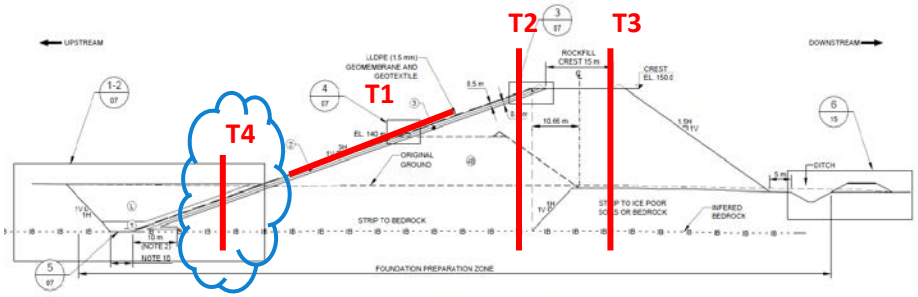


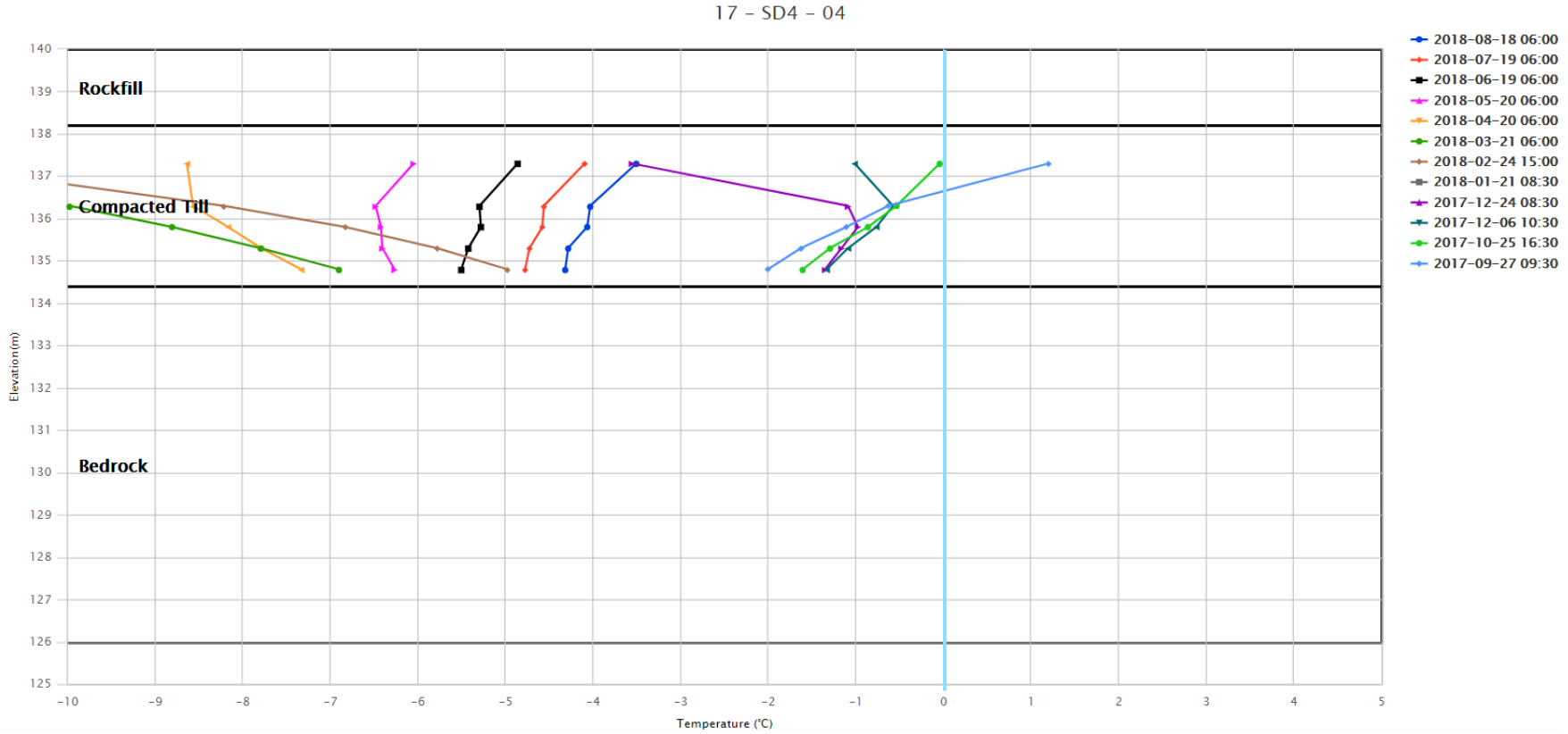
TAILING STORAGE FACILITIES INSTRUMENTATION 2018

2.2 SOUTH CELL: SADDLE DAM 4

SD4 Thermistors 4 (T4)

- From Sept 29th, 2017 to Aug 18th, 2018
- Compacted till frozen all year long below elevation 136.5 (masl)





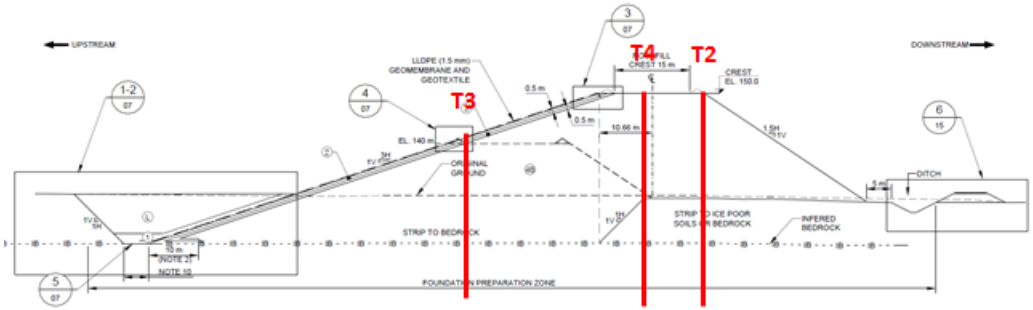
1. South Cell Operational Structures

(2018)

TAILING STORAGE FACILITIES INSTRUMENTATION 2018

2.3 SOUTH CELL: SADDLE DAM 5

Thermistors Emplacement : T1, T2, T3 & T4

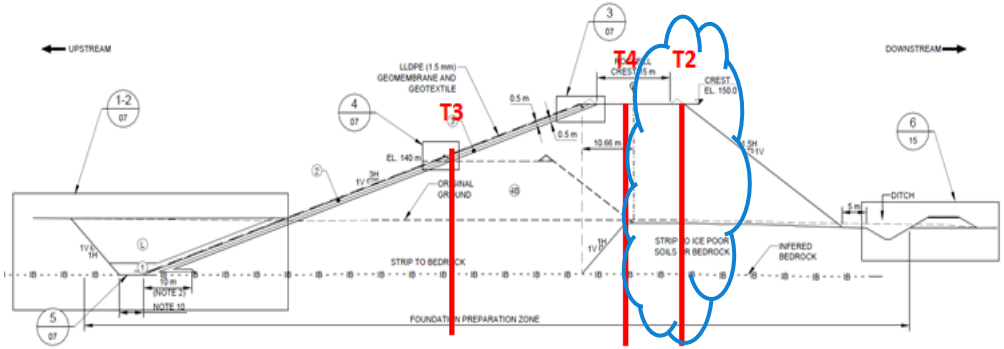


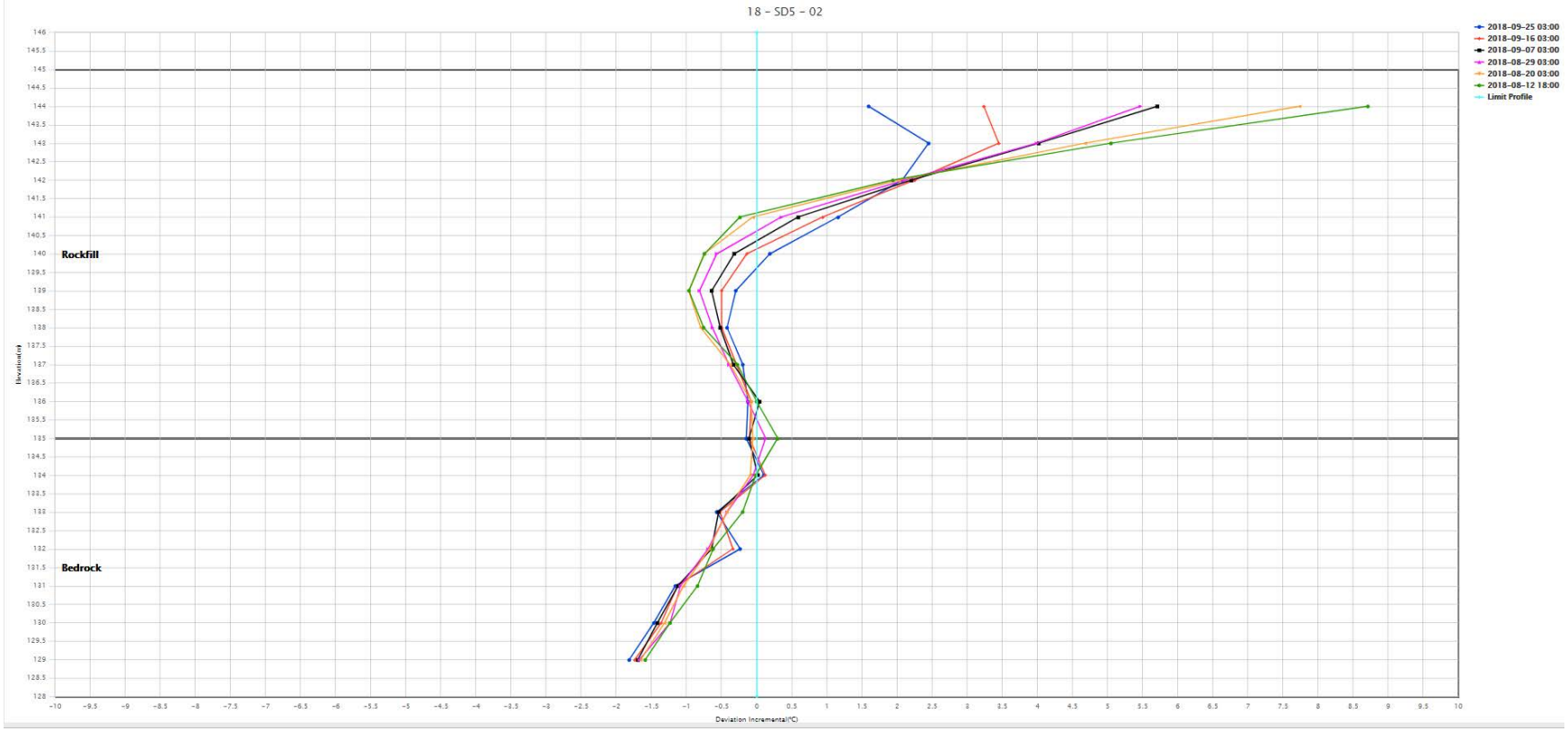
AGNICO EAGLE

2.3 SOUTH CELL: SADDLE DAM 5

SD5 Thermistors 2 (T2)

- From Aug 12 to Sept 25, 2018
- 2 days interval since SD5-T2 was installed during the August 2018 instrumentation campaign.





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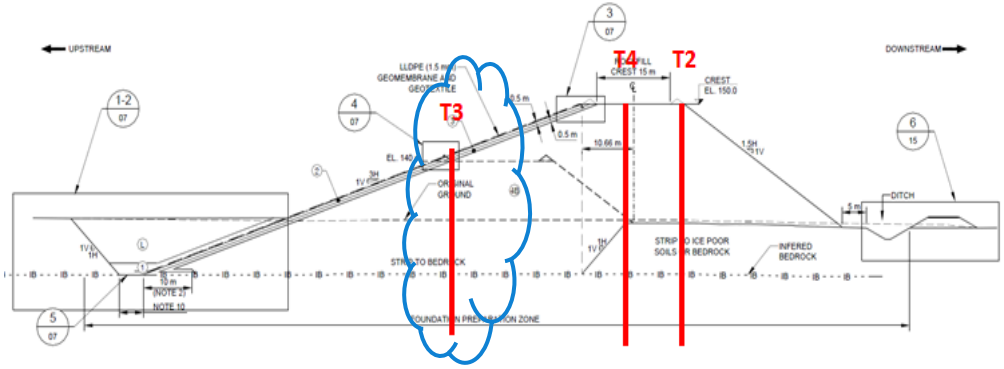
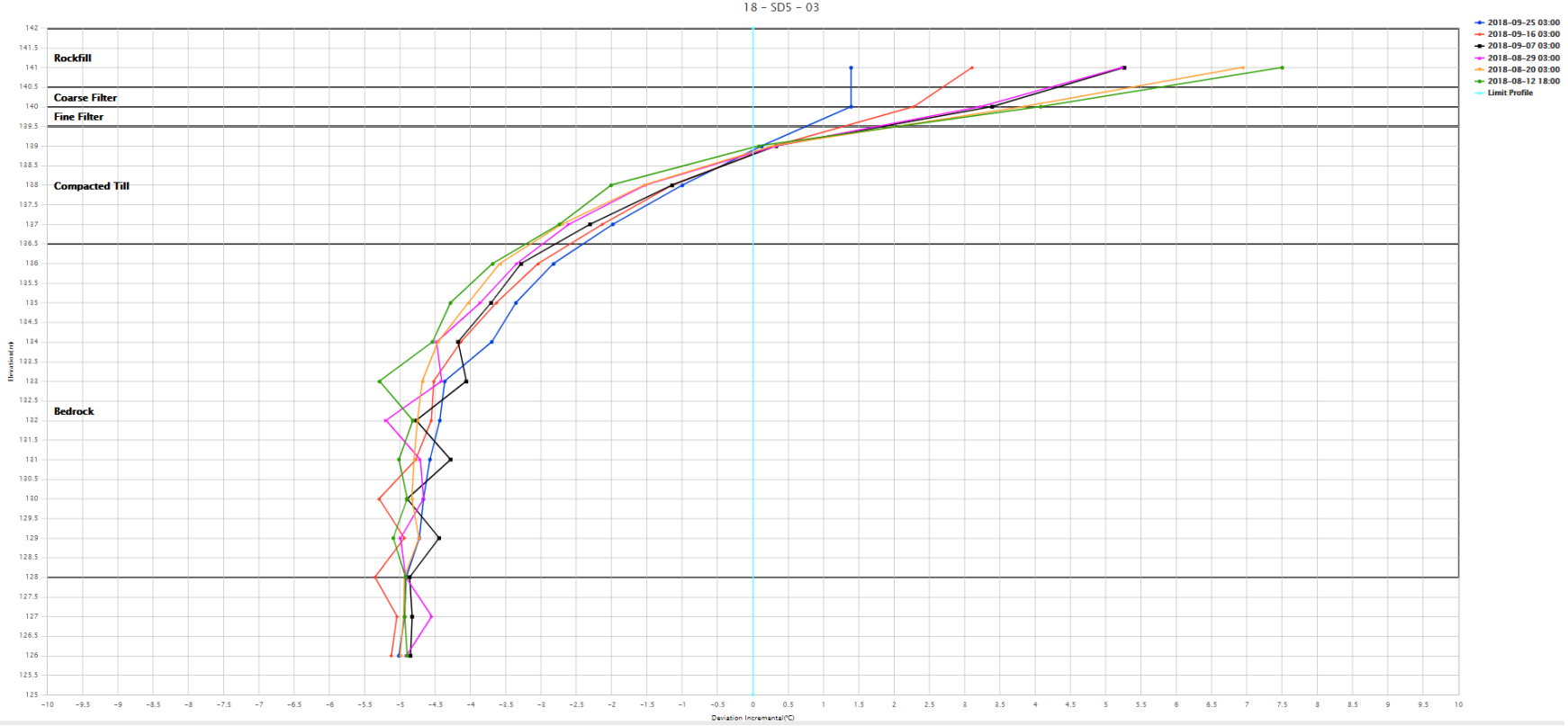
2.3 SOUTH CELL: SADDLE DAM 5

SD5 Thermistors 3 (T3)

- From Aug 12 to Sept 25, 2018
- 2 days interval since SD5-T3 was installed during the August 2018 instrumentation campaign.



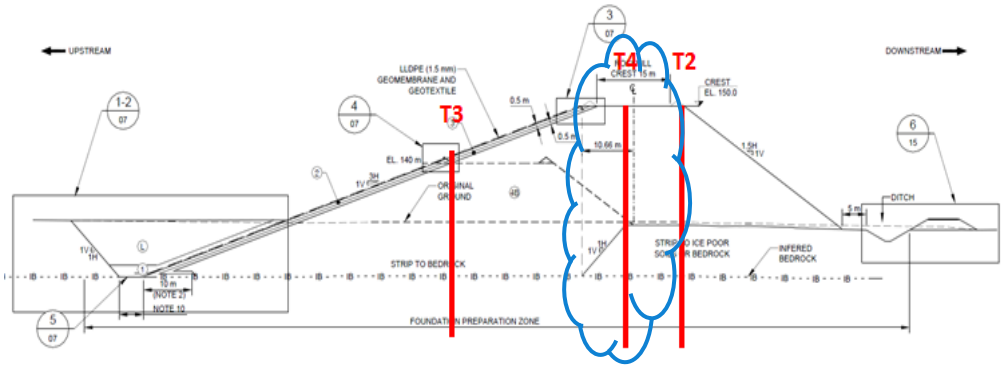


AGNICO EAGLE

2.3 SOUTH CELL: SADDLE DAM 5

SD5 Thermistors 4 (T4)

- From Aug 12 to Sept 25, 2018
- 2 days interval since SD5-T4 was installed during the August 2018 instrumentation campaign .



CONCLUSION

- The TSF instruments are read regularly and many have been automated this year. This allows more frequent readings and a better understanding of the temperature trend in the tailings and TSF structures.
- At the end of July and beguining of August 2018, new instruments were installed at SD3, SD4, SD5 and at the North Cell Internal Structure in order to follow the evolution of those structures.
- Most of the thermistances follow a normal behavior.
- Regular data review will be done to confirm the structures react as expected.

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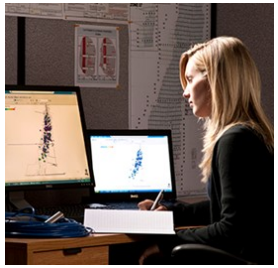

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WORLD GOLD COUNCIL

APPENDIX D

All-Weather Private Road (AWPR)

APPENDIX D1

Culverts Along AWPR Photographic Log

Photograph D1-1: unnamed km 5+700

Date: August 28, 2018 **Photo Number**: 030

Description: View of the culvert inlet. Good condition, inlet is short in length as the road rolling surface is at the edge of the inlet.

Photograph D1-2: PC-17A km 8+830

Date: August 28, 2018 **Photo Number**: 033

Description: View of the culverts inlet. No sign of degradation since last year.

Photograph D1-3: PC-17A km 8+830

Date: August 28, 2018 **Photo Number**: 035

Description: View of the culverts outlet. No sign of degradation since last year.

Photograph D1-4: PC-17 km 8+850

Date: August 28, 2018 **Photo Number**: 034

Description: View of the culverts inlet. Good condition.

Photograph D1-5: PC-17 km 8+850

Date: August 28, 2018 **Photo Number**: 036

Description: View of the culverts outlet (right side of the picture). Good condition.

Photograph D1-6: R-04 km 12+050

Date: August 28, 2018 **Photo Number**: 038

Description: View of the culvert inlet. In good condition.

Photograph D1-7: R-04 km 12+050

Date: August 28, 2018 **Photo Number**: 037

Description: View of the culvert outlet. In good condition.

Photograph D1-8: R-05A km 15+745

Date: August 28, 2018 **Photo Number**: 042

Description: View of the culvert inlet. In good condition.

Photograph D1-9: R-05A km 15+745

Date: August 28, 2018 **Photo Number**: 041

Description: View of the culvert outlet. In good condition.

Photograph D1-10: R-07 km 25+900

Date: August 28, 2018 **Photo Number**: 050

Description: View of the culvert inlet. In good condition.

Photograph D1-11: R-07 km 25+900

Date: August 28, 2018 **Photo Number**: 049

Description: View of the culvert outlet. In good condition.

Photograph D1-12: PC-11 km 39+552

Date: August 28, 2018 **Photo Number**: 056

Description: View of the culvert inlet. The inlet is too high and water is flowing underneath.

Photograph D1-13: PC-11 km 39+552

Date: August 28, 2018 **Photo Number**: 055

Description: View of the culvert outlet. In good condition, almost submerged.

Photograph D1-14: R-14 km 67+840

Date: August 28, 2018 **Photo Number**: 075

Description: View of the outlet culverts. The middle and northern culverts show small signs of erosion at the outlet and these culverts are collapsed inside (hole in the middle). Expected to continue performing well.

Photograph D1-15: R-17 km 77+440

Date: August 28, 2018 **Photo Number**: 081

Description: View of the culvert inlet. In good condition.

Photograph D1-16: R-17 km 77+440

Date: August 28, 2018 **Photo Number**: 080

Description: View of the culvert outlet. In good condition.

Photograph D1-17: R-18A km 80+950

Date: August 28, 2018 **Photo Number**: 084

Description: View of the culverts inlet. In good condition. The southern culvert inlet is partially buried.

Photograph D1-18: R-18A km 80+950

Date: August 28, 2018 **Photo Number**: 085

Description: View of the culverts outlet. In good condition.

Photograph D1-19: R-20 km 85+490

Date: August 28, 2018 **Photo Number**: 088

Description: View of the culvert outlet. Outlet is a little bit twisted. The middle of the culvert is slightly collapsed. Water flows beneath the culvert. The culvert is in stable condition.

Photograph D1-20: R-21 km 87+300

Date: August 28, 2018 **Photo Number**: 090

Description: View of the culverts inlet. Both culverts are slightly collapsed in the middle. In stable condition, but should have been installed lower to avoid erosion issue.

Photograph D1-21: R-21 km 87+300

Date: August 28, 2018 **Photo Number**: 089

Description: View of the culverts outlet. Both culverts are slightly collapsed in the middle. In stable condition, but should have been installed lower to avoid erosion issue.

Photograph D1-22: R-23 km 93+600

Date: August 28, 2018 **Photo Number**: 093

Description: View of the culvert inlet. The culvert is installed too high and there is a low flow of water through the road rockfill. In good condition.

Photograph D1-23: R-23 km 93+600

Date: August 28, 2018 **Photo Number**: 094

Description: View of the culvert outlet. The culvert is installed too high and there is a low flow of water through the road rockfill. In good condition.

Photograph D1-24: R-24 km 98+100

Date: August 28, 2018 **Photo Number**: 096

Description: View of the culverts inlet. South inlet is installed too high. Both culverts show deformation in the upper part.

Photograph D1-25: R-24 km 98+100

Date: August 28, 2018 **Photo Number**: 095

Description: View of the culverts outlet. Both outlets are installed too high. The outlet of the southern culvert (left) shows signs of erosion. Both culverts show deformation in the upper part.

Photograph D1-26: R-26 km 104+400

Date: August 28, 2018 **Photo Number**: 099

Description: View of the culverts outlet. In good condition.

Photograph D1-27: R-26 km 104+400

Date: August 28, 2018 **Photo Number**: 100

Description: View of the culverts inlet. In good condition. In good condition.

APPENDIX D2

Bridges Along AWPR Photographic Log

Photograph D2-1 Bridges 1 – R02 km 8+750

Date: August 28, 2018 **Photo Number**: 032

Description: Looking at the north abutment.

Photograph D2-2 Bridges 1 – R02 km 8+750

Date: August 28, 2018 **Photo Number**: 031

Description: Looking at the south abutment.

Photograph D2-3 Bridges 2 – R05 km 17+600

Date: August 28, 2018 **Photo Number**: 044

Description: Looking at the north abutment.

Photograph D2-4 Bridges 2 – R05 km 17+600

Date: August 28, 2018 **Photo Number**: 042

Description: Looking at the south abutment. Minor damage to the bin wall.

Photograph D2-5 Bridges 3 – R06 km 23+100

Date: August 28, 2018 **Photo Number**: 046

Description: Looking at the north abutment.

Photograph D2-6 Bridges 3 – R06 km 23+100

Date: August 28, 2018 **Photo Number**: 045

Description: Looking at the south abutment.

Photograph D2-7 Bridges 5 – R13 km 62+060

Date: August 28, 2018 **Photo Number**: 067

Description: Looking at the bridge from the south abutment.

Photograph D2-8 Bridges 5 – R13 km 62+060

Date: August 28, 2018 **Photo Number**: 068

Description: Looking at the bridge (north abutment).

Photograph D2-9 Bridges 6 – R15 km 69+200

Date: August 28, 2018 **Photo Number**: 076

Description: Looking at the south abutment. Damage to the bin wall likely caused during snow removal activities. Bridge is tipping toward the west side on the abutment.

Photograph D2-10 Bridges 6 – R15 km 69+200

Date: August 28, 2018 **Photo Number**: 077

Description: Looking at the north abutment. Damage to the bin wall likely caused during snow removal activities. Bridge is tipping toward the west side on the abutment.

APPENDIX E

All-Weather Private Road (AWPR)

APPENDIX E1

Culverts along Amaruq Road Photographic Log

Photograph E1-1: Culvert #66 km 16+324

Date: September 1, 2018 **Photo Number**: 364

Description: View of culvert inlet, half buried.

Photograph E1-2: Culvert #73 km 18+850

Date: September 1, 2018 **Photo Number**: 363

Description: View of culvert outlet, in good condition.

Photograph E1-3: Culverts #208, #209 and #210, km 49+431 to 49+435

Date: September 1, 2018 **Photo Number**: 338

Description: View of culvert outlets, in good condition.

Photograph E1-4: Culverts #208, #209 and #210, km 49+431 to 49+435

Date: September 1, 2018 **Photo Number**: 337

Description: View of culvert inlets, in good condition.

Photograph E1-5: Culvert #283 km 62+965

Date: September 1, 2018 **Photo Number**: 330

Description: View of culvert outlet, in good condition.

Photograph E1-6: Culverts #284, #284-2 and #284-3, km 63+070 to 63+074

Date: September 1, 2018 **Photo Number**: 329

Description: View of culvert outlets, in good condition.

APPENDIX E2

Bridges Along AWPR Photographic Log

Photograph E2-1 Bridges 1 – km 3+400

Date: September 1, 2018 **Photo Number**: 377

Description: Looking at the north abutment from downstream.

Photograph E2-2 Bridges 1 – km 3+400

Date: September 1, 2018 **Photo Number**: 378

Description: Looking at the north abutment from upstream.

Photograph E2-3 Bridges 1 – km 3+400

Date: September 1, 2018 **Photo Number**: 376

Description: Looking at the south abutment from downstream.

Photograph E2-4 Bridges 1 – km 3+400

Date: September 1, 2018 **Photo Number**: 375

Description: Looking at the south abutment from upstream.

Photograph E2-5 Bridges 2 – km 10+700

Date: September 1, 2018 **Photo Number**: 371

Description: Looking at the north abutment from upstream.

Photograph E2-6 Bridges 2 – km 10+700

Date: September 1, 2018 **Photo Number**: 372

Description: Looking at the north abutment from downstream.

Photograph E2-7 Bridges 2 – km 10+700

Date: September 1, 2018 **Photo Number**: 370

Description: Looking at the south abutment from upstream.

Photograph E2-8 Bridges 2 – km 10+700

Date: September 1, 2018 **Photo Number**: 369

Description: Looking at the south abutment from downstream.

Photograph E2-9 Bridges 3 – km 16+000

Date: September 1, 2018 **Photo Number**: 368

Description: Looking at the north abutment from upstream.

Photograph E2-10 Bridges 3 – km 16+000

Date: September 1, 2018 **Photo Number**: 367

Description: Looking at the north abutment from downstream.

Photograph E2-11 Bridges 3 – km 16+000

Date: September 1, 2018 **Photo Number**: 365

Description: Looking at the south abutment from upstream.

Photograph E2-12 Bridges 3 – km 16+000

Date: September 1, 2018 **Photo Number**: 366

Description: Looking at the south abutment from downstream.

Photograph E2-13 Bridges 4 – km 20+000

Date: September 1, 2018 **Photo Number**: 362

Description: Looking at the north abutment from upstream.

Photograph E2-14 Bridges 4 – km 20+000

Date: September 1, 2018 **Photo Number**: 361

Description: Looking at the north abutment from downstream.

Photograph E2-15 Bridges 4 – km 20+000

Date: September 1, 2018 **Photo Number**: 359

Description: Looking at the south abutment from upstream.

Photograph E2-16 Bridges 4 – km 20+000

Date: September 1, 2018 **Photo Number**: 360

Description: Looking at the south abutment from downstream.

Photograph E2-17 Bridges 5 – km 23+900

Date: September 1, 2018 **Photo Number**: 358

Description: Looking at the north abutment from upstream.

Photograph E2-18 Bridges 5 – km 23+900

Date: September 1, 2018 **Photo Number**: 357

Description: Looking at the north abutment from downstream.

Photograph E2-19 Bridges 5 – km 23+900

Date: September 1, 2018 **Photo Number**: 355

Description: Looking at the south abutment from upstream.

Photograph E2-20 Bridges 5 – km 23+900

Date: September 1, 2018 **Photo Number**: 356

Description: Looking at the south abutment from downstream.

Photograph E2-21 Bridges 6 – km 26+100

Date: September 1, 2018 **Photo Number**: 353

Description: Looking at the north abutment from upstream.

Photograph E2-22 Bridges 6 – km 26+100

Date: September 1, 2018 **Photo Number**: 352

Description: Looking at the north abutment from downstream.

Photograph E2-23 Bridges 6 – km 26+100

Date: September 1, 2018 **Photo Number**: 350

Description: Looking at the south abutment from upstream.

Photograph E2-24 Bridges 6 – km 26+100

Date: September 1, 2018 **Photo Number**: 351

Description: Looking at the south abutment from downstream.