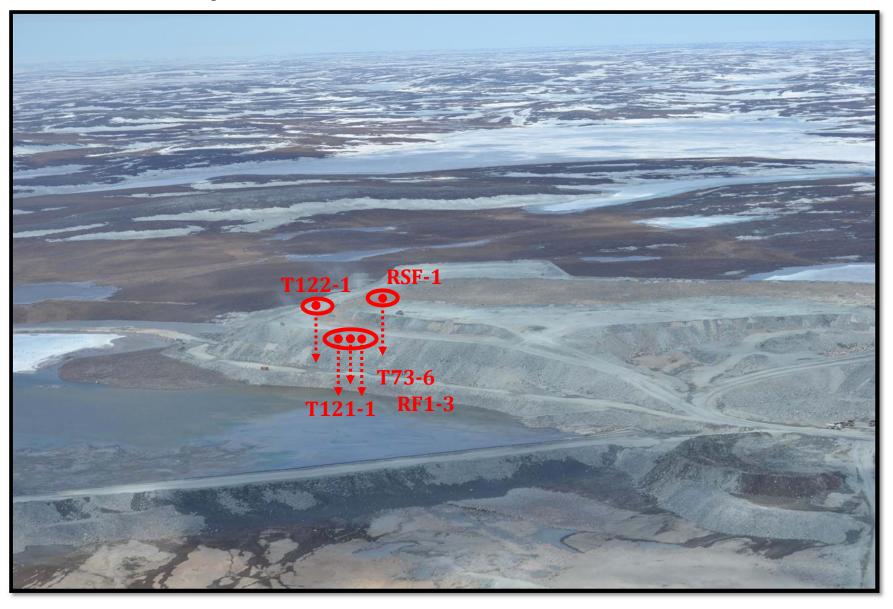
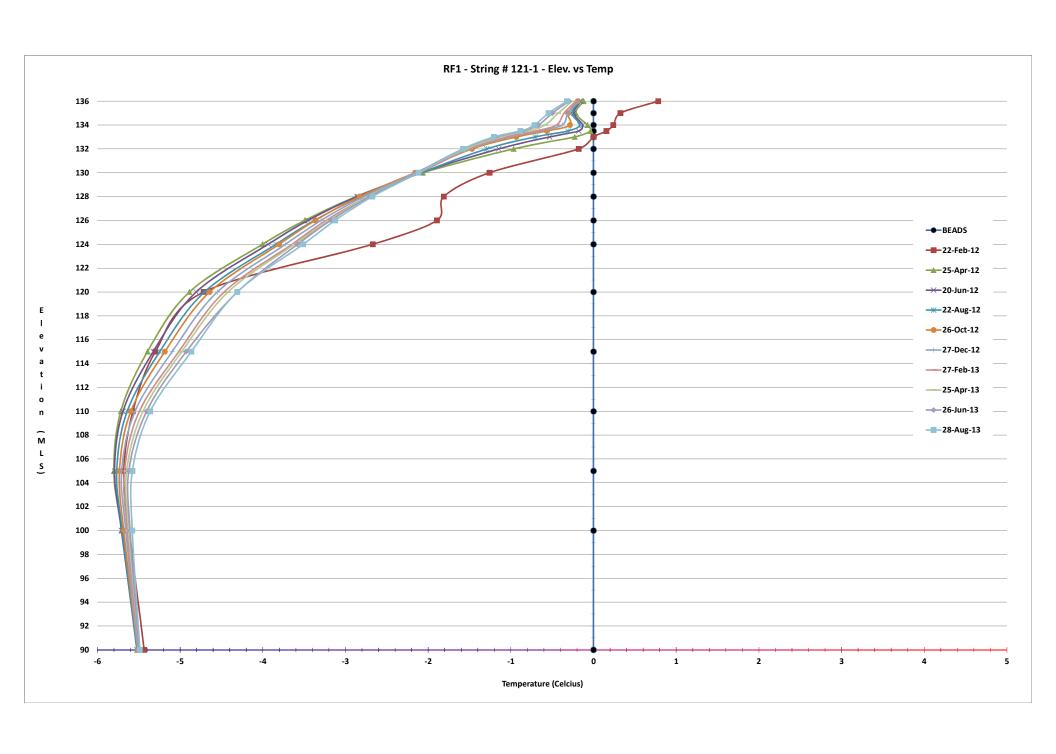
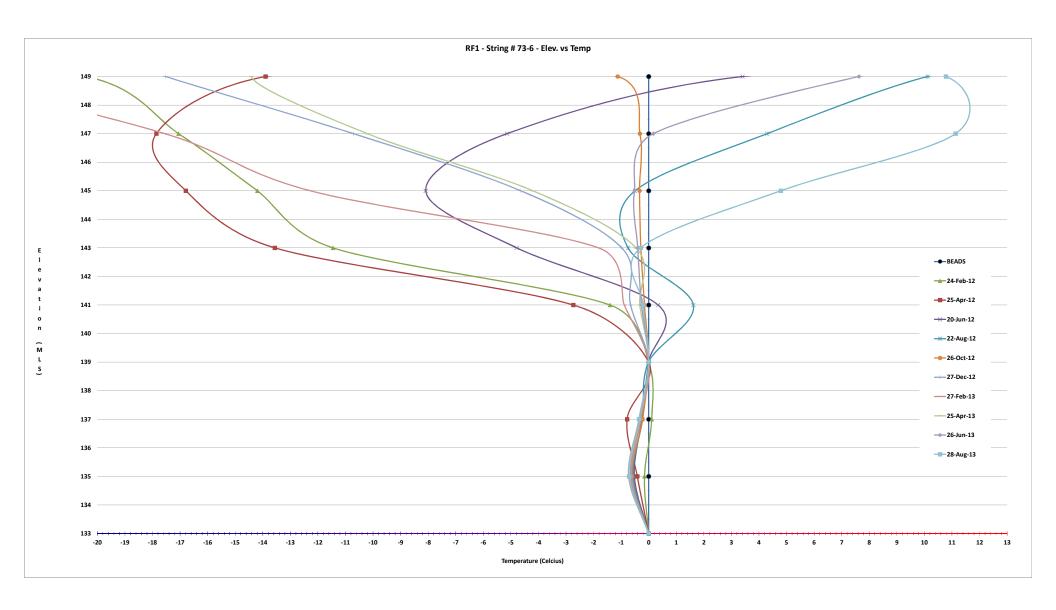
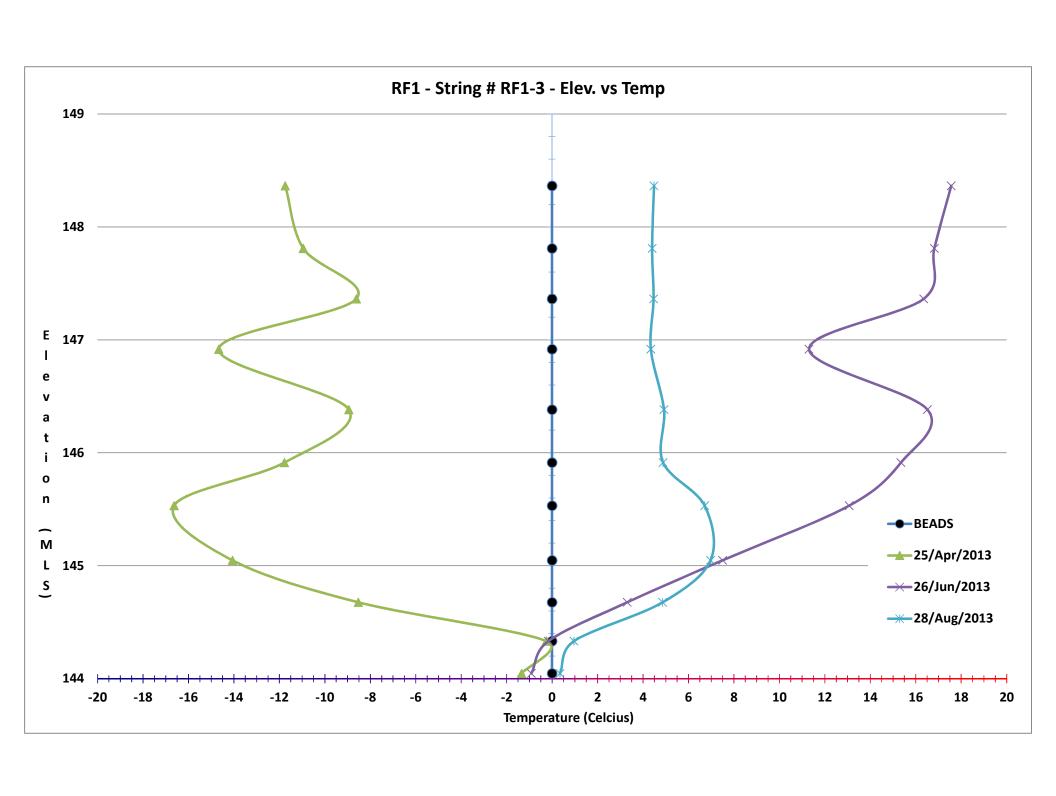


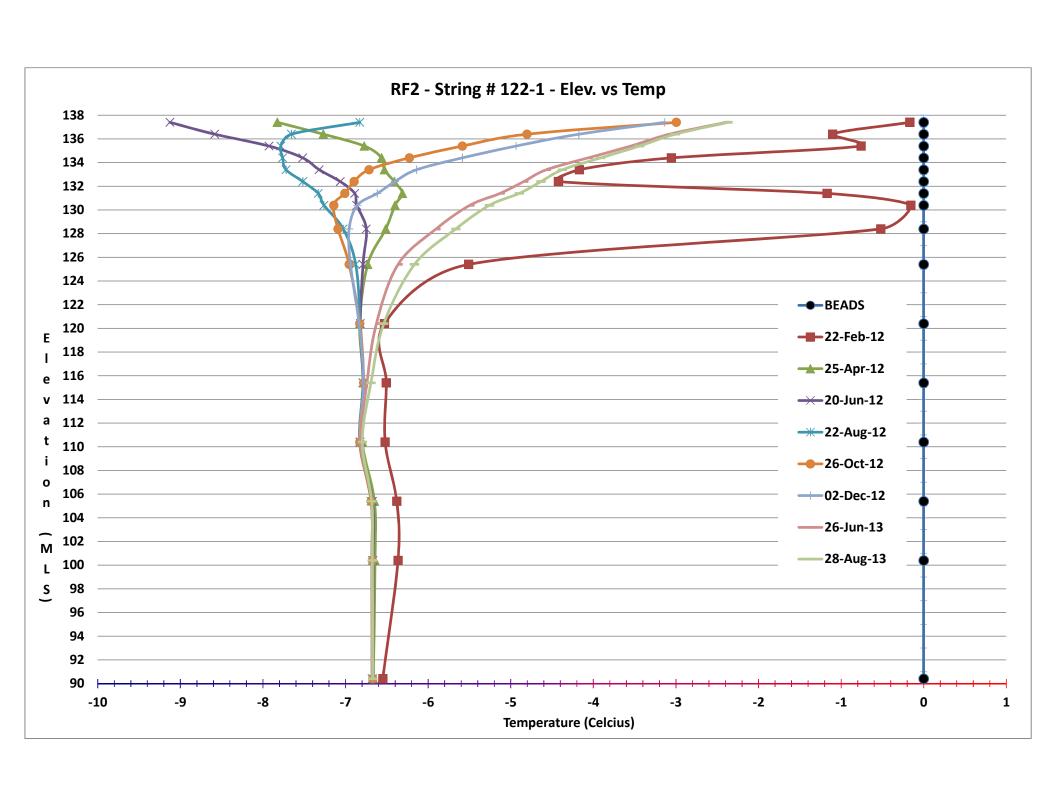
## Waste Dump, RF1 and RF2

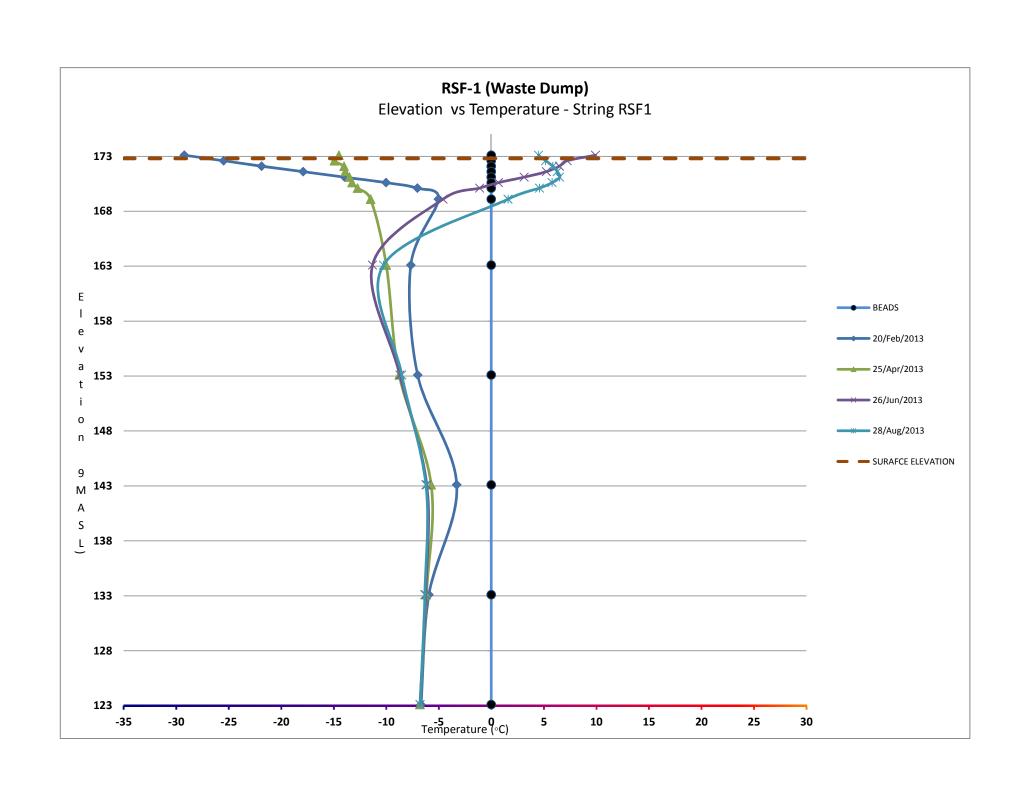


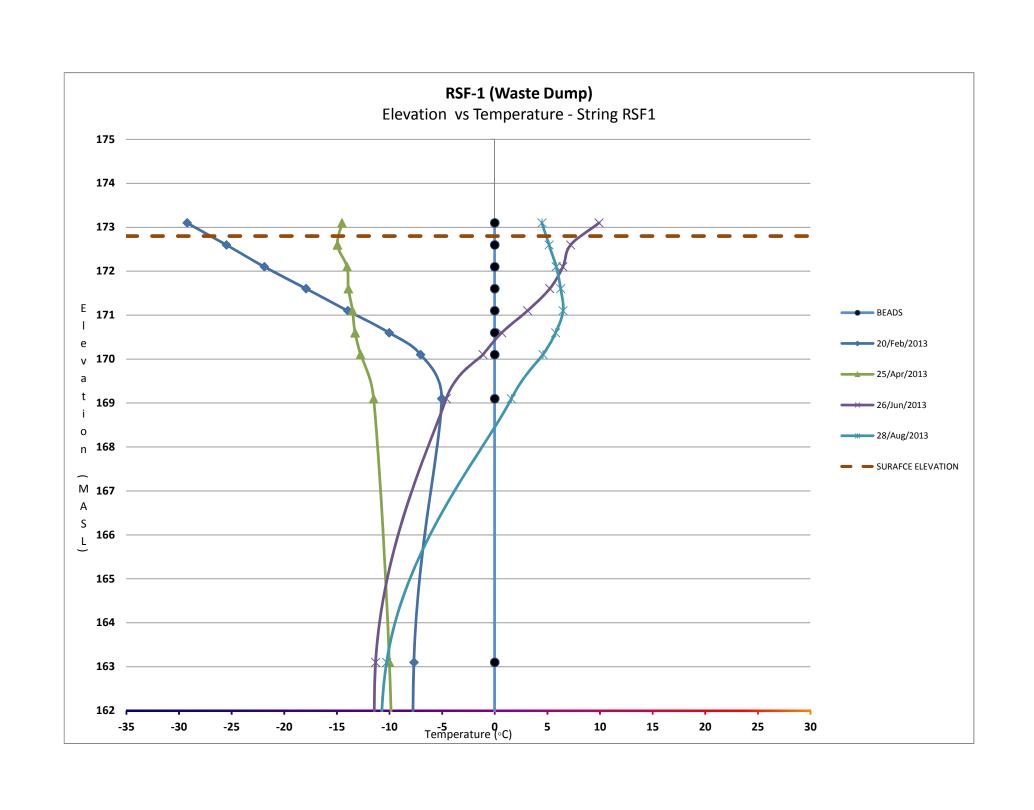






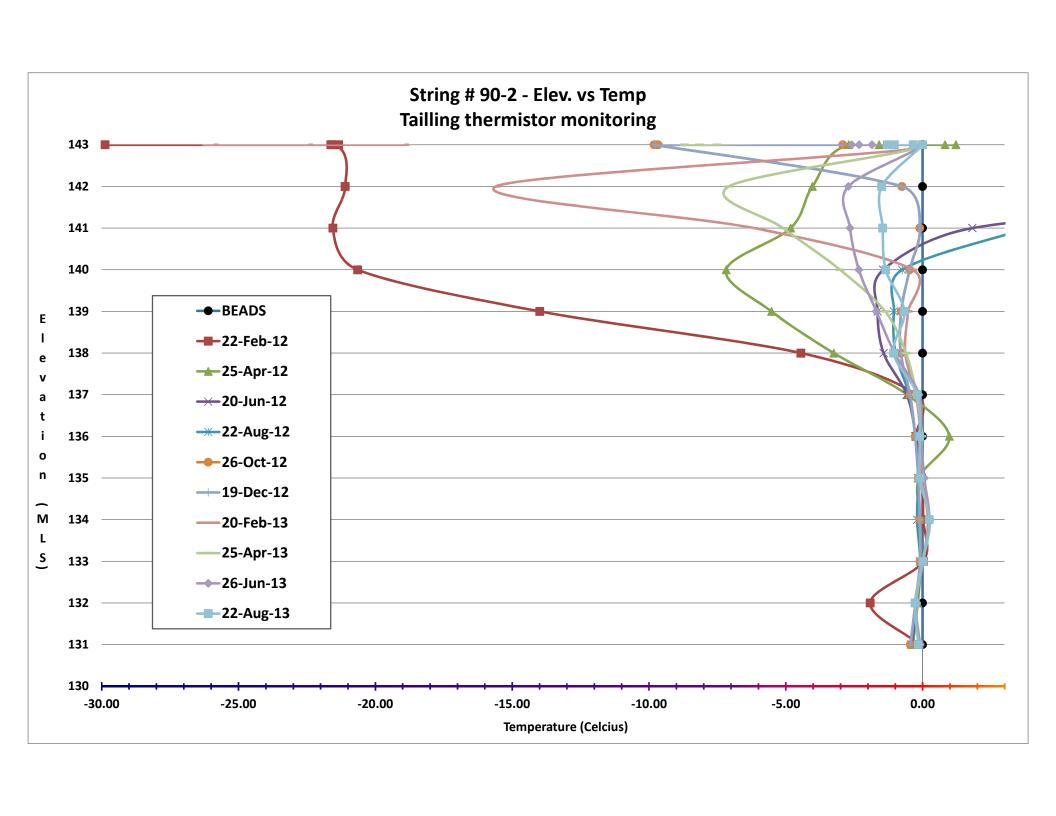


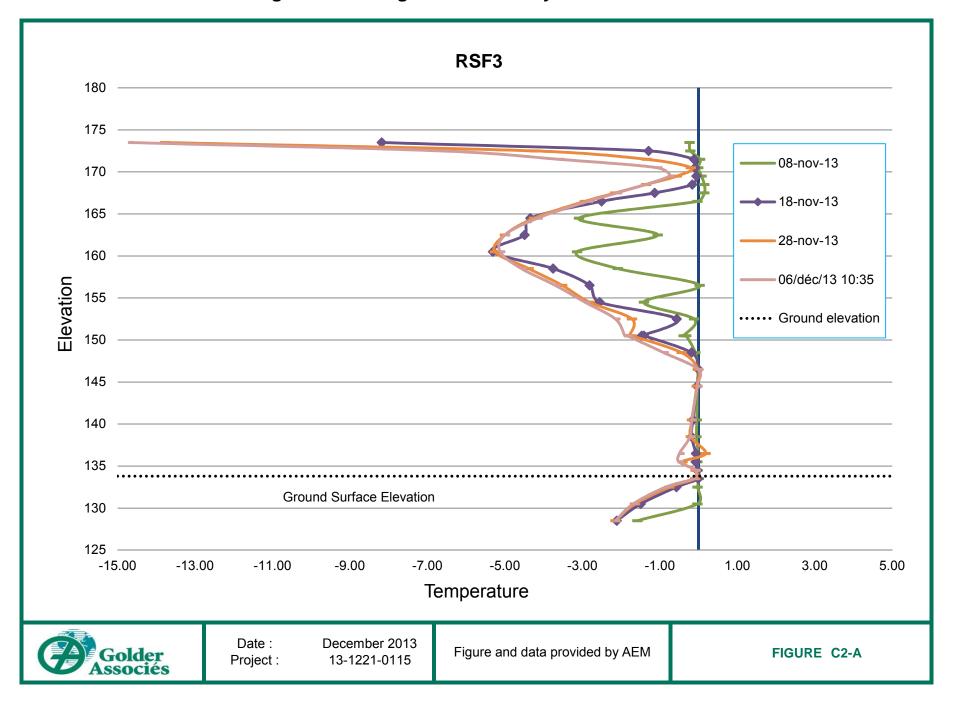


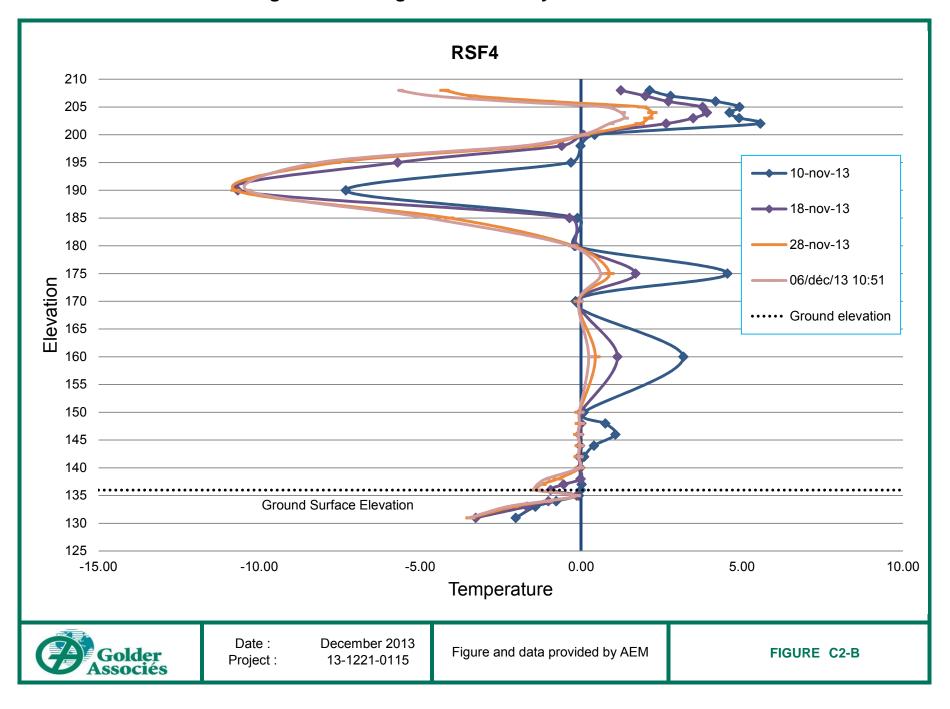


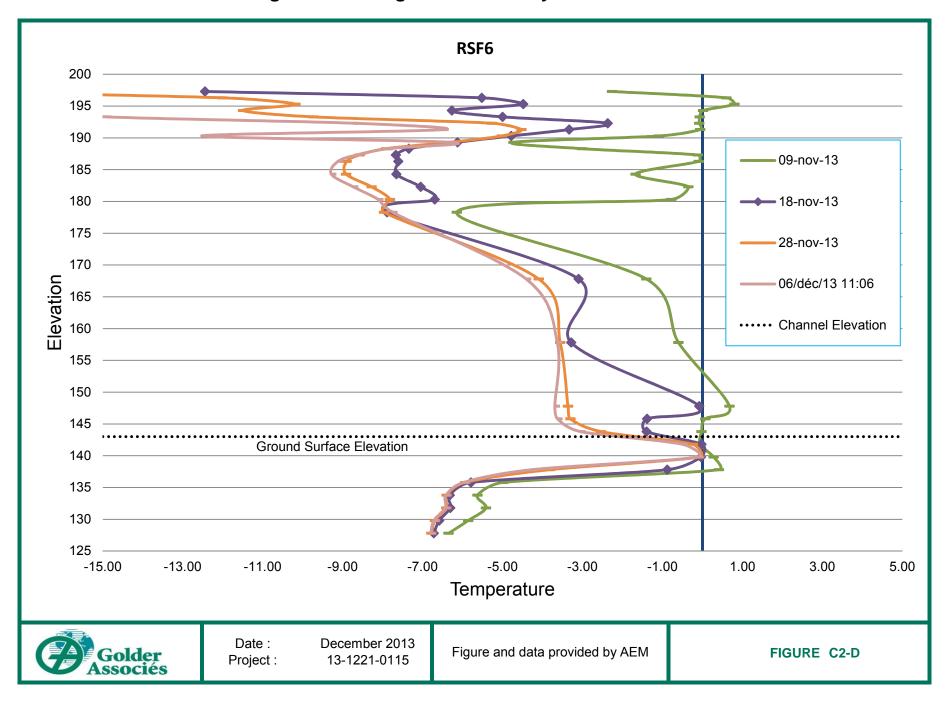
# **Tailings**

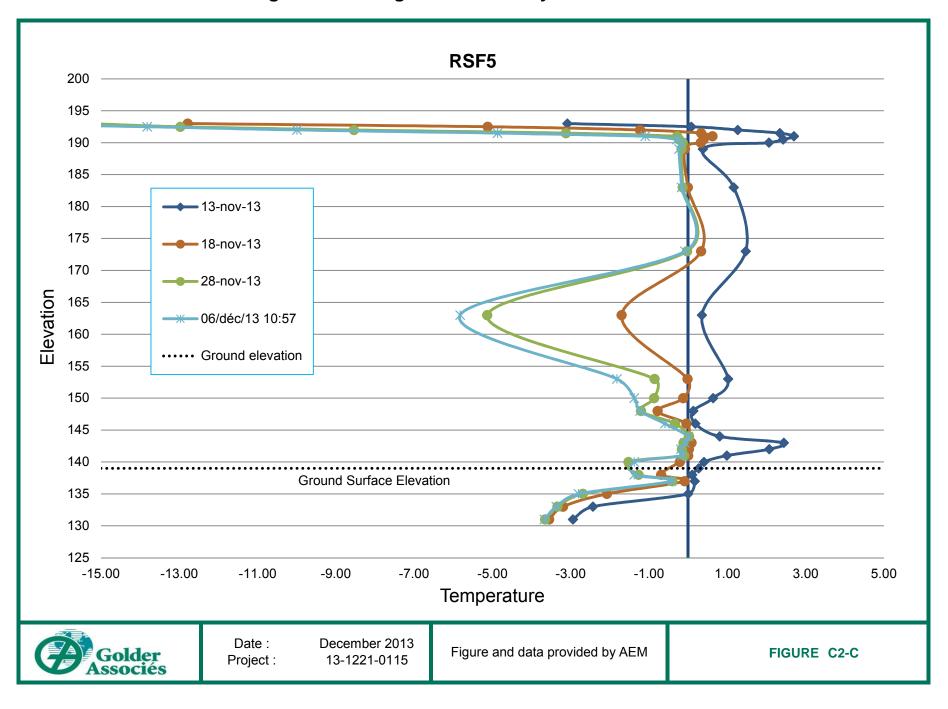
















## **APPENDIX D**

**Construction Summary Report Rock Storage Facility - Interim Till Plug** 



# CONSTRUCTION SUMMARY REPORT ROCK STORAGE FACILITY – INTERIM TILL PLUG

AGNICO-EAGLE MINES LIMITED MEADOWBANK GOLD PROJECT

**OCTOBER 30<sup>TH</sup>, 2013** 

#### **EXECUTIVE SUMMARY**

The construction of the Interim till plug at Meadowbank was conducted from August 26th 2013 and September 1st 2013. The till plug is located on the upstream side of the access road to the North Cell Ditches, between the Waste Rock Storage Facility (RSF) and the NP2 lake. The till plug is designed and constructed as a zoned earth fill structure intended to block seepage coming from the RSF to go into NP2 lake and facilitate seepage collection on the upstream side.

Work carried out during construction of the till plug included excavation of soft sediment, till placement and water seepage control work. This construction report issued by AEM presents the general construction procedure.

As-Built data have been sent to the Tailings Storage Facility (TSF) designer for integration of the structure in the North Tailings Cell revised design.

### **DOCUMENT CONTROL**

Document Version	Date	Revised Section	Revision
Draft	2013-09-30		
Final	2013-10-30		

# CONSTRUCTION SUMMARY REPORT ROCK STORAGE FACILITY – INTERIM TILL PLUG

#### TABLE OF CONTENT

SECTION	N 1.0 - IN	TRODUCTION	1
SECTION	N 2.0 - SC	COPE	2
SECTION	N 3 0 - DF	ESIGN AND TECHNICAL SPECIFICATIONS	5
3.1		MATERIALS AND PLACEMENT SPECIFICATIONS	
0		Zone 1 – NPAG Rockfill	
		Zone 1A - Fine Rockfill (0-200 mm)	
		Zone 2 –Till	
SECTION	J 4 O - CO	DNSTRUCTION ACTIVITIES AND DESCRIPTION OF THE WORK	E
4.1		DEWATERING AND SEEPAGE CONTROL	
4.2		SITION LAYER OF ZONE 1A FINE ROCKFILL ALONG THE ROAD	
4.3		VATION OF THE TRENCH BELOW THE ROAD	
4.4		2 TILL PLACEMENT IN THE EXCAVATION AND ALONG THE ROAD	
4.5		1A FINE ROCKFILL PLACEMENT OVER THE TILL AS EROSION	
		ECTION	7
SECTION	۷ 5.0 - Q(	CONTINUITY TESTING AND RESULTS	7
5.1		NSPECTION AND PROCEDURE REVIEW	
SECTION	N 6.0 - OF	PERATION AND MONITORING	8
SECTION	N 7.0 - SL	JMMARY AND CLOSURE	8

### **APPENDIX**

APPENDIX A Selected Construction Photos

APPENDIX B As-Built Drawings

## CONSTRUCTION SUMMARY REPORT ROCK STORAGE FACILITY – INTERIM TILL PLUG

#### **SECTION 1.0 - INTRODUCTION**

The Portage Rockfill Storage Facility (RSF) at Meadowbank is located in the north portion of the main mine site, adjacent to the Tailing Storage Facilities (TSF). The Rockfill Roads (RF1 and RF2) along the west side of the RSF are part of the TSF North Cell. The North Cell Diversion Ditches (Diversion Ditches) are located around the North Cell to keep freshet surface drainage water from contacting the RSF and the TSF. The East ditch flows through Lake NP-2 and connects to Lake NP-1. Figure 1 presents the general arrangement of the TSF and RSF.

During an AANDC Water License inspection on July 29th and 30th 2013, it was observed that red colored seepage from the northwest side of the RSF was seeping through the road perimeter into Lake NP-2. Samples were taken by both the Inspector and AEM staff (split sample). Analysis results from this sampling were received by AEM on August 16th, 2013. The results received shown that the water collecting in the sump behind the waste dump and that seeped to NP-2 could originate from the supernatant tailing water.

To avoid further contamination of the Lake NP-2, design and construction of an interim till plug was undertaken by Agnico Eagle Mines (AEM). This construction was aimed to reduce the amount of seepage reported to NP-2 lake and to increase the pumping of the seep water contained within the sump. This construction is considered as a first step emergency action and further investigation will be undertaken to assess, prevent and control possible seepage from the TSF and RSF.

Following assessment of the situation, future permanent structures might be constructed if required. The interim plug structure might be incorporated to the permanent containment structure.

The construction work for the till plug was done by Fernand Gilbert Limited (SANA) under the supervision of AEM. The construction surveillance was done by AEM representatives. Survey of the work was completed by AEM.

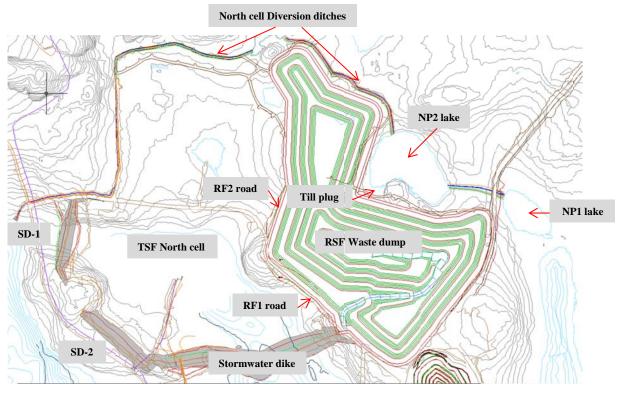


Figure 1: General arrangement of the TSF and RSF

#### **SECTION 2.0 - SCOPE**

This construction summary report presents the general construction procedure for the till plug conducted between August 26<sup>th</sup> 2013 and September 1<sup>st</sup> 2013 at Meadowbank. Work procedures and construction steps are summarized in this report. A review of the proposed design and technical specifications is presented, followed by the description of construction activities. The site inspection during construction, operation and monitoring are then presented.

#### **SECTION 3.0 - DESIGN AND TECHNICAL SPECIFICATIONS**

Design and Technical Specifications were elaborated by AEM Engineering prior to the start of the till plug construction and are resumed in the following section. Typical sections from the original design are available in Figure 2.

#### 3.1 FILL MATERIALS AND PLACEMENT SPECIFICATIONS

The construction of the till plug includes three different zones of material. The requirements for each zone are described below.

#### 3.1.1 Zone 1 – NPAG Rockfill

- The selected fill material consists of waste clean blasted rock from Portage/Goose pit composed of non-potentially acid generating (NPAG) rocks;
- The existing road along NP2 Lake and the RSF includes NPAG Rockfill material.

#### 3.1.2 Zone 1A - Fine Rockfill (0-500 mm)

- The selected fill material consists of waste clean blasted rock (0-500 mm) from Portage/Goose Pit and is composed of NPAG rock;
- No topsoil, unsuitable organic soils, snow, ice are allowed in this zone;
- Lift thickness specified: 500 mm to 1 000 mm before compacting;
- Compaction achieved during placement with excavator bucket.

#### 3.1.3 Zone 2 - Till

- Natural till is obtained from stripping of the Goose Pit or excavation in the Central Dike;
- Non-dispersive soil, including glacial till or clay with fines (sieve # 200 or <0.075 mm) content of minimum 30%, moisture requiring from -2% to +2% of OMC (Optimum Moisture Content).</li>
- No topsoil, unsuitable organic soil, snow, ice, frozen lumps;
- Lift thickness specified: 300 mm to 500 mm before compacting;
- Compaction achieved during placement with excavator bucket.

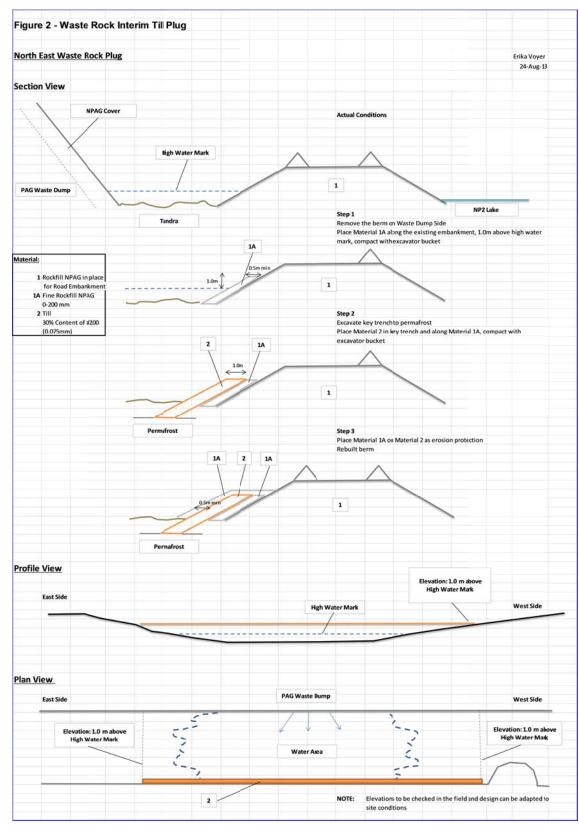


Figure 2: design drawings of the interim waste rock storage facility till plug to prevent seeping water from reaching NP-2 lake.

#### SECTION 4.0 - CONSTRUCTION ACTIVITIES AND DESCRIPTION OF THE WORK

The scope of work for the construction of the till plug conducted from August 26<sup>th</sup> 2013 to September 1<sup>st</sup> 2013 consists of activities listed in the following major work items:

- Sump dewatering and seepage control;
- Placement of the transition layer of Zone 1A "Fine Rockfill" along the road;
- Excavation of the trench below the road elevation;
- Zone 2 "Till" placement in the excavation and along the road;
- Zone 1A "Fine Rockfill" placement over the till as erosion protection.

These items are discussed in the following sections below.

Please note that in order to have the smallest section of the road exposed to seepage at any given time, all works was done in small section not wider than 3-4 meters. The steps followed were: preparation of the upstream slope, excavation of the foundation and till placement. Final cover for erosion protection placement over the till layer was done once before the end of the day. This sequence of events was also chosen to minimize the exposure time of the permafrost to the elements and prevent it to thaw. The concept of the design was to have a foundation composed of either bedrock or permafrost.

Selected photographs of the work progress taken throughout the construction program, showing various aspects of the construction work, are available in Appendix A.

As-built drawings are available in Appendix B.

#### 4.1 SUMP DEWATERING AND SEEPAGE CONTROL

The first step prior to all works in the area is to pump the seepage water from the two main channels out of the till plug area. In order to control the water level through the entire construction period, a water truck from SANA was hauling (as needed) 14,000 litres of seepage water and disposed of it in the tailings pond over the Stormwater dike. A 3" diesel pump (model Godwin CD103) was placed within the 2 main deepest channels to keep them as empty as possible to allow the working area to be as dry as possible for the beginning of the excavation. The pump was moved as the work progresses.



Figure 3: view of the 2 main channels and the pumping station after the completion of the works.

#### 4.2 TRANSITION LAYER OF ZONE 1A NPAG ROCKFILL ALONG THE ROAD

According to the design, a transition layer 1A needs to be put in place prior to the excavation and till placement along the entire upstream side of the road (on the RSF side). As the primary constituent material of the road was already fine NPAG soapstone, the 1A layer was replace by remodeling the in-situ material. The coarser material encountered was removed from the slope and the remaining finer soapstone was flattened and recompacted with the excavator bucket to create a 2 in 1 slope. The preparation of the road upstream slope began 1m above the high water marks left on the tundra after freshet, on both eastern and western abutments of the natural topographic low.

#### 4.3 EXCAVATION OF THE TRENCH BELOW THE ROAD

Excavation of the unfrozen deleterious material was realized with a CAT 345 excavator. The excavation depth was adapted according to the material encountered. Unfrozen tundra, soft till and/or sediments were removed until refusal either on frozen till or bedrock. The foundation exposed was then cleaned and approved by AEM representative before further works performed. The excavation depth over the entire length of the road was ranging from 0.5 to 2.5 m deep (averaging around 1.3m). The deepest portions that had been excavated were the 2 main seepage channels and the shallowest were the eastern and western abutments that were directly over bedrock. As suggested by the Environment department, the excavation debris was put in front of the trench to act as a first barrier against any extraordinary event that might happen in the

area. During the excavation, most of the water flooding the trench was flowing from the actual road structure itself and not from the tundra.

#### 4.4 ZONE 2 TILL PLACEMENT IN THE EXCAVATION AND ALONG THE ROAD

Once a zone of 4-5m wide was excavated and the foundation exposed and approved by the AEM representative, a till layer of at least 500mm was placed in the excavation and compacted with the shovel bucket. The selected till was chosen to meet the specifications presented in section 3.1.3. The till was coming from a stock pile that was built in 2012 for Central dike construction, hauled with 50T trucks and dumped in the slope where it was pick up and spread with the excavator. Prior to any till placement, all the material coarser than 150mm was automatically discarded by the operator.

#### 4.5 ZONE 1A FINE ROCKFILL PLACEMENT OVER THE TILL AS EROSION PROTECTION

Once the till layer was completed, a protective layer of fine filter has to be put in place to prevent any erosion of the layer. The selected material was fine soapstone that was hauled with 50T trucks from SANA. The rock was coming from Goose pit and dumped over the till blanket to be spread, placed and compacted by the excavator bucket. Every boulders or rocks over 500mm was discarded by the operator. The thickness of the protective layer was at least 500mm and has been adapted to the topography of the excavation.

#### **SECTION 5.0 - QC CONTINUITY TESTING AND RESULTS**

#### 5.1 <u>SITE INSPECTION AND PROCEDURE REVIEW</u>

AEM representatives routinely conducted visual observation of work procedure during the construction. Review of the work procedure was done on a daily basis and corrections were made if needed. Daily survey was conducted by AEM representatives for daily progress and to ensure that limits and grades were followed correctly during the construction. Photographs of the work progress were taken throughout the construction program recorded. Daily report for each shift work were issued and filed by AEM representatives. The foundation of the trench was also assessed, approved and surveyed by the AEM representative prior to all material placements but no report was filed on this activity.

#### **SECTION 6.0 - OPERATION AND MONITORING**

Since the completion of the works, the water level is closely monitored by the both Environment and Engineering departments. A staff gauge has been placed at the seepage location to determine and visually quantify the water level increases. A visual daily inspection of the area is done after to ensure we keep the level as low as possible. Whether the water became too high, the Mine department or SANA is advise and a water truck is sent to the area to pump the water and dispose of it in the tailings pond. This operation will be continued until weather permitting in fall 2013 and will be restarted as soon as freshet begins in 2014.

#### **SECTION 7.0 - SUMMARY AND CLOSURE**

The construction of the interim till plug was conducted between August 26<sup>th</sup> and September 1<sup>st</sup> 2013. Construction was completed in accordance with the requirements of the construction design elaborated by AEM.

During the course of the work, one (1) field change was made to the proposed design to optimize the construction activities.

A visual monitoring program consisting of frequent field visit by the Geotechnical team was put in place to insure the integrity of the structure. As part of their normal routine, a water sampling campaign, of both upstream and downstream sides of the structure, is conducted by the Environment department.

APPENDIX A Selected Till plug Construction Photos



Figure 1: Excavation of the active layer until reaching the permafrost. Between 0.5 and 3.8 m were required to reach proper foundation.



Figure 2: excavation of the foundation to permafrost / bedrock). The width of the trench at the bottom was at least one bucket wide. Note the excavated material is discarded on the upstream side.



Figure 3: till placement with the excavator bucket and compaction.



Figure 4: preparation of the transition NPAG on the roadside. Once excavation completed, soapstone was flattened and compacted before any till placement. Note the coarser material discarded from the till (red arrow).



Figure 5: final till placement over an entire section after 1 day of work. The till is flattened and compacted before any rockfill placement.



Figure 6: Final placement of soapstone rockfill protective layer (1A) over the till, once compacted.



Figure 7: water accumulation along the side of the road before works begin. View of the eastern channel.



Figure 8: water accumulation along the side of the road before works begin. View of the western channel.



Figure 9: water control during the construction. A small 3" electric pump and a 3" diesel pumps were used.



Figure 10: photo of the final result of the entire till plug from West to East. The actual pumping station and the 2 active seepage channels are visible on the eastern abutment.

APPENDIX B As-built drawings