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MOUNT POLLEY MINE
Tailings Storage Facility Stage 9
2013 As-Built Report

Submitted to:

Mount Polley Mining Corporation,
Likely, BC

Submitted by:

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IMPORTANT NOTICE

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SUMMARY

This report presents the annual review of the operation and performance of the Mount Polley Mine Corporation (MPMC) tailings storage facility (TSF) for 2013, together with the as-built report documenting the 2013 construction of the embankments. The following gives a general summary of the 2013 TSF activities and key developments. This report has been prepared in accordance with the requirements of the British Columbia Ministry of Energy and Mines (MEM). The following points give a general summary of the 2013 TSF construction activities and the instrumentation overview.

1) 2013 Construction Season Summary

The Stage 9 TSF raise targeted a minimum crest raise of El. 967.5 m via a centerline design as presented in AMEC's 2013 Construction Monitoring Manual. (AMEC 2013). Construction of the Stage 9 raise began with the placement of Zone S in late April. Zone S placement was suspended on October 30. At the end of construction the Zone S (till core) was completed to a minimum elevation of 967.5 m with Zones F and T (filter and transition) completed to a minimum elevation of 966.5 m.

The 2013 embankment raise consisted of:

- Placement of zone materials:
  - Zone U – comprised of tailings sand cells along the South and Perimeter Embankments and a portion of the Main Embankment, as well as non acid-generating (NAG) rockfill along the majority of the Main Embankment;
  - Zone S – comprised of compacted glacial till;
  - Zone F – comprised of filter zone NAG rockfill;
  - Zone T – comprised of transition zone NAG rockfill; and
  - Zone C – comprised of run of mine NAG rockfill.
- Foundation preparation of abutment tie-in on the Perimeter and South Embankments.
- Foundation preparation and Zone C material placement to start a buttress below the Perimeter Embankment.

An AMEC representative was on site to observe the start of the construction and to provide training for the MPMC personnel responsible for the construction monitoring. AMEC provided periodic visits throughout the construction season up to the end of August to verify that the materials and construction methodology satisfied the specifications. Starting at the end of August an AMEC representative was onsite to monitor and test all material placements, and to collect instrumentation data.

MPMC performed all related earthwork construction for Zone U (Upstream fill), Zone T (Transition) and Zone C (NAG Rock Shell). Material placement and related earthwork construction for Zone S and Zone F were completed by Peterson Contracting Ltd (Peterson). Prior to the end of August MPMC monitored daily construction, issued daily reports, sampled materials, and conducted instrumentation data gathering. AMEC reviewed daily reports,

performed laboratory test on the provided samples, reviewed provided instrumentation data, and conducted site visits during critical staged of construction and at minimum on a monthly basis.

2) Instrumentation Summary

In 2013, a number of previously unknown Vibrating wire piezometers (VWP) were located and some previously functioning VWPs were destroyed or failed. Table 1.1 summaries the locations and changes of the various VWPs:

Table 1.1 Changes in VWP Status

Embankment	Functional at End of 2012	Located During 2013	Destroyed During 2013	Total Functional
Main	55	3	2	**56**
Perimeter	13	0	1	**12**
South	11	0	2	**9**
Total	**79**	**3**	**5**	**77**

Trends can be seen in the VWP in four separate material categories; foundation, till core (Zone S), filter and drains (Zone F), and tailings fill (Zone U).

- Pore pressures in foundation soils in around the TSF embankment were generally noted as stable with minor fluctuations except for J1 were the piezometer responded to the dewatering and refilling of perimeter borrow pit 1. During reporting, the readings from VWP I2 were noted to be inconsistent and it was determined that a previous identifier was incorrect and that the VWP was originally installed in the upstream tailings and not in the foundation as previously reported.

- Pore pressures in the till core are generally found to be stable, with a slightly increasing trend in response to the rising pond level. A14 and A2, piezometers showed a greater than typical pore pressure increase; however it appears that it has stabilized at the end of the year. This can be most likely explained by the vertical placement of the piezometer and the lack of an established fine grain beach at that section of the embankment. Piezometer F3 also showed a greater than average increase that is likely due to the position of installation being right on the upstream boundary between the till core and the tailings beach. Piezometer D4 has reported negative values since installation and is assumed to be unreliable.

- Pore pressures in all filter and drain piezometers except D3 remained unchanged throughout the year. Piezometer D3 had a slight increase in the pore pressure that may indicate a restriction or blockage in the drainage of the filter material at this location and should continue to be monitored closely.

- Pore pressures in the tailings and upstream fill generally experienced an upwards trend in response to the rising pond level. In addition, piezometers that were installed at a lower elevation experienced lower response relative to the piezometers near the pond elevation.

A total of nine slope inclinometers installed in the TSF are currently functional, three below the Perimeter Embankment and six below the Main Embankment. During the 2013 construction season five of the SIs below the Main Embankment were extended to allow for the build up of the Main buttress. The following general trends in the slope inclinometers were noted during 2013 and can been seen on the plots in Appendix C:

- SI01-02 showed an approximately 2 mm displacement between the end of January 2013 and when it was reinitialized on June 29th. Between June 29th and the last reading on January 21, 2014 SI01-02 showed an additional 9 mm of movement. During stage 9 construction the rate of movement was relatively consistent at approximately 1 mm per month. The observed displacement is within the tolerable limits and thus does not present any immediate danger to the embankment. SI01-02 has seen 35 mm of total movement since February 7th 2007.

- SI06-03 displayed approximately 3 mm of displacement prior to being reinitialized on June 18th but no displacement below the rock fill after that time. Since the displacement is small for the time frame, the amount of movement could be the result of instrumentation noise.

- During 2013 no displacement was noted on SI06-01, SI06-02, SI12-01, SI12-02 and SI11-02 except in the upper rock fill.

- SI11-04 is noted to have a compression displacement but no other substantial movement. This displacement sometimes occurs as a result of the installation process. Over the last couple of years this instrument has shown to decompress slightly over the winter months and then recompress again in early spring.

1.0 INTRODUCTION

1.1 General

The Mount Polley Mine is located in central British Columbia, approximately 60 km northeast of Williams Lake. The Mount Polley copper and gold mine commenced production in 1997 and operated until October 2001 when operations were suspended for economic reasons. In March 2005 the mine restarted production and has been in continuous operation since. Ore is crushed and processed by selective flotation to produce a copper-gold concentrate. The mill throughput rate is approximately 20,000 tonnes per day (approx. 7.3 million tonnes per year). Mill tailings are discharged as slurry into the Tailings Storage Facility (TSF) located on the south area of the mine property. Figure 1.1 shows an aerial view of the site from 2013.

The starter dam for the TSF embankment was constructed in 1996 to a crest elevation of 927.0m. The starter dam was constructed out of a homogeneous compacted till fill. Beyond the starter dam the TSF embankment comprised compacted till as well as rockfill zones. The embankment was raised in subsequent years as follows:

- To elevation 934.0 m in 1997.
- To elevation 936.0 m in 1998.
- To elevation 937.0 m in 1999.
- To elevation 941.0 m in 2000.
- To elevation 942.5 m in 2001.
- To elevation 944.0 m in 2004.
- To elevation 946.0 m in 2005.
- To elevation 949.0 m in 2006.
- To elevation 950.9 m in 2007.
- To elevation 951.9 m in 2008.
- To elevation 953.9 m in 2009.
- To elevation 958.0 m in 2010.
- To elevation 960.1 m in 2011.
- To elevation 963.5 m in 2012.

Construction of the Stage 9 dam raise began at the end of April 2013 and was suspended in November 2013. The Stage 9 raise entailed a raise of approximately 4.0 m from an approximate El. 963.5 m to El. 967.5 m. The raise, with a minimum crest (Zone S) of El. 567.5 m is projected to provide storage and freeboard through to summer 2014. The next dam raise is scheduled to be carried out in the spring/summer/fall of 2014.

Figure 1.1: Aerial View of Mount Polley Mine Site: 2013

1.2 Documentation Requirements

This report includes the relevant as-built information for Stage 9 (2013) raise as well represents the 2013 annual review of the MPMC TSF. The scope of this report includes the following:

- Description of the Stage 9 raise design, and design modifications that were implemented during construction;
- Description of conditions encountered during construction;
- Inspection reports, field and laboratory test results including sample locations and test standards and/or methodologies;
- Description of the quality assurance and quality control (QA/QC) procedures and results;
- Photographs documenting construction progress and final conditions;
- As-built drawings;
- Confirmation that the Stage 9 TSF construction was carried out in accordance with the design intent;
- Summary of instrumentation installed within the TSF;

2.0 STAGE 9 DESIGN OVERVIEW

2.1 General

The Mount Polley TSF is comprised of one overall embankment that is approximately 4.7 km in length. The embankment is subdivided into three sections; referred to as the Main Embankment, Perimeter Embankment and South Embankment. Heights vary along the embankment and are approximately 56 m, 38 m, and 29 m for the Main, Perimeter and South embankments respectively.

2.2 Tailings Discharge and Beach Management

Tailings are transported from the mill to the impoundment via an approximately 7 km long HDPE pipeline. Near the end of the construction season the pipeline route was altered slightly to create a better grade and to provide room for dam expansion. Cell construction was carried out from corner 5 advancing along the Perimeter embankment to the Main embankment to about Sta. 2+700. Insufficient tailings line pressure prevents cell construction along the central portion of the Main embankment and single point discharge is employed (approximately Sta. 2+700) to facilitate the beach development. Discharge from Sta. 2+700 was maintained for about 2 weeks after which discharge was relocated to corner 4 for the resumption of cell development. Cellular development was begun along the South Embankment near the end of 2013. The pipeline design flow is 20,000 tpd at about 35% solids by dry weight.

2.3 Process Water Reclaim

The tailings pond supernatant is recycled to the mill for use as process water. It is transported via the reclaim pumping system, which consists of a barge, pipeline and booster pump station. The reclaim pipeline system returns water from the TSF to the mill for use in the mill process.

2.4 Freeboard Requirements

The freeboard requirement for the TSF is 1.4 m to allow for the 72-hour PMP event, which corresponds to approximately 1.07 Mm^3 (resulting is a rise of pond level of 0.6 m) plus 0.8 m to allow for wave run-up. MPMC holds the option of transferring excess pond water into the Perimeter Borrow Pit 1 if required to satisfy freeboard requirements.

2.5 Seepage Collection Ponds

Seepage collection ponds are located downstream of each of the three embankments that create the TSF. The seepage collection ponds collect seepage from the embankments, embankment drain discharge as well as direct runoff from the embankment and reporting catchments. Records indicate that the ponds were excavated into low conductivity glacial till. A culvert running into the main seepage pond was detected to be plugged during a site visit by AMECs project manager and was consequently clear by an excavator. (see photo 20) After the culvert was cleared all the ponds were observed to be in good condition.

2.6 Drain Flow Data

Flows from the upstream toe drain and foundation drains of the Main embankment are measured at the sump located at the Main embankment seepage collection pond. Upstream toe drains from the Perimeter and South embankments discharge into ditches which carry the flow to their respective seepage collection ponds where it is measured at the end of pipe. Water from the upstream toe and foundation drains is recycled to the TSF or aerated weather permitting. Drain flows from the South and Perimeter embankments are read weekly as weather permits.

2.7 2013 Dam Design

The 2013 construction schedule was planned to comprise the Stage 9 TSF embankment design raise targeting an elevation of 967.5 m. AMEC prepared a design package presenting the stability analyses and IFC drawings for the raise to El. 967.5 m which was submitted by MPMC to the MEM for approval.

The design of the Stage 9 raise has not changed from previously approved and constructed Stage 8a raise design cross sections, consisting of a downstream shell of NAG rockfill, a central, low permeability till core and a filter sequence downstream of the core. Details of the Stage 9 design are found in drawings 2013AB.02 – 2013AB.16.

The stage 9 raise maintain a downstream slope of 1.3H:1V, which is temporary as the final dam downstream slope will be flattened as constructed. During the course of the 2013 construction season waste material was stripped away from the surface below the Perimeter Embankment to make room for the future expansion of the TSFs footprint. The elevation of the buttress below the Main Embankment was also raised from ## m to 925 m and preparation for a buttress was started below the Permeter Embankment. The NAG rockfill (Zone C) in the dam shell was placed and compacted by dozer and haul truck traffic. Transition material (Zone T) was obtained by selectively sorting run-of-mine waste rock. Sand and gravel filter material (Zone F) was processed by on site crushing of run-of-mine waste rock. Till core fill (Zone S) was obtained from a locally borrowed, low permeability glacial till. Total tailings (Zone U) are deposited into the impoundment and, in combination with run-of-mine waste rock, provide upstream support for the embankments, progressively raised in a centreline configuration to El.967.5 m.

3.0 CONSTRUCTION MONITORING PROGRAM

3.1 Responsibilities for Construction Monitoring

Construction monitoring during the period of April to the end of August 2013 was mainly carried out by a MPMC field inspector. Prior to the end of August AMEC's support engineer, reviewed daily construction records and performed regular site visits to monitor the quality of construction and assess MPMC's monitoring of the construction. After the end of August AMEC's support engineer took on the responsibilities of the MPMC field inspector as well as the responsibilities of the support engineer with the exception of any duties requiring surveying.

3.2 AMEC's Support Engineer

While on site the responsibilities of AMEC's support engineer were as follows:

- Monitor, train, and assist MPMC personnel with the requirements of construction monitoring;
- Monitor, sample, and requisition tests of the borrow areas, as required;
- Monitor and perform QA testing of compacted till core soils, as required;
- Review and approval of proposed borrow soils;

- Review and approval of transition and filter material, processing methodology and monitoring practices;
- Monitor and approve the filter trench excavation and preparation;
- Monitor and approve abutment preparation;
- Address any concerns or out-of-compliance situations observed and recorded during construction;
- Carry out the quality control field and laboratory testing;
- Direct the MPMC personnel to address the survey requirements, results, etc.; and
- Meet as required with MPMC to review the construction program.

Prior to the end of August AMEC's support engineer provided on-site supervision during the following periods:

- *April Site Visit: April 22 to April 15, April 29 to May 1*
- *May Site Visit*: May 7 to May 9 and May 13
- *June Site Visit*: June 4 to June 6, June 17 to June 19, June 26 to June 28
- *July Site Visit*: July 3 to July 5
- *August Site Visit*: August 2, August 12 to August 14

Starting on August 25 AMEC's support engineer was on-site for all material placement and instrumentation readings up until the writing of this report.

While in the office the responsibilities of AMEC's support engineer were as follows:

- Review daily construction reports;
- Review compaction results;
- Plot and review instrumentation readings;
- Address any concerns or out-of-compliance situations noted by MPMC personnel; and
- Coordinate with MPMC personnel and AMEC's Project Manager/Senior Engineer.

3.3 AMEC's Project Manager

AMEC's Project Manager performed a site visit on August 12 to 14. In general, the purpose of the site visit was to view the construction activities, liaise with MPMC project personnel and discuss any issues with the TSF.

3.4 MPMC Field Inspector

MPMC Field Inspectors were responsible for the following:

- Monitor and maintain a photographic record of ongoing construction activities;
- Review borrow pit material to verify material consistency;
- Delineate embankment zones with stakes (every 25 to 50 m);
- Perform QC compaction testing of placed Zone S material (as per material placement specifications);
- Collect material samples for QC laboratory testing;
- Conduct as-built surveys of various zones;
- Prepare and submit daily construction reports;

- Collect and submit instrumentation data; and
- Report out-of-compliance situations to AMEC's Support Engineer.

Examples of daily construction reports prepared during the construction season are presented in Appendix C.

3.5 QA/QC Testing

A summary of the testing requirements is given in Table 3.3.1.

Table 3.3.1: Embankment Material Types and QA/QC Testing Requirements

MATERIAL TYPE	ON-SITE TESTING	OFF-SITE TESTING	SAMPLE COLLECTION SCHEDULE
Zone S Till Core	Source Classification: Visual inspection of borrow material. In-Place Testing: Visual inspection of zone dimension, and material. ND Density Testing (D6938-10) Moisture Content (D4318-10)	Source Classification and In-Place Testing : Proctor (D698-07 / D4718-07) Atterberg (D421-07 / D4318-10) Hydrometer Gradation (D421-07 and D422-07) Sieve Gradation (D6913-09)	Source Classification : One (1) per biweekly per source or One (1) per 10,000 m^3 per source In-Place Testing: One (1) per offset biweekly per source or one (1) per 6,500 linear meters per source Moisture Content: One (1) per 1000 linear meters per lift per day
Zone F Filter	During Production/Transportation: Wash Sieve Gradation (C117-04 and C136-06) During Placement: Visual inspection of material size, compaction, preparation, and zone dimension. Wash Sieve Gradation (C117-04 and C136-06)	During Production/Transportation: Wash Sieve Gradation (C117-04 and C136-06) In-Place Testing: Wash Sieve Gradation (C117-04 and C136-06)	During Production/Transportation: One (1) per 5,000 m^3 per stockpile A duplicate sample for off-site testing one (1) per stockpile In-Place Testing: One (1) per placement event or one (1) per 2,500 linear meters A duplicate sample for off-site testing one (1) per 4,500 linear meters
Zone T Transition	In-Place Testing: Wash Sieve Gradation (C117-04 and C136-06) Confirmation of waste rock inertness, as required. Visual inspection of material size, compaction, preparation, and zone dimension.	In-Place Testing: Wash Sieve Gradation (C117-04 and C136-06)	In-Place Testing: One (1) per 5,000 m^3 material placed. A duplicate sample for off-site testing one (1) per 10,000 m^3
Zone C Rockfill	Confirmation of waste rock inertness, as required. Visual in-place inspection of material size, preparation, and placement.	Not Applicable	Not Applicable

3.6 Instrumentation Monitoring

MPMC personnel are responsible for monitoring both vibrating wire piezometers and inclinometers located within the TSF. During the 2013 construction period, the instrumentation was generally read once every two weeks with inclinometers readings offset a week from the piezometer readings.

For the period prior to and after the 2013 construction period through the end of 2013, instrumentation monitoring was reduced to readings once a month.

4.0 TSF EMBANKMENT - STAGE 9 CONSTRUCTION OVERVIEW

4.1 General

Construction of the Stage 9 raise entailed a raise of approximately 4.0 m from approximate El. 963.5 m to a minimum crest El. 967.5 m. Till core (Zone S) placement took place between April 30 and October 30, 2013. The following subsections provide a brief summary of the 2013 construction activities for the TSF.

Drawing 2013AB.01 provides a general mine layout and the location of the borrow sources used in the Stage 9 construction. Drawing 2013AB.02 shows the as-built embankment in plan view while drawings 2013AB.03 through 2013AB.05 show the as-built sections of the embankment in relation to the design.

Throughout the report, references to specific photographs are listed to better illustrate given details about the embankment construction process. In each case, the photograph will be noted by a number; the photographs are presented in Appendix A.

4.2 Foundation Preparation

Preparation of the perimeter abutment was started in late November but was postponed due to poor weather conditions. As a result at the time of this report no removal of overburden had been completed for the drainage blanket and only one compacted lift of zone S material had been placed. Preparations at the south abutment were completed on October 20th. Foundation preparation for the abutments was carried out in accordance with the guidelines outlined in AMEC's 2013 Construction Monitoring Manual (AMEC 2013) as follows:

- **Removal of overburden** – At the south abutment an area within the dam footprint and 2 m beyond, was stripped of organic material, loose or soft soils and deleterious material (including previously placed waste rockfill). At the perimeter abutment only the area under the S zone was stripped (Photo 1).

- **Test pitting** – Prior to cutoff trench construction, excavation of two test pits were performed (one at each of the south and perimeter abutments) to confirm that a minimum of 2 m depth of native till was present beneath the embankment core limits. The test pits were completed downstream of the core limits such that the existing soils under the till core contact were not compromised (see photo 2). Bedrock with less than 2 m of native till overburden was only encountered above 967.5 m el. in the south embankment test pit. (see Photo 3)

- **Drainage Blanket construction** - Prior to placement of the drainage blanket at the south abutment, proof-rolling of the exposed native abutment material was completed using a 10 ton vibratory smooth drum compactor (Photo 4). A drainage blanket consisting of a minimum 0.6 m thick lift of Zone F material was then placed to the full extents of the embankment area.

- **Drainage ditch construction** – Construction of a drainage ditch was performed by excavating a ditch approximately 0.6 to 1.0 m in depth and 2.0 m in width, along the South Embankment downstream of the abutment core extensions. The ditch was constructed in order to accommodate drainage trench detail implemented in past raises, aligned along the toe of the dam. On the South Embankment the corrugated drainage pipe was extended and placed at the base of the trench. The trench was then backfilled with filter material (Zone F).

4.3 Fill Placement

4.3.1 Zone U – Upstream Shell

Upstream support for the raising of the TSF embankment is provided by NAG tailings. The majority of the upstream shell comprised end of pipe spigotted tailings, utilizing cells, reworked with a dozer to achieve proper distribution, provide compaction and expedite excess water drainage. (see Photo 5) Further shaping of Zone U confining berms was done with the aid of an excavator. The majority of this work was carried out without AMEC supervision. Where the tailings could not be used for shell construction due to pipeline and pumping limitations, NAG waste rock was brought to the TSF by haul truck and placed/shaped by excavators and dozers (see photo 6). Specifically, NAG waste rock was substituted for use as Zone U along the central portion of the Main Embankment between Corner 2 and Corner 3. Prior to Zone S placement downstream of Zone U, AMEC's Support Engineer inspected the NAG waste rock that had been used as Zone U to ensure that large boulders (diameter > 1 m) did not exist near the Zone U/Zone S interface.

4.3.2 Zone S – Till Core

The till fill core material used in the construction of the TSF embankment was obtained from three different sources below the TSF embankment. Two of the borrow pits are located downstream of the Perimeter Embankment between Corner 1 and Corner 2 and the other borrow pit is located below the Main Embankment at corner 2. (see Photos 7, 8, 9 respectively)

Prior to beginning the 2013 Zone S raises, repairs had to be made to the existing till core. Due to insufficient support on the upstream side of the till over the winter months, a section of the till had slumped and the total required width of 5 m had to be re-established. This was accomplished by trenching out approximately 0.5 m of Zone U at the upstream intersection of Zone S and U. This approximately 300 mm deep trench was then backfilled and compacted with proper Zone S till along the Perimeter and Main Embankments. (see photo 21 and 22)

The placement of Zone S material was performed by Peterson and generally followed the methodology outlined below:

- Prior to placement of the first lift of till core during 2013, the existing till (Zone S and native till on the abutments) was prepared by proof-rolling with a 10 ton vibratory smooth drum roller. Areas that were noted to be soft or affected by the frost were removed and replaced with approved Zone S material.
- The top 0.1 m of the prepared surface was scarified with the aid of a dozer/grader, to promote bonding between successive lifts. (see Photo 10)

- The surface was moisture conditioned as required to further promote proper bonding of successive till lifts. (see photo 19)
- The till fill was end dumped by haul trucks and spread in 0.3 m thick lifts with a dozer. (see Photo 11)
- Compaction of the till was primarily achieved using the combination of a 10 ton sheep's foot drum vibrating compactor and a 10 ton smooth drum vibrating compactor.
- On average, for every three (3) lifts placed, the downstream face of the till was trimmed and shaped by an excavator to maintain design lines during the excavation of the filter trench.

4.3.3 Zone F – NAG Filter Rock

The material utilized for Zone F sand and gravel was crushed on site at the primary crusher. Haul trucks were used to transport and stockpile the material around the TSF embankment for use in construction. Drawing 2013AB.02 illustrates the stockpile locations used during the 2013 construction.

Prior to the placement of Zone F material a 1.5 m wide trench was excavated in previously placed Zone C material on the downstream side of the till core. (see photo 12) This trench was excavated along the downstream design line along the till to expose the previously placed filter at a depth of approximately 0.9 m or three 0.3 m till lifts. The filter material was then end dumped by a haul truck into the trench and smoothed off at surface with a grader. (see photos 13, 14)

4.3.4 Zone T – Transition NAG Rock

The material utilized for Zone T was crushed on site and transported to the embankment as required. Prior to the back filling of the filter trench with Zone F material the downstream sidewall of the trench was inspected for any unsuitable Zone T material. Any material that was found to be oversize (greater than 150 mm) or had greater than 20% fines was removed and with an excavator after the backfilling of the filter trench was completed. (see photo 15) The removed material was replaced by suitable Zone T material hauled and placed by MPMC with the aid of a loader and grader.

4.3.5 Zone C – Downstream Shell NAG Rock

The Zone C downstream rockfill shell (placed by MPMC) was constructed with NAG rockfill obtained from waste rock produced in the mining operation. Prior to placement, the surface was scarified with the aid of a grader/dozer in areas where pavement like surfaces had developed. The scarification was performed to avoid continuous, low hydraulic conductivity zones within the rockfill shell, thus promoting downward drainage through the rockfill. The NAG rock was transported from active mining areas to the embankment via haul truck and placed and spread by dozers in approximately 1 m thick lifts. (see photo 16)

In addition to the raising of the existing Zone C level, construction was started on a buttress below the Perimeter Embankment and the existing buttress below the Main Embankment was also raised. The Main Embankment buttress was raise to an elevation of 925 m by placing a single lift of Zone C material via haul truck and spread with a dozer.

Prior to the placement of any Zone C material to create a buttress below the Perimeter Embankment the existing organics and waste material was striped by an excavator and hauled outside the proposed dam's footprint. Once an area was stripped down to native till AMECs support engineer inspected its condition to ensure that there were no soft spots, standing water, or organic material. (see photo 23) After foundation of the buttress was approved MPMC started bringing in Zone C material and placing it in 1.5 m lifts with a haul truck and dozer. When the initial 1.5 m lift was completed an additional one or two lifts were placed with thickness of approximately 3 m. (see photo 24).

At the end of the construction season the whole length of the Perimeter Embankment had been stripped and Zone C material had been placed from approximately station 4+400 to station 3+500. The remaining stripped area for station 3+500 to station 2+700 was approved by AMECs support engineer but will have to be reapproved prior to the start of the 2014 construction season due to the potential change in conditions over the winter. An additional section between approximately station 4+300 and station 4+100 was stripped at the toe of the dam at the end of the 2013 construction season but was covered in snow before it could be approved by AMECs support engineer.

4.4 Survey Control

Survey control requirements for the 2013 construction of the TSF included the following:

- Establishing and maintaining upstream and downstream limits of the Zone S (the stakes were generally placed every 25 to 50 m along the entire length of the embankment, and as requested by Peterson);
- Maintaining the downstream crest chainage during construction;
- Verifying that a 5 m till core width was maintained during construction;
- Establishing and verifying the Zone F transition line for placement of Zone T material;
- Locating and later marking out the location of any unsuitable material identified in the Zone T material.
- Surveying the location and elevation of in-situ density tests;
- Collecting and storing data as required for the as-built record; and
- Providing location and elevation data as required by the AMEC Support Engineer.

MPMC personnel performed the survey control described above for the 2013 construction season.

4.5 Quality Control and Quality Assurance Testing

QA/QC testing of the fills used in the construction of the embankment involved on-site and off-site tests. On-site testing included in-situ nuclear densometer tests (ASTM D6938-10) to confirm adequate compaction of the till fills placed. Sieve analyses of the Zone F filter material to assess particle size gradation (ASTM D-422-63) were also performed on-site, prior to the end of August and off-site after, to confirm adequate compliance to specifications.

Off-site tests of the fills included Standard Proctor Density (SPD) tests (ASTM D-698) that provided reference values used in the field to assess whether the compacted fill had achieved the 95% SPD in the design specifications. Tests of the fill material particle size gradation (ASTM D-422-63) were performed to assess whether the fill material satisfied the allowable gradation envelope according to the design specifications. Test of the core materials Atterberg limits (ASTM D-4318-98) were also performed. The results of these tests are presented in Appendix B.

During the 2013 construction season, the testing frequencies as outlined in Section 3.2 were generally maintained. A summary of the quantities of each different material type and the number and types of tests performed on the fills is provided in Table 4.1.

Table 4.1: TSF Summary of Material Quantities and Laboratory testing

Material Type	Source Of Material	Volume Placed (m^3)	QA/QC Tests Performed
Zone C – Downstream Shell NAG Rock	Springer Pit (ROM)*	XX	Visual
Zone T – Transition NAG Rock	Springer Pit (Road Crush product)		3 Gradations (MPMC) 1 Gradations (AMEC)
Zone F – NAG Filter Rock	Springer Pit (Filter Crush)	XX	26 Gradations (MPMC) 13 Gradations (AMEC)
Zone S - Till Core	Perimeter Borrow 1 Perimeter Borrow 2 Main Borrow	XX	18 Proctor (AMEC) 18 Gradation (AMEC) 18 Atterberg limits (AMEC) 253 ND field density (AMEC) 540 ND field density (MPMC) 34 Laboratory Moisture tests
	Total Fill Volume Placed	**XX**	

*Run of mine material (no processing required)

4.5.1 Zone S – Till Core

Till material found in the borrow pits was generally consistent, within the specification and was classified as a low plasticity Sandy Silt, some clay with some to trace gravel.

A glaciolacustrine unit was encountered interbedded within the till in some areas of the borrow pit. The glaciolacustrine material typically meets the core material specification, however due to its poor workability, this material was wasted or whenever possible intermixed with till in a ratio of 1 part glaciolacustrine and 2 parts till.

The in-situ density and moisture content of the compacted till were determined by a nuclear densometer (ASTM D6938-10). (see Photo 17) Where field test results indicated that the specified 95% Standard Proctor Maximum Dry Density (SPMDD) was not achieved, the area was re-compacted until satisfactory test results were achieved. Samples of till were also collected and periodically sent to AMEC's Prince George lab facility for geotechnical index testing. In addition to the 18 samples that were collected and tested as part of the Zone S material, two samples were collected from behind corner 5 in order to determine if the material being stripped from that location would meet the requirements of the Zone S material. (see photo 18) The two samples (TS13-15 and TS13-16) were subjected to gradation, Atterberg limits, and proctor testing and found to unacceptable for Zone S material due to the low compaction results and high moisture content.

The SPMDD value used in the field was selected from the first SPMDD (1953 kg/m^3) lab result for the 2013 construction season and adjusted as necessary based on observations of the soil. The average of the SPMDD lab results taken from the 18 samples for the 2013 construction season was 2068 kg/m^3.

Test results for the in-situ density and moisture content of the till were recorded and entered into a spreadsheet. Plots of the test results were prepared and are presented in Appendix B.

4.5.2 Zone F – NAG Filter Rock

Filter Zone F was produced by running run-of-mine NAG waste rock through the mill crusher. The majority of the material brought to and placed on the embankment was fairly consistent, plotting within the accepted filter design criterion. Approximately half of the on-site tested samples plotted slightly to the coarse side of the specified envelope for the finer range of sizes (D_{15} to D_{30}), as indicated on the grain size analyses curves shown in Appendix B. Three additional samples plotted to the coarse side in the range of D_{60} to D_{10} but were considered acceptable for placement as Zone F material. This slight deviation from the gradation specification could be due to segregation of the material during transportation and placement. Generally, based on the visual assessments as well as the laboratory testing results, the Zone F material was judged an acceptable filter for the Zone T.

4.5.3 Zone T – Transition Zone

Transition Zone T was produced by running run-of-mine NAG waste rock through the mill crusher. Visual inspections of the Zones F and T interface indicated acceptable filter compatibility. Routine visual assessments were carried out during construction to determine qualitatively the conformance of Zone T transition to the gradation specifications and its acceptability as a filter for Zone F filter rock. Based on the visual assessments, the Zone T was judged an acceptable filter for the Zone F. Sieve analyses were also conducted on samples of the Zone T and results are presented in Appendix B.

4.5.4 Zone C – Downstream Shell NAG Rock

The Zone C downstream rockfill shell was constructed with NAG rockfill obtained from the Springer Pit. The Zone C gradation specifications call for a broad range of sizes smaller than 1 m (maximum diameter). Routine visual assessments were carried out during construction to determine qualitatively the conformance of Zone C transition to the gradation specifications and its acceptability as a filter for Zone T filter rock. Based on the visual assessments, the Zone C was judged an acceptable filter for the Zone T.

4.6 Conformance of 2013 Construction with Design Intent

In general, the 2013 Stage 9 raise of the embankment is judged to have been carried out in conformance with design intent. This conclusion is based on AMEC's periodic observations of the construction, review of reports prepared by MPMC when AMEC was not on site, and the review of QA/QC records.

However, there are two items which are currently out of compliance with original design intent but do not pose any immediate concerns to embankment stability or overall function. The items listed below are to be corrected prior to or at the beginning of the 2014 construction season:

- **Zone F & Zone T elevation**: Zones F and T are at elevations lower than the Zone S elevation along the Perimeter and South Embankments. As-built elevations immediately recorded after the suspension of construction in 2013 were provided to AMEC by MPMC. The elevations indicated that the difference between the Zone S and Zone T/F lifts was approximately 1 m and 0.9 m in the Perimeter and South embankments, respectively. Maintenance of the Zones F and T above the tailings/pond level is part of the TSF design requirements. MPMC is aware that the elevation of the tailings was to be closely monitored following the 2013 construction and raising the level of the filter and transition materials as necessary.

- **Perimeter Embankment Tie-in:** The elevation of Zone S at the location of the Perimeter tie-in at corner 5 is lower than the remaining Zone S along the Perimeter Embankment. The elevations indicate that the tie-in remains up to # m lower than adjacent Perimeter Embankment elevation of ### m. This location is to be closely monitored during the TSF pond elevation increase and needs to be corrected before future work can be started during the 2014 Construction season.

5.0 INSTRUMENTATION MONITORING

5.1 General

Instrumentation functioning in the TSF currently consists of nine (9) slope inclinometers (SI) and seventy seven (77) vibrating wire piezometers (VWP). During the course of 2013 the piezometers B7, D5, E4, F1, and I1 failed or were destroyed and are no longer read. No new instruments were installed during the 2013 construction season; however some existing instruments were extended and reinitialized. The as-built locations of the inclinometers and piezometers (organised by planes) is shown in plan view on Drawing 2013AB.07.

5.2 Piezometers

Vibrating wire piezometers have been installed in each of the embankments in the following locations: foundation, tailings, upstream fills, Zone F, Zone S and in various embankment drains. The piezometric data has been organized by planes. Drawings 2013AB.08 through 2013AB.16 show the relative placement of the vibrating wires within the embankment and the foundation in section view. The planes are located in the embankments as follows:

- Perimeter Embankment: G, D, J
- Main Embankment: K, B, A, C, E
- South Embankment: I, F

Trends can be seen in the VWP in four separate material categories; foundation, till core (Zone S), filter and drains (Zone F), and tailings/upstream fills (Zone U). A general description of these trends is presented below and can been see on the VWP plots in Appendix C:

- Pore pressures in foundation soils in around the TSF embankment were generally noted as stable with minor fluctuations except for J1 were the piezometer responded to the dewatering and refilling of perimeter borrow pit 1. During reporting, the readings from VWP I2 were noted to be inconsistent and it was determined that a previous identifier was incorrect and that the VWP was originally installed in the upstream tailings and not in the foundation as previously reported.

- Pore pressures in the till core are generally found to be stable, with a slightly increasing trend in response to the rising pond level. A14 and A2, piezometers showed a greater than typical pore pressure increase; however it appears that it has stabilized at the end of the year. This can be most likely explained by the vertical placement of the piezometer and the lack of an established fine grain beach at that section of the embankment. Piezometer F3 also showed a greater than average increase that is likely due to the position of installation being right on the upstream boundary between the till core and the tailings beach. Piezometer D4 has reported negative values since installation and is assumed to be unreliable.

- Pore pressures in all filter and drain piezometers except D3 remained unchanged throughout the year. Piezometer D3 had a slight increase in the pore pressure that may indicate a restriction or blockage in the drainage of the filter material at this location and should continue to be monitored closely.

- Pore pressures in the tailings and upstream fill generally experienced an upwards trend in response to the rising pond level. In addition, piezometers that were installed at a lower elevation experienced lower response relative to the piezometers near the pond elevation.

5.3 Slope Inclinometers

A total of 9 slope inclinometers installed in the TSF are currently functional, three in the Perimeter Embankment and 6 in the Main Embankment. The inclinometers are located at the downstream toe of the embankments within the foundation soils. Drawings 2013AB.10 through 2013AB.13, and 2013AB.16 show the locations of the inclinometers in section view.

Due to the length of time between calibrations the slope indicator tool, used to read the slope inclinometers, gave some inconsistent readings at the end of the construction season. These inconsistencies were generally restricted to the less critical B-axis though some surveys had to be abandoned due to excessive errors in the readings. The following general trends in the slope inclinometers were noted during 2013 and can been seen on the plots in Appendix C:

- SI01-02 showed an approximately 2 mm displacement before it was reinitialized on June 29th. Between June 29th and the last reading on January 21, 2014 SI01-02 showed show and additional 9 mm of movement. During stage 9 construction the rate of movement was relatively consistent at approximately 1 mm per month. The observed displacement is within the tolerable limits and thus does not present any immediate danger to the embankment. SI01-02 has seen 35 mm of total movement since February 7th 2007.

- SI06-03 displayed approximately 3 mm of displacement prior to being reinitialized on June 18th but no displacement below the rock fill after that time. Since the displacement is so small for the time frame it this amount of movement could be the result of instrumentation noise.

- During 2013 no displacement was noted on SI06-01, SI06-02, SI12-01, SI12-02 and SI11-02 except in the upper rock fill.

- SI11-04 is noted to have a compression displacement but no other substantial movement. This displacement sometimes occurs as a result of the installation process. Over the last couple of years this instrument has shown to decompress slightly over the winter months and then recompress again in early spring.

5.4 Instrumentation Extensions

Due to the expansion of the Main Embankment a number of the instruments had to be extended.

5.4.1 Vibrating Wire Piezometers

The VWP were extended by means of electrically splicing on additional cable to the existing cable that was above ground surface. The new cables were then long enough to relocate the ends of VWP so that they were not in the way of the Main Embankment expansion. Due to the extension, a number of previously separated stations were combined for ease of taking readings. Previous stations AX1, AX5 and AX6 were combined into one station now labelled AX1 and previous stations BX1, BX2 and BX4 were combined into a single station labelled BX1. An additional previously unknown station was also discovered and labelled as BX5. Additional VWP were extended, in the same way as those below the Main Embankment, along the crest of the embankments to accommodate the scheduled stage 9 raise.

5.4.2 Slope Inclinometers

Five of the six SIs below the Main Embankment were extended upward to accommodate the raising of the toe buttress. After the extension in mid June the SIs were reinitialized for the new total depth. Table 5.1 below shows the SIs that were extended, by how much they were extended, and what the new total maximum depth is.

Table 5.1: Summary of Extended Slope Inclinometers

Instrument Name	Extension (m)	Previous Surveyed Depth (m)	New Surveyed Depth (m)
SI01-02	2.9	37.5	40.5
SI06-01	9.0	43	48.5
SI06-02	9.1	32	41
SI06-03	7.2	41	48
SI11-01	3.0	48	49

Note: In the case of SI06-01 and SI11-01 the new survey depth was restricted to less than the new total depth by the length of the cable used to survey the holes (50 m). The bottom few meters of these holes were deemed at low risk for movement based on historical readings.

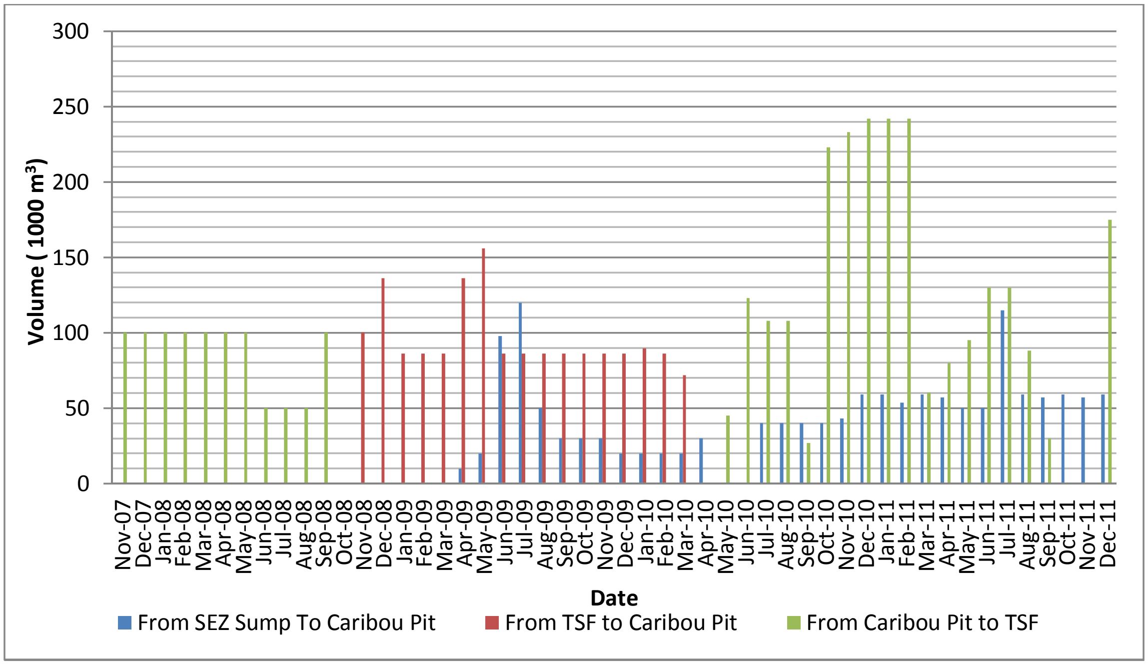
6.0 WATER MANAGEMENT

6.1 General

MPMC maintains the water balance for the impoundment and it has not been reviewed by AMEC. Integral component of any mine is the short and long term solid waste and water management. AMEC understands that currently the total inflow from precipitation and surface runoff exceeds losses from evaporation. Thus, MPMC mine site is operating under a water surplus condition, with the surplus being stored in the TSF, the Caribou Pit and North East Zone

Pit. In addition, to control and maintain required water balance, MPMC transfers water as needed. The volumes transferred are shown in Figure 6.1.

Figure 6.1 Water Volume Transferred



6.2 Site Water Management Plan

7.0 WORKS TO BE COMPLETED

There are a number of outstanding tasks pertaining to the ongoing development of the tailings storage facility. These tasks are important to the proper completion of the development of the tailings embankment and AMEC is to be updated on their progress. These tasks include, but are not limited to:

- *Placement of the downstream filter and transition materials (Zones F and T)*: Zone F and T placement on the Perimeter, Main and South embankments to the minimum crest elevation of 967.5 m needs to be completed prior to the pond elevation reaching 967.5 m and/or the commencement of the 2014 construction period.

- Completion of the Perimeter Abutment: Zone S material placement to reach 967.5 m el needs to be completed in order to continue the dam raise in the 2014 construction season. In addition the cut off trench and filter blanket need to be completed at this location.

- *Instrumentation monitoring:* Monitoring of all TSF instrumentation needs to continue at the recommended intervals outlined in the 2013 Construction Monitoring Manual (AMEC

2013). As well the extension of the SIs below the Perimeter Embankment need to be completed prior to its widening.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusions drawn on the basis of this annual review and as-built report are as follows:

1. The TSF embankment was raised to a minimum crest elevation (till core) of 960.5 m in 2013.
2. The 2013 raise construction of the TSF embankment was carried out in conformance with design intent.
3. Monitoring of the TSF embankment via instrumentation and visual inspections indicated the following:
    a. Surveys of inclinometers in and below the downstream shell of the dam indicate that movements are minor and thus pose no immediate stability concerns.
    b. Foundation pore pressures have been stable.
    c. Pore pressures in the till fill of the dam have increased slightly due to the pore pressure increase of the tailings but not beyond what would be expected.
    d. The TSF embankment is performing in accordance with its design intent.

Recommendations made on the basis of this annual review and as-built report are as follows:

9.0 REPORT CLOSURE

This report has been prepared for the exclusive use of Mount Polley Mine Corporation for specific application to the area within this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. It has been prepared in accordance with generally accepted geotechnical and tailings dam engineering practices. No other warranty, expressed or implied, is made.

Respectfully submitted,

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DRAWINGS

APPENDIX A

2012 CONSTRUCTION SEASON PHOTOGRAPHS

APPENDIX B

MATERIAL TESTING RESULTS

APPENDIX C

INSTRUMENTATION PLOTS

APPENDIX D

SAMPLE REPORTS