RAINY RIVER MINE

OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL

PART II - TAILINGS MANAGEMENT AREA

New Gold Inc.
Rainy River Project
5967 Highway 11/71, P.O. Box 5
Emo, Ontario
P0W 1E0

September 2022

Version 2022-1

REVIEW AND REVISION HISTORY

The OMS Manual shall be reviewed annually and following any significant changes at the site to assess if the document is representative of the current condition and operation of the dam at the time of the review. Revisions to the manual should be undertaken within six months of changes. It is the responsibility of the Tailings Dam Engineer to initiate the OMS review.

The review team and approval record are given in Table 1. The version history of the OMS Manual is shown in Table 2.

Table 1: Review Team

Role	Name	Company /Department	Position	Signature	Date
Prepared by (1)	Winston Ding	NG Capital Projects	Tailings Dam Engineer	<Original signed by>	Oct 14, 2022
Reviewed by	Travis Pastachak	NG Capital Projects	Capital Projects Manager	<Original signed by>	Oct 14, 2022
	Gord Simms	NG Mine Operations	Mine Manager	<Original signed by>	Oct 17, 2022
	Garnet Cornell	NG Environment	Environment Superintendent	<Original signed by>	Oct 25, 2022
	Derek McKinnon	NG Site Service	Maintenance Superintendent	<Original signed by>	Oct 25, 2022
	Calvin Boese	SRK	Interim Engineer of Record	<Original signed by>	Oct 25, 2022
	Michael Dabiri	SRK	Interim Engineer of Record	<Original signed by>	Oct 31, 2022
Approved by	Mohammad Taghimohammadi	NG Mill	Mill Manager	<Original signed by>	Oct 31, 2022

(1) This update would not be able to complete without team effort. Thanks for the input from Caroline, NGI Environment; Renee, NGI Community and support from NGI Mill, Mine Ops and Site Service.

Table 2: Revision Summary

Revision Number	Details of Revision	Date of Issue	Comment
Rev. A	Issued for Internal Review	February 28, 2022	Completed on Mar. 12, 2022
Rev. B	Issued for EOR Review	May 1, 2022	Completed on June 13, 2022
Rev. 0	Issued for Use	September 30, 2022	

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1.0 OBJECTIVE

The objective of this document is to provide procedures for the operation, maintenance, and surveillance (OMS) of the Tailings Management Area (TMA) at the New Gold Inc. (NGI) Rainy River Mine (RRM), located near Emo, Ontario. This OMS Manual serves as a reference for the safe operation of the structures related to tailings, water management, and water diversion structures. For readability, the OMS Manual has been separated into “Parts”, as listed below:

- Part 1: General
- **Part 2: TMA**
- Part 3: WMP
- Part 4: MRP
- Part 5: SEDIMENT CONTROLS
- Part 6: FRESHWATER DIVERSIONS
- Part 7: WATER DISCHARGE
- Part 8: EPRP

To simplify and condense the OMS Manual, the site conditions were removed from the individual structure parts and covered in Part 1 of the OMS Manual. This part is only about the operation, maintenance, and surveillance of the TMA

2.0 Facility Description

2.1 TMA Overview

The purpose of the TMA is to:

- Contain tailings waste material produced from the milling process
- Provide recycle water to the mill
- Provide sufficient time for heavy metals to naturally degrade to low levels

Stripping and construction of the TMA commenced in 2016 with the TMA Cell 1. Tailings deposition in TMA Cell 1 commenced in November 2017 with placement into TMA Cell 2 beginning in May 2018. Tailings placement into TMA Cell 3 began in May 2019.

2.2 Dam Zones and Materials

Low Permeability Units

Water retention and seepage are controlled through dams by the clay cores. The clay core comprises compacted clay from WML or BRE. This material is divided into two zones:

- Zone 1 (Core – Select Clay) comprises WML with plasticity index greater than 20%.
- Zone 1A (Core – Random Clay) comprises WML or BRE.

Filters and Drains

Fine and coarse filter and drain materials are used downstream of the clay core to mitigate internal erosion (i.e., piping) and manage seepage through the clay core. Filter and drain materials for the TMA and water management dams consist of:

- Zone 4 (Chimney Fine Filter) and 4A (Blanket Fine Filter) material have a maximum particle size of 25 mm and maximum fines content (material below the No. 200 sieve) of 5% and 12%, respectively.
- Zone 5 (Transition Filter/Drain) is a coarse aggregate with a maximum particle size of 75 mm.

Dam Shells

Mine rock from the open pit (run of mine) is used as dam shell material to provide overall stability for the dams. The upstream shells are constructed from potentially acid generating (PAG) or non-acid generating (NAG) random granular fill (Zone 2 and 2A), and the downstream shells are constructed using NAG rockfill (Zone 3 and 3A).

Zones 2 and 3 comprise relatively coarse particle sizes to minimize material processing and sorting for construction. Zones 2A and 3A are transition rockfills between the relatively coarse shell material and the core and/or filters.

- Zones 2 and 2A (Upstream Shell - Random Granular Fill) comprises random granular fill with a maximum particle size of 900 mm and 450 mm, respectively.
- Zones 3 and 3A (NAG Rockfill) comprises a well-graded, free draining rockfill with a maximum particle size of 900 mm and 450 mm, respectively.

Table 2- summarize the dam zones, materials, and construction specifications for TMA. See BGC-4910-DT00-RPT-0026.001 for details.

Table 2- 1: TMA Dam Zone and Materials

Zone	Material	Borrow Source	Construction
1	WML: PI (Plasticity Index) ≥ 20 FC (Fines Content) ≥ 55%	EOR Approved	OMC (Optimum Water Content) +8% > WML > OMC - 2% ≥ 95% SPMDD (Standard Proctor Max. Dry Density) ≤ 300 mm lift thickness
1A	WML/BRE: FC ≥ 55%	EOR Approved	OMC+8% > WML > OMC - 2%; OMC+4% > BRE > OMC - 2% ≥ 95% SPMDD ≤ 300 mm lift thickness
4	Chimney Filter Sand, MPS (Max. Particle Size) ≤ 25mm FC ≤ 5%	Off-Site	≥ 95% SPMDD ≤ 300 mm lift thickness NAG (Non-Acid Generating)
4A	Blanket Filter Sand, MPS ≤ 25mm FC ≤ 12%	Off-Site	≥ 95% SPMDD ≤ 300 mm lift thickness NAG
5	Transition Filter Sand & Gravel: MPS ≤75mm	On-Site Quarry	≤ 300 mm lift thickness, 6 Pass 10-ton static smooth drum NAG
2	US (Upstream) Random Fill Rockfill: MPS ≤ 900mm	Open Pit	≤ 2,000 mm lift thickness, 6 one-way Pass 100-ton haul truck ≤ 1,500 mm lift thickness, 10 one-way Pass 40-ton haul truck/Bulldozer ≤ 1,500 mm lift thickness, 14 one-way Pass 30-ton haul truck/Bulldozer PAG (Potential Acid Generating) /NAG
2A	US Select Fill Rockfill: MPS ≤ 450mm	Open Pit	≤ 1,000 mm lift thickness, 10 one-way Pass 15-ton static smooth drum PAG/NAG
3	DS (Downstream) Clean Mine Rock Rockfill: MPS ≤ 2,000mm	Open Pit	≤ 3,000 mm lift thickness, 6 one-way Pass 200-ton haul truck ≤ 2,000 mm lift thickness, 6 one-way Pass 100-ton haul truck/Bulldozer ≤ 1,500 mm lift thickness, 10 one-way Pass 40-ton haul truck/Bulldozer ≤ 1,500 mm lift thickness, 14 one-way Pass 30-ton haul truck/Bulldozer NAG
3A	DS Clean Mine Rock Rockfill: MPS ≤ 450mm	Open Pit	≤ 1,000 mm lift thickness, 10 one-way Pass 15-ton static smooth drum NAG

2.3 TMA Raise Schedule

Except for the TMA, construction of other dams has previously been completed. TMA dam raise construction is assumed to be completed by Nov. 30 of each year. Table 2- presents the TMA dam raise schedule (BGC-4910-DT00-RPT-0007.003).

Table 2- 2: TMA Dam Raise Schedule

Year	Dam Crest Elevation (m)	Raise Height (m)	Spillway Invert Elevation (m)
2019-2020	371.5	2.5	367.2
2021 (Stage 3 Raise)	373.6	2.1	371.8
2022 (Stage 4 Raise)	375.1	1.5	373.3
2023 (Stage 5 Raise)	376.6	1.5	374.8
2024 (Stage 6 Raise)	377.9	1.3	376.1
2025 (Ultimate raise)	379.1	1.2	377.3

2.4 Pumps and Pipelines

The TMA pumps and pipelines are owned by Mill and operated by Site Service. The WMP pipelines include:

- Tailings line from Mill to TMA. At the Y junction, the tailings line splits into two: One goes along SD through Boster Station to WD and ND. The other goes through NE section of SD to NRR.
- Reclaim Water line from TMA pumpstation to Mill.
- Water lines to pump water in the sumps to TMA.
- A waterline from MRP to TMA.

The pumpstation is on the upstream of WD 4 and WD 5 intersection.

This section will be better delineated after SRK completes its side-wide management review.

2.5 Seepage Collection

The TMA seepage collection system includes a network of finger drains, seepage collection ditches, and seven sumps. Three of sumps are located at the TMA North Dam (Sump 3, 4 and

5), three at South Dam, and one at West Dam 4 built in early 2021. Seepage from the West Dam 5 is collected in the WMP, and as a result, no seepage collection infrastructure is required.

South Dam sump locations

- Cell 1 Sump at station 0+500
- Water Discharge Pond at station 1+500 m; and
- TMA South Dam Seepage Collection Sump at station 2+300 m.

Two emergency sumps for emergency tailings discharge are located at SD 1+050 (Emergency Sump 1) and SD 2+650 (Emergency Sump 2). Emergency Sump 1 does not collect dam seepage. Emergency Sump 2 collects some of South Dam seepage. The dual function of the Emergency Sump 2 is under EOR's review.

TMA seepage collection sumps were sized to contain an EDF corresponding to the 25-year 24-hour rainfall event; except for TMA North Dam Sump 4, which was designed to store the Inflow Design Flood (IDF) in addition to the EDF. The selected IDF is runoff from the 100-year 24-hr rainfall event, except for TMA North Dam Sump 4, the emergency spillways for the TMA North Dam seepage collection sumps were sized to pass the IDF with a minimum freeboard of 0.3 m above the peak routed water level.

2.6 TMA Closure

Information regarding the closure of the TMA is available in the site wide Rainy River Mine Closure Plan 2019 Amendment. This document is available on the Environmental Department SharePoint site. The closure plan is updated as required.

- The TMA dam crest ultimate elevation is 379.5 m; spillway invert and TMA pond elevation is 378.5 m; maximum tailings elevation adjacent to the TMA perimeter dams is approximately 378.5 m. The tailings beach slope will be at 2% to El 375.5 m which then continues horizontally.
- Combined wet and dry cover at closure.
- Tailings will be deposited along the inside perimeter of the TMA dams and a dyke extending towards the center of the TMA to develop tailings beaches.
- Progressive reclamation is proposed such that an overburden cover of approximately 150 m width will be placed by the end of operations on the tailings beaches around approximately two thirds of the ultimate perimeter, with the remaining approximately one

third of the length to be constructed at closure, with exception around the existing reclaim system.

- The overburden cover will consist of 1.0 m overburden and 0.3 m growth medium placed on exposed tailings beaches to promote vegetation regrowth. The remainder of the surface will be maintained in a flooded condition with a nominal 2 m of water cover.
- The maximum level of tailings at closure adjacent to the dam will be at or below the level of the closure spillway such that they remain below the maximum level of flooding.
- TMA closure spillway is to be located at the TMA West Dam (Dam 4).

3.0 OPERATIONS

3.1 General Operating Requirements

3.1.1 Environment Notice Level

The Environment Notice Level (ENL) corresponds to a level at which NGI Environment manager and surface water engineer need to be notified to initiate the contingency plan and bring down the pond level.

3.1.2 Environment Incident Level

The Environment Incident Level (EIL) is an abnormal condition with potential spill of the contained tailings to the environment without meeting the water discharge quality requirement by ECA and if it occurs, NGI needs to report to the regulator.

3.1.3 Dam Safety Notice Level

The Dam Safety Notice Level (DSN) corresponds to a level at which the Tailings Dam Engineer and the Capital Project Manager need to be notified to plan for increased surveillance or other response.

3.1.4 Dam Safety Incident Level

A Dam Safety Incident Level (DSI) is an abnormal condition or performance of the dam (including mis-operation or component failure) with the potential to jeopardize the safety of the dam but that, at this time, is not expected to lead to a breach of the dam and NGI need to report to the regulator.

3.1.5 Tailings Operation Notice

According to the tailings deposition plan (BGC-4910-DT00-0007.003) dated Oct. 1, 2021, the following tailings operation situation if not meet should be noticed to Capital Project Manager and EOR.

The operation criteria for the length of beach above water (BAW) are:

- Min. 400 m for South Dam (SD) at its normal operation condition (50th percentile pond)
- Expected to be min. 200 m for West Dam (WD) and North Dam (ND) for normal operation condition, but periodically and locally, water is allowed to be against the dams.
- For 99th percentile pond, BAW is 0-400 m for all perimeter dams.

3.1.6 Tailings Operation Incident Level

A tailings Operation Incident Level (TOIL) is a condition that the elevation of tailings beach close to the dam upstream face reaches the Max. Elevation which is defined to be 0.4 m below the dam

crest by the EOR. The dam crest should be the approved dam raise. If TOIL is reached, the potential of tailings spill over the dam is high and NGI need to report to the regulator.

3.2 Tailings Deposition

The recent update of tailings deposition plan is available in the report on Tailings Deposition Plan and Dam Raise Schedule - 2021 Update (BGC-4910-DT00-0007.003) and it is suggested to update annually.

3.2.1 Deposition Criteria

- Slurry tailings can be deposited through spigots spaced approximately 100 m apart along the TMA dams, or
- End-dumping at along the TMA north ring road (NRR).
- Discharge locations along NRR are located a minimum of 400 m from perimeter dams.
- Max. Elevation of the tailings beach close to upstream dam face must be greater than 0.4 m below the dam crest. This criterion is not applicable to the discharge at NRR.
- Min. Elevation of the tailing beach close to the upstream dam face should be reached before next dam raise.
- It is necessary to meet the Target Elevation according to the results of the tailings deposition modeling.
- Maintain the required BAW length according to the annual deposition plan update.

3.2.2 Operation Constraints and Preferences

- Connect and disconnect pipeline on the day of the scheduled mill maintenance shutdown when needed.
- Maintain the same locations of pipeline crossing the dam and booster station.
- Preferably stay long at the same discharge locations, especially during winter months.
- Not to interfere with dam raise construction where possible.
- Monitor suspend solid loading reaching decant pond by measuring turbidity/ TSS (total suspended solids) while discharge along West Dam and North Dam.
- Tailings pipeline to the NRR should maintain always connected as a backup plan in case any emergency condition of tailings discharge along perimeter dams occurs. Operation of tailings pipeline needs flexibility especially during winter months.
- Maintain a pond close to the NRR to connect with natural flow in Loslo Creek and Marrs Creek for TMA closure.

3.2.3 Deposition Targets

Stage 3 dam crest is Elev. 373.6. The **Max. Elevation** for tailings deposition is therefore 373.2 before approval of Stage 4 dam raise construction. It is the TOIL.

Based on TMA Stage 4 Raise Detailed Design Report IFC (BGC-4910-DT00-RPT-0027.002) and site instruction (SIN22-TMA-0005), if upstream rockfill buttress for certain dam sections is

replaced with tailings, the **Min. Elevation** before start of Stage 4 dam raise construction is shown in **Error! Reference source not found.**.

The **Target Elevation** for the three years (2021-23) is summarized in according to 2021 tailing deposition report (BGC-4910-DT00-0007.003). Tailings deposition plan is expected to be updated every year.

Table 3- 1: Stage 4 Dam Raise Required Min. Tailings Elevation

South Dam			West Dam			North Dam		
To Station	Min. Elev.		To Station	Min. Elev.		To Station	Min. Elev.	
	Tailings	Waste Rock/ Tailings		Tailings	Waste Rock/ Tailings		Tailings	Waste Rock/ Tailings
0+815	370.0	-/370.0	0+980	369.0	369.5/ 368.3	0+600	372.2	371-370/ 368
1+900	371.0	-/371	1+861	370.0	-/370	0+975	370.5	370.5-369.7/ 368.25
2+050	371.7					1+250	368.25	-/368.25
3+550	371.0					1+800	368.5	-/368.5
						2+540	371.6	371.5/-

Table 3- 2: The Target Tailings Elevation

Period		Target Elevation			
		South Dam	West Dam	North Dam	NRR
Apr-21	Jun-21	370.1	370.1	370.1	
Jul-21	Aug-21	370.9		370.1	
Sep-21	Oct-21	371.1			371.1(2)
Nov-21	Aug-22				371.1(3)
Sep-22	Oct-22		371.1		
Nov-22	Dec-22			371.1(1)	
Jan-23	Mar-23			372.8	
Apr-23	Jun-23				372.8
Jul-23	Dec-23	373.0			

(1) Dam 4 only; (2) Spigot 1; (3) Spigot 2/3

3.2.4 Deposition Elevation Survey

Under normal deposition conditions, tailings at the active discharge locations must be surveyed at least once a week.

When the tailings elevation at the active discharge location is less than 0.4 m below the Max. Elevation (TOIL), the elevation survey must be conducted every other day. Survey stakes can be spray-painted to mark Max. Elevation to reduce the frequency of surveying required.

Once tailings discharge at one location is stopped, the tailings elevation at that location should be surveyed in that week.

The tailings elevation should be surveyed at the same location every time for consistency. It is suggested to put stakes within 6 m (20 ft) distance to the active spigot at both sides if it is safe to do so with snow coverage in winter months.

3.2.5 Tailings Pipeline Operation

Operating the tailings pipeline is Mill's accountability and responsibility. The Capital Projects team and Site Service team provide support.

Tailings pipeline modification is Site Service's accountability and responsibility. The Capital Projects team and Mill team provide support.

3.2.6 RASCI and Reporting

Multi-teams participate in tailings deposition. A RASCI (Responsible, Accountable, Support, Consulted and Informed) chart is developed as shown in **Error! Reference source not found.**. T his table is reviewed as part of the update of the Manual.

Tailings' elevation is reported weekly. Tailings Dam Engineer (TDE) or TDE's representative update tailings elevation table and charts for reporting.

Table 3- 3: RASCI of Tailings Deposition and Pipeline Relocation

Project Title: TMA Tailings Discharge & Pipe Relocation

Roles and Responsibilities
Responsible, Accountable, Supportive, Consulted, Informed

RASCI Matrix
(Jan. 31, 2022)

Deliverable or Task		Status	Capital Projects Manager	Tailings Dam Engineer	Project Coordinator/ Dam technician	Superintendent	Mill Manager	Superintendent	Metalurgy Superintendent	Environmental Manager	Water Resources Engineer	Mine Manager	Chief Engineer	Superintendent	EoR	O'Kane	Maintenance Manager	Superintendent	Supply Chain
			Project Team				Mill			Environment		Mine Operations			Consultants		Site Services		Others
Phase 1 - Deposition Schedule																			
1.1	Develop Deposition Plan		A	R			I	C		C	S	I	I		R	I	I	C	
1.2	Develop Schedule			R	S	I	A	S	S	I	I	I	I						
1.3	Survey Pond Elevations			I			I			A	R	I	I		I	I			
1.4	Survey Pond Bottoms			I			I			A	R	I	I		I				
1.5	Monitor Pond - Design Thresholds		I	S			I			A	R	I	I						
1.6	Develop Water Balance Model		I	I			C			A	R	C	C		I	S			
1.7	Beach Survey			S						A	R								
1.8	Monthly Presentation Feedback		A	R	I	I	C	I		I	C								
Phase 2 - Operating Tailings Line																			
2.1	Commission Tailings Line		A		R	S	C	S		I	I							S	S
2.2	Maintain Infrastructure - HDPE						C	S		I	I						A	R	S
2.3	Maintain Infrastructure - Pumping						A	R		I	I						I	S	S
2.2	Maintain Infrastructure - Instruments			A	R					I	I								S
2.4	Switch Spigot Discharge Locations			I	I		A	R		I	I								
2.5	Inspect Tailings Lines			I			A	R		I	I						I		
2.6	Monitor and Record Flow Rates		I	I	I		A	R		I	I	I	I					S	
2.7	Install New Tailings Lines		A	C	R	S	C	S		C	I							S	S
2.8	Install Booster Pumps		A	C	R	S	C	S		C	I								S
2.9	Water Quality Sampling			I						A	R								
2.10	Dust Management					R		R		A				R					
Phase 3 - Tailings Line Modifications																			
3.1	Detailed Work Plan		C	R	C	S	A	R		I	I	I	I		I		I	S	
3.2	Deactivating Tailings Line		I	I	C	S	I	S		I	I				I		A	R	
3.3	Moving Tailings Line		I	I	C	S	I	S		I	I				I		A	R	
3.4	Reconnecting Tailings Line		I	I	C	S	I	S		I	I				I		A	R	
3.5	Geotechnical Instrumentation		A	R		S												S	
3.6	Cutting Back Spigots			I						A	R						I	S	

R	Responsible	Assigned to complete the task or deliverable
A	Accountable	Has final decision-making authority and accountability for complete. Only 1 per task.
S	Support	Provides support and assistance to the responsible role
C	Consulted	An adviser, stakeholder, or subject matter expert who is consulted before a decision or action
I	Informed	Must be informed after a decision or action

3.3 Dam Raise Construction

Stage 4 detailed design report was finalized for dam raise construction (BGC-4910-DT00-RPT-0026.001). Stage 4 raise to dam crest elevation of 375.1 m is planned to complete in November 2022.

3.3.1 Construction Execution Plan

Capital Projects team has prepared an execution plan for the 2022 dam raise construction. The execution plan is reflective of the engineer's design and specifications, local climate conditions and procurement and availably of required resources, The execution plan includes the following items.

- Construction Schedule Considerations
  - Placement and compaction of rockfill can be conducted year-round in areas where the foundation has previously been prepared and approved.
  - Placement of the clay core and filters should not take place during freezing conditions and should typically be completed before the start of winter.
  - Buttresses must be completed in each Design Zone prior to raising of the crest within the Design Zone to meet factor of safety requirements.
  - Borrow areas for clay and filter material must be developed prior to construction.
- Foundation Preparation
  - Foundation surfaces require approval by the Owner's Representative prior to fill placement.
  - Foundation preparation specifications are outlined in the Technical Specifications.
- Water Management During Construction
  - Surface runoff and dam seepage are collected through perimeter ditches and reported to the eight sumps for pumping back to TMA or discharging to the environment if meeting the discharge criteria.
  - Interception dewatering trenches excavated through the peat should be used to drain the peat and direct water away from foundation areas
- Erosion and Sediment Control
  - The proposed Erosion and Sediment Control (ESC) plan consists of working within the established seepage collection ditches which will prevent sediment from leaving the TMA Area.
  - Where work is performed outside of the seepage collection ditch area, staked silt barriers should be placed to prevent sediment from leaving the construction areas.
- Ultimate Pre-loading Buttress Placement
  - The placement of fills for the Ultimate pre-loading design is optional, and completion of the Ultimate pre-loading fills is not required prior to the issuing of the letter of conformance for the TMA Stage 4 raise design.
  - Buttress placement will progress from downstream to upstream with the lowest elevation buttresses completed in advance of the start of construction of the higher elevation buttresses.
  - Pre-loading fills shall be placed according to the priority list provided by EOR.

3.3.2 CQC and CQA

EOR has prepared drawings and technical specifications for 2022 TMA Dam Raise Construction. The Stage 4 TMA Dam Raise Construction contract has been awarded to Ledcor CMI Ltd.

The contractor develops its own quality management plan for construction quality control (CQC) based on the Stage 4 detailed design for the construction of dam core (Zone 1/1A), filters and drains (Zone 4/4A, 5). NGI's representative at the site provides construction quality assurance (CQA) on the contractor's work.

NGI uses its own construction fleet including surveyors for the construction of dam shells (Zone 2/2A and 3/3A) and TMA ancillary structures. NGI's site representative is responsible for CQA of the work.

The EOR will prepare a construction records report (CRR) for the completed raise summarizing the construction completed that year. Construction record drawings will be included in this report along with the results of CQC and CQA testing, a discussion of construction observations, and a summary of any design changes and special events warranting documentation that occurred during the construction season. This Report is typically due 60 days after construction has completed.

After completion of the annual TMA dam raise, EOR issues the letter of conformance (LOC) to New Gold. The Stage 3 LOC was issued on Jan. 11, 2022.

3.3.3 Instrument Installation and Raise

The inventory of the instruments requires raise with Stage 4 construction was prepared.

TMA Stage 4 raise design assumes Base-Case PWP conditions, which needs to be confirmed by instrumentation monitoring prior to the beginning of construction. Should observed PWP response exceeds the Base-Case PWP conditions, the following mitigation actions may be required:

1) placement of additional buttressing fill at the downstream toe,
2) temporary halt to fill placement in affected areas until acceptable PWP dissipation is achieved to satisfy the stability criteria, or
3) increase or add wick drain foundation mitigation to accelerate PWP dissipation.

Table 3-4 : presents the RASCI for the instrumentation. Standard of Operating Procedures (SOPs) for instrumentation is listed below and attached in Appendix A of the Manual.

- DAM-SOP-0001, Slope Inclinometer
- DAM-SOP-0007, Standpipe Piezometer
- DAM-SOP-0008, Magnetic Extensometer
- DAM-SOP-0009, Settlement Plate
- DAM-SOP-0010, Data Logger
- DAM-SOP-0011, Survey Monuments
- DAM-SOP-0012, NWP Cable Splicing

Table 3-4 : RASCI for Geotechnical Instrumentation

newgold	Project Title:	TMA Instrumentation			Roles and Responsibilities Responsible, Accountable, Supportive, Consulted, Informed				
RASCI Matrix Feb. 23, 2022	Roles	Capital Projects Manager	Tailings Dam Engineer	Tailings Dam Technician	Construction Superintendent	Project Coordinator	Surveyor	Mill Manager	EoR
Deliverable or Task	Status	Project Team						Mill	Consultants
Phase 1 - Instrumentation									
1.1 Collection and storage of instrument data.			A	R					C
1.2 Maintaining the record of data perform quality assurance of the data collection and reduction.		A	R	S					S
1.3 Timely reporting of instrumentation data, which includes comparing data to thresholds.		A	R	S	I	I		I	S
1.4 Responding to instrument threshold exceedances to assess dam performance.			A	S	I	I		I	R
1.5 Instrumentation data assessment in semi-annual reports.		A	S	S		I		I	R
1.6 Plan and execute instrumentation update project		A	S	I	S			I	R
Phase 2 - Instrument Raises									
2.1 Creat instrument inventory for dam raise including procurment of instruments, devices and accessories			A	R		S			I
2.2 Plan instrument raise according to construction schedule			A	R		S			I
2.3 Overall QA/QC process for instruments			A	R	S	S			
2.4 Pre/post instrument survey			I	S	A	I	R		
2.5 Verifies adherence to IFC and SOPs			A	R	I	I	I		C
2.6 Complete raise/trench/burrito			A	R	S	S			
2.7 Verify complete forms and photos are stored in appropriate location			A	R					

R	Responsible	Assigned to complete the task or deliverable
A	Accountable	Has final decision-making authority and accountability for complete. Only 1 per task.
S	Supportive	Provides support and assistance to the responsible role
C	Consulted	An adviser, stakeholder, or subject matter expert who is consulted before a decision or action
I	Informed	Must be informed after a decision or action

3.4 Flood, Pond, Dam and Tailings Operation Criteria

Before the Stage 4 Dam Raise Construction is complete and accepted by the EOR, the operation criteria are the following:

- ENL (Environment Notice Level) is assigned to be the same as NOWL which is Elev. 371.3. If reached, NGI need inform the regulator with 48 hours per ECA and initiate Environment Contingency Plan to bring down the pond level.
- EIL (Environment Incident Level) is assigned to be the same as the MOWL (EDF event), i.e., the invert of spillway which is Elev. 371.8. If reached, NGI need to pause the tailings discharge to the TMA and report to the regulator.
- DSN (Dam Safety Notice Level) for TMA dams is assigned to be the same as EIL which is Elev. 371.8. If reached, NGI needs to initiate Enhanced Surveillance.
- DSI (Dam Safety Incident Level) for TMA dams is Elev. 372.6 m corresponding to the IDF level. If reached, NGI need to report to the regulator and initiate EPRP.
- TOIL (Tailings Operation Incident Level): Tailings Elev. 373.2. If reached, NGI need to cease the discharge and move the discharge to other locations, and report to the regulator.

Summary of key Stage 4 dam operation elevation data is shown in Table 3- 5: .

Table 3- 5: TMA Dam Operation Elevation Data

Description	Elevation (m)
Stage 4 Dam Crest to be Constructed to	375.1
Stage 3 Dam Crest	373.6
TOIL (Tailings Operation Incident Level)	373.2
IDF (Inflow Design Flood, Maximum Flood Level)	372.6
DSI (Dam Safety Incident Level)	
Sill / Invert of Emergency Spillway	371.8
DSN (Dam Safety Notice Level)	
EIL (Environment Incident Level)	
MOWL (Max. Operation Water Level)	
NOWL (Normal Operation Water Level)	371.3
Pond Level for the Increased Surveillance (High Pond)	
ENL (Environment Notice Level)	
Min. Operation Water Level	363.4

3.5 Environmental Protection

The TMA is surrounded by a wildlife fence installed to reduce wildlife contact with the TMA. The wildlife fence is inspected for any damage at least once per month.

When possible, tailings will be kept saturated with water to mitigate risk of airborne tailings fines during high wind events. When this saturation is not possible, other dust suppression methods will be utilized, where practicable (example: latex dust suppression).

4 MAINTENANCE

4.1 Type and Procedure

Preventative Maintenance, also called Routine Maintenance, is the planned, recurring maintenance activities conducted at a fixed or approximate frequency and not typically arising from results of surveillance activities.

Predictive Maintenance is the pre-defined maintenance conducted in response to results of surveillance activities that measure the condition of a specific component against performance criteria.

Event-Driven Maintenance, also called Corrective Maintenance, is in the event of unusual conditions or incidents that require immediate maintenance actions.

Maintenance records are retained by NGI teams who perform the work in accordance with the procedures described in this document. The teams are Site Service, Mill, Environment and Capitial Projects. The maintenance flowchart is illustrated in Figure 4- 1.

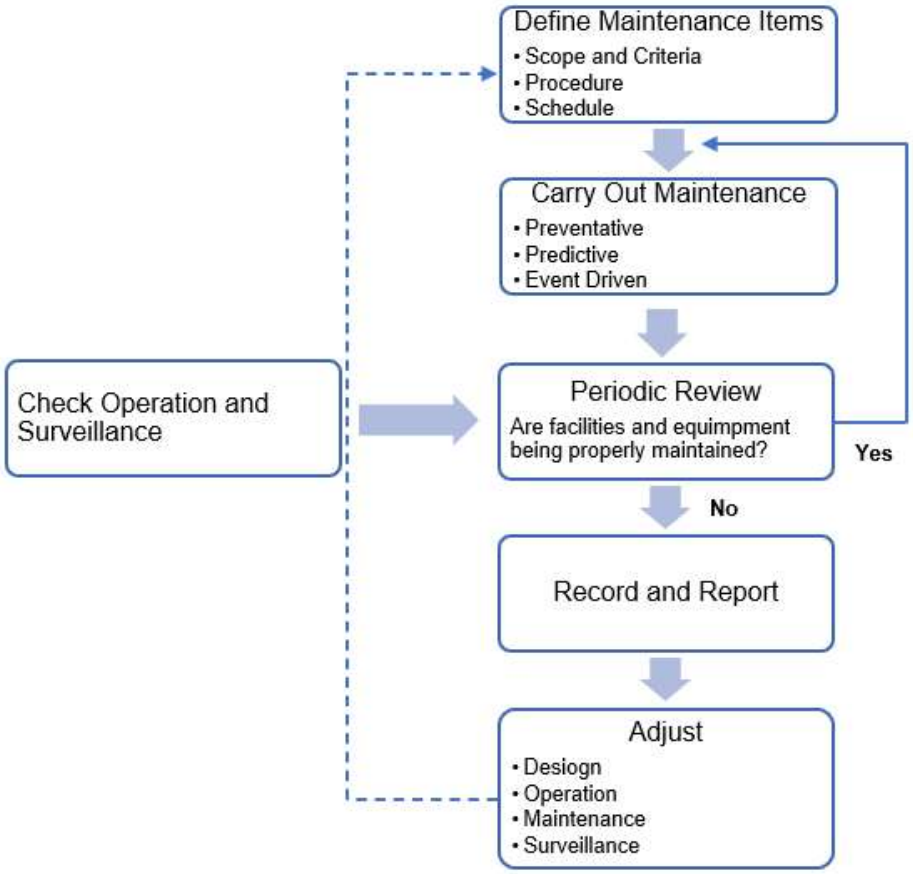

Figure 4- 1: Maintenance Flow Chart

4.2 Preventative and Predictive Maintenance

4.2.1 Roads and Gates

Roads and gates are maintained by Site Service Department as required.

4.2.2 Pipelines and Pumps to TMA

Maintain the tailings and reclaim pumps and the pipelines by Mill Department

- Regular performance tests on seepage pond pumps
- Annual calibration and maintenance as required on flow meters
- Replace pipe, bends and fitting components as required
- Remove accumulated debris from valves, reducers and off takes
- Carryout maintenance as recommended by fitting and valve suppliers
- Regularly inspect major wear components
- Maintain emergency dump ponds in a dewatered/empty state
- Maintain and replace system instrumentation as required

Changes to pumping configurations, ditching, piping, or operating parameters need to be approved by the Mill Manager and the Environmental Manager.

4.2.3 Mobile Equipment

Mobile Equipment Maintenance by Mobile Maintenance Department

- Mobile equipment maintenance is performed based on operating hours and as otherwise required. The maintenance schedule uses the manufacturer's recommendations.

4.2.4 Geotechnical Instruments and Water Monitoring Instruments

Geotechnical and Water Monitoring Instrument calibration by Capital Projects

- Periodic calibration of instruments follows manufacturer's recommendations.
- Calibration certificates will be maintained by Mill Maintenance for water monitoring instrumentation. Geotechnical instrumentation records are maintained by the Tailings Dam Engineer
- Malfunctioning or damaged instruments may require repair or replacement per manufacturer guidelines and in consultation with the EOR or approved procedure.

- In the event of replacement of dam instruments, several overlapping readings of the old and new instrument are required to ensure continuity of the data records.

4.2.5 Dam Inspection and Predictive Maintenance

Repair any deficiencies as noted in the Survey 123 online Dam Safety Inspections by related teams, such as

- Repair erosion gullies, local slumps or slides in the dam face, diversion ditches or spillway channels.
- Clearing vegetation along the diversion channels, seepage collection ditches and sumps.
- Removal of beaver dams along the diversion channels, seepage collection ditches and sumps.
- Re-grade the dam crest, as required, to prevent local ponding and direct surface runoff towards the pond.
- If annual survey determines necessary, correct dam crest, overflow spill way and diversion channel invert irregularities to avoid concentrated runoff.

4.3 Event-Driven Maintenance

RRM staff will provide a means to assess event-driven maintenance needs through response action planning. Response planning is based on risk prioritization, maintenance crew mobilization or “call out” procedures, required repairs and replacement material availability. Event-driven maintenance actions will follow applicable safety and performance procedures. Unusual conditions that require maintenance are to be communicated to maintenance staff as per related RASCI.

4.3.1 Pipeline Leaks or Breaks

In the event of a pipeline leak or break the system is de-energized and repaired as follows:

- Inspect entire pipeline
- Repair or replace affected components
- Repair damage caused by a leak or break
- Remediate area of released tailings
- Reclaim disturbed areas
- Follow spill reporting procedures

4.3.2 Earthquake Occurrence

After an earthquake, the following are undertaken:

- Repair the damaged roads, collection ditches, emergency spillway, and diversion channels.
- Repair the slumped section of dam rockfill zones.

- Restore dam crest elevation if survey results indicate settlements.
- Clear spill and repair the disturbance to the pipeline and pumps if damage is observed.

4.3.3 Flood Event

Following a flood event, the following will be undertaken:

- Restore the damaged roads, collection ditches, and diversion channels.
- Repair the eroded area of the dams.
- Repair the emergency spillway if it damaged.

4.4 Reporting Requirements

- Maintenance information is communicated as per related RASCI chart and in accordance with this Manual.
- Equipment logs, manuals and calibration records are maintained for reference and use by responsible staff.
- Maintenance diaries and logs are maintained and accessible for review by other parties.
- Dam inspection checklist is uploaded to SharePoint and the inspection log summarizing the number of inspections carried weekly and monthly will be uploaded to SharePoint as well.

5 SURVEILLANCE

5.1 General

The objective of the surveillance program is to provide confirmation of the adequate performance of the facility, including containment, stability, and operational function by observing, measuring, and recording data relative to potential failure modes and specific operational controls.

The surveillance at TMA involves:

- Visual Inspections
  - Daily pipeline inspection
  - Min. once a weekly/ monthly (Winter) dam inspection
  - Drone inspection when needed
- Annual Dam Safety Inspections
- ITRB
- Dam Safety Reviews
- Special Inspections and Increased Levels of Surveillance
- Instrumentation

5.2 Visual Inspection

5.2.1 Pipeline Inspection

Inspection of tailings pipeline and water reclaim pipeline is conducted twice per 12-hour shift by the Mill. RASCI chart for the pipeline inspection is shown in **Error! Reference source not found.**.

5.2.2 Dam Inspection

Dam surveillance consists of weekly and monthly inspections

- min. once every week visual inspection of active construction perimeter dams and seepage ditches during summer construction period. A more detailed inspection is carried out at the end of the summer months.

- monthly visual inspections of side-wide dams during winter months when snow covers the dams.

These inspections are carried out by TDTs and other trained site inspectors and are designed to detect / observe conditions that could indicate a concern with the performance or operation of the dam.

See Appendix C: Weekly and Monthly Site Inspection Checklists.

newgold Rainy River

newgold

Project Title: Tailings and Water Line Inspections

Roles and Responsibilities
Responsible, Accountable Supportive, Consulted, Informed

RASCI Matrix

	Deliverable or Task	Status	Capital Projects Manager	Tailings Dam Engineer	Tailings Dam Technician	Mill Manager	Superintendent	Environmental Manager	Designate	Maintenance Manager	Superintendent	Health & Safety Manager	Designate	Engineer of Record (BGC)	Regulators	All workers and visitors at site	Operations Manager	Superintendent / Survey
			Projects Team			Mill		Environment		Site Services (SS)		Safety		Others			Mine Ops	
Phase 1 - Daily Inspections																		
1.1	Twice/12-hr Shift Drive Inspection of Active Mill Lines					A	R											
1.2	Once/24-hr Drive Inspection of Active SS Lines									A	R		S					
1.3	Once/12-hr Drive Inspection of Active Ops Lines										S						A	R
1.4	Complete Mill Inspection Form (Appendix A) and Digitally Store N:\Mill\Mill Report Sheets\Line patrol- Tailings			I		A	R	I		I	I							
1.5	Complete SS Inspection Form (Appendix A) and Digitally Store Site Services forms TBD Site Services location TBD			I		I	I	I		A	R		S				I	I
1.6	Complete Ops Inspection Form (Appendix A) and Digitally Store Ops forms TBD Ops location TBD			I		I	I	I		I	I						A	R
1.7	Clear shrubs and bushes, as required to detect potential leaks									A	R							
Phase 2 - Weekly/Monthly Inspections																		
2.1	During instrumentation readings, inspect pipelines for spills			A	R	I												
2.2	Weekly inspection, by means of Drone or other, ~2.5 km of Lines west of Hwy 600, SW of WMP. Complete forms, as per item 1.2.			I				I		A	R							S
Phase 3 - Semi-Annual & Irregular Inspections																		
3.1	Inspection after commissioning and all irregular repairs on Mill lines		I	I		A	R	I	S									
3.2	Inspection after commissioning and all irregular repairs on SS lines							I	S	A	R							
3.3	Walk all active Mill lines in Spring (fluctuating temperatures)		I	I		A	R	I	S									
3.4	Walk all active Mill lines in Late Fall (fluctating temperatures)		I	I		A	R	I	S									
3.5	Walk all active SS lines in Spring (fluctuating temperatures)							I	S	A	R							
3.6	Walk all active SS lines in Late Fall (fluctating temperatures)							I	S	A	R							
Phase 4 - Actions & Reporting Requirements																		
4.1	Signs to be made for offsite lines, including unique location identifiers and Main Security phone (1-807-482-0955)									A	R							I
4.2	Report immediately any leaking water/tailings lines to Environment at 1-807-632-6152								S			A				R		
4.3	Once contacted, Security Personnel to implement "Reported Spill" procedure. TBD		I	I	I	I	I	I	I	I	I	A	R					
4.4	If a leak is detected, implement "Tailings and Water Line Leak" procedure. TBD		S	S		S	R	A	R	S	R	S		I	I			
4.5	Verify compliance to regulatory commitments on pipelines			I		R	S	A		R	S				I			

R	Responsible	Assigned to complete the task or deliverable
A	Accountable	Has final decision-making authority and accountability for complete. Only 1 per task.
S	Support	Provides support and assistance to the responsible role
C	Consulted	An adviser, stakeholder, or subject matter expert who is consulted before a decision or action
I	Informed	Must be informed after a decision or action

Note
Certain lines belong to different groups. A map of pipeline ownership is attached and should be read in tandem with this RASCI.
Pit to Sump 5 and Pit to MRP is owned by Ops.

Figure 5- 1: RASCI for Pipeline Inspection

TDTs and Trained Site Personnel shall:

- Carry out weekly and monthly inspections using Weekly / Monthly Site Inspection Checklists developed by the TDE. The inspections can be documented on paper copies or by using the appropriate checklist on the Dam Inspection App.
- During dam construction season, use the weekly checklist to inspect the perimeter dams and affiliated structures twice a week, and use the monthly checklist for the scheduled last inspection of month.
- During winter months, conduct monthly dam inspection only.
- Notify the TDE of any abnormal or unusual conditions.
- Forward completed Weekly and Monthly Site Inspection Checklists to the TDE for timely review.

The TDE shall:

- Prepare and revise the Weekly and Monthly Site Inspection Checklists as required.
- Review copies of the completed Weekly and Monthly Site Inspection Checklists.
- Present to results of inspection to the monthly Tailings Management System (TMS) presentation

5.3 Dam Safety Inspections

Annual inspections are intended to be part of a more thorough review of the condition of the facility and are carried out by the EOR. The inspections will include the following key items:

- Visual inspection of the facility by the engineer, including taking appropriate photographs of the observed conditions.

- Review of routine inspection records prepared by operating personnel in the past year;

- Review whether recommendations from previous year's inspection(s) have been addressed, and any incidents or actions arising from those previous recommendations.

- Review of instrumentation and monitoring data.

- Review of tailings deposition and water management operations of the facility including reconciliation of the annual water and mass balance. Review of pond levels (and depth) and freeboard, and reports of any incidents (and remedial measures) that may have occurred.

- An evaluation and interpretation of the structural performance of the dam and related components and identify any potential safety deficiencies or recommended items that need to be addressed in the coming year.

- Review construction records, QA/QC data and as-built information on dam construction and beaching; and

- Evaluation of the OMS Manual to assess the need for updating.

The results of the inspection and review will be documented in a report

The 2022 DSI was carried out in the week of July 4. The TDE is responsible for organizing the DSI.

The DSI will be carried out by the Dam Safety Review (DSR) consultant in the year of the DSR.

5.4 ITRB

The review of the TMA design and construction is part of the Independent Technical Review Board (ITRB) which has been held twice every year in Spring and Fall. Since the first ITRB meeting held in April 2016, a total of 14 meetings have been held. The most recent ITRB was held on May 10 and 11, 2022.

TDE is responsible to organize the meeting and for tracking the action logs from the ITRB meeting with the support from other NGI teams.

5.5 Dam Safety Reviews

The Canadian Dam Association (CDA) Dam Safety Guidelines (CDA, 2007) recommend a comprehensive dam safety review be carried out every 5 years during operations, prior to decommissioning and following closure, by a qualified 3rd party consultant. The DSR must be completed by a consultant who is free of any conflict of interest that could be caused by prior participation in the design, construction, operation, maintenance, or inspection of the dam under review.

The comprehensive review provides independent verification of:

- Safety and environmental performance of the facility.

- Adequacy of the surveillance program.

- Adequacy of delivery of OMS Manual requirements.

- Design basis with respect to current standards and possible failure modes; and

- Compliance with new engineering standards (including analysis to confirm if necessary).

The first DSR was completed in 2021 by SRK Consulting. Next DSR will be performed in year 2026.

5.6 Special Inspections and Increased Levels of Surveillance

Special and increased site surveillance is required in response to unusual or uncertain performance a structure or element or unusual operating conditions or loading is applied to the TMA dams. These inspections will be designed to provide a better understanding of the performance of the structure, ensure developing issues are assessed and if required, appropriate actions are taken.

A special inspection may be required by the TDE, when unusual conditions are discovered by routine site surveillance or detected by the instrumentation monitoring system, indicating possible poor performance of a design element or elements during normal operating conditions. Special inspections are initiated and managed by the TDE. The TDE will coordinate with other resources for arranging the inspections.

Increased site surveillance is normally required when there are unusual changes in loading and operating conditions at the dam (e.g., pond surcharge, spilling) or following the occurrence of natural events (e.g., flood, earthquake). Increased site surveillance can be initiated by TDE and or Capital Project Manager. Appendix B contains Surveillance Response Plan (SRP) for High Pond, Post-EQ, Increase Seepage and Observed Dam Deformation.

When a special inspection and/or increased surveillance is required, the TDE shall:

- Advise the Capital Project Manager.
- Identify requirements for increased surveillance in consultation with the Capital Project Manager.
- Identify the information needed for assessment of dam safety: instrument readings, pond operations, equipment availability, visual observations, etc.
- Document the requirements for increased surveillance.
- TDE to discuss findings with the Engineer of Record.

The Capital Project Manager shall:

- Initiate special inspections and/or increased levels of surveillance during or following any major flood, earthquake, or abnormal behaviour or event which may have or could damage equipment, structures or facilities affecting the safety of the dams.
- Initiate increased levels of surveillance whenever indications of potentially unsafe or deteriorating conditions (e.g., seepage, leakage or deformation) exist.
- Maintain increased surveillance until the condition posing the threat to dam safety has been assessed and/or remediated to an acceptable condition.

Following initiation of a special inspection and/or increased site surveillance, the TDTs and Trained Site Personnel shall:

- Follow the instructions of the TDE and provide completed copies of the inspection checklist.

5.6.1 Pond Surcharge

High Pond is defined as NOWL and higher. When the pond exceeds NOWL, special surveillance and increased surveillance is required for every other day. When the pond exceeds MOWL, special surveillance and increased surveillance is required for every day.

See Appendix B - Surveillance Response Plan for High Pond.

5.6.2 Earthquakes

The TDE in conjunction with the Capital Project Manager and other teams will confirm the significance of the seismic event and level of response required. If the seismic event is significant, an inspection of the facilities must be conducted.

See Appendix B – Surveillance Response Plan for Post-Earthquake Evaluation.

5.6.3 Increased Seepage through the Dams

Unusual leakage from the dam which may indicate damage to the perimeter dams. TDE will determine a specific surveillance for the increase seepage through the dams is required.

See Appendix B – Surveillance Response Plan for the Increased Seepage.

5.6.4 Observed Dam Deformation

Settlement, sinkhole formation, cracking, offsets, leaking or other signs of substantial distress of the perimeter dams. TDE together with the Capital Project Manager will determine a specific surveillance for the observed dam deformation is required.

See Appendix B – Surveillance Response Plan for Observation of Deformation.

5.6.5 Other Unusual Conditions

Other conditions that may require increased surveillance is included in Table 5- 1.

Table 5- 1: Other Unusual Condition for Inspection

Unusual Event	Post – Event Inspection/Surveillance
Rapid snowmelt and/or heavy rainstorms exceeding a 1:1-year, 24 hr rainfall (51 mm)	• Inspect the (visible) slopes and the crests of all the tailings dams looking for areas of concentrated runoff and erosion. • Make note of saturated ground/soft ground conditions at dam slopes and toes. • Examine dam slopes for indications of localized slumping/instability. Inspect all pump stations and pipelines. • Check the water levels in all ponds/reservoirs against the critical levels and keep checking these levels until the pond/reservoir inflows subside. • Discuss findings with the Engineer of Record. • Check piezometric levels at dam sites if instructed to do so.
Unusually high winds (exceeding 60 kph i.e., 75 % of maximum used in design)	• Check the condition of erosion protection on the upstream slopes of the dams. • Check the instrument data relay device.
Extreme snowpack (170cm cumulative snowfall) (i.e., 120% or greater than normal snowfall at Barwick)	• Check the water levels in all ponds/reservoirs against the critical levels and keep checking these levels until the spring freshet is over. • Evaluate the situation in terms of snowmelt scenarios. • Make predictions as to the expected storage capacity available in ponds/reservoirs. • If deemed necessary, mobilize pumping and mobile treatment equipment to site.

5.7 Instrumentation

5.7.1 Instrumentation Data Reading Frequency

Other than the automated data acquisition system whose data collection is hourly, data collection frequency for the instruments requiring manual reading is outlined in Table 5- 2 according to the Stage 4 Instrumentation Thresholds for TMA and Water Management Dams (BGC-4910-DT00-MEM-0030).

Table 5- 2: Data Collection and Submission Frequencies

Instrument/Elevation	Data Collection/Processing and Threshold Exceedance Reporting Frequency [1]			Data Submission Frequency
	In Areas of Active Construction	Immediately Post Construction (as directed by EOR)	Operations	
Vibrating Wire Piezometers [2]	Twice Weekly [3]	Weekly [4]	Weekly [4]	Weekly
Ground Elevation Survey above VWPs	Monthly	Not Applicable		Monthly
Fill Placement Summary [5]	Weekly	Not Applicable		Weekly
Standpipe Piezometers [2]	Weekly	One reading TwoWeeks after the end of construction [8]	Monthly	Monthly
Slope Inclinometers	Weekly	One reading TwoWeeks after the end of construction [8]	Monthly	Monthly
Settlement Plates/Magnetic Settlement Systems	Monthly			Monthly
Pond Elevations (All Dams)	Weekly			Weekly
Effective Crest Elevations [6] (All Dams)	Annually			Annually
Effective Spillway/Diversion Channel Invert Elevations [7] (All Dams)	Annually			Annually

Notes:

1. Data collection frequencies may be increased or decreased by the EOR based on observed conditions. Data collection frequencies will progress from active construction, to post construction, to operations. Acceptable deviations for monthly readings are up to one-week, acceptable deviation for weekly and biweekly readings is up to one day.
2. Piezometers with no thresholds assigned are to be read monthly. VWPs not connected to the automated system shall be read manually at the same frequencies as standpipe piezometers (i.e., weekly during active construction).
3. VWP data is logged and available hourly, threshold exceedances will be reported on Monday and Thursday of each week.
4. VWP data is logged and available hourly, threshold exceedances will be reported weekly.
5. Fill placement summary includes maps of weekly fill placement and fill elevation heatmaps relative to TMA Stage 4 and Ultimate Pre-loading design surface.
6. The effective crest elevation is the lowest surveyed point along the dam crest.
7. The effective spillway/diversion channel invert elevation is the lowest surveyed elevation along the spillway/diversion channel sill.
8. End of construction is defined as two weeks after the completion of TMA Stage 4 and Ultimate Pre-loading fill placements within a specific design zone.

5.7.2 Instrument Thresholds and Action Plan

The trigger level threshold indicates a value exceeding those used as a basis for meeting the design criteria. An alert level threshold indicates a more significant magnitude threshold exceedance.

These thresholds are monitored using the following instruments and methods:

- Piezometers, which are used to monitor the PWP within the embankment and foundation materials
- Slope inclinometers (SI), which are used to monitor soil deformation within the embankment and foundation materials
- Survey equipment, which is used to monitor effective crest and effective spillway/diversion channel elevations.

5.7.3 PWP Thresholds

Trigger levels are assigned to instruments within the TMA and Water Management Dams, whereas Alert Levels are only assigned to TMA structures. Thresholds were developed to correspond to the following PWP conditions:

Trigger Levels:

- TMA Stage 4 Design Trigger: measured PWP exceeds TMA Stage 4 design PWP at tip location (PWP exceeds PWP corresponding to design FOS)
- TMA Ultimate Pre-loading Design Trigger: measured PWP exceeds TMA Ultimate Pre-loading design PWP at tip location (PWP exceeds PWP corresponding to design FOS)
- Water Management Dams Trigger: measured PWP exceeds maximum fill elevation at tip location.

Alert Levels:

- TMA Stage 4 Design Alert: significantly exceeds TMA Stage 4 design PWP at tip location (PWP exceeds PWP corresponding to FOS of 1.3 or lower) for WML and BRE CH.

Construction induced PWPs within the WML and BRE CH have been identified as controlling stability for the dams. BGC performed stability modelling to develop PWP alert thresholds for piezometers installed within WML and BRE CH in areas where construction is planned. The estimated threshold value for each piezometer is presented in Table A-1 in 2022 Instrumentation Thresholds for TMA and Water Management Dams (BGC-4910-DT00-MEM-0030.001) and implemented in each VWP for monitoring the PWP response during Stage 4 dam raise construction.

5.7.4 SI Thresholds

Slope inclinometers have been installed to monitor embankment and foundation soil displacement. Deformation thresholds were developed for slope inclinometers as following (BGC-4910-DT00-MEM-0030.001).

Trigger Level

- Rates of displacement above 0.2 mm/day measured in a discrete deformation zone.

Alert Level

- Accelerating rates of displacement above 0.2 mm/day, or blockage of the slope inclinometer casing.
- Evidence of movement continuation between slope inclinometers.
- Unusual visual observations, including toe bulging, cracks, or other signs of instability.

5.7.5 Dam Settlement Threshold

Settlement thresholds were developed to monitor the settlement along the dam crest and between the dam crest and spillway invert (BGC-4910-DT00-MEM-0030.001).

- The total settlement trigger level is defined as an effective crest/invert elevation 0.10 m lower than the design elevation.
- The total settlement alert level is defined as an effective crest/invert elevation 0.20 m lower than the design elevation.
- The differential settlement trigger level is defined as a reduction of a crest to invert vertical elevation difference of 0.05 m or more from the design.
- The differential settlement alert level is defined as a reduction of a crest to invert vertical elevation difference of 0.10 m or more from the design.

The dam crest elevations and spillway invert elevations are shown in **Error! Reference source n ot found.** (Part 1).

5.7.6 Action Plan for Threshold Exceedance

The action plan to address exceedance of the thresholds is shown in Figure 5- 2.

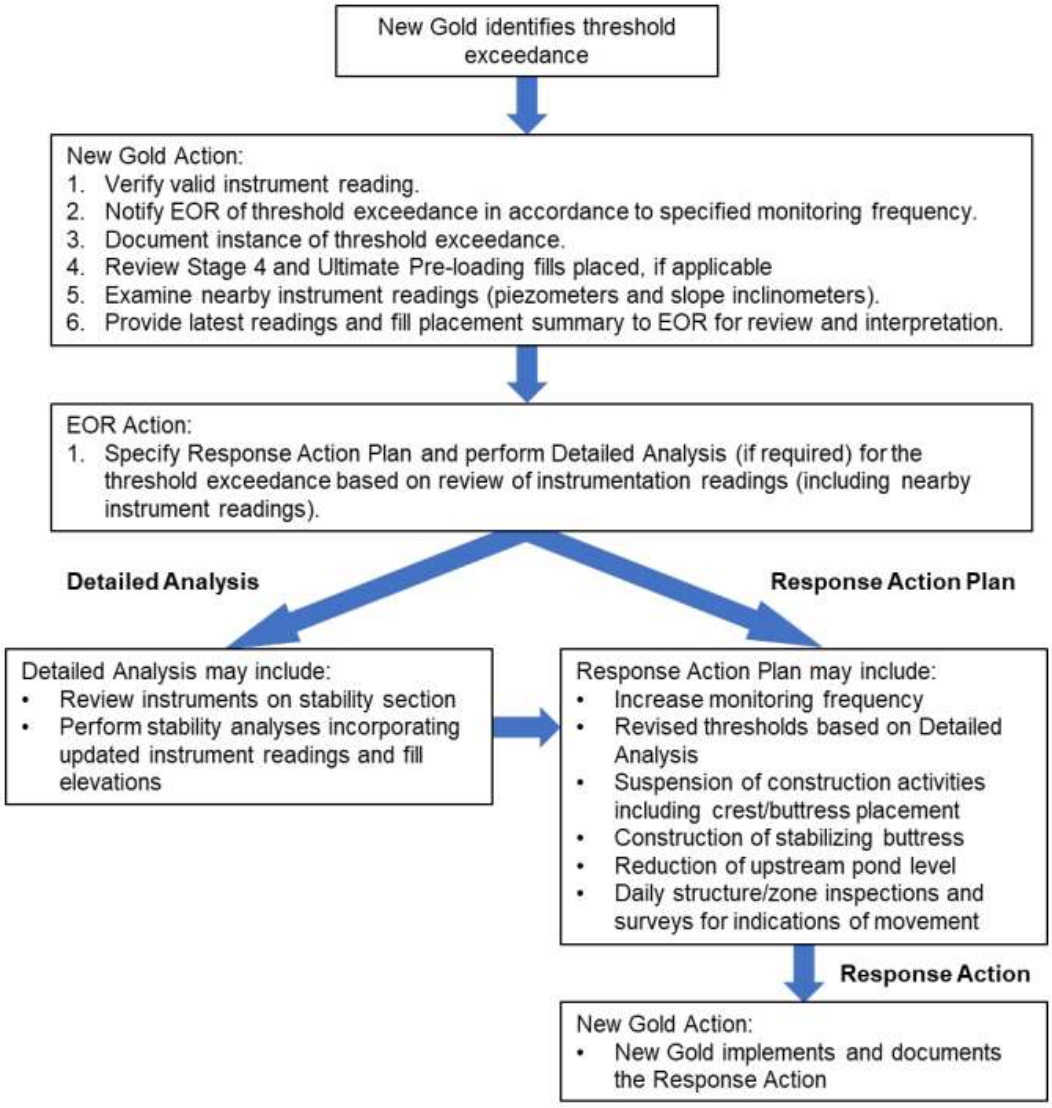

Figure 5- 2: Threshold Exceedance Responsibilities Workflow

5.8 Other Surveillances

5.8.1 Pond Level

The ponds are surveyed min. three times per week during summer months and once a week during the winter months. NGI Environment is responsible for surveying the TMA pond level. Information obtained from the survey is logged in a tracking spreadsheet and kept on the Environment Department SharePoint site. This is required to:

- Calculate the distance to all target and threshold pond operation levels.

- Estimate pond volume including ice of winter months for mill water make-ups.

Should the ponds exceed the NOWL elevation, a plan to return water levels to below the NOWL will be implemented. This plan may include options of transferring fluids to the Open Pit or shutting down the mill. The decision will be made by the General Manager in consultation with the Environmental Manager and Mill Manager.

5.8.2 Water License Sampling and Testing

At RRM, water and effluent quality monitoring is conducted in accordance with the prescribed analytes and sampling frequency as required by Amended Environmental Compliance Approval (ECA) #3855-C4E3FF issued on June 28, 2021, by the Ontario Ministry of Environment, Conservation and Parks (MECP). Additionally, the federal *Metal and Diamond Mining Effluent Regulation SOR/2002-222 (MDMER)* and provincial O. Reg 560/94: *Effluent Monitoring and Effluent Limits – Metal Mining Sector* also have prescribed analytes and sampling frequencies that are applicable to RRM.

The NG Environment collects all water and effluent quality samples. Water and effluent quality data are stored by the Environment Department in the environmental data management software Equips by EarthSoft. A water and effluent quality sampling schedule are produced by NG Environment in Q4 annually for the following year to ensure compliance with ECA and other regulatory sampling requirements.

See Water Management Plan developed by NG Environment for details.

5.8.3 LiDAR, Bathymetry, and Other Survey

Bathymetric surveys of TMA pond are scheduled annually by the Environmental team. These coincide with LiDAR surveys of rest of TMA area.

All dam crest elevations and spillway/diversion channel invert elevations will be surveyed annually to check the dam settlement threshold.

The “Fill Placement Summary” (FPS) is collected weekly, and data is submitted monthly. The FPS includes maps of weekly fill placement and fill elevation heatmaps relative to TMA Stage 4 design surface.

5.9 Summary of Surveillance Frequency

The frequency of all surveillance activities including the action owners is summarized in Table 5-3. A table has been created to record the visual routine inspections over the year.

Table 5- 3: Surveillance Frequency

Type of Surveillance		Facility	Season/Event	Frequency	Action by	Notes
Visual Inspection	Routine	Dams	Summer	Min. once a week on active construction dams. Fore detailed for month-end inspection	TDT, Trained Personnel, TDE	Use the monthly checklist for the month-end week inspection.
			Winter	Monthly on all dams	TDT TDE	When dams are covered by snow.
		Pipelines	Twice per 12-hour shift		Mill	
	Special	Dams	Pond Surcharge	When needed	TDT, Trained Personnel, TDE	
			EQ			
			Seepage			
			Dam Deformation			
			Other Unusual Events			
Instrumenta-tion	Routine	Dams	Area of Construction	Twice weekly to monthly/ annually	TDT, Trained Personnel	See Table 4-3 for details
			Post-Construction	Weekly to monthly/annually		
			Operation	Weekly to monthly/annually		
Others	Pond Level	Ponds	Summer	Min. three times a week	Environment	
			Winter	Weekly		
	Water Sampling and Testing	Ponds			Environment	See ECA for details
	LiDAR	Dams	Summer	Annually	External	
	Bathymetry	TMA Pond	Summer	Annually	External	May not be conducted in 2023

5.10 Reporting

The Mill Manager, or designated responsible party, and Tailings Dam Engineer will review collected data records from facility monitoring and assess the need for maintenance activities or response. Corrective actions will be identified and tracked to closure.

The Environmental Manager is responsible for overseeing sample and data collection and analysis. Reporting will meet MECP requirements and the annual DSI report will also be submitted to the MNDM. Reporting includes:

- As built reports of the annual raise construction of TMA dams, will be submitted to MECP within 90 days of completion
- An annual report based on the DSI including ECA approval requirements
- Monthly water quality monitoring report
- Annual report shall include:
    - Status of recommendations made in previous annual performance reports
    - Summary of geotechnical instrumentation performance
    - Changes in the facilities/structures from the previous year
    - Dam safety documentation status (i.e., OMS, EPRP, DSR)
    - Record of inspections conducted throughout the reporting period
    - Summary of construction planned for the upcoming year
    - Operating problems and corrective actions
    - Summary of calibration and maintenance works
    - Use of contingency plans
    - Surface water and groundwater monitoring reports including water balance
    - ML/ARD updates
    - Discharge volumes and quality

Additional reporting requirements may be developed as the RRM progresses.

6 EMERGENCY PREPAREDNESS AND RESPONSE PLAN

Emergency preparedness aims to ensure that the strategic direction and required building blocks for an eventual response are in place. A detailed Emergency Preparedness and Response Plan (EPRP) is outlined in Part 8 of this Manual.

APPENDIX A

STANDARD OF OPERATING PROCEDURES

APPENDIX B

SURVEILLANCE RESPONSE PLANS

The Surveillance response Plans (SRP) are intended to provide initial guidance to the first on-site inspector until the extent of the situation has been identified and further surveillance plans and/or remedial options developed.

Surveillance Response Plans for the following scenarios are included in this Appendix:

- High Pond
- Post-Earthquake
- Increased Seepage through the Earth Dam
- Observation of Dam Deformation

SURVEILLANCE RESPONSE PLAN

HIGH POND

MANIFESTATION OF FAILURE MODES

- Increased risk of piping (dam has not experienced this reservoir level before)
- Increased or new seepage (new historic high for reservoir, overtopping of the core)
- Deformations
- Inability to pass or store inflows resulting in overtopping of dam
- Spill causing damage to dam
- Runoff causing erosion of the dam or abutment

POTENTIAL CAUSES OF HIGH POND

- Surcharged pond due to high inflows

INITIAL DUTIES / ACTIONS

If the pond level exceeds or is expected to exceed one of the increased surveillance levels (once per day, 24 /7) the Capital Project Manager shall dispatch appropriate personnel to inspect the dams as documented in this SRP and shall notify the Tailings Dam Engineer (TDE).

The purpose of this inspection is to evaluate the performance of the dam and spillway during higher-than-normal pond conditions. As the level of the pond continues to rise the frequency and detail of the increased surveillance response will also increase.

Based on the pond level and the observed performance of the dams, the Capital Project Manager in conjunction with the TDE and / or Surface Water Engineer shall determine the severity of the situation and the appropriate level of response as identified in the EPRP.

i) Stand Down (no further actions required)
ii) No expanded notifications required (situation will be monitored by site staff only)
iii) Declare a Dam Incident (EPRP)
iv) Declare a Dam Alert / Breach (EPRP)

The Capital Project Manager and TDE supported by other resources will determine if immediate remedial measures are required.

Personnel Dispatched to Site

- Take a copy of the attached Inspection Checklists.
- Obtain the required supplies and tools
- Access by crew trucks may not be safe. If the crew cannot reach the site, advise the Capital Project Manager as soon as possible.
- Once at site the crew should observe the dam from a safe vantage point to confirm the dam appears safe to access.
- The crew should pay special attention to:
    - Condition of the spillway channel
    - Spillway flows causing erosion of the toe of the dam
    - Potential new or increased seepage flows
- Once the inspection of the dam and spillway are complete the crews will relay the results of the inspection to the Capital Project Manager.
- Do not leave site until instructed to do so.

Tailings Dam Engineer

- Inform the Capital Project Manager of Dam Safety Surveillance of the situation as it develops.
- Develop an increased surveillance plan appropriate for condition.
- Review instrumentation data.
- Review potential remedial measures with:
    - Capital Project Manager
    - EOR

SITE INSPECTOR CHECKLIST
for TMA High Pond

Name:_____

Date: _____Time of arrival: _____

Inspect the condition of the dams and Spillway

1. From a safe vantage point check that it is safe to approach the dam. Call the Capital Project Manager if the dam is not considered safe to approach.
2. Record weather conditions: _____
3. Record Pond level_____
4. Is there any sign of new deformation such as: cracking, slumping, change of alignment and depressions? YES NO
    a. If yes use deformation checklist to record details of the observations.
5. Is there any sign of new or increased seepage? YES NO
    a. If yes use seepage checklist to record the details of the observations.
6. Is there damage to the spillway? YES NO
    a. If yes use seepage checklist to record the details of the observations
7. Estimate the length of tailings beach. SD:___m, WD:__m, ND:__m

Fig 1. Plan View of TMA

SURVEILLANCE RESPONSE PLAN

POST-EARTHQUAKE EVALUATION

SIGNIFICANCE

TMA dams are designed to withstand small earthquakes. During an earthquake some structural damage could occur to the dam or ancillary structures that could compromise the integrity of the dam.

MANIFESTATION

- Deformation of the dam (see Deformation SRP)
- Increased seepage (see Increased Seepage SRP)
- Structural damage ancillary structures (spillway and ditches)
- Sand boils, liquefaction

INITIAL DUTIES / ACTIONS

General Response

Following any felt earthquake the Capital Project Manager and the TDE shall determine if an inspection is required.

When conditions are considered safe, staff will report to work at a designated location. Once staff has returned to work, the Capital Project Manager should dispatch crews to inspect the dam(s).

Following the initial inspection of the dam, the Capital Project Manager in conjunction with the TDE and / or other appropriate resources shall determine the severity of the situation and the appropriate level of response.

i) Stand Down (no further actions required)
ii) No expanded notifications required (situation will be monitored by site staff only)
iii) Declare a Dam Incident (EPRP)
iv) Declare a Dam Alert / Breach (EPRP)

The Capital Project Manager and TDE supported by other resources will determine if immediate remedial measures are required.

Personnel Dispatched to Site

- Take a copy of the attached Inspection Checklists.

- Obtain the required supplies and tools
- Access by crew trucks may not be safe. If the crew cannot reach the site, advise the Capital Project Manager as soon as possible.
- Once at site the crew should observe the dam from a safe vantage point to confirm the dam appears safe to access.
- Starting at the crest of the dam and working down the slope the crew should check for any unusual deformations and / or seepage.
- Following the inspection of the dam the crew should inspect the spillway for obvious signs of structural damage.
- Once the inspection of the dam and spillway are complete the crews will relay the results of the inspection to the Capital Project Manager.
- Do not leave site until instructed to do so.

Tailings Dam Engineer

- Inform the Capital Project Manager of the situation as it develops.
- Develop an increased surveillance plan appropriate for condition. Define resources from site.
- Review instrumentation data.
- Review potential remedial measures with:
    - Capital Project Manager
    - EOR

SITE INSPECTOR CHECKLIST
For TMA Post-EQ Evaluation

Name:_____ Date: _____

Time of arrival: _____

Inspect the condition of the dam:

1. From a safe vantage point check that it is safe to approach the dam(s). Call the Capital Project Manager if the dam is not considered safe to approach.
2. Record weather conditions: _____
3. Record Pond level_____
4. Is there any sign of new deformation such as: cracking, slumping, change of alignment (roads, no-post barrier, and fences) and depressions? YES NO
   • If yes use deformation checklist to record details of the observations.
5. Is there any sign of new or increased seepage? YES NO
   • If yes use seepage checklist to record the details of the observations

Inspect the condition of the Spillway:

6. Is there damage to the Sill? YES NO
7. Is there damaged to the toe? YES NO
8. Is there damaged to the side walls? YES NO

Fig 1. Plan View of TMA

SURVEILLANCE RESPONSE PLAN

INCREASED SEEPAGE

SIGNIFICANCE

Seepage flows are a prime indicator of the performance of an earthfall dam. Unexpected changes in seepage flow and in particular the occurrence of “dirty” or “muddy” seepage could indicate a deteriorating condition within the dam. If left unattended the situation could result in the failure of the dam in a relatively short period of time. As a result, any report of unexpected increased seepage or “muddy” seepage should be treated with the utmost concern.

Changes in seepage flows are directly associated with a failure mode, so if a change in seepage flows is reported to site, trained personnel should be immediately dispatched to investigate. Preferably TDE will be available to respond immediately, however if an Engineer is not available, one of the routine inspectors, i.e., TDT, should be dispatched. The inspector should follow the attached checklist titled “Site Inspector”.

MANIFESTATION

- Increased or decreased core piezometer levels
- Increased downstream shell water levels
- Wet spot(s) on the downstream face, toe or downstream of the dam
- New seepage flows.
- Observation of “dirty” or “muddy” seepage exiting the ground
- Seepage boils downstream
- Deformations (sinkholes, slumping)

POTENTIAL CAUSES

Possible causes for a change in seepage flows downstream of the crest of the dam are listed below in order of highest to lowest concern.

- Rupture or leakage of a through-going water passage
- Internal erosion (piping) of the core
- Cracking of the core due to earthquake, settlement, hydraulic fracture
- Deterioration of a foundation cut off
- Overtopping of the core (flood)
- Diverted surface seepage
- Environmental
    - Higher than normal pond levels
    - Extraordinary rainfall, snowmelt

INITIAL DUTIES / ACTIONS

GENERAL RESPONSE

Unusual observations are to be reported to the Capital Project Manager immediately. Capital Project Manager shall call the TDE immediately and dispatch personnel to site for further observations. The level of increased surveillance to be determined based on the severity of the situation.

The Capital Project Manager in conjunction with the TDE and / or other appropriate resources shall determine the severity of the situation and the appropriate level of response as identified in the EPRP.

i) Stand Down (no further actions required)
ii) No expanded notifications required (situation will be monitored by site staff only)
iii) Declare a Dam Incident (EPRP)
iv) Declare a Dam Alert / Breach (EPRP)

The Capital Project Manager and DSE supported by other resources will determine if immediate measures are required.

Personnel Dispatched to Site

- Take a copy of the attached Inspection Checklist.
- Obtain the required supplies and tools
- Assess personal safety conditions and observe the seepage area from a safe vantage point.
- Note the location, size, clarity (i.e., "thick" muddy condition vs. a "cloudy" appearance) and estimate of the flow quantity
- Note if the condition is "stable" or "deteriorating " (i.e., seepage area enlarging/flows increasing quickly)
- Note any other unusual features in the immediate area (i.e., fresh cracks or depressions/holes)
- If safe to do so, try to mark the limits of the seepage area for future referencing
- Do not leave site until instructed to do so.

Tailings Dam Engineer

- Decide if site visit is warranted.
- Inform the Capital Project Manager of the situation.
- Develop an increased surveillance plan appropriate for condition. Define resources from site,
- Review instrumentation data.
- Review potential mitigation with:
    - Capital Project Manager
    - EOR

SITE INSPECTOR CHECKLIST
For Increased Seepage at TMA

Name:_____

Date: _____

Time of arrival: _____

1. Check that it is safe to approach the seepage area.
2. Record location of seepage below and mark on attached plan drawing.
3. Measure / estimate rate of seepage.
4. Check to see if the seepage water is “dirty”.
5. Stake out and measure area where seepage is exiting the dam.
6. Dimensions of Seepage Zone
7. Check for any erosion or sloughing in area where seepage is exiting the dam.
8. Record weather conditions: _____
9. Record pond level_____
10. Photograph seepage area
11. Call details back to Capital Project Manager.

If no further direction given by Capital Project Manager/ TDE, continue with the following:

12. Inspect the rest of the dam using the Routine Weekly Inspection Checklist. Look for signs of deformation such as:
    - Depressions
    - Cracking
    - Sinkholes
    - Changes in the alignment along the crest
13. If anything looks unusual report back to Capital Project Manager immediately.
14. Continue to monitor and record seepage at least every hour and check that there are no changes in the flow or turbidity. Report any changes in the seepage flows to the Capital Project Manager immediately.
15. Continue to inspect the entire dam every two hours following the Routine Weekly Inspection Checklist.
16. Do not leave site until Capital Project Manager instructs you to do so.

Record of Seepage

Time	Flow (L/min)	Dirty (Y or N)	Time	Flow (L/min)	Dirty (Y or N)

Fig 1. Plan View of TMA

SURVEILLANCE RESPONSE PLAN

DAM DEFORMATION

SIGNIFICANCE

Deformation of the dam can lead to increased seepage and / or loss of freeboard which could threaten the integrity of the dam. Deformations may be triggered by a change in conditions such as earthquake loading or increased piezometric levels in the downstream shell.

Observation of surface deformations could be the external manifestation of internal damage to the dam such as ongoing internal erosion or piping.

MANIFESTATION

- Cracking (transverse, longitudinal)
- Slumping / sliding
- Sinkholes
- Dips or depressions
- Bulging
- Change of alignment of linear features (sharp or gradual)
- Changes in instrumentation readings (survey, extensometers, or inclinometers)
- Increased piezometric levels due to cracking of the core

POTENTIAL CAUSES

Possible causes for deformations of the dam are listed below:

- Loss of strength of shell or foundation (liquefaction, strain softening, internal erosion)
- Internal erosion, loss of material (sinkhole)
- Increased piezometric levels reducing effective stress (core cracking, internal erosion, leak from water passage, extraordinary rainfall, or snowmelt)

INITIAL DUTIES / ACTIONS

GENERAL RESPONSE

Unusual observations are to be reported to the Capital Project Manager immediately. Capital Project Manager shall call the TDE immediately and dispatch personnel to site for further observations. The level of increased surveillance to be determined based on the severity of the situation.

The Capital Project Manager in conjunction with the TDE and / or other appropriate resources shall determine the severity of the situation and the appropriate level of response as identified in the EPRP.

i) Stand Down (no further actions required)
ii) No expanded notifications required (situation will be monitored by site staff only)
iii) Declare a Dam Incident (EPRP)
iv) Declare a Dam Alert / Breach (EPRP)

The Capital Project Manager and DSE supported by other resources will determine if immediate measures are required.

Personnel Dispatched to Site

- Take a copy of the attached Inspection Checklist.
- Obtain the required supplies and tools
- Assess personal safety conditions and observe the extent of the deformations from a safe vantage point.
- Note the location, size, offset, amount of freeboard, etc. on the attached checklist.
- Note if the condition is "stable" or "deteriorating " (i.e., is the rate of movement visible)
- Note any other unusual features in the immediate area (i.e., new seepage or wet spots at or downstream of the deformation)
- If safe to do so, try to mark the limits of the deformed area for future referencing
- Do not leave site until instructed to do so.

Tailings Dam Engineer

- Decide if site visit is warranted.
- Inform the Capital Project Manager of the situation.
- Develop an increased surveillance plan appropriate for condition. Define resources from site,
- Review instrumentation data.
- Review potential mitigation with:
    - Capital Project Manager
    - EOR

SITE INSPECTOR CHECKLIST
for TMA Dam Deformation

Name:_____

Date: _____

Time of arrival: _____

1. Check that it is safe to approach the deformed area.
2. Record Pond level_____
3. Estimate Freeboard _____
4. Record location of deformed area below and mark on attached plan drawing.
5. Deformation Type
    a. Cracking or Offset
        i. Along the crest or across the crest
        ii. Length_____Width_____of crack
        iii. Vertical offset _____
        iv. Depth of crack _____
    b. Slumping or Slide
        i. Length_____Width_____of slumped area
        ii. Vertical offset at top of slump_____
        iii. Estimated Volume
    c. Sinkhole
        i. Length_____Width _____
        ii. Depth _____
    d. Other types of deformations describe below:

    _____

    _____
6. Photograph deformed area.
7. Call details back to Capital Project Manager.
8. Once measurements are completed stake area and monitor for further movements.

If no further direction given by Capital Project Manager continue with the following:

9. Inspect the rest of the dam using the Routine Weekly Inspection Checklist. Look forsigns of deformation such as:
   - New or increased seepage (If observed go to the Increased Seepage SRP)
   - Other areas of deformation
10. If anything looks unusual report back to Capital Project Manager immediately.
11. Continue to measure and record the Length, Width etc. every hour and check that there are nochanges. Report any changes in the measurements to the Capital Project Manager immediately.
12. Continue to inspect the entire dam every two hours following the Routine Weekly Inspection Checklist.
13. Do not leave site until manger instructs you to do so.

Fig. 1. Plan View of TMA

APPENDIX C

INSPECTION CHECKLISTS

The following inspection checklists are prepared and issued by the Tailings Dam Engineer.

- Weekly Site Inspection Checklist
- Monthly Site Inspection Checklist

TMA – WEEKLY INSPECTION CHECKLIST

Inspector:_____Date: _____
Weather:_____Pond Water Level (m):

Inspect the following items for safety, general appearance, and evidence of damage or potentialinstability.

Legend: ✓ = No change since previous inspection or normal
D = Defect or deterioration since previous inspection. (Add details under Remarks")
- = Not inspected (explanation)

ITEM	Check	REMARKS
1. South Dam		
1) Abutments		
2) Crest		
3) Upstream Slope		
4) Downstream Slope		
5) Downstream Toe		
6) Estimate length of tailings beach		
7) Erosion below spigot?	Y / N	
8) Tailings stacking up.	Y / N	
2. West Dam		
1) Crest		
2) Upstream Slope		
3) Downstream Slope		
4) Estimate length of tailings beach		
5) Erosion below spigot?	Y / N	
6) Tailings stacking up?	Y / N	
3. North Dam		
1) Abutment		
2) Crest		
3) Upstream Slope		
4) Downstream Slope		
5) Downstream Toe		
6) Estimate length of tailings beach		
7) Erosion below spigot?	Y / N	
8) Tailings stacking up?	Y / N	
4. Spillway		
1) Spillway Sill		
2) Spillway Channel		
3) Spillway Toe		
4) Estimate length of tailings beach		
5. Diversion Ditches and Sumps		
1) Flow	Y / N	
2) Estimate flow (lpm)		
3) Vegetation growth		
4) Sloughing or slumps		

TMA DAM – MONTHLY INSPECTION CHECKLIST

Inspector:_____

Date:_____

Weather:_____

Reservoir Water Level (m):_____

Inspect the following items for safety, general appearance, and evidence of damage or potentialinstability.

Legend: ✓ = No change since previous inspection or normal

D = Defect or deterioration since previous inspection. (Add details under "Remarks")

- = Not inspected (explanation)

ITEM	Check	REMARKS
1. ACCESS AND SECURITY		
1.1 Access Road		
1.2 Security (gates and locks)		
1.3 Fence		
2. SOUTH DAM		
2.1 Dam Crest		
2.1.1 Cracking		
2.1.2 Settlement		
2.1.3 Erosion		
2.1.4 Other Movement, such as Alignment		
2.2 Upstream Slope		
2.2.1 Angles		
2.2.2 Bulging/Cracking		
2.2.3 Erosion		
2.2.4 Non-Uniform Slope		
2.2.5 Settlement		
2.2.6 Sloughing		
2.3 Downstream Slope		
2.3.1 Angles		
2.3.2 Bulging/Cracking		
2.3.3 Erosion		
2.3.4 Non-Uniform Slope		
2.3.5 Settlement		
2.3.6 Sloughing		
2.4 Downstream Toe		
2.4.1 Vegetation		
2.4.2 Wet Spot/ Ice		
2.4.3 Bulging		
2.4.4 Piping		
2.5 Tailings Deposition		
2.5.1 Leaking along Tailings Line		
2.5.2 Tailings Stacking Up		
2.5.3 Tailings Formed Channel		
2.5.4 Erosion at Spigot		
2.5.5 Tailings Dusting		
2.5.6 Discharge 0.4 m below Dam Crest		
2.5.7 Estimate Beach Length		
2.6 Seepage Collection Ditch		
2.6.1 Estimate Flow		
2.6.2 Sloughing		
2.6.3 Vegetaion		
2.6.4 Sump		

ITEM	Check	REMARKS
3. WEST DAM		
3.1 Dam Crest		
3.1.1 Cracking		
3.1.2 Settlement		
3.1.3 Erosion		
3.1.4 Other Movement such as Alignment		
3.2 Upstream Slope		
3.2.1 Angles		
3.2.2 Bulging/Cracking		
3.2.3 Erosion		
3.2.4 Non-Uniform Slope		
3.2.5 Settlement		
3.2.6 Sloughing		
3.3 Downstream Slope		
3.3.1 Angles		
3.3.2 Bulging/Cracking		
3.3.3 Erosion		
3.3.4 Non-Uniform Slope		
3.3.5 Settlement		
3.3.6 Sloughing		
3.4 Tailings Deposition		
3.4.1 Leaking along Tailings Line		
3.4.2 Tailings Stacking Up		
3.4.3 Tailings Formed Channel		
3.4.4 Erosion at Spigot		
3.4.5 Tailings Dusting		
3.4.6 Discharge 0.4 m below Dam Crest		
3.5.7 Estimate Beach Length		
3.5 Seepage Collection Ditch		
3.5.1 Estimate Flow		
3.5.2 Sloughing		
3.5.3 Vegetaion		
3.5.4 Sump		

ITEM	Check	REMARKS
4. NORTH DAM		
4.1 Dam Crest		
4.1.1 Cracking		
4.1.2 Settlement		
4.1.3 Erosion		
4.1.4 Other Movement, such as Alignment		
4.2 Upstream Slope		
4.2.1 Angles		
4.2.2 Bulging/Cracking		
4.2.3 Erosion		
4.2.4 Non-Uniform Slope		
4.2.5 Settlement		
4.2.6 Sloughing		
4.3 Downstream Slope		
4.3.1 Angles		
4.3.2 Bulging/Cracking		
4.3.3 Erosion		
4.3.4 Non-Uniform Slope		
4.3.5 Settlement		
4.3.6 Sloughing		
4.4 Downstream Toe		
4.4.1 Vegetation		
4.4.2 Wet Spot/ Ice		
4.4.3 Bulging		
4.4.4 Piping		
4.5 Spillway		
4.5.1 Estimate Tailings Beach Length		
4.5.2 Erosion		
4.5.3 Sill		
4.5.4 Toe		
4.6 Tailings Deposition		
4.6.1 Leaking along Tailings Line		
4.6.2 Tailings Stacking Up		
4.6.3 Tailings Formed Channel		
4.6.4 Erosion at Spigot		
4.6.5 Tailings Dusting		
4.5.6 Discharge 0.4 m below Dam Crest		
4.5.7 Estimate Beach Length		
4.7 Seepage Collection Ditch		
4.7.1 Estimate Flow		
4.7.2 Sloughing		
4.7.3 Vegetation		
4.7.4 Sump		