RAINY RIVER PROJECT

OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL

PART VI - DIVERSIONS

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

February 2021

Version 2021-1

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

	Name	Company /Department	Position	Signature	Date
Prepared by	Patrick Green	NG Capital Projects	Tailings Dam Engineer		
Reviewed by	Travis Pastachak	NG Capital Projects	Capital Projects Manager		
	Darrol VanDeventer	NG Mine Operations	Mine Manager		
	Tyler Buckingham	NG Mill	Mill Manager		
	Tony Lord	NG Maintenance	Mobile Maintenance Manager		
	Andre Zerwer	BGC Engineering Inc.	Engineer of Record		
Approved by	Sylvie St. Jean	NG Environment	Environment Manager		

Table 2 - Revision Summary

Revision Number	Details of Revision	Date of Issue	Comment
Rev A	Issue for Review	February 9, 2021	N/A

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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 Diversion channels and dams 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 PONDS
- **Part 6: DIVERSIONS**
- Part 7: WATER TREATMENT
- Part 8: EPP

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. The topics discussed in Part 1 under Section 4.0 – Site Baseline Conditions are:

- Site Location and Tenure
- Temperature
- Precipitation
- Evaporation
- Hydrology
- Geology
- Hydrogeology
- Water Quality
    - Tailings
    - Biodiversity
    - Fish
- Vegetation
- Wildlife
- Natural Hazards

2.0 SITE AND FACILITIES DESCRIPTION

The RRM site is in the Township of Chapple located 70 kilometres (km), by road, northwest of Fort Frances, in Northwestern Ontario. New Gold has 100% interest in the lands forming the RRM through direct ownership or option agreement.

The freshwater diversions function to reduce inflows to the RRM and provide offsetting habitat for the loss of portions of Loslo, Marr, Clark, and West creeks. Diversion of the non-contact runoff from these catchments reduces the effluent management requirements. All structures support fish habitat. Freshwater diversion is provided by two systems:

- West Creek diversion including the Stockpile and West Creek dam, ponds, and diversions
- Clark Creek diversion including the Clark Creek and Teeple dam, ponds, and diversions

The freshwater ponds are designed to minimize the net freshwater inflows into the project by diverting non-contact runoff around the site via dams, ponds, and diversion channels. The West Creek Pond, Clark Creek Pond, Stockpile Pond and Teeple Pond dams were developed in a single dam raise during the construction phase to support the requirements of the *Water Management Plan for Operations* (Amec Foster Wheeler, 2015).

The freshwater diversion structures have been developed in accordance with the design briefs and as-built reports summarized in

Table 3. A detailed list of Drawings is provided in Appendix A.

Table 3 - Supporting Documents for the West Creek and Clark Creek Diversions

Document Title	Reference
Design Brief – Water Management Dams	(Amec Foster Wheeler, 2015b)
Design Update – Clark Creek Pond Dam	(Amec Foster Wheeler, 2016i)
Stockpile Pond Dam – Design Revision and Operating Guidelines	(Amec Foster Wheeler, 2016j)
West Creek Dam – Design Revision and Operating Guidelines	(Amec Foster Wheeler, 2016k)
Clark Creek Diversion – As-built Report	(Amec Foster Wheeler, 2017a)
West Creek Diversion – As-built Report in preparation	(Amec Foster Wheeler, 2017b)
Drawing Title	**New Gold Document Number**
West Creek Pond Dam – Layout and Foundation – Preparation Plan & Details	3098004-002510-A1-D50-0001
West Creek Diversion Channel – Plan and Profile	3098004-002510-A1-D70-0003
Stockpile Pond Dam – Plan, Typical Section and Profile	3098004-002580-A1-D70-0002
Stockpile Pond Diversion Channel – Plan and Profile	3098004-002580-A1-D70-0004
Clark Creek Pond Dam – Plan, Typical Section and Profile	3098004-004400-A1-D70-0001
Clark Creek Pond Diversion Channel – Plan and Profile	3098004-004400-A1-D70-0002
Teeple Road Dam – Plan, Typical Section and Profile	3098004-004400-A1-D70-0003
Teeple Road Pond Diversion Channel – Plan and Profile	3098004-004400-A1-D70-0004

2.1 Dam Consequence Classification

The structures for the West Creek Diversion (Stockpile Pond Dam and West Creek Pond Dam) were classified as VERY HIGH using the Ontario Lakes and Rivers Improvement Act (LRIA) “Classification and inflow design flood criteria”. This is generally equivalent to a Canadian Dam Association (CDA) consequence of EXTREME.

The Clark Creek structures (Teeple Dam and Clark Creek Dam) were classified as LOW using the Ontario Lakes and Rivers Improvement Act (LRIA) “Classification and inflow design flood criteria”. This is generally equivalent to a Canadian Dam Association (CDA) consequence of LOW.

2.2 West Creek Diversion

The West Creek Diversion system diverts flows from the West Creek and its tributaries around the Open Pit and discharges into the Pinewood River at Loslo Creek. It includes the Stockpile Pond Dam and Diversion Channel, which divert flows around the Plant Site, and the West Creek Pond and Diversion Channel, whichdiverts flows around the Open Pit. The following sections describe the components of this diversion.

2.2.1 Stockpile Pond and Diversion Channel

The objective of the Stockpile Pond is to divert freshwater from natural ground into the West Creek Watershed. The Stockpile Pond Diversion Channel was designed to convey the Probable Maximum Flood (PMF) from the plant site area to the West Creek Pond. The Stockpile Pond Diversion will also provide fish habitat compensation. The Stockpile Pond Diversion Channel base width varies from 6 to 33 m with 4H:1V side slopes. The total length of the diversion channel is about 1,200 m.

The dam height is 7.5 m with 4:1 slopes with a crest width of 6 m and length of 175 m. The dam crest elevation is 375.5 m and the diversion channel invert is 372.2 m. NOWL provides capacity for 93,700 m^3 of storage with greater volumes discharges through the 33 m spillway into the diversion channel. The diversion channel is a low (<1%) gradient channel reporting to the West Creek Pond with a typical bottom width of 6 m.

The design brief for the dam is RRP-GEO-REP-003. Construction was completed on the diversion in November 2016 and confirmed by the EOR (RRP-GEO-MEM-080-R1). Construction of the dam was completed in May 2017 and confirmed by the EOR (RRP-GEO-MEM-119-R1). The dam was constructed with a central clay core and random fill and or NPAG rock shells.

2.2.2 West Creek Pond and Diversion Channel

The West Creek Pond is located north of the Open Pit and west of the Process Plant at a point that allows for the raising of the pond water level sufficiently to divert flows westerly through a diversion channel and around the Open Pit. The West Creek Dam intercepts all West Creek flows from the north, as well as drainage from two tributaries to the east, diverted through the Stockpile Diversion Channel.

The West Creek Dam is a central clay core with random fill upstream shell and NPAG mine rock downstream shell. It has a crest elevation of 364.9 m (~156,000 m^3), maximum height of 7.4 m, and overall side slopes of 7.9H:1V including rock toe berms. The West Creek Pond has been designed to contain the PMF while discharging to the West Creek Diversion Channel.

The first 615 m of the West Creek Diversion Channel acts as the Emergency Spillway of the West Creek Dam and has been designed to convey a PMF event. The spillway invert elevation is 361.0 m and is 8 m wide. This provides a freeboard of 4.0 m at normal water level in the pond. During a PMF event the peak water level would rise to 364.5 m, leaving 0.4 m of freeboard.

2.2.3 West Creek Diversion Overflow Structure

The Overflow Structure (or weir) is located at Sta. 0+615 within the Diversion Channel. A box culvert (62.5 m long by 2.4 m wide/tall) constricts the channel flow such that a side overflow weir may be activated (invert elevation 360 m, width 50 m). The purpose of the overflow structure is to restrict the flow rate discharging from the culvert under high flow conditions. The remaining ~4,000 m of diversion channel is over flat ground with minimal elevation change. The reduced flows through this section of diversion channel allow a much smaller channel excavation.

The overflow structure has been designed such that during a PMF event, the flow rate downstream of the culvert, i.e., in the channel, does not exceed the 100-year flood outflow from the West Creek Pond (26.9 m^3/s). The diversion channel upstream of the diversion structure will back up, with excess flows diverted through the side overflow channel. Containment is provided above the culvert by a berm across the diversion channel with a crest elevation of 363 m. The peak water level in the diversion channel during a PMF event will be 362.5 m, providing 0.5 m of freeboard to the crest of the berm.

The overflow structure will be activated for events greater than the 10-year storm. The peak overflow channel discharge during a PMF event will be 163.8 m^3/s. The overflow channel discharges onto a flat, grassy plain south of the West Creek Diversion Channel and north of the ultimate WMRS. This area, termed the exclusion zone, is shown on Figure 1 and is required to remain undeveloped to prevent the loss of natural vegetation until Sediment Pond 1.

2.3 Clark Creek Diversion

The purpose of the Clark Creek diversion is to divert natural drainage and runoff around the East Mine Rock Stockpile and provide fish habitat offsetting. The Clark Creek Diversion Channel diverts runoff from the Clark Creek upstream of the Clark Creek Dam and the EMRS, through the Clark Creek diversion channel into Teeple Pond and subsequently into Teeple Diversion and to the Pinewood River via a culvert under Teeple Road.

Construction of the Clark Creek Diversion occurred between August 29, 2015 and December 4, 2016 and authorised by LRIA FF-2015-03A and the Fisheries Act approval. There are applicable federal and provincial EA commitments, however as a freshwater diversion there a limited MECP requirements beyond sediment control.

Clark Creek and Teeple Dams were constructed as homogenous clay fill embankments utilizing native clay overburden. The clay fill is protected by gravel and cobble sized materials, with a layer of geotextile separation, to prevent erosion. Overflow sections for Teeple Dam are included on the dams to carry storm flows (i.e., activated by 2-year event) and have been designed to handle events more than the 100-year return design flow. Overflow sections are provided to permit the safe passage of water in the event the pond level exceeds the maximum operating water level. There are no active controls on the water flows. Clark Creek Dam features a 20 m wide overflow section and Teeple Road Dam features a 150 m wide overflow section designed to allow water and fish to flow over the structure.

The diversions are designed to convey the 1:100-year flow and are typically 6 m wide (base width) with 4:1 slope. The Clark Creek diversion is 1,200 m and the Teeple Diversion is 580 m long.

Table 4 - Design Parameters for the Clark Creek Diversion

Design Parameter	Unit	Clark Creek	Teeple
Embankment dam crest elevation	m	380.0	379.0
Dam overflow section invert elevation	m	379.9	378.7
Normal Water Level (NWL) elevation	m	378.75	378.5
Diversion channel inlet invert elv.	m	378.75	378.5
Diversion channel outlet elv.	m	377.6	371.5
Diversion channel gradient (average)	%	0.1	1.2
Diversion channel side slopes		4:1	4:1

Deviations from design occurred for both diversions, however not anticipated to have a negative effect of stability. Examples of deviation include absence of low flow channel, oversized boulders, variances on habitat feature frequency and riffles either not meeting design elevation or being too steep

2.4 Site Access

Access to Clark Creek and Teeple dam requires the MCL Gate Key to access the old Haul Road 1, via Teeple Road. The remaining diversion structures are normally accessible on site.

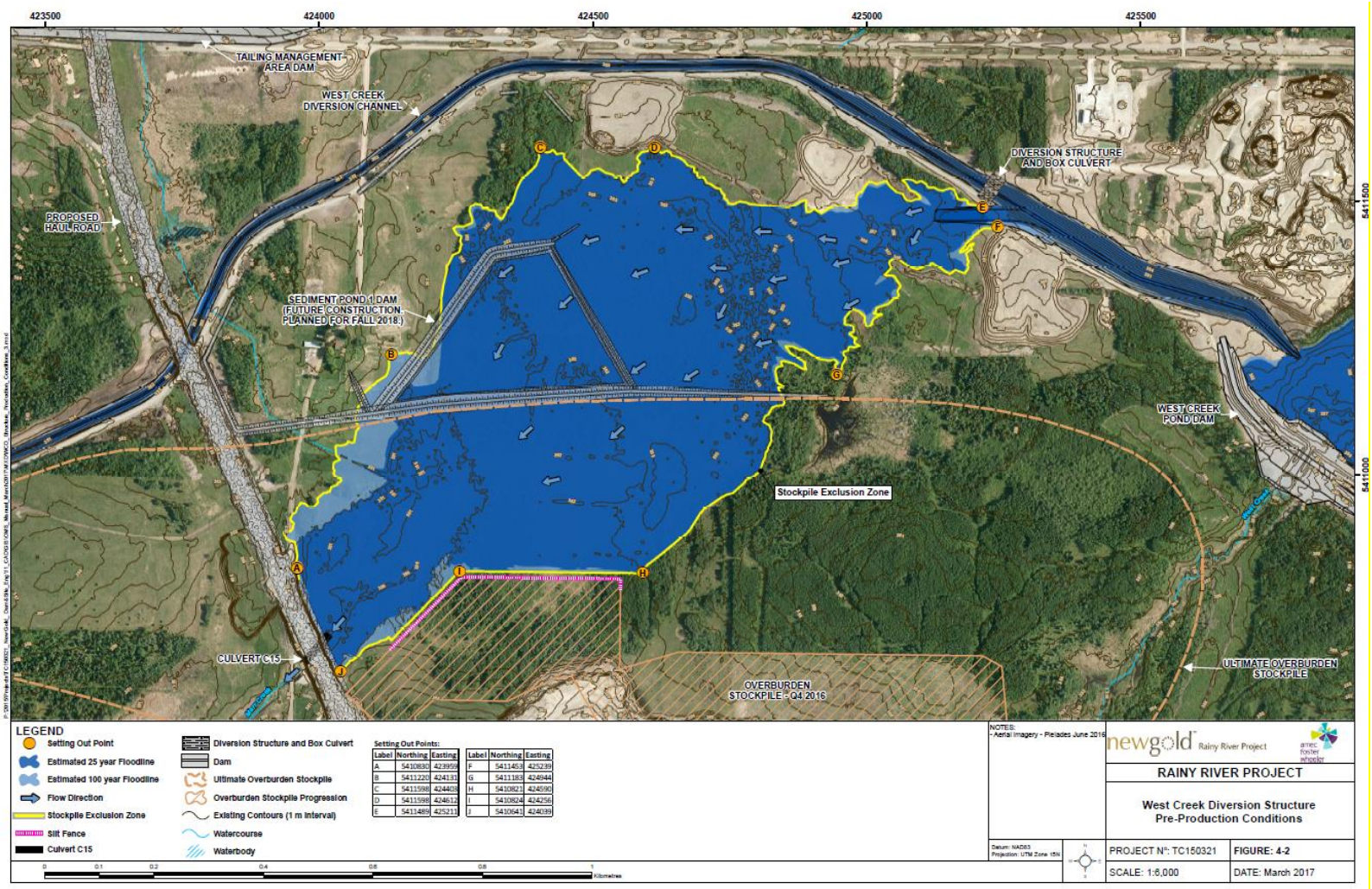

Figure 1 - West Creek Diversion Overflow Map

3.0 OPERATIONS

The freshwater diversion structures (dams and diversion channels) are designed to be operated passively. Clark, Teeple and West Creek Ponds are full, and the diversions are flowing naturally.

Stockpile pond is currently under investigation as the pond has not filled as per design. It is suspected that water is escaping into the underlying aquifer and bypassing the dam. Further investigations are planned for 2021, with potential solutions to be implemented late 2021 or 2022.

3.1 Closure Plan

Closure of the embankments will typically involve but is not limited to reaching of embankments to prevent ponding of water and revegetating slopes to reclaim the area. Some embankment structures will still have a role during the closure phase, and these will not be breached. Freshwater diversion and constructed wetland structures are designed to operate passively and will remain in place at closure

3.2 Reporting Requirements

Reporting is sub-divided as routine, planned reports of defined frequency, and those that are non-routine.

Routine

- Monthly monitoring report including a summary of all monitoring data collective, all non routine calibration/maintenance procedures, tabulation and description of any bypass/upset conditions
- Annual reporting to MECP on March 31 for the previous year, a works performance report and a surface water monitoring report
- Quarterly electronic effluent monitoring reports to ECCC
- Annual electronic effluent monitoring report and environmental effects monitoring reports to ECCC by March 31
- Annual reporting on compensation habitat to the Department of Fisheries and Oceans (DFO) as well as Environment and Climate Change Canada (ECCC) by December 31

Non-routine

- Report all spills as defined in the Environmental Protection Act immediately to spills action centre (SAC), follow New Gold Incident Reporting Guidelines and follow up in writing to MECP within 10 days describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation
- Any observation of sheen/foam/settable solids within the works report immediately to (SAC) immediately and written reporting within 7 days
- Any exceedance of effluent limits report to SAC immediately, written confirmation to MECP within 7 days

- If acute toxicity tests fail, within 15 days report in writing to MECP with the cause and remedial actions proposed/implemented
- Notify ECCC immediate if MMER Sch 4 limits are exceeded, pH is outside 6-9.5 range or if the effluent is acutely lethal with a written report within 30 days

Records are retained consistent with CEAA condition 11 for a minimum of 25 years or until decommissioning ends, whichever is longer and kept locally. This exceeds the ECA permit requirement of 3 years. Records include place/date/time of sampling, dates and analysis performed, analytical techniques used, names of persons collected/analyzing sampling and results of analysis.

Each of the regulatory approval requirements related to the construction, operation and eventual reclamation of the Site have specific compliance reporting requirements with defined deadlines or reporting periodicity. In general, the reporting includes:

- Operation, Maintenance and Surveillance Plan(s) for dams, water management (water quality) and air/noise emissions
- Emergency Preparedness Plan(s)
- As-Built Drawings and related Construction Reports
- Dam Safety Inspection and Review Reports
- Environmental Monitoring Plans
- Environmental Monitoring and Performance Reports.

The environmental approvals and permits received from the government that are maintained by the New Gold Environmental Department should be referred to for details of monitoring, inspection and reporting requirements.

In addition, the New Gold Environmental Department should be notified of any proposed major modification to RRM facilities, in order that they can liaise with the appropriate government ministries to determine if additional approvals or amendments to existing approvals are required.

4.0 MAINTENANCE

The following periodic maintenance is required:

- Maintain the tailings and reclaim pumps and associated lines and containment
- Clear debris, snow and ice which may block flow through the decant facility or emergency spillways
- Maintain water management structures including spillways, ditches, and diversions
- Maintain equipment, power and water lines, and instrumentation
- Repair any deficiencies as noted in the Dam Safety Inspections (DSI); and
- Reconstruct the support for tailings discharge pipelines wherever washouts occur.

Maintenance records are retained by maintenance personnel performing the work in accordance with the procedures described in this document. Timing of maintenance actions for unusual conditions should be based on specific recommendations from surveillance findings. Scope and time frames for routine maintenance activities are determined and scheduled by the Maintenance Department and based on manufacturer's recommendations and best practices.

The maintenance flowchart is illustrated in Figure 2.

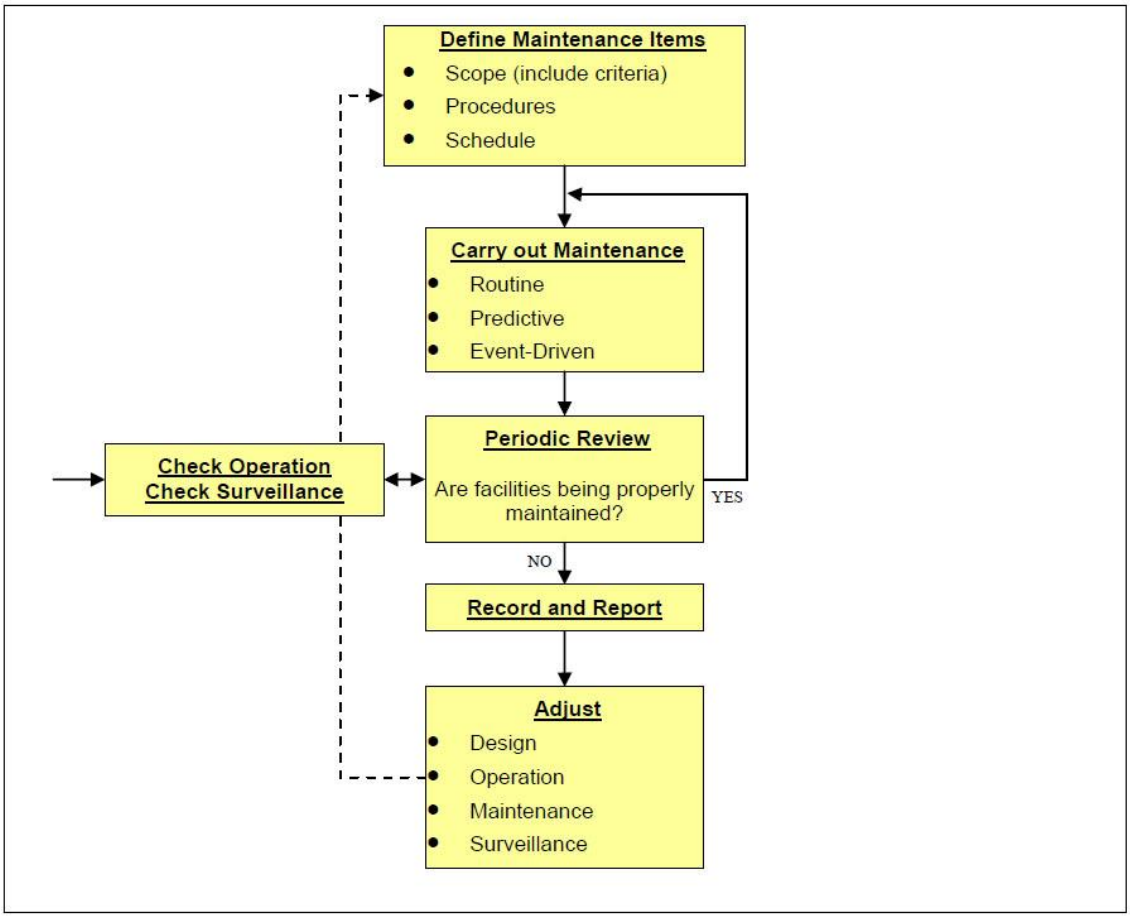

Figure 2 - Maintenance Flow Chart

4.1 Routine and Predictive Maintenance

Routine and predictive maintenance includes removal of vegetation, beaver dams, ice blockage or sediment accumulation that would otherwise affect the performance of a structure.

4.2 Dams

The following are examples of specific maintenance activities:

- Regularly check diversion ditches, spillways and culverts for accumulation of debris or sediment, or any other form of blockage including ice, and remove if required
- Visually inspect diversions, spillways, seepage collection sumps, dams and all ditches for cracking, bulging, slumping, and any other indications of slope movement (note, any indications of slope movement shall be reported to a qualified geotechnical engineer)
- Re-grade the dam crest, as required, to prevent local ponding and direct surface runoff towards the pond

- Repair erosion gullies, local slumps or slides in the dam face, diversion ditches or spillway channels
- Regularly check diversion ditches for accumulation of debris or sediment, or any other forms of blockage, and remove if required
- Removal of vegetation
- If annual survey determines necessary, correct dam crest, overflow spill way and diversion channel invert irregularities to avoid concentrated runoff

4.3 Geotechnical and Water Monitoring Instrumentation

Geotechnical and water monitoring instrumentation is calibrated by the manufacturer prior to shipment. Following instrument installation, initial reading procedures will be followed. Subsequent calibration will follow 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 instrumentation, several overlapping readings of the old and new instrument are required to ensure continuity of the data records.

4.4 Pumping Systems and Pipelines

Maintenance of the tailings delivery, water recirculation systems and seepage pumps will include:

- 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

The maintenance of pumps is the responsibility of New Gold and maintenance records are required to be maintained. Each pump requires spill pan, spill kit, and flotation device. Changes to pumping configurations, ditching, piping, or operating parameters need to be approved by the Environmental Manager. In an emergency call out (after hours), the Managers or their alternate, will provide direction in consultation with the New Gold Environmental Department.

Fundamental to the successful operation of the ponds and pumping strategy is a timely reaction to rainfall events, ensuring that pumps come 'online' or are taken 'offline' as design trigger levels are reached.

4.5 Mobile Equipment

Mobile equipment is maintained based on a planned reliability program and as otherwise required. Equipment includes:

- Dozers
- Excavators
- Water truck
- Pickup trucks
- Mobile crane
- Flatbed and picker truck
- Replacement of mobile equipment as required

4.6 Event Driven Maintenance

In the event of unusual conditions or incidents that require immediate maintenance actions but are not considered an emergency, repairs and replacement of facility components are made as required and activities documented. 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 RASCI.

4.6.1 Earthquake Occurrence

Subsequent to an earthquake, the following are undertaken:

- Inspect dam and beach areas for sign of distress due to deformation
- Inspect dam for signs of liquefaction (e.g., local sand boils, etc.)
- Measure freeboard for compliance with design requirements
- Inspect toe area of dam for signs of deformation or piping of fines
- Inspect diversions, ditches, and spillways for sign of slumping or changes in geometry
- Inspect seepage collection areas
- Collect instrumentation data and submit to EoR for analysis

4.6.2 Flood Event

Following a flood event, as defined in Table 9, the following will be undertaken:

- Measure freeboard for compliance with design requirements
- Inspect dam, diversions, ditches, spillways, and diversions for signs of excessive erosion

- Inspect seepage return system for adequacy
- Implement appropriate response based on observations/measurements as defined in this manual

4.7 Reporting Requirements

Maintenance information will be communicated as per RASCI chart and in accordance with this OMS Manual.

Equipment logs and manuals will be maintained for reference and use by responsible staff.

Maintenance diaries and logs shall be maintained and accessible for review by other parties.

5.0 SURVEILLANCE

5.1 Objectives

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.

5.2 Surveillance Procedures

A program of regular periodic surveillance is required to ensure that the facilities are performing adequately and that problems are detected for necessary corrective actions to be implemented in a timely manner. The following surveillance procedures will be conducted:

- Visual monitoring by site staff
- Measurement of geotechnical instruments
- Sampling and testing in accordance with requirements
- LiDAR and bathymetry survey
- Collection of climate data from weather station
- Annual Dam Safety Inspections (DSI)
- Dam Safety Reviews (DSR) to be conducted in accordance with CDA, based on dam classification
- Event driven geotechnical inspections following any extreme weather events, including wind, rainfall, or earthquakes

5.3 Visual Monitoring by Site Staff

Visual monitoring by site staff is undertaken to identify potential failure modes, the associated visual observations are described in Table 5.

Table 5 - Failure Modes and Observable Conditions

Failure Mode	Conditions Related to Possible Increased Risk of Potential Failure Mode
Overtopping	• High water level • Blockage of water management structures • Extreme meteorological event • Dam settlement • Excessive accumulation of solids (near reclaim pocket) • Erosion from burst tailings pipe
Instability	• Cracking • Dam settlement • Slope movement

	• Dam bulging • Increased pore water pressures within the dam • Increased seepage • Erosion • Seismic event
Piping	• Sediment laden seepage • Wet spots at downstream dam toe or on downstream slope • Sinkholes

Inspection frequencies are followed as per Table 6. The TMA and WMP dams are inspected simultaneously to the tailings pipelines (See MIL-CND-SOP-0009 for details). Forms are available in Appendix G.

Table 6 - Inspection Frequencies

Type	Frequency
Routine Inspection:	
Dam	Target 2x per shift
Diversions	Monthly
Sediment Ponds	Monthly
Ditches	Weekly
Seepage collection system	Target 2x per shift
Spillways	Weekly
Pipelines & Spigots	Target 2x per shift
Tailings Pond Monitoring:	Weekly
Pump intake	Target 2x per shift
Inflows, Outflows, Condition	Monthly
Annual Dam Inspection	Annually, with no snow cover
Event Driven Inspection	Following unusual events (defined in Table 9)
Comprehensive Review (DSR):	
Low and Moderate HPC dams	Every 10 years and prior to decommissioning
Very High HPC dams	Every 5 years and prior to decommissioning

All dams are formally inspected by the Tailings Dam Engineer monthly and results are reported to management and the EoR. During snow cover, access to Clark Creek Dam and Teeple Pond Dam may restrict formal inspections but will be attempted.

5.4 Geotechnical Instrumentation

The performance of the dams is monitored using a variety of instruments. Instrumentation measurements, along with visual inspections, serve as the primary mechanisms for performance monitoring of the TMA and Water Management dams. A brief description of each instrument is provided below. Additional details are available in BGC-4910-DT00-MAN-0002.001.

- Slope Inclinometers (SI) – A vertical PVC pipe (either red or blue) installed through the ground typically into bedrock that measures horizontal deformation

- Vibrating Wire Piezometers (VWP) – A pressure transducer and polyurethane coated wire that measures the pore water pressure within the dam fill materials and foundation soils

- Standpipe Piezometers – A vertical PVC pipe with a perforated or screened section that is capable of measuring water levels and allows collecting water samples

- Settlement Plates – A base plate is installed at some depth with a riser pipe extending to surface, which allows the monitoring of vertical consolidation/settlement of soils

- Magnetic Extensometers – Used to monitor vertical consolidation, these are installed as a series of magnetic rings, either around corrugated PVC tubing or slope inclinometer casing within the foundation

- Survey Monuments – A bar of steel is driven into the ground and the top of the bar is surveyed to monitor displacement

The following sub-sections are subject to change and should be read in conjunction with BGC-4910-DT00-MEM-0014.001.

5.4.1 Reading Frequency

Table 7 presents the data collection, reporting, and submission frequencies for geotechnical instrumentation. Note that these frequencies may change based on EoR observations.

Table 7 - Data collection, threshold reporting, and data submission frequencies

Instrument Type	Data Collection/Processing and Threshold Exceedance Reporting Frequency (Days)			Data Submission Frequency
	Active Construction	Post Construction	Operations	
SI	7	14	30	30
VWP	Twice Weekly	7	7	7
Standpipe	7	14	30	30
Settlement Plate	30			30
Magnetic Extensometer	30			30
Survey Monuments	30			30

Leveloggers are installed in all diversion Ponds. These readings are collected quarterly by the Environment team.

5.4.2 Data Collection and Processing

The Tailings Dam Technician is responsible for data collection and maintenance of the VWP automated system. All instruments are manually collected, except for VWP. The VWP is connected to a datalogger, which records hourly readings for the instrument. These readings are then transmitted by radio frequency to Hubs located at the Marr site or the E-House at the intersection of WD4, WD5 and Cell 1 Dam. The Hubs transmit the collected data through cell service to the Cloud, which is stored as .csv files. These files are located at:

\\pcs01-yag\Campbellsci\LoggerNet

All geotechnical instrumentation is processed using VBA enabled excel spreadsheets. These spreadsheets store the collected data from all instruments. Additional tools for scheduling, quality assurance, monitoring trends and reporting are built into the sheets. These files are located at:

\\FPS02-YAG\\Engineering\Geotechnical\07 - Instrumentation (V: Drive)

The Tailings Dam Engineer is accountable for scheduling, collecting measurements, assuring data, and maintenance of geotechnical instrumentation. The EoR is responsible for interpretation of this data.

The raw data provided by the Barron Weather Station is used in the piezometer processing sheets to correct for barometric pressure.

5.4.3 Thresholds

Instruments have been installed to form a network of monitoring points to provide information as a basis to assess geotechnical performance of the TMA and Water Management dams. Instrument measurements are compared against defined thresholds linked to the design basis. 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.

5.4.4 GIS

The VWP have been included in the New Gold GIS web viewer. These are updated twice weekly using the processing sheets. While it is intended for all instruments to be integrated into the New Gold GIS web viewer, only the VWP have been added. The following folder link stores the automated process for adding piezometers into the GIS system:

V:\Engineering\Geotechnical\07 - Instrumentation\00) GIS

The “To_Import.csv” file is updated using the processing spreadsheets. Once complete, it is copied into the “To_Import” folder. A script searches every 30 seconds for a file and automatically

uploads the data to the GIS web viewer. The “To_Import.csv” is then moved to the “Imported” folder and relabelled with the time it was uploaded (YYYY-MM-DD_HRMMSS).

To view this data in the GIS web viewer, the “Geotechnical Database” must be selected. The layers “Piezos 30-Day Rolling V2” or “Total Head Elev. By Geology” are both updated through this process. The symbols used for the 30-Day rolling are as shown in Figure 3. The green, yellow, and red colours indicate that it is either below, above trigger, or above alert thresholds, respectively. The numbers indicate the magnitude of change in the last 30 days.

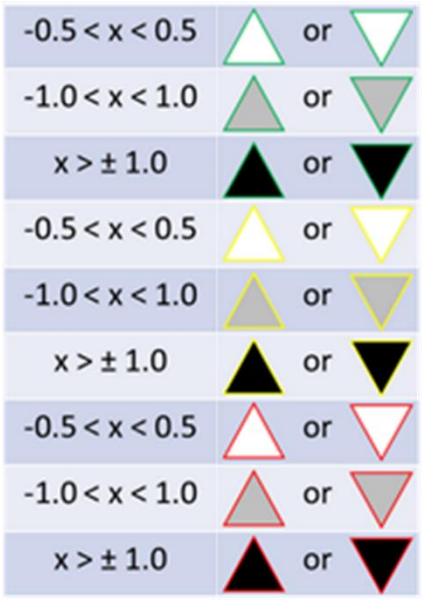

Figure 3 - Symbols for VWP used in GIS

5.5 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) #7004-BC7KQ5 issued on February 11, 2020 by the Ontario Ministry of Environment, Conservation and Parks (MECP), replacing expired ECA #5781-9VJQ2J (construction) and rescinded ECA #5178-9TUPD9 (operation) issued on May 8, 2015 and September 1, 2015 respectively. 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 Department collects all water and effluent quality samples. Water and effluent quality data is stored by the Environment Department in the environmental data management software EQuIS by EarthSoft. A water and effluent quality sampling schedule is

produced by the Environment Department in Q4 annually for the following year to ensure compliance with ECA and other regulatory sampling requirements.

5.6 Survey

All dam crest elevations and spillway/diversion channel invert elevations will be surveyed annually. This is to verify that foundation consolidation has not lowered the effective containment elevations of the dam structures.

5.7 Weather Stations

The RRM weather station was installed at the Barron Site in September 2016 and is maintained by the Environment Department. The data collected by the Barron weather station is hosted by Campbell Scientific, and the data is updated twice per day at 09:00 and 16:00. In Q4 2020, the Barron weather station was upgraded to include an all-weather precipitation gauge, snow depth sensor, evaporation pan and newer models of existing instruments.

5.8 Dam Safety Inspections

The annual Dam Safety Inspection (DSI) is completed by the EoR, typically during the summer months. Recommendations from the DSI are recorded in an action tracker to closure.

The DSI is not required when the Dam Safety Review (DSR) is completed.

5.9 Dam Safety Reviews

The Dam Safety Review (DSR) is a requirement of the CDA. DSR scheduling requirements are summarized in Table 8. 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 CDA Dam Safety Guidelines recommend that a DSR be conducted every 5 years for an EXTREME consequence dam.

Table 8 - DSR Schedule

Dam Name	Construction Complete (DD-MMM-YY)	CRR Issued	Date of Initial Filling	Initial DSR (3 year from filling)	DSR Frequency (5 years from initial)
TMA AND WMP DAMS					
TMA North Dam	05-Sep-18	15-Jan-19	2019	2021	2026
TMA West Dam (Dam 4)	18-Jul-17	31-Oct-17	2019	2021	2026
Settling Pond Dam	18-Jul-17	31-Oct-17	2018	2021	2026
TMA West Dam (Dam 5)	07-Aug-17	31-Oct-17	2017	2021*	2026
TMA South Dam (0+000 – 0+800)	06-Sep-17	06-Dec-17	2017	2021*	2026
TMA South Dam (0+800 – 1+250)	19-Oct-17	15-Jan-19	2018	2021	2026
TMA South Dam (1+250 – 3+250)	16-Nov-18	29-Mar-19	2019	2021	2026
TMA Cell 1 Dam**	03-Sep-17	06-Dec-17	2017	NA	NA
TMA Cell 2 Dam**	NA	NA	2018	NA	NA
WMP Dam 1	18-Oct-16	31-Oct-17	2018	2021	2026
WMP Dam 2	02-Jul-17	31-Oct-17	2018	2021	2026
WMP Dam 3	07-Jul-17	31-Oct-17	2018	2021	2026
WATER MANAGEMENT DAMS					
Sediment Pond 1 Dam	31-Oct-18	12-Aug-19	2019	2021	2026
Sediment Pond 2 Dam	24-Sep-17	29-Dec-17	2017	2021*	2026
Sediment Pond 3 Dam			2020	2021	2026
West Creek Pond Dam	21-May-17	29-Dec-17	2017	2021*	2026
Stockpile Pond Dam	11-Oct-17	12-Jan-18	2018	2021	2026
Mine Rock Pond Dam	04-Dec-16	19-May-17	2017	2021*	2026
Clark Creek Pond Dam	25-Nov-16	19-May-17	2017	2021*	2026
Teeple Pond Dam	23-Sep-18	27-Feb-19	2019	2021	2026
Water Discharge Pond Dam	31-Oct-18	12-Aug-19	2019	2021	2026
Plant Site Ponds					

* Initial DSR is due 2020 but will be completed in 2021.
** Dams to be overtopped and inundated by tailings.

5.10 Event Driven Procedures

A list of unusual events and post-inspection requirements are given in Table 9.

Table 9 - Inspection Requirements Following Unusual Events

Unusual Event	Post – Event Inspection/Surveillance
Earthquakes	Carry out a detailed walkover of all dam structures, including crests, downstream and upstream (visible) slopes and dam toes, and all spillways, looking for signs of cracks, bulging, settlement, and/or other deformations. Look for and note any changes in seepage, particularly with respect to the rate of seepage flows at dam slopes and seepage clarity. Read all piezometers. Inspect downstream toes of dams for sand boils and dam slopes for sinkholes. Inspect ponds upstream of the dams looking for 'whirlpools. Inspect all pump stations and pipelines. Discuss findings with the Engineer of Record.
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 likely used in design)	Check the condition of erosion protection on the upstream slopes of the dams.
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 possible 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.
Significant, relatively rapid erosion (any cause) of dam slope of 'sudden' seepage break at dam slope or downstream of dam in form of continuous seepage or boils	Notify Tailings Dam Engineer and EOR. Inspect clarity of seepage, rate of seepage and amount of material sloughed. Consider initiating Emergency Response Plan
Pond level close to, or approaching a critical level	Notify Environment Manager. Consider initiating Emergency Response Plan
Significant change in an instrumentation reading –	Check the historical readings paying special attention to seasonal changes and check the measurement again.

Unusual Event	Post – Event Inspection/Surveillance
see table below for definition of significant change	Carry out visual inspection of all areas in the vicinity of the instrument of interest. Contact the Engineer of Record.

5.11 Documentation

Documentation of surveillance and monitoring activities shall be maintained by the Environment Manager, or as designated, as described in the preceding sections and will include recording of:

- Routine visual observations (departures from normal conditions)
- Photographs
- Instrumentation monitoring
- Analyses and evaluations
- Reviews

Documentation will include, as a minimum, the following:

- Weekly routine inspection log
- Monthly tailings facility and process water pond monitoring report
- Monthly instrumentation reports
- Annual Dam Safety Inspection reports
- Comprehensive Dam Safety Review report

Documentation will include a electronic filing system for inspection reports, photographic and video records, incident reports, instrumentation readings, instrumentation plots, annual inspections and third-party reviews, readily available for review in an emergency event.

5.12 Reporting

The Mill Manager, or designated responsible party, and Geotechnical 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 MNRF. Reporting includes:

- As built reports of the dams, excluding the Clark and West Creek diversions, 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:
    - 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.

6.0 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 Response and Preparedness Plan (ERPP) is outlined in Part 8 of the OMS.