RAINY RIVER PROJECT

PART I - GENERAL - OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL WATER MANAGEMENT STRUCTURES

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1.0 INTRODUCTION

The Rainy River Mine (RRM) is located in the Rainy River District, in northwestern Ontario in Chapple Township, approximately 65 kilometers (km) northwest of Fort Frances and 420 km west of Thunder Bay. The mine includes an open pit mine, a mill, tailings management area (TMA), process water and water treatment structures. The project is currently in its third year of construction and first year of operations at the time of this Operation, Maintenance and Surveillance (OMS) manual update (to September 10, 2018).

This OMS Manual has been prepared by New Gold Inc. (NGI) for the Rainy River Mine (RRM). This document serves as a reference for the safe operation of the structures related to tailings, water management, and water diversion.

Because of the many facilities at the RRM, the OMS Manual has been separated into "Parts", as listed below:

- Part 1: General – Tailings and Water Management Structures
- Part 2: Tailings Management Area (TMA)
- Part 3: Water Management Pond (WMP)
- Part 4: Mine Rock Pond (MRP)
- Part 5: Sediment Ponds
- Part 6: Freshwater Diversions
- Part 7: Water Treatment
- Part 8: Pinewood and Culverts
- Part 9: Emergency Preparedness Plan (EPP)

The OMS is a requirement of the Ministry of Natural Resources and Forestry (MNRF), Lakes Rivers Improvement Act (LRIA) approvals, and has been prepared in general accordance with the latest guidelines titled "Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities:" developed by the Mining Association of Canada (MAC, 2011).

New Gold is also committed to an integrated water management including water balance and water quality that applies to all mining activities undertaken and during the Rainy River Mine (RRM) operations and closure.

The goal of the OMS Manual is to provide specific guidance the operation to the Tailings, Water Management and Water Diversion dams. The objectives of this OMS are to define and describe the following:

- Roles and responsibilities of personnel assigned to the facility;
- The key components of the facility;
- Set out procedures required to operate, monitor the performance of, and maintain a facility to ensure that it functions in accordance to design, meets regulatory and corporate policy obligations, and links to emergency preparedness and response;

- Procedures and processes for managing change;
- Requirements for analysis and documentation of the performance of the facility;
- Serve as a training document for personnel that are new to the mine;
- Identify potentially unsafe conditions or indicators and provide links to emergency response procedures; and
- Satisfy the requirements of the Mining Association of Canada's (MAC) guidelines Towards Sustainable Mining (TSM) initiative.
- Meet regulatory requirements with regard to surface water quality management, monitoring and contaminant releases;
- optimize water resources on-site, to support the water balance in minimizing make up water requirements and to meet discharge criteria;
- define processes for the release of contaminants from approved discharge locations;
- define monitoring requirements to ensure any impacts are measured and potential pollution is minimized; and
- Identify contingencies for the release of contaminants in the event discharge criteria are not met.

The OMS Manual covers operations of the facility through the commissioning, operations, and closure phases of the Rainy River Mine. The tailings facilities include the equipment and operations beginning with the tailings discharge from the mine mill, pipelines, deposition equipment, tailings, water treatment and water management (seepage collection ponds) and water diversion. In addition, the OMS guides operators and staff on when to initiate the Emergency Preparedness Response Plan (EPRP).

This management plan also covers the management of surface water quality including monitoring and discharge. Groundwater is not part of the scope of this plan, except for seepage collection systems, as releases are to surface water, and monitoring for groundwater is through the groundwater monitoring plan. This plan is developed pursuant to conditions 3c and 3e of the operations ECA. Reference is made to the construction ECA discharges to allow for transition between project phases and part of the current discussions with the authorities is to merge both ECAs into one.

This document has been prepared primarily for use by the mine personnel who are responsible for the operation, maintenance and surveillance of the tailings facility. It contains information and instructions necessary to perform the above required activities. Comprehensive checklists and procedures for operation, maintenance and annual inspections are utilized by the RRM e.g., through the SAP work order system and are not reproduced herein.

Water and water quality is a significant and important resource to all Communities of Interest (COI). The RRM has a positive water balance and has been permitted to discharge, ultimately into the Pinewood River, which is a river that supports indigenous use, sport fishing and other water users. The receiving capacity of Pinewood River is variable and limited due to low summer and winter flows and high freshet and storm driven flows.

This plan has been developed as part of the site operation, maintenance and surveillance (OMS) manual and in fulfilment of Operations Environmental Compliance Approval (ECA) 5178-9TUPD9 condition 3(1)(e)&(c).

1.1 Regulatory Requirements and Guidelines

This document is consistent with the New Gold Tailings, Heap Leach and Waste Rock Facilities Management Policy and was prepared pursuant to the MAC guidelines for *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities* (MAC, 2011).

There are a number of Federal and Provincial environmental approvals required to construct, operate, and eventually reclaim the mine. Key Provincial legislation related to the RRM includes the: *Ontario Water Resources Act*, *Environmental Protection Act*, *Endangered Species Act*, *Mining Act*, *Lakes and Rivers Improvement Act*, *Public Lands Act* and *Planning Act*. From the Federal perspective, the *Fisheries Act* and the associated Metal and Diamond Mining Effluent Regulation are the primary regulatory instruments related to the RRM.

The primary approval(s) for construction of the various hydraulic structures and associated water storage facilities are as follows:

- Work Permits from Ontario Ministry of Natural Resources and Forestry (MNRF), under the *Lakes and Rivers Improvement Act* (LRIA).
    - These permits approve the design of the dams and appurtenances, in accordance with the provided design drawings and report.
    - LRIA approvals are generally required for each annual dam raising campaign.
- Discharge of effluent (e.g. from the TMA) is governed by the Environmental Compliance Approvals (ECAs) for Industrial Sewage Works issued under the *Environmental Protection Act* by the Ontario Ministry of the Environment Conservation and Parks (MECP).
    - The ECAs dictate the quality and quantity of effluent allowed to be discharged to the environment as well as other measures intended to ensure the environment is protected; as well as the overall design of the facility.
- Permits to Take Water (PTTWs) issued under the *Ontario Water Resources Act* direct water takings associated with the Site, including dam foundation dewatering and water supply from the Pinewood River.
    - Where water takings (surface or groundwater) are required to support construction and operation, they are generally restricted by the PTTWs received from the MECP which limit the volume of water that can be taken from the environment.
- A Closure Plan has been filed with the Ministry of Energy Northern Development and Mines (ENDM) under the *Mining Act,* which describes the planned development and operation of the RRM, the proposed approach to closure of the RRM, and outlines the associated financial assurance related to closure aspects.

- This Closure Plan will be amended from time to time as required, such as any changes to the proposed operation of the TMA, or other changes to the RRM which are deemed to be material.

- The Closure Plan primarily focuses on the physical and chemical stability of the site post-closure or during a temporary shutdown scenario.

- Planning to date has assumed long term cover of the potentially acid generating (PAG) tailings to inhibit oxidation.

In addition to these and other regulatory approval requirements, a number of commitments were made regarding the RRM through the Federal and Provincial environmental assessment processes. These commitments were initially tabulated in Table 14-1 of the Rainy River Project, Final Environmental Assessment Report (AMEC, January 2014) and are maintained and tracked by the Environmental Department as the Rainy River Mine Commitments Registry. In particular, the Federal environmental assessment decision statement condition 3 states the following:

3.1 The Proponent shall minimize changes caused by the Designated Project to water levels and water flows in the Pinewood River, the Minor Creek System, and the Modified Minor Creek System in such a way as to protect fish and fish habitat, by implementing mitigation measures including, but not limited to;

- 3.1.1 recycling of water, for ore processing, from the tailings management area and ponds constructed for water management;
- 3.1.2 optimizing the timing, position and quantity of final effluent discharge between the final effluent discharge points;
- 3.1.3 filling the open pit during the decommissioning and abandonment phases in a manner which meets the flow requirements in the Pinewood River while allowing the pit to be filled as expeditiously as possible to reduce any adverse environmental effects; and
- 3.1.4 not taking water from the Pinewood River when flows are below the minimum threshold set by Ontario.

3.2 The Proponent shall, for all effluent, comply with the Metal Mining Effluent Regulations, the Fisheries Act and any site-specific water quality requirements set by Ontario. To ensure compliance, the Proponent shall implement, at a minimum, the following mitigation measures:

- 3.2.1 treat effluent prior to discharge to the environment;
- 3.2.2 treat tailings slurry to break down cyanide and precipitate heavy metals;
- 3.2.3 collect site contact water and seepage in ditches and divert to either the tailings management area or water management facilities for release via final discharge points;
- 3.2.4 install and operate a water quality control structure in the constructed wetland to prevent the release of final effluent discharge not compliant with the Regulations or requirements;

The Proponent shall control acid rock drainage and metal leaching so that all effluent and passive outflow from the Project Site comply with the Metal and Diamond Mining Effluent Regulations, any site-specific water quality requirements set by Ontario, and the Fisheries Act, as applicable at any time. To ensure compliance, the Proponent shall implement, at a minimum, the following mitigation measures:

- 3.3.1 line the former Clark Creek channel (under the east mine rock stockpile) with non potentially acid generating material;
- 3.3.2 sort waste rock into potentially acid generating and non-potentially acid generating rock stockpiles through the development and implementation of a detailed mine rock segregation program using criteria for determining potentially acid generating material set by Ontario;
- 3.3.3 design and construct the perimeter ditching around the east mine rock stockpile and low grade ore stockpile to accommodate a 100-year flood event;
- 3.3.4 use potentially acid generating material only for the purpose of constructing the tailing management dam, where saturated conditions can be maintained. Potentially acid generating material must not be used for any other construction purpose;

The following Provincial environmental assessment approval and conditions of approval are also of note, including

- Collectively and individually, the processes and water management strategies proposed for the RRP are Best Management Practices and/or Best Available Technology Economically Achievable (BATEA), and NG has committed to the use of such processes and water management strategies in the Final EA Report
- Treatment of the tailings slurry to levels equal to or less than 1 mg/L weak acid dissociable cyanide before deposition in the tailings management area (which is well below the 50 mg/L weak acid dissociable cyanide threshold criteria outlined by the International Cyanide Management Code);
- Using in-plant SO2/Air treatment for cyanide destruction and heavy metal precipitation to optimize the quality of groundwater seepage associated with the tailings management area during operations and following mine closure;
- Managing the site for ARD control, both during operations and following closure to prevent adverse water quality impacts to the Pinewood River, including that associated with any groundwater seepage;
- All final discharge points will have a point of control to immediately cease discharge. A control structure will be constructed at the discharge points to be in compliance with MDMER.
- Runoff and seepage from the TMA and stockpiles will be captured, monitored, and either released to the environment if applicable criteria are met and/or re-used in the process plant during operations.
- Open pit dewatering water will be contained and if necessary, treated before it is discharged to the environment.

Where pertinent to the operation of tailings and water management and water diversions, specific regulatory approvals have been included in this manual (Table 1-1). However, the full list of regulatory conditions has not been reproduced herein and should be reviewed, where required, including when changes to the OMS of the facilities are considered. The full list of regulations, permits and approvals associated with this OMS are available through the site environmental team who should be contacted for the most current environmental approval and regulatory requirements.

Table 1-1 Summary of Permits and Approvals Relating to the OMS

Legislation	Permit	OMS Component	Influence
Environmental Protection Act	Environmental Compliance Approval #0412-A2LR4V (Air)	TMA	Limits and requirements related to emissions and discharges related to air.
	Environmental Compliance Approval #5178-9TUPD9 (Industrial Sewage)	TMA, process water management and water treatment	Limits and requirements related to emissions and discharges to the environment.
Ontario Water Resources Act and O.Reg 387/04	PTTW number 8776-9W2QN3	WMP/Pinewood River	Defines water taking limits and defines reporting and monitoring requirement
	Permit to Take Water – Surface and Groundwater PTTW 0040-9VUL6B and PTTW 7430-AYEN78 TMA Infrastructure	TMA and process water management	Defines water taking limits and defines reporting and monitoring requirement
	Permit to Take Water – Surface and Groundwater PTTW 2133-9VUPVZ and PTTW 8101-AY8HT5 Construction Phase	Fresh Water Diversions and Water Treatment	Defines water taking limits and defines reporting and monitoring requirement
Lakes Rivers Improvement Act	FF-2015-02B (as amended) West Creek Diversion and Dam	Freshwater Diversions	Management, protection, preservation and use of waters and lakes. Ensure that dams are suitably located, constructed, operated and maintained.
	FF-2015-03B Clark Creek Diversion (as amended)	Freshwater Diversions	
	FF-2015-04 Tailings Management Area	TMA, Process Water Management and Water Treatment	
	FF-2015-04A (as amended March 6, 2017) Water Management 4 and 5	Process Water Management	
	FF-2015-04B (as amended March 6, 2017) Water Management Ponds1, 2 and 3	Process Water Management	
	FF-2015-04C Tailings Management Area (Start-Up Arrangement), Haul Road 13 and TMA Start-Up Cell	Tailings Management Area	

Legislation	Permit	OMS Component	Influence
	FF-2015-05A (as amended) Mine Rock Pond	Process Water Management	
	FF-2015-07 Pinewood River Intake/Discharge Structure	Process Water/Water Treatment	Management, protection, preservation and use of waters and lakes.
	FF-2017-03 Tailings Management Area Cell 2	Tailings Management Area	Management, protection, preservation and use of waters and lakes. Ensure that dams are suitably located, constructed, operated and maintained.
Endangered Species Act	ESA Permit FF-C-001-14	All	Defines project boundaries, disturbance limits including noise and dust and reclamation
Fisheries Act	Authorization 15-HCAA-00039	Freshwater diversions	West, Clark, Teeple, Stockpile dams and diversions
	Metal Mining Effluent Regulation (MMER) discharge notification	TMA, WMP Water Treatment and seepage	Standards/limits for quality of effluent discharged into waters frequented by fish.
Ontario Environmental Assessment Act	Provincial EA Approval Conditions	All	Conditions subject to the Approval to proceed with the planning, design, construction, operation and closure of a combination open pit and underground gold mine.
Federal Canadian Environmental Assessment Act 2012	Federal EA Approval Conditions	All	Conditions in relation to the environmental effects referred to in subsection 5(1) of CEAA 2012, with which the Proponent must comply.
Environmental Assessment (EA) Act	Environmental Assessment (EA) Commitments	All	Commitments identified in the final Environmental Assessment (EA) Report, in accordance with the Federal Environmental Impact Statement (EIS) Guidelines and Provincially approved Amended Terms of Reference (ToR).

1.2 Review and Update

The accountability for review and updates of the OMS Manual is with the Mill Manager (who will designate responsibility for the review) as well as the General Manager who has final site authority.

Updates to the OMS manual are required to incorporate change as facilities are constructed or change in facility design, performance, capacity, operations/closure requirements, site

management, roles and responsibilities, regulations or procedures. When updated the OMS manual will be reviewed by the Environmental Department, Engineer of Record (EOR) and annually, as part of review by the Independent Tailings Review Board (ITRB) or at their request.

The OMS will be updated prior to operating new structures. The OMS manual will be reviewed, at minimum, on an annual basis. The OMS manual will be submitted to MNRF as defined by permit conditions as part of annual updates.

Previous revisions and future proposed revisions are outlined in the revision history presented below (Table 1-2). Comments from the MNRF and ITRB are included in Appendix G. This revision history will be updated for each revision – this revision is current to August 15, 2017.

Table 1-2 OMS Revision History

Revision	Addition	Details	Date
Pre-Production OMS Manual (3098004-000000-A1-EMA-0001):			
AG	Revised Final for Pre-Production	Updated dam design criteria, instrumentation details – submitted for MNRF review and comment	August 31, 2016
AH	Revised Final for Pre-Production	Updated in response to MNRF comments – see appendix G	October 5, 2016
AI	Revised Final for Pre-Production	Removed reference to WMP filling plan	November 10, 2016
AJ	Final with West Creek Diversion updates	Required by MNRF in West Creek Diversion LRIA approval	March 31, 2017
00	For Use	WMP Filling, Clark Creek Diversion (MNRF approval April 28, 2017)	May 1, 2017
01	For Use	Updated for WMP filling above 364.7	July 2017
OMS Manual for Operations (3098004-000000-A1-EMA-0002):			
AC	Final draft	Including TMA Start-up Cell details submitted to MNRF	March 31, 2017
OMS Manual – Current revisions			
2017-08	Updated based on ITRB comments and MNRF conditions for MRP and Cell 2 and 3	ITRB comments (Appendix G) responses • Updated sections to current project status and current to Aug 15, 2017 • Contact list updated (s2.3) • Revised geology section re plastic clay tills (s3.3) • Included trigger levels for instrumentation and defined	August 2017

Revision	Addition	Details	Date
		thresholds for event driven surveillance (Table 7.3) • States responsibility for OMS updates (s1.2 and s2.2) • Reworded reference to MNRF screening but submission for comment (s1.2) MNRF requirements consistent with LRIA permit conditions • Mine Rock Pond (s4.3.2 and s5.3.2) • Cell 2 (s4.2.2. and s5.1.2) • Cell 3 (s4.2.3 and s5.1.2)	
2018-03	TMA Cell 2 completion	Including updated OMS prior to the commissioning of TMA Cell 2 Update to include the Contaminant Release, Surface Water Quality and Monitoring Plan as per MECP ECA requirements Including as built drawings for the WMP, MRP, TMA Cell 1 and 2 and WCD consistent with LRIA permit conditions Including a responsibility matrix, as per ITRB's recommendation	October 2018
Future Planned Updates – excludes updates required as a result of unplanned changes			
TBD	Water Discharge Pond and Constructed Wetland	Update OMS prior to the commissioning of theses facilities	November 30, 2018 or as determined by LRIA conditions of approval
TBD	Sediment Ponds 1 and 2	Update OMS prior to the commissioning of theses facilities	
TBD	Annual update 2018	Annual review and update e.g., include ITRB comments	November 2018

1.3 Supporting Documents

The OMS manual and supporting documents will be stored in a location accessible to those required to follow the manual i.e., RRM sharepoint site. The list of supporting documents (Table 1-3) isn't an exhaustive list and permit approvals are based on applications and supplemental information which need to be followed (see list of regulatory permits and approvals Table 1-2).

The following documents and procedures are relevant to the geotechnical site investigations, design, construction, and operation of the TMA, process water ponds, and freshwater diversion dams and channels are listed below (Table 1-3). However, additional information is provided in the facility description section of this manual (see section 4). A list of supporting drawings is provided in Appendix A. Additional details regarding pumping requirements, tailings pumping and

pipeline designs and water recirculation pumping and pipeline designs are provided in Appendix B.

Safety requirements for work at the RRM and apply to work associated with the OMS are documented on the RRM health and safety sharepoint site and include;

- Hazard Identification and Risk Management;
- Document Records and Development Control;
- Training and Competency Awareness;
- Incident Management;
- Job Hazard Analysis; and
- Emergency Preparedness and Response Plan (EPRP) for the Site (New Gold, 2017).

Table 1-3 Supporting Documents

Document Number				Document Title
RRP	GEO	MEM	001	ITRB Recommendations and Implications
RRP	GEO	MEM	002	Dam Change Effect on Constraint in Northwest
RRP	GEO	MEM	004	Supplemental Information West Creek Diversion Amendment
RRP	GEO	MEM	006	Design Criteria for TMA Dams
RRP	GEO	MEM	011	WMP Fill Plan Memo
RRP	GEO	MEM	012	West Creek Diversion Channel - Overflow Diversion Structure
RRP	GEO	MEM	013	Clark Diversion Channel - As Built Hydraulic Assessment
RRP	GEO	MEM	17A	WMP Borrow Filling (Formally WMP Level 1 Filling)
RRP	GEO	MEM	019	LRIA: Mine Rock Pond Amendment
RRP	GEO	MEM	020	WMP Borrow Filling - Supplemental Information
RRP	GEO	MEM	021	West Creek Diversion Amendment Box Culvert
RRP	GEO	MEM	025	Dam 1 Work Authorization
RRP	GEO	MEM	026	WMP Dam 1 - Geotech Investigation and Stability Analysis
RRP	GEO	MEM	030	TMA South Dam - Haul Road 13 Construction
RRP	GEO	MEM	033	Teeple Dam IDF Stability
RRP	GEO	MEM	034	West Creek Diversion Channel - Sequencing of Sediment Pond 1 Dams
RRP	GEO	MEM	037	Water Management Pond Water Intake Structure
RRP	GEO	MEM	039	Clark Creek Plans and Specifications Comments & Responses
RRP	GEO	MEM	043	TMA LRIA - TMA Start Up Cell Seepage Collection - Supplemental Information
RRP	GEO	MEM	056	Teeple Permanent Repair - Supplemental Information
RRP	GEO	MEM	063	Seismic Stability Assessment of TMA Dams
RRP	GEO	MEM	065	Permanent Seepage Collection Drawings Comments & Reponses
RRP	GEO	MEM	071	Teeple Pond Diversion Channel Completion
RRP	GEO	MEM	074	Clark Pond Diversion Channel Completion
RRP	GEO	MEM	076	Addendum to WMP Dams 1,2,3 and Dam 4 and 5
RRP	GEO	MEM	080	Stockpile Pond Diversion Channel Completion
RRP	GEO	MEM	088	Clark Creek Dam Completion
RRP	GEO	MEM	089	Teeple Road Dam Completion

RRP	GEO	MEM	100	MNRF QAQC Information Request
RRP	GEO	MEM	104	Seismic Stability Assessment of MRP Dam
RRP	GEO	MEM	106	Seismic Stability Assessment of MRP Dam - ITRB Responses
RRP	GEO	MEM	108	TMA Cell 2 - Design Criteria
RRP	GEO	MEM	114	Appendix A of RRP-GEO-REP-026
RRP	GEO	MEM	115	Appendix B of RRP-GEO-REP-026
RRP	GEO	MEM	116	TMA Cell 2 - Sump Sizing
RRP	GEO	MEM	119	Stockpile Dam Completion
RRP	GEO	MEM	130	Sediment Pond Spillway Details
RRP	GEO	MEM	134A	West Creek Diversion Channel - As-built Review
RRP	GEO	MEM	134B	West Creek Diversion Channel - As-built Review
RRP	GEO	MEM	138	West Creek Dam Compliance
RRP	GEO	MEM	141	WMP Dams Final Stage Design Compliance
RRP	GEO	MEM	143	Cell 1 Borrow Deposition
RRP	GEO	MEM	144	TMA Cell 1 - Pre-Commissioning
RRP	GEO	REP	001	TMA geotechnical investigations
RRP	GEO	REP	1A	Geotechnical Investigations Report, Tailings Management Area, Volume 1 – Design Implications – Version 3
RRP	GEO	REP	1B	Geotechnical Investigations Report, Tailings Management Area, Volume 2 – Investigation and Interpretations
RRP	GEO	REP	003	West Creek Pond Dam - Design Revision and Operating Guidelines
RRP	GEO	REP	004	Stockpile Pond Dam Design Revision
RRP	GEO	REP	006	Design Update - Clark Creek Dams
RRP	GEO	REP	007	MRP Dam Design Revision Report
RRP	GEO	REP	008	Design brief TMA start up cell
RRP	GEO	REP	017	Instrumentation Plan Water Dams
RRP	GEO	REP	018	WMP Filling Plan - To Elevation 367m
RRP	GEO	REP	022	WMP Dewatering Plan
RRP	GEO	REP	024	2016 Dam Instrumentation
RRP	GEO	REP	026	TMA Cell 2 Design Brief
RRP	GEO	REP	027	Clark Diversion As-built Report
3098004-004000-A1-ETR-0004-00				2013/2014 Geotechnical Site Investigations Report
3098004-004400-A1-ETR-0003-00				Water Management Plan for Operations
3098004-004400-A1-ETR-0004-00				Design Brief – Water Management Dams
3098004-004000-A1-ETR-0012-00				Dam Instrumentation During Construction
3098004-001100-A1-ETR-0001-00				Mine Waste Management Plan
3098004-004400-A1-ETR-0002-00				Water Management Plan for Construction
3098004-004000-A1-ETR-0005-AB				Tailings Deposition Plan
				Fish Habitat Offset Strategy
3098004-004000-A1-ETR-0006-00				Design Brief – Tailings Management Dams
3098400-004000-A1-ETR-0004-00				2013-2014 Geotechnical Field Investigations

1.4 Document and Records Control

Records from shift and periodic (daily, weekly and annual) TMA and water management system inspections will be retained in a secure repository as per the requirements of the site document control system. Once documents are printed, they are uncontrolled. Document Control follows the New Gold RRM document control procedures.

All records relating this OMS manual shall be retained for a minimum period of 25 years or until decommissioning ends, whichever is longer, as per regulatory requirements in the Federal CEAA Decision Statement. This includes place, date, time of sampling, dates and types of analysis performed, analytical techniques, methods or procedures, results of analysis and the names of persons who collected, analysed each sample and documentation of their training. All records and documents shall be retained at a facility close to the RRM.

2.0 ROLES AND RESPONSIBILITIES

This section identifies the individuals having responsibility for the operation, maintenance and surveillance of the tailings, process water and freshwater dams and diversion channels. Though the accountability of tailings and water management lies with the General Manager, the Mill Manager is responsible for the operation of the tailings and water management at the RRM. The Environmental Department provides environmental technical support, including monitoring, land and water management and environmental contact with regulatory agencies.

2.1 Definitions

- Surface Water

  A collection of water above ground in the form of a lake, wetland, stream, river or impounded by a constructed structure e.g., dam, sump etc.

- Process Water

  Water that has been reclaimed from the TMA/WMP/MRP for use in the Mill or dust suppression

- Mine Water

  Water that has been pumped from the open pit or underground as part of the dewatering process

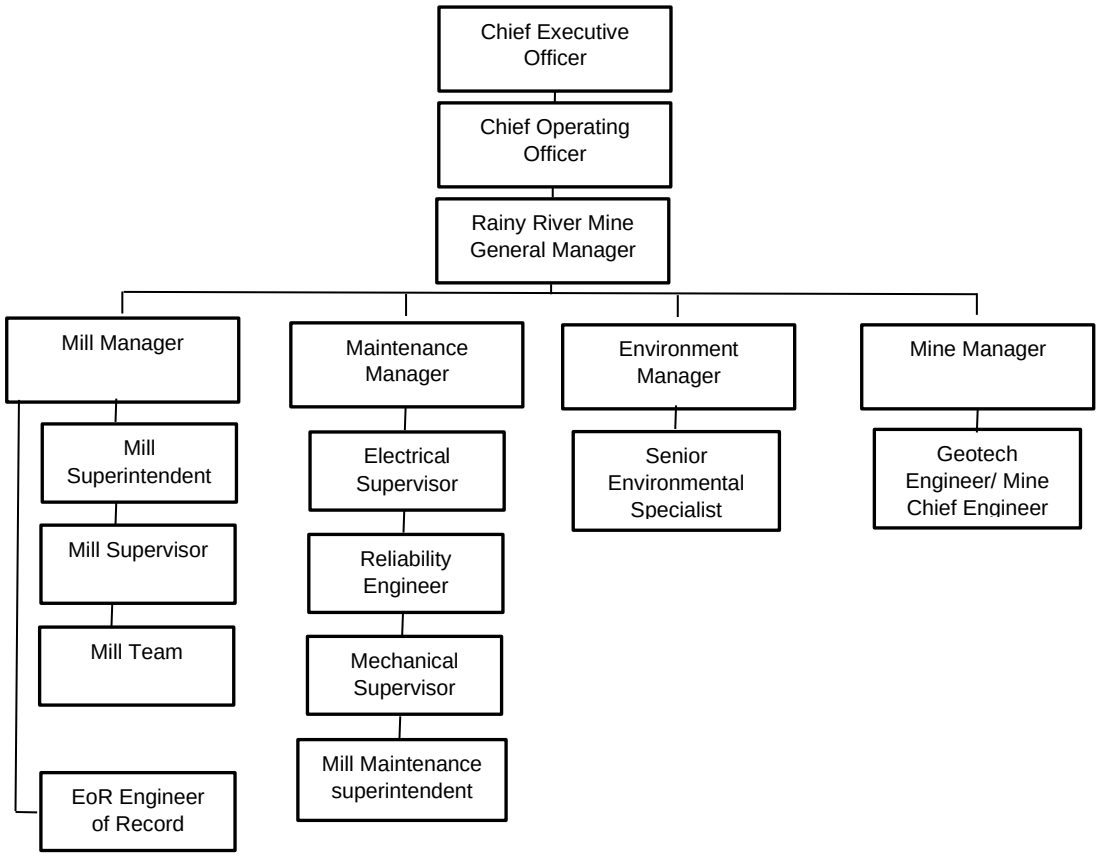
- Communities of Interest (COI)

  Communities that have an interest in the workings at New Afton site. Includes all stakeholders and First Nations partners.

2.2 Organizational Structure

The organizational structure for the RRM, relative to the OMS, is illustrated in Figure 2-1. The RRM/New Gold personnel and contact information associated with the positions referenced within each organizational flow chart can be found in Table 2-1. The organization chart is representative of the organization of persons related to the OMS following the construction and hand over of facilities. Prior to the handover of facilities, the EOR reports through the construction management team, for those facilities under construction.

Figure 2-1 Organisation Chart For Tailings and Water Management



2.3 Roles and Responsibilities

Executive Vice President / Chief Operating Officer:

- Is formally responsible for all of New Gold's operations; and
- Has responsibility for corporate "*Tailings, Heap-leach and Waste Rock Facilities Management Policy*". (included in Appendix C)

General Manager:

- Has accountability for tailings management;
- Provide support for the implementation of this plan
- Ensure resources are available for the management of water quality and effluent release
- Shall ensure that all TMA, process water and freshwater structures meet Canadian Dam Association, Dam Safety Guidelines;

Mill Manager:

- Has responsibility for the tailings management facility and ancillary process water management structures, and water diversion structures including operation, maintenance and surveillance;
- Accountable for ensuring maintenance of the OMS Manual and conformance to the Mining Association of Canada's "Guide to Developing Operation, Maintenance and Surveillance for Tailings and Water Management Facilities";
- Ensures that manuals for the tailings and water management systems are reviewed annually, including an assessment of the effectiveness of the established system and performance against objectives, and updated as required;
- Ensures that the tailings handling and disposal operation is staffed by trained and competent persons;
- Integrates guidance from the Environment Department under the requirements of regulatory approvals and the Environmental Management System (EMS) where applicable to tailings management;
- Shall submit an annual dam safety inspection report for all dams (TMA area and others) to MECP/MNRF where required; and
- Report any potential facility design changes that could affect the facility's integrity.
- Coordination of activities with the EOR during operations; and
- Has emergency management and response roles.

Maintenance Manager:

- Has primary responsibility for the maintenance work and maintenance management systems including dams and water management structures; and
- Ensures records of maintenance inspections for the dams and water management structures and related activities are accurately and permanently recorded and provided to the Geotechnical Engineer and the Engineer of Record (EOR).

Reliability Engineer, Mechanical Superintendent and Electrical Supervisors:

- Oversees planning and execution of equipment maintenance through the work order system;
- Arranges/conducts maintenance for equipment e.g., calibration and maintains instrumentation calibration records; and
- Identifies issues and corrective actions to prevent incidents.

Chief Mine Engineer / Geotechnical Engineer:

- Manages dam design, construction and contracts;
- Design works and review construction to confirm permit requirements for the works are built as required
- Completing quarterly and annual inspections on TMA, process water and freshwater dams, diversion channels;

- Ensuring monitoring activities are undertaken as per schedule;
- Responding to concerns raised by operations personnel;
- Maintaining a dam raise schedule;
- Review spigotting and dam construction schedules;
- Construction oversight for major dam raise projects;
- Ensure that the OMS Manual is updated appropriately, as assigned by the Mill Manager; and
- Coordinating and managing survey.

Mill Superintendent:

- Responsible for ensuring daily, monthly and as-required reports with respect to all aspects of the operation, maintenance and surveillance of the tailings facilities are prepared, including all records of inspection and monitoring;
- Ensures that a system exists to implement the OMS manual procedures and requirements and the system is subjected to regular review and effectiveness checks;
- Participates in the review cycle for the OMS manual; and
- Undertakes any modifications as required to maintain a safe and effective tailings operation including adjustments to deposition plans, equipment and facilities.

Mill Supervisor:

- Responsible for the day-to-day operation, maintenance and surveillance of the tailings distribution system and related works including buildings, equipment, pipes, pumps, and dams;
- Verifies work order completion;
- Identifies new and revised maintenance requirements; and
- Performs visual inspection surveillance of tailings facilities including dams, pipelines, decants and other operations.

Mill Team:

- Responsible for operating, inspecting and maintaining dams and water pump houses;
- Responsible for security inspections during the shift, via work requests;
- Perform inspections, monitoring, audits and assessments including but not limited to;
    - Visual inspection (dams, water, spillways and pipelines);
    - Water levels;
    - Freeboard; and
    - Instrumentation.
- Ensures adequate maintenance, via work requests, of access roads, diversion ditches, emergency spill catchment areas and the reclaim water system; and

- Adjusting spigotting as directed by the supervisor.

Engineer of Record (EOR):

- Verifies the TMA and water diversion structures are constructed and operated as per the design intent;
- Performs Annual Dam Safety Inspections as per regulatory requirements; and
- Provides support for safe operation of the TMA and water diversion structures.

Environmental Manager:

- Support the Operation, Maintenance and Surveillance activities;
- Maintain contact and communication with regulatory agencies;
- Assist with environment related technical support such as inspection and evaluation of stability by an external expert;
- Ensure regulatory and other sampling, monitoring, and analyses programs are conducted as required and all analytical results and/or reports are reviewed and reported to the appropriate internal and external stakeholders;
- Ensure rehabilitation and stabilization programs are conducted for tailings in conjunction with closure plan requirements;
- Prepare Annual Reports to regulatory agencies; and
- Administer and track compliance against Permits.

Environmental Team:

- Conduct sampling requirements to ensure compliance and monitor against baseline and guideline data;
- Ensure employees, contractors and managers are aware of their requirements under water management;
- Monitor conformance with relevant permits for the OMS manual requirements;
- Integrate tailings operations activities into the EMS;
- Identify and assess applicable tailings related regulatory requirements including permits, licenses, authorizations;
- Support tailings/geotechnical engineering and operations in meeting permit requirements; and
- Provides environmental support to the mill area activities and parties including but not limited to: construction, earth moving, erosion and dust control and water discharges.

Document Control

- Provide for the communication of information and storage of records

2.4 Contact Information

The RRM contact information, for the positions listed in Sections 2.1 and 2.2, can be found in Table 2-1.

Table 2-1 RRM Contact Information

Position	Name	Phone Number	Mobile	Email
President CEO	Renaud Adams	(416) 324-6002	(416) 303-1511	Renaud.adams@newgold.com
Executive Vice President	Robert J. Chausse	(416) 324-6001	(416) 316-5211	Rob.Chausse@newgold.com
Director HSE	Claude McKenzie	(807) 482-0954	(807) 708-3203	Claude.McKenzie@newgold.com
General Manager	Eric Vinet	(416) 645-7283	(416) 881-7405	Eric.Vinet@newgold.com
Mine Manager	Darrol VanDeventer	(807) 482-0900	(807) 708-7488	Darrol.VanDeventer@newgold.com
Mill Manager	Tyler Buckingham	(807) 482 0900	(807) 707-7241	Tyler.Buckingham@newgold.com
Environmental Manager	Sylvie St. Jean	(807) 482-0900	(807) 707-3497	Sylvie.St.Jean@newgold.com
Maintenance Manager	Tony Lord	(807) 482-0900	(647) 456-8475	Tony.Lord@newgold.com
Mill Superintendent	Todd Durand	(807) 482-0900	(807) 708-8408	Todd.Durand@newgold.com
Mill Shift Supervisor	David O'Brien	(807) 482-0900		
Mill Shift Supervisor	Ron Langdon	(807) 482-0900		Ron.Langdon@newgold.com
Mill Shift Supervisor	Gilbert Tougas	(807) 482-0900		Gilbert.Tougas@newgold.com
Mill Shift Supervisor	Robert Manns	(807) 482-0900		
Mill Maintenance Supervisor	Don Ibey	(807) 482-0900		Don.Ibey@newgold.com
Maintenance Mechanical Supervisor	Derek Nelson	(807) 482-0900		Derek.Nelson@newgold.com
Maintenance Mechanical Supervisor	Mitch Lemaire	(807) 482-0900		
Maintenance Electrical Supervisor	Lewis Kempf	(807) 482-0900		Lewis.Kempf@newgold.com
Maintenance Electrical Supervisor	Bill Cole	(807) 482-0900		Bill.Cole@newgold.com
Reliability Engineer - Maintenance	Ian Strain	(807) 482-0919	(807) 707-1060	Ian.Strain@newgold.com
Tailings Dam Engineer	Patrick Green	(807) 482-0900		Patrick.Green@newgold.com
New Gold Environment On Call		(807) 632-6152		rainyriver.enviro@newgold.com
Ministry of Natural Resources and Forestry – MNRF	Andrew Bromley	(807) 475-1368		Andrew.Bromley@ontario.ca
Ministry of Environment Conservation and Parks	Matt Hoffmeister	(807) 468-2703		Matt.Hoffmeister@ontario.ca
Spills Action Centre (SAC)		(800) 268-6060		
Ministry of Energy Northern Development and Mines	Neal Bennett	(807) 475-1123		Neal.Bennett@ontario.ca
Environmental Canada and Climate Change	Gordon Moore	(613) 990-9744		Adam.Scheepers@canada.ca
Engineer of Record	Andre Zerwer	(705) 222-3192		AZerwer@bgcengineering.ca

2.5 Competency and Training

Training and education will be provided to employees to enhance their performance and RRM will ensure that all personnel receive the level of training to ensure they are competent. Tailings specific training is essential in ensuring safe and effective operation of the TMA as well as correct construction. The RRM in conjunction with the Engineer of Record will provide training programs or opportunities as required and job related training covering aspects related to requirements for the specific types of equipment and operational requirements.

Table 2-1 demonstrates the training that will be provided at a minimum, to support operation of the tailings water, process water, water treatment and freshwater management structures as required.

Table 2-1 OMS Manual Training Matrix

Training	TMA contractor	Mill Crews and Supervisor	Mill Supt.	Geotech. Engineer	Enviro Dept.	Mgmt. Team
Site Orientation	X	x	x	x	x	x
Daily Inspection		x				
Quarterly Inspection			x	x	x	
OMS / General Tailings & Ponds	X	x	x	x	x	
EPRP training	X	x	x	x	x	x
Construction method of TMA raises	X			x		
Towards Sustainable Mining			x	x	x	x
Instrument Data Collection		x		x	x	

3.0 SITE CONDITIONS

3.1 Site Location and Tenure

The site is located in the Township of Chapple, approximately 65 kilometers (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, however surface rights are not owned throughout the site boundary.

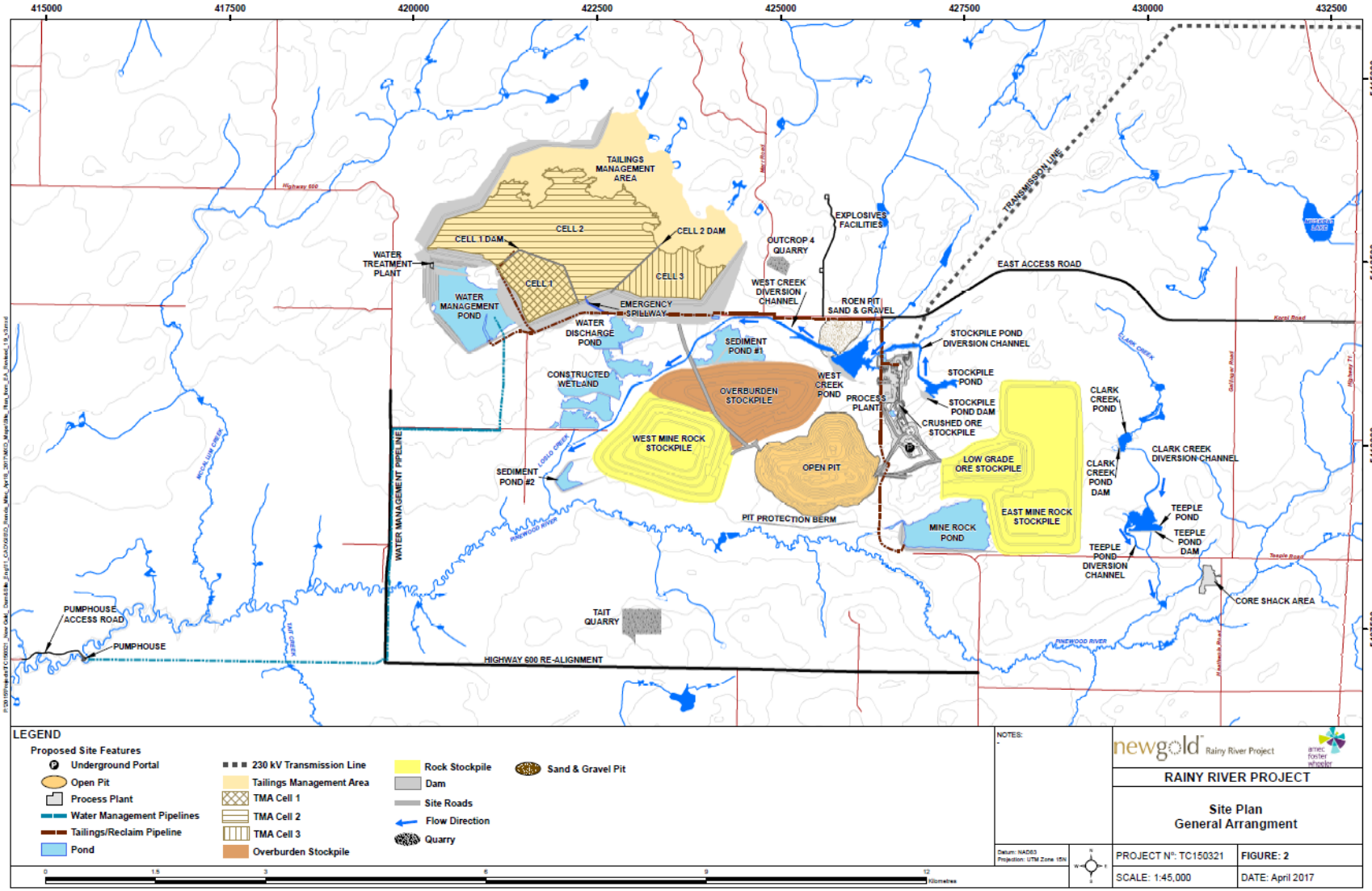
The RRM is located with lands used by Indigenous Groups for traditional and ceremonial purposes including but not limited to the following groups; Rainy River First Nations, Naicatchewenin First Nation, Big Grassy River First Nation, Naotkamegwanning (Whitefish Bay) First Nation, Anishinaabeg of Naongashiing (Big Island) First Nation, Ojibways of Onigaming First Nation, and the Sunset Country Métis community (represented by Métis Nation of Ontario Region 1 Consultation Committee). New Gold has regulatory requirements and/or biparty agreements to engage with these communities.

Road access to the site is by provincial Highways 600 and 71 and Korpi Road (east access road). A site location map is provided in Figure 3-1. The mine is serviced by local municipal infrastructure and is in close proximity to Fort Frances, Ontario for support and supply.

The site topography is variable with elevations ranging from 350 m to 390 m. The terrain is comprised of both forested and non-forested areas, including agricultural and wetland areas. The local drainage systems are characterized by numerous small creeks that drain into the Pinewood River. The small creeks typically originate from rocky uplands or headwater wetland systems.

The forested areas are dominated by mixed poplar and black spruce forests. Wetlands are comprised mainly of treed and open fens, together with wetland thickets and marsh areas.

Figure 3-1 Rainy River Mine Site Plan General Arrangement



3.2 Climate

Weather at the site is seasonal with cold winters with freezing conditions from November until March. The site receives ~700 mm of precipitation in an average year and the pond evaporation is estimated to be ~540 mm (Table 3-1). An estimated evapotranspiration of 500 mm is inferred by the difference between precipitation and runoff in the Pinewood River.

Table 3-1; Mean Annual and 1:20 year Precipitation and Evaporation

Barwick - 1981 to 2010 Canadian Climate Normals station data													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-15	-11.6	-4.4	4.4	11.4	16.4	19	17.9	12.6	5.5	-3.4	-11.8	3.4
Rainfall (mm)	0.2	3	11	30.4	75.1	124.7	102.9	78.8	75.5	51.3	13.6	2.1	568
Snowfall (cm)	29.5	18.3	18.8	8.9	1.1	0	0	0	0.8	7.5	28.3	28.6	142
Precipitation (mm)	29.8	21.3	29.8	39.2	76.2	124.7	102.9	78.8	76.2	58.8	41.8	30.7	710
Pond Evaporation													
Pond Evaporation (mm)	0	0	0	0	109	110	129	104	63	23	0	0	538
Barwick 2018 station data													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug*	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-14.2	-15.7	-3.8	0.2	13.9	18.1	20.1	18.6					
Difference (°C)	1.1	-4.1	0.6	-4.2	2.5	1.7	1.1	0.7					
Rainfall (mm)	0	0	0	5.4	70.7	98.2	75.1	70.6					
Snowfall (cm)	21.6	27.4	6.4	10.4	0	0	0	0					
Precipitation (mm)	21.6	27.4	6.4	15.8	70.7	98.2	75.1	70.6					358.8
% Difference	-27.5	28.6	-78.5	-59.7	-7.2	-21.3	-27.0	-31.4					-45.7

Site runoff varies widely in response to the climatic conditions. In normal (50% non-exceedance) and wetter years there is surplus water available for taking for site catchments or the Pinewood River. However, the Pinewood River frequently has no flow in September, and in extreme dry years, presents a water supply risk to the project.

Further details regarding the climatic conditions and hydrology can be found in the Water Management Plan for Operations (RRP-GEO-REP-026 R1). The site and project climatic characteristics (and seismic hazard analysis) are summarized in Table 3-2.

Table 3-2 Site Characteristics used in Geotechnical Design

Criterion	Source or Calculation	Value	Unit
Climatic Data			
Monthly temperatures (Note 1)			
Mean	Environment Canada - Barwick Station (Stn 6020559)	3.2	°C
Low (February)		-15.9	°C
High (August)		18.8	°C
Period of freezing		November to	-
Precipitation (Note 2)			
Mean annual precipitation	Environment Canada - Barwick Station (Stn 6020559)	682.1	mm
Mean annual rainfall		543.7	mm
Mean annual snowfall		138.4	cm
Storm events (24-hour) (Note 3)			
2-yr	Ministry of Transportation (MTO)	51	mm
5-yr		51	mm
10-yr		93	mm
25-yr		102	mm
100-yr		129	mm
Regional Flood (Timmins Storm)		193	mm
Probable Maximum Precipitation (PMP)		586	mm
Wind velocities (for wind-wave calculations)			
Average annual maximum	(Note 4)	16	km/h
Maximum likely		80	km/h
Probabilistic Seismic Hazard Analysis (Note 5)			
Peak Ground Acceleration for Rock Sites (outcrops)			
475	Natural Resources Canada	0.009	g
2,475		0.036	g
10,000		0.096	g
Peak Ground Acceleration for Overburden Sites (20 to 30 m)			
475	Natural Resources Canada	0.014	g
2,475		0.054	g
10,000		0.136	g

Notes:

1. Data obtained between 1971-2000
2. Data obtained between 1979-2012
3. Data for 2 to 100 year return obtained from MTO (2010), PMP) from AES IDF values prepared by the Hydrometeorology Division, Canadian Climate Centre, Station Rainy River, ON, Station Number 6026852
4. AMEC, 2013. Rainy River Gold Project, Climate, Air Quality, and Sound Baseline Study
5. The 1:10,000 year earthquake is considered equivalent to the maximum credible earthquake. AMEC, 2012. Earthquake Ground Motion Hazard Assessment, Rainy River Gold Project, Richardson Township, Ontario

3.3 Surficial and Bedrock Geology

The RRM is positioned within the Achaean age Rainy River Greenstone Belt that forms part of the 900 km long, east-west trending Wabigoon Subprovince of the Canadian Shield. In general, the Rainy River Greenstone Belt is bounded by the Sabaskong Batholith in the north and the Rainy Lake Batholithic Complex in the east. It extends south into Minnesota where the Long Point Intrusive Rocks, the Baudette Intrusive Rocks (both granitoid), and the Rainy Lake – Seine River Fault, the Vermillion Fault and the Four Towns Fault constrain the belt.

The site is characterized by gently undulating topography, strongly influenced by a sequence of glaciations, which on higher ground has left bedrock exposed with little to no overburden cover. In the lower lying areas, thick overburden deposits primarily of glacial origin (e.g., till) are found.

The mine site area can be divided into two general physiographic types based on topography and frequency of bedrock outcrops. The north and east portions of the project site have numerous bedrock outcrops, with variable soil cover, where the bedrock has a significant influence on the surface topography. The southwest and central portions of the site have thicker and more extensive soil deposits, with isolated bedrock outcrops.

The surficial geology generally consists of the following stratigraphy:

- Peat/Holocene: variable thickness ranging from thin veneers to greater than 3 m in thickness;
- Glaciolacustrine clay: typically located below the peat layer (Brenna Formation) and above the Whiteshell Till (Wylie Formation). The upper unit is typically low to high plastic silty clay, with occasional sand layers. The lower unit is typically clay silt and fine sand. Both units have varved silt and clay with varying thickness typically in the millimeter scale;
- Whitemouth Lake (WML) Till: Thickest and most widespread unit on site. The till is typically medium to high plastic silty clay with trace to some sand and gravel;
- Whiteshell Till: confined under the Whitemouth Till, the Whiteshell Till is a silty sand till with some gravel and cobbles and trace clay with some boulders. It is an aquifer with artesian pressures (above the ground surface) in some locations; and
- Bedrock: underlying the Whiteshell Till.

Groundwater recharge to the deeper groundwater system (shallow bedrock and Whiteshell Till) is limited to areas where the bedrock is at surface or has limited cover of overburden, mainly to the north and east of the open pit. Very limited recharge to the deeper groundwater system is probable through the Whitemouth Lake Till on higher ground. Where glaciolacustrine clays and peat are present, recharge to the deeper groundwater system is minimal.

Note; the TMA dams have been designed assuming high pore pressures and residual strength in the clayey foundation units (Upper/Lower Glaciolacustrine and WML Till). Further details regarding the surficial geology at the site and design criteria for the TMA Dams is provided in TMA – Volume 1 – Dam Design Implications (Amec Foster Wheeler, 2016f) and Volume 2 – Investigation and Interpretations (Amec Foster Wheeler, 2016g).

3.4 Geochemistry

3.4.1 Mine Rock

Static and kinetic geochemical testing representing all major lithology types of non-ore mine rock in the vicinity of the proposed pit development determined that approximately 50% of the mine rock samples were unlikely to generate acidic drainage (NPAG) in the future (neutralization potential ratio [NPR] >2). The remainder of the samples were classified as potentially acid generating (PAG) materials with NPR<2. It's noted that NPR ratios are influences by the low concentrations of both sulphides and carbonates.

Progressive encapsulation of the PAG rock during operations and at closure will limit precipitation infiltration and flushing of oxidation products from the mine rock. Restriction of oxygen inflow to the PAG rock may occur as a result of complete encapsulation of the pile.

The dam design includes only non-potentially acid generating (NPAG) mine rock downstream of the dam core. PAG rock is used in the completion of portions the TMA starter cell/cell 1, cell 2 dam and the upstream sections of the ultimate TMA dams.

3.4.2 Tailings

Based on geochemical testing, the tailings are PAG with an expected lag time to net acidic conditions of approximately 30 years. In addition, there is a potential risk of elevated cadmium concentrations in the TMA during operations due to leaching from the tailings.

Metal release from subaerial (beached) tailings may occur prior to acidic conditions and management of the tailings pond water may be required at this time. Metal release may occur from submerged tailings; however, subaerial tailings appear to be a greater source of loadings than submerged tailings. The milled ore is also a substantial source of loadings to the tailings pond, in some cases (e.g., cadmium) it is the dominant loading source early in mining operations.

Geochemical assessments suggest that Cd concentrations in the TMA may exceed the working site-specific value (0.001 mg/L subject to confirmation through permitting) within 1 year after mining begins. Reductions in the tailings beach areas could extend the period of time until exceedance is reached. Water treatment in the WMP is planned to be employed to support discharges from the WMP meeting discharge effluent quality targets.

3.5 Hydrology and Water Flow

The collection of runoff and hydrology data for the RRM is challenged by low gradient, small systems and frequent beaver impoundment. Water Survey of Canada Station 05PC011 at the Pinewood River provides the longest and most reliable available data set. Water Survey of Canada Station 05PC023 (at Highway 617) provides a shorter period of record and is known to provide erroneous readings of up to 20 %. Table 3-3 presents mean streamflow data in the Pinewood River as presented in the EA application, which have been pro-rated where required and in winter months.

Table 3-3; Monthly Streamflow in the Pinewood River at WSC 05PC011

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	0.218	0.144	0.538	9.595	7.135	5.412	3.163	1.536	1.787	2.352	1.913	0.383	194.8
5th %ile	0.073	0.049	0.181	3.228	2.400	1.820	1.064	0.517	0.601	0.791	0.644	0.129	65.5
95 %ile	0.440	0.292	1.087	19.41	14.43	10.95	6.398	3.107	3.615	4.758	3.870	0.776	394.1

The RRM site on the north side of the Pinewood River is drained by four small creek systems, which from east to west are: Clark Creek (Teeple Drain), West Creek, Marr Creek and Loslo Creek (Cowser Drain). These creek basins range in size from 7.3 km2 (Marr Creek) to 16.35 km2 (West Creek). Major portions of the Clark Creek, Marr Creek and Loslo Creek basins will be overprinted by RRM developments, principally the tailings management area and stockpiles. West Creek currently flows through the proposed open pit and will have to be diverted around the pit in order for the RRM to proceed.

It should be also noted that the lower approximately 3.3 km reach of Loslo Creek and 2.3 km of Clark Creek leading to the outflow into the Pinewood River have been previously designated as Municipal drains under the Drainage Act (respectively, the Cowser Drain constructed in 1980 and the Teeple Drain constructed in 1994).

3.6 Water Quality

Water quality in the area of the RRM is influence by the presence of clays/silts and water quality guidelines are frequently exceeded at baseline or upstream sites. There are a number of circumstances where exceedance of the Provincial Water Quality Objectives (PWQO) and Canadian Environmental Quality Guidelines (CEQG) values are common:

- Total metal values for samples showing elevated total suspended solids (TSS), especially for very common minerals such as aluminum and iron;
- Total aluminum concentrations in areas where clay / silt soils are common, as aluminum is a common clay mineral;
- Samples collected from under the ice in low volume water systems, because the process of ice formation tends to exclude ions from the ice crystal lattice, thereby concentrating the ejected ions in the underlying water column; and
- Samples collected during summer drought conditions in low volume water systems, because of ion concentration due to evaporative processes

The majority of parameters for surface waters met PWQO and CEQG for the protection of aquatic life, with the exception of common exceedances for aluminum (mainly CEQG), iron and phosphorus; frequent exceedances for cadmium (CEQG), copper (mainly CEQG) and cobalt (PWQO); and occasional, to rare, exceedances for arsenic, lead, nickel and zinc.

3.7 Hydrogeology

Regional groundwater flow is generally towards the west in the Pinewood River watershed, but locally is towards the Pinewood River corridor. Horizontal gradients are relatively steep on higher ground, approaching 0.01, but become more subdued in the lower lying areas where they decrease to approximately 0.003. This change in horizontal gradient is a strong indication that,

as the groundwater flows from the higher ground to lower elevations, there is flow from the relatively impermeable shallow bedrock to the more permeable Whiteshell Till and other granular material immediately above the bedrock, referred to generically as the Pleistocene lower granular deposits (PLGD).

Groundwater in the shallow bedrock and PLGD becomes confined as it moves westwards and towards the Pinewood River beneath the lower permeability silty clays of the Whitemouth Lake Till and the glaciolacustrine deposits that largely sandwich this till (the Pleistocene Aquitard). Artesian conditions within the shallow bedrock and PLGD are common along the stream corridors with upwards gradients on the order of 0.03 to 0.1, while downwards gradients occur in the higher areas between the streams.

Groundwater quality is typical calcium magnesium-bicarbonate type water with the majority of sampling points having total dissolved solids exceeding 500 mg/L. Sampling of groundwater since 2007 has indicated metal concentrations above application guidelines e.g., arsenic, cobalt, iron, molybdenum, zinc, mercury and uranium.

3.8 Biological

3.8.1 Fisheries

The fish community proximal to the RRM is dominated by baitfish and forage fish species with sportfish (e.g., Walleye and Northern Pike) in the lower Pinewood River below the Pinewood Pumphouse. Presently Marr and Loslo Creek are fish bearing and a fish relocation porgram is underway. West Creek and Clark Creek are former tributaries to the Pinewood River and have been offset for by the Clark Creek Diversion and West Creek Diversion. Clark Creek Diversion and West Creek Diversion are offsetting habitat and support all life history stages of baitfish and forage fish species.

The freshwater diversions are fish bearing waters and subject to protection under numerous permits and legislation e.g., *Fisheries Act*. Cowser Drain (Loslo Creek) and the Pinewood River are also fish bearing. Water quality discharges into these areas must meet MMER and ECA permit requirements. Additional studies as required by the ECA e.g., for mercury, sulphate and ammonia are ongoing, the results of which may influence operation of the TMA.

3.8.2 Vegetation

The RRM is within Ecoregion 5S (Agassiz Clay Plain) and there are no published Significant Wildlife Habitat Ecoregion Criteria Schedules for this ecoregion. Apsen-Birch hardwood forest is the dominant (46.6 %) forest type proximal to the mine, followed by coniferous swamp / wetland (29.4 %). Agricultural lands are present across 8 % of the area proximal to the mine, primarily along roads and in areas of well drained clays. No records of rare vegetation communities or rare plants were identified during the Environmental Assessment.

Based on the ecoregion, the growing season length is 180-190 days with mean annual temperatures of 1.5 to 3.0 ºC. The frost free period is ~125 days from mid-May to mid/late September (Ministry of Agriculture; 1976-2005).

3.8.3 Wildlife

Key wildlife aspects influencing the OMS manual include the presence of;

- Species at risk including but not limited to Eastern Whip-poor-will and bobolink which require consideration of limits of disturbance, timing of works, noise mitigation and dust management;

- Snapping turtles, for which measures must be taken to prevent them entering the TMA, process water and water treatment facilities;
- Migratory birds requiring noise mitigation measures, reduced light pollution, timing windows on clearing, deterrents to prevent use of the TMA and monitoring for use of the TMA;
- Deer, which along with other wildlife require that a fence is to be constructed around the active tailings deposition areas; and
- Bear, which along with other wildlife need to be managed through controlling wildlife-human interactions including reporting, no harassing of wildlife, no fishing or hunting on the mine site, speed restriction and waste management to exclude wildlife.

3.9 Natural Hazards

Natural hazards to the RRM are limited to weather related hazards e.g., flooding, drought, extreme cold or high winds and forest fires. Other natural hazards e.g., volcanic activity, subsidence, avalanches and landslides are not expected to affect the mine given surrounding geology and topography. Responses to natural hazards are considered as part of the site EPRP. Potential natural hazards relating to the OMS are discussed here, however further consideration on how to respond to natural hazards is considered in the maintenance and contingency sections.

- Forest Fire; there is potential for forest fire to affect operations of the mine, with the cycle in the area of the RRM being 63 to 210 years. The RRM has a fire prevention and preparedness plan (June 2017) developed with the MNRF.
- Pit Slope Failure; could be cause by flooding or slope instability. Modelling of the 1:100 year flow in the Pinewood River would result in the Pinewood River cresting adjacent to the pit at between 347-349 masl. A berm is proposed to protect the pit. This is the same mitigation proposed as for managing ice jams in the Pinewood River.
- Flooding; there is potential for flooding, and associated rainfall to affect operations of the mine. Design of the dams and diversion structures has considered these events as described in section 4 and contingencies are discussed in section 10. Results of flooding leading to a potential need to discharge additional water is offset by the increased assimilative capacity of the receiving environmental at the permitted 1:1 discharge ratio.
- Drought; drought conditions may result in a reduction in water availability for processing and discharge. Drought conditions for processing is mitigated through the design of the WMP and water storage. In the event of 5^{th} %ile low flow fall, only 1.53 Mm^3 could be discharged. However, this is managed through capacity in the TMA, WMP and water treatment.
- Seismic hazard; the site is located in the Canadian Shield which is comprised of Precambrian granites and gneisses that host some of the oldest rocks in the world. No earthquakes recorded with a magnitude greater than M 4.5 have occurred within approximately 500 km of the site. The results of the probabilistic seismic hazard analysis (PSHA) are shown in Table 3-1. Further details regarding the PSHA are provided in the *2013/2014 Geotechnical Site Investigations Report* (AMEC, 2014d).

3.10 WATER BODIES WITH POTENTIAL FOR CONTAMINANTS

Further details of water bodies with potential for contaminants are contained in the following sections, however, the summary here provides an overview of linkages between the water bodies with respect to water quality and influence on contaminant release.

- Tailings Management Area (TMA) Cell 1, Cell 2, Cell 3 and ultimate TMA
    - Receives treated (SO2/air) tailings from the mill, pump back from Sediment ponds 1 and 2;
    - Provides subaqueous disposal of tailings which are expected to be potentially acid generating (PAG)
    - Provides aging for effluent through planned dam raises ahead of storage needs
    - Provides consideration for cadmium management through balancing tailings beach size
    - Provides mitigation for MeHg accumulation by depositing tailings in a cellular manner supporting rapid permanent flooding of organic matter
- Water Management Pond (WMP)
    - Receives treated supernatant from TMA cell 1 during 1st 6 months of operations after which discharges to the WMP from the TMA are through a water treatment plant at up to 20,000m3/day commencing November 2018
    - Receives pump back BCR 2, constructed wetland and WDP
    - Provides freshwater make up to the plant
    - Provides aging of effluent prior to discharge toward the Pinewood River
    - Provides ammonia treatment through bubblers
- Runoff and Seepage collection systems
    - Receives run off for 1:25 year 24h events and seepage containment around the WMP, TMA and WMRS and for 1:100 year 24h event at the EMRS and LGORE
    - Seepage collection from the MRP is not required, as it is operated with minimal volume and is the seepage collection for the EMRS
    - Discharges back to the source of the seepage or any one of MRP, WMP, TMA, water discharge pond, sediment ponds 1&2
- Sumps including plant site ponds north and south, and tailings emergency dump ponds
    - Receives run off from the plant site – plant site north&south pond and polishing pond and discharges through the mill to the WMP
    - Emergency dump ponds are ultimately discharged to the MRP, WMP or TMA as appropriate.
- Temporary Sumps

  - Receives runoff from the OB dump and WMRS – sumps 1&2 and provides containment for 1in2 year 24h event discharging to the Pinewood River via splashpad
  - Receives surface water collection from the open pit – sump 4 and 5 – and provides containment for 1in2 year 24h event and discharges the Mine Rock Pond
  - Receives dewatering from the north wells of the open pit– sump 6 – and provides containment for 1in2 year 24h event and discharges either to the MRP or to the Pinewood via a splashpad

- Constructed wetland (including water discharge pond), BCR 1 and 2, Nitrification Cell
  - Provides effluent treatment (focused on cyanide complexes, nitrates and sulphates but also residual metals/amonia) and treatment following discharge from the WMP and mitigates flow losses in the Pinewood River
  - Notwithstanding discharge limits, discharge volume from WMP into the constructed wetland is up to 20,000m³/day based on 20 day retention, however, depending on system performance this may be modified.
  - Discharges to Loslo Creek are permitted from the start of spring melt to end November at level no greater than 20% of the flow of the Pinewood and mixing ratio of 1:1
- Open Pit
  - Receives groundwater inflow and surface runoff anticipated at 3000 to 4000 m3/day on average
  - Discharges to the MRP
- Mine Rock Pond (MRP)
  - Receives runoff and seepage from the east mine rock stockpile (EMRS) and form the open pit with an MOWL of 0.5Mm³ provides storage for the EDF (1.3Mm³)
  - Provides freshwater make up to the plant
  - No discharges from the MRP – water pumped to the plant or high flows divert to the open pit, or sumps 4 and 5
- Sediment ponds 1 and 2
  - Receives run off from the overburden (OB) dump and west mine rock stockpile (WMRS) which are progressively reclaimed
  - Sediment pond 1 receives storm flow >1:10 24h event from the West Creek Diversion
  - Settling and retention of 12 days for 1:25 year 24h event
  - Discharges to TMA

4.0 FACILITY DESCRIPTIONS

The components of the RRM relative to the scope of the OMS include tailings and process water management, freshwater diversions and water treatment. The site layout is shown on Figure 3-1.

While there is interconnectivity between the systems, for the purposes of the OMS they are categorised in these groupings and reference made between them where required e.g., water management pond, water discharge pond and constructed wetland.

Tailings and process water management are provided by the following;

- Tailings Management Area –TMA (including cells 1, 2 and 3 and associated pipelines);
- Mine Rock Pond - MRP.

The TMA provides long term containment for the tailings. The mill make-up water is reclaimed from the Tailings Management Area (TMA), the Water Management Pond (WMP) and/or the Mine Rock Pond (MRP) as described in Appendix A.1. The TMA dam raising schedule is divided into five stages and has been set to ensure ample pond storage is available to satisfy mill make-up water supply and effluent management requirements.

The TMA has been designed to optimize natural degradation processes, by ensuring there is sufficient time to allow for heavy metals to precipitate to low levels in the pond. The natural degradation processes are most effective during warm weather conditions when biophysical activity is optimal, and are also augmented by exposure to sunlight. A treatment plant is also planned to treat TMA water for metals before discharging into the WMP, and is scheduled to be built in the Fall of 2018.

Bubblers (10) throughout the WMP provides sufficient aeration to treat for ammonia and will keep the water over the WMP from completely freezing during the winter. Mill make-up water is provided through reclaim from the TMA and/or the transfer of contact water from the Mine Rock Pond (MRP) decided by the reclaim logic described in Appendix A.1. Treated surplus water is transferred to the WMP before it is discharged to the environment predominately via the constructed wetland. A pipeline to the Pinewood River can also discharge water during a short period in spring. The wetland will treat for nitrate and sulphates and any residual metals and will become the primary treatment plant at closure. Effluents planned for discharge to the environment will meet discharge criteria or be pumped back to the WMP for further treatment.

Freshwater diversion is provided by the following;

- Clark Creek diversion including the Clark Creek and Teeple dam and diversions; and
- West Creek diversion including the Stockpile and West Creek dam and diversions.

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.

Water treatment is provided by the following;

- Water Treatment Plant, Water Discharge Pond (WDP) and the Constructed wetland – (CW); and
- Sediment ponds 1 and 2.

Sedimentation ponds have been designed to allow for the settlement of total suspended solids present in the non-contact runoff or effluent prior to discharge to the environment. Sediment Ponds #1 and #2 receive runoff and seepage from the West Mine Rock Stockpile (WMRS). The Water Discharge Pond (WDP) and Constructed Wetland receive discharge water from the WMP. The constructed wetland is the primary and priority discharge location from the WMP (to mitigate

flow reductions in the Pinewood River) ahead of discharging to the Pinewood River downstream of McCallum Creek.

4.1 Design Criteria and Basis

The basis for design of the tailings, process water, freshwater diversion and sedimentation dams are summarized in the subsequent sections. Where practically possible, the RRM has been designed to minimize effort at closure by promoting progressive reclamation opportunities including but not limited to: establishing the TMA closure cover and developing the East Mine Rock Stockpile (EMRS) and West Mine Rock Stockpile (WMRS) to closure slopes.

Results from field investigations (subsurface and groundwater conditions) have been incorporated to the design as per the documented findings from the *2013/2014 Geotechnical Site Investigations* (AMEC, 2014d) and *Geotechnical Investigations Report – TMA, Volume 1 – Design Implications* (Amec Foster Wheeler, 2016f).

Table 4-1 Summary of Dam Design Criteria

Dam	Hazard Potential Classification	Upstream Watershed	Maximum Operating Pond Level		Environmental Design Flood		Inflow Design Flood	Spillway design/Emergency Spillway design			Design Slopes
			Volume	Level	Storm Event	Volume		Width	Design Flow	Max. flow depth (IDF)	
-	-	-	Mm3	m	-	Mm^3	-	m	m3/s	m	(_H:1V)
Tailings Management Area											
Cell 1	Very high	None/Tailings		369.9	100 yr 30 day	0.320	PMF	8			11
Cell 2	Very high	Loslo/Tailings		364.05	100 yr 24h	0.828	PMF	19	293.0	1.4	11
Process Water Management											
WMP	Very high	TMA	5.0	369.7	100 yr 30 day	0.630	PMF	8	3.7	0.50	4-9.2
MRP	Very high	EMRS	0.5	356.8	100 yr 30 day	1.0	PMF	15	64.7	1.60	11
Freshwater Diversions											
Clark Creek Dam	Low	Clark Creek		378.75	n/a	n/a	100-yr	20		0.30	5.5
Teeple Dam	Low			378.5	n/a	n/a	100-yr	120		0.10	6.0
Stockpile Pond Dam	Very high	West Creek	0.095 NOWL	372.2	n/a	n/a	PMF	33	79.6	2.30	6.5
West Creek Dam	Very high		0.156 NOWL	361.0	n/a	n/a	PMF	8			7.9

Notes
Hazard potential classification per LRIA
Spillways have been designed to pass an IDF event while satisfying minimum freeboard requirements
PMF is probably maximum flood
To be updated for WDP, CW and Sediment ponds 1 and 2 based on approvals

Table 4-2 Summary of Dam Characteristics

Purpose & Facility	Dam Name	Type of Dam	Construction Method	Crest Elev.	Max. Dam Height	Dam Length	Crest Width	Slopes	Spillway		Normal Freeboard
									Invert Elev.	Width	
				(m)	(m)	(m)	(m)	(_H : 1V)	(m)	(m)	(m)
Tailings containment dams											
Tailings Management Area (TMA)	TMA North	Central core	Staged centreline raises	366.5 (final 379.5)	2.5	3620	20	11.0	365.5 (emergency)	10	varies
	TMA South				11.0	3505	20				
	TMA West				7.5	1865	20				
	TMA Cell 1	Rockfill & liner	Final	371.5		1470	10	11.0	370.5 (emergency)	8	varies
Process Water Management											
Water Management Pond (WMP)	WMP Dam 1	Homogeneous	Final	371.5	4.2	850	10	4.0	370.5 (emergency)	8	3.6
	WMP Dam 2			371.5	9.5	800	10	5.5 *			
	WMP Dam 3			371.5	13.3	750	10	9.2 *			
	Settling Pond			371.5		550	5	4.0	n/a		3.6
Mine Rock Pond	Mine Rock Pond	Central core	Final	360.2	13.0	1655	10	11.0	358.9 (emergency)	80	3.4
Freshwater Diversion											
Clark Creek Diversion	Clark Creek	Homogeneous	Final	380.0	2.0	285	6	5.5 *	379.9	6	1.3
	Teeple Road	Homogeneous	Final	379.0	5.0	465	6	6.0 *	378.7	6	0.5
West Creek Diversion	Stockpile Pond	Central core	Fianl	375.5	9.8	380	6	6.5 *	372.3	20	3.2
	West Creek	Central core	Final	364.9	8.9	750	10	7.9 *	360.9	8	3.9
Sediment Control											
Water Discharge Pond (WDP)	Water Discharge Pond	Homogeneous	Final	355.2	2.2	350	6	4.0	354.2	5	1.0
Constructed Wetlands	Pond A	Homogeneous	Final	347.5	1.5	715	5	3.0	347	50	0.5
	Pond B			349.0	2.0	840			348.5		0.5
	Pond C			350.5	2.5	1015			350		0.5
	Pond D			351.5	1.5	305			351		0.5
	Pond E			352.5	1.5	190			352		0.5
West Mine Rock Stockpile	Sediment Pond #1	Central core	Final	354.0	3.8	1750	6	4.0	353.7 (emergency)	60	0.8
	Sediment Pond #2	Homogeneous	Final	348.2	5.2	1460	6	4.0	348 (emergency)	115	2.2
	Temporary Sediment Pond	Homogeneous	Final, temporary	348.6		600	6	4.0	348.5 (emergency)	60	0.6

Notes:

1) Refer to the relevant design reports for design details.
2) Normal freeboard is the height between the normal pond level and dam crest
3) Emergency spillways are noted in parenthesis for contact water ponds that require Environmental Design Flood (EDF) containment. Otherwise, spillways are working or overflow spillway.
4) Inclinations with an asterisk (*) include toe berms

5.0 Approved Discharges/Releases

The following table summates the approved discharges for the site. Approved discharges and all other contact water runoff and seepage will be managed consistent with MMER requirements. Water may be used for dust suppression or other industrial uses e.g., drilling and truck washing except from the TMA consistent with the management of water for dust suppression (December 2016).

Runoff and seepage from the plant site, EMRS, OB&WMRS, LGORE, WMP, TMA and other areas as required will be directed to one or more of the process plant, MRP, water discharge pond, TMA, WMP, sediment ponds 1 and 2 or constructed wetland. Seepage and collection systems and ditching are designed at minimum for 1:25yr 24h storm except the EMRS, which is 1:100 year 24h storm.

At all times during discharge from WMP pipeline, sediments 1&2 and wetland final discharge, except where attributable to background conditions, surface water benchmarks in Table 5 of the ECA must be achieved at SW22 and SW24.

In the event of exceedance of volume or quality, contingencies will be applied and required reporting conducted - see contingency and reporting sections. The exceedance is considered a spill.

Approved Discharge	Description	Quality	Quantity	ECA	MDMER	Comment
Process Plant wastewater treatment	Cyanide destruction SO2/air circuit with parallel 1,402m^3 reactors and 90min retention time	<1mg/L WAD	1,580m^3/h max capacity	Ops	N/A	Provincial EA commitments also apply
TMA	Total ultimate storage capacity 104Mt with 17.5M^3 of water over 527ha, 25-30m dam height			Ops	N/A	
Constructed wetland	Five ponds created by dams	Table 2 ops ECA	1:1 combined, with effluent not exceeding natural flow	Ops	Notice given	Preferentially used ahead of pipeline – no discharge during winter
WMP Water Discharge Pipeline to the	10km 24inch HDPE pipe discharging to the Pinewood River with a	Table 2 ops ECA		Ops	Not submitted	No discharge during winter – preferentially

Pinewood River						use the wetland
Sediment pond 1	560,000m^3 pond over 54ha with ~3.1m high dam. Treats OB stockpile discharging to the West Creek Diversion	Table 3 ops ECA	1:5 to WCD (<16.7% of flow)	Ops	Notice given	If effluent limits in ECA Tables 3 or 4 exceeded, pump to WMP/TMA; Designed for 1in25year 24h event with 12 days residence time
Sediment pond 2	356,000m^3 pond over 17ha with ~3.5m high dam. Treats OB stockpile and WMRS discharging via ditching to the Pinewood River	Table 4 ops ECA	1:10 to Pinewood River (<9.1%)	Ops		
Domestic Sewage Treatment Plant	As designed/approved			Ops		
Oil/Water Separator	As designed/approved			Ops		
Preliminary Phase MRP inc OB pile	Temporary discharge until MRP completed	Table 3 con ECA		Con	Yes – PRF1	MMER Discharge location 48°49'42" N 94°00'01" W. No discharge in operation
In pit sumps 3&4	Built to convey water to MRP or WMP or discharge to the Pinewood River	Table 3 con ECA		Con	Yes – PRF2&3	One MRP completed – cease discharge from sumps
OB and WMRS – sumps 1&2	Receiving 280ha of runoff with storage capacity of 50,000m3; 12 day retention of 1in2 year 24h event	Table 3 con ECA		Con	Yes – PRF9	Used in conjunction with perimeter ditching around south stockpile area
WMRS temp sediment pond	Storage capacity of 49,200m3 within the WMRS	Table 3 con ECA		Con	As per PRF-9	Permit to construct expires May 2018

Plant site Ponds N&S and polishing pond	Temporary discharge until completion of Mine Rock Pond			Con	Yes – PRF6-8	

6.0 Water Quality Treatment Plans

To meet water quality objectives and regulatory limits the following strategies are implemented;

- Diversion of non-contact water to reduce the volume of water to be managed. This includes the Clark and West Creek Diversions.
- Maximizing water recycling to limit make up water requirements and overall water volume to be managed
- Compact footprint to reduce area of distance and contact water to be managed
- Collecting site contact water and seepage in ditches and divert to either the tailings management area or water management facilities for release via final discharge points
- Mine rock segregation and ML/ARD management with PAG material not used in construction except for where it will remain subaqueously covered and an engineered cover over the EMRS
- Treating tailings slurry for cyanide destruction and precipitate heavy metals
- Constructing and operating a water treatment plant in the WMP
- Conducting dam raises in sufficient time to PAG rock is inundated prior to the anticipated onset of acid production and allow for supernatant aging prior to discharge to the WMP and ultimately to the Pinewood River

For specific parameters the following water quality treatments are applied;

- TSS
    - Limit areas of disturbance and constructing timing
    - Progressive reclamation of disturbed areas and stockpiles e.g., design criteria for sediment ponds 1 and 2 assumes three years of active work area exposed
    - Use of sediment and erosion control measures, as required, prioritizing erosion prevention ahead of controlling sediment laden runoff
- Cyanide
    - Limit cyanide use in the processing plant to what is consumed in the process
    - Process plant waste water treatment (SO2/air) to reduce free cyanide concentration to 1 mg/l in the tailings supernatant
    - Retention/aging of tailings supernatant in the TMA to allow for photodegredation
    - See ammonia
- Ammonia
    - Use of emulsion to reduce ammonia residuals
    - Scheduling dam raises to allow storage / aging of effluent

    - Aging effluent in the TMA before seasonal (June to August nominally) discharge to the WMP for overwintering ahead of discharge through the constructed wetland the following year
    - Drawing down the WMP after winter and by the end of May to allow capacity for filling from the TMA
    - Limiting discharge timing to the constructed wetland to between freshet and the end of November or additional limits based on system performance
    - Where required, use of phosphate in the WMP/wetland to increase the rate of ammonia uptake and aeration in the WMP/wetland to support uptake/volatization
- Cadmium
    - Tailings beach management to minimize mobilization of cadmium
    - Water treatment plant consisting of lime neutralization with possible ferric sulphate coagulant addition for heavy metal removal (with alkali effluent water being neutralized before discharge to the WMP)
- Sulphate
    - Reduce rates of generation through mine rock segregation, using NPAG in construction, limiting SO^2 use in CN destruction circuit to what is consumed by the process, progressive reclamation and subaqueous disposal of tailings
    - Reducing releases to the receiving environment include having higher dilution ratios that approved and taking water from the Pinewood River through operations (subject to permit approval) to prevent buildup of sulphate in the recycled water.
    - If required, apply additional treatment following investigation and sampling of tailings during early operations (Years 1&2)
- Mercury – methylmercury (MeHg)
    - Recycling water from WMP/TMA through the plant which will result in mercury removal in the processing plant
    - Discharge of supernatant from Cell 1 into the WMP to increase sulphide concentration above optimum conditions for methylation
    - Tailings deposition plan is cellular to rapidly flood organic material therefore reducing the opportunity for methylation to occur
    - Tailings deposition to rapidly flood deep organic soils in the former Loslo and Marr Creek channels, where possible
    - Limit water level fluctuations in newly flooded areas to the extent possible i.e., once covered remain covered
    - Stripping of organic soils from the MRP, where feasible
    - Divert run off from NPAG stockpile (EMRS) and MRP to the plant

Water quality plans for the sewage treatment plant and oil/water separator will be developed at the time of approval or concurrent with the start of operation of those works.

7.0 Release Plan for Approved Discharges

The section applies to the WMP pipeline discharge, constructed wetland final effluent, sediment pond 1&2. Temporary sumps are addressed through the attached document (Temporary Sump Management Plan). Release plans for the sewage treatment plant and oil/water separator will be developed at the time of approval or concurrent with the start of operation of those works.

Determining receiving environment capacity (flow monitoring)

- A hydrometric station has been established in the Pinewood River and will be used to calculate discharge limits in the Pinewood River at Loslo Creek and at the WMP pipeline discharge
- An additional hydrometric station or equivalent flow measuring device will be established in the West Creek Diversion proximal to the Sediment Pond 1 outlet
- Based on the flow in the Pinewood or West Creek Diversion, in a 24h period for the proceeding 48h, a daily (24h) discharge rate will be established

Determining suitability for release

- This is based on water quality results as required by permit conditions, or additional internal sampling and visual observation i.e., absence of film/sheen/foam.

Controlling and measuring release volume

- Flow will be released from a control structure e.g., flow control gate at the respective effluent release locations. The flow control gate will be sized to control flows over the anticipated discharge range and permitted mixing ratios
- Released volumes will be adjusted at least daily to match the receiving environment capacity
- Measuring releases will be conducted by an annually calibrated flow meter with an accuracy no less than +/-15% and capable of operating under winter conditions
- Volumes will be recorded from the flow meter automatically or via manually on discharge checklists/discharge records.
- In the event of discharges not being suitable for discharge the release control structure will be closed and contingencies applied (see contingency section), specifically pump back to TMA/WMP.

Once finalized the contaminant release plan will be submitted to MECP for approval, prior to any discharges from the WMP/WDP/CW, Sediment ponds 1 & 2, or the Pinewood River pipeline.

8.0 Monitoring Requirements

Water quality monitoring requirements are defined in the ECA. The purpose of monitoring is to inform operation of the works and areas of site that may influence water quality and meet permit requirements. Monitoring includes;

Surface Water Quality

- Following provincially approved protocols – see section 7(4) of the ECA;
- Developing a TSS/NTU relationship within 6 weeks of discharges from the sediment ponds;
- Visual inspection of the works to ensure they are free from floating and settleable solids and no visible film/sheen or foam;
- Sampling in locations and with the frequency specified in Table 6 for pipeline discharges, sediment pond 1 and 2 discharges, constructed wetland final pond and oil/water separator; and
- Sampling in locations and with the frequency specified in Table 7&8 for the receiving environment.

Flow monitoring

- Continuous flow monitoring for WMP pipeline discharge, constructed wetland final discharge and sediment ponds 1 and 2 with an accuracy of +/-15% calibrated annually with winter operational capability
- Calculate the daily flow rate for each stream

Long term monitoring

- Follow the Pinewood River Biological Effects Monitoring Plan and monitoring requirements for the MMER
- Mercury monitoring plan as defined in the study plan terms of reference
- Sulphate monitoring plan as defined in the study plan terms of reference

Internal monitoring

- Additional monitoring locations maybe added to support understanding of the water quality plan and inform mitigation. Sampling protocols and parameter lists maybe varied as required e.g., isotope sampling for source water determination. Sampling locations may include;
  - TMA supernatant particularly during year 1 to determine sulphate and cadmium concentrations;
  - WMP pond;
  - Seepage ponds;
  - Constructed wetland upstream of the final effluent;
  - Sediment pond 1&2; and
  - Additional receiving environment locations based on feedback or request.

9.0 Contingencies

Immediate response for effluent not meeting criteria is consistent with steps taken in spill response;

- Stop the release of the contaminant e.g., shut the release control structure
- Treat for the exceedance e.g., addition of flocculants
- Divert or cease inflows into the works where possible
- Reclaim/pumpback to containment e.g., WMP/TMA

Two contingency plans have been developed as part of MECP approvals for water treatment;

- Pinewood River Quality Contingency Plan, Version 1 August 2016; and
- Groundwater and Surface Water Contingency Plan, Version 2 October 2015.

In summary contingency options outlined in these plans include limiting discharges, acceleration of TMA dam raises, add water quality treatment, additional monitoring, and provision of water to affected areas and increased mixing ratios/improved mixing. The trigger for implementation of contingency in surface water is if protection of aquatic life criteria are not achieved 90 % of the time.