RAINY RIVER MINE

OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL

PART VI – FRESHWATER DIVERSIONS

New Gold Inc.
Rainy River Project
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Version 2022-1

REVIEW AND REVISION HISTORY

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

The review team and approval record are given in **Error! Reference source not found.**. The v ersion history of the OMS Manual is shown in **Error! Reference source not found.**.

Table 1 - Review Team

	Name	Company /Department	Position	Signature	Date
Revised by	Winston Ding	NG Capital Projects	Tailings Dam Engineer	<Original signed by>	Oct 14, 2022
Reviewed by	Travis Pastachak	NG Capital Projects	Capital Projects Manager	<Original signed by>	Oct 14, 2022
	Gord Simms	NG Mine Operations	Mining Manager	<Original signed by>	Oct 17, 2022
	Garnet Cornell	NG Environment	Environmental Superintendent	<Original signed by>	Oct 25, 2022
	Derek McKinnon	NG Maintenance	Maintenance Superintendent	<Original signed by>	Oct 25, 2022
	Michael Dabiri	SRK	Interim EOR	<Original signed by>	Oct 31, 2022
Approved by	Mohammad Taghimohammadi	NG	Mill Manager	<Original signed by>	Nov 1, 2022

Table 2 - Revision Summary

Revision Number	Details of Revision	Date of Issue	Comment
Rev. A	Issued for EOR review	August 15, 2022	Review received on Sept. 2, 2022
Rev. B	Addressed review comments		
Rev. 0	Issued for use	Sept. 30, 2022	

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1.0 OBJECTIVE

The operation, maintenance, and surveillance manual (OMS Manual, the Manual) provides procedures and reference for the safe operation of the structures related to tailings, and water management structures at the New Gold Inc. (NGI) Rainy River Mine (RRM), located near Emo, Ontario. For readability, the OMS Manual has been separated into “Parts” as listed below. This is Part 6 for freshwater diversion structures.

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

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

2.0 FACILITIES DESCRIPTION

2.1 Overview

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

2.2 Design and Construction Documents

The freshwater diversion structures have been developed in accordance with the design briefs and as-built reports summarized in Table 2-1.

Table 2-1: Supporting Documents for the West Creek and Clark Creek Diversions

Document Title	Reference
Design Brief – Water Management Dams	3098004-RPT-0015 REV 00
Design Update – Clark Creek Pond Dam	MNRF-IPT-0004.008
Stockpile Pond Dam – Design Revision and Operating Guidelines	MNRF-IPT-0005.007
West Creek Dam – Design Revision and Operating Guidelines	MNRF-IPT-0005.006
Clark Creek Diversion – As-built Report	RRP-GEO-REP-027
West Creek Diversion – As-built Report in preparation	RRP-GEO-REP-028 R1
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
West Creek Diversion Plan, Profile, and Section As Built	3098004-002510-A1-D70-0003-2
West Creek Diversion Plan, Profile and Section As Built	3098004-002510-A1-D70-0003-3
West Creek Dam Spillway Plan and Sections	3098004-002510-A1-D70-0004
West Creek Diversion Channel Overflow Diversion Structure Section and Details	3098004-002510-A1-D70-0005
West Creek Diversion Channel Culvert C11 Plan and Section	3098004-002510-A1-D70-0006
West Creek Diversion Channel Culvert C12 Plan and Section	3098004-002510-A1-D70-0007
West Creek Diversion Channel Culvert C13 Plan and Section	3098004-002510-A1-D70-0008
West Creek Diversion Channel Culvert C14 Plan and Section	3098004-002510-A1-D70-0009
Marr Creek Diversion Channel Culvert C15 Plan and Section	3098004-002510-A1-D70-0010
West Creek Diversion Channel Culvert C16 Plan and Section	3098004-002510-A1-D70-0011
West Creek Diversion Channel Temporary Side Spillway Plan, Profile and Sections	3098004-002510-A1-D70-0012
West Creek Pond Dam Temporary Overflow Spillway Typical Section, Profile and Details	3098004-002510-A1-D70-0014

Stockpile Pond Dam – Plan and Typical Section	3098004-002580-A1-D70-0002
Stockpile Pond Dam Layout and Foundation Preparation Plan and Profile	3098004-002580-A1-D70-0003
Stockpile Pond Diversion Channel – Plan and Profile	3098004-002580-A1-D70-0004
Stockpile Pond Plan View	3098004-002580-A1-D50-0001
Stockpile Pond Cross Sections	3098004-002580-A1-D50-0002
Stockpile Diversion Typical Cross Sections in Overburden	3098004-002580-A1-D50-0003
Stockpile Diversion Plan and Profile in Overburden	3098004-002580-A1-D50-0004
Stockpile Diversion Typical Cross Sections in Rock	3098004-002580-A1-D50-0005
Stockpile Diversion Plan and Profile in Rock	3098004-002580-A1-D50-0006
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
Clark Creek Pond Plan View	3098004-004400-A1-D50-0002
Clark Creek Pond Cross Sections	3098004-004400-A1-D50-0003
Clark Creek Diversion Typical Cross Sections	3098004-004400-A1-D50-0004
Clark Creek Diversion Typical Plan and Profile	3098004-004400-A1-D50-0005
Marr Creek Connection to West Creek Diversion Channel	3098004-002510-A1-D50-0009
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
Teeple Road Dam Overflow Section Permanent Repairs	3098004-004400-A1-D70-0005
Teeple Road Dam Overflow Section Permanent Repairs	3098004-004400-A1-D70-0006
Teeple Road Dam Non-Overflow Section Permanent Repairs	3098004-004400-A1-D70-0007

2.3 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, which diverts flows around the Open Pit. The following sections describe the components of this diversion.

2.3.1 Stockpile Pond and Diversion Channel

The Stockpile Pond is located north of the Primary Crusher and east of the Mill. Blocked by the Stockpile Pond Dam, water in the pond increases until it reaches the Diversion Channel, which conveys the flow around the mine via the West Creek Pond and Diversion.

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 also provides fish habitat compensation. The Stockpile Pond Diversion Channel base width varies from 33 m to 6 m at the tapered inlet, with 4H:1V side slopes. The total length of the diversion channel is about 1,200 m.

The dam height is 9.8 m with overall side slopes of 6.5H:1V (4H:1H without berms), 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 (372.2 m) 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 then-EOR (RRP-GEO-MEM-080-R1). Construction of the dam was completed in May 2017 and confirmed by then-EOR (RRP-GEO-MEM-119-R1). The dam was constructed with a central clay core and random fill and or NPAG rock shells.

2.3.2 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 8.9 m, and overall side slopes of 7.9H:1V including rock toe berms (4H:1V without 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.

2.3.3 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 relatively 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 into Sediment Pond 1. 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.

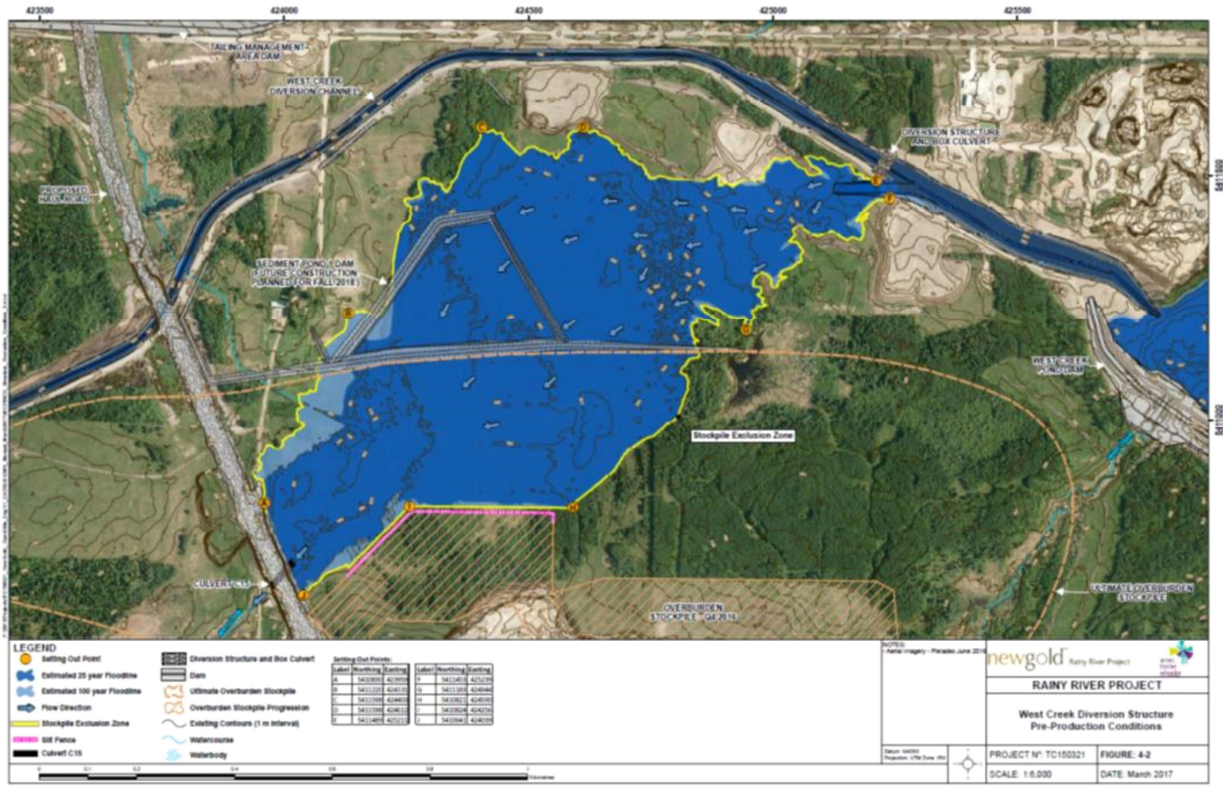

Figure 2-1: West Creek Diversion Overflow Map

2.3.4 Summary of West Creek Design Features

The design parameter of the West Creek Diversion is summarized in Table 2-2.

Table 2-2: Design Parameters for the West Creek Diversion

Design Parameter	Unit	Stockpile	West Creek
Embankment dam crest elevation	m	375.5	364.9
Diversion channel inlet invert elevation	m	372.2	360.9
Diversion channel outlet elevation	m	360.6	344.2
Diversion channel gradient (average)	%	0.85	0.35
Diversion channel side slopes	H: V	4:1*	4:1

*Different (near vertical) at rock section of the channel

2.4 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 are 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 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 2-3: 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
Diversion channel inlet invert elevation	m	378.75	378.5
Diversion channel outlet elevation	m	377.6	371.5
Diversion channel gradient (average)	%	0.1	1.2
Diversion channel side slopes	H: V	4:1	4:1

Deviations from design occurred for both diversions, however, are 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

2.5 Closure Plan

Closure of the embankments will typically involve but is not limited to breaching 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.

3.0 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 has been investigated as the pond has historically not filled as per design. It is suspected that water is escaping into the underlying aquifer and bypassing the dam.

3.1 Pond Storage Capacity

The stage storage relationship of the three sediment ponds, WDP and SRP is provided in **Table 3- 1**.

Table 3- 1: Pond Storage Capacity (1)

SPD		WCD		Clark		Teeple	
Elevation (m)	Storage Volume (m^3)	Elevation (m)	Storage Volume (m^3)	Elevation (m)	Storage Volume (m^3)	Elevation (m)	Storage Volume (m^3)
368.5	1,021	357.5	952	376.5	333	376.5	1,480
369.0	4,636	358.0	5,172	377.0	816	377.0	5,962
369.5	11,164	358.5	13,422	377.5	3,724	377.5	15,286
370.0	19,261	359.0	26,712	378.0	7,814	378.0	40,184
370.5	29,927	359.5	45,327	378.5	13,328	378.25	58,582
371.0	43,004	360.0	72,037	378.75	18,926	378.5	80,587
371.5	58,142	360.5	112,686	379.0	27,526	378.75	106,855
372.0	75,291	361.0	162,507	379.25	38,023	379.0	136,842
372.3	86,742	361.5	221,529	379.5	58,833		
372.5	97,004	362.0	291,071	379.75	118,243		
373.0	119,921	362.5	374,901	380.0	216,399		
373.5	145,326	363.0	475,551	380.25	347,345		
374.0	173,839	363.5	589,771				
374.5	207,010	364.0	713,997				
375.0	246,922	364.5	847,745				
375.5	295,428	365.0	991,870				

1. Data obtained from report 3098004-RPT-0015 Rev 00.

3.2 Flood, Pond and Dam Operation Criteria

See Section 3.1 of Part 2 for TMA of this Manual for definition of ENL, EIL, DSN and DSI.

- DSN (Dam Safety Notice Level) for freshwater dams is assigned to be the same as the invert of overflow spillway for Teeple Dam and Clark Dam. Both dams were designed for overtopping the overflow spillway. For the SPD Dam and WCD Dam, both were designed

to hold PMF with diversion passing the PMF. The invert of diversion channel/ spillway is not assigned to be the DSN level.

If DSN is reached, RRM needs to initiate Enhanced Surveillance.

- DSI (Dam Safety Incident Level) for freshwater dams corresponds to the IDF level for SPD Dam and WCD Dam. Teeple Dam and Clark Dam were designed to be overtopped and no DSI is assigned to them.

  If DSI is reached, RRM need to report to the regulator and initiate EPRP.

Summary of freshwater diversion dam operation elevation data is shown in **Table 3- 2**.

Table 3- 2: Freshwater Diversion Operation Criteria

Description	Elevation (m)			
	SPD	WCD	Clark	Teeple
Dam Crest	375.5	364.9	380.0	379.0
IDF (Inflow Design Flood, Maximum Flood Level)	375.0(1)	364.5	379.9(2)	378.7(2)
DSI (Dam Safety Incident Level)			N/A	N/A
Sill / Invert of Overflow Spillway	N/A(3)	N/A(3)	379.9	378.7
DSN (Dam Safety Notice Level)				
Pond Level for the Increased Surveillance (High Pond)				
Diversion Channel Inlet Invert Elevation	372.2	360.9	378.75	378.5
NOWL (Normal Operation Water Level)				
Min. Operation Water Level				

(1) Assumed to be same as Peak Water Level at Spillway, Table 6 in Appendix C2, AMEC, Detail design, Design Brief – Water Management Dams (3098004-RPT-0015 Rev 00)
(2) Designed to be overflowed via overflow swale on crest.
(3) Designed to store PMF and pass-through diversion channel

3.3 Environment Protection

Section 10 of ECA (2290) proves the approved surface water monitoring and recording program.

- Table 9 in Section 10 (ECA 2290) presents the locations for surface water sampling.
- Table 10 in Section 10 (ECA 2290) presents the parameters and sampling frequency and types for surface water quality monitoring.
- Table 11 in Section 10 (ECA 2290) presents the trigger values for surface water quality monitoring.

See Section 12 of ECA (2290) for the reporting requirements for the environment purposes.

4.0 MAINTENANCE

4.1 Type and Procedure

Refer to Section 4.1 of Part 2 for TMA of the Manual.

4.2 Preventative and Predictive Maintenance

4.2.1 Roads and Gates

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

The Stockpile Pond & Diversion are accessed through the main site access to the east of the site offices. The West Creek Pond and Diversion are accesses through the main site access and to the west of the site offices.

The Clark Creek Diversion is accessed via Teeple Road at the southern extents of the mine site. The access road is gated and locked. The Tailings Dam Engineer has a key to the lock.

4.2.2 Geotechnical Instruments and Water Monitoring Instruments

Refer to Section 4.2.4 of Part 2 for TMA of the Manual.

4.2.3 Dam Inspection and Predictive Maintenance

Refer to Section 4.2.5 of Part 2 for TMA of the Manual.

Beaver dams are frequently observed at the freshwater diversion structures. NG environment specialist should be notified once observed. Removal of beaver dams should be conducted by qualified contractor.

4.3 Event-Driven Maintenance

Refer to Section 4.3 of Part 2 for TMA of the Manual.

4.3.1 Earthquake Occurrence

Refer to Section 4.3.2 of Part 2 for TMA of the Manual.

4.3.2 Flood Event

Refer to Section 4.3.3 of Part 2 for TMA of the Manual.

4.4 Reporting Requirements

Refer to Section 4.4 of Part 2 for TMA of the Manual.

5.0 SURVEILLANCE

5.1 General

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

The surveillance at the freshwater diversion structures involves:

- Visual Inspections
  - Monthly dam inspection
  - Drone inspection when needed
- Annual Dam Safety Inspections
- ITRB
- Dam Safety Reviews
- Special Inspections and Increased Levels of Surveillance
- Instrumentation

5.2 Visual Inspection

5.2.1 Dam Inspection

Part of site-wide monthly inspections. See Appendix A: Freshwater Diversion Dam Monthly Site Inspection Checklists. Refer to Section 5.2.2, Part 2 for TMA of this Manual.

5.3 Dam Safety Inspections

Part of annual site-wide dam safety inspections carried out by the EOR. Refer to Section 5.3, Part 2 for TMA of this Manual.

5.4 ITRB

Part of site-wide water management review in ITRB meeting. Refer to Section 5.4, Part 2 for TMA of this Manual.

5.5 Dam Safety Reviews

Part of site-wide dam safety review. Refer to Section 5.5, Part 2 for TMA of this Manual.

5.6 Special Inspections and Increased Levels of Surveillance

5.6.1 Pond Surcharge

High Pond is defined as MOWL and higher. When the pond exceeds MOWL, special surveillance and increased surveillance is required.

See Appendix B – Site Inspection Checklist for High Pond at Freshwater Diversions.

5.6.2 Earthquakes

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

See Appendix B – Site Inspection Checklist for Post-Earthquake Evaluation of Freshwater Diversions.

5.6.3 Increased Seepage through the Dams

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

See Appendix B – Site Inspection Checklist for the Increased Seepage at Freshwater Diversions.

5.6.4 Observed Dam Deformation

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

See Appendix B – Site Inspection Checklist for Observation of Deformation of Freshwater Diversions.

5.6.5 Other Unusual Conditions

Other conditions that may require increased surveillance, such as rapid snowmelt, heavy rainstorm, or wind, or snowpack is same as for TMA in Part 2 of the Manual.

5.7 Instrumentation

5.7.1 Instrumentation Data Reading Frequency

Instrument data reading and report frequency following Operation condition outlined in Table 4- 3 according to the Stage 4 Instrumentation Thresholds for TMA and Water Management Dams (BGC-4910-DT00-MEM-0030).

5.7.2 Instrument Thresholds and Action Plan

VWP's are installed at each of the diversion dams. Refer to Section 5.7.2 of Part 2 for TMA of the Manual.

5.7.3 PWP Thresholds

Refer to Section 5.7.3 of Part 2 for TMA of the Manual.

5.7.4 SI Thresholds

Refer to Section 5.7.4 of Part 2 for TMA of the Manual.

5.7.5 Dam Settlement Threshold

Refer to Section 5.7.5 of Part 2 for TMA of the Manual.

5.7.6 Action Plan for Threshold Exceedance

Refer to Section 5.7.6 of Part 2 for TMA of the Manual.

5.8 Other Surveillances

5.8.1 Pond Level

Automated pond level monitoring instrumentation has recently been installed on site. Part of site-wide pond level survey. Refer to Section 5.8.1, Part 2 for TMA of this Manual.

5.8.2 Water License Sampling and Testing

Part of site-wide Water License Sampling and Testing program by Environment Department. Refer to Section 5.8.2, Part 2 for TMA of this Manual.

5.8.3 Other Survey

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

5.9 Summary of Surveillance Frequency

Refer to Section 5.9 of Part 2 for TMA of the Manual.

5.10 Reporting

Refer to Section 5.10 of Part 2 for TMA of the Manual.

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.

APPENDIX A

INSPECTION CHECKLISTS

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

- Monthly Site Inspection Checklist

FRESHWATER DIVERSION DAMS – MONTHLY INSPECTION CHECKLIST

Inspector:_____

Date:_____

Weather:_____

Reservoir Water Level (m):_____

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

Legend: ✓ = No change since previous inspection or normal

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

\- = Not inspected (explanation)

ITEM	Check	REMARKS
1. ACCESS AND SECURITY		
1.1 Access Road		
1.2 Security (gates and locks)		
1.3 Fence		
2. Teeple Dam		
2.1 Dam Crest		
2.1.1 Cracking		
2.1.2 Settlement		
2.1.3 Erosion		
2.1.4 Other Movement, such as Alignment		
2.2 Upstream Slope		
2.2.1 Angles		
2.2.2 Bulging/Cracking		
2.2.3 Erosion		
2.2.4 Non-Uniform Slope		
2.2.5 Settlement		
2.2.6 Sloughing		
2.3 Downstream Slope		
2.3.1 Angles		
2.3.2 Bulging/Cracking		
2.3.3 Erosion		
2.3.4 Non-Uniform Slope		
2.3.5 Settlement		
2.3.6 Sloughing		
2.4 Downstream Toe		
2.4.1 Vegetation		
2.4.2 Wet Spot/ Ice		
2.4.3 Bulging		
2.4.4 Piping		
2.5 Spillway		
2.5.1 Erosion		
2.5.2 Sill		
2.5.3 Toe		
2.6 Diversion Channel		
2.6.1 Estimate Flow		
2.6.2 Sloughing		
2.6.3 Vegetaion		
2.6.4 Blockage		

ITEM	Check	REMARKS
1. ACCESS AND SECURITY		
1.1 Access Road		
1.2 Security (gates and locks)		
1.3 Fence		
2. Clark Dam		
2.1 Dam Crest		
2.1.1 Cracking		
2.1.2 Settlement		
2.1.3 Erosion		
2.1.4 Other Movement, such as Alignment		
2.2 Upstream Slope		
2.2.1 Angles		
2.2.2 Bulging/Cracking		
2.2.3 Erosion		
2.2.4 Non-Uniform Slope		
2.2.5 Settlement		
2.2.6 Sloughing		
2.3 Downstream Slope		
2.3.1 Angles		
2.3.2 Bulging/Cracking		
2.3.3 Erosion		
2.3.4 Non-Uniform Slope		
2.3.5 Settlement		
2.3.6 Sloughing		
2.4 Downstream Toe		
2.4.1 Vegetation		
2.4.2 Wet Spot/ Ice		
2.4.3 Bulging		
2.4.4 Piping		
2.5 Spillway		
2.5.1 Erosion		
2.5.2 Sill		
2.5.3 Toe		
2.6 Diversion Channel		
2.6.1 Estimate Flow		
2.6.2 Sloughing		
2.6.3 Vegetaion		
2.6.4 Blockage		

ITEM	Check	REMARKS
Stockpile Dam		
2.1 Dam Crest		
2.1.1 Cracking		
2.1.2 Settlement		
2.1.3 Erosion		
2.1.4 Other Movement, such as Alignment		
2.2 Upstream Slope		
2.2.1 Angles		
2.2.2 Bulging/Cracking		
2.2.3 Erosion		
2.2.4 Non-Uniform Slope		
2.2.5 Settlement		
2.2.6 Sloughing		
2.3 Downstream Slope		
2.3.1 Angles		
2.3.2 Bulging/Cracking		
2.3.3 Erosion		
2.3.4 Non-Uniform Slope		
2.3.5 Settlement		
2.3.6 Sloughing		
2.4 Downstream Toe		
2.4.1 Vegetation		
2.4.2 Wet Spot/ Ice		
2.4.3 Bulging		
2.4.4 Piping		
2.6 Stockpile Diversion		
2.6.1 Estimate Flow		
2.6.2 Sloughing		
2.6.3 Vegetaion		
2.6.4 Sump		

ITEM	Check	REMARKS
West Creek Dam		
2.1 Dam Crest		
2.1.1 Cracking		
2.1.2 Settlement		
2.1.3 Erosion		
2.1.4 Other Movement, such as Alignment		
2.2 Upstream Slope		
2.2.1 Angles		
2.2.2 Bulging/Cracking		
2.2.3 Erosion		
2.2.4 Non-Uniform Slope		
2.2.5 Settlement		
2.2.6 Sloughing		
2.3 Downstream Slope		
2.3.1 Angles		
2.3.2 Bulging/Cracking		
2.3.3 Erosion		
2.3.4 Non-Uniform Slope		
2.3.5 Settlement		
2.3.6 Sloughing		
2.4 Downstream Toe		
2.4.1 Vegetation		
2.4.2 Wet Spot/ Ice		
2.4.3 Bulging		
2.4.4 Piping		
2.6 West Creek Diversion		
2.6.1 Estimate Flow		
2.6.2 Sloughing		
2.6.3 Vegetaion		
2.6.4 Sump		

APPENDIX B

SURVEILLANCE RESPONSE PLANS

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

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

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

The failure mode, duties, and actions are like those developed for TMA dams. Only site inspection checklist has been developed specific for freshwater dams.

SITE INSPECTOR CHECKLIST
for Teeple Pond High Pond

Name:_____

Date: _____Time of arrival: __

Inspect the condition of the dams and Spillway

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

Fig 1. Plan View of Teeple Dam

SITE INSPECTOR CHECKLIST
For Teeple Dam Post-EQ Evaluation

Name:_____ Date: ___

Time of arrival: _____

Inspect the condition of the dam:

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

Inspect the condition of the Spillway:

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

Fig 1. Plan View of Teeple Dam

SITE INSPECTOR CHECKLIST
For Increased Seepage at Teeple Dam

Name:_____ Date: __

Time of arrival: _____

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

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

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

Record of Seepage

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

Fig 1. Plan View of Teeple Dam

SITE INSPECTOR CHECKLIST
for Teeple Dam Deformation

Name:_____ Date: __

Time of arrival: _____

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

    _____

    _____

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

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

9. Inspect the rest of the dam using the Routine Weekly Inspection

Checklist. Look forsigns of deformation such as:

- New or increased seepage (If observed go to the Increased Seepage SRP)
- Other areas of deformation

10. If anything looks unusual report back to Capital Project Manager immediately.

11. Continue to measure and record the Length, Width etc. every hour and check that there are nochanges. Report any changes in the measurements to the Capital Project Manager immediately.

12. Continue to inspect the entire dam every two hours following the Routine Weekly Inspection Checklist.

13. Do not leave site until manger instructs you to do so.

Fig 1. Plan View of Teeple Dam

SITE INSPECTOR CHECKLIST
for Clark Pond High Pond

Name:_____

Date: _____Time of arrival: __

Inspect the condition of the dams and Spillway

7. From a safe vantage point check that it is safe to approach the dam. Call the Capital Project Manager if the dam is not considered safe to approach.
8. Record weather conditions: _____
9. Record Pond level_____
10. Is there any sign of new deformation such as: cracking, slumping, change of alignment and depressions? YES NO
    a. If yes use deformation checklist to record details of the observations.
11. Is there any sign of new or increased seepage? YES NO
    a. If yes use seepage checklist to record the details of the observations.
12. Is there damage to the spillway? YES NO
    a. If yes use seepage checklist to record the details of the observations

Fig 1. Plan View of Clark Dam

SITE INSPECTOR CHECKLIST
For Clark Dam Post-EQ Evaluation

Name:_____ Date: ___

Time of arrival: _____

Inspect the condition of the dam:

9. From a safe vantage point check that it is safe to approach the dam(s). Call the Capital Project Manager if the dam is not safe to approach.

10. Record weather conditions: _____

11. Record Pond level_____

12. Is there any sign of new deformation such as: cracking, slumping, change of alignment (roads, no-post barrier, and fences) and depressions? YES NO

- If yes use deformation checklist to record details of the observations.

13. Is there any sign of new or increased seepage? YES NO

- If yes use seepage checklist to record the details of the observations

Inspect the condition of the Spillway:

14. Is there damage to the Sill? YES NO

15. Is there damaged to the toe? YES NO

16. Is there damaged to the side walls? YES NO

Fig 1. Plan View of Clark Dam

SITE INSPECTOR CHECKLIST
For Increased Seepage at Clark Dam

Name:_____ Date: __

Time of arrival: _____

17. Check that it is safe to approach the seepage area.
18. Record location of seepage below and mark on attached plan drawing.
19. Measure / estimate rate of seepage.
20. Check to see if the seepage water is “dirty”.
21. Stake out and measure area where seepage is exiting the dam.
22. Dimensions of Seepage Zone
23. Check for any erosion or sloughing in area where seepage is exiting the dam.
24. Record weather conditions: _____
25. Record pond level_____
26. Photograph seepage area
27. Call details back to Capital Project Manager.

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

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

Record of Seepage

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

Fig 1. Plan View of Clark Dam

SITE INSPECTOR CHECKLIST
for Clark Dam Deformation

Name:_____ Date: __

Time of arrival: _____

14. Check that it is safe to approach the deformed area.

15. Record Pond level_____

16. Estimate Freeboard _____

17. Record location of deformed area below and mark on attached plan drawing.

18. Deformation Type

a. Cracking or Offset
   i. Along the crest or across the crest
   ii. Length_____Width_____of crack
   iii. Vertical offset _____
   iv. Depth of crack _____

b. Slumping or Slide
   i. Length_____Width_____of slumped area
   ii. Vertical offset at top of slump_____
   iii. Estimated Volume

c. Sinkhole
   i. Length_____Width _____
   ii. Depth _____

d. Other types of deformations describe below:

_____

_____

19. Photograph deformed area.

20. Call details back to Capital Project Manager.

21. Once measurements are completed stake area and monitor for further movements.

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

22. Inspect the rest of the dam using the Routine Weekly Inspection

Checklist. Look forsigns of deformation such as:

- New or increased seepage (If observed go to the Increased Seepage SRP)
- Other areas of deformation

23. If anything looks unusual report back to Capital Project Manager immediately.

24. Continue to measure and record the Length, Width etc. every hour and check that there are nochanges. Report any changes in the measurements to the Capital Project Manager immediately.

25. Continue to inspect the entire dam every two hours following the Routine Weekly Inspection Checklist.

26. Do not leave site until manger instructs you to do so.

Fig 1. Plan View of Clark Dam

SITE INSPECTOR CHECKLIST
For SPD Dam Post-EQ Evaluation

Name:_____ Date: ___

Time of arrival: _____

Inspect the condition of the dam:

17. From a safe vantage point check that it is safe to approach the dam(s). Call the Capital Project Manager if the dam is not safe to approach.

18. Record weather conditions: _____

19. Record Pond level_____

20. Is there any sign of new deformation such as: cracking, slumping, change of alignment (roads, no-post barrier, and fences) and depressions? YES NO

• If yes use deformation checklist to record details of the observations.

21. Is there any sign of new or increased seepage? YES NO

• If yes use seepage checklist to record the details of the observations

Inspect the condition of the Spillway:

22. Is there damage to the Sill? YES NO

23. Is there damaged to the toe? YES NO

24. Is there damaged to the side walls? YES NO

Fig 1. Plan View of SPD Dam

SITE INSPECTOR CHECKLIST
For Increased Seepage at SPD Dam

Name:_____ Date: __

Time of arrival: _____

33. Check that it is safe to approach the seepage area.
34. Record location of seepage below and mark on attached plan drawing.
35. Measure / estimate rate of seepage.
36. Check to see if the seepage water is “dirty”.
37. Stake out and measure area where seepage is exiting the dam.
38. Dimensions of Seepage Zone
39. Check for any erosion or sloughing in area where seepage is exiting the dam.
40. Record weather conditions: _____
41. Record pond level_____
42. Photograph seepage area
43. Call details back to Capital Project Manager.

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

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

Record of Seepage

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

Fig 1. Plan View of SPD Dam

SITE INSPECTOR CHECKLIST
for SPD Dam Deformation

Name:_____ Date: __

Time of arrival: _____

27. Check that it is safe to approach the deformed area.

28. Record Pond level_____

29. Estimate Freeboard _____

30. Record location of deformed area below and mark on attached plan drawing.

31. Deformation Type

a. Cracking or Offset
   i. Along the crest or across the crest
   ii. Length_____Width_____of crack
   iii. Vertical offset _____
   iv. Depth of crack _____

b. Slumping or Slide
   i. Length_____Width_____of slumped area
   ii. Vertical offset at top of slump_____
   iii. Estimated Volume

c. Sinkhole
   i. Length_____Width _____
   ii. Depth _____

d. Other types of deformations describe below:

_____

_____

32. Photograph deformed area.

33. Call details back to Capital Project Manager.

34. Once measurements are completed stake area and monitor for further movements.

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

35. Inspect the rest of the dam using the Routine Weekly Inspection

Checklist. Look forsigns of deformation such as:

- New or increased seepage (If observed go to the Increased Seepage SRP)
- Other areas of deformation

36. If anything looks unusual report back to Capital Project Manager immediately.

37. Continue to measure and record the Length, Width etc. every hour and check that there are nochanges. Report any changes in the measurements to the Capital Project Manager immediately.

38. Continue to inspect the entire dam every two hours following the Routine Weekly Inspection Checklist.

39. Do not leave site until manger instructs you to do so.

Fig 1. Plan View of SPD Dam

SITE INSPECTOR CHECKLIST
For WCD Dam Post-EQ Evaluation

Name:_____ Date: ___

Time of arrival: _____

Inspect the condition of the dam:

25. From a safe vantage point check that it is safe to approach the dam(s). Call the Capital Project Manager if the dam is not safe to approach.

26. Record weather conditions: _____

27. Record Pond level_____

28. Is there any sign of new deformation such as: cracking, slumping, change of alignment (roads, no-post barrier, and fences) and depressions? YES NO

• If yes use deformation checklist to record details of the observations.

29. Is there any sign of new or increased seepage? YES NO

• If yes use seepage checklist to record the details of the observations

Inspect the condition of the Spillway:

30. Is there damage to the Sill? YES NO

31. Is there damaged to the toe? YES NO

32. Is there damaged to the side walls? YES NO

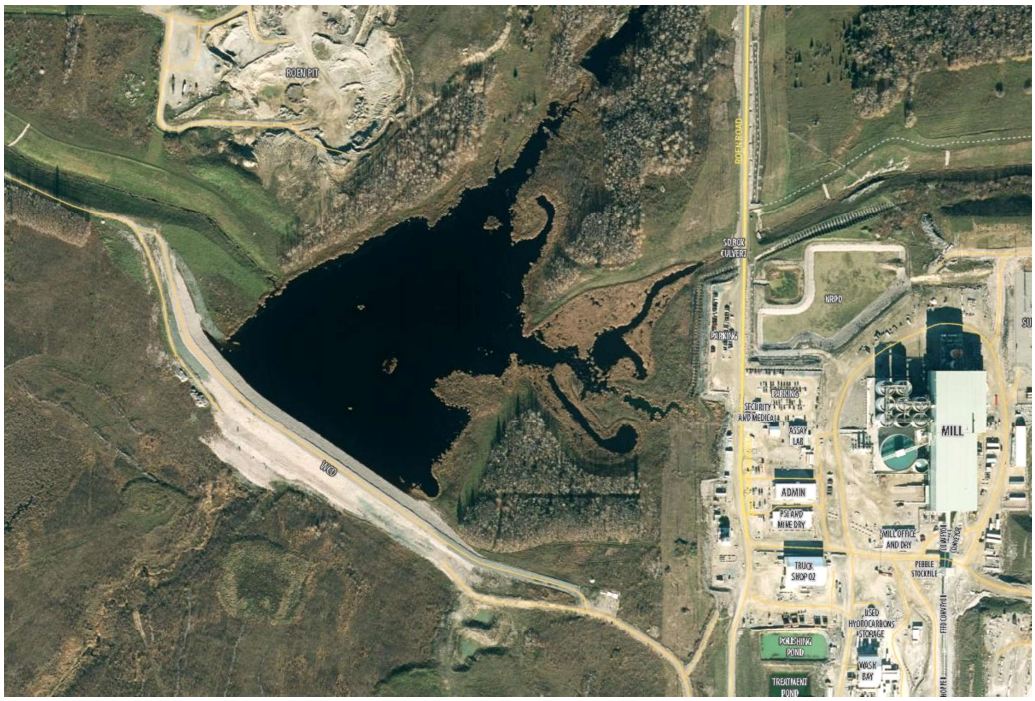

Fig 1. Plan View of WCD Dam

SITE INSPECTOR CHECKLIST
For Increased Seepage at WCD Dam

Name:_____ Date: __

Time of arrival: _____

49. Check that it is safe to approach the seepage area.
50. Record location of seepage below and mark on attached plan drawing.
51. Measure / estimate rate of seepage.
52. Check to see if the seepage water is “dirty”.
53. Stake out and measure area where seepage is exiting the dam.
54. Dimensions of Seepage Zone
55. Check for any erosion or sloughing in area where seepage is exiting the dam.
56. Record weather conditions: _____
57. Record pond level_____
58. Photograph seepage area
59. Call details back to Capital Project Manager.

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

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

Record of Seepage

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

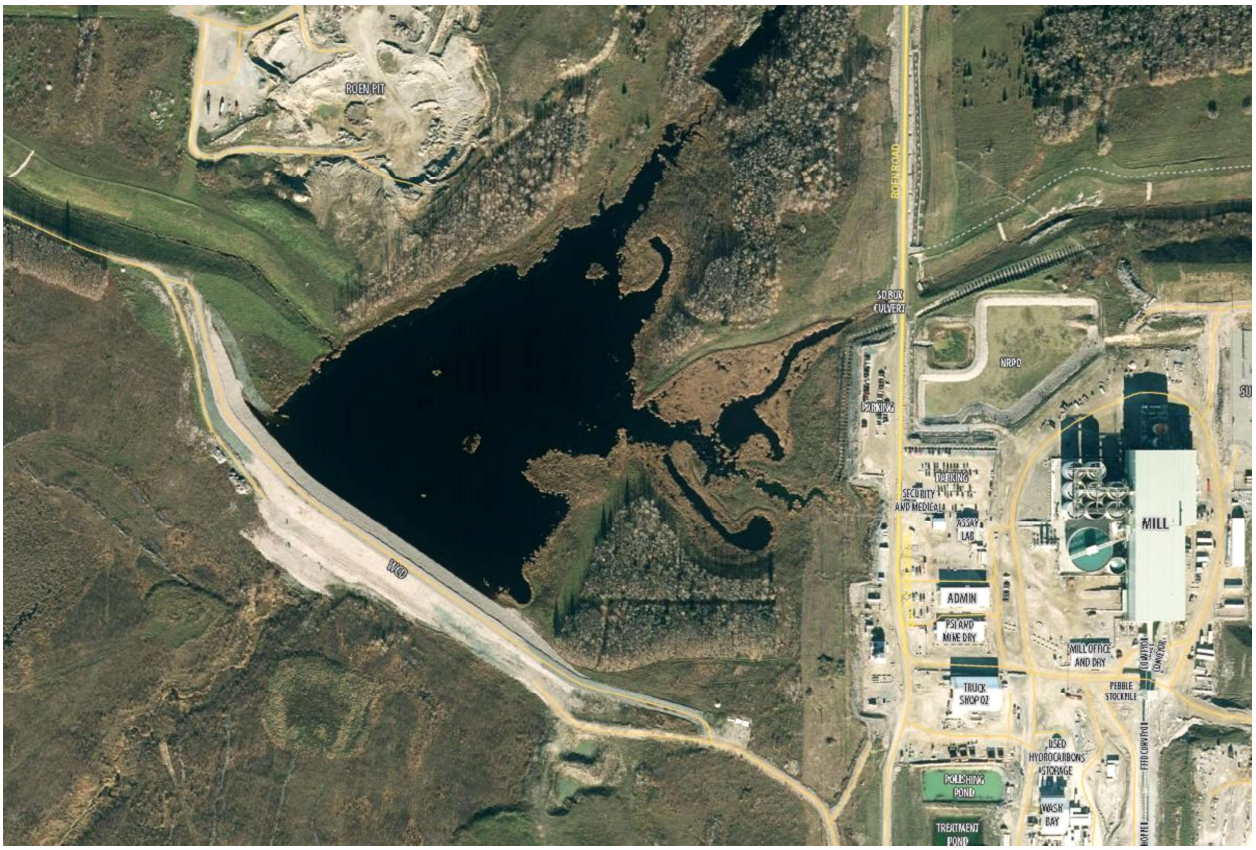

Fig 1. Plan View of WCD Dam

SITE INSPECTOR CHECKLIST
for WCD Dam Deformation

Name:_____ Date: __

Time of arrival: _____

40. Check that it is safe to approach the deformed area.

41. Record Pond level_____

42. Estimate Freeboard _____

43. Record location of deformed area below and mark on attached plan drawing.

44. Deformation Type

a. Cracking or Offset
   i. Along the crest or across the crest
   ii. Length_____Width_____of crack
   iii. Vertical offset _____
   iv. Depth of crack _____

b. Slumping or Slide
   i. Length_____Width_____of slumped area
   ii. Vertical offset at top of slump_____
   iii. Estimated Volume

c. Sinkhole
   i. Length_____Width _____
   ii. Depth _____

d. Other types of deformations describe below:

_____

_____

45. Photograph deformed area.

46. Call details back to Capital Project Manager.

47. Once measurements are completed stake area and monitor for further movements.

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

48. Inspect the rest of the dam using the Routine Weekly Inspection

Checklist. Look forsigns of deformation such as:

- New or increased seepage (If observed go to the Increased Seepage SRP)
- Other areas of deformation

49. If anything looks unusual report back to Capital Project Manager immediately.

50. Continue to measure and record the Length, Width etc. every hour and check that there are nochanges. Report any changes in the measurements to the Capital Project Manager immediately.

51. Continue to inspect the entire dam every two hours following the Routine Weekly Inspection Checklist.

52. Do not leave site until manger instructs you to do so.

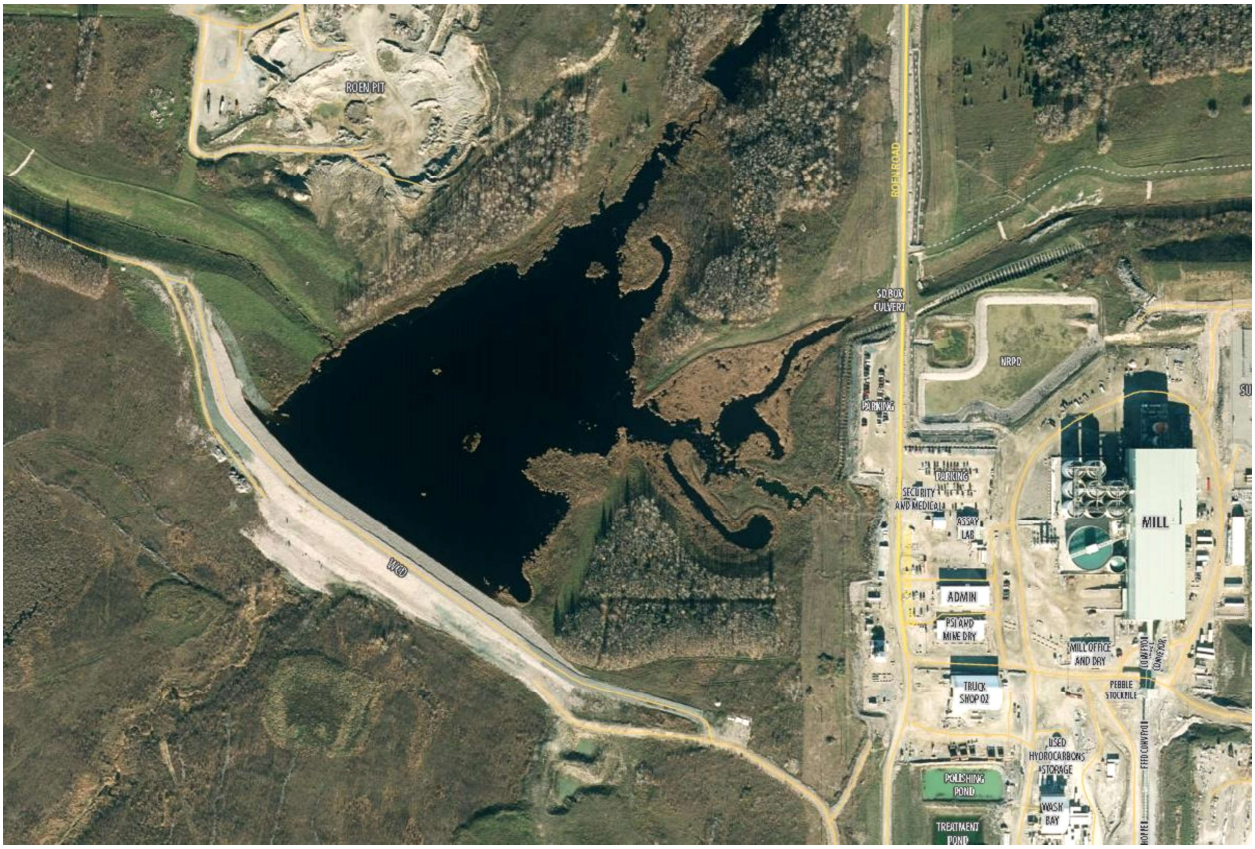

Fig 1. Plan View of WCD Dam