Appendix I1

Management Plans

MEADOWBANK GOLD PROJECT

DEWATERING DIKES

Operation, Maintenance and Surveillance Manual

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 7
February 2018

DEWATERING DIKES

OPERATION, MAINTENANCE AND

SURVEILLANCE MANUAL

MEADOWBANK GOLD PROJECT

AGNICO EAGLE MINES LIMITED

This Operation, Maintenance and Surveillance Manual has been prepared by Agnico Eagle Mines Limited and is to be used for the operation, maintenance and surveillance of the Dewatering Dikes at the Meadowbank Gold Project. All Registered Manual Holders are responsible for ensuring that they are using the most recent revision of this document. This Operation, Maintenance and Surveillance Manual, may not be copied in whole or in part without the written consent of Agnico Eagle Mines Limited.

IMPLEMENTATION SCHEDULE

This Plan is immediately implemented.

DISTRIBUTION LIST

AEM- General Mine Manager

AEM- Environment Superintendent

AEM- Mine Operations Superintendent

AEM- Engineering Superintendent

AEM- General Services Manager

AEM- Site Services Superintendent

AEM- Corporate Environment Director

AEM- Health and Safety Superintendent

Golder- Dike Design Engineer

SNC- Dike Design Engineer

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
(first revision)	February 2012	All	All	
V2	August 27, 2013	All	All	
V3	September 15, 2013	All	All	Updated items mentioned by MDRB and the Mine Inspector in the Annual Geotechnical Inspection in September 2013
V4	January 2015	All	All	
V5	January 2016	All	All	
V6	February 2017	All	All	
V7	February 2018	All	All	

Approved by:

Pierre McMullen
Engineering Superintendent

Nancy Duquet-Harvey
Environmental Superintendent -NU

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

SECTION 1 • INTRODUCTION

1.1 PURPOSE

This document includes procedures for the operation, maintenance and surveillance (OMS) of the Dewatering Dikes at the Meadowbank Gold Project, Nunavut, operated by Agnico Eagle Mines Limited (AEM), Meadowbank Division. The Dewatering Dikes are comprised of the following structures: East Dike, Bay-Goose Dike, South Camp Dike, and Vault Dike. The dewatering dikes isolate the open pit mining activities from Second Portage Lake, Third Portage Lake and Wally Lake.

The responsibilities of AEM staff have been allocated based on the current management structure. As the management structure changes the OMS Manual should be revised and distributed accordingly.

This OMS Manual refers to the dewatering, operations, and decommissioning phases of the Dewatering Dikes.

1.2 REGULATORY REQUIREMENTS

This manual addresses specific requirements from regulatory agencies and provides procedures to maintain compliance. Regulatory requirements are presented in the documents summarized in Table 1.1.

Table 1.1 Regulatory Requirements

Document	Document Reference No.	Review Date
Territorial Lands Act - Land Lease	Production Lease KVPL08D280	Expires December 27, 2027
Environmental Impact Assessment	NIRB project certificate No. 004	n/a – Only if substantial modifications to original application are to be carried out
Water Licence Type A	Nunavut Water Board Water License 2AM-MEA1525	Expires July 22, 2025
	Nunavut Water Board Water License 2AM-MEA No. 2AM-MEA0815* (during construction and dewatering)	Expired May 31, 2015

The operating, maintenance, surveillance and emergency procedures recommended by the Canadian Dam Association (CDA) “Dam Safety Guidelines” (CDA 2007) and the Mining Association of Canada (MAC) “Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities” (MAC, 2005) have been incorporated into this manual.

The CDA Dam Safety Guidelines (CDA, 2007) states: “dam operation, maintenance and surveillance shall be provided so that an acceptable level of dam safety is ensured.” This manual contains protocols and information that will assist AEM to operate, maintain, and monitor the Dewatering Dikes in a safe manner and identify early signs of distress. Qualified personnel shall operate, maintain and monitor the structures and adequate records shall be maintained for general and reference purposes.

1.3 CONSEQUENCES OF FAILURE

The Dewatering Dikes consequence of failure classification is based on the guidelines provided in the CDA Dam Safety Guidelines (CDA 2007) and is presented in Table 1.2. The East Dike and Bay-Goose Dike are rated as “High” consequence of failure structures based on the potential for loss of life and “High” economic loss. The South Camp Dike and Vault Dike are rated as a “Significant” consequence of failure structure based on a temporary risk to workers, and classified as “Low” due to economic loss.

No flooding or inundation mapping has been completed. It is assumed that failure of the East Dike could flood the Portage Pit, resulting in associated threat to the safety of mine personnel, equipment, and other workings within the dewatered area. Similarly, it is assumed that failure of the Bay-Goose Dike could flood the Goose Island Pit and Portage Pit, resulting in associated threat to the safety of mine personnel, equipment, and other workings within the dewatered area. Flooding would likely cause cessation of mining operations within one or both pits, either temporarily or permanently. It is assumed that failure of South Camp Dike could not flood the Bay-Goose Pit as the Third Portage Lake water level at South Camp Dike is too low. A failure of Vault Dike could flood Vault Pit resulting in associated threat to the safety of mine personnel, equipment, and other workings within the dewatered area. Flooding would likely cause cessation of mining operations either temporarily or permanently.

Table 1.2 Classification of Dams in Terms of Consequences of Failure (CDA 2007)

Dam Class	Population at Risk [Note 1]	Incremental losses		
		Loss of Life [Note 2]	**Environmental and Cultural Values**	**Infrastructure and Economics**
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or fewer	Significant loss or deterioration of *important* fish or wildlife habitat Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
Very High	Permanent	100 or fewer	Significant loss or deterioration of *critical* fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affection important infrastructure or services *(e.g., highway, industrial facility, storage facilities for dangerous substances)*
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services *(e.g., hospital, major industrial complex, major storage facilities for dangerous substances)*

Note 1. *Definitions for population risk:*

None – *There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.*

Temporary – *People are only temporarily in the dam-breach inundation zone (e.g., seasonal cottage use, passing through on transportation routes, participating in recreational activities).*

Permanent – *The population at risk is ordinarily located in the dam-breach inundation zone (e.g., as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).*

Note 2. *Implications for loss of life:*

Unspecified – *The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.*

1.4 REGISTERED MANUAL HOLDERS AND REVISIONS

The Engineering Superintendent is responsible for maintaining an up-to-date list of the registered holders of this OMS Manual in Table 1.3.

The Engineering Superintendent is also responsible for the issue of all revisions and addenda to the registered holders of this Manual. Revisions will be made, as and when required, by re-issuing a complete section, table or appendix so that the old section, table or appendix can be removed and replaced. Each registered holder is responsible for placing the revisions and addenda in his or her manual and for recording receipt of the same in Table 1.3.

Table 1.3 List of OMS Manual Holders

Position / Name / Address or Location
General Mine Manager / Luc Chouinard / OFFICE
Environment Superintendent / Nancy Duquet-Harvey / OFFICE
Mine Operations Superintendent / Yan Côté, Nicolas P. Deschamps (asst.) / OFFICE
Engineering Superintendent / Pierre McMullen, Miles Legault (asst.) / OFFICE
Logistics Coordinator / Mathieu Grenier / OFFICE
Energy & Infrastructures Superintendent / Bruce Waugh / OFFICE
Vice President, Environment / Michel Julien / AEM Toronto Office
Health and Safety Superintendent / Norman Ladouceur, Yves Levesque (asst.) / OFFICE
Dike Design Engineer / Golder Associates Ltd./ 500 – 4260 Still Creek Drive, Burnaby, BC, V5C 6C6
Dike Design Engineer / SNC-Lavalin Inc./ 5500, Boulevard des Galeries, Bureau 200, Quebec, Quebec, G2K 2E2
Update as Required

Table 1.4 Record of Revisions/Addenda

Revision No.	Section	Table	Appendix	Addenda No.	Date of Revision
1	All	All	All	-	February 2012
2	All	All	All	-	August 2013
3	All	All	All	-	September 2013
4	All	All	All	-	January 2015
5	All	All	All	-	January 2016
6	All	All	All	-	February 2017
7	All	All	All	-	February 2018

1.5 ANNUAL REVIEW OF MANUAL

This manual will be reviewed by AEM on at least an annual basis and revised as necessary to accommodate changes in the condition and operation of the facilities. The registered users of the manual are encouraged to provide comments and suggestions for improvement of the manual and the procedures specified in it to the Engineering Superintendent. The comments and suggestions communicated will be considered in the subsequent review.

1.6 REFERENCE DOCUMENTS AND DRAWINGS

Table 1.5 is a summary of key reference documents for the Dewatering Dikes. All design and as-built documents can be found in hard copy onsite in the engineering department, as well as in electronic copies on the dikes server.

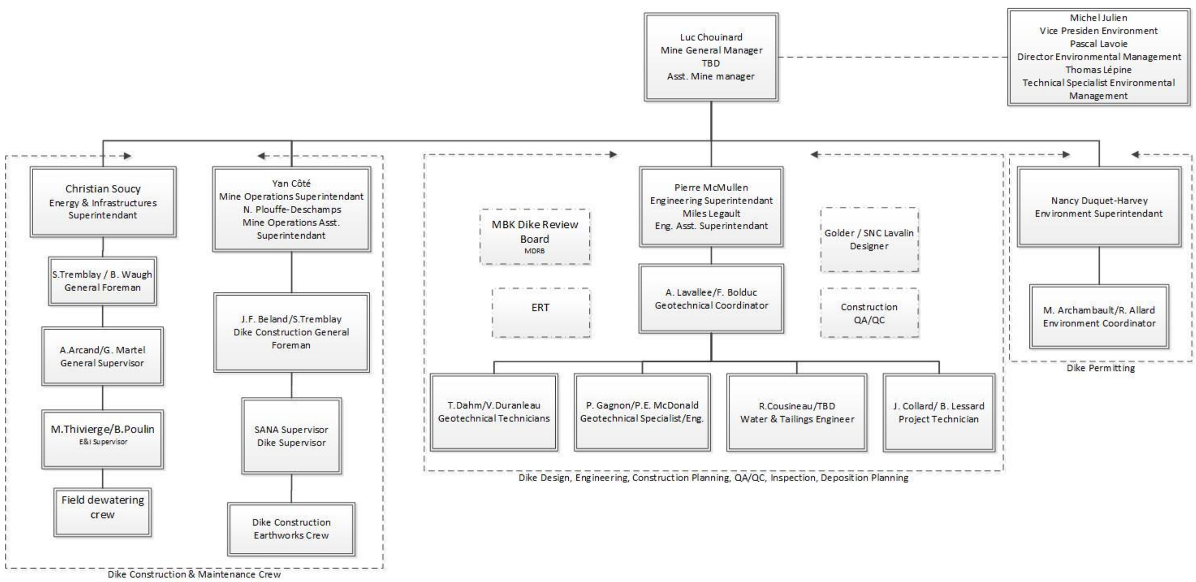
Table 1.5 Summary of key reference documents for the Dewatering Dikes

Dewatering Dike	Type of Information	Document Number	Document Title
East Dike	Design	Doc. 572	East Dike Design Meadowbank Gold Project (Golder 2008b)
	As-built	Doc. 900	East Dike Construction As-Built Report Meadowbank Gold Project (Golder 2009d)
	Remediation	Doc. 916	Meadowbank East Dike Grouting Response Plan (Golder 2009b)
		Doc. 953	East Dike CPT Investigation Meadowbank Gold Project" (Golder 2010b)
		Doc. 986	East Dike Sinkhole Investigation Program Meadowbank Gold Project (Golder 2010a)
Bay-Goose Dike	Design	Doc. 802	Bay-Goose Dike and South Camp Dike Designs (Golder 2009a)
	As-built	Doc. 1328	Bay Goose Dike Construction As-Built Report Meadowbank Gold Project (Golder 2013)
South Camp Dike	Design	Doc. 802	Bay-Goose Dike and South Camp Dike Designs (Golder 2009a)
	As-built	NA	South Camp Dike Construction Summary Report, Meadowbank Gold Project (AEM 2012)
Vault Dike	Design	610548-2020-4GER-0001	Detailed Engineering of Vault Dike (SNC, 2013a)
	Technical Specifications	610548-2020-4GEF-0001	Construction of Vault Dike – Technical Specifications (SNC, 2013b)
	As-built	NA	Construction Summary Report Vault Dike (AEM, 2013)

SECTION 2 • ROLES AND RESPONSIBILITIES

An organizational chart of the current management structure is shown in Figure 1. This chart shall be updated to reflect changes in management structure, as necessary, such that it is maintained up-to-date.

Figure 1 Organizational Structure



2.1 RESPONSIBILITIES

The responsibilities for each management position during dewatering and during operations of the Dewatering Dikes are shown in Table 2.1 and Table 2.2, respectively. For the purpose of this manual, dewatering is defined as completed, and operation begins when the downstream toe of the dike is exposed.

Table 2.1 Responsibilities during Dewatering

Position	Responsibilities
Manager of Regulatory Affairs	Liaise with external stakeholders during an emergency event including NIRB, Nunavut Water Board, NGO's, government agencies.
General Mine Manager	Initiate and oversee emergency or contingency protocols during emergency events.
	Liaise/direct/coordinate the Meadowbank Dike Review Board (MDRB).
	Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual.
Assistant Mine Manager	Initiate and oversee emergency or contingency protocols during emergency events, if General Manager is not on site.
	Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual.
Mine Operations Superintendent	Maintain access to the Dewatering Dikes, including making road repairs, controlling dust and removing snow. Maintain stockpiles of construction material.
	Carry out field maintenance on the dikes as required, including material placement, electrical and mechanical repairs.
Engineering Superintendent/Geotechnical Coordinator/ Geotechnical Engineer/Specialist	Construction of seepage collection works.
	Carry out inspections of the dikes as required in the OMS Manual.
	Monitor Dewatering Dike instrumentation as required in the OMS Manual.
	Monitor pumping rates for dewatering, upstream and downstream water levels, and freeboard.
	Liaise with Design Engineer during dewatering regarding dike performance, pumping rates, water quality, instrumentation measurements, etc.
	Review geotechnical and environmental monitoring data for compliance with Water License regulations and to evaluate dike performance with respect to design parameters.
	Prepare reports including description of activities on dikes, pumping rates, instrumentation readings, water quality data, dike performance, visual observations, etc. as required in the OMS Manual.
	Determine dewatering pumping schedule based on the water quality monitoring.
	Maintain instrumentation, readout units, data acquisition system and cabins.
	Coordinate work force as required for monitoring and maintenance.

Position	Responsibilities
	Coordinate equipment, labour, materials and maintenance activities required for pumps and pipelines during dewatering.
	Revise and update the OMS Manual to reflect as-built conditions and any other changes.
	Maintain up to date list of registered holders of the OMS Manual.
	Issue all revisions and addenda to registered OMS Manual holders.
	Carry out field operations including pumping.
Environment Superintendent / Sr. Coordinator	Monitor water quality.
	Monitor total suspended solids at pump intake.
	Review environmental monitoring data for compliance with Water License and regulations and to evaluate dike performance with respect to design parameters.
	Liaise with external stakeholders including NIRB, Nunavut Water Board, NGO's, government agencies.
Energy & Infrastructures Superintendent	Maintain and service pumps and pipelines for dewatering.
	Coordinate equipment, labour and materials for maintenance during dewatering.
	Carry out field maintenance on material placement, electrical and mechanical repairs.
	Coordinate labour as required for monitoring.
Design Engineer	Communicate with Engineering Superintendent/ Dike Advisor on frequent basis regarding performance of dewatering dikes.
	Review instrumentation package (to be provided by Engineering Superintendent/Dike Advisor) on a frequent basis.
Meadowbank Dike Review Board (MDRB)	Be updated on the performance of the dewatering dikes behaviour during their operation.
Emergency Response Team	Follow the guidance written in the Emergency Response Plan in an emergency situation

Table 2.2 Responsibilities during Operation

Position	Responsibilities
Manager of Regulatory Affairs	Liaise with external stakeholders during an emergency event including NIRB, Nunavut Water Board, NGO's, government agencies.
General Mine Manager	Liaise with external stakeholders including NIRB, Nunavut Water Board, NGO's, government agencies.
	Liaise / coordinate / direct the MDRB.
	Initiate and oversee emergency or contingency protocols during emergency events.
	Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual.
	Coordination of mine staff and equipment during an emergency.
Assistant Mine Manager	Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual.
	Coordination of mine staff and equipment during an emergency if General Manager is not on site.
Mine Operations Superintendent	Maintain access to the Dewatering Dikes and seepage collection systems, including making road repairs, controlling dust and removing snow.
	Carry out field maintenance on the dikes as required, including material placement, electrical and mechanical repairs.
Engineering Superintendent/Geotechnical Coordinator/ Geotechnical Spec. or Eng	Carry out inspections of the dikes, ditches and sumps as required in the OMS Manual.
	Monitor seepage pumping rates.
	Monitor Dewatering Dike instrumentation as required in the OMS Manual.
	Review geotechnical instrumentation and environmental monitoring data to evaluate dike performance with respect to design parameters and for compliance with Water License and regulations.
	Prepare reports including description of activities on dikes, pumping rates, instrumentation readings, water quality data, dike performance, visual observations, etc. as required in the OMS Manual.
	Liaise with Design Engineer regarding dike performance, pumping rates, water quality, instrumentation measurements, etc.
	Maintain instrumentation, readout units, data acquisition system and cabins.
	Coordinate work force as required for monitoring and maintenance.
	Coordinate equipment, labour, materials and maintenance activities required for pumps and pipelines associated with the seepage collection systems and any runoff diversions.
	Revise and update the OMS Manual to reflect as-built conditions of seepage collection system and future modifications.
	Maintain up to date list of registered holders of the OMS Manual.
	Issue all revisions and addenda to the registered OMS Manual holders.
	Liaise with MDRB as required.

Position	Responsibilities
	Carry out field operations.
Environment Superintendent / Sr. Coordinator	Monitor water quality of seepage and runoff collected in sumps and ditches.
	Review environmental monitoring data for compliance with Water License and regulations and to determine dike performance with respect to design parameters.
	Liaise with external stakeholders including NIRB, Nunavut Water Board, NGO's, government agencies.
Energy & Infrastructures Superintendent	Maintain and service pumps and pipelines for seepage and runoff.
	Coordinate equipment, labour and materials for maintenance during dewatering.
	Carry out field maintenance on material placement, electrical and mechanical repairs
	Coordinate labour as required for monitoring and maintenance.
	Purchase equipment as required.
Design Engineer	Communicate with Engineering Superintendent/ Dike Advisor on a frequent basis regarding performance of dewatering dikes. Frequency to be determined by Engineering Superintendent/ Dike Advisor.
	Review instrumentation package (to be provided by Superintendent/Dike Advisor) on a frequent basis, frequency to be determined by Engineering Superintendent/ Dike Advisor.
	Carry out annual inspection and reporting.
Meadowbank Dike Review Board (MDRB)	Be updated on the performance of the dewatering dikes behaviour during operation.
Emergency Response Team	Follow the guidance written in the Emergency Response Plan in an emergency situation

All site personnel are responsible for informing their Managers of any indications of abnormal situations or conditions that may be observed.

The responsibilities and authorities of each position in the OMS Manual should be updated to reflect any changes to the overall management structure as they occur.

2.2 REQUIRED LEVELS OF KNOWLEDGE

A minimum level of knowledge and training are required for personnel to adequately carry out their responsibilities and to appropriately realize their level of authority. Personnel should understand consequences of non-compliance for their area and have an understanding of emergency procedures. The recommended minimum levels of knowledge for the anticipated positions are as summarized in Table 2.3.

Table 2.3 Recommended Minimum Knowledge and Training Requirements

Position	Recommended Minimum Knowledge and Training
Manager of Regulatory Affairs	Review of the OMS Manual, with an understanding of the operational requirements.
	Detailed knowledge of emergency response procedures.
General Mine Manager	Detailed understanding of the OMS Manual, with a complete understanding of the design, dewatering and operational requirements, particularly monitoring, inspection and dam safety review requirements.
	Complete understanding of environmental compliance issues and monitoring requirements.
	Understanding of all related technical documents for design and construction.
	Detailed knowledge of emergency response procedures.
Assistant Mine Manager	Detailed understanding of the OMS Manual, with a complete understanding of the design, dewatering and operational requirements, particularly monitoring, inspection and dam safety review requirements.
	Complete understanding of environmental compliance issues and monitoring requirements.
	Understanding of all related technical documents for design and construction.
	Detailed knowledge of emergency response procedures.
Environment Superintendent / Sr. Coordinator	Detailed understanding of the OMS Manual, with a complete understanding of the design, dewatering and operational requirements.
	Detailed and ongoing review of all monitoring, inspections and dam safety reviews.
	Complete understanding of environmental compliance issues and monitoring requirements.
	Knowledge of emergency response procedures.
Mine Operations Superintendent	Basic knowledge of the OMS Manual, with an understanding of the design requirements.
	Detailed knowledge of emergency response procedures.
Engineering Superintendent/Geotechnical Coordinator/ Geotechnical Spec. or Eng	Detailed understanding of the OMS Manual, with a complete understanding of the design, dewatering and operational requirements.
	Detailed knowledge of monitoring protocols and requirements.
	Detailed and ongoing review of all monitoring, inspections and dam safety reviews.
	Complete understanding of all related technical documents for design, dewatering, operation, risk assessment and emergency response.
	Detailed understanding of all operational elements within the facility and their operational and maintenance requirements.
	Detailed knowledge of emergency response procedures.
Environment Personnel	Knowledge of the OMS Manual, with an understanding of the dewatering and operational requirements set out in this OMS

Position	Recommended Minimum Knowledge and Training
	Manual.
	OMS Manual should be reviewed with the Environmental Superintendent.
	Detailed knowledge of environmental monitoring protocols and requirements.
	Knowledge of emergency procedures.
Mine Personnel	Knowledge of the OMS Manual, with an understanding of the dewatering and operational requirements set out in this OMS Manual.
	Knowledge of emergency response procedures.
Geotechnical Engineering Personnel	Knowledge of the OMS Manual, with an understanding of the design, dewatering, and operational requirements set out in this OMS Manual.
	Detailed knowledge of monitoring protocols and requirements.
	Knowledge of emergency procedures.
Energy & Infrastructures Superintendent	Basic understanding of the OMS Manual, including the design, dewatering and operational requirements set out in the OMS Manual.
	Detailed knowledge of all operational elements set out in the OMS and required for an event of emergency, such as available materials quantity and locations, equipment inventory and locations and available labour.
	Knowledge of emergency response procedures.
External Personnel (Design Engineer and MDRB)	Varied levels of knowledge and understanding depending on involvement.
	General Manager shall determine levels of knowledge and instruct personnel.
Emergency Response Team	Knowledge of emergency response procedures.

The OMS Manual should be updated to reflect any changes in responsibilities or management structure as they occur.

SECTION 3 • DESCRIPTION OF DEWATERING DIKES

The Meadowbank Gold Project site is located approximately 80 km north of Baker Lake, Nunavut. The gold ore deposits are situated adjacent to and beneath Second Portage Lake, Third Portage Lake and Vault Lake. The mine plan includes the construction and operation of a series of dewatering dikes to isolate the open pit mining activities from the lakes. Figure 2 presents the site plan. The Dewatering Dikes consist of the following structures:

- East Dike;
- Bay-Goose Dike;
- South Camp Dike; and
- Vault Dike.

A description of the physical conditions of the site, as well as a description of the climate, geological and geotechnical conditions can be found in various documents including the design documents for the East Dike and Bay-Goose Dike Doc. 572 Sections 3.0 and 4.0 (Golder 2008b) and Doc. 802 Section 2.0 (Golder 2009a), respectively.

In 2008 the East Dike and West Channel Dikes were constructed to isolate the northwest arm of Second Portage Lake to permit mining of Portage Pit and also to provide an area for the storage of tailings. Dewatering of the northwest arm of Second Portage Lake began in the spring of 2009 and was halted during the summer of 2009. Dewatering recommenced in the fall of 2009. The downstream toe of the East Dike has been exposed continuously since July 2010 although was mostly exposed by July 2009. Dewatering of the basin continued intermittently as other construction and site water was transferred to the basin as part of the operations. The West Channel Dike was no longer required and was removed as part of mining operations in the Portage Pit in 2012.

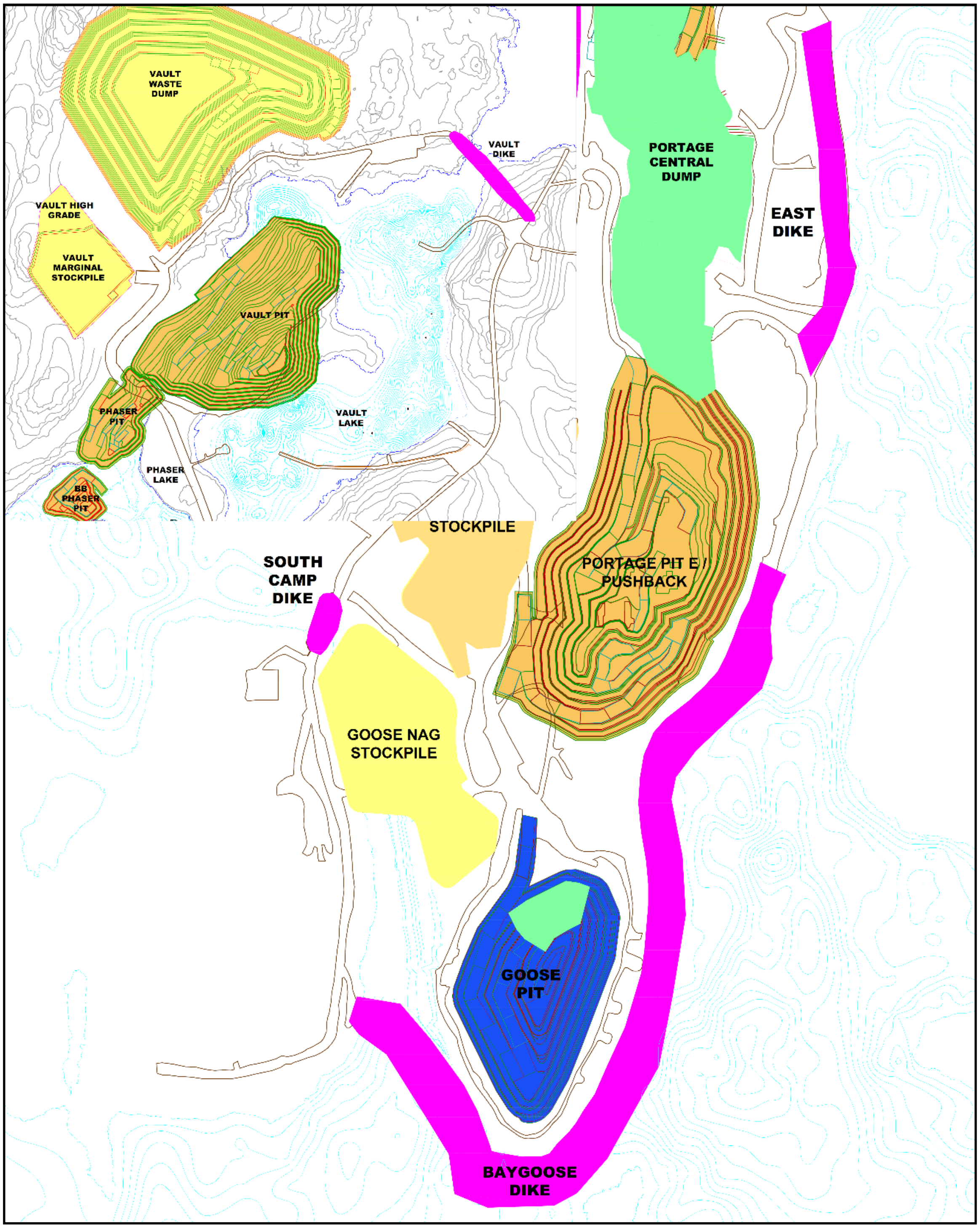
In 2009 the South Camp Dike was constructed. The earthworks component of the Bay-Goose Dike construction occurred over two summer construction seasons. The north portion of the Bay-Goose Dike was constructed in 2009 and the south portion in 2010. Grouting and jet grouting works commenced in 2010 and were completed by mid-July 2011.

Dewatering of the Bay-Goose Basin occurred between July 25 and November 14, 2011 following completion of the Bay-Goose Dike construction and instrumentation installation. In March 2012, the pre-stripping of Goose Pit started. Goose Pit mining operations were completed in 2015. Pit waste rock infilling has been completed and is planned for 2017-2019.

The construction of Vault Dike at Meadowbank was conducted from February 2013 to March 2013. Vault Dike is located across a shallow creek which connects Wally Lake and Vault Lake, at the Vault Pit area. Vault Dike is essential to allow the dewatering of Vault Lake and to isolate Vault Pit during mining activities from Wally Lake. The dewatering of Vault Lake started on June 27th, 2013 and was completed in the summer of 2014.

The following subsections provide additional details for each of the Dewatering Dikes.

Figure 2 Site Plan



3.1 EAST DIKE

The East Dike together with the West Channel Dike isolates the northwest arm of Second Portage Lake. During the operational phase of the mine, the East Dike isolates the Portage Pit from Second Portage Lake. In closure, as the plan will include breaching of the Bay-Goose Dike thereby flooding both Goose and Portage Pits, then the East Dike will separate Third Portage Lake from Second Portage Lake. There are no spillways or water diversion works associated with the East Dike. The East Dike also used to serve as a haul road to connect the North Portage Pit to the ore stockpiles and to the crushing facility within the plant site. The West Channel Dike used to cover a narrow channel and prevent flow from Third Portage Lake to Second Portage Lake. The West Channel Dike together with the East Dike isolated the northwest arm of Second Portage Lake. The West Channel Dike was no longer required and was removed as part of mining operations in the Portage Pit in 2012.

The East Dike was constructed in the summer of 2008 and grouting of the foundation and bedrock occurred in 2008 and during the first quarter of 2009. It is approximately 800 m in length, and was constructed within Second Portage Lake prior to dewatering. The dike consists of a wide rockfill shell, with downstream filters and a soil-bentonite cutoff wall that extends to bedrock. The cutoff wall extends up to 8 m below lake level.

3.1.1 East Dike - Design and Construction

The East Dike design is contained within Doc. 572 (Golder 2008b). A plan view and profile of the constructed dike is presented on Figure 3 and includes the locations of instrumentation installations used for monitoring. A typical cross section through the dike and is shown on Figure 4. Additional as-built information and as-built drawings for the East Dike are provided in Doc. 900 (Golder 2009e).

Dike construction occurred in the following general manner:

<u>Rockfill Embankment:</u>

- A rockfill platform approximately 50 m wide was advanced from the south abutment to the north. The rockfill platform provided construction access and support for the core materials.

- The width of the rockfill platform (embankment) was subsequently increased by placement of additional rockfill on the downstream side, to provide an adequate road width to accommodate two-way haul traffic.

<u>Initial Trench Excavation:</u>

- Rockfill and lakebed soils were excavated from the crest of the rockfill platform to expose bedrock along the cutoff centreline. Loose blocks or slabs from the bedrock surface were removed, as practical.

Backfilling of the Initial Trench:

- A coarse granular filter (150 mm minus) was placed using the bucket of the excavator on the downstream slope of excavation.
- Then the remaining portion of the excavation was backfilled with Core Backfill (19 mm minus) material in the central portion along the cutoff wall centreline and Coarse Filter (150 mm minus) material on the upstream and downstream sides of the Core Backfill. Backfilling of the trench with the Core Backfill and Coarse Filter materials was a simultaneous activity and occurred progressively as the initial trench was the excavation front advanced.
- At the bedrock surface, a minimum of 5 m of Core Backfill material was to be placed.

Compaction of Core Backfill:

- Core Backfill and Coarse Filter were placed to an elevation 2 m above the water level to form a platform from which densification could occur.
- The Core Backfill was densified using multiple passes of dynamic compaction. Craters produced by the dropped weight were backfilled to level the working platform between passes.

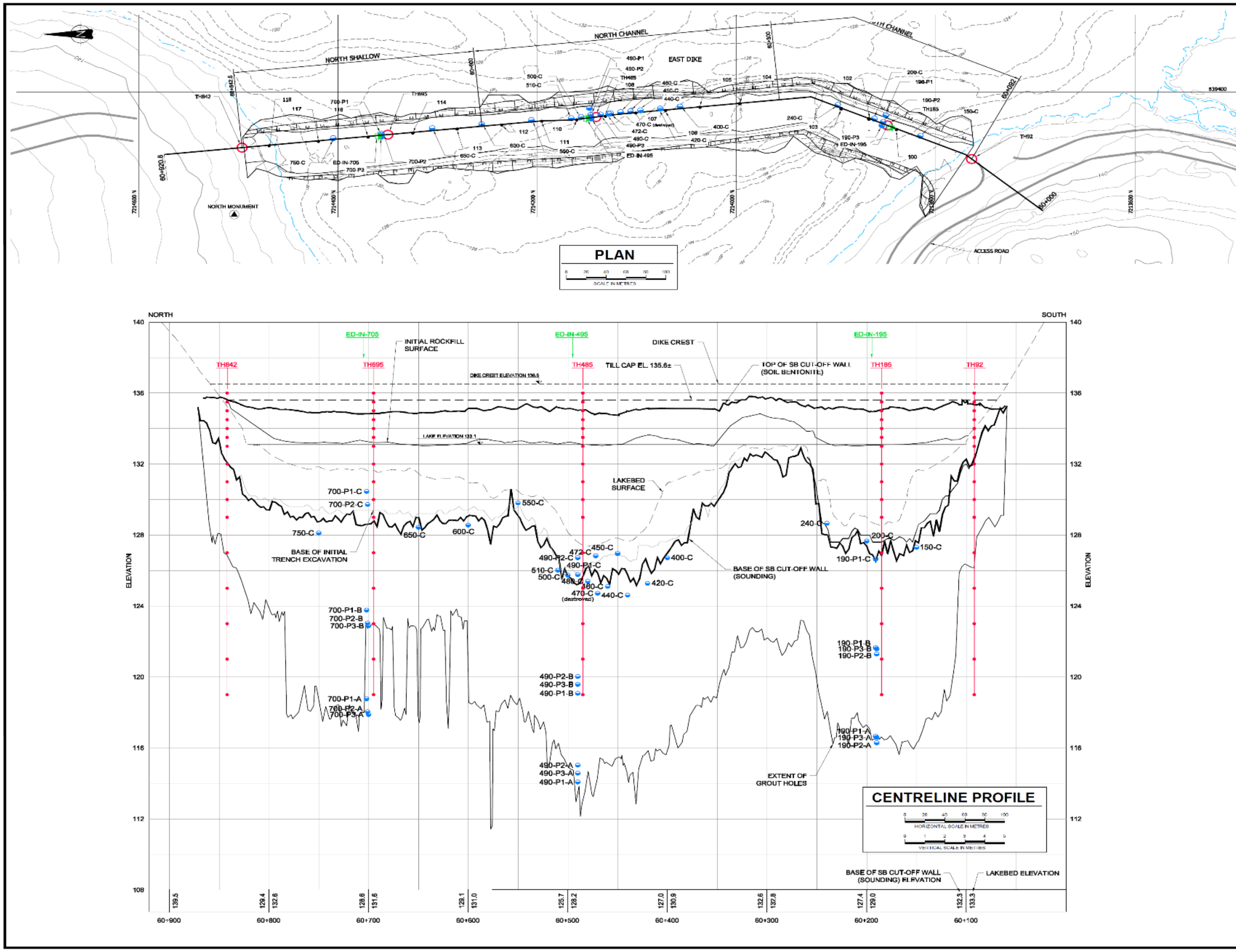
Cutoff:

- A 1 m wide trench was excavated through the Core Backfill material and extended to the bedrock surface along the cutoff wall centreline. Bentonite slurry was used to support the trench.
- The trench was backfilled with soil-bentonite.

Grouting:

- Grouting of the bedrock foundation and “contact area” identified as the zone between the base of the cutoff wall and bedrock surface was performed through the centerline of the cutoff wall.

Figure 3 East Dike Plan and Profile



LEGEND:

- LAND-BASED TOPOGRAPHIC MAJOR CONTOURS INTERVAL 10m
- LAND-BASED TOPOGRAPHIC MINOR CONTOURS INTERVAL 2m
- BATHYMETRIC MAJOR CONTOURS INTERVAL 2m
- SHORE LINE
- CUTOFF WALL CENTRELINE
- EXISTING THERMISTOR
- SURVEY MONUMENT LOCATION
- PIEZOMETER
- INCLINOMETER
- SURVEY CONTROL MONUMENT

NOTES:

1) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2) ALL ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (MASL) UNLESS OTHERWISE NOTED.
3) GRID REFERENCE: NAD 83, UTM ZONE 14.
4) CONTOUR INFORMATION ON LAND SUPPLIED BY AGNICO-EAGLE MINES LIMITED (AEM), MEADOWBANK DIVISION.
5) LAKEBED SURFACE INTERPOLATED FROM 2006 BATHYMETRY DATA. DETAILED BATHYMETRY (0.5m INTERVAL) BASED ON 2008 SURVEY.
6) LAKE CONTOURS ARE BASED ON SURVEYED LAKE SURFACE ELEVATION: SECOND PORTAGE LAKE = 133.1m.

PIEZOMETER LOCATION TABLE

NAME	STATION	EASTING	NORTHING
150-C	60+149.94	639347.4	7213816.4
190-P1	60+190.54	639355.8	7213857.4
190-P2	60+190.15	639363.0	7213853.9
190-P3	60+189.86	639366.6	7213852.1
200-C	60+200.00	639370.5	7213861.5
240-C	60+239.86	639382.3	7213899.7
400-C	60+400.00	639379.7	7214056.0
420-C	60+420.00	639381.9	7214076.4
440-C	60+440.00	639379.9	7214096.3
450-C	60+450.14	639375.0	7214106.0
460-C	60+460.00	639377.8	7214116.2
470-C	60+470.00	639376.5	7214126.2
472-C	60+472.00	639376.2*	7214128.2*
480-C	60+480.00	639375.1	7214136.2
490-P1	60+489.91	639361.9	7214144.6
490-P2	60+490.21	639369.8	7214145.7
490-P3	60+490.40	639373.8	7214146.3
500-C	60+500.00	639372.3	7214155.8
510-C	60+510.00	639370.9	7214165.6
550-C	60+550.24	639365.0	7214205.60
600-C	60+600.06	639360.0	7214255.1
650-C	60+650.13	639355.0	7214304.9
700-P1	60+701.54	639342.0	7214355.3
700-P2	60+700.53	639350.0	7214355.1
700-P3	60+700.14	639353.9	7214355.1
750-C	60+750.06	639345.5	7214404.4

THERMISTOR LOCATION TABLE

NAME	STATION	EASTING	NORTHING
TH92	60+092	639325.0	7213763.8
TH185	60+185	639362.9	7213848.4
TH485	60+485	639372.4	7214140.7
TH695	60+695	639352.5	7214349.8
TH842	60+842	639337.9	7214496.1

INCLINOMETER LOCATION TABLE

NAME	STATION	EASTING	NORTHING
ED-IN-705	60+704.80	639351.5	7214359.6
ED-IN-495	60+495	639371*	7214151*
ED-IN-195	60+194.69	639366.6	7213857.3

* COORDINATE ASSUMED, TO BE CONFIRMED BY SURVEY

PROJECT
AEM
AGNICO-EAGLE MINES LIMITED
MEADOWBANK GOLD PROJECT
NUNAVUT

TITLE
EAST DIKE INSTRUMENTATION PLAN AND PROFILE

PROJECT No. 09–1428–5007			PHASE No. 3000
DESIGN	FE	10NOV10	SCALE AS SHOWN REV.
CADD	GG	10NOV10	**FIGURE C1-1**
CHECK			
REVIEW			

Figure 4 East Dike Typical Section

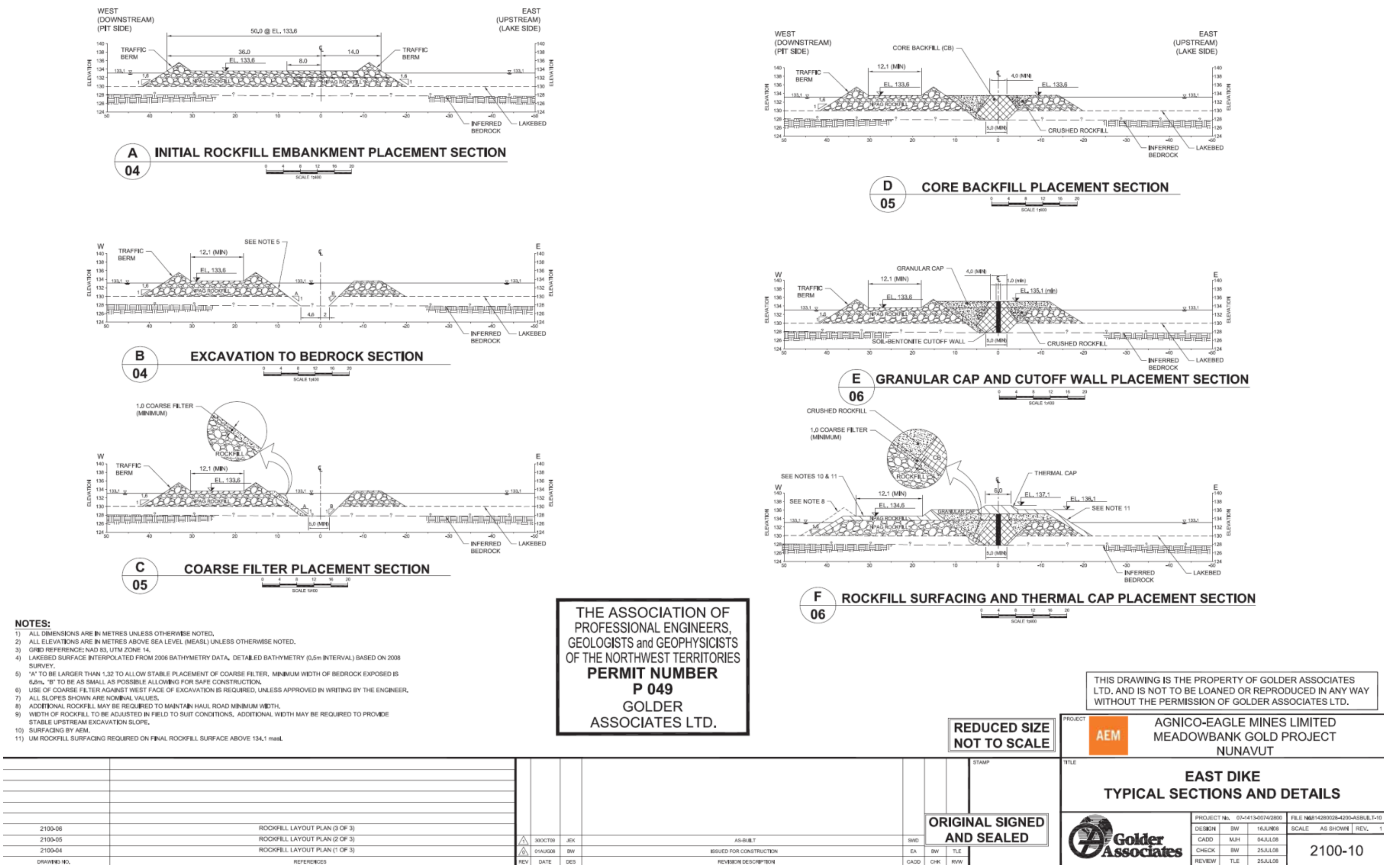
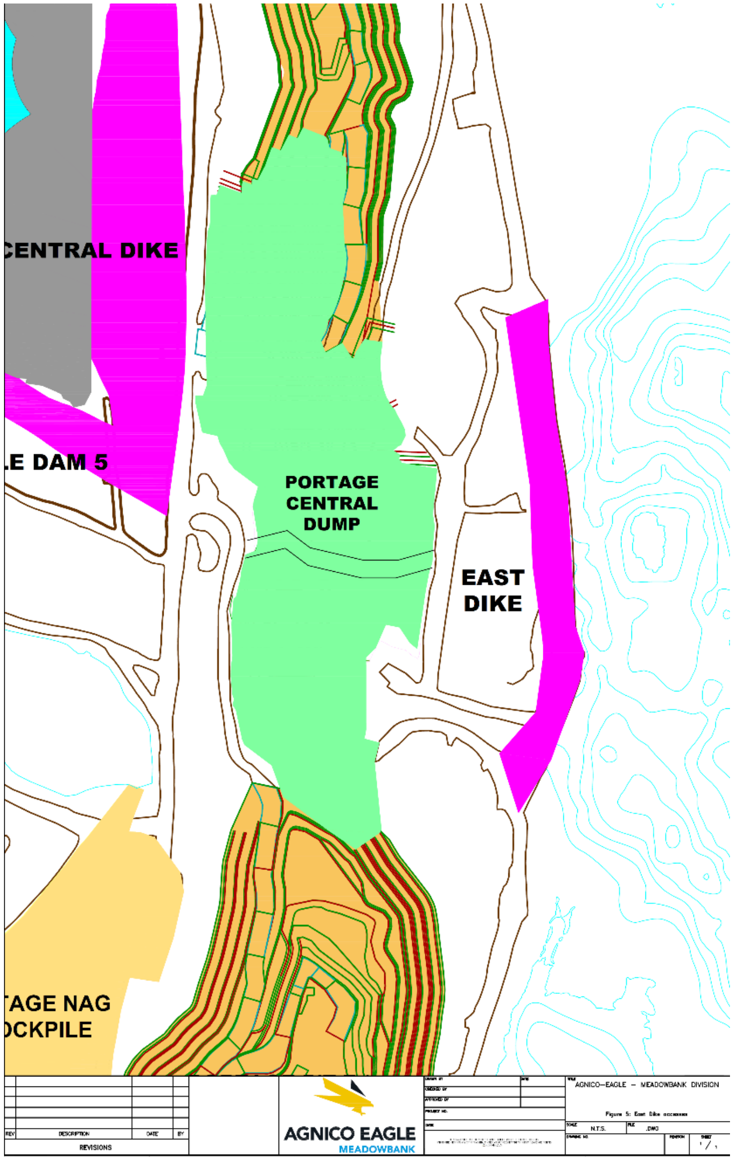


Figure 5 East Dike and Access Roads



3.1.2 East Dike - Instrumentation

Instrumentation was installed prior to dewatering to monitor the behaviour of the dike and dike foundation during dewatering and operation. Instrumentation consisted of:

- Single vibrating wire piezometers located downstream of the cutoff wall;
- Arrays of vibrating wire piezometers, installed at various levels, upstream, immediately downstream of the cutoff wall and further downstream;
- Thermistor strings installed through the centreline of the cutoff wall;
- Inclinometers installed through the centreline of the cutoff wall; and
- Survey monuments along the centreline of the cutoff wall.

The monitoring network was expanded through the installation of additional instruments. Table 3.1 summarizes existing instrumentation.

Table 3.1 Existing Instrumentation Summary

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
Vibrating Wire Piezometer Array	60+190	190-P1-A	10	116.7	190-P1 Top of steel casing: El. 136.39
		190-P1-B	10	121.7	
		190-P1-C	10	126.7	
		190-P2-A	2	116.34	190-P2 Top of steel casing: El. 136.54
		190-P2-B	2	121.34	
		190-P2-C	2	126.34	
		190-P3-A	-2	116.63	190-P3 Top of steel casing: El. 136.54
		190-P3-B	-2	121.63	
Vibrating Wire Piezometer Array	60+490	490-P1-A	11	114.12	490-P1 Top of steel casing: El. 136.20
		490-P1-B	11	119.12	
		490-P1-C	11	125.81	
		490-P2-A	3.1	115.07	490-P2 Top of steel casing: El. 136.15
		490-P2-B	3.1	120.07	
		490-P2-C	3.1	126.76	
		490-P3-A	-0.9	114.62	490-P3 Top of steel casing: El. 136.02
		490-P3-B	-0.9	119.62	
Vibrating Wire Piezometer Array	60+700	700-P1-A	9.9	118.81	700-P1 Top of steel casing: El. 136.27
		700-P1-B	9.9	123.81	
		700-P1-C	9.9	130.5	
		700-P2-A	2	118.08	700-P2 Top of steel casing: El. 136.48
		700-P2-B	2	123.08	
		700-P2-C	2	129.77	
		700-P3-A	-1.9	117.93	700-P3 Top of steel casing: El. 136.40
		700-P3-B	-1.9	122.92	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
Individual Vibrating Wire Piezometers	60+150	150-C	2.1	127.35	Top of steel casing: El. 136.33
	60+200	200-C	2	127.71	Top of steel casing: El. 136.29
	60+240	240-C	2	128.71	Top of steel casing: El. 136.26
	60+400	400-C	2.2	126.76	Top of steel casing: El. 136.27
	60+420	420-C	2	125.32	Top of steel casing: El. 137.10
	60+440	440-C	2	124.66	Top of steel casing: El. 137.14
	60+450	450-C	1.9	127	Top of steel casing: El. 136.22
	60+460	460-C	2	125.15	Top of steel casing: El. 137.60
	60+470	470-C	2	124.76	Top of steel casing: El. 137.43
	60+480	480-C	2	125.44	Top of steel casing: El. 137.65
	60+500	500-C	2	125.78	Top of steel casing: El. 137.34
	60+510	510-C	2	126.06	Top of steel casing: El. 137.10
	60+550	500-C	2	129.85	Top of steel casing: El. 136.24
	60+600	600-C	1.9	128.6	Top of steel casing: El. 136.53
	60+650	650-C	2	128.48	Top of steel casing: El. 136.59
	60+750	750-C	1.5	128.16	Top of steel casing: El. 136.93

Instrumentation Type	**Station Location**	**Label / Identification**	**Offset from Centreline + is d/s; - is u/s**	**Elevation (masl)**	**Details**
Thermistor Strings	60+092	TH92	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.
	60+185	TH185	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.
	60+485	TH485	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.
	60+440	P440	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+443	S443	0	136.5 (1stBead)	Beads at Elev. 136.50, 136.45, 136.40, 136.35, 136.30, 136.25, 136.20, 136.15, 136.10, 136.05, 136.00, 134.00, 132.00, 130.00, 128.00 and 126.00 masl.
	60+446	P446	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+449	S449	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+452	P452	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+455	S455	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
	60+458	P458	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+461	S461	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+464	P464	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+467	S467	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+479	S479	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+482	P482	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+483	T483	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+486	T486	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+488	P488	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
	60+491	S491	0	136 (1^{st}Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+494	P494	0	136 (1^{st}Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+497	S497	0	136 (1^{st}Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+500	P500	0	136.5 (1^{st}Bead)	Beads at Elev. 136.50, 136.25, 136.00, 135.00, 134.00, 133.00, 132.00, 131.00, 129.00, 127.00, 125.00, 123.00, 121.00, 119.00, 117.00 and 115.00 masl.
	60+503	S503	0	136 (1^{st}Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+506	P506	0	136 (1^{st}Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+509	S509	0	136 (1^{st}Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+512	P512	0	136 (1^{st}Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+515	S515	0	136 (1^{st}Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
	60+518	P518	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+521	S521	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+695	TH695	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.
	60+842	TH842	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
Inclinometer	60+195	ED-IN-195 (A and B Axis)	0.05	137.6 (Collar Elevation)	Azimuth 51.2 degree Destroyed in 2010
	60+495	ED-IN-495 (A and B Axis)	0.05	137.6 (Collar Elevation)	Azimuth 347.9
	60+705	ED-IN-705 (A and B Axis)	0.09	137.6 (Collar Elevation)	Azimuth 20.4 degree
Initial Crest Survey Monuments		100	0	136.9	Most have been destroyed since installation.
		101		136.8	
		102		136.7	
		103		136.6	
		104		136.9	
		105		136.8	
		106		136.9	
		107		136.7	
		108		136.6	
		109		136.5	
		110		136.6	
		111		136.3	
		112		136.5	
		113		136.7	
		114		136.8	
		115		136.7	
		116		136.8	
		117		136.7	
		118		136.7	

As installation of additional instrumentation occurs to broaden the existing monitoring network or to replace damaged instruments, the summary table and figures shall be updated.

Blast monitoring is carried out using portable blast monitoring seismographs that measure both blast induced velocities and accelerations at the point of monitoring (i.e. crest and/or the toe of the dike).

- Instrumentation locations are shown both in plan and profile on Figure 5.
- Records of all instrument installation details, data sheets, and calibration sheets shall be maintained and stored in a central location, such that they are readily available to AEM personnel and external reviewers.

3.1.3 East Dike - Dewatering

During dewatering of the northwest arm of Second Portage Lake, an apparent leak through the East Dike of up to 0.5 m^3/s occurred over several days near Sta. 60+490. The leak then appeared to self-heal following drilling works for the additional grouting carried out in this sector. A sinkhole cavity of about 18 m^3 in the general vicinity of the leak (Sta. 60+472) also appeared in July 2009. The sinkhole was located immediately upstream of the cutoff wall and extended at least partially through the cutoff wall. A Technical Memorandum entitled "Meadowbank East Dike Grouting Response Plan – Completed Works" (Golder 2009b) provides additional information regarding the remedial grouting work and Golder Doc. No. 961 (Golder, 2009d) "East Dike Sinkhole Summary Report" provides more details about the sinkhole.

Following the appearance of the sinkhole, a cone penetration test (CPT) investigation was conducted, and three diamond drill holes and a surface geophysical survey were advanced in the area to obtain additional information. Based on the CPT results, there appeared to be a zone of coarser grained material (area with lower fines content) in the apparent leak area. The drilling investigation indicated that there may be soil between the base of the cut-off wall and underlying bedrock that was not completely excavated and/or grouted. An additional investigation of the sinkhole and apparent leakage area consisting of the temporary installation of thermistor strings and monitoring of the thermal condition was initially conducted in 2010 and repeated in 2011. Based on the thermal results, it appeared that a pervious zone existed within the cut-off wall and shallow bedrock between approximately Sta. 60+440 and 60+504. In the past, AEM considered potential mitigation options to reduce seepage through the dike and to provide contingency protection for the Portage Pit. Based on the stability of the dike and the seepage rate, remediation or implementation of contingency control measures is not considered necessary. The condition of the dike will continually be monitored and if the condition of the dike is judged to be deteriorating then remediation would be reassessed. Details regarding these investigations are provided in East Dike CPT Investigation Report (Golder, 2010b) and East Dike Sinkhole Investigation Program October-November 2009 (Golder 2010a).

The seepage is currently controlled by a seepage collection system and is not impacting the mining operation. The seepage is regularly monitored and appears to have stabilized and does not have a negative effect on the dike stability.

3.1.4 East Dike - Seepage Collection System

The purpose of the seepage collection system is to:

- Collect and convey seepage and runoff away from the downstream toe area; and
- Allow measurement of seepage through the dike.

The downstream toe of the East Dike was mostly exposed by July 2009 and then entirely by July 2010. Three seepage zones have been identified along the toe of the East Dike at approximately Sta. 60+480, Sta. 60+225 and Sta. 60+550. A temporary rectangular weir was installed in 2009 to monitor the seepage observed at approximately Sta. 60+480. Monitoring of the seepage from this location has occurred during the open water season (approximately mid-July through early October) in 2009 and 2010. During 2010, a temporary v-notch weir was installed to measure a second zone of seepage exposed near Sta. 60+225 following dewatering. This portion of the dike was not exposed for visual inspection in 2009 due to the downstream water elevation. No monitoring system has been installed in the area around Sta. 60+550. Seepage flows have been measured to be between 7 L/s and 11 L/s at Sta. 60+480 and around 4 L/s at Sta. 60+225 and estimated to be about 1 L/s at Sta. 60+550.

The installation of a seepage collection system downstream of East Dike to capture and pump the seepage water started in September 2011 and was completed in 2012. After the system installation, 3 zones of seepage were identified near the downstream toe. The zones at about Sta. 60+247 and Sta. 60+498 each had a collection sump with pump connected to a year round pumping and piping system.

In 2011, the downstream seepage at Sta. 60+498 had been stable at a rate of about 864 m^3/day (10 L/s) with no visual signs of turbidity, which was consistent with rates recorded during previous years. In 2011, the seepage downstream at Sta.60+247 appeared stable at around 345.6 m^3/day (4L/s) with no visual signs of turbidity noted, which was consistent with previous rates. Since the installation of the seepage collection system, all seepage is being captured within the sumps and no sign of additional seepage on the ground surface or downstream in the Portage Pit was observed. No active monitoring of the seepage rate at these locations occurred in 2012 but AEM has been visually inspecting the flow in the sumps and no turbidity was noted. AEM performed a pump test after the installation of the sumps, it was noted that the measured flow were consistent with 2010 and 2011 data. Flow meters have been installed in 2013 at the exit of each pump. Since then, the observed flow average 524 m^3/day in 2017 with a maximum flow of 935 m^3/day in September and minimum flow of 254 m^3/day in March 2017.

3.1.5 East Dike - Access

Access to the East Dike is from the north and south abutments, shown on Figure 2 and Figure 5. In 2010, the East Dike was used as a haul road connecting the North Portage Pit to the Plant Site. East Road was built downstream and used to function as haul road to get access from the east to Portage Pit. No haul trucks use the East Dike or East Road anymore during normal operations. A shortcut access is possible from the Pit E Ramp through the Central Dump, as seen on Figure 5.

3.2 BAY-GOOSE DIKE

The Bay-Goose Dike together with the South Camp Dike isolates the Bay-Goose Basin from Third Portage Lake, which permits mining of the Goose Pit and the southern portion of Portage Pit. No spillways or water diversion works are associated with the Bay-Goose Dike. Figure 2 shows the location of Bay-Goose Dike.

The Bay-Goose Dike is approximately 2,200 m in length and was constructed “in the wet”, prior to dewatering. The dike consists of a wide rockfill shell, with downstream filters and a cutoff wall constructed of a mixture of materials dependent on the location along the dike:

- Soil-bentontie (SB);
- Cement soil-bentonite (CSB);

- Jet grouted columns;
- A combination of soil-bentonite and cement soil-bentonite;
- A combination of soil-bentonite and/or cement soil-bentonite and jet grouted columns; and
- With the exception of the south abutment, the cutoff system (including the jet grouted columns) extends to bedrock and is up to 20 m below lake level.

The earthworks component of the Bay-Goose Dike construction occurred over two summer construction seasons. The north portion of the Bay-Goose Dike was constructed in 2009 and the south portion in 2010. Grouting and jet grouting works commenced in 2010 and were completed by mid-July 2011.

Further details regarding the dike are provided in the following subsections.

3.2.1 Bay-Goose Dike – Design and Construction

The dike design is provided within Doc. 802 (Golder 2009a). A plan view of the dike along with the instrument locations is shown on Figure 6. Figure 7 provides the profile view along the cutoff wall centreline and provides the profile view of instrumentation details. Typical cross sections are shown on Figure8 . As-built drawings of the dike can be found in Golder 2009a.

Dike construction occurred in the following general manner:

<u>Rockfill Platform / Embankment:</u>

- A rockfill platform of varying width (approximately 60 to 90 m) was advanced from the north abutment to Goose Island, between July and September 2009 to an elevation of about 134 m.
- A rockfill causeway about 25 m wide was advanced from Goose Island to the south abutment between February and June 2010 while ice cover existed on Third Portage Lake. Ice was broken and removed, as practical, in front of the advancing rockfill platform.
- Following ice breakup from the lake in July 2010, additional rockfill was placed to widen the causeway to the full design width of the rockfill platform (approximately 55 to 100 m).
- The rockfill platforms surface elevation was about 134 m and was used to provide a working surface for the subsequent construction activities. The rockfill also provides lateral support for the granular core materials.

<u>Initial Trench Excavation:</u>

- Rockfill and lakebed soils were excavated from the rockfill platform surface to bedrock or competent lakebed soils along the cutoff centreline. As much as practical, loose blocks or slabs from the bedrock surface were removed.

- Ice rich soils beneath the cutoff wall were removed with the exception of at the south abutment where beyond Sta. 32+112 some ice-rich soils remain beneath the base of the initial trench excavation and cutoff wall.
- The required bottom width of the excavation varied based on its depth and varied between 8 and 11 m.

<u>Backfilling of the Initial Trench:</u>

North Portion of Dike

- A layer of Core Backfill (19 mm minus) material was placed along the downstream slope of the excavation such that Core Backfill material would be in contact with the lakebed soils.
- Then the remaining portion of the excavation was backfilled with Core Backfill (19 mm minus) material in the central portion along the cutoff wall centerline, with Coarse Filter (150 mm minus) material simultaneously placed on either side of the Core Backfill. Backfilling of the excavated trench occurred progressively as the excavation front advanced.

South Portion of Dike

- In very limited areas along the alignment, a layer of Core Backfill (19 mm minus) material was placed along the downstream slope of the excavation prior to the primary backfilling of the trench.
- The excavation was backfilled with Core Backfill (19 mm minus) material in the central portion along the cutoff wall centerline, with Coarse Filter (150 mm minus) material simultaneously placed on the downstream side of the Core Backfill and a “Fine Rockfill” material placed on the upstream side. Backfilling of the excavated trench occurred progressively as the excavation front advanced.
- In areas to be compacted using the vibratory-densification method, the width of Core Backfill material was required to be 8 m. Therefore, once the initial backfilling had been completed relatively small V-shaped excavations were made at the surface on either side of the initially placed Core Backfill. These excavations were then refilled with Core Backfill material to provide the required 8 m width of Core Backfill.

<u>Compaction of Core Backfill:</u>

- For all of the North Portion of the dike and a majority of the South Portion of the dike, a 2 m layer of Core Backfill, Coarse Filter, and Rockfill was placed to increase the elevation of the platform to provide a working surface for the dynamic compaction.
- The Core Backfill was densified using multiple passes of dynamic compaction. Craters produced by the dropped weight were backfilled to the level of the working platform between passes.
- For the South Portion of the dike, in zones where the initial excavation was not extended to bedrock, termed “partial cutoff” zones, compaction of the Core Backfill material was done using

two methods: vibratory-densification and dynamic-compaction. Vibratory-densification of the Core Backfill material was conducted from the initial rockfill platform working surface (134 m). Vibro-densification was utilized to treat the Core Backfill material at the base of the excavation up to an elevation of about.128 m (i.e. 6 m below the water level). Then the 2 m of additional Core Backfill, Coarse Filter, and Rockfill materials were placed to increase the elevation of the platform to about 136 m creating the working surface for the dynamic compaction. The upper portion of the Core Backfill material was then treated using multiple passes of dynamic compaction. Craters produced by the dropped weight were backfilled to the level of the working platform between passes.

Cutoff:

- A 1 m wide trench was excavated through the Core Backfill material and extended to bedrock or competent till surface along the cutoff wall centreline. Bentonite slurry was used to support the trench.
- The trench was backfilled with:
    - Soil-bentonite (SB);
    - Cement Soil-bentonite (CSB); or
    - A combination of SB and CSB.
- Then a capping layer about 0.5 m thick of SB was placed above the trench to an approximate elevation of 136.5 m.

Jet Grouted Wall

- Jet grouting has been used to extend the low permeability element (cutoff wall) of the dike to the bedrock surface. A double jet system was used with a cement water ratio of 1:1 to construct the jet grouted columns. Jet grouting was completed from a working platform elevation of approximately 137 m.
- Jet grouting beneath the cutoff wall to the bedrock surface was conducted in the "partial cutoff" areas where the cutoff wall was not excavated to bedrock. This occurred in Channel 1 (Sta. 32+007 to 32+110), Channel 2 (Sta. 31+820 to 31+928), and Channel 3 (Sta. 31+575 to 31+611). Jet grouted columns were constructed with a centre to centre spacing of 1.2 m with an overlap with the cutoff wall and extended into the bedrock surface. Columns were constructed in two passes, primary columns at a spacing of 2.4 m with secondary columns subsequently constructed between the primary columns.
- Jet grouting was also conducted in two additional areas of the dike where significant silt accumulated at the base of the initial excavation and prevented the cutoff wall from being successfully constructed to bedrock. These two areas the North Channel (Sta. 30+361 to 30+435) and between Channel 1 and Channel 2 (Sta. 31+928 to 32+007). Jet grouted columns were constructed with a centre to centre spacing generally of 1.5 m, with the exception of the

portion between Sta. 31+928 and Sta. 31+966.4 where a spacing of 1.2 m was utilized, following a primary and secondary sequence for installation.

Grouting:

- The working platform along the cutoff wall centerline was raised with Coarse Filter material to an elevation of 137 m, from which grouting work was conducted.
- Grouting of the bedrock foundation and “contact area” identified as the zone between the base of the cutoff wall or jet grout columns and bedrock surface was performed through the centerline of the cutoff wall.

Figure 6 Bay-Goose Dike Instrumentation Plan

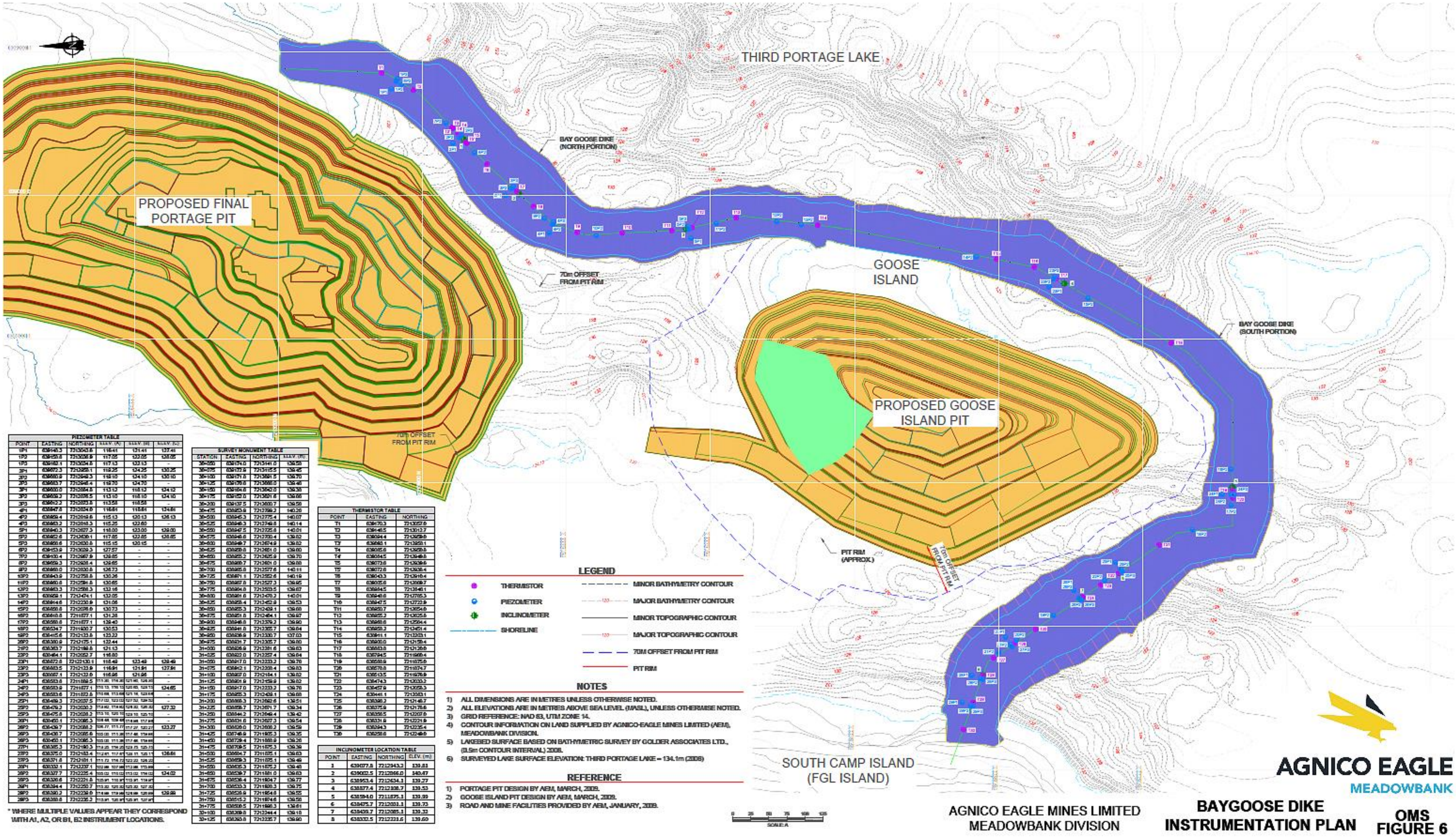


Figure 7 Bay-Goose Dike – Profile View of SB and CSB Placement Zones and Instrumentation profile

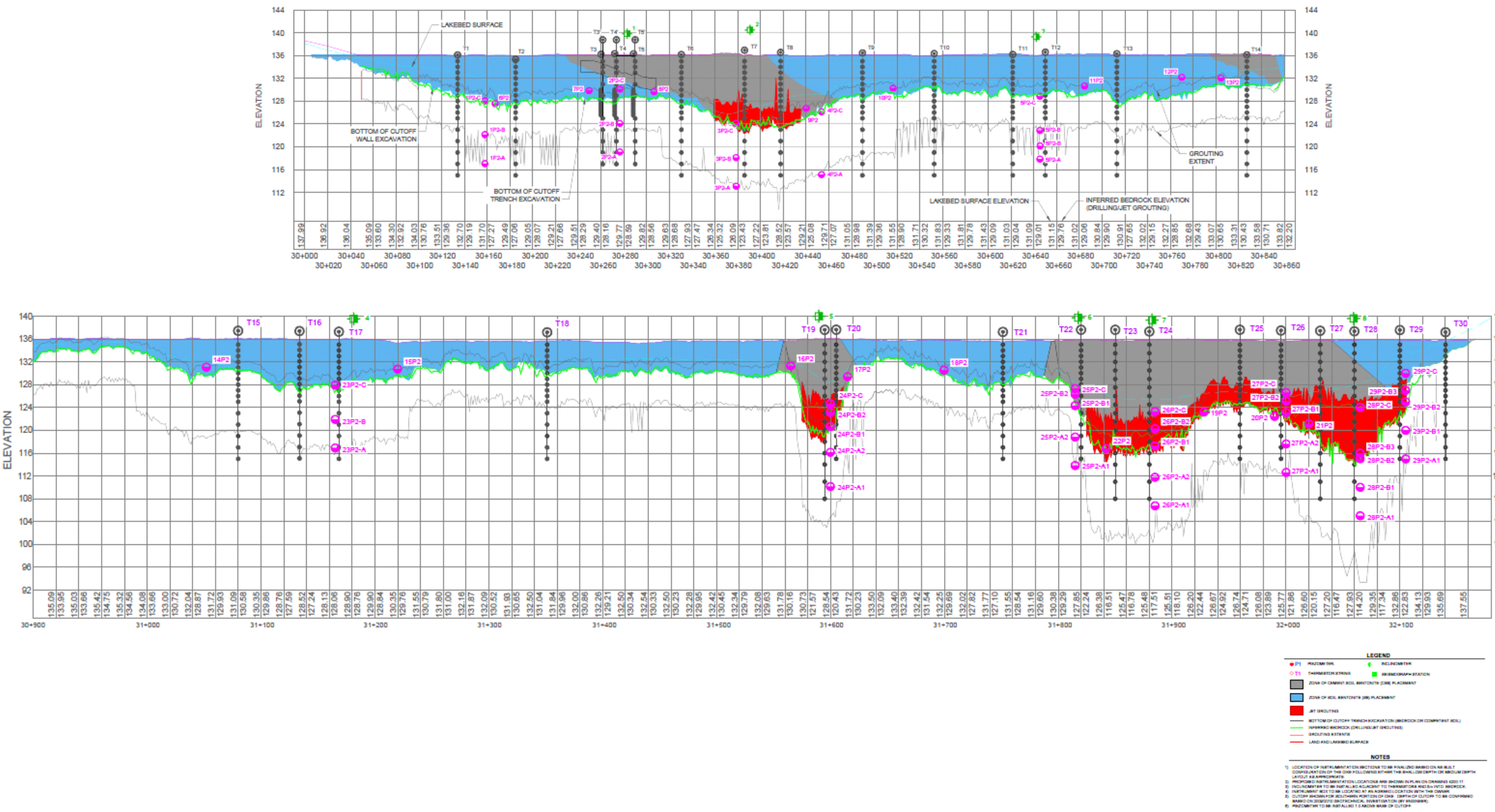
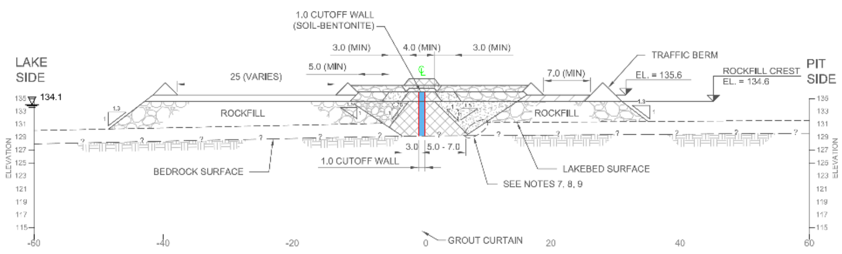
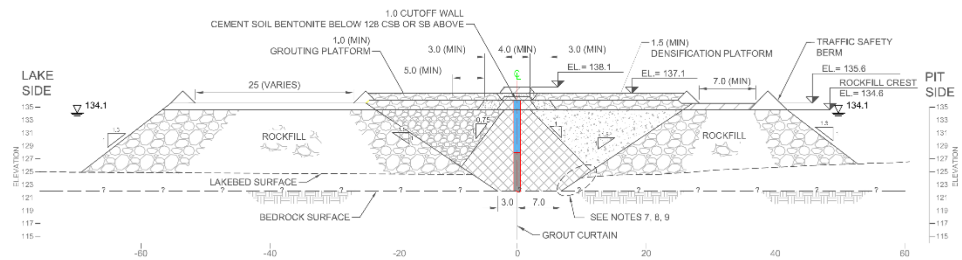


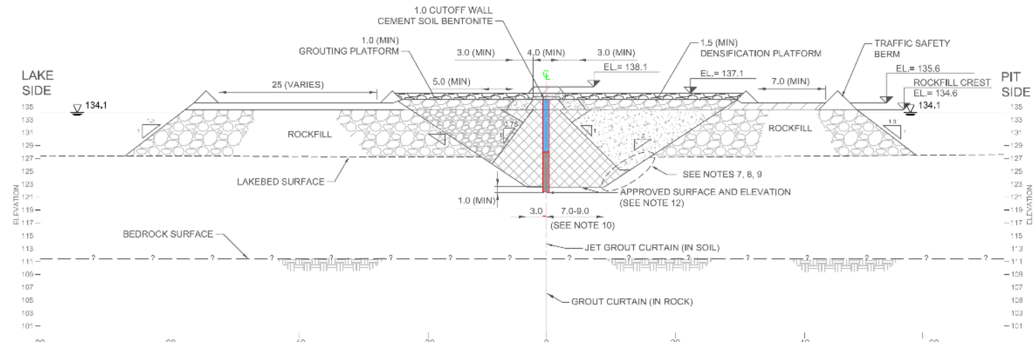
Figure 8 Bay-Goose Dike – Typical Sections



A TYPICAL SECTION - BEDROCK ELEVATION ABOVE 128.0
4300-13 SCALE: A



B TYPICAL SECTION - BEDROCK ELEVATION BELOW 128.0
4300-13 SCALE: A



C TYPICAL SECTION- PARTIAL CUTOFF WALL
4300-13 SCALE: A

NOTES

1) ALL DIMENSIONS IN METERS UNLESS OTHERWISE NOTED
2) ALL ELEVATIONS IN METERS ABOVE SEA LEVEL (MASL) UNLESS OTHERWISE NOTED
3) ALL SLOPES SHOWN ARE NOMINAL VALUES.
4) GEOCHEMICAL CLASSIFICATION OF NPAG IS RESPONSIBILITY OF AEM. ALL MATERIALS USED IN CONSTRUCTION ARE TO BE NPAG.
5) ALL ICE RICH MATERIAL BENEATH THE CUTOFF WALL WAS EXCAVATED, EXCEPT BETWEEN STA 32+112 AND 32+166.
6) BEDROCK AND LAKEBED SURFACES ARE SHOWN AS SMOOTH LINES FOR ILLUSTRATIVE PURPOSES. UNDULATING AND UNEVEN SURFACES EXIST.
7) CORE BACKFILL WITHIN THE DOWNSTREAM SIDE OF THE TRENCH WAS PLACED WITHIN 2m OF THE LAKEBED SEDIMENT ELEVATION.
8) MATERIAL PLACEMENT ANGLES FOR THE CORE BACKFILL AND COARSE FILTER ARE APPROXIMATE. DOWNSTREAM CORE BACKFILL SLOPE WAS MONITORED TO ENSURE THE 2m LIMIT (SEE NOTE 7) WAS ACHIEVED.
9) ALONG PORTIONS OF THE ALIGNMENT, LATERAL PLACEMENT OF CORE BACKFILL ON THE DOWNSTREAM SIDE OF THE EXCAVATION WAS REQUIRED IN ADVANCE OF THE PROGRESSIVE BACKFILLING OF CORE BACKFILL AND COARSE FILTER/FINE ROCKFILL. THE ENGINEER DETERMINED WHERE LATERAL PLACEMENT WAS REQUIRED.
10) IN PARTIAL CUTOFF WALL SECTIONS, WHERE DEPTH OF SOIL LEFT IN PLACE IS LESS THAN 4m BELOW BASE OF INITIAL EXCAVATION THEN DIMENSION IS 7.0m OTHERWISE 9.0m, IN CHANNEL 1 DIMENSIONS WAS APPROXIMATELY 7m.
11) BASE WIDTH OF EXCAVATION ON UPSTREAM SIDE OF CENTRELINE WAS INCREASED LOCALLY TO 6m TO ACCOMMODATE CORNER CONSTRUCTION OF CUTOFF WALL.
12) IN PARTIAL CUTOFF SECTIONS THE INITIAL EXCAVATION WAS EXCAVATED UNTIL COMPETENT SOILS ENCOUNTERED. AND CUTOFF TRENCH EXTENDED GENERALLY 1.0m INTO COMPETENT MATERIAL BELOW INITIAL TRENCH EXCAVATION, AS APPROVED BY ENGINEER.

LEGEND

- INFERRED BEDROCK
- COARSE FILTER
- CORE BACKFILL
- ROCKFILL SURFACING AND THERMAL CAP
- ROCKFILL
- FINE ROCKFILL
- SOIL BENTONITE (SB)
- CEMENT SOIL BENTONITE (CSB)

SCALE: A

AGNICO EAGLE
MEADOWBANK

AGNICO EAGLE MINES
MEADOWBANK DIVISION

**BAYGOOSE DIKE
TYPICAL SECTION**

FIGURE 9

3.2.2 Bay-Goose Dike – Instrumentation

Instrumentation was installed prior to dewatering to monitor the performance of the dike and dike foundation during dewatering and throughout the operational life of the structure.

Instrumentation provides information on the performance of the structure and its foundation and allows comparison with predictions of performance made during the design studies for deformation, seepage and thermal behaviour. Instrumentation may also provide early warnings regarding the development of unexpected pore water pressure responses to dewatering, pit blasting, increasing seepage and increasing deformation.

Several types of instruments have been installed to collect the required information, including the following:

- Single vibrating wire piezometers located downstream of the cutoff wall;
- Arrays of vibrating wire piezometers, installed at various levels, upstream, immediately downstream of the cutoff wall and further downstream;
- Thermistor strings installed through the centreline of the cutoff wall;
- Inclinometers installed through the centreline of the cutoff wall; and
- Survey monuments along the centreline of the cutoff wall.

Table 3.2 summarizes existing instrumentation. The instrumentation locations are shown in plan and section on Figure 6 and Figure 8, respectively.

Table 3.2 Existing Instrumentation Summary

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
Vibrating Wire Piezometer Array	30+158	1P1-A	14.43	116.41	1P1 Top of steel casing: El. 137.04 m
		1P1-B	14.43	121.41	
		1P1-C	14.43	127.41	
		1P2-A	1.97	117.05	1P2 Top of steel casing: El. 136.88 m
		1P2-B	1.97	122.05	
		1P2-C	1.97	128.05	
		1P3-A	1.94	117.13	1P3 Top of steel casing: El. 136.53 m
		1P3-B	1.94	122.13	
Vibrating Wire Piezometer Array	30+276.5	2P1-A	14.4	119.25	2P1 Top of steel casing: El. 136.99 m
		2P1-B	14.4	124.25	
		2P1-C	14.4	130.25	
		2P2-A	2.1	119.10	2P2 Top of steel casing: El. 137.52 m
		2P2-B	2.1	124.10	
		2P2-C	2.1	130.10	
		2P3-A	1.93	119.70	2P3 Top of steel casing: El. 137.18 m
		2P3-B	1.93	124.70	
Vibrating Wire Piezometer Array	30+378.5	3P1-A	14.42	113.12	3P1 Top of steel casing: El. 137.24 m
		3P1-B	14.42	118.12	
		3P1-C	14.42	124.12	
		3P2-A	2.03	113.10	3P2 Top of steel casing: El. 138.01 m
		3P2-B	2.03	118.10	
		3P2-C	2.03	124.10	
		3P3-A	2.01	113.58	3P3 Top of steel casing: El. 138.01 m
		3P3-B	2.01	118.58	
Vibrating Wire Piezometer Array	30+453.5	4P1-A	14.44	116.61	4P1 Top of steel casing: El. 137.14 m
		4P1-B	14.44	118.61	
		4P1-C	14.44	124.61	
		4P2-A	2.03	115.13	4P2 Top of steel casing: El. 137.40 m
		4P2-B	2.03	120.13	
		4P2-C	2.03	126.13	
		4P3-A	1.98	115.25	4P3 Top of steel casing: El. 137.68 m
		4P3-B	1.98	120.25	
Vibrating Wire Piezometer Array	30+645.5	5P1-A	14.58	118.00	5P1 Top of steel casing: El. 137.04 m
		5P1-B	14.58	123.00	
		5P1-C	14.58	129.00	
		5P2-A	1.97	117.85	5P2 Top of steel casing: El. 137.03 m
		5P2-B	1.97	122.85	
		5P2-C	1.97	128.85	
		5P3-A	2.09	115.15	5P3 Top of steel casing: El. 137.05 m
		5P3-B	2.09	122.60	
Vibrating Wire Piezometer Array	31+165	23P1-A	14.51	118.49	23P1 Top of steel casing: El. 137.62 m
		23P1-B	14.51	123.49	
		23P1-C	14.51	129.49	
		23P2-A	2.15	116.91	23P2 Top of steel casing: El. 137.86 m
		23P2-B	2.15	121.91	
		23P2-C	2.15	127.91	
		23P3-A	1.92	116.96	23P3 Top of steel casing: El. 136.59 m
		23P3-B	1.92	121.96	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
Vibrating Wire Piezometer Array	31+600	24P1-A1	14.50	111.30	24P1 Top of steel casing: El. 137.45 m
		24P1-A2	14.50	116.30	
		24P1-B1	14.50	121.80	
		24P1-B2	14.50	124.30	
		24P2-A1	2.10	110.15	24P1 Top of steel casing: El. 137.83 m
		24P2-A2	2.10	116.15	
		24P2-B1	2.10	120.65	
		24P2-B2	2.10	123.15	
		24P2-C	2.10	124.65	
		24P3-A1	2.20	110.64	24P3 Top of steel casing: El. 136.72 m
		24P3-A2	2.20	115.64	
		24P3-B1	2.20	121.16	
		24P3-B2	2.20	123.64	
Vibrating Wire Piezometer Array	31+815	25P1-A1	14.26	117.02	25P1 Top of steel casing: El. 137.45 m
		25P1-A2	14.26	122.02	
		25P1-B1	14.26	127.52	
		25P1-B2	14.26	129.52	
		25P2-A1	1.80	113.82	25P1 Top of steel casing: El. 137.77 m
		25P2-A2	1.80	118.82	
		25P2-B1	1.80	124.32	
		25P2-B2	1.80	126.32	
		25P2-C	1.80	127.32	
		25P3-A1	2.13	115.10	25P3 Top of steel casing: El. 138.16 m
		25P3-A2	2.13	120.10	
		25P3-B1	2.13	123.10	
		25P3-B2	2.13	125.10	
Vibrating Wire Piezometer Array	31+885	26P1-A1	14.44	104.44	26P1 Top of steel casing: El. 137.27 m
		26P1-A2	14.44	109.44	
		26P1-B1	14.44	114.94	
		26P1-B2	14.44	117.94	
		26P2-A1	1.85	106.77	26P1 Top of steel casing: El. 137.93 m
		26P2-A2	1.85	111.77	
		26P2-B1	1.85	117.27	
		26P2-B2	1.85	120.27	
		26P2-C	1.85	123.27	
		26P3-A1	2.10	105.00	26P3A Top of steel casing: El. 136.41 m
		26P3-A2	2.10	111.36	
		26P3-B1	2.10	117.46	26P3B Top of steel casing: El. 137.93 m
		26P3-B2	2.10	119.86	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
Vibrating Wire Piezometer Array	32+000	27P1-A1	14.45	113.25	27P1 Top of steel casing: El. 137.58 m
		27P1-A2	14.45	118.25	
		27P1-B1	14.45	123.75	
		27P1-B2	14.45	125.75	
		27P2-A1	2.03	112.61	27P1 Top of steel casing: El. 137.64 m
		27P2-A2	2.03	117.61	
		27P2-B1	2.03	123.11	
		27P2-B2	2.03	125.11	
		27P2-C	2.03	126.61	
		27P3-A1	1.91	111.72	27P3 Top of steel casing: El. 137.71 m
		27P3-A2	1.91	116.72	
		27P3-B1	1.91	122.22	
		27P3-B2	1.91	124.22	
Vibrating Wire Piezometer Array	32+065	28P1-A1	14.40	102.99	28P1 Top of steel casing: El. 136.41 m
		28P1-A2	14.40	107.99	
		28P1-B1	14.40	112.99	
		28P1-B2	14.40	115.99	
		28P2-A1	1.90	105.02	28P1 Top of steel casing: El. 138.13 m
		28P2-A2	1.90	110.02	
		28P2-B1	1.90	115.02	
		28P2-B2	1.90	118.02	
		28P2-C	1.90	124.02	
		28P3-A1	1.86	105.91	28P3 Top of steel casing: El. 137.89 m
		28P3-A2	1.86	110.91	
		28P3-B1	1.86	115.91	
		28P3-B2	1.86	118.91	
Vibrating Wire Piezometer Array	32+105	29P1-A1	14.44	115.32	29P1 Top of steel casing: El. 136.69 m
		29P1-A2	14.44	120.32	
		29P1-B1	14.44	125.32	
		29P1-B2	14.44	127.32	
		29P2-A1	2.01	114.99	29P1 Top of steel casing: El. 136.62 m
		29P2-A2	2.01	119.99	
		29P2-B1	2.01	124.99	
		29P2-B2	2.01	126.99	
		29P2-C	2.01	129.99	
		29P3-A1	2.04	115.91	29P3 Top of steel casing: El. 136.80 m
		29P3-A2	2.04	120.91	
		29P3-B1	2.04	125.91	
		29P3-B2	2.04	127.91	

Instrumentation Type	**Station Location**	**Label / Identification**	**Offset from Centreline (+ is d/s – is u/s)**	**Elevation (masl)**	**Details**
Vibrating Wire Piezometer Individual	30+167	6P2	1.98	127.57	6P2 Top of steel casing: El. 136.86 m
	30+249.5	7P2	2.02	129.85	7P2 Top of steel casing: El. 137.80 m
	30+306.5	8P2	1.98	129.65	8P2 Top of steel casing: El. 137.50 m
	30+440	9P2	1.98	126.73	9P2 Top of steel casing: El. 137.43 m
	30+516.5	10P2	2.00	130.26	10P2 Top of steel casing: El. 137.16 m
	30+684.5	11P2	2.04	130.65	11P2 Top of steel casing: El. 137.15 m
	30+770	12P2	2.1	132.16	12P2 Top of steel casing: El. 137.09 m
	30+804.5	13P2	1.95	132.05	13P2 Top of steel casing: El. 137.19 m
	31+052	14P2	2.04	131.06	14P2 Top of steel casing: El. 137.81 m
	31+220	15P2	2.07	130.73	15P2 Top of steel casing: El. 137.01 m
	31+565	16P2	2.10	131.28	16P2 Top of steel casing: El. 137.65 m
	31+615	17P2	2.10	129.40	17P2 Top of steel casing: El. 137.67 m
	31+700	18P2	1.87	130.53	18P2 Top of steel casing: El. 137.59 m
	31+842	22P2	2.01	116.80	22P2 Top of steel casing: El. 137.98 m
	31+928	19P2	1.99	123.22	19P2 Top of steel casing: El. 137.28 m
	31+990	20P2	2.22	122.44	20P2 Top of steel casing: El. 137.70 m
	32+020	21P2	1.93	121.13	21P2 Top of steel casing: El. 137.94 m
Thermistor Strings	30+134	T1	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+185	T2	0	135	Beads at Elev. 135, 134, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+260	T3	0	130	Beads at Elev. 130, 129.7, 129.4, 129.1, 128.8, 128.5, 128.2, 127.9, 127.6, 127.3, 127, 126.7, 126.4, 126.1, 125.8 and 125.5 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	30+261.5	T3’	0	136	Beads at Elev. 135.97, 134.97, 133.97, 132.97, 130.97, 128.97, 126.97, 124.97, 122.97, 120.97, 118.97 and 116.97 masl.
	30+272	T4	0	130	Beads at Elev. 130, 129.7, 129.4, 129.1, 128.8, 128.5, 128.2, 127.9, 127.6, 127.3, 127, 126.7, 126.4, 126.1, 125.8 and 125.5 masl.
	30+273.5	T4’	0	136	Beads at Elev. 135.97, 134.97, 133.97, 132.97, 130.97, 128.97, 126.97, 124.97, 122.97, 120.97, 118.97 and 116.97 masl.
	30+288.5	T5	0	130	Beads at Elev. 130, 129.7, 129.4, 129.1, 128.8, 128.5, 128.2, 127.9, 127.6, 127.3, 127, 126.7, 126.4, 126.1, 125.8 and 125.5 masl.
	30+290	T5’	0	136	Beads at Elev. 135.97, 134.97, 133.97, 132.97, 130.97, 128.97, 126.97, 124.97, 122.97, 120.97, 118.97 and 116.97 masl.
	30+330.5	T6	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+386	T7	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+417.5	T8	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+489.5	T9	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	30+553.25	T10	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+621.5	T11	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+650	T12	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+713	T13	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+827	T14	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+080	T15	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+134.5	T16	0	135.08	Beads at Elev. 135.08, 134.08, 133.08, 132.08, 131.08, 130.08, 129.08, 128.08, 127.08, 126.08, 125.08, 123.08, 121.08, 119.08, 117.08 and 115.08 masl.
	31+170	T17	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+352	T18	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+595	T19	0	135	Beads at Elev. 135, 133.5, 132, 130.5, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	31+605	T20	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+752.5	T21	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+820	T22	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+850	T23	0	135	Beads at Elev. 135, 133.5, 132, 130.2, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.
	31+880	T24	0	135	Beads at Elev. 135, 133.5, 132, 130.2, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.
	31+960	T25	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+995	T26	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	32+030	T27	0	135	Beads at Elev. 135, 133.5, 132, 130.2, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.
	32+060	T28	0	135	Beads at Elev. 135, 133.5, 132, 130.2, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.
	32+100	T29	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	32+140	T30	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130,

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
					129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
Inclinometer	30+282	1	0	139.8 (collar elevation)	
	30+390	2	0	140.5 (collar elevation)	
	30+640	3	0	139.3 (collar elevation)	
	31+180	4	0	139.5 (collar elevation)	
	31+590	5	0	140.0 (collar elevation)	
	31+815	6	0	139.7 (collar elevation)	
	31+885	7	0	139.3 (collar elevation)	
	32+065	8	0	139.6 (collar elevation)	
Crest survey monuments	30+050	1	0	139.6	
	30+075	2	0	139.5	
	30+100	3	0	139.7	
	30+125	4	0	139.5	
	30+150	5	0	139.4	
	30+175	6	0	139.7	
	30+200	7	0	139.6	
	30+475	8	0	140.3	
	30+500	9	0	140.1	
	30+525	10	0	140.1	
	30+550	11	0	140.0	
	30+575	12	0	139.8	
	30+600	13	0	139.8	
	30+625	14	0	139.6	
	30+650	15	0	139.7	
	30+675	16	0	139.9	
	30+700	17	0	140.1	
	30+725	18	0	140.2	
	30+750	19	0	139.9	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	30+775	20	0	139.7	
	30+800	21	0	140.0	
	30+825	22	0	139.5	
	30+850	23	0	139.7	
	30+875	24	0	137.0	
	30+900	25	0	139.9	
	30+925	26	0	139.6	
	30+950	27	0	137.0	
	30+975	28	0	139.8	
	31+000	29	0	139.6	
	31+025	30	0	139.6	
	31+050	31	0	139.8	
	31+075	32	0	139.8	
	31+100	33	0	139.8	
	31+125	34	0	139.8	
	31+150	35	0	139.8	
	31+175	36	0	139.7	
	31+200	37	0	139.5	
	31+225	38	0	139.3	
	31+250	39	0	139.4	
	31+275	40	0	139.5	
	31+300	41	0	139.6	
	31+425	42	0	139.4	
	31+450	43	0	139.3	
	31+475	44	0	139.4	
	31+500	45	0	139.6	
	31+525	46	0	139.5	
	31+550	47	0	139.5	
	31+650	48	0	139.6	
	31+675	49	0	139.8	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	31+700	50	0	139.7	
	31+725	51	0	139.6	
	31+750	52	0	139.6	
	31+775	53	0	139.6	
	32+100	54	0	139.2	
	32+125	55	0	139.9	

3.2.3 Bay-Goose Dike - Seepage Collection System

In 2012, four small seepage areas were identified with a total of 9 seepage channels along the dike. The number of active seepage channels decreases each year, as some channels stop flowing. No turbidity has been observed in the seepage. The total flow coming from these seepages each year has been decreasing. The flow of the seepages is directed toward Goose Pit as part of natural reflooding. The overall seepage is less than anticipated and is not a concern for now. The area will continue to be monitored to follow the evolution of the seepage in these areas.

Refer to the 2017 Annual Geotechnical Inspection (Golder Associates) for detailed field observations made on the dike. No mitigation measure has been implemented on the dike other than additional geotechnical instrumentation installation and field investigation in certain areas. No seepage collection has been implemented so far as the seepage is not affecting the mine operation or the integrity of the dike. The condition of the dike will continually be monitored and if the condition of the dike is judged to be deteriorating then remediation would be reassessed.

3.2.4 Bay-Goose Dike - Access

Access to the Bay-Goose Dike is from the north and south abutments as shown on Figures 2 and 6. Access to the downstream toe is by foot from the Bay-Goose pit ring road, which is a road that runs around the top circumference of the Bay-Goose pit. The south abutment of the dike is accessible from the main camp, after passing the fuel storage and refuelling station, travelling southward crossing the South Camp Dike. The access road forks, take the access road on the left (east) and continue southward on South Camp Island until reaching the south abutment of the Bay-Goose Dike. The north abutment of the Bay-Goose Dike is accessible from the south abutment of the East Dike.

The Bay-Goose Dike is not intended to be used as a haul road, but merely a structure to dewater the isolated portion and permit open pit mining of the Goose deposit and the southern portion of Portage Pit. Traffic on the dike is restricted to dike and environment personnel only; this measure was taken to protect the dike and the instrumentation.

3.3 SOUTH CAMP DIKE

The South Camp Dike covers a narrow channel within Third Portage Lake and in conjunction with the Bay-Goose Dike isolates the Bay-Goose Basin from Third Portage Lake. No spillways or water diversion works are associated with the South Camp Dike.

The South Camp Dike is located south of the plant site area and is used to connect the mainland to South Camp Island. Figure 2 shows the location of the South Camp Dike. It covers a narrow channel, approximately 60 m in width, where water depths were between 0.5 and 1 m.

The South Camp Dike was primarily constructed between April and June of 2009, prior to ice breakup. During the winter of 2009-2010 additional thermal capping material and rockfill for the haul road was added to the dike. The South Camp Dike has a broad rockfill shell with a bituminous geomembrane liner installed on the upstream side of the shell. The liner was founded on native frozen (permafrost) till material, in a trench approximately 3 to 5 m below the lakebed surface. Compacted granular material mixed with bentonite was placed above the toe of the liner. The haul road is located on the downstream side of the dike.

3.3.1 South Camp Dike – Design and Construction

The South Camp Dike design and as-built drawings are presented within Doc. 802 (Golder 2009a). A plan view and typical section of the as-built dike are shown on Figure 9.

The dike design includes the following components: a rockfill shell, a bituminous geomembrane liner and granular material mixed with bentonite.

3.3.2 South Camp Dike - Instrumentation

Two thermistor strings exist on the upstream side of the South Camp Dike to monitor the thermal behaviour of the foundation soils at the liner key-in trench. Instrumentation is shown in section on Figure 9

Table 3.3 summarizes existing instrumentation in the South Camp Dike.

Table 3.3 South Camp Dike Existing Instrumentation Summary

Thermistor String	Location		Approx. Offset from Centerline + is d/s; - is u/s	Elevation (masl)	Details
	Northing	Easting			
SD-09-A	7,213,148	638,151	-27 m	133 (1st bead)	Beads at Elev. 133, 132, 131, 130, 129, 128, 127, 126, 124, 122, 120, 118, 116, 114, 112 and 110 masl
SD-10	7,213,142	638,168	-45 m	132.4 (1st bead)	Beads at Elev. 132.4, 131.4, 130.4, 129.4, 128.4, 127.4, 126.4, 125.4, 123.4, 121.4, 119.4, 117.4, 115.4, 113.4, 111.4 and 109.4 masl

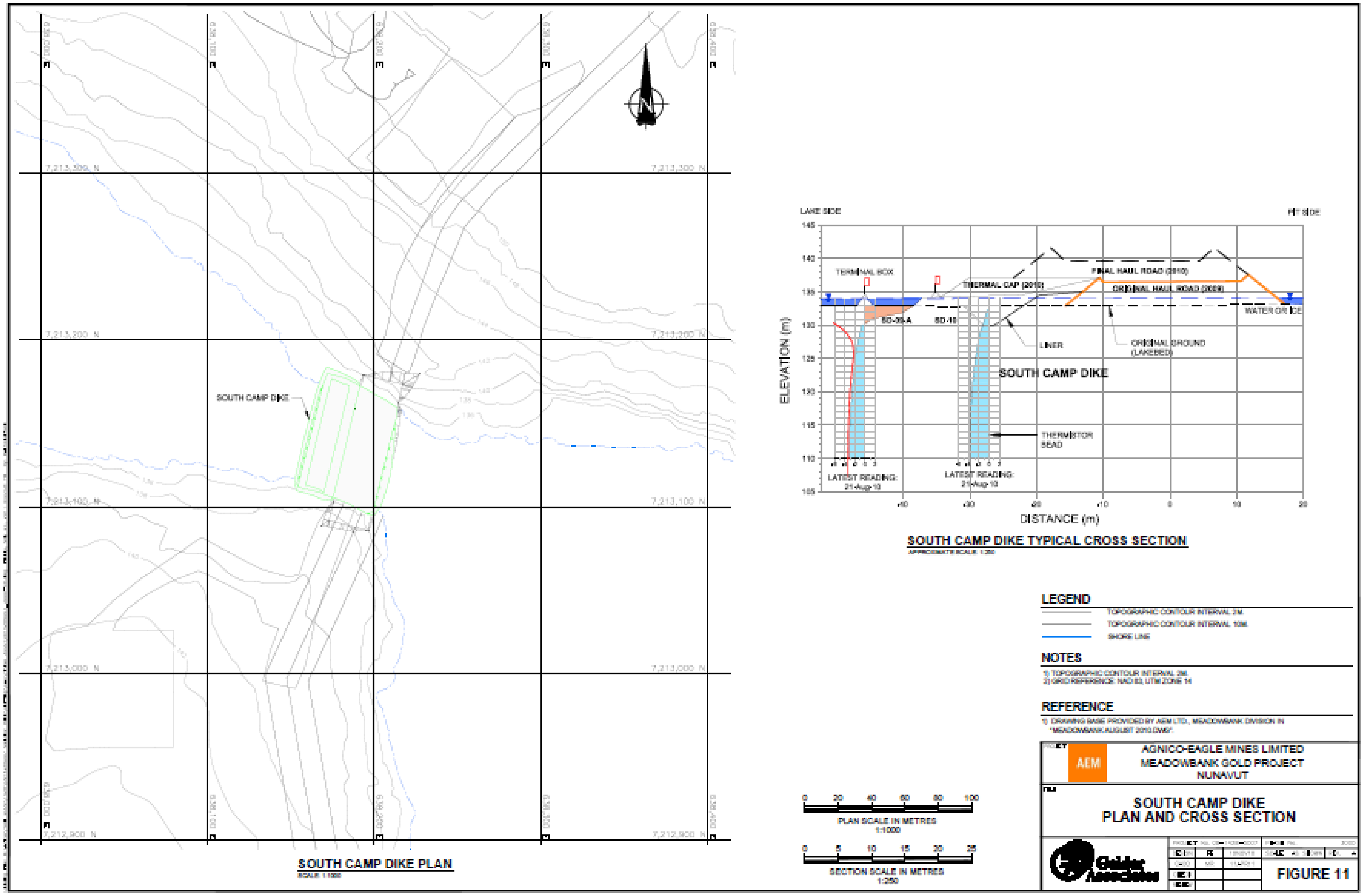
3.3.3 Seepage Collection System

As of summer 2017 no seepage through the South Camp Dike has been discovered. Seepage through the dike will be visually monitored if discovered. Seepage and runoff from the South Camp Dike will be collected in ditches along the downstream toe and directed to topographic lows if required based on the visual monitoring.

3.3.4 South Camp Dike - Access

Access to the South Camp Dike is from the north and south abutments as shown on Figures 2 and 10. The South Camp Dike connects the mainland to South Camp Island.

Figure 9 Plan, cross section and profile of South Camp Dike



3.4 VAULT DIKE

The construction of the Vault Dike at Meadowbank was conducted from February 2013 to March 2013. Vault Dike is located across a shallow creek which connects Wally Lake and Vault Lake, at the Vault Pit area approximately 8 km north of the main Meadowbank site. Vault Dike is essential to allow the dewatering of Vault Lake and to isolate Vault Pit during mining activities from Wally Lake.

Vault Dike is designed and constructed as a zoned rockfill dam with filter zones, an impervious upstream liner consisting of a bituminous membrane, and an upstream key trench made of aggregate mixed with bentonite. The filter zones minimize seepage and internal erosion and facilitate seepage collection. Vault Dike includes a key trench at the base of the upstream side filled with a 0-25 mm fill amended with bentonite surrounding the liner. Coarse and fine filter material was placed on the upstream slope as geomembrane bedding. The bulk part of the dike consists of coarse rockfill material. The embankment crest is at El. 142.4 m and the upstream toe is at approximately El. 139.4 m. The downstream toe is at approximately El. 139.6 m and the bottom of the key trench ranges from El. 135.6m to El. 142.3m, with an average height of El. 137.0m. The upstream and downstream fill slopes of the dam are 1.5H:1V.

The location of the Vault dike is shown on Figure 2. Dewatering of Vault Lake was completed in the summer of 2014.

3.4.1 Vault Dike – Design and Construction

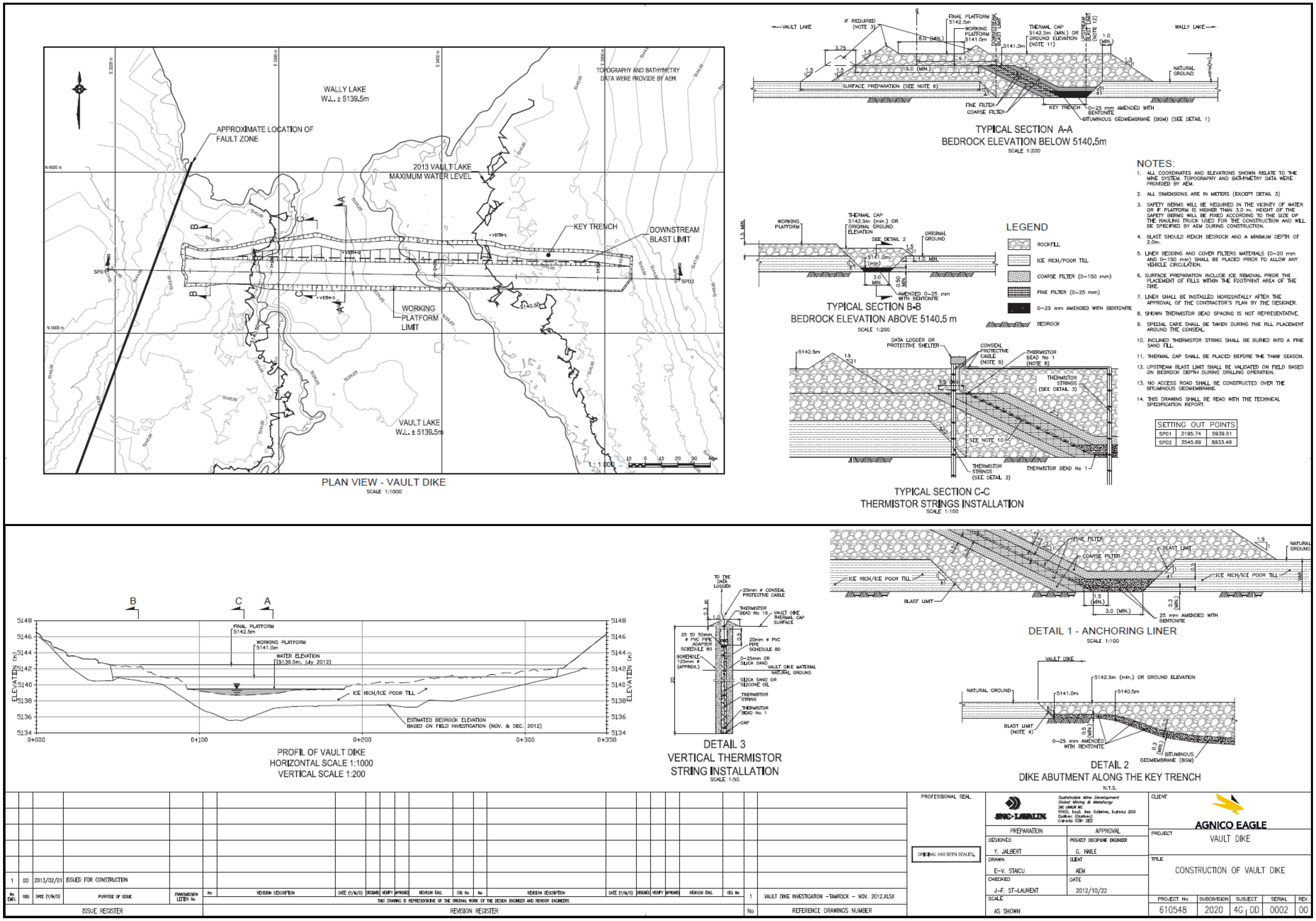
The Vault Dike design is presented in the report "Detailed Engineering of Vault Dike" (SNC, 2013a). A Vault Dike typical section plan view is included in Figure10. As-built information and as-built drawings of the Vault Dike are provided in Construction Summary Report Vault Dike (AEM, 2013).

Vault Dike is designed and constructed as a zoned rockfill dam with filter zones, an impervious upstream liner consisting of a bituminous membrane, and an upstream key trench made of aggregate mixed with bentonite. The filter zones minimize seepage and internal erosion and facilitate seepage collection.

3.4.2 Vault Dike – Dewatering

Vault Dike is essential to allow the dewatering of Vault Lake and to isolate Vault Pit during mining activities from Wally Lake. The dewatering of Vault Lake started on June 27th, 2013 and was completed in the summer of 2014. The approximate pool volume to be dewatered was 2 Mm^3. The downstream water levels and the upstream water levels needed to be closely monitored during dewatering to preserve the integrity of the dike.

Figure 10 Vault Dike Typical Section



3.4.3 Vault Dike - Instrumentation

Installation of the thermistor strings began on February 26, 2013 and was completed April 14, 2013. Installation of the thermistors was completed by AEM with assistance from the Contractor /TCG and complied with the construction specifications.

TH3 was installed on the downstream side of the dike. TH3 was installed in the deepest channel downstream of the dike. TH5 was installed inclined under the liner on February 26, 2013. TH6, TH7, and TH8 were installed after construction was complete using a Rockmaster drill between April 12, 2013 and April 14, 2013. T6 was installed upstream of the dike in the deepest channel upstream of the liner. TH7 was installed east of the deepest channel in the unthawed till zone found during construction. TH8 was installed upstream of the dike in the deepest channel outside of the key trench. The locations of the five thermistors at Vault Dike are shown on the as-built drawings in plan view in Figure 10 and their details are shown in Table 3-4. The five (5) thermistor strings were installed to monitor Vault Dike and the thermal behaviour of its foundation. At this point, only one critical section has been identified in the deepest section of the dike.

Table 3.4 Vault Dike Existing Instrumentation Summary

Thermistor String	Location		Elevation (masl)	Details
	Northing	Easting		
VD-TH3	5921.97	3324.066	139.5 (1st bead)	Beads at Elev. 139.5, 138.5, 137.5, 136.5, 135.5, 134.5, 133.5, 132.5, 131.5, 130.5, 128.5, 126.5, 124.5, 122.5, 120.5, and 118.5 masl
VD-TH5	5945.52	3322.511	141.4 (1st bead)	Beads at Elev. 141.4, 141.4, 141.4, 141.4, 141.1, 141.0, 140.5, 140.0, 139.5, 139.0, 138.4, 137.9, 137.4, 136.8, 136.4, and 136.1 masl
VD-TH6	5943.00	3322.000	140.5 (1st bead)	Beads at Elev. 140.5, 139.5, 138.5, 137.5, 136.5, 135.5, 134.5, 133.5, 132.5, 131.5, 130.5, 129.5, 127.5, 125.5, 124, and 121.5 masl
VD-TH7	5946.00	3346.00	140.5 (1st bead)	Beads at Elev. 140.5, 139.5, 138.5, 137.5, 136.5, 135.5, 134.5, 133.5, 132.5, 131.5, 129.5, 127.5, 125.5, 123.5, 122.0 and 119.5 masl
VD-TH8	5957.00	3322.00	140.5 (1st bead)	Beads at Elev. 140.5, 139.5, 138.5, 137.5, 136.5, 135.5, 134.5, 133.5, 132.5, 131.5, 129.5, 127.5, 125.5, 123.5, 122.0 and 119.5 masl

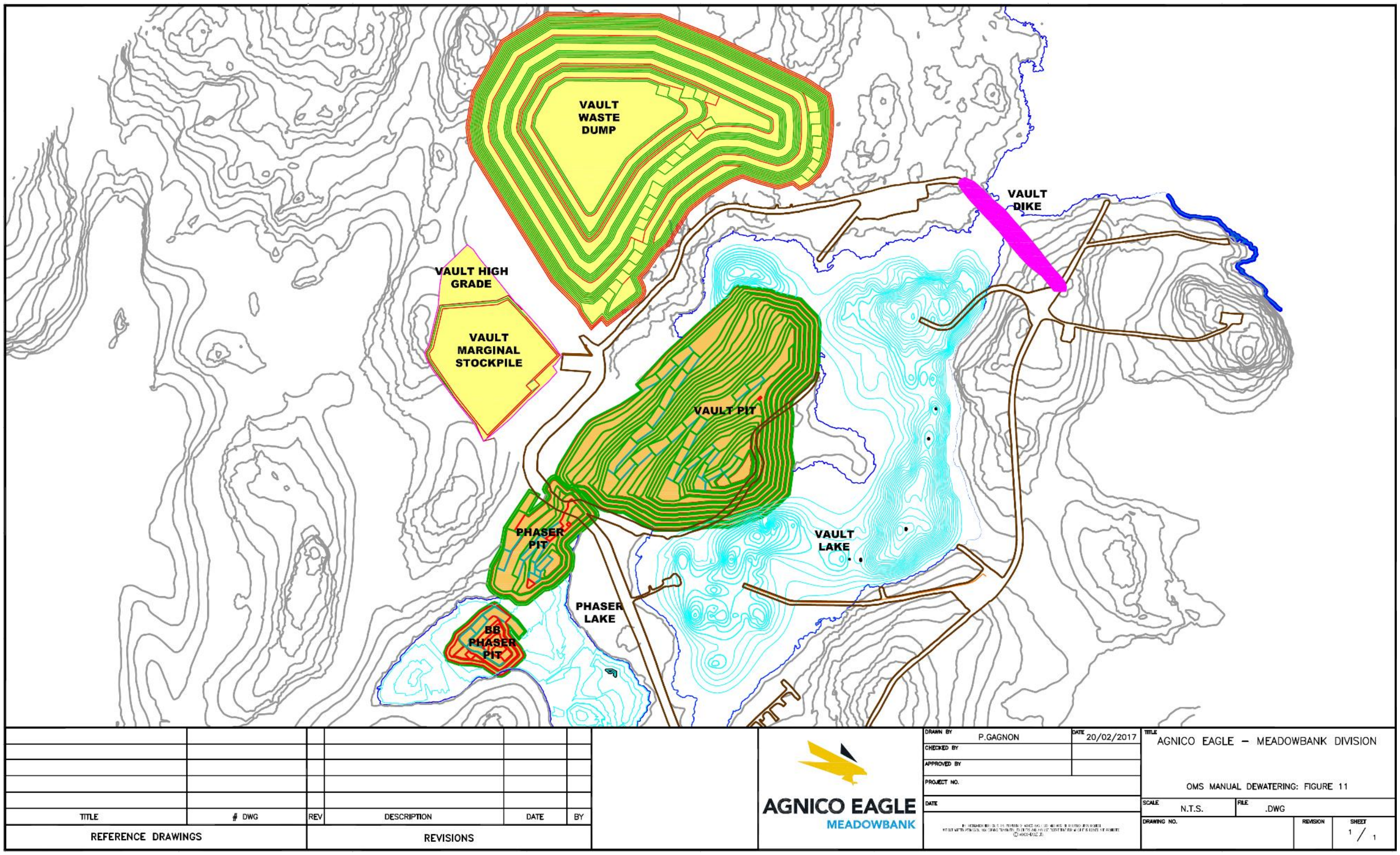
3.4.4 Vault Dike - Seepage Collection System

As of summer 2017 no seepage through the Vault Dike has been discovered. Seepage through the dike will be visually monitored if discovered. Seepage and runoff from the Vault Dike will be collected in ditches along the downstream toe and directed to topographic lows if required based on the visual monitoring.

3.4.5 Vault Dike - Access

Two access roads were constructed to the dike footprint – one from Vault Dike Road West and from Vault Dike Road East. Figure 11 presents a map of the general Vault Pit area with the access roads. Vault Dike Road West begins where Vault Road ends at the Vault Waste Dump, runs northeast to pass Dewatering Road A and ends at the northwest end of the dike (Station 0+000). Vault Dike Road East begins at Vault Road between the Tower Pad and the Office Pad, runs northeast to pass Dewatering Road B and Dewatering Road C and ends at the southeast end of the dike (Station 0+350).

Figure 11: General Vault Pit area with the access roads



SECTION 4 • DEWATERING

The Dewatering Dikes isolate the open pit mining activities from the Second Portage Lake, Third Portage Lake, and Wally Lake. The northwest arm of Second Portage Lake was dewatered upon completion of the East Dike and West Channel Dike in 2009. A total of 6.7 Mm^3 were pumped from the Second Portage Arm.

The Bay-Goose Dike together with the South Camp Dike isolates the Bay-Goose Basin from Third Portage Lake. Dewatering of the Bay-Goose Basin commenced on July 25, 2011 and was completed on November 14 2011. As the operational stage of Goose Pit has started, both dikes are no longer under dewatering conditions. The approximate pool volume dewatered is in the order of 3 Mm^3. This is referring to the amount of water removed to expose the majority of the downstream toe of the Bay-Goose Dike.

Vault Dike isolates Vault Pit from Wally Lake. Dewatering of Vault Lake started on June 27th, 2013 and was completed during the summer of 2014. The approximate pool volume to be dewatered was in the order of 2 Mm^3.

All of the dewatering dikes are now in the operation phase as dewatering is complete. The following outlines the key criteria and constraints that will need to be observed and followed in accordance with the design objectives, concepts, and assumptions for the Dewatering Dikes.

4.1 FREEBOARD

The design criteria for minimum freeboard for the Dewatering Dikes are presented in Table 4.1. The freeboard may change due to fluctuations in Second Portage and Third Portage Lakes or due to settlement in the dikes. Maintenance may be required to restore loss of freeboard due to settlement.

Table 4.1 Design Minimum Freeboard

Structure	Minimum Freeboard	
	Rockfill Structure (Dike Crest) (m)	Low Permeability Element (Cutoff Wall or Liner) (m)
East Dike	3.0	1.0
Bay-Goose Dike	4.0	1.0
South Camp Dike	3.0	1.0
Vault Dike	3.0	1.5

4.2 WATER MANAGEMENT AND QUALITY

Dewatering water from the Vault Lake Basin was pumped and directly discharged to Wally Lake thru a diffusor, or processed through the Water Treatment Plant (WTP) to reduce Total Suspended Solids (TSS). The Nunavut Water Board Water License (No. 2AM-MEA0815, previous to No. 2AM-

MEA1525) states that the TSS maximum monthly mean value should not exceed 15.0 mg/L and that the short term maximum level is 30 mg/L and turbidity maximum monthly mean value should not exceed 15 NTU and the short term maximum level is 30 NTU. The Vault Lake discharge is also considered as an effluent under the Metal Mining Effluent Regulations (MMER) and must meet the criteria of this regulation for arsenic, copper, cyanide, lead, nickel, zinc, TSS and toxicity of trout and daphnia. Under the MMER regulation, the TSS maximum monthly mean value should not exceed 15.0 mg/L and maximum concentration in a grab sample is 30.0 mg/L. In all stages of the Vault Lake dewatering the WTP was not required because the regulation criteria limit was reached.

4.3 SURVEILLANCE AND MONITORING REQUIREMENTS

Surveillance and monitoring requirements are defined in Sections 7 and 8 of this manual.

Pore water pressures in the foundation shall be monitored during dewatering as a predictor of possible slope instability. Both pore water pressures and temperature measurements shall be monitored during dewatering as one method of detecting potential zones of seepage. The quantity of water pumped out during dewatering was monitored with flow meters in addition to monitoring the water level downstream of the each dewatering dikes and also elevation of the surrounding water bodies.

4.4 SAFETY AND SECURITY

Access to the mine site is controlled by AEM security and public access to the area is restricted.

SECTION 5 • OPERATIONS

The following outlines the key criteria and constraints that will need to be observed and followed to operate the dewatering dikes in accordance with the design objectives, concepts and assumptions.

5.1 FREEBOARD

The design criteria for minimum freeboard for the Dewatering Dikes are presented in Table 5-1. The freeboard may change due to fluctuations in lake levels or due to settlement of the dikes. Maintenance may be required to restore loss of freeboard due to settlement.

Table 5.1 Freeboard

Structure	Freeboard	
	To the Dike Crest (m)	To the Dike Cut-off Wall or Liner (m)
East Dike	3.0	1.0
Bay-Goose Dike	4.0	1.0
South Camp Dike	3.0	1.0
Vault Dike	3.0	1.5

5.2 WATER MANAGEMENT

Water from the seepage collection systems of the Dewatering Dikes is to be pumped to the pit sumps and/or directly to the Tailings Storage Facility or former Attenuation Pond, or even in Second Portage Lake in the case of East Dike. Seepage rates may increase with time as the pits are developed downstream of the dikes. As described in Sections 7 and 8 of the document, seepage rates, volumes and the condition of the seepage water (i.e. turbidity, temperature, etc.) are to be monitored.

Table 5.2 summarizes design criteria for the seepage and runoff flow into the seepage collection sumps. The quantity of seepage through the dike is an estimate based on design analyses and should be periodically reviewed during dewatering and operations.

Table 5.2 Sump Design Criteria

Criteria **Type of Storage**	**Description** **Temporary**
Required Storage Capacity	Seepage from the foundation and embankment plus Average daily 10 year freshet volume
Foundation and Embankment Seepage	Design rate: 300 m^3 /day prior to Portage Pit development (East Dike). However, seepage rates in 2009 to 2014 have been between 860 to 1300 m^3/day and 2015 to 2016 between 490-600 m^3/day. Design rate: 700 m^3 /day prior to Goose Island Pit development (Bay-Goose Dike)
Average daily 10 year freshet	Average daily 10 yr snowmelt over 14 day melt period
Design Pump Capacity	Sufficient to pump: Foundation and Embankment Seepage plus 10-year annual snow melt in 14 days

Regular monitoring of the seepage volume is required. Sumps size and pump capacity is to be regularly reviewed and upgrades made if deemed necessary by AEM.

5.3 WATER QUALITY

Water quality of the seepage and runoff collected in the sumps and ditches at the toe of the Dewatering Dikes is to be monitored during operations. Daily inspections during dewatering and weekly inspections during operation are required as an indicator of dike performance to note whether seepage water is clear, cloudy or if fine material is present.

SECTION 6 • MAINTENANCE PROCEDURES

Maintenance is important for the safe operation of the Dewatering Dikes. The Engineering Superintendent is responsible for proper and timely maintenance of the Dewatering Dikes embankments, instrumentation, seepage collection system and access.

6.1 PLANNED AND UN-PLANNED MAINTENANCE

Maintenance is divided into planned and un-planned maintenance. Planned maintenance will be scheduled according to manufacturer's requirements for instrumentation and equipment such as pumps. Planned maintenance may be routine, preventative and/or routine inspection observations including low risk / consequence observations.

Un-planned maintenance shall generally derive from routine inspection observations including medium-high risk / consequence observations and / or extreme events including extreme meteorological events, seismic events, etc. where the maintenance requirement is critical and is required immediately.

All planned and un-planned maintenance of pumps and dewatering equipment will be documented in a database organized and maintained by AEM Maintenance Department.

6.2 EMBANKMENT EROSION

Erosion of the rockfill embankments is not expected during dewatering or operations. In the event that the upstream face is eroded by wave action or ice scouring then any gullies or depressions that develop are to be filled in with rockfill material and re-sloped.

6.3 SEEPAGE COLLECTION SYSTEM

Seepage is expected to exit the downstream toe of the Dewatering Dikes, in particular at low points along the alignment of the structure. Seepage should be monitored and ditches and sumps maintained to avoid erosion and deterioration of the seepage collection system. Sediments, snow and ice may accumulate in the ditches and sumps during operation. The ditches and sumps will require ongoing cleaning and maintenance as needed.

Pumps located at the seepage collection system sumps will require maintenance based on the manufacturer's specifications. Pump installations are to be winterized to provide year round capacity for pumping, if necessary.

Heat tracing of the pipelines will require maintenance. It is expected that the feeder pipelines to the main pipelines are sloped sufficiently to drain the pipes and not permit ice or sediment accumulation, but this should be confirmed in the field.

6.4 INSTRUMENTATION

All cables, thermistors, inclinometers, piezometers, and survey/displacement monuments must be adequately protected with barriers, signs, and flagging to prevent accidental damage. The instrumentation installed in the Dewatering Dikes is to remain operational until closure of the facility.

Instrumentation will require regular maintenance based on manufacturer's specification. The slope inclinometer casing will require either frequent bailing or filling with a solution of non-toxic antifreeze to prevent freezing and icing.

Calibration sheets and initial instrumentation readings will be included upon replacement of malfunctioning instrumentation; the OMS Manual will be updated accordingly.

6.5 ACCESS

Access roads to the Dewatering Dikes along the crest of the dikes need to be maintained. Access will also be maintained along the seepage collection system and to the sumps at the toe of the East Dike and Bay-Goose Dike. Maintenance activities for access will be conducted.

SECTION 7 • SURVEILLANCE

A program of regular surveillance is required to ensure that the Dewatering Dikes, instrumentation and seepage collection systems are performing adequately and that problems are detected so that the necessary corrective actions can be implemented in a timely manner.

7.1 SURVEILLANCE REQUIREMENTS

Surveillance is required for early detection of possible failure mechanisms. In 1995, the International Commission on Large Dams (ICOLD) released a study summarizing failure mechanisms for world-wide water retaining dam incidents during the 1800s and 1900s. The potential failure mechanisms applicable to the Dewatering Dikes, primarily East Dike and Bay-Goose Dike, based on the ICOLD study are summarized in Table 7-1.

Table 7.1 Summary of Consequences and Proposed Monitoring/Action for Rare Events Based on Water Retaining Embankment Failure Modes Identified in ICOLD (1998)

Failure Mode	Scenario	Consequence	Monitoring/Action
Overtopping	(1) Lake level rise because of restricted outflow e.g. Second Portage outlet (excessive inflow is a far less likely scenario).	Water spilling over the crest. The crest is wide and comprises coarse rockfill. Adequate freeboard is provided by the rockfill crest elevation being 3 m above the lake level and the low permeability element 2 m above. Any rise in lake level is anticipated to be less than the freeboard. Significant damage to the dike is unlikely, based on performance of other rockfill structures subjected to overtopping or flow through events. Mining operations might need to be suspended, but there will be considerable warning time given the design freeboard and the storage volume within the lakes.	Outflow channels should be inspected weekly during the thaw and ice break-up. If overtopping is likely, a temporary spillway could be constructed and armoured to control and localize flow at shallow dike sections (e.g. abutment). Lake level to be monitored on a regular basis.
	(2) Dam crest settles more than 2 m over a distance of approximately 50 m. Not a credible failure mechanism. Observed settlement of the East Dike and Bay-Goose Dike crest during construction was on the order of 0.3 m to 0.5 m. Additional settlement is expected to be smaller in magnitude.	Same as (1).	The situation envisaged in this scenario should develop slowly with crest settlement evident. Monitoring of crest settlement is appropriate, and is included in the surveillance program. Rockfill and till are available from the mining operation can be placed to raise the dike crest, if settlement occurs.

Failure Mode	Scenario	Consequence	Monitoring/Action
Internal Erosion	(3) Dike Section: the low permeability element of the dikes Cutoff wall, jet grout columns, shallow foundation is defective, allowing high water flow through the structure. This defect could potentially erode zones of the dike and lead to loss of material from the dam (piping) increase the seepage, sinkholes in the crest.	The East Dike cutoff wall could progressively loose material, thereby increasing the hydraulic conductivity and resulting in an increased rate/volume of seepage through the dike and development of sinkholes in the dam crest. This is not likely to be a catastrophic failure mode as the rockfill shoulders of the dike will be stable and the filters are founded on or near bedrock. At its worst, this would lead to temporary flooding within the open pit of the mine and a cessation of mining. The Bay-Goose Dike cutoff wall system although similar to East Dike, has potential to lose more material from the dike structure, through piping as in the "deep sections" where jet grouting was conducted, downstream filter material does not extend to bedrock and a higher hydraulic head exists. Internal erosion could lead to increased seepage, sinkhole development, settlement of the crest, and although not probable, loss of containment.	Monitor seepage from downstream face for rate and volume, and for presence of sediment in seepage. Would become evident as localized intensive seepage at the dike toe or beyond. May also see settlement in the cutoff wall or dike crest. Will be most likely in deep water sections with higher gradients. Monitor piezometric and thermistor data for signs of increased flow through the cutoff wall and change in piezometric pressures. Selection of a remediation plan would be based on conditions encountered, but could include the installation of a downstream filter blanket and grouting.
	(4) Foundation: Till is non-uniform with more transmissive zones and zones of erodible material (i.e. silt layers) that may not be self-filtering. It is possible that material loss of the foundation tills and/or through the fractured bedrock with silt infillings could occur and result in high rates of seepage and a loss. Seepage could flow along the transmissive zone beneath the downstream rockfill section and erode the foundation tills at the downstream toe or into the downstream rockfill because of the lack of filtering.	Limited seepage at the toe or into the rockfill would accelerate into a larger flow and could lead to the undermining of the dike if no action was taken. This is a credible catastrophic failure mode if increased seepage is not detected in time.	Monitor seepage flow rates and condition and piezometric and thermistor responses for signs of increased seepage. Monitor dike crest for signs of sinkholes, settlement or slope instability. Remedial actions could comprise of grouting, a reverse filter and rockfill buttress depending on location of the flow and configuration of the foundation. In the worst case, the dewatered areas may be deliberately flooded in a controlled manner, the cutoff repaired, and the areas dewatered.
Seepage within Embankment	(5) Seepage on its own is not a credible failure scenario. The downstream rockfill shell has extremely high flow through capacity. The rockfill zone is both	No credible consequences. May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage.	Seepage monitoring program.

Failure Mode	Scenario	Consequence	Monitoring/Action
	large and pervious, so that seepage will not daylight on the downstream face and lead to instability. Any seepage related failures must include internal erosion, see above.		
Seepage within Foundation	(6) Defective construction of cutoff system leading to transfer of unexpectedly high fraction of the reservoir head into the downstream part of the dike foundation, or leading to a piping event as described above (internal erosion).	This failure mechanism has caused embankment failures elsewhere because of pore pressure induced instability. However, at East Dike it is unlikely that it could cause failure of this dike. However, for Bay-Goose Dike this is more of a possibility. The most likely consequence is downstream toe slumping requiring a localized stabilizing berm before the crest roadway could be reinstated.	This mechanism is more likely to arise during dewatering. Monitoring of piezometric heads and thermistor string data.
Internal Conduit Rupture	(7) There are no internal conduits or other structures extending through the dikes.	Not applicable.	Not applicable.
Slope Instability	(8) Normal Operation: The rockfill shoulders of the dikes have high shear strength, making it a conservative design. For slope failure to be a concern, it requires failure in the foundation which would then extend into the overlying dike. Sliding failure is considered unlikely given the low horizontal forces generated by water and ice forces relative to the normal frictional force due to the weight of the dike and the friction angles of foundation materials.	A foundation failure would cause a rotational slip or sliding failure until equilibrium was reached. This mechanism would limit access along the dike until repaired. Failure through the rockfill shoulders will not necessarily compromise the water retaining element of the dikes. Failures which reach the core may cause failure.	This mechanism should develop during construction or dewatering, due to increased loads and associated pore water pressure. Initial stages of failure should be observable as tension cracks in the dike crest. Walk-over inspection of the dike by a trained inspector is an appropriate monitoring strategy. Survey of crest, face, and toe is also appropriate. Stabilizing berms can be placed inside the dike or through water along the upstream shoulder.
	(9) Pit Wall instability that extends towards the dike and causes instability of the dike	If the instability impacted the low permeability element of the dike, then failure of the entire structure and loss of mining operations could occur. This is more likely to be a cause of failure for the Bay-Goose Dike as the offset between the low permeability element and pit crest is much	Slope inclinometer monitoring of the cutoff wall. Pit wall stability monitoring. Depressurization of pit walls. Draining of lakebed soils between pit crest and dike and/or removal of these materials.

Failure Mode	Scenario	Consequence	Monitoring/Action
		less than for East Dike.	Adjustment of mine plan, if necessary.
	(10) Earthquake Induced: Occurrence of an extreme earthquake, much in excess of the current understanding of seismicity of the area.	The extreme earthquake loading for this site is a low magnitude. Settlement of the dike could occur in the event of a large earthquake. Dynamic compaction of the core in the East Dike and Bay-Goose Dike during construction may have subjected the rockfill shells to accelerations equivalent to the expected earthquake loading. This would not be a failure situation. The crest is also erosion resistant for any earthquake induced wave action in the impounded water.	Dike inspection following earthquakes felt on site.
Failure of Cutoff Wall Due to Movement of the Dike	(11) Differential horizontal movement of dike due to water or ice loading, or pit wall failure, or blast vibrations. Creates a breach in the cutoff wall system. Ice and water forces are not credible due to the ratio of frictional forces generated by the self weight of the dike versus ice loads and water pressure. Pit wall failure (see above).	Large inflows through the breach. Dewatered areas would flood requiring suspension of mining activities. Potential for loss of life for workers downstream of the dikes. Excessive vibration from overblasting could potentially damage the CSB and/or jet grout columns resulting in cracks or fissure, however the cement content within these portions of the wall should reduce the erodability of the wall and therefore protect the integrity of the dike, even though seepage rates would increase. It is anticipated that the SB material would deform adequately such that cracks would not be produced.	Prism monitoring for pit wall stability. Blast vibration monitoring on the dikes. Monitoring inclinometers within the cutoff wall.
Unexpected Settlements	(12) Unexpected foundation soils consolidate during dike construction. A significant quantity of clay that was not recognized during foundation excavation would be required to generate settlement required for a water release event. Settlement of the core will be limited.	2 m of settlement would be required to allow water flow through the rockfill and over the settled core. This flow would not cause failure of the rockfill shells. It would also be readily repaired by placing more end-dumped till into the settled zone.	Settlement monitoring of the dikes and visual inspection. Excessive settlements may be remediated by excavating rockfill above the core and placing more till.

Table 7-1 to be updated as necessary during operation

7.2 SURVEILLANCE PROTOCOLS

The surveillance program consists of several types of inspections:

<u>During Dewatering:</u>

- Daily Dewatering Inspection – carried out on an on-going basis by designated qualified mine personnel to assess the performance of the dikes during dewatering. Reporting can be daily if routine, or immediately if conditions warrant;

- Weekly Dewatering Inspection – carried out by designated qualified mine personnel, to assess the performance of the dikes during dewatering with reporting occurring weekly or immediately if conditions warrant; and

- Design Engineer Inspection – upon exposure of the downstream toe to view seepage and review the performance of the dike.

<u>During Operations:</u>

- Routine Inspection – carried out on a weekly basis by designated qualified mine personnel to assess operating of the seepage collection systems including the sumps and performance of the structures. Results of these routine inspections are documented if a change in condition is observed;

- Monthly Visual Inspection – carried out and documented monthly by a designated qualified mine personnel to assess operating status of the seepage collection systems including the sumps, and performance of the structures;

- Engineering Inspection – carried out annually by a qualified engineer, during open water period, to verify that the facilities are functioning as intended; and

- Dam Safety Review – carried out by an a dike review board of independent engineers every year to review all aspects of the design, construction, operation, maintenance, processes and other systems affecting the dam's safety, including the dam safety management system. The review defines and encompasses all components of the "dam system" under evaluation including the dam, foundations, abutments and seepage collection works.

7.3 RESPONSIBILITIES AND FREQUENCY

It is anticipated that the Engineering Superintendent and support personnel and/or the Environment Superintendent and support personnel and/or Mine Superintendent and support personnel will be responsible for the inspections of the Dewatering Dikes, seepage collection systems, instrumentation and access routes during dewatering and operation. The inspections by the Design Engineer and for the Dam Safety Review will be conducted by qualified independent engineers. The inspection, monitoring and review requirements are summarized in Table 7-2 and described in the following sections.

Table 7.2 Inspection, Monitoring and Review Requirements

Party Responsible	Required Inspection, Review or Monitoring	Required Frequency
Design Engineer	Dewatering Inspection	During dewatering once downstream toe is exposed
Engineering Superintendent and Geotechnical Coordinator/ Geotechnical Engineer/Specialist and/or support personnel; Environment Superintendent and/or support personnel;	Daily Dewatering Inspection	Daily and immediately following earthquakes, high intensity rainfall events and other extreme events
	Routine Inspection of Dewatering Dikes, seepage collection system, and access.	Weekly and immediately following blasting, large blasts occurring in close proximity to the structures, earthquakes, high intensity rainfall events and other extreme events
	Monitoring of instrumentation (thermistor strings, vibrating wire piezometers, inclinometers, survey prisms and monuments, pump rates, lake water levels)	Varies – see Section 8.0
Engineering Superintendent and/or Geotechnical Engineer/Specialist and/or designated qualified personnel	Weekly Dewatering Inspection	Weekly and immediately following earthquakes, high intensity rainfall events and other extreme events
	Monthly Visual Inspection of Dewatering Dikes, seepage collection system, and access.	Monthly and immediately following large blasts occurring in close proximity to the dikes, earthquakes, high intensity rainfall events and other extreme events
Qualified Engineer	Engineering inspection of the Dewatering Dikes, drainage works, access and instrumentation.	Annually
Independent Engineer (Meadowbank Dike Review Board)	Dam Safety Review	Annually

7.3.1 Dewatering Inspections (Daily and Weekly)

Inspections during dewatering form part of the duties and responsibilities of the Engineering Superintendent, Geotechnical Engineer/Specialist and/or support personnel and the Environment Superintendent and/or support personnel must be carried out by designated and qualified personnel. It is assumed that daily Inspections may be conducted by less knowledgeable staff and weekly inspections by more knowledgeable staff.

Ideally the inspections should be carried out by the same individual or by a small group in order to maintain continuity in the observations. The main operational and structural parameters should be reviewed and verified by the Engineering Superintendent, Geotechnical Engineer/Specialist and Environment Superintendent. Data collected will be summarized on the respective Dewatering Dike Field Inspection Sheets and stored for easy access and long term record keeping.

The following information should be noted and recorded in the inspection to detect signs of wear, damage or potential loss of structural integrity:

<u>Dike Structure:</u>

- compliance with minimum freeboard requirements:
- crest elevation;
- upstream water elevation; and
- downstream water elevation.

<u>Crest:</u>

- surface cracking; and
- local subsidence.

<u>Upstream face conditions above water line:</u>

- cracking;
- distortion or displacement;
- wave erosion; and
- slope angle.

<u>Downstream face conditions:</u>

- cracking;
- distortion or displacement;
- slumping;
- erosion;
- slope angle;
- seepage quantity and quality (turbidity); and
- wet areas.

<u>Area downstream of dike toe:</u>

- Seepage quantity and quality (turbidity);

- cracking;
- erosion;
- bulging; and
- indications of instability.

Abutments:

- indications of instability;
- erosion at dike – ground surface contact; and
- seepage appearing from abutments.

Barges, Dewatering ramps, and pumps:

- pumping rates and dewatering rate;
- water quality being pumped in regards to turbidity;
- conditions of the holding cables and location of the barge in the dewatering pool;
- presence of ice on the barge due to leaks; and
- general condition of the pumps and the presence of leaks (pumps or piping).

The inspection forms are included in Appendix A.

Photographs should be used to augment the inspection forms. As much as possible, these should be taken from the same vantage points during each inspection so that changes in conditions can be readily identified. Photographs shall be captioned or annotated with a date stamp.

The observations and/or events indicating a trend that are considered “triggers” requiring reference to action items and reporting procedures are outlined in the Emergency Preparedness Plan in Section 11. A summary of triggers for the dewatering inspection are:

- Increasing measurements in total suspended solids at dewatering pump intake or outlet;
- Decrease in the rate of dewatering, when not attributed to a decrease in the pumped volume;
- Instrumentation responses indicating seepage; and
- Increasing measurements in dike displacement such as crest heave/settlement or lateral movements.

7.3.2 Operation Routine Inspections and Monthly Visual Inspections

Routine Inspections are part of the duties and responsibilities of the Engineering Superintendent, Geotechnical Engineer/Specialist and/or their support personnel and the Environment Superintendent and/or support personnel and must only be carried out by designated and qualified personnel. Ideally the inspections should be carried out by the same individual or small group in order to maintain continuity in the observations. The main operational and structural parameters should be reviewed and verified by the Engineering Superintendent, Geotechnical Engineer/Specialist and the Environment Superintendent.

Routine Inspections are carried out by the geotechnical technicians as they perform their data readings and other duties on the dewatering dikes. Technicians are trained to watch for changes in the condition of the dewatering dikes, and report anything out of the ordinary to the geotechnical engineers/Specialists so it can be investigated further. Technicians look for any signs of damage to the dikes and monitor seepage conditions. Once a month, a formal visual inspection will be performed and documented on each Dewatering Dike (see Appendix A). The report is reviewed by the Geotechnical Eng. /Spec. and stored in a suitable location for easy accessibility and long-term record keeping.

Routine Inspections are also carried out on a bi-weekly basis by the geotechnical engineers/specialist. These inspections will also occur if an inspection carried out by the geotechnical technician discovers anything that needs to be investigated further.

Table 7.3 present the routine inspection frequency and responsible for each of the dewatering dike structures. The inspection frequency presented in this table assumed that the dikes are in a stable condition (green level of the TARP). If unfavorable condition would be observed and the TARP level would increase, the inspection frequency would be revised accordingly.

Table 7.3 Routine Inspection frequency and responsible per structure

Structure	**Routine Inspection frequency**	**Inspection officer**	**Visual Inspection Documentation frequency**
Bay Goose Dike	Weekly	Geotechnical Technician	Monthly
	Bi-Weekly	Geotechnical Eng./Spec.	
East Dike	Weekly	Geotechnical Technician	Monthly
	Bi-Weekly	Geotechnical Eng./Spec.	
Vault Dike	Bi-Weekly	Geotechnical Technician	Monthly
	Bi-Weekly	Geotechnical Eng./Spec.	
South Camp Dike	Bi-Weekly	Geotechnical Technician	Monthly
	Bi-Weekly	Geotechnical Eng./Spec.	

The following information should be noted and recorded in the monthly inspection forms to detect signs of wear, damage, or potential loss of structural integrity:

<u>Dike Structure:</u>

- Compliance with minimum freeboard requirements:
- crest elevation; and
- upstream water elevation.

Crest:

- Any indication of cracking or settlement/subsidence;
- Upstream face conditions:
- surface cracking;
- distortion or displacement; and
- wave erosion.

Downstream face conditions:

- cracking;
- distortion or displacement;
- slumping;
- erosion; and
- seepage quantity and quality (turbidity) and wet areas.

Abutments:

- indications of instability;
- erosion at dike – ground surface contact; and
- seepage appearing from abutments (quantity and quality).

Downstream toe of dike:

- seepage quantity and quality (turbidity);
- changes on surface;
- cracking;
- erosion;

- bulging;
- soft wet zones;
- accumulation of fines/silts; and
- ice.

Ditches / Seepage Collection System:

- changes in surface;
- indication of cracking;
- erosion;
- bulging;
- soft wet zones;
- accumulation of fines/silts; and
- ice blockage.

Sumps:

- changes in surface;
- indication of cracking;
- erosion;
- bulging;
- soft wet zones;
- accumulation of fines/silts; and
- ice blockage.

Pumping structures and pipelines:

- leaks; and
- function at capacity.

Seepage:

- rates and location;
- water quality, specifically the presence of fines (turbidity); and
- access.

Other:

- Review of general condition of the access to the Dewatering Dikes, along the Dewatering Dikes crest surface and access to seepage collection system, including sumps and pumping system at the downstream toe;
- Indications of instability (e.g. potholes, slumping or cracks, in the road or path or the cut slopes above them); and
- Accumulations of debris or other materials on the road or paths.

Sample inspection forms are included in Appendix A.

Photographs shall be used to augment the inspection form. As much as possible, these are to be taken from the same vantage points during each inspection so that changes in conditions can be readily identified. Photos should be annotated or captioned and should include a date stamp.

The observations and/or events indicating a trend that are considered "triggers" requiring reference to action items and reporting procedures are outlined in the Emergency Preparedness Plan (see Section 11).

7.3.3 Operation Engineering Inspection

An annual inspection of each of the Dewatering Dikes should be carried out by a qualified engineer. During this inspection, the following dewatering structures will be visited:

- BayGoose Dike;
- East Dike;
- South Camp Dike; and
- Vault dike.

The objective of the inspection is to carry out a detailed review of the conditions of the facilities and facility operations. This will provide information to be used to revise the operation, maintenance and surveillance programs as necessary and to assist in planning for future operation of the facility.

Each inspection should address the following:

- Review of inspections performed during dewatering;

- Review and comment on results of monthly visual inspection reports;
- Review and comment on results of performance monitoring instrumentation;
- Review operational performance criteria and confirm that the original design assumptions are still valid; and
- Review and provide recommendations regarding operation, maintenance and monitoring for the following year.

7.3.4 Operation Dam Safety Review

A dike review board of independent engineers should carry out a dam safety review of the Dewatering Dikes and associated facilities annually or after:

- Major modifications to the design or design criteria;
- Discovery of unusual conditions that can endanger the dikes;
- After extreme hydrological or seismic events; and
- Decommissioning.

The high consequence failure rating based on the Dam Safety Guidelines (CDA, 2007) suggests a review every seven years. Instead, AEM - Meadowbank committed to annual review. The review shall be carried out according to the recommendations laid out in the Dam Safety Guidelines (CDA, 2007).

This review will include, but is not be limited to:

- Review of the dikes classification;
- Site inspection;
- Review of design and construction records;
- Review of monitoring practices and the instrumentation records
- Update of the stability assessment based on the results of the instrumentation readings obtained to that time, construction records and site observations;
- Assessment of the operation of the facilities;

SECTION 8 • MONITORING AND INSTRUMENTATION

Monitoring of the Dewatering Dikes is carried out for the purpose of:

- Environmental monitoring during dewatering and operation;
- Assessing physical stability of the structure during dewatering and operation;
- Assessing overall performance of the dikes; and
- Aiding in design of future dikes.

Monitoring complements the Surveillance of the Dewatering Dikes and should be taken into account in combination with the routine surveillance described in Section 7.0.

Monitoring is divided into the following aspects:

- Drawdown rate and water quality during dewatering;
- Geotechnical instrumentation including piezometers, thermistors, inclinometers, survey prisms, etc.; and
- Seepage rates and water quality during operation.

8.1 DEWATERING – DRAWDOWN RATE AND WATER QUALITY

The water quality criteria for discharge are listed in Nunavut Water Board Water License 2AM-MEA0815 (prior to Water License 2AM-MEA1525) Part D, item 16 and into the Metal Mining Effluent Regulation. The water quality data collection protocols and schedule are included in the Water Management Plan.

8.2 GEOTECHNICAL MONITORING

The existing geotechnical instrumentation is shown in the as-built drawings for each dewatering dike.

Section 3.0 of this document describes the existing geotechnical instrumentation of the Dewatering Dikes.

8.2.1 Data Collection Protocols and Schedule

Upstream and downstream elevations of Second Portage Lake and Third Portage Lake water and ice levels, if applicable, should always be recorded when piezometer readings are recorded and when the survey prisms and monuments are monitored.

The following sections describe the routine geotechnical monitoring program of permanent instrumentation and are summarized in Table 8.1 below.

Table 8.1 Geotechnical Instrumentation Monitoring Program

Instrumentation	Monitored By	Reported To	Frequency during Dewatering	Frequency during Operations
Piezometers	Manually by Engineering Personnel during dewatering; and Automatically during operations (overseen by Engineering Personnel)	Engineering Superintendent	Daily / every 3 hours	Daily / every 3 hours
Slope Inclinometer Casings	Manually by Engineering Personnel during dewatering; and Manually during operations (overseen by Engineering Personnel)	Engineering Superintendent	Monthly	Quarterly
Thermistors	Manually by Engineering Personnel during dewatering; and Automatically and Manualy during operations (overseen by Engineering Personnel)	Engineering Superintendent	Automatically: Daily / every 3 hours. Manually: Every 3 days in Summer & Weekly in Winter	Automatically: Daily / every 3 hours. Manually: Weekly
Surface Monuments and Surface Prisms	Manually by Engineering Personnel during dewatering; and Manually during operations (overseen by Engineering Personnel)	Engineering Superintendent	Not Operational	None or Weekly (if TARP level not green).
Seismographs	Manually by Engineering Personnel during dewatering; and Manually during operations (overseen by Engineering Personnel)	Engineering Superintendent	During blasting at the Portage Pit or Goose Island Pit adjacent to the dikes	During blasting at the Portage Pit or Goose Pit adjacent to the dikes

The instrumentation data is reviewed every week by the Geotechnical Technician and every two weeks by the Geotechnical Engineer/Specialist. The frequency of monitoring will depend, to some degree, on preceding data and on the state of operation. Thus the data is reviewed regularly and the Engineering Superintendent may change the program and amend the OMS Manual as necessary.

Measurements and a review of all instrumentation shall be carried out immediately after significant seismic or climatic events.

An automatic data acquisition system is used to collect data from the piezometers and thermistors. The automatic data acquisition system includes data loggers and instrumentation cabins along the dikes crest. The data collected is downloaded every three hours. Each cabin is supplied with electricity through solar panels and a backup battery.

The equipment for monitoring is maintained by designated Engineering personnel. Data analysis, review and correction are carried out by the Engineering personnel and reported to the Engineering Superintendent.

8.2.1.1 Thermistors

Data presentation for the thermistors should include:

- temperature vs. time plots (presenting all thermistor beads on each string); and
- temperature vs. depth plots over time.

The plots should indicate the thermistor string reference number and dates of the measurements. Additionally the plots should also indicate air temperature and, if relevant, lithology and both elevations and depths.

8.2.1.2 Survey Monuments and Prisms

The lake elevation is recorded at the same time the survey monuments and prisms are measured. All survey work must be carried out to a minimum precision of 3 mm.

Data presentation for the survey monuments should include:

- total net movement plots (to present total displacement);
- vertical displacement plots; and
- lateral displacement plots parallel and perpendicular to the dike axis.

The plots should indicate the survey monument number, what is considered positive and negative movement (for example, downstream/upstream, heave/settlement) and the dates of the measurements.

8.2.1.3 Slope Inclinometer Casings

The vertical and horizontal position of the top of the inclinometer casing will be recorded by surveying when the slope inclinometers readings are taken. All survey work must be carried out to a minimum precision of 3 mm.

Data presentation for the slope inclinometers should include:

- cumulative displacement plots (to view total displacement);
- incremental displacement plots (to present increasing or accelerating movements between readings);
- cumulative displacement at crest versus time; and

- time plots at zones of identified displacement.

The plots should indicate the slope inclinometer number, what is considered positive and negative movement (for example, downstream/upstream, heave/settlement) and the dates of the measurements. Both elevations and depths should be presented together with the lithology.

8.2.1.4 Vibrating Wire Piezometers

Data presentation for the vibrating wire piezometers should include:

- plots of total head as elevation versus time; and
- plots of temperature versus time for piezometers.

The plots should indicate the vibrating wire piezometers number and dates of the measurements. Additionally the plots should also indicate upstream lake elevation or ice level and, if relevant, lithology and both elevations (referred to the mine datum) and depths.

8.2.1.5 Seismographs

Data presentation for the seismographs should include:

- Weekly summary graph showing peak accelerations registered versus the time when they occurred.

The plots should also indicate the seismograph readout identification, date and location.

8.2.2 Anomalous Instrumentation Data

Anomalous instrumentation data includes the following:

<u>Thermistors:</u>

- Increase or decrease in measurements (over two or more readings) that cannot be explained by seasonal temperature variations;

<u>Survey monuments and prisms:</u>

- Accelerating displacement rate of the survey monuments

  (x, y, z directions) (over two or more readings);

<u>Inclinometers:</u>

- Cumulative increases in displacement (greater than 3 cm);

Piezometers:

- Increases or decreases in pore water pressure measurements that cannot be explained by seasonal lake level variations; and

Seismographs:

- Vibrations during a blast are not observed.

If anomalous readings are observed, the following actions should be taken:

- Inspect the dike where possible and appropriate;
- Check data, reductions and calculations for accuracy and correctness;
- Re-read to check the reading;
- Check readout equipment to verify that it is functioning correctly;
- Verify calibration;
- If instrument has stopped functioning, notify the Engineering Superintendent immediately. If considered critical, a replacement instrument should be installed;
- If the anomalous reading is confirmed, a detailed review of the effects of the reading should be carried out and design or remedial actions should be implemented if determined necessary by the Engineering Superintendent; and
- Increase monitoring frequency to assess progression of anomaly.

8.2.3 Documentation of Instrumentation Data

The instrumentation data is reviewed on a weekly and bi-weekly basis by the geotechnical team. Instrumentation data for each dewatering dike is compiled, analyzed and documented into a single Instrumentation Report emitted on a quarterly basis. The report is created by the Geotechnical Technician, reviewed by the Geotechnical Eng./Spec. and stored in a suitable location on the network for easy accessibility and long-term record keeping. The Report is distributed to all dewatering dike stakeholders and selected members of the Corporate office.

8.3 SEEPAGE MONITORING - OPERATIONS

Seepage and runoff will be collected and conveyed in drainage ditches at the downstream toe of the East Dike and Bay-Goose Dike to sumps located at topographic lows. The rate of seepage and quality of seepage should be monitored during operations.

8.3.1 Data Collection Protocols and Schedule

The rate of seepage and run-off will be monitored indirectly by monitoring and recording pumping rates. The seepage location and elevation along the face should be noted during inspections. The water quality should be monitored daily by visual observations for sediments (turbidity). Visual inspection should document sediment, ice or snow deposits in the ditches and sumps. The data shall be collected by designated mine personnel and reviewed by the Engineering Superintendent. The Engineering Superintendent may change the sampling frequency and amend the OMS Manual as necessary.

8.3.2 Anomalous Measurements

Anomalous measurements of the seepage may occur and include the following:

- Increase or decrease in pump rates that are inconsistent with rainfall or runoff events;
- Sediments present in the seepage water; and
- Changes in seepage location, flow, and quality.

If anomalous readings are observed, the following action should be taken:

- Inspect the seepage collection area;
- Check data, reductions, and calculations for accuracy and correctness;
- Re-read to check the reading;
- Check readout equipment to verify that it is functioning correctly;
- Verify calibration;
- If instrument has stopped functioning, notify the Engineering Superintendent immediately. If considered critical, a replacement instrument should be installed;
- If the anomalous reading is confirmed, a detailed review of the effects of the increased seepage should be carried out and design or remedial actions should be implemented if determined necessary by the Engineering Superintendent; and

- Increase monitoring frequency to assess progression of anomaly.

SECTION 9 • REPORTING PROCEDURES AND DATA MANAGEMENT

9.1 REPORTING PROTOCOLS

9.1.1 Inspection Documents

All inspection documents and reviews shall be reported to the Mine Management, Engineering Superintendent and the Environment Superintendent.

9.1.2 Instrumentation Measurements

All geotechnical instrumentation measurements shall be reported to the Engineering Superintendent. Pumping rates during dewatering and operation shall be reported to the Geotechnical Coordinator and the Engineering Superintendent.

9.1.3 Emergencies

All documents regarding instrumentation and inspections prior to an emergency and during an emergency shall be provided to all parties involved including the General Mine Manager, Engineering Superintendent, Environment Superintendent, and Design Engineer.

9.2 DATA MANAGEMENT

An electronic library or database, which is easily accessible, shall be set up to catalogue and store inspection documents, maintenance reports and instrumentation measurements. Hard copies shall also be catalogued and stored on site. The following will be stored in the hard copy and/or electronic format:

<u>Dewatering:</u>

- Daily dewatering inspection report; and
- Instrumentation measurements.

<u>Operations:</u>

- Visual inspection report;
- Engineering inspection;
- Dam Safety Review;
- Planned and un-planned maintenance reports; and
- Instrumentation measurements and quarterly reports.

SECTION 10 • DECOMMISSIONING

10.1 GENERAL

The decommissioning of the dikes will take place progressively as the Dewatering Dikes are breached and the northwest arm of Second Portage Lake and Bay-Goose Basin are allowed to flood.

The main objectives of the decommissioning are:

- Maintain dike stability;
- Meeting applicable water quality objectives;
- Sequential pit flooding in a controlled manner; and
- Maintain 1 m head difference across the East Dike at closure.

10.2 EAST DIKE EMBANKMENTS

The East Dike will remain intact during the controlled flooding of the Portage Pit and Goose Island Pit areas in order to isolate flooded pit waters from Second Portage Lake. The pit areas are flooded gradually over the course of several years. Once the water levels have stabilized within the flooded pits and water qualityhas meet the water quality requirement of the Water License 2AM-MEA1525 , parts of the other dewatering dikes will be decommissioned to allow circulation of pit water and lake water.

The East Dike will remain, preserving the 1 m difference in elevation between Third Portage Lake and Second Portage Lake.

10.3 SEEPAGE COLLECTION SYSTEM

The sumps and ditches at the downstream toe of the Dewatering Dikes will be flooded at closure. All pumps, pipes, and equipment shall be removed prior to flooding, as part of the closure activities.

10.4 INSTRUMENTATION AND MONITORING

Long-term inspection shall be carried out to ensure the adequate performance of the post-closure facility.

SECTION 11 • EMERGENCY PREPAREDNESS PLAN

The Dam Safety Guidelines prepared by the Canadian Dam Association (2007) states that "A dam which does not impose an unacceptable risk to people or property, and which meets safety criteria that are acceptable to the government, the engineering profession and the public is a safe dam".

This guiding principle has been taken into account for the design of the dewatering dike embankments and the emergency procedures.

The East Dike and Bay-Goose Dike are rated as "High Consequence of Failure" (CDA 2007) as discussed in Section 1.3. The South Camp Dike and Vault Dike are rated as a "Significant Consequence of Failure" (CDA 2007) as discussed in Section 1.3.

To respond to possible hazards and emergencies involving the dewatering dikes, emergency response plans have been designed. This section provides a summary of the actions, triggers and measures in the event of an emergency.

In case of an emergency, the documents listed in Table 12.1 shall be referenced. The Emergency Response Plan (ERP) shall also be referenced. The Dike Failure Scenario Appendices from the ERP are included in Appendix B.

11.1 EMERGENCY PROCEDURES

The purpose of the Emergency Preparedness Plan (EPP) is to present a basic procedure for responding to potential failure mechanisms. The procedure identifies various measurable or observable effects or causes of the failure mechanisms and identifies the appropriate people to notify. Potential failure mechanisms are summarized in Table 12.2 with potential measurable and observable causes and effects.

11.1.1 Operation

Table 12.3, 12.4, 12.5 and 12.6 summarizes the triggers for implementing the EPP for each of the dewatering dikes with respect to the potential measurable and observable effects or causes of the various failure mechanisms.

Table 12.7 indicates the chain of communication to follow so persons in charge are notified for different states of emergency.

Table 12.8 indicates the responsibilities of persons for each emergency level in terms of who performs the decision making, mobilization, and action to be taken.

Table 12.9 indicates the names and contact numbers of the persons in charge during an emergency event.

11.2 EMERGENCY DETAILS

In the unlikely event of a catastrophic dike breach that could endanger workers the Code 1 procedure described in Section 11.2.4 would be followed to warn all workers of the situation. Then an evacuation of the affected areas and pits would be carried out and directed by the ERT Team in person and over the emergency channel. In the event of an embankment failure, the following information should be used during the emergency response:

Project Name:	Meadowbank Gold Project
Dike Names:	East Dike, Bay-Goose Dike, South Camp Dike, Vault Dike
Owner's Name:	Agnico Eagle Mines Limited (867) 793-4610
Lake Name:	Second Portage Lake /Third Portage Lake /Wally lake
Site Location:	Latitude: 65°01'07''N Longitude: 96°04'26''W

11.2.1 Access to the Project Site

- 80 km north of the Hamlet of Baker Lake
- Site accessible by all-weather private road from Baker Lake.
- Site accessible by aircraft and helicopter.

	Name	**Phone Number**
Local Charter Company:	Calm Air International Ltd.	Baker Lake : (867) 793-2873
Local Helicopter Company:	Kitikmeot Helicopters Ltd	(867) 983-2544
Charter Aircraft Company:	Nolinor Aviation	(450) 476-0018

11.2.2 Emergency Assessment and Risk Assessment

In case of an event, emergency assessment will be done first by AEM Geotechnical Engineering personnel and the Engineering Superintendent on site. Assessment will be done according the criteria stated in the Table 12.2 and Table 12.3, 12.4, 12.5, 12.6.

11.2.3 Emergency Communication and Actions

In case of an event, after the emergency assessment, the persons involved in the emergency response team need to be notified following the chain of command stated in Table 12.7. Contact details of each person are available in Table 12.9.

According to the state of the event, decision and action plan will be taken by the persons notified. Action plan will be defined according to the level of emergency and the cause of the event. Immediate action plan will be taken with material and equipment available on site, as listed in Section 11.4.

Table 12.10 is based on Appendix A of the AEM Emergency Response Plan, which describes the risk of failure for East Dike and Bay-Goose Dike and provides contingency or corrective actions for possible failure mechanisms.

Table 12.12 is the risk assessment for East Dike, Bay-Goose Dike, South Camp Dike and Vault Dike. The ratings for the likelihood and consequence of failure have been included for the risk assessment in Table 12.11. The overall risk rating is the product of the likelihood and consequence ratings. The overall risk rating of the structure for the identified failure mechanism can then be determined. The controls which are in place can potentially reduce the overall risk rating.

11.2.4 Site Emergency Procedure

As specified in the Emergency Response Plan, Ver. 12, Section 4:

In the event of an immediate emergency that is or could impact persons or equipment, the employee will have to follow our emergency procedure:

- Emergency is initiated - by calling **6911** on desk type phones, or calling on two-way radio on **"Working Channel" – Code 1 – Code 1 – Code 1.**
- All communication stops except for those involved with the Emergency – i.e.: First Aid Room attendants, Medics, ERT as required.
- All work stops in First Aid Room / Clinic – and in affected area – depending on seriousness of Emergency – the whole site.
- First Aid Room Attendant / Medic will answer the phone and/or radio.

  Note: if the First Aid Room Attendant / Medic do not answer, then Security Guard will answer and/or a Supervisor on radio will answer so that Emergency Response can be initiated.
- **Responder –** will ask where the medic is required.
- **Caller –** will give a brief description of the Emergency – name, location and what is wrong and/or required.
- **Responder –** will confirm location and details of incident and activate the **ERT** team. Security will be notified by responder and a page will be sent out to all **ERT** team members on site. (All **ERT** team members on site now carry pagers).
- The person at the casualty(s) will administer First Aid if trained to do so.
- Incident Commander Center will be immobilized as to ensure that communications, transportation, and effective deployment of **ERT** resources are conducted. It is mandatory that the Official In-Charge be notified immediately.
  - Transportation will be arranged to meet at the **ERT** hall by the two large doors for medical gear and **ERT** team members.

The **ERT** team (minimum of 6 team members) will assemble as quickly as possible. (Expectation – when the pager goes off – all **ERT** team members will make their way expediently to the **ERT** hall).

11.2.5 Communication Equipment Location

Communication equipment can be found at the following locations (*to be updated if required*):

- 3 phone land lines are located in the main office;
- Base station radios are located in the main office;
- Drills will have either base station radios or handhelds—depending on their distance from camp and will have satellite phones available; and
- Emergency Communication Plans (including emergency contact numbers) are located adjacent to all phones and radios and in each drill.

11.3 MEDICAL AND FIRST AID SERVICES

In case of injury the medic and First Aid station are located in the Service Building. The first aid channel on the radio is 1. The nearest hospital is located in Baker Lake.

Health Center:	Baker Lake Health Center	*Phone #:*	(867) 793-2816 (867) 793-2817

11.4 ON SITE EQUIPMENT AND MATERIAL

11.4.1 Pumping Equipment

The following is a list of onsite pumping equipment available for use during an emergency event:

Unit Number	Description	Model
61PWA01	Dewatering pump #1	Godwin model HL250M
61PWA02	Dewatering pump #2	Godwin model HL250M
61PWA03	Dewatering pump #3	Godwin model HL250M
61PWA04	Dewatering pump #4	Godwin model HL250M
61PWA05	Dewatering pump #5	Godwin model HL250M
61PWA06	Dewatering pump #6	Godwin model HL250M
61PWA07	Pit Dewatering pump #7	Godwin model CD80M
61PWA08	Pit Dewatering pump #8	Godwin model CD80M
61PWA09	Dike Dewatering pump #9	Godwin model CD100M
61PWA10	Dike Dewatering pump #10	Godwin model CD103M
61PWA11	Dike Dewatering pump #11	Godwin model CD103M

61PWA12	Dike Dewatering pump #12	Godwin model CD103M
61PWA13	Pit Dewatering pump #13	Godwin model HL5MS
61PWA14	Pit Dewatering pump #14	Godwin model HL5MS
61PWA15	Bay-Goose Seepage dewatering pump #9	Godwin model CD103M
61PWA16	Bay-Goose Seepage dewatering pump #10	Godwin model CD103M
61PWA17	Bay-Goose Seepage dewatering pump #11	Godwin model CD103M
61PWA18	Bay-Goose Seepage dewatering pump #12	Godwin model CD103M

Note: To be updated as required

11.4.2 Mobile Equipment

The following are lists of onsite mobile equipment of AEM and SANA available for use during an emergency event:

AEM Mobile Equipment List (to be updated as required)

Unit Number	Description	Unit Number	Description	Unit Number	Description	Unit Number	Description	Unit Number	Description	Unit Number	Description
6151COM11	PNEUMATIC COMPRESSOR (AIR)	61GEN10	CUMMINS GEN SET 6CT, TWIN	61HTR28	HAUL TRUCK 150T CAT 785C	61PCK15	PICK UP F350 (MOB.MNTCE CRANE)	61PCK79	PICK-UP F250 MNTCE SUPERINTEND	61TRK07	WATER DELIVERY TRUCK FORD
61ATV01	HONDA ATV	61GEN13	CATERPILLAR GENSET 200KW D200P	61HTR29	HAUL TRUCK 150T CAT 785D 2011	61PCK16	PICK UP F350 (BLASTER)	61PWA01	DEWATERING PUMP # 1	61TRK08	SEPTIC TRUCK TRUCK FORD
61ATV02	HONDA ATV	61GEN16	CATERPILLAR GENSET 30KW D30-8	61HTR30	HAUL TRUCK 150T CAT 785D 2011	61PCK17	PICK UP F350 WAREHOUSE	61PWA02	DEWATERING PUMP # 2	61TRK11	CEMENT TRUCK MAC - AMARUQ
61ATV03	HONDA ATV	61GEN34	WHITEOUT GENERATOR	61HTR31	HAUL TRUCK 150T CAT 785D	61PCK18	PICK UP F350 (GEOLOGY)	61PWA03	DEWATERING PUMP # 3	61TRK12	1 AXLE SHUNT TRUCK
61ATV04	HONDA ATV	61GEN37	JOHN DEERE MODEL 6081AF001	61HTR32	HAUL TRUCK 150T CAT 785D	61PCK19	PICK UP F250 (MOBILE MNTCE)	61PWA04	DEWATERING PUMP # 4	61TRK13	KENWORTH TRUCK
61ATV05	HONDA ATV	61GEN49	ERT GENERATOR	61HTR33	HAUL TRUCK 150T CAT 785D	61PCK20	PICK UP F250 (ENVIRONMENT)	61PWA05	DEWATERING PUMP # 5	61TRK14	KENWORTH TRUCK
61BAC01	BACKOE TEREX O&K RH40-E	61GEN50	ERT GENERATOR	61HTR34	HAUL TRUCK 150T CAT 785D	61PCK21	PICK UP F250 MINE PIT DEWATER.	61PWA06	DEWATERING PUMP # 6	61TRK15	KENWORTH TRUCK
61BAC02	BACKOE CATERPILLAR 345CL	61GEN51	KUBOTA GENSET #1 - AMARUQ	61LGT01	AMIDA TOWER LIGHT AL5080D	61PCK22	PICK UP F250 (MINE RESUCE)	61PWA07	DEWATERING PUMP # 7	61TRK16	KENWORTH TRUCK
61BAC03	BACKOE CATERPILLAR 307	61GEN52	KUBOTA GENSET #2 - AMARUQ	61LGT02	INGERSOLL RAND L20 TOWER LIGHT	61PCK23	PICK UP F250 (ELECT MILL)	61PWA08	DEWATERING PUMP # 8	61TRK17	KENWORTH TRUCK
61BAC04	BACKOE CATERPILLAR 330D	61GEN53	AMARUK ROAD SHELTER GENSET	61LGT03	INGERSOLL RAND L20 TOWER LIGHT	61PCK24	PICK UP F250 MINE HELP/BIT SHO	61PWA09	DEWATERING PUMP # 9	61TRK18	GARBAGE TRUCK KENWORTH
61BAC05	BACKOE CATERPILLAR 345DQ	61GRA01	MOTOR GRADER 16H CAT	61LGT04	INGERSOLL RAND L20 TOWER LIGHT	61PCK25	PICK UP F250 MINE HELP/BIT SHO	61PWA10	DEWATERING PUMP # 10	61TRK19	FIRE TRUCK
61BAC06	BACKOE CATERPILLAR 385C	61GRA02	MOTOR GRADER 160H CAT	61LGT05	INGERSOLL RAND L20 TOWER LIGHT	61PCK26	PICK UP F250 (SITE SERV FIELD)	61PWA11	DEWATERING PUMP # 11	61TRK21	FUEL TRUCK
61BAC07	BACKOE CATERPILLAR 345DL	61GRA03	MOTOR GRADER 16M CAT	61LGT06	INGERSOLL RAND L20 TOWER LIGHT	61PCK27	PICK UP F250 (SITE SERVICE)	61PWA12	DEWATERING PUMP # 12	61TRK22	SNOW PLOW WITH WING&SANDER
61BAC08	BACKOE PC1250 KOMATSU	61GRA04	MOTOR GRADER 16M CAT	61LGT07	INGERSOLL RAND L20 TOWER LIGHT	61PCK28	PICK UP F250 (DYKE SUPER.)	61PWA13	DEWATERING PUMP # 13	61TRK23	SNOW PLOW WITH WING&SANDER
61BAC09	BACKOE 390DL CATERPILLAR	61GRA05	CATERPILLAR GRADER 16M	61LGT08	LIGHT TOWER GEOLOGY	61PCK29	PICK UP F250 MINE.SUP.AUX.EQUI	61PWA14	DEWATERING PUMP # 14	61TRK24	STEAMER TRUCK
61BAC10	BACKOE TEREX O&K RH120-E	61HEA01	FROST FIGHTER IDF-350	61LGT09	WACKER TOWER LIGHT LTC4	61PCK30	PICK UP F250 DIKES /DEWATERING	61PWA15	DEWATERING PUMP # 15	61TRK28	INTERNATIONAL TIRE TRUCK
61BAC11	BACKOE BUCYRUS RH120-E	61HEA02	ALLMAND HEATER MH-1000 MNTCE	61LGT11	WACKER TOWER LIGHT LTC4	61PCK31	PICK UP F250 (MILL)	61PWA16	DEWATERING PUMP #16	61TRK30	LUBE TRUCK
61BAC12	BACKOE TEREX O&K RH120-E	61HEA03	ALLMAND HEATER MH-1000 MNTCE	61LGT12	WACKER TOWER LIGHT LTC4	61PCK32	PICK UP F250 (ELECT. DEPT.)	61PWA17	DEWATERING PUMP #17	61TRK31	MECHANICAL SERVICE TRUCK
61BAC13	BACKOE CAT6030	61HEA05	LANAIR WASTE OIL BURNER MX 300	61LGT13	INGERSOLL RAND L20 TOWER LIGHT	61PCK33	PICK UP F250 (ENGINEERING)	61PWA18	ENVIRONMENT EMERGENCY PUMP	61TRK32	GMC AIR PLANE FUEL TANKER
61BUC06	BUCKET CAT6030	61HEA08	FROST FIGHTER IDF-350	61LGT14	LGT WACKER LTC4L	61PCK34	PICK UP F250 SECURITY ON SITE	61PWA19	150HP ELECTRICAL PUMP	61TRK33	CAT LUBE TRUCK T300
61BUS01	BUS YELLOW BLUE BIRD	61HEA11	FROST FIGHTER IDF-350	61LGT18	AMIDA TOWER LIGHT LT5000-4MH	61PCK35	PICK UP F250 (ROAD CREW)	61RBD01	ROTARY BLAST DRILL 6" ATLAS	61TRK34	STERLING SERVICE TRUCK
61BUS02	MINIBUS BLUE BIRD	61HEA12	FROST FIGHTER IDF-350	61LOA01	LOADER IT14G CAT	61PCK36	PICK UP F250 (ROAD CREW)	61RBD02	ROTARY BLAST DRILL 6" ATLAS	61TRK35	FUEL TRUCK PETERBILT 367
61BUS03	MINIBUS BLUE BIRD	61HEA13	FROST FIGHTER IDF-350	61LOA02	LOADER IT14G CAT	61PCK37	PICK UP F250 (EXPLORATION)	61RBD03	ROTARY BLAST DRILL 6" ATLAS	61TRK36	SNOW PLOW WITH WING&SANDER WHT
61BUS04	BAKER LAKE PASSANGER VAN E350	61HEA14	FROST FIGHTER IDF-350	61LOA03	LOADER 992G CATERPILLAR	61PCK38	PICK UP F250 (EXPLORATION)	61RBD04	ROTARY BLAST DRILL 6" ATLAS	61TRK38	FORD SERVICE TRUCK
61BUS05	BUS RED BLUE BIRD	61HEA15	MILL FROST FIGHTER # 1	61LOA04	LOADER 992G CATERPILLAR	61PCK39	PICK UP E350 AMBULANCE	61RBD05	LONG HOLE DRILL CM785	61TRK39	LUBE TRUCK
61BUS06	BAKER LAKE MINI BUS	61HEA16	MILL FROST FIGHTER # 2	61LOA05	LOADER 420E IT CAT (PEPINE)	61PCK40	PICK UP (IT GREY RENTAL)	61RBD06	DML DRILL 6" ATLAS	61TRK40	CEMENT TRUCK MACK
61BUS07	INTERNATIONAL BUS - AMARUQ	61HEA17	MILL FROST FIGHTER # 3	61LOA06	LOADER 966H CATERPILLAR-AMARUQ	61PCK41	PICK UP F250 (P.A BOSSE)	61RBD07	DML DRILL 6" ATLAS	61TRK41	PUMP TRUCK MACK
61BUS08	BLUE BIRD BUS	61HEA18	MILL FROST FIGHTER # 4	61LOA07	SCRAP-LOADER 966H CATERPILLAR	61PCK42	PICK UP F250 (FIELD TEAM LEAD)	61RBD08	DML DRILL 6" ATLAS	61TRK42	FUEL TRUCK (VAULT)
61BUS09	BUS YELLOW BLUE BIRD	61HEA19	MILL FROST FIGHTER # 5	61LOA08	LOADER TC44H JOHN DEERE	61PCK43	PICK UP F350 (CONSTRUCTION)	61SBL03	SNOWBLOWER T85-R52	61TRK43	WATER TRUCK (VAULT)
61BUS10	USED INTERNATIONAL BUS	61HEA20	FROST FIGHTER IDF-350	61LOA09	LOADER 966H CATERPILLAR	61PCK44	PCK F250 2011 (SUP. BLASTER)	61SCI05	SCISOR LIFT GENIE GS3232	61TRK44	SERVICE TRUCK (VAULT)
61BUS11	BLUE BIRD BUS	61HEA21	FROST FIGHTER IDF-350	61LOA10	LOADER 980H CATERPILLAR	61PCK45	PCK F350 2011 (BLASTER PICK)	61SCI06	GENIE S85	61TRK45	LUBE TRUCK (VAULT)
61BUS12	BLUE BIRD BUS	61HEA22	FROST FIGHTER IDF-350	61LOA11	LOADER 420E CATERPILLAR-AMARUQ	61PCK46	PCK F250 2011 GEOLOGY	61SCI07	MAN LIFT GENIE Z-45/25	61TRK46	FIRE TRUCK
61COM01	DOOSAN MOBILE COMPRESSOR	61HEA24	FROST-FIGHTER IDF-350	61LOA12	LOADER 980H CATERPILLAR	61PCK47	PCK F250 2011 PIT PROD. SUP.	61SCI08	MAN LIFT GENIE Z-45/25	61TRL01	BEDARD TANKER TRAILER
61COM02	MOBILE AIR COMPRESSOR	61HEA26	FROST-FIGHTER IDF-350	61LOA13	WHEEL LOADER 992K CATERPILLAR	61PCK49	PCK F250 2011 DRILL&BLAST SUP	61SCI10	GENIE S85 (OLD 61REN07)	61TRL03	BELLY DUMP TRAILER
61COM03	COMPRESSOR QGD25 QINCY	61HEA27	FROST-FIGHTER IDF-350	61LOA14	TIRE HANDLER LOADER	61PCK50	F-250 BLUE 2011 MINE SERV. SUP	61SCI11	GENIE S85 - AMARUQ	61TRL04	LOW BED TRAILER
61COM04	COMPRESSOR 2545 IR	61HEA28	INGERSOLL RAND	61LOA15	LOADER 980K CATERPILLAR	61PCK51	PCK F250 2012 (S.S FIELD SERV)	61SCI12	GENIE S85	61TRL05	LOW BED TRAILER
61COM05	DOOSAN AIR COMPRESSOR	61HEA33	FROST-FIGHTER IDF-350	61LOA16	LOADER IT14G CATERPILLAR	61PCK52	PCK F450 2011 (WAREHOUSE)	61SCI13	GENIE S125	61TRL06	FUEL TANKER BEDARD 54000L
61COM06	MILL MOBILE COMPRESSOR	61HEA35	FROST-FIGHTER IDF-350	61LOA17	LOADER WA-600 KOMATSU	61PCK53	PICK UP F250 (PROCESS PLANT)	61SCI14	GENIE S125	61TRL07	FUEL TANKER BEDARD
61CPT01	CATERPILLAR COMPACTOR CS76	61HEA36	FROST-FIGHTER IDF-350	61LOA18	LOADER 966H CATERPILLAR	61PCK54	PICK UP F250 (ENGINEERING)	61SCI15	SCISSOR LIFT GENIE 32'	61TRL08	DOUBLE DROP LOW BOY
61CPT02	CATERPILLAR COMPACTOR CS563	61HTR01	HAUL TRUCK 100T CATERPILLAR	61MCR01	CRANE 120T MANITOWOC	61PCK55	PICK UP F250 (SURVEY)	61SCI16	SCISSOR LIFT GENIE 32'	61TRL09	FIRE TRAILER SKID W/ PUMP
61DOZ01	DOZER D8T CATERPILLAR	61HTR02	HAUL TRUCK 100T CATERPILLAR	61MCR02	CRANE 80T TEREX	61PCK56	PICK UP F250 (GEOLOGY)	61SCI17	MAN LIFT JLG 30' MODEL E300AJP	61TRL10	DISPATCH COMM TRAILER
61DOZ02	DOZER D9T CATERPILLAR	61HTR03	HAUL TRUCK 100T CATERPILLAR	61MCR03	CRANE 35T GROVE	61PCK57	PICK UP F250 (ROAD CREW)	61SCI18	MAN LIFT JLG 30' MODEL E300AJP	61TRL11	DISPATCH COMM TRAILER
61DOZ03	DOZER D8R CATERPILLAR	61HTR04	HAUL TRUCK 100T CATERPILLAR	61MCR04	90T LORAINE CRANE	61PCK58	PICK UP F250 - EXPLORATION	61SKD01	SKID STEER 262C CATERPILLAR	61TRL12	DISPATCH COMM TRAILER
61DOZ04	SCRAP - DOZER D7H CATERPILLAR	61HTR05	HAUL TRUCK 100T CATERPILLAR	61MCR05	25T INTERNATIONAL BOOM TRUCK	61PCK59	PICK UP F250 ELEC. SUPERINTEND	61SKD02	SKID STEER 753 CATERPILLAR	61TRL13	DISPATCH COMM TRAILER
61DOZ05	DOZER D9T CATERPILLAR	61HTR06	HAUL TRUCK 100T CATERPILLAR	61MCR06	CRANE 200T AMERICAN	61PCK60	PICK UP F250 (G.F DYKE)	61SKD03	SKID STEER 262C CATERPILLAR	61TRL14	DISPATCH COMM TRAILER
61DOZ06	DOZER D9T CATERPILLAR	61HTR07	HAUL TRUCK 100T CATERPILLAR	61MFT01	MOBILE FUEL TANKER TRAILLER	61PCK61	PICK UP F250 (SITE SERVICE)	61SKD04	SKID STEER 262C CAT	61TRL15	DISPATCH COMM TRAILER
61DOZ07	DOZER D9T CATERPILLAR	61HTR08	HAUL TRUCK 100T CATERPILLAR	61MFT02	MOBILE FUEL TANKER TRUCK	61PCK62	PICK UP F250 (MINE G.F)	61SMD01	MILLER BIG BLUE 400D MOB WELD	61TRL16	DISPATCH COMM TRAILER
61DOZ08	DOZER 834H CATERPILLAR	61HTR09	HAUL TRUCK 50T CATERPILLAR	61MFT03	MOBILE FUEL TANKER TRUCK	61PCK63	PICK UP F250 (A. HAMEL)	61SNC01	SNOWCAT EMERGENCY VEHICULE	61TRL17	DISPATCH COMM TRAILER
61DOZ09	DOZER D6T CATERPILLAR	61HTR10	TOW HAUL 120T	61PCK01	PICK UP F350 (MILL)	61PCK64	FORD EXPEDITION (AIR STRIP)	61SNO01	SNOW MOBILE	61TRL18	DISPATCH COMM TRAILER
61ENG53	BOAT ENGINE HONDA 75 HP	61HTR11	HAUL TRUCK 777F CATERPILLAR	61PCK02	PICK UP F350 (GARBAGE PICK UP)	61PCK65	PICK UP F-350 2008 (WAREHOUSE)	61SNO02	SNOW MOBILE	61TRL19	DISPATCH COMM TRAILER
61FKL02	FORK LIFT HYSTER RH35	61HTR12	HAUL TRUCK 777F CATERPILLAR	61PCK03	PICK UP F350 (MILL MNTCE)	61PCK66	PICK UP F-550 (MOBILE)	61SNO03	SKI DOO SCANDIC	61TRL20	DISPATCH COMM TRAILER
61FKL03	FORK LIFT WAREHOUSE CAT	61HTR13	HAUL TRUCK 777F CATERPILLAR	61PCK04	PICK UP F350 (PROCESS PLANT)	61PCK67	PICK UP F250 TRAINING/ KITCHEN	61TPA01	ZOOM BOOM GENIE GTH844	61TRL21	DISPATCH COMM TRAILER
61FKL04	FORK LIFT ZOOM BOOM RZ2	61HTR14	HAUL TRUCK 777F CATERPILLAR	61PCK05	PICK UP F350 (BLASTER)	61PCK69	PICK UP F250 TRAINING MINE DEP	61TPA02	ZOOM BOOM GENIE GTH844	61TRL22	STEAM-PRESSURE WASH TRAILER
61FKL05	MILL FORK LIFT CAT	61HTR15	WATER TRUCK 773D CATERPILLAR	61PCK06	PICK UP F350 (POWER PLANT)	61PCK70	PICK UP F250 FIELD SITE SERVIC	61TPA03	HYSTER CONTAINER HANDLER	61TRL23	STEAM-PRESSURE WASHER TRAILER
61FKL06	TRUCK SHOP FORKLIFT CAT DP40KL	61HTR20	HAUL TRUCK 150T CATERPILLAR	61PCK07	PICK UP F350 (MINE HELPER)	61PCK71	PICK UP F250 (GEOLOGY)	61TPA04	IR ZOOM BOOM 1056C (OLD REN16)	61TRL24	EXTENSIBLE TRAILER MANAC
61FKL07	RAYMOND LIFT 740DR32IT	61HTR21	HAUL TRUCK 150T CATERPILLAR	61PCK08	PICK UP F350 (MILL MNTCE)	61PCK72	PICK UP F250 (TO REPLACE)	61TPA05	TELEHANDLER VR1056D (OLD REN15	61TRL26	SPLEIPNER
61FKL08	RAYMOND LIFT ETDR40TT	61HTR22	HAUL TRUCK 150T CATERPILLAR	61PCK09	PICK UP F350 (ENGINEERING)	61PCK73	PICK UP F250 - EXPLORATION	61TRK01	KENWORTH WATER TRUCK 4000 GL	61TRL27	MOBILE FUEL TANKER JET-A
61FKL09	TRUCK SHOP FORKLIFT HYSTER	61HTR23	HAUL TRUCK 150T CAT 785D	61PCK10	PICK UP F350 (DEWATERING)	61PCK74	PICK UP F250 (VAULT)	61TRK02	KENWORTH TRUCK	61VSE01	KAWASKI MULE
61FKL10	ZOOM BOOM TL1255C CAT	61HTR24	HAUL TRUCK 150T CAT 785D	61PCK11	PICK UP F350 (SECURITY BAKER)	61PCK75	PICK UP F450 BIT TRUCK (VAULT)	61TRK03	KENWORTH TRUCK	61VSE02	KAWASKI MULE
61FKL11	FORK LIFT R80 CAT	61HTR25	HAUL TRUCK 150T CAT 785D	61PCK12	PICK UP F350 (WAREHOUSE)	61PCK76	PICK UP F250 MTNCE SUPERVISOR	61TRK04	KENWORTH TRUCK	61VSE05	KAWASKI MULE (SITE SERVICES)
61GEN08	CATERPILLAR 3508 GENSET	61HTR26	HAUL TRUCK 150T CAT 785C	61PCK13	MINI-VAN E350 CLUB WAGON (BL)	61PCK77	PICK-UP F250 - EXPLORATION	61TRK05	KENWORTH TRUCK (3AXLE TRACTOR)	61VSE06	KAWASKI MULE
61GEN09	CUMMINS GEN SET 6CT, TWIN	61HTR27	HAUL TRUCK 150T CAT 785C	61PCK14	EXPEDITION XLT MOB.MNTCE SUP.	61PCK78	PICK-UP F250 MINE SUPERINTEND	61TRK06	KENWORTH TRUCK	61VSE08	KUBOTA MULE RTV1100

SANA Mobile Equipment List (to be updated as required)

Qamanittuaq
SANA

Bouteur	
Cat D8T	438
Cat D8T	443

Excavatrice	
Cat Bac 345	11-0301
Cat Bac 345	12-0303
Cat Bac 345 DLS	13-0301
Komatsu PC 1250	11-0303
Komastu PC 1250	15-0303
Cat Bac 365 C	12-0305
Komatsu PC 450	16-0304
Komatsu PC 450	17-0301
Komatsu PC 450	17-0302

Chargeur	
Cat Loader 906	10-0202
Cat Loader 980H	268
Cat Loader 980CR	10-0201
Komatsu Loader WA500	278
Komatsu Loader WA500	17-0201
Komatsu Loader WA500	17-0202
Komatsu Loader WA600	11-0201
Komatsu Loader WA600	13-0201

Camion 50T	
Cat HTR 773F	1516
Cat HTR 773F	1517
Cat HTR 773F	1518
Cat HTR 773F	1519
Cat HTR 773F	1520
Cat HTR 773F	1535
Cat HTR 773F	1536
Komatsu HD605	16-1001
Komatsu HD605	16-1002
Komatsu HD605	16-1003
Komatsu HD605	16-1004

Camion 40T	
Cat 740	17-1001
Cat 740	17-1002

Véhicule Lourd	
Fuel Truck	11-0121
Fuel Truck	1228
Fardier Mack	1166
Camion à Eau	1231
Camion à Eau	10-0106
Autobus Blue Bird	1760
Autobus	17-0105
Autobus	17-0106
Camion Lumières	1244
Autobus Blanche	15-0101
Fardier Kenworth	1220
Sableur	1217
Grader 14 M Cat	513
Grader 16 H Cat	17-0501
6X6	16-5119
Tramac	9922

Compacteur	
Compacteur Hamm	744
Compacteur Cat	11-1101

Tour D'éclairage	
Magnum	10-5603
Magnum	10-5605
Magnum	11-5602
Magnum	11-5603
Magnum	12-5601
Magnum	12-5602
Magnum	12-5603
Magnum	12-5604
Magnum	12-5605
Magnum	12-5606
Allmand	15-5613
Allmand	15-5615
Allmand	17-5601
Allmand	17-5602
Allmand	17-5603
Allmand	17-5604
Allmand	17-5605
Allmand	17-5606
Allmand	17-5607
Allmand	17-5608
Allmand	17-5609
Allmand	17-5610

Foreuse	
Novamac TCG 03	10-0901
Novamac TCG 04	10-0902
Novamac TCG 05	9928
Tamrock	9932
Tamrock	996

Generatrice	
Generatrice	G - 19
Generatrice	G - 214
Generatrice	G - 229
Generatrice	G - 241
Generatrice	G - 250
Generatrice	G - 257
Generatrice	10-5502
Generatrice	10-5501
Generatrice	15-5501
Generatrice	15-5502
Generatrice	16-5501
Generatrice	16-5502

Zoom-Boom	
Zoom-Boom	1773
Zoom-Boom TH255	1779
Zoom-Boom JCB	16-1202
Scissor Lift	16-7101

Garage	
Soudeuse	S-01
Soudeuse	S-02
Soudeuse	S-03
Soudeuse	S-04
Soudeuse	S-05
Soudeuse	S-06
Soudeuse	10-7603
Soudeuse	13-7601
Soudeuse	16-7601
Soudeuse	16-7604

Concasseur	
Jaw crusher	7004
Cone crusher/screen	7005
Convoyeur	7006

Camionnette	
Dodge Ram 2500	1743
Dodge Ram 2500	1744
Dodge Ram 2500	1765
Dodge Ram 2500	1767
Dodge Ram 2500	1769
Dodge Ram 2500	1772
Dodge Ram 2500	10-0004
Dodge Ram 2500	10-0005
Dodge Ram 2500	10-0006
Dodge Ram 2500	10-0007
Dodge Ram 2500	10-0008
Dodge Ram 2500	10-0010
Dodge Ram 2500	10-0016
Dodge Ram 2500	11-0014
Dodge Ram 2500	11-0022
Dodge Ram 3500	12-0014
Dodge Ram 3500	12-0015
Dodge Ram 2500	12-0016
Dodge Ram 2500	12-0017
Dodge Ram 2500	16-0006
Dodge Ram 2500	16-0007
Dodge Ram 2500	16-0008
Dodge Ram 2500	16-0009
Ram 2500 Promaster	16-0010
Ford F350	17-0001
Dodge Ram 2500	17-0005
Dodge Ram 2500	17-0006
Dodge Ram 2500	17-0007
Dodge Ram 2500	17-0008
Dodge Ram 2500	17-0009
Dodge Ram 2500	17-0010
Dodge Ram 2500	17-0011
Dodge Ram 2500	17-0012
Dodge Ram 2500	17-0013
Dodge Ram 2500	17-0014

Compresseur	
Compresseur	919
Compresseur	9925
Compresseur	15-6902
Compresseur	16-6901
Compresseur	16-6902
Compresseur	COMP-01
Compresseur	COMP-02

Unité De Service	
Unité De Service	12-0111
Unité De Service	10-0103
Unité De Service	11-0118
Unité De Service	11-0119
Unité De Service	17-0104
Lube Truck	12-0103
Unité De Service (Dyn)	17-0103

Ambulances	
Flagro	12-5906
Flagro	16-5901
Flagro	17-5901
Flagro	17-5902
Flagro	17-5903
Flagro	17-5904

Dozer	
Cat D8T	438
Cat D8T	443

Excavator	
Cat Bac 345	11-0301
Cat Bac 345	12-0303
Cat Bac 345 DLS	13-0301
Komatsu PC 1250	11-0303
Cat Bac 365 C	12-0305
Komatsu PC 450	16-0304

Loader	
Cat Loader 906	10-0202
Cat Loader 980H	268
Cat Loader 980CR	10-0201
Komatsu Loader WA500	278
Komatsu Loader WA600	11-0201
Komatsu Loader WA600	13-0201

50T Hault Truck	
Cat HTR 773F	1516
Cat HTR 773F	1517
Cat HTR 773F	1518
Cat HTR 773F	1519
Cat HTR 773F	1520
Cat HTR 773F	1535
Cat HTR 773F	1536
Komatsu HD605	16-1001
Komatsu HD605	16-1002
Komatsu HD605	16-1003
Komatsu HD605	16-1004

Heavy Equipment	
Fuel Truck	11-0121
Fardier Mack	1166
Water truck	1231
Water truck	10-0106
Bus Blue Bird	1760
Light truck	1244
White bus	15-0101
Fardier Kenworth	1220
Sableur	1217
Grader 14 M Cat	513

Compacteur	
Compactor Hamm	744
Compactor Cat	11-1101

Light Plant	
Magnum	10-5605
Magnum	11-5602
Magnum	11-5603
Magnum	12-5601
Magnum	12-5602
Magnum	12-5603
Magnum	12-5604
Magnum	12-5605
Magnum	12-5606
Allmand	15-5613
Allmand	15-5615

Drill	
Novamac TCG 03	10-0901
Novamac TCG 04	10-0902
Novamac TCG 05	9928
Tamrock	9932
Tamrock	996

Generator	
Generator	G - 19
Generator	G - 214
Generator	G - 229
Generator	G - 241
Generator	G - 250
Generator	G - 257
Generator	10-5502
Generator	
Generator	

Zoom-Boom	
Zoom-Boom	1773
Zoom-Boom TH255	1779
Zoom-Boom JCB	16-1202

Garage	
Welding machine	S-01
Welding machine	S-02
Welding machine	S-03
Welding machine	S-04
Welding machine	S-05
Welding machine	S-06
Compressor	COMP-01
Compressor	COMP-02

Pickup Truck	
Dodge Ram 2500	1743
Dodge Ram 2500	1744
Dodge Ram 2500	1765
Dodge Ram 2500	1767
Dodge Ram 2500	1769
Dodge Ram 2500	1772
Dodge Ram 2500	1798
Dodge Ram 2500	10-0004
Dodge Ram 2500	10-0005
Dodge Ram 2500	10-0006
Dodge Ram 2500	10-0007
Dodge Ram 2500	10-0008
Dodge Ram 2500	10-0010
Dodge Ram 2500	10-0016
Dodge Ram 2500	11-0014
Dodge Ram 2500	11-0022
Dodge Ram 3500	12-0014
Dodge Ram 3500	12-0015
Dodge Ram 2500	12-0016
Dodge Ram 2500	12-0017
Dodge Ram 2500	16-0006
Dodge Ram 2500	16-0007
Dodge Ram 2500	16-0008
Dodge Ram 2500	16-0009
Ram 2500 Promaster	16-0010

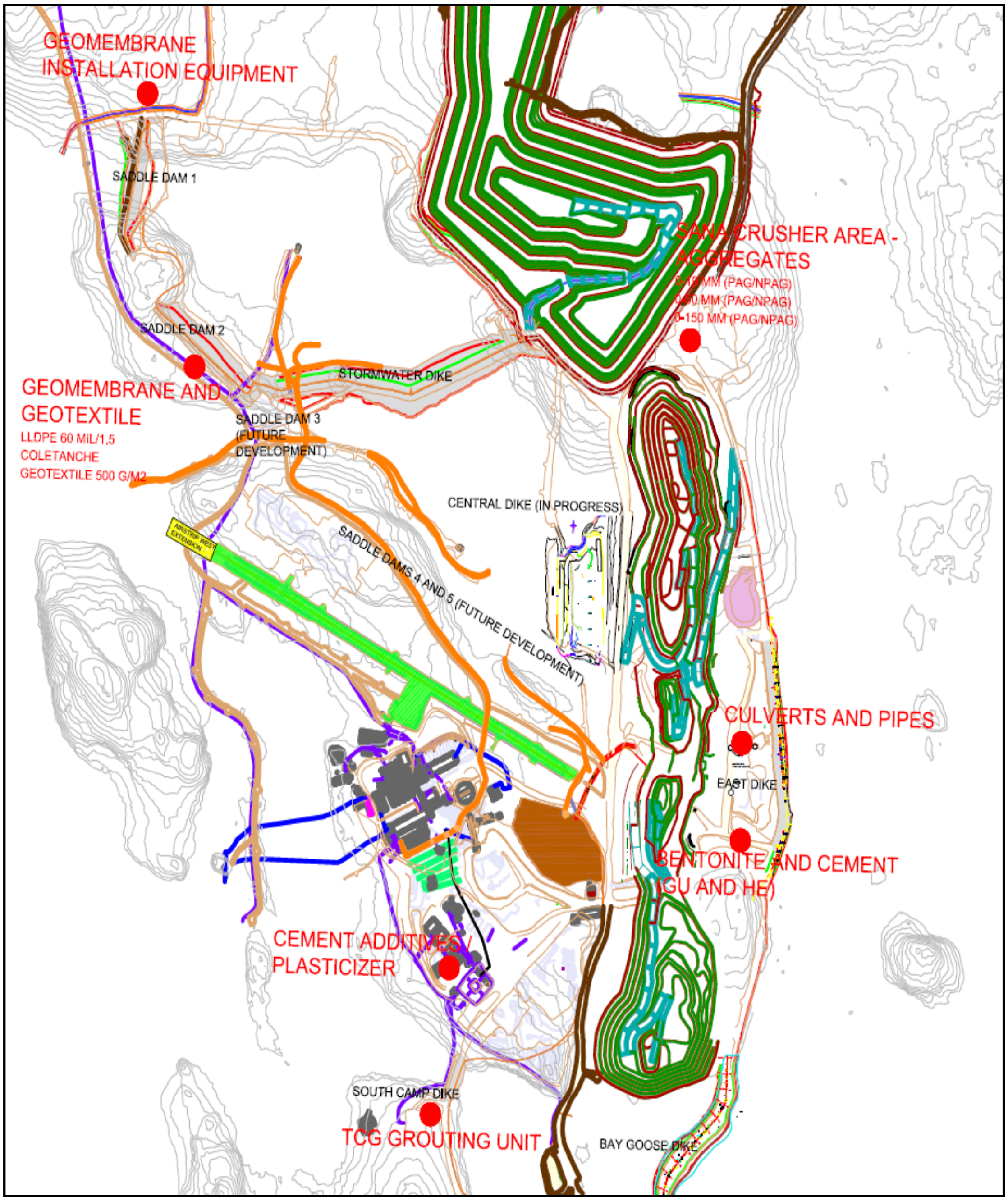
Compressor	
Compressor	919
Compressor	9925
Compressor	15-6902
Compressor	16-6901
Compressor	16-6902

Service Unit	
Service Unit	10-0103
Service Unit	11-0118
Service Unit	11-0119
Service Unit	12-0111

Crusher	
Jaw crusher	7004
Cone crusher and screen	7005
Convoyeur	7006

Ambulance	
Flagro	12-5906
Flagro	

Earthwork Material and Equipment



The following map presents the earthwork material, including geomembrane and cement, available on site in case of an emergency.Figure 12 Earthwork Material and Equipment Location

SECTION 12 • EMERGENCY RESPONSE REFERENCE DOCUMENTS

Table 12.1 Emergency Response Reference Documents

Document	Current Revision
Emergency Response Plan	Updated by AEM. Version 12, January 2018. (Intelex)
Emergency Preparedness Plan	In Dewatering Dikes OMS Manual, Version 7, February 2018

Note: To be updated as required

Table 12.2 Potential Effects or Causes of Failure Mechanisms

Failure Mechanism	Potential Measurable and Observable	
	Causes	**Effects**
Overtopping	(1) Lake level rise. (2) Dam crest settlement	Water inflow leading to erosion of downstream foundation soils and associated crest settlement.
Internal Erosion	(1) Loss of cut-off wall/liner at construction defects in cut-off wall/liner, Core Backfill and filter. (2) Loss of bentonite from cut-off wall at defect in construction (3) Loss of till foundation at defect in dike section.	Sinkhole observable at crest Slower lake drawdown during dewatering Increase in seepage pumping rate during operations Increase in pore water pressures downstream of cut-off wall/liner Increase in turbidity / suspended solids of seepage
Seepage Within Embankment	Increase in seepage rate due to cut-off wall/liner failure	Increased seepage water handling. Not likely to compromise stability of dike.
Seepage Within Foundation	Un-observable defects in cut-off/liner construction.	High flow during initial dewatering or shortly thereafter.
Internal Conduit Rupture	Not applicable	Not applicable
Slope Instability	(1) ice or wave forces, or traffic on crest, seepage, weakness of foundation soils (2) Earthquake seismic event or blasting (3) Pit wall failure	Increase in settlement and/or settlement rate Increase in displacement and/or displacement rate of dike toe Cracks along the dike crest Sloughing of the face Bulging of dike toe Disruption of seepage collection ditch

Failure Mechanism	Potential Measurable and Observable	
	Causes	Effects
Failure of Cut-off Wall/Liner Due to Movement of the Dike (Cut-off wall/liner lateral movement)	Differential horizontal movement of dike due to water or ice loading, pit wall stability, excessive dike settlement Seepage.	Large inflows associated with a breach in the dike. Increase in lateral deformation or increase in rate of deformation in slope inclinometer reading Increase in pore water pressure downstream of cut-off wall/liner Increase in pumping rate Dislocation, cracks, settlement localized above or adjacent to cut-off wall/liner
Unexpected settlements	Consolidation of foundation soils or dike fills	Overtopping in extreme case large settlement of cut-off wall/liner.

Table 12.3 Threshold Criteria during Operation for East Dike

		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Downstream toe displacement, sloughing or bulging	None visible	Visible displacement or bulging	Toe displacement related to a sloughing slide from near downstream crest to 5 m from centreline Bulging > 1 m in height	Toe displacement related to a sloughing slide reaching 5 m from centreline Bulging greater than 4m in height
	Tension crack along downstream rockfill embankment (more than 3 m from centreline)	Within 7 m of the downstream crest edge and < 0.1 m deep and < 3 m length along the dike	Within 10 m of the downstream crest edge and > 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack along upstream rockfill embankment (more than 3 m from centreline)	< 0.1 m deep and < 3 m length along the dike	> 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack within 3 m each side of the cutoff wall at crest (upstream or downstream)	None visible	< 0.1 m deep or < 0.1 m wide	> 0.1 m deep or > 0.1 m wide	> 0.1 m deep or > 0.1 m wide
	Sinkhole on crest	Not visible	> 5 m outside from centreline	Within 5 m from centreline	Within 5 m from centreline
	Cut-off wall lateral cumulative deformation (based on survey monument)	None	<0.05 m	> 0.05 and 0.10 m	> 0.10 m
	Cut-off wall lateral cumulative deformation (based on inclinometer)	None	< 0.05 m	> 0.05 m and < 0.10 m	> 0.10 m
	Lake elevation	< 134.1 masl	> 134.1 and < 134.8 masl	> 134.8 and < 135.6 masl	> 135.6 masl
	Pore water pressure (based on piezometers)	Pore water pressure measurements stable or decreasing.	Increasing trend in pore water pressure downstream of cut-off wall.	Anomalous trends (sharp increase) in pore water pressure downstream of cut-off wall.	Anomalous trends (sharp increase) in pore water pressure downstream of cut-off wall.
	Temperature variation along centreline (based on thermistors and piezometers)	Temperature measurement stable and similar variation at surface from previous years.	Increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer
	Seepage through dike (excluding Freshet water)	< 3,000 m^3/day	>3,000 m^3/day and <6,000 m^3/day and / or turbidity in the water	> 6,000 m^3/day and < 20,000 m^3/day and / or turbidity in the water	> 20,000 m^3/day *Condition where the seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
Action Required		• Instrumentation monitoring and visual inspection according to frequency set out in OMS manual. • Possibility of a mitigation plan to be evaluated by Engineering Department.	• Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Identify potential cause • Implement engineering review.	• Suspend activities on dike crest at area of concern • Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Plan and take appropriate mitigation measures with engineering review. (Use as reference contingency measures for different scenarios proposed by AEM (See Table 12-9)). • Reassess thresholds and conditions for red category (emergency situation) taking into account the changing conditions presently observed and interactions of various items.	• Temporary evacuation of personnel and equipment from pit and suspension of activities. • Update planning and take appropriate mitigation with engineering review.
Personnel Notified		Geotechnical Engineer/Specialists, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 12.4 Threshold Criteria during Operation for Bay-Goose Dike

		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Downstream toe displacement, sloughing or bulging	None visible	Visible displacement or bulging	Toe displacement related to a sloughing slide from near downstream crest to 5 m from centreline and bulging > 1 m in height	Toe displacement related to a sloughing slide reaching 5 m from centreline Bulging greater than 4m in height
	Tension crack along downstream rockfill embankment (more than 3 m from centreline)	Within 7 m of the downstream crest edge and < 0.1 m deep and < 3 m length along the dike	Within 10 m of the downstream crest edge and > 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack along upstream rockfill embankment (more than 3 m from centreline)	< 0.1 m deep and < 3 m length along the dike	> 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack within 3 m of either side of the cutoff wall at crest	None visible	< 0.1 m deep or < 0.1 m wide	> 0.1 m deep or > 0.1 m wide	> 0.1 m deep or > 0.1 m wide
	Sinkhole on crest	Not visible	> 5 m outside from centreline	Within 5 m from centreline	Within 5 m from centreline
	Cut-off wall lateral cumulative deformation (based on survey monument)	None	<0.05 m	> 0.05 and 0.10 m	> 0.10 m
	Cut-off wall lateral cumulative deformation (based on inclinometer)	None	< 0.05 m	> 0.05 m and < 0.10 m	> 0.10 m
	Lake elevation	< 135.1 masl	> 135.1 and < 135.8 masl	> 135.8 and < 136.1 masl	> 136.1 masl
	Pore water pressure (based on piezometers)	Pore water pressure measurements stable or decreasing.	Increasing trend in pore water pressure downstream of cut-off wall.	Anomalous trends (sharp increase) in pore water pressure downstream of cut-off wall.	Anomalous trends (sharp increase) in pore water pressure downstream of cut-off wall.
	Temperature variation along centreline (based on thermistors and piezometers)	Temperature measurement stable and similar variation at surface from previous years.	Increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer
	Seepage through dike at toe (excluding Freshet water)	< 300 m^3/day	>300 m^3/day and <1,000 m^3/day and / or turbidity in the water	> 1,000 m^3/day and < 2,000 m^3/day and / or turbidity in the water	> 2,000 m^3/day *Seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
	Seepage through dike in North Channel area	< 150 m^3/day	>150 m^3/day and <500 m^3/day and / or turbidity in the water	> 500 m^3/day and < 1,000 m^3/day and / or turbidity in the water	> 1,000 m^3/day *Seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
	Seepage through dike in pit (excluding Freshet water, estimated visually)	Slow trickle of water along pit walls, easily handled by regular pit sumps	Steady stream of water along pit walls, easily handled by regular pit sumps	Large quantity of water flowing down the pit walls, cannot be easily handled by regular pit sumps, mining activities are impacted	Water flowing down the walls cannot be handled by regular pit sumps and has markedly increased in flow rate and quantity, mining activities are disrupted.
Action Required		• Instrumentation monitoring and visual inspection according to frequency set out in OMS manual. • Possibility of a mitigation plan to be evaluated by Engineering Department.	• Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Identify potential cause • Implement engineering review.	• Suspend activities on dike crest at area of concern • Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Plan and take appropriate mitigation measures with engineering review. (Use as reference contingency measures for different scenarios proposed by AEM (See Table 12-9)). • Reassess thresholds and conditions for red category (emergency situation) taking into account the changing conditions presently observed and interactions of various items.	• Temporary evacuation of personnel and equipment from pit and suspension of activities. • Update planning and take appropriate mitigation with engineering review.
Personnel Notified		Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 12.5 Threshold Criteria during Operation for South Camp Dike

		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Downstream toe displacement, sloughing or bulging	None visible	Visible displacement or bulging	Toe displacement related to a sloughing slide from near downstream crest to 5 m from centreline Bulging > 1 m in height	Toe displacement related to a sloughing slide reaching 5 m from centreline Bulging greater than 4m in height
	Tension crack along downstream rockfill embankment (more than 3 m from centreline)	Within 7 m of the downstream crest edge and < 0.1 m deep and < 3 m length along the dike	Within 10 m of the downstream crest edge and > 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack along upstream rockfill embankment (more than 3 m from centreline)	< 0.1 m deep and < 3 m length along the dike	> 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Sinkhole on crest	Not visible	> 5 m outside from centreline	Within 5 m from centreline	Within 5 m from centreline
	Lake elevation	< 135.6 masl	> 135.6 and < 136.3 masl	> 136.3 and < 136.6 masl	> 136.6 masl
	Temperature variation within foundation (based on thermistors)	Temperature measurement stable and similar variation at surface from previous years.	Increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer
	Seepage through dike (excluding Freshet water)	< 300 m^3/day	>300 m^3/day and <1,000 m^3/day and / or turbidity in the water	> 1,000 m^3/day and < 2,000 m^3/day and / or turbidity in the water	> 2,000 m^3/day *Condition where the seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
Action Required		• Instrumentation monitoring and visual inspection according to frequency set out in OMS manual. • Possibility of a mitigation plan to be evaluated by Engineering Department.	• Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Identify potential cause • Implement engineering review.	• Suspend activities on dike crest at area of concern • Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Plan and take appropriate mitigation measures with engineering review. • Reassess thresholds and conditions for red category (emergency situation) taking into account the changing conditions presently observed and interactions of various items.	• Temporary evacuation of personnel and equipment from pit and suspension of activities. • Update planning and take appropriate mitigation with engineering review.
Personnel Notified		Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 12.6 Threshold Criteria during Operation for Vault Dike

		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Downstream toe displacement, sloughing or bulging	None visible	Visible displacement or bulging	Toe displacement related to a sloughing slide from near downstream crest to 5 m from centreline Bulging > 1 m in height	Toe displacement related to a sloughing slide reaching 5 m from centreline Bulging greater than 4m in height
	Tension crack along downstream rockfill embankment (more than 3 m from centreline)	Within 7 m of the downstream crest edge and < 0.1 m deep and < 3 m length along the dike	Within 10 m of the downstream crest edge and > 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack along upstream rockfill embankment (more than 3 m from centreline)	< 0.1 m deep and < 3 m length along the dike	> 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Sinkhole on crest	Not visible	> 5 m outside from centreline	Within 5 m from centreline	Within 5 m from centreline
	Lake elevation	< 141.5 masl	> 141.5 and < 142.2 masl	> 142.2 and < 142.5 masl	> 142.5 masl
	Temperature variation within foundation (based on thermistors)	Temperature measurement stable and similar variation at surface from previous years.	Increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer
	Seepage through dike (excluding Freshet water)	< 300 m^3/day	>300 m^3/day and <1,000 m^3/day and / or turbidity in the water	> 1,000 m^3/day and < 2,000 m^3/day and / or turbidity in the water	> 2,000 m^3/day *Condition where the seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
Action Required		• Instrumentation monitoring and visual inspection according to frequency set out in OMS manual. • Possibility of a mitigation plan to be evaluated by Engineering Department.	• Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Identify potential cause • Implement engineering review.	• Suspend activities on dike crest at area of concern • Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Plan and take appropriate mitigation measures with engineering review. • Reassess thresholds and conditions for red category (emergency situation) taking into account the changing conditions presently observed and interactions of various items.	• Temporary evacuation of personnel and equipment from pit and suspension of activities. • Update planning and take appropriate mitigation with engineering review.
Personnel Notified		Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 12.7 Communication Charts for Each Emergency Level

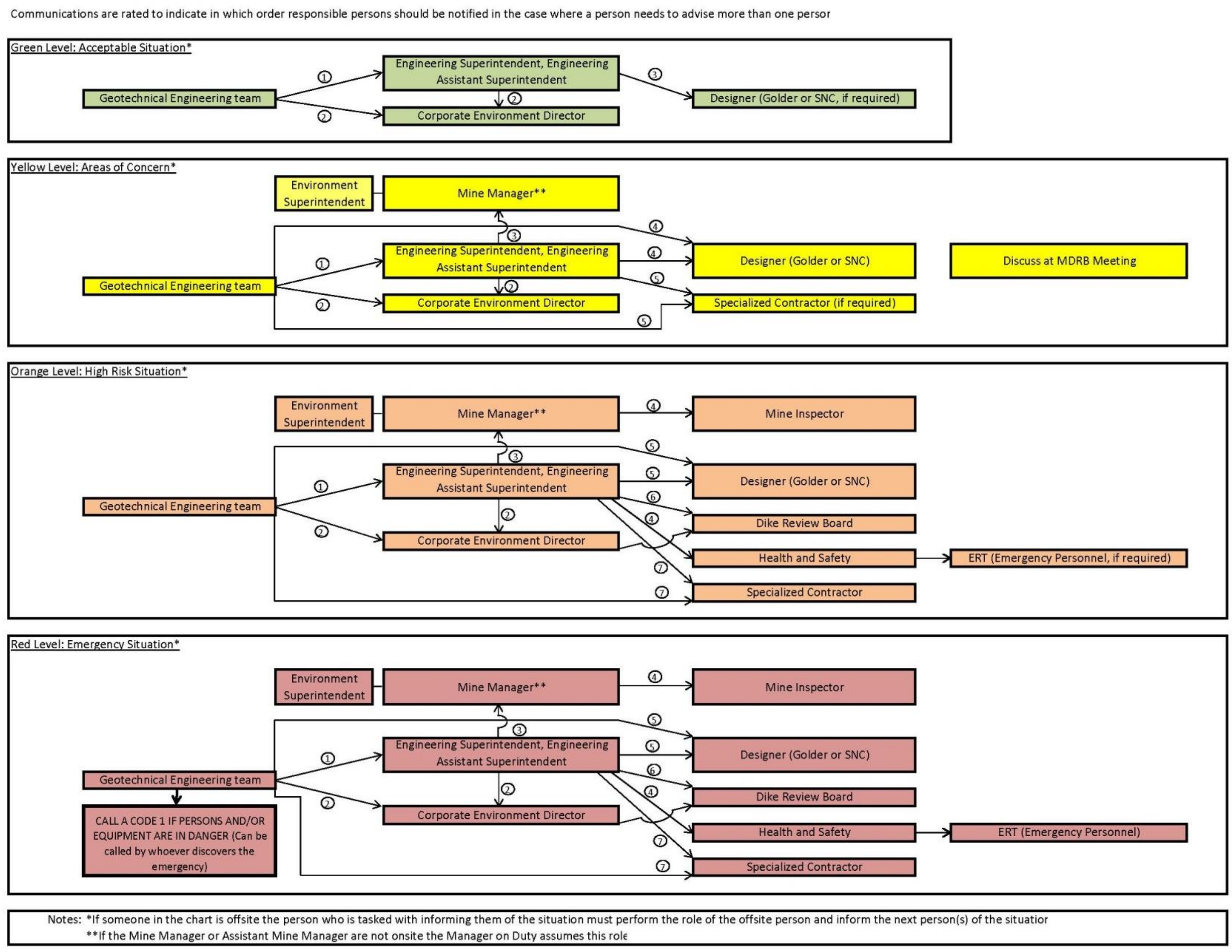


Table 12.8 Responsibilities of Persons for Each Emergency Level

	Decision Making	Mobilization	Performing the Action to be Taken
Green Acceptable Situation	Geotechnical Engineer/Specialist	Geotechnical Engineer/Specialist	Geotechnical Team*
Yellow Areas of Concern	Geotechnical Engineer/Specialist, Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Environment Superintendent	Geotechnical Engineer/Specialist, Geotechnical Coordinator	Geotechnical Team* Specialized Contractor (if required)
Orange High Risk Situation	Geotechnical Engineer/Specialist, Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Corporate Environment Director Dike Review Board Environment Superintendent Mine Manager Health and Safety (if required)	Geotechnical Engineer/Specialist, Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent	Geotechnical Team* Specialized Contractor ERT (if required)
Red Emergency Situation	Geotechnical Engineer/Specialist, Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Corporate Environment Director Dike Review Board Environment Superintendent Mine Manager Health and Safety	Geotechnical Engineer/Specialist, Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent Mine Manager Health and Safety	Geotechnical Team* Specialized Contractor ERT

*The Geotechnical Team consists of the Geotechnical Coordinator, Geotechnical Engineer/Specialist, the Project Technician, Tailings & Water Management Engineers, and the Geotechnical Technicians.

Table 12.9 Names and Contact Details

Internal Emergency Response Contact Information Chart		
Position	**Name/Location**	**24-Hour Contact #**
Geotechnical Engineer/Specialist	Patrice Gagnon	Ph: 819-759-3555 ext. 6726 cell: 418-376-0975
	Pier-Eric McDonald	Ph: 819-759-3555 ext. 6726 cell: 514-967-9092
Geotechnical Coordinator	Alexandre Lavallée	Ph: 819-759-3555 ext. 6726 cell: 438-868-1905
	Frederick L. Bolduc	Ph: 819-759-3555 ext. 6837 cell: 514-703-1727
Engineering Superintendent	Pierre McMullen	Ph: 819-759-3555 ext. 6721 cell: 819-860-2556
Engineering Assistant Superintendent	Miles Legault	Ph: 819-759-3555 ext. 6721 cell: 418-825-3891
Corporate, Vice-President Environment	Michel Julien	Ph: 461-947-1212 ext. 3738 cell: 514-244-5876
Designer (Golder or SNC)	Golder Burnaby: Dan Walker, Fiona Esford Golder Montreal: Yves Boulianne	Burnaby Office: 604-296-4200 Montreal Office: 514-383-0990
	SNC: Yohan Jalbert, Simon Beaulieu	Quebec City Office: 418-621-5500
Specialized Contractor	SANA (FGL Group)	Onsite Ph: 819-759-3555 ext. 6963 Ph: 418-615-0559
Environment Superintendent	Nancy Duquet-Harvey	Ph: 819-759-3555 ext 6980 Cell: 819-865-4385
Mine Manager	Luc Chouinard	Ph: 819-759-3555 ext. 6725 cell: 819-856-8160
Dike Review Board	Anthony Rattue Norbert Morgenstern Don Hayley	anthony.rattue@bell.net norbertm@ualberta.ca don.hayley@icloud.com
Mine Inspector	Lex Lovatt	Lex.Lovatt@wscc.nt.ca
Health and Safety	Normand Ladouceur	Ph: 819-759-3555 ext. 6720 cell: 819-860-6258
	Yves Levesque (asst.)	Ph: 819-759-3555 ext. 6720 cell: 819-856-9051
ERT (Emergency Personnel)	Emergency response personnel available on site to assist with spill and emergency response activities	Coordinated by the Emergency Measures Counsellor
Incident Commander	André Rouleau	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191 Code 1
	Philippe Beaudoin	Ph: 819-759-3555 ext. 6809 cell: 819-860-6258 Code 1

Emergency Measures Counsellor	André Rouleau Bernard Paradis	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191
Health Professionals / Medical Clinic	Medical Clinic 1	Ph: 819-759-3555 ext. 6734
	Medical Clinic 2	Ph: 819-759-3555 ext. 6751
AEM Management Representative	Luc Chouinard	Ph: 819-759-3555 ext. 6725 cell: 819-856-8160
Human Resource Superintendent	Dominic Richard	Ph: 819-759-3555 ext 6723 cell: 819-856-0426

Table 12.10 Emergency Response Summary for East Dike and Bay-Goose Dike

Concern	Area		Failure Likelihood	Comments/Monitoring	Contingency or Corrective Action
Overtopping and Subsidence	1a	Lake level rise because of restricted outflow from Third Portage or Second Portage Lake (excessive inflow is a far less likely scenario)	Low	Lake levels and crest elevations should be monitored as part of daily safety information provided to mine management. Outflow channels should be inspected during thaw, open water season and during ice break-up.	The crest is wide and comprises coarse rockfill. Significant damage to the dike is not credible, based on performance of other rockfill structures subjected to overtopping or flow through events. Mining operations may need to be suspended, but there will be considerable warning time given the design freeboard and the storage volume within the lakes.
	1b	Dam crest settles more than 2 m	Low	This scenario requires extensive loss of support in the foundation since the rockfill of the dikes is essentially not settlement prone itself after construction and dewatering. For foundation settlement of this magnitude to occur, a piping event must develop or there is unexpected layer of compressible soil in the foundation. A foundation investigation was carried out prior to construction. The situation would develop slowly with crest settlement evident at least several weeks before a run-away event develops. Easily observed cracks should be evident. Monitoring of the crest settlement should be conducted routinely.	The crest is wide and comprises of coarse rockfill. Significant damage to the dike is not credible, based on performance of other rockfill structures subjected to overtopping or flow through events Rockfill and till available from the mining operations can be placed to raise the dike crest. Mining operations may need to be suspended, but there will be considerable warning time given the slow development of the scenario.
	1c	Wave action	Low	Wide beach, large freeboard and wide rock dam crest zone makes this a low concern	If large wave action is observed, can add rip-rap and/or raise dam crest
Internal Erosion	2a	Dike Section: Cut-off wall is defective, allowing high water flow. This defect occurs at a location where the core allows high flows and where the fills are defective; the combination allows erosion of the cut-off and/or the Core Backfill.	Low	The cut-off wall and/or core backfill will develop a progressively increasing void ratio, thereby increasing the rate of water flow through the dike. This is not a catastrophic failure mode as the rockfill will be stable and at its worst would lead to temporary suspension of mining.	Monitor seepage from downstream face for rate of seepage and for presence of sediment in seepage. Will become evident as localized intensive seepage at dike toe and can be repaired. May also see settlement in the core or cut-off wall near the filter. Will be most likely in deepest section. Gradients across the core in shallow water may not be high enough to cause piping.
	2b	Dike Section: Cut-off wall loses bentonite because of improper construction	Low	The cut-off wall will develop progressively increasing voids, thereby increasing the rate of water flow through the dike. This is not a catastrophic failure mode as the rockfill will be stable and at its worst would lead to temporary suspension of mining.	Monitor seepage from downstream face for rate of seepage and for presence of sediment in seepage. Will become evident as localized intensive seepage at dike toe and can be repaired. May also see settlement in the core near the filter. Will be most likely in deepest section. Gradients across the core and cut-off in shallow water may not be high enough to cause piping.
	2c	Foundation till is possibly non-uniform with more transmissive zones and not self-filtering. It is possible that one of these zones may align with defective construction of the cut-off wall allowing high flows. Seepage would lead to erosion of the cut-off into the downstream rockfill. Seepage could also erode the foundation tills at the downstream toe or into the downstream rockfill because of the lack of filtering.	Low	Limited seepage at the toe or into the rockfill would accelerate in to a large inflow, and could lead to the undermining of the dike if no action was taken. This is a credible catastrophic mode if increased seepage is not detected in time. No particular instrumentation is needed as this failure mode will show itself as localized and increasing seepage. It could be detected by walk-over inspection by an experienced engineer or technician.	Remedial action could comprise a reverse filter and rockfill buttress depending on location of the flow and configuration of the foundation, freezing or grouting, if identified in time. In the worst case, the pit may be deliberately flooded in a controlled manner, the cut-off repaired and the pit dewatered. Build additional dike downstream increasing pumping.

Concern	Area		Failure Likelihood	Comments/Monitoring	Contingency or Corrective Action
Seepage	3a	Within the Embankment	Low	Seepage on its own is not a credible failure scenario. The downstream rockfill shell has extremely high flow through capacity. The rockfill zone is both large and pervious, so that seepage will not daylight and lead to instability. Any seepage related failures must include internal erosion.	No credible consequences. May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage.
	3b	Within the Foundation	Medium	Defective construction of cut-off leading to transfer of unexpectedly high fraction of the reservoir head into the downstream part of the dike foundation, or leading to a piping event as described in internal erosion (2c). If this mechanism arises it should show itself during initial dewatering or very shortly thereafter.	This failure mechanism has caused embankment failures elsewhere because of straightforward pore water pressure induced instability. However it is unclear that it could cause failure of the dike because of the large width compared to the retained water head. The most likely consequence is downstream toe slumping requiring a localized stabilizing berm before the crest could be reinstated.
Structural - Slope Instability	4a	Normal Operation: Slope Failure	Low	The rockfill shoulders of the dike are wide and have high shear strength, making it a conservative design. Slope failure requires failure in the foundation and which would extend into the overlying dike. Sliding failure is considered unlikely given the low horizontal forces generated by the water and ice relative to the normal frictional force due to the weight of the dikes and the frictional angles of foundational materials. This mechanism should develop during construction or dewatering, due to the increase in load and associated pore water pressure development. Initial stages of failure should be observable as tension cracks in the dike crest. Walk-over inspection of the dike by trained inspector is an appropriate monitoring strategy in addition the instrumentation. Survey of crest face and toe should also be conducted.	A foundation failure would cause a rotational slip or sliding failure until equilibrium was reached. This mechanism would limit access along the dike until repaired. Failure through the rockfill should not necessarily compromise the water retaining function of the dike. Slope failures which reach the core may cause dam failure. Stabilizing berms can be placed at the downstream toe of the dike.
	4b	Earthquake Induced: Slope Failure	Low	Site is located in a low seismic zone. Dam consisting of massive rock zone has a low sensitivity to seismic motion.	In the event a seismic event produced cracks, construction material and equipment will be available for rapid response.
	4c	Erosion; washout, ice scour	Low	Crest – minimum 50 m section, Downstream – large quarry rock face.	Monitor – if any erosion is observed place additional mine rock
Structural – Lateral Movement	5a	Failure of Cut-off Wall	Low	Differential horizontal movement of the dike due to dewatering, water or ice loading or pit wall failure may create a breach in the cut-off wall. Ice and water forces are not credible due to the ratio of frictional forces generated by the self weight of the dike versus ice loads and water pressure. Pit wall failure unlikely based on assessments of pit wall stability. Large inflows through the breach may occur as a consequence if the cut-off wall breached. Pit would flood requiring suspension of mining activities. Potential for loss of life of workers inside dikes. Inclinometer, settlement prism and monument monitoring should be done routinely.	If the pit floods, then repairs to cut-off would be done prior to dewatering.
Subsidence	6	Foundation Soils	Low	Unexpected foundation soils consolidated during dike construction or dewatering. A significant quantity of clay would be required to generate settlement resulting in a water release event. Settlement of the core zone will be limited by dynamic compaction. Prism and monument monitoring should be done routinely.	A 2 m core settlement would be required to allow water to flow through the rockfill and over the settled cut-off. This flow would not cause failure of the rockfill shells. It would also be readily repaired by excavating rockfill above the cut-off wall and placing more till. Soil conditions will be observed during dewatering to accommodate actual conditions.

Concern	Area		Failure Likelihood	Comments/Monitoring	Contingency or Corrective Action
Premature Closure	7	Corporate Bankruptcy or Early Resource Depletion	Low	Bond is provided for this eventuality. Design of rehabilitation is the same as rehabilitation at closure of project.	Pumping will be suspended and the downstream area allowed to flood. The East Dike and Bay-Goose Dike will be monitored to meet closure requirements.
Pump and Pipeline Failure	8	Pumping from Sumps to Process Plant	Medium	Freezing protection is provided by heat tracing and insulation. Pipelines monitored pump pressures at plant and frequent site inspection.	Sump designed for expected seepage capacity. Pumping equipment designed for 1 in 25 year storm events and average freshet. Redundant lines (Minimal interruption to Process Plant operation).

Table 12.11 Risk Matrix

				Consequence :				
				HIGH				
					MEDIUM		LOW	
Likelihood:				Catastrophic 5	Major 4	Significant 3	Minor 2	Insignificant 1
Almost Certain	HIGH		5	25 (very high risk)	20	15	10	5
Likely	HIGH	MEDIUM	4	20	16 (high risk)	12	8	4
Possible		MEDIUM	3	15	12	9 (medium risk)	6	3
Unlikely		LOW	2	10	8	6	4 (low risk)	2
Rare		LOW	1	5	4	3	2	1 (very low risk)

Table 12.12 Risk assessment for East Dike, Bay-Goose Dike, South Camp Dike and Vault Dike

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls		Overall Risk Rating
					Monitoring	**Corrective Action**	
	Lake level rise because of restricted outflow (e.g., blockage of outlet from Second Portage Lake).	**LOW – 2** Temporary ice jam occurring at the outlet is possible for a short duration in the spring. The cutoff wall and liner system provide adequate freeboard above normal lake level.	Water spilling over the crest. Erosion of the dike abutment and / or downstream foundation	**LOW - 2** The crest is wide and comprises coarse rockfill. Significant damage to the dike is unlikely based on design.	Routine monitoring of lake levels. Outflow channels should be inspected regularly just before and during the thaw and ice break-up (freshet).	If an obstruction is present, clear blockage at outlet. Develop action plan based on conditions encountered.	4
	Lake level rise because of excessive inflow.	**LOW – 2** Due to the large surface area of the lakes, a large volume of water is required to cause a significant increase in the lake elevation. The cutoff wall and liner system provide adequate freeboard above normal lake level.	Water spilling over the crest. Erosion of the dike abutment and / or downstream foundation	**LOW - 2** The crest is wide and comprises coarse rockfill. Significant damage to the dike is unlikely based on design.	Routine monitoring of lake levels.	Develop action plan based on conditions encountered.	4
	Settlement of the cutoff wall system. (Not applicable to South Camp Dike or Vault Dike)	**MED – 3** The cutoff wall system is founded on or close to bedrock reducing potential for the foundation, and in turn the cutoff wall, to settle. Some settlement of the soil bentonite may be expected. The maximum depth of the soil bentonite cutoff wall is typically such that settlement exceeding the minimum freeboard is unlikely.	Water spilling over the crest. Erosion of the dike abutment and / or downstream foundation.	**MED - 3** The crest is wide and comprises coarse rockfill. Significant damage to the dike is unlikely based on design.	Survey of cutoff wall to detect and quantify settlement. Routine monitoring of lake levels.	Till available from the mining operation could be placed above the cutoff wall if significant settlement occurred. (Note – all material over cut-off wall would need to be excavated (i.e. thermal cap, grouting platform))	9
Overtopping	Settlement of the rockfill embankment over a significant width of the crest.	**<u>EAST DIKE</u>** **<u>BAY-GOOSE DIKE</u>** **LOW – 2** Adequate rockfill freeboard has been provided such that settlement in excess of the freeboard is not anticipated. Settlement can only occur where lakebed soils were left underneath the rockfill embankment but the majority of the settlement is anticipated to have occurred during construction since additional fill was placed to bring to design elevation. The East Dike has had additional maintenance as it was operated as a haul road.	Potential erosion of upstream filters and cutoff for BG and ED. Potential exposure to wave action (see below in wave action section).	**MEDIUM - 3** The hydraulic barrier, cutoff wall system, remains in place. Wave erosion of the cutoff system unlikely due to the presence of surrounding granular material.	Monitoring of Rockfill settlement	Rockfill available from the mining operation can be placed to raise the crest height, if settlement occurs.	6
	Settlement of the rockfill embankment over a significant width of the crest.	**<u>SOUTH CAMP DIKE</u>** **<u>VAULT DIKE</u>** **LOW – 1** Existing monitoring of the dike within the foundation shows that it remains frozen throughout the year; therefore, thawing of foundation material is unlikely to happen, but in the event it does happen, it will allow settlement of the rockfill.	Potential exposure to wave action (see below in wave action section).	**LOW - 2** The hydraulic barrier, liner system, remains in place. Additional water will flow towards the open pit and mining infrastructures.	Routine monitoring of the foundation's temperature.	Develop an action plan to add low hydraulic conductivity barrier if flow is not manageable.	2
	Wave Action	**LOW – 2** Adequate freeboard is provided by the rockfill crest elevation. A wide rockfill crest which is erosion resistant reduces potential impact to the cut-off wall/liner.	Water spilling over the crest. Erosion of the dike abutment and / or downstream foundation	**LOW - 2** Wave erosion of the cutoff wall system unlikely due to the presence of surrounding granular filter system.	Monitor wave height during storm events or periods of strong winds.	Rockfill can be placed to raise the crest height, if necessary.	4

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls: Monitoring	Controls: Corrective Action	Overall Risk Rating
Internal Erosion (piping)	Erosion of the cutoff wall. If a component of the cutoff wall is defective allowing high water flow through the structure. This defect could potentially erode the cutoff wall. (NOT APPLICABLE TO SOUTH CAMP DIKE OR VAULT DIKE)	**MEDIUM HIGH – 4** The soil bentonite has the potential to be eroded under high hydraulic gradients. Although erosion of the downstream foundation soils could potentially occur in association with erosion of the cutoff wall, the width of the rockfill embankment, thickness of soils, and hydraulic head significantly reduce the likelihood of failure. The granular materials within the dike have been designed to be filter compatible reducing the risk for erosion. This mechanism is more likely to occur during dewatering or shortly thereafter. **EAST DIKE**: As the East Dike has been dewatered since 2010, the likelihood of further deterioration is less. **BAY-GOOSE DIKE**: The cement content of the cement soil bentonite and jet grout should reduce its potential for erosion. A layer of erodible material (e.g. silt) at the base of the cutoff wall / bedrock contact, was identified and jet grouted to reduce erosion potential. Other areas of erodible material may still exist beneath the cutoff wall. Two areas at Bay-Goose Dike (Sta. 30+230 to 03+350 and Sta. 30+795 to 30+850) have a higher risk for flow through the cutoff wall because the more rigid cement soil bentonite was placed over softer, more deformable soil bentonite. A gap at the interface due to differential settlement or cracking of the cement soil bentonite is possible. The zone between Sta. 30+230 and 30+350 is considered at greater risk. The Bay-Goose design has included a filter blanket downstream of the cutoff wall to reduce internal erosion of the cut-off wall.	Increased seepage, through the dike core evident as localized intensive seepage at the dike toe or beyond. Settlement of the cutoff wall or dike crest, most likely in deep water sections with higher gradients.	**MEDIUM HIGH - 4** This is not likely to be a catastrophic failure mode as the filter material and rockfill embankments of the dike will remain stable. Additional seepage would come into the pit as the seepage collection system is not designed for such inflow. Could lead to the undermining of the dike if no action was taken and significant erosion of the foundation soils on the downstream side of the dike occurred. Loss of containment may result. Potential economic loss due to cessation/suspension of mining. **BAY-GOOSE DIKE**: High seepage leading to erosion is more likely to occur during dewatering when the pit has not been developed. The high seepage rate would delay the start of mining, with financial implication. With no pit development, minimal health and safety risk to personnel are expected.	Monitor seepage flow for rate and volume, and for presence of sediment in seepage (turbidity). Monitor piezometric and thermistor data for signs of increased flow through the cutoff wall and change in piezometric pressures. Monitor dike crest for signs of sinkholes or settlement. Increased seepage, evident as localized flow at the dike toe or beyond, in particular in topographic lows along the dike alignment	Based on conditions encountered, develop an action plan. This could include grouting, compaction grouting, and/or the installation of a downstream filter blanket.	**16**
	BAY-GOOSE DIKE ONLY: Erosion of the foundation (primarily applies where initial excavation was terminated above bedrock). Seepage flows through / between the jet grout columns, along sand and gravel zones within the till, and through potential erodible material. The foundation tills may be eroded into the downstream rockfill or through fractures in the bedrock.	**MEDIUM-4** The potential for gaps within the jet grout columns exist and allow for flow. The cement content of the jet grout columns should reduce the columns potential for erosion. Till is non-uniform with discontinuous layers / lenses of sand and gravel, and erodible material (i.e. silt layers) that may not be self-filtering. For erosion to occur, the seepage through or between the jet grout columns would need to connect with a permeable zone (e.g. zone of sand and gravel) which in turn needs to be in close proximity to a zone of erodible material that can be removed and the seepage forces need to be sufficient to cause the erosion. If this mechanism arises, it should show itself during initial dewatering or very shortly thereafter. May result in slower lake drawdown.	Increased seepage, evident as localized intensive seepage at the dike toe or beyond.	**MEDIUM HIGH-4** This is a significant failure mode if increased seepage is not detected in time. Undermining of the dike could lead to overall failure of the structure and flooding within the open pit resulting in cessation of mining and economic loss. Could lead to the undermining of the dike if no action was taken and significant erosion of the foundation soils on the downstream side of the dike occurred. Loss of containment may result.	Monitor seepage flow for rate and volume, and for presence of sediment. Monitor piezometric and thermistor data for signs of increased flow through the foundation and change in piezometric pressures. Monitor dike crest for signs of sinkholes, settlement or slope instability. Monitor inclinometers.	Remedial action could comprise grouting, a reverse filter on downstream and rockfill buttress, depending on location of the flow and configuration of the foundation. In the extreme, the dewatered areas may be deliberately flooded in a controlled manner, the cutoff wall repaired, and then dewatered.	**16**

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls		Overall Risk Rating
					Monitoring	Corrective Action	
	Interconnected open fractures in the bedrock that permit foundation material or cutoff wall material to be lost. (NOT APPLICABLE TO SOUTH CAMP DIKE OR VAULT DIKE)	**MEDIUM – 3** High hydraulic gradients exist at the base of the cutoff wall and potentially within the bedrock, especially along deeper areas of the dike. Grouting was conducted to reduce the permeability of the bedrock and contact zone. There is, however, a potential that bedrock fractures were initially infilled with silt prior grouting. This silt may erode once a hydraulic gradient is imposed and thereby form a pathway for either foundation soil or soil bentonite cutoff wall material to erode. Large setback of dike from pit crest in some parts increases the seepage path thereby reducing the hydraulic gradient imposed. BAY-GOOSE DIKE The cement content of the cement soil bentonite and jet grout reduces potential erodability and was used in the deepest portions of the dike.	Increased seepage, initially evident downstream of the dike or within the pit wall.	**HIGH - 5** This is a catastrophic failure mode if increased seepage is not detected in time. Could lead to the undermining of the dike if no action was taken and significant erosion of the foundation soils on the downstream side of the dike occurred. Loss of containment may result. This could lead to flooding within the open pit of the mine and a cessation of mining.	Monitor seepage flow for rate and volume, and for presence of sediment (turbidity). Monitor piezometric and thermistor data for signs of increased flow through the foundation and change in piezometric pressures. Monitor dike crest for signs of sinkholes, settlement or slope instability. Monitor inclinometers.	Grouting of the fractured bedrock. Deep bedrock grouting. In shallower areas, grouting or freezing. Installation of downstream filter blanket, stability berm.	**15**
	Erosion along instrumentation installed within the cutoff wall system. (NOT APPLICABLE TO SOUTH CAMP DIKE OR VAULT DIKE)	**LOW – 1** Preferential flow paths may exist along the edge of vertical instrumentation conduits (thermistors, inclinometers, grout casings) due to inadequate sealing. Preferential seepage path of precipitation and melt water are potential sources of water which can flow down along the edge of the conduits. Erosion caused by precipitation and melt water is very unlikely due to the small volume of water. If this mechanism arises, it should show itself during initial dewatering or very shortly thereafter.	Gradual erosion of the SOIL BENTONITE material adjacent to the instrumentation.	**LOW – 2** This is not a catastrophic failure mode as the filter material and rockfill embankments of the dike will remain stable.	Monitor seepage flow for rate and volume, and for presence of sediment. Monitor piezometric and thermistor data for signs of increased flow through the foundation and change in piezometric pressures. Monitor dike crest for signs of sinkholes, settlement or slope instability.	Replacement of the instrumentation and sealing of the annular space.	**2**
High Seepage rates with no internal erosion	Through the Dike Section (including bedrock contact) : **EAST DIKE DIKE:** Increase in hydraulic conductivity of the dike's cutoff wall system resulting in high seepage flow through the structure. **BAY-GOOSE DIKE:** Increase in hydraulic conductivity of the dike's cutoff wall system (cutoff wall and jet grout columns) resulting in high seepage flow through the structure. **SOUTH CAMP DIKE AND VAULT DIKE:** Punctured or torn liner which will likely increase flow through the structure.	**MEDIUM – HIGH– 4** This seepage on its own is not a failure scenario. Seepage-related failures must include internal erosion (see above). Interface between different material exist and could lead to seepage with preferential paths (bedrock contact and for Bay-Goose dike: cement soil bentonite over soil bentonite material and potential gaps between jet grouting columns) If this mechanism arises it should show itself during initial dewatering or very shortly thereafter.	Increased seepage water handling.	**MEDIUM -3** May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage. The downstream rockfill shell is both large and pervious and has an extremely high flow through capacity. **EAST DIKE AND BAY-GOOSE DIKE:** The large filter zone combination of core backfill and coarse filter are filter compatible and would maintain the structural integrity of the dike.	Monitor seepage flow for rate and volume, and for presence of sediment (turbidity).	Upgrade seepage collection system and increase pump capacity. Investigate and delineate high permeability zone. Installation of downstream filter blanket, stability berm	**12**

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls		Overall Risk Rating
					Monitoring	Corrective Action	
	Through the bedrock: Fractures in the bedrock results in increased seepage into the pit.	**MEDIUM - 3** Seepage on its own is not a failure scenario. **EAST DIKE AND BAY-GOOSE DIKE:** Extensive bedrock grouting within the dike foundation reduces the likelihood for seepage at shallow depths. If this mechanism arises it should show itself as the pit advances with depth. **SOUTH CAMP DIKE AND VAULT DIKE:** Existing monitoring show that foundation material and bedrock beneath the structure is frozen throughout the year.	Increased seepage through the pit wall.	**LOW – 1** No significant consequences for the dike itself. May require upgrade of the seepage collection system. May result in increased inflows into the pit, and the potential cessation of mining with resulting financial loss.	Monitor seepage flow for rate and volume, and for presence of sediment (turbidity).	Installation of dewatering / depressurization wells to remove water before it reaches the pit. Deep bedrock grouting. In shallower areas, grouting or freezing.	**3**
Slope Instability (rotational or slip or sliding failure on the upstream and downstream side)	Failure through the dike and/or foundation. Concentrated seepage and elevated pore pressures may result in weakening of the foundation.	**LOW -2** The rockfill embankments have high shear strength. For slope failure to be a concern, it requires failure in the foundation which would then extend into the dike. Failure through the rockfill embankments will not necessarily compromise the water retaining element of the dike. Sliding failure is considered unlikely given the low horizontal forces generated by water and ice forces relative to the normal frictional force due to the weight of the dike and the friction angles of foundation materials. Limited available information on soil properties for dike stability analysis. This mechanism should develop during construction or dewatering, due to increase loads and associated pore water pressure.	Sloughing of the face Large seepage / inflow only if instability resulted in loss of the cutoff wall system.	**HIGH - 5** If failure were to occur it is likely to be through the lakebed soils affecting the rockfill embankments Failure which reaches the core may cause overall failure of the structure, leading to flooding within the open pit of the mine and a cessation of mining. Potential for loss of life for workers downstream of the dike. Limited access along the dike until repaired.	Initial stages of failure should be observable as tension cracks in the dike crest. Walk-over inspection of the dike by a trained inspector. Monitoring for bulging of dike toe. Survey of the dike crest, face, and toe. Slope inclinometer monitoring of the cutoff wall. Monitor piezometric and thermistor data for signs of increased flow through the foundation and change in piezometric pressures.	Stabilizing berms can be placed upstream and/or downstream of the dike. Installation of downstream filter blanket, buttress	**10**
	Excessive Vibration Due to blasting within the pit; or due to the occurrence of an extreme earthquake.	**LOW -2** The extreme earthquake loading for this site is of low magnitude. The East Dike setback of dike from pit crest reduces the vibration caused by blasting. The Bay-Goose Dike setback of dike from pit crest reduces the vibration caused by blasting. Rockfill structures are designed to resist against wave created by earthquake. **EAST DIKE AND BAY-GOOSE DIKE:** Dynamic compaction of the core during construction likely subjected the rockfill shells to accelerations equivalent to the expected earthquake loading and blasting vibration. Excessive vibration is unlikely to cause failure through the rockfill. The vibration may result in increased pore pressures within the foundation soils, weakening the foundation. This may cause failure in the rockfill but is unlikely to extend into the cutoff wall system.	Settlement of the dike could occur in the event of large vibrations. Increase in displacement and/or displacement rate of dike toe Sloughing of the face. Large seepage / inflow only if instability resulted in loss of the cutoff wall system.	**MEDIUM - 4** If failure were to occur it is likely to be through the lakebed soils affecting the rockfill shell. Limited access along the dike until repaired. Although unlikely, failure which reaches the core / liner may cause overall failure of the structure, leading to flooding within the open pit of the mine and a cessation of mining. Potential for loss of life for workers downstream of the dikes.	Survey of the dike crest, face, and toe. Dike inspection following larger than anticipated vibrations and earthquakes. Blast vibration monitoring Monitoring for bulging of dike toe. Look for cracks along the dike crest.	In the event the vibration produced cracks, monitor and assess the situation, and develop a remediation plan.	**8**

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls: Monitoring	Controls: Corrective Action	Overall Risk Rating
	Pit wall instability that extends towards the dike and causes instability of the dike (NOT APPLICABLE TO SOUTH CAMP DIKE AND VAULT DIKE)	**EAST DIKE: LOW -2** **BAY-GOOSE DIKE: MEDIUM -3** Pit wall failure unlikely based on assessments of pit wall stability and setback. East Dike setback is greater than Bay-Goose Dike setback; therefore, it is viewed that the likelihood rating would be different for each structure. The respect of the setback established from pit crest. East Dike has a large setback from the pit crest, and therefore a low probability that pit instability will affect the dike. The Bay-Goose Dike setback from the pit crest is less than East Dike, and therefore has a higher probability that pit instability will affect the dike.	Increase in displacement and/or displacement rate of dike toe. Large seepage / inflow only if instability resulted in loss of the cutoff wall system.	**HIGH-5** If the instability impacted the cutoff wall system of the dike, then failure of the entire structure could result. Cessation /suspension of mining operations would have already occurred due to significant pit wall instability or failure.	Slope inclinometer monitoring of the cutoff wall. Survey of the dike crest and visual inspection. Pit wall stability monitoring. Visual observation related to cracks along the dike crest.	Depressurization of pit walls. Draining of lakebed soils between pit crest and dike and/or removal of these materials. Cut back slopes of pit wall and soils to unload the crest. Adjustment of mine plan, if necessary. Develop action plan to stabilize the instable pit wall area.	**EAST DIKE** **10** **BAY-GOOSE DIKE** **15**
Failure of cutoff wall	**BAY-GOOSE DIKE ONLY:** Excessive vibration from overblasting or earthquake above design could potentially damage the cement soil bentonite and/or jet grout columns resulting in cracks or fissures.	**LOW-2** The vibration may result in increased pore pressures within the foundation soils, weakening the foundation. This may cause failure in the rockfill but is unlikely to extend into the cutoff wall system. Refer to internal erosion as a failure mechanism if cracks lead to internal erosion. It is anticipated that the soil bentonite material would deform such that cracks would not be produced.	Increased seepage water handling.	**MEDIUM HIGH-4** May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage. The cement content within these portions of the wall should reduce the erodability of the wall and therefore protect the integrity of the dike, even though seepage rates would increase.	Monitor seepage flow for rate and volume, and for presence of sediment (turbidity). Blast vibration monitoring on the dikes. Monitoring inclinometers within the cutoff wall.	Upgrade seepage collection system and increase pump capacity. Develop action plan related to potential grouting in cutoff wall fractured zone.	**8**
Failure of the liner system	**SOUTH CAMP DIKE AND VAULT DIKE ONLY:** Settlement of the foundation material	**LOW-2** In the unlikely event of thawing of the foundation material beneath the liner, settlement of the dike's foundation material will increase tension in liner, and potentially tear the liner	Increased seepage water handling.	**LOW-2** No significant consequences for the dike itself. May require upgrade of the seepage collection system.	Monitor seepage flow for rate and volume. Monitor thermistor data for signs of increased flow through the foundation.	Upgrade seepage collection system and increase pump capacity. Installation of downstream filter blanket, buttress Develop mitigation plan to decrease seepage through the structure	**4**
Premature Closure	Corporate Bankruptcy or Early Resource Depletion	**LOW-2**	Pumping will be suspended allowing the downstream area to flood (Note – long term closure plan is for flooding to occur). No or limited monitoring of dikes.	**LOW-2** Bond is provided for this eventuality. Design of rehabilitation is the same as rehabilitation at closure of project. Before mining operations could resume any water downstream would need to be pumped out and assessment of performance would need to be done.	Environmental monitoring to ensure closure requirements are met.		**4**

SECTION 13 • REFERENCES

Table 13.1 References

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2	AEM 2013. Construction Summary Report Vault Dike. July 29, 2013. Ver. 1.	
3	AMEC (AMEC Earth and Environmental) 2003. Baseline Hydrology Study.December 2003 with January 2004 errata sheets.	
4	AMEC 2005a. Meadowbank Gold Project Hydrologic Monitoring 2004 Draft Data Report. February.	
5	AMEC 2005b. Meadowbank Gold Project Feasibility Study Report. June.	
6	CDA (Canadian Dam Association) 2007. Dam Safety Guidelines.	
7	Golder (Golder Associates Ltd.) 2002. Factual Report on Geotechnical Drilling, Hydrogeological and Geophysical Investigations, Meadowbank Project, Nunavut. July 12. Doc. No. 116	
8	Golder 2003. Summary Report on Spring 2003 Field Geotechnical Studies, Meadowbank Project, Nunavut. September 8. Doc. No. 208	
9	Golder 2007a. Final Report Detailed Design of Dewatering Dikes Meadowbank Gold Project. Final Report. March 13. Doc. No. 342 Ver. 0.	
10	Golder 2007b. Report Addendum Detailed Design of Dewatering Dikes Meadowbank Gold Project. July 12. Doc. No. 492 Ver. 0.	
11	Golder 2008a. 2007 Till Core Material Investigation and Laboratory Testing, Meadowbank Gold Project. Technical Memo. January 25. Doc. No. 538 Ver. 0.	
12	Golder 2008b. East Dike Design Meadowbank Gold Project. Report. October 31 Doc. No. 572 Ver. 0.	
13	Golder 2009a. Bay-Goose Dike and South Camp Dike Designs. Meadowbank Gold Project, Nunavut. February 2. Doc. No. 802 Ver. 0.	
14	Golder 2009b. Meadowbank East Dike Grouting Response Plan - Completed Works. July 14. Doc. No. 916 Ver. 0.	
15	Golder 2009c. 2009 Annual Geotechnical Inspection - Meadowbank Gold Project. November 30. Doc. No. 969 Ver. 0.	
16	Golder 2009d. East Dike Additional Details for Work Carried Out Between Stations 60+452 and 60+500. Meadowbank Gold Project. November, 2009. Doc. No. 961 Ver. 0.	
17	Golder 2009e. East Dike Construction As-Built Report Meadowbank Gold Project, Nunavut. December 15. Doc. No. 900 Ver. 0 Rev. 1.	
18	Golder 2009f. West Channel Dike Construction As-Built Report Meadowbank Gold Project, Nunavut. December 16. Doc. No. 980 Ver. 0.	
19	Golder 2010a. East Dike Sinkhole Investigation Program, October-November 2009, Meadowbank Gold Project. March 5 2010. Doc. No. 986 Ver. 0.	
20	Golder 2010. Draft of South Camp Construction As-built report. No. 1037 Ver. B. Meadowbank Gold Project. 22 April 2010	
21	Golder 2010b. East Dike CPT Investigation - Meadowbank Gold Project, Nunavut. July 22. Doc. No. 953 Ver. 0.	
22	Golder 2010c. 2010 Annual Geotechnical Inspection. Meadowbank Gold Project, Nunavut. December 3. Doc. No. 1216 Ver. 0.	

No.	Title	Document Centre Reference
23	Golder 2011a. Draft of 2011 Annual Geotechnical Inspection. Meadowbank Gold Project, Nunavut. November 21 2011. Doc. No. 1305 Ver. B.	
24	Golder 2013. Bay Goose Dike Construction As-Built Report Meadowbank Gold Project. Meadowbank Gold Project, Nunavut. April 2013. Doc. No. 1328 Ver. 0.	
25	ICOLD (International Congress of Large Dams) 1998. Dam Failures and Statistical Analysis. Bulletin 99.	
26	MAC (Mining Association of Canada) 2005. Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities.	
27	MMC (Meadowbank Mining Corporation) 2014. Emergency Response Plan. November. Ver. 9	
28	SNC 2013a. Detailed Engineering of Vault Dike. Meadowbank Gold Project, Nunavut. January 14. Doc. No. 610548-2020-4GER-0001 Ver. 0.	
29	SNC 2013b. Construction of Vault Dike – Technical Specifications. Meadowbank Gold Project, Nunavut. February 1. Doc. No. 610548-2020-4GEF-0001 Ver. 0.	

Appendix A

Inspection Forms

BAY GOOSE DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE MEADOWBANK

The instrumentation data is treated separately in the instrumentation quarterly report.

Inspecting Officer	Thomas Dahm
Report No.	BG-VIR-73
Inspection Date	December 22nd, 2017

Dike name	Bay Goose Dike

Last Inspection Date	Nov 20th, 2017					
Weather during the current inspection	-34 C°	Sunny ☒	Overcast ☒	Rain ☐	Snow ☐	Wind ☒
	Comments:					
Main changes since the last inspection	Areas are still snow covered and frozen. Frozen conditions.					

Tarp level (Based on OMS manual revision from March 2017)	***Green***

General Condition Summary

- Area where the seepage stations are now completely frozen and there is no flow.
- The water in Bay Goose West pond has completely frozen and no pumping required.
- The three (3) areas at the toe of the dike are all currently frozen. They are the northern pond between the Goose and Portage Pits, the pond area in the south corner downstream of the dike and the pond area near DL9
- The ditch across the ring road to connect the south pond with the Goose Pit is now frozen.
- The upstream and downstream slopes are generally in good condition. Sloughing seen on the dike downstream toe in previous years has not moved. There does not seem to be any new developments and they are now frozen.
- The crest and road surface are in good condition; the settlement, depressions, cracks and sloughing features noted in previous inspections didn't show movements. Due to frozen conditions, there is not suspected to be any movement. The road crest is now frozen and plowed regularly after snowfall.

Inspecting Officer: Thomas Dahm Review Officer: Patrice Gagnon Date Reviewed: 12/23/2017
(DD/MM/YR)

BAY GOOSE DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

Field observations

Location	Observations	Recommendations
Downstream slope and berm	▪ The toe has 3 areas where water was ponding near the dike: the northern pond between the Goose and Portage Pits, the pond area in the south corner downstream of the dike and the pond area near DL9. All these areas are now frozen with cold temperatures. ▪ Sloughing on the slope is stable. Frozen conditions. ▪ Overall, the downstream slope appears to be in good condition. All downstream slopes are covered in snow and frozen. ▪ DL1 and DL2 Pz show a spike in temperatures. Inspection was completed and nothing was noted. Same trend as the last 2 previous years. Will get GKM to investigate. Updated: GKM changed the MUX board and the temperatures have stabilized back. DL3 has exhibited the same temperature behaviour. Will fix with GKM once new MUX on site. ▪ Settlements and cracks on the berm are stable.	▪ Continue to monitor the sloughing, cracks and settlements. ▪ Monitor DL3 area to verify it's the board and not any other issues.
Upstream slope and berm	▪ Settlements and sloughing on the slope are stable. ▪ Overall, the upstream slope appears to be in good condition covered in snow and frozen; visually there is no concern. ▪ Cracks, settlements and sloughing on the berm are stable. ▪ With the onset of winter and frozen conditions there appears no more settling of upstream slope and berms.	▪ Continue to monitor the sloughing, erosion, cracks and settlements.
Crest	▪ The thermal capping and the crest are still showing old signs of settlement, and depressions, cracks and sloughing on the upstream side as described in previous inspection reports. These features have not gotten worse since the last inspection. ▪ Overall the road is in good condition and harder now since the snow and cold weather. The crest is frozen. ▪ It is to note that the dike is still closed to all heavy vehicles.	▪ Continue to monitor the sloughing, depressions, settlements and cracks.

BAY GOOSE DIKE VISUAL INSPECTION REPORT

Methodology: For the visual inspection, any anomaly or change since the last inspection must be reported. These anomalies include cracks, erosion, settlements, sink holes, bulging, sloughing, seepage signs, snow/ice, rutting, mud, ponds/puddles, signs of saturated soil and any damage on the liner or objects/water over the liner.

Seepage Report

4 seepages stations: #6, 7, 8 and #9 are completely frozen.

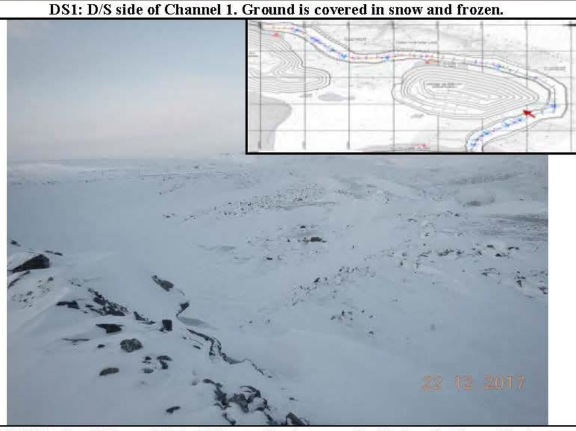
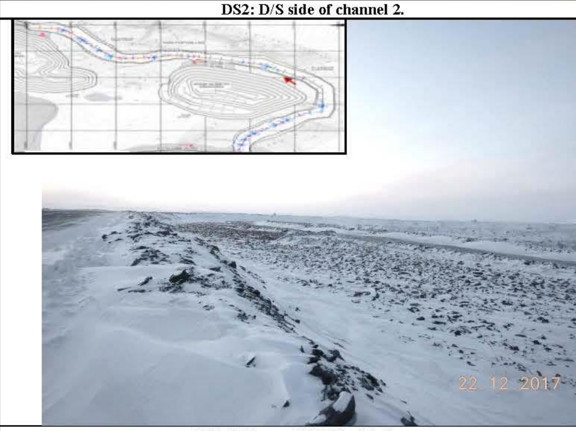
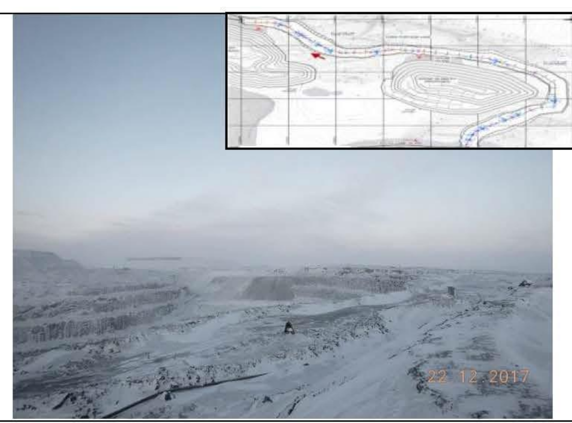
Location	Observations	Recommendations
STA # 6 – 31+570 (Channel 3) N: 7211914.922 E: 638614.989 Elev.: 130.849m	Seepage rate measured at 0 l/s during inspection	Seepage stations are now completely frozen and under snow
STA # 7 – 30+640 (Central Shallow) N: 7212639 E: 638908 Elev.: 131.000m	Seepage rate measured at 0 l/s during inspection	Seepage stations are now completely frozen and under snow
STA # 8 – 30+420 (North Channel) N: 7212881.8418 E: 638948.2624 Elev.: 128.770m	Seepage rate measured at 0 l/s during inspection	Seepage stations are now completely frozen and under snow
STA # 9 – 30+380 (North Channel) N: 7212920 E: 638614.989 Elev.: 129.000m	Seepage rate measured at 0 l/s during inspection	Seepage stations are now completely frozen and under snow

BAY GOOSE DIKE VISUAL INSPECTION REPORT

Aerial view of the Goose Bay Dike

BAY GOOSE DIKE VISUAL INSPECTION REPORT

Downstream slope and berm

	
DS1: D/S side of Channel 1. Ground is covered in snow and frozen.	**DS2: D/S side of channel 2.**
	
DS3: D/S side of Channel 3. A ditch was dug to connect with the pit. Ground is frozen and full of snow.	**DS4: D/S near DL9. Pond is frozen.**
	

BAY GOOSE DIKE VISUAL INSPECTION REPORT

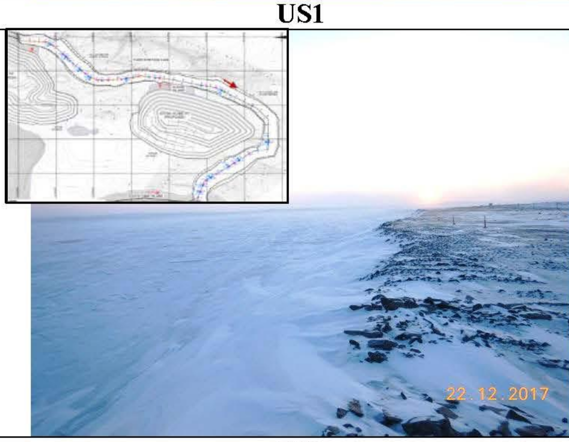
AGNICO EAGLE
MEADOWBANK

DS5: D/S side of the North Channel.	DS6

Upstream slope and berm

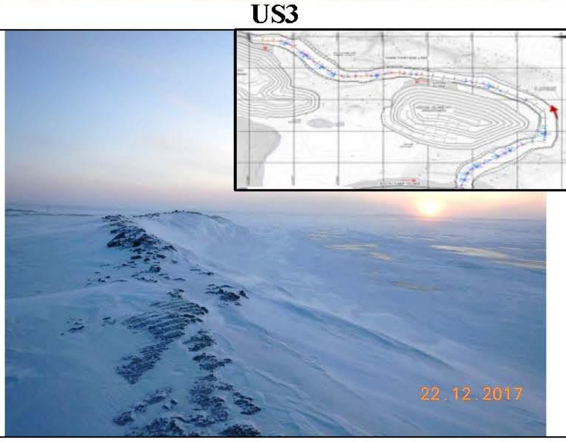
US1

US2

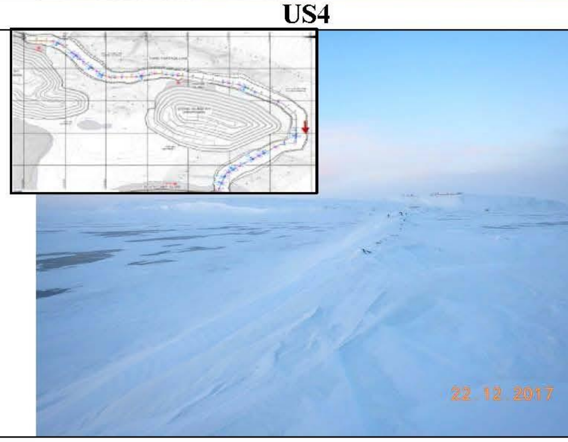


US3

US4



US5



US6

BAY GOOSE DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

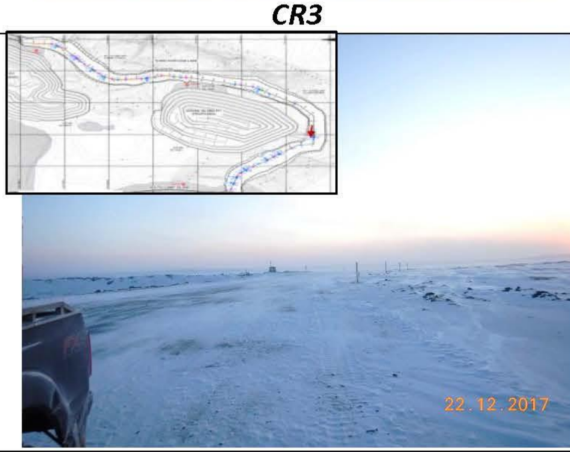
Crest surface

CR1

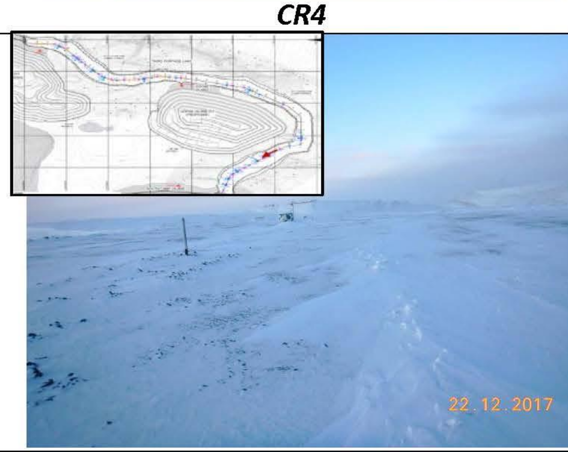
CR2

CR3

CR4



CR5



CR6

Appendix B

Dike Failure Scenario from the ERP

Dewatering Dike System

The Dewatering Dike System includes the East Dike, Bay Goose Dike, South Camp Dike and Vault Dike as shown on the general mine site plan provided at the beginning of this document. The dike construction for East Dike and Bay Goose Dike involved the dumping of rockfill into water to create the shells of the dikes, excavation through rockfill and lakebed soils to bedrock, placement of granular filter and core materials, dynamic compaction, construction of the cut off wall using slurry supported trench techniques and grouting of the bedrock and contact between the cut off wall and bedrock using cementitious grout. South Camp Dike and Vault Dike both include a bituminous liner and a key trench cut-off to make the structure impermeable. East Dike and Bay Goose Dike have crest widths in excess of 50 m and are not used by haul trucks during normal mine operation. South Camp Dike and Vault Dike have crest widths in excess of 25 m and may be used as haul roads during normal mine operation.

East Dike and Bay Goose Dike are considered high consequence structures, based on Canadian Dam Association (CDA, 2007) Dam Safety Guidelines. South Camp Dike is considered to be a significant consequence structure, based on Canadian Dam Association (CDA, 2007) Dam Safety Guidelines. Vault Dike is considered to be a low consequence structure, based on Canadian Dam Association (CDA, 2007) Dam Safety Guidelines. The dikes are relatively low, wide structures that exceed the minimum design criteria factors-of-safety (FoS) for stability for pre-drawdown conditions, operation conditions with maximum head difference across the dikes, pseudo-static earthquake conditions, and post closure conditions. Consequently, the probability of dike failure is considered to be low provided that the dikes are constructed according to the design. Mitigation against failure of the dikes includes a quality control and quality assurance program during construction, and an ongoing program of dike surveillance and monitoring during operations, as specified in the design.

For information on the consequences and monitoring/action for the various embankment failure modes possible at the Dewatering Dikes see Table A.1 below.

East Dike

The East Dike was constructed in 2008, with foundation grouting continuing into early 2009. The East Dike has a crest length of 800 m, including abutments, and was constructed in water with a maximum water depth to bedrock at the cut off of 7.2 m. The crest of the East Dike is at elevation 137.1 m and the average lake level along the dike is 133.1 m. The main components of the East Dike include a rockfill shell, a granular core with downstream filter zone, a soil-bentonite cut-off wall through the densified granular core zone to the underlying foundations, and a grout curtain from the base of the cut-off wall into the underlying bedrock.

During operations, the East Dike separates the eastern portion of Second Portage Lake from the Portage Pit and the Tailings Storage Facility behind the Central Dike. Following closure, the East Dike will remain as a permanent structure that will separate Third Portage Lake (El. 133.6 m) from Second Portage Lake (El. 133.1 m) and maintain the existing water elevation difference of 1 metre.

The East Dike is approximately 800 m in length through an average water depth of approximately 2.3 metres, and a maximum water depth to bedrock of about 7.2 m. Crest width is approximately 55 metres. Minimum setback from the Portage Pit (distance between dike toe and pit crest) is greater than 170 metres.

Bay Goose Dike

The Bay Goose Dike together with the South Camp Dike isolates the Bay-Goose Pit from Third Portage Lake. The Bay Goose Dike acts as a permanent structure to allow mining of the Goose Pit and the southern portion of Portage Pit. The main components of the Bay Goose Dike include a rockfill shell, a granular core with downstream filter zone, a soil-bentonite and cement-soil-bentonite cut-off wall through the densified granular core zone to the underlying foundations, a jet grouted wall between the base of the cut-off wall and bedrock where the cut-off wall was not constructed on bedrock, and a grout curtain from the base of the cut-off wall or jet grouted wall into the underlying bedrock.

The Bay Goose Dike is approximately 2,200 m in length, and was constructed in water depths less than 9 metres at the cut off. Crest width varies between approximately 85 and 100 m. Minimum design setback from the Portage and Goose Pit is 70 metres.

South Camp Dike

The South Camp Dike covers a narrow channel within Third Portage Lake and in conjunction with the Bay Goose Dike isolates the Bay Goose Pit from Third Portage Lake.

The South Camp Dike is located south of the plant site area and is used to connect the mainland to South Camp Island. It covers a narrow channel, approximately 60 m in width, where water depths were between 0.5 and 1 m.

The South Camp Dike was primarily constructed between April and June of 2009, prior to ice breakup. During the winter of 2009-2010 additional thermal capping material and rock fill for the haul road was added to the dike. The South Camp Dike has a broad rock fill shell with a bituminous geo-membrane liner installed on the upstream side of the shell. The liner was founded on native frozen (permafrost) till material, in a trench approximately 3 to 5 m below the lakebed surface. Compacted granular material mixed with bentonite was placed above the toe of the liner. The haul road is located on the downstream side of the dike. The South Camp Dike is approximately 85 m in length through water depths between 0.5 and 1m. Crest width is approximately 25 metres.

Vault Dike

The construction of the Vault Dike at Meadowbank was conducted from February 2013 to March 2013. Vault Dike is located across a shallow creek which connects Wally Lake and Vault Lake, at the Vault Pit area approximately 8 km north of the main Meadowbank site. Vault Dike is essential to allow the dewatering of Vault Lake and to isolate Vault Pit from Wally Lake during mining activities.

Vault Dike is designed and constructed as a zoned rock fill dam with filter zones, an impervious upstream liner consisting of a bituminous membrane, and an upstream key trench made of aggregate mixed with bentonite. The filter zones minimize seepage and internal erosion and facilitate seepage collection. Vault Dike includes a key trench at the base of the upstream side filled with a 0-25 mm fill amended with bentonite surrounding the liner. Coarse and fine filter material was placed on the upstream slope as geomembrane bedding. The bulk part of the dike consists of coarse rock fill material. The embankment crest is at El. 142.4 m and the upstream toe is at approximately El. 139.4 m. The downstream toe is at approximately El. 139.6 m and the bottom of the key trench ranges from El. 135.6m to El. 142.3m, with an average height of El. 137.0m. The upstream and downstream fill slopes of the dam are 1.5H: 1V. The Vault Dike is approximately 275 m in length through a maximum water depth of 1 m. The crest width is approximately 25 metres.

Table A.1: Meadowbank Dewatering Dikes Summary of Consequences and Proposed Monitoring/Action for Rare Events Based on Water Retaining Embankment Failure Modes Identified in ICOLD Study (1995)

Failure Mode	Scenario	Consequence	Monitoring/Action
Overtopping	(1) Lake level rise because of restricted outflow from Third Portage, Second Portage Lake or Wally Lake (excessive inflow is a far less likely scenario).	Water spilling over the crest. The crest is wide and comprises coarse rock fill. Significant damage to the dike is not credible, based on performance of other rock fill structures subjected to overtopping or flow through events. Mining operations might need to be suspended, but there will be considerable warning time given the design freeboard and the storage volume within the lakes.	Lake levels should be part of safety information provided to mine management. Outflow channels should be inspected weekly during thaw, open water season, and during ice break-up. If overtopping is likely, a temporary spillway could be constructed and armoured to control and localize flow at shallow dike sections.
	(2) Dam crest settles more than 2m over a distance of (say) 50m or so. This scenario requires extensive loss of support in the foundation since the rock fill of the dikes is essentially not settlement prone itself. For foundation settlement of this magnitude to occur, a piping event must develop and which in itself might be a failure mode. Or, there would have to be an unexpected layer of compressible soil in the foundation.	Same as (1).	The situation envisaged in this scenario should develop slowly with crest settlement evident at least several weeks before a run-away event develops. Easily observed cracks should be evident. Monitoring of crest settlement is appropriate, and is included in the design. Rockfill and till available from the mining operation can be placed to raise the dike crest.
Internal Erosion	(1) Dike Section: Cut off wall, cut off key trench or bituminous liner is defective, allowing high water flow across the wall. This defect occurs at a deep water location where the core backfill and filters are segregated and permeable; the combination allows erosion of the cut off wall and increasing seepage.	The cut off wall will develop a progressively increasing void ratio, thereby increasing the rate of water flow through the dike. This is not a catastrophic failure mode as the rockfill shoulders of the dike will be stable, and at its worst, would lead to temporary suspension of mining.	Monitor seepage from downstream face for rate of seepage, and for presence of sediment in seepage. Will become evident as localized intensive seepage at dike toe and can be repaired. May also see settlement in the cut off wall. Will be most likely in deep water sections. Gradients across the cut off wall in shallow water are not high enough to cause piping.
	(2) Dike Section: Cut off wall loses bentonite because of improper construction.	Same consequences as erosion because of defect, as above.	Bentonite makes up 2% of the cut off wall fill. Loss of this material will increase the permeability of the cut off wall and increase the rate of seepage.

Failure Mode	Scenario	Consequence	Monitoring/Action
	(3) Foundation: Till is possibly non-uniform with more transmissive zones and not self-filtering. It is possible that one of these zones may align with defective construction of the core backfill and defective construction of the cut off wall allowing high flows. Seepage along the transmissive zone beneath the downstream rockfill section could erode the foundation tills at the downstream toe or flow into the downstream rockfill because of the lack of filtering.	Limited seepage at the toe or into the rockfill would accelerate into a large inflow, and could lead to the undermining of the dike if no action was taken. This is a credible catastrophic failure mode if increased seepage is not detected in time.	No particular instrumentation is needed as this failure mode will show itself as localized and increasing seepage. It could be detected by walk-over inspection by an experienced engineer or technician. Remedial action could comprise a reverse filter and rockfill buttress depending on location of the flow and configuration of the foundation, freezing, or grouting if identified in time. Quality control of cut off is important, and most important for deep water sections. In the worst case, the pit may be deliberately flooded in a controlled manner, the cut off repaired, and the pit dewatered.
Seepage within Embankment	Seepage on its own is not a credible failure scenario. The downstream rockfill shell has extremely high flow through capacity. The rockfill zone is both large and pervious, so that seepage will daylight on the downstream face and lead to instability. Any seepage related failures must include internal erosion, see above.	No credible consequences. May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage.	Seepage monitoring program.
Seepage within Foundation	Defective construction of cut off leading to transfer of unexpectedly high fraction of the reservoir head into the downstream part of the dike foundation, or leading to a piping event as above.	This failure mechanism has caused embankment failures elsewhere because of straightforward pore pressure induced instability. However, it is unclear that it could cause failure of the Dewatering Dikes because of their large width compared to the retained water head. The most likely consequence is downstream toe slumping requiring a localized stabilizing berm before the crest roadway could be reinstated.	If this mechanism arises it should show itself during initial dewatering or very shortly thereafter.

Failure Mode	Scenario	Consequence	Monitoring/Action
Internal Conduit Rupture	There are no water off take works or other structures extending through the dikes.	Not applicable.	Not applicable.
Slope Instability	(1) Normal Operation: The rockfill shoulders of the dikes are wide and have high shear strength, making it a conservative design. Slope failure requires failure in the foundation and which would then extend into the overlying dike. Sliding failure is considered unlikely given the low horizontal forces generated by water and ice forces relative to the normal frictional force due to the weight of the dikes and the friction angles of foundation materials	A foundation failure would cause a rotational slip or sliding failure until equilibrium was reached. This mechanism would limit access along the dike until repaired. Failure through the rockfill shoulders will not necessarily compromise the water retaining function of the dikes. Failures which reach the core may cause failure.	This mechanism should develop during construction or dewatering, due to increase in load and associated pore water pressure increase. Initial stages of failure should be observable as tension cracks in the dike crest. Walk-over inspection of the dikes by a trained inspector is an appropriate monitoring strategy. Survey of crest, face, and toe is also appropriate. Stabilizing berms can be placed inside the dikes or through water along the upstream shoulder.
	(2) Earthquake Induced: Occurrence of an extreme earthquake, much in excess of the current understanding of seismicity of the area.	The extreme earthquake loading for this site is a low magnitude. Settlement of the dikes could occur in the event of a large earthquake. Dynamic compaction of the core during construction may have subjected the rockfill shells to accelerations equivalent to the expected earthquake loading. This would not be a failure situation. The crest is also erosion resistant for any earthquake induced wave action in the impounded water.	Dike inspection following earthquakes felt on site.

Failure Mode	Scenario	Consequence	Monitoring/Action
Failure of Cut off Wall or Bituminuous Liner Due to Movement of the Dikes	Differential horizontal movement of dikes due to water or ice loading, or pit wall failure. Creates a breach in the cut off wall, cut off key trench or bituminuous liner. Ice and water forces are not credible due to the ratio of frictional forces generated by the weight of the dike versus ice loads and water pressure. Pit wall failure involving the dike unlikely based on assessments of pit wall stability and setback distance between the pit and the dikes.	Large inflows through the breach. Pit would flood requiring suspension of mining activities. Potential for loss of life for workers inside dikes.	No enhanced monitoring. Prism monitoring program sufficient. If the pit floods, then repairs to cut off or bituminuous liner would be done prior to dewatering.
Unexpected Settlements	Unexpected foundation soils consolidate during dike construction. A significant quantity of clay that was not recognized during foundation excavation would be required to generate settlement required for a water release event. Settlement of the core will be limited by dynamic compaction.	2 m of core settlement would be required to allow water flow through the rockfill and over the settled core. This flow would not cause failure of the rockfill shells. It would also be readily repaired by placing more end-dumped till into the settled zone.	No enhanced monitoring required, as settlement would be apparent from prism monitoring data and visual inspection. Excessive settlements may be remediated by excavating rockfill above the core and placing more till. Soil conditions will be observed during construction, and design revised to accommodate actual conditions.

A.1.1 Failure Scenario during Operations

The 'worst-case' scenario for failure of the dewatering dikes during operations would involve a movement of the dikes that compromises the integrity of the cut off wall, cut off key trench or bituminous liner. However, the rockfill has a very high flow-through capacity and a high strength and will not move unless the foundation is involved. The water will flow through the upstream rockfill first, then through the core and cut off wall, cut off key trench or bituminous liner, and finally through the downstream rockfill berm. Flow through cracks opening in the foundation may erode the foundation soils and the core. The upstream rockfill will choke the flow to some degree, and flow will decrease once the downstream toe of the dike is inundated and the head difference across the dike begins to reduce.

Although this describes a 'worst-case' scenario, a catastrophic failure of the pit dewatering dike system is not considered a credible failure mode. Elements of the dike design, including the width of the dike section, and the inclusion of filters, in addition to the cut off wall, cut off key trench and bituminous liner make catastrophic failure of the dike highly unlikely. However, for the purposes of this document, the effects of such a failure are described below.

<u>Potential Effect</u>

In the case of East Dike, the worst-case scenario would be associated with the short portion of the dike through the deepest water along the alignment at the centre of the dike. In this area the water depth is as much as 7 m to bedrock at the cut off wall within the dike. This inflow could potentially result in loss of workers caught in flowing water. Breach of the East Dike would be unlikely to trap workers in the pit when access ramps are on the west side, opposite the inflows. Breach of the East Dike would result in cessation of mining, either temporarily or permanently.

Upon completion of the East Dike and dewatering of the northwest arm of Second Portage Lake, there was approximately 17 million m^3 (Mm^3) of water remaining in Second Portage Lake. If the segment of dike at the deepest portion were suddenly removed, flow from Second Portage Lake into the pit would continue until the elevation of the lake drops by several metres, at which time the current lake bottom would be exposed and would act as a barrier to flow towards the pit. This scenario is the worst in the final year of pit operation when pit volume is the largest. The volume of water associated with this drawdown would be on the order of about 10 Mm^3. Some erosion of the till between the pit crest and dike toe would be expected, so the depth of water loss from the lake may be larger, but this would take some time to fully develop.

Inflow to the pit could expose large amounts of shoreline and shoal habitat around the lake. Water flowing into the pit could entrain suspended solids and dissolved constituents from the dike material and pit walls. If necessary, the water could be retained within the pit and diked area and would be amenable to treatment (e.g., particle settling, in-situ amendment) before discharge, should it be required.

The ecological effects of the exposure of shoreline and shoal habitat on fish and fish habitat would be to temporarily eliminate spawning areas and result in reduced water quality from exposure of sediment to wave and wind induced erosion. The effect of this would last approximately one year as inflow from Third Portage Lake to Second Portage Lake averages 10 Mm^3 annually (AMEC, 2003). Presuming that the dike breach is repaired, water levels in Second Portage Lake would rise over the spring and summer to return to pre-breach elevations and would re-fill the lake in the event of a 'worst-case' scenario.

In the case of Bay Goose Dike, the worst-case scenario dike breach that could allow the greatest amount of water inflow would be associated with the southeast segment of the dike through the deepest water along the alignment. In this area, water depth is as much as 20 m deep at the cut off, and the pit could be as deep as 130 m. This inflow could potentially result in loss of workers caught in flowing water. Breach of the Bay Goose Dike would be unlikely to trap workers in the pit when access ramps are on the northwest side, opposite the inflows. Breach of the Bay Goose Dike would result in cessation of mining of the Goose Pit, either temporarily or permanently.

In the unlikely event that such a failure of the Bay Goose Dike were to occur, the rate and volume of water entering the downstream pit would depend on the magnitude of the breach and the length of time to repair the breach. Third Portage Lake has an estimated volume of 446 Mm^3 (Golder, 2006). The final volume of Portage Pit (38.1 Mm^3) is roughly 8.5% of the volume of the lake, while Goose Pit (8.2 Mm^3) is approximately 1.8% of the volume. In the case of a catastrophic breach of the Bay Goose Dike, the estimated Third Portage Lake water level drawdown would be approximately 1.0 m and 0.5 m, respectively assuming that the failure occurs when the pits are completely excavated and a complete filling of the pits. These estimated worst-case scenario changes in water level are comparable to the mean average annual difference between high and low water (0.3 m) on Third Portage Lake.

There would be a small impact to fish and fish habitat in Third Portage Lake in the event of a 0.5 m to 1.0 m drop in water level. Areas used for spawning may be slightly nearer to the ice cover and a small amount of habitat might be vulnerable to freezing. Water quality within the pit would be temporarily impaired from an increase in suspended and dissolved solids, although water quality would return to near background during the first winter as sediment would settle under the ice cover.

In the case of South Camp dike, the worst-case scenario dike breach that could allow the greatest amount of water inflow would be associated with the centre segment of the dike through the deepest water along the alignment. In this area, the water depth is only a maximum of 1 m. This inflow could put the workers at risk at the site on a temporary basis and a potential loss of life between 0 and 10 due to workers caught in flowing water. Breach of South Camp Dike could eventually result in cessation of mining, either temporarily or permanently.

If the segment of dike at the deepest portion were suddenly removed, flow from Third Portage Lake into the pit would continue until the elevation of the lake drew down slightly as South Camp Dike retains a maximum depth of 1 m of water. The impact of a potential failure would likely be limited.

Inflow to the pit could expose a limited amount of shoreline and shoal habitat around the lake. Water flowing into the pit could entrain suspended solids and dissolved constituents from the dike material and pit walls. If necessary, the water could be retained within the pit and diked area and would be amenable to treatment (e.g., particle settling, in-situ amendment) before discharge, should it be required.

The ecological effects of the dike failure will probably have no significant fish or wildlife habitat, affected or deteriorated. Presuming that the dike breach is repaired, water levels in Third Portage Lake would rise over the spring and summer to return to pre-breach elevations and would re-fill the lake in the event of a 'worst-case' scenario.

In the case of Vault dike, the worst-case scenario dike breach that could allow the greatest amount of water inflow would be associated with the centre segment of the dike through the deepest water along the alignment. In this area, the water depth is only a maximum of 1 m. This inflow could put the workers at risk at the site on a temporary basis and a potential loss of life between 0 and 10 due to workers caught in flowing water. Breach of the Vault Dike could eventually result in cessation of mining, either temporarily or permanently.

If the segment of dike at the deepest portion were suddenly removed, flow from Wally Lake into the pit would continue until the elevation of the lake drew down slightly as Vault Dike retains a maximum depth of 1 m of water. The impact of a potential failure would be limited.

Inflow to the pit could expose a limited amount of shoreline and shoal habitat around the lake. Water flowing into the pit could entrain suspended solids and dissolved constituents from the dike material and pit walls. If necessary, the water could be retained within the pit and diked area and would be amenable to treatment (e.g., particle settling, in-situ amendment) before discharge, should it be required.

The ecological effects of the dike failure will probably have no significant fish or wildlife habitat, affected or deteriorated. Presuming that the dike breach is repaired, water levels in Wally Lake would rise over the spring and summer to return to pre-breach elevations and would re-fill the lake in the event of a 'worst-case' scenario.

Mitigation, Management, and Monitoring

A major cut off breach scenario due to pit wall movement, while possible, has a low probability of occurrence in East Dike or Bay Goose Dike. If foundation movement was sufficient to compromise the cut off wall, then the core backfill would act as a semi-permeable element and limit flow. Water would first need to flow through the rockfill shell, the core backfill, the damaged cut off wall, and then through more of the core, filters, and the downstream rockfill. Provided that the downstream filter elements against the rockfill shell are properly constructed, then migration of the core and cut off wall into the rockfill will not occur. Some additional seepage may occur due to failure of the cut off wall; however this would be noted during regular monitoring. Mitigation could be by jet grouting, freezing, or installation of sheet piling through the cut off wall.

The use of appropriately graded filters in the design of dikes and dams is standard engineering practice, and is the key to preventing internal erosion. The dike design includes the use of a two zone filter on the upstream face of the pit side rockfill. During the construction of the dikes a quality control and quality assurance program was undertaken.

Routine visual inspection of the dikes is to be conducted on a regular basis to document any changes in the dikes.

During the operation of the dikes, a series of monitoring instrumentation will be installed, including:

- Thermistors to monitor the thermal regime in the dike and foundations;
- Slope inclinometers and prisms to monitor deformations within the dikes; and
- Piezometers to measure pressure and to infer flow through the dikes.

Piezometers downstream of the cut off wall would be monitored for pressure changes as the pits are deepened. Increasing pressure would indicate that less head loss is occurring across the seepage cut off, which might indicate that a crack has formed, permeability is increasing, or the pit is experiencing inflows from some other potential flow pathway. The instrumentation will be monitored to identify any potentially problematic areas relating to dike instability. Mitigation measures for seepage and piping could include:

- Additional pressure grouting of bedrock materials;
- De-pressurization wells;
- Construction of a slurry cut off wall within the core just upstream of the suspected seepage area;
- Jet grouting of the core and foundation in the suspected seepage or crack area;
- Construction of a cutter soil mixing (CSM) wall in the suspected crack area;
- Freezing;
- Installation of toe drains; and
- Construction of interceptor ditches within the down-stream overburden materials.
- Allow pit to flood, install new cut off or bituminous liner under no-flow conditions, then dewater and resume mining.

Specific monitoring and mitigation strategies have been developed as part of an Operations Plan (OMS Manual) for the dewatering dikes.

A.1.2 Failure Scenario during Closure

At end of mine life, once the water quality of the pit lake has been determined to be suitable for release, a portion of the south end of the Bay-Goose Dike will be removed resulting in a hydraulic connection between the Goose/Portage Pit Lake and Third Portage Lake. The East Dike will be the only dike that will remain in service. The elevation of the pit lake will be equal to Third Portage Lake. The elevation difference between the pit lake and Second Portage Lake will be approximately 1 m. Consequently, there will be a low hydraulic gradient from the pit lake towards Second Portage Lake. During the closure and post-closure period, the natural central and east channel outlets that connect Third Portage to Second Portage Lake will continue to carry the entire flow between the two lakes.

<u>Potential Effect</u>

A breach of the East Dike would create an additional outlet and cause water to leave the Portage/Goose pit area and spill into Second Portage Lake at a greater rate, partly at the expense of flow from the central and east channel outlets. This would cause a rise in water level in Second Portage Lake and a reduction in level in Third Portage Lake. The additional water would flow through the channel connecting Second Portage Lake to Tehek Lake until the water elevations in Second and Third Portage lakes equilibrated.

In the event of such a scenario, water would flow from Third Portage Lake, northward through the pit lake area, and then east through a potential East Dike breach and into Second Portage Lake. There is a naturally large outlet capacity via the connecting channel from Second Portage to Tehek Lake. Water residence time in Second Portage Lake during and after mine development is less than one year. Thus, in the event of an East Dike breach, any additional water added to Second Portage Lake would leave the system relatively quickly. Given the flow-through nature of the lake there would be little net change in Second Portage Lake volume or lake elevation as water would easily be absorbed into the much larger Tehek Lake.

Drawdown of Third Portage Lake would be limited, given the large size of the lake (33 km^2) and the constriction points within the system that would slow drawdown. Specifically, the magnitude of drawdown in the event of a breach would depend on the magnitude and depth of the breach, time of year (winter ice cover would prevent loss of water), response time, flow rate (i.e., the loss of water depends on the location of the breach and friction through the system), and the outlet capacity of Second Portage Lake. For example, total annual average discharge from Third Portage to Second Portage Lake is approximately 10 Mm^3 with a mean annual difference in water level between spring and fall of 0.3 m. Given the large size of Third Portage Lake, a breach resulting in the loss of 10 Mm^3 of water, which is equivalent to an entire open water season of runoff through all discharge channels would result in a drawdown of only about 0.3 m. Maximum drawdown would be one metre.

Reductions in water level would therefore be small and have only minor impacts to fish habitat in Third Portage Lake. Adverse impacts to water quality would not be expected given that water quality within Goose/Portage pits is expected to be very high.

Mitigation, Management and Monitoring

Internal erosion of the cut off wall could result in an increase of the rate of water flow through the East Dike. However, this is extremely unlikely due to the low hydraulic gradient across the East Dike (~ 1 m of head difference) and the filter effect of the core backfill. Such a scenario is more likely to occur during the operational phase of the East Dike when the hydraulic gradient across the dike section is much higher, though in the opposite direction. If such a scenario were to occur, it would not be considered a catastrophic failure mode due to the stability of the rockfill shoulders comprising the outside structural elements of the dike.

A breach in the East Dike during closure could be managed by the placement of material to reduce the flow of water and reduce potential erosion of the till core. The hydraulic gradient across the dike at closure is low. The dike could be repaired and hydrologic conditions restored without any danger to the overall stability of the dike, provided annual monitoring is carried out following closure.

OIL HANDLING FACILITY

OIL POLLUTION EMERGENCY PLAN

For

Meadowbank Mine Fuel Farm in Baker Lake

May 2017

Version 8

EXECUTIVE SUMMARY

This document presents the Oil Pollution Emergency Plan for Agnico Eagle Mines Limited (Agnico) Meadowbank Division. This plan is pursuant to the Canada Shipping Act 2001; and all the subtending regulations.

Oil Pollution Emergency Plan (OPEP) designates lines of authority, responsibility, establishes proper reporting and details plans of action in the event of a spill. This plan applies to the operational phase of the fuel transfer which takes place at Agnico Eagle Ltd.'s Baker Lake Marshaling Facilities and Oil Handling Facility located at latitude 64°18'36"N and longitude 95°58'04"W.

A hard copy of the OPEP will be available at the Baker Lake Marshalling facility during the transfer operations.

ACRONYMS

Agnico	Agnico Eagle Mines Limited
ECC	Emergency Control Center
ERT	Emergency Response Team
ERP	Emergency Response Plan
Fuel	P50 Arctic Grade diesel fuel and/or Jet-A aviation fuel
IMO	International Maritime Organization
MARPOL	*The International Convention for the Prevention of Pollution from Ships,* 1973, and the *Protocols* of 1978 and 1997, as amended from time to time
OHF	Oil Handling Facility
OPEP	Oil Pollution Emergency Plan
SCP	Spill Contingency Plan
SOPEP	Ship Oil Pollution Emergency Plan
SMP	Spill Management Plan
TEU	Twenty-foot equivalent unit

DISTRIBUTION LIST

Agnico - Environmental Superintendent

Agnico – General Mine Manager

Agnico – Health and Safety Superintendent

Agnico – Energy and Infrastructures Superintendent

Agnico – General Services Superintendent

Agnico – ERT Emergency Measures Councilor

Baker Lake – Baker Lake Hamlet Office

Baker Lake – Fire Department

Coastal Shipping Limited – General Manager

Transport Canada – Marine Pollution Officer

Canadian Coast Guard Environmental Response

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
0	12/09/02	All	All	Comprehensive plan for Agnico's Baker Lake Fuel Farm Facilities
1	12-09-17		10, 12, 13	P10: Tide and Currents reference change; P12: Rephrasing of the last paragraph title; P13: in INITIAL SPILL RESPONSE PRIORITIES table into Section 2 RESPOND SAFELY, rewording to show only diesel fuel actions.
2	13-03-30	6 & App. D	10	Oil Handling Facility Declaration; 2013 Jet-A to start being stored at OHF
			12	Adequate lighting required during fuel transfer
		9	20 21	Item list on inside door of each Sea can. Internal Contacts Updated
		10 & App. C	23	Update to Agnico site spill training & Location of training records
		13	29	Major Failure At Helicopter Island
		14 & App. E	30	In-situ Burning
		16	32	New for 2013
3	January 2014	ALL		Comprehensive Review
4	July 2014	ALL		Comprehensive Review after Transport Canada Assessment
5	November 2014	ALL		Comprehensive Review following non-compliance letter received from Transport Canada
6	July 2015			Annual Comprehensive Review
		Sec 1	1	Update Declaration
		Fig 5	18	Update Pager numbers
		Table 5,6,7	26&27	Update Contact numbers
		Footnote 3	35	Contact date for JJ Brickett with CCG
		Table 8	44	Update Training Dates
7	May 2016	Sec 1	1	Update Declaration
		Fig 5	18	Update Pager number
		Tables 5,6,7	26-28	Update Contact numbers
		Table 8	45	Update Training Dates

		Appendix A		Update Contact numbers
		Appendix D		Update Meeting Minutes
8	May 2017	Sec 1	1	Update Declaration
		Fig 5	18	Update Pager number
		Tables 5,6,7	31-33	Update Contact numbers
		Section 10.2.1	40	Add details related to the Fisheries Act Regulation and Birds Migratory Convention
		Table 8	50	Update Training Dates
		App. B	55	Removed Appendix B Transfer Conduit Annual pressure Test as per TC Inspector's comments

Prepared By: ______________________

Erika Voyer
Environment General Supervisor

Approved by: ______________________

Jamie Quesnel
Nunavut Environment Superintendent

Table of Contents

FIGURES

TABLES

APPENDICES

SECTION 1. OIL HANDLING FACILITY DECLARATION

Pursuant to paragraph 168(1) (b) (i) of the Canada Shipping Act 2001, Agnico Eagle Mines Ltd. (Agnico) has signed an Oil Handling Facility Declaration. This Declaration can be found posted at the Oil Handling Facility (OHF).

OIL HANDLING FACILITY DECLARATION

Pursuant to paragraph 168(1) of the Canada Shipping Act 2001, I, Jamie Quesnel (Name of the operator of the oil handling facility), declare that to comply with the Oil Handling Facility Regulation, Respecting the circumstances in which operators of oil handling facilities shall report discharges or anticipated discharges of pollutants, the manner of making the reports and the persons to whom the reports shall be made; all the information contained in the submission is true and complete to the best of my ability and accurately reflect our interpretation of the regulations.

The persons listed below are authorized to implement the oil pollution emergency plan:

NAME	COMPANY	ADDRESS	PHONE	EMAIL
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(Signed by the operator of the oil handling facility or its representative)

May 17, 2017
(Date)

AGNICO EAGLE

SECTION 2. GENERAL INTRODUCTION

The Oil Pollution Emergency Plan (OPEP) is to set in motion the necessary actions to stop or minimize the loss of fuel resulting from a mishap at Agnico Eagle Mines Limited's Baker Lake Fuel Farm Oil Handling Facility located in Baker Lake, Nunavut during the ship to shore fuel transfer. Additionally, it provides direction to Agnico personnel and/or contractors at the laydown and tank farm areas, and to Agnico's Emergency Response Team (ERT) for emergency spill response situations; describes oil pollution scenarios, defines the roles and responsibilities of management and responders; and outlines the measures taken to prevent spills. The purpose of the OPEP is to minimize potential health and safety hazards, environmental damage and cleanup costs.

2.1 Fundamental Principles

The following OPEP is submitted for compliance to the Canada Shipping Act 2001 and all the subtending regulations and to outline the appropriate spill response protocol during fuel transfer operations at the Baker Lake OHF. A hard copy of the OPEP will be located on site for reference and review during transfer operations. This OPEP will be reviewed annually and updates will be provides to TCMSS for compliance prior to every shipping season. The following priorities shall be taken into account when responding to an oil pollution incident and in the following order:

1. Safety of the workers;
2. Safety of the OHF;
3. Safety of the community of Baker Lake;
4. Prevention of fire and explosion;
5. Minimize of the oil pollution incident;
6. Notify and reporting of the oil pollution incident to associated Governing bodies;
7. Environmental impact of the spill;
8. Complete clean-up from the oil pollution incident.

2.2 Legislative Requirements

This plan was prepared in accordance with federal legislation listed below, which lists legislative instruments applicable to Agnico's Baker Lake Fuel Oil Handling Facility. All requirements found in the Canada *Shipping Act*, *2001*, ss. 168 are laid out in the Meadowbank Mine site OHF Concordance Table which will be submitted to Transport Canada as a stand-alone document.

The OPEP complies with the requirements for procedures, equipment and resources as set out in the *Canada Shipping Act* (s.s. 660.2(4)) specific to a fuel handling facility - the bulk incoming transfer of fuel from ship-to-shore and spill scenarios directly relating to this operation.

The following standards and regulatory requirements have been reviewed in preparation of this document:

- Canada Shipping Act;
- Response Organizations and Oil Handling Facilities Regulations;
- Vessel Pollution and Dangerous Chemical Regulation;
- Environmental Response Arrangements Regulations;
- Oil Handling Facilities Standards (TP 12402E);
- Response Organization Standards (TP 12401);

- Arctic Waters Oil Transfer Guidelines (TP 10783);
- Environmental Prevention and Response National Preparedness Plan (TP 13585);
- Release and Environmental Emergency Notification Regulations;
- Guidelines for reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants; and
- Requirements of the Central & Arctic Regional Response Plan.

2.3 Related Documents

Management and monitoring plans for Meadowbank mine that provided input to the Oil Pollution Emergency Plan include the following:

1. Spill Contingency Plan;
2. Emergency Response Plan; and
3. Shipboard Oil Pollution Emergency Plan[1].

The cornerstones of contingency planning for Agnico are the Spill Contingency Plan and the Oil Pollution Emergency Plan. These, coupled with the Emergency Response Plan, describe the processes to be followed in responding to a spill. The OPEP on its own provides the necessary information in the event of a mishap where fuel is lost during the transfer of fuel from a tanker vessel to the Fuel Tank Facility.

The OPEP complements the Spill Contingency Plan and it should not be construed as superseding it. The Spill Contingency Plan addresses a wider scope of operations stretching 110 kilometers from the Meadowbank mine site in the north to their infrastructure in the south. The OPEP strictly covers the transfers of fuel from ship to OHF.

2.4 Meadowbank Mine Oil Pollution Emergency Plan

This Plan is a working document that will be reviewed annually and updates provided to TCMSS for compliance prior to every shipping season.

This plan specifically centres on the activities in ship-to-shore transfer of fuel from a small tanker delivering fuel to Agnico's Baker Lake Fuel Tank Facility constructed in Baker Lake. On site personnel at the Facility are expected to respond to spill incidents (generally smaller than $1m^3$) that can be contained and cleaned up without assistance, while the Emergency Response Team will respond to larger spills.

Fuel is being delivered to Agnico's Baker Lake Fuel Farm by Coastal Shipping Limited, a Division of the Woodward Group of Companies. Fuel is stored within the existing tank farm owned and operated by Agnico. The Shipboard Oil Pollution Emergency Plan (SOPEP) is the responsibility of the shipping company. The outline of the SOPEP prepared by Coastal Shipping Limited can be found in Appendix A – 1.1.

[1] *The Shipboard Oil Pollution Emergency Plan (SOPEP) contains all information and operational instructions as required by the "Guidelines for the development of the Shipboard Marine Pollution Emergency Plan" as developed by the International Marine Organization. Woodward's, the shipping company, is responsible for this Plan.*

SECTION 3. PLANNING STANDARDS

3.1 Facility Category

Oil handling facilities are categorized according to their maximum oil transfer rate in cubic meters per hour, in respect of the oil product loaded or unloaded to or from a ship, as follows (Table 1):

Table 1 - Category of OHF

Category of Oil Handling Facility	Maximum Oil Transfer Rate (cubic meters/hour)
Level 1	150
Level 2	750
Level 3	2 000
Level 4	More than 2 000

The product transfer rate (Diesel and Jet-A) for the Agnico's Baker Lake Fuel Farm OHF at Baker Lake is $400m^3$/hr. As indicated in the OHF Standards TP 12402, this flow rate requires the onsite spill response capacity to meet a Level 2. To do this, the OHF will have the equipment and resources to respond to a $5m^3$ spill within the required timelines specified in the Response Organization and Oil Handling Facility Regulations:

1. Contain and control in one hour of spill detection; and
2. Commence cleanup within six hours after spill detection.

3.2 General Planning Guidelines

3.2.1 Response Time Standards

Agnico and contractor personnel at Baker Lake Fuel Farm have appropriate training to respond to spills, if it is safe to do so (see Table 8). The material onsite can be deployed within one hour to contain a spill of $5m^3$ or less, unless deployment within one hour will be unsafe. Generally, for spill greater than $1m^3$, the OPEP and the Emergency Response Plan (ERP) will be activated and the Emergency Response Team (ERT) located at Meadowbank mine site will come in Baker Lake to help. Realistically, the ERT can be on site within 125 minutes (or less) ready to help for the clean-up activity. If the spill is greater than $5m^3$, material from the Meadowbank Mine site will be required and will be bring at the Baker Lake OHF within 125 minutes to finalize the containment (if not complete) and recovered of the oil pollution incident.

3.2.2 On-Water Recovery

Agnico will have a registered boat at the Baker Lake barge area that is ready to be deployed in the case of an emergency situation. It will have all required components for an industrial use vessel. All personal involved in a response situation will need to have or complete the pleasure craft operator's certification.

If additional water crafts are required to help with the containment of a spill from the OHF, local resources such as Peters Expediting Ltd. and Baker Lake Contracting & Supplies (BLCS) can be use. Contact info for these companies can be found in Table 6.

3.2.3 Dedicated Facility Spill Response Equipment

Agnico has 3 sea cans with spill response equipment at the Baker Lake shore within Agnico's Marshalling area and includes booms that can rapidly be deployed to limit the spread of any spill on water. The list of equipment can be found in Table 2. The spill supplies and resources are in place to respond to a $5m^3$ spill within the required timelines as specified in the Response Organizations and Oil Handling Facility Regulations. These sea cans will be inspected before each transfer season to ensure that all the spill response material and PPE are there and stored in a manner that is organized and accessible in order to comply with regulatory requirements and allow an efficient spill response. See Appendix D – 1.1 for the checklist inspection sheet that can be found in the sea can.

3.2.4 Transfer Conduit

The transfer conduit or hose that is used to transfer fuel from Coastal Shipping Vessels to the Agnico Baker Lake Fuel Farm OHF will be pressure tested annually by Coastal Shipping according to the regulation prior it being placed into service. A copy of the annual pressure test will be made available to TCMSS on request. The transfer conduit will always have a bursting pressure of not less than 4 times its maximum design pressure and the design pressure will be clearly marked on the conduit.

3.2.5 MBK-ENV-0013: OHF / Ship to Shore Fuel Discharge Procedure

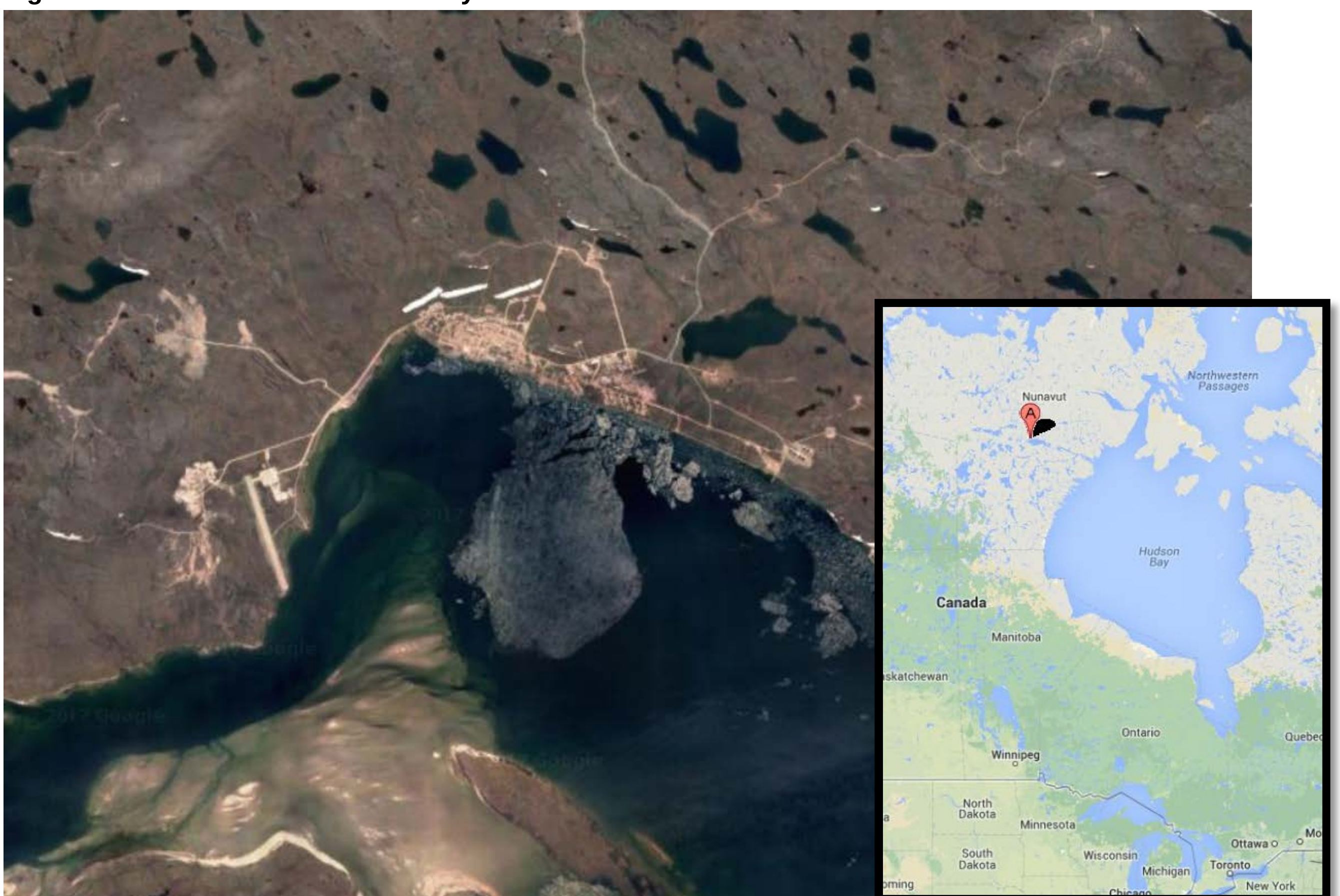
Agnico has created an internal procedure to ensure all planning and precautions are in place prior to the transfer of any fuel from the vessels to the OHF. This procedure can be found in Appendix D – 1.2.

SECTION 4. BAKER LAKE MARSHALLING AREA AND FUEL STORAGE FACILITY

4.1 General Overview and Site Description

Agnico's Oil Handling Facility (OHF) is located in the area of Baker Lake at latitude 64°18 22.778" N and longitude 95°57'33.990" W. The location shown on Figure 1 provides more detail. The Fuel Tank Facility consists of six - 10 million litres diesel fuel[2] (10,000 m^3) storage tanks all holding P50 grade diesel), and 18 tanks holding 1,800,000 litres of Jet-A fuel (Figure 2). The Facility is located adjacent to Agnico's Marshalling area, approximately 250 meters from the shore of Baker Lake at high tide. Power is provided by a generator for the fuel pump module located next to the tank farm.

Figure 1 - Location of the Community of Baker Lake



[2] *1000 litres = 1 m^3 of fuel. Cubic meters are used throughout this document.*

4.2 Fuel Storage Facilities Infrastructure

4.2.1 P-50 Fuel Tanks

The diesel fuel tanks are contained within an impermeable lined and bermed area. The steel fuel tanks have been field-erected and built to API-650 standards with each bermed area holding two tanks. This area is capable of containing 110% of the volume of one 10,000 m^3 storage tank. Each impermeable lined and bermed cell has the following:

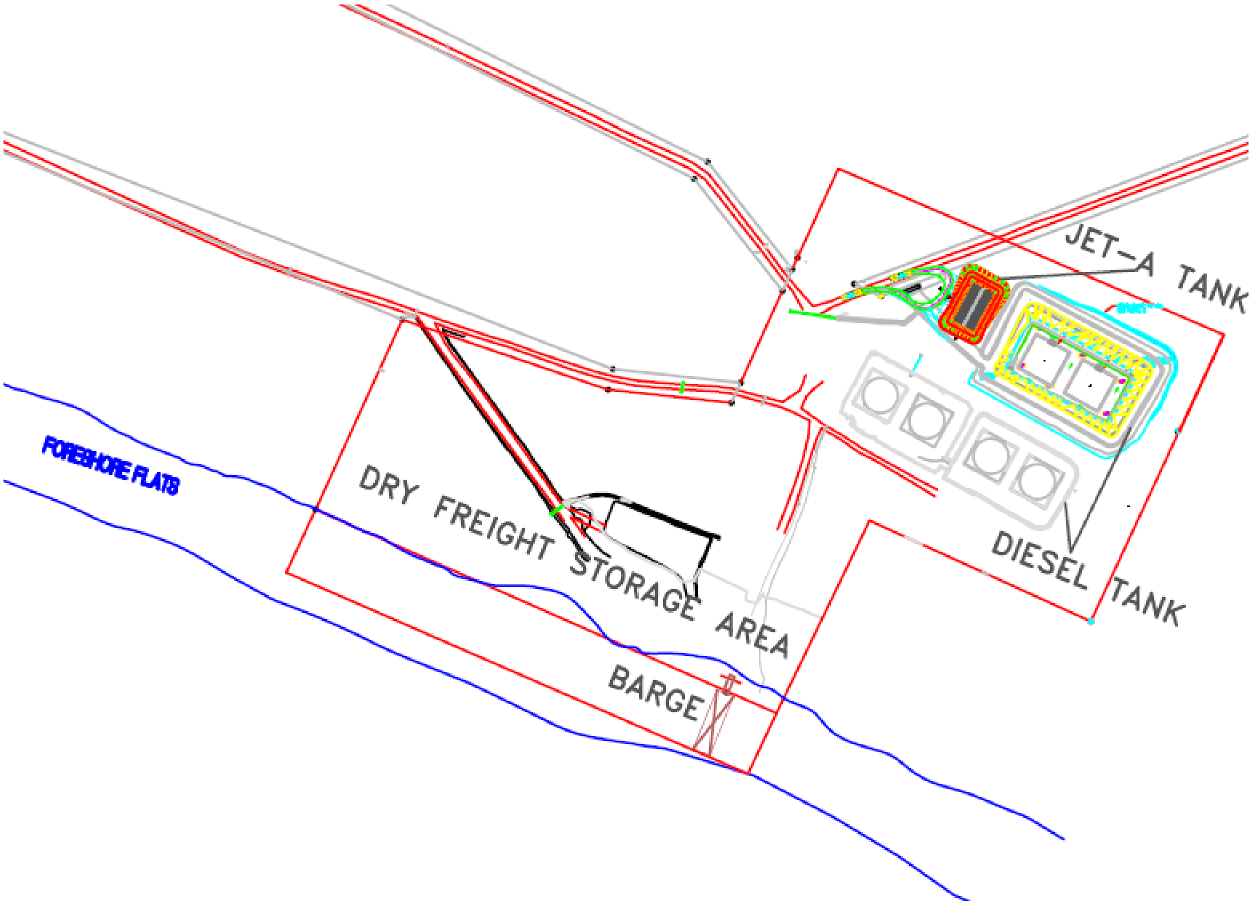
- A granular base for the tank completed with an impermeable LLDPE liner system and granular dikes;
- Two – 10,000 m^3 tanks complete with the required appurtenances such as stairs, base manholes, water draw offs, re-supply nozzle, suction nozzle, tank lighting, tank level monitoring, roof manhole, manual gauge hatch, tank temperature and P/V vent;
- Piping for unloading and loading; and
- Site lighting via fixtures mounted from the dispensing building.

The Tank Farm Facility is designed to meet the following standards:

- National Fire Code 2010;
- *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* – 2008; and
- Canadian Council of Ministers of the Environment, "*Environmental Code of Practice of Aboveground and Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products – 2003* (Updated in 2013) (PN1326)".

The Oil Handling Facility (OHF) is constructed and operated in accordance with Transport Canada Arctic Waters Oil Transfer Guidelines (TP 10783E) and Oil Handling Facility Guidelines (TP 12402E). A fuel dispensing pad area completed with a dispensing unit is located in a lined facility with a provision to capture any and all spills at the fueling area and direct them to a containment area provided at the tank farm.

Figure 2 - Agnico's Baker Lake Oil Handling Facility – Ship to Shore Transfer Area



4.2.2 Jet-A Fuel

The Jet-A fuel tanks are contained within an impermeable lined and bermed area. The steel fuel tanks have been field-erected and built to API-650 standards with the bermed area holding eighteen tanks. This area is capable of containing >110% of the volume of one 100,000L storage tank. The impermeable lined and bermed cell has the following:

- A granular base for the tank completed with an impermeable bituminous liner system and granular dikes;
- Eighteen (18) – 100,000L tanks completed with the required appurtenances such as stairs, base manholes, water draw offs, re-supply nozzle, suction nozzle, tank lighting, tank level monitoring, roof manhole, manual gauge hatch, tank temperature and P/V vent; and
- Piping for unloading and loading.

The Jet-A Fuel Facility is designed to meet the following standards:

- National Fire Code 2010;
- *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* –

2008; and

- Canadian Council of Ministers of the Environment, "*Environmental Code of Practice of Aboveground and Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products – 2003* (Updated in 2013) (PN1326)".

4.3 Baker Lake Shoreline and Marine Characteristics

The following Baker Lake Shoreline and Marine Characteristics were gathered during the Environmental Impact Assessment that was performed prior to construction of the Baker Lake Marshalling facility and Tank Farm.

4.3.1 Topography

The bulk fuel storage area is located east of the Hamlet of Baker Lake, approximately 350 m north of Baker Lake. The OHF sits on a low terrace parallel with the shoreline of the lake. There is a gradual slope (5 to 10% grade) toward Baker Lake with an approximate elevation change of 35 m from the OHF to the Baker Lake shoreline. The Baker Lake shoreline is gently sloping, well-drained and is lined with marine gravels, sands and boulders.

4.3.2 Geology

The regional surficial geology is characterized by sandy till, bedrock outcrops, felsenmeer (ice-shattered bedrock) and shallow lakes (Golder, 2007). The most common soil type in this region is glacial till. Marine beach deposits are found along the north shore of Baker Lake.

The soil near the bulk fuel storage facility is comprised of silts, sands, gravels, cobble and boulders and frost-susceptible glacial till overlying weathered bedrock (Golder, 2007). The soil thickness is typically less than 1.4 m with permafrost or bedrock encountered at less than 2 m. Approximately 60% of the surface area surrounding the bulk fuel storage facility is comprised of bedrock outcrop.

4.3.3 Flora and Fauna

There are no trees and few shrubs in the area surrounding the bulk fuel storage facility. The site is covered by low-lying vegetation; predominated by grassy hummocks, dwarf willow, sedge, green moss and lichen.

Arctic ground squirrels, ptarmigan and songbirds are inhabitants in the area surrounding the bulk fuel storage facility. Lake cisco, lake trout, arctic char, lake whitefish, round whitefish, slimy sculpin and stickleback are predominant species found in Baker Lake.

4.3.4 Subsurface Conditions

Test pits excavated in 2005 near the Bulk Fuel Storage Facility and between the tanks and the shoreline indicate a saturated top layer (0.2 m) of organic material (primarily green moss) (Golder, 2005; 2007). A layer of grey to black medium sand is present up to 0.7 m thickness throughout the area, below which a saturated, grey brown, sand and silt layer is found.

Bedrock is exposed at shallow depths throughout the site in locations where topsoil or till soils are present (Golder, 2005). Bedrock is encountered at a maximum depth of 1.4 m. As predicted by the soil conditions, seepage flows in test pits indicate high site drainage (*Baker Lake Bulk Fuel Storage Facility Environmental Performance Monitoring Plan Version 3; June 2014*).

4.3.5 Water Quality

Baker Lake water quality closely resembles distilled water as many conventional water chemistry parameters are at or below detection limits (BAER, 2005). The water column is generally well mixed and the water chemistry homogenous. During the open water season there is limited vertical stratification in temperature and dissolved oxygen, with observed higher salinity in the bottom strata.

4.3.6 Bathymetric Data

As required by Water License 2AM-MEA1525 Schedule B, Item 4: *A bathymetric survey(s) conducted prior to each year of shipping at the Baker Lake Marshaling Facility*. The result of this annual bathymetry can be provided if needed.

4.3.7 Tides and Currents that Prevail at the Facility

There is a general southward current in Hudson Bay at Chesterfield Inlet of about 19 km/day (CCG 2008). Tides are 4.6 meters with strong cross-currents at Chesterfield Inlet; usually flowing south-west at about 1.85 km/hr.

4.3.8 Meteorological Conditions Prevailing at the Facility

Monthly meteorological data has been collected from 1971 to 2000 from the Baker Lake “A” climate station, which is a Meteorological Service of Canada climate station. Snow and rain are combined to give monthly average precipitation. The prevailing winds for the area are generally from the north to north-west and average 20.4 km/hr.

4.3.9 Surrounding Area Environmental Sensitivities

The community of Baker Lake is a hamlet in the Kivalliq Region, in Nunavut on mainland Canada. Located 320 km inland from the west coast of the Hudson Bay, it is near the nation's geographical centre, and is notable for being the Canadian Arctic's sole inland community. The hamlet is located at the mouth of the Thelon River on the shore of Baker Lake.

The freshwater provided to the community is taken in Baker Lake. The freshwater intake is located approximately 3.4 km from the Meadowbank OHF. See Figure 3 below for the exact location. In case of a spill during fuel transfer, preventive action will be taken to avoid any contamination in close proximity of the water intake and cause health and safety problems to the community:

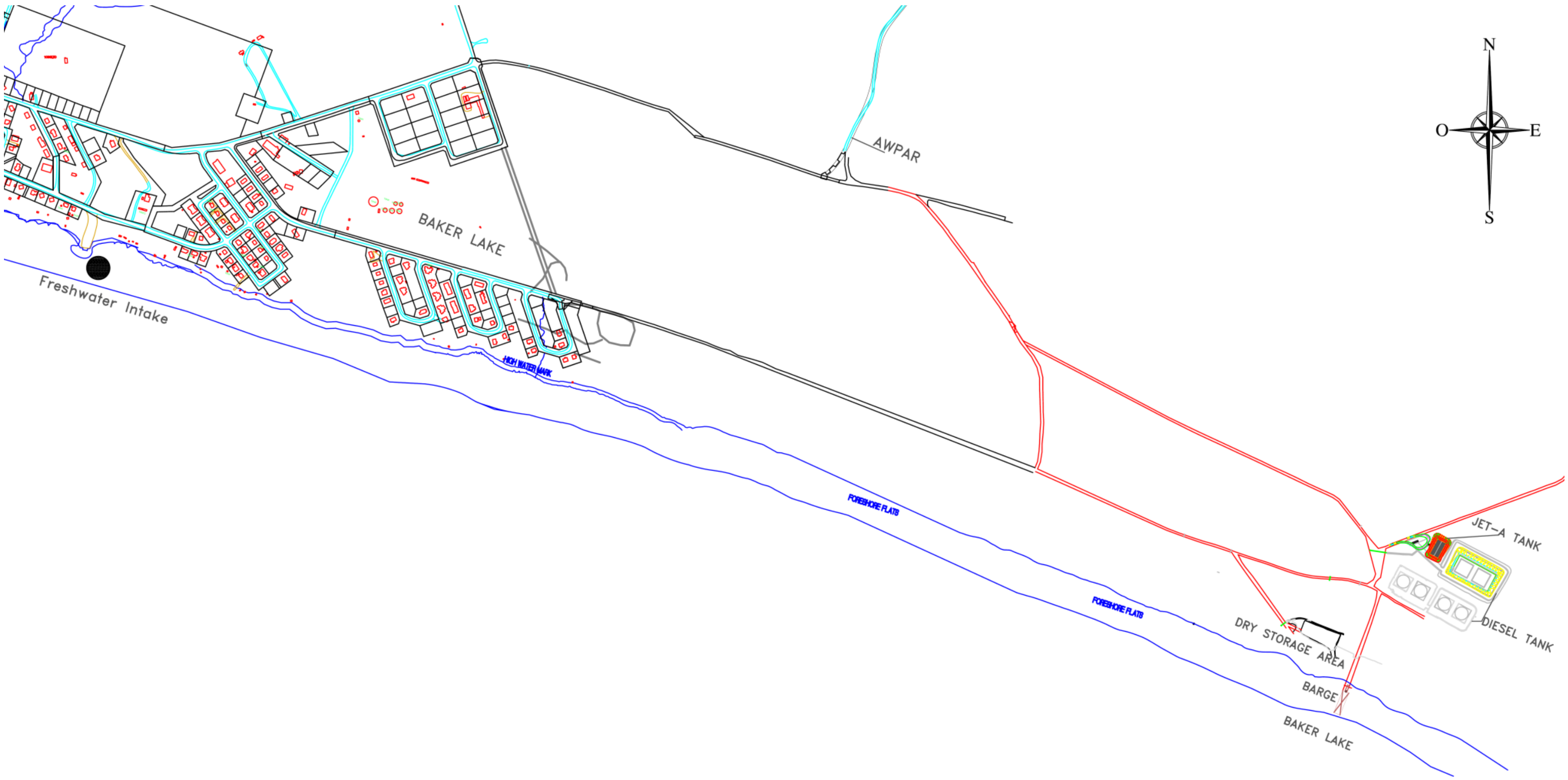
1) As part of the spill procedure, Agnico will make the community of Baker Lake aware of any spill to ensure measures can be taken to ensure safety of the community by contacting Mayor / Hamlet counsel and Fire department;
2) As part of the spill procedure, boom and absorbents pads will be deployed to confined and limit the progression of the spill into the water;
3) Booms will be deployed to capture the spill;
4) If spill cannot be captured prior to spreading towards the freshwater intake, booms will be deployed around the freshwater pump and regular inspection will be done to see if there are

visible sheen;

5) As a precaution and depending of the spill size, Agnico will work with the Baker Lake Hamlet Counsel to provide a notice to the community of Bake Lake to stop the consumption of the freshwater during the time spill is recovered and until a test on water is conducted. During this time Agnico will provide potable water to the community. [A]As soon as the spill will be recovered and it's determined that the freshwater intake and distribution system is not contaminated the consumption of freshwater will resume;

[A] The Meadowbank project keeps a supply of 120 twenty litre bottles of drinking water in supply at all times in case of emergency. As well the water treatment plant is capable of producing >200m^3 of water a day and the current usage for the mine site is ~110m^3. Thus if required the Meadowbank mine can produce drinking water for the community for an emergency cease in the consumption of potable water due to a spill at the Baker Lake Marshalling Facility.

Figure 3 - Location of Community Freshwater Intake at Baker Lake



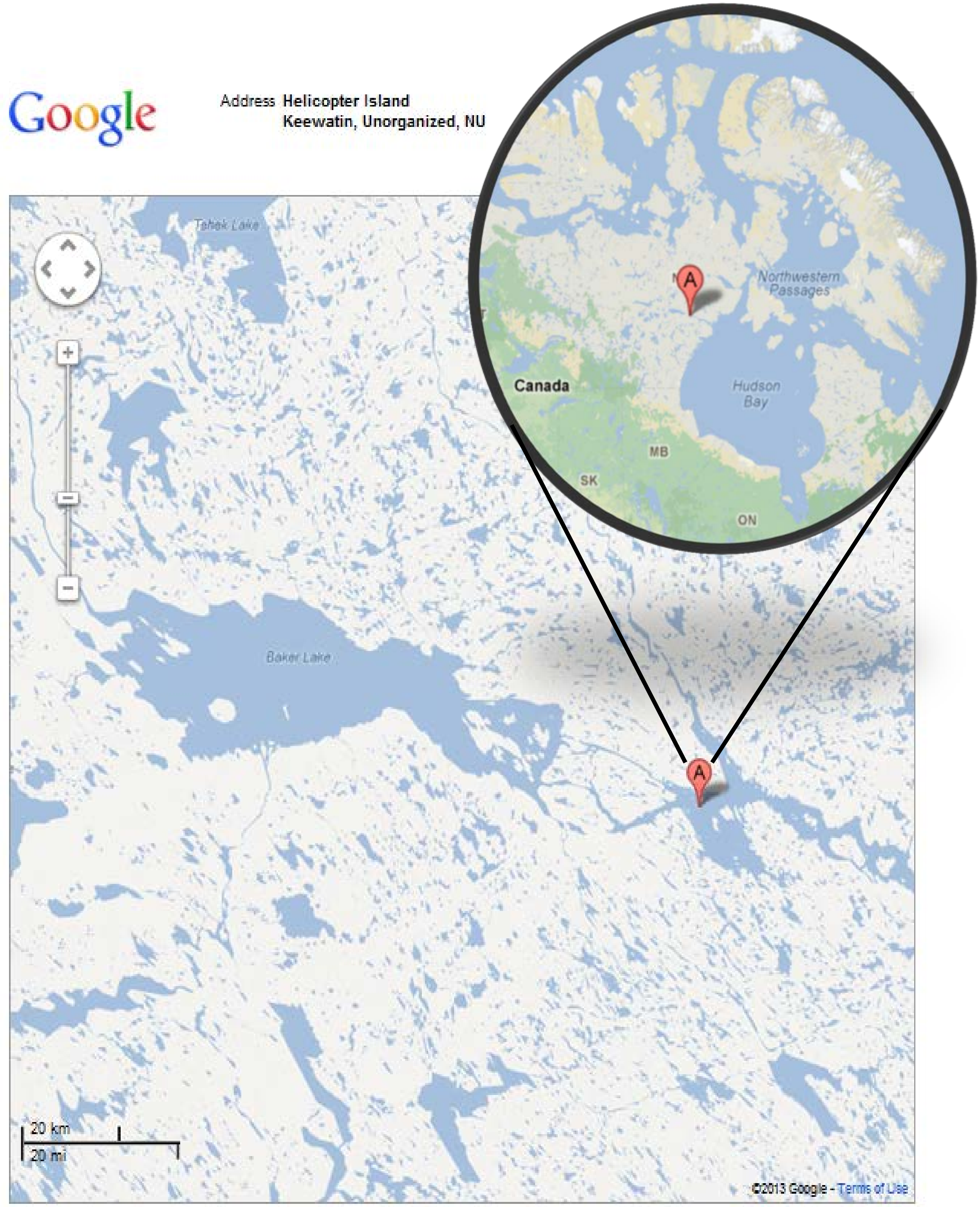
SECTION 5. SITE ACTIVITIES

5.1 Nature of the Oil Product

The main fuel stored at the Agnico's Baker Lake Fuel Farm will be P50 diesel and Jet-A. You can find, in Appendix C, the MSDS for Diesel and Jet-A. All other fuels such as gasoline and possibly other grades of diesel will be purchased in drums or 1m^3 totes and brought to the mine site for storage into the Meadowbank Fuel Storage Facility, or purchased and brought to site from a contractor in Baker Lake.

Coastal Shipping Limited, a division of the Woodward's Group of Companies, is contracted by Agnico to supply and deliver diesel fuel and Jet-A to Agnico's OHF facilities in Baker Lake. The tanker picking up the fuel will be double hulled, Motor Tank type ship, will have segregated ballast compartments and would be able to carry up to 20,000 m^3 of diesel and Jet-A fuel collectively. Ballast will not be required during the inward voyage to Baker Lake by the smaller ships. However, ballast will be picked up while on anchor outside the access passage after offloading the diesel and Jet-A fuel for its outward journey. A total of three (3) tanker loads of fuel will be required to fill the six diesel tanks in the tank farm, cumulatively holding 60,000 m^3 and one (1) tanker load to fill the 18 Jet-A tank, cumulative holding 1,800m^3.

Figure 4 - Location of Helicopter Island



5.2 Bulk Transfer

It is expected that the large tankers delivering diesel fuel and Jet-A will anchor in the same general location as the dry cargo vessels, shown on Figure 4. Ship-to-ship transfer of fuel will occur at this location from the larger tanker to a smaller tanker that can navigate the access passage. The carrying capacity of the small tanker will be either 7,300 m^3 or 10,500 m^3. The Ship to be used at any one time will be subject to its availability at the time when the large fuel tanker is set to deliver fuel to Agnico Eagle Mines Limited's Baker Lake Fuel Farm Oil Handling Facility. The small tanker will anchor directly to Agnico's spud barge. From there, transfer hoses (Conduit) are connected to a shore based pipeline for transfer of P-50 diesel fuel to the diesel tank farm. For Jet-A fuel separate hoses will be laid out from the vessel to the Jet-A storage containment. These hoses or conduit will carry the Jet-A fuel from the vessel to the Jet-A tanks.

Ballast will not be required for the inward voyage of the small tanker as it arrives at Baker Lake loaded with diesel fuel and Jet-A. After transferring the diesel fuel or Jet-A fuel to the tank farm, the small tanker will take on ballast in its segregated ballast compartments before sailing out to Helicopter Island to pick up another load of fuel from the large tanker anchored outside the access passage. Ballast will be dispelled as ship-to-ship transfer of diesel or Jet-A occurs and the small tanker is loaded. This sequence of events will be repeated until the large tanker is empty or the tank farm is full.

Due consideration will be given to prevailing and expected wind, weather and tide conditions when undertaking ship-to-ship and ship-to-shore fuel transfers. The large tanker anchored near Helicopter Island and the small tanker anchored near Baker Lake will be clear of land and traffic routes, and in open water of a depth exceeding the draught of the vessel(s). For ship-to-ship transfers, the ships will be secured alongside or anchored.

The small tanker will discharge at a rate of 400 m^3/hr for diesel fuel and 200 m^3/hr for Jet-A taking approximately one (1) day to fill. Communications between the shore and the small tanker will be maintained throughout to ensure the safe transfer of the fuels and to avoid the overfilling of the tanks. The ship-to-shore transfer to be used will be similar to that used at communities throughout Nunavut.

5.3 Measures to Minimize a Diesel and Jet-A Pollution Incident

The small tanker will be anchored offshore in water of sufficient depth to allow for draught and tidal changes during transfer.

The transfer of the fuels will use sound, well-rehearsed practices, include an adequate number of trained and alert personnel, have sufficient materials, and use well maintained, thoroughly tested equipment. A team of trained personnel on the tanker will be in charge of the tanker fuel transfer equipment, while an onshore team will be in charge of the land based transfer equipment. Agnico will have at least 2 trained personnel on the land to observe for any leak detection: a third part contractor (Intertek) and the Baker Lake Supervisor. The role of the third part contractor will be to apply procedure and oversee operation during the fuel transfer. To do this, the third part contractor will need to come on site at least one (1) day before the first day of transfer to receive the appropriate training given by the Environmental Department. Fire-fighting, spill response equipment and supplies will be located on the tanker and onshore near to the transfer point as required by Transport Canada. This will include readily available absorbent material at the flexible hose connections on deck and onshore to quickly address minor spills at predictable minor spill locations. Additionally, Agnico has placed a sea can with spill response supplies (including boat) and equipment at Agnico's Baker Lake Fuel Farm area where it can quickly be accessed in the event of a spill.

Four-inch (10 cm) steel piping able to accommodate a flow rate of approximately 400 m^3/hr will lead down to the shore from the diesel tank farm. Conduit from ship-to-shore will be connected to the fuel-receiving manifold located onshore using a dry-break coupling(s). For Jet-A fuel separate hoses will be laid out from the vessel to the Jet-A storage containment. Other measures to be taken to minimize and prevent spills include and must be followed by the on land responsible:

- Complete checklist before / during transfer for the on-land responsible (See Appendix E);
- Complete checklist, provide by Woodward, with vessel captain before transfer begin (Appendix E);
- Complete inspection / inventory of spill response sea can before transfer;
- During the transfer, regular monitoring will be undertaken for detection of incipient spills and leaks between the tanker and the tank farm;
- Radio test before transfer and after that each hour between the personnel on land and the captain of the vessel;
- Transfer operations will be suspended should any leak be detected or filling alarm are activated;
- The onshore area and ship deck will be well light as fuel transfers could continue around the clock;
- Minimization of land drainage containing spilled diesel or Jet-A to limit the amount reaching the marine environment;
- Have a good knowledge of the OPEP requirement and protocol to follow is case of a spill by receiving a training / review each year before the transfer season; and
- The regular update of the OPEP.

During the ship-to-shore transfer, Agnico will have competent personnel on location at all times to monitor the fuel transfer and maintain contact with the tanker's crew. Should problems arise, the ship can be called to shut down the transfer and onshore piping will be closed down. In the event of a spill that escapes the containment boom, diversion booming will be deployed to minimize migration of a spill throughout Baker Lake. Adequate lighting will be put in place during all transfers, to allow for proper inspections of transfer locations around the clock. The lighting system intensity will be not less than 54 lx at each transfer connection point of the vessel and OHF and a lighting intensity not less than 11 lx at each transfer operation work area around each transfer connection point of the vessel and OHF.

See *APPENDIX D: MBK-ENV-0013: OHF / Ship to Shore Fuel Discharge Procedure.*

5.4 Portable Containment Pools

At the connection of the ship's conduit to the OHF manifold a portable containment pool will be erected and in place during the transfer of product. This pool is capable of holding ~250L of liquid in the case that there is a leak at the flange or residual drips out of the conduit or hard wall pipe.

Spill "pop-up" pools will be in place under each joint for the conduit used to fill the Fuel tanks. These pop-up pools are only capable of holding 20-50 L of fuel and are in place to catch residual and be a first line of defense in the case of a leak.

SECTION 6. MEADOWBANK RESPONSE TO EMERGENCIES

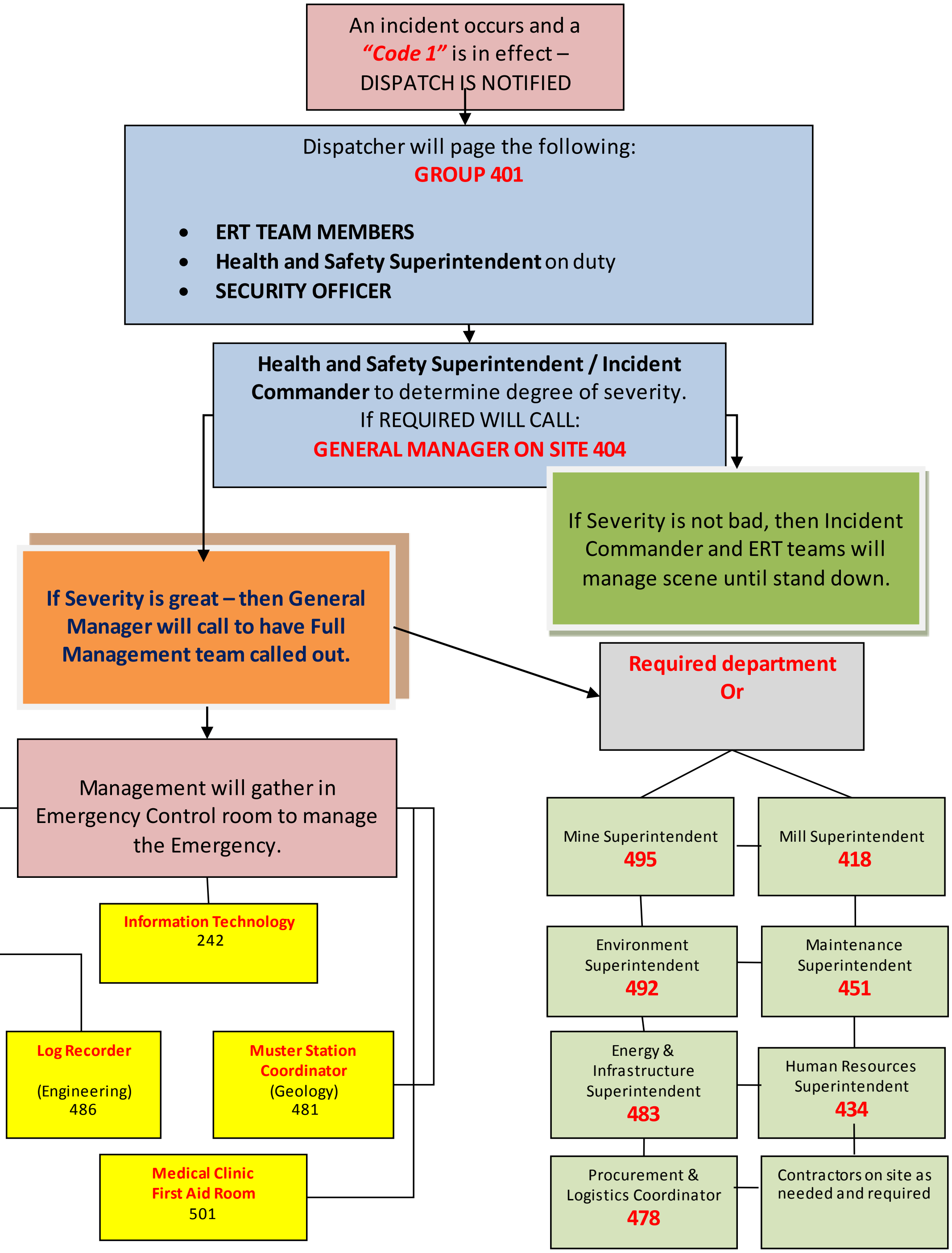
The Agnico Baker Lake Tank Farm OHF is considered Level 2 Handling facility as indicated in the OHF Standards TP 12402. With a transfer rate of ~400 m^3/hr Agnico's OHF must have the spill response capacity to respond to a minimum of a $5m^3$ spill.

6.1 Response Management Structure

Agnico has an Emergency Response Team (ERT) at the Meadowbank Mine trained and responsible for controlling the Level 2 or greater spills at the Agnico's Baker Lake laydown and tank farm, and for assisting with medical and other emergencies that may occur at the mine site or the OHF.

Figure 5 depicts the Response Management System.

Figure 5 - Response Management System



6.2 Logistics and Planning

The Emergency Measures Counsellor (EMC) will ensure that site drawings and equipment lists are posted conspicuously in key locations throughout the site so that important information is always readily available. This will include the following:

- Location and isolation points of energy sources;
- Location of emergency equipment (e.g., fire water pumps, fire extinguishers, monitors, self-contained breathing apparatus);
- Emergency procedures outlines, such as specialist firefighting, chemical neutralization;
- Location of equipment for combating pollution (e.g., booms, pumps, absorbents, dispersants);
- Availability of internal and external emergency medical support (e.g., hospitals, clinics, ambulances, medical supplies, personnel with medical or first aid training);
- Location of toxicity testing facilities (e.g., gas and water);
- Location of wind direction / speed indicators;
- Directions on how to contact the local or regional weather forecasting service;
- Location of personal protective equipment and directions on its proper use; and
- Location of first aid stations and muster areas.

The Incident Commander, EMC, and Health and Safety Superintendent will know where, throughout the project site, all of this information is posted and where emergency equipment is stored. These individuals will also be trained in the proper use of emergency equipment.

SECTION 7. EQUIPMENT AND PPE

The following sections describe the items that are available in the case of a spill at the Agnico Eagle Mines Limited's Baker Lake Fuel Farm Oil Handling Facility. Equipment has been classified into items available for spill sizes either up to or greater than 5m^3. However, any and all means will always be used to respond to a spill in a timely manner and ensure a prompt clean-up of any spill.

7.1 OHF Response Equipment for spills up to ~5m^3

The following equipment (Table 2) is available right at the OHF at any given time in a sea can designated for ***Environmental Emergency*** and can be deployed on scene within one hour, if it's safe to do, to contain and control the spill. Agnico can deploy this material within one hour.

Table 2 - Material available in the Spill Response Sea Can at Agnico's OHF

Quantity	Equipment/tool name
3	Empty drums (sealed)
2	Mini Berm 36"x 36"
2	4 Drums Berm 4'x 8'
4	Tarp 20'x 30'
4	Tarp 30'x 50'
10	Oil Spill Absorbent Pads
5	Universal Absorbent Boom 5"x 10' (For Hydro-soluble Chemical)
5	Universal Absorbent Boom 8"x 10' (For Hydro-soluble Chemical)
5	Petroleum base Absorbent Boom 5"x 10' (for Petroleum product)
4	Maritime Barrier (Baffle)
5	ABS pipe: 10' long x 4" diameter
2	Cell-U-Sorb (Absorbent)
2	Amerisorb Peat moss (Absorbent)
2	Oil Gator Absorbent
1	Plug Patties
4	Quatrex bags
2	Fork Lift Crate
4	Hand Shovel
1	Cro Bar Chisel
1	Ice Breaker Chisel
1	Sledge hammer
15	Rod bar 4'
1	½ drum containment
1	16ft Boat with motor and gasoline jerry can (sea can #321225)

7.2 Additional Response Equipment or for Spills >5m^3

All equipment previously mention is available for use during any emergency situation for a spill greater than 5m^3. The following equipment would take time to get to the spill site; time would vary depending on distance from the spill. All these equipment and resources can be deployed on scene in <6 hours for the recover and clean-up of the spill.

7.2.1 General Equipment

This section addresses the emergency response machinery, equipment, tools and other resources that will be made available on-site for spill counter measures.

7.2.1.1 Mobile Equipment

Mobile Equipment available to Agnico, that will be used for spill contingency include:

- Graders-4
- Cranes-6
- Snowmobiles-3
- Vacuum Truck-1
- Loaders-14
- Backhoe-10
- Bulldozer-8
- Forklift & Hysters-16
- Water Trucks-2

Winch Trucks-2
Pickup Trucks-70
Generator Sets-20
Fire Truck-1
Boats-4
Fuel Trucks-2
Bobcat-2
Haul Trucks-25
Snow Cat-1

All the previous listed equipment can be found on the Meadowbank mine site. Wheeled equipment can be at the OHF in Baker Lake in 3-6 hours. Tracked equipment would have to be loaded and transported which would take 5-6 hours.

7.2.1.2 Containment System

Temporary containment systems are also available on site and include:

- Absorbent Booms - 130 kits; 4 booms per Kit; each boom 8”x10’
  - 122 Universal booms; each boom 5”x10’
- Open top Drums x 80@200L
- Tanks – 2 x 100,000L tanks
- Tailings Pond – capable of holding contaminated fluids >1,000 m^3 capacity
- Spill absorbent material packages/pads - Quantity changes depending on demand on the Meadowbank site

7.2.1.3 Emergency Transportation

Emergency transportation that will be used under an emergency situation are:

- Aircraft (fixed wing or helicopter)
- 4-wheel drive vehicles >70
- Snowmobiles x 3
- Boats and motor x 4

7.2.2 Spill Response Kits and Containers

7.2.2.1 Kits

Spill response kits are strategically located where required. Each department and work area is responsible for providing sufficient spill response kits in their respective work areas. The kits are kept in marked and accessible locations. The locations include all fuel storage areas, chemical storage areas and so on.

All of the mobile equipment on site (including heavy equipment) contains an emergency spill kit.

7.2.2.2 Emergency Trailer

Agnico also have an Environmental Emergency Trailer which is easily accessible and mobile. The trailer is located on site east of the Environmental Office at the Meadowbank Mine Site. This trailer contains the following items:

- Pump Elastec
- Pump accessories
- Vaccum ends
- 45 gallons top
- Tubing 2 inches diameter
- Tubing 3 or 4 inches diameter
- Diesel Fuel jerry can (place on a miniberm)
- Spill kit accessory (red box)
- Drums opener
- Wescot (to open empty drum screw)
- Empty drums
- 2 drums berm
- 4 drums berm 4x8
- Tarp 20x30
- Tarp 30x50
- Oil white spill pads
- Universal boom 5x10
- Universal boom 8x10
- ABS pipe: 10' (4")
- ABS pipe: 10' (6")
- Cell U-Sorb
- Sphagsorb
- 3 Size of Wedge wood
- Plug pattie
- Quattrex bags
- Hand shovel
- Ice braker chisel
- Sledge hammer
- Rod bar (4')

7.2.2.3 AWAR Sea cans

Along the AWAR there are 9 environmental emergency sea cans. These sea cans are strategically placed along the road at water crossings. Each environmental emergency sea can contains the following material:

- Empty drums (Sealed)
- Mini berm 36"x36" x4'
- 4 drum spill berm 4x8
- Tarp 20'x30'
- Tarp 30'x50'
- Oil white spill pads
- Universal boom 5"x10' (Chemical)
- Universal boom 8"x10' (Chemical)
- Oil only booms 5"x10' (Hydro-carbons)
- Maritime barrier (Baffle)
- ABS pipe: 10' (4")
- Cell U-Sorb
- Amerisorb peat moss
- Oil gator absorbant
- Plug pattie
- Quattrex bags
- Fork lift crate (pallets)
- Long handle round point shovel
- Chisel point crow bar 16 lbs 57"
- Ice braker chisel
- Sledge hammer 12 lbs 36"
- Rod bar (4')

7.3 PPE

7.3.1 PPE at OHF for Spills <5m^3

The following PPE (Table 3) will be found in the Emergency Trailer and also on sea can at the OHF:

Table 3 - PPE available at OHF

Quantity	Equipment/tool name
3	Rain gear -- Pants and Top (L & 2-XL)
3	Rubber boots (size 8,10,12)
6	Rubber gloves
3	Goggles
3	Tyvex suits (L & 2 XL)
3	Safety glasses
3	Leather gloves

This is adequate PPE intended for 3 persons. Additional PPE will be available from the Meadowbank mine site.

7.3.2 PPE for Spills >5m^3

Personal Protective Equipment is stored in bulk quantities at the Meadowbank Warehouse. Quantities of each can be found on site using the JD Edwards system. In addition, the community of Baker Lake has certain PPE that can be purchased through Agnico Eagle after consulting the Agnico Eagle Procurement and Logistics department; however quantities of this PPE cannot be relied on within Baker Lake.

SECTION 8. COMMUNICATION

The primary basis for communication will be the phone system; back-up communication will be available via satellite phone. For on-site communication, hand-held radios will be mandatory for all employees working or travelling in remote areas from the OHF. Cell phones can be used as an additional means of communication however only CDMA service is available at the OHF. Back-up power sources and replacement batteries for communications equipment will be available to provide continuous, uninterrupted operation either at fixed facilities or at emergency sites.

Key site personnel will be accessible at all times by either portable radios, radios in vehicles, or office radios. The Health Care Professional will carry a hand-held radio and will be available at all times. Security personnel will monitor the emergency channel twenty-four hours per day. Senior management personnel will rotate as “On-Call Managers” for after-hour emergencies. An accommodations list that highlights key personnel will be posted and updated as required.

In the event of a major emergency all external communications for the mine site and associated areas will be cut and all external contact will take place solely through the Emergency Control Center at the Meadowbank Site.

During fuel transfer operation, the vessel master and the operator of the OHF will always have a two-way communication on a continuing basis. This two-way communication will be the direct communication by radio and the use of the cell phone.

8.1.1 Communication with the Public

Communication with public bodies during the state of emergency will be the responsibility of the General Mine Manager or by the Communications & Public Affairs Corporate Director.

In the case that the communities of Baker Lake should need to be evacuated on short notice, the Emergency Response Team will immediately assist in the evacuation of the community. The General Mine Manager will immediately contact the Mayor of the Hamlet to inform regarding the situation. In addition, if safe to do so, a radio notification should be immediately broadcast on the Baker Lake Radio station.

8.1.2 Hand Held Radio Communication

The channels used for hand held radio communication on the Meadowbank mine site, the All Weather Private Road, OHF, and associated facilities are as follows in Table 4:

Table 4 - Agnico Radio Channels

Surface
1. Spare RPTR
2. Mill Simplex
3. Mill Repeater
4. Exploration
5. Simplex 5
6. Baker Lake
7. Project
8. Auto-Patch

9. Agnico Surface
10. MB Dykes
11. Goose Operation
12. Portage Operation
13. Vault Operation
14. RD MB
15. RD KM37
16. RD Baker

The colors in each zone represents that they are 'linked' together. For instance, the RD MB, RD KM37 and RD Baker are plugged in a way that 3 persons talking on those 3 channels separately will hear each other as if they were on the same channel.

8.1.3 Contacts

Internal contact information is contained in Table 5 for all Agnico personnel involved in spill recovery. Table 6 contains contact information for contractor contacts which can be called for assistance with spill recovery. Table 7 is a list of government officials and external contacts to notify and provide subsequent reporting.

Table 5 - Agnico Contact

Title	Name	Telephone No.
Sr. Vice President, Environment and Sustainable Development	Louise Grondin	416.847.8656 Cell: 819.724.2020
Vice President of Environment	Michel Julien	416.947.1212 ext. 3738 Cell: 514.244.5876
Director of Environment, Environment and Sustainable Development	Gonzalo Rios	604.608.2557 ext. 6537
Corporate Director, Communications & Public Affairs	Dale Coffin	416.847.8669 Cell: 647.274.4154
Director, Regulatory Affairs	Stephane Robert	819.759.3700 ext. 5188 Cell: 819.763.0229
Manager of Nunavut Services Group	Jason Allaire	819.759.3555 ext. 8004 M: 819.355.2608
Meadowbank General Mine Manager	Bertin Paradis	819.759.3555 ext. 6725 Cell: 819.355.9348
Meadowbank Assistant General Manager	Luc Chouinard	819.759.3555 ext. 6896 Cell: 819-856-8160
H&S Superintendent or H&S Ass. Superintendent	Normand Ladouceur or Yves Levesque	819.759.3555 ext.6720 Cell: 819.860.6258 or 819.759.3555 ext.6720 Cell: 819.856.9051
Incident Commander	André Rouleau or Philippe Beaudoin	819.759.3555 ext.6809 Cell: 819.355.2191 or

		819.759.3555 ext.6809 Cell: 450.847.4214
Environmental Nunavut Superintendent	Jamie Quesnel	819.759.3555 ext.6838 Cell: 819.856.0821
Environmental General Supervisor	Erika Voyer	819.759.3555 ext.6980 Cell: 819.856.1956
Environmental Senior Coordinator	Martin Archambault or Robin Allard	819.759.3555 ext. 6744
Environmental Department	Environmental Technicians	819.759.3555 ext.6747/6759
On-site Medics	On-site Nurses	819.759.3555 ext.6734/6751
Site Security	On-site Security	(867) 793.4610 ext. 6748

Table 6 - Contractors / Local Contacts

Title	Telephone No.	Contact in Emergency for:
Nolinor Aviation Services	Protocol Agent (867).759.3700 ext. 8008 Emergency (450) 476.0018 (888) 505.7025	Flight services for additional crew, or additional supplies
First Air	1.800.267.1247 Emergency (867) 669.6694 (867) 444.2002	Flight services for additional crew, or additional supplies
Calm Air	1.800.839.256 Emergency (204) 677.5013 (204) 677.5019	Flight services for additional crew, or additional supplies
Dyno Nobel Explosives Ltd.	(819) 825.5441	Heavy Equipment, Man power, Emergency Blasting
Woodward Group of Companies (Shipping)	(709) 896.2421	Fuel Hauler
Baker Lake Contracting & Supplies	(867) 793.2831 Press #1 (867) 793.1679	Man power, equipment, trades personnel i.e. pipefitter, plumber, electrical
Peter's Expediting	(867) 793.2703 Cell (867) 793.1701	Equipment, man power, Ground transportation services
Arctic Fuel Services	(867) 793.2311 Office (867) 793.2301 Supervisor	Fuel hauling, trucking, man power.

Table 7 - External Contacts

Organization/Authority	Telephone Number	Fax Number
NT-NU 24-Hour Spill Report Line	(867) 920-8130 spills@gov.nt.ca	(867) 873-6924
Workers Safety and Compensation Commission	(877) 661-0792 (Emergency) or (800) 661-0792	
Kivalliq Inuit Association	(867) 645-2800 (867)645-2810 (reporting line)	(867) 645-2348
Nunavut Water Board	(867) 360-6338	(867) 360-6369
INAC Inspector	(867) 645-2830	(867) 979-6445
Department of Fisheries and Ocean (DFO) – Nunavut Regional Office	(867) 979-8000	(867) 979-8039
Government of Nunavut – Department of Environment	(867) 975-7700	(867) 975-7742
Kivalliq Health Services – Baker Lake	(867) 793-2816 or (867) 793-2817 *Dial 0*	(867) 793-2812
Baker Lake Hamlet Office	(867) 793-2509	
Baker Lake Fire Emergency	(867) 793-2900	
RCMP Regular Hour RCMP 24 Hour Emergency Number	(867) 793-0123 (867) 793-1111	
Canadian Coast Guard (in the event of a spill to the marine environment) Superintendent Environmental Response	(800) 265-0237 (519) 383-1954 (519) 381-6186 (cell)	(519) 337-2498
Transport Canada – Tech services Stephen Sherburne Philip Levesque	(780) 495-6325 (204) 984-5786 Cell : 204-801-6951	(780) 495-8607

All above phone numbers are current as of <u>April 2017.</u>

SECTION 9. ROLES AND RESPONSIBILITIES

9.1.1 First Responder (Third Party Contractor (Intertek Personnel) and Spud Barge Supervisor)

The person who has caused a spill or is the first to observe the spill is the first responder.

The responsibilities of the First Responder are as follows:

- Oversee the fuel transfer operation;
- Follow procedure set-up in the OPEP to prevent and minimize spill (See Section 5.3)
- In case of spill to land, ice or water, contact the Baker Lake Gatehouse to report the incident;
- Identify and contain the spill, IF SAFE TO DO SO; commence preparing spill response equipment, and
- Participate in spill response as a member of the clean-up crew.

9.1.2 Supervisor (Spud Barge Supervisor)

The responsibilities of the Supervisor are as follows:

- Contact the Baker Lake Gatehouse; contact Environment Department;
- Gather facts about the spill; and
- Participate in spill response.

9.2 Roles & Responsibilities of the Emergency Control Group

Below are the roles and responsibilities of the Emergency control group.

9.2.1 Official In-Charge

The Official In-Charge (General Manager or designate) will take charge for overseeing and approving the overall emergency strategy.

Immediate duties of the Official In-Charge include:

- Consult with the Incident Commander the status of emergency;
- Appoint an Emergency Log Recorder to maintain a written record of the time and events, including all discussions, instructions and decisions made by the Emergency Control Team;
- Issues specific tasks to the members of the Management as they arrive at the Control Room, as per this guideline;
- Brief the Emergency Control Team;
- Ensure that the safety of personnel is maintained, throughout the operation;
- Ensure procedures are in place for prompt dispatch of requested personnel, materials and

equipment to the emergency area;

- Arrange for all reports to be presented at specific intervals to the Emergency Control Team;

- Finalize the recommendations of the Incident Commander for rescue and recovery operations;

- The Official In-Charge is the only person authorized to release information to Government Agencies, Corporate Office or the Local Communities. He may delegate this activity to other members of the Emergency Control Team;

    - Verify all information you release;
    - Keep a record of all inquiries (media and non-media);
    - Do not speculate on causes;
    - Do not speculate on resumption of normal operations or when the problem will be solved; and
    - Advise that further updates will be forth coming.

- Notify the corporate management, if the following appear probable:

    - Fatalities;
    - Injuries that could probably become items of local, regional or national media interest;
    - There is a public health or environmental risk;
    - An incident involving chemicals where there is a large volume or the potential for over reaction (e.g., cyanide);
    - A spill of effluent or contaminated water or chemical substance to an area that lies outside the area of drainage control of the mine site (i.e., an external spill);
    - Mine operations may be stopped for more than two (2) days; and
    - Government authorities will become involved.

- Ensure all response teams, regulatory agencies and any other agency on emergency alert notice are advised when the emergency has ended;

- Ensure all documentation (i.e., notes, log sheets, written instructions, etc.) is gathered for the creation of the final report; and

- Participate in debriefing.

9.2.2 General Superintendents

- General Services, Operations and Maintenance will report to the Emergency Control Room and support the General manager/Designate in whatever capacity required;

- They will also ensure that the Superintendent/Designate in each of their respective Department's is aware of the emergency; and

- They will assist with the investigation and write up of the final report.

9.2.3 Incident Commander: A Trained Staff Member (ERT Coordinators or Supt.)

The responsibilities of the Incident Commander include:

- Ensure Security has been notified of emergency;
- Ensure the evacuation procedures have been activated, if required;
- Ensure that there are sufficient ERT members available to respond to the emergency;
- Ensure that the ERT has back-up support, a standby Team;
- Ensure that ERT Team has refreshments and nourishment (if the emergency requires several hours to resolve);
- Assess the size and severity of the emergency and the likely consequences. Establish response priorities; as well coordinate prevention of fire or explosion;
- Maintain communication with the ERT Captain;
- Advise the Official In-Charge of the ERT Team's activities, regarding the rescue and recovery operations;
- Appoint sufficient personnel, equipment and outside services are available. Utilize the members of the Emergency Control Team to organize these resources;
- Advise Official In-Charge when the emergency situation is under control and give the "All Clear";
- Participate in emergency investigation;
- Coordinate an orderly return to normal operating conditions;
- Arrange for a debriefing session, and utilize the services of all involved in resolving the emergency; and
- Assist to write the final report.

9.2.4 Emergency Response Team (ERT Team) Duties:

- The ERT Team Members must report to the Fire Hall, when paged for a "Code One" emergency;
- ERT Team Members will be given instructions on the emergency by the Incident Commander;
- ERT Team Members will follow instructions from the Incident Commander and will not put the Team at risk; and
- The ERT Team Captain will maintain radio contact with the Incident Commander throughout the emergency.

9.2.5 Environmental Superintendent/Designate Duties:

The following are the responsibilities of the Environmental Superintendent/Designate;

- Provide technical advice on probable environmental effects resulting from a spill and how to minimize them;
- Ensure that the ERT Members of his crew have responded to the “code One” emergency;
- Provide advice to the Official-in-Charge for appropriate spill response procedures;
- Ensure that Environmental Staff are available to direct the spill response action plan; and
- Assist with restoring of the Operations back to normal operating standards.

9.2.6 Health and Safety Superintendent/Designate Duties:

The Health and Safety Superintendent/Designate will be responsible for:

- Ensure that an Incident Commander is in place to oversee the ERT Teams;
- Ensure that all Management respond to the emergency and meet in the emergency control room;
- Oversee all activities that require Security or Nursing and arrange for Medevac transport, if required;
- Assist with getting a “head count” for the Official in-charge; and
- Assist with obtaining outside help if required.

9.2.7 Energy and Infrastructures Superintendent/Designate Duties:

The following are the responsibilities of the Site Services Superintendent/Designate;

- Ensure that all his employees are accounted for;
- Ensure that all ERT Member on his Crew, respond to the “ Code One” emergency;
- If the “ Emergency” is involves the site facilities, assist the Official-in-Charge with the action plan to deal with the emergency;
- Assist as required by supplying equipment and/or manpower; and
- Assist with restoring of the Operations back to normal operating standards.

9.2.8 Human Resources Superintendent/Designate Duties:

The following are the responsibilities of the Human Resources (HR) Superintendent/Designate:

- Ensure that all HR employees are accounted for; and

- Provide assistance to the Official-in-Charge if there are employees issues, such as injuries, transportation requirements, etc.

9.2.9 Health Care Professional (Nurse/Medic):

The on-site health professionals are responsible for the following:

- Providing on-site first aid and other medical support;

- Establish a triage location if there are multiple casualties;

- Arrange for medevac transportation, if required; and

- Ensuring that the first aid room is maintained at all times, by using First Responders as support.

9.2.10 Security Department:

The on-site Security Supervisor is responsible for the following:

- Ensure that access points to the emergency are properly guarded;

- Notify the Baker Lake Gatehouse if the emergency involves the all-weather private road (AWPR); and

- Assist with other duties as requested by the Emergency Control Group.

9.3 Debriefing

After an incident has taken place and the location is brought back to normal operating standards a debriefing session will occur between ECG, Field Supervisors for the incident, ERT Captain(s), and the supervisor of the department involved with the spill.

The point of this debriefing session to determine the *who, what, where, when, why, and how* the incident occurred. It will also be the time to reflect on the steps that were taken to carry out the response and to determine what was done right and what corrective measures need to be put in place to better the response if needed in the future.

SECTION 10. GENERAL SPILL PROCEDURES

SPILL RESPONSE PRIORITIES

1. **Safety of the personnel working at or around the OHF**
    a. Contact all personnel working around the spud barge area and make them aware
    b. Make contact with the vessels Captain to make aware the ship and stop the transfer of the product
    c. Dawn appropriate PPE
    d. STOP the spill
2. **Make safe the facility**
    a. Create a no entry perimeter to ensure unaware persons do not enter the area in which the incident took place.
    b. Barricade entrances to the facility with red danger tape
    c. Have a person designated to watch entrances to ensure no community persons come on to site.
3. **Make the community of Baker Lake aware of the Spill to ensure measures can be taken to ensure safety of the community**
    a. Contact Mayor / Hamlet counsel
    b. Fire department
    c. RCMP
4. **Prevent fires or explosions / Stop all ignition sources**
    a. Disconnect power supplies
    b. Do not contain diesel or Jet-A fuel if vapors might ignite
    c. Allow fuel vapors to evaporate before intervention
5. **Minimize the Spill**
    a. When safe to proceed stop the spread of the product
    b. Use spill response equipment in emergency sea cans and ask for additional material if the spill is greater than 5m^3
6. **Notice and Report the Spill**
    a. Spill need to be reported to Transport Canada, Coast Guard and Government of Nunavut immediately
    b. Other governing bodies will also be notified (see section 10.2)
7. **Environmental Impact**
    a. Deter wildlife from entering spill area. Keep track of any wildlife mortalities
    b. Determine what impacts the spill will have on the Environment
8. **Clean-up**
    Commence clean-up of the spill

10.1 Coordination with Government Agencies

10.1.1 Coordination with Transport Canada Technical Service Environmental Response

In the event of a marine spill Transport Canada Technical Service Environmental Response (TC) will be contacted immediately regarding the incident. Agnico will adhere to further recommendations from TC in response to the spill.

TC will also be contacted annually prior to the deposition of fuel at the OHF. As well, annual approval of this OPEP will be required by TC Pollution prevention Officer.

10.1.2 Coordination with Canadian Coast Guard

In the event of a marine spill, the coordination with Canadian Coast Guard (CCG)[3] is required and they will be contacted to report the incident. A description of the event will be provided to the CCG Environmental Response. Agnico will adhere to further recommendations from CCG in response to the spill.

On an Annual basis prior to the shipment of fuels to the OHF commencing, Agnico will contact the CCG and make them aware that the shipping season will be starting so they are aware that fuels will be travelling to Agnico's Baker Lake Fuel Tank Facility constructed in Baker Lake.[4] Also Agnico will inquire if there is any update to "*The Central and Arctic Regional Response Plan (2008).*"

Agnico's Environmental Group will annually, prior to fuel transfer, review "*The Central and Arctic Regional Response Plan (2008).*" A copy of this plan can be found in Appendix B for reference. The plan will be reviewed to ensure that the OPEP and the actions of Agnico's OHF meet all requirements listed for an OHF.

10.1.3 Other Government Agencies

Agnico will contact all government agencies associated with the Meadowbank Gold Project as is the norm for any reportable spill. These groups include: Government of Nunavut (GN) via 24 hour spill reporting line, Indigenous and Northern Affairs Canada (INAC)), Nunavut Water Board (NWB), Environment and Climate Change Canada (ECCC) and Kivaliq Inuit Association (KIA).

10.2 Reporting Requirements

10.2.1 Government of Nunavut Reporting Requirements

As per the Canada Shipping Act spills to the marine environment will be reported to the Transport Canada Technical Service Environmental Response and Canadian Coast Guard (contact numbers in Table 7). Marine spills will be reported in accordance with Transport Canada Guideline TP- 9834E, *Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants*. Others to receive the spill report include the Kivalliq Inuit Association, Hamlet of Rankin Inlet, Fisheries and Oceans Canada, Canadian Coast Guard and Indigenous and Northern Affairs Canada Canada and Environment and Climate Change Canada (ECCC). Incidents that require media communications will be the responsibility of Agnico General Mine Manager or Public Affairs Corporate Director.

To ensure compliance with Section 36(3) and 38(5) of the *Fisheries Act* and Section 5(1) of the *Migratory Birds Convention Act*, all spills of fuel or hazardous materials, regardless of quantity, into a water body or

[3] CCG: 1-800-265-0237, Superintendant Environmental Response Phone: 519-383-1954 Cell phone:519-381-6186
[4] Plan submitted by email to CCG before the 2016 Shipping Season and will be for the 2017 Shipping Season once approve by TC.

onto ice will be reported immediately to the NT-NU 24-HOUR SPILL REPORT LINE (phone: (867) 920-8130, fax: (867) 873-6924, spills@gov.nt.ca).

Agnico possess a thorough internal spill reporting system that documents all spills for internal tracking. A copy of this Agnico internal spill report can be found in Appendix F, this is the spill report that the first responder will have to complete. Regardless of the volume, these spills are all reported to the Environment Department and if the NT-NU spill limits are exceeded or if the spill occurs in a water body (regardless of quantity), the Environmental Department reviews the incident, produces the NT-NU spill report and submits the NT-NU spill report to the regulator listed above. Investigation of all reportable spills is completed by the Meadowbank Environment Department.

10.3 Treatment and Disposal

All diesel or Jet-A fuel recovered through the spill response and any contaminated material will be taken to the Meadowbank mine site for recovery and, if applicable, incineration. It could also be packaged for disposal/recycling by a certified hazardous waste management company in southern Canada.

10.4 Resuming Unloading

The unloading of fuel from the tanker to the OHF will not resume if it hinders the response to the spill in any way. Unloading will resume once all problems are corrected, thus ensuring that the spill will not continue.

SECTION 11. SPILL SCENARIOS AND RESPONSE STRATEGIES

Agnico will strive to prevent any accidental spills and take all reasonable steps to minimize the risk of spill incidents and their impact on the environment. In 2016, an exercise program scenario was developed as a prevention protocol for the OHF operation. Safety, including use of personal protective equipment around water, and spill response training were part of this training. This exercise program evaluated the effectiveness of all the aspects of the procedure, equipment and resources that are identified in the OPEP. A summary of the 2016 exercise is provided in Appendix D - 1.4. An exercise will be conducted this year and the summary will be provided in next year's revision of the OPEP.

11.1 Product Properties and Response Strategy

Jet fuel, Jet-A, Jet-A1, or kerosene is a type of aviation fuel designed for use in aircraft powered by gas-turbine engines. It is colourless to straw-coloured in appearance.

P50 Diesel is a bright oily substance that has a low viscosity. It spreads rapidly on the water, has a low solubility in salt water (60 mg/L), and a high evaporation rate as described in the text box below.

At Baker Lake, the wind is largely from the NW to N.

Predicted Evaporation Rate of Spilled Diesel

Weight percent Evaporation = (5.8 + 0.045T) in(t)
Where T = water temperature
t = time in minutes

After a time span of 60 minutes at a surface temperature of 5°C, up to 25 % weight of the spilled diesel would have evaporated.

After 240 minutes, or 4 hours, the weight percent of the diesel that would have evaporated would be 33%.

Source: *Environment Canada, Emergencies Science and Technology Division*

In relation to Jet-A Fuel we will use the same evaporation rate as diesel as per Journal of Petroleum Science Research states; "*Diesel fuel and similar oils, such as jet fuel, kerosene and the like, evaporate as a square root of time. The reasons for this are simply that diesel fuel and such like have a narrower range of compounds which evaporating at similar rates, yield rates which together sum as a square root.*"[5]

As a result of the properties of diesel and Jet-A and the environmental conditions that predominate at Baker Lake, the spill response will need to aim to stop the spilled product from spreading across Baker Lake. This could include activating the Shipboard Oil Pollution Emergency Plan. The tanker would have response equipment on board and a fully trained crew in spill response. This, coupled with a shore based

[5] Journal of Petroleum Science Research (JPSR) Volume 2 Issue 3, July 2013 - *Modeling Oil and Petroleum Evaporation* by Merv F. Fingas

response under the OPEP, would ensure sufficient resources are available to control and recover as much diesel and Jet-A fuel as feasible.

11.2 Pipeline safeguards

There are a number of safeguards in operating the ship-to-shore pipeline; these include:

- Save-all trays to capture any minor spills at the ends of the floating pipeline;
- Dry-break couplings at both ends of the floating pipeline;
- A pressure test will be performed before the diesel transfer to confirm the system is free of leaks; and
- Both the crew on the tanker and Agnico's shore based personnel will be fully trained in spill response and spill recovery.

11.3 Wildlife

During a spill event, Agnico will take care to deter any animal that will be near the spill area to minimize the risk to wildlife. In a case of mortalities, Agnico will track any mortality and report these numbers to the GN.

11.4 Scenarios

Three scenarios are considered, these being:

1. A spill between the ship and the flange of the OHF, the floating pipeline, resulting in a spill smaller than 1000 L of diesel or Jet-A fuel;
2. A major failure between the ship and the flange of the OHF, the floating pipeline, resulting in a spill greater than 1000 L but smaller than 5000L of diesel or Jet-A fuel; and
3. Spill greater than 5000 litres.

In most instances Agnico personnel and/or contractors will be able to respond to the spill but if necessary, backup can be requested by calling for the assistance of the Agnico Emergency Response Team that is stationed at the Meadowbank site located 110 kilometers away. The ERT can be at Baker Lake within 125 minutes to take charge of the spill response. Agnico will make every effort to have its equipment and resources deployed within 6 hours of an incident.

Diesel and Jet-A spills will be responded to in the same way. Review of the CANUTEC Emergency Response Guidebook designates the spill response to both products as the same.[6]

[6] 2012 Emergency Response Guidebook

Scenario 1: **Loss between the ship and the flange of the OHF, the floating pipeline, resulting in spill smaller than 1000L of diesel or Jet-A fuel.**

Appropriate Actions	Resources
1. Communicate with vessel and immediately stop the ship-to-shore transfer of fuel, if it's safe to do. The transfer should not restart in a manner that would interfere with the immediate, effective and sustained response to the oil pollution. 2. Make sure that the environment is safe for the facility and vessel personnel, the facility and Baker Lake community. 3. Make sure that risk of fire or explosion are minimize. 4. Contact person found on OHF Declaration to initiate the OPEP. 5. Minimize the oil pollution incident by containing the spilled fuel to spreading within the marine environment, if it's safe to do. 6. Notify CCG, local and regulatory authorities. 7. Containment boom is manned to prevent the escape of fuel outside the boom. 8. If necessary, place a diversion boom outside the containment boom to stop the diesel from getting onto the beach. 9. Spread absorbent material on the spill to capture it. 10. Monitor any fuel that could not be recovered and collect water samples near the spill site and in the access passage for analysis. Repeat as necessary. 11. If diesel reaches the beach, excavate the contaminated beach material and take it to the Landfarm area at the Meadowbank site.	a. Crew on the tanker trained in spill response. b. Agnico's shore based personnel trained in spill response and recovery. c. Emergency Response Team to take control of the spill response and recovery. d. Spill response equipment and supplies maintained on board the tanker and also in the sea can located on shore of Agnico's Fuel Farm and Marshalling area. e. Save-alls (Pop-up pools) placed under the pipeline manifolds to collect minor spills. f. Shore-based boat to position booms. g. Absorbent booms to recover spilled diesel on sea water. h. Heavy equipment such as excavators, back hoes, vacuum trucks, and dump trucks available if beach is contaminated.

Scenario 2: **Loss between the ship and the flange of the OHF, the floating pipeline, resulting in spill greater than 1000L but smaller than 5000L of diesel or Jet-A fuel.**

Appropriate Actions	Resources
1. Communicate with vessel and immediately stop the ship-to-shore transfer of fuel, if it's safe to do. The transfer should not restart in a manner that would interfere with the immediate, effective and sustained response to the oil pollution. 2. Make sure that the environment is safe for the facility personnel, the facility and Baker Lake community. 3. Make sure that risk of fire or explosion are minimize. 4. Contact person found on OHF Declaration to initiate the OPEP. 5. Minimize the oil pollution incident by containing the spilled fuel to spreading within the marine environment, if it's safe to do. 6. Notify CCG, local and regulatory authorities. 7. Containment boom is manned to prevent the escape of fuel outside the boom. 8. If necessary, place a diversion boom outside the containment boom to stop the diesel from getting onto the beach 9. Spread absorbent material on the spill to capture it 10. For larger amounts of spilled materials on water, use absorbent booms to collect the spilled diesel 11. Monitor any fuel that could not be recovered and collect water samples near the spill site and in the access passage for analysis. Repeat as necessary. 12. If diesel reaches the beach, excavate the contaminated beach material and take it to the Landfarm area at the Meadowbank site.	a. Crew on the small tanker trained in marine spill response. b. Crew from the large tanker anchored outside the access passage. c. Agnico's shore based personnel trained in near shore spill response and recovery. d. Emergency Response Team trained for near shore spill response. e. Shore-based boat to position booms and spread absorbent material. f. Spill response equipment and supplies maintained on board the tanker, in Agnico sea can locate at Agnico's Marshalling area. g. Additional booms to place outside the containment boom. h. Additional boats can be transported from the Meadowbank site as well local boats can be rented from local contracting companies i Heavy equipment such as excavators, back hoes, vacuum trucks, and dump trucks for waste materials. j. in the case of larger spills an Incident Command System will be set up at the Meadowbank site as laid out in the Meadowbank Emergency Response Plan.

Scenario 3: **A spill >5,000 litres**

In the case of an ***Extreme*** spill, Agnico follow the actions listed in Scenario 2 to complete the best clean up possible. Between the spill response equipment that the tanker delivering fuel has on board and the spill response supplies at the OHF, a spill up to the size of 5, 000 - 10, 000L will be able to be controlled and cleaned up. However if the spill is greater than 10, 000L, at this point Agnico will require external assistance with the clean-up.

The Canadian Coast Guard (CCG) will be made aware each year prior the fuel transfer, there is a possibility that under direction of CCG that there spill depot supplies located in Baker Lake may be used.

SECTION 12. PREVENTIVE MEASURES

Agnico recognises that spill prevention is more desirable than any modern efficient cleanup measures after the fact. Preventive measures have been adopted in relation to any transport, transfer, use and storage of diesel and Jet-A fuel. The tankers carry a Ship Oil Pollution Emergency Plan (SOPEP) as per the MARPOL 73/78 requirement under Annex I. All ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by the International Maritime Organization (IMO).

A SOPEP contains the following things:

- The action plan contains duty of each crew member at the time of spill, including emergency muster and actions;
- General information about the ship and the owner of the ship etc.;
- Steps and procedure to contain the discharge of oil into the sea using SOPEP equipment;
- On-board Reporting procedure and requirement in case of oil spill;
- List of authorities to contact and reporting requirements in case of oil spill. Authorities like port state control, oil clean up team etc. are to be notified;
- Drawing of various fuel lines, along with other oil lines on board vessel with positioning of vents, save-all trays, etc.;
- General arrangement of ship, which includes location of all the oil tanks with capacity, content, etc.; and
- The location of the SOPEP locker and contents of the locker with a list of inventory. (Marine Insight 2012)

The Spill Contingency Plan, Emergency Response Plan and the Oil Pollution Emergency Plan identify potential causes of emergencies and provides for the development and implementation of strategies to minimize the likelihood of the same.

As described in the Spill Contingency Plan, exercises are part of training for the Emergency Response Team. This will include comprehensive spill response exercise to practice the use of spill response equipment, including the use of booms and oil water separator.

The OPEP will be updated annually based on the results of spill exercises, changes to the infrastructure at Agnico's Fuel Handling Facilities, changes to procedures and other variables. The updated OPEP will be distributed to the Agnico Emergency Response Team, Transport Canada, the Kivalliq Inuit Association, the Municipality of Baker Lake and other agencies as appropriate.

12.1 Training

The environmental department and ERT team received training from a response organization and as a result will be able to respond to or assist with incidents that may occur at the OHF.

12.1.1 Meadowbank site Personnel

A designated Emergency Response Team (ERT) consisting of on-site personnel is established at Agnico's Meadowbank Mine Site. Agnico will ensure that the ERT is trained and staffed in sufficient number so that the ERT is present at all times. All members of the team will be trained and familiar with emergency and spill response resources, including their location and access, the Spill Contingency Plan, the Oil Pollution Emergency Plan and appropriate emergency spill response methodologies. The ERT will have up to 60 members, each of whom will train approximately 8 hours per month.

The training will include the following:

- Worker health and safety during emergency interventions;
- A review of the spill response plan and responsibilities of the ERT members;
- The nature, status, and location of fuel and chemical storage facilities;
- The on-site and off-site spill response equipment and how to use it;
- Emergency contact lists;
- Communication methods and signals;
- Desktop exercises of “worst case” scenarios;
- Emergency evacuation;
- Fires or explosions;
- Emergency equipment and use;
- Personal protective equipment and clothing;
- Marine shoreline recovery operations; and
- The likely causes and possible effects of spills.

Every employee at the Meadowbank project will receive spill and waste management induction during their initial site orientation, so they are able to respond to small spills and raise the alarm if a larger response is required. ERT members will receive more extensive spill response training and learn how to respond while wearing personal protective clothing, use of specific spill response gear, proper deployment of absorbents and maritime boom.

The Environmental Department will regularly provide tool-box sessions to give information on spill response and reporting procedures.

You can find records of different trainings that Agnico personnel have attended in Table 8. Basic spill response training will be completed in 2017 by all Agnico employees and contractors working on the Meadowbank project as part of the induction which is mandatory for all personnel coming to the Meadowbank site.

12.1.2 OHF Personnel Training

Prior to the first discharge of fuel form the vessel to the OHF a mandatory training will take place. This will be a review with all the personnel responsible for the shore based portion of the fuel transfer, including the third party contractor and the Baker Lake supervisor, the current OPEP and make them aware of the procedures to follow in case of a spill before the first fuel barge arrived. A copy of the 2017 log sheet will be provided to TCMSS once the training is completed.

In April 2016, a meeting with all Departments of Agnico involved with fuel transfer was held. The OPEP, prior to and during transfer checklists were reviewed. Meeting minutes can be found in Appendix D – 1.3. The minutes from meeting that will be held in 2017 prior to shipping season will be include in the next OPEP update.

12.1.3 Boat Operators

All people involved in the supervision during operation and / or on the spill response will complete the training course for the pleasure craft operator. Records of pleasure craft operator certification will be retained by the Meadowbank Training department.

All concerned persons working for Agnico Eagle Mines Ltd. must possess a pleasure craft operator card and provide proof of this certification prior to operating any boat relating to the Meadowbank project which includes the Baker Lake Marshalling facility. This includes emergency responders.

Table 8 - Spill Response Training

Agnico Eagle Mines Meadowbank Division

Spill Response Training

	Name	Company	Spill Response Operations Course / CCG	Emergency Planning and Spill Response Awareness / SWAT Consulting	OHF & AWPR Spill Response / Jamie Kataluk	OHF & AWPR Spill Response / Tom Thompson	OHF & AWPR Spill Response / Robin Allard	OHF & AWPR Spill Response / Martin Therialut	OHF Spill Response and Ship to Shore Checklist / Jeffrey Pratt
AEM EE	Jeffrey Pratt	AEM		15/01/2013		14/07/2015			30/09/2014
AEM EE	Robin Allard	AEM	01/01/2012	16/01/2013		14/07/2015			30/09/2014
AEM EE	Martin Theriault	AEM	01/01/2011	15/01/2013				16/07/2016	
AEM EE	Fanny Laporte	AEM		15/01/2013					
AEM EE	Richard Jackson	AEM		15/01/2013					
AEM EE	Tom Thomson	AEM	24/04/2015	15/01/2013					
AEM EE	Jamie Kataluk	AEM	24/04/2015	16/01/2013					30/09/2014
AEM EE	Randy Schwandt	AEM						16/07/2016	
AEM EE	Dave Holmstrom	AEM		16/01/2013					
AEM EE	Potogu Noah	AEM			10/07/2013				
AEM EE	Stephane Larose	AEM		16/01/2013					
AEM EE	Jean-Claude Poitras	AEM					18/06/2013		
AEM EE	Bernard Paradis	AEM					18/06/2013		
AEM EE	Serge Pare	AEM					18/06/2013		
AEM EE	Ray Carlson	AEM					18/06/2013		
AEM EE	Mark Nulait	AEM						20/09/2012	
AEM EE	Tim Chappelle	AEM						20/09/2012	
AEM EE	Alexandre Arcand	AEM						25/09/2012	
AEM EE	Alexande Ouellette	AEM				14/07/2015			30/09/2014
AEM EE	Fredy Riveron	AEM						16/07/2016	
AEM EE	Steve Paquin	AEM							30/09/2014
NOT AEM	Francois Moses	Intertek				14/07/2015			30/09/2014
NOT AEM	Alberto Rodriguez	Intertek				14/07/2015			30/09/2014
NOT AEM	Cerbah Nassim	Intertek						16/07/2016	
NOT AEM	Jose Vergara	Intertek						16/07/2016	
NOT AEM	Sanik Faraq	Intertek				14/07/2015			30/09/2014

AGNICO EAGLE

SECTION 13. COASTAL SHIPPING

13.1.1 Coastal Shipping

In Appendix A - 1.2 you will find the contact information for Coastal Shipping during the barge season. This contact information will be used again in the 2017 season; no changes are required for this year. This will be reviewed with Coastal Shipping on an annual basis.

SECTION 14. REFERENCES

Transport Canada *Oil Handling Facilities Standards*, TP12402E.

Canadian Coast Guard, Central & Arctic Region, 2008. *Regional Response Plan.*

Marine Insight, 2012. What is Ship Oil Pollution Emergency Plan (SOPEP)? http://www.marineinsight.com/misc/maritime-law/what-is-ship-oil-pollution-emergency-plan-sopep/#ixzz21B2YvDTW http://www.marineinsight.com/misc/maritime-law/what-is-ship-oil-pollution-emergency-plan-sopep/#ixzz21B1dDGL5

Moller, T.H. & Santner, R.S. 1997. *Oil Spill Preparedness and Response: the Role of Industry,* 1997 International Oil Spill Conference, Technical Report IOSC-005.

National Oceanic and Atmospheric Administration http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/in-situ-burning.html

Transport Canada, TP- 12401, 1995. *Response Organizations Standards.*

Transport Canada, TP-12402, 1995. *Oil Handling Facilities Standards.*

Transport Canada, TP-10783, 1997*. Arctic Waters Oil Transfer Guidelines.*

Transport Canada Guideline, TP-10783E, 1997. *Arctic Waters Oil Transfer Guidelines,* Prairie and Northern Region, Marine (AMNS - OTT).

Transport Canada, TP-13585, 2008. *Environmental Prevention and Response National Preparedness Plan.*

Transport Canada Guideline TP- 9834E, 2009. *Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants*.

Journal of Petroleum Science Research (JPSR) Volume 2 Issue 3, July 2013 - Modeling Oil and Petroleum Evaporation by Merv F. Fingas

APPENDIX A 1.1- COASTAL SHIPPING LTD. SOPEP

The WOODWARD GROUP OF COMPANIES

Coastal Shipping Limited
A Division of Woodward Group of Companies

Coastal Shipping Ltd.
The Woodward Group of Companies
114 Main Street, P.O. Box 910
Lewisporte, NL A0G 3A0 CANADA

Shipboard Marine Pollution Emergency Plan (SMPEP)

M/T "STEN FJORD"

APPROVED
MARPOL, Annex I, Reg.37, Annex II, Reg. 17, in compliance with IMO Res. MEPC. 85(44) as amended by IMO Res. MEPC. 137(53)
SEE LETTER
Date: 2016-07-25

Prepared By: Poseidon Marine Consultants Ltd.
Document No.:16-060-003
Revision: 2
Revision Date: 21 July 2016

CONFIRMATION OF ACKNOWLEDGE

Shipboard Marine Pollution Emergency Plan

Date Entered:	Rank:	Name:	Signature:

Document History

Revision	Date	Description	By
0	19 May 2016	Issued for delivery voyage only	AJM
1	17 June 2016	Issued for use	LAB
2	21 July 2016	Revised per DNVGL comments	AJM

Revision Summary

Revision	Affected Sections	Remarks	By
1	17 June 2016	General Revision	LAB
2	21 July 2016	Reference scenario "Cargo contamination yielding hazardous conditions. Reference amendment MEPC.138(53).	AJM

Table of Contents

Appendices

A Spill Equipment Inventory

B Vessel Drawings

- General Arrangement
- Diagram of Fuel Fill/Transfer
- Tank Capacity Plan
- Lubricating Oil System
- Stripping System
- Bilge System

1.0 Ship Particulars

SHIP'S IDENTIFICATION

DNV GL REGISTER NUMBER	G94069
NAME OF SHIP	STEN FJORD
CALL SIGN	XJAD
IMO NUMBER	9187409
TYPE OF SHIP	CHEMICAL / OIL TANKER
PORT OF REGISTRY	ST. JOHN'S
GROSS TONNAGE	8882
FLAG	CANADA
OFFICIAL NUMBER	839928

Owner / Managers: See Section 4, "Ship Interest Contacts"

2.0 Introduction

1. This Shipboard Marine Pollution Emergency Plan (hereafter referred to as the "Plan") is written in accordance with the requirements of regulation 26 of Annex I and regulation 16 of Annex II of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 there to and amended by Res. MEPC. 78 (43). As recommended by IMO this plan is a **combination of a Shipboard Oil Pollution Prevention Plan (SOPEP) and a Shipboard Marine Pollution Emergency Plan (SMPEP) for noxious liquid substances (NLS).**

2. The purpose of the Plan is to provide guidance to the Master, officers and operating personnel onboard the Ship, with respect to the steps to be taken when an oil or marine pollution incident has or is likely to occur. The appendices contain communication data of all contacts referenced in the Plan, as well as other reference material.

3. The Plan contains all information and operational instructions required by the "Guidelines for the development of the Shipboard Marine Pollution Emergency Plan" as developed by the Organization (IMO) and published under MEPC. 85(44) and MPEC.54 (32) amended by MPEC.86(44). .

4. This Plan has been examined by Transport Canada - Marine Safety, (herein after referred to as "the Board") and, except as provided below, no alteration or revision shall be made to any part of it without prior approval of the Board.

5. Changes to Sections 4 and the appendices will not be required to be approved by the Board. The appendices should be maintained up to date by the Owners, Operators, and Managers.

6. For the purposes of this Plan, the Master is taken to be that person who is a member of the vessel's operational personnel and to which is given senior responsibility for the vessel and any circumstances pertaining thereto.

7. Before entering a port of call, the Master should be aware of local emergency response procedures and organizations and have up to date contact information readily available.

3.0 Reason for Shipboard Marine Pollution Emergency Plan

1. This Plan is intended to assist the ship's personnel in dealing with an unexpected discharge of oil or noxious liquid substances. Its primary purpose is to set in motion the necessary actions to stop or minimize the discharge of those substances and to mitigate its effects. Effective planning ensures that the necessary actions are taken in a structured, logical and timely manner.

2. The primary objectives of this Plan are to:
    - prevent pollution
    - stop or minimize outflow when a damage to the ship or its requirement occurs
    - stop or minimize outflow when an operational spill occurs in excess of the quantity or instantaneous rate permitted under the present Convention.

3. Further, the purpose of the Plan is to provide the Master, officers and certain crew members with a practical guide to the prevention of marine spills and in carrying out the responsibilities associated with regulation 26 of Annex I and Reg. 16 of Annex II of MARPOL 73 / 78.
    - procedures to report an oil / marine incident.
    - Coastal States (Focal Points) and Port Contact Lists to be contacted in the event of any pollution incident.
    - co-ordination with national and local Authorities in combating a pollution.

4. In summary, the Plan will serve to promote a practiced response when the ship's personnel are faced with a spill.

5. Although the Plan is designed as a ship-specific tool it must be also be considered as an additional instrument and is a link to shore-based plans. With this, the Plans allow an efficient co-ordination between the ship and shore-based Authorities / Organizations in mitigating the effects of any pollution incident.

6. The Plan includes a summary flowchart (See page 8-9) to guide the Master through reporting and acting procedures required during an oil pollution incident response.

7. The Plan is likely to be a document used on board by the Master and the officers of the ship and must therefore be available in the working language used by them.

8. The Plan is not applicable if the vessel operates in U.S waters within the EEZ (exclusive economic zone). The Vessel Response Plan (VRP) has to be activated.

9. All Procedures in this Plan are in line with Coastal emergency procedures which can be found in the file Emergency Preparedness as part of the Safety Management System (SMS). They should be referred to in any case for obtaining additional information.

3.1 Shipboard Marine Pollution Emergency Plan – Summary Flow Chart

This flow diagram is an outline of the course of action that shipboard personnel should follow in responding to a pollution emergency based on the guidelines published by the Organization. This diagram is not exhaustive and should not be used as a sole reference in response. Consideration should be given inclusion of specific reference to the Plan. The steps are designed to assist ship personnel in action to stop or minimize the discharge of oil or NLS and mitigate its effects. These steps fall into two main categories - reporting and actions.

SUMMARY FLOWCHART

Discharge of Oil or Noxious Liquid Substances (Probable or Actual)

Assess Nature of Incident

Actions Required

- Sound Alarm and Muster Crew
- Identify spill source
- Personnel Protection
- Spill Assessment
- Vapour Monitoring
- Evacuation

REPORTING

- By Master and/or Designated Crew Member

When to Report

- all probable and actual spills

How to Report

- by quickest possible means to Coastal Radio Station, Designated Ship Movement Reporting Station or Rescue Coordination Centre
- by quickest possible means to local authorities

Who to Contact

- nearest coastal state
- harbour and terminal operators (in port)
- Vessel Management

What to Report

- Initial Report - Res.A854(20)
- regular Follow Up Reports
- characteristics of spilled oil
- cargo, ballast, and bunkers
- weather and sea conditions
- slick movement
- assistance required (e.g. salvage, lightening, equipment, personnel, chemicals)
- assistance NOT required

ACTIONS TO CONTROL DISCHARGE

- measures to minimize the escpae of oil and threat to the marine environment

NAVIGATIONAL MEASURES

- alter course, speed, or position
- change of list and/or trim
- anchoring
- setting aground
- initiate towage
- assess safe haven requirements
- weather, tide, swell forecasts
- slick monitoring
- recording of events & communications

SEAMANSHIP MEASURES

- safety assessment and precautions
- advice on priority countermeasures
- damage stability and stress considerations
- ballast / deballasting
- internal cargo transfer operations
- emergency ship-to- ship transfers of cargo and/or bunkers
- set up shipboard responses for repairs, firefighting, cleanup operations, etc.

STEPS TO INITIATE EXTERNAL RESPONSE

- refer to coastal Port State listings for local help
- refer to Vessel Interests contact list
- external clean-up resources required
- continued monitoring of activities

4.0 Reporting Requirements

4.1 General

The reporting requirements of this section comply with those of regulation 26 Annex I and16 Annex II of MARPOL 73 / 78.When the ship is involved in an incident which results in the discharge of oil or NLS, the Master is obliged under the terms of MARPOL 73 / 78 to report details of the incident, without delay, to the nearest Coastal state by means of the fastest telecommunication channels available.

The intent of these requirements are to ensure that Coastal States are informed, without delay, of any incident giving rise to pollution, or threat of pollution of the marine environment, as well as of the assistance and salvage measures, so that appropriate action may be taken.

Without interfering with ship owner's liability, some coastal states consider that it is their responsibility to define techniques and means to be taken against a marine pollution incident and approve such operations which might cause further pollution i.e. lightening. States are in general entitled to do so under the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 and the Protocol relating to Intervention on the High Seas in Cases of Pollution by Substances other than Oil, 1973.

4.2 Reporting Procedures

For easy reference the reporting requirements in the context of this plan are divided in to the following information blocks:

4.2.1 When to Report

Taking the summary flowchart as shown on page 9 as a basic guide into consideration reports are necessary in the following cases:

1. Actual Discharge

   The Master is obliged to report to the nearest Coastal state whenever there is a discharge of oil:

- resulting from damage to the ship
- resulting from damage to the ship's equipment
- for the purpose of securing the safety of a ship or saving life at sea
- during the operation of the Ship in excess of the quantity or instantaneous rate permitted under the present Convention.

2. Probable Discharge

   The Master is obliged to report even when no actual discharge of oil or NLS has occurred but there is a probability that one could occur.

However, as it is not practicable to lay down precise definitions of all types of situations involving probable discharge of oil / NLS which would warrant an obligation to report, the Master is obliged to judge by himself whether there is such a probability and whether a report should be made.

Therefore, it is recommended that, at least, the following events are carefully considered by the Master; taking into account the nature of the damage failure or breakdown of the ship, machinery or equipment as well as the ship's location , proximity to land, weather, state of the sea and traffic density - as cases in which a probable discharge is more likely:

- damage, failure or breakdown which affects the safety of the ship (e.g. collision, fire, grounding, explosion, structural failure, flooding, cargo, cargo shifting, list, etc.); or

- failure or breakdown of machinery or equipment which results in impairment of the safety of navigation (e.g. failure or breakdown of steering gear, propulsion, electrical generating system, essential shipborne navigation aids etc.)

If in doubt, the Master should always make a report in cases aforementioned.

In all cases the Authorities should be kept informed by the Master as how the situation progress and be advised when all threats of pollution have passed.

4.2.2 Information Required

As required in article 8 and Protocol I of MARPOL 73 / 78 Convention the Master or other persons having charge of the ship should report the particulars of any pollution incident. In this context the International Marine Organization (IMO), in 1997, adopted Resolution A.851(20) "General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents involving Dangerous Goods, Harmful Substances and / or Marine Pollutants" as amended with MEPC.138(53).

The intent of the Resolutions aforementioned is to enable Coastal States and other interested parties to be informed, without delay, of any incident giving rise to pollution, or threat of pollution of the marine environment, as well as of assistance and salvageable measures, so that appropriate action may be taken.

Nothing in this chapter relieves the Master in using sound judgment to make sure that any incident or probable discharge is reported as quickly as possible in the prevailing situation. When Transmitting initial reports to the authorities of the nearest Coastal State, the Master or other persons dealing with such a transmission should take note of IMO Resolution A.851(20) as amended with MEPC.138(53).

Especially the format of the initial report as well as supplementary follow up reports should conform to the guidance contained in Resolution A.851(20) as amended with MEPC.138(53). All reporting whether initial or follow up, should follow IMO's reporting format as outlined below and should contain the following information:

4.2.3 Format and Information Required for Official Report

AA VESSEL NAME, CALL SIGN, FLAG

BB DATE AND TIME (GMT) OF INCIDENT: 11/1935 meaning 11th of month at 7:35 pm.

CC SHIPS POSITION: 2230N 0600E meaning 22 deg. 30 min. N, 6 deg. E

DD SHIPS POSITION: By true bearing (3 digits) and distance from clearly identified landmark.

EE TRUE COURSE (3 digits)

FF SPEED IN KNOTS AND TENTHS OF A KNOT (3 DIGITS)

LL ROUTE INFORMATION – Intended Track

MM RADIO STATIONS AND FREQUENCIES GUARDED

NN TIME OF NEXT REPORT (same as in BB)

OO DRAFT (4 DIGITS - meters and centimeters)

PP TYPES AND QUANTITIES OF CARGO AND BUNKERS ON BOARD

QQ BRIEF DETAILS OF DAMAGE, LIMITATIONS ETC. (must include condition of vessel and ability to transfer cargo, ballast, or fuel)

RR BRIEF DETAILS OF ACTUAL POLLUTION (oil type, estimate of quantity discharged, whether discharge continues, cause, estimate of slick movement)

SS WEATHER AND SEA CONDITIONS (wind force/direction, relevant tidal and/or current information)

TT NAME, ADDRESS, FAX, TELEPHONE NUMBERS OF VESSEL OWNER OR REPRESENTATIVE.

UU DETAILS OF LENGTH, BREADTH, TONNAGE, AND TYPE OF VESSEL

WW TOTAL NUMBER OF PERSONS ON BOARD

XX MISC. DETAILS (This includes brief details of incident, actions taken, injuries sustained and assistance required. If no outside assistance is required, then this should be clearly stated.)

All follow up reports by the Master should include information relevant to the Coastal State Authorities to keep them informed as the incident develops.

Follow up reports should include information on any significant changes in the ship's condition, the rate of release and spread of the substances, weather and sea conditions and clean-up activities underway.

In this context details of bunker and cargo disposition, condition of any empty tanks and nature of any ballast carried are information needed by those involved in order to assess the threat posed by an actual or probable discharge from the damaged ship.

4.2.4 Whom to Contact

The Master is responsible for reporting any incident involving an actual or probable discharge of oil or NLS. Contact information for coastal State and other concerned parties (port contacts, vessel interest contacts) is located in Appendix 2.

4.2.4.1 Coastal State Contacts

The vessel, in accordance with the regulations, has onboard a **declaration** that the vessel's management has, in accordance with 167 of the Canada Shipping Act 2001, entered into an arrangement with a response organization to which a certificate of designation has been issued pursuant to section 169 in respect of the quantity of oil that is carried both as fuel and cargo on board the vessel.

Three response organizations (RO) have been established in Eastern Canada. Although each of the ROs is independent Corporations they are linked together through various support and mutual aid agreements. Each of the ROs has a specific Geographic Area of Response (GAR) and a certified response capability of 10,000 tonnes. The following table provides a list of the ROs and a general description of their GARs.

Response Organization	Geographic Area of Response (GAR)
• Eastern Canada Response Corporation Ltd. (ECRC)	• In general the waters of the Canadian Great Lakes, Quebec and the Atlantic Coast excluding areas covered by Alert and PTMS
• Atlantic Emergency Response Team ("ALERT") Inc.	• In general the Port of Saint John, New Brunswick and surrounding waters.
• Point Tupper Marine Services Limited (PTMS)	• In general the Port of Port Hawkesbury, Nova Scotia and surrounding waters.

Prior to commencing a voyage the master or his onboard designate is responsible to ensure that the necessary declarations for the intended voyage are onboard and necessary contact information has been inserted in the manual in Appendix 4: Who to contact under section "Additional Contact Information".

As an example of whom to contact please refer to the page 31 for Eastern Canada Response Corporation (ECRC) call out sheet. If conditions permit (i.e. time and prevailing conditions) the MASTER shall consult with vessel management contact prior to activation of any response organization. The person or persons identified in the **declaration** shall be responsible for contacting and mobilizing the response organization.

5.0 Steps to Control Discharge

Ship personnel will most probably be in the best position to take quick action to mitigate or control the discharge of oil or noxious liquid substances from their ship. Therefore, this Plan provides the Master with clear guidance on how to accomplish this mitigation for a variety of situations.

It is the Master's responsibility to initiate a response in the event of a discharge of oil / NLS or substantial threat of discharge - actual or probable - into waters.

In no case action should be taken that in any way could jeopardize the safety of personnel either onboard or ashore.

In cases of a discharge of noxious liquids substances the Master has to refer to the "Material Safety Data Sheet" (MSDS) provide onboard for any NLS cargo. Consideration is to have to be made to any danger resulting from discharge of such substances, i.e. mixing with water, air, other materials / substances.

Special consideration is to be taken in case of the necessity to transfer cargo into another compartment onboard of the compatibility of the material to be transferred and the material of pipes and tanks to be used for such actions.

In cases of small spills on deck, the vessel's crew should take whatever actions are necessary to prevent oil from escaping over the side. Once the spill is contained on deck, the crew will need to take action to clean up the oil. **Spilled oil shall not be washed over the side**. Once oil is in the water, the crew's ability to respond in a practical manner is greatly reduced.

The following list specifies different kinds of possible operational spills with regard to reactions to be taken.

5.1 Operational Spills

5.1.1 Operational Spill Prevention

All crew members shall maintain a close watch for the escape of oil or NLS during bunker or cargo operations.

Prior to bunker or cargo transfer the competent crew members should mobilize the spill equipment, as far as available on board, and place it close to the planned operation, e.g. along the railing on the side at which bunker operation takes place. All deck scuppers and open drains must be effectively plugged. Accumulations of water should be drained periodically and scupper plugs replaced immediately after the water has run off. Any free floating substances should be removed prior to draining.

Bunker or Cargo tanks which have been topped up should be checked frequently during the remaining operations to avoid an overflow.

Unless there are permanent means for retention of any slight leakage at ship / shore connections for bunker or cargo transfer, it is essential that a drip tray is in place to catch any leaking substance.

All crew members of the ship's crew should be familiar with the fundamentals of the ship's vital systems including the ventilation and electrical systems. Crew members should be able to isolate the accommodation and/or machinery spaces using the louvers and fan shutoffs and, from the distribution panels, isolate electrical circuits in areas of risk.

In the event of an operational spill which occurs during bunkering or cargo operations, it is important that the bunkering party terminate any and all bunkering operations and close all manifold valves.

Before closing any manifold valves, the bunkering / cargo party must immediately inform the terminal / loading master so that they may take action to eliminate the possibility of over- pressurization of the shore side transfer components.

After dealing with the cause of the spill, it may be necessary to obtain permission from local authorities and/or the terminal before resuming bunkering or cargo operations.

If the possibility of fire or explosion exists, nonessential air intakes to accommodations and machinery spaces should be closed and all sources of ignition should be eliminated. See Section 1.3.3 of this Plan.

Care must be taken to consider stability and stress when taking action to mitigate the spillage of oil. Internal transfers should be undertaken only with a full appreciation of the likely impact on the vessel's overall stress and stability. Please refer to the "Approved Stability Book" carried on board.

5.1.2 Operational Spill Checklist

Action Considered	Designated Person	Completed
Sound emergency alarm	Person Discovering Incident	Y / N
Mobilize Oil Pollution Prevention Team	Chief Engineer / Master	Y / N
Cease all bunkering operations	Chief / 2nd Engineer	Y / N
Locate source of leakage	Chief / 2nd Engineer	Y / N
Operate manifold valves	Chief / 2nd Engineer	Y / N
Close all nonessential vent intakes and tank vents as required	Chief / 2nd Engineer	Y / N
Stop or reduce outflow	Chief Engineer / Deckhand	Y / N
Assess fire risk	Chief Officer	Y / N
Commence clean up	Chief Officer	Y / N
Assess Stress / Stability	Master / Chief Officer	Y / N
Transfer fuel from damaged area to slack tanks or other containment space	Chief / 2nd Engineer	Y / N
Request outside assistance if required	Master	Y / N
Counter excessive list if required / possible	Chief Officer	Y / N

5.1.3 Pipeline Leakage

In the event of leakage from an oil / NLS pipeline, valve, hose or metal arm, the Chief Engineer must ensure that the following actions are taken:

- Stop oil flow, close manifold and other valves.
- Sound emergency alarm and mobilize Oil Pollution Prevention Team
- Locate source and drain affected section into an available empty or slack tank. Repair if possible
- If there is any possibility of vapours entering the engine room or accommodation intakes, appropriate preventative steps must be quickly taken.
- Absorb spill with any absorbent materials on hand and dispose of oil soaked materials in an appropriate container.
- If oil is overboard, report to proper authorities immediately (as per section 4 of this plan).

5.1.4 Tank Overflow

In the event of an oil tank overflow, the Chief Engineer must ensure that the following actions are taken:

- Stop oil flow, close manifold and other valves.
- Sound emergency alarm and mobilize Oil Pollution Prevention Team
- Place drain buckets under overflow pipes to contain possible spills.

- If there is any possibility of vapours entering the engine room or accommodation intakes, appropriate preventative steps must be quickly taken.
- Drain or transfer oil to slack or empty tanks if possible with due consideration paid to vessel stability. If no slack or empty tanks are available, oil may be pumped back ashore through delivery lines, having first gained permission to do so.
- Absorb spill with any absorbent materials on hand and dispose of oil soaked materials in an appropriate container.
- If oil is overboard, report to proper authorities immediately (as per section 4 of this plan).

5.1.5 Hull Leakage

If oil is noticed on the water near the vessel during normal operations and cannot be accounted for, the possibility of hull leakage should be suspected.

In the event of a hull leakage, the Master must ensure that the following actions are taken:

- Sound emergency alarm and mobilize Oil Pollution Prevention Team.
- Stop any transfer or bunkering operations.
- Identify damage and report to proper authorities immediately (as per section 4 of this plan). Consider a diver if necessary and possible.
- If possible, contain spill using materials on hand and dispose of oil soaked materials in an appropriate container.
- If there is any possibility of vapours entering the engine room or accommodation intakes, appropriate preventative steps must be quickly taken.
- Transfer fuel away from suspected leaks to empty or slack tanks if possible, or to a ballast tank if necessary. If in port, arrangements can be made to pump oil ashore to tanks or trucks. Due consideration is to be paid to vessel stress and stability.
- If it is not possible to identify the leaking tank, reduce level in all tanks in the vicinity, giving due consideration to vessel stress and stability.

5.1.6 Spills caused by Equipment in Machinery Spaces

If operational spills are caused by failure of equipment in machinery spaces, any further operation of this equipment should be stopped immediately and measures are to be taken to avoid a spill. Such equipment may be:

- Oily - water separating equipment or oil filtering equipment or oil filtering equipment to de-oil bilge water from the engine room bilges.
- Valves in pipes connecting ballast / cargo systems
- Cooling pipes in cooler systems
- Gearing of bow thruster
- Stern tubes
- Sound emergency alarm and mobilize Oil Pollution Prevention Team.
- Absorb spill with any absorbent material in hand and dispose of oil soaked materials in an appropriate container.
- Do not restart equipment until problem has been rectified.

5.2 Spills Resulting from Accidents

In the event of a casualty the Master's first priority will be to ensure the safety of personnel and the vessel and initiate action to prevent escalation of the incident and marine pollution.

5.2.1 Ship grounded / stranded

If the vessel grounds, the Master must ensure that the following actions are taken:

- Sound emergency alarm, muster crew, and Mobilize Oil Pollution Prevention Team once safe to do so.
- Eliminate all avoidable sources of ignition and ban smoking onboard. Action bust be taken to prevent hazardous vapours from entering accommodation and machinery spaces. See section 1.1.3.
- Identify damage by means of a visual inspection.
- Take soundings around vessel to determine the nature and gradient of seabed.
- Check differences in tidal range at grounding site.
- Evaluate tidal current in grounding area.
- Take soundings of all tanks on shell and compare with departure soundings.
- Determine probability and/or quantity of oil released
- If oil release is determined or is probably, this is to be included in the casualty report.
- Determine other possible hazards to the vessel such as sliding off the grounding site or further damage from seas / swell, and torsion forces.

At this point, determine risk of additional damage to vessel by attempting to refloat. If remaining aground is determined to be less of a risk then:

- Use anchors to prevent vessel movement.
- Take on ballast in empty tanks with due consideration paid to stress and stability. Please refer to the approved stability book.
- Consider transfer of fuel from damaged tanks with due consideration paid to stress and stability. Please refer to the approved stability book.
- Reduce longitudinal stress on the hull by transfer of fluids internally. Please refer to the approved stability book.
- If the change in stability and stress cannot be calculated onboard, contact the vessel's management to arrange for the necessary calculations. Refer to appendix 3 for information which should be provided.

5.2.1.1 Prevention of Fire and Explosion

If a fire or explosion occurs on board, the vessel's fire control party must ensure that the following actions are taken:

- Sound emergency alarm, muster crew, and mobilize Oil Pollution Prevention Team once safe to do so.

- Determine extent of damage and what damage control measures can be taken.
- Determine whether there are casualties.
- Request assistance as deemed necessary.
- Take necessary actions to prevent smoke and other hazardous vapours from entering the accommodation and machinery spaces.
- Assess possibility of oil leakage.
- Determine possible actions to control the discharge of oil. This will depend largely on the damage to the ship and cargo.
- If there is a discharge or possible discharge of oil, this to be included in the casualty report.
- Should abandonment be necessary, the Master must ensure that every effort is made to maneuver survival craft upwind of any oil spill.

5.2.1.2 Hull Damage / Hull Failure / Containment Failure

If the vessel suffers structural hull failure, the Master must ensure that the following actions are taken:

- Sound emergency alarm, muster crew, and mobilize Oil Pollution Prevention Team once safe to do so.
- Reduce speed or stop to minimize stress on hull.
- Assess immediate danger of sinking or capsizing.
- Initiate damage control measures if possible.
- If lightening is required, all efforts should be made to wait for a barge or other ship to receive the cargo.
- If oil has spilled, or if it is necessary to jettison oil to maintain stability, make a report as per section 2.
- If the change in stability and stress cannot be calculated onboard, contact the vessel's management to arrange for the necessary calculations.
- Consider forecasted weather conditions and their effect on the situation.
- Should abandonment be necessary, the Master must ensure that every effort is made to maneuver survival craft upwind of any oil spill.

5.2.1.3 Procedures to reduce or Stop Outflow of Oil or NLS

The Master should assess the possibility of damage to the environment and whatever action can be taken to reduce further damage from any release, such as;

- Transfer /cargo internally, provided shipboard piping system is in an operational condition and in careful view of the compatibility of the substance and the tanks/pipes used for transfer, and taking into account the impact on the ship's overall stress and stability.
- Isolate damaged/penetrated tanks hermetically to ensure that hydrostatic pressure in tanks remains intact during tidal changes.
- Evaluate the necessity of transferring bunkers / cargo to barges or other ships and request such assistance accordingly.

- Evaluate the possibility of additional release of oil or NLS in close co-operation with coastal states.

In case of large differences between the tide levels, the Master should try to isolate the damaged tanks to reduce additional to reduce additional loss of substances.

5.2.1.4 Refloating by own means

The Master should also evaluate the question of refloating the vessel by own means. Before such an attempt is made, it must be determined:

- whether the ship is damaged in such a way that it may sink, break up or capsize after getting off
- whether the ship , after getting off, may have maneuvering problems upon leaving the dangerous area on its own.
- whether machinery, rudder or propeller are damaged due to grounding or may be damaged by trying to get off ground by own means.
- whether the ship may be trimmed or lightened sufficiently to avoid damage to other tanks in order to reduce additional pollution.
- weather evaluation; whether there is time/reason to await improvements in weather or tide.
- whether ship's structure permits refloating/consultation of GL Emergency Response Service
- whether all steps of Coastal Shipping Ltd. procedure "Grounding" have been complied with.

5.2.1.5 Securing the Ship

If the risk of further damage the ship is greater in an attempt to refloat the ship by own means, than in remaining aground until professional assistance has been obtained, the ship's Master should try to secure the ship as much as possible:

- Trying to prevent the ship from moving from its present position
- By dropping anchors (adequate water depth and anchor ground provided)
- By taking ballast into empty tanks, if possible
- Trying to reduce longitudinal strain on hull by transferring ballast or bunkers internally
- Reducing fire risk by removing all sources of ignition.

Inform in line with Section 2 all parties interested about Grounding and the actions taken so far.

5.2.2 Fire/Explosion

If an explosion and a fire occur onboard, sound the GENERAL ALARM immediately. Further actions should be initiated in accordance with the ship's Muster List. In case of fire and explosion the following priorities exist:

- Rescuing lives
- Limiting damage /danger to the ship and cargo
- Preventing environmental pollution

The Coastal Shipping Emergency Procedure **"Fire and Explosion"** in the file Emergency Preparedness should be complied with.

Steps to control the discharge of oil will depend largely on the damage to the ship and cargo. Special information thereto is contained in subparagraphs 3.2.4, 3.2.5 and 3.2.6. Inform in line with Section 2 all parties interested about the Fire /Explosion and the actions taken so far.

5.2.3 Collision

The Master shall follow the emergency plan as given in Coastal Shipping Ltd Emergency procedure "Collision" in file: Emergency Preparedness as follows:

- Sound emergency alarm, muster crew, and mobilize Oil Pollution Prevention Team once safe to do so.
- Determine whether there are casualties.
- If there is a possibility of fire or explosion, eliminate all avoidable sources of ignition and ban smoking onboard. Action should be taken to prevent flammable vapours from entering the accommodation and machinery spaces. .
- Decide whether separation of vessels may cause or increase spillage of oil, or increase the risk of sinking.
- If any oil tanks are penetrated, isolate these tanks or transfer oil to slack or empty tanks with due attention paid to stress and stability of the vessel. Please refer to the approved stability book.
- If there is an oil spill, make a report as per section 4.
- If possible to maneuver, the Master, in conjunction with the appropriate shore authorities should consider moving his ship to a more suitable location in order to facilitate emergency repair work or lightening operations, or to reduce the threat posed to any sensitive shoreline areas.

5.2.4 Excessive List

Should the ship for some reasons suddenly start to list excessively during discharging/loading operations, or bunkering, all ongoing operations should be stopped immediately until the cause has been determined.

The Officer on duty should inform the Master and/or Chief Officer without delay.
The Master should try to determine the reason for excessive list, and take steps to rectify the situation and to stabilize the ship's condition:

- Check reasons for list
- Soundings / Ullage to be taken in all tanks

- Bunker / Ballast / Cargo pumps to be made ready
- Consider measures to minimize list in transferring liquid from one compartment to another
- Ensure water tightness of empty spaces
- Close all opening
- Secure vent pipes to avoid ingress of water
- If bunkering: change to corrective tanks for rectifying the situation
- If ballasting / de-ballasting: change to corrective tanks to rectify the situation
- If there is reason to believe that the list may cause any spill, notify as per Section 4
- If the ship's crew is in jeopardy, prepare lifeboats for launching, and notify as per Section 4

If the situation is brought under control, inform all parties interested.

5.2.5 Dangerous reaction of cargo / contamination yielding a hazardous condition

In case of spillage of NLS cargo on deck, to the sea, or incidental mixture with other cargo through internal tanks leakage, consider dangerous reactions of such mixtures. Promptly consult the Material Sheet Data Sheet (MSDS) available for the cargo onboard about possible hazards and necessary precautions. Take necessary actions to protect the crew from contact with spilled material or its vapours and review first aid procedures in the event of contact.

5.2.6 Other dangerous cargo and / or vapour release

In case of release of dangerous NLS take necessary actions for the protection of the crew against health hazards, especially by contact with materials or its toxic vapours. Avoid material or vapours spreading over the ship. If any dangerous material or vapour is released from any part of the containment system, take arrangements to free the deck area as far as possible by turning the ship to have the accommodation upwind of the point of release.

Evacuate crew members from the endangered area. If persons have to carry out any unavoidable duties within the endangered area, insure personal protection devices are used for those persons to avoid direct contact. All possible sources of ignition should be eliminated and non-essential air intakes shut down to prevent intake of vapour into accommodation and engine spaces.

Take measures to reduce tanks level or pressure to stop any emission of material or vapour. Report such spillage to nearest coastal state in order to arrange precautionary measures for the environment.

5.2.7 Loss of tank environmental control

Consider loss of environmental control as a possible explosion hazard. Consult the MSDS sheets for specific hazards. Avoid air intake to the spaces.

5.2.8 Ship submerged / foundered / wrecked

If the ship is wrecked to the extent that it or parts of it are submerged, take all measures to evacuate all persons onboard. Avoid contact with any spilled cargo or oil. Alert other shops and/or the nearest coastal state for assistance in rescuing lives and the as far as possible.

5.3 Priority Actions

Top priority shall in all cases of emergency be the safety of the persons onboard and to take actions to prevent escalation of the incident. Immediate consideration should be given to the protective measures against fire, explosions, and personal exposure to toxic vapour.

Detailed information about damage sustained to the ship and its containment system has to be obtained. On the basis of the information the Master can decide next actions for the protection of lives, the ship, the cargo and the environment.

The Master should take into account the following when he is determining whether salvage assistance will be needed or not:

- Nearest land or hazard to navigation
- Vessel's set and drift
- Estimated time of casualty repair
- Determination of nearest capable assistance and its response time.

Detailed information about the cargo, especially NLS Cargo has to be available and to be referred to further actions regarding the cargo.

In case of necessary movement of cargo within the ship careful consideration is to be given to hull strength and stability as well as to the compatibility of all material (cargo, tanks, coating, piping) in view of any transfer actions planned.

Plans / tables about location and specification of the current cargo as well as bunkers and ballast have to be readily available. Information about current cargo / bunker / ballast distribution and the MSDS for the carried cargo substances are available at:

- Cargo, bunkers, ballast distribution: Cargo Office
- Material Safety Data Sheets (MSDS); Alleyway opposite of the cargo office

5.4 Mitigating Activities

If safety of both the ship and the personnel has been addressed the Master shall care for the following issues:

- Assessment of the situation and monitoring of all activities as documented evidence
- Care for further protection of the personnel, use of protection gear, assessment of further risk for health and safety
- Containment of the spilled material by absorption and proper and safe disposal of all material onboard until proper delivery ashore under close guidance of the safety information given by the Product Data Sheet
- Decontamination of Personnel after finishing the cleanup process.

5.5 Transfer of Bunker / Cargo - Lightening

If the ship has sustained extensive structural damage, it may be necessary to transfer all or part of the cargo/bunker to another ship. In Ship to Ship transfer operations involving a specialized service ship, the Master of that ship will normally be in overall charge.

In the case of non-specialized ships the Master or other person in overall charge of the operation should be mutually agreed and clearly established by the Masters concerned prior to the start of operations. The actual bunker/cargo transfer should be carried out in accordance with the requirements of the receiving ship.

In all cases each Master remains responsible for the safety to be jeopardized by the action of the other Master, his owner, regulatory officials or others.

The ship to ship transfer operations should be coordinated with the appropriate responsible local Authority. When selecting the area of operation the Masters should consider the following points:

- The need to notify and obtain the agreements of any responsible authority
- The destinations of the ships concerned
- The shelter provided, particularly from sea and swell
- The sea area and depth of water, which should be sufficient for maneuvering during mooring, unmooring, and transfer operations and allow a safe anchorage if operations have to be undertaken at anchor
- The traffic density
- The weather conditions and weather forecasts.

Further, before commencing Ship to Ship Transfer operations each ship should carry out, as far as possible, appropriate preparations like:

- Pre-mooring preparations of the ship
- Positioning of fenders if such equipment is available on board

- Mooring equipment arrangements
- Checking the communication channels between the two ships.

In addition to the general principles of Ship to Ship operations as aforementioned the Master should take note of supplemented instructions issued in the Coastal Shipping Ltd bunkering procedures.

5.6 Damage Stability and Hull Stress Calculation

Whenever the tank status changes in the course of the incident the stability and stress of the vessel has to be checked using the class approved cargo computer.

In case of hull damage stability shall instantly be checked using the appropriate application of the cargo computer. The damage control plan should be referred to. In addition to that the **GL Emergency Response Service** is to be consulted for proper stress and stability calculations.

Whenever possible the contact to the **GL Emergency Response Service** will be via Coastal Shipping Ltd. office in order to reduce the workload onboard. Otherwise the vessel can contact the **GL Emergency Response Service** directly using the following numbers:

Phone: **011-49-40-3614-9134**
Mobile: **011-49-172-405-9713**
Fax: **011-49-40-361-493-620**
email: **matthias.galle@gl-group.com**

5.7 Vessel Stress and Stability Information

VOYAGE PARTICULARS

Departure Port

Departure Date

Time (GMT)

VESSEL CONDITION IMMEDIATELY BEFORE CASUALTY

Mean Draft Forward

Mean Draft Aft

KG(solid)

KG(fluid)

LCG of Vessel

Condition of Tanks and Compartments

#	COMPARTMENT	S.G.	TONNES

5.7.1General Responsibilities of the Master and designated Officers / crew members

The responsibilities of the Master Officers and the crew onboard in the event of a spill actual or probable to bring the accident under control on board, limit overflows or cleanup procedures, and to secure the ship immediately if an incident occurs.

The following is an example which can be used by the Master to aid in designating officers. Should changes to the team be made, please make a record in this section :

Master
Chief Mate
Chief Engineer

In the event of an emergency, the team should be called out as soon as it is safe to do so.

The team should be given necessary training in the use of such equipment as oil absorbents that the vessel may carry. All members crew should be aware of their duties should an oil spill occur.

Master

- In overall charge.
- Informs terminal authorities or coastal authorities of incident.
- Informs the local agent and requests agent to inform the local underwriter's representative.
- Advises the company's head office of the situation. Keeps everyone updated at regular intervals. and advises of any changes in status of the emergency.
- Keeps log of all events and progress of actions.

Chief Mate

- In charge of deck / cargo operations.
- In charge of lifeboats if required.
- Keeps the Master informed and updated on the situation and of the results of steps taken to contain any spills and limit outflow.
- Insures all openings in the deck and superstructure are closed to limit vapour entry.
- Position sorbent / clean up material to prevent any fluid escape.

Chief Engineer

- In charge of bunkering operations.
- Organizes distribution of oil spill detergents if required.
- Stops bunkering operations if applicable.
- Stops pumps and any unnecessary pieces of machinery.

Other Personnel

Deck Officer on duty

- Alerts and informs Chief Officer / Chief Engineer on the situation.
- Mobilize off duty crew as necessary.

Engineer on duty

- Assist the Chief Engineer.
- Prepare for fire fighting.
- Ensure sufficient power and water to deck.
- Organizes onboard clean up equipment.

Deck Officer off duty

- Under the direction of the Master, responsible for the reporting and record keeping of all events.

On duty Ratings

- Alerts the Officer on duty of any leakage.
- Position sorbent / clean up material to prevent any fluid escape.

Off duty personnel

- Assist as required

6.0 National and Local Co-Ordination Steps to Control Discharge

In accordance with the Canadian Pollutant Discharge Reporting Regulations, the Master or Owner of a ship must report, without delay, any discharge or anticipated discharge of a pollutant in Canadian waters or fishing zones, to a Pollution Prevention Officer (PPO). Reports must be made in the manner described in Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants, TP 9834, or "General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants" adopted by the IMO by Resolution A.851(20) as amended with MEPC.138(53). These initial reports can be made to Marine Communication and Traffic Service (MCTS) or any other Canadian Coast Guard Radio Station (CGRS), on the frequencies listed in the publication, Radio Aids to Marine Navigation (RAMN).

In addition to the above process for reporting a spill from a vessel to a PPO through a CGRS or MCTS, the Canadian Coast Guard maintains a 24 hour Operations Center which can be contacted at:

Canadian Coast Guard Operations Center
344 Slater Street
Ottawa, Ontario
K1A 0N7

Tel: (613) 990-5600 Fax: (613) 995-4700

Alternatively, spills may be reported to the appropriate regional center or nearest Vessel Traffic Service
Center:

Newfoundland

St. John's	Tel:	1-709-772-2083
		1-800-563-2444 (24 hr.)
	Fax:	1-709-772-5369
Placentia Bay	Tel:	1-709-227-2182
	Fax:	1-709-227-5637
Port Aux Basques	Tel:	1-709-695-2167
	Fax:	1-709-695-7784
Goose Bay	Tel:	1-709-896-2252
	Fax:	1-709-896-8455
St. Anthony	Tel:	1-709-454-3852
	Fax:	1-709-454-3716

Nunavut

Nordreg Canada	Tel:	1-867-979-5724
P.O Box 189	Fax:	1-867-979-2464
Iqaluit, NU		
X0A 0H0		

Nova Scotia

Halifax	Tel:	1-902-426-9750 (MCTS Operations)
		1-902-426-9738 (Officer in Charge)
	Fax:	1-702-426-4483
Sydney	Tel:	1-902-564-7751 (MCTS Operations)
		1-902-564-7752 (Officer in Charge)
	Fax:	1-702-564-7662

New Brunswick

Saint John	Tel:	1-506-636-4696 (MCTS Operations)
		1-506-636-4269 (Officer in Charge)
	Fax:	1-506-636-5000

Quebec

Quebec City	Tel:	1-418-648-4427 (MCTS Operations)
		1-418-648-7459 (Officer in Charge)
	Fax:	1-418-648-7244
Montreal	Tel:	1-450-928-4544 (MCTS Operations)
		1-450-928-4547 (Officer in Charge)
	Fax:	1-450-928-4547
Riviere-Au-Renard	Tel:	1-418-269-5686 (MCTS Operations)
		1-418-269-7718 (Officer in Charge)
	Fax:	1-418-269-5514

Greenland

Spill Notification Point	Tel:	+299-101111
Groenlands Kommando	Fax:	+299-10112
Maritime Rescue Coordination Center Gronnedal		
KK-3930 Gronnndell		

Competant National Authority	Tel:	+45-31 578310
National Agency of Environmental Protection		+45-86 123099 (24hr)
Strandgade 29	Fax:	+45-31 572449/+45-86 181140
DK- 1401 Copenhagen		

Note:

The following contacts have been included as they are within the expected range of operation of the Vessel. Due to the nature of the Vessel's voyages and varied ports of call this list should not be considered exhaustive. For this reason space has been included at the end of this section for addenda.

Within Canada, administrative inquiries related to pollution prevention, compliance and enforcement, vessel regulations, design and construction should be directed to:

Director General, Marine Safety
Transport Canada
Mailstop: AMS
330 Sparks Street
Ottawa, Ontario
K1A 0N5
Tel: (613) 998-0610 Fax: (613) 954-1032

Inquiries relating to pollution response should be directed to:

Director General, Rescue and Environmental Response
Canadian Coast Guard
344 Slater Street
Ottawa, Ontario
K1A 0N7
Tel: (613) 990-3110 Fax: (613) 996-8902

ECRC East Coast Response Corporation
1201-275 Slater Street
Ottawa, Ontario
K1P 5H9
Tel:(613)930-9690

Additional Contact Information

Region	
Spill Notification Point	Contact Numbers

Region	
Spill Notification Point	Contact Numbers

Region	
Spill Notification Point	Contact Numbers

Region	
Spill Notification Point	Contact Numbers

Vessel Contacts

Vessel Management

Coastal Shipping Limited (Owners)
P. O. Box 910
Lewisporte, NL
A0G 3A0
Canada
Ph: (709) 535-6944
Fax: (709) 535-3354

24 Hour Emergency Contacts

Vice President, Operations	Dennis White	(709) 896-2421 work (709) 896-1404 cell (709) 896-2870 home
General Manager	Paul Gersok	(709) 535-6944 work (709) 541-1807 cell pgersok@woodwards.nf.ca
Marine Superintendent/DPA	Craig Farrell	(709) 535-6944 work (709) 541-0789 cell cfarrell@woodwards.nf.ca
Engineering Superintendents	Jim Babij	(709) 579-6127 work (709) 727-5065 cell (709) 576-0160 home
	Kevin Brewer	(709) 579-6127 work (709) 682-0826 cell (709) 227 2600 home

Appendix A:

Spill Equipment Inventory

MT Sten Fjord

List of Oil Spill Equipment

All equipment to be kept in the forepeak storage room with the exception of small quantities kept in the SOPEP bin located for ready access on the Poop Deck.

- 8 bags sawdust
- 26 booms
- 25 boxes rags
- 50 bags absorb-all
- 11 boom anchors
- 1 windy pump

Also to be kept onboard a sufficient quantity of squeegees, straw brooms, shovels, brushes, mops, degreaser, disposal bags, and personal protective equipment.

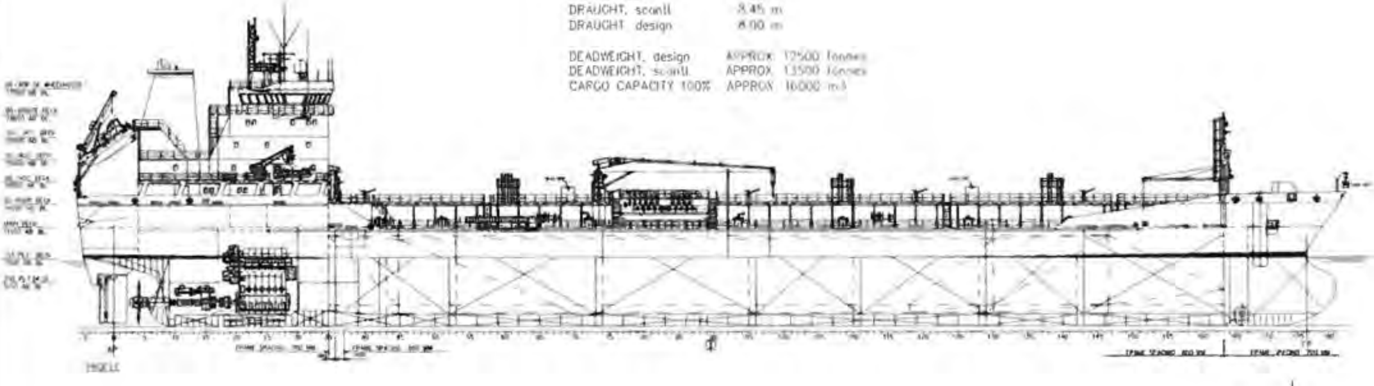
Appendix B:

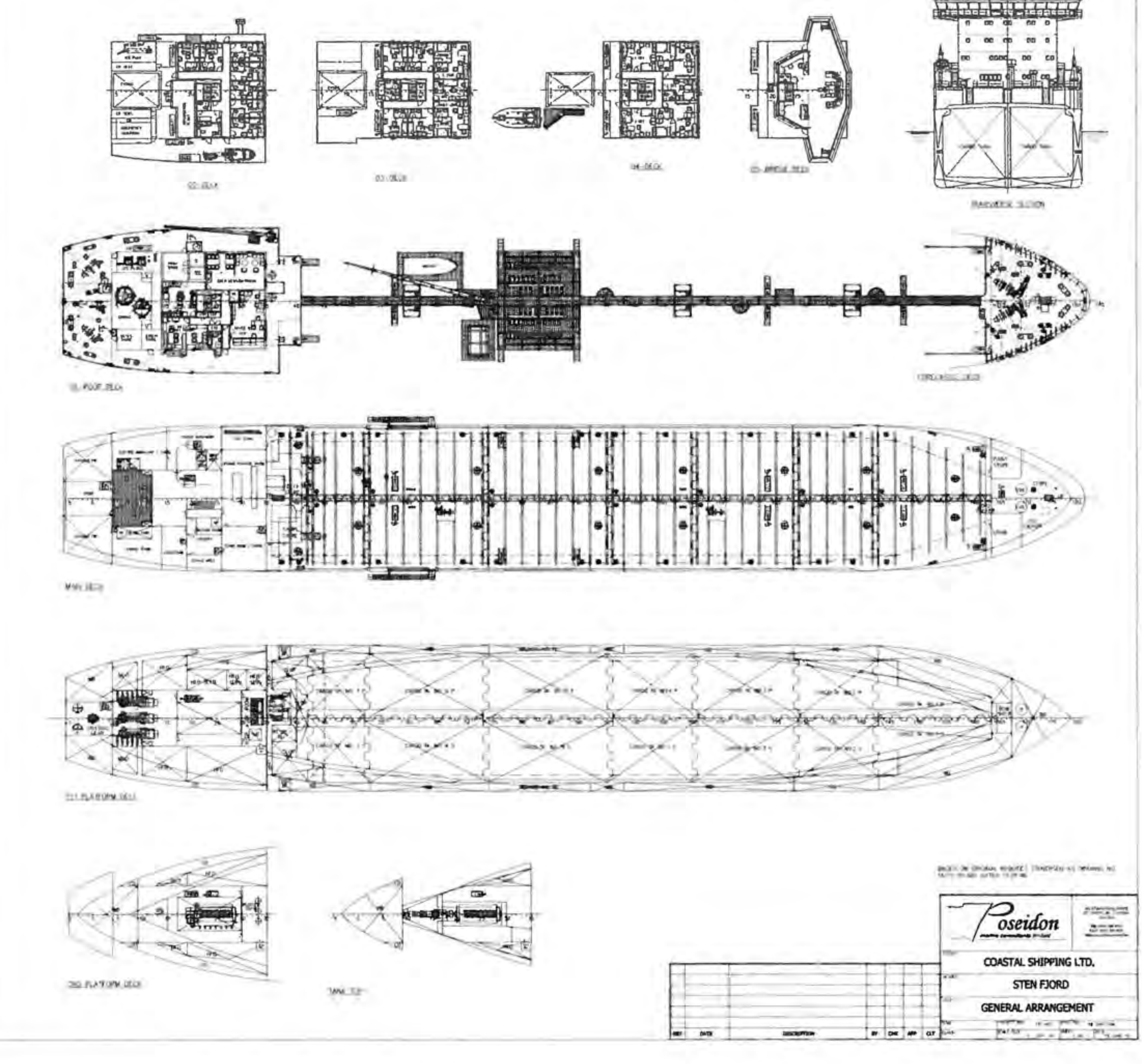
Vessel Drawings

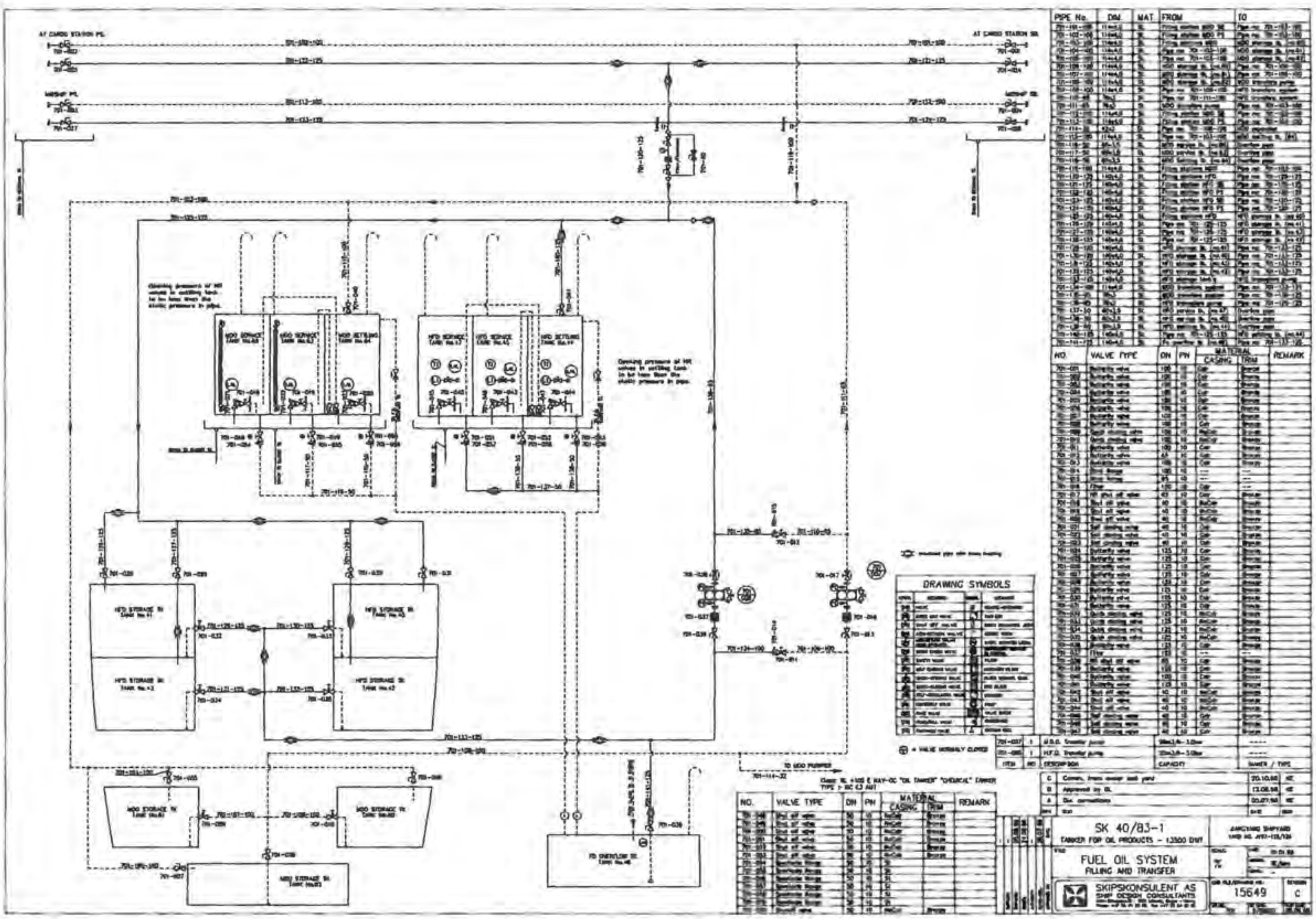
GENERAL ARRANGEMENT

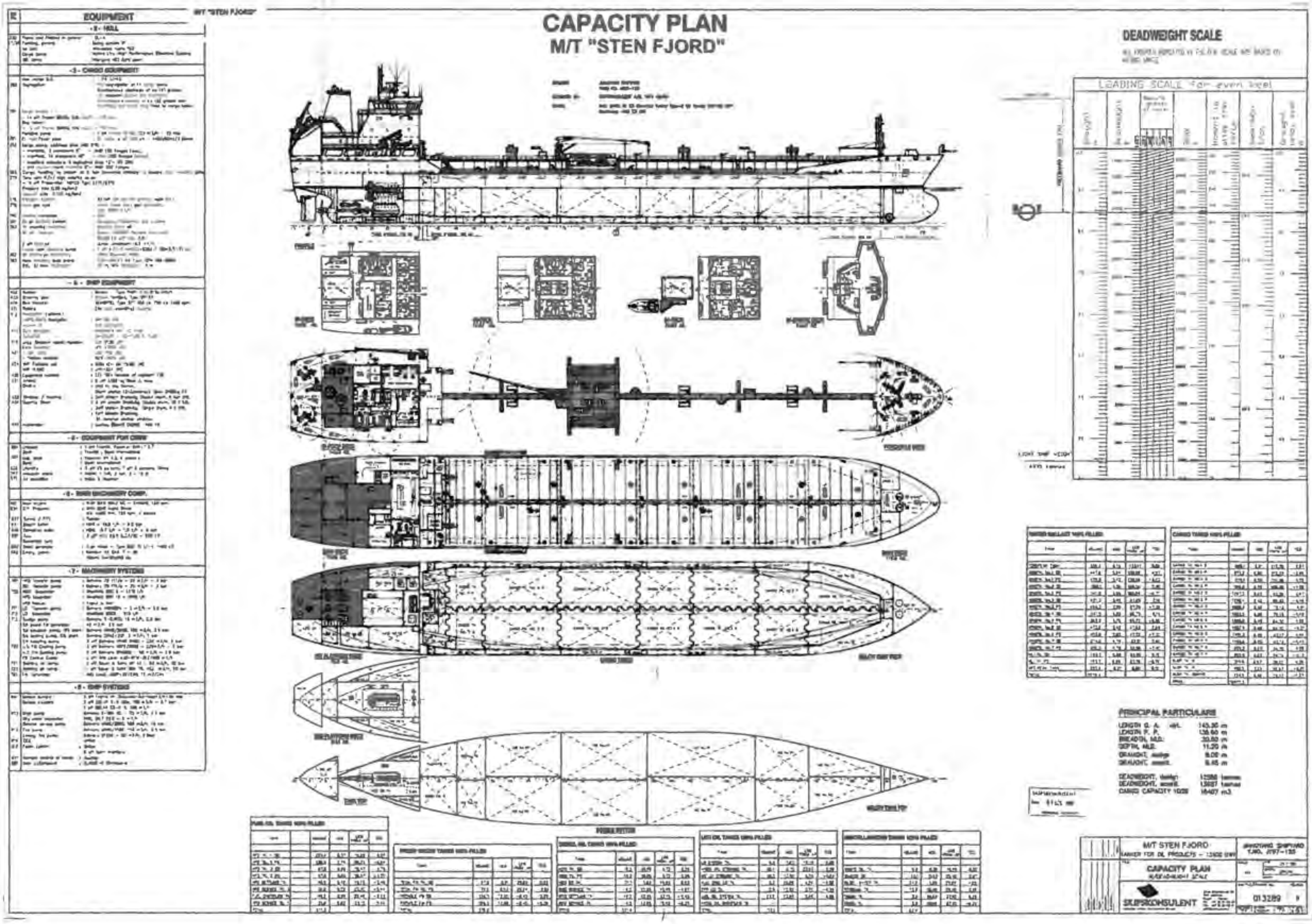
PRINCIPAL PARTICULARS

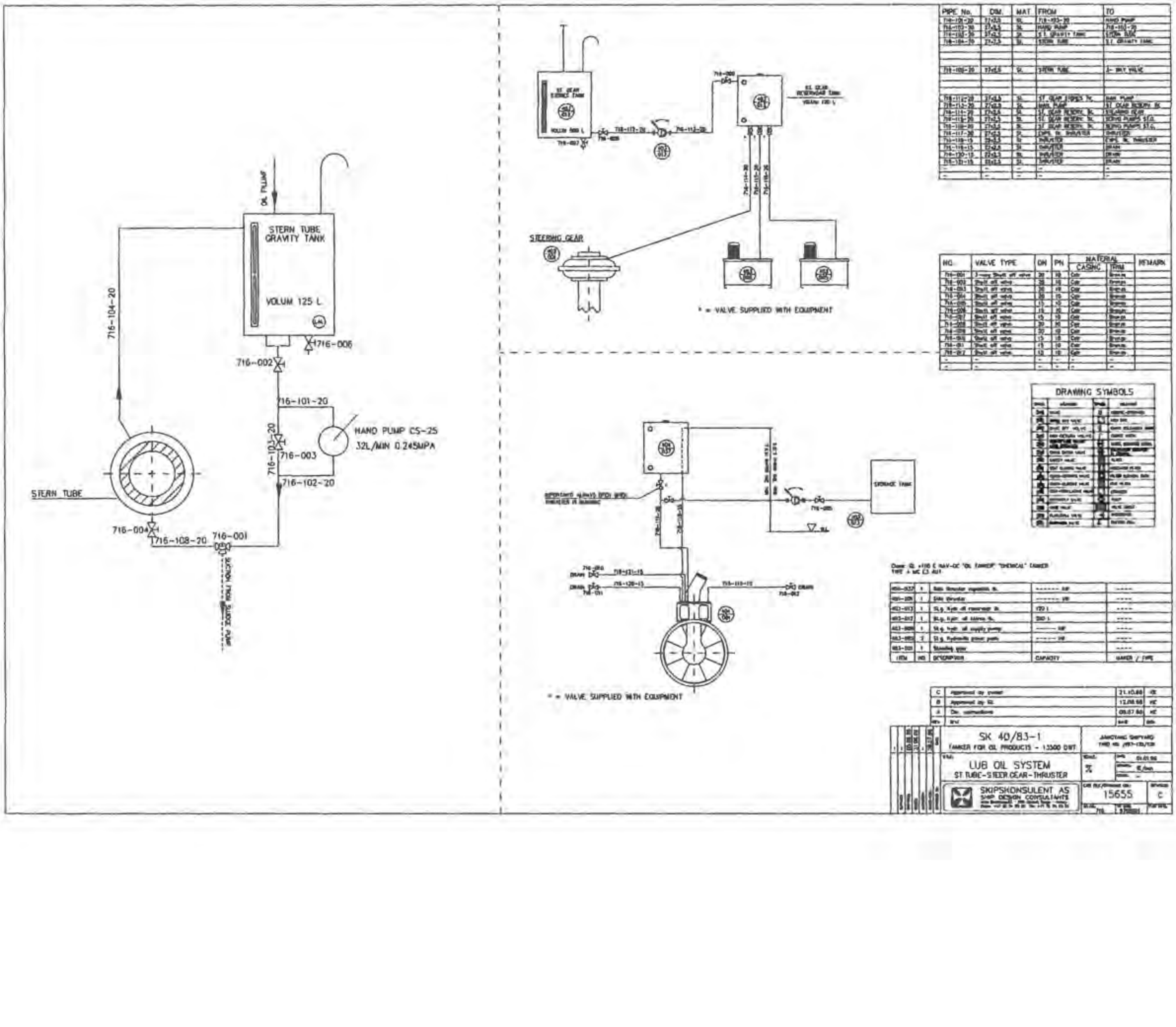
LENGTH O. A. abt	145.30 m
LENGTH P. P.	130.60 m
BREADTH, MLD.	20.80 m
DEPTH, MLD	11.20 m
DRAUGHT, scantl	8.45 m
DRAUGHT design	8.00 m
DEADWEIGHT, design	APPROX 12500 Tonnes
DEADWEIGHT, scantl	APPROX 13500 Tonnes
CARGO CAPACITY 100%	APPROX 16000 m3

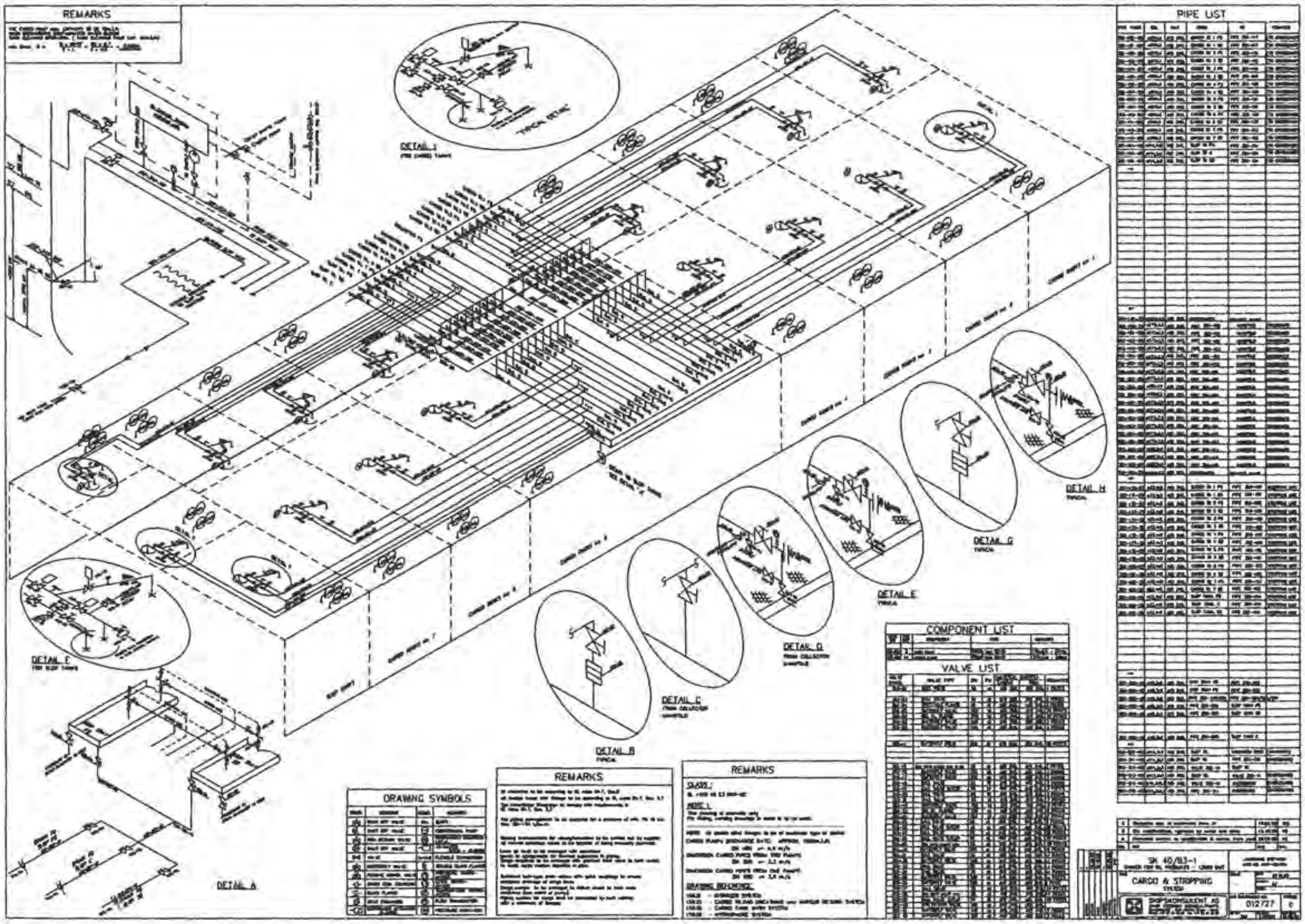


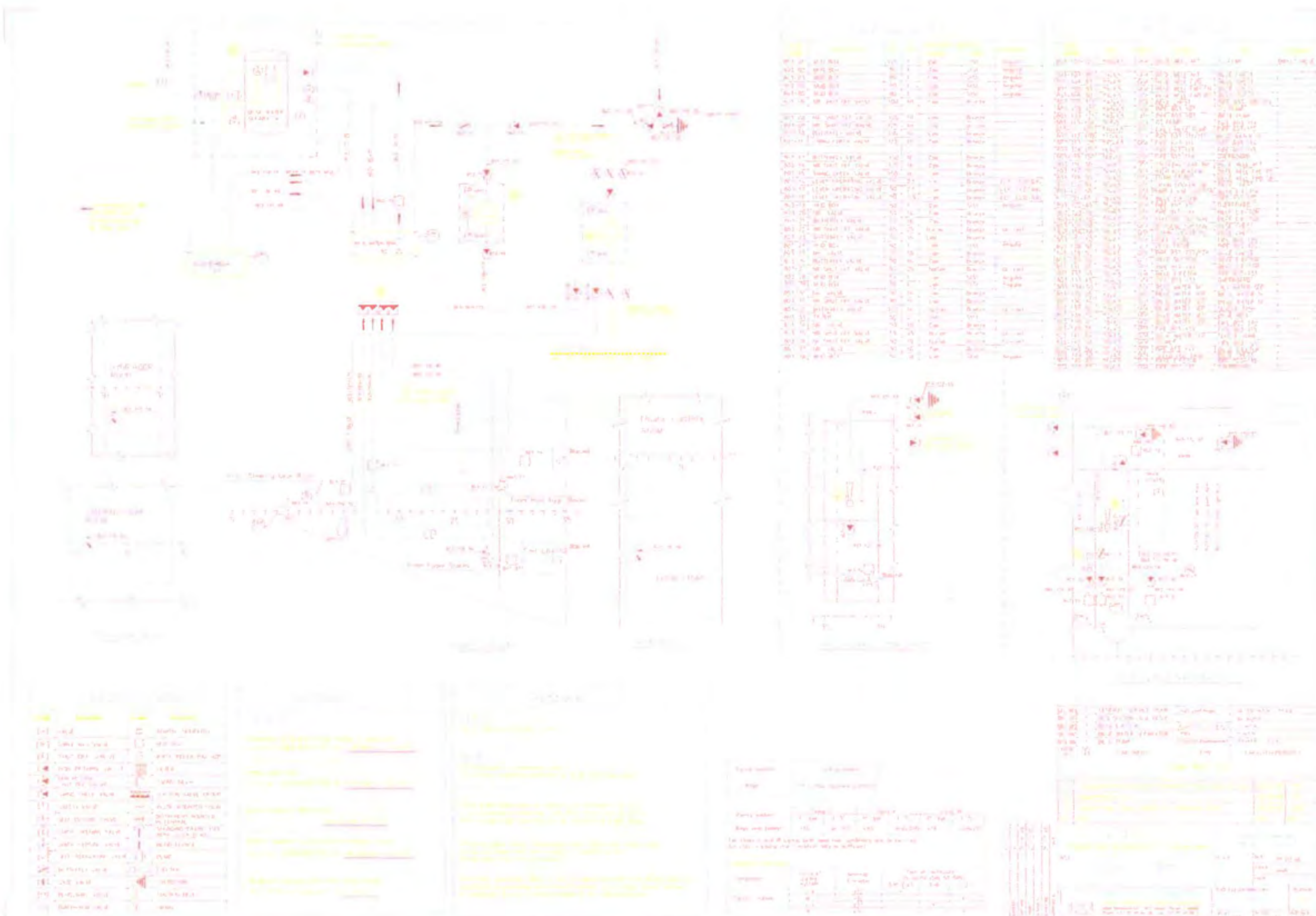



DRAWING SYMBOLS
NO.
VALVE TYPE
DN
PN
MATERIAL
CASING
TRIM
REMARK
PIPE No.
DIM.
MAT.
FROM
TO
ITEM
DESCRIPTION
CAPACITY
SK 40/83-1
TANKER FOR OIL PRODUCTS - 12500 DWT
FUEL OIL SYSTEM
FILLING AND TRANSFER
SKIPSKONSULENT AS
SHIP DESIGN CONSULTANTS
15649
C


CAPACITY PLAN
M/T "STEN FJORD"
M/T "STEN FJORD"
EQUIPMENT
DEADWEIGHT SCALE
LOADING SCALE for even keel
PRINCIPAL PARTICULARS
LENGTH F. P. 136.60 m
DEPTH, MLD. 11.20 m
CARGO CAPACITY 100% 16407 m3
M/T STEN FJORD
TANKER FOR OIL PRODUCTS
CAPACITY PLAN
SKIPSKONSULENT
013289


STERN TUBE
GRAVITY TANK
VOLUM 125 L
OIL FILLING
716-104-20
716-006
716-002
716-101-20
716-103-20
716-003
HAND PUMP CS-25
32L/MIN 0.245MPA
716-102-20
STERN TUBE
716-004
716-108-20
716-001
SUCTION FROM SLUDGE PUMP
STEERING GEAR
* = VALVE SUPPLIED WITH EQUIPMENT
PIPE No.
DIM.
MAT.
FROM
TO
NO.
VALVE TYPE
DN
PN
MATERIAL
CASING
TRIM
REMARK
DRAWING SYMBOLS
STORAGE TANK
* = VALVE SUPPLIED WITH EQUIPMENT
SK 40/83-1
TANKER FOR OIL PRODUCTS - 13500 DWT
LUB OIL SYSTEM
ST TUBE-STEER GEAR-THRUSTER
SKIPSKONSULENT AS
SHIP DESIGN CONSULTANTS
15655
C


REMARKS
DETAIL I
"TYPICAL DETAIL"
PIPE LIST
DETAIL H
TYPICAL
DETAIL G
TYPICAL
DETAIL E
TYPICAL
DETAIL D
DETAIL C
DETAIL B
TYPICAL
DETAIL F
DETAIL A
COMPONENT LIST
VALVE LIST
DRAWING SYMBOLS
REMARKS
REMARKS
SK 40/83-1
CARGO & STRIPPING
SYSTEM
SKIPSKONSULENT AS
012727



APPENDIX A 1.2- COASTAL SHIPPING LTD. CONTACT INFO

BAKER LAKE AREA OPERATIONAL PROCESSES

To further support safe operations in the Baker Lake area between Woodward and Atlantic Towing, the following information and procedures will be followed in the 2017 season.

1.0 COMMUNICATION PROTOCOL

Daily e-mail sent out by each vessel to all vessels by 8:00am. Distribution of e-mail would include all ATL, Woodward and Desgagnes vessels in the area.

E-mail to include:

- Current position
- ETA thru narrows
- Communication equipment status

Long Distance Communication

- Primary – satellite phone
- Secondary – Sat-C

Short Distance Communication

- VHF communication – channel 16

2.0 ATL COMMUNICATION INFORMATION

Atlantic Beech

- E-mail: 43252810@stratosmobile.net
- Cellular: (902) 229-3904
- Satellite: 011-8707-6481-1379

Atlantic Teak

- E-mail: 432521310@stratosmobile.net
- Cellular: (506) 343-4539
- Satellite: 011-8707-6487-5881

ATL VHF working channel is 69

WOODWARD COMMUNICATION INFORMATION

*** 2017 Contacts found at the end of this document.

WOODWARD VHF working channel is 10

DESGAGNES TRANSARCTIK INC.

Sedna Desgaganes

- E-mail: captain.sedna@desgagnes.com
- Cellular: (581) 998-3961
- Satellite: (418) 907-1134

Zelada Desgaganes

- E-mail: captain.zelada@desgagnes.com
- Cellular: (581) 998-6295
- Satellite: (418) 241-6175

Master Claude A. Desgagnes

- E-mail: captain.claudea@desgagnes.com
- Cellular: (418) 802-8596
- Satellite: (418) 907-8409

Master Rosaire A. Desgaganes

- E-mail: captain.rosairea@desgagnes.com
- Cellular: (418) 254-2355
- Satellite: (514) 907-5719

3.0 RULES OF THE WATER WAYS

Note: Outbound refers to Tanker and/ or Tug & Barge leaving Baker Lake for Helicopter Island
Inbound refers to Tanker and/or Tug & Barge leaving Helicopter Island for Baker Lake

Helicopter Island to Baker Lake

Inbound ATL Tug will contact outbound Woodward Tanker by e-mail to get its transit time thru the narrows . Tug and barge will depart Helicopter Island 3 and ½ hours prior to the transit time of the Tanker. It takes 3 hours for the Tug and Barge to reach the narrows from Helicopter Island. This allows plenty of time for all 4 vessels to transit the narrows. A couple of minutes before entering

Inbound ATL Tug and Barge **WILL ALWAYS** depart Helicopter Island prior to inbound Woodward Tanker. Inbound Woodward Tanker **WILL ALWAYS** follow inbound ATL Tug and Barge until to entrance of Baker Lake (no passing). Inbound ATL Tug and Barge and inbound Woodward Tanker will communicate on VHF channel 16 and should give a "security call" on channel 16 before entering the channel (satellite used as back up). All vessels (inbound and outbound) will use VHF channel 16 for communication (satellite used as back up).

Inbound ATL Tug and Barge will pass thru the narrows first, followed by the inbound Woodward Tanker. Outbound Woodward Tanker will pass thru the narrows next, followed by the outbound ATL Tug and Barge.

Baker Lake to Helicopter

Outbound Woodward Tanker will depart for the narrows. When reaching the narrows, outbound Woodward Tanker **WILL NEVER** proceed until inbound traffic has cleared the narrows. Outbound Woodward Tanker will hold position above the narrows just south of Bannerman Island.

Outbound ATL Tug and Barge will depart for the narrows. When reaching the narrows, outbound ATL Tug and Barge **WILL NEVER** proceed until inbound traffic has cleared the narrows. Outbound ATL Tug and Barge will hold position above the narrows just south of Bannerman Island.

Once inbound vessel traffic has cleared the narrows, the outbound Woodward Tanker will proceed thru the narrows first. The outbound ATL Tug and Barge **WILL ALWAYS** proceed thru the narrows after the outbound Woodward Tanker. All vessels (inbound and outbound) will use VHF channel 16 for communication (satellite used as back up).

FUEL HOSE POSITIONING

The fuel hose from the Woodward Tanker will be connected to the far side of the vessel away from the spud barge. The fuel hose will lay directly to shore, where a support structure will guide the fuel hose along the shore line until it mates with the shore manifold. This eliminates the risk of the ATL Tug and Barge coming into contact with the fuel hose while departing/ arriving at the spud barge. Also, a tender will be near the cargo hose with a line in order to move the hose away from the tug and barge.

In case of foul weather, where the tug and barge must cast off in a hurry, pumping operations will be suspended for a very short period of time, while the tug and barge depart.

APPENDIX B - The Central and Arctic Regional Response Plan (2008)

Canadian Coast Guard
Central & Arctic Region

Regional Response Plan

December 2008

LETTER OF PROMULGATION

The *Central & Arctic Regional Response Plan (2008)* replaces the *Central & Arctic Region Contingency Chapter (2006)* and the *Arctic Response Strategy (1999)*. This plan is a component of the *Canadian Coast Guard National Response Plan* which is the responsibility of the Director of Safety and Environmental Response Systems, Ottawa. It establishes the framework and the procedures by which Central & Arctic Region will prepare for, assess, respond to and document actions taken in response to pollution incidents in this Region.

The saving of life is of paramount consideration and the Plan is subordinate to the operational requirements of marine search and rescue.

The Plan has been reviewed by the internal partners identified in Section 3.3 in context to the services they may provide and by the external partners identified in Sections 3.4 and 3.5 to confirm their mandated response authorities.

Responsibility for the *Regional Response Plan* lies with the Assistant Commissioner Coast Guard Central & Arctic Region. The Central & Arctic Region Environmental Response branch is the custodian of the plan. The responsibility for specific sections is identified in Section 7 - Plan Maintenance and Custodians. Comments, recommendations and communications relating to the various sections are clearly identified in this section.

REVISION RECORD

CENTRAL & ARCTIC REGIONAL RESPONSE PLAN			
Section	Replace	Transmittal No.	Description of Changes
Entire Plan	All	December 1, 2005	Complete revision of Central & Arctic Regional Response Plan
Entire plan	All	April 1, 2006	Complete revision of Central & Arctic Regional Response Plan
7.1 Maintenance Process	Page 7-1	May 8, 2007	Update address to 520 Exmouth Street
8.3 CCG ER Phone List	Page 8-1	June 4, 2007	Update address to 520 Exmouth Street
Entire Plan	All	December 2008	Complete revision of Central & Arctic Regional Response Plan

Section 1 - INTRODUCTION

1.1. Authority

This plan is based upon the policy and guiding principles set forth in the *National Response Plan* of the *Canadian Coast Guard National Response Strategy*.

1.2. Purpose

The *Central and Arctic Regional Response Plan* is designed as a guide to Canadian Coast Guard staff and relevant stakeholders involved in marine spill responses. It outlines the Regional application of the various roles of On-Scene Commander (OSC) (active response), Federal Monitoring Officer (FMO) (ensuring the Responsible Party fulfills their obligations), and as a Resource Agency (in assistance to other Lead Agencies).

It contains the specific information and activities that are pertinent to all spill response activities within Central & Arctic Region (C&A Region).

1.3. Area of Responsibility

For the purposes of marine pollution response Central & Arctic Region is defined geographically as:

- The contiguous waters of the Canadian Arctic (North of 60^{o} Latitude) to the limits of the International Boundary, including the North Slope Area of the Yukon Territories, and internal waters of the Northwest Territories and the Territory of Nunavut; and

- The waterways contained within the provinces of Alberta, Saskatchewan, Manitoba, Ontario, and a western portion of Quebec commencing at the east wall of the Beauharnois Lock in the St. Lawrence River.

(see Figure 1-1 Fisheries and Oceans Central & Arctic Region)

Significant waterways include the Canadian Great Lakes and interconnecting waterways to the international Boundary with the United States, Hudson and James Bays, Lake Winnipeg, Lake Athabasca and interconnecting waterways, Great Slave Lake, Mackenzie River and the Northwest Passage in the Canadian Arctic.

There are also a number of specific geographic locations which, although not excluded from Canadian Coast Guard's mandate, require coordination between the managing authorities and this plan. These areas include the waters associated with the various Port Authorities (Hamilton, Thunder Bay, Toronto and Windsor) and the St. Lawrence Seaway Authority (Welland Canal, St. Lawrence Locks) as defined by the *Canada Marine Act, 1998*.

Figure 1-1: Fisheries and Oceans Central & Arctic Region

1.4. Safety Policy

Safety is the first and foremost consideration in any pollution response in Central & Arctic Region. This commitment is expressed throughout this and other documents as well as in the programs relied on by the Environmental Response (ER) branch to prepare for such spills (i.e. training and exercising programs). General safety procedures and considerations to be followed by all members of the Regional Response Team are identified in Section 5.7 of this plan.

1.5. Links to the National Response Plan

The Guiding Principles and Mandate (including legislative, interdepartmental, intergovernmental and international agreements) as well as designation of Lead and Resource Agency roles are contained in the *National Response Plan Section 1 – Introduction.* The mechanism for activating the Environmental Response National Response Team is also defined in the *National Response Plan*.

1.6. Regional Response Plan Structure

The Regional Response Plan is structured to reflect the three fundamental phases of Environmental Response activities. These are:

1) Preparedness - through the regional application of Contingency Planning (resulting in specific response strategies), Training (state of personnel readiness), Exercising (state of system readiness) and Inventory Maintenance and Management (state of mechanical/equipment readiness).

2) Response Operations - identifying the mechanisms for:
    - *Initiating* (through a dedicated Duty Officer and Assessment process),
    - *Sustaining* (Operational functions as Lead or Resource Agency),
    - *Controlling* (using the Response Management System), and
    - *Finalizing* the response activity (decommissioning and reporting).

3) Claims, Recovery and After-action activities - for the documentation and recovery of spent resources from the polluter, their agents, national or international funding conventions.

Surrounding these fundamentals are the specifics of the Environmental Response Program in Central and Arctic Region that are too cumbersome to be included in the main text of this Response Plan. They include: Regional Agreements and Memoranda of Understanding, Regional Organization and the specific Annexes which support the program. Finally, the Response Plan includes the preliminary and supplementary matter such as Letter of Promulgation, Record of Revision and the Identification of Custodians and the Plan Maintenance process.

1.7. Linkages to other Response Plans in the Region

When a pollutant is spilled into the water, the Canada Shipping Act is not the only legislation that applies. Recognizing that being designated Lead Agency for pollution response to mystery spills and spills from vessels does not preclude other agencies from completing their mandate CCG acknowledges that the Internal and External Partners listed in Sections 3.4 and 3.5 have plans that are active within Central & Arctic Region.

1.8. Linkages to International Joint Plans

International Joint Plans and agreements affecting Central & Arctic Region include:

- Canada-United States Joint Marine Pollution Contingency Plan

- Canada-Denmark Agreement for Co-operation Relating to the Marine Environment, Annex B (Joint Marine Contingency Plan concerning Incidents resulting from Shipping Activities)

- Great Lakes Water Quality Agreement, Annex 9

- International Boundary Waters Treaty Act

The Canadian Coast Guard Environmental Response Branch also provides technical support for the Emergency Prevention, Preparedness and Response (EPPR) Working Group of the Arctic Council. The EPPR Working Group exchanges information on best practices for preventing spills, preparing to respond to spills should they occur, and practical response measures for use in the event of a spill.

The Arctic Council is an intergovernmental forum of the eight circumpolar countries (Canada, Denmark, Finland, Iceland, Norway, Sweden, the Russian Federation and the United States of America) that provides a mechanism to address the common concerns and challenges faced by the Arctic governments and the people of the Arctic.

Some work has been initiated with the Russian Federation for the development of a Joint Pollution Response Plan. To date no agreements have been signed.

Section 2 - AGREEMENTS AND MEMORANDA OF UNDERSTANDING

2.1 Overview

The Canadian Coast Guard (CCG), both Central & Arctic and National Headquarters, maintain numerous memoranda and letters of understanding and agreement between other government departments which outline shared responsibilities in pollution response. A brief description of the major agreements is listed below.

- Letter of Agreement between Canadian Coast Guard, Environmental Response Branch and Canadian Coast Guard, Operational Services and Canadian Coast Guard, Technical Services regarding the use of Environmental Response First Response Units (FRUs) by non-environmental response staff. This agreement concerns the use of FRUs at the various CCG facility sites (bases, sub-bases and search and rescue stations).

- Northwest Territories/Nunavut Spills Working Agreement. This agreement formalizes procedures whereby spill investigation and monitoring in the Northwest Territories (NT) and Nunavut (NU) can be coordinated.

- Fisheries & Oceans (DFO) and Environment Canada (EC) Letter of Agreement respecting transfer of responsibility as lead agency for mystery spills from Environment Canada (EC) to the Canadian Coast Guard/Fisheries & Oceans Canada (July 1996)

- Transport Canada (TC) and Fisheries & Oceans (DFO) Memorandum of Understanding respecting Marine Transportation Safety & Environmental Protection (May 1996). This MOU outlines the responsibilities transferred from TC to DFO in accordance with the *Public Service Rearrangement and Transfer of Duties Act*. Those pertinent to this plan include:
    a) The responsibility for ensuring the provision of pollution clean up services
    b) The authority to take actions to mitigate or prevent pollution from ships

- Letter of Understanding between the Canadian Coast Guard and the Hamilton Port Authority to outline the roles that the CCG and the HPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Thunder Bay Port Authority to outline the roles that the CCG and the TBPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Toronto Port Authority to outline the roles that the CCG and the TPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Windsor Port Authority to outline the roles that the CCG and the WPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

Some memoranda of understanding and letters of agreement have been rendered defunct by virtue of the dissolution or reorganization of the entities that signed the original document. It is the Region's intent to assess the need for an MOU and in those cases where renewal is needed, to draft a new MOU and submit to the partner organization the request for re-entry into that agreement. For further information on these memoranda, please contact the Environmental Response Planning Section.

Section 3 - ORGANIZATION

3.1 General Application

This section describes the primary working relationships between Fisheries and Oceans (DFO), Canadian Coast Guard, Environmental Response branch (CCG/ER) and the various internal and external partners, clients and external resources.

Internal partners include: Other DFO sectors, directorates and branches, and other federal departments which provide direct assistance or have specific mandates which directly affect response activities.

External partners include those entities that share the burden of pollution response for their specific area of responsibility. These agencies include the provincial and territorial government ministries with the generic mandate of pollution response.

Clients include those entities that are specifically identified by the *Canada Shipping Act (CSA)* and have direct involvement in the response regime; they include Oil Handling Facilities (OHF), Legislated Ships and Non-legislated Ships.

External resources are those resources outside of the government that the Canadian Coast Guard may engage while conducting spill response activities. These include the Response Organizations (RO) certified by Transport Canada and other independent contractors which may perform more specific functions.

3.2 Fisheries and Oceans, Canadian Coast Guard - Environmental Response Branch (CCG/ER)

The Assistant Commissioner, Canadian Coast Guard through the Maritime Services Directorate and the Superintendent of Environmental Response (ER) directs the Regional Environmental Response Team. This team represents one facet of the overall crisis management structure within Central and Arctic Region and performs the function of the Lead Response Agency for pollution incidents as defined in the *National Response Plan – Section 1* of the *Canadian Coast Guard National Response Strategy.* The branch consists of approximately seventeen (17) full time employees (FTEs).

Internally, the Environmental Response Branch is made up of five (5) distinct but integrated functions:

1) *Direction and Administration* - providing the overall guidance, management and liaison with Headquarters. The Superintendent holds the responsibility for escalating a response and/or dedicating resources.
2) *Planning* - providing the design and management of plans and procedures to facilitate the preparedness posture of the Region (responsible for developing and maintaining intradepartmental, interdepartmental, client and regime stakeholder relationships).

3) *Operations and Inventory Maintenance & Management* - provide the management and maintenance of equipment to ensure the operational response readiness of the Region.
4) *Training* - provides the coordination and delivery of educational materials, to internal as well as external partners and clients, in support of the overall preparedness posture of the Region.
5) *Exercising* - provides the management and coordination of internal and external partners and clients to validate, practice and reinforce all aspects of the Response readiness of the Region.

In addition to these core functions, each staff member is required to actively participate in the operational aspects of the response regime based upon their skill and ability levels. This includes assuming various roles within the Response Management Structure acting as Duty Officer (DO) and supporting the overall emergency preparedness structure within the Region (not necessarily related exclusively to oil spills or pollution).

In the context of this Plan, the Environmental Response Branch is tasked to:

- Fulfill the Canadian Coast Guard's obligations as Lead Agency in an OSC or FMO posture in responding to marine pollution incidents from ships in waters of Canadian interest as well as from unknown sources.
- Act as a Resource Agency in support of a response led by another agency when requested.
- Staff a Duty Officer position on a 24/7 basis which, together with other agency representatives, will assess or direct the assessment of spill reports.
- Ensure that an appropriate response to pollution incidents is initiated on a timely basis.
- Provide initial response capabilities throughout the region.
- Monitor response and clean-up priorities when polluter has accepted responsibility.
- Ensure international commitments in spill preparedness and response are fulfilled.
- Provide a pollution response capability for lightering, salvage and offshore recovery operations.
- Provide Regional and HQ briefings on status of emergency operations.
- Evaluate, acquire and maintain specialized marine emergency countermeasures equipment and develop deployment techniques.
- Develop, distribute and maintain the *Central and Arctic Regional Response Plan* of the *Canadian Coast Guard National Response Strategy* (including area annexes) on behalf of Fisheries and Oceans.
- Review and comment on other government as well as industry pollution response plans upon request.
- Provide pollution response related training to Canadian Coast Guard and civilian personnel.

- Conduct spill response exercises according to the Canadian Coast Guard National Exercise Program (NEP) standards.
- Provide detailed explanations of response operations and policies to representatives of the media, interest groups, industry, police and Provincial and Municipal governments.
- Provide a centre of expertise for pollution concerns.
- Develop and foster a good working relationship with other authorities, shipping and oil/chemical handling communities.
- Working with Environmental Response Headquarters and the Chemical Industry to develop, implement and maintain a corresponding and complimentary regional capability for spills of hazardous and noxious substances other than oil.

3.3 Internal Partners – Fisheries and Oceans

Other branches and directorates within Fisheries and Oceans which directly and in a continuous active way support preparedness and response activities include:

Marine Traffic and Communications Branch (MTCS) – CCG/Marine Programs Directorate

Marine Traffic and Communications Services operates a marine VHF/MF/HF communications system (depending on location) primarily for the provision of marine safety information, distress coordination and marine traffic regulation. MCTS will support Environmental Response (ER) activities by:

- Establishment of Movement Restriction Areas (MRA's) or exclusion zones as directed by the Federal Monitoring Officer (FMO) or On Scene Commander (OSC).
- Providing communications/radio equipment operators in support of off-site ER operations.
- Dissemination of marine information and issuing marine Notices to Shipping (NOTSHIPS).
- Providing vessel tombstone information including, but not limited to, vessel name, call sign, nationality, tonnage, dangerous cargo type and quantity.

Regional Operations Centre (ROC) and Fleet Resources – CCG/Operational Services Directorate

Regional Operations Centre

The ROC provides notification to the Environmental Response Duty Officer (ERDO) when notified of a spill or an occurrence which may result in a spill. Upon receiving information regarding a spill, the ROC confirms the report using reliable resources and agencies. When the incident has been confirmed the Operation Centre begins the alerting and notification procedure. A schedule of ERDOs, approved by the Superintendent Environmental Response Canadian Coast Guard, will be maintained by the ER Regional Emergency Operations Officer (REOO) and forwarded to ROC for distribution.

The Regional Operations Centre will support the Environmental Response Branch during a marine pollution incident by:

- Maintaining up to update contact lists for Canadian Coast Guard and other government agencies for use as incidents progress.
- Coordinating the allocation of CCG resources as required by the FMO or the OSC to respond to a marine pollution incident.
- Provide communications support (when necessary).

<u>Fleet Resources</u>
Fleet Resources may be called upon to provide a host of support and/or lead services depending upon the type and severity of the situation and limitations or constraints of the vessel. Commanding Officers maintain full responsibility for the operation and safety of their vessel and personnel and therefore, will/may:

- Be called upon to be interim On-scene Commander.
- Be the principal point of contact aboard ship for the Environmental Response Duty Officer or On Scene Commander.
- Investigate spill reports for the purpose of confirmation.
- Provide surveillance and monitoring of third party (or pollutant) as required.
- Initiate early spill response; containment, boom or sorbent material deployment, clean up and recovery procedures.
- Provide site safety, (i.e. fire fighting, first aid and crowd control).

Fleet does maintain their own limited capabilities to respond to their needs as required.

Canadian Coast Guard Bases
In preparation for and during a pollution incident, CCG bases may also provide resources for response. These resources are generally within the scope of normal base activities and include:

- Small vessel use
- Base facilities (boardrooms, workshops)
- Helicopter landing pads
- Boat launch and docking slips
- Staging areas

Safety, Security and Emergency Services Branch – DFO Corporate Services
For large spills of a significant nature the Regional Manager of Safety, Security & Emergency Services may provide the following:

- Advice and recommendations to the On Scene Commander on issues of site and employee safety and the application of departmental security policy measures.
- General occupational health & safety and security advice to the On-Scene Commander/Deputy On-Scene Commander as per the departmental Loss Control Manual.

- A Health & Safety Officer to perform the functions of the Heath & Safety Officer described in the Response Management System User Guide. This person will report directly to the OSC or FMO throughout the duration of the response.

On occasions when the Regional Manager of Safety & Security (or delegate) is not available, or when spills are of a minor nature, the On-Scene Commander shall appoint a member of the response team to fulfill the general duties required.

Communications Branch – DFO Communications

Communications team manages the media (external) handling inquiries from print, radio, television and internet news organizations through the application of *Fisheries & Oceans Crisis Communications Plan*. Communications branch coordinates all aspects of information being released to ensure the public is getting the most relevant, accurate information as soon as practicable.

Legal Services

The DFO Legal Services in CCG Headquarters section will provide legal advice and guidance in the event of a marine pollution incident where CCG may or has been engaged. This especially includes advice on the issuance of Letters of Undertaking (LOUs) and in situations where Canadian Coast Guard may have to take command and control of an incident away from the Polluter.

Other DFO Resources

Indirectly, but just as significant in the event of a spill, is the availability of other DFO resources. This includes any and all appropriate functions including, but not limited to the following:

- Trenton Joint Rescue Coordination Centre – CCG, Maritime Services Directorate, Search and Rescue Branch (SAR)
- Finance and Administration – Human Resources and Corporate Services Directorate
- Human Resources - Human Resources and Corporate Services Directorate
- Facilities – Real Property
- Other Technical Resources – CCG, Integrated Technical Services Directorate
- Fish Habitat Branch – Habitat Fisheries and Oceans Management

3.4 Internal Partners – Other Government Departments

Other federal departments which provide direct assistance or have specific mandates which directly affect response activities include:

Environment Canada (EC)

There are two (3) Environment Canada regions located within Central & Arctic region. They are Ontario, Prairie and Northern and Pacific and Yukon Regions.

The Environmental Emergencies Section provides:

- In Ontario, the Co-chair (with the Ontario Ministry of the Environment (MOE)) of the Regional Environmental Emergencies Team (REET).
- In the Arctic (consisting of the three Territories), the Co-chair (with the relevant Territorial Government, Department of Environment) for the Arctic Regional Environmental Emergencies Team.
- Coordination of the Shoreline Cleanup and Assessment Teams (SCAT).
- Advice concerning environmental impacts associated with vessel source spills, resource sensitivity and prioritization, environmental forecasting, spill and cleanup monitoring and clean up techniques and priorities
- Sampling assistance, identification and characterization of materials

The REET serves as a mechanism for the provision of consolidated, coordinated and comprehensive environmental information and advice concerning the fate and effects of hazardous and noxious substances, spill trajectories, resources and shoreline protection strategies, clean up priorities, physical and chemical counter measures, remedial endpoints, damage assessment, and the management of hazardous wastes generated during a spill and other matters which arise while planning and responding to emergency events which affect or risk environmental quality. In the planning mode REET members meet to improve contingency plans, resolve regional preparedness issues and exchange new scientific and response ideas.

In Ontario Region, Environment Canada has divided the province into eighteen (18) REET areas and plans to hold one (1) REET meeting per area per year, consolidating some areas where possible and maintaining annual meetings in the higher risk areas (Windsor, Sarnia, Sault Ste. Marie).

Two of three primary Arctic REET (AREET) areas are in Prairie and Northern Region: the Northwest Territories and Nunavut Territory. There is no REET established in Alberta, Saskatchewan and Manitoba.

The Meteorological Service of Canada (part of EC and REET) provides:

- Meteorological forecasting

The Canadian Wildlife Service (part of EC and REET) provides

- Advice on wildlife protection, rescue and rehabilitation
- Permits for wildlife hazing and capture

Transport Canada (TC)

The Environmental Response Systems Division in Ottawa is responsible for Canada’s Marine Oil Spill Preparedness and Response Regime. It:

- works with other federal agencies and departments, such as Fisheries and Oceans Canada, the Canadian Coast Guard and Environment Canada to establish guidelines and regulatory framework for preparedness and response to oil spills and spills of noxious and hazardous substances into Canada’s marine environment.

- Manages the National Aerial Surveillance Program

There are two Transport Canada regions located within Central & Arctic region. They are Ontario and Prairie and Northern regions.

The Aircraft Services Directorate provides:

- Aerial surveillance as part of the Prevention mandate within Transport Canada, and can provide aerial spill tracking, recording, and personnel transport.

The Marine Safety Branch provides:

- Technical advice and recommendations to the On-Scene Commander or the Ship Owner regarding, but not limited to, lightering, damage assessment and salvage.

  Note: The MOU between Transport Canada and Fisheries & Oceans Respecting Marine Transportation Safety & Environmental Protection (May 1996) Annex D – E-5 states that "Transport Canada and Fisheries and Oceans will jointly approve salvage operations, emergency lightering or discharge of cargo." After discussing this clause with two senior surveyors, they both agree – Marine Safety does not approve salvage plans. Marine Safety advises and recommends only.
- Restriction of transit or movement of a vessel following a damage assessment.
- Spill investigation and enforcement of the various aspects of the pollution prevention conventions and legislation in Canada
- Regional planning, in conjunction with EC and CCG, for the selection of Places of Refuge. Note: in the Great Lakes and connecting channels, selection of a place of refuge will be determined in conjunction with the USCG and USEPA.
- Monitoring of the spill preparedness activities of Oil Handling Facilities (OHFs) and certified Response Organizations (ROs) through a review and audit process.

Indian and Northern Affairs Canada (INAC)

Canadian Coast Guard (CCG) works most closely with INAC in Nunavut (NU) and the Northwest Territories (NT). INAC has lead responsibilities in the Arctic for spills on water which do not originate at federal facilities, exploration facilities or from ships and barges. INAC also, by letter of agreement, will investigate ship-source spills on behalf of CCG. INAC is also a member of the Beaufort Sea Emergency Preparedness Working Group, along with CCG/DFO, EC, TC and other appropriate agencies.

National Energy Board (NEB)

Based in Calgary, Alberta, the National Energy Board is an independent Agency that reports to parliament through the Ministry of Natural Resources. The NEB is the

Lead Agency for spills that occur at offshore and nearshore oil and gas exploration and production facilities.

In the event of a marine pollution incident where CCG is requested for assistance as a resource agency, CCG is available to provide pollution response expertise as indicated under Section 7.2 of the *National Response Plan* as it relates to NEB.

Public Safety Canada

Public Safety Canada is the federal coordinating department responsible for engaging relevant federal departments in an integrated Government of Canada response to an emergency.

For emergencies requiring an integrated Government of Canada response, federal support is based on a regional “single- window” concept. This concept is intended to facilitate regional interdepartmental and intergovernmental coordination, while not unduly restricting operations. Coordination includes sharing of pertinent information in order to maintain situational awareness.

The Government Operations Centre (GOC) is a 24/7facility where an integrated Government of Canada response is managed. It is the focal point of information management flow and provides strategic-level activities. It’s permanent staff includes watch officers, duty officers specializing in national communications as well as a geomatics team to map incidents.

Indirect support from other federal departments in the form of advice or resources also comes from: Heritage Canada (Parks Service) in the form of support to REET, National Defense regarding assistance and resources, RCMP with respect to investigations and those sections or departments specifically identified in the various Memorandums of Understanding (MOU) as outlined in Section 2 of this chapter.

3.5 External Partners - Provincial and Territorial Ministries and Departments

In general, liaison with provincial and territorial concerns is facilitated through REET (Regional Environmental Emergencies Team), which is chaired by Environment Canada (EC) or, in the case of the Province of Ontario, is co-chaired by Environment Canada and the Ontario Ministry of the Environment (MOE). The following agencies have the primary mandate for marine or freshwater pollution response in their province or territory of jurisdiction:

Territory or Province	Department
Northwest Territories	Environment and Natural Resources
Nunavut	Department of Environment
Alberta	Alberta Environment
Saskatchewan	Saskatchewan Environment

Manitoba	Manitoba Conservation
Ontario	Ontario Ministry of the Environment

In emergency situations conflicts sometimes arise with respect to legal and administrative jurisdiction and application of standards and common practices. To facilitate these issues the various Ministries related to emergency measures are usually contacted to provide coordination and clarify where necessary the concerns. These include:

- Government of Nunavut – Department of Community of Government Services, Emergency Management Division
- Government of the Northwest Territories – Department of Municipal and Community Affairs – Emergency Services Division
- Government of the Yukon Territories – Department of Community Services, Emergency Measures Organization
- Government of Ontario - Ministry of the Community Safety & Correctional Service, Emergency Measures Ontario
- Government of Manitoba –Manitoba Emergency Measures Organization
- Government of Saskatchewan – Resource Management and Corrections & Public Safety, Saskatchewan Emergency Measures Organization
- Government of Alberta – Ministry of Municipal Affairs, Public Safety Division, Emergency Management Alberta

Provincial Governments can provide consolidated access to local, municipal and provincial resources.

Central & Arctic Region recognizes that First Nations have a vested interest in response operations that may occur in their territory and will ensure that they are represented on the REET or have access to the Federal Monitoring Officer or On Scene Commander through the CCG Liaison Officer.

3.6 Clients

With respect to ship-source pollution incidents, there are three major groups the Canadian Coast Guard will be directly engaged with. These are Oil Handling Facilities, Legislated Ships and Ships as defined in *Part XV* of the *Canada Shipping Act.*

Oil Handling Facilities (OHF)

Operators of facilities that transfer oil to or from oil tankers over 150 gross registered tonnes or other vessels over 400 gross registered tonnes are required by the Canada Shipping Act (2001) to:

- Have an Oil Pollution Emergency Plan (OPEP) on site.
- Have a declaration conforming to the regulations on site.
- Take reasonable measures to implement their required oil pollution emergency plan in the event of an oil pollution incident.

- Have on site the resources required to contain a spill of oil equal to the facility's rated capability within one hour.
- Begin recovery/cleanup operations of oil equal to the facility's rated capability within 6 hours.
- Have an arrangement with a certified Response Organization (RO) that permits the handling of spills beyond the rated capabilities of the Oil Handling Facility.[1]

Legislated Ships
In Canadian waters, ships over 400 gross registered tonnes and oil tankers over 150 gross registered tonnes are required to have a Shipboard Oil Pollution Emergency Plan (SOPEP) and an arrangement with a certified Response Organization (RO) to respond to an oil pollution incident of an amount equivalent to the maximum amount of product that the vessel can carry as fuel and/or as cargo up to a maximum of 10,000 tonnes.[1]

Other ships as defined by Part XV of the Canada Shipping Act (CSA)
Any ship that is less than 400 GRT or any tanker less than 150 GRT is still covered by the *Canada Shipping Act (2001)* in that it must report the potential or actual pollution incident to a Pollution Response Officer, or in the case of an incident in Canadian Arctic Waters as defined by the Arctic Waters Pollution Prevention Act to a Pollution Prevention Officer. The ship must take immediate steps to mitigate or remedy the situation. These ships are not required to have a Shipboard Oil Pollution Emergency Plan nor an arrangement with a certified Response Organization.

3.7 External Resources
There are two main categories of external resources that the Canadian Coast Guard (CCG) will engage. These are the Response Organizations certified by Transport Canada under the *Canada Shipping Act (2001)* and other contractors.

Response Organizations (ROs)
Response Organizations are privately established pollution response companies certified by Transport Canada. These companies hold a certificate of designation to handle oil spills of up to 10,000 tonnes (T). Response Organizations can provide the polluter or any lead agency with the resources, trained personnel and operational management structure to deal with a marine oil pollution incident within its identified Geographical Area of Response (GAR).

The Eastern Canada Response Corporation (ECRC) is the only certified response organization in Central & Arctic Region. The company is certified to ten thousand tonnes (10 000T) and two of its three regions cover Central & Arctic Region.

[1] There is no requirement for an Oil Handling Facility nor a Legislated Ship to have an arrangement with a Response Organization certified by Transport Canada in Canadian waters north of 60° North Latitude

1) ECRC Great Lakes Region is managed from the Response Centre in Corunna, Ontario. Its area of coverage includes all waters
   - south of 60 degrees north in the provinces of Alberta, Saskatchewan, Manitoba and Ontario to that portion of the St. Lawrence River in the Province of Ontario
   - to a line drawn between Butternut Bay (Latitude 44 31' 12" north and Longitude 75 46' 54" west) on the Canadian side
   - to Oak Point (Latitude 44 30' 48" north and Longitude 75 45' 20" west) on the US side of the St. Lawrence River.

2) ECRC Quebec Region (also known as Societé d'Intervention Maritime Est du Canada - SIMEC) is managed from the Response Centre in Quebec City, Quebec and has staffed Response Centres in Verchères, Quebec and in Sept-Iles, Quebec. Their coverage includes:
   - James Bay, Ungava Bay and in Hudson Bay south of the sixtieth parallel North and that portion of the St. Lawrence River in the Province of Ontario
   - to a line drawn between Butternut Bay (Latitude 44 31' 12" North and Longitude 75 46' 54" West) on the Canadian side to Oak Point (Latitude 44 30' 48" north and Longitude 75 45' 20" West) on the US side of the St. Lawrence River.

There are no certified response organizations established north of 60° N latitude.

Although resources from the Response Organizations in the south may be made available for use north of 60°, they must obtain the necessary approvals to move equipment from their designated area of response.

Contractors
Private sector contractors may be engaged by the CCG as required. All standard government contracting rules apply.

Section 4 – PREPAREDNESS

4.1 Overview

Oil spill preparedness is defined by the advanced planning used to create systems to effectively and efficiently combat the range of spills likely to be encountered.

In Central and Arctic Region, preparedness involves:

- The development of regional procedures to be followed in the event of an incident, coordinated by the Planning section.
- The implementation, training and maintenance of the Response Management System (RMS) to manage and combat the incident.
- The identification of priorities, development of strategies, logistics and tactics necessary to fulfill those priorities, lead by the Planning section.
- The liaising with internal and external partners, clients and resources that may be involved in pollution response activities, lead by the Planning section.
- The training and continued maintenance and upgrading of skills, coordinated through the Training specialist.
- The exercising and quality assurance activities required to continuously reinforce the training and contingency planning activities, facilitated through the Exercise specialist.
- The asset management including the acquisition, lifecycle maintenance, operational readiness and storage of equipment lead by the Operations section and Inventory specialist.
- The integration of other Canadian Coast Guard Assets and Human Resources, when necessary, through the Training and Exercising processes.

The Memorandum of Understanding (MOU) between the Director General/Maritime Services (MS) and the Director General/Integrated Technical Support (ITS) of the Canadian Coast Guard (March 2004) specifies that the ITS Directorate will be the single CCG focus for the life cycle management of all CCG physical assets and for the development of all technical solutions. It is unknown when ITS will assume the services of design, procurement, in-service support and disposal of all equipment and systems required to satisfy ER’s mandate. In the interim, ER will remain the focal point.

4.2 Response Management System (RMS)

The Canadian Coast Guard uses the Response Management System (RMS) as its emergency management system. It is based on, and operates under the same principles as the Incident Command System (ICS) which was developed in the U.S. to coordinate multi-agency responses to large forest fires. The system was adjusted to reflect the current marine oil spill response regime and Canadian law. The Canadian Coast Guard does not implement the ICS principle of unified command, but will participate in any command structure used by the Polluter or Other Lead Agency.

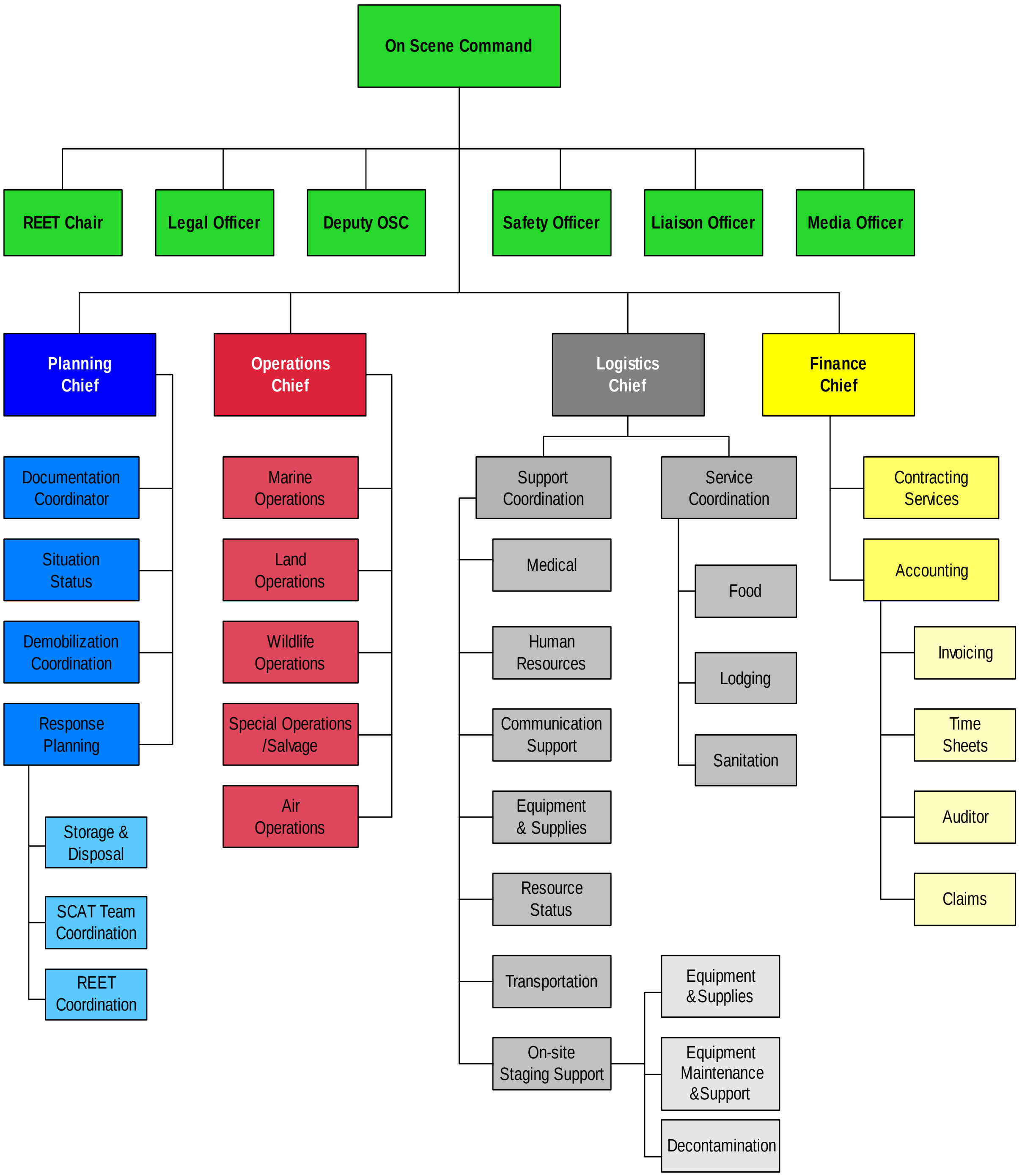
The RMS uses a “management by objectives” approach. It outlines the roles and responsibilities of individual positions, identifies the reporting structure, establishes a common set of terminology and uses standardized forms and paperwork. The central document in the RMS process is the Incident Action Plan, which documents the existing conditions and outlines objectives and strategies for recovery and response.

The system structure is designed to expand or contract to best fit the specific circumstances of the incident. Not all positions within the system will be staffed for every incident; in those cases the supervising position shall be responsible for all subordinate tasks/roles. Regional staff members have been designated as members of the Regional Response Team and may be called upon to fill specified roles in this management system (see Figure 4.1 for a fully expanded system design).

The system also contains management tools that can be used by the On Scene Commander and response personnel to better manage the system and the spill incident. These tools include a field operations guidebook, forms, reports, established meeting schedules and agendas. The RMS will also be used by the Federal Monitoring Officer and their Incident Monitoring Team while monitoring the Polluter’s response to an incident.

The detailed RMS process is contained in a separate document referenced in Section 9.1 of this plan (Response Management Systems User’s Guide, Version 3.0 (May 2006)).

Figure 4.1 - CCG RMS Command Structure



4.3 Planning

Area Plans

To facilitate an effective and efficient response, Canadian Coast Guard administers 16 area plans as an annex to the Central & Arctic Regional Response Plan. They are Keewatin, Baffin, Beaufort Sea & Amundsen Gulf, Great Slave Lake, Hudson & James Bay, Kitikmeot, Mackenzie River & Delta, Inland Waters S of 60, Lake Erie, Lake Huron, Lake of the Woods, Lake Ontario, Lake Superior, St. Lawrence, St. Mary's and St. Clair & Detroit areas. These plans incorporate detailed response information for specific manageable geographic areas or response communities. The normal operating period for an area plan is the first 12-24 hours of a spill response.

They are developed and maintained as follows:

1) <u>Risk Analysis</u>
   The risk analysis determines which communities or areas are most likely to be endangered by a potential oil spill and why, their associated environmental sensitivities, plus the typical type of spill that could be expected. When considering the environmental sensitivities, the focus is on what is most likely to be impacted and to consider as many factors as are applicable. A single factor discovered in the risk assessment is just one of many layers in the decision to make a site a priority.

2) <u>Priority Identification/Verification</u>
   Current priorities are discussed with members of the Regional Environmental Emergencies Team (REET) at planning meetings. It provides the opportunity for additions, deletions or modifications. Where there are no REET meetings held, community consultations are organized by the Planning section.

3) <u>Strategy and Tactics Development</u>
   Canadian Coast Guard determines RMS objectives for the agreed upon priorities. Strategies are designed, that name the activities relative to those objectives. Those activities may be response actions to be implemented, or may be the type of resources that could be affected by the spill. For area plan development, tactics provide the detail for implementing the selected strategies. Tactics then specify the resources, both human and equipment, to facilitate, to install or to maintain the strategy.

4) <u>Updating</u>
   Area plans are reviewed and updated annually.

Regional Procedure Development

Regional procedures for notification, verification, activation and cost recovery of a response are all described in the *Central & Arctic Regional Response Plan* of the *Canadian Coast Guard National Response Plan*. Supporting documentation in the form of Standard Operating Procedures and supplementary plans (e.g. Health & Safety Plan and Media Relations Plan) are not included in the Regional Response Plan but are referenced in Section 9.

Liaison with External and Internal Partners, Clients and Resources

To ensure that all partners, clients and resources are aware of the Canadian Coast Guard's mandate and responsibilities as they pertain to pollution preparedness and response, the Environmental Response Planning Section takes the initiative to:

- Work with Internal Partners within Fisheries & Oceans to communicate the branch's needs in the event of a pollution incident.

  Exception: Coordination of the Duty Officer (DO) function between Environmental Response (ER) and the Regional Operations Centre (ROC) is coordinated by the Regional Emergency Operations Officer REOO).
- Work with other government departments that have a mandate for pollution response within their jurisdiction to communicate the role that Canadian Coast Guard plays in marine and freshwater pollution incidents and to share what resources Canadian Coast Guard maintains for pollution response activities and the mechanism to access these resources in the event that another Lead Agency may require them for a non-CCG mandated spill or other type of emergency.
- Liaise with potential clients (oil handling facilities, shipping companies and other operators) so that CCG expectations in the event of an incident are understood.
- Provide copies of area plans to CCG vessels that are relevant to their area of operations. CCG ER will brief Operations at the pre and post season conferences on any changes to the plans and/or to the captain and/or crew's responsibilities.
- Maintain a network of contractors that can provide services to Canadian Coast Guard in the event of a pollution incident that exceeds the resource capability of the region.
- Upon request of the Regional Advisory Councils (RACs) or Secretariat (Transport Canada) on Marine Oil Spill Response, provide information on Central & Arctic Region's preparedness and spill response activities.

Arctic Community Emergency Plans

The Canadian Coast Guard is committed to assisting Arctic communities in the development of the marine pollution component of their Community Emergency Plans. This commitment was made in 1999 when the CCG Arctic Response Strategy (ARS) was published. The Arctic Response Strategy has since been re-assessed and viable components have been incorporated into the text of this Plan.

4.4 Training Program and Curriculum

Introduction

The Training Curriculum of the Environmental Response Branch is focused on providing the necessary skills and knowledge for responders to function effectively during a spill response operation. As the competencies required for an effective spill response are described and organized within the Response Management System (RMS), so too can the training curriculum be described in the context of RMS.

With RMS as the framework for spill response, all response team members will be trained in theory and application of RMS. The level of training complexity will vary by level of individual responsibility, but all members will have fundamental knowledge of the structure and processes that drive the RMS.

In addition to the training curriculum described in this section, it is understood that there are competencies and certifications required that are not specific to ER or spill response. These would include driver's licenses, radio operator's licenses, and familiarity with basic electronic equipment such as phones, fax machines, cell phones and laptop computers.

Training Curriculum

Command Staff

During a spill response operation, the command staff will vary depending on the size and complexity of the spill.
On a smaller spill, senior ER staff members may be appointed to command positions with few subordinate or supporting positions.
On larger scale spills, the OSC may be the Director of Maritime Services, or Assistant Commissioner Canadian Coast Guard, with multiple support positions from ER staff, CG fleet, base personnel and contractors.

To adequately prepare personnel for the management functions of spill response, the following curriculum has been identified:

> On Scene Command Course (OSC)
> This course trains participants in all aspects of spill response including planning, implementation, and supervision. Other topics include legislation, legal issues, financial responsibilities, and media relations. Prerequisites include BOSRC, MSROC, PPO designation, media relations and management training.
>
> Response Management System Course (RMS)
> The current RMS curriculum is an introductory two-day course on the system and its user's guide. It is anticipated that future development will include multiple levels of training which will include organizational structure and

responsibilities, as well as in-depth requirements of each position within this emergency management structure.

Federal Monitoring Course (FMO) - Proposed
Subject to national development, this course will augment the On Scene Command Course to provide those persons designated as Canadian Coast Guard Federal Monitoring Officers the necessary skills and knowledge to perform FMO duties.

Operations Section

During a spill response operation, the operations section of the RMS may be populated by regional ER staff, CCG fleet officers and crew, CCG/DFO base personnel or contractors. The resident knowledge of this group will vary, and a comprehensive ER training program exists to train responders in spill response operations. Training for members of the CCG Regional Response Team (RRT) personnel is offered in the following three areas:

(a) Safety Training
(b) Operational Training
(c) Specialty Training

(a) Safety Training
Health and Safety training is required to ensure compliance with federal and provincial legislation with the ultimate goal of ensuring the health and safety of response personnel. Additional video and printed reference material is available through the Canadian Coast Guard ER Training Officer.

Site Safety Course
The Site Safety Course is designed for response personnel prior to commencing work on a response site. Topics include employer and employee responsibilities, classification and hazards of petroleum products, and the safety practices and considerations associated with both water-based and shore-based operations. Site safety training is mandatory for Regional Response Team members and all volunteers or short time workers who may be employed during a response.

Workplace Hazardous Materials Information System (WHMIS)
This 3-hour course is provided to Canadian Coast Guard employees to ensure compliance with appropriate worker safety legislation. It was developed to ensure workers have the necessary information to work safely with hazardous materials in their workplace.

First Aid/CPR
This 16 hour course provides the participants with the skills and knowledge to successfully obtain the St. John Ambulance Standard First Aid Certificate. The primary focus of this 14-hour course is to provide adequate knowledge

and level of skill to persons in positions of responsibility to provide for persons suffering from respiratory and circulatory arrest. Preventative measures are discussed.

Small Non-Pleasure Vessel Basic Safety Course - MED A3
The 8-hour MED A3 course is *required by regulation* for crewmembers of small non-pleasure vessels of not more than 150 GT operating not more than 20 miles offshore. Topics include marine hazards and emergencies, marine firefighting, lifesaving appliances and abandonment and survival and rescue skills.

Transportation of Dangerous Goods (TDG)
This 6-hour course provides personnel with the responsibility for the transportation of dangerous goods to be aware of and comply with safety measures and appropriate legislation concerning TDG.

(b) Operational Training
There are various levels of oil spill response courses designed for response team members, ships crews and other responders who may be expected to assist with marine oil spill response. Operational training related to the assessment and response to petroleum spills is delivered by ER while training for response to hazardous and noxious materials spills is obtained outside of the Branch.

First Responder Oil Spill Training (FROST)
This 1 day course is designed specifically for CCG personnel in Central & Arctic Region who are designated custodians of First Response Units (FRUs), and may be tasked with deployment of the pollution countermeasures equipment. It has also been adapted for use in communities north of 60° where Arctic Community packs function as first response units.
It teaches First Responders to:

- assess an oil spill according to its extent, possible source and likely behavior
- deploy boom for containment and protection purposes and in support of response activities
- work safely at the spill site

Basic Oil Spill Response Course (BOSRC)
This 20 hour course instructs First Responders how to:

- assess an oil spill according to its extent, possible source and likely behavior
- deploy boom for containment and protection purposes and in support of response activities
- operate oil recovery equipment
- undertake basic shoreline cleanup operations
- work safely at the spill site

Marine Spill Response Operations Course (MSROC)

This 40-hour course will enable trained and experienced personnel to coordinate and supervise the response operations of a marine oil spill. It is intended to train individuals to be On Scene Commander (OSC) for small (tier 1) spills, or operations section chief on larger spills. Topics include legislative framework, safety, equipment suites and strategies, media relations, RMS, shoreline assessment and cleanup techniques, and disposal. Prerequisites include BOSRC, a Radio Operator License and current or future deployment to a spill response team.

Environmental Response Duty Officer (ERDO) Training

This 15 hour course is a prerequisite for duty officers for the ER branch and the regional operations centre. It introduces the participant to CCG mandate, lead agency responsibilities and introductory spill assessment techniques. It also integrates delivery of training on the Marine Pollution Incident Reporting System (MPIRS), the database used to capture spill report and response information.

Pollution Response Officer (PRO) Training

This three day course is currently provided by the Environmental Response Branch of the Canadian Coast Guard and is required training for all Environmental Response personnel. Participants who successfully complete this course earn the designation of Pollution Response Officer under Part 8 of the Canada Shipping Act (2001). This course examines the powers of a PRO, specific procedures related to vessel directions and detentions and the legal framework and implications surrounding the execution of those powers. Course participants also learn sampling procedures and gain an understanding of the role of other government agencies involved in a marine pollution incident.

Pollution Prevention Officer (PPO) Training

This 40 hour course is currently provided by the Marine Safety Branch of Transport Canada. It is a prerequisite for any officer of the Canadian Coast Guard to be delegated Pollution Prevention Officer (PPO) powers under the *Arctic Waters Pollution Prevention Act*. Participants learn the existing pollution prevention and response regime, the powers of a PPO and the specific tasks of prevention, control, investigation and prosecution.

Small Vessel Operator Proficiency

This 21-hour course meets the training needs of the small vessel master. This course is required by regulation (for vessels less than 5GT on sheltered and near coastal voyages) and teaches participants to effectively manage safety of those on board, protect the vessel from damage and protect the marine environment.

Basic Barge Operator Training
This course was developed and is delivered by regional ER staff. Through both classroom and practical sessions, the course introduces participants to safe boating practices and procedures, rules of the road, collision regulations, load plans for pollution response vessels, safe deployment of oil spill response equipment and basic trailer towing and maneuvering.

Single Side Sweep System
The single side sweep is an equipment suite designed to allow one vessel to perform oil containment and recovery, and allow for temporary storage. This two day training session is provided to some ER staff and crews of Canadian Coast Guard vessels that can support this equipment. This training typically is conducted with crews who have previously completed BOSRC.

HAZMAT Awareness
This 6-hour course is intended for First Responders on the scene of a hazardous materials incident and shows how to assess the incident. Topics include; First Responder's role and responsibilities, scene safety, recognizing and identifying hazardous materials, incident management, and sources of assistance.

HAZMAT Technicians Level
This 40-hour course is designed for responders to releases or potential releases of hazardous substances. The focus is on recognizing and evaluating a hazardous materials incident, organizing the response team, protecting response personnel, identifying and using response resources, implementing basic control measures, decision-making, and protecting the public and environment. Emphasis is on hands-on use of equipment practically applying lecture information through exercises. Participants will wear fully encapsulating suits.
Prerequisite: Hazmat Awareness.

(c) Specialty Training
Specialty training includes training that only select members of the Regional Response Team (RRT) will have to apply.

Shoreline Clean up and Assessment (SCAT)
This 24-hour course covers how oil impacts the shoreline. Specific topics include shoreline types and effects of oil, wind, waves and ice on shorelines. Shoreline protection and cleanup methods are described in depth. Field exercises are conducted as part of the training.

Media Training
This 16-hour course is designed to provide participants with the skills and knowledge to communicate effectively and proficiently with various forms of media. Topics include; developing and disseminating incident information to

news media, incident personnel, other appropriate agencies and organizations.

Communications System Training
This 8 hours hands-on course provides participants with the knowledge and skills to provide communications in support of a spill response. Topics include; mobile telephone, fax, and intercom set up, preparing communication plans, and internal/external spill response communications.

Wildlife Rehabilitation
The capture and treatment of oiled wildlife is typically assigned to the trained experts at Canadian Wildlife Service (CWS). This CWS training is periodically made available to outside agencies, and some ER staff may participate to facilitate a better understanding of each others' role at the time of a spill.

Financial Management
This training is provided by the Public Service Commission (PSC) and teaches government spending and cost accounting principles. It is imperative that any response team member who may have to purchase assets or manage contracts be familiar with these practices and procedures.

Planning Section
During a spill response operation, the planning section of the RMS will likely be populated with ER staff whose substantive positions are as Planning Officers within the branch. Therefore, the planning skills and training required to effectively and efficiently perform these tasks should be resident within our branch staff.

Should additional personnel be required to fulfill these roles, they would require training in RMS, as well as Site Safety (as required by OSH regulation). The required planning skills and spill response knowledge may be acquired through various training or experience factors, and would be assessed prior to assignment on the response team. In addition to planning skills, preferred training might include SCAT, FROST and/or BOSRC, and MSROC.

Logistics Section
During a spill response operation, the logistics section of the RMS will likely be populated with ER staff whose substantive position involves the tracking of spill response equipment inventory and human resources within the region. Therefore, the skills and training required to efficiently and effectively perform the logistics function should be resident within our regional ER staff.

Should additional personnel be required to fulfill these roles, they would require training in RMS, as well as Site Safety (as required by OSH regulation). The required logistical skills may be acquired through various training or experience factors (knowledge of IRCMS and TMA, BOSRC training) and would be assessed prior to assignment on the response team.

Finance Section

During a spill response operation, the finance section of the RMS will likely be populated by regional finance staff whose substantive positions involve government expenditure and cost accounting knowledge and application. Therefore, the skills and knowledge required to effectively and efficiently perform the finance function should be resident within regional Canadian Coast Guard staff. These personnel will require RMS and Site Safety training prior to deployment on a spill response team.

Training Records

Records for personnel trained in spill response and/or emergency management are maintained by the Region.

4.5 Exercise Program

Introduction

Under the guidelines of the National Exercise Program (NEP), the Environmental Response Branch will implement a Regional Exercise Program. This program will be conducted over a three-year cycle. Coordination of the program will be the responsibility of the Regional Exercise Officer (RXO) of the Environmental Response Branch. Exercises will be designed and conducted in coordination with departmental staff, CCG base staff and CCG vessels on a regular basis. The purpose of the Regional Exercise Program is to validate environmental response training and regional emergency preparedness standards, policies and procedures.

Canadian Coast Guard will, through regional and area-specific exercising, ensure high priority initiatives such as exercising complex equipment (i.e. Lori Brush skimmers, sweep systems and command/communications facilities) are undertaken and will use industry and private sources of personnel where possible and/or appropriate.

Exercise Planning Matrix

The matrix below represents a typical three year exercising cycle followed by Canadian Coast Guard. The program cycle is designed to test all 17-response functions as outlined under NEP as well as including the different types of exercises. It includes internal, external (with other government departments as well as private sector organizations) and international exercises.

Table 4.1 *- Central & Arctic Region Exercise Matrix*

EXERCISE TYPE	YEAR1	YEAR2	YEAR3
Notification	**Quarterly**	**Quarterly**	**Quarterly**
Management	**2**	**2**	**2**
Operational drills	**3**	**3**	**3**
Combined Functional	**1**	**1**	**1**
Full Scale	**0**	**1**	**0**

Notification exercises will test the regional call-out system. Some of these exercises will be internal to the branch, some will be a full regional call-out to all CCG and DFO staff as well as to external resources (eg: freight contractors to check their availability to move Marine Emergency Response Trailers (MERTs) or First Response Units (FRUs).

Management exercises will focus on the development of the spill through the Response Management System (RMS).

Operational Drills will focus on equipment deployments in packages (i.e. a First Response Unit, NOFI V-Sweep).

Combined Functional exercises will be an equipment deployment (operational drill) with the goal of implementing a tactic designed in one of the Region's Area Plan Annexes.

A *Full Scale* exercise will incorporate a management-type exercise with the concurrent deployment of a spill countermeasure system (system = pollution containment, recovery, primary and secondary storage devices)

Exercising Partnership
Canadian Coast Guard will endeavor to participate, by request and on a situation by situation basis, in exercises lead by Oil Handling Facilities (OHFs), certified Response Organizations (ROs) and other government agencies throughout the Region.

Central and Arctic Region is a part of the Canadian Coast Guard response community and as such is also part of the International Response Community. Canadian Coast Guard's regional boundaries are in such close proximity with our United States neighboring response communities that joint exercising is a high priority. Specifically this region conducts joint exercises in the geographic areas of the Great Lakes and the Beaufort Sea with the United States Coast Guard's (USCG) (9^{th}) ninth (Great Lakes) and (17^{th}) seventeenth (Alaska) districts, respectively.

Exercise Evaluation and Shared Learnings
An important part of the National Exercise Program is the evaluation and use of subsequent findings. Four types of information can be learned from an exercise, all of which lead to improvement of overall response capability.

1) Contingency planning
2) Response techniques
3) Response training
4) Exercise program development

The primary sources of the information and learning will be the formal exercise evaluation report that is produced for every exercise by the evaluation team. This formal exercise report will follow the format laid out in Section 11 of the *Canadian Coast Guard National Exercise Program Planning and Evaluation Guide*.

4.6 Inventory Management, Maintenance and Infrastructure

Inventory Response Control Management System

To ensure that a nationally consistent and effective state of preparedness is maintained, an Inventory Response Control & Management System (IRCMS) has been implemented which utilizes The Management Authority database as its main tool. CCG HQ administers this system in concert with regional IRCMS Officers. In this region the program is administered by the Logistics and Statistics Officer in the Operations Section.

This system has been developed to:

- Maintain a real time record of the location and quantity of resources;
- Maintain a proper state of readiness through a pro-active approach using work orders and preventative maintenance;
- Assist in keeping response managers informed about Environmental Response's state of preparedness;
- Assist in the tracking of National Response Team personnel or equipment assigned to National or International incidents

Pre-positioned Equipment Caches and Depots

Central and Arctic Region covers an extremely large geographical and culturally diverse portion of Canada. There are, in essence, two zones of operation which are entrenched in the *Canada Shipping Act*. These are:

- the <u>Arctic Zone</u>, or all areas of Canadian jurisdiction north of 60^0 North Latitude; and
- the <u>Central Zone</u>, dominated in a marine transportation sense by the Great Lakes, but which include the southern portions of Hudson and James Bay, along with the major waterways and watersheds of Lake Winnipeg, Winnipegosis, Lake of the Woods, and Lake Athabasca.

The Environmental Response (ER) Branch has pre-positioned equipment to facilitate and maintain an effective response operation. Response strategies in each of the two zones (Central or Arctic) are based upon identification of local and regional response. This is means that the equipment generally required for such a spill size is contained within the Region. This capacity is supplemented by nationally available resources, which would be "cascaded" from/to other regions when and if required. Preparedness capacities in other regions are identified in their respective Regional Response Plans.

Arctic Zone

Arctic Community Packs (ACPs) are placed in northern communities for rapid (local) initial response. Canadian Coast Guard provides initial response training to members of the communities so that they may effectively deploy equipment in the ACPs in the event of a spill. Access (keys) for the ACPs have been given to an official in each community in most cases. The Senior Response Officer (ER-Hay River) maintains the current key holder listing.

The inventory for each Canadian Coast Guard Arctic Community Pack location is listed in Table 4-2. The program has received funding under the Health of the Oceans Initiative to proceed with placing Arctic Community Packs in additional sites. The equipment profiles at the existing Arctic Community Pack sites will be changed to reflect characteristics of the community. The inventory at all communities will be "site specific" and will coincide with response strategies designed by the ER planning group. The locations for the proposed additional Arctic Community Packs are: Baker Lake, Broughton Island (Qikiqtarjuaq), Chesterfield Inlet, Churchill, Hall Beach, Kimmirut, Iqaluit, Pangnirtung, Tuktoyaktuk and Yellowknife.

The main base of operations with Environmental Response dedicated personnel is located in Hay River, Northwest Territories. This base is home to a Rapid Air Transportable (RAT) cache of equipment known as the "RAT150". The RAT150T used in conjunction with the "Delta" (∆) 1000T meets planning standards for a 1000 tonne (T) response. The selection of equipment for the RAT150 must meet pumping rates / capacities of 1000T thresholds and be complimentary[2] to the equipment held in the ∆1000T depots.

The response package, warehoused in Hay River, will be maintained in 100% readiness during the shipping season. The equipment will be broken down and be containerized such that it will fit through the smallest cargo door of any of the selected aircraft. Equipment will be TDG compliant, be palletized as appropriate, and labelled for ease of selection and loading.

[2] The logistics of moving large bulky items (ISO containers) in the arctic necessitates a LCM, deck barge, cargo vessel, icebreakers or any combination thereof. Consequently it is estimated that the 1000T design capacity would be available staged on-scene in 5 - 7 days. Following the doctrine *something sooner rather than everything later* having 150T of the 1000T equipment suite air-lifted within 48 hours is preferable to having nothing until the entire 1000T capacity arrives a week later.

Table 4-2 *- Canadian Coast Guard Arctic Community Pack Locations*

LOCATION	EQUIPMENT SUMMARY			
	Boom (24”)	Skimmers	Boats	Storage
Arctic Bay (Ikpiarjuk)	3,650’	TDS-118	16' Aluminum	Open top Tank
Cambridge Bay (Ikaluktutiak)	1,350’	TDS-118	16' Aluminum	Open top Tank
Cape Dorset (Kinngait)	1500’	TDS-118	16' Aluminum	Open top Tank
Clyde River (Kangiqtugaapik)	4,500’	TDS-118	16' Aluminum	Open top Tank
Coppermine (Kugluktuk)	1,350’	TDS-118	16' Aluminum	Open top Tank
Coral Harbour (Salliq)	1,500’	TDS-118	16' Aluminum	Open top Tank
Gjoa Haven (Uqsuqtuuq)	1,350’	TDS-118	16' Aluminum	Open top Tank
Holman (Ulukhaktok)	1,500’	TDS-118	16' Aluminum	Open top Tank
Rankin Inlet (Kangiqsiniq)	2,200’	TDS-118	16' Aluminum	Open top Tank
Resolute (Qausuittuq)	1,350’	TDS-118	16' Aluminum	Open top Tank
Hay River FRU +	1,000’	-	37’ Seatruck 42’ Cutter	-

In combination with the RAT150T, equipment found in the ∆1000T depots will be at a 1000T capacity. Hence, the delta or “∆” is the difference between the RAT150T and a full 1000T. The ∆1000T depots will have containerized heavier equipment (not suitable for air transport to smaller communities) augmenting the RAT150T to a 1000T capacity, ready to be loaded on deck barge, Canadian Coast Guard icebreaker or freighter. While response personnel cascade in to the spill site pre-identified local, CCG base and available ER personnel will mobilize to the centres and load the equipment on suitable marine transport.

Three ∆1000T depots are strategically located in the northern communities of Tuktoyaktuk (NorthWest Territories), Iqaluit (Nunavut), and in Churchill (Manitoba). For the purposes of response in Central & Arctic Region, Churchill is included in the Arctic Zone of operations despite it being south of 60° North Latitude due to the similarities in response characteristics that it shares with locations north of 60° North Latitude.

Table 4-3 *- Canadian Coast Guard Arctic Design Inventory*[3]

PCM equipment	Description	Hay River RAT150T	Tuk ∆1000T	Iqaluit ∆1000T	Churchill ∆1000T
Skimmers	Light to medium product /disk type	3	1	1	1
	Heavy product /weir type	0	2	2	2
Boom	24" river type	0	10000'	10000'	10000'
	24" lay-flat type	5000'	0	0	0
Land storage	4T Open top tank	0	0	0	0
	8T Open top tank	7	3	3	3
	45T shore bladders	3	0	0	0
O/w storage	Total (in 5-25T Seaslugs)	50	250T	250T	250T
Pumps	2" low pres / volume style	4	1	1	1
	4" trash	5	1	1	1
	3" positive displacement	6	1	1	1
Vessels	"Car-topper" + 9.9hp	0	0	0	0
	Seatruck	0	2	2	2
	RAT RHI	2	0	0	0
Generators	5KW gas	7	2	2	2
Pressure washer	Larger hot water type	1	1	1	1
	Small cold water type	3	1	1	1
Incinerator	Sorbent	2	0	0	0
	Liquid waste	2	0	0	0

Central Zone

The Central zone is dominated by the Great Lakes and has well defined road transportation infrastructure.

Local / first response inventories have been established at all regional Canadian Coast Guard shore-side facilities that have fleet assets or a significant number of program vessels and that have operational personnel to deploy the equipment. Standardized inventory consists of a 20-24' trailer with a 1000' (nominal) of 24" boom and related accessories.

The 2500T Rapid Road Transportable cache is centred around the St. Mary's River and from time to time in major CCG facilities in Ontario. The response package warehoused in a series of 45' transport trailers will be maintained in 100% readiness during the shipping season. The primary purpose of the RRT 2500T system is significant containment of resources; shoreline, sheltered, and off-shore sweep and recovery ability; and staging and storage transfer area equipment.

[3] Inventories in Tuktoyaktuk and Iqaluit are at 95% completion. The Churchill Depot is at about 50% (pending the construction of a new and adequate facility) with the bulk of the inventory in storage at the Thundar Bay Coast Guard base. The RAT 150 needs an evaluation of the command and control component as well as storage for the second Saccke burner.

Table 4-4 *Canadian Coast Guard RRT 2500T Design Inventory*

PCM equipment	Description	BOOMERT #1-5 (each)	SKIMMERT #1 and #2[4]	Softside
Skimmers	Light to medium product/ disk type	-	3	
	Heavy product/ weir type	-	1	1
Boom	24" river type	4000'		
Sweep	36" Nofi V-sweep	-		1
Land storage	4T Open top tank	-	7	1
O/w storage	25T Towable bladders	-	4	4
Pumps	3" positive displacement	-	4	1
Generators	5KW gas	-	2	

Table 4-5 *Canadian Coast Guard locations for First Response Units (FRUs)*

Location	Relevant Area Plan(s)	Primary custodian	Secondary custodian
Amherstburg	Lake Erie/St. Clair-Detroit	SAR crew	ITS field services
Cobourg	Lake Ontario	SAR crew	
Gimli	Lake Winnipeg	SAR crew	
Goderich	Lake Huron	SAR crew	
Kenora	Lake of the Woods	ITS field services	
Kingston	Lake Ontario	SAR crew	
Meaford	Lake Huron	SAR crew	
Parry Sound	Lake Huron	ER personnel	ITS field services
Port Dover	Lake Erie	SAR crew	
Port Weller	Lake Ontario	SAR crew	
Prescott	St. Lawrence River	ER personnel	ITS field services
Selkirk	Lake Winnipeg	ITS field services	
Thunder Bay	Lake Superior	SAR crew	ITS field services
Tobermory	Lake Huron	SAR crew	
Hay River	Mackenzie River & Delta	ER personnel	ITS field services

[4] An additional SkimMERT is being added this year to accommodate additional hoses. The exact configuration of each SKIMMERT is not known yet so the inventories will remain listed together for this year.

Section 5 - RESPONSE OPERATIONS

5.1 Pattern of Response

Based upon the principles outlined in the *National Response Plan*, *(Sections 1.3, 1.5 & 4.4),* Central and Arctic Region assesses, notifies relevant parties, and initiates the tasking/deployment of necessary resources. This is based upon the determination of CCG's role as Lead or Resource Agency and the appropriate CCG Posture. The Duty Officer (DO) is tasked with this initial assessment, which is then verified by the Superintendent, Environmental Response. The appropriate response is activated by the Superintendent who in turn assigns an On-scene Commander (OSC) or Federal Monitoring Officer (FMO) and notifies Canadian Coast Guard (CCG) Management. Upon termination of the incident cost recovery actions are undertaken. To illustrate the generic process see Figure 5-1-Typical Sequence of Events and Table 5-1-Typical Functions Descriptions has been provided.

CCG Expectations of Ships for Response

In most instances when a spill occurs the initial report will trigger the mobilization of local response organizations. It is not normally practical for ship personnel to be directly involved in the clean up activities.

<u>Small Spills</u>
Ships are expected to take whatever actions listed in their Shipboard Oil Pollution Emergency Plan (SOPEP) that are reasonable and necessary to prevent the oil from escaping over the side and having done so, to take action to clean-up the oil contained on deck. Spilled oil should not be washed overboard, nor should degreasers or dispersants be used on spilled oil in the water. Once the oil is in the water, the ship's ability to respond in a practical manner is greatly reduced. It is Canadian Coast Guard's expectation that a response organization or other competent contractor be called upon to provide operational response capability at the discretion of the Polluter.

Where there is no availability of local response contractors or where there is a delay in response activation, the Master of the vessel should consider the use of available materials to contain and clean up the spilled oil by, for example, using ship-stocked absorbent material or utilizing mooring ropes or air filled hoses as makeshift booms.

<u>Large Spills</u>
The ship is restricted as to what action it can take to respond to a major spill. In the case of a casualty the safety of the ship and crew take priority. Therefore the ship's actions will be limited to reporting the incident details

to the appropriate authorities and to ensure that a response is initiated. In large spills it is Canadian Coast Guard's expectation that the Polluter appoint an On-Scene Commander (OSC) which may be a representative of the company that owns the ship or the ship's insurer.

Canadian Coast Guard needs to be kept informed as to the escalating response costs accrued by the Polluter during a response in order to prepare for the possibility that the Polluter will cease their response activities once their Limit of Liability is reached.

CCG expectations of Oil Handling Facilities (OHF) for Response

In most instances when a spill occurs, the initial report will trigger the mobilization of the facility response team. It is normal, in most cases, for the oil handling facility personnel to be the initial responders when a spill occurs.

<u>Small Spills</u>
For the purpose of this plan, a small spill will be defined based on the maximum oil transfer rate of the oil handling facility (i.e. what Level it is assigned under the *Canada Shipping Act, 2001),* which directly links to the minimum spill size to which it must be prepared to respond to within one hour. Oil handling facilities are required to have the resources on site to contain a spill of a minimum size within one hour and have the resources required to recover, or where the oil cannot be recovered the resources to control a spill of a minimum spill size within six hours. Response organizations may be called upon to provide additional operational response capability at the discretion of the Polluter.

<u>Large Spills</u>
For the purposes of this plan, any spill above the facility's minimum spill size will be characterized as a large spill. Oil handling facility personnel are still expected to deploy their on-site equipment. Response organizations will likely be called upon to provide additional operational response capability at the discretion of the Polluter.

***Figure 5-**1 - Pattern of Response – Typical Sequence of Events*

Spill Occurs or Spill Potential Exists

Spill Potential can occur due to circumstances surrounding a vessel collision, grounding or striking. Transport Canada is the lead agency for determining spill potential through the

Coast Guard Notification and Spill Verification

Regional Operations Centre (ROC) receives notification through:

- Provincial/Territorial Spills Hotlines
- CCG Dedicated Spill Hotline
- CCG/MCTS Radio Stations

See Functions #2-3

Environmental Response Assessment

CCG Posture

Activation of Resources

The ER Assessment determines a valid CCG posture and recommendation to activate a response.

Postures include:

- Lead Agency: OSC or FMO

Response Implementation

And Monitoring

Response Management System is implemented to manage CCG Resources and facilitate cost recovery actions.

See Function #6

Spill Monitoring for Regional and HQ Management will be facilitated through Superintendent Functions

Cost Recovery

Upon conclusion of a "response", cost recovery actions are initiated through:

- Polluter (s)
- Protection & Indemnity Clubs (Insurer)
- Ship source Oil Pollution Fund (SOPF)

Response Audit

A Post Incident Review & Analysis is required for the "Operational" components of a Spill

Upon conclusion of the Cost Recovery Action a final review may be necessary in

Table 5-1 *- Pattern of Response – Function Descriptions*

Function		***Description***
1	**Responsible Party/Third Party Functions** *(Spill occurs or sufficient potential risk exists)*	• Spill is sighted/reported. Spill reports originate from source (to regulatory body) or by third party (to various emergency or dedicated pollution hotlines) • Transport Canada is responsible for determining potential risk
2	**Spills Hotline Functions** *(Canadian Coast Guard Notification)*	• Assessment for dissemination • Dissemination (fan out according to applicable procedures) to relevant parties, calls from other spill hotlines are received by CCG-ROC.
3	**CCG-ROC Duty Officer Functions** *(Canadian Coast Guard Spill Verification)*	• Spill Assessment-pollution verification ➢ Mandate Confirmation ➢ Pollution Verification ➢ Source Credibility • Notification to ERDO • Dissemination • Initiation of MPIRS
4	**ER Duty Officer Functions** *(Environmental Response Assessment – CCG Posture)*	• Spill Assessment-response analysis • Source Control/Mitigation • Safety Issues • Tactical & Logistical Issues • Recommendation to Superintendent of likely Response Posture • Documentation – MPIRS
5	**Superintendent Functions** *(Environmental Response Assessment – Activation of CCG Resources)*	• Response Posture Evaluation ➢ Potential Risk to CCG Personnel and Equipment ➢ Propriety of request ➢ International Implications • Identification of OSC/FMO • Obtain an Order-In-Council (Arctic) • Obtain a Finance Code & Regional File Number • Notification of Senior Management and ongoing monitoring • MPIRS documentation • Obtain AC CCG sign off on MPIRS situation report
6	**OSC/FMO Functions** *(Response Implementation*	• Management or monitoring of response using the Response Management System (RMS). Escalation or de-escalation in accordance with needs of the incident. • Consolidation of all documentation upon conclusion of the response for Cost Recovery purposes. • Coordinate final debrief to facilitate future improvements to the systems and processes in place.
7	**Chief Financial Officer Function** *(Cost Recovery)*	• Utilizing CCG Ship-source and Marine Pollution Response Costing Principles and Documentation Standards (DFO 6332) compile pollution response costs recovery claim.

8.	**Internal Review Team Functions** *(Audit)*	• Utilizing the National Exercise Program Planning and Evaluation Guide, a Team is selected to complete the Post-Incident Review of an incident. • Improvements & corrective actions are to be documented

5.2 Spill Potential or Pollution Risk Assessment

Given an actual spill (i.e. pollutant in the water), the activities specified in this plan are rather obvious. However, in the event of vessel grounding, striking or collision that does not immediately result in a release, the responsibility for determining the risk of pollution rests with a Pollution Prevention Officer (PPO) within the Marine Safety (MS) branch of Transport Canada (TC). Should TC-MS be unable to make that determination, the Canadian Coast Guard (CCG), Environmental Response Duty Officer (ERDO) will complete that requirement. In some cases this may involve engaging a marine architect as no accredited expertise for vessel stability assessment resides within the ER section.

For all other areas where Canadian Coast Guard is the Lead Agency, this activity shall be considered the responsibility of the Canadian Coast Guard, Environmental Response Duty Officer.

5.3 Notification

To facilitate the notification of Canadian Coast Guard, and in addition to the existing Marine Communications system, a series of call-out or “Spill Hotline” agreements with the Province of Ontario, Nunavut and Northwest Territories and other Federal Departments within the Region have been implemented.

In addition, Central and Arctic Region, provides a 24 hr public access spills hotline:

24 hour toll free - Spills Hotline:
1-800-265-0237

Notification may occur through various mechanisms, depending upon the manner in which the spill (incident) occurs.

5.4 Verification

In all cases, spill information is initially processed and verified through the Regional Operations Centre (ROC) located in Sarnia, Ontario (See Section 3.3 – Organization). The ROC Officer on duty:

1. Determines whether the pollution is within Canadian Coast Guard’s mandate as Lead Agency or as a potential Resource Agency
2. Establishes the credibility of the source

3. Identifies the following:
    - Incident name (nature of incident)
    - Time of call (local / UTC)
    - Time of spill (local/UTC) *(if available)*
    - Reported by / call back particulars
    - Source determination
    - Incident background and description of clean-up activities (if any)
    - On-scene environmental/atmospheric conditions
    - Pollutant type and quantity
    - Verifying party contact information (as applicable)
4. Initiates an MPIRS entry for the following cases:
    - Originally pursuing verification as Canadian Coast Guard mandate but additional information about source changes lead to another agency
    - Canadian Coast Guard mandate and verified no pollution
    - Canadian Coast Guard mandate and verified pollution
    - Likely to impact on / impacting on foreign waters
    - Significant impact on region, though not falling under Canadian Coast Guard mandate.
    - Request for Canadian Coast Guard as a resource agency.
5. Enters information into MPIRS (indicated in #3 above) as well as name of paged ERDO.

This information is then relayed to the Environmental Response Duty Officer to determine Canadian Coast Guard posture. It should be noted that all spill incidents, irrespective of CCG's mandate, may require Canadian Coast Guard resources if requested (see Resource Agency Role in Section 1.5 of the *National Response Plan).*

By agreement, spill verification will be completed by the Regional Operations Centre (ROC) Duty Officer*.* The verification will be complete when the ER Duty Officer is advised where Canadian Coast Guard is Lead Agency. (see Figure 5.2 Pollution Verification Process and Figure 5.3 Response Analysis Process)

5.5 Spill Assessment – Environmental Response Duty Officer

To facilitate the requirement for efficient and rapid notification and assessment of incidents, Central and Arctic Region, in accordance with the *National Response Plan,* Section 4.4, has instituted a 24-hr year round monitoring regime integrated with the Regional Operations Centre (ROC). The following sections identify the context in which this activity is carried out.

Coordination

The coordination of the ER Duty Officer is the responsibility of the ER Regional Emergency Operations Officer (REOO). These duties include assigning shifts in an equitable manner, keeping records of the duty officer schedules, maintaining equipment required to perform ER Duty Officer functions, reviewing individual ER Duty Officer performance, reviewing ER Duty Officer procedures, and liaising with the ROC and National HQ.

Performance

The ER Duty Officer function shall be performed by the following positions provided sufficient experience, appropriate training, and at the discretion of the Superintendent ER:

- ✓ Senior Officers
- ✓ Those in capacity to act for Senior Officer.

Review

The ER Duty Officer procedures shall be reviewed in reaction to:

- Changes at the Regional Operations Centre (ROC) affecting the ER Duty Officer function
- Changes in Canadian Coast Guard (CCG) policy on the response to ship source pollution
- In consideration of accepted recommendations stemming from exercises and operational responses.

The individual officer performance shall be reviewed in context of their execution of a spill assessment.

Responsibilities

At the beginning of the ER Duty Officer's shift the following are required:

- Functioning communication equipment (pager, cell phone/Blackberry);
- The necessary analytical tools (e.g. spill assessment forms, Greenwood's Guide to Great Lakes Shipping, Area Plans, Oil Spill Response Field Guide, OSH reference tools, and the CANUTEC Emergency Response Guide book.)

During the ER Duty Officers shift the following are required to be complete:

- MPIRS cases for any spill reports that required ER Duty Officer analysis by noon of the next business day;
- Extra Duty Reports;
- Notification of the next ER Duty Officer and the ER Regional Emergency Operations Officer of any on-going cases.

Availability

The availability of the ER Duty Officer is 24 hours/7 days a week. Pages must be responded to within 10 minutes of notification. Should the ER Duty Officer (DO) be unable to fulfill their duties at any time during the shift, they are required to notify the ER Regional Emergency Operations Officer (REOO) immediately who will notify the ROC of any changes immediately. The following activities conflict with the performance of the ER Duty Officer function:

- travel out of country / region / pager range;
- inability to respond immediately due to performance of other job functions (instructing a course, running an exercise, delivering a presentation, involved in a maintenance run that would be too difficult to reschedule, chairing a meeting, or participating in any activity that requires attendance or would be inappropriate to leave);
- inability to respond immediately due to personal reasons (vacation, sickness, etc.).

Should an individual become unavailable for a significant portion of the shift for reasons noted above, that shift may be assigned to another officer at the discretion of the ER Regional Emergency Operations Officer.

Function

The primary function of the ER Duty Officer is to complete an initial incident assessment and analysis, making a recommendation to the Superintendent of ER as to the appropriate course of action. [**]

The initial assessment will be complete for the following cases:

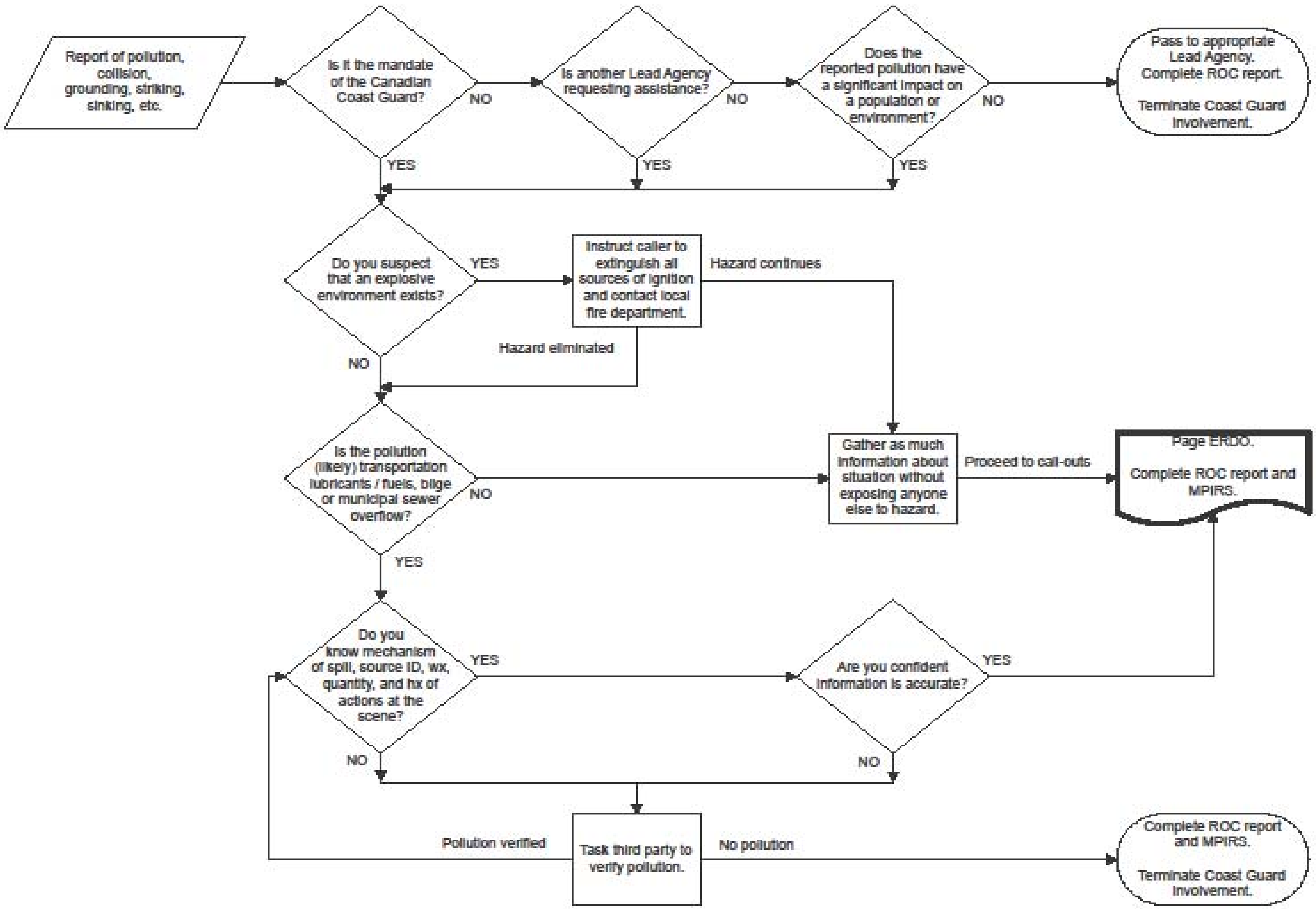
- Canadian Coast Guard mandate and verified pollution
- Likely to impact on / impacting on foreign waters
- Significant impact on region, though not falling under Canadian Coast Guard mandate.
- Request for Canadian Coast Guard as a resource agency.

The analysis function is complete when the Superintendent ER is informed and advised of the recommended course of action that will consider the following (see flow chart):

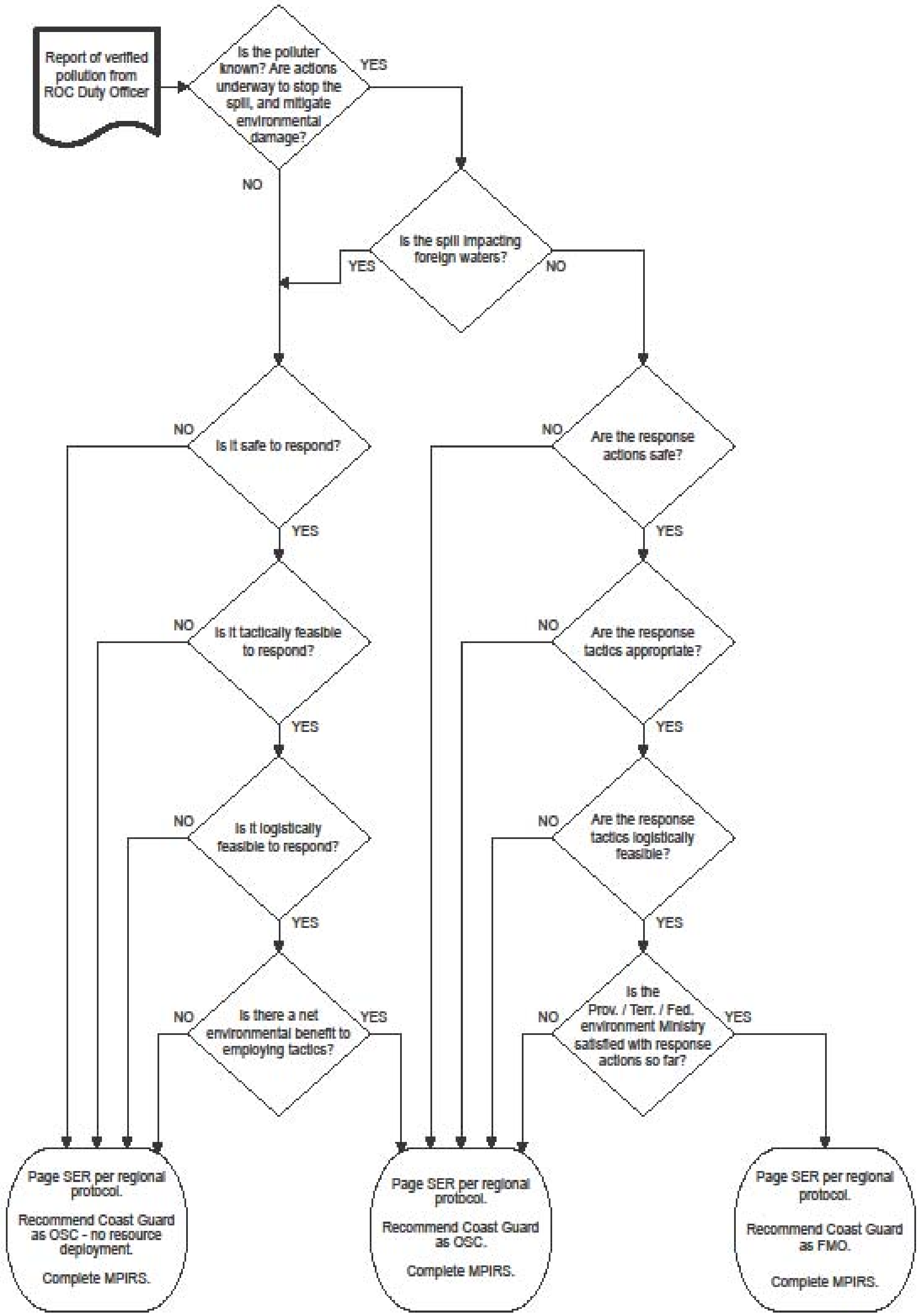
- polluter's actions and intentions (if applicable);
- safety concerns, tactical, logistical, and environmental feasibility of any response.

[**] The ER Duty Officer does not need to notify the Superintendent of any incidents that require "no activation" of CCG resources (assets/personnel) in monitoring/clean-up activity.

Spill assessment: *pollution verification process*



Spill assessment: *response analysis process*



5.6 Activation of Canadian Coast Guard Response Resources

In the event of small (0-150 T) to medium size (150-1000 T) spill incidents, the Superintendent, Environmental Response, acting upon the assessment provided by the Duty Officer, initiates/activates the appropriate response. This entails, but is not limited to, the following activities:

- Identification of overall health and safety risks to response personnel.
- Establishing the propriety of the recommended response posture. This includes the verification of international issues in border areas.
- Verification of Canadian Coast Guard capability to respond, impact on normal regional operations and, if necessary, the potential requirement for the notification and activation of the National Response Team.
- Assignment of the designated On-Scene Commander (OSC) or Federal Monitoring Officer (FMO). SROs are typically assigned as FMO/OSC for incidents occurring within their geographic area.
- Obtaining the necessary Order-in-Council, for spills in Arctic Waters
- Obtaining the financial project code, and forwarding it to the OSC/FMO.
- Signing a contract with the Response Organization (RO) in accordance with PWGSC contracting rules.
- Creation and dissemination of initial situation report to Regional and National management in accordance with the *Safety and Environmental Response Systems (SERS) – Incident Notification Guidelines*.
- Completion of MPIRS to document above activities.

For significantly larger spill incidents (1000T and above) the Superintendent, Environmental Response shall immediately assume the OSC/FMO role, notify Regional and National management of the situation and initiate the Response Management System (RMS) (and activation of the National Response Team, if necessary) in addition to the above activities. Upon stabilization of the immediate emergency, the Assistant Commissioner, Canadian Coast Guard, Central and Arctic Region and/or Director General, Canadian Coast Guard shall assess the requirement for assigning a new OSC/FMO.

5.7 Response Implementation

As stated previously (Section 4 - Preparedness), the Canadian Coast Guard will employ the Response Management System (RMS) as its primary management and operational tool. At the heart of this system is the development of clear obtainable objectives and the implementation of the supporting tactical deployment. This is achieved through the creation of incident action plans spanning specified operational time periods. For small spills these plans can be rather informal. As spill size and impacts increase, so to will the complexity of operational assignments and hence a need for greater formalization of the Incident Action Plan.

All operations shall be carried out in accordance with the Guiding Principles set out in *Section 1.3* of the *National Response Plan* and the *Oil Spill Response Field Guide* (ISBN 0-660-16112-5).

Central and Arctic Region covers an extremely large geographical and culturally diverse portion of Canada. There are, in essence, two zones of operation which are entrenched in the *Canada Shipping Act*.
These are the:

- Arctic zone, or all areas of Canadian jurisdiction north of 60^0 N Latitude;
- Central zone, dominated in a marine transportation sense by the Great Lakes, but which include the southern portions of Hudson, James and Ungava Bay, along with the major waterways and watersheds of Lake Winnipeg, Winnipegosis, Lake of the Woods, and Lake Athabasca.

Arctic zone – first response
The highest risk of pollution in the arctic is during a ship fuel transfer to facilities in Canada's northern communities. Should pollution occur, the vessel and oil handling facility have responsibilities to implement their Oil Pollution Emergency Plans (OPEP) that deal with source control. The next step would be for the community to respond using its response plan, protecting the identified priority area(s) and employing the response equipment in an Arctic Community Pack, if so equipped.

Arctic zone – escalation
If the pollution is beyond the ship, facility, and community response then the Rapid Air Transportable (RAT)150T will be the first line Canadian Coast Guard ER response (Arctic icebreakers or Special River Nav-aid Tenders may have been on-scene first). Upon activation of the RAT150T, standing offers with aviation contractors will be called up. Closest ER personnel will be dispatched to the community to assess, plan, assemble (and train) responders, while preparing to stage the in-coming equipment. The Hay River base personnel will transport the pallets to the airport where they will be loaded into the awaiting airframe. Upon arrival the pallets will be unloaded and a trailer tongue and wheels affixed to the pallet to facilitate movement (by ATV if necessary) to a forward staging area and ultimately to a beach site. The timeframe for full forward staged capacity with personnel at any community with suitable runways is under 48 hours.

The hospitality industry of Arctic communities can be rapidly overwhelmed with the influx of as little as 10 people. Experience has shown that these communities could only support 10-15 additional personnel and only offer 10-15 community responders. Consequently, the RAT was designed considering the amount and type of equipment that is most easily handled by a combination of trained

Canadian Coast Guard personnel and community responders. The RAT150T response is predicated on an in-community response with the following positions identified in the table below:

Table 5-2 *Anticipated personnel usage for the RAT150T in an Arctic community*

Position	Canadian Coast Guard responder	Community responder
OSC	X	
OSC support		X
Chief Ops & Planning	X	
Logs – services	X	X
Logs – support	X	X
Ops skimming (A)	X	X
Ops skimming (B)	X	X
Ops shoreline (A)	X	X X X X
Ops shoreline (B)	X	X X X X
Ops booming vessel (A)	X	X
Ops booming vessel (B)	X	X
Transfer / disposal	X	X
Totals	**11**	**16**

Upon escalating beyond a RAT150T response, the ∆1000T will be stood up. Standing offers / arrangements with local contractors will be activated to move the containers / seatrucks to a location where they can be transferred to a ship / barge. If required, closest Canadian Coast Guard base personnel will be dispatched to the depot to assist. The closest suitable marine transportation asset will also be contracted to move the equipment to the spill site. The timeframe for full forward staged capacity with personnel is estimated at one week.

As the 150T response is predicated on an in-community response a larger spill would have to be supported by a Canadian Coast Guard icebreaker, rented camp barge, or flown in from surrounding communities.

Table 5-3 *Anticipated personnel usage for the 1000T in an Arctic community.*

Position	Canadian Coast Guard ER responder	CCG Fleet or professional contractor	Community responder
OSC	X		
OSC support		X	X
Chief of Planning	X		
Plan – response	X		
Plan – demobilization	X		
Chief of Logs	X		
Logs – services		X	X
Logs – support	X X	X X X	
Chief of Ops	X		
Air Ops		X	
Ops on-water	X X	X X X X	
Ops shoreline	X X		X X X X X X X X X X
Ops booming	X X	X X X X	
Transfer / disposal	X	X	X
Totals	**14**	**13**	**13**

Central Zone – first response

The highest risk of pollution occurring in the region is found in the Great Lakes. Statistically the areas in the Great Lakes of highest risk are the connecting channels due to volumes, numbers of transits, and convergence factors (existing VTS / navigational aid systems recognize this). Areas with traditionally high pleasure craft and small commercial craft traffic experience frequent (though low in volume) pollution incidents.

If the pollution is in the local vicinity of a Canadian Coast Guard Search and Rescue (SAR) station or facility with operational staff, a First Response Unit (FRU) may be deployed as an initial attempt at containment. If more equipment sweeps systems or recovery units are required then the Rapid Road Transportable (RRT) 2500T will be activated.

Transfer of Lead Agency

Transfer of Lead from CCG

Should an incident initially appear to fall within the jurisdiction of the Canadian Coast Guard yet later is determined to be another government agency's

responsibility, the CCG-appointed OSC or FMO will verbally acknowledge the transfer of Lead Agency responsibility followed by written confirmation on the terms of the transfer (this may require time for termination of a response contract with CCG and the establishment of a response contract with the appropriate Lead Agency.) When the Lead is transferred from CCG to another Lead Agency, CCG will submit an invoice of its response costs to the Lead Agency for response activities undertaken up to the time of transfer recognition.
Should the Lead Agency wish to retain CCG as a Resource Agency, the criteria in Section 7 of the *National Response Plan* of the *CCG National Marine Spills Response Plan* will apply.

<u>Transfer of Lead to CCG</u>
When the Lead is transferred to Canadian Coast Guard from another agency, the Canadian Coast Guard will incorporate the appropriate costs borne by the other agency in the initial stages of the spill into its claim to the Polluter or to the Ship Source Oil Pollution Fund, (SOPF) as the case may be.

Safety Procedures and Considerations
All petroleum cargoes are considered hazardous substances. Canadian Coast Guard command, clean-up, monitoring and verification personnel have protective equipment and training available to them up to Level “D”. All Environmental Response branch staff have been issued with a variety of personal protective equipment (PPE) and are expected to deploy to a spill site (includes exercises and training) with all appropriate gear. Safety glasses and rain suits with rubber boots and gloves are appropriate for Canadian Coast Guard's traditional verification of and response to oil pollution.

Bulk chemical carriers, rail cars, road trailers, sour (H2S) petroleum products or BTX (benzene, toluene, xylene) carried on oil tankers are all sources of substances for which Canadian Coast Guard personnel are not readily equipped for. In most cases where the pollutant reported is suspected to be from one of these sources Canadian Coast Guard assets should not be tasked to verify. If it falls within Canadian Coast Guard mandate the ER program personnel will get directly involved in the verification, likely looking to other government departments or contractors to continue with the assessment and response.

When the pollution is reported to the ROC by a member of the public, or by a credible professional as a mystery spill, closer examination of the circumstances or probable cause of the pollution will occur as part of spill verification. During the conversation with the individual reporting the incident the ROC Duty Officer will want to find out what it is that they observed. These are:

- Colour [typical petroleum silvery to rainbow to dark purple / brown or is it frothy, green organic matter, rusty, etc.]
- Odour [does it smell like gas, diesel, rotten eggs, no odour]
- Proximity to any likely source [vessel, industrial outfall, municipal outfall, midlake, mid channel, washed up industrial storage drum]

- Volumes [football field sized, shopping mall parking lot big, or a thin ribbon]
- Other factors [heavy rainfall in last 12 hours; seasonal conditions / times / areas known for algae blooms; fish or animal kills].

By picking up on any "flags" during an assessment it can be reasonably determined whether the pollution should not/should be classified as a hazardous substance (for which CCG personnel are unable to respond to). The ER duty officer will consult with experts in Environment Canada (EC), Spills Action Centre (SAC), and CANUTEC, as appropriate to determine the safety for personnel.

Alternative countermeasures

Alternative countermeasures are those non-mechanical techniques utilized in oil spill response operations such as in-situ burning, dispersant application, and shoreline cleaner application.

<u>Central Zone</u>
The likelihood of approval of in-situ burning operations on the Great Lakes or in connecting channels or inland lakes is minimal. The use of dispersants in the Great Lakes, connecting channels or in inland waterways will not be considered. Shoreline cleaner agents approved by Environment Canada may be considered.

<u>Arctic Zone</u>
In view of the difficulties associated with mounting an effective response in the Arctic, the CCG has recommended that further research be done in the areas of in-situ burning, the use of dispersants (reference Quebec paper) and other oil in ice recovery methods. This research should be operational R&D and assume that the product spilled is Arctic diesel and that the spill occurs during the Arctic shipping season.

5.8 Summary Report and Post Incident Review

It is regional policy to provide a Summary Report and/or conduct a formal Post Incident Review for incidents deemed noteworthy or valuable by the OSC/FMO or Assistant Commissioner, Canadian Coast Guard.

Summary Report

The summary report shall contain at minimum the following, but can include any information deemed relevant by the OSC/FMO.

<u>Summary Incident Report Format</u>

(a) Overview of Crisis Event

- spill source (not cause), initial environmental conditions and assessment of situation

(b) Spill chronology
- spill response activities and climate/wind /sea condition data
- key response objectives (success and failures in implementation), major shifts in tactics, other agencies involvement

(c) Costs and cost recovery issues
- total estimated cost summary
- identification of Cost Recovery requirements and options

(d) References
- Situation Reports

Post Incident Review

The main objective of a Post Incident Review is the evaluation of the incident to ultimately improve Canadian Coast Guard’s effectiveness at spill response. To that end, this requirement is essentially similar to the principles of exercise evaluation. Therefore, when required, the review shall be conducted in accordance with the principles contained in the *National Exercise Program – Evaluation guidelines, Chapter 11*.

This entails six distinct tasks:

1) Brief the Evaluation Team
2) Brief the Response Team
3) Evaluate the Incident
4) Prepare a Preliminary Summary of Key Observations
5) Hold an Incident Debriefing Session
6) Prepare an Official Post Incident Evaluation Report

<u>Post Incident Evaluation Report Format</u>

(a) Executive Summary -Summarizes overall findings and observations
(b) Overview of Incident Objectives -Briefly describes the key objectives, environmental conditions and initial situation assessment
(c) Evaluation Techniques and Criteria - Describes the technique(s) (i.e. self, peer or independent evaluation) and the major evaluation criteria used
(d) Assessment of Key Incident Objectives - This provides a critical appraisal of the incident objectives or major shifts in tactics. Each key objective assessment will include the following:

Findings – A summary statement describing key positive and negative findings.

Specific Observations - Observed decisions and tasks noted during the incident by responders, management and interested parties.

Conclusions - Assessment of the impact of the finding on overall achievement of the incident objective(s)

Recommendations – A description of potential corrective or follow-up action required to implement the findings to improve overall marine spill response preparedness.

(e) Appendices or Attachments - May or may not be required

Section 6 – CLAIMS & COST RECOVERY

6.1 Purpose

The purpose of this section of the *Regional Response Plan* is to outline the requirements and regional processes to assist in the creation of a claim to the relevant fund or directly to a polluter.

The ability of Canadian Coast Guard to recover or pursue recovery of response expenses or costs associated with monitoring activities is set out in the *Marine Liability Act, Part 6, "Liability and Compensation for Pollution"*. This ability to recover costs is seen as the embodiment of the polluter-pay-principle set out in the *National Response Plan, Guiding Principles, Section 1.3*.
Note: That at this time there is no mechanism to recover monitoring costs from an oil handling facility.

In addition to the above and recognizing the potential financial risks and impacts to Canada, Canadian legislation also provides for the creation and maintenance of a Ship-Source Oil Pollution Fund, (SOPF). This fund, in addition to the International Oil Pollution Compensation Fund (IOPCF) and the Protection & Indemnity (P&I) Clubs, provides for the assessment of claims/loss against member ships and/or shipping companies. Neither of these funds hinder nor otherwise limit Canadian Coast Guard's ability to lay claims directly against a Polluter. However, the Polluter is only required to reimburse a claim up to its Limit of Liability. This limit is calculated using the guidelines established in the *Convention on Limitation of Liability for Maritime Claims (LLMC), 1976*.

6.2 Policy Guidelines

The following points serve as regional guidelines for pursuing cost recovery activities:

- The decision to seek cost recovery should be made based on common sense and in consultation with other operational and finance team members.
- Cost recovery should be avoided in situations where the administrative costs of recovery action exceed the dollars expected to be recovered.
- Cost recovery embodies the "Polluter Pays" principle.
- Costs incurred while acting as a resource agency must be recovered from the lead agency.
- Costs incurred while acting as OSC/FMO are recoverable from either the polluter, its P&I Club, the Ship-Source Oil Pollution Fund or from the International Oil Pollution Compensation Fund.

6.3 Responsibilities

On-Scene Commander/Federal Monitoring Officer (OSC/FMO)
The OSC/FMO is responsible for ensuring that complete and accurate documentation is provided for a timely and effective cost recovery process. The OSC/FMO is responsible for preparing all documentation necessary to initiate cost recovery.

Regional Finance Staff
Response, monitoring and administrative costs must be calculated in accordance with national financial accounting and recording practices. Senior administrative officers within Maritime Services may be called upon to provide expert advice as required. It is recommended that a regional finance representative be on-scene as soon as possible to help establish procedures, to safeguard documentation, and to ensure the integrity of the costing process.

Environmental Response Headquarters
The Environmental Response Senior Advisor for Cost Recovery and Claims will submit those claims that are intended for the Ship-Source Oil Pollution Fund and to International Fund Conventions in accordance with the guidelines specified by each. The Advisor will also issue equipment charge-out rates periodically for use by all regions.

6.4 Process

The Response Management System (RMS) documentation (field notes, Incident Action Plans, Minutes and meeting records, time sheets and any and all expense records, invoices/requisitions etc.) shall form the basis of data for the Cost Recovery action.

The Region will initiate cost recovery actions against the Polluter. Should the Polluter be unable or unwilling to pay the costs, the Region will forward the claim to HQ Senior Advisor for Cost Recovery and Claims for submission to the Ship-Source Oil Pollution Fund. Should the costs of the response exceed the Limit of Liability of the Polluter, reimbursement of costs will be through the SOPF and then through the IOPCF. Claims associated with mystery spills will be submitted directly to HQ for a claim against the SOPF.

6.5 Documentation

Proper documentation alleviates the need to reconstruct the incident after the fact, reduces the volume of questions, and adds credence to the claim. The key source of information that enables various parties to determine the degree of reasonableness of the actions taken and the costs claimed is the part of the cost recovery summary known as a “narrative”. That justification is considered to be a critical component to successful and timely claims.

The regional guideline for producing cost summaries and documentation handling is as follows:

Incidents of minimum complexity and limited expenditures (under $15K)

- Expenditures may be summarized within the body of the Final Report, including any description of "calculated" values (i.e. administration costs)
- Original invoices shall be kept on the dedicated spill file.

Incidents of medium complexity and moderate expenditures (up to $50K)

- Expenditures will be summarized in a single table by Cost Element within the body of the Final Report.
- A supporting cost summary document or appendix shall be created to provide a detailed cost summary by date. Copies of the expenditure documentation will be included.
- Original invoices shall be kept on the dedicated spill file organized by date.

Incidents of high complexity and significant expenditures ($50K plus)

- Expenditures will be summarized in a single table by Cost Element within the body of the Final Report. (similar to medium complexity incidents)
- A supporting cost summary document will be created summarizing the daily expenditures by individual cost element, followed by a cumulative summary of each cost element (spreadsheet of all daily summaries). The sum total of all cost elements will then be summarized for use in the final report.
- Due to the volume of transactions, copies of the expenditure documents will not be provided in the supporting cost summary document.
- Original invoices will be kept in their original state, filed by date and archived when feasible to a dedicated file.

Table 6.1 Sample Cost Element Table

Cost Element	Description
Personnel	Includes hourly regular and overtime costs associated with CCG Staff (includes EBP)
Equipment	Includes cost of all CCG assets, based upon established charge out rates
Purchases/Expendables	Includes expendables such as office supplies and PPE
Travel	Includes meals and accommodation costs incurred by CCG staff accordance with TB travel directive.
Contractors	Includes the costs of all private sector contractor/goods and services.
Administration	Includes the cost of CCG administration.
Total Estimated Cost	

6.6 References

- CCG Ship Source and Marine Pollution Response Costing Principles and Documentation Standards DFO2004-6332
- Cost Recovery of Ship Source and Marine Pollution Response Directive # D-4010-2001-01
- Cost Recovery Related Policies, Memorandum dated October 26, 1998, File AWE 1001-5-2-1 (AWEA)

6.7 Third Party Claims

While monitoring or responding to an incident, Canadian Coast Guard will refer all inquiries regarding third party claims to the Polluter. In the case of a mystery spill, the Canadian Coast Guard will encourage claimants to submit a claim directly to the Ship Source Oil Pollution Fund.

Section 7 - PLAN MAINTENANCE AND CUSTODIANS

7.1 *Maintenance Process*

Responsibility
The *Regional Response Plan* of the *Canadian Coast Guard Marine Spills Response Plan* for Central & Arctic Region is the responsibility of:

Assistant Commissioner, Canadian Coast Guard
Central & Arctic Region
520 Exmouth Street
Sarnia, Ontario
N7T 8B1
fax (519) 383-1991

Revision Requests
All requests or suggestions for revision to this plan should be forwarded, in writing, to the above noted address and should include the following information:

- Originator (including return address and telephone number)
- Date
- Subject (i.e. request for revision)
- Suggested change (including section and page number references)
- Reason for revision

All formally received requests will be acknowledged in writing and assessed for inclusion into the plan. Upon approval the revision will be distributed accordingly.

Revision Record
Upon receiving a revision transmittal, recipients are requested to ensure that its number is next in sequence to the previous issue, process the amendments according to the transmittal instructions and complete the revision record in this section.

Should there be any discrepancies or questions, the recipient should contact the Canadian Coast Guard, Assistant Commissioner, Central & Arctic Region at the above address.

The onus is on the plan holder to maintain a current plan.

7.2 *Canadian Coast Guard Custodians*

This document is structured to reflect the fundamental phases of Environmental Response (ER) activities and hence reflects the co-operative nature of each aspect of the Central and Arctic Region Environmental Response organization. In conjunction with this, each component has been assigned to a specific section within the branch (e.g. training is the responsibility of the Training Officer). The Assistant Commissioner – Canadian Coast Guard, Central and Arctic Region retains the overall responsibility for the document's implementation. The Emergency Plan Development Officer (EPDO) facilitates the physical management and co-ordination of this document.

These custodial relationships herein are designed to facilitate the annual review and maintenance of the *Regional Response Plan*.

Letter of Promulgation	Emergency Plan Development Officer
Record of Revision	Plan Holders
Section 1 – Introduction	Emergency Plan Development Officer
Section 2 - Agreements & Memoranda of Understanding	Emergency Plan Development Officer
Section 3 – Organization	Emergency Plan Development Officer
Section 4 – Preparedness 4.2 RMS	 Regional Training Officer
4.3 Planning	Emergency Plan Development Officer
4.4 Training	Regional Training Officer
4.5 Exercising	Regional Exercise Officer
4.6 Inventory Maintenance & Management	Regional Emergency Operations Officer
Section 5 – Response Operations	Regional Emergency Operations Officer
Section 6 – Claims & Cost Recovery	TBD
Section 7 - Plan Maintenance & Custodians	Emergency Plan Development Officer
Section 8 – Contacts	Emergency Plan Development Officer
Section 9 – References & Annexes	Responsibility for each annex is assigned in each Annex.

All unassigned sections shall be considered the responsibility of the Emergency Plan Development Officer unless otherwise indicated.

7.3 Plan Distribution

The *Regional Response Plan* shall be distributed to all holders of the *Canadian Coast Guard Marine Spills Response Plan*, in accordance with the Area of Responsibility set in Section 1 - Introduction. This includes the relevant Federal and Provincial Lead Agencies as described in the National Response Plan Section 1, sub-section 1.5; all Canadian Coast Guard Management; Facilities and Vessels; all Oil Handling Facilities and relevant certified Response Organizations by request and in accordance with Transport Canada-Marine

Safety, Compliance and Enforcement division. All subsequent revisions will be automatically distributed to these plan holders.

Any member of the general public wishing to obtain a copy may do so through the Fisheries and Oceans, Canadian Coast Guard, National Headquarters. These plan holders will not be advised of revisions.

Section 8 – CONTACTS

8.1 Pollution Reports for Canadian Coast Guard, Central & Arctic Region

To report a pollution emergency anywhere within Central & Arctic Region telephone the Canadian Coast Guard, Regional Operations Centre (ROC) toll free at:

1-800-265-0237

or report via

Marine Radio on VHF, Channel 16.

8.2 Other Lead Agencies that Maintain Spill Report Lines

- Ontario Ministry of the Environment - Spills Action Centre: 1-800-268-6060
- Territorial Spills Line – Arctic Alarm: 1-867-920-8130
- Manitoba Conservation: 1-204-944-4888
- Saskatchewan Environment - Saskatchewan Spill Centre: 1-800-667-7525
- Alberta Environment: 1-800-222-6514

8.3 Canadian Coast Guard, Environmental Response Branch (CCG/ER) Phone List – Regular Office Hours

Regional Office, Canadian Coast Guard 520 Exmouth Street Sarnia, ON N7T 8B1	
Title	**Telephone**
Superintendent, Environmental Response	519-383-1954
Emergency Plan Development Officer	519-464-5126
Assistant Contingency Planning Officer	519-383-1953
Regional Exercise Officer	519-383-1978
Regional Emergency Operations Officer	519-383-1956
Environmental Training Officer	519-383-1957
Administrative Assistant	519-383-1951

Canadian Coast Guard Base 42037 McKenzie Highway Hay River, NT X0E 0R9	
Title	**Telephone**
Senior Response Officer	867-874-5557
Response Specialist	867-874-5558
Response Specialist	867-874-5559

Canadian Coast Guard Base PO Box 1000, 401 King Street Prescott, ON K0E 1T0	
Title	**Telephone**
Senior Response Officer	613-925-2865 x 157
Response Specialist (2)	613-925-2865 x 262
Logistics and Statistics Officer	613-925-2865 x 126

Canadian Coast Guard Base 28 Waubeek Street Parry Sound, ON P2A 1B9	
Title	**Telephone**
Senior Response Officer	705-746-2196 x 228
Response Specialist	705-746-2196 x 270
Response Specialist	705-746-2196 x 201

Section 9 – REFERENCES & ANNEXES

9.1 References

The following list includes those documents which supplement the Regional Response Plan.

Supplement	Custodian
Environmental Response Manual – Standard Operating Procedures and Directives	Canadian Coast Guard, Environmental Response, Headquarters
Response Management System User’s Guide, version 3.0 (May 2006)	Canadian Coast Guard, Environmental Response, Headquarters
Environmental Response Superintendent’s Manual	Superintendent, Environmental Response, Regional Office
Environmental Response Regional Health & Safety Plan	Environmental Response, Regional Emergency Operations Officer
National Exercise Program (NEP) Manual	Canadian Coast Guard, Environmental Response Headquarters
Inventory Control and Response Management System – TMA database	Regional Logistics and Statistics Officer, Environmental Response
DFO Crisis Communications Plan	DFO Corporate Services, Communications Branch

9.2 Annexes

The following Area Plans make up the Annexes to the Regional Chapter:

1) St. Lawrence River and Lake Francis
2) Lake Ontario
3) Lake Erie
4) St. Clair and Detroit River
5) Lake Huron, Georgian Bay and North Channel
6) St. Mary’s River
7) Lake Superior
8) Lake of the Woods
9) Inland waters (South of 60°N Latitude)
10) Hudson and James Bay
11) Baffin Region
12) Keewatin Region
13) Kitikmeot Region
14) Great Slave Lake Region
15) Mackenzie River and Delta
16) Beaufort Sea and Amundsen Gulf

APPENDIX C - MSDS Jet-A and Diesel

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : DIESEL FUEL

Synonyms : Seasonal Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, D50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel, Furnace special, Biodiesel blend, B1, B2, B5, Diesel Low Cloud (LC). Marine Gas Oil

Product code : 101802, 100107, 100668, 100658, 100911, 100663, 100652, 100460, 100065, 101796, 101793, 101795, 101792, 101794, 101791, 100768, 100643, 100642, 100103, 101798, 101800, 101797, 101788, 101789, 101787, 102531, 100734, 100733, 100640, 100997, 100995, 100732, 100731, 100994

Manufacturer or supplier's details

Petro-Canada
P.O. Box 2844, 150 - 6th Avenue South-West
Calgary Alberta T2P 3E3
Canada

Emergency telephone number

Suncor Energy: +1 403-296-3000;
Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use : Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining diesels, marine diesels, MDO and naval distillates may have a higher flash point requirement.

Prepared by : Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	Bright oily liquid.
Colour	Clear to yellow (This product may be dyed red for taxation purposes).
Odour	Mild petroleum oil like.

GHS Classification

Flammable liquids : Category 3

Acute toxicity (Inhalation) : Category 4

Skin irritation	:	Category 2
Carcinogenicity	:	Category 2
Specific target organ toxicity - single exposure	:	Category 3 (Central nervous system)
Specific target organ toxicity - repeated exposure	:	Category 2 (Liver, thymus, Bone)
Aspiration hazard	:	Category 1

GHS Label element

Hazard pictograms :

Signal word : Danger

Hazard statements :
H226 Flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H332 Harmful if inhaled.
H336 May cause drowsiness or dizziness.
H351 Suspected of causing cancer.
H373 May cause damage to organs (Liver, thymus, Bone) through prolonged or repeated exposure.

Precautionary statements :
Prevention:
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ eye protection/ face protection.
P281 Use personal protective equipment as required.
Response:
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.

P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P331 Do NOT induce vomiting.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Storage:
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P403 + P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.
Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Primary Routes of Entry	:	Eye contact Ingestion Inhalation Skin contact Skin Absorption
Target Organs	:	Skin Eyes Respiratory Tract
Inhalation	:	May cause respiratory tract irritation. Inhalation may cause central nervous system effects. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness.
Skin	:	Causes skin irritation.
Eyes	:	Causes eye irritation.
Ingestion	:	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Aspiration hazard if swallowed - can enter lungs and cause damage.
Aggravated Medical Condition	:	None known.

Carcinogenicity:

IARC	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
OSHA	No component of this product present at levels greater than or

equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
kerosine (petroleum), hydrodesulfurized	64742-81-0	70 - 100 %
kerosine (petroleum)	8008-20-6	
fuels, diesel	68334-30-5	
fuel oil no. 2	68476-30-2	
Alkanes, C10-20-branched and linear	928771-01-1	0 - 25 %
Soybean oil, Methyl ester	67784-80-9	0 - 5 %
Rape oil, Methyl ester	73891-99-3	
Fatty acids, tallow, Methyl esters	61788-61-2	

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.
Seek medical advice.

In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash skin thoroughly with soap and water or use recognized skin cleanser.
Wash clothing before reuse.
Seek medical advice.

In case of eye contact : Remove contact lenses.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.

If swallowed : Rinse mouth with water.
DO NOT induce vomiting unless directed to do so by a physician or poison control center.
Never give anything by mouth to an unconscious person.
Seek medical advice.

Most important symptoms : First aider needs to protect himself.

and effects, both acute and delayed		

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Carbon dioxide (CO_2) Water fog. Foam
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO_2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H_2S), smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid spark promoters. Ground/bond container and

equipment. These alone may be insufficient to remove static electricity.
Avoid contact with skin, eyes and clothing.
Do not ingest.
Keep away from heat and sources of ignition.
Keep container closed when not in use.

Conditions for safe storage : Store in original container.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Keep in a dry, cool and well-ventilated place.
Keep in properly labelled containers.
To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
kerosine (petroleum), hydrodesulfurized	64742-81-0	TWA	200 mg/m3	ACGIH
kerosine (petroleum)	8008-20-6	TWA	100 mg/m3	NIOSH REL

Engineering measures : Use only in well-ventilated areas.
Ensure that eyewash station and safety shower are proximal to the work-station location.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hand protection

Material : neoprene, nitrile, polyvinyl alcohol (PVA), Viton(R). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for

		wear and tear. At the first signs of hardening and cracks, they should be changed.
Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Bright oily liquid.
Colour	:	Clear to yellow (This product may be dyed red for taxation purposes).
Odour	:	Mild petroleum oil like.
Odour Threshold	:	No data available
pH	:	No data available
Pour point	:	No data available
Boiling point/boiling range	:	150 - 371 °C (302 - 700 °F)
Flash point	:	> 40 °C (104 °F) Method: closed cup
Auto-Ignition Temperature	:	225 °C (437 °F)
Evaporation rate	:	No data available
Flammability	:	Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.
Upper explosion limit	:	6 %(V)
Lower explosion limit	:	0.7 %(V)
Vapour pressure	:	7.5 mmHg (20 °C / 68 °F)

Relative vapour density	:	4.5
Relative density	:	0.8 - 0.88
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	No data available
Viscosity		
Viscosity, kinematic	:	1.3 - 4.1 cSt (40 °C / 104 °F)
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Runoff to sewer may create fire or explosion hazard.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents and acids.
Hazardous decomposition products	:	May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Eye contact
Ingestion
Inhalation
Skin contact
Skin Absorption

Acute toxicity

Product:

Acute oral toxicity	Remarks: No data available
Acute inhalation toxicity	Remarks: No data available
Acute dermal toxicity	Remarks: No data available

Components:

kerosine (petroleum), hydrodesulfurized:

Acute oral toxicity LD50 (Rat): > 5,000 mg/kg

Acute inhalation toxicity	LC50 (Rat): > 5.2 mg/l Exposure time: 4 hrs Test atmosphere: dust/mist
Acute dermal toxicity	LD50 (Rabbit): > 2,000 mg/kg
kerosine (petroleum):	
Acute oral toxicity	LD50 (Rat): > 5,000 mg/kg
Acute inhalation toxicity	LC50 (Rat): > 5 mg/l Exposure time: 4 h Test atmosphere: dust/mist
Acute dermal toxicity	LD50 (Rabbit): > 2,000 mg/kg
fuels, diesel:	
Acute oral toxicity	LD50 (Rat): 7,500 mg/kg
Acute dermal toxicity	LD50 (Mouse): 24,500 mg/kg
fuel oil no. 2:	
Acute oral toxicity	LD50 (Rat): 12,000 mg/kg
Acute inhalation toxicity	LC50 (Rat): 4.1 mg/l Exposure time: 4 h Test atmosphere: dust/mist

Skin corrosion/irritation

Product:

Remarks: No data available

Serious eye damage/eye irritation

Product:

Remarks: No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.
Contaminated packaging	:	Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1202
Proper shipping name	:	Diesel fuel
Class	:	3
Packing group	:	III
Labels	:	3
Packing instruction (cargo aircraft)	:	366

IMDG-Code

UN number	:	1202
Proper shipping name	:	DIESEL FUEL
Class	:	3
Packing group	:	III
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

49 CFR

UN/ID/NA number	:	1202
Proper shipping name	:	Diesel fuel
Class	:	3
Packing group	:	III
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

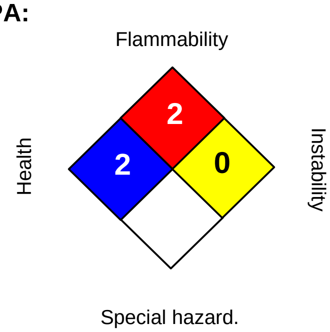
The components of this product are reported in the following inventories:

DSL	On the inventory, or in compliance with the inventory
TSCA	All chemical substances in this product are either listed on the TSCA Inventory or are in compliance with a TSCA Inventory exemption.
EINECS	On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2
FLAMMABILITY	2
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

APPENDIX D 1.1– Agnico Pre-discharge and Spill Response Sea Can checklists

Agnico Eagle Mines: Meadowbank Division
Environment Department

Pre-discharge Checklist for AEM's Oil Handling Facility in Baker Lake

Date: ____________________ **Inspected By:** ____________________

Time: ____________________ **Vessel Unloading:** ____________________

Pre-Discharge Check List	Conform	Non-Conform	Comments
Is there two way communications between the OHF and the off-loading Vessel?			
Has a review of response material checklist been completed?			
Current Copy of OPEP and Declaration at the OHF.			
Prior to discharge have the certification of the transfer conduits been received?			
Has there been secondary containment placed underneath each connection of Conduit?			
Is lighting in place at the transfer flange to provide illumination during any transfers taking place during the low to no light hours.			
Prior to discharge has the Vessels Ship/Shore checklist been reviewed and a completed copy received by AEM.			
Prior to discharge inform H&S and Environment Departments that fuel transfer will commence.			
Has the emergency response equipment been reviewed with all personnel and contractors on shore.			

Comments/Recommendations:____
____
____
____
____
____
____
____

Signature : ____

Agnico Eagle Mines: Meadowbank Division
Environment Department

AGNICO EAGLE
MEADOWBANK

Inventory report for Spill Response Sea Can at AEM's Oil Handling Facility in Baker Lake

Date: ____________________ **Inspected By:** ____________________

Time: ____________________ **Vessel Unloading:** ____________________

Subject	Conform	Non-conform	Comments
Is the material and PPE stored in a manner that is organized and accessible in order to easily respond to spill?			
Are the sea cans in physically good shape? Easy to open?			
Are the sea cans identified as "Environmental Emergency Sea Can"?			
Is all the spill material in place? Nothing Missing?			
3 x Empty drums (sealed)			
2 x Mini Berm 36"x 36"			
2 x 4 Drums Berm 4'x 8'			
4 x Tarp 20'x 30'			
4 x Tarp 30'x 50'			
10 x Oil Spill Absorbent Pads			
5 x Universal Absorbent Boom 5"x 10' (For Hydro-soluble Chemical)			
5 x Universal Absorbent Boom 8"x 10' (For Hydro-soluble Chemical)			
5 x Petroleum base Absorbent Boom 5"x 10' (for Petroleum product)			
4 x Maritime Barrier (Baffle)			
5 x ABS pipe: 10' long x 4" diameter			
2 x Cell-U-Sorb (Absorbent)			
2 x Amerisorb Peat moss (Absorbent)			

Agnico Eagle Mines: Meadowbank Division
Environment Department

2 x Oil Gator Absorbent			
1 x Plug Patties			
4 x Quatrex bags			
2 x Fork Lift Crate			
4 x Hand Shovel			
1 x Cro Bar Chisel			
1 x Ice Breaker Chisel			
1 x Sledge hammer			
15 x Rod bar 4'			
1x ½ drum containment			
100 feet of rope			
Knife to cut rope			
Emergency Boat			
18ft Lund boat			
20 HP motor			
Fresh gasoline in jerry can			
Boat Safety Kit			
2 Mustang Suits			
2 Paddles			
Anchor with 30 feet of rope			
Additional 20 feet of rope			
Is all the PPE material in its place?			
3 x Rain gear -- Pants and Top (L & 2-XL)			
3 x Rubber boots (size 8, 10,12)			
6 x Rubber gloves			
3 x Goggles			
3 x Tyvex suits (L & 2 XL)			

Agnico Eagle Mines: Meadowbank Division
Environment Department

AGNICO EAGLE MEADOWBANK

3 x Safety glasses			
3 x Leather gloves			

Comments/Recommendations:____

____

____

____

____

____

____

____

Signature : ____________________________________

APPENDIX D 1.2 – OHF Ship to Shore Fuel Discharge Procedure

OHF / Ship to Shore Fuel Discharge

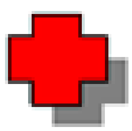
		PROCEDURE NUMBER:	**MBK-ENV-0013 Rev. 2**
People concerned	• **Environment** • **Site Services** • **Procurement and Logistics** • **Health and Safety**	**Prepared by**	**Environment Department**
		Authorized by	**Jeffrey Pratt – Environment Coordinator**
Effective :	**July 8, 2015**	***"Safety First, Safety Last … Safety Always!"*** ***"No Repeats" – Our Stepping Stone to ZERO HARM***	
This procedure corresponds to the required minimum standard. Each and every one also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.			

Objective:

- To ensure that prior to the discharge of any fuel into the Agnico Eagle Baker Lake Tank Farm or Agnico Eagle Baker Lake Oil Handling Facility (OHF) that all proper steps are in place to ensure compliance with Canadian Shipping Act, as well as Nunavut Water Board License and Nunavut Impact Review Board Certificate.

Concerned departments:

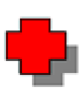

Environment


Health & Safety


Site Services


Procurement and Logistics

Risks/ Impacts Legend

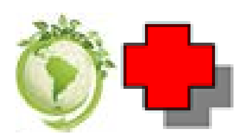
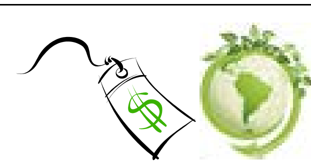

Health & Safety


Process/quality

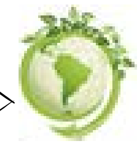

Legal Requirement


Environment

Prior to the beginning of the annual fuel discharge the following must be completed.

Procedure	*Risks/ Impacts*
1. The Oil Pollution Emergency Plan (OPEP) must be reviewed on an annual basis and updated prior to the first annual discharge. This will include but not limited to: a) Reviewing the Phone numbers for emergency's b) Updating maps c) Review and if necessary update equipment lists d) Review roles and responsibilities e) Update Declaration This is the responsibility of the Environment department.	
2. Contact Canadian Coast Guard and Transport Canada Pollution Prevention and make them aware of plans for transferring of fuel into our OHF for that season. This is the responsibility of the Environment department.	
3. Complete *Inventory report for Spill Response Sea Can at AEM's Oil Handling Facility in Baker Lake*. (*Inventory Checklist found on Page 6) This is the responsibility of the Environment department.	
4. Ensure Woodward (Shipping Company) has provided Transfer Conduit Annual certification. This is the responsibility of Environment Department.	
5. All personnel who will be a part of the fuel transfer (including Baker Lake Supervisor and third part contractor Intertek) must review the OPEP and be familiar with preventive measures to take and with the steps to take in the case of a spill event while fueling. This is the responsibility of Procurement and Logistics	
6. Install secondary containment underneath each connection of conduit on land. This is the responsibility of Environment Department	

7. Monitor secondary containment underneath each connection of conduit on land. This is the responsibility of Procurement and Logistics	
8. Ensure there is two way functional communications between the OHF and the off-loading Vessel. This is the responsibility of Procurement and Logistics	
9. Ensure there is lighting in place at the transfer flange to provide illumination during any transfers taking place during the low to no light hours. This is the responsibility of Procurement and Logistics	
10. Prior to any discharge AEM must receive a copy of the Ship/Shore checklist completed by Woodward. And should verify this has been completed (as much as realistically possibly without boarding the ship). This is the responsibility of Procurement and Logistics	
11. Contact must be made with both the H&S and Environmental Departments prior to the discharge of fuels. Meadowbank Health & Safety meadowbank.healthandsafety@agnicoeagle.com Meadowbank Environment meadowbank.environment@agnicoeagle.com This is the responsibility of Procurement and Logistics	
12. The *Pre-discharge Checklist for AEM's Oil Handling Facility in Baker Lake* must be completed, signed and provided to the Environment department prior to discharge. (*Checklist found on Page 5) This must be done for each fuel tanker for each campaign. This is the responsibility of Procurement and Logistics	
Transfer	
1. Once the above points are completed, the ship to shore transfer can commence.	
2. Photos of the complete fuel transfer process should be taken, visually proving that all above procedures have been reached. This is the responsibility of Environment department and Procurement and Logistics.	

3. During the ship-to-shore transfer, AEM will have competent personnel on location at all times to monitor the fuel transfer and maintain contact with the tanker's crew. This is the responsibility of Procurement and Logistics.	 
4. Monitor the fuel transfer at the beginning of each transfer and after that on an hourly basis checking the manifold, conduit, tank, and any connection points on land for spills and/or leaks. Communication between shore and ship should take place on an hourly basis. This is the responsibility of Procurement and Logistics.	 
5. We are required by law to have a fuel spill scenario every two years. However, since we have shift work at Meadowbank, to ensure adequate training annually we will do mock spill/training and switch shifts each year. This way each shift completes every second year. This is the responsibility of Environment Department in conjunction with ERT to plan and execute.	

APPENDIX D 1.3 – 2016 Meeting Minutes of Fuel Transfer Procedure Revision Meeting

Environmental, P&L and E&I Departments
Ship to Shore Fuel Discharge Meeting Agenda
Agnico-Eagle Mines Limited
Meadowbank Project

Date:	April 19, 2016
Prepared By:	Environment Department
Meeting Lead By:	Robin Allard and Erika Voyer
Attendees:	Monique Cossette (P&L), Christian Soucy (E&I), Alex Arcand (E&I), Robin Allard (ENV), Erika Voyer (ENV)
Distribution:	Meadowbank Environment, Meadowbank Procurement and Logistic, Meadowbank Energy and Infrastructure

E&I – Energy and Infrastructures, P&L – Procurement and Logistics, ENV - Environment

	Procedure MBK-ENV-0013 Review	**Task Owner**	**Due Date**
1	**OPEP Review**	ENV	May 9th (+60 days prior to transfer)
2	**Contact Canadian Coast Guard and Transport Canada Pollution Prevention**	ENV	May-June
3	**Complete Inventory report for spill response c-can**	ENV	May-June
4	**Ensure that Woodward provide Transfer Conduit Annual certification (Hose Cert.)**	ENV	Prior to first transfer – in OPEP
5	**All personal to review the OPEP and be familiar with preventive measures.** (OPEP will be provided by Env.)	All	Prior to first transfer – July 1st
6	**Install secondary containment underneath each connection of conduit on the land** - *For Jet A hose installation – collaboration between P&L and E&I*	ENV	Prior to first transfer
7	**Monitor secondary containment underneath each connection of conduit on land.**	P&L (Intertek)	Before and during transfer
8	**Ensure there is two way functional communications between the OHF and the off-loading Vessel**	P&L	Before and during transfer
9	**Ensure there is lighting in place at the transfer flange to provide illumination during any transfers taking place during the low to no light hours**	P&L/ E&I (if repairs is required)	Before and during transfer
10	**Prior to any discharge AEM must receive a copy of the **<u>Ship/Shore checklist completed by Woodward</u>. And should verify this has been completed (as much as realistically possibly without boarding the ship).**	P&L	Prior to each transfer

11	**Contact must be made with both the H&S and Environmental Departments prior to the discharge of fuels (generally by email)**	P&L	Prior to each transfer
12	**The <u>Pre-discharge Checklist for AEM's Oil Handling Facility in Baker Lake</u> must be completed, signed and provided to the Environment department prior to discharge.** **This must be done for each fuel tanker for each campaign.**	P&L (Intertek)	Prior to each transfer
	During Transfer Procedure review		
1	**Once the above points are completed, the ship to shore transfer can commence** - *Valve opening and sequence for tank filling will be completed by E&I*		
2	**Photos of the complete fuel transfer process should be taken, visually proving that all above procedures have been reached**	ENV. and P&L	Prior and during transfer
3	**During the ship-to-shore transfer, AEM will have competent personnel on location at all times to monitor the fuel transfer and maintain contact with the tanker's crew.**	P&L (Intertek)	During transfer
4	**Monitor the fuel transfer at the beginning of each transfer and after that on an hourly basis checking the manifold, conduit, tank, and any connection points on land for spills and/or leaks. Communication between shore and ship should take place on an hourly basis**	P&L (Intertek)	During transfer
5	**We are required by law to have a fuel spill scenario every two years. However, since we have shift work at Meadowbank, to ensure adequate training annually we will do mock spill/training and switch shifts each year. This way each shift completes every second year.**	ENV and ERT	Summer, during period of transfer
	Miscellaneous		
1	**Document required prior to fuel transfer** - Hose certifications (Hydrostatic test) – Woodwards (will be included in OPEP) - **Notice of readiness, Floating hose Ship/Shore Cargo checklist , Cargo preparation checklist - Woodwards - OHF Ship to Shore Fuel Discharge AEM Checklist prior to transfer - AEM	P&L	

2	**Intertek role and responsibility** Intertek is the contractor under the responsibility of P&L hired for the fuel transfer. Intertek must be aware of the required procedure for the fuel transfer and have received the proper documents (OPEP, OHF / Ship to Shore Fuel Discharge AEM procedure). Intertek will complete some tasks related to P&L responsibilities during transfer.	P&L	
3	**Management of the wildlife monitors to be on the barge** - ENV will contact Woodwards for lodging on the boat - ENV will contact Comm. Affairs in BL for management of the monitors this summer	ENV/Comm. Affairs	
4	**Inspection by Environment**	ENV	Prior and during transfer

APPENDIX D 1.4 – 2016 Mock Spill Minutes

On October 3rd, 2016 AEM Sr. Environment Technician Tom Thomson and Environment Technician Randy Schwandt met with Intertek personal in Baker Lake to conduct a mock spill at the Baker Lake transfer valve.

AEM Sr. ENV Tech Tom Thomson took photographs and documented the spill actions as well as acted as the "Control Room" responder. AEM ENV Tech Randy Schwandt acted as the BL Dispatch and the ENV Technician on the scene.

The scenario was a leaking flange at the transfer valve. The secondary containment under the transfer valve had overflowed and was now leaking diesel fuel into the tundra and towards the shoreline. Below is the timeline of the scenario.

13:30 – Spill occurs (45g drum w/water and dye is tipped over outside the secondary containment pool)

13:34 – Intertek crew do visual inspection of transfer valve and pipeline. Overflow of secondary containment pool and leaking flange at the transfer valve is observed by Intertek crew.

13:36 – Intertek crew calls the vessel to stop transfer of fuel and relays the message of leaking flange at transfer valve to the Captain.

13:40 – Intertek crew has receive confirmation from captain of vessel that fuel transfer has stopped. Intertek calls Code 1 to Baker Lake dispatch. BL dispatch confirms the spill and advises Intertek that they will relay information to Environment department.

13:45 – Intertek crew goes to Emergency Sea-Can to pull out spill response equipment

13:50 – Spill response equipment is deployed by Intertek crew and containment of the spill commences. ENV Tech arrives on site to assess the spill and advise crew of containment and clean up actions

13:52 – AEM ENV Tech relays status of the spill and clean up/containment actions to AEM Control room.

13:55 – AEM ENV Tech asks Site Service for vacuum truck and ENV team for Emergency spill trailer with pump to be brought down to Baker Lake to empty secondary containment pool.

14:00 – AEM ENV Tech asks Intertek crew if the spill is contained. Intertek confirms and ENV tech relays status of spill to MBK control room and MBK environment team.

AEM Comments/Recommendations: Intertek crew communicated and confirmed with the vessel the stopping of fuel transfer. The Baker Lake dispatch was also notified of the spill. After identifying the source of the spill and assuring the safety of the crew - Intertek commenced preparing spill response equipment for containment and clean up.

AEM stressed the importance of taking all necessary precautions to ensure that a spill does not enter Baker Lake. Containment booms, diversion booms, or maritime booms are all available in the Emergency Sea Cans. Be sure to use all available resources to contain spill. AEM also mentioned that any heavy equipment such as backhoes, excavators, dump truck is available at any time in the event of a spill. Intertek should not hesitate to ask for AEM assistance.

AEM mentioned the importance of the making the facility safe by installing barricades or a "No Entry" perimeter around the spill area. Intertek should not hesitate to ask for AEM assistance.

AEM mentioned to Intertek/ENV Tech to follow chain of command. Use people/resources as necessary – i.e. send 1 or 2 people to get spill response gear, another person to barricade area, another person to call dispatch or control, etc.

AEM mentioned the OPEP and Spill Contingency plan located in the spud barge office. If Intertek crew is unsure of what to do or what procedures to follow – they can refer to the plans listed above or call Environment department. Again – Intertek should not hesitate to ask for AEM assistance.

Intertek Comments/Recommendations: Intertek asked AEM to provide a radio with BL Dispatch, Vessel, and Spud Barge radio frequencies to allow for quicker communication with the Spud Barge and BL dispatch in the event of a spill.

Intertek asked AEM to provide more "spill" drums (at each connection) or move one of the emergency spill Sea-cans closer to the transfer valve to allow for faster deployment of spill recovery equipment in the event of a spill.

Intertek asked AEM for a solid berm or a solid secondary containment pool around the transfer valve. The current secondary containment pool walls are pushed down by the pipes and would not fully contain a spill or leak if it occurred. Intertek suggested a small genset, pump, and empty tote be accessible to empty the containment pool in the event of a spill.

Intertek suggested to AEM an upgrade of spill response equipment, including more equipment to respond a spill that entered Baker Lake.

Intertek asked for additional tower lights along the pipeline to assist in the inspection process.

APPENDIX E 1.1– COASTAL SHIPPING LTD. SHIP TO SHORE CHECKLIST

Ship / Shore Cargo Checklist

Vessel: ____________________
Port: ____________________
Date: ____________________
Operation: ❒ Discharge ❒ Load

Letter Codes

A Any procedures and agreements should be in writing in the remarks column of this checklist or other mutually acceptable form. In either case, the signature of both parties is required

P In the case of a negative answer, the operation should not be carried out without the permission of the port authority.

R Items to be rechecked regularly, not exceeding the time specified in the declaration

General cargo considerations: (check (❒ under Ship/Shore if OK, otherwise provide comment)

Item	Ship	Shore	Code	Comments
Is the vessel securely moored?			**R**	Stop Cargo at _______ knts wind velocity Disconnect at _______ knts wind velocity Unberth at _______ knts wind velocity
Are emergency towing wires correctly positioned?			**R**	
Is there safe access between the ship and the shore?			**R**	
Is the ship ready to move under it's own power?			**P R**	
Is there an effective deck watch in attendance on the ship and adequate supervision on shore?			**R**	
Is the agreed ship/shore communication system operative?			**A R**	Method:
Has the emergency signals to be used by the ship and shore been explained and understood?			**A**	
Have the procedures for cargo, bunkering and ballast been agreed upon?			**A R**	
Have the hazards associated with toxic substances within the cargo being handled been identified and understood?				
Has the emergency shutdown procedure been agreed?			**A**	
Are fire-hoses and fire fighting equipment on board and ashore positioned and ready for immediate use?			**R**	
Are cargo and bunker hoses/arms in good condition, properly rigged and appropriate for intended use?				
Are scuppers effectively plugged drip tray valves closed both on board and ashore?			**R**	
Are unused cargo and bunker connections properly secured with blank flanges fully bolted?				
Are Sea and overboard discharge valves closed when not in use?				
Are all cargo and bunker tank lids closed?			**A R**	
Is the agreed tank venting system being used?				
Has the operation of P/V valves been verified?				
Are flashlights in use of an approved type?				
Are portable VHF/UHF radios of an approved type?				
Are the ships MF/HF radios grounded, VHF radios set to low power and 10 cm radars shut off?				
Is any portable electrical equipment disconnected?				
Are all external doors and ports in the accommodation closed?			**R**	
Are air intakes, which may permit the entry of cargo vapours, closed?				
Is the galley staff informed of loading/discharged operations?				
Are Smoking regulations being observed?			**R**	
Are naked light rules being observed?			**R**	
Is there provision for an emergency escape?				

Ship / Shore Cargo Checklist

Are there sufficient personnel on board and ashore to deal with an emergency?			**R**	
Are adequate insulating means in place in the ship shore connection?				
Is the pumproom ventilation adequate?			**R**	
Have the requirements for closed loading been agreed?				
Has a vapour return line been connected?				
If so, have the operating parameters been agreed?				
Are ship emergency fire control plans located externally?				
Are appropriate signals being displayed?				

Inert Gas Systems (if in use):

Item	Ship	Shore	Code	Comments
Is the Inert Gas System operational and in good working order?			**P**	
Are deck seals in good working order?			**R**	
Are Liquid levels in P/V breakers Correct?			**R**	
Have O^2 Analysers been calibrated and are working properly?			**R**	
Are IG pressure and Oxygen recorders working properly?			**R**	
Are all Cargo tanks at positive pressure with O^2content of <8%?			**P R**	
Are all IG Tank valves correctly set and locked?			**R**	
Are all the persons in charge of cargo operations aware that in the case of failure of the Inert Gas Plant, discharge operations should cease and the terminal be advised?			**R**	

Tank Cleaning (if planned while ship is at berth):

Item	Ship	Shore	Code	Comments
Has the port authority approved any tank-cleaning operations planned during the ships stay?			**P**	

Operations:

Item	Value	Ship	Shore
Initial cargo transfer rate to be used (m^3/hr, bbls/hr, etc)			
Maximum cargo transfer rate to be used (m^3/hr, bbls/hr, etc)			
Topping off rate to be used (m^3/hr, bbls/hr, etc)			
Maximum hose pressure to be used (bar)			
Quantity of cargo to be transferred (m3, bbls of each grade)			
Hose to be drained after transfer complete	❒ Ashore ❒ Back to vessel		
Hose to be cleared by	❒ Gravity ❒ Comp. Air ❒ Pig		
Emergency stop button located	❒ On Ship ❒ Ashore		

Declaration:

We the undersigned have checked, where appropriate jointly the items on this checklist and are satisfied that the entries made are to the best of our knowledge correct.We have also made arrangements to carry out repetitive checks as necessary and agreed that those items with the letter **R** in the column **Code** should be rechecked at intervals not exceeding __________ hours.

Signatures: **For Vessel** **For Shore**

	For Vessel		For Shore
Name:	______________________	Name:	______________________
Rank:	______________________	Position:	______________________
Signature:	______________________	Signature:	______________________
Date & Time:	______________________	Date & Time:	______________________

APPENDIX E 1.2– COASTAL SHIPPING LTD. CARGO PRE ARRIVAL

Cargo Preparation Checklist

Vessel: ____________________
Port: ____________________
Date: ____________________

Prior to entering a port or terminal:

Item	Completed
Emergency towline, anchor releasing mechanism, and mooring lines and winches are inspected to determine that the equipment is ready for use and in good condition.	

Prior to cargo transfer operations an examination and testing of the following items:

Item	Completed
All external doors, ports, and similar openings, which lead directly from the tank deck to the accommodation or machinery spaces, are closed.	
P/V valves and the venting system have been inspected and properly set for the transfer operation and the high-level alarm system has been tested. A High Level and PV Valve Checks form has been completed	
Pumproom strainer covers, inspection plates, and drain plugs are properly positioned and secure.	
Flange connections are all fully bolted and tightened with no improvised arrangements in place.	
Visual examination of all hoses and verification of hose certificate before use.	
Sea and overboard discharge valves, when not in use, are securely closed, lashed and sealed.	
Fire extinguishing and pollution control equipment is in place and ready for immediate deployment.	
Scupper plugs have been inspected and are in place and secured.	
Bondable drip trays are available for each manifold connection to be made.	
Tools for deploying, connecting blowing, pigging, disconnecting and recovering cargo hose are prepared as required.	
All cargo transfer valves are operational and positioned as be required. Closed valves are lashed as appropriate.	
When loading multiple grades, sufficient segregation is in place and ship personnel are made aware.	
Manifold(s) to be used are fitted with the correct reducers or adaptors for expected connection and all unused manifolds are drained and blanked.	
All pressure and temperature gauges on manifolds to be used are functioning correctly and calibrated.	
Emergency shut down mechanism has been tested and ship personnel are familiar with its use.	
Fire wires are positioned correctly, if required by terminal.	
Sufficient auxiliary machinery is running to ensure adequate electrical power is available during cargo operations.	
Compressed air is available on deck to run SOPEP pumps and blow/pig hoses are required.	
A list of responsible officers on duty during transfer is posted and readily available. Crew are familiar with their watches during cargo operations.	
Arrangements have been made to ensure the Master and/or the Chief Officer will be on board and available at all times during cargo operations.	

Additional comments or conditions:

Signatures:

Name: ____________________	Name: ____________________
Rank: ____________________	Rank: Chief Officer
Signature: ____________________	Signature: ____________________

APPENDIX F – Agnico Internal Spill Report Form

Agnico Eagle Mines Meadowbank Project:
Internal Spill Reporting Form

(Spills greater than the *Reportable Volume*, see Spill Contingency Plan, require the completion and submission of the *Nunavut Spill Report Form*)

AGNICO EAGLE	Meadowbank Project	Spill report #.
Date and time of spill :		
Location of spill :		
First responder name :		
Company Name:		
AEM Contact:		
Nature of contaminant :		
Volume/quantity of the container / tank (L)		
Quantity spilled (L) :		
Cause of the spill :		
Contaminant collected by :		
Follow-up done by :		
Actions taken :		
Report completed by:		Date :
Incident investigation recommended :	YES ☐	NO ☐
Government agency notified :	YES ☐	NO ☐
Date of notification to government agency :		
Date of report :	Signature of environmental personnel :	

MEADOWBANK GOLD PROJECT

Emergency Response Plan

Prepared by:
Agnico-Eagle Mines Limited – Meadowbank Division

Version 12
January 2018

EXECUTIVE SUMMARY

The Emergency Response Plan (ERP) is activated when an operations-related emergency, accident or malfunction occurs, or if such an incident is foreseeable. The ERP outlines potential emergency scenarios, initial actions for emergencies and the internal and external resources available including personnel, emergency response equipment and communication systems.

The ERP will be reviewed and updated as required, but on a minimum basis of at least once per year or following its implementation should a cyanide release occur.

IMPLEMENTATION SCHEDULE

This Plan will be immediately implemented**.**

DISTRIBUTION LIST

AEM – Linked to Intelex Documents on AEM Intranet system for following authorized users:

AEM – General Mine Manager / Designate

AEM – Health and Safety Superintendent / Designate

AEM – Human Resources Superintendent / Designate

AEM – Engineering Superintendent / Designate

AEM – Geology Superintendent / Designate

AEM – Environment Superintendent / Designate

AEM – Process Plant Superintendent / Designate

AEM – Energy & Infrastructure Superintendent / Designate

AEM – Mine Superintendent / Designate

AEM – Maintenance Superintendent / designate

AEM – General Supervisor Inventory

AEM – Emergency Response Counselors

AEM – OHSC Co-chairs

AEM – Security Officers

Updated Hard copies distribution list:

AEM -- Meadowbank Emergency Response Centers

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/10/31	Appendix A		Revision to include East Dike design modifications
2	09/11/16	All Sections		Confirmation of specific details and procedures Account for as-built designs and emergency preparedness for dike failure scenarios
3	12/01/31	All Sections		Review of all the documents
4	12/07/27	All Sections		Review of all documents
5	13/05/21	All Sections		Review of all documents – logo change – Duty cards
6	13/08/09	All Sections		Added appendixes at back
7	13/09/05	All Sections		Updated information on Dykes, Storm Water
8	14/07-23	All Sections		Revised procedure for calling a Code 1 using radios
9	14/11-10	All sections		General Revision and compliance with International Cyanide Management Code
10	16-08-24	All sections		General Revision and compliance with RMMS
11	17-01-05	All sections		General Revision in accordance with Intelex nomenclature and its new links Emergency Telecom plan link added. (Section 3) Vessel Contingency Plan link added. (4.8.1)
12	18-01-03	All sections		General Revision Amaruq Road Construction Emergencies (4.13) deleted

Prepared By: Norm Ladouceur

Norman Ladouceur.
Health and Safety Superintendent

Approved By:

____
Luc Chouinard
Meadowbank General Manager

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

SECTION 1 • INTRODUCTION

1.1 PURPOSE AND SCOPE OF THE EMERGENCY RESPONSE PLAN

The purpose of this Emergency Response Plan (ERP) is to provide a consolidated source of information for employees, contractors, and site visitors to respond quickly and efficiently to any foreseeable emergency that would likely occur at the Meadowbank project site. This ERP forms a component of the Environmental Management System (EMS) for the Project. As such, it is a working document that will be reviewed and updated on a regular basis as mine development, construction and operations proceed.

This ERP addresses gold mining, processing, transportation and related activities at the Meadowbank site as well as possible emergency scenarios that may occur off-site along the All Weather Access Road or at the Baker Lake Marshalling Facility. Guiding the development of this document has been the principle that an effective ERP must provide:

- A clear chain of command for safety and health activities;
- Well-defined corporate expectations regarding safety and health;
- Comprehensive hazard prevention and control methods; and
- Record-keeping requirements to track program progress.

AEM will ensure that all employees, contractors and site visitors fully understand and comply with all legislated safety standards, and the policies and procedures outlined in the ERP.

This ERP will be reviewed annually, or more frequently as required, to ensure compliance with applicable legislation, to evaluate its effectiveness and to continually improve the procedures. All employees, contractors and site visitors are encouraged to offer suggestions for ways to eliminate potential hazards and improve work procedures.

1.2 AEM'S POLICY STATEMENT

AEM is committed to protecting the health and safety of all its workers and the environment, and to adhering to all legislated safety standards. The necessary resources will be available to respond quickly and efficiently to all emergencies to prevent injury to, or degradation of, the health of individuals or the environment. In implementing this emergency response policy, AEM will set preparedness targets and report its progress on a regular basis.

To this end:

All relevant safety and emergency response laws and regulations will be incorporated into the ERP as minimum standards.

Senior management is responsible for making funds and other resources available, including hiring and training qualified personnel, to ensure the successful implementation of the ERP in the event of an emergency.

All supervisors are responsible for ensuring that their employees are aware of, and trained in, the proper emergency response procedures and that procedures and contact information are posted in all work areas. Supervisors are also responsible for ensuring that all employees follow safe work methods and all related regulations to prevent emergencies from occurring, and that they are provided with the proper tools to do so, including Personal Protective Equipment (PPE).

An emergency response team and coordination center is established at the Meadowbank site.

The ERP will be tested on a periodic basis to ensure its effectiveness.

1.3 POLICY WITH RESPECT TO CONTRACTORS AND VISITORS

Every person working at or visiting the Meadowbank site receives an orientation upon arrival and as such is apprised of, and required to follow the ERP policies and procedures set forth in this manual. For a list of responsibilities, see Section 2.

Major contractors, such as those for mining and hauling, are required to have their own H&S services. This is verified by AEM management prior to engagement of the contractor.

1.4 ENVIRONMENTAL POLICY

AEM is committed to achieving a high standard of environmental care in conducting its mineral exploration activities. AEM's Environmental Policy includes:

- Compliance with all applicable legislation including laws, regulations, and standards. Where laws do not exist, appropriate standards will be applied to minimize environmental impacts resulting from exploration activities.
- Open communication with government, the community, and employees on environmental issues.
- Development and adherence to management systems that adequately identify, monitor, and control environmental risks associated with AEM's exploration activities.
- Assurance that the employees are aware of their responsibilities and comply with AEM's Environmental Policy and field guide.

It is the policy of AEM to protect the environment, public health and safety, and natural resources by conducting operations in an environmentally sound manner while pursuing continuous improvement of our environmental performance.

SECTION 2 • ORGANIZATIONAL RESPONSIBILITIES

This section details the roles and responsibilities of all parties involved in emergency response planning and implementation at the Meadowbank mine site.

2.1 GENERAL MANAGER

The General Manager is responsible for implementing and maintaining the ERP. In addition, the General Manager's responsibilities are to:

- Act as a spokesperson on behalf of AEM with the public, media, and government agencies, as required;
- Prepare and submit any formal reports (within the required time frame) to regulators and AEM management detailing the occurrence of an emergency; this includes submitting an incident reporting form;
- Ensure that the Health & Safety and Environment Superintendents have the means (financial and otherwise) to ensure that all required resources are made available, or provided from off-site if required;
- Work with the Health &Safety, Human Resources and Environment Superintendent to evaluate what training is required by all staff, ensure that all staff are given appropriate training, and ensure that all staff are retrained as needed;
- Ensure that the Human Resources Superintendent has the means (financial and otherwise) to ensure that all employees' training requirements are current;
- Ensure that inspections of emergency response training practices and emergency response equipment are carried out;
- Ensure that emergency response exercises are conducted annually,
- Ensure that the results of the regular inspections are used to improve emergency response practices, and improve relevant plans accordingly;
- Complete an annual detailed review of the ERP with the management team and the Join Health and Safety Committee with particular emphasis on the objectives and methods of the plan, and the job descriptions of all positions named within;
- Ensure that updates to new emergency communications information (new phone numbers, changes in reporting structure, etc.) are distributed as soon as the new information becomes available;

2.2 EMERGENCY CONTROL GROUP – ***ON SITE MANAGEMENT TEAM***

No single department can handle an emergency situation alone. Everyone must work together to manage the emergency and coordinate the effective use of all available resources.

Therefore at the time of any emergency, all the management team and/or their designate must report to the 3rd floor Emergency Response Control room #1 or to the Emergency Response

Control Room #2, at the Training room or to the Emergency Response Control Room #3 at the Meadowbank gatehouse.

The Emergency Control Group structure lends support, fosters efficiency and provides additional knowledge during an emergency response situation.

The Official In-Charge, (General Mine Manager or Designate) maintains the overall coordination and direction of the Emergency and ensures the continued safety of all employees and the public.

However, the Superintendent or designate of the Area affected by the emergency, will assist with the development of the overall emergency response plan.

The remainder of the Emergency Control Group will be given specific tasks to perform that will assist with the management and coordination of the emergency response plan.

Roles & Responsibilities of the Emergency Control Group (See Duty Cards)

2.2.1 Official In-Charge

The Official In-Charge (General Manager or designate) will take charge for overseeing and approving the overall emergency strategy.

Immediate duties of the Official In-Charge include:

- Consult with the Incident Commander the status of emergency.
- Appoint an Emergency Log Recorder to maintain a written record of the time and events, including all discussions, instructions and decisions made by the Emergency Control Group;
- Appoint a Muster Station Coordinator, who will ensure that proper head counts are conducted at three (3) designated Muster Stations.
- Issues specific tasks to the members of the Emergency Control Group as they arrive at the Control Room, as per this guideline;
- Brief the Emergency Control Group;
- Ensure that the safety of personnel is maintained, throughout the operation.
- Ensure procedures are in place for prompt dispatch of requested personnel, materials and equipment to the emergency area.
- Arrange for all reports to be presented at specific intervals to the Emergency Control Group
- Finalize the recommendations of the Incident Commander for rescue and recovery operations.

- The Official In-Charge is the only person authorized to release information to Government Agencies, Corporate Office or the Local Communities. He may delegate this activity to other members of the Emergency Control Team.
    - Verify all information you release;
    - Keep a record of all inquiries (media and non-media);
    - Do not speculate on causes;
    - Do not speculate on resumption of normal operations or when the problem will be solved;
    - Advise that further updates will be forth coming.

- Notify the corporate management, if the following appear probable:
    - fatalities;
    - injuries that could probably become items of local, regional or national media interest;
    - there is a public health or environmental risk;
    - an incident involving chemicals where there is a large volume or the potential for over reaction (e.g., cyanide);
    - a spill of effluent or contaminated water or chemical substance to an area that lies outside the area of drainage control of the mine site (i.e., an external spill);
    - mine operations may be stopped for more than two (2) days;
    - Government authorities will become involved.

- Ensure all response teams, regulatory agencies and any other agency on emergency alert notice are advised when the emergency has ended.
- **At all time, the mine acting manager will decide to take over external communications from site accordingly with the Meadowbank Crisis Management Plan.**

- Ensure all documentation (i.e., notes, log sheets, written instructions, etc.) is gathered for the creation of the final report.

- Participate in debriefing.

2.2.2 Incident Commander – Usually a Trained Staff Member (ERT Coordinators or Supt. / GF.)

The responsibilities of the Incident Commander include;

- Ensure Security has been notified of emergency;

- Ensure the evacuation procedures have been activated, if required;

- Ensure that there are sufficient ERT members available to respond to the emergency;

- Ensure that the ERT has back-up support, a standby Team;

- Ensure that ERT Team has refreshments and nourishment (if the emergency requires several hours to resolve);

- Assess the size and severity of the emergency and the likely consequences. Establish response priorities;

- Maintain communication with the ERT Captains.

- Advise the Official In-Charge of the ERT Team's activities, regarding the rescue and recovery operations.

- Appoint sufficient personnel, equipment and outside services are available. Utilize the members of the Emergency Control Team to organize these resources.

- Advise Official In-Charge when the emergency situation is under control and give the "All Clear".

- Participate in emergency investigation.

- Coordinate an orderly return to normal operating conditions.

- Arrange for a debriefing session, and utilize the services of all involved in resolving the emergency.

- Assist to write the final report.

2.2.3 Emergency Coordination Center Log Recorder :

- "*Keep a systematic record of the emergency events" and get an accurate "Head Count during Emergencies***"**

- These persons can be the Engineering Supt/Designate/ General Supt. (whoever is available to perform these duties).

- The log is intended to be a systematic record of the events from the start of the emergency through all phases to termination, and will be used in the preparation of the final report. It is important that the log be legible and that all information is recorded.

- Date and time the incident was reported, who reported the event;
- Every person entering or exiting the ''Emergency Control Room'' must report to Log Recorder.
- Record all subsequent developments as they occur;
- Record all phone calls all discussions and decisions made;
- Record any other information that needs to be captured for the final report;
- Keep all the sheets of paper used to record information numbered, for the final report;
- All the pages will be initialed by the recorder and official in-charge;
- The official document will stay with the Health & Safety Department upon completion of the emergency.

2.2.4 Meadowbank Site / Muster Stations Coordinator*:*

“Provide a Head Count during E m e r g e n c i e s ”.

- As soon as Management begins to assemble in the Emergency Control Room , the Person In Charge (the manager/designate) needs to assign a member of the Management Team *to be responsible for ensuring that the Muster Stations are contacted.*
- These persons can be the Geology Supt/Designate/ General Supt. (whoever is available to perform these duties).

- The Muster Stations Coordinator is required to contact the three Muster Stations by radio on channel **‘’Muster Station’’** to ensure that there is a Supervisor or designate in charge of that specific muster station and give him/her 20 minutes to achieve the head count.

- The Muster Stations Coordinator will need to record the time the muster station was called, who is in-charge of the muster station, and any other instructions that have been given.

- The Muster Stations Coordinator needs to open the Flo on his/her laptop in order to cross reference the names, once they receive the lists from the Muster Stations. (Additional persons may need to be assigned to assist with the cross reference, in order to complete the head count in a timely manner).

2.2.5 Emergency Response Team (ERT Team) Duties:

- The ERT Team Members must report to the Fire Hall, when paged for a “code One” emergency;

- ERT Team Members will be given instructions on the emergency by the Incident Commander;

- ERT Team Members will follow instructions from the Incident Commander and will not put the Team at risk;

- The ERT Team Captain will maintain radio contact with the Incident Commander throughout the emergency:

2.2.6 Mine Superintendent/Designate Duties;

- Ensure that all employees working, are accounted for;

- Ensure that the ERT Members of his crew have responded to the “code One” emergency;

- If the “Emergency” is in the Mining area, then assist the Official-in-Charge with the action plan to deal with the emergency:

- Assist as required by supplying equipment and/or manpower;

- Assist with restoring of the Operations back to normal operating standards:

2.2.7 Mill Superintendent/Designate Duties;

- Ensure all employees working, at this time, are accounted for;
- Ensure that the ERT Members on his crew, have responded to the " Code One" emergency;
- If the " Emergency" is in the Mill facilities, assist the Official-in-Charge with the action plan to deal with the emergency:
- Assist as required by supplying equipment and/or manpower;
- Assist with restoring of the Operations back to normal operating standards:

2.2.8 Environmental Superintendent/Designate Duties:

- Provide technical advice on probable environmental effects resulting from a spill and how to minimize them;
- Ensure that the ERT Members of his crew have responded to the "code One" emergency;
- Provide advice to the Official-in-Charge for appropriate spill response procedures;
- Ensure that Environmental Staff are available to direct the spill response action plan;
- Assist with restoring of the Operations back to normal operating standards:

2.2.9 Health and Safety Superintendent/Designate Duties:

- Ensure that an Incident Commander is in place to oversee the ERT Teams;
- Ensure that all Management respond to the emergency and meet in the emergency control room;
- He will oversee all activities that require Security or Nursing. He will arrange for Medevac transport, if required;
- Will assist with getting a "head count" for the Official in-charge;
- Assist with obtaining outside help if required:

2.2.11 Energy & Infrastructure Superintendent / Designate Duties:

- Ensure that all his employees are accounted for
- Ensure that all ERT Member on his Crew, respond to the " code One" emergency;
- If the " Emergency" involves the Site facilities, assist the Official-in-Charge with the action plan to deal with the emergency:
- Assist as required by supplying equipment and/or manpower;

- Assist with restoring of the Operations back to normal operating standards:

2.2.12 Maintenance Superintendent/Designate:

- Ensure that all of his employees are accounted for;
- Ensure that all ERT Members of his crew respond to the "Code One" emergency;
- If the "Emergency" is in the Maintenance Shops, then assist the Official-in-Charge with the action plan to deal with the emergency;
- Assist as required by supplying equipment and/or manpower;
- Assist with restoring of the Operations back to normal operating standards:

2.2.13 Human Resources Superintendent/Designate Duties:

- Ensure that all HR employees are accounted for;
- Provide assistance to the Official-in-Charge if there are employees issues, such as injuries, transportation requirements, etc.

2.2.14 Health Care Professional (Nurse/Medic):

The on-site health professionals are responsible for the following:

- Providing on-site first aid and other medical support;
- Ensure the Mass Casualty center becomes operational if there are multiple casualties;
- Arrange for medevac transportation, if required;
- Ensuring that the first aid room is maintained at all times, by using First Responders as support:

2.2.15 Security Department:

The on-Site Security Supervisor is responsible for the following:

- Ensure that access points to the emergency are properly guarded.
- Notify the Baker Lake Gatehouse if the emergency involves the All-weather private Road (AWPR).
- Assist with other duties as requested by the Emergency Control Group.

2.2.16 Procurement and Logistic / Warehouse Department:

The on-Site Procurement or Warehouse General Supervisor / Designate will be responsible for:

- Ensure that all his employees are accounted for
- Ensure that all ERT Member on his Crew, respond to the " code One" emergency;

- Assist as required by supplying equipment and/or manpower;
- Assist with restoring of the Operations back to normal operating standards:

2.2.17 Duty Cards for each Department/Roles and Responsibilities

Each individual roles and responsibilities are defined on the following pages:

Name: ___________________________

Date: ____________________________

Time assumed Role: _______________

Manager On Duty - Duty Card	**Completed**	**Time**
1. Notified of an emergency – Make decision to have the whole Emergency Control Group paged		
2. Brief Control Group on the emergency		
3. Appoint a Scribe – Engineering department		
4. Decide if communications are to be cut – Notify IT		
5. Ensure that the emergency remains confidential – limit what is said to employees		
6. Conduct a head count – (Muster Stations) Assign duty to Geology Department		
7. Ensure unaffected Departments are put on Standby – E.g.: mine dept. – may need equipment		
8. Ensure all Service Departments are put on Standby – as required by ERT – Camp / Mine / Site Services / Maintenance / Manpower / Equipment / Tools / Equipment		
9. Ensure Power House is on standby		
10. Ensure that Protocol is on standby – flights to and from site for our workers / Mutual Aid teams		
11. Ensure Warehouse is on standby:		

Note: list of materials taken will be kept and accounted for after the emergency is over		
12. Do we need radios, ERP, Site Drawings out for incident command team		
13. Security / Close Roads		
Once Emergency is over:		
1. Initiate the "Emergency Stand Down" when required		
2. Follow up with HR Designate on any victim or surviving members concerns		
3. Hold a de-briefing with Personnel prior to them exiting the site		
4. Gather any information for Corporate HQ and Regulatory Agencies (Mines Inspector)		
5. Prepare and facilitate a Debriefing Session		
6. **General Manager will liaise with media with ALL information going out from site.**		
*** Write notes on reverse side and return this Card to Scribe after the Incident Debriefing for compilation purposes**		
No information will be relayed to Corporate or Media without the expressed confirmation of the Manager on Duty.		

Name: ______________________

Date: ______________________

Time assumed role: ____________

Health & Safety Department or Designate Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Offer support to Emergency Control Group members		
3. Account for all persons in Health and Safety Dept.		
4. Liaison between Emergency Response Teams and Emergency Control Group members		
5. Review remaining Emergency Response Capabilities: manning, equipment, resources		
Questions to ask: a) Do we need to stop operations? (Ex: SCBA use – if SCBA's are required for emergency, and we have other confined space work occurring, do we cancel? b) Do we need to reduce or have rescuers stand down during an emergency to ensure that we have adequate numbers available for continuation of normal operations? c) (Ex: mine rescue team called out to an emergency, 12 people show up, only 6 is required for emergency, and then 6 can stand down and go back to work and be available if another emergency occurs at same time. d) If people and equipment are available to meet		

Regulation requirements, then normal operations can continue. If not – consider putting alternate plans in place.		
6. Respond to any field requests		
7. Maintain notes of all decisions made with times as required.		
8. Organize and manage any site security requirements		
9. Liaison with any other emergency resource provider		
10. Provide information updates to the Emergency Control Group		
11. Maintain Health and Safety Standards at the Mine Site during any incident		
12. Assist with any trauma management situations and Post Incident Debriefing sessions as required		
13. Participate in the incident debriefing session		
14. Liaison with the Department Head where incident occurred and help with incident investigation process		
15. Advise on corrective action initiatives		
16. Communicate with Mines Inspector – Serious Injury / Dangerous Occurrence – only after approval of Manager on duty		
***Write notes on reverse side and return this Card to scribe after the Incident Debriefing**		

Name: ____________________________

Date: _____________________________

Time assumed role: ________________

Department Head where incident occurred Duty Card	**Completed**	
Print Name:		
1. Report to Command Centre		
2. Gather all available information and share with Emergency Control Group members		
3. Account for all persons under area of responsibility – (Need to determine who is missing and where they may be)		
4. Confirm effective Communications with Responders and Relative Supervisors		
5. Confirm Incident losses and status of the incident		
6. Designate an Assistant if required		
7. Assess current resources and determine if additional resources are required		
8. Manage Personnel duty hours, needs, food and other		
9. Visit the incident scene if required – and Safe to do so		
10. Assemble any information required for a report		
11. Attend the Incident Debriefing		
***Write notes on reverse side and return this Card to Scribe after the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: __________________

Logistic Duty Card **(Designated by Acting Manager)**	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Account for all persons under area of responsibility		
3. Ensure that flights are arranged for outgoing and incoming purposes when required		
4. Ensure IT is available upon request – (cut communications) fix radios etc.		
5. Arrange transportation of all personnel as required		
6. Arrange for provision of food, water, temporary shelter, radios, PPE, etc. when required		
7. Assemble any information required for a report		
8. Participate in the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe after the Incident Debriefing**		

Name: ______________________________

Date: _______________________________

Time assumed role: __________________

Warehouse or Designate Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Account for all persons under area of responsibility		
3. Assemble lists for inventory of possible equipment or supply needs		
4. Source any supplies and equipment that is requested by the Manager on Duty		
5. Source any requests for external services or supplies		
6. Designate an Assistant if Required		
7. Schedule Support Staff Personnel if required		
8. Ensure that someone is available at all times during the entire emergency to supply equipment materials as necessary		
9. Assemble any information required for a report		
10. Participate in the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe after the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: ___________________

Human Resources/Designate Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Account for all persons under area of responsibility		
3. Set up a format for any media communications		
4. Confirm information accuracy if required		
5. Designate an Assistant if required		
6. Ensure proper notification systems are followed (RCMP are responsible for initial notification of family in fatal events)		
7. Coordinate any follow up visits to family of victims		
8. Confirm that Employee Assistance Program, Critical Incident Stress or Victim Services is available to injured or survivors or Post Traumatic Stress sufferings of any personnel		
9. Assemble any information required for a report		
10. Help Manager on Duty prepare communication to advise workforce		
11. Participate in the Incident Debriefing		
12. **All communication to media will be done through the Manager on Duty**		
***Write notes on reverse side and return this Card to scribe after the Incident Debriefing**		

Name: ______________________________

Date: _______________________________

Time assumed role: ___________________

Emergency Response Team Captain Duty Card	**Completed**	**Time**
Print Name:		
1. Respond to the scene or requested area with all available and applicable equipment		
2. Confirm communication with the Incident Commander at Base Station		
3. Contact Department Head of affected area for any request or directions through Incident Commander		
4. Direct emergency activities with your Team		
5. Maintain Safe Working Standards with you team		
6. Offer periodic Status Reports to Incident Commander at Base Station		
7. Secure the incident scene – as per Regs. 16.03/16.04		
8. Liaison with any other external emergency personnel		
9. Ensure area clearances with Helicopter Pilots – if required		
10. Respond accordingly within you and your team's capabilities		
11. Request any additional resources through your Incident Commander at Base Station		
12. Assemble any information required for a report		

13. Attend the Incident Debriefing		
14. Take Cell Phone with them when going off site – phone number is 867-793-1330		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Note: Captain must have a report that will be submitted at completion of emergency which includes all of the above.

Name: ______________________________

Date: ______________________________

Time assumed role: ____________________

Environmental Department Duty Card	Completed	Time
Print Name:		
1. Report to Command Centre		
2. Account for all persons in area of responsibility		
3. Be available as a resource to Emergency Control Group		
4. Maintain a log of events, calls, requests, external personnel and contact lists if requested		
5. Liaison with all field operations on the incident when involving spills/chemicals		
6. Liaise with Government Regulators as necessary for reporting spills/chemicals etc. upon approval of Manager on Duty.		
7. Designate an Assistant if required to help out in the field		
8. Direct external Emergency Spill Response Personnel to proper location(s) if required		
9. Assemble any information required for a report		
10. Attend the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: ____________________

Maintenance Department Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Account for all persons in area of responsibility		
3. Be available as a resource to Incident Command Group		
4. Maintain a log of events, calls, requests, external personnel and contact lists		
5. Liaison with all field operations on the incident when involving equipment, machinery		
6. Have personnel available to deal with broken down machinery etc.		
7. Designate an Assistant if required to help out in the field		
8. Make equipment and manpower available if required by Emergency Response Team		
9. Assemble any information required for a report		
10. Attend the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: ____________________

Mine Department Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Account for all persons in area of responsibility		
3. Be available as a resource to Emergency Control Group		
4. Maintain a log of events, calls, requests, external personnel and contact lists		
5. Liaison with all field operations on the incident when involving incidents in the pit		
6. Ensure that contractors in area of responsibility are notified and accounted for		
7. Designate an Assistant if required to help out in the field		
8. Make equipment and manpower available as necessary to help Emergency Response Teams		
9. Assemble any information required for a report		
10. Attend the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: ____________________

Engineering Department Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Account for all persons in area of responsibility		
3. Be available as a resource to Emergency Control Group		
4. Maintain a log of events, calls, requests, external personnel and contact lists (SCRIBE) for the incident		
5. Liaison with all field operations on the incident when involving incidents where engineering is required		
6. Designate an Assistant if required to help out in the field		
7. Make equipment and manpower available as necessary to help Emergency Response Teams		
8. Assemble any information required for a report		
9. Attend the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: ____________________

Geology Department Duty Card	Completed	Time
Print Name:		
1. Report to Command Centre		
2. Account for all persons in area of responsibility		
3. Be available as a resource to Emergency Control Group		
4. Conduct a proper head count of all persons assembled in the Muster Stations (Site occupancy lists are available through the FLO system)		
5. Maintain a log of events, calls, requests, external personnel and contact lists		
6. Designate an Assistant if required to help out in the field		
7. Make equipment and manpower available as necessary to help Emergency Response Teams		
8. Assemble any information required for a report		
9. Attend the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: ____________________

Energy & Infrastructure Department Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Account for all persons in area of responsibility		
3. Be available as a resource to Emergency Control Group		
4. Ensure that manpower, equipment is available for the proper function and maintenance of fire sprinkler systems		
5. Ensure that manpower, equipment is available to maintain an open road (AWPR) to Baker Lake		
6. Ensure that manpower is available as airport marshal and for moving material arriving in aircraft, fuel, etc.		
7. Ensure that manpower, equipment is available for transportation of men/gear to help Emergency Response Teams		
8. Ensure that personnel and equipment is available to maintain the required electrical power supply		
9. Maintain a log of events, calls, requests, external personnel and contact lists		
10. Designate an Assistant if required to help out in the field		
11. Make equipment and manpower available as necessary to help Emergency Response Teams		
12. Assemble any information required for a report		

13. Attend the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: ____________________

Process Plant Department Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Account for all persons in area of responsibility		
3. Be available as a resource to Emergency Control Group		
4. Conduct a proper head count of all persons assembled in the Arctic Corridor Muster Station		
5. Maintain a log of events, calls, requests, external personnel and contact lists		
6. Designate an Assistant if required to help out in the field		
7. Make equipment and manpower available as necessary to help Emergency Response Teams		
8. Assemble any information required for a report		
9. Attend the Incident Debriefing		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Name: ______________________________

Date: ______________________________

Time assumed role: ____________________

Camp/Housekeeping Department Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre through HR		
2. Account for all persons in area of responsibility		
3. Be available as a resource to Emergency Control Group		
4. Ensure an adequate supply of food when requested		
5. Ensure that an adequate supply of blankets, washers/dryers are available when requested		
6. Maintain a log of events, calls, requests, external personnel and contact lists		
7. Designate an Assistant if required to help out in the field		
8. Make equipment and manpower available as necessary to help Emergency Response Teams		
9. Assemble any information required for a report		
10. Ensure that HR has all available information		
***Write notes on reverse side and return this Card to scribe during the Incident Debriefing**		

Name: ______________________________

Date: _______________________________

Time Assumed Role: _________________

To be filled out by Incident Commander:

Incident Commander Duty Card	**Completed**	**Time**
Print Name:		
1. Initiate an emergency response as required		
2. Ensure communications with Emergency Response Team Captain and be there to request assistance or resources		
3. Ensure incident scene is secured as required		
4. Liaise between Emergency Response Team and Emergency Control Group		
5. Ensure that all gear, equipment, supplies required by Emergency Response Team is made available to them		
6. Have the gear, equipment, supplies brought to Emergency Response Teams when required		
7. Assemble any information required for a report		
8. Request any additional resources at any time required		
9. Attend the Incident Debriefing if requested		
***Write notes on reverse side and return this Card to ICS during the Incident Debriefing**		

Name: ______________________________

Date: _______________________________

Time assumed role: __________________

Scribe Duty Card	**Completed**	**Time**
Print Name:		
1. Report to Command Centre		
2. Scribe all accounts of activity in chronological order		
3. Scribe information as requested by the Emergency Control Group – Manager on Duty		
4. Provide a detailed report at end of incident		
5. Assemble any information required for a report		
***Write notes on reverse side and return this Card to ICS during the Incident Debriefing**		

2.3 OCCUPATIONAL HEALTH AND SAFETY COMMITTEE:

The Occupational Health and Safety Committee are responsible for:

- Review the emergency response plan on an annual basis.
- Assist with any investigation resulting from the emergency.

2.4 ALL EMPLOYEES:

All employees are responsible for:

- Reporting to the nearest Muster Station when an fire alarm is sounded;;
- Employees reporting to the Muster Station need to assemble at the placard that has their department name.
- Employee's must be quiet and await the "head count**".**
- Reporting any emergency by either using a two-way radio on your regular "working channel" (Note: Working zone channel 9 (AEM Surface should initiate a Code 1 on channel 3 (Mill Repeater) or by using the telephone to call 6911, to describe the type, the location, and nature the emergency, including possible injuries, trapped personnel, and the presence of any chemical or explosive hazards.

2.5 SUPERVISOR:

The Supervisor is responsible for:

- Ensuring the "Code One" call in, is accurate and that all the pertinent information is available for the official-in-Charge. (providing details regarding the type, the location, and the nature of the emergency, including possible hazardous materials involved and health and safety concerns);
- Ensure all workers on his shift are accounted for.

2.6 OTHER PERSONNEL:

Depending on the nature of the emergency (medical, electrical, mechanical, fire, etc.) other site personnel, including the Site Electrician, Site Mechanic, and others, may be called upon to play key roles.

2.7 EMERGENCY RESPONSE CONTACT INFORMATION – INTERNAL & EXTERNAL

AEM internal emergency response personnel, their duties, and phone numbers has been compiled in Table 2.1, Important external contacts such as regulatory agencies, health organizations and transportation companies providing evacuation support are listed in Table 2.2.

Table.1: Internal Emergency Response Contact Information Chart

NOTE: Pagers are activated by dialing **6930** and listen for instructions

GENERAL MANAGER or Acting Manager	**Pager: 404**
Luc Chouinard	**Ext: 6896**
	Cell: 819-856-8160
INCIDENT COMMANDER	**Pager: 402 Ext: 6809**
Andre Rouleau	**Cell: 819-355-2191**
Philippe Beaudoin	**Cell: 450-847-4214**
Health & Safety	**Pager: 213**
Information Technology	**Pager: 282**
Security	**Pager: 468**
Engineering	**Pager: 230**
Geology	**Pager: 218**
Mining Dept.	**Pager: 234**
Environment	**Pager: 232**
Process Plant	**Pager: 214**
Energy and Infrastructure	**Pager: 219**

Human Resources	**Pager: 217**
Maintenance	**Pager: 231**
Logistic and Warehouses	**Pager: 216**

In order to reach the whole management team with one call: PAGER 6930 - 408

Every department has the obligation to designate a representative that is wearing the departmental pager and is also knowing and understanding basic principles of the Emergency Response Plan.

Table 2.2: External Emergency Phone Numbers

Organization / Authority	Telephone Number	Fax Number
NT-NU 24-HOUR SPILL REPORT LINE	867.920.8130	867.873.6924
Nunavut Water Board	867.360.6338	867.360.6369
Environnent Canada, Environnemental Protection Branch	867.669.4700	867.873.8185
Environment Canada: 24-hour emergency pager monitored by Emergency and Enforcement	867-920-8130	Same as NT-NU 24-hours spill
Manager Pollution Control & Air Quality Environmental Protection, Government of Nunavut	867.975.7748	867.975.5981
General Inquiry Department of Environment, Government of Nunavut	867.975.7700	
Indian and Northern Affairs Canada (INAC) – Water Resources Manager, Nunavut Regional Office	867.975.4550	867.975.4585
Indian and Northern Affairs Canada (INAC) – Manager, Land Administration, Nunavut Regional Office	867.975.4280	867.975.4286
Kivalliq Inuit Association – Reporting Line	867.645.2810 or 867.645.2800	
Department of Fisheries and Oceans (DFO) – Nunavut Regional Office	867.979.8000	867.979.8039
Workers Safety and Compensation Commission **WSCC Emergency** Mine Inspector: Lex Lovatt Chief Inspector of mines – Fred Bailey	800.661.0792 **800.661.0792** 867.445.1742 867.669.4430	
Health Services – Baker Lake	867.793.2816 867.793.2817	
Keewatin Air Ambulance (Medevac) 24h/7 – Rankin Inlet dispatch	867.645.4455	
Baffin Regional Hospital (Iqaluit)	867.979.7300	

Baker Lake RCMP Baker Lake RCMP – emergency number Cambridge Bay RCMP	867.793.0123 867.793.1111 867.983.1111	
Baker Lake Hamlet Office	867.793.2874	
Baker Lake Fire Emergency	867.793.2900	
Baker Lake Radio Station	867.793.2962	
Baker Lake Airport	867.793.2564	
Poison & Drug information service (PADIS)	866-727-1110	
Search and rescue – Arctic Armed Forces Rescue Coordination Centre Trenton	800.267.7270 613.965.3870	
NAVCAN (Flight Information Center North Bay)	866.541.4109	
CANUTEC (Spill Support Information)	613.996.6666	
Charter Aircraft (for Evacuation)		
Keewatin Air Ambulance (Medevac) 24h/7 – Rankin Inlet dispatch	867.645.4455	
Calm Air	204.677.0513 204.677.0519	
Nolinor	450.476.0018 888.505.7025	
First Air	867.669.6694 867.444.2002	
Helicopter Transport Services (HELI transport)	613.839.5868	
Nunavut Emergency Management – Rankin Inlet	1-867-645-6803	
Nunavut Emergency Management – Iqaluit	1-867-979-6262	

2.8 EMERGENCY COORDINATION CENTRE

Emergency operations will be directed out of the Emergency Control Centre (ECC). The ECC is located in the 3rd Floor of the Service Building Conference Room, or in the Training room 1, on the main floor, or in the Airport Controller Building by Air Strip from where the following will take place:

- Key decisions will be made and operations will be managed;
- Technical information to direct emergency activities will be provided;
- A communications center will be established for emergency operations and to communicate with other organizations;
- Resource procurement will be provided and resource use will be directed;
- Any damage will be assessed and long-range objectives and plans will be developed; and
- Information on the emergency will be stored and disseminated to all necessary internal and external parties.

The following information is available at the center:

- Shutdown procedures for operations;
- Locations of hazardous material storage areas;
- Locations of emergency and safety equipment;
- Locations of first aid stations and muster areas;
- Maps of communities and environmental maps;
- Information on location of other communications equipment, including portable sets;
- Information on emergency power;
- Contacts for other utilities;
- Operating manuals;
- Materials Safety Data Sheets (MSDS);
- List of personnel with alternate skills for use in emergencies;
- Type and location of alarm systems;
- Accident report forms;
- Accident status board and log book;
- Notification lists, staff lists, contact lists, with regular and emergency telephone/pages numbers, etc.

The ICC will be located at a safe and secure place near the site of the emergency. All responses and mitigation efforts developed at the ECC will be implemented through the ICC.

In the event of an emergency, security personnel may be required to establish and maintain a security perimeter to prevent or minimize injury to personnel, to preserve evidence for investigation, or to prevent unauthorized access to the scene.

2.9 TRAINING

The HR Superintendent is responsible for documenting, tracking, and updating all training activities. Record of training requirements and training attendance will be kept, tracked and updated for all employees by the HR Superintendent to ensure that retraining occurs as required.

For mine operations, AEM will ensure a sufficient number of trained ERT team members are on site at all times. All members of the ERT will be trained and familiar with emergency procedures. Emergency training will be conducted annually to ensure that a sufficient number of team members are available and that their training is up-to-date.

2.10 EMERGENCY RESPONSE EQUIPMENT

The Emergency Measures Counsellor will ensure that site drawings and equipment lists are posted conspicuously in key locations throughout the site so that important information is always readily available. This will include the following:

- Location and isolation points of energy sources;
- Location of emergency equipment (e.g., fire water pumps, fire extinguishers, monitors, self-contained breathing apparatus);
- Emergency procedures outlines, such as specialist firefighting, chemical neutralization;
- Availability of internal and external emergency medical support (e.g., hospitals, clinics, ambulances, medical supplies, personnel with medical or first aid training);
- Location of toxicity testing facilities (e.g., gas and water);
- Location of wind direction / speed indicators;
- Location of personal protective equipment and directions on its proper use; and
- Location of first aid stations and muster areas.

The Incident Commander, EMC, and Health and Safety Superintendent will know where, throughout the project site, all of this information is posted and where emergency equipment is stored. These individuals will also be trained in the proper use of emergency equipment.

SECTION 3 • COMMUNICATION SYSTEMS

The primary basis for communication will be the phone system; back-up communication will be available via satellite phone. For on-site communication, hand-held radios will be mandatory for all employees working or travelling in remote areas from the main camp. Back-up power sources and replacement batteries for communications equipment will be available to provide continuous, uninterrupted operation either at fixed facilities or at emergency sites.

Key site personnel will be accessible at all times by either portable radios, radios in vehicles, or office radios. The Health Care Professional and Security personnel will carry a portable local phone and will be available at all times. Senior management personnel will rotate as "On-Call Managers" for after-hour emergencies. An accommodation list that highlights key personnel will be posted and updated as required.

Lists of employees trained in first aid, mine rescue, and Emergency Response will also be posted. Employees and contractors who will be on site for extended periods will be trained initially and then retrained annually. This training will include the locations and use of emergency equipment, terminology used, and who needs to be contacted immediately in the event of an emergency.

There is a document listing all telecommunications systems supported by the Department of Information Technology during an emergency and their location. It also uses procedures for certain equipment and procedure in the case of a request for closure of all telecommunications services with the outside.

This document can be found under **APPENDIX ''A''**

SECTION 4 • EMERGENCY MEASURES

In the event of an emergency, the employee will have to follow our emergency procedure:

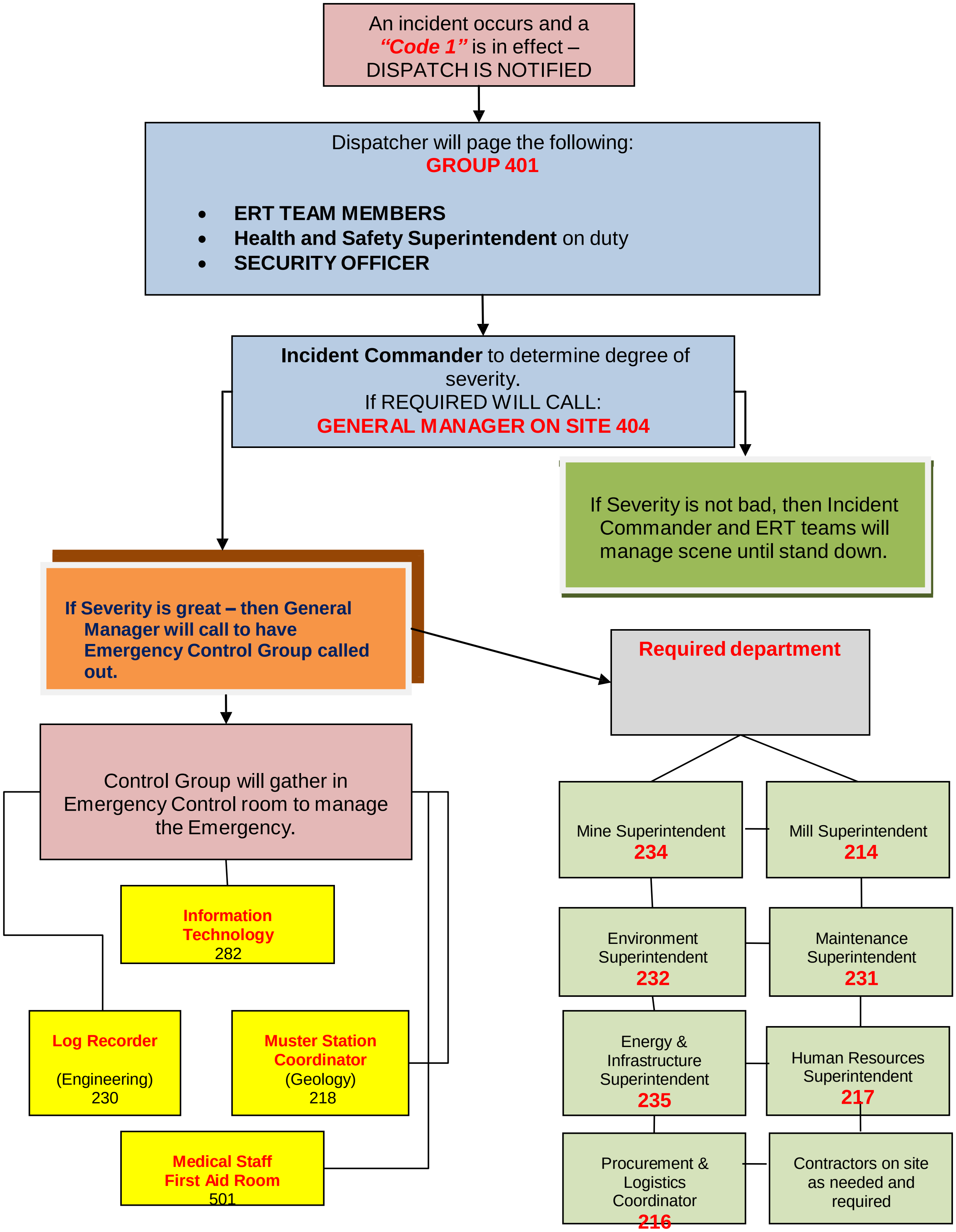
A Code 1 can be called by any person on site as long as they have a two-way radio to report an accident, serious incident or fire which requires the response of the ERT (Emergency Response Team). All ***Code 1*** should be called on your regular “working channel” (Note: Working zone channel 9 (AEM Surface should initiate a Code 1 on channel 3 (Mill Repeater)

or ***6911*** on phone.

The procedure steps:

- Call ***Code One*** over the two-way radio “working channel” ***three (3) times*** and identify the type of accident, serious incident or fire.
- Give your name, location and the nature of the accident, serious incident or nature of the fire to the person on the other end of phone or two-way radio (dispatch).
- Upon notification of the ***Code 1,*** the “dispatch” is the only person who will communicate with the person who initiated the Code One.
- The “dispatch” will contact ERT via pagers to notify them of the ***Code 1*** emergency.
- The ERT will immediately respond to the ERT staging area (ERT garage).
- The Incident Commander or ERT Team Captain (First Captain on scene) will evaluate the call and announce if deemed necessary the cessation of work and activities in the affected area. This will be done on the appropriate work area channel (example “Zone 1, channel “3”).
- **EXAMPLE: ‘’All work in ZONE 1 must cease until further notice, this includes all active pit areas.’’**
- The Incident Commander or ERT Team Captain will dispatch the Emergency Response Team to the incident site, with the appropriate equipment for the situation.

Once the ***Code 1*** is called, Radio Silence on “working channel” that initiated ***Code 1*** must be observed until advised otherwise by the Incident Commander or ERT Team Captain.


An incident occurs and a *"Code 1"* is in effect – DISPATCH IS NOTIFIED
Dispatcher will page the following:
GROUP 401
ERT TEAM MEMBERS
Health and Safety Superintendent on duty
SECURITY OFFICER
Incident Commander to determine degree of severity.
If REQUIRED WILL CALL:
GENERAL MANAGER ON SITE 404
If Severity is not bad, then Incident Commander and ERT teams will manage scene until stand down.
If Severity is great – then General Manager will call to have Emergency Control Group called out.
Required department
Control Group will gather in Emergency Control room to manage the Emergency.
Information Technology
282
Log Recorder
(Engineering)
230
Muster Station Coordinator
(Geology)
218
Medical Staff
First Aid Room
501
Mine Superintendent
234
Mill Superintendent
214
Environment Superintendent
232
Maintenance Superintendent
231
Energy & Infrastructure Superintendent
235
Human Resources Superintendent
217
Procurement & Logistics Coordinator
216
Contractors on site as needed and required

4.1 FIRE

The Camp Complex and Process Plant is equipped with a fire detection and audible fire warning system. All site operating personnel receive basic training in the use of fire extinguishers. This training is tracked by the HR Superintendent.

For any situation involving fires, the first action will be to extinguish the fire if it is safe to do so and then report the incident. If the person cannot safely put out the fire, it must be reported as quickly as possible. In the event of a fire alarm, all employees not directly involved with fighting the fire will report to the designated muster location (section 5.2). Employees will remain in this area until assigned other duties by the ERT or until given clearance that the emergency is over.

When an alarm occurs, the incident commander will:

- Locate the source of fire.
- Dispatch the evacuation at the safest muster point.
- Assign a captain and his team.
- Ensure the security of all the ERT's members or any other required service persons (medics, security guard, electricians, etc…).
- Inform Acting Mine Manager of the situation.
- If the intervention of the mine inspector is necessary for a special investigation, he will ask to the security department to ensure the integrity of the scene.
- Call the end of the emergency operations and invites everyone evacuated to reintegrates their original locations.

General Manager or designate can decide to use any available machinery to separate all or part of a building to protect people or minimize losses.

Incident Reports are to be filed detailing the causes of the fires and responses undertaken. This information will be used by the EMC in subsequent fire prevention activities.

4.1.1 Muster Point

In the event that an evacuation is necessary, it is important that all affected personnel leave the emergency area and congregate at a pre-determined area or *Muster point* so that a head count can be taken to determine if there are any missing persons. Employees must remain at the muster point until the supervisor of the emergency area gives permission to return to work.

Upon hearing a fire alarm, smoke alarm, or evacuation alarm:

- ***Do Not Panic*** – Always ensure that you are prepared for the weather conditions – Dress appropriately – (Winter clothing during winter months).
- *DO NOT* delay and *DO NOT* stay and finish work before taking the proper steps to evacuate.
- Always **close** windows/doors as you leave your room or office etc.
- *Always* head to the *closest* **EXIT** door and follow **EXIT** signs to the closest muster station.
- If there is smoke between your location and the nearest muster, follow **EXIT** signs to the closest Outside door.
- Once outside head to the *closest* "*Muster Station*".
- Once in "*Muster Station*" – Stay put until relieved or instructed otherwise by the **Muster Station Leader.**

- The **Muster Station Leader** will designate a specific guard for every door of the muster in order to avoid people already registered to leave the Muster Station.
- The **Muster Station Leader** will *conduct a tally* (head count) of everyone in his/her department. Ensure that you get your name on the tally form.
- Note: on nightshift, the highest level of Management may be a front line Supervisor.
- *DO NOT* enter a building when the alarm is sounding. Head straight to a “Muster Station”.
- *Never* go through a building to get to a “Muster Station”. Once you are outside, the first door you open should be the one to the “Muster Station”.
- *Never* disregard an evacuation alarm. We understand that the system goes off without incident on occasion, but to disregard an *alarm is to endanger your life and the lives of others.*
- *Stay in* “Muster Station” until you are instructed to “Stand Down” by the **Incident Commander** or the **Muster Station Leader**.
- *Do Not* leave “Muster Station” to go outside for a smoke. It is important for your Supervisor to know where you are at all times – especially during an “Emergency”.
- The only person authorized to initiate a “Stand Down” is the **Incident Commander/ERT Captain or the General Manager or designate**.
- Failure to follow proper Evacuation Procedures will result in Discipline.
- The following areas are considered “**<u>Muster Stations</u>**” (see Figure)

4.2 MEDICAL EMERGENCIES

- Emergency is initiated - by calling **6911** on desk type phones, or calling on Two-way radio on "**Working Channel" – Code 1 – Code 1 – Code 1.**
- All communication stops except for those involved with the Emergency – I.e.:ERT, Dispatcher, Medical personnel at the clinic, as required.
- All work stops in affected area or (depending on seriousness of Emergency) the whole site.
- Dispatcher will answer the phone and/or radio call.
- **Responder –** will ask where the medic is required, what is the nature of the emergency? Etc…
- **Caller –** will give a brief description of the Emergency – name, location and what is wrong and/or required.
- **Responder –** will confirm location and details of incident and activate the **ERT** team. A page call will be sent out to **medical personnel (pager 501)** or to the **First responder team (pager 403)** or, if required, all **ERT** team members(pager 401) on site.
- The person at the casualty(s) will administer First Aid if trained to do so.
- Incident Commander will be immobilized as to ensure that communications, transportation, and effective deployment of **ERT** resources are conducted. Depending on the gravity of the situation, It is possible that the Official In-Charge be notified immediately.
- Transportation will be arranged to meet at the **ERT** hall by the two large doors for medical gear and **ERT** team members.
- The **ERT** team (minimum of 6 team members) will assemble as quickly as possible. (Expectation – when the page goes off – all **ERT** team members will make their way expediently to the **ERT hall).**
- As soon as steps have been implemented to properly attend to the casualties, the Incident Commander will notify the appropriate authorities of the accident by telephone, providing as much information as possible. A complete accident description and investigation form is required to be submitted as soon as possible. The accident description and investigation form will be completed and submitted by the General Mine Manager. Unless some action is required to remove an immediate hazard, the site of any serious accident will be cordoned off and remain unchanged until clearance is received from the appropriate authorities.

4.2.1 MEDICAL EVACUATION (MEDEVAC) PLAN

In the event of serious injury, it may be necessary to remove the individual from the source of the danger and to administer emergency first aid. The Health Professional will be notified immediately in order to take charge of the situation and ensure the safe removal of the injured person to the first aid room if possible.

- The **ERT** team will respond with (Nurse / Medic) and assist as necessary with equipment, treatment etc.
- The (Nurse / Medic) and as many **ERT** team members as required will respond to the incident site. When the (Nurse / Medic) arrives at the scene, they will notify the First Aid Treatment Room.
- First Aid will be administered to casualty(s); the casualty(s) will be secured and transported to the First Aid Room. Vehicles transporting casualty(s) will have priority over any other vehicle on site.
- Once the "Mechanisms of Injury" and the patient's condition have been assessed, a decision will be made by the (Nurse / Medic) whether a Medevac is required and decide on ground or air transportation. There are guidelines to follow to make this determination.

  First thing: Dr. Lee (AEM – MBK) Medical Director - will be notified.

  Then, Baker Lake Health Centre will be contacted to obtain a warrant number.

If a **MEDEVAC** is required, the Health Care Provider will call the following airline:

- ❖ Keewatin Air: (**867)-645-4455 or (877)-879-8477**

The following **INFORMATION** will be relayed to **Medical Facility** that you have reached and to **MEDEVAC** dispatcher:

- ❖ Give Patient's Name, Age, Mechanism of Injury, Nature of Injuries, and Medical Condition. Give all tests, treatment which you have done as well as ALL of the medication that has been administered to patient including the patient's past medical history and medications that he/she is taking.
- ❖ The TRANSFER sheet should be included and if possible FAX: to the Health Care Facility who will be receiving the **MEDEVAC and patient.**

If the **MEDEVAC** comes to site with a **Medical crew:**

- ❖ The **MEDEVAC** team will call ahead to notify their ETA.
- ❖ The patient will STAY in First Aid Room until his/her **Condition is stabilized**
  - ❖ Unnecessary delays will be avoided in transportation of Patient to Receiving Health Care Provider.

- The Manager on Duty or designate will ensure that a vehicle is sent to the airstrip at the ETA.
- The **MEDEVAC Medical crew** with their equipment will be brought to the First Aid Room.
- Once the **MEDEVAC** equipment is in place, the **ERT** team will assist the **MEDEVAC Medical crew,** and (Nurse / Medic) with the transfer of the patient to the ambulance, and into the aircraft.

If the accident requiring a MEDEVAC is work related, the incident scene, materials, machinery, medical equipment etc. will remain undisturbed until the investigating team has conducted the investigation. This type of incident is considered a "Reportable Incident" therefore the Mines Inspector shall be notified (without delay). The Official In-Charge will be responsible to ensure that this occurs. Under no circumstances shall any person move, or otherwise interfere with any wreckage or equipment at the scene of a "reportable incident" until an inspector has conducted an investigation of the incident and has given permission to do so.

The Official In-Charge will make all necessary calls to the outside for notification purposes: I.e.: Corporate Office notification, Mines Inspector, RCMP, etc.

If the incident is of a fatality, it is CLEAR that the Coroner or in his/her absence, the RCMP are in total control of the incident scene. The scene is to remain undisturbed until orders have been issued by either of these two authorities. *Refer to Section 4.10 (Fatality on site) of this Emergency Response Plan.*

The scene will then be released to the local authorities such as the Mines Inspector for their portion of the investigation.

Upon arrival of the aircraft to the airport of the Receiving Medical Facility (other than Baker Lake), the receiving team will be notified and a designated person will call the Incident Command (control center) and update them on their arrival and the next steps to be taken. I.e.: transportation to Receiving Medical Facility.

Control Click here to link to the Medical Evacuation Communication Pathway procedure

4.3 AIRPLANE CRASH DISASTER

Emergency Response begins as soon as an air crash is identified or reported.

- When the Meadowbank Air Traffic Controller or Meadowbank Dispatcher is notified that an approaching aircraft is having difficulty, they will immediately notify the Incident Commander and General Manager or Designate.
- In the event of reported air crash off-site the Meadowbank Air Traffic Controller or Meadowbank Dispatcher will notify the General Manager or Designate.
- Emergency Response procedure will be initiated if required for response by ERT
- The ERT Team on scene will make a preliminary assessment and notify the Nursing Clinic.
- The Nurse or Medic, with the ERT Team, shall establish triage, treatment, transportation, communication, and staging.

- The ERT Incident Commander will direct all emergency response actions, and assess the need for additional resources keeping the Command Post updated as to all actions

- The RCMP will establish access and traffic control and assist the Coroner in body recovery and identification, if necessary.

- The Incident Commander will instruct emergency response personnel to not move debris associated with the wreckage, ie. Cargo, plane remnants, passenger belongings, unless there is imminent danger of items being destroyed, or unless they inhibit access to passenger rescue.

- The Coroner/RCMP is responsible for the identification, movement and/or removal of the fatality. Unauthorized personnel are not to move the dead without express approval of the Coroner/RCMP, except when there is a question of whether the person is deceased or if the body is in danger of being destroyed. In all cases involving the movement of a body, personnel moving the body shall make careful note of the location and condition of the body for the Coroner/RCMP.

- Upon notification of an air disaster, NAV Canada will be responsible for air traffic in proximity to the scene, with immediate regulatory control of airspace around the area.

- They will keep the airspace clear of intrusive air traffic, to the limits of the regulations.

- **Recovery:**

- Recovery immediately follows emergency response. It involves direction from the General Manager or Designate.
- Maintaining access control to the scene.
- Providing emergency social services (critical stress debriefing), for employees and rescue workers.
- Investigating the accident.
- Clean-up of the crash site.

4.4 PIPELINE BREAKAGE

- Pipelines will be used to transport tailings solids, reclaim water, freshwater, and domestic sewage on site. Pipeline breakage could lead to localized, short-term smothering of vegetation, the release of poor-quality water, and potentially exposure of mine personnel to infectious or toxic substances. In the event of a pipeline breakage, the following actions will be taken as required and when it is safe to do so:
- Shut off the feed to the pipeline;
- Call dispatch in order to have Incident Commander notified of the breakage.
- Physically contain the spill through the construction of dikes, berms, sumps and collection ditches;
- Pump collected water to the tailings reclaim pond or sewage treatment plant;
- Collect and remove solids for disposal in the tailings facility, incineration, or off-site disposal at a licensed disposal facility; and
- Monitor for residual contaminants on land and in surface water.
- A general response procedure for the handling of spilled domestic sewage (infectious substances) is provided in the Spill Contingency Plan **(Appendix M).**
- A specific response procedure for cyanide involved systems is provided in **Appendix B** of the Meadowbank Site Emergency Response Plan.

4.5 TOXIC GAS RELEASES

- In the event of a toxic gas release, the following actions will be taken:
- Immediately evacuate the area/building and notify the incident commander;
- If possible and safety permits, turn off the source of the gas and ventilate (i.e., open windows/doors to outdoors) the area;
- Call dispatch in order to have Incident Commander notified of the release.
- Isolate the area and restrict access to ERT personnel only; and
- Implement air quality monitoring
- For the mill, refer to the specific procedure: **MBK-MIL-PRO *General Alarm Evacuation Procedure*.**

  Control + click here to link to this procedure
- A general response procedure for the release of compressed gases is provided in the Spill Contingency Plan.

❖ **IN THE EVENT THAT CYANIDE HYDROGEN (HCN) IS INVOLVED, REFER TO APPENDIX B OF THIS DOCUMENT.**

- **4.6**

DIKE FAILURE

- In the event of a dike failure, the following actions will be taken:
- Immediately evacuate the area and pit where failure could affect and notify the incident commander;
- Isolate the area and restrict access to ERT personnel only
- Use any material, heavy equipment and tools to make temporary or permanent repairs. All work to be conducted under ECC's supervision.

A detailed Emergency Preparedness Plan (EPP) was developed to address the consequences of failure of any of the dikes on site. The procedure was developed by the Geotechnical Engineering team with the assistance of the dike designer (Golder Associates provided the first version of the dike OMS and EPP, which was then elaborated upon by AEM) and the review of the EMC and the Satety Superintendent. The EPP for the dewatering dikes and Tailings Storage Facility are available in the Operation, Maintenance and Surveillance Manual (OMS manual) for the Tailing Storage Facilities and the Dewatering Dikes. Background information and potential failure scenarios of the dewatering dikes and Tailings Storage Facility are provided in Appendix A.

In the event that the failure involves Tailings installations, refer to Appendix B.1.6

4.7

EMULSION PLANT

- A detailed Emergency Response Plan (ERP) was prepared by Dyno Nobel and addresses incidents and potential incidents involving the manufacturing, handling and storage of explosives and related products in Dyno Nobel Canada Inc.' magazines, emulsion plants and worksites at Meadowbank.
- **The ERP for Dyno Nobel Emulsion plant is provided in Appendix C.**

4.8

BAKER LAKE MARSHALLING FACILITY

- The Baker Lake Marshaling facilities is located 2 Km., east of the Hamlet of Baker Lake and is used for the interim storage of supplies, including hazardous materials, prior to being transported to the mine site. The fuel farm at the Facility is used for bulk storage of:

  60,000,000 liters of fuel

  1,900,000 liters of Jet ''A'' fuel.

Spill emergencies occurring at the Marshaling Facility will be handled according to the:

Spill Contingency Plan (Refer to Appendix M).

In case of any other major disaster, the primary Emergency procedures will fall under the Hamlet of Baker Lake authorities' responsibility.

By-Law no 212 (Emergency Response Plan) has already been adopted by local authorities.

4.8.1 VESSEL CONTINGENCY PLAN

At any time emergency situations can occur and without warning aboard vessels dock siding in Baker Lake. Crewmembers might require mutual assistance from Emergency Response crews in Baker Lake or Meadowbank.
Refer to **Appendix ''G''** for procedures to be followed in order to respond effectively.

4.9

EMERGENCIES DEALING WITH REAGENTS

At Meadowbank mine site, we carry the following reagents:

- Cyanide (Sodium Cyanide)
- Copper Sulphite
- Lime (Calcium Oxide) (Quick Lime)
- Sodium Metabisulphite
- Caustic Soda (Sodium Hydroxide)
- Sulphur (Prill form)
- Nitric Acid
- Calcium Chloride (Dust Suppression)
- Flocculants
- Lead Nitrate
- Milsperse (Antiscalant)

Emergency Procedures for dealing with some of these reagents are found in **Appendix B of this Emergency Response Plan.**

4.10 FATALITY OCCURING ON SITE

- **INCIDENT SITE**:
- **<u>Work related fatality:</u>**
  - Incident site must be kept barricaded off and guarded and undisturbed except for the purpose of preventing injury or relieve suffering, until appropriate personnel (RCMP), (Coroner), (Mines Inspector) have conducted their investigations and have released the scene.
  - Only the coroner or the medical director is eligible to declare that a person is officially dead. Medical staff at MBK should be the first to be put in contact with medical authorities for this purpose.
  - At all-time RCMP shall be notified of a fatality on site and all facilities should be supplied to their representatives in order to assist them for required investigation.
  - RCMP is the only communication channel that will be issued toward victim's relatives. They will make all arrangements in order to make sure that the relatives are aware of the situation.
  - All communications going out from MBK will be under the acting manager's control as long as needed in order to avoid misunderstandings or confusion for every concerned.
  - If involving chemical, biological, radiological or nuclear agent, consult with the Incident Commander regarding the agent dispersed, dissemination method, level of PPE required, location, geographic complications (if any), and the number of person(s) involved.
  - Ensure that all person(s) involved have the proper level of PPE protection, training and knowledge to deal with the situation.
  - Notification of a work related fatality (or ''reportable incident'') shall be made to WSCC according to Mine Act and Regs 16:02

  <u>At all time, the mine acting manager will decide to take over external communications from site accordingly with the Meadowbank Crisis Management Plan.</u>

- **RECOVERY AND ON-SITE MORGUE**:
  - Gather all necessary information and document all findings.
  - Wear PPE until all bodies(s) are deemed free of contamination if necessary.
  - Establish a preliminary (holding) morgue. The remaining's should be kept at cool temperature and away from freezing. Vault WTP is actually designated as temporary morgue.
  - Depending on the situation, it might be possible that RCMP will require the remaining's to be sent to their facilities for extensive investigation.
  - Gather all necessary information and document all findings.
  - According to the situation the site manager will take all actions in order to respectfully evacuate the remaining to the required destination.
  - If suspecting contamination, see the Decontamination section for decontamination procedures.
  - If needed, decontaminate affected bodies before they are removed from the incident site.

4.11

MISSING PERSON

- As soon as a worker is missing from his regular work (at beginning of shift or during the day) the supervisor will ensure that the worker's room, workplace, and public areas have been searched, in addition to checking with the Medical Clinic personnel.
- After this primary search, if the worker is still missing, the Meadowbank Security Officer (SO) must be advised. If the Security office is closed, the Front desk Officer will be advised.
- If nobody can be reached at the Camp front entrance offices, then, the Medical Clinic personnel should be notified. The nurse will take charge and follow up with the searches by getting in touch with the Security Officer and/or the ERT Incident Commander (IC).

The procedure: **MBK-HSS-EMR-PRO Missing person** will be initiated.
Control + Click here to link to the document

4.12

MASS CASUALTY EMERGENCIES

- By definition a Mass (Multiple) Casualty Incident (MCI) is any incident in which Emergency Service Resources, such as personnel and equipment, are overwhelmed by the Number and Severity of Casualties.
- In the make-up of our MCI Plan there should be Two (2) sections. Both sections would generally be happening simultaneously. These sections are giving more details and can be found through the: **MBK-HSS-EMR-PLN Mass Casualty Management** plan:

  Control + Click here to link to the document

SECTION 5 • REFERENCES

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SECTION 6 • LIST OF ACRONYMS

AEM	Agnico Eagle Mines Limited – Meadowbank Division
AMQ	Agnico Eagle's Amaruq Mining Area
AWPAR	All Weather Private Access Road
CDA	Canadian Dam Association
DFO	Fisheries and Oceans Canada
ECC	Emergency Coordination Centre
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPP	Emergency Preparedness Plan
ERG	Emergency Response Guidebook
ERP	Emergency Response Plan
ERT	Emergency Response Team
FoS	Factors-of-Safety
GN	Government of Nunavut
HAZCOM	Hazard Communication
HMMP	Hazardous Materials Management Plan
HR	Human Resources
HSC	Occupational Health & Safety Committee
IATA	International Air Transport Association
IC	Incident Commander
ICC	Incident Command Centre
INAC	Indian and Northern Affairs Canada
KIA	Kivalliq Inuit Association
MMER	Metal Mining Effluent Regulations

MSDS	Materials Safety Data Sheets
MSHA	Mine Safety and Health Administration
NWB	Nunavut Water Board
OHSA	Occupational Health and Safety Administration
OHSP	Occupational Health & Safety Plan
PPE	Personal Protective Equipment
SCP	Spill Contingency Plan
SO	Security Officer
TDG	Transportation of Dangerous Goods
TSF	Tailings Storage Facility
WCB	Worker's Compensation Board
WHMIS	Workplace Hazardous Materials Information System

APPENDIX A

MBK-IT-EMR-PLN Emergency Telecom Plan at Meadowbank

Control + Click here to link to this plan

APPENDIX B

Emergencies involving Reagents.

- ## Immediate Actions

For all spills and releases of any hazardous material, the following steps should always be taken:

- Stop the flow of material and/or contain it, if possible, using proper safety equipment and precautions. **Do not endanger yourself!**
- Administer first aid if required. If anyone comes in direct contact with cyanide solution decontaminate them immediately, monitor them closely and give oxygen if there is any indication of symptoms of poisoning.
- Contact your supervisor. Call for help.
- Secure the area.
- Prevent unnecessary exposure.
- Perform remedial action for cleanup.

Emergencies involving reagents might be addressed by first responders, by using **EMERGENCY RESPONSE GUIDEBOOK**

ERG2012.pdf

(SEE APPENDIX K)

In an emergency, CANUTEC may be called collect at 613-996-6666 (24 hours)
***666 cellular (Press star 666, Canada only)**

B.1: Cyanide (Sodium Cyanide)

UN #: 1689 (Guide 157 of the Emergency Response Guidebook)

Environmental remediation of a spill of cyanide will be managed under the: MBK Spill Contingency Plan

Control + Click here to link to Environment Spill Contingency Plan

- **B 1.1 General Cyanide Spill/Release Guidelines**

Immediate Actions

For all spills and releases of cyanide, the following steps should always be taken:

- Prevent unnecessary exposure.
- Stop the flow of material and/or contain it, if possible, using proper safety equipment and precautions. Do not endanger yourself.
- Administer first aid if required. If anyone comes in direct contact with cyanide solution decontaminate them immediately, monitor them closely and give oxygen if there is any indication of symptoms of poisoning.
- Contact your supervisor, call for help.
- Secure the area.
- Monitor for HCN Gas with appropriate Gas Monitor.

Supervisor's Immediate Action

- Eliminate or reduce immediate health and safety hazards and administer first aid if required, Call for help by dialing 6911 or calling a Code 1 on the radio.
- Arrange for removal and transportation of injured out of the dangerous zone, if safe to do so.
- Begin containment if needed. Protect yourself and others.
  - Remove all unnecessary personnel and restrict entry to the area.
  - If the problem is in the mill, make sure the Mill Evacuation procedure is complete.
  - Ensure safe procedures are followed and proper safety equipment is used.
  - Eliminate the source.
- Assess the incident.
  - Determine the source, quantity, and type of material that was spilled/released.
  - Quantify health and environmental hazards, toxic vapors, ground/surface water contamination if and when required by I.C. or Environment Supervisor.
- Perform remedial action for cleanup.
- Clean up the incident area when asked by I.C.

All spills and remedial actions taken must be reported immediately to the area Supervisor.

- Protect yourself. Don't become a casualty. Wear the necessary personal protective equipment needed for containment. Use the "buddy" system. The following equipment along with containers of household bleach are located in the warehouse.
  - Rubber Gloves
  - Chemical Protective Suit (TYCHEM QC)
  - Rubber Boots
  - Chemical Goggles
  - Respirator (Handling Dry Cyanide Only)

Caution: Respirator is for protection from solid cyanide and solids containing cyanide i.e. dust, mud, etc. A respirator will not protect you from deadly HCN gas.

Perform lifesaving rescues and first aid. If needed, administration of cyanide antidote will be done by medical clinic personnel by applying the following procedure:

Control + Click here to link to the Medical Protocol Cyanide poisoning Management

SODIUM and/or Calcium CYANIDE (SOLID and/or FLAKED) (ID#1689, ERG #157)

If the release occurs in a wet area (i.e. rain storm) personnel shall obtain and wear self-contained breathing apparatus and full protective clothing/gear. The area should be monitored for HCN gas. The release should be controlled with earthen berms. Adding chemicals to reduce risk of HCN vapor emission will be done only under Incident Commander or Environmental Supervisor's authority.. Pump or excavate cyanide back into the nearest containment facility as directed by the Incident Commander or Environmental Supervisor. If a release occurs in a dry area personnel shall wear the appropriate respirator with cyanide dust cartridge and work coveralls. Using a shovel, carefully place material into a dry container for transport to an approved process component. Deposit the material in an area designated by the Incident Commander or Environmental Supervisor. Flush the spill area with water (use water spray to reduce vapors). **Do not use water if it will cause the spill to flow off of the containment.** The spilled cyanide can be reused and does not create a waste to be disposed of.

SODIUM CYANIDE - DILUTE PROCESS SOLUTIONS (ID# 1689 ERG #157)

This process is for diluted weak cyanide solutions. The process solutions may be high pH and may cause injury to exposed skin. Control flow by shutting down pumps and valves. Personnel shall wear full personal protective equipment, including clothing (TYCHEM Qc). Control area of spill with earthen berms. In case of questionable or unknown pH, monitor the area with an HCN monitor. Adding chemicals to reduce risk of HCN vapor emission will be done only under Incident Commander or Environmental Supervisor's authority. Pump any solution back into the nearest containment facility. Excavate all wet soil and haul it to an approved containment facility. Solution samples should be taken and analyzed under Incident Commander or Environmental Supervisor's authority.

NOTE: Should the process plant need to be evacuated; the procedure MBK-MIL-PRO General Emergency Evacuation will apply

Control + Click here to link to this procedure

B 1.2 Cyanide Transportation Accidents

Although there is a procedure for Transportation of dangerous goods on the Meadowbank AWAR, **(MBK-ENV-PRO AWAR_TDG)**
Control + Click here to link to this procedure

The following actions are to be taken in the event of an accident on the AWAR or at the barge unloading facilities **involving cyanide transport** vehicle.

- Call Dispatch and report the location and nature of the accident and indicate the type of assistance required (medical help, environmental clean-up, fire and/or mechanical help);
- AEM personnel working in this area will evacuate and secure the 2 access roads leading to the unloading/storage area.
- Meadowbank's Incident Commander on duty will take command of any action required by the situation at this moment.
- Local resources (Baker Lake Fire dept. or R.C.M.P.) will not be involved in this process.

IF THERE IS A VICTIM and IF SAFE TO DO SO: Remove the victim from spoiled area

- As the very first minutes are critical for the victim, administration of oxygen must be the first action to be done on scene (IF THERE IS EVIDENCE THAT THE VICTIM IS CONTAMINATED WITH CYANIDE, THE DECONTAMINATION PROCEDURE MUST BE APPLIED PRIOR OF ANY ACTION).

- Cross contamination may be fatal to rescuers if they are not correctly protected against inhalation, skin absorption or ingestion of Cyanide or by-products. Proper PPE must include TYCHEM Qc suit, proper face mask, gloves, rubber boots etc…

WARNING: EVALUATE THE LIKELY HARM WITHOUT INTERVENTION

Before decontaminating the victim with water, all clothing should be removed.
Flush body immediately with water until medical help arrives or before transporting victim.
Dust half masks **do not protect** against HCN gas

IF THERE IS NO VICTIM:

- Secure the accident site so that the vehicles or spilled chemical not continue to present a hazard to others. This may involve blocking off the road back from the site in both directions in the event of a more serious accident.

- **If safe to do so** secure the site to prevent continued spill or leakage of contaminants into the surrounding environment.

- Upon receiving the accident call, Dispatch will initiate the mine's Emergency Response Team passing along the information to the Emergency Incident Commander (I.C.). The I.C. will then call out the required Emergency Response Personnel to assist at the accident site. He will also make sure to inform the Acting Manager of the situation.

- Accident site decontamination will then be initiated as per the **Meadowbank Site Spill Contingency Plan.**

  Control + Click here to link to this plan

- Once the accident site is secured, all people requiring assistance have been removed to medical care and cyanide spill controlled, the Emergency Incident Commander will turn the scene over to the mine's safety personnel so that an appropriate accident investigation can be initiated.

B 1.3 Cyanide involved in Fires.

- Sodium cyanide (NaCN) is non-combustible.
- The agent itself does not burn.
- Sodium cyanide releases highly flammable and toxic hydrogen cyanide gas (HCN) on contact with acids or water.
- Fire will produce irritating, corrosive, and/or toxic gases.
- Stay upwind.
- Note: Most foam will react with the agent and release corrosive/toxic gases.
- For small fires, **do not use carbon dioxide**; use dry chemical, dry sand, or alcohol-resistant foam. **NOTE:** At Meadowbank, we are using non-Alcohol-resistant foam.
- For large fires, use water spray, fog, or alcohol-resistant foam. Move containers from the fire area if it is possible to do so without risk to personnel. Use water spray or fog; do not use straight streams. Dike fire control water for later disposal; do not scatter the material.
- For fire involving tanks or car/trailer loads, fight the fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after the fire is out. Withdraw

immediately in case of rising sound from venting safety devices or discoloration of tanks. Always stay away from tanks engulfed in fire. **NOTE:** At Meadowbank, most of the cyanide product is under its solid state.

- Run-off from fire control or dilution water may be corrosive and/or toxic, and it may cause pollution.
- If the situation allows, control and properly dispose of run-off (effluent).

Control + Click here to link to Environment Spill Contingency Plan

B 1.4 Important release of HCN from storage

- Large quantities of sodium cyanide are used at the Meadowbank Gold Project to optimize gold recovery from the ore. Due to transportation restrictions, normally a full year's supply of sodium cyanide will be transported and stored on site. This product will be stored on secured and separate laydown known as ''Overpad'' storage area, The product will also be handled, transferred and used in compliance with appropriate legislation and applicable Best Management Practices.

- Procurement and Logistics Department's workers are ruled by Procedure ''MBK-PRL-PRO Cyanide Storage Procedure'' for Cyanide Storage.

- **Control + Click here to link to this procedure**

- In the event of a major release of HCN from the storage area it will be critical that any worker in the immediate area of the release evacuate upwind and call for help by following the **Code 1 procedure.**

- Upon receiving the HCN release call, Dispatch will initiate the mine's Emergency Response Team passing along the information to the Emergency I.C. The Emergency I.C. will then call out the required Emergency Response Personnel to assist at the release site. He will also make sure to inform the Acting Manager of the situation.
- Emergency Response Team will make sure evacuation is completed in Red and Yellow zones as determined in the **Emergency Response Guidebook 2012** and then will monitor the area by using MX-6 gas monitors. Following monitoring, and analyzing wind direction, air dampness and any other significant input, the decision will be then taken to evacuate a larger perimeter if needed to do so.

- Depending of wind direction, the following buildings/area may be used as ''MUSTER STATIONS'' in case of a catastrophic situation requiring a major evacuation of the premises:

  - *FGL/SANA buildings*

  - *VAULT pit Refuge*

  - *DYNO-NOBEL Emulsion plant*

- After re-assessing the situation, Emergency I.C. and Acting Manager will decide if a complete Meadowbank site evacuation or if any other Emergency or remediation measure is required.

B 1.5.1 PROCESS PLANT Important release of HCN

- The cyanide transferred from the Storage laydown to the process plant is stored outdoor on a specific laydown, in front of door ''C'' of the Process Plant
- A maximum of 24 tons (24 bags) are stored in the mill at the same time.
- In case of a release of HCN, the monitoring system of the process plant will be activated automatically and the Emergency Evacuation of the mill will take place, accordingly to **Procedure MBK-MIL-PRO- General Emergency Evacuation.**
  Control + Click here to link to this procedure
- Upon receiving the HCN release call, Dispatch will initiate the mine's Emergency Response Team passing along the information to the Emergency I.C. The Emergency I.C. will then call out the required Emergency Response Personnel to assist at the release site. He will also make sure to inform the Acting Manager of the situation.
- Emergency Response Team will make sure evacuation is completed in Red and Yellow zones as determined in the **Emergency Response Guidebook 2012** and then will monitor the area by using MX-6 gas monitors. Following monitoring, and analyzing wind direction, air dampness and any other significant input, the decision will be then taken to evacuate a larger perimeter if needed to do so.

- Depending of wind direction, the following buildings/area may be used as ''MUSTER STATIONS'' in case of a catastrophic situation requiring a major evacuation of the premises:

  - *FGL/SANA buildings*
  - *VAULT pit Refuge*
  - *DYNO-NOBEL Emulsion plant*

- After re-assessing the situation, Emergency I.C. and Acting Manager will decide if a complete Meadowbank site evacuation or if any other Emergency or remediation measure is required.

B 1.5.2 PROCESS PLANT: Release during mixing / unloading

- Every Process Plant worker is required to be trained on ''Chemical Awareness'' and ''Mill Induction'' trainings. These mandatory trainings are scheduled on regular basis by training department for every new worker at Process Plant. Moreover, Oxygen administration training is given to every Reagent Operators, Supervisors or Relief Operators working at Process Plant.

- There is an Oxygen administration First Aid Kit nearby the Mixing area. This kit includes: Oxygen administration portable system, and an Automated External Defibrillation kit. As the ''buddy'' system is always used, an affected (splashed) worker will be first removed from spoiled area, given oxygen, undressed and taken under the Emergency shower.
- In case of a release of HCN, the monitoring system of the process plant will be activated automatically and the Emergency Evacuation of the mill will take place, accordingly to **MBK-MIL-PRO General Emergency Evacuation**
- **Control + Click here to link to this procedure**
- According to this procedure, after head count at Muster, if workers are missing, the Code 1 Procedure will be applied.

B 1.5.3 PROCESS PLANT: Pipe, Valve breakage.

- In case of a small visible leak on the cyanide network (pipe, valve, etc…), a red ribbon and required warning tags will immediately be installed in order to protect the affected area. Supervisor will take all necessary measures to stop the leak and repair the broken part. The primary measure will be to communicate with the Process Plant Operator and have the broken section isolated and/or de-activated by control room operator.

- In case of a major and/or catastrophic leak that could endanger workers, then there will be an immediate evacuation of mill as per the General Emergency Evacuation procedure.

B 1.5.4 PROCESS PLANT: Major breakage on tailing lines, cyanide treatment pumps or tank rupture.

- If a sudden major breakage is happening on any vital cyanide destruction and/or tailing lines, complete stopping of the Process Plant will immediately be required.
- Complete stopping will be done by following procedure **MBK-MIL-OP-PRO Process Plant Shutdown V7**

Control+ Click here to link to this procedure

Also, the Process Plant Reagent operator will immediately close the manual valve at the feed of the CIP to prevent the leach tank from emptying inside the mill and then, overflowing. Also the valve at the exit of leach tank #9 towards the CIP will be closed as additional safety measure. This will prevent any major spill inside the mill that could result in slurry going out of the mill.

- Should the breakage involve tailing lines only, then procedure: **MBK-**

  MIL-OP-PRO Process Plant Loss of Tailings will be applied.

  Control + Click here to link to this procedure

B 1.6 Failure or overtopping of tailings impoundments.

Should a major problem occurring to tailing impoundments, all emergency measures as recommended by engineering department are depicted into two manuals:

- **Control + Click here to link to the ''Dewatering Dikes OMS Manual''**
- **Control + Click here to link to the ''TSF OSM Manual''**
- These manuals should be consulted as containing primary emergency measures for tailing impoundments failure and more likely Section 8 and 9 as below:

- ***Extract from OMS Manual:***

GENERAL INFORMATION ABOUT CYANIDE

Common Names:

- Sodium salt of hydrocyanic acid

Agent Characteristics

- **APPEARANCE**: White crystalline or granular powder.
- **DESCRIPTION**: Sodium cyanide releases hydrogen cyanide gas, a highly toxic chemical asphyxiant that interferes with the body's ability to use oxygen. Exposure to sodium cyanide can be rapidly fatal. It has whole-body (systemic) effects, particularly affecting those organ systems most sensitive to low oxygen levels: the central nervous system (brain), the cardiovascular system (heart and blood vessels), and the pulmonary system (lungs). Sodium cyanide is used commercially for fumigation, electroplating, extracting gold and silver from ores, and chemical manufacturing. Hydrogen cyanide gas released by sodium cyanide has a distinctive bitter almond odor (others describe a musty "old sneakers smell"), but a large proportion of people cannot detect it; the odor does not provide adequate warning of hazardous concentrations. Sodium cyanide is odorless when dry. Sodium cyanide is shipped as pellets or briquettes. It absorbs water from air (is hygroscopic or deliquescent).
- **METHODS OF DISSEMINATION**:
  - Indoor Air: Sodium cyanide can be released into indoor air as fine droplets, liquid spray (aerosol), or fine particles.
  - Water: Sodium cyanide can be used to contaminate water.
  - Food: Sodium cyanide can be used to contaminate food.
  - Outdoor Air: Sodium cyanide can be released into outdoor air as fine droplets, liquid spray (aerosol), or fine particles.
  - Agricultural: If sodium cyanide is released as fine droplets, liquid spray (aerosol), or fine particles, it has the potential to contaminate agricultural products.
- **ROUTES OF EXPOSURE**: Sodium cyanide can affect the body through ingestion, inhalation, skin contact, or eye contact.

Personal Protective Equipment

- **GENERAL INFORMATION**: First Responders should use a NIOSH-certified Chemical, Biological, Radiological, Nuclear (CBRN) Self Contained Breathing Apparatus (SCBA) with a Level A protective suit when entering an area with an unknown contaminant or when entering an area where the concentration of the contaminant is unknown. Level A protection should be used until monitoring results confirm the contaminant and the concentration of the contaminant.

  NOTE: Safe use of protective clothing and equipment requires specific skills developed through training and experience.

Emergency Response

- **CHEMICAL DANGERS**:
  - Sodium cyanide is water-reactive.
  - Sodium cyanide decomposes on contact with acids, acid salts, water, moisture, and carbon dioxide, producing highly toxic, flammable hydrogen cyanide gas.
  - Sodium cyanide solution in water is a strong base; it reacts violently with acid and is corrosive.
  - Sodium cyanide is incompatible with strong oxidants.
  - Carbon dioxide from the air is sufficiently acidic to liberate toxic hydrogen cyanide gas on contact with sodium cyanide.

- **EXPLOSION HAZARDS**:
  - Sodium cyanide reacts violently with strong oxidants such as nitrates, chlorates, nitric acid, and peroxides, causing an explosion hazard.
  - Upper and lower explosive (flammable) limits in air are not available for sodium cyanide.
  - Containers may explode when heated or if they are contaminated with water.

- **FIRE FIGHTING INFORMATION**:
  - Sodium cyanide is non-combustible.
  - The agent itself does not burn.
  - Sodium cyanide releases highly flammable and toxic hydrogen cyanide gas on contact with acids or water.
  - Fire will produce irritating, corrosive, and/or toxic gases.
  - Note: Most foam will react with the agent and release corrosive/toxic gases.
  - For small fires, do not use carbon dioxide; **use dry chemical**, dry sand, or alcohol-resistant foam.
  - For large fires, use water spray, fog, or alcohol-resistant foam. Move containers from the fire area if it is possible to do so without risk to personnel. Use water spray or fog; do not use straight streams. Dike fire control water for later disposal; do not scatter the material.
  - For fire involving tanks or car/trailer loads, fight the fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after the fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tanks. Always stay away from tanks engulfed in fire.
  - Run-off from fire control or dilution water may be corrosive and/or toxic, and it may cause pollution.
  - If the situation allows, control and properly dispose of run-off (effluent).

- **INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES**:
  - If a tank, rail car, or tank truck is involved in a fire, isolate it for 0.5 mi (800 m) in all directions; also consider initial evacuation for 0.5 mi (800 m) in all directions.
  - Small spills (when spilled in water)
    - First isolate in all directions: 200 ft (60 m).
    - Then protect persons downwind during the day: 0.1 mi (0.2 km).
    - Then protect persons downwind during the night: 0.4 mi (0.7 km).
  - Large spills (when spilled in water)
    - First isolate in all directions: 1300 ft (390 m).
    - Then protect persons downwind during the day: 0.8 mi (1.3 km).
    - Then protect persons downwind during the night: 3.0 mi (4.9 km).

- **PHYSICAL DANGERS**:
  - Vapors may collect and stay in confined areas (e.g., sewers, basements, and tanks).
  - Hazardous concentrations may develop quickly in enclosed, poorly-ventilated, or low-lying areas. Keep out of these areas. Stay upwind.
  - Hydrogen cyanide gas produced from sodium cyanide mixes well with air; explosive mixtures are easily formed.

Signs/Symptoms

- **TIME COURSE**: Effects occur rapidly following exposure to sodium cyanide. Inhalation exposure to hydrogen cyanide gas released from sodium cyanide produces symptoms within seconds to minutes; death may occur within minutes.

- **EFFECTS OF SHORT-TERM (LESS THAN 8-HOURS) EXPOSURE**: Early symptoms of cyanide poisoning include lightheadedness, giddiness, rapid breathing, nausea, vomiting (emesis), feeling of neck constriction and suffocation, confusion, restlessness, and anxiety. Accumulation of fluid in the lungs (pulmonary edema) may complicate severe intoxications. Rapid breathing is soon followed by respiratory depression/respiratory arrest (cessation of breathing). Severe cyanide poisonings progress to stupor, coma, muscle spasms (in which head, neck, and spine are arched backwards), convulsions (seizures), fixed and dilated pupils, and death. The CNS is the most sensitive target organ of cyanide poisoning. Cardiovascular effects require higher cyanide doses than those necessary for CNS effects. In serious poisonings, the skin is cold, clammy, and diaphoretic. Blue discoloration of the skin may be a late finding. Severe signs of oxygen deprivation in the absence of blue discoloration of the skin suggest cyanide poisoning.

- **EYE EXPOSURE**:
  - Redness, pain, and severe deep burns.

- Contact with the eyes can contribute to whole-body (systemic) toxicity. See Inhalation Exposure.

- **INGESTION EXPOSURE**:
  - Nausea, vomiting (emesis), abdominal pain, and irritation or corrosion of the lining of the esophagus and stomach.
  - Whole-body (systemic) toxicity can occur. See Inhalation Exposure.

- **INHALATION EXPOSURE**:
  - Mild to moderate: Central Nervous System (CNS) effects: headache, confusion, anxiety, dizziness, weakness (malaise), and loss of consciousness. Cardiovascular effects: palpitations. Respiratory effects: respiratory tract irritation, difficulty breathing or shortness of breath (dyspnea), and transient increase in rate and depth of breathing (hyperpnoea). Gastro Intestinal effects: nausea and vomiting (emesis).
  - Severe: CNS effects: coma, seizures, and dilated pupils (mydriasis). Cardiovascular effects: shock, abnormal or disordered heart rhythms (dysrhythmias), critically low blood pressure, and cardiac arrest. Respiratory effects: abnormally rapid, followed by abnormally slow respirations; accumulation of fluid in the lungs (pulmonary edema); and respiratory arrest. Eye effects: dilated pupils, inflammation of the surface of the eye, and temporary blindness.

- **SKIN EXPOSURE**:
  - Irritation, tissue damage (ulceration), burning sensation, and pain
  - Absorption through the skin can contribute to whole-body (systemic) toxicity. See Inhalation Exposure.

Decontamination

- **INTRODUCTION**: The purpose of decontamination is to make an individual and/or their equipment safe by physically removing toxic substances quickly and effectively. Care should be taken during decontamination, because absorbed agent can be released from clothing and skin as a gas. Your Incident Commander will provide you with decontaminants specific for the agent released or the agent believed to have been released.

- **DECONTAMINATION CORRIDOR**: The following are recommendations to protect the first responders from the release area:
  - Position the decontamination corridor upwind and uphill of the hot zone. The warm zone should include two decontamination corridors. One decontamination corridor is used to enter the warm zone and the other for exiting the warm zone into the cold zone. The decontamination zone for exiting should be upwind and uphill from the zone used to enter.
  - Decontamination area workers should wear appropriate PPE. See the PPE section of this card for detailed information.

- A solution of detergent and water (which should have a pH value of at least 8 but should not exceed a pH value of 10.5) should be available for use in decontamination procedures. Soft brushes should be available to remove contamination from the PPE. Labeled, durable 6-mil polyethylene bags should be available for disposal of contaminated PPE.

- **INDIVIDUAL DECONTAMINATION**: The following methods can be used to decontaminate an individual:
  - Decontamination of First Responder:
    - Begin washing PPE of the first responder using soap and water solution and a soft brush. Always move in a downward motion (from head to toe). Make sure to get into all areas, especially folds in the clothing. Wash and rinse (using cold or warm water) until the contaminant is thoroughly removed.
    - Remove PPE by rolling downward (from head to toe) and avoid pulling PPE off over the head. Remove the SCBA after other PPE has been removed.
    - Place all PPE in labeled durable 6-mil polyethylene bags.
  - Decontamination of Patient/Victim:
    - Remove the patient/victim from the contaminated area and into the decontamination corridor.
    - Remove all clothing (at least down to their undergarments) and place the clothing in a labeled durable 6-mil polyethylene bag.
    - Thoroughly wash and rinse (using cold or warm water) the contaminated skin of the patient/victim using a soap and water solution. Be careful not to break the patient/victim's skin during the decontamination process, and cover all open wounds.
    - Cover the patient/victim to prevent shock and loss of body heat.
    - Move the patient/victim to an area where emergency medical treatment can be provided.

First Aid

- **GENERAL INFORMATION**: Careful observation, supplemental oxygen, and supportive care may be sufficient therapy for the patient/victim who does not exhibit physical findings of cyanide toxicity. For the patient/victim exhibiting physical findings of cyanide toxicity, initial treatment consists of administration of antidotes under a physician's direction, respiratory and circulatory support (oxygen and IV fluids), correction of chemical imbalances in the blood, and seizure control**. Speed is critical.** Avoid mouth-to-mouth resuscitation regardless of route of exposure. Avoid contact with vomitus, which may off-gas hydrogen cyanide.
- **Seek for medical attention by bringing the victim to the clinic after decontamination**
- **If Antidote is needed, it must be administrated by our medical clinic's personnel, under the** :
  MBK-HSS-CLI Medical Protocol Cyanide Poisoning Management procedure

  Control + Click here to link to this procedure

- **EYE CONTACT**:
  - Immediately remove the patient/victim from the source of exposure.
  - Immediately wash eyes with large amounts of tepid water for at least 15 minutes.
  - Monitor the victim for signs of whole-body (systemic) effects.
  - If signs of whole-body (systemic) poisoning appear, see the Inhalation section for treatment recommendations.
  - Seek medical attention immediately.

- **INGESTION**:
  - Immediately remove the victim from the source of exposure.
  - Establish secure large-bore IV access.
  - Ensure that the patient/victim has an unobstructed airway.
  - Do not induce vomiting (emesis).
  - Immediately administer 100% oxygen.
  - Prepare a cyanide antidote kit, for use under a physician's direction, for symptomatic patient/victims. See the Antidote section for antidote administration procedures.
  - Treat seizures with benzodiazepines.
  - Seek medical attention immediately.

- **INHALATION**:
  - Immediately remove the patient/victim from the source of exposure.
  - Evaluate respiratory function and pulse.
  - Ensure that the patient/victim has an unobstructed airway.
  - Immediately administer 100% oxygen.
  - Assist ventilation as required.
  - If breathing has ceased (apnea), provide artificial respiration.
  - The nursing staff will:
    - Establish secure large-bore intravenous (IV) access.
    - Prepare a cyanide antidote kit, for use under a physician's direction, for symptomatic patient/victims. See the Antidote section for antidote administration procedures.
  - Monitor for respiratory distress.
  - Seek medical attention immediately.

- **SKIN**:
  - Immediately remove the patient/victim from the source of exposure.
  - See the Decontamination section for patient/victim decontamination procedures.
  - Monitor the patient/victim for signs of whole-body (systemic) effects.
  - If signs of whole-body (systemic) poisoning appear, see the Inhalation section for treatment recommendations.
  - Seek medical attention immediately.

APPENDIX C

MBK-HSS-EMR-PLN-Dyno Emergency Response Plan

Control + Click here to link to this Specific Emergency Response Plan

APPENDIX D

MBK-ENV-PLN Oil Pollution Emergency Plan

Control + Click here to link to this specific Emergency Response Plan

APPENDIX E

MBK-HSS-PLN-EMR_Nolinor Emergency Response Plan

Nolinor ERP Plan (Note: This protected document is only available directly on Intelex under H&S Plans – Emergency Response

APPENDIX F

MBK-HSS-PLN Baker Lake Facilities O M Manual- Drawings Appendix

Control + click here to link to the document

APPENDIX G

MBK-HSS-EMR-PLN Desgagnes Vessel Contingency Plan

Control + Click here to link to the plan

APPENDIX H

<u>MBK-ENV-PLN-BL </u>Baker Lake Bulk Fuel Storage Facility Environmental Performance Monitoring Plan Ver. 2

<u>Control + Click here to link to this specific Plan</u>

APPENDIX I

MBK-ENV Meadowbank Transportation Management Plan AWPAR

Control + Click here to link to this specific plan

APPENDIX J

Appendix J is left Blank

APPENDIX K

MBK-HSS-EMR-PLN Emergency Response Guideline Handbook – ERG 2012

ERG2012.pdf

Control + Click here to open the book

APPENDIX L

<u>Site Maps Quick Link</u>

SITE MAPS ARE ELECTRONICALLY AVAILABLE AT THE EMERGENCY CRISIS RESPONSE ROOM

APPENDIX M

SPILL Contingency Plan (Environment)

Control + Click here to link to this plan

APPENDIX N

MBK-HSS-EMR-PLN MEADOWBANK CRISIS MANAGEMENT PLAN

CONTROL + CLICK HERE TO LINK TO THIS PLAN

MEADOWBANK GOLD PROJECT

TAILINGS STORAGE FACILITY

Operation, Maintenance and Surveillance Manual

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 8
February 2018

TAILINGS STORAGE FACILITY

OPERATION, MAINTENANCE AND

SURVEILLANCE MANUAL

MEADOWBANK GOLD PROJECT

AGNICO EAGLE MINES LIMITED

IMPLEMENTATION SCHEDULE

This Plan is immediately implemented.

DISTRIBUTION LIST

AEM - General Manager Meadowbank

AEM- Environment Superintendent

AEM- Mine Operations Superintendent

AEM- Engineering Superintendent

AEM- General Services Manager

AEM- Site Services Superintendent

AEM- Corporate Environment Director

AEM- Health and Safety Superintendent

Golder- Dike Design Engineer

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
(first revision)	February 2012	All	All	
V2	August 27, 2013	All	All	
V3	September 15, 2013	All	All	Updated items mentioned by MDRB and the Mine Inspector in the Annual Geotechnical Inspection in September 2013
V4	January 2015	All	All	
V5	October 2015	All	All	
V6	February 2016	All	All	
V7	March 2017	All	All	
V8	February 2018	All	All	Integration of the updated Central Dike TARP and Emergency Action Plan

Approved by:

Pierre McMullen
Engineering Superintendent

Nancy Duquet-Harvey
Environmental Superintendent - NU

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

%	Percent
°C	Degrees Celsius
1:100	1 in 100 years (return period)
2H:1V	Slope of 2 horizontal units to 1 vertical unit
AEM	Agnico Eagle Mines Limited
CDA	Canadian Dam Association
Elev.	Elevation
EPP	Emergency Preparedness Plan
ERP	Emergency Response Plan
g	Gravitational acceleration constant (9.80 m/s^2)
Golder	Golder Associates Ltd.
m	Metre
M	Million
MAC	Mining Association of Canada
OMS	Operation, maintenance and surveillance
SD1	Saddle Dam 1
SWD	Stormwater Dike
TSF	Tailings Storage Facility
tpd	Tonnes per day

LIST OF DEFINITIONS

Active Layer: Ground above the top of permafrost. This layer freezes and thaws seasonally.

Permafrost: Bedrock or soil at a temperature at or below 0^oC for a continuous period of two or more years. It is important to note that permafrost is not permanent. It is also important to note that the term permafrost does not imply the presence or absence of ice in the bedrock or soil.

SECTION 1 • INTRODUCTION

1.1 PURPOSE

This operation, maintenance and surveillance (OMS) manual provides a reference document to be used by the personnel responsible for the operation, maintenance and surveillance of the Tailings Storage Facility (TSF) at the Meadowbank Gold Project that is owned and operated by Agnico Eagle Mines Limited (AEM).

The TSF is the permanent surface storage facility for tailings produced during the operation of the mine. Refer to Section 3.0 for description details of the TSF.

Qualified personnel shall be used for the operation, maintenance and surveillance of the TSF and adequate records shall be maintained for regulatory, general and reference purposes. As the management structure changes, the OMS manual should be revised and distributed accordingly. A primary objective during the early phases of operation and development of the TSF, especially during that of the North Cell, was to optimize these activities for use during subsequent development phases.

This OMS manual addresses the operational issues of the TSF. It does not examine design, construction or closure issues in detail. Details of the design and construction requirements for the TSF are presented in the references provided later in this document. Details on closure are included in the Interim Closure and Reclamation Plan (Golder, 2014).

1.2 REGISTERED MANUAL HOLDERS AND REVISIONS

Each copy of this OMS manual is assigned a unique identification number.

The AEM Engineering Superintendent is responsible for maintaining an up-to-date list of the registered holders of this OMS manual in Table 1-1.

The AEM Engineering Superintendent is also responsible for the issue of all revisions and addenda to all Registered Manual Holders of this OMS manual. Revisions will be made, as and when required, by re-issuing a complete section, table and/or appendix so that the superseded section, table and/or appendix can be removed and replaced. All Registered Manual Holders are responsible for placing the revisions and addenda in their copy of the OMS manual and for recording receipt of the same in Table 1-2.

1.3 REGULATORY, CDA AND MAC GUIDELINE REQUIREMENTS

This OMS manual sets out procedures to ensure compliance with the AEM regulatory requirements which are summarized in Table 1-3.

The Canadian Dam Association (CDA) Dam Safety Guidelines (CDA 2007) states, “Dam operation, maintenance and surveillance encompass a number of activities and constraints defined to ensure that the dam is managed with appropriate regard for safety.” The preparation and use of this OMS manual achieve this requirement. Reference to CDA (2007) was made in the preparation of this OMS manual.

The Mining Association of Canada (MAC) has prepared two reference documents for management of tailings facilities: “A Guide to the Management of Tailings Facilities” (MAC 2008) and “Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities” (MAC 2005). Both of these documents were used in preparation of this OMS manual.

1.4 DAM CLASSIFICATION

Table 1-4 presents the classification information and the following is noted for the perimeter containment structures of the TSF (i.e. Saddle Dams 1 to 5, inclusive, the Stormwater Dike and the Central Dike):

- Loss of life: the embankment is classified as “high” due to the limited number of workers in the Portage and Goose Pits downstream of the Central Dike coupled with AEM’s procedures for pit evacuation in the event of an emergency;
- Environmental and Culture Values: the embankment is classified as “high” due to the water license requirements and environmental permitting considerations;
- Infrastructure and Economic Losses (third parties): the embankment is classified as “high” due to the water license requirements and environmental permitting considerations; and
- The dam classification for the TSF perimeter containment structures is determined by the highest of the three ratings above; therefore, these structures are classified as “high” consequence structures.

1.5 ANNUAL REVIEW OF MANUAL

This OMS manual will be reviewed by AEM on an annual basis and revised as necessary to accommodate changes in the condition and operation of the TSF. The Registered Manual Holders of the OMS manual are encouraged to provide comments and suggestions for improvement of the OMS manual and the procedures specified in it to the AEM Engineering Superintendent. The comments and suggestions communicated will be considered in the annual review.

1.6 REFERENCE DOCUMENTS AND DRAWINGS

A summary of the documentation prepared for the TSF, including design reporting, as-built reporting, technical specifications, construction drawings, instrumentation installation reporting and deposition planning, is presented in Table 1-5. The most current technical specifications and construction drawings referenced in Table 1-5 are presented in Table 1-6 to Table 1-8, inclusive. All design and as-built documents can be found in hard copy onsite in the engineering department, as well as in electronic copies on the dikes server.

Table 1-1 List of OMS Manual Holders

Name / Position / Address or Location
General Mine Manager / Luc Chouinard / OFFICE
Environment Superintendent / Nancy Duquet-Harvey / OFFICE
Mine Operations Superintendent / Yan Côté, Nicolas P. Deschamps (asst.) / OFFICE
Engineering Superintendent / Pierre McMullen, Miles Legault (asst.) / OFFICE
Logistics Coordinator / Mathieu Grenier / OFFICE
Energy & Infrastructures Superintendent / Bruce Waugh / OFFICE
Vice President, Environment / Michel Julien / AEM Toronto Office
Health and Safety Superintendent / Norman Ladouceur, Yves Levesque (asst.) / OFFICE
Dike Design Engineer / Golder Associates Ltd./ 500 – 4260 Still Creek Drive, Burnaby, BC, V5C 6C6
Update as Required

Table 1-2 Record of OMS Manual Revisions and Addenda

Revision No.	Section	Table	Appendix	Addenda No.	Date of Revision
1	All	All	All	-	February 2012
2	All	All	All	-	August 2013
3	All	All	All	-	September 2013
4	All	All	All	-	January 2015
5	All	All	All	-	October 2015
6	All	All	All	-	March 2016
7	All	All	All	-	March 2017
8	All	All	All	-	February 2018

Table 1-3 Regulatory Requirements

Document	Document Reference and/or No.	Review Date
Territorial Lands Act – Land Lease	Production Lease KVPL08D280	Expires December 27, 2027
Environmental Impact Assessment	NIRB Project Certificate No. 004	Only required if substantial modifications to original application are to be carried out
Water License Type "A"	Nunavut Water Board Water Licence 2AM-MEA1525	Expires July 22, 2025

Table 1-4 Classification of Dams in Terms of Consequences of Failure (after CDA 2007)

Dam Class	**Population at Risk** [Note 1]	**Incremental losses**		
		Loss of Life [Note 2]	**Environmental and Cultural Values**	**Infrastructure and Economics**
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	**Permanent**	**10 or fewer**	**Significant loss or deterioration of *important* fish or wildlife habitat** **Restoration or compensation in kind highly possible**	**High economic losses affecting infrastructure, public transportation, and commercial facilities**
Very high	Permanent	100 or fewer	Significant loss or deterioration of *critical* fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affection important infrastructure or services *(e.g., highway, industrial facility, storage facilities for dangerous substances)*
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services *(e.g., hospital, major industrial complex, major storage facilities for dangerous substances)*

Note 1. Definitions for population risk:

None – There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.

Temporary – People are only temporarily in the dam-breach inundation zone *(e.g., seasonal cottage use, passing through on transportation routes, participating in recreational activities).*

Permanent – The population at risk is ordinarily located in the dam-breach inundation zone *(e.g., as permanent residents)*; three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).

Note 2. Implications for loss of life:

Unspecified – The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.

Table 1-5 Tailings Storage Facility Documentation Summary

Item	Description	Reference
TSF Design Basis	Report	Golder (2008)
Stormwater Dike and Saddle Dam 1 Geomembranes	Technical Memorandum	Golder (2009)
Revised configuration for Saddle Dam 1	E-Mail	Golder (2009; no formal document issued)
Deposition Plan (North Cell)	Report	Golder (2011, 2012)
Construction Report TSF	Report	AEM (June 2013)
North Cell Diversion Ditches	Report	AEM (July 2013)
Deposition Plan (North & South Cells)	Presentation	AEM (2013 to 2017)
Central Dike As-Built Report	Report	GAL(February 2017)
Saddle Dam 3 As-Built Report	Report	GAL (February 2017)
Saddle Dam 4 As-Built Report	Report	GAL(February 2017)
Saddle Dam 5 As-Built Report	Report	GAL (February 2017)
Central Dike As-Built Report	Report	GAL(January 2018)
Saddle Dam 3 As-Built Report	Report	GAL(January 2018)
Saddle Dam 4 As-Built Report	Report	GAL(January 2018)
Saddle Dam 5 As-Built Report	Report	GAL(January 2018)
Update as Required		

Table 1-6 Listing of Specifications for Tailings Storage Facility

Item (Prepared By)	Specification No. and Title	Revision No. and Title	Date of Revision
Golder	Specification-TSF Dike Construction	Doc. 795 Rev. 0	October 16, 2009
Golder	Central Dike Design Changes	Doc 1453 1312210034 TME Rev0	April 24, 2014
Golder	Detailed Design Report for Saddle Dams 3, 4 and 5	Doc 1504 1416081 SD3,4 & 5 Design Rev1	May 12, 2015
Update as Required			

Table 1-7 List of Construction Drawings for Embankment Structures

Drawing No. (Prepared by)	Title	Revision No.	Date of Revision
4100-30 to 4100-39 (Golder)	Tailings Storage Facility – Stormwater Dike	0	July 10, 2009
4100-50 to 4100-60 (Golder)	Tailings Storage Facility – Saddle Dam 1	0	July 10, 2009
SD2-SD3-01 to SD2-SD3-13 (Golder)	Tailings Storage Facility –Saddle Dam 2 and Saddle Dam 3	A	August 25, 2010
SD6-01 to SD6-11 (Golder)	Tailings Storage Facility – Saddle Dam 6	A	September 13, 2010
Figure 1—Supersedes Drawing Nos. 4100-30, 4100-31, and 4100-32 (Golder)	Agnico-Eagle Mines Limited, Meadowbank Gold Project Nunavut, Stormwater Dike Staged Layout Plan	N/A	August 5, 2009
Figure 2—Supersedes Drawing Nos. 4100-33, Detail 3 on 4100-34 (Golder)	Tailings Storage Facility Typical Cross-Section and Details	N/A	August 5, 2009
Figure 1—Supersedes Drawing Nos. 4100-51, 4100-52, 4100-53, and 4100-58 (Golder)	Tailings Storage Facility Saddle Dam 1 Rockfill Plan and Liner Details	N/A	August 17, 2009
All drawings in the Construction Report TSF (AEM)	Construction Report Tailings Storage Facility	N/A	June 15, 2013
All drawings in the Detailed Design Report for Saddle Dams 3, 4 and 5 Doc 1504 1416081 SD3,4 & 5 Design Rev1	Detailed Design Report for Saddle Dams 3, 4 and 5	N/A	May 12, 2015
Update as Required			

Table 1-8 List of Construction Drawings for Infrastructure and Piping

Drawing No. (Prepared by)	Title	Revision No. and Title	Date of Revision
All Booster Pump Design Drawings	Booster Pump Design Drawings, MEAD-360	N/A	June 26, 2012
Weekly Update Geotech Planning (AEM)	Weekly Geotech Update	Updated Weekly	N/A
Tailing deposition plan (AEM)	Waste Rock and Tailings Plan	Updated Annually	February 2018
All drawings in the Construction Summary Report North Cell Diversion Ditches (AEM)	Construction Summary Report North Cell Diversion Ditches	N/A	July 27, 2013
All South Cell Infrastructures Drawings (AEM)	Reclaim pump drawings 61-430 Pig launcher drawings 61-360 Central Dike Seepage drawings P1607151-1000-00	N/A	2016
Update as Required			

SECTION 2 • ROLES AND RESPONSIBILITIES

There are several AEM department teams involved in the operation, maintenance and surveillance of the TSF:

The Engineering Department has a team of people that:

- Plan and oversee the construction of the embankments of the TSF;
- Provides the overall management of the TSF;
- Oversees the design, development, construction and deposition activities of the TSF;
- Monitors the thermistor instrumentation of the TSF;
- Monitors quantity and manages the water of the TSF, including the perimeter water control structures;
- Planning the operation, maintenance and surveillance of the tailings distribution system;
- Conducts visual inspections of the TSF, including the perimeter water control structures;
- Monitors the water level elevations of the perimeter sumps and the embankment slope monitoring points; and
- Coordinates activities and ensure compliance with the regulatory requirements of the TSF.

The Energy and Infrastructures department has a team of people that:

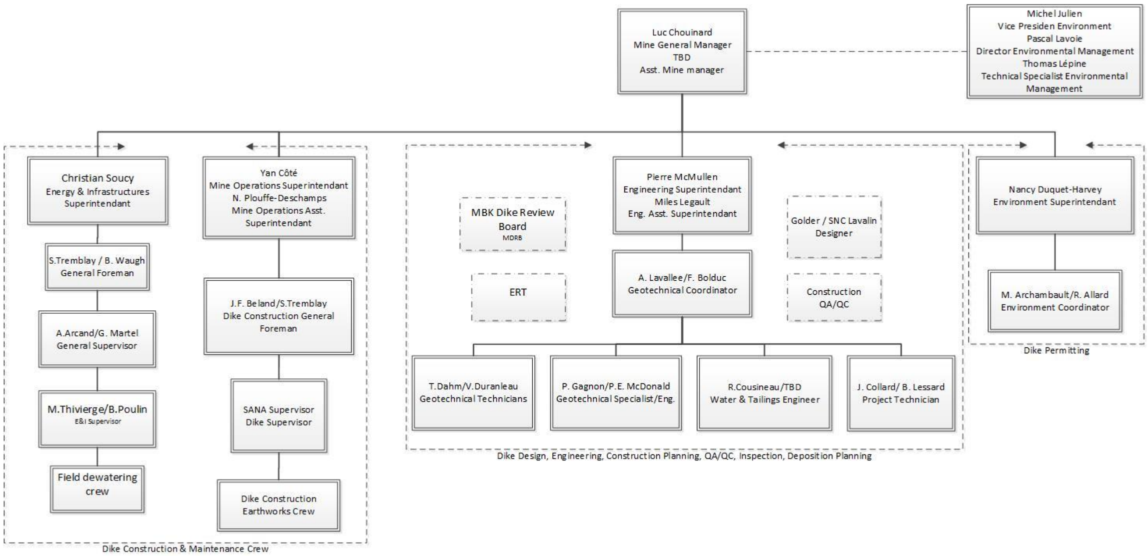
- Carry out the operation, maintenance and surveillance of the tailings distribution system;

The Environment Department has a team of people that:

- Monitors the water quality from the TSF ponds and related sumps; and
- Coordinates activities and ensure compliance with the regulatory requirements of the TSF.

The organizational chart of the current management team is shown on Figure 1. This chart shall be updated to reflect changes in management and/or changes in operational criteria in accordance with AEM's overall management and operational requirements.

Figure 1 AEM Tailings Storage Facility Management Structure



Note: To be updated as required

2.1 ROLES, RESPONSIBILITIES AND AUTHORITY

The roles and responsibilities for each AEM position and the authority during the operational cycle of the TSF are listed in Table 2-1. The roles and responsibilities of each position should be updated to reflect changes to the overall management structure.

All site personnel are responsible for informing their Superintendent of any indications of abnormal situations that may be observed.

2.2 REQUIRED LEVELS OF KNOWLEDGE

The recommended minimum levels of knowledge by the various positions are as summarized in Table 2-2. Training of personnel shall be carried out to ensure the minimum levels of knowledge set out in Table 2-2 are attained by all personnel and positions involved in the operation of the facility. AEM's training department, with support from relevant personnel, shall carry out all training. Training shall be logged and registered according to the department protocols.

Table 2-1 Roles and Responsibilities

Position	Role	Responsibility
General Mine Manager	Oversees mine development and planning, operations and permitting	Initiate and oversee emergency or contingency protocols during emergency events. Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual. Ensures that proper planning is carried out and that required resources are made available. Oversees and provides input in all matters arising in the operation and management of the mine including the TSF.
Engineering Superintendent /Geotechnical Coordinator/ Geotechnical Engineer/Specialist	Overall TSF management	Coordinates all TSF management related activities. Coordinates with Environmental Superintendent on environmental issues. Ensures Mining Association of Canada (MAC) compliance. Ensures Canadian Dam Association (CDA) compliance. Ensures monitoring is carried out in accordance with the TSF monitoring program, other applicable programs, approved protocols and frequency. Reviews existing and assess future monitoring requirements. Reviews construction designs and schedules. Reviews the QA/QC system to meet construction design. Reviews TSF operating and training manuals – assists in completion of manuals. Ensures documentation and records related to TSF development, construction and operations are kept and are up-to-date. Authorizes emergency work in the event of non-compliance or emergency operational requirements. Reports operational issues to the Mine Superintendent. Ensures all systems are properly maintained. Prepares TSF development, construction, QC and activity reports. Coordinates and reviews regular facility inspections by AEM staff.
E&I Supervisor	Oversees TSF maintenance	Maintains access to the TSF, road surface repairs, dust control and snow removal. In charge of piping installation and maintenance.
Dike Construction Supervisor	Oversees TSF development	Oversees and provides input in construction of the TSF matters. In charge of earthwork construction Supervises Contractor(s).
Environment Superintendent /Sr.	Oversees environmental data collection	Liaise with external stakeholders including NIRB, Nunavut Water Board and government agencies Assesses current and future monitoring requirements.

Position	Role	Responsibility
Coordinator	and processing	Reviews government permits and recommends monitoring for compliance. Oversees TSF water, collection pond and groundwater sampling in accordance with approved protocols. Interprets environmental (facility water quality) data Monitors compliance with water quality and quality from the TSF, and reports non-compliance events and/or trends to Operations Manager. Supervises Environmental Sr. Coordinators Indicates water quality sampling locations, sample collection protocols and analytical parameters in coordination with the Environmental Consultant. Senior TSF environmental oversight. Acts as AEM's contact for governmental oversight of TSF. Reports environmental issues to the General Manager and Operations Manager. Ensures with Engineering Superintendent TSF instrumentation data collection, processing and reporting. Reviews government permits and recommends monitoring for compliance. Assesses future monitoring requirements. Ensures compliance with regulatory requirements. Validates laboratory test results. Processes laboratory data and prepares summary reports. Ensures compliance with water management protocols.Supervises Environmental Technicians.
Geotechnical Engineering Consultant	TSF annual inspections	Provides construction-level design, reports, drawings and technical specifications. Provides deposition planning design and reporting. Communicates through Engineering Superintendent and Environment Superintendent. Performs regularly scheduled Third Party Inspections. Performs Special Inspections, as required. Reviews as-built and monitoring reporting. Reviews field quality assurance (QA) and quality control (QC) programs. Reviews geotechnical designs relative to actual field conditions.

Table 2-2 Recommended Minimum Knowledge of OMS Manual

Position	Recommended Minimum Knowledge
General Mine Manager / Assistant Mine Manager	Review of the OMS Manual with an understanding of the operational requirements. Detailed knowledge of emergency response procedures.
Mine Operations Superintendent	Basic knowledge of the OMS Manual, with an understanding of the design and operational requirements. Detailed knowledge of emergency response procedures.
Engineering Superintendent/ Geotechnical Coordinator/ Geotechnical Engineer/Speciali st	Detailed understanding of the OMS Manual, with a complete understanding of the design and operational requirements. Detailed and ongoing review of all monitoring, inspections and embankment safety reviews. Complete understanding of all related technical documents for design, operation, risk assessment and emergency response. Review of the operations manuals on an annual basis. Detailed knowledge of emergency response procedures.
Environment Superintendent	Detailed understanding of the OMS Manual, with an understanding of the design and operational requirements set out in this OMS Manual. Detailed understanding of all operational elements within the facility and their operational and maintenance requirements. Detailed knowledge of emergency preparedness and emergency response procedures.
Environmental Sr. Coordinator	Detailed understanding of the OMS Manual, with a complete understanding of the design and operational requirements. Detailed and ongoing review of all monitoring, inspections and embankment safety reviews. Complete understanding of all related technical documents for design, operation, risk assessment and emergency response. Review of the operations manuals on an annual basis. Detailed knowledge of emergency preparedness and emergency response procedures
Process Plant Superintendent	Basic knowledge of the OMS Manual, with an understanding of the design requirements. Detailed knowledge of emergency response procedures.
External Personnel (Consultants and Contractors)	Varied levels of knowledge and understanding depending on involvement. Detailed knowledge of emergency preparedness plan.

SECTION 3 • FACILITY DESCRIPTION

3.1 BACKGROUND

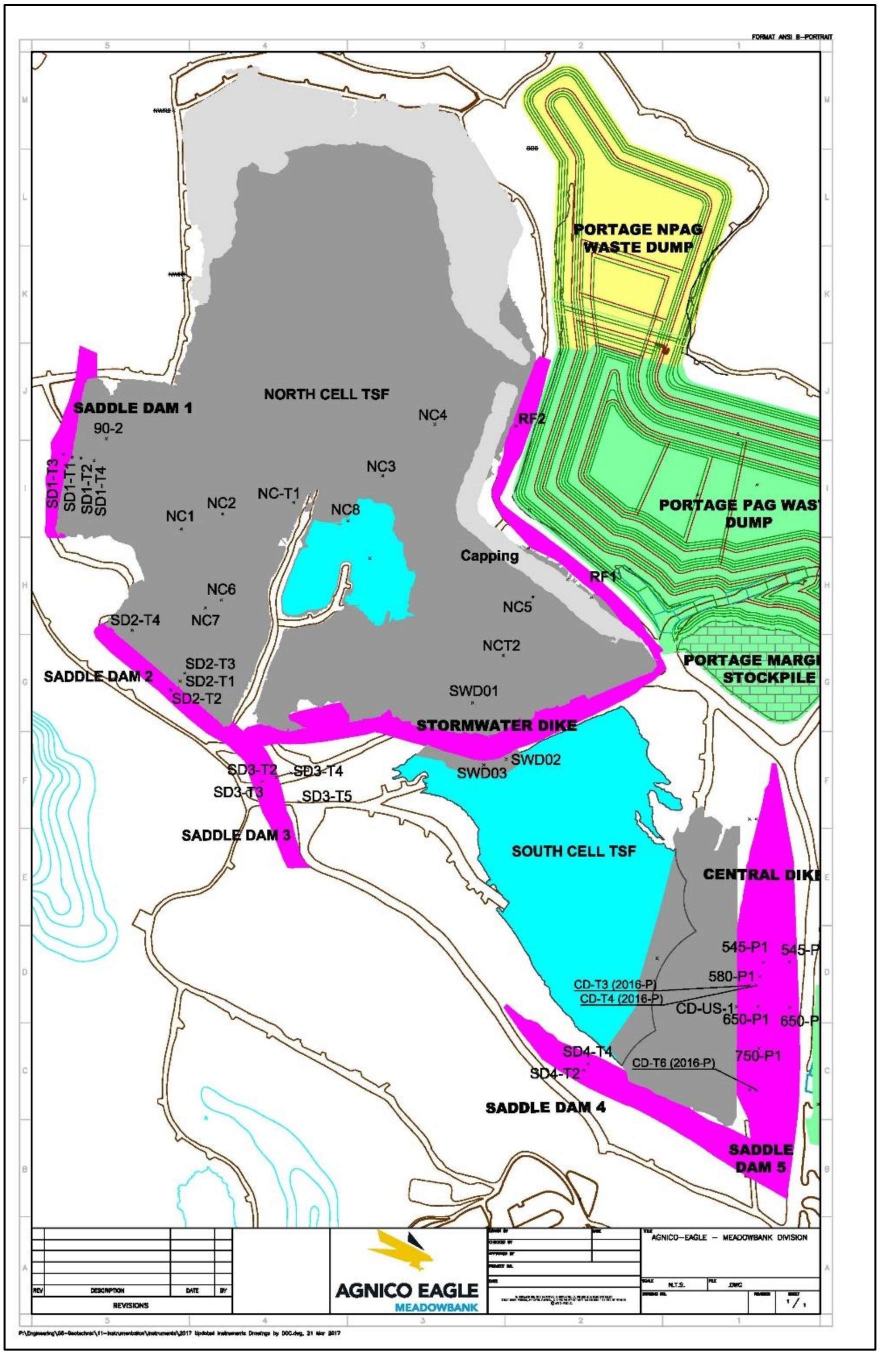
The TSF is the permanent surface storage facility for tailings produced during the operation of the mine. The TSF is located north of the Process Plant Site, as presented on Figure 2, and was developed in two cells in the following order:

1. North Cell; and
2. South Cell.

The main components of the TSF are:

- Perimeter containment structures (Saddle Dams 1 to 5, inclusive, rockfill structures RF1 & 2 and the Central Dike);
- Seepage and run-off perimeter water control structures;
- Internal deposition structure (Stormwater Dike);
- Deposition infrastructure;
- Dewatering infrastructure;
- Instrumentation; and
- Reclaim water system: supernatant pond and water treatment facility.

Figure 2 Plan of Tailings Storage Facilities



3.2 DESIGN AND OPERATIONAL CRITERIA

The main design and operational criteria for the TSF are summarized in Table 3-1.

3.3 FACILITY COMPONENTS

3.3.1 Perimeter Containment Structures

A series of containment structures comprising of Saddle Dam 1 (SD1), to SD5, inclusive, and the Central Dike form the perimeter of the TSF. These structures are shown on Figure 2.

3.3.2 Internal Deposition Structures

To facilitate deposition within the TSF, the Stormwater Dike (SWD) is located within the facility (refer to Figure 2). This structure divides the North Cell and the South Cell.

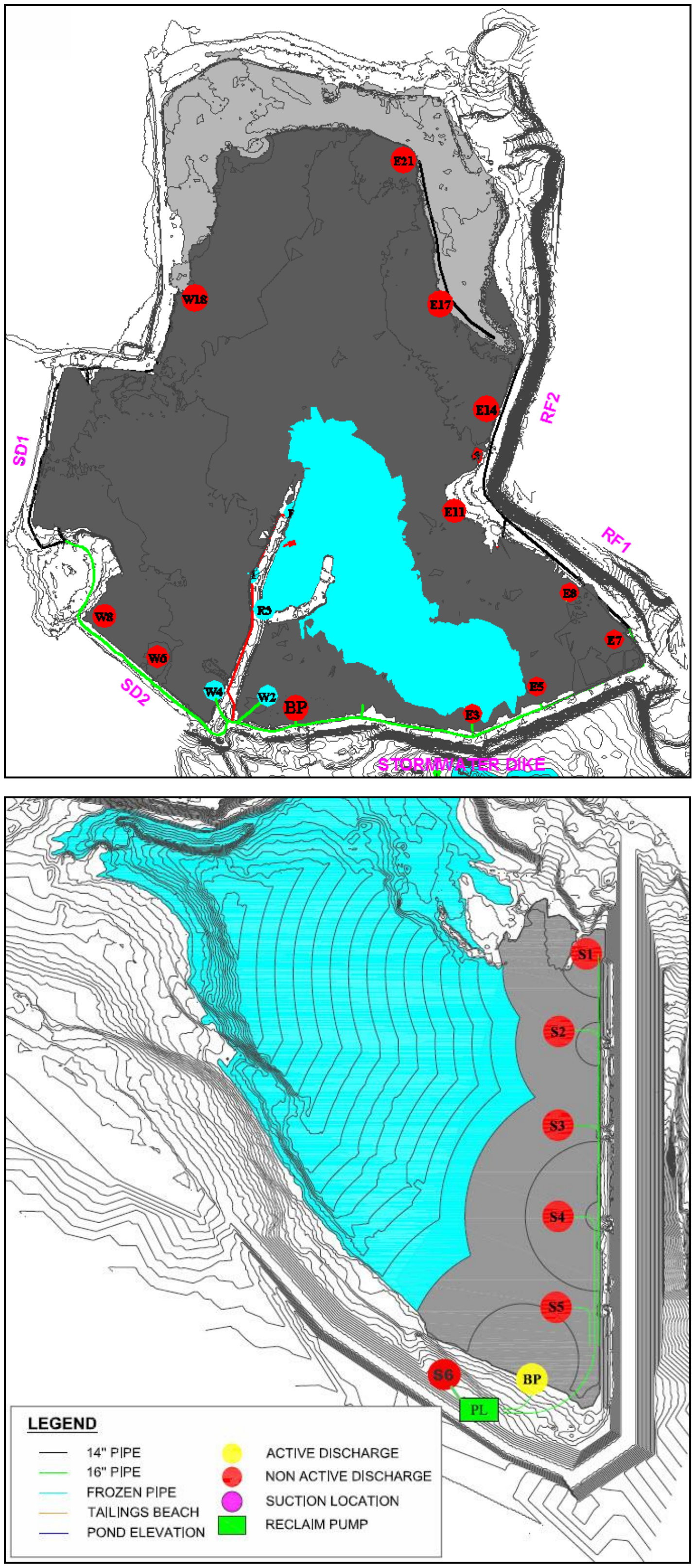
3.3.3 Perimeter Water Control Structures

The design objective of the perimeter water control structures, comprising of ditches and sumps, is to collect surface water runoff and seepage from the TSF for pumping back to the tailings facility. The purpose of controlling the runoff and seepage from the TSF is to prevent it from reporting to the downstream environment. The perimeter water control structures will be used throughout the operating life of the TSF. These will continue to be used into the post-closure of the project until both the TSF and adjacent ground returns to pre-development permafrost conditions or the surface runoff and seepage waters are of acceptable quality to be discharged directly to the environment.

3.4 TAILINGS DISTRIBUTION SYSTEM

The tailings distribution piping system for transporting slurry from the Process Plant to and for deposition into the TSF is presented on Figure 3. The tailings deposition in the North Cell (fig.3 top image) is not active since 2015.

Figure 3 Spigot Locations



3.5 WATER MANAGEMENT SYSTEM AND PIPING

Water is pumped from the supernatant pond to the Mill Plant for recirculation. Water collected from the non-contact perimeter ditches (diversion ditches) and sumps is generally directed to the TSF or pumped into the environment if the regulatory water quality limits are respected. Water collected from the Saddle Dams seepage collection systems are sent directly to the TSF.

3.6 FACILITY CLOSURE

A cover of non-acid generating waste rock will be placed over the TSF to promote drainage from the surface; no pond will be maintained within the facility. The tailings will begin freezing during operations and remain fully frozen into the post-closure period. Additional details are provided in the closure plan.

3.7 INSTRUMENTATION

The perimeter containment structures of the TSF are instrumented with geotechnical instrumentation and monitored during operations. Monitoring will continue during post-closure. Monitoring is performed to confirm performance of the structures relative to the design.

3.8 PUBLIC SAFETY

Public access to the mine site is restricted by security gates and on-site security upon exiting aircraft and vehicles.

Table 3-1 Design and Operational Criteria

Component	Item	Criteria	Source/Comment
Perimeter Containment Structure Design	Life of mine (LOM Budget2016_V00) Storage Capacity	24.1 Mm^3	Calculated by AEM
	Life of mine total ore	30.6Mt	AEM
	Life of Mine	8 years	AEM
	Canadian Dam Association hazard classification	High	CDA (2007)
	Seismicity for this site: Peak horizontal acceleration based factored 1 in 10,000 year event	0.04 g	Golder (2007)
	Stability: Minimum factor of safety for static load conditions	1.3	Golder (2007)
	Stability: Minimum factor of safety for pseudostatic load conditions	1.1	Golder (2007)
	Embankment crest width	10.0 m (nominal)	Refer to drawings
	Perimeter containment structure downstream side slope*:	1.5H:1V for rock fill	Refer to drawings
	Perimeter containment structure upstream side slope*:	3H:1V (2H:1V for part of Central Dike only)	Refer to drawings

Component	Item	Criteria	Source/Comment
	Interior embankments downstream side slope*:	1.5H:1V for rock fill	Refer to drawings
	Interior embankments upstream side slopes*:	3H:1V	Refer to drawings
Perimeter Water Control Structure Design	Design Event Storage Capacity: Temporary sumps : Perimeter sumps:	1:10 year freshet runoff event 1 :100 year freshet runoff event	Refer to drawings
	Ditch Gradient	Minimum 0.5%	Refer to drawings
Process Plant Rate	Nominal daily processing rate	8,440 tpd	AEM
Operation	Tailings discharge solids content	52%	AEM
Operation	Dry density planned in modelling	1.22 to 1.44 t/m^3	From measured data. Varies in function of exposed beaches length.
Operation	Deposition slope angle for slurry	SC: sub-aerial: 0.73% ; sub-aqueous: 2.95% NC: sub-aerial: 0.45% ; sub-aqueous: 2.36%	Assumed value pending survey.
Ice	Ice entrapment (by volume)	50% (30% pore water and 20% pure ice entrapment)	Assumed value pending field investigations.
Operation	Specific Gravity for tailings solids	1.6	AEM
Operation: Water Control Structures	Perimeter sump recommended Freeboard	Minimum 1.5 m	Refer to drawings
Operation: Water Control Structures	Design Pump Capacity	Sufficient to dewater a sump for the 1:100 design event in a 2 week period.	

*Note: *Fill placement to be in accordance with the relevant specification*.

SECTION 4 • OPERATIONS

Operation of the TSF requires the management of tailings deposition and storage using inputs from the deposition plan and management of water within the facility.

4.1 OPERATIONAL PHILOSOPHY

Tailings are pumped from the process plant and deposited in the TSF as slurry according to the deposition plan. The objectives of the deposition plan are to:

- Develop long tailings beaches upstream of the perimeter structures;
- Maintain the supernatant pond away from the upstream faces of the perimeter structures;
- Receive tailings from the process plant at all times;
- Limit ice entrapment within the deposited tailings; and
- Provide a flexible plan with the realization that the tailings will be variable in properties (e.g. solids content) and having a variable schedule depending on the processing schedule.

The North Cell diversion ditches intercept non-contact surface runoff to limit income of new fresh water in the TSF during operations. The West diversion ditch interception sump is used to stored water inflow and assesses water quality prior to discharge to the 3rd Portage. Any seepage water from the TSF will be collected in that sump until closure of the North Cell TSF.

4.2 DEPOSITION PLANNING CRITERIA AND CONSTRAINTS

The following constraints were identified as being desirable inputs into the deposition planning work:

- Limit switching between tailings deposition lines so to reduce line flushing requirements;
- Changing between deposition points on a given line will, in general, consist of stopping the flow of tailings in the line, redirecting it through a bypass, flushing the line with water for cleaning and the relocation of the deposition point followed by the reinstatement of tailings flow through the deposition line; and
- All pipelines should be flushed of tailings and fully dewatered prior to periods of non-use to reduce the likelihood of materials and/or water freezing within the pipelines.

Operating Criteria and constraints should be reviewed periodically and updated in the OMS Manual as required (Table 3-1).

4.3 WATER MANAGEMENT

The perimeter ditches will intercept and route non-contact runoff water away from the TSF to the environment and potential seepage from the TSF will be redirected to the collection sumps. The sumps will provide short-term storage prior to the pumping of the water to the tailing pond. A practical minimum level of water within the sump should be maintained during operations. The maximum operating water level for a given sump is 1.5 m below the sump rim. The diversion ditches redirect non-contact runoff water away from the TSF to the environment.

SECTION 5 • MAINTENANCE

Maintenance at the TSF is important for safe, continuous operation, and integrity of the facility.

The objectives of the maintenance program are to review and identify maintenance requirements, executing corrective measures and timely repairs of the containment structures, perimeter water control structures, facility access, and infrastructure.

5.1 CONTAINMENT STRUCTURES

Erosion of the rock fill embankments is not expected. However, it is expected that periodic maintenance and re-sloping especially following thawing at the start of each summer may be required at times during operations.

The SWD, as it is an internal structure, is tolerant to settlement. Maintenance during the summer is expected once the frozen materials thaw. Grading, reshaping and nominally compacting additional material should be expected.

The exposed liner should be inspected during the summer season. Repairs shall be done for any damage during that season.

5.2 DITCHES AND SUMPS

Flows may erode the ditches and/or sumps. Sediment, snow and/or ice may accumulate in the ditches and sumps and will require removal to maintain operational functionality and provide storage capacity. Removal of excessive material deposits from the ditches and sumps should be performed as required. The ditches and sumps will require routine monitoring for signs of deterioration and to address any cleaning and maintenance that is required.

Pumps located at the temporary and perimeter sumps will require maintenance based on Manufacturer's specifications and recommendations.

5.3 INSTRUMENTATION

The instrumentation of the TSF shall be maintained to enable collection of the data. Repair, replacement and installation of additional instrumentation should be expected during the development of the TSF.

5.4 PIPELINES AND PUMPS

Maintenance on pumps and tailing pipes should be performed during Mill Plan scheduled shut-down periods or when they are not in operation. General inspection of the pipes should be performed on a regular basis. The heat tracing of the tailings distribution and dewatering pipelines will require maintenance. After each change of deposition point, the pipeline is cleaned and drained with a pig. The pipes are inspected after the cleaning. During winter time, pipe ends are wrapped into a membrane to avoid any snow blockage.

SECTION 6 • SURVEILLANCE

The principal objective of the TSF surveillance program is to identify conditions that would compromise the integrity of the facility well in advance of problems occurring and adjusting the design and/or operation to reduce risk. The TSF surveillance program focuses on four areas of interest:

1. Stability and deformation of the perimeter containment structures;
2. The thermal conditions beneath and within the TSF;
3. The quantity and quality of seepage from the TSF; and
4. Material movement and placement (locations and quantities of all material types being deposited, disposed and placed) in the TSF.

Table 6-1 (see Section 6.2) was developed to determine the items which will be monitored, the monitoring frequency and the responsible party. The items should be monitored at a frequency such that project commitments and/or requirements are satisfied and such that trends may be developed for optimization of the operation of the TSF. Table 6-1 should be reviewed and updated as required while maintaining the project commitments.

6.1 INSPECTIONS

A series of regularly scheduled inspections is required to ensure that the TSF facility is performing as intended and to identify problems and issues so that necessary corrective actions may be implemented in a timely manner. Surveillance tasks include visual inspections, monitoring of instrumentation and water levels and preparation of written and photographic documentation.

The main types of inspections are as follows:

- Routine inspections – performed on a weekly basis by AEM geotechnical team;
- Monthly visual inspection – performed by AEM geotechnical team;
- Engineering Inspection – performed annually by a Geotechnical Engineering Consultant familiar with the design and operation of the facility to verify that the facilities are functioning as intended
- Dam Safety Review – carried out by the dike review board of independent engineers every year to review all aspects of the design, construction, operation, maintenance, processes and other systems affecting the dam’s safety, including the dam safety management system. The review defines and encompasses all components of the “dam system” under evaluation including the dam, foundations, abutments and seepage collection works.

Table 6-1 Surveillance Items and Frequencies

Party Responsible	Required Inspection, Review or Monitoring	Required Frequency
Engineering Superintendent and Geotechnical Coordinator/ Geotechnical Engineer/Specialist and/or support personnel; Environment Superintendent and/or support personnel;	Routine Inspection of TSF Dikes, seepage collection system, and access.	Weekly or monthly and immediately following blasting, large blasts occurring in close proximity to the structures, earthquakes, high intensity rainfall events and other extreme events
	Monitoring of instrumentation (thermistor strings, vibrating wire piezometers, survey prisms, pump rates)	Varies – see Section 6.2
Engineering Superintendent and/or Geotechnical Engineer/Specialist and/or designated qualified personnel	Monthly Visual Inspection of TSF Dikes, seepage collection system, and access.	Monthly and immediately following large blasts occurring in close proximity to the dikes, earthquakes, high intensity rainfall events and other extreme events
Qualified Engineer	Engineering inspection of the TSF Dikes, drainage works, access and instrumentation.	Annually
Independent Engineer (Meadowbank Dike Review Board – MDRB)	Dam Safety Review	Annually

6.1.1 Routine Inspections and Monthly Visual Inspections

Routine Inspections are part of the duties and responsibilities of the Engineering Superintendent, Geotechnical Engineer/Specialist and/or their support personnel and the Environment Superintendent and/or support personnel and must only be carried out by designated and qualified personnel. Ideally the inspections should be carried out by the same individual or small group in order to maintain continuity in the observations. The main operational and structural parameters should be reviewed and verified by the Engineering Superintendent, Geotechnical Engineer/Specialist and the Environment Superintendent.

Routine Inspections are carried out by the geotechnical technicians as they perform their data readings and other duties on the dewatering dikes. Technicians are trained to watch for changes in the condition of the TSF dikes, and report anything out of the ordinary to the geotechnical engineers/Specialists so it can be investigated further. Technicians look for any signs of damage to the dikes and monitor seepage conditions.

Once a month, a formal visual inspection will be performed and documented on each TSF Dike (see Appendix I). The report is reviewed by the Geotechnical Eng. /Spec. and stored in a suitable location for easy accessibility and long-term record keeping.

Routine Inspections are also carried out on a bi-weekly basis by the geotechnical engineers/specialist. These inspections will also occur if an inspection carried out by the geotechnical technician discovers anything that needs to be investigated further.

Inspections of the TSF perimeter containment structures and water control structures are to be conducted and documented. Inspection forms used to conduct and document these inspections are included in Appendix I.

The following is a list of general information which should be recorded during each inspection:

❖ Water Control Structures (by Engineering department):

- Sump water elevation (staff gauge readings) noted and reviewed to ensure normal freeboard;
- General dewatering pipeline condition, signs of leaks or abnormal conditions; and
- Depth of flow in ditches, inspection of ditches and downstream berm condition, signs of potential seepage.

❖ Perimeter Containment Structures (by Engineering department):

- Inspection of the general condition of interior and perimeter embankment crest, toe, and slopes, looking for: settlement, erosion, seepage, cracking, liner deterioration, animal burrows or other abnormal conditions;
- Description and status of embankment construction activities; and
- Inspection of embankment slopes for any signs of instability.

❖ Tailings Distribution System (by Engineering department and Energy and Infrastructure Supervisor):

- General pipeline condition, signs of leaks or abnormal conditions;
- Deposition location point and beach elevation relative to spigot elevation;
- Length of beach; and
- Pipeline flow, slurry density, pipeline pressure.

Table 6.2 present the routine inspection frequency and responsible for each of the TSF structures. The inspection frequency presented in this table assumed that the dikes are in a stable condition (green level of the Trigger Action Response Plan - TARP) with the exception of Central Dike and Stormwater Dike which are at the yellow level of the TARP. If unfavorable condition would be observed and the TARP level would increase, the inspection frequency would be revised accordingly.

Table 6-2 Routine Inspection frequency and responsible per structure

Structure	**Routine Inspection frequency**	**Inspection officer**	**Visual Inspection Documentation frequency**
Central Dike	Weekly	Geotechnical Technician	Monthly and include review of instrumentation data
	Bi-Weekly	Water & Tailings Eng.	

Structure	Routine Inspection frequency	Inspection officer	Visual Inspection Documentation frequency
Stormwater Dike	Weekly	Geotechnical Technician	Monthly and include review of interpreted data
	Bi-Weekly	Water & Tailings Eng.	
SD 1, SD 2, RF-1, RF-2	Monthly	Geotechnical Technician	Monthly
	Monthly	Water & Tailings Eng.	
SD3, SD4, SD5	Weekly	Geotechnical Technician	Monthly
	Bi-Weekly	Water & Tailings Eng.	Monthly
Tailings distribution system	Monthly	Water & Tailings Eng. E&I Supervisor	Monthly

The completed Perimeter Containment Structures and Water Control Structures inspection forms are stored in an electronic data base system for the TSF. Hard copies of the inspection forms are catalogued and stored on site.

6.1.2 Engineering Inspection

Engineering inspections shall be carried out anually by a qualified Geotechnical Engineering Consultant who is familiar with the design and on-going operation of the TSF. During this inspection, the following tailings management structures will be visited:

- Central Dike;
- Stormwater Dike;
- Saddle Dams 1 to 5;
- RF-1 & 2;
- West Diversion ditches; and
- the perimeter roads around the North Cell.

The objective of the inspections is to carry out a detailed review of the conditions of the facilities and facility operation during the spring freshet and prior to freeze up.

The Geotechnical Engineering Consultant issues an inspection report to AEM containing observations and recommendations. This report provides information to be used to revise the operation, maintenance and surveillance programs as necessary and to assist in planning for future operation of the facility.

6.1.3 Dam Safety Review

A dike review board of independent engineers should carry out a dam safety review of the TSF and associated facilities annually or after:

- Major modifications to the design or design criteria;
- Discovery of unusual conditions that can endanger the dikes;
- After extreme hydrological or seismic events;

The high consequence failure rating based on the Dam Safety Guidelines (CDA, 2007) suggests a review every seven years. Instead, AEM - Meadowbank committed to annual review. The review shall be carried out according to the recommendations laid out in the Dam Safety Guidelines (CDA, 2007).

This review will include, but is not be limited to:

- Review of the dikes classification;
- Site inspection;
- Review of design and construction records;
- Review of monitoring practices and the instrumentation records
- Update of the stability assessment based on the results of the instrumentation readings obtained to that time, construction records and site observations;
- Assessment of the operation of the facilities;

6.2 **INSTRUMENTATION AND SURVEY**

Instrumentation is installed to monitor the stability and deformation of the perimeter containment structures, ground temperature, seepage, water quality and to monitor operational performance. Instrumentation is to be maintained, replaced, added, extended and relocated during the development of the TSF; therefore this section should be updated regularly. The current instrumentation locations are shown on Figure 4. Current instrumentation for the TSF includes thermistors. Piezometers are installed at Central Dike and Stormwater Dike. Survey of the water and tailing elevation are also taken at different locations in the TSF.

The instrumentation and survey levels are to be read and recorded at the frequencies shown in Table 6-3.

The instrumentation data is reviewed every week by the Geotechnical Technician and every two week by the Water & Tailings Engineer. The frequency of monitoring will depend, to some degree, on preceding data and on the state of operation. Thus the data is reviewed regularly and the Engineering Superintendent may change the program and amend the OMS Manual as necessary.

The instrumentation is to be monitored by the responsible party and at the frequency shown on Table 6-3 and at any other periods of extended rainfall or run-off. Immediate readings of all instrumentation shall be carried out following a significant seismic or climatic event.

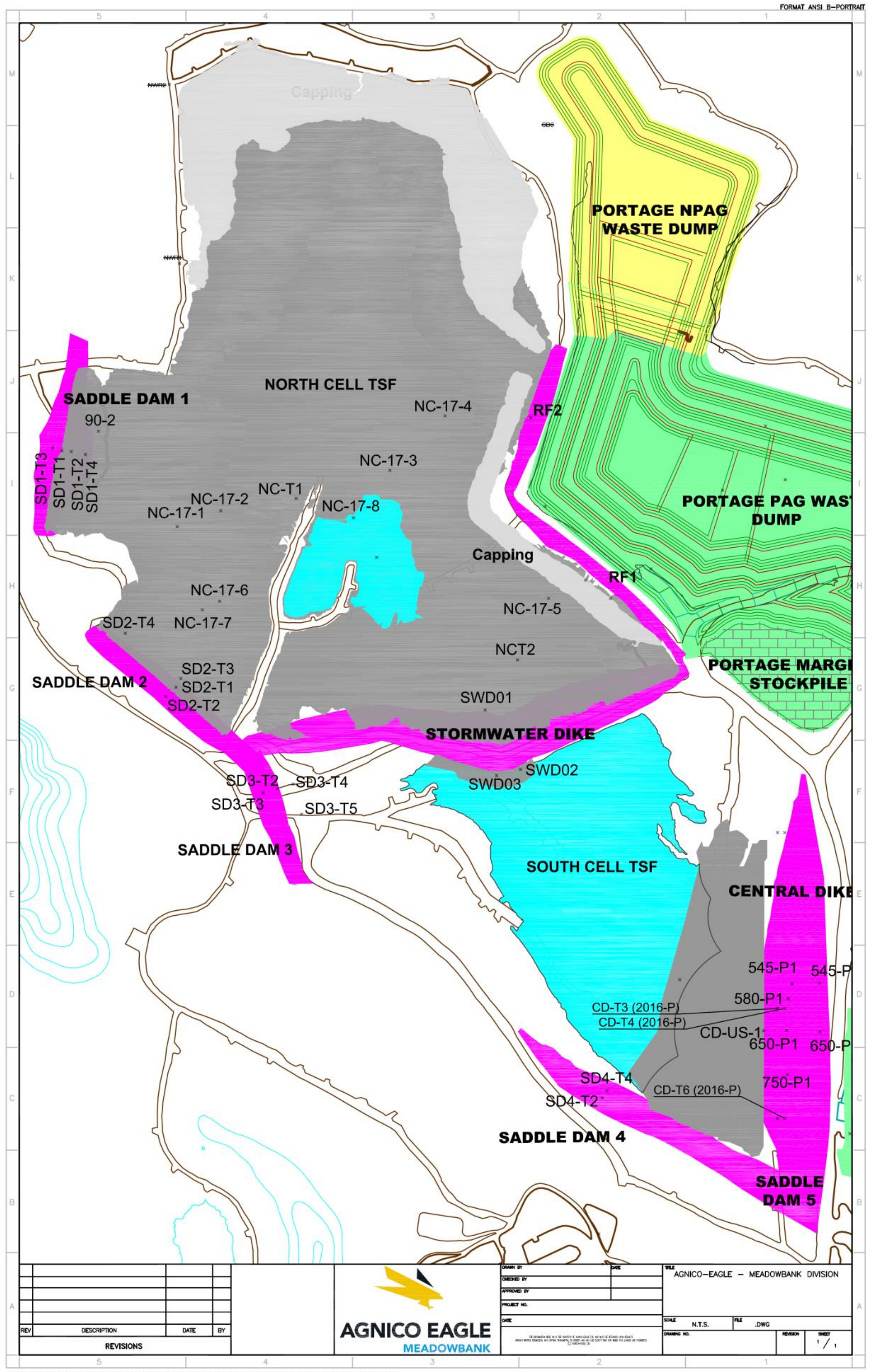
The instrumentation data shall be analyzed and summarized by the engineering and environmental departments. The instrumentation readings are to be reviewed by the Geotechnical Engineering Consultant performing the third party inspection.

The equipment for monitoring is maintained by designated Engineering personnel. Data analysis, review and correction are carried out by the Engineering personnel and reported to the Engineering Superintendent.

Table 6-3 Surveillance Items and Frequencies

Instrumentation	***Monitored By***	***Reported To***	***Frequency***
Thermistors and Piezometers	• Manually by Engineering and Environment Personnel	Engineering and Environment Superintendent Geotechnical Coordinator	Weekly
Survey Monuments and Prisms	• Manually by Engineering Personnel	Engineering and Environment Superintendent Geotechnical Coordinator	Weekly in summer and bi-weekly in winter
Water level survey	• Manually by Engineering Personnel	Engineering and Environment Superintendent Geotechnical Coordinator	Daily during freshet; and Monthly during non-freshet period

Figure 4 Approximate Location of Current Instrumentation



Thermistors have been installed in the area of the TSF to measure ground temperatures. Piezometers have been installed at Central Dike and Stormwater Dike to measure the piezometric level in the ground. Prisms are present on the crest of Stormwater Dike. Additional thermistors and piezometers will be installed in the future during operations and closure.

Maintenance and calibration of the instruments and extensions should be carried out according the Manufacturer's recommendations.

6.2.1.1 Thermistors

Data presentation for the thermistors should include:

- temperature vs. time plots (presenting all thermistor beads on each string); and
- temperature vs. depth plots over time.

The plots should indicate the thermistor string reference number and dates of the measurements. Additionally the plots should also indicate air temperature and, if relevant, lithology and both elevations and depths.

6.2.1.2 Survey Monuments and Prisms

All survey work must be carried out to a minimum precision of 3 mm.

Data presentation for the survey monuments should include:

- total net movement plots (to present total displacement);
- vertical displacement plots; and
- lateral displacement plots parallel and perpendicular to the dike axis.

The plots should indicate the survey monument number, what is considered positive and negative movement (for example, downstream/upstream, heave/settlement) and the dates of the measurements.

6.2.1.3 Vibrating Wire Piezometers

Data presentation for the vibrating wire piezometers should include:

- plots of total head as elevation versus time; and
- plots of temperature versus time for piezometers.

The plots should indicate the vibrating wire piezometers number and dates of the measurements. Additionally the plots should also indicate upstream lake elevation or ice level and, if relevant, lithology and both elevations (referred to the mine datum) and depths.

6.2.2 Anomalous Measurements

Anomalous instrumentation data includes the following:

- Thermistors:

  - Increase or decrease in measurements (over two or more readings) that cannot be explained by seasonal temperature variations or instrument malfunction.

- Piezometers:
  - Sudden increase or decrease in measurements (over two or more readings) that cannot be explained by normal variation of the piezometric level or instrument malfunction.

- Survey Monuments and prisms :
  - Accelerating displacement rate of the survey monuments

    (x, y, z directions) (over two or more readings);

If anomalous readings are observed, the following actions should be taken:

1. Inspect the embankment where possible and appropriate;
2. Check data, reductions and calculations for accuracy and correctness;
3. Re-read to verify the reading;
4. Check readout equipment to verify that it is functioning correctly;
5. Verify calibration;
6. If instrument has stopped functioning, notify the Engineering Superintendent and Geotechnical Coordinator immediately. If considered applicable, a replacement instrument should be installed;
7. If the anomalous reading is confirmed, a detailed review of the effects of the reading should be carried out based on the specific inspection and design or remedial actions should be implemented if determined necessary by the Engineering Superintendent and Geotechnical Coordinator; and
8. Increase monitoring frequency to assess progression of anomaly.

6.2.3 Seepage Monitoring

The seepage monitoring performed for the TSF comprises of visual inspections of the perimeter water control structures, the quantity tracking of water pumped to and from the TSF, rate of seepage and water quality of seepage through the embankment, and testing water samples collected from the perimeter sumps.

Visual inspections should document sediment, ice and snow deposits in the ditches and sumps.

Anomalous measurements of the seepage may occur and include the following:

- Increase or decrease in pump rates that are inconsistent with rainfall or runoff events or predictive models;
- Sediments present in the seepage water; and
- Changes in seepage location, flow and quality.

If anomalous readings are observed, the following actions should be taken:

1. Inspect the water control structure area;
2. Check data, reductions, and calculations for accuracy and correctness;
3. Re-read;
4. Check readout equipment to verify that it is functioning correctly;
5. Verify calibration;
6. If the anomalous seepage measurement is confirmed, a detailed review of the effects of the increased seepage should be carried out based on the specific inspection and design or remedial actions should be implemented if determined necessary by the Engineering Superintendent and Geotechnical Coordinator;
7. Manage the seepage properly by collecting it, then pumping the seepage and sending it to a treatment facility, treating it if necessary, then finally discharging the seepage through a final discharge point; and
8. Increase monitoring frequency to assess progression of anomaly.

6.2.4 Documentation of Instrumentation Data

The instrumentation data is reviewed on a weekly and bi-weekly basis by the geotechnical team. Instrumentation data for each TSF dikes is compiled, analyzed and documented into a single Instrumentation Report emitted quarterly. The instrumentation data for structure with a yellow TARP level are also included in the visual inspection report. The instrumentation report is created by the Geotechnical Technician, reviewed by the Geotechnical Eng./Spec. and stored in a suitable location on the network for easy accessibility and long-term record keeping. The Report is distributed to all TSF stakeholders and selected members of the Corporate office.

6.3 WATER QUALITY

The quality of water collected in the TSF ponds and associated sumps and sampled from the water sampling locations is to be monitored. The monitoring plan summarize water quality and water flow monitoring to be conducted for the Meadowbank gold project, according to the Water License 2AM-MEA1525 requirements .

SECTION 7 • REPORTING AND DATA MANAGEMENT

7.1 REPORTING

7.1.1 Inspection Documents

All inspection documents and reviews shall be submitted to the Engineering Superintendent and the Geotechnical Coordinator and accessible to all in the local network.

7.1.2 Instrumentation Measurements and Water Quality Results

Instrumentation measurements and water quality results collected shall be reported to the Engineering Superintendent and the Geotechnical Coordinator. Pumping rates during operation shall be reported to the Engineering Superintendent and the Geotechnical Coordinator.

7.1.3 Emergencies

All documents regarding instrumentation and inspection during an emergency situation and prior to the emergency shall be made available to all parties involved including the General Manager, Assistant General Manager, Environment Superintendent, Engineering Superintendent, Geotechnical Coordinator, Process Plant Superintendent, Mine Operations Superintendent, Maintenance Superintendent, and the Geotechnical Engineering Consultant.

7.2 DATA MANAGEMENT

All surveillance records including visual embankment inspections, instrumentation measurements, flow, and water quality results shall be stored in an electronic library or database system which is easily accessible to staff involved with the TSF. Examples of surveillance data stored, but not limited to, are:

- Visual inspection reports,
- Engineering inspection
- Dam safety review
- Water quality testing results
- Quarterly instrumentation report

SECTION 8 • EMERGENCY PREPAREDNESS PLAN

The Dam Safety Guidelines prepared by the Canadian Dam Association (2007) states that “A dam which does not impose an unacceptable risk to people or property, and which meets safety criteria that are acceptable to the government, the engineering profession and the public is a safe dam”.

This guiding principle has been taken into account for the design of the TSF embankments and the emergency procedures.

The TSF perimeter containment structures are classified as a “High Consequence of Failure” (CDA 2007) as discussed in Section 1.4.

To respond to possible hazards and emergencies involving the TSF, emergency response plans have been designed. This section provides a summary of the actions, triggers and measures in the event of an emergency.

In case of an emergency, the documents listed in Table 9-1 shall be used and implemented. The Emergency Response Plan (ERP) shall also be referenced. Dike failure scenarios are presented in Appendix II of this OMS. A specific emergency response plan pertaining to Central Dike is presented in Appendix II.

8.1 EMERGENCY PROCEDURES

The purpose of the Emergency Preparedness Plan (EPP) is to present a basic procedure for responding to potential failure mechanisms. The procedure identifies various measurable or observable effects or causes of the failure mechanisms and identifies the appropriate people to notify. Potential failure mechanisms are summarized in Table 9-2 with potential measurable and observable causes and effects.

8.1.1 Operation

Table 9-3 and 9-4 summarizes the triggers for implementing the EPP with respect to the potential measurable and observable effects or causes of the various failure mechanisms during operations.

Table 9-5 indicates the chain of communication to follow so persons in charge are notified for different states of emergency.

Table 9-6 indicates the responsibilities of persons for each emergency level in terms of who performs the decision making, mobilization, and action to be taken.

Table 9-7 indicates the names and contact numbers of the persons in charge during an emergency event.

8.2 **EMERGENCY DETAILS**

In the unlikely event of a catastrophic dike breach that could endanger workers the Code 1 procedure described in Section 8.2.4 would be followed to warn all workers of the situation. Then an evacuation of the affected areas and pits would be carried out and directed by the ERT Team in person and over the emergency channel. In the event of an embankment failure, the following information should be used during the emergency response:

Project Name:	Meadowbank Gold Project
Perimeter Containment Structure Names:	SD1, SD2, SD3, SD4, SD5, Central Dike
Owner's Name:	Agnico Eagle Mines Limited (867) 793-4610
Site Location:	Latitude: 65°01'07''N Longitude: 96°04'26''W

8.2.1 Access to the Project Site

- 80 km north of the Hamlet of Baker Lake;
- Site accessible by all-weather private road from Baker Lake; and
- Site accessible by aircraft and helicopter.

	Name	**Phone Number**
Local Charter Company:	Calm Air International Ltd.	Baker Lake : (867) 793-2873
Local Helicopter Company:	Kitikmeot Helicopters Ltd	(867) 983-2544
Charter Aircraft Company:	Nolinor Aviation	(450) 476-0018

8.2.2 Emergency Assessment

In case of an event, emergency assessment will be done first by AEM Geotechnical Engineering personnel and the Engineering Superintendent on site. Assessment will be done according the criteria stated in the Table 9-2, 9-3 and 9-4.

8.2.3 Emergency Communication and Actions

In case of an event, after the emergency assessment, the persons involved in the emergency response team need to be notified following the chain of command stated in Table 9-5. Contact details of each person are available in Table 9-7.

According to the nature of the event, a decision and action plan will be taken by the persons notified. The action plan will be defined according to the level of emergency and the cause of the event. The immediate action plan will be taken with material and equipment available on site, as listed in Section 8.4.

8.2.4 Site Emergency Procedure

As specified in the Emergency Response Plan, Ver.12, Section 4:

In the event of an immediate emergency that is or could impact persons or equipment, the employee will have to follow our emergency procedure:

- Emergency is initiated - by calling **6911** on desk type phones, or calling on two-way radio on **"Working Channel" – Code 1 – Code 1 – Code 1.**
- All communication stops except for those involved with the Emergency – i.e.: First Aid Room attendants, Medics, ERT as required.
- All work stops in First Aid Room / Clinic – and in affected area – depending on seriousness of Emergency – the whole site.
- First Aid Room Attendant / Medic will answer the phone and/or radio.

  Note: if the First Aid Room Attendant / Medic do not answer, then Security Guard will answer and/or a Supervisor on radio will answer so that Emergency Response can be initiated.
- **Responder –** will ask where the medic is required.
- **Caller –** will give a brief description of the Emergency – name, location and what is wrong and/or required.
- **Responder –** will confirm location and details of incident and activate the **ERT** team. Security will be notified by responder and a page will be sent out to all **ERT** team members on site. (All **ERT** team members on site now carry pagers).
- The person at the casualty(s) will administer First Aid if trained to do so.
- Incident Commander Center will be immobilized as to ensure that communications, transportation, and effective deployment of **ERT** resources are conducted. It is mandatory that the Official In-Charge be notified immediately.
  - Transportation will be arranged to meet at the **ERT** hall by the two large doors for medical gear and **ERT** team members.

The **ERT** team (minimum of 6 team members) will assemble as quickly as possible. (Expectation – when the pager goes off – all **ERT** team members will make their way expediently to the **ERT** hall).

8.2.5 Communication Equipment Location

Communication equipment can be found at the following locations:

- Phone land lines are located in the main office;
- Base station radios are located in the main office;
- Drills will have either base station radios or handhelds—depending on their distance from camp and will have satellite phones available; and

- Emergency Communication Plans (including emergency contact numbers) are located adjacent to all phones and radios and in each drill.

8.3 MEDICAL AND FIRST AID SERVICES

In case of injury the medic and First Aid station are located in the Service Building. The nearest hospital is located in Baker Lake.

Health Center:	Baker Lake Health Center	*Phone #:*	(867) 793-2816 (867) 793-2817

8.4 ON SITE EQUIPMENT AND MATERIAL

8.4.1 Pumping Equipment

The following is a list of onsite pumping equipment available for use during an emergency event:

Unit Number	Description	Model
61PWA01	Dewatering pump #1	Godwin model HL250M
61PWA02	Dewatering pump #2	Godwin model HL250M
61PWA03	Dewatering pump #3	Godwin model HL250M
61PWA04	Dewatering pump #4	Godwin model HL250M
61PWA05	Dewatering pump #5	Godwin model HL250M
61PWA06	Dewatering pump #6	Godwin model HL250M
61PWA07	Pit Dewatering pump #7	Godwin model CD80M
61PWA08	Pit Dewatering pump #8	Godwin model CD80M
61PWA09	Dike Dewatering pump #9	Godwin model CD100M
61PWA10	Dike Dewatering pump #10	Godwin model CD103M
61PWA11	Dike Dewatering pump #11	Godwin model CD103M
61PWA12	Dike Dewatering pump #12	Godwin model CD103M
61PWA13	Pit Dewatering pump #13	Godwin model HL5MS
61PWA14	Pit Dewatering pump #14	Godwin model HL5MS
61PWA15	Bay-Goose Seepage electric dewatering pump #9	Godwin model CD103M
61PWA16	Bay-Goose Seepage electric dewatering pump #10	Godwin model CD103M
61PWA17	Bay-Goose Seepage electric dewatering pump #11	Godwin model CD103M
61PWA18	Bay-Goose Seepage electric dewatering pump #12	Godwin model CD103M

Note: To be updated as required

8.4.2 Mobile Equipment

The following are lists of onsite mobile equipment of AEM and SANA available for use during an emergency event:

Bouteur	
Cat D8T	438
Cat D8T	443

Excavatrice	
Cat Bac 345	11-0301
Cat Bac 345	12-0303
Cat Bac 345 DLS	13-0301
Komatsu PC 1250	11-0303
Komastu PC 1250	15-0303
Cat Bac 365 C	12-0305
Komatsu PC 450	16-0304
Komatsu PC 450	17-0301
Komatsu PC 450	17-0302
Chargeur	
Cat Loader 906	10-0202
Cat Loader 980H	268
Cat Loader 980CR	10-0201
Komatsu Loader WA500	278
Komatsu Loader WA500	17-0201
Komatsu Loader WA500	17-0202
Komatsu Loader WA600	11-0201
Komatsu Loader WA600	13-0201

Camion 50T	
Cat HTR 773F	1516
Cat HTR 773F	1517
Cat HTR 773F	1518
Cat HTR 773F	1519
Cat HTR 773F	1520
Cat HTR 773F	1535
Cat HTR 773F	1536
Komatsu HD605	16-1001
Komatsu HD605	16-1002
Komatsu HD605	16-1003
Komatsu HD605	16-1004

Camion 40T	
Cat 740	17-1001
Cat 740	17-1002

Véhicule Lourd	
Fuel Truck	11-0121
Fuel Truck	1228
Fardier Mack	1166
Camion à Eau	1231
Camion à Eau	10-0106
Autobus Blue Bird	1760
Autobus	17-0105
Autobus	17-0106
Camion Lumières	1244
Autobus Blanche	15-0101
Fardier Kenworth	1220
Sableur	1217
Grader 14 M Cat	513
Grader 16 H Cat	17-0501
6X6	16-5119
Tramac	9922

Compacteur	
Compacteur Hamm	744
Compacteur Cat	11-1101

Tour D'éclairage	
Magnum	10-5603
Magnum	10-5605
Magnum	11-5602
Magnum	11-5603
Magnum	12-5601
Magnum	12-5602
Magnum	12-5603
Magnum	12-5604
Magnum	12-5605
Magnum	12-5606
Allmand	15-5613
Allmand	15-5615
Allmand	17-5601
Allmand	17-5602
Allmand	17-5603
Allmand	17-5604
Allmand	17-5605
Allmand	17-5606
Allmand	17-5607
Allmand	17-5608
Allmand	17-5609
Allmand	17-5610

Foreuse	
Novamac TCG 03	10-0901
Novamac TCG 04	10-0902
Novamac TCG 05	9928
Tamrock	9932
Tamrock	996

Generatrice	
Generatrice	G - 19
Generatrice	G - 214
Generatrice	G - 229
Generatrice	G - 241
Generatrice	G - 250
Generatrice	G - 257
Generatrice	10-5502
Generatrice	10-5501
Generatrice	15-5501
Generatrice	15-5502
Generatrice	16-5501
Generatrice	16-5502

Zoom-Boom	
Zoom-Boom	1773
Zoom-Boom TH255	1779
Zoom-Boom JCB	16-1202
Scissor Lift	16-7101

Garage	
Soudeuse	S-01
Soudeuse	S-02
Soudeuse	S-03
Soudeuse	S-04
Soudeuse	S-05
Soudeuse	S-06
Soudeuse	10-7603
Soudeuse	13-7601
Soudeuse	16-7601
Soudeuse	16-7604

Concasseur	
Jaw crusher	7004
Cone crusher/screen	7005
Convoyeur	7006

Camionnette	
Dodge Ram 2500	1743
Dodge Ram 2500	1744
Dodge Ram 2500	1765
Dodge Ram 2500	1767
Dodge Ram 2500	1769
Dodge Ram 2500	1772
Dodge Ram 2500	10-0004
Dodge Ram 2500	10-0005
Dodge Ram 2500	10-0006
Dodge Ram 2500	10-0007
Dodge Ram 2500	10-0008
Dodge Ram 2500	10-0010
Dodge Ram 2500	10-0016
Dodge Ram 2500	11-0014
Dodge Ram 2500	11-0022
Dodge Ram 3500	12-0014
Dodge Ram 3500	12-0015
Dodge Ram 2500	12-0016
Dodge Ram 2500	12-0017
Dodge Ram 2500	16-0006
Dodge Ram 2500	16-0007
Dodge Ram 2500	16-0008
Dodge Ram 2500	16-0009
Ram 2500 Promaster	16-0010
Ford F350	17-0001
Dodge Ram 2500	17-0005
Dodge Ram 2500	17-0006
Dodge Ram 2500	17-0007
Dodge Ram 2500	17-0008
Dodge Ram 2500	17-0009
Dodge Ram 2500	17-0010
Dodge Ram 2500	17-0011
Dodge Ram 2500	17-0012
Dodge Ram 2500	17-0013
Dodge Ram 2500	17-0014

Compresseur	
Compresseur	919
Compresseur	9925
Compresseur	15-6902
Compresseur	16-6901
Compresseur	16-6902
Compresseur	COMP-01
Compresseur	COMP-02

Unité De Service	
Unité De Service	12-0111
Unité De Service	10-0103
Unité De Service	11-0118
Unité De Service	11-0119
Unité De Service	17-0104
Lube Truck	12-0103
Unité De Service (Dyn)	17-0103

Ambulances	
Flagro	12-5906
Flagro	16-5901
Flagro	17-5901
Flagro	17-5902
Flagro	17-5903
Flagro	17-5904

Unit Number	Description	Unit Number	Description	Unit Number	Description	Unit Number	Description	Unit Number	Description	Unit Number	Description
6151COM11	PNEUMATIC COMPRESSOR (AIR)	61GEN10	CUMMINS GEN SET 6CT, TWIN	61HTR28	HAUL TRUCK 150T CAT 785C	61PCK15	PICK UP F350 (MOB.MNTCE CRANE)	61PCK79	PICK-UP F250 MNTCE SUPERINTEND	61TRK07	WATER DELIVERY TRUCK FORD
61ATV01	HONDA ATV	61GEN13	CATERPILLAR GENSET 200KW D200P	61HTR29	HAUL TRUCK 150T CAT 785D 2011	61PCK16	PICK UP F350 (BLASTER)	61PWA01	DEWATERING PUMP # 1	61TRK08	SEPTIC TRUCK TRUCK FORD
61ATV02	HONDA ATV	61GEN16	CATERPILLAR GENSET 30KW D30-8	61HTR30	HAUL TRUCK 150T CAT 785D 2011	61PCK17	PICK UP F350 WAREHOUSE	61PWA02	DEWATERING PUMP # 2	61TRK11	CEMENT TRUCK MAC - AMARUQ
61ATV03	HONDA ATV	61GEN34	WHITEOUT GENERATOR	61HTR31	HAUL TRUCK 150T CAT 785D	61PCK18	PICK UP F350 (GEOLOGY)	61PWA03	DEWATERING PUMP # 3	61TRK12	1 AXLE SHUNT TRUCK
61ATV04	HONDA ATV	61GEN37	JOHN DEERE MODEL 6081AF001	61HTR32	HAUL TRUCK 150T CAT 785D	61PCK19	PICK UP F250 (MOBILE MNTCE)	61PWA04	DEWATERING PUMP # 4	61TRK13	KENWORTH TRUCK
61ATV05	HONDA ATV	61GEN49	ERT GENERATOR	61HTR33	HAUL TRUCK 150T CAT 785D	61PCK20	PICK UP F250 (ENVIRONMENT)	61PWA05	DEWATERING PUMP # 5	61TRK14	KENWORTH TRUCK
61BAC01	BACKOE TEREX O&K RH40-E	61GEN50	ERT GENERATOR	61HTR34	HAUL TRUCK 150T CAT 785D	61PCK21	PICK UP F250 MINE PIT DEWATER.	61PWA06	DEWATERING PUMP # 6	61TRK15	KENWORTH TRUCK
61BAC02	BACKOE CATERPILLAR 345CL	61GEN51	KUBOTA GENSET #1 - AMARUQ	61LGT01	AMIDA TOWER LIGHT AL5080D	61PCK22	PICK UP F250 (MINE RESUCE)	61PWA07	DEWATERING PUMP # 7	61TRK16	KENWORTH TRUCK
61BAC03	BACKOE CATERPILLAR 307	61GEN52	KUBOTA GENSET #2 - AMARUQ	61LGT02	INGERSOLL RAND L20 TOWER LIGHT	61PCK23	PICK UP F250 (ELECT MILL)	61PWA08	DEWATERING PUMP # 8	61TRK17	KENWORTH TRUCK
61BAC04	BACKOE CATERPILLAR 330D	61GEN53	AMARUK ROAD SHELTER GENSET	61LGT03	INGERSOLL RAND L20 TOWER LIGHT	61PCK24	PICK UP F250 MINE HELP/BIT SHO	61PWA09	DEWATERING PUMP # 9	61TRK18	GARBAGE TRUCK KENWORTH
61BAC05	BACKOE CATERPILLAR 345DQ	61GRA01	MOTOR GRADER 16H CAT	61LGT04	INGERSOLL RAND L20 TOWER LIGHT	61PCK25	PICK UP F250 MINE HELP/BIT SHO	61PWA10	DEWATERING PUMP # 10	61TRK19	FIRE TRUCK
61BAC06	BACKOE CATERPILLAR 385C	61GRA02	MOTOR GRADER 160H CAT	61LGT05	INGERSOLL RAND L20 TOWER LIGHT	61PCK26	PICK UP F250 (SITE SERV FIELD)	61PWA11	DEWATERING PUMP # 11	61TRK21	FUEL TRUCK
61BAC07	BACKOE CATERPILLAR 345DL	61GRA03	MOTOR GRADER 16M CAT	61LGT06	INGERSOLL RAND L20 TOWER LIGHT	61PCK27	PICK UP F250 (SITE SERVICE)	61PWA12	DEWATERING PUMP # 12	61TRK22	SNOW PLOW WITH WING&SANDER
61BAC08	BACKOE PC1250 KOMATSU	61GRA04	MOTOR GRADER 16M CAT	61LGT07	INGERSOLL RAND L20 TOWER LIGHT	61PCK28	PICK UP F250 (DYKE SUPER.)	61PWA13	DEWATERING PUMP # 13	61TRK23	SNOW PLOW WITH WING&SANDER
61BAC09	BACKOE 390DL CATERPILLAR	61GRA05	CATERPILLAR GRADER 16M	61LGT08	LIGHT TOWER GEOLOGY	61PCK29	PICK UP F250 MINE.SUP.AUX.EQUI	61PWA14	DEWATERING PUMP # 14	61TRK24	STEAMER TRUCK
61BAC10	BACKOE TEREX O&K RH120-E	61HEA01	FROST FIGHTER IDF-350	61LGT09	WACKER TOWER LIGHT LTC4	61PCK30	PICK UP F250 DIKES /DEWATERING	61PWA15	DEWATERING PUMP # 15	61TRK28	INTERNATIONAL TIRE TRUCK
61BAC11	BACKOE BUCYRUS RH120-E	61HEA02	ALLMAND HEATER MH-1000 MNTCE	61LGT11	WACKER TOWER LIGHT LTC4	61PCK31	PICK UP F250 (MILL)	61PWA16	DEWATERING PUMP #16	61TRK30	LUBE TRUCK
61BAC12	BACKOE TEREX O&K RH120-E	61HEA03	ALLMAND HEATER MH-1000 MNTCE	61LGT12	WACKER TOWER LIGHT LTC4	61PCK32	PICK UP F250 (ELECT. DEPT.)	61PWA17	DEWATERING PUMP #17	61TRK31	MECHANICAL SERVICE TRUCK
61BAC13	BACKOE CAT6030	61HEA05	LANAIR WASTE OIL BURNER MX 300	61LGT13	INGERSOLL RAND L20 TOWER LIGHT	61PCK33	PICK UP F250 (ENGINEERING)	61PWA18	ENVIRONMENT EMERGENCY PUMP	61TRK32	GMC AIR PLANE FUEL TANKER
61BUC06	BUCKET CAT6030	61HEA08	FROST FIGHTER IDF-350	61LGT14	LGT WACKER LTC4L	61PCK34	PICK UP F250 SECURITY ON SITE	61PWA19	150HP ELECTRICAL PUMP	61TRK33	CAT LUBE TRUCK T300
61BUS01	BUS YELLOW BLUE BIRD	61HEA11	FROST FIGHTER IDF-350	61LGT18	AMIDA TOWER LIGHT LT5000-4MH	61PCK35	PICK UP F250 (ROAD CREW)	61RBD01	ROTARY BLAST DRILL 6" ATLAS	61TRK34	STERLING SERVICE TRUCK
61BUS02	MINIBUS BLUE BIRD	61HEA12	FROST FIGHTER IDF-350	61LOA01	LOADER IT14G CAT	61PCK36	PICK UP F250 (ROAD CREW)	61RBD02	ROTARY BLAST DRILL 6" ATLAS	61TRK35	FUEL TRUCK PETERBILT 367
61BUS03	MINIBUS BLUE BIRD	61HEA13	FROST FIGHTER IDF-350	61LOA02	LOADER IT14G CAT	61PCK37	PICK UP F250 (EXPLORATION)	61RBD03	ROTARY BLAST DRILL 6" ATLAS	61TRK36	SNOW PLOW WITH WING&SANDER WHT
61BUS04	BAKER LAKE PASSANGER VAN E350	61HEA14	FROST FIGHTER IDF-350	61LOA03	LOADER 992G CATERPILLAR	61PCK38	PICK UP F250 (EXPLORATION)	61RBD04	ROTARY BLAST DRILL 6" ATLAS	61TRK38	FORD SERVICE TRUCK
61BUS05	BUS RED BLUE BIRD	61HEA15	MILL FROST FIGHTER # 1	61LOA04	LOADER 992G CATERPILLAR	61PCK39	PICK UP E350 AMBULANCE	61RBD05	LONG HOLE DRILL CM785	61TRK39	LUBE TRUCK
61BUS06	BAKER LAKE MINI BUS	61HEA16	MILL FROST FIGHTER # 2	61LOA05	LOADER 420E IT CAT (PEPINE)	61PCK40	PICK UP (IT GREY RENTAL)	61RBD06	DML DRILL 6" ATLAS	61TRK40	CEMENT TRUCK MACK
61BUS07	INTERNATIONAL BUS - AMARUQ	61HEA17	MILL FROST FIGHTER # 3	61LOA06	LOADER 966H CATERPILLAR-AMARUQ	61PCK41	PICK UP F250 (P.A BOSSE)	61RBD07	DML DRILL 6" ATLAS	61TRK41	PUMP TRUCK MACK
61BUS08	BLUE BIRD BUS	61HEA18	MILL FROST FIGHTER # 4	61LOA07	SCRAP-LOADER 966H CATERPILLAR	61PCK42	PICK UP F250 (FIELD TEAM LEAD)	61RBD08	DML DRILL 6" ATLAS	61TRK42	FUEL TRUCK (VAULT)
61BUS09	BUS YELLOW BLUE BIRD	61HEA19	MILL FROST FIGHTER # 5	61LOA08	LOADER TC44H JOHN DEERE	61PCK43	PICK UP F350 (CONSTRUCTION)	61SBL03	SNOWBLOWER T85-R52	61TRK43	WATER TRUCK (VAULT)
61BUS10	USED INTERNATIONAL BUS	61HEA20	FROST FIGHTER IDF-350	61LOA09	LOADER 966H CATERPILLAR	61PCK44	PCK F250 2011 (SUP. BLASTER)	61SCI05	SCISOR LIFT GENIE GS3232	61TRK44	SERVICE TRUCK (VAULT)
61BUS11	BLUE BIRD BUS	61HEA21	FROST FIGHTER IDF-350	61LOA10	LOADER 980H CATERPILLAR	61PCK45	PCK F350 2011 (BLASTER PICK)	61SCI06	GENIE S85	61TRK45	LUBE TRUCK (VAULT)
61BUS12	BLUE BIRD BUS	61HEA22	FROST FIGHTER IDF-350	61LOA11	LOADER 420E CATERPILLAR-AMARUQ	61PCK46	PCK F250 2011 GEOLOGY	61SCI07	MAN LIFT GENIE Z-45/25	61TRK46	FIRE TRUCK
61COM01	DOOSAN MOBILE COMPRESSOR	61HEA24	FROST-FIGHTER IDF-350	61LOA12	LOADER 980H CATERPILLAR	61PCK47	PCK F250 2011 PIT PROD. SUP.	61SCI08	MAN LIFT GENIE Z-45/25	61TRL01	BEDARD TANKER TRAILER
61COM02	MOBILE AIR COMPRESSOR	61HEA26	FROST-FIGHTER IDF-350	61LOA13	WHEEL LOADER 992K CATERPILLAR	61PCK49	PCK F250 2011 DRILL&BLAST SUP	61SCI10	GENIE S85 (OLD 61REN07)	61TRL03	BELLY DUMP TRAILER
61COM03	COMPRESSOR QGD25 QINCY	61HEA27	FROST-FIGHTER IDF-350	61LOA14	TIRE HANDLER LOADER	61PCK50	F-250 BLUE 2011 MINE SERV. SUP	61SCI11	GENIE S85 - AMARUQ	61TRL04	LOW BED TRAILER
61COM04	COMPRESSOR 2545 IR	61HEA28	INGERSOLL RAND	61LOA15	LOADER 980K CATERPILLAR	61PCK51	PCK F250 2012 (S.S FIELD SERV)	61SCI12	GENIE S85	61TRL05	LOW BED TRAILER
61COM05	DOOSAN AIR COMPRESSOR	61HEA33	FROST-FIGHTER IDF-350	61LOA16	LOADER IT14G CATERPILLAR	61PCK52	PCK F450 2011 (WAREHOUSE)	61SCI13	GENIE S125	61TRL06	FUEL TANKER BEDARD 54000L
61COM06	MILL MOBILE COMPRESSOR	61HEA35	FROST-FIGHTER IDF-350	61LOA17	LOADER WA-600 KOMATSU	61PCK53	PICK UP F250 (PROCESS PLANT)	61SCI14	GENIE S125	61TRL07	FUEL TANKER BEDARD
61CPT01	CATERPILLAR COMPACTOR CS76	61HEA36	FROST-FIGHTER IDF-350	61LOA18	LOADER 966H CATERPILLAR	61PCK54	PICK UP F250 (ENGINEERING)	61SCI15	SCISSOR LIFT GENIE 32'	61TRL08	DOUBLE DROP LOW BOY
61CPT02	CATERPILLAR COMPACTOR CS563	61HTR01	HAUL TRUCK 100T CATERPILLAR	61MCR01	CRANE 120T MANITOWOC	61PCK55	PICK UP F250 (SURVEY)	61SCI16	SCISSOR LIFT GENIE 32'	61TRL09	FIRE TRAILER SKID W/ PUMP
61DOZ01	DOZER D8T CATERPILLAR	61HTR02	HAUL TRUCK 100T CATERPILLAR	61MCR02	CRANE 80T TEREX	61PCK56	PICK UP F250 (GEOLOGY)	61SCI17	MAN LIFT JLG 30' MODEL E300AJP	61TRL10	DISPATCH COMM TRAILER
61DOZ02	DOZER D9T CATERPILLAR	61HTR03	HAUL TRUCK 100T CATERPILLAR	61MCR03	CRANE 35T GROVE	61PCK57	PICK UP F250 (ROAD CREW)	61SCI18	MAN LIFT JLG 30' MODEL E300AJP	61TRL11	DISPATCH COMM TRAILER
61DOZ03	DOZER D8R CATERPILLAR	61HTR04	HAUL TRUCK 100T CATERPILLAR	61MCR04	90T LORAINE CRANE	61PCK58	PICK UP F250 - EXPLORATION	61SKD01	SKID STEER 262C CATERPILLAR	61TRL12	DISPATCH COMM TRAILER
61DOZ04	SCRAP - DOZER D7H CATERPILLAR	61HTR05	HAUL TRUCK 100T CATERPILLAR	61MCR05	25T INTERNATIONAL BOOM TRUCK	61PCK59	PICK UP F250 ELEC. SUPERINTEND	61SKD02	SKID STEER 753 CATERPILLAR	61TRL13	DISPATCH COMM TRAILER
61DOZ05	DOZER D9T CATERPILLAR	61HTR06	HAUL TRUCK 100T CATERPILLAR	61MCR06	CRANE 200T AMERICAN	61PCK60	PICK UP F250 (G.F DYKE)	61SKD03	SKID STEER 262C CATERPILLAR	61TRL14	DISPATCH COMM TRAILER
61DOZ06	DOZER D9T CATERPILLAR	61HTR07	HAUL TRUCK 100T CATERPILLAR	61MFT01	MOBILE FUEL TANKER TRAILLER	61PCK61	PICK UP F250 (SITE SERVICE)	61SKD04	SKID STEER 262C CAT	61TRL15	DISPATCH COMM TRAILER
61DOZ07	DOZER D9T CATERPILLAR	61HTR08	HAUL TRUCK 100T CATERPILLAR	61MFT02	MOBILE FUEL TANKER TRUCK	61PCK62	PICK UP F250 (MINE G.F)	61SMD01	MILLER BIG BLUE 400D MOB WELD	61TRL16	DISPATCH COMM TRAILER
61DOZ08	DOZER 834H CATERPILLAR	61HTR09	HAUL TRUCK 50T CATERPILLAR	61MFT03	MOBILE FUEL TANKER TRUCK	61PCK63	PICK UP F250 (A. HAMEL)	61SNC01	SNOWCAT EMERGENCY VEHICULE	61TRL17	DISPATCH COMM TRAILER
61DOZ09	DOZER D6T CATERPILLAR	61HTR10	TOW HAUL 120T	61PCK01	PICK UP F350 (MILL)	61PCK64	FORD EXPEDITION (AIR STRIP)	61SNO01	SNOW MOBILE	61TRL18	DISPATCH COMM TRAILER
61ENG53	BOAT ENGINE HONDA 75 HP	61HTR11	HAUL TRUCK 777F CATERPILLAR	61PCK02	PICK UP F350 (GARBAGE PICK UP)	61PCK65	PICK UP F-350 2008 (WAREHOUSE)	61SNO02	SNOW MOBILE	61TRL19	DISPATCH COMM TRAILER
61FKL02	FORK LIFT HYSTER RH35	61HTR12	HAUL TRUCK 777F CATERPILLAR	61PCK03	PICK UP F350 (MILL MNTCE)	61PCK66	PICK UP F-550 (MOBILE)	61SNO03	SKI DOO SCANDIC	61TRL20	DISPATCH COMM TRAILER
61FKL03	FORK LIFT WAREHOUSE CAT	61HTR13	HAUL TRUCK 777F CATERPILLAR	61PCK04	PICK UP F350 (PROCESS PLANT)	61PCK67	PICK UP F250 TRAINING/ KITCHEN	61TPA01	ZOOM BOOM GENIE GTH844	61TRL21	DISPATCH COMM TRAILER
61FKL04	FORK LIFT ZOOM BOOM RZ2	61HTR14	HAUL TRUCK 777F CATERPILLAR	61PCK05	PICK UP F350 (BLASTER)	61PCK69	PICK UP F250 TRAINING MINE DEP	61TPA02	ZOOM BOOM GENIE GTH844	61TRL22	STEAM-PRESSURE WASH TRAILER
61FKL05	MILL FORK LIFT CAT	61HTR15	WATER TRUCK 773D CATERPILLAR	61PCK06	PICK UP F350 (POWER PLANT)	61PCK70	PICK UP F250 FIELD SITE SERVIC	61TPA03	HYSTER CONTAINER HANDLER	61TRL23	STEAM-PRESSURE WASHER TRAILER
61FKL06	TRUCK SHOP FORKLIFT CAT DP40KL	61HTR20	HAUL TRUCK 150T CATERPILLAR	61PCK07	PICK UP F350 (MINE HELPER)	61PCK71	PICK UP F250 (GEOLOGY)	61TPA04	IR ZOOM BOOM 1056C (OLD REN16)	61TRL24	EXTENSIBLE TRAILER MANAC
61FKL07	RAYMOND LIFT 740DR32IT	61HTR21	HAUL TRUCK 150T CATERPILLAR	61PCK08	PICK UP F350 (MILL MNTCE)	61PCK72	PICK UP F250 (TO REPLACE)	61TPA05	TELEHANDLER VR1056D (OLD REN15	61TRL26	SPLEIPNER
61FKL08	RAYMOND LIFT ETDR40TT	61HTR22	HAUL TRUCK 150T CATERPILLAR	61PCK09	PICK UP F350 (ENGINEERING)	61PCK73	PICK UP F250 - EXPLORATION	61TRK01	KENWORTH WATER TRUCK 4000 GL	61TRL27	MOBILE FUEL TANKER JET-A
61FKL09	TRUCK SHOP FORKLIFT HYSTER	61HTR23	HAUL TRUCK 150T CAT 785D	61PCK10	PICK UP F350 (DEWATERING)	61PCK74	PICK UP F250 (VAULT)	61TRK02	KENWORTH TRUCK	61VSE01	KAWASKI MULE
61FKL10	ZOOM BOOM TL1255C CAT	61HTR24	HAUL TRUCK 150T CAT 785D	61PCK11	PICK UP F350 (SECURITY BAKER)	61PCK75	PICK UP F450 BIT TRUCK (VAULT)	61TRK03	KENWORTH TRUCK	61VSE02	KAWASKI MULE
61FKL11	FORK LIFT R80 CAT	61HTR25	HAUL TRUCK 150T CAT 785D	61PCK12	PICK UP F350 (WAREHOUSE)	61PCK76	PICK UP F250 MTNCE SUPERVISOR	61TRK04	KENWORTH TRUCK	61VSE05	KAWASKI MULE (SITE SERVICES)
61GEN08	CATERPILLAR 3508 GENSET	61HTR26	HAUL TRUCK 150T CAT 785C	61PCK13	MINI-VAN E350 CLUB WAGON (BL)	61PCK77	PICK-UP F250 - EXPLORATION	61TRK05	KENWORTH TRUCK (3AXLE TRACTOR)	61VSE06	KAWASKI MULE
61GEN09	CUMMINS GEN SET 6CT, TWIN	61HTR27	HAUL TRUCK 150T CAT 785C	61PCK14	EXPEDITION XLT MOB.MNTCE SUP.	61PCK78	PICK-UP F250 MINE SUPERINTEND	61TRK06	KENWORTH TRUCK	61VSE08	KUBOTA MULE RTV1100

SANA Mobile Equipment List (to be updated as required)

Dozer	
Cat D8T	438
Cat D8T	443

Excavator	
Cat Bac 345	11-0301
Cat Bac 345	12-0303
Cat Bac 345 DLS	13-0301
Komatsu PC 1250	11-0303
Cat Bac 365 C	12-0305
Komatsu PC 450	16-0304

Loader	
Cat Loader 906	10-0202
Cat Loader 980H	268
Cat Loader 980CR	10-0201
Komatsu Loader WA500	278
Komatsu Loader WA600	11-0201
Komatsu Loader WA600	13-0201

50T Hault Truck	
Cat HTR 773F	1516
Cat HTR 773F	1517
Cat HTR 773F	1518
Cat HTR 773F	1519
Cat HTR 773F	1520
Cat HTR 773F	1535
Cat HTR 773F	1536
Komatsu HD605	16-1001
Komatsu HD605	16-1002
Komatsu HD605	16-1003
Komatsu HD605	16-1004

Heavy Equipment	
Fuel Truck	11-0121
Fardier Mack	1166
Water truck	1231
Water truck	10-0106
Bus Blue Bird	1760
Light truck	1244
White bus	15-0101
Fardier Kenworth	1220
Sableur	1217
Grader 14 M Cat	513

Compacteur	
Compactor Hamm	744
Compactor Cat	11-1101

Light Plant	
Magnum	10-5605
Magnum	11-5602
Magnum	11-5603
Magnum	12-5601
Magnum	12-5602
Magnum	12-5603
Magnum	12-5604
Magnum	12-5605
Magnum	12-5606
Allmand	15-5613
Allmand	15-5615

Drill	
Novamac TCG 03	10-0901
Novamac TCG 04	10-0902
Novamac TCG 05	9928
Tamrock	9932
Tamrock	996

Generator	
Generator	G - 19
Generator	G - 214
Generator	G - 229
Generator	G - 241
Generator	G - 250
Generator	G - 257
Generator	10-5502
Generator	
Generator	

Zoom-Boom	
Zoom-Boom	1773
Zoom-Boom TH255	1779
Zoom-Boom JCB	16-1202

Garage	
Welding machine	S-01
Welding machine	S-02
Welding machine	S-03
Welding machine	S-04
Welding machine	S-05
Welding machine	S-06
Compressor	COMP-01
Compressor	COMP-02

Pickup Truck	
Dodge Ram 2500	1743
Dodge Ram 2500	1744
Dodge Ram 2500	1765
Dodge Ram 2500	1767
Dodge Ram 2500	1769
Dodge Ram 2500	1772
Dodge Ram 2500	1798
Dodge Ram 2500	10-0004
Dodge Ram 2500	10-0005
Dodge Ram 2500	10-0006
Dodge Ram 2500	10-0007
Dodge Ram 2500	10-0008
Dodge Ram 2500	10-0010
Dodge Ram 2500	10-0016
Dodge Ram 2500	11-0014
Dodge Ram 2500	11-0022
Dodge Ram 3500	12-0014
Dodge Ram 3500	12-0015
Dodge Ram 2500	12-0016
Dodge Ram 2500	12-0017
Dodge Ram 2500	16-0006
Dodge Ram 2500	16-0007
Dodge Ram 2500	16-0008
Dodge Ram 2500	16-0009
Ram 2500 Promaster	16-0010

Compressor	
Compressor	919
Compressor	9925
Compressor	15-6902
Compressor	16-6901
Compressor	16-6902

Service Unit	
Service Unit	10-0103
Service Unit	11-0118
Service Unit	11-0119
Service Unit	12-0111

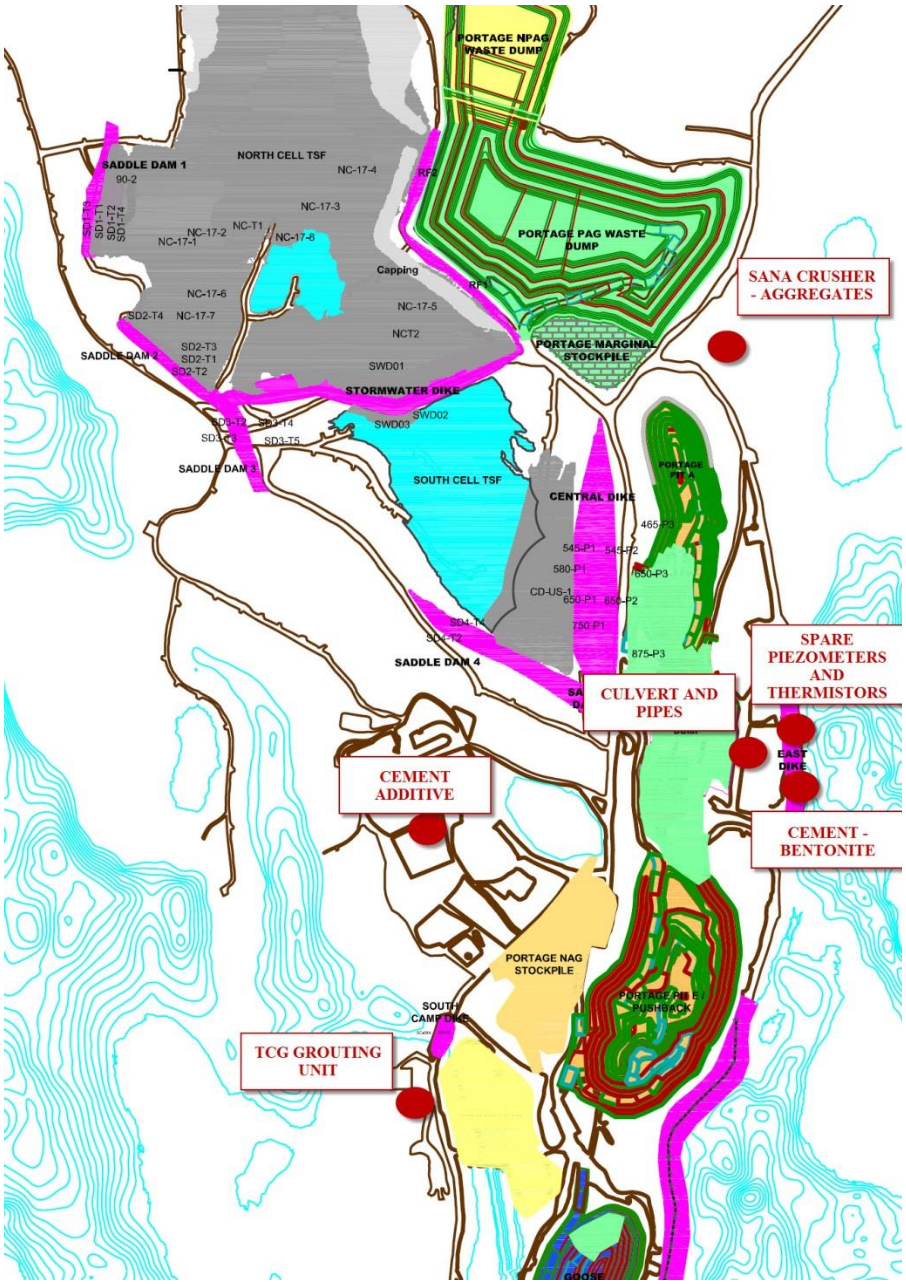
Crusher	
Jaw crusher	7004
Cone crusher and screen	7005
Convoyeur	7006

Ambulance	
Flagro	12-5906
Flagro	

8.4.3 Earthwork Material and Equipment

Figure 5 presents the earthwork material, including geomembrane and cement, available on site in case of an emergency.

Figure 5 Earthwork Material and Equipment location



SECTION 9 • EMERGENCY RESPONSE REFERENCE DOCUMENTS

Table 9-1 Emergency Response Reference Documents

Document	Current Revision
Emergency Response Plan	Updated by AEM. Version 12, January 2018
Emergency Preparedness Plan	In TSF OMS Manual, Version 7, March 2017

Note: To be updated as required

Table 9-2 Potential Effects or Causes of Embankment Failure Mechanisms

Embankment Failure Mechanism	Potential Measurable and Observable	
	Causes	Effects
Overtopping	(1) Slurry/water level within the cell rises. (2) Embankment crest settlement	Increase of seepage leading to erosion of downstream foundation soils. Increase in seepage pumping rate during operations Increase in turbidity / suspended solids of seepage
Internal Erosion	(1) Loss of tailings water, erosion through embankments (2) Loss of mineral soil foundation at defect in embankment section.	Sinkhole observable at crest Increase in seepage pumping rate during operations Increase in turbidity / suspended solids of seepage
Slope Instability	(1) Ice or wave forces, or traffic on crest, seepage, weakness of foundation soils (2) Earthquake seismic event or blasting	Increase in settlement and/or settlement rate Increase in displacement and/or displacement rate of embankment toe Cracks along the embankment crest Sloughing of the face Bulging of embankment toe
Unexpected settlements	Consolidation	Potential slurry/water overtopping the

Embankment Failure Mechanism	Potential Measurable and Observable	
	Causes	Effects
	of foundation soils or embankment fills	embankment leading to erosion of downstream foundation soils. Increase in seepage pumping rate during operations Increase in turbidity / suspended solids of seepage

Table 9-3 Threshold Criteria During Operation (Excluding Central Dike)

		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of Concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Cumulative crest settlement from operations start up	No settlement observed	< 0.2 m	> 0.2 m and < 1.0 m Increasing rate of settlement	> 1.0 m Increasing rate of settlement
	Downstream toe displacement	No displacement observed	Affecting seepage collection system	Loss of roadway	Loss of roadway
	Shear crack along rockfill embankment (differential settlement)	No shear crack observed	< 0.4 m deep	> 0.4 m and < 0.8 m deep	> 0.8 m deep
			< 5 m length along the dike	> 5 m and < 10 m length along the dike	> 10 m length along the dike
	Tension crack embankment alignment at crest	No tension crack observed	< 0.25 m deep	> 0.25 m and < 1 m deep	> 1 m deep
			< 0.10 m wide across the dike	> 0.10 m and < 0.20 m wide across the dike	> 0.20 m wide across the dike
			< 5 m length along the dike	> 5 m and < 10 m length along the dike	> 10 m length along the dike
	Sloughing along downstream rockfill embankment face	No sloughing observed	Observed	Observed and worsening from yellow situation	Observed and worsening from orange situation
	Embankment lateral cumulative deformation	No deformation observed	< 0.1 m	> 0.1 m and <0.25 m	> 0.25 m
	Seepage through embankment	No seepage observed	< 1/3 pumping rate capacity	> 1/3 and < 2/3 pumping rate capacity	> 2/3 pumping rate capacity
	Increase of seepage rate	No increase in seepage rate	< 5% per day over five consecutive days	> 5% < 10% per day over four consecutive days	> 10% per day over three consecutive days
	Turbidity of seepage water	No turbidity observed	Turbidity observed for first time	Turbidity observed and source of sediments matching cut-off wall or foundation till mineralogy	Turbidity observed and source of sediments matching cut-off wall or foundation till mineralogy
	Sinkhole on crest	No depressions or sinkholes on crest observed	Localized depression of embankment crest	Observed	Well developed
Action Required			Monitor as normal All cracks filled or repaired If cracks re open implement engineering review Identify source of turbidity	Implement engineering review Suspend activities on embankment crest at chainage of concern Intensify monitoring at chainage of concern	Remove personnel and equipment from pit and suspend activities
Personnel Notified		Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder, if required).	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor (if required), Mine Operations Manager, Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor, Mine Operations Manager, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor, Mine Operations Manager, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 9-4 Threshold Criteria During Operation (Central Dike Only) - TARP

		Personnel notified	Seepage				
			Change in inferred Seepage Rate	***Total D/S pumped***	***Downstream Pond Elevation***	***Compliance to seepage model (1)***	
			Threshold	**Threshold**	**Threshold**	**Threshold**	**Possible actions**
Green	Normal	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder, if required).	Sudden or cumulative increase of < 25% over last 3 days	< 200 m3/h averaged on last 3 days (below capacity of one HL250 F.S ≥ 3)	Pond elevation stable at < 115.3 masl	Expected trend observed	General : Continue monitoring as per standard practices
Yellow	Monitor	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor (if required), Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Sudden or cumulative increase of > 25% over last 3 days	≥ 200 m3/h and < 1300 m3/h averaged on last 3 days (capacity of two HL250)	Pond elevation > 115.3 but < 115.8 masl	Stable seepage rate	Specific : Increase pumping capacity with back up HL250 pump in place General : Install additional instruments General : Implement engineering review
Orange	Proactive	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor, Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).		≥ 1300 m3/h and < 1500 m3/h averaged on last 3 days (limit capacity of two HL250)	Pond elevation >115.8 but < 116 masl	Opposite trend observed	Specific : Evaluation and planning of parallel dewatering infrastructures Specific : Inspect West Road integrity General : Evaluation and planning of alternative deposition location General : Evaluation and planning of diminution of South Cell hydraulic head
Red	Reactive	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor, Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel), Regulators.		≥ 1500 m3/h averaged on last 3 days (over capacity of two HL250)	Pond elevation > 116 masl		Specific : Install parallel dewatering infrastructures and consider installation of a 3rd HL250 pump Specific : Frequent inspection of Portage pit and West Road for flooding evidence Specific : Manage flood water in the pit General : Alter deposition sequence to increase tailings cover General : Execution of South Cell hydraulic head diminution strategy General : Grouting General : Initiate Emergency Response Plan

(1) Specific model: Doc1562 CD Seepage Modelling 16670255 Rev0 - must be interpreted by the designer and/or geotechnical coordinator

		Personnel notified	Instrumentation monitoring (1)					
			Piezometers P1 installed in the till layer total head (2)	***Piezometers P2 installed in the till layer total head (3)***	***Change in Piezometric head***	***Thermistors***	***Downstream pond and TSS***	
			Threshold	**Threshold**	-	**Threshold**	**Threshold**	**Possible actions**
Green	Normal	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder, if required).	< 121.5 masl F.o.S > 1.5	< 115.5 F.o.S > 1.5	change less than 1 m in 3 day	Seasonal trend observed	Background TSS observed (4mg/L)	General : Continue monitoring as per standard practices Specific : Daily inspection of the structure by qualified personal and frequent instrumentation monitoring
Yellow	Monitor	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor (if required), Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	121.6 - 126.2 masl 1.5 > F.o.S > 1.3	115.5 - 117.8 masl 1.5 > F.o.S > 1.3	change of 1 m in 3 days of piezometric head	Peak of temperature similar to South Cell TSF temperature observed in at least a single bead	Single TSS event of 30 mg/L	General : Evaluate needs to install additional instruments General : Implement engineering review
Orange	Proactive	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor, Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	126.3 - 127.4 masl 1.3 > F.o.S > 1.1 and based on interpretation by Geotechnical Coordinator or Designer	> 117.9 F.o.S < 1.3 and based on interpretation by Geotechnical Coordinator or Designer			Sustained high turbidity over 30 mg/L	Specific : Implement engineering review Specific : Increase in frequency of monitoring at station of concern Specific : Build buttress General : Evaluate needs to install additional instruments General : Evaluation and planning of alternative deposition location General : Evaluation and planning of diminution of South Cell hydraulic head
Red	Reactive	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor, Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel), Regulators.						General : Alter deposition sequence to increase tailings cover General : Execution of South Cell hydraulic head diminution strategy (could include emptying the South Cell) General : Grouting General : Initiate Emergency Response Plan

(1) Instrumentation data must be interpreted by geotechnical coordinator or dike designer (Golder)
(2) Failure of till foundation: add report reference Specific model : Doc1562 CD Seepage Modelling 16670255 Rev0 - Section 6
(3) Backward erosion: add report reference. Specific model : Doc1562 CD Seepage Modelling 16670255 Rev0 - Section 7.3

		Personnel notified	Visual Inspection							
			Loss of tailings	***Dike Vertical Movement - Cumulative crest settlement***	***Downstream toe displacement***	***Tension/shear crack at crest***	***Embankment lateral cumulative deformation (1)***	***Sloughing along downstream rockfill embankment face***	***Sinkhole on embankment***	
			Threshold	**Threshold**	**Threshold**	**Threshold**	**Threshold**	**Threshold**	**Threshold**	**Possible actions**
Green	Normal	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder, if required).	Normal operating conditions	No settlement observed	No displacement observed	No tension crack observed	No deformation observed	No sloughing observed	No depressions on crest	General : Continue monitoring as per standard practices Specific : Daily inspection of the structure by qualified personal and frequent instrumentation monitoring
Yellow	Monitor	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor (if required), Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Localized depression in tailings observed	<0.2m	Observed displacement at the toe	< 0.10 m wide across the dike & < 5 m length along the dike	< 0.1 m	Single event observed	Localized depression of embankment crest	Specific : Fill all cracks General : Install additional instruments General : Implement engineering review
Orange	Proactive	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor, Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Presence of sustained localized depression in tailings and/or tailings observed inside the downstream pond	> 0.2 m and < 1.0 m Increasing rate of settlement	Displacement rate observed	> 0.10 m and < 0.20 m wide across the dike > 5 m and < 10 m length along the dike	> 0.1 m and <0.25 m	More than one events observed	Sinkhole identified	Specific : Implement engineering review Specific : Increase in frequency of monitoring at station of concern Specific : Build buttress General : Evaluation and planning of alternative deposition location General : Evaluation and planning of diminution of South Cell hydraulic head
Red	Reactive	Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder), Specialized Contractor, Mine Operations Manager, Environment General Supervisor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel), Regulators.	Increase in depression hole dimension and/or tailings observed inside the Portage Pit	> 1.0 m Increasing rate of settlement	Acceleration of displacement rate	> 0.20 m wide across the dike > 10 m length along the dike	> 0.25 m	Continued event(s)	Development of sinkhole	General : Alter deposition sequence to increase tailings cover General : Execution of South Cell hydraulic head diminution strategy (could include emptying the South Cell) General : Grouting General : Initiate Emergency Response Plan

NOTE: *Specific action are triggered by specific risk (stability, seepage, environment)while general action are applied to all risk category*

If more than one criteria is triggered, a reevaluation of our global Alert level will be performed by the AEM team

Table 9-5 Communication Charts for Each Emergency Level

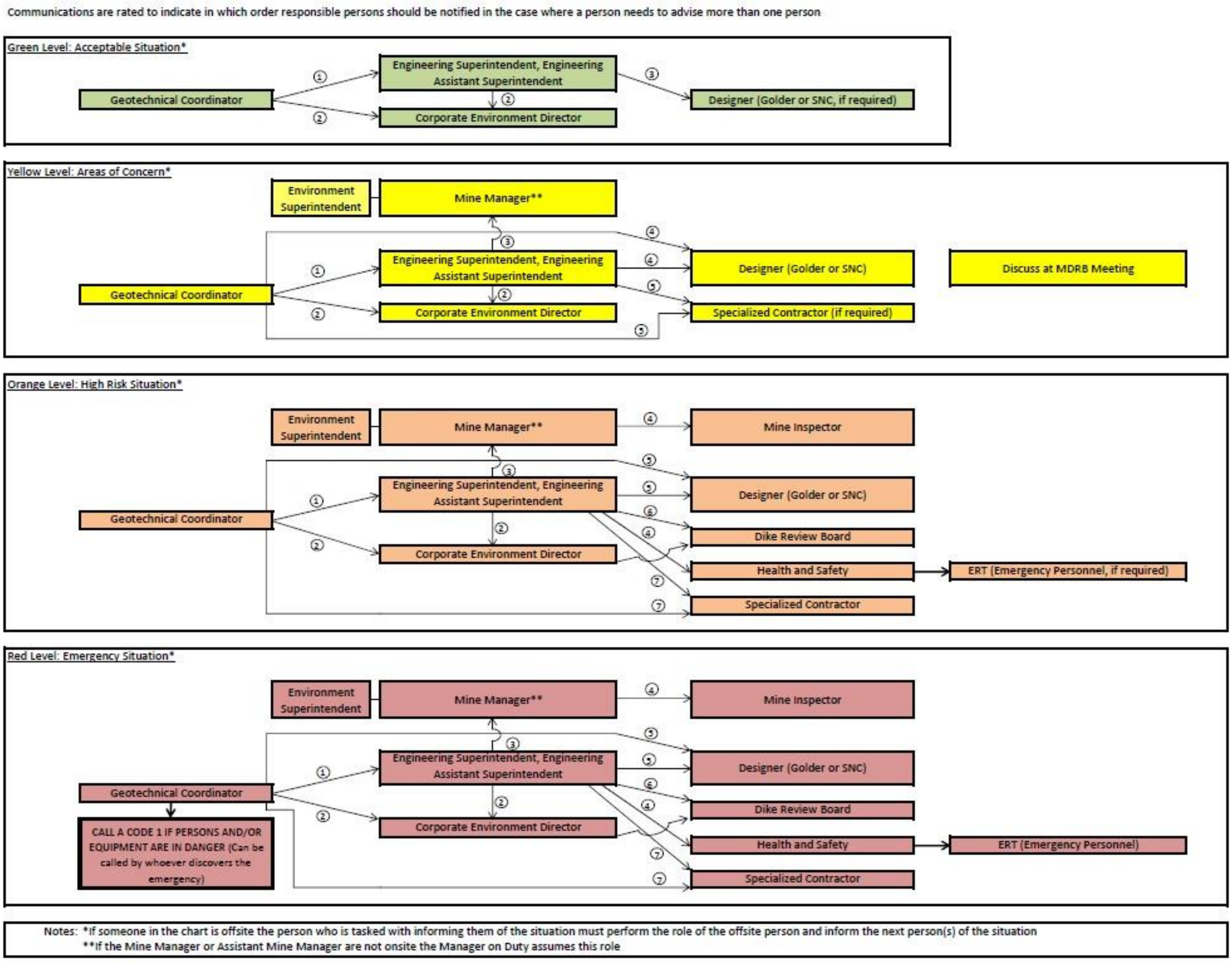


Table 9-6 Responsibilities of Persons for Each Emergency Level

	Decision Making	Mobilization	Performing the Action to be Taken
Green Acceptable Situation	Geotechnical Engineer/Specialist	Geotechnical Engineer/Specialist	Geotechnical Team*
Yellow Areas of Concern	Geotechnical Engineer/Specialist Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Environment Superintendent	Geotechnical Engineer/Specialist Geotechnical Coordinator	Geotechnical Team* Specialized Contractor (if required)
Orange High Risk Situation	Geotechnical Engineer/Specialist Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Corporate Environment Director Dike Review Board Mine Manager Health and Safety (if required) Environment Superintendent	Geotechnical Engineer/Specialist Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent	Geotechnical Team* Specialized Contractor ERT (if required)
Red Emergency Situation	Geotechnical Engineer/Specialist Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Corporate Environment Director Dike Review Board Mine Manager Health and Safety Environment Superintendent	Geotechnical Engineer/Specialist Geotechnical Coordinator Engineering Superintendent Engineering Assistant Superintendent Mine Manager Health and Safety	Geotechnical Team* Specialized Contractor ERT

*The Geotechnical Team consists of the Geotechnical Coordinator, Geotechnical Engineer/Specialist, the Project Technician, Tailings & Water Management Engineers, and the Geotechnical Technicians.

Table 9-7 Names and Contact Details (to be updated as required)

Internal Emergency Response Contact Information Chart		
Position	**Name/Location**	**24-Hour Contact #**
Geotechnical Engineer/Specialist	Patrice Gagnon	Ph: 819-759-3555 ext. 6726 cell: 418-376-0975
	Pier-Eric McDonald	Ph: 819-759-3555 ext. 6726 cell: 514-967-9092
Geotechnical Coordinator	Alexandre Lavallée	Ph: 819-759-3555 ext. 6726 cell: 438-868-1905
	Frederick L. Bolduc	Ph: 819-759-3555 ext. 6837 cell: 514-703-1727
Engineering Superintendent	Pierre McMullen	Ph: 819-759-3555 ext. 6721 cell: 819-860-2556
Engineering Assistant Superintendent	Miles Legault	Ph: 819-759-3555 ext. 6721 cell: 418-825-3891
Corporate, Vice-President Environment	Michel Julien	Ph: 461-947-1212 ext. 3738 cell: 514-244-5876
Designer (Golder)	Golder Burnaby: Dan Walker, Fiona Esford Golder Montreal: Yves Boulianne, Annie Beaulieu	Burnaby Office: 604-296-4200 Montreal Office: 514-383-0990
Specialized Contractor	SANA (FGL Group)	Onsite Ph: 819-759-3555 ext. 6963 Ph: 418-615-0559
Environment Superintendent	Nancy Duquet-Harvey	Ph: 819-759-3555 ext 6980 Cell: 819-865-4385
Mine Manager	Luc Chouinard	Ph: 819-759-3555 ext. 6725 cell: 819-856-8160
Dike Review Board	Anthony Rattue Norbert Morgenstern Don Hayley	anthony.rattue@bell.net norbertm@ualberta.ca don.hayley@icloud.com
Mine Inspector	Lex Lovatt	Lex.Lovatt@wscc.nt.ca
Health and Safety	Normand Ladouceur	Ph: 819-759-3555 ext. 6720 cell: 819-860-6258
	Yves Levesque (asst.)	Ph: 819-759-3555 ext. 6720 cell: 819-856-9051
ERT (Emergency Personnel)	Emergency response personnel available on site to assist with spill and emergency response activities	Coordinated by the Emergency Measures Counsellor
Incident Commander	André Rouleau	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191 Code 1
	Philippe Beaudoin	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191 Code 1
Emergency Measures Counsellor	André Rouleau Bernard Paradis	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191

Health Professionals / Medical Clinic	Medical Clinic 1	Ph: 819-759-3555 ext. 6734
	Medical Clinic 2	Ph: 819-759-3555 ext. 6751
AEM Management Representative	Bertin Paradis	Ph: 819-759-3555 ext. 6725 cell: 819-355-9348
Human Resource Superintendent	Dominic Richard	Ph: 819-759-3555 ext 6723 cell: 819-856-0426

SECTION 10 • REFERENCES

Canadian Dam Association (CDA) 2007. Dam Safety Guidelines.

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Mining Association of Canada (MAC) 2008. A Guide to the Management of Tailings Facilities. Second Edition.

AEM, Emergency Response Plan, Ver.10, August 2016

Appendix I
Tailings Storage Facility - Inspection Form

SADDLE DAM 4 VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

The instrumentation data is treated separately in the instrumentation quarterly report.

Inspecting Officer	Vincent Duranleau
Report No.	SD4-VIR-01
Inspection Date	Dec 7, 2017

Dike/Dam name	Saddle Dam 4

Last Inspection Date	Dec 7, 2017					
Weather during the current inspection	-25	Sunny ☒	Overcast ☒	Rain ☐	Snow ☐	Wind☒
	Comments:					
Main changes since the last inspection	First field inspection as the dike is now in operation.					

Tarp level (Based on OMS manual revision from March 2017)	***Green***

General Condition Summary

- The upstream and downstream slopes are in good condition.
- The rolling surfaces are in good condition.
- The exposed liner surface is good; no rips or holes were found.
- South Cell: tailings deposition at the time of the visit was at the deposition point S2.
- The tailings beaches are in good condition.

Reviewed by: Rebecca Cousineau

Date reviewed: December 17, 2017

SADDLE DAM 4 VISUAL INSPECTION REPORT

Field observations

Location	Observations	Recommendations
Downstream slope and berm	▪ The entire slope is in good condition, there is no visible sign of movement in the slope area. ▪ There is a small frozen water accumulation at the toe of the dike close to the entrance (surface water).	▪ None
Upstream slope and berm	▪ The liner is in good condition on the entire structure. ▪ There is no bumper on the upstream side. ▪ Instruments cables are present in the slope.	▪ None
Crest	▪ The rolling surface is in good condition. ▪ An instruments shack was moved on the upstream side crest.	▪ Keep the entrance and rolling surface free of snow accumulations.

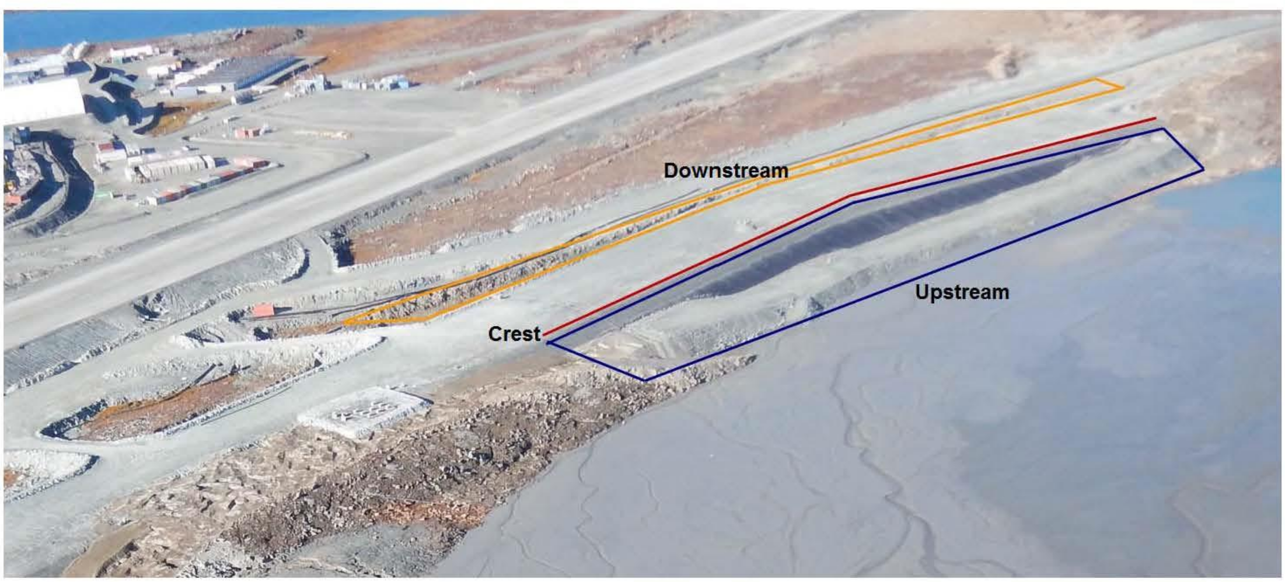
<u>Methodology:</u> For the visual inspection, any anomaly or change since the last inspection must be reported. These anomalies include cracks, erosion, settlements, sink holes, bulging, sloughing, seepage signs, snow/ice, rutting, mud, ponds/puddles, signs of saturated soil and any damage on the liner or objects/water over the liner.

SADDLE DAM 4 VISUAL INSPECTION REPORT

Seepage Report

Location	Observations	Recommendations
No seepage observed.	▪	▪

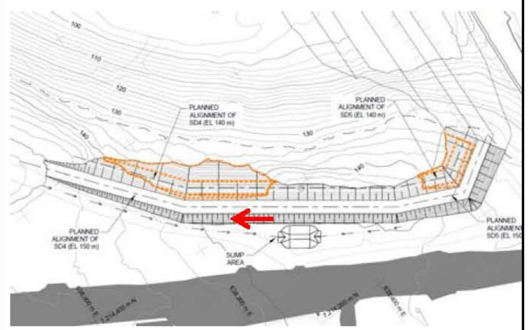
Aerial view of Saddle Dam 4

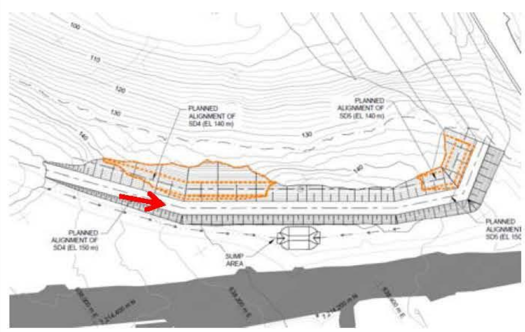


SADDLE DAM 4 VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

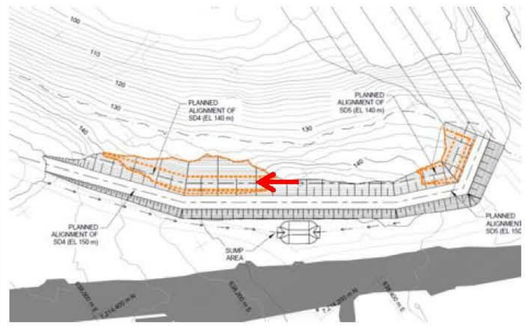
Downstream slope and berm

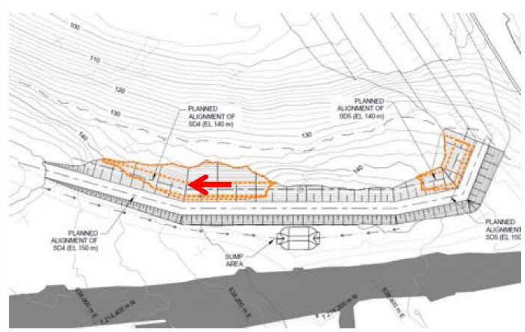
	
DS1:	Location and orientation of DS1.

	
DS2:	Location and orientation of DS2.

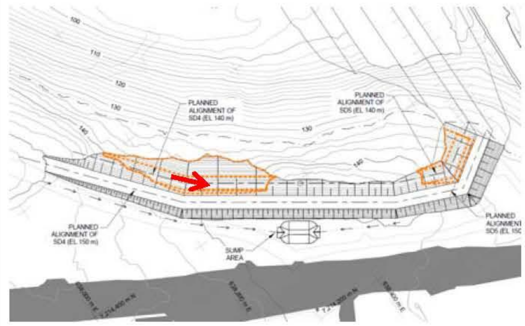
SADDLE DAM 4 VISUAL INSPECTION REPORT

Upstream slope and berm

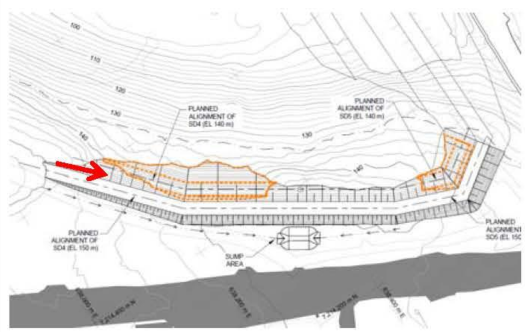
	
US1:	Location and orientation of US1.

	
US2:	Location and orientation of US2.

SADDLE DAM 4 VISUAL INSPECTION REPORT



US3:	Location and orientation of US3.

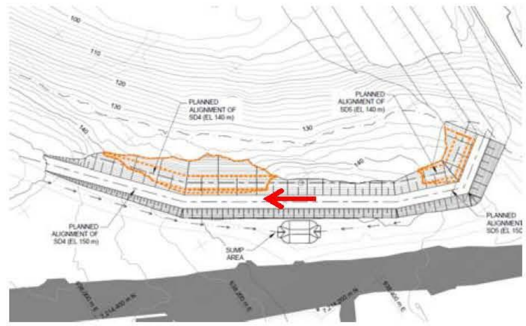


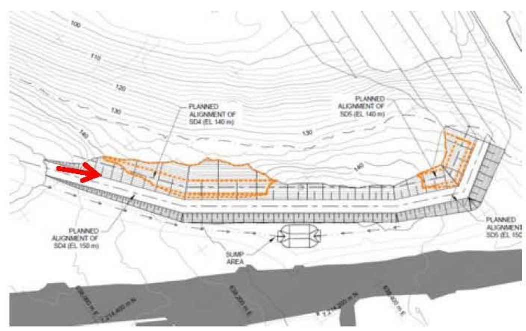
US4:	Location and orientation of US4.

SADDLE DAM 4 VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

Crest surface

	
CR1:	Location and orientation of CR1.

	
CR2:	Location and orientation of CR2.

Appendix II
DikeEmergency Plans

Dike Response Plans

A. Central Dike

B. Saddle Dams

C. Stormwater Dike

A) Central Dike

The South Cell Impoundment is comprised of a Central Dike, a series of perimeter dikes, and the natural basin of the northwest arm of Second Portage Lake, as shown on the general mine site plan provided at the beginning of this document. The Central Dike cross-section consists of:

- A rockfill embankment, constructed from run-of-mine waste rock, placed in lifts and compacted, with the upstream face designed at 3H:1V and 2H:1V and the downstream face designed at a 1.5H:1V slope;
- An upstream two zones granular filter and inverted granular filter along the foundation;
- A bituminous liner with appropriate cover on the upstream face and part of the foundation;
- A central or upstream key trench.

The Central Dike is a high consequence structure, based on Dam Safety Guidelines (CDA, 2007). Slope stability analyses show that the dike will meet or exceed design FoS for stability under static and pseudostatic earthquake load conditions. Consequently, the probability of failure of the Central Dike is considered to be very low.

For information on the consequences and monitoring/action for the various embankment failure modes possible at the Central Dike see Table A.2 below.

Table A.1: Meadowbank Tailings Storage Facility Summary of Consequences and Proposed Monitoring / Action for Rare Event Based On Water Retaining Embankment Failure Modes Identified in ICOLD Study (1995)

Failure Mode	Scenario	Consequence	Monitoring/Action
Overtopping	(1) Pond Level rises because of restricted outflow (excessive inflow is a far less likely scenario). Water will spill at the low point on the dike system, which will depend on the construction schedule.	Water spills over the crest but, as this crest is both wide and comprises coarse compacted rock fill, minimal damage to the dike is credible. There will be considerable warning time prior to overtopping given the design freeboard and the storage volume.	Adjust decant and/or deposition rate. Add spillway in Central Dike, Saddle Dam, or natural ground.
	(2) Dam crest settles more than available freeboard over a distance of (say) 50m or so. This scenario requires unexpected foundation condition, such as glacial lake clay deposits. Settlement would occur upon placement of rock fill during dike raise construction. Freeboard is greatest immediately after a raise and this scenario is therefore unlikely to occur.	Water and tailings spill over crest and if settlement was rapid might erode the crest. Travel of tailings will be dependent on volume of water available, and level of thaw. Tailings would only go to the pit, and not reach the lake.	The situation envisaged is unlikely. This scenario would develop slowly during construction of the dike. Crest settlement would be evident at least several weeks before an overtopping event occurred. Easily observed cracks should be evident during summer period, but could be hidden during the winter. Systematic crest settlement monitoring is appropriate, and included in the design. Production and addition of tailings to the Tailings Storage Facility could be stopped to maintain freeboard. A spillway could also be constructed. The tailings deposition plan maintains a long beach between the dike and the pond, which provides additional freeboard to overtopping of the dike by pond water.

Internal Erosion	(1) Dike Section: Upstream bituminous liner contains defects arising from undetected damage during installation. May lead to loss of water, but filter retains tailing.	Loss of water into the rock fill. This is not a catastrophic failure mode, because the rock fill of the dike will be stable, and at its worst, would lead to temporary suspension of mining. Plus the bituminous liner does not propagate a tear like a plastic liner, so undetected damage is typically small and does not grow. Also, the foundation slopes down towards the tailings, so seepage impounds in the rock fill and will tend to reduce further seepage	Not necessary to monitor directly. Will become evident as possible seepage at dike toe. QA/QC program during construction is the main defence against this scenario.
	(2) Dike Section: Upstream bituminous liner contains defects arising from undetected damage during installation. This defect occurs at the same location as a filter defect.	Loss of tailings and water into the rock fill. This is not a catastrophic failure mode, because the rock fill of the dike will be stable, and at its worst, would lead to temporary suspension of mining. Accumulation of ponded water within the rock fill would decrease the head difference driving flow, thereby limiting the potential for a catastrophic failure.	Not necessary to monitor directly. Will become evident as possible intensive seepage at dike toe, and potentially as tailings fines within seepage downstream of the toe. QA/QC program during construction is the main defence against this scenario.
Seepage within Embankment	Seepage on its own is not a credible failure scenario. The rock fill is pervious so seepage will daylight on the downstream face. Flow through the rock fill will not lead to instability. Any seepage related failures must include internal erosion, see above.	No credible consequences.	No scenario specific monitoring required.
Seepage within Foundation	If the till foundation had a zone of more pervious soil (e.g. gravel seams) and the more pervious zone was preferentially exposed to water pressure, then normal seepage would transmit an unexpectedly high fraction of the reservoir head into the downstream part of the dike foundation. This scenario requires construction defects in filters, liner, and cut off trench fill.	This failure mechanism has caused other embankment failures elsewhere because of straightforward pore pressure induced instability. However, it is unclear that it could cause failure of the Central Dike because of its large width compared to the retained water head. The most likely consequence is downstream toe slumping requiring a localized stabilizing berm.	If this mechanism arises it should show itself gradually as the tailings and water level increase in the basin by buildup of pore water pressures in the foundation. This would be detected during routine monitoring of piezometers installed in the foundation. Pressure relief wells could be installed in the foundation during operations. The tailings deposition plan maintains a long beach between the pond and the dike. This will reduce seepage gradients beneath the dike. In addition, the tailings act as an upstream blanket on the bottom of the TSF to limit seepage into the foundation.

Internal Conduit Rupture	There are no water off take works or other structures extending through the dikes.	Not applicable.	Not applicable.
Slope Instability	(1) Normal Operation: The rockfill has high frictional strength and the design widths make it conservative. Slope failure requires failure in the foundation, which would then extend into the overlying dike.	A foundation failure would cause a rotational slip or sliding failure until equilibrium was reached. This mechanism would limit access along the dike until repaired. Failure through the rock fill will not necessarily compromise the tailings or water retaining function of the dike.	Initial stages of failure should be observable as tension cracks in dike crest and movement at dike toe. Walk-over inspection of dikes by a trained inspector is an appropriate monitoring strategy. Survey of crest, face and toe is also appropriate. If movements associated with increases in foundation pore pressures are discovered, then construction could be stopped or staged to allow pore pressure dissipation. Placement of rockfill as a downstream toe berm could help prevent failure.
	(2) Earthquake Induced: Occurrence of an extreme earthquake, a very rare event.	The extreme earthquake loading for site is a low magnitude event. A large earthquake would not be expected to cause a catastrophic failure, rather the dike would settle. The Central Dike rock fill is placed in the dry and compacted, and will therefore have limited settlement. This would not be a failure situation. The crest is also erosion resistant for earthquake induced wave action in the impounded water.	No monitoring is necessary. Dike should be inspected following any earthquakes felt on site.
Liner Failure Due To Foundation Movement	Differential horizontal movement of the dike due to pit wall failure. Creates a breach in the liner and filter. Pit wall failure is unlikely based on assessments of pit wall stability and the setback between the pit and the toe of the dike. Also, the liner and rock fill can withstand significant deformation, making this an unlikely scenario.	Tailings and water escape into the dike rock fill, but pond there because the foundation slopes towards the dike, rather than the pit. It is noted that the tailings pond is operated approximately 500 metres away. Rapid escape of water will therefore be limited.	No enhanced monitoring. Prism monitoring program and visual inspection sufficient. Movement would be evident in setback area between dike and pit. Tailings at face of dike may be excavated to allow repair of liner, or placement of filter material. Other options include freezing tailings at face of dike.
Unexpected Settlements	The foundation till is expected to consolidate during construction and operations. There is no credible mechanism for a large degree of unexpected settlement following construction required to eliminate freeboard and release tailings/water.	A large settlement could lead to water flowing through the rock fill, but this would not cause failure of the rock fill. It could also be readily repaired by placing more end-dumped rock fill, and extending the liner, in a manner similar to the periodic raise.	No enhanced monitoring required, as excessive settlement would be apparent from prism monitoring data, and visual inspection.

A1 CENTRAL DIKE TRIGGER ACTION PLAN

The following section presents the actions to undertake according to different observations done during normal operations of the Central Dike structure.

A.1 Increase in Seepage Rate

An emergency situation could arise from a sudden increase in the seepage rate reporting to the Central Dike downstream pond (ST-S-5) which could overwhelm the pumping system installed (maximum capacity of 1550 m^3/h) and overflow in the Portage Pit. This mechanism could arise without compromising the integrity of the structure due to seepage occurring through the bedrock.
In case of such an event, immediate closure and evacuation of the west road, Pit A and mining below El. 116m in Pit E must be established unless deemed to be safe to continue by Engineering Superintendent or delegate. Emergency access and production haulage is to be rerouted through the Portage in-pit dump. Pumping in Portage Pit is to be sustained as long as it is deemed safe to so. Parallel dewatering unit (HL250) is to be installed at ST-S-5 to manage the seepage until sufficient pumping capacity has been achieved.
The next step of the emergency plan will be to decrease the water level in the South Cell until the seepage rate decreases to the Orange alert level threshold. This will be achieved by using one or more of the following strategy:

1) Passive transfer of water from ST-S-5 to Goose Pit using the already established transfer line. Due to the 1:1 hydraulic connection between the South Cell and ST-S-5, the water level in the South Cell will decrease at the same rate as the seepage is transferred to Goose Pit. Parallel dewatering line from ST-S-5 to Goose Pit could be installed to establish additional transfer lines to Goose Pit for the additional pumping units. Installing such a line would take approximately 1 week.
2) Active transfer of water from the South Cell to Goose Pit. A line would be established from the reclaim area in the South Cell to Goose Pit which would approximately take 2 weeks. HL250 would be used for this active transfer of water.

Strategy 1 and 2 would allow continuing tailings deposition in the South Cell if the TARP level related to stability does not increase during the event.

1.2 Loss of Tailings

An emergency situation could arise from the observation of flow of tailings from the South Cell confirmed by visual observation of tailings at ST-S-5 or outside the perimeter of the TSF.
The response plan when the situation is first observed will be to modify the tailings deposition plan to cover the zone where tailings are being lost in the South Cell. To promote the filling of the area, the South Cell water level could be lowered using passive and/or active transfer until the tailings loss is stopped. Mining operation could continue in Portage if the other TARP indicators stay constant.
If the situation show signs of deterioration, the tailings deposition will be interrupted in the South Cell and the water level will continue to be lowered until tailings lost is stopped. If such condition occurs, a remediation plan will need to be implemented to resume tailings deposition or to decrease the water level of the South Cell.

1.3 Dike instability

An emergency situation could arise from observation of signs of instability of the structure. These signs would be related to the instability of the as described in Central Dike TARP (OMS manual). This emergency situation would be a precursor sign of a failure of the structure and would be observed by visual signs such as excessive deformation, settlement and cracking. Before initiating an emergency response these observations must first be analysed by the geotechnical coordinator or delegate. The response plan for this situation will be to interrupt tailings deposition in the South Cell and to decrease the water level in the South Cell using passive transfer from ST-S-5 to Goose Pit and/or active water transfer from the reclaim pump area. The mining activity in Portage Pit will be postponed and traffic will be restricted on the West Road. An engineering assessment of the structure and the development of a remediation plan will need to be implemented before resuming deposition activity in the South Cell.

1.4 Communication Strategy

The stakeholder notified of the emergency situation and the communication chart is defined in the Central Dike TARP and the OMS manual of the tailings dike. These stakeholders will be informed as soon as an emergency is declared. The emergency situations described above have a potential duration of several days or weeks. During the emergency situation, frequent meetings will be held with the stakeholders and frequent documented updates will be communicated. The frequency of these communications will be determined in the first emergency meeting and adjusted based on the evolution of the situation after having received the consent of all involved stakeholders.

A2 FAILURE SCENARIO DURING OPERATIONS

In the case of failure of the Central Dike during operations, the ‘worst-case’ scenario would involve a flow of unfrozen water and tailings in association with a catastrophic failure of the dike in the later stages of mining when personnel and machinery are working in the open pit directly downstream of the Tailings Storage Facility (TSF).

2.1 Potential Effect

The failure of the Central Dike could result in the sudden release of dike material and tailings from the TSF into that portion of the Portage Pit immediately adjacent to the dike. This could potentially result in loss of life. This would result in cessation of mining activities, either temporarily or permanently.

There would be no effect on the receiving environment water quality, fish or fish habitat because tailings would be contained within the pit and the dewatering dikes and the area would not yet be flooded.

2.2 Mitigation, Management and Monitoring

The calculated FoS for this failure mode, under static and pseudo-static conditions, are above design criteria in the Dam Safety Guidelines (CDA, 2007). Consequently, the probability of such a failure developing is low. Based on the tailings deposition plan, it is expected that the tailings pond will typically be 500 m or more from the face of the Central Dike. Furthermore, thermal modeling indicates the tailings and Central Dike will be frozen or partially frozen, and that the facility will tend to the frozen state in the long term. Therefore, a catastrophic failure of the Central Dike without some form of prior dam distress providing a warning of deteriorating conditions is not considered a credible catastrophic failure mode.

Mitigation against such a failure mode occurring will be to construct the Central Dike to design so that it is physically stable under all loading conditions. A comprehensive quality control and quality assurance program was put in place in the previous stages of construction and will be undertaken during dike construction to confirm foundation conditions, material type and quality, and to adjust designs as necessary to accommodate actual or unexpected conditions found at site.

- A management plan was developed for the operation of the tailings facility, and includes appropriate operational controls and monitoring activities. During operations, instrumentation will be installed to monitor not only the physical performance of the Central Dike itself, but also the performance of the TSF. The instrumentation installed and to be installed includes thermistors to monitor the thermal regime in the dike and foundations, and deposited tailings.
- Piezometers to measure pressure and to infer flow through the dike and foundation materials
- Prisms to monitor deformations within the dike.

If necessary, the stability of the foundation materials and of the dike during operations can be enhanced through the construction of a stabilizing toe berm or through freezing.

A3 FAILURE SCENARIO DURING CLOSURE

In the case of failure of the Central Dike during or following closure, the 'worst-case' scenario would involve a catastrophic failure of the dike and the release of tailings into the lake.

3.1 Potential Effect

Failure of the Central Dike during or following closure is not expected to result in loss of life, as mining operations will have finished.

Under this scenario, a catastrophic failure of the Central Dike could result in the sudden and unexpected release of dike material and tailings into the Portage Pit lake area. This could potentially produce a wave of sediment laden water that could over-top the East Dike.

Such a scenario would destroy fish habitat along the dike face and smother benthic habitat outwards from the failure area. Suspended solids and dissolved metals would increase in the water column and would cause displacement of fish and possible toxicity of some bottom sediments, depending on how much tailings material was lost. The new face would be subject to chronic erosion of fine tailings material until such time as a new, stable dike face could be established. Failure of the dike would not cause a change in water level. Impacts would be localized because the Central Dike is situated in the upper part of a blind arm of the lake with an extremely limited drainage area and low turnover. Consequently, transport of suspended sediment away from the area would be restricted and the area of impact would be relatively small.

3.2 Mitigation, Management, and Monitoring

The calculated FoS for the Central Dike design are greater than design criteria for post closure for static and pseudo-static (earthquake) conditions. Consequently, the likelihood of a failure occurring is low. Furthermore, thermal modeling indicates the tailings and Central Dike will progressively freeze, and that the facility will tend to the frozen state in the long term. Freezing will increase dike and tailings stability and decrease tailings mobility, and therefore this is not considered a credible catastrophic failure mode.

Mitigation against such a failure mode occurring will be to construct the Central Dike to the design so that it is physically stable under static and pseudo-static loading conditions, and to monitor during the mine life to assess the overall performance of the dike and the TSF. Data gathered during the operational period of the TSF can be used to re-evaluate the performance of the Central Dike structure in the context of longer term stability post closure.

B) Saddle Dams

Five Saddle dams will be constructed around the limits of the tailings basin. Two Saddle Dams were built between 2009 and 2011, the three other Saddle Dams have been built in 2015 through 2017. The saddle dam locations are shown on the general mine site plan provided at the beginning of this document. The saddle dams were constructed by dumping a rockfill berm with a crest width of 30 m to allow haul truck traffic. The Saddle Dams will be re-sloped, with a minimum 15 m crest width. The downstream face will be angle of repose, or 1.32H:1V (Horizontal:Vertical), and the upstream face will be 3H:1V. The Saddle Dams will have an upstream two-zone granular filter and a liner. There is a potential for release of attenuation water, reclaim water, or tailings to Third Portage Lake in the event of an overtopping or catastrophic failure.

For information on the consequences and monitoring/action for the various embankment failure modes possible at the Saddle Dams see Table 2.2 for the Central Dike.

B.1 FAILURE SCENARIO DURING OPERATIONS

Depending upon the phase of operations, breach or complete failure of a Saddle Dam could result in the uncontrolled release of Attenuation Pond water, Reclaim Pond water or tailings to Third Portage Lake. There is also the possibility of the Saddle Dams being overtopped through the formation of a wave resulting from a slope failure within the Portage Waste Rock Storage Facility and the sudden release of waste rock into the TSF.

A tailings beach will be formed on the toe of each Saddle Dam. As a result, the Reclaim Pond will be pushed away from the Saddle Dams. As the tailings and Saddle Dams are expected to freeze, and freezing will reduce the chance of tailings reaching Third Portage Lake, failure of the Saddle Dams with release of tailings to Third Portage Lake is not considered to be credible.

An overtopping or breach failure of the section of the Saddle Dams located just south of the intersection with the Stormwater Dike (Saddle Dam 3) could potentially result in flow of Reclaim Pond water and/or tailings toward Third Portage Lake.

B1.2 Potential Effect

Should an overtopping event or breach occur in a Saddle Dam, water flowing toward Third Portage Lake would consist of Reclaim Pond water which is predicted to exceed Metal Mining Effluent Regulations (MMER) guidelines for a number of constituents.

As a worst case of failure resulting in a dam breach, the total predicted Reclaim Pond volume of 0.75 Mm^3 could be released towards Third Portage Lake. The Saddle Dams would not be expected to fail due to overtopping. This failure mode is not expected to release a considerable volume of water to Third Portage Lake. Given the size of Third Portage Lake, the impacts to water quality and on fish from a release of Reclaim Pond water would likely be localized.

A worst case scenario would also involve the flow of non-frozen tailings into Third Portage Lake. The distance between the toe of the Saddle Dams and Third Portage Lake is on the order of 150 m to 300 m. Such a scenario would destroy fish habitat and smother benthic habitat outwards from the failure area. Suspended solids and dissolved metals would increase in the water column and would cause displacement of fish and possible toxicity of some bottom sediments, depending on how much tailings material was lost.

B1.3 Mitigation, Management, and Monitoring

The dams are designed according to Dam Safety Guidelines (CDA, 2007), and were and will be constructed under controlled conditions. A comprehensive quality control and quality assurance program was put in place in the previous stages of construction and and will be undertaken during construction to confirm foundation conditions, material type and quality, and to adjust designs as necessary to reflect actual conditions found at site. The dams are predicted to eventually freeze, which will enhance stability. Therefore, failure of Saddle Dams by overtopping, full breaching or foundation and slope failure is not considered to be credible.

With respect to slope stability failure, the Saddle Dams are constructed of rockfill, which has high shear strength. Slope stability failures must therefore occur through foundation soils. The calculated FoS for slope stability failure modes through foundation soils are above the design criteria in the Dam Safety Guidelines (CDA, 2007) for static and pseudo-static conditions. Consequently, the probability of such a failure developing is low.

The tailings are expected to freeze, and freezing will reduce the chance of tailings reaching Third Portage Lake. The distance from Saddle Dam 1 to Third Portage Lake is about 300 m at its closest point. Leaks of supernatant water and or tailings from the South Saddle Dam would be most likely to occur during operations. Leaks would be visible, and could be mitigated during operations.

B.2 FAILURE SCENARIO DURING CLOSURE

At closure Reclaim Pond water will be pumped to an Attenuation Pond, the basin behind the Saddle Dams will be drained and filled with run-of-mine, acid-buffering ultramafic waste rock (NPAG). The rock is expected to freeze over time. Failure of the Saddle Dams following closure is not considered to be credible. Further, the lack of water will reduce mobility of tailings if failure occurs.

B2.1 Potential Effect

No effects to water quality, fish or fish habitat is expected.

B2.2 Mitigation, Management, and Monitoring

As described previously, the dams were and will be designed to meet Dam Safety Guidelines (CDA, 2007). The dams were and will be constructed under controlled conditions. During the construction of the dams a comprehensive quality control and quality assurance program was and will be undertaken to confirm foundation conditions, material type and quality, and to adjust designs as necessary to reflect actual or unexpected conditions found at site. Monitoring during operations will ensure the Saddle Dams perform as intended. The dams will eventually freeze, which will enhance stability. Therefore, post-closure failure of the Saddle Dams by full breaching or foundation and slope failure is not considered to be credible.

C) Stormwater Dike

The Stormwater Dike is located at the northwest end of Second Portage Lake, within the TSF as shown on the general mine site plan provided at the beginning of this document. The location of the Stormwater Dike was selected to optimize the storage capacity of the main tailings basin, and of the Portage Attenuation Pond. The dike separates the tailings basin from the Attenuation Pond until approximately 2014 at which point the tailing deposition will start in the South tailing Cell. At the end of mine life, any remaining water will be transferred to the Portage Pit as part of reflooding and treated if required.

The Stormwater Dike was constructed using rock fill, with an upstream slope of 3H: 1V and a downstream slope at angle of repose for rock fill. The minimum crest width is 12 m. Final crest is at elevation 150.0 m. The dike has a filter zone placed on the south face, underlying an impermeable element of bituminous geo-membrane. The maximum height of the dike is about 13 m. At the maximum cross section, the width of the base of the dike is approximately 95 m.

For information on the consequences and monitoring/action for the various embankment failure modes possible at Storm water Dike see Table 2.2.

C1 FAILURE SCENARIO DURING OPERATIONS

If slope failure of the Stormwater Dike were to occur when tailings are at their maximum elevation in the main tailings basin, and if the tailings are not frozen, this could potentially result in the sudden flow of tailings into the Attenuation Pond area or in the South Cell. This in turn could potentially result in the development of a wave which overtops the Saddle Dam at the northwest end, releasing tailings and reclaim water to Third Portage Lake.

C1.1 Potential Effect

A breach or failure of the Stormwater Dike may cause a wave-induced overtopping of the Saddle Dam at the northwest end. The Saddle Dam would not be expected to fail due to a single overtopping wave event.

This failure mode is not expected to release water to Third Portage Lake. The distance between the toe of the Saddle Dam and Third Portage Lake is on the order of 150 m, so tailings would likely settle out. The potential impacts on Third Portage Lake water quality, fish and fish habitat would likely be minor, localized and short-lived. ______

C1.2 Mitigation, Management, and Monitoring

The Stormwater Dike was designed to meet Dam Safety Guidelines (CDA, 1999). The upstream side slopes were designed to allow machine traffic, and are therefore highly conservative with respect to slope stability. The dike was constructed in the dry under controlled conditions. During the construction of the dike a comprehensive quality control and quality assurance program was undertaken to confirm foundation conditions, material type and quality, and to adjust designs as necessary to reflect actual conditions found at site. The dike will eventually freeze, which will enhance stability. Therefore, failure of the dike due to overtopping is not considered to be credible.

C.2 FAILURE SCENARIO DURING CLOSURE

The Stormwater Dike will be covered by tailing on both upstream and downstream side, to equal out the different elevations. At closure the Reclaim Pond water will be, the basin behind the Saddle Dams and Stormwater Dike will be drained and filled with run-of-mine, acid-buffering ultramafic waste rock (NPAG).

The rock is expected to freeze over time. Failure of the Stormwater Dike following closure is not considered to be credible. Further, the lack of water will reduce mobility of tailings if failure occurs.

C2.1 Potential Effect

No effects to water quality, fish or fish habitat is expected.

C2.2 Mitigation, Management, and Monitoring

The Stormwater Dike was designed to meet Dam Safety Guidelines (CDA, 1999). The dike was constructed under controlled conditions. During the construction of the dike a comprehensive quality control and quality assurance program was undertaken to confirm foundation conditions, material type and quality, and to adjust designs as necessary to reflect actual or unexpected conditions found at site. Monitoring during operations ensure the Stormwater Dike performs as intended. The dike will eventually freeze, which will enhance stability. Therefore, post-closure failure of the Stormwater Dike by full breaching or foundation and slope failure is not considered to be credible.