DOMINION DIAMOND

SECTION 3

PROJECT DESCRIPTION

DOMINION DIAMOND

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Appendix 3A Jay Project Mine Water Management Plan
Appendix 3B Jay Project Conceptual Closure and Reclamation Plan
Appendix 3C Risk Assessment for Accidents and Malfunctions of the Jay Project

Section 3 Abbreviations

Abbreviation	Definition
DAR	Developer's Assessment Report
Diavik Mine	Diavik Diamond Mine
Dominion Diamond	Dominion Diamond Ekati Corporation
e.g.	for example
EA	environmental assessment
Ekati Mine	Ekati Diamond Mine
et al.	and more than one additional author
FPK	fine processed kimberlite
i.e.	that is
ICRP	Interim Closure and Reclamation Plan
LLCF	Long Lake Containment Facility
Meadowbank Mine	Meadowbank Gold Mine
MK	magmatic kimberlite
NWT	the Northwest Territories
PK	processed kimberlite
Project	Jay Project
PS1	pumping system one
PS2	pumping system two
PS3	pumping system three
PVK	primary volcaniclastic kimberlite
RVK	re-sedimented volcaniclastic kimberlite
TCWR	Tibbitt to Contwoyto Winter Road
TOR	Terms of Reference
TransK	transitional kimberlite
TSS	total suspended solids
VK	volcaniclastic olivine-rich kimberlite
Water Licence	Class A Water Licence W2012L2-0001
WLWB	Wek'èezhìi Land and Water Board
WPKMP	Wastewater and Processed Kimberlite Management Plan
WROMP	Waste Rock and Ore Storage Management Plan
WRSA	waste rock storage area

Section 3 Units of Measure

Unit	Definition
%	percent
°	degree
ha	hectare
kg	kilogram
km	kilometre
km^2	square kilometre
kPa	kiloPascal
kW	kilowatt
m	metre
m^3	cubic metre
masl	metres above sea level
ML	million litres
mm	millimetre
MPa	megaPascal
Mt	million tonnes
MW	megawatt
tpd	tonnes per day
m^3/hr	cubic metres per hour

3 PROJECT DESCRIPTION

3.1 Introduction

Dominion Diamond Ekati Corporation (Dominion Diamond) is a Canadian-owned and Northwest Territories (NWT) based mining company that mines, processes, and markets Canadian diamonds from its Ekati Diamond Mine (Ekati Mine). Dominion Diamond also markets its 40 percent (%) share of the diamond production from the Diavik Diamond Mine (Diavik Mine, NWT) operated by Rio Tinto Plc of London, England. The existing Ekati Mine is located approximately 200 kilometres (km) south of the Arctic Circle and 300 km northeast of Yellowknife in the NWT (Map 3.1-1).

Dominion Diamond is proposing to develop the Jay kimberlite pipe (Jay pipe) located beneath Lac du Sauvage. The proposed Jay Project (Project) will be an extension of the Ekati Mine, which is a large, stable, and successful mining operation that has been operating for 16 years. Most of the facilities required to support the development of the Jay pipe and to process the kimberlite currently exist at the Ekati Mine. The Project is located in the southeastern portion of the Ekati claim block approximately 25 km from the main facilities and approximately 7 km to the northeast of the Misery Pit, in the Lac de Gras watershed (Map 3.1-2).

The proposed approach to mining the Jay pipe is to isolate the area of Lac du Sauvage overlying the pipe within a water-retaining dike and then dewater the diked area to allow for open-pit mining. The approach is similar in concept to those implemented for the Diavik Mine and the Meadowbank Gold Mine (Meadowbank Mine) in Nunavut. The Project will also require an access road, pipelines, and power lines to the new open pit.

LEGEND

- JAY PROJECT
- EXISTING MINE OR PROJECT
- TERRITORIAL CAPITAL
- POPULATED PLACE
- HIGHWAY
- ALL-SEASON ROAD
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- TERRITORIAL/PROVINCIAL BOUNDARY
- TREELINE
- WATERCOURSE
- WATERBODY

150 0 150

SCALE 1:6,000,000 KILOMETRES

REFERENCE

WATER OBTAINED FROM ATLAS OF CANADA
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
PROJECTION: CANADA LAMBERT CONFORMAL CONIC

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

LOCATION OF THE JAY PROJECT

Golder Associates

PROJECT		13-1328-0041
DESIGN	AK	22/09/14
GIS	JG	15/10/14
CHECK	JV	15/10/14
REVIEW	JC	15/10/14

FILE No. DAR_PD_010_GIS

SCALE AS SHOWN REV. 0

MAP 3.1-1

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LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- KIMBERLITE PIPE
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

REFERENCE

CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

3 0 3

SCALE 1:150,000 KILOMETRES

PROJECT

DOMINION DIAMOND™

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

EKATI PROPERTY MAP

PROJECT		13-1328-0041	FILE No. DAR_PD_002_GIS
DESIGN	RK	12/08/14	SCALE AS SHOWN REV 0
GIS	AK/LR	15/10/14	
CHECK	JV	15/10/14	MAP 3.1-2
REVIEW	JC	15/10/14	

Golder Associates

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DOMINION DIAMOND

3.1.1 Purpose and Scope

The purpose of this Project Description is to meet the Terms of Reference (TOR) issued on July 17, 2014 by the Mackenzie Valley Review Board for the Jay Project. This section of the Developer's Assessment Report (DAR) for the Project addresses the Development Description section (Section 6) in the TOR. The entire TOR document is included in Appendix 1A, and the Table of Concordance for the DAR is provided in Appendix 1D.

As per the TOR, Dominion Diamond should:

> *"…ensure that a description of all its planned facilities and activities is included in the Developer's Assessment Report, including any proposed new facilities or activities not listed in Section 3.1 of the Terms of Reference. Further, the developer will provide a description of all existing facilities that will be used as part of this project, specifically details of any modification required accommodating the Project or refurbishing required extending the life of the facilities…"*
>
> and
>
> *"…describe the proposed Jay Project, providing details of all works and activities throughout construction, operation, closure and reclamation, and long-term monitoring phases, with a description of major activities by phase."*

This level of description is required for all Project components that are considered part of the proposed extension, including:

- new infrastructure, facilities, and management plans;
- existing infrastructure, facilities, and management plans; and,
- development phases and schedule.

This Project Description is intended to provide information on the Project for the Mackenzie Valley Review Board and other interested parties. The facility designs, construction methods, and operating practices described in the Project Description are based on pre-feasibility engineering studies and designs, and feedback from community engagement where appropriate. Final designs, construction methods, and operating practices will be developed from detailed engineering, which will be undertaken upon Project approval. Changes to the Project Description resulting from ongoing engagement with communities and engineering optimization are expected to maintain or enhance environmental performance.

An overview of the Project and the Project schedule is included in Section 3.2. The geology, geochemical, and geotechnical setting is described in Section 3.3. Existing Ekati Mine infrastructure facilities are described in Section 3.4, and the existing operational management plans are summarized. Jay Project components are described in Section 3.5. Closure and reclamation details are provided in Section 3.5.8, and Accidents and Malfunctions are discussed in Section 3.6.

3.2 Project Overview

The Project is an extension project, which will extend the operating life of the existing Ekati Mine by licensing the development of an additional kimberlite pipe. Kimberlite from the Jay Pit will be transported to the processing plant at the Ekati main camp, along the new Jay Road and the existing Misery Road. Before processing, the kimberlite may be stored within the temporary kimberlite storage areas. At the processing plant, the diamonds will be physically separated from the kimberlite, leaving coarse processed kimberlite and fine processed kimberlite (FPK) behind.

Coarse processed kimberlite will continue to be stored in the existing waste rock storage areas (WRSAs), while FPK will be deposited in the existing Koala and Panda open pits and associated underground workings. The FPK slurry from the processing plant will be transported via slurry pipelines, as currently conducted at site. For details about the existing facilities that will be used for the Project, refer to Section 3.4.

Along with the kimberlite, waste rock will also be extracted from the Jay Pit. The waste rock will be stored on surface within a new Jay waste rock storage area (WRSA).

The fundamental components and activities of the Project include the following:

At Lac du Sauvage

- roads, pipelines, and power lines to Lac du Sauvage;
- use of non-potentially acid generating (non-PAG) granite rock mined from the Lynx Pit and/or quarrying of granite rock for construction material;
- containment dike around the Jay kimberlite pipe;
- diversion of a small drainage area on the west shore of Lac du Sauvage (Sub-Basin B Diversion Channel) to direct the Christine Lake outflow south around the diked area into the main basin of Lac du Sauvage;
- fish-out of the isolated portion of Lac du Sauvage within the diked area;
- pumping systems for dewatering and ongoing operational water management;
- exposure of the lakebed overlying the Jay kimberlite pipe (Jay pipe) by dewatering within the diked area;
- open-pit mining of the Jay Pit;
- development of the Jay WRSA and haul roads;
- continued use of the existing Misery site, including the use of the mined-out Misery Pit as a water management facility during dewatering and operations;
- incorporating reclamation of the Lynx Pit into Project activities by filling the mined-out open pit with water from Lac du Sauvage during dewatering; and,
- reclamation and closure of Project components (pit back-flooding, dike breaching, re-establishing surface flows, and other activities).

At Ekati Main Camp and Site

- processed kimberlite deposition into the mined-out Koala and Panda open pits;
- continued use of the Misery access road;
- continued use of the Ekati main camp, processing plant, airstrip, and all other related facilities; and,
- ongoing reclamation of completed areas with no further operational value (e.g., certain areas of the Long Lake Containment Facility (LLCF).

The design of these facilities and activities uses approaches that have been successfully implemented at the Ekati Mine and other northern mines. The existing Ekati Mine environmental monitoring, management, and mitigation programs will all be expanded to incorporate the activities proposed for the Jay Project. As stated in Section 1, the Project maximizes the use of the existing infrastructure to reduce the environmental footprint.

3.2.1 Project Schedule

Once Dominion Diamond has obtained the necessary operational permits, licences, and authorizations, the construction phase will be initiated. The primary time constraint for the Project is that kimberlite production must be delivered to the processing plant by 2020 to avoid a shutdown of the Ekati Mine. An overview of the timeline and general activities for the Project is provided in Table 3.2-1. Images showing the development of the Jay Project, including following reclamation are shown in Maps 3.2-1 to 3.2-6.

Table 3.2-1 Overview of Project Timeline and General Activities for the Jay Project

Year	Project Phase	General Activities
2016	Construction	• Construction of roads, power line, dike, pipelines, and pumping facilities initiated
2017 to 2018	Construction	• Construction of roads, dike, pipelines, and pumping facilities continues • Construction of Sub-Basin B Diversion Channel • Fish-out within diked area
2019	Construction/ Operations	• Construction completed • Dewatering of the diked area • Use of the Misery Pit for dewatering water management • Back-flooding of Lynx Pit • Pre-stripping for Jay open pit • Production of kimberlite to processing plant from Jay open pit begins
2020 to 2029 (10 Years)	Operations	• Mining of the Jay open pit • Misery Pit used for minewater management • Storage of waste rock at Jay waste rock storage area • Storage of fine processed kimberlite in the mined-out Panda and Koala pits, and coarse kimberlite reject in the coarse kimberlite reject management area

Table 3.2-1 Overview of Project Timeline and General Activities for the Jay Project

Year	Project Phase	General Activities
2030 to 2033 (4 Years)	Closure	• Pumping minewater from the Misery Pit to the Jay Pit • Back-flooding the Jay Pit and the dewatered area of Lac du Sauvage • Back-flooding of the Misery Pit with a cap of water from Lac du Sauvage • Roads and Sub-Basin B Diversion Channel decommissioned • Reclamation of surface facilities

3.2.1.1 Construction

Construction is expected to take approximately three years (2016 to 2019; Table 3.2-1). Construction will include the following activities:

- Granite rock will be quarried for construction material, and/or granite rock mined from the Lynx Pit will be used for construction of components of the Jay Project.
- A road will be extended from the Misery Road to the Lac du Sauvage shoreline.
- A lay-down area near Lac du Sauvage will be constructed to support dike construction and operations.
- A small lunchroom, office, and washroom facility with emergency shelter, storage and field maintenance facilities will be constructed at the lay-down area.
- A horseshoe-shaped water retention dike will be built from the shoreline out into Lac du Sauvage to isolate the portion of the lake overlying the Jay pipe. The dike will be 5 km long with a maximum depth of water of approximately 13 metres (m).
- The isolated portion of Lac du Sauvage within the diked area will be fished out.
- Pumping systems, pipelines, and a power line for dewatering the diked area and for ongoing operational water management will be constructed from the Jay Pit area to the Misery Pit.
- The isolated portion of Lac du Sauvage will be dewatered to expose the lakebed overlying the Jay kimberlite pipe. Approximately 29.6 million cubic metres (m^3) of water will be removed from the diked area during dewatering. Initial dewatering will be directed to Lac du Sauvage; once water quality is no longer suitable for direct discharge (i.e., higher levels of total suspended solids [TSS]), pumping will be directed to the mined-out Lynx and Misery pits.
- A small drainage area on the west shore of Lac du Sauvage (Sub-Basin B Diversion Channel) will be diverted to direct the Christine Lake outflow south around the diked area into the main basin of Lac du Sauvage.

Once the lakebed is exposed in the diked area, mining operations will begin.

3.2.1.2 Operations

The construction period will be followed by an approximate ten-year operational period (2019 to 2029) during which kimberlite from the Jay Pit will be mined and processed. The Jay Pit will be mined using conventional open-pit truck-shovel operations. Mining is expected to end in Year 2029. However, as per typical mining practices, additional economic resources may be identified, as the resource becomes better defined during the operations phase. Should economics be favourable, the Jay open-pit mining could be followed by underground operations consistent with other Ekati Mine pits (e.g., Panda and Koala pits), and these resources would constitute additional years of the life of the Ekati Mine. Additional drilling continues to define potential additional resources, and subsequent drilling throughout the operations will confirm resources.

During operations, the mined-out Misery Pit will be used for minewater management (i.e., surface runoff and groundwater inflows to the Jay Pit). After approximately Year 5 of operations, when the Misery Pit has reached operational storage capacity level with safety freeboard to the pit outlet, water will be pumped to Lac du Sauvage. Waste rock will be stored at the Jay WRSA, which will be located on the west shore of Lac du Sauvage. Fine processed kimberlite from the processing plant will be placed in the mined-out Panda and Koala pits, and coarse kimberlite reject will be placed in the coarse kimberlite reject management area.

Operation of the mine will include the following activities:

- The Jay open pit will be developed using the conventional drill and blast techniques. Overburden, waste rock, and kimberlite will be moved by truck and shovel operations.
- Mining rock trucks will haul waste rock and overburden from the pit to the Jay WRSA, which will be located on the shore of Lac du Sauvage adjacent to the pit.
- Mining rock trucks will haul kimberlite from the pit to ore transfer pads, which will be located near the Jay Pit and near the Misery Road.
- Long-haul trucks will then haul kimberlite from the ore transfer pads at the Jay Pit and near the Misery Road to the processing plant or to a stockpile near the processing plant. The haul is approximately 4 km along the new Jay Road, and 25 km along the existing Misery Road. The use of kimberlite stockpiles provides operational efficiencies and allows flexibility to maintain a consistent feed rate at the processing plant, while accommodating possible brief segmented road closures, if necessary, for poor weather or caribou presence.
- The kimberlite will be processed in the existing processing plant to recover diamonds.
- Water for the processing plant is taken from the existing LLCF.
- The FPK will be deposited in the mined-out Panda and Koala open pits via pipelines from the processing plant to the pits. This method has been successfully demonstrated at the Beartooth Pit.

- Ongoing operational water management will divert natural runoff away from the Jay Pit, and will include collection of surface minewater and open pit minewater within the diked area. Open pit minewater will be pumped to the base of the Misery Pit. Surface minewater will be pumped to the top of the Misery Pit. Beginning in approximately Year 5, water will be drawn from the top of the Misery Pit and discharged into Lac du Sauvage through a diffuser.

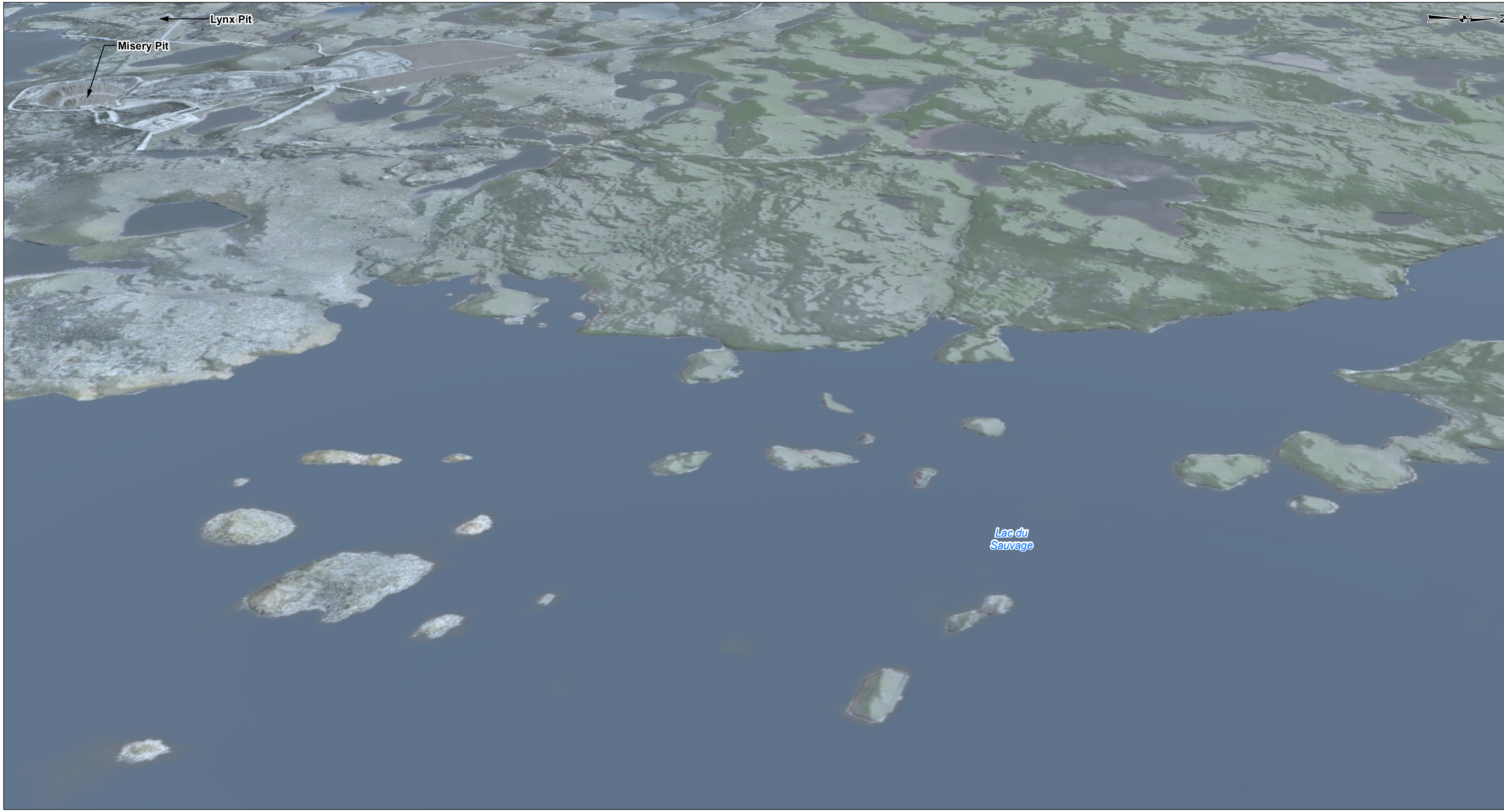
Once the open pit is completed, mining operations cease and closure begins.

3.2.1.3 Closure

Reclamation of some existing facilities that have no operational value will proceed during the Project. This will include, for example, Cells A, B, and C of the LLCF. Reclamation of other existing facilities will proceed upon completion of the Project. This will include, for example, the Ekati main camp and processing plant.

Active closure will occur after the completion of mining, and is currently scheduled to take place over four years starting in 2030. This will include removal of site infrastructure and disposal of materials, either on-site or off-site as appropriate. Water will be pumped from the Misery Pit to the bottom of the Jay Pit, and the diked area will be back-flooded with water from Lac du Sauvage. Roads and the Sub-Basin B Diversion Channel will be decommissioned. The Misery, Panda, and Koala pits will be covered with a freshwater cap.

Once monitoring has shown that water quality within the diked area is suitable, the dike will be breached and the isolated portion of Lac du Sauvage will be reconnected. The Misery Pit will be allowed to overflow to Lac de Gras once water quality is suitable. Monitoring will continue until it is shown that the site meets all regulatory closure objectives. Version 2.4 of the Ekati Mine Interim Closure and Reclamation Plan (ICRP) was approved by the Wek'èezhìı Land and Water Board (WLWB) in November 2011 (BHP Billiton 2011) and is anticipated to be updated to incorporate the Project as part of future regulatory processes.



NOTES

1. PERSPECTIVE VIEW LOOKING WEST FROM ABOVE JAY PIPE PRODUCED FROM LIDAR TOPO AND AIR PHOTO

REFERENCE

3D IMAGE: GOLDER, 2014
3D IMAGE DERIVED FROM LIDAR DATA AND ORTHOPHOTOS OBTAINED FROM AURORA, 2013

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

BASE CASE CONDITIONS

Golder Associates

PROJECT	13-1328-0041		FILE No. DAR_VIS_001_GIS	
DESIGN	RK	11/09/14	NOT TO SCALE	REV 0
GIS	JR/LR	15/10/14	MAP 3.2-1	
CHECK	JV	15/10/14		
REVIEW	JC	15/10/14		

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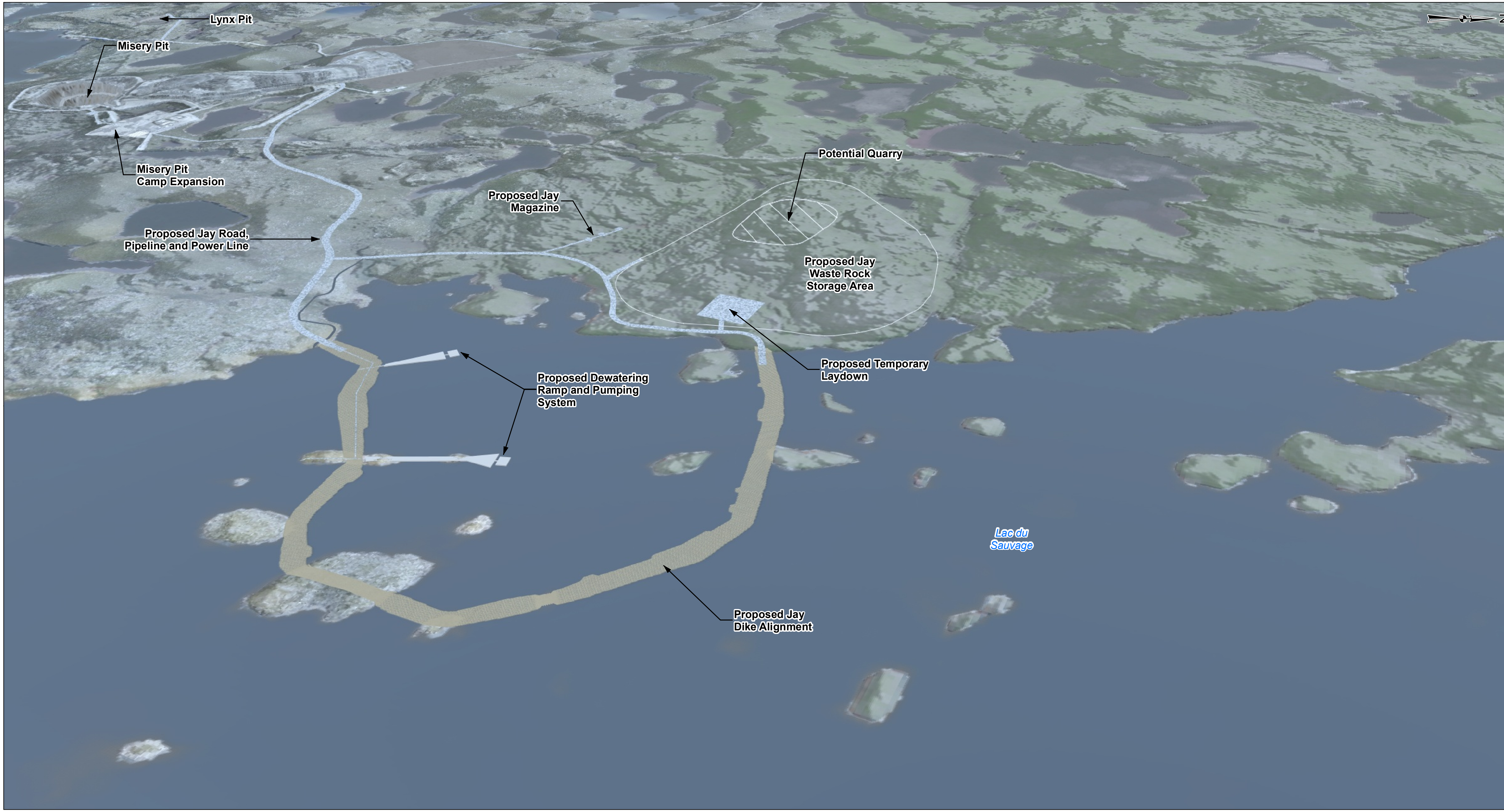

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NOTES

1. PERSPECTIVE VIEW LOOKING WEST FROM ABOVE JAY PIPE PRODUCED FROM LIDAR TOPO AND AIR PHOTO

REFERENCE

3D IMAGE: GOLDER, 2014
3D IMAGE DERIVED FROM LIDAR DATA AND ORTHOPHOTOS OBTAINED FROM AURORA, 2013

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND

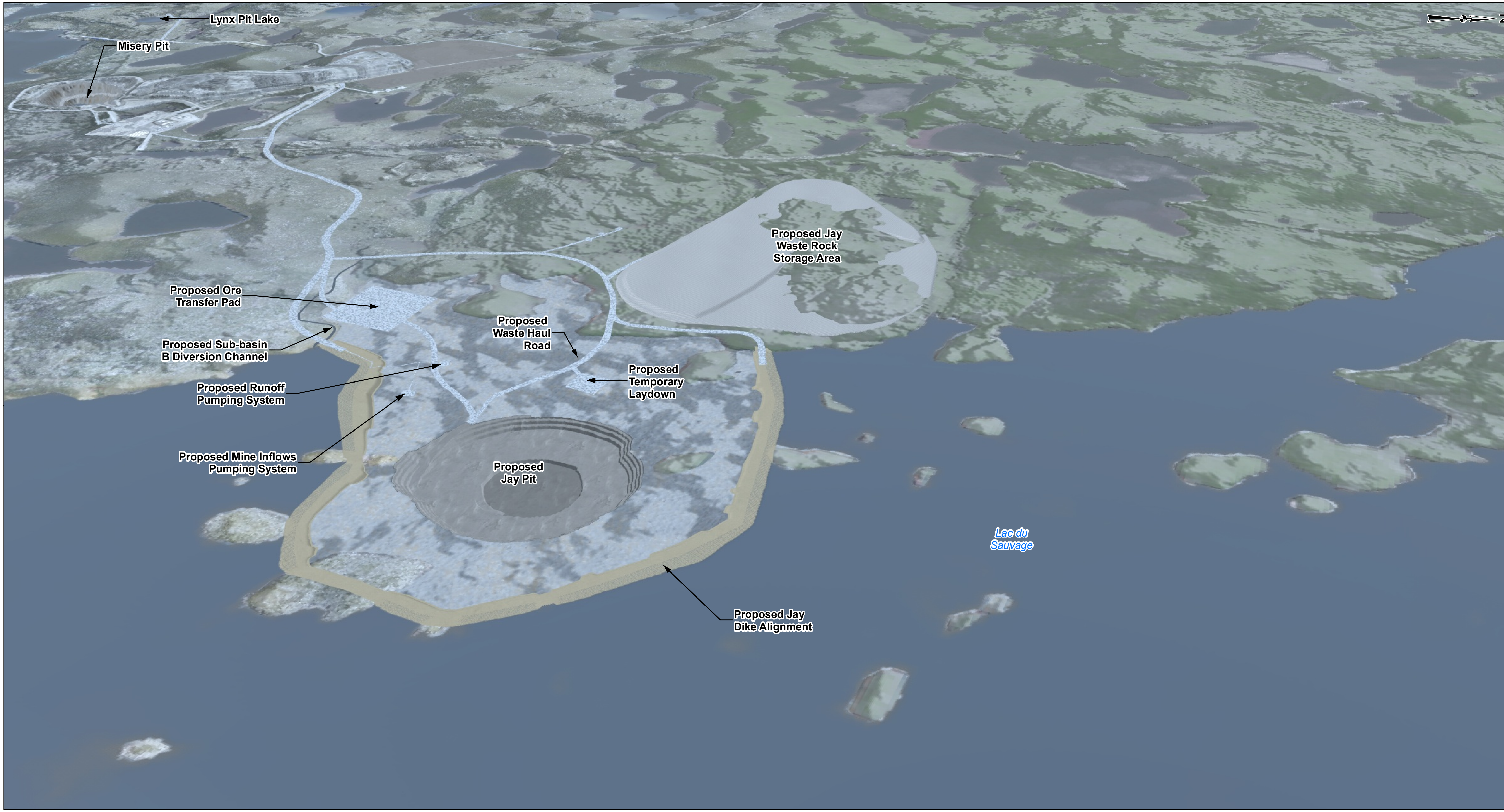
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

JAY PROJECT CONSTRUCTION

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_VIS_002_GIS
DESIGN	RK	11/09/14	NOT TO SCALE REV 0
GIS	JR/LR	15/10/14	
CHECK	JV	15/10/14	MAP 3.2-2
REVIEW	JC	15/10/14	



NOTES

1. PERSPECTIVE VIEW LOOKING WEST FROM ABOVE JAY PIPE PRODUCED FROM LIDAR TOPO AND AIR PHOTO

REFERENCE

3D IMAGE: GOLDER, 2014
3D IMAGE DERIVED FROM LIDAR DATA AND ORTHOPHOTOS OBTAINED FROM AURORA, 2013

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

JAY PROJECT
END OF YEAR 1 OPERATIONS

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_VIS_003_GIS	
DESIGN	RK	11/09/14	NOT TO SCALE	REV 0
GIS	JR/LR	15/10/14	**MAP 3.2-3**	
CHECK	JV	15/10/14		
REVIEW	JC	15/10/14		

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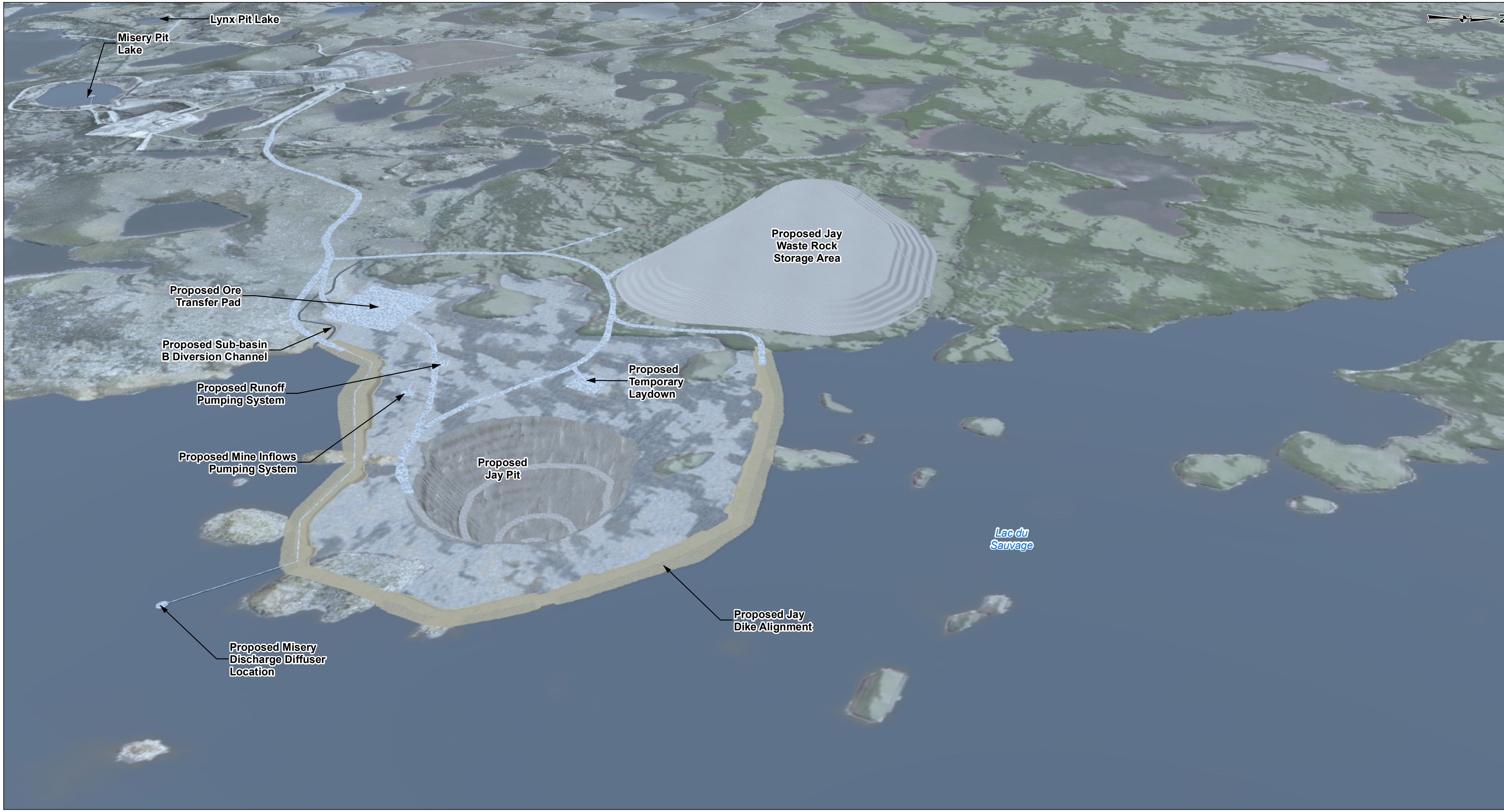

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NOTES

1. PERSPECTIVE VIEW LOOKING WEST FROM ABOVE JAY PIPE PRODUCED FROM LIDAR TOPO AND AIR PHOTO

REFERENCE

3D IMAGE: GOLDER, 2014
3D IMAGE DERIVED FROM LIDAR DATA AND ORTHOPHOTOS OBTAINED FROM AURORA, 2013

DOCUMENT

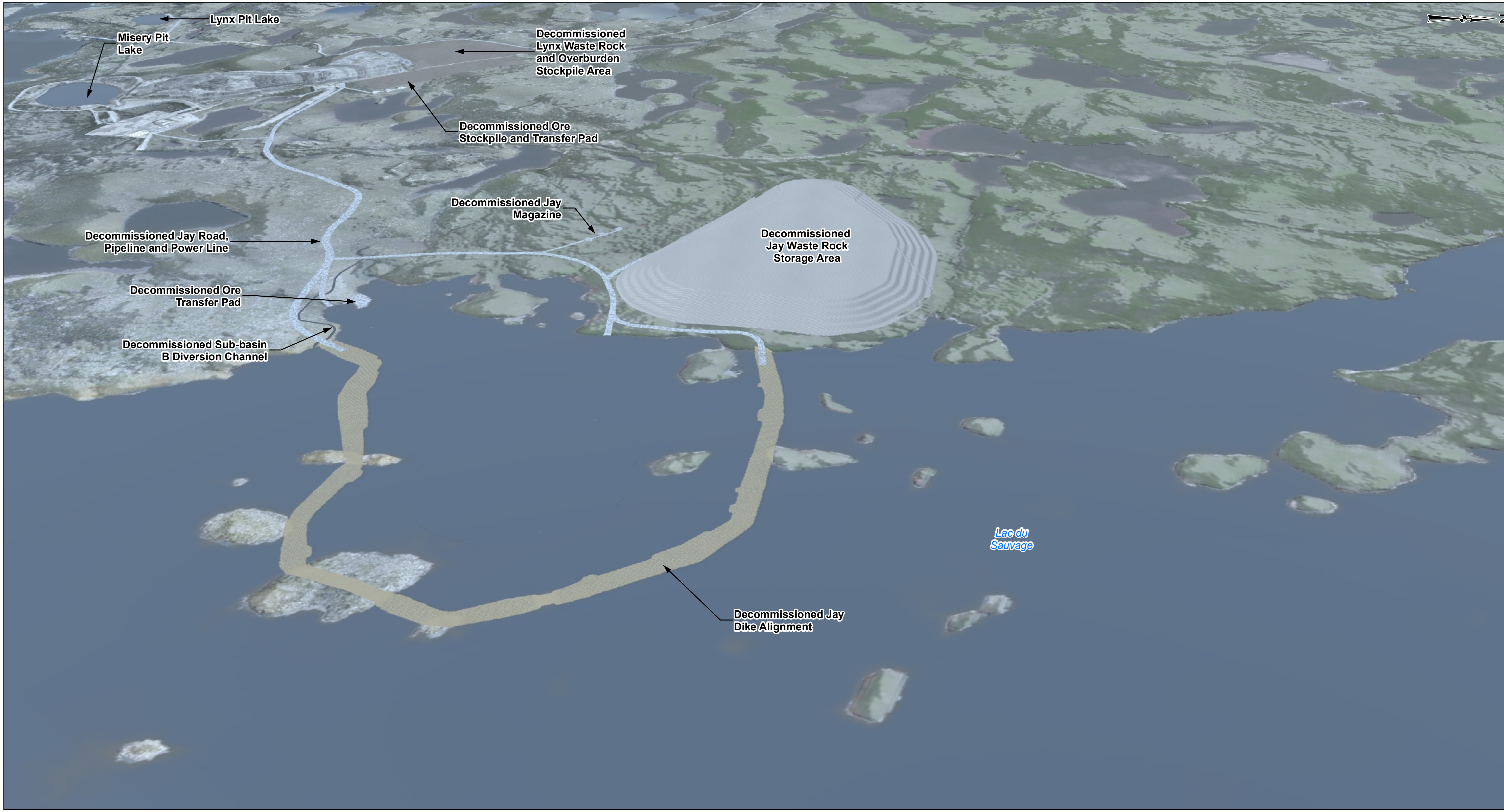
DEVELOPER'S ASSESSMENT REPORT

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
JAY PROJECT
END OF YEAR 10 OPERATIONS

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_VIS_004_GIS
DESIGN	RK	11/09/14	NOT TO SCALE — REV 0
GIS	JR/LR	15/10/14	MAP 3.2-4
CHECK	JV	15/10/14	
REVIEW	JC	15/10/14	



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NOTES

1. PERSPECTIVE VIEW LOOKING WEST FROM ABOVE JAY PIPE PRODUCED FROM LIDAR TOPO AND AIR PHOTO

REFERENCE

3D IMAGE: GOLDER, 2014
3D IMAGE DERIVED FROM LIDAR DATA AND ORTHOPHOTOS OBTAINED FROM AURORA, 2013

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND

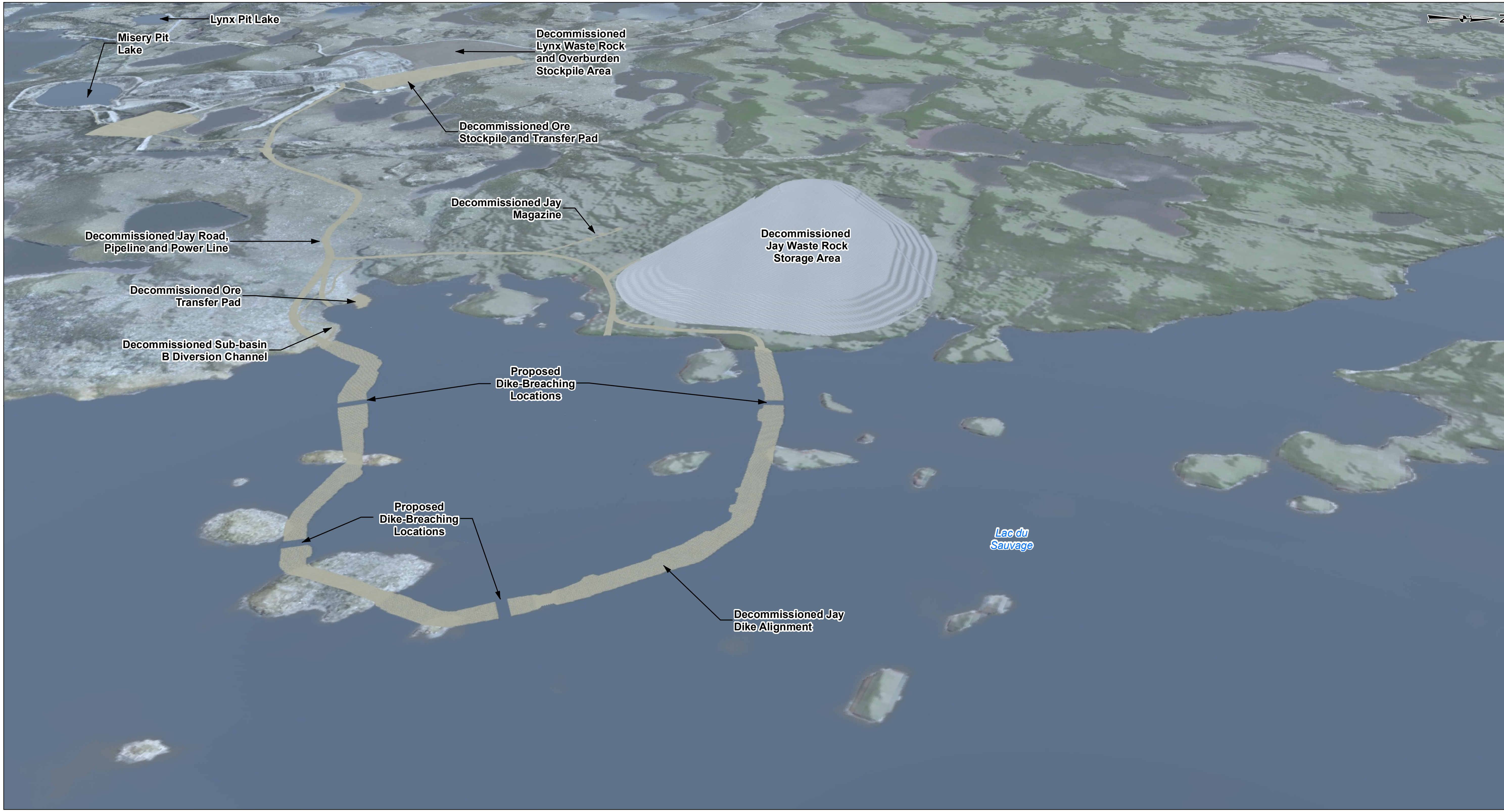
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

CLOSURE

Golder Associates

PROJECT	13-1328-0041		FILE No. DAR_VIS_005_GIS	
DESIGN	RK	11/09/14	NOT TO SCALE	REV 0
GIS	JR/LR	15/10/14	MAP 3.2-5	
CHECK	JV	15/10/14		
REVIEW	JC	15/10/14		



NOTES

1. PERSPECTIVE VIEW LOOKING WEST FROM ABOVE JAY PIPE PRODUCED FROM LIDAR TOPO AND AIR PHOTO

REFERENCE

3D IMAGE: GOLDER, 2014
3D IMAGE DERIVED FROM LIDAR DATA AND ORTHOPHOTOS OBTAINED FROM AURORA, 2013

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

POST CLOSURE CONDITIONS IN YEARS 10, 25, AND 50

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_VIS_006_GIS	
DESIGN	RK	11/09/14	NOT TO SCALE	REV 0
GIS	JR/LR	15/10/14	MAP 3.2-6	
CHECK	JV	15/10/14		
REVIEW	JC	15/10/14		

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3.3 Geological, Geochemical, and Geotechnical Setting

3.3.1 Geology

3.3.1.1 Ekati Mine Site

The Ekati claim block is located in the Slave Structural Province. The regional geology is based largely on work by Hoffman (1989) and Helmstaedt (2009). The Slave Structural Province represents the exposed part of the Slave Craton, one of the Archean granite-greenstone building blocks of the Precambrian core of North America. Rock types within the Slave Province and defining the bedrock units at the Ekati claim block can be assigned to three broad lithostratigraphic groups: metasedimentary schists, migmatites, and various syn- and post-tectonic intrusive inclusions, made up predominantly of granite, granodiorite, and tonalite. In addition, five mafic Proterozoic dyke swarms, ranging in age from circa 2.23 to 1.27 billion years ago, intrude the area (LeCheminant and van Breemen 1994; Kjarsgaard 2001; Nowicki et al. 2003; Nowicki et al. 2004; Helmstaedt 2009; Dominion Diamond 2013a).

Bedrock is overlain by Quaternary glacial deposits, which range in thickness from veneers (less than 2 m), to blankets (2 to 5 m), to hummocky deposits (more than 5 m up to 15 m). Glaciofluvial deposits are also present, the most prominent being an extensive network of sinuous eskers that transect the Ekati claim block and form part of a large southeast–northwest trending trunk esker. Lacustrine deposits occur in association with the numerous lakes on the claim block. Thin alluvial deposits have formed along streams, and pond deposits have accumulated in shallow depressions (Dredge et al. 1994; Nowicki et al. 2004; Dominion Diamond 2013a).

The kimberlite pipes at the Ekati Mine are part of the Lac de Gras kimberlite field, which is located in the central Slave Craton. The kimberlites intrude both granitoids and metasediments (Nowicki et al. 2004; Dominion Diamond 2013a) (Geology Baseline Report, Annex III).

Mudstone xenoliths and disaggregated sediment within the Ekati Mine kimberlites and other bodies of the Lac de Gras field indicate the presence of young (late-Cretaceous to early-Tertiary), partially consolidated cover sediments at the time of emplacement (Mineral Services Canada Inc. 2002; Nowicki et al. 2004). The Ekati Mine kimberlites range in age from 45 to 75 million years; they are mostly small pipe-like bodies (surface areas are for the most part less than 3 hectares [ha], but they can extend to as much as 20 ha) that typically extend to projected depths of 400 to 600 m below the current surface.
Kimberlite morphologies are strongly controlled by near-surface structures such as joints and faults (Nowicki et al. 2004).

The infill of the kimberlites on the Ekati claim block can be broadly classified into the following six rock types (Dominion Diamond 2013a):

- magmatic kimberlite (MK) – hypabyssal;
- tuffistic kimberlite (TK);
- primary volcaniclastic kimberlite (PVK);
- olivine-rich, volcaniclastic kimberlite (VK);
- re-sedimented volcaniclastic kimberlite (RVK); and,
- kimberlitic sediments.

With few exceptions, the Ekati kimberlites are made up almost exclusively of VK, including very fine to medium-grain kimberlitic sediments, RVK, and PVK. The RVK represents pyroclastic material that has been transported (e.g., by gravitational slumping and flow process) from its original depositional environment (likely along the crater rim) into the open pipe, and has undergone varying degrees of reworking with the incorporation of surficial material (mudstone and plant material) (Mineral Services Canada Inc. 2002).

While occasional peripheral kimberlite dykes are present, geological investigations undertaken to date do not provide any evidence for the presence of complex root zones or markedly flared crater zones (Nowicki et al. 2004).

Economic mineralization is mostly limited to olivine-rich RVK and PVK types. Approximately 10% of the 150 known kimberlite pipes in the Ekati claim block are of economic interest or have exploration potential (Dominion Diamond 2013a).

3.3.1.2 Jay Pipe

Before 2014, 16 diamond drill holes and 17 reverse circulation holes, totalling 3,872 m and 4,979 m, respectively, had been completed in the Jay pipe area (Dominion Diamond 2013a). Core drilling using synthetic diamond-tipped tools and/or carbide bits was used to define the pipe contacts and internal geology. Geological logging was completed on all 33 drill holes, and core from 15 diamond drill holes was photographed.

The Jay pipe is located beneath Lac du Sauvage, in the southeastern corner of the property, approximately 25 km southeast of the Ekati main camp and approximately 7 km north-northeast of the Misery Pit. The pipe is overlain by overburden that is 5 to 10 m thick, which is then covered by up to approximately 35 m of water.

The Jay pipe has a roughly circular outline in plan view (Map 3.3-1), with a surface area of approximately 13 ha (375 by 350 m), and a steep-sided pipe morphology as illustrated by the section view in Figure 3.3-1. The sides of the pipe are interpreted to be roughly planar with minor concavities and bulges. The shape, particularly the north side, is believed to be coincident with geological structures.

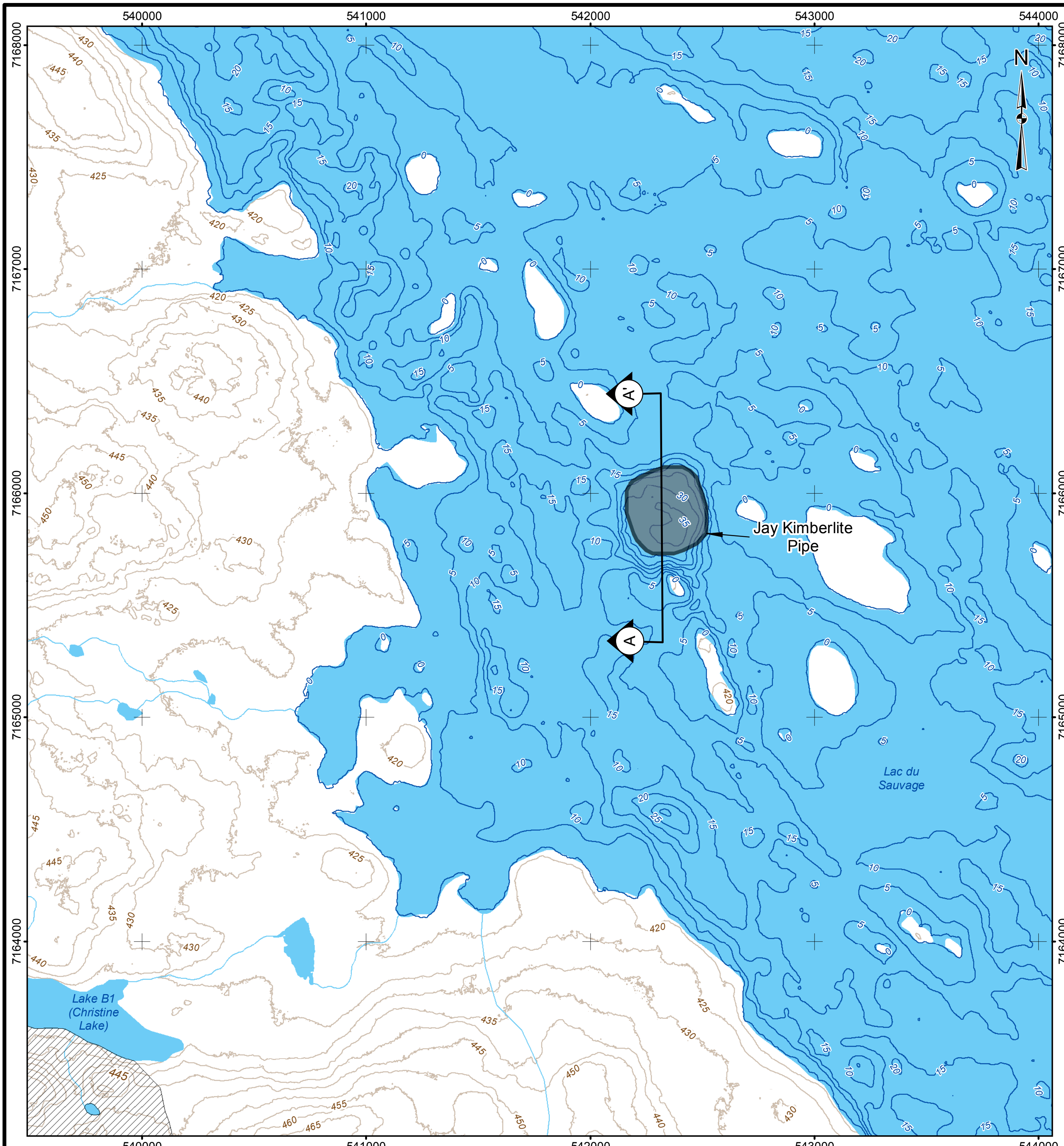
The Jay pipe is hosted within granitic rocks, ranging from granite to granodiorite in composition. A regional contact with meta-sedimentary rocks occurs to the west, and a diabase dyke trending approximately east-west occurs to the north of the pipe. Regional structures interpreted from geophysics extend east-west to the north of the Jay pipe and north-south to the west of the pipe. The east-west structure to the north of the Jay pipe may be associated with the diabase dyke. However, other zones of increased jointing have also been recognized in two core holes. The north-south structure may be associated with the metasediment-granite contact (Annex III).

Based on the current extent of drilling, and detailed geological logging of core and reverse circulation samples, the pipe is divided into the following three domains (Harrison et al. 2009; Dominion Diamond 2013a; Annex III):

1) The RVK domain is the uppermost 110 to 170 m in stratigraphic thickness. Small-scale chaotic bedding is present, which is defined by waves of silty to sandy laminates, and variations in olivine abundance. Variable amounts and sizes of black, pale grey, blue-grey, blue-green, brown, and tan-coloured mudstone and siltstone xenoliths are present. In core intersections, the RVK domain is comprised of repeating, large-scale graded mega-beds defined by mud, breccia, and olivine content. The upper portion of the mega-beds is composed of olivine-poor, mud- and clay-rich unconsolidated mudstone to RVK. Small-scale bedding is present but is very-fine grained. Rare shale breccia is present.

2) The transitional kimberlite (TransK) domain is a 30- to 70-m-thick package of interbedded RVK and VK material of varying degrees of alteration. The transition from the RVK domain to the VK domain is indistinct and is marked by the appearance of small interbeds of fresh to highly altered, dark- to pale-coloured VK.

3) The PVK domain is primarily olivine-rick, competent, grey-blue to green PVK with partially altered olivine set in a serpentinized matrix. The upper contact of the VK domain is marked by the absence of RVK and presence of highly altered, pale-coloured VK material. Small, irregularly shaped, mudstone and granitic xenoliths are present, but decrease in abundance with depth.



LEGEND

- KIMBERLITE PIPE
- BATHYMETRY DEPTH CONTOUR (5 m INTERVAL)
- ELEVATION CONTOUR (5 m INTERVAL)
- WATERCOURSE
- WATERBODY
- ESKER
- CROSS SECTION

500 0 500

SCALE 1:25,000 METRES

REFERENCE

LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND™

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

JAY KIMBERLITE PIPE LOCATION PLAN VIEW

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_PD_011_GIS
DESIGN	AL	24/09/14	SCALE AS SHOWN REV. 0
GIS	LR/AK	15/10/14	
CHECK	JV	15/10/14	MAP 3.3-1
REVIEW	JC	15/10/14	

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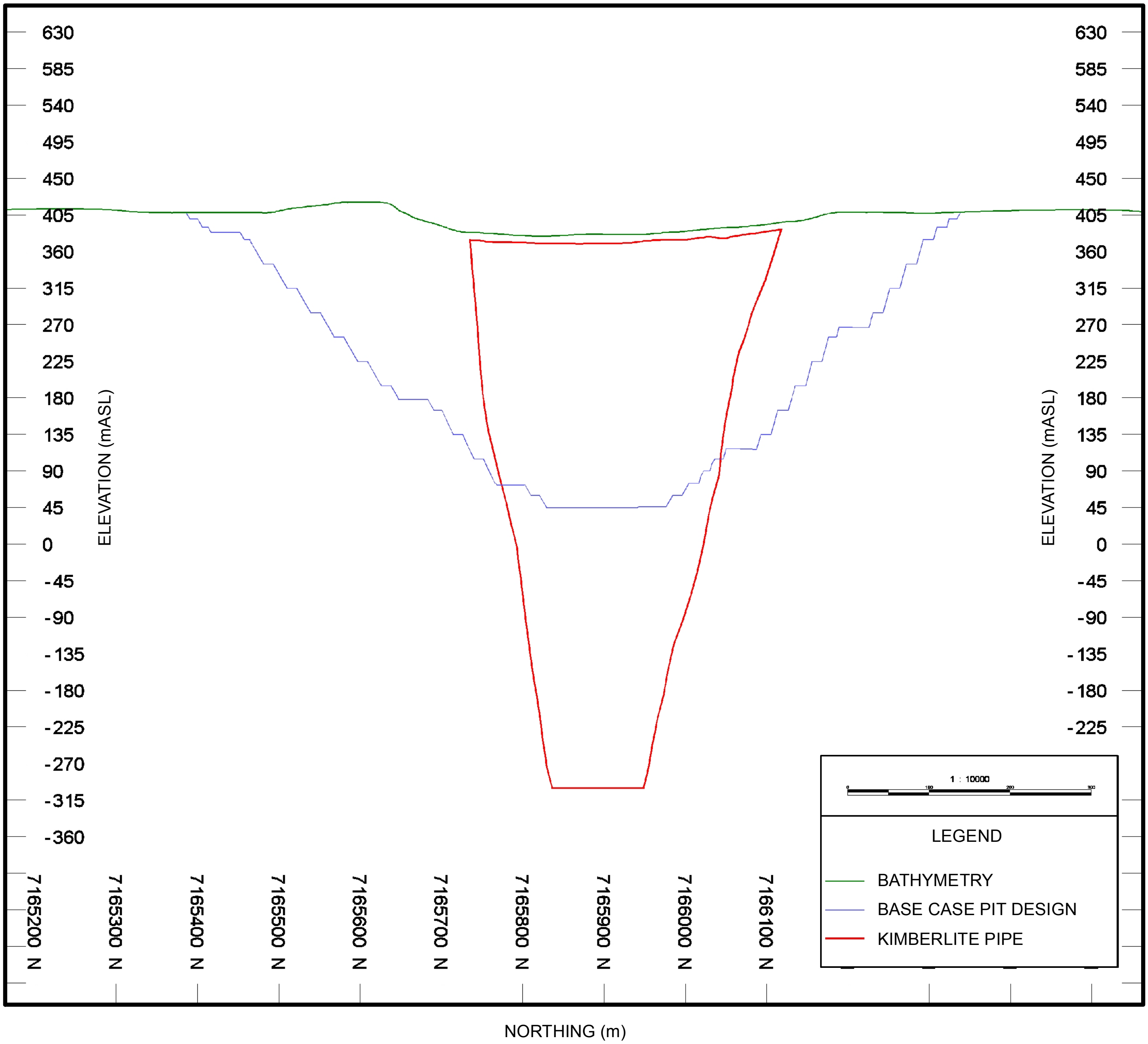

NOTES

1. THIS IS DISPLAYING CROSS SECTION A - A'
2. mASL = METRES ABOVE SEA LEVEL

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

JAY KIMBERLITE PIPE AND PIT CROSS SECTION

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_PD_004_GIS
DESIGN	RK	17/07/14	SCALE AS SHOWN REV. 0
GIS	LR/AK	14/10/14	FIGURE 3.3-1
CHECK	JV	14/10/14	
REVIEW	JC	14/10/14	

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The domains are roughly sub-horizontal and are interpreted to extend the width of the pipe. The boundaries between the domains are transitional in nature.

The geological logging indicates that four principal host-rock types exist at the Jay site: two-mica granite, metasediment, tonalite, and mafic dykes. For additional regional and site-specific geological details, refer to Annex III.

The current resource estimate for the Jay kimberlite pipe includes 45.6 million tonnes (Mt) of indicated resource (Golder 2014a).

3.3.2 Geochemical Conditions

The results of geochemical characterization are used to evaluate acid rock drainage and metal leaching potential that may result from chemical weathering of minerals present in rock that is exposed during construction and mining (Geochemistry Baseline Report, Annex VIII). Oxidation of sulphide minerals, such as pyrite, can produce acidity, sulphate, and metals. The acidity produced by oxidation of sulphide minerals can be neutralized by the dissolution of carbonate minerals and, to a lesser degree, certain silicate minerals present in the rock.

Geochemical characterization of the main rock types at the Ekati Mine has been ongoing since 1995 (refer to the Ekati Mine Waste Rock and Ore Storage Management Plan Version 4.1 [Dominion Diamond 2014] for additional information). A regional geochemical dataset was compiled using existing data from the Ekati Mine, which were collected between 1995 and 2014. The regional dataset was supplemented with the results of geochemical testing of samples collected from the Jay pipe in 2014. The regional dataset was used to develop an understanding of the acid rock drainage and metal leaching potential of overburden, granite, diabase, metasedimentary rock, and kimberlite in the Project area. The results of analysis of supplemental samples collected from the Jay pipe were used to confirm the acid rock drainage and metal leaching characteristics of material that will be mined from the Jay pipe, relative to the regional dataset.

Kimberlite and processed kimberlite have a low potential for acid generation, owing to the abundance of carbonate minerals in these materials. However, they are capable of leaching metals in neutral pH conditions including aluminum, arsenic, copper, nickel, and iron (regional dataset), and cadmium, copper, molybdenum, nickel, selenium, sulphate, and silver (Jay pipe dataset). These materials will be handled and stored as described in this Project Description, which is consistent with existing, approved management practices at the Ekati Mine.

The primary waste rock to be encountered (approximately 70%) during mining of the Jay pipe is anticipated to be granite (quartz diorite, granodiorite, two-mica granite, and pegmatite). The remainder is anticipated to be metasediment with minor amounts of diabase and barren or low-grade kimberlite.

Granite (including granodiorite, two-mica granite, and biotite granite) consists of silicate minerals including quartz, potassium feldspar, plagioclase, biotite, and muscovite. Sulphide minerals are rare in two-mica granite, and fine-grained pyrite has been occasionally observed in granodiorite. The granitic rock at the Ekati Mine has been characterized as non-potentially acid generating. Overburden also has a low acid-generating potential. The regional dataset indicated that granite may have the potential for leaching metals (aluminum, copper, arsenic, cobalt, and nickel), but samples collected from the Jay pipe had a low metal leaching potential. Granite will be handled, used, and stored as described in this Project Description, which is consistent with existing, approved management practices at the Ekati Mine.

Metasedimentary rock is known to contain trace concentrations of sulphide minerals, with occasional concentrations of 2% to 5%. Diabase dykes are classified as magnetic or non-magnetic. Diabase dykes contain trace concentrations of sulphide minerals, including pyrite, chalcopyrite, and pyrrhotite, and magnetic diabase dykes contain the iron mineral magnetite. Thus, the metasedimentary rock is classified as potentially acid generating (Annex VIII). Further, this material is capable of leaching metals (aluminum, arsenic, copper, cadmium, iron, nickel, silver, and zinc) in neutral and acidic conditions. This material will be handled and stored as described in this Project Description, which is consistent with existing, approved management practices at the Ekati Mine.

3.3.3 Geotechnical Conditions

A geotechnical and hydrogeological field investigation was carried out in the Jay pipe area from February to May 2014 (Golder 2104b,c,d). The field program consisted of the following activities related to the proposed Jay Dike and Jay Pit:

- drilling of four HQ-3 sized, diamond-cored, geotechnical boreholes in the proposed Jay Pit area;
- drilling of seven sonic-cored geotechnical boreholes, and eight HQ-3 sized, diamond-cored, geotechnical boreholes along the proposed Jay Dike alignment;
- geotechnical data collection from soil and rock cores, including the description and orientation of structural discontinuities in rock;
- field assessment of rock strength and point load strength testing;
- soil and rock core sample collection for laboratory testing;
- hydrogeological characterization through hydraulic conductivity testing;
- installation of a deep thermistor to collect ground temperature data with depth and time; and,
- installation of a Westbay multi-level monitoring well for groundwater sample collection.

The geotechnical information collected during the field investigation was used to develop an engineering geology model for the proposed Jay Pit area, to identify the major geological structures, to characterize the orientation and strength of the discontinuities encountered in the rocks, and to assess the quality of the rock masses comprising the main geotechnical domains.

3.3.3.1 Engineering Geology Model

The engineering geology model developed for the Project area based on the information collected during the 2014 field investigation considers the following main components:

- overburden consisting, in general, of unstratified till mixed with boulders, gravel, sand, silt, and clay;
- fresh, strong to very strong, predominantly good-quality rock masses consisting of granitoid rocks, metasediments, migmatites, pegmatite, and diabase dykes;
- fault zones within the bedrock that tend to locally reduce the rock mass quality to fair or poor; and,
- altered, very weak to moderately strong, poor to fair quality kimberlite.

3.3.3.2 Major Geological Structures

The structural model for the proposed Jay Pit indicates the occurrence of northwest–southeast and east-west trending faults. Inspection of the core from the geotechnical boreholes drilled during the 2014 Jay Pit field investigation indicates that the fault zones are infilled with material consisting mainly of clay and gouge. Based on the geotechnical core logging data, the majority of the faults logged exhibit a joint condition rating of 0 or 6.

3.3.3.3 Discontinuity Characterization

The core logging structural orientation data collected during the Jay Pit field investigation indicated the following:

- The granitoid, pegmatite, and diabase rocks have minimal foliation, and the joint orientations are fairly consistent between the different geotechnical holes.
- The dominant joint set observed in the granitoid, pegmatite, and diabase rocks dips at 25 degrees (°), on average, towards the southwest.
- The intrinsic foliation in the metasediments dips at 61°, on average, towards the southwest.
- The main joint sets in the metasediments are either sub-parallel or orthogonal to the foliation.

Based on the above observations, the structural domains in the proposed Jay Pit area have been defined as follows:

- a granitoid structural domain, which includes pegmatite and diabase structures; and,
- a metasediments structural domain.

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The peak and residual Mohr-Coulomb strength parameters for the joint and foliation surfaces were developed from the results of laboratory direct shear testing, and are summarized in Table 3.3-1.

Table 3.3-1 Discontinuity Peak and Residual Strength Parameters

Rock Type	Feature Type	Peak Shear Strength Cohesion (kPa)	Peak Shear Strength Friction Angle (°)	Residual Shear Strength Cohesion (kPa)	Residual Shear Strength Friction Angle (°)
Granitoid	Joint and Foliation	44	38	0	37
Metasediments	Joint	0	38	0	29
	Foliation	0	31	0	27

kPa = kiloPascal; ° = degree.

3.3.3.4 Rock Mass Characterization

The rock mass strength parameters for the main geotechnical domains in the Jay Project area were developed from the core logging data collected during the 2014 field investigation, and from the results of laboratory unconfined compressive strength, triaxial compressive strength, and Brazilian indirect tensile strength testing. The generalized Hoek-Brown rock mass strength parameters for granitoid, metasediments, and VK are summarized in Table 3.3-2.

Table 3.3-2 Rock Mass Strength Parameters

Design Domain	Generalized Hoek-Brown Rock Mass Strength σ_{ci} (MPa)	m_i	Geological Strength Index
Granitoid	146	19	88[(a)]
Metasediments	84	11	70
Volcaniclastic Kimberlite	31[(b)]	6	50[(b)]

a) The granitoid Geological Strength Index includes the core logging data for pegmatite.

b) The σ_{ci} and Geological Strength Index parameters for volcaniclastic kimberlite are based on historical core logging data collected in the Project area.

σ_{ci} = Hoek-Brown intact rock strength; MPa = megaPascal; m_i = Hoek-Brown constant.

3.3.4 Hydrogeology

The Jay open pit is expected to be excavated in unfrozen ground within the Lac du Sauvage talik. Because bedrock surrounding the pit is predominantly made up of granitic rock and metasediments with relatively low hydraulic conductivity, it is expected that mine inflow will be largely controlled by enhanced permeability zone(s) created by structural features such as fractured rock zones and/or faults. Due to their genesis, kimberlite pipes are typically associated with structural discontinuities; these zones can provide pathways for groundwater flow increasing groundwater inflows to the mine.

Groundwater inflow to the Jay Pit will be composed of shallow and deep groundwater. Local areas of Lac du Sauvage, particularly the areas immediately outside the dewatered area may become a source of shallow groundwater inflow to the pit. In addition, excavation of the pit may lead to an upward flow (referred to as saline upwelling) of deep-seated saline groundwater (i.e., upwards gradient to the Jay Pit). The resulting minewater pumped from the open pit will be the result of the mixing of freshwater from Lac du Sauvage and groundwater. Minewater will be expected to contain elevated concentrations of chloride, and other ions characteristic of deep groundwater, in relation to the lake water.

The upper levels of the Jay open pit would not be expected to encounter substantive quantities of deep groundwater. As the pit is excavated deeper towards the regional base of permafrost (e.g., approximately 350 m below ground surface), the quantity of deep groundwater, and the concentration of characteristic ions such as chloride, may increase. The increased density of the water with depth, as a result of the increased total dissolved solids concentration with depth, will result in a fluid density gradient that is anticipated to counteract the upward gradient to some degree.

The Mine Water Management Plan is outlined in Section 3.5.4. For further discussion regarding the hydrogeological setting of the Project, refer to the Hydrogeology Baseline Report (Annex IX).

3.4 Existing Infrastructure, Facilities, and Operational Management Plans

3.4.1 Existing Site Infrastructure and Facilities

The Project is an extension of the life of the Ekati Mine, a large, stable, and successful mining operation. As the Project is proposed to extend the Ekati Mine life beyond the currently anticipated closure date of 2019, the existing facilities at the Ekati Mine that are planned for use have the capacity to handle the Project.

The principal facilities at the Ekati Mine include the following:

- main accommodations complex: dorm-style sleeping rooms; dining, kitchen, and recreation areas; first aid station, emergency response/mine rescue stations; maintenance shops; sewage treatment plant; potable water treatment facility; and incinerator room;
- processing plant, Koala Pit, Panda Pit, Beartooth Pit, Fox Pit, Misery Pit, Pigeon Pit (under development), and Lynx Pit (planned);
- Panda/Koala/Beartooth WRSA, Misery WRSA, Fox WRSA, and Pigeon WRSA (under development);
- LLCF;
- Grizzly Lake freshwater supply system;
- coarse kimberlite reject management area;
- truck shop/office/warehouse complex that provides for heavy and light vehicle maintenance, heated warehouse storage, change rooms, an environmental laboratory, and an administration office;
- bulk storage for diesel fuel;

- bulk lubrication facility, that is situated adjacent to the truck shop and holds bulk lubricant and glycol;
- site roads and existing Misery Road;
- airport; and,
- all related support facilities and equipment for operation of the above.

Ancillary buildings/facilities located at the Ekati main camp area include the following:

- power plant;
- Panda Diversion Channel;
- Pigeon Stream Diversion;
- ammonium nitrate storage facility;
- emulsion plant;
- waste management building, where waste is prepared for transport to off-site management facilities;
- site maintenance shed and Sprung facility, which is used for shipping and receiving;
- airport building;
- landfill;
- landfarm;
- contaminated snow containment facility;
- incineration facilities; and,
- geology (core logging) and helicopter facility, that consists of a few small structures on the geology laydown pad to support exploration drilling activities and helicopter flight operations.

Surface facilities to support the Koala North and Koala underground operations include two maintenance shops, a warehouse, an office complex/change house, a compressor building and batch plant (for mixing concrete), a cold storage building, and a 1 million litre (ML) fuel tank located within a bermed area.

Facilities at the Fox Pit include two 9-ML fuel tanks, a truck line-up area, a dispatch trailer, and trailer complex with washrooms and offices.

The principal facilities at the Misery Site include the following:

- Misery Pit;
- Misery WRSA;
- accommodation complex for 115 people, consisting of single-occupancy rooms, kitchen complex, recreation room, and exercise gym;

- mine office and dry;
- three Type 4 explosive magazines;
- mine maintenance shop and wash bay;
- utility service building;
- communication tower and trailer;
- powerline from Ekati powerhouse (under construction 2014 and 2015);
- diesel power generators with electrical substation (standby status only after activation of powerline from Ekati powerhouse);
- 9-ML fuel tank farm with off-loading and dispersing; and,
- Lynx Pit and associated extension of Misery WRSA (construction scheduled to start in 2015).

A description of the existing primary facilities that relate directly to the Jay Project are provided in the following subsections. Existing water management facilities at the Ekati Mine that will be used for the Project include the LLCF (Section 3.4.1.5), and the Grizzly Lake freshwater supply facility and other freshwater sources (Section 3.4.1.8.8).

3.4.1.1 Main Accommodation Complex

The Ekati main camp has single-occupancy accommodations for over 700 personnel. The camp complex consists of: dorm-style sleeping rooms; dining, kitchen, and recreation areas; a first aid station; emergency response and mine rescue stations; maintenance shops; a sewage treatment plant; a potable water treatment facility; and an incinerator room.

No modifications to the Ekati Main accommodations complex or refurbishments to these facilities are anticipated to accommodate the Project. The life of the facilities will be extended to encompass the life of the Project.

3.4.1.2 Processing Plant

A single, centralized processing plant is located within the Ekati main camp, just southwest of the Koala Pit. Kimberlite processing through the plant typically averages 12,500 tonnes per day (tpd) as a continuous operation (i.e., 24 hours a day, 365 days a year).

The processing of kimberlite is a physical process rather than a chemical process. No processing reagents are used in this facility. Settling aids such as flocculants are stored and handled according to established operating procedures. Simplified, the general process can be described by: size reduction (crushing); washing (also referred to as scrubbing); screening (filtering the material by size); and primary and secondary concentration (separating the material by density). This process is described in more detail in the Wastewater and Processed Kimberlite Management Plan (WPKMP).

It is critical to the success of the Ekati Mine generally that diamond separation in the processing plant is as effective as feasible. Processing plant efficiency is evaluated and operational refinements are implemented on an on-going basis. It is likely that some operational changes to crushing, diamond separation methods, or general throughput of the processing plant will be identified through ongoing Project design iterations. However, no modifications of a nature that would affect this assessment are anticipated to accommodate the Project.

3.4.1.3 Misery Road

Personnel, diamond-bearing kimberlite, supplies and equipment are transported between the Ekati main camp and the Misery camp on the existing Misery Road. The road is approximately 29 km long and connects to the Tibbitt to Contwoyto Winter Road (TCWR) just southwest of the Misery site.

Minor operational refinements are implemented on an on-going basis throughout mine operations, and such minor refinements might be implemented for the Project. No substantive modifications or refurbishments of the existing Misery Road of a nature that would affect this assessment are anticipated to accommodate the Project. The use of the road will be extended to encompass the life of the Project.

3.4.1.4 Open Pits

The Project proposes to make beneficial use of several existing pits at the Ekati Mine, as described in the subsections below.

3.4.1.4.1 Panda and Koala Pits

Open-pit mining at the Panda Pit commenced in August 1998 and continued through to July 2003. Underground production at the Panda Pit began two years later in June 2005 and was completed in 2010 after which the underground workings were decommissioned for closure. Open-pit mining at the Koala Pit commenced in 2003 and was completed in 2007. Underground production at the Koala Pit commenced in 2007 and is anticipated to continue until 2019.

For the Project, the mined-out Panda and Koala pits, and associated underground workings, will be used for FPK deposition.

3.4.1.4.2 Misery Pit

Phase 1 of the Misery open-pit mining was operated from 2002 to 2006, at which time, mining was temporarily suspended. Phase 2 of developing the Misery Pit was commenced in 2012 and is anticipated to operate until 2017 or 2018.

For the Project, the mined-out Misery Pit will be used as a water management facility. Lake water containing elevated TSS levels will be pumped to the Misery Pit from the diked area of Lac du Sauvage during the construction and dewatering phases of the Project. Minewater from the Jay open pit during the operational phase of the Project will be pumped to and managed in the Misery Pit. See Section 3.5.4 for additional details on water management.

3.4.1.4.3 Lynx Pit

Construction for the Lynx Project is anticipated to commence in 2015 and to operate to 2017. Reclamation of the Lynx open pit is currently anticipated to be accomplished by back-flooding with water from Lac de Gras.

Through the Jay Project, reclamation back-flooding of the Lynx Pit will be accomplished by pumping water containing elevated TSS during dewatering of the diked area of Lac du Sauvage during the construction and dewatering phase. The Lynx Pit has an estimated maximum storage capacity of approximately 5.2 million m^3. However, only 4.9 million m^3 of water from the diked area will be pumped to the Lynx Pit. This provides approximately 3 m or 300,000 m^3 of storage allowance which corresponds to approximately 2.5 years of natural net inflows to the Lynx pit lake. This time is expected to be conservatively sufficient to allow for TSS settling within the Lynx pit lake. Ultimately, natural runoff reporting to Lynx pit lake will discharge through the original Lynx channel to Lac de Gras. Water quality monitoring conducted for the reclamation program will be completed to verify that in-pit water quality is suitable for release before overflow.

3.4.1.5 Long Lake Containment Facility

The LLCF is located at the headwater of the western Koala watershed, which feeds into the Lac de Gras watershed. The LLCF currently includes the following components:

- five containment cells: Cells A, B, and C currently receive and store FPK and waste water; Cell D is currently used as a water management area and may receive FPK in the future; and Cell E acts as a water management pond prior to discharge to the receiving environment;
- three filter dikes: Dikes B, C, and D are designed to retain processed kimberlite solids within the upstream cell while allowing water to filter through to the downstream cell;
- the outlet dam: serving as the downstream water control structure that retains water until sampled, authorized, and then pumped to the receiving environment;
- water pumps: pumps on the upstream side of Dike C are used seasonally to pump water from Cell C to the reclaim barge in Cell D; pumps in Cell D supply recycle water to the processing plant; pumps at Dike D are used seasonally to transfer water to Cell E; and pumps in Cell E transfer the water that meets Water Licence discharge criteria to the receiving environment (discharge point is Leslie Lake);

- access roads: roads are located along the north side of Cell A, around the perimeter of Cell B, and the east and south sides of Cell C and D; a road and discharge pipeline on the west side of Cell C and the south side of Cell A are under construction; and,
- associated pipelines.

The operating plan for the LLCF maximizes the use of the upstream areas (Cells A, B, and C) for FPK deposition combined with the use of the mined-out Beartooth Pit, and contingency use of Cell D. Deposition into Cell B is primarily complete and reclamation field trials are underway.

The completed areas in Cells A, B, and C will be reclaimed through the life of the Project as a continuation of the research and reclamation work being currently undertaken under the approved ICRP.

For the Project, Cell D will continue to serve as a source of recycle water for the processing plant, as a minewater management pond, and as a contingency deposition area for FPK. The continued contingency use of Cell D for FPK deposition is a safe and authorized measure that prevents mine shutdown in the event of line blockage or breakage between the processing plant and the primary deposition locations, or other reasons. Cell E will continue to serve as a water management pond and effluent discharge location (i.e., no FPK deposition).

No modifications or refurbishments to Cells D and E of the LLCF are anticipated to accommodate the Project. The operating life of Cells D and E will be extended to encompass the life of the Project.

3.4.1.6 Coarse Kimberlite Reject Management Area

The coarse kimberlite reject storage area within the Panda/Koala/Beartooth WRSA was commissioned in 1998. The screened coarse fraction of kimberlite feed and heavy media separation light fraction from the processing of kimberlite at the processing plant is trucked to this location. The runoff from this storage area drains to the LLCF. As part of ongoing operational planning, Dominion Diamond is evaluating the value of re-processing portions of the coarse kimberlite reject storage area.

No substantive modifications or refurbishments to the coarse kimberlite reject storage area of a nature that would affect this assessment are anticipated to accommodate the Project. The operating life of the facility will be extended to encompass the life of the Project.

3.4.1.7 Workforce

In 2012, the Ekati Mine provided over 1,300 person-years of direct employment, of which 52% was Northern and 27% was Northern Aboriginal. The Project will continue to provide operational employment of similar volume for the life of the mine. It is expected that this workforce will continue working for the Project. It is anticipated that direct and contracting positions with the Project will result in 635 person years (total) of employment during the construction phase. During the operations phase, direct and contractor employment at the Project is expected to average 1,252 person years annually. Following closure, the reclamation phase is projected to require 282 person years (total) of employment.

3.4.1.8 Ancillary Facilities

3.4.1.8.1 Panda Diversion Channel

The water flowing downstream from North Panda Lake is diverted by the Panda Dam around the Panda and Koala pits through the Panda Diversion Channel. This structure has been designed and permitted as a permanent structure, which provides fish migration and instream habitat.

No modifications or refurbishments to the Panda Diversion Channel are anticipated to accommodate the Project.

3.4.1.8.2 Airport

The Ekati Mine has an all-weather gravel airstrip that is 1,950 m long with an aircraft control building. The airport is equipped with runway lighting and an approach system, navigational aids, radio transmitters and weather observation equipment. Approximately 63,815 kilograms (kg) of freight is shipped to site weekly.

Hercules C140, other freight aircraft, or combi-configuration passenger/freight aircrafts are used to transport fresh produce, light freight, and equipment to the site. General freight is flown to the site throughout the year, averaging four to five Hercules C140, or equivalent, flights per week.

Passengers, both employees and contractors, are transported to the mine on charter flights. Aircraft include jets, ATRs, Dash 7/8s, King Airs, Beech 99s, Twin Otters, and others. There are approximately 75 flights per month including community charters. Approximately 872 passengers are flown either to or from site weekly.

The Project is not anticipated to result in transport activity levels outside that typically experienced at the Ekati Mine, because workforce demand is not predicted to increase, and periods of heavy construction activity have been experienced throughout the life of the mine.

No modifications or refurbishments of the airport or airstrip are anticipated to accommodate the Project. The operating life of the facility will be extended to encompass the life of the Project.

3.4.1.8.3 Sewage

The Ekati Mine has two main sources of sewage, the sanitary sewage system at the main site and the sewage from the remote work sites (e.g., Fox Pit and the Misery Pit facilities). Sewage collected from the underground operations and the remote working sites is trucked to the Ekati main camp sewage facility. An enclosed sanitary sewage treatment plant treats all domestic wastewater, and provides primary and secondary levels of treatment. The final treated effluent is pumped to the processing plant and discharged to the LLCF. The operation of this facility is described in the current Waste Management Plan and WPKMP.

No modifications or refurbishments to the management of sewage at site are anticipated to accommodate the Project. The operating life of the facility will be extended to encompass the life of the Project.

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3.4.1.8.4 Landfills

The Ekati main camp solid waste landfill was commissioned in 1998, and is located in the Panda/Koala/Beartooth WRSA. The landfill is used for the disposal of inert non-hazardous wastes (e.g., metal, concrete) that are generated as part of operations.

A landfill at Misery site was commissioned in 2001, and is located in the Misery WRSA.

The operation of these facilities is described in the current Waste Management Plan.

No modifications or refurbishments of the landfills are anticipated to accommodate the Project beyond the possible enlargement or re-development within the same WRSAs following established procedures. The operating life of the facilities will be extended to encompass the life of the Project.

3.4.1.8.5 Landfarm

The landfarm was constructed in 1998. It is a lined facility designed with a leachate collection system and side berm to control runoff. The landfarm is used for the management of hydrocarbon-impacted soil generated as a result of operational spills of hydrocarbon-based products. Hydrocarbon-impacted soil with an average particle size of less than 4 centimetres are bio-remediated at the landfarm facility. Hydrocarbon-impacted material that is unsuitable for on-site bioremediation is stored at the facility temporarily until it is shipped off site for proper disposal. The operation of this facility is described in the Waste Management Plan.

No modifications or refurbishments of the landfarm are anticipated to accommodate the Project. The operating life of the facility will be extended to encompass the life of the Project.

3.4.1.8.6 Contaminated Snow Containment Facility

The contaminated snow/ice facility was constructed in 2004. The bermed and lined facility is designed for the containment of hydrocarbon-impacted snow and ice that are generated as a result of operational spills. Following the spring melt, the hydrocarbon contaminant sheen is removed from the facility as per the Waste Management Plan requirements for hydrocarbon-impacted material, and the remaining water is pumped to the LLCF.

No modifications or refurbishments of the contaminated snow containment facility are anticipated to accommodate the Project. The operating life of the facility will be extended to encompass the life of the Jay Project.

3.4.1.8.7 Incineration Facilities

The landfill at the Ekati Mine does not accept waste that could attract wildlife; thus, waste such as food waste and paper are incinerated. A state of the art incinerator building is located 5 km from the Ekati main camp and adjacent to the LLCF. The dual incinerators started running daily in October 2012 at a throughput rate of 2,000 to 2,500 pounds per day. Oxygen and temperature levels are controlled, resulting in efficient operation. Stack testing was completed to confirm that the incinerators are being operated effectively.

As contingency, a refurbished incinerator is located at the Ekati main camp, which provides a backup unit if unplanned maintenance occurs or poor weather prevents access to the incinerator complex. The operation of the incineration facilities are described in the current Waste Management Plan.

No modifications or refurbishments of the incineration facilities are anticipated to accommodate the Project. The operating life of the facility will be extended to encompass the life of the Jay Project.

3.4.1.8.8 Water Supply

Freshwater is supplied to the Ekati Mine operations from Grizzly Lake. A water treatment plant for potable water is located at the Ekati main camp. Potable water for the Misery site is trucked from the Ekati main water treatment facility. Other licenced freshwater sources include Little Lake, Thinner Lake, Falcon Lake, and Lac de Gras.

Water withdrawals for the Ekati Mine are primarily from Grizzly Lake, with approximately 95% of freshwater withdrawal from Grizzly Lake. Reported average annual withdrawals from Grizzly Lake over the period 2003 to 2012 were 107,220 m^3 (BHP Billiton 2005, 2006, 2007, 2008, 2010, 2011, 2012; Dominion Diamond 2013b). Process water for the processing plant is recycled within the processing plant and pumped back from the LLCF. The freshwater intake pumps operate in accordance with the Fisheries and Oceans Canada *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO 1995).

As per the approved Water Licence W2012L2-0001, a maximum of the following can be withdrawn from each water source per year: Grizzly Lake 200,000 m^3; Little Lake 400,000 m^3; Thinner Lake 15,000 m^3; Falcon Lake 100,000 m^3; and Lac de Gras 100,000 m^3.

The Project is not anticipated to affect overall water usage at site.

No modification to the sources or management of freshwater intakes at site is anticipated to accommodate the Project. The operating life of the Grizzly Lake facility and the other licenced freshwater sources will be extended to encompass the life of the Project.

3.4.1.8.9 Fuel Storage

Fuel storage on site has a capacity of 98 ML. A central bulk fuel farm that contains eight tanks and approximately 68 ML is located at the Ekati main camp. Other satellite fuel farms are currently located at the Misery (9 ML fuel tank with dispensing and offloading facilities), Fox, and Koala North sites.
To support the logistics of fuel delivery to the site, the Ekati Mine leases a tank farm in Yellowknife with a capacity of 80 ML. The fuel tanks are double-lined and housed within bermed areas on an impervious liner.

Fuel storage, dispensing, and offloading activities are covered under the Ekati Mine Spill Contingency Plan. The Spill Contingency Plan was developed to establish and document practices for responsible management of controlled substance spills and focuses on spill prevention and spill response.

The operating life of the fuel storage facilities will be extended to encompass the life of the Project.
The Misery tank farm storage capacity may be expanded if necessary to optimize the transportation, use, handling, and emissions from diesel fuel for the Project. No additional land disturbance or permitting is anticipated for such an expansion.

3.4.1.8.10 Communications

On-site communications are provided by microwave link from Yellowknife, which is operated by a local telecommunication company, Northwestel. The microwave link has dedicated bandwidth to provide voice, data, and internet services. Also located on-site is a backup satellite connection that has lower capacity than the main microwave link, but can be used as required. Communications at the Misery site are provided by an extension of the microwave link from the Ekati main camp, and are being upgraded to fibre optic cable as part of the 2014/2015 power line installation.

Internal site communications are provided by radio, phone, local area network, and wireless internet. A fleet management system, Wenco, is also used to track material movement and equipment status.

No modifications or refurbishments of the communications at site are anticipated to accommodate the Project. The operating life of the facilities and equipment will be extended to encompass the life of the Project.

3.4.1.8.11 Power and Electrical

The main power plant for the Ekati Mine consists of seven 4.4 megawatt (MW) diesel generator sets operating at 4,160 volts. The main plant provides power to the process operations, accommodations complex, underground operations, and truck shop/office complex. Waste heat from the power plant is recovered by means of glycol heat exchangers to heat buildings and process water.

The Misery operation uses three, 455 kilowatt (kW) standalone diesel generators connected to a common synchronized power distribution system. This power distribution system has two distribution centres, the synchronized power distribution centre, and a second distribution centre located at the accommodation complex. Underground cables provide power to the site and terminate at each respective building. A rock crusher at the Misery site is currently operated with an independent diesel generator.

Construction of a power distribution line was initiated in 2014 to distribute power from the Ekati Mine powerhouse to the Misery site for existing operational needs. This installation will provide operating and environmental efficiencies resulting from centralized power generation. Completion and activation of the power line (planned for 2015) will allow the Misery generators to be taken off-line and used only in a backup capacity.

For the Project, the power distribution line from the Ekati Mine powerhouse is proposed to be extended to the necessary locations at Lac du Sauvage such that the efficiencies of centralized power generation are continued. Approximately 3 MW of power will be required at the pump locations for the dewatering stages of the Project, and 1 MW of power, thereafter, for the life of the mining activities.

No modification or refurbishment of the main Ekati Mine power plant are anticipated to accommodate the Project. The operating life of the facility will be extended to encompass the life of the Project.

3.4.1.8.12 Explosives Manufacturing and Storage

Storage and handling of explosives will continue to be conducted in accordance with the procedures in place at the Ekati Mine and supervised by the Ekati Mine blasting team. Appropriate explosives management practices (e.g., storage and handling controls, spill and waste management, blast design efficiency, minimize overloading, minimizing misfires) will be undertaken on site, consistent with practices already in place at the Ekati Mine. These practices are documented in the Nitrogen Response Plan, which is a requirement of the Water Licence.

Current procedures may be modified from time to time based on conditions in the field. Current procedures use a gassed emulsion doped with 30% ammonium nitrate prill (Emulsion 70-30 blend). It is estimated that 500,000 kg of emulsion blend (density of 1.12 grams per cubic centimetre) will be used per month.

The three, Type 4 explosive magazines located at the Misery Site are currently used for storage of primers, boosters, packaged products, and surface delays. Bulk supplies for explosives manufacturing will be stored in the existing ammonium nitrate storage facility at the Ekati main camp, which has a capacity of 16,500 tonnes. Bulk explosives will be manufactured in the existing emulsion plant at the Ekati main camp.

No modification or refurbishment of the facilities are anticipated to accommodate the Project. The operating life of the facilities will be extended to encompass the life of the Project.

3.4.1.8.13 King Pond Settling Facility

The King Pond Settling Facility is the primary minewater management pond at the Misery site prior to discharge to the receiving environment (Cujo Lake to Christine Lake, and then into Lac du Sauvage) based on discharge criteria specified in the Water Licence. The King Pond Settling Facility will be maintained as a contingency measure for minewater management for the Project.

No modification or refurbishment of the King Pond Settling Facility is anticipated to accommodate the Project. The operating life of the facilities will be extended to encompass the life of the Project.

3.4.2 Tibbitt to Contwoyto Winter Road

The Tibbitt to Contwoyto Winter Road (TCWR) provides seasonal road access to the Ekati Mine. The Ekati Mine is located at approximately kilometre 405 of the road. Approximately 85% of the road consists of frozen lakes and ponds, which are connected by short overland portages.

Fuel, large equipment, and heavy consumables are trucked to the site on the TCWR. Ekati Mine freight typically varies with up to 4,000 trucks per year. The logistics of planning and expediting the delivery of freight required for a full year of operation by the winter road over an approximately two-month period is critical to successful mining operations.

The TCWR is built, permitted, and operated by a joint venture of mining companies (Diavik Diamond Mines Inc., Dominion Diamond, and De Beers Canada Inc.) operating in the area, and is shared by other industrial users (i.e., exploration companies). The road is open to the public and provides access for hunters and tourists. This seasonal winter road is open for eight to ten weeks each year (i.e., from late January to the beginning of April, depending on weather and the season's load requirements), and must be re-flooded each year to service mines in the area. Occasionally, the winter road is extended by others north from Lac de Gras to Contwoyto Lake.

The road is capable of accommodating high levels of traffic. During peak usage years, over 10,000 truckloads per year were safely transported to the mine sites (Joint Venture 2013).

Three seasonal maintenance/staging camps are located along the road. The most northerly is the Lac de Gras camp, which is located on the southeastern shore of Lac de Gras.

No modifications or refurbishments of the TCWR are anticipated to accommodate the Project.

3.4.3 Environmental Management Plans

The Ekati Mine currently has environmental management plans relevant to the Project in place for the existing operations. These management plans will be amended to encompass the Project as the most effective means of ensuring that existing practices and past Ekati Mine operating experience is utilized to manage environmental risks for the Project. Each of the plans undergoes, and will continue to undergo periodic review and amendment according to current circumstances and following the principles of adaptive management. Many of the plans are requirements of the Ekati Mine Water Licence, and as such, are also subject to the public review and approval process conducted by WLWB.

The primary environmental management plans for consideration are noted below. Other management plans will also be relevant to the Project, such as the Spill Contingency Plan under the Water Licence, the Archaeology Management Plan under the Environmental Agreement, and Response Plans under the Aquatic Response Framework.

3.4.3.1 Waste Management Plan

The objective of the Waste Management Plan is to maintain a safe and healthy workplace at the Ekati Mine, and to work to minimize potential adverse effects to the environment through sound waste management practice. The plan addresses the specific requirements of the Ekati Mine Water Licence, and has been approved by the WLWB.

The Waste Management Plan provides clear direction to Ekati Mine staff, contractors, and stakeholders on how waste is managed through each of the waste streams to final disposal. The scope of the plan covers all activities associated with the mine including the Ekati main camp, the Misery site, and exploration activities.

The Ekati Mine follows the principles of Reduce, Reuse, Recycle, and Recover. Waste is preferentially avoided if possible to minimize environmental impact. Waste that cannot be avoided is treated and disposed of appropriately. The first step in ensuring appropriate waste treatment and disposal is proper waste classification. Once waste is designated to the correct waste stream, a classification-specific management plan governs the treatment and disposal of the material.

There are two broad classifications of waste at the Ekati Mine: non-mineral waste and mineral waste. Waste rock, kimberlite, and coarse kimberlite rejects are mineral waste and the handling of which is completed in accordance with the Waste Rock and Ore Storage Management Plan . Minewater, FPK, and sewage are also mineral waste and the handling of these materials is completed in accordance with the Wastewater and Processed Kimberlite Management Plan (Section 3.4.3.7).

Kitchen waste and camp and office waste (not including wood, metal, paper, cardboard, or plastic) are non-mineral waste and the handling of which is completed in accordance with the Incinerator Management Plan. Inert waste including wood, metal, and concrete are also non-mineral waste, but the handling of these materials is completed in accordance with the Landfill Management Plan (Section 3.4.3.4).

Hazardous waste, such as Workplace Hazardous Materials Information System (WHMIS) Controlled Products, is classified as non-mineral waste. These materials are properly treated and disposed of in accordance with the Hazardous Waste Management Plan (Section 3.4.3.3).

Hydrocarbon-impacted materials, such as rock, soil, or snow that has been exposed to hydrocarbon contamination, are also classified as non-mineral waste. These materials are properly treated and disposed of in accordance with the Hydrocarbon-Impacted Materials Management Plan (Section 3.4.3.5).

Activities associated with the Project will be covered under the existing Waste Management Plan. The plan may require minor amendment for the Project.

3.4.3.2 Incinerator Management Plan

The Incinerator Management Plan is designed to achieve the safe and efficient operation of incinerator units at the Ekati Mine. The plan is a component of the Waste Management Plan that describes waste collection and segregation, incinerator operation, ash management, and data collection. The plan includes initiatives to minimize waste volumes and limit harmful stack emissions (e.g., dioxins, furans, and mercury).

Activities associated with the Project will be covered under the existing Incinerator Management Plan. This plan is not anticipated to require amendment for the Project.

3.4.3.3 Hazardous Waste Management Plan

The Hazardous Waste Management Plan describes procedures for managing hazardous waste, and directs staff and contractors on how to process waste not suitable for the landfill. The plan is a component of the Waste Management Plan.

Activities associated with the Project will be covered under the existing Hazardous Waste Management Plan. This plan is not anticipated to require amendment for the Project.

3.4.3.4 Solid Waste Landfill Management Plan

The primary objective of the Landfill Management Plan is to prevent waste from entering the landfill that may attract or be harmful to wildlife or the environment. The plan is a component of the Waste Management Plan that describes what wastes are suitable for disposal in the on-site landfill.

Activities associated with the Project will be covered under the existing Landfill Management Plan. This plan may require minor amendment for the Project.

3.4.3.5 Hydrocarbon-Impacted Material Management Plan

The Hydrocarbon-Impacted Material Management Plan provides the framework for the management of hydrocarbon-impacted materials. The plan is a requirement of the Water Licence that has been approved by the WLWB, and it is a component of the Waste Management Plan. The plan identifies the sources of hydrocarbon-impacted materials, and the site facilities designed to treat and dispose of these materials.

Activities associated with the Project will be covered under the existing Hydrocarbon-Impacted Material Management Plan. This plan may require minor amendment for the Project.

3.4.3.6 Waste Rock and Ore Storage Management Plan

The Waste Rock and Ore Storage Management Plan (WROMP) describes the environmental characteristics of waste rock, and the design approach that is used at the Ekati Mine to mitigate environmental risks. The WROMP addresses the requirements of the Water Licence, and includes the geology, production history, and description of the existing waste rock storage facilities. The plan also provides a description of the geochemical characterizations of waste rock and coarse kimberlite rejects including acid/alkaline drainage potential.

The WROMP has been approved by the WLWB, and will be amended to include the relevant information for the Jay WRSA. This operational amendment will be addressed as part of the regulatory process subsequent to successful completion of the environmental assessment (EA). The Developer's Assessment Report (DAR) will provide the basis for the amendment.

3.4.3.7 Wastewater and Processed Kimberlite Management Plan

The Wastewater and Processed Kimberlite Management Plan (WPKMP) addresses the specific requirements of the Water Licence, and describes the placement of processed kimberlite within the LLCF and Beartooth Pit, and the site-wide minewater management.

The WPKMP has been approved by the WLWB, and will be amended to include the relevant information for minewater and FPK management related to the Project. This operational amendment will be addressed as part of the regulatory process subsequent to successful completion of the EA. The DAR will provide the basis for the amendment.

3.4.3.8 Interim Closure and Reclamation Plan

Reclamation of the Ekati Mine is described in the Ekati Mine Interim Closure and Reclamation Plan (ICRP). This plan is an integrated and all-inclusive plan as required under the Water Licence and Environmental Agreement.

The ICRP has been approved by the WLWB, and will be amended to include the relevant information and changes resulting from the Project. This amendment will be addressed as part of the regulatory process subsequent to successful completion of the EA. The DAR will provide the basis for the amendment.

3.4.3.9 Wildlife Management Plan

The Wildlife Management Plan describes the approach to managing risks related to the interaction of wildlife with people, mine facilities, and mine activities. The plan provides direction for operational work procedures, and for the annual Wildlife Effects Monitoring Program. The Wildlife Management Plan is a requirement of the Environmental Agreement, and it addresses the outcomes of ongoing engagement with Aboriginal communities, the Government of the Northwest Territories Department of Environment and Natural Resources, and the Independent Environmental Monitoring Agency. New information and lessons learned are incorporated into the plan periodically.

The Wildlife Management Plan will be amended to include the relevant information and changes resulting from the Project. This amendment will be addressed during the regulatory process subsequent to successful completion of the EA. The DAR will provide the basis for the amendment.

3.5 Jay Project Components

The conceptual design of the various components specific to the Jay Project are described below. These components are shown for the construction phase in Map 3.5-1, and for the operations phase in Map 3.5-2.

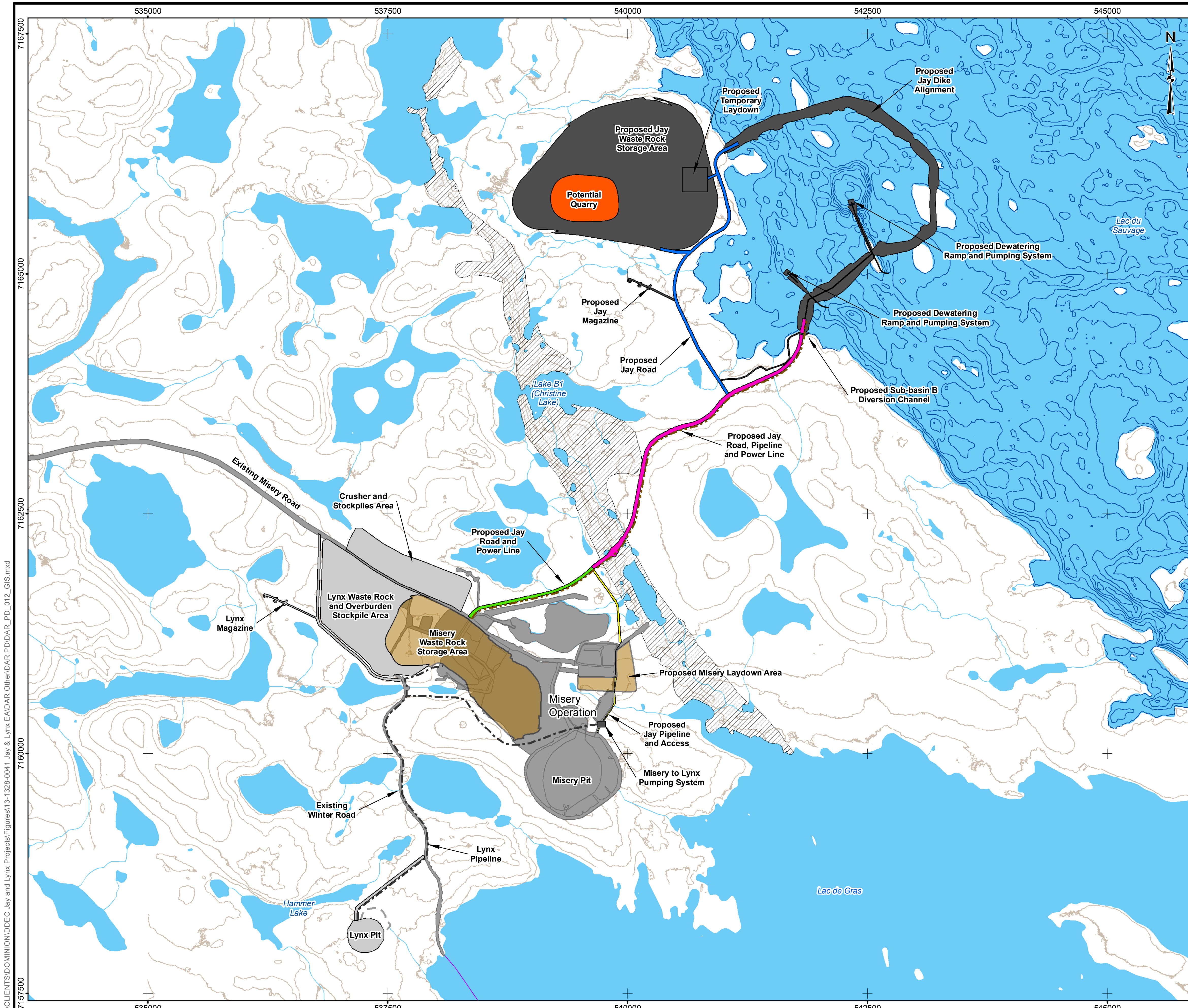
During construction and operations of these components, appropriate sediment and erosion controls will be undertaken. Other relevant management plans and practices consistent with those used at the Ekati Mine, and as relevant, at other Northern projects, will also be applied. Detailed sediment and erosion control planning will be conducted during detailed design. Runoff and seepage from Project facilities will be managed according to existing Ekati Mine environmental management plans (Section 3.4.3) and the Project Mine Water Management Plan (Appendix 3A).

The final design is subject to further refinement based on ongoing data collection, regulatory engagement, community engagement, and design iteration. However, an appropriate degree of conservatism has been integrated into the assumptions for the purposes of the EA that ensures that the EA adequately and conservatively addresses the potential environmental risks.

3.5.1 Buildings and Infrastructure

3.5.1.1 Truck Shop

The existing truck shops at the Ekati main camp and at the Misery site will be utilized for equipment maintenance and repairs. The final Project optimization studies may indicate that enlarging the Misery site truck shop is the most effective approach, and if so, the existing truck shop could be enlarged or replaced. If necessary to accommodate a larger work area, application would first be made to GNWT for amendment of the area covered by the Misery surface lease. A possible design enhancement and lease amendment of this nature would not affect this assessment. No other permitting would be required and no additional overall land disturbance would be anticipated.



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- WINTER ROAD
- BATHYMETRY CONTOUR (5 m INTERVAL)
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY
- ESKER

JAY PROJECT FOOTPRINT

- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD AND POWER LINE)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED JAY PIPELINE ROAD (ACCESS ROAD AND PIPELINE)
- POTENTIAL QUARRY

LYNX PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED LYNX LAKE
- LYNX PIPELINE
- LYNX PROJECT INFRASTRUCTURE

MISERY PROJECT FOOTPRINT EXPANSION

- MISERY PROJECT INFRASTRUCTURE

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN. POTENTIAL QUARRY MAY BE REQUIRED WITHIN THE FOOTPRINT OF THE PROPOSED JAY WASTE ROCK STORAGE AREA

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

1 0 1
SCALE 1:40,000 KILOMETRES

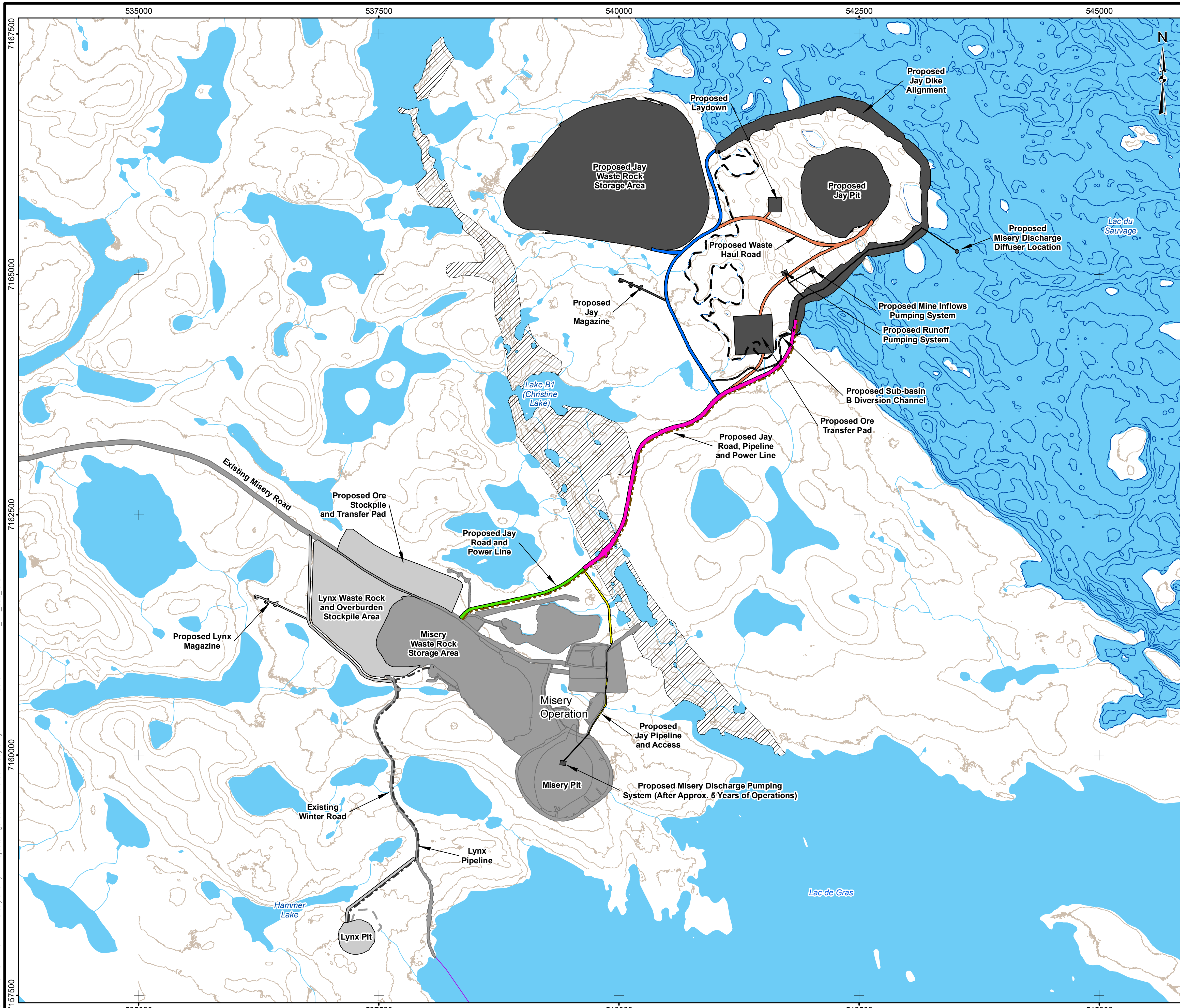
PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

DEVELOPMENT FOOTPRINT CONSTRUCTION AND DEWATERING

Golder Associates

PROJECT	13-1328-0041		FILE No. DAR_PD_012_GIS	
DESIGN	AL	25/09/14	SCALE AS SHOWN	REV 0
GIS	LMR	20/10/14		
CHECK	JV	20/10/14	MAP 3.5-1	
REVIEW	JC	20/10/14		



LEGEND

- EKATI MINE FOOTPRINT (MISERY OPERATION)
- WINTER ROAD
- BATHYMETRY CONTOUR (5 m INTERVAL)
- ELEVATION CONTOUR (10 m INTERVAL)
- WATERCOURSE
- WATERBODY
- ESKER

JAY PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED AREA
- POWER LINE
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD NORTH (HAUL ROAD)
- PROPOSED JAY ROAD (HAUL ROAD AND POWER LINE)
- PROPOSED JAY ROAD (HAUL ROAD, PIPELINE AND POWER LINE)
- PROPOSED JAY PIPELINE ROAD (ACCESS ROAD AND PIPELINE)
- PROPOSED OPERATION ROADS

LYNX PROJECT FOOTPRINT

- EXISTING SHORELINE OF DEWATERED LYNX LAKE
- LYNX PIPELINE
- LYNX PROJECT INFRASTRUCTURE

NOTES

ROAD, PIPELINES, AND POWER LINE ARRANGEMENT TO BE DETAILED AS PART OF FURTHER PRE-FEASIBILITY DESIGN. APPROXIMATE CORRIDOR WIDTHS ARE SHOWN.

REFERENCE

JAY PROJECT CONCEPTUAL ENGINEERING REPORT, EKATI MINE, DOC#: 1313280041-E14037-R-REV0-4060, DATED: MAY 13, 2014
JAY PROJECT DESIGN BASIS MEMORANDUM FOR PRE-FEASIBILITY DESIGN OF PROJECT ROADS AND PIPELINE BENCHES, DOC#: 1313280041-E14031-TM-REVD-2020, DATED: AUGUST 1, 2014
LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

DEVELOPER'S ASSESSMENT REPORT

1 0 1

SCALE 1:40,000 KILOMETRES

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

DEVELOPMENT FOOTPRINT OPERATIONS

Golder Associates

PROJECT		13-1328-0041	FILE No. DAR_PD_005_GIS	
DESIGN	RK	17/07/14	SCALE AS SHOWN	REV 0
GIS	LMR	15/10/14	MAP 3.5-2	
CHECK	JV	15/10/14		
REVIEW	JC	15/10/14		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\DAR Other\DAR PD\DAR_PD_005_GIS.mxd

3.5.1.2 Misery Accommodations Complex

The existing accommodations complex at the Misery site will be used to house a portion of the construction workforce for the Project. These facilities currently include accommodations for 115 people, consisting of single-occupancy rooms, a kitchen complex, recreation room, and exercise gym.

The operating life of the accommodations facilities will be extended to encompass the life of the Project.

The final project optimization studies may indicate that an enlargement of the camp capacity is the most effective approach. Space is available adjacent to the existing accommodations which could support accommodations for approximately 100 more people. No new land disturbance or permitting would be required for this expansion. A final decision on this as a potential enhancement will be determined during detailed design.

3.5.1.3 Surface Facilities for Open-Pit Mining

A lunchroom, office, and washroom facility with temporary emergency shelter and supplies will be constructed at the Jay site. A laydown/truck ready area will also be constructed at the Jay site for field maintenance of heavy equipment.

3.5.1.4 Pumping Systems

As part of the water management system, the Project will construct pumping systems between the Jay site and the Misery Pit, and from the Misery Pit to the Lynx Pit. Each pumping system will consist of a pump station and a pipeline. A pipe bench will be constructed to accommodate the pipelines, which will follow existing and proposed road alignments to the extent practical to minimize the Project footprint. The pumping systems will have different arrangements to accommodate separate stages of water management during the construction and operational phases of the Project, as outlined below and shown in Maps 3.5-1 and 3.5-2. The Mine Water Management Plan for the Project is described further in Sections 3.5.2 and 3.5.4, and Appendix 3A, Jay Project Mine Water Management Plan.

For the initial dewatering stage of the Project (Map 3.5-1), water from the diked area of Lac du Sauvage that is sufficiently clear of sediment will be pumped directly into Lac du Sauvage. For this stage, three pumping systems will be established:

- a pumping system that consists of a pumping station on barges and a 0.7-km-long pipeline will pump water from the PS1 pumping station (located in the diked area) to the main basin of Lac du Sauvage;
- a pumping system that consists of a pumping station on barges and a 0.5-km-long pipeline will pump water from the PS2 pumping station (located in the diked area) to the main basin of Lac du Sauvage; and,
- a pumping system that consists of a pumping station on barges and a 0.7-km-long pipeline will pump water from the PS3 pumping station (located in the diked area) to the main basin of Lac du Sauvage.

For the later dewatering stage of the Project when drawing down the water level within the diked area is anticipated to result in elevated TSS concentrations, the water will be pumped directly to the Misery and Lynx pits where solids will be expected to readily settle from the water column. For this stage, the three pumping systems described above will be extended as follows:

- the pumping system PS1 will consist of the PS1 pumping station on barges and a 7.2-km-long pipeline, and will pump water from the PS1 pumping station (located in diked area) to the Misery Pit area;
- the pumping system PS2 will consist of the PS2 pumping station on barges and a 6.1-km-long pipeline, and will pump water from the PS2 pumping station (located in the diked area) to the Misery Pit area;
- the pumping system PS3 will consist of the PS3 pumping station on barges and a 7.2-km-long pipeline, and will pump water from the PS3 pumping station (located in the diked area) to the Misery Pit area; and,
- a temporary booster pump station and a 5.3-km-long pipeline that will allow for a portion of the flow from one of the pipelines into the Misery Pit to be diverted to the Lynx Pit.

The Lynx Pit is expected to reach the maximum operating capacity level (set to allow safety freeboard to the pit outlet) at the end of the dewatering phase of the Project.

During the operational phase of the Project, when minewater management is required (Map 3.5-2), the water will be pumped from the diked area to the Misery Pit and stored in the Misery Pit; a portion of the water will be released from the Misery Pit to the receiving environment beginning approximately five years into open-pit mining. For this stage, three pumping systems will be established:

- A pumping system that consists of the PS1 pumping station and a 9.7-km-long pipeline will pump minewater from the PS1 pumping station (located in the mine inflows sump within the diked area) to the bottom of the Misery Pit.
- A pumping system that consists of the PS2 pumping station and a 6.1-km-long pipeline will pump runoff water from the PS2 pump station (located in Jay runoff sump within the diked area) to the top of the Misery Pit.
- A pumping system that consists of the PS3 pumping station on barges and a 7.8-km-long pipeline to Lac du Sauvage will pump water from the PS3 pumping station (located at the Misery Pit) to Lac du Sauvage beginning in approximately Year 5 of mine operations. The discharge to Lac du Sauvage will occur through an engineered diffuser outfall.

3.5.1.5 Roads and Pads

One primary access road to Lac du Sauvage, the Jay Road, will be constructed to connect the Project to the existing Misery Road, the existing facilities at the Misery site, and the Ekati main camp. The Jay Road will be the only road crossing the Lac du Sauvage esker. Roads required during the construction and operations phase of the Project are shown in Maps 3.5-1 and 3.5-2. The following site roads will be constructed:

- a road from the Misery Road to the south abutment of Jay Dike referred to as the Jay Road, which will be approximately 5.1 km long;
- a road from the Jay Road to the north abutment of the Jay Dike and Jay WRSA, which will be approximately 3.16 km long;
- a road from the Jay Road to the Misery camp, which will branch off from the Jay Road just north of King Pond and will be approximately 1.86 km long; and,
- during operations, roads will extend within the isolated and dewatered portion of Lac du Sauvage connecting the Jay Road to the Jay Pit and sumps and the Jay Pit to the Jay WRSA, which will be a total of approximately 4.1 km long.

Design principles for the Project access and haul roads include the completion and operation of roads in compliance with applicable regulations and guidelines, and in a manner that preserves permafrost. To reduce effects to permafrost, no cuts are planned for the site roads, except at the crossing of the esker. Road alignment options for crossing the esker were discussed during community engagement meetings and site visits, to obtain feedback from the communities. This feedback was taken into consideration in selecting the alignment.

The haul roads will be designed to accommodate two-way traffic. The roads (i.e., excluding the pipeline spur road) will be approximately 23 m wide, which is three times the largest vehicle width. The roads will be constructed using non-PAG rock to a standard that is safe for use by mine operating equipment. The roads will be designed to accommodate the CAT 789D haul truck, which has a gross machine weight of 324,319 kg and a payload of 194,000 kg (nominally 190 tonne). Side berms are required for safety where the height of the road is greater than 3 m.

The minimum operable foundation of the road is typically a 1.35-m layer of coarse mine rock (1 m minus material), topped by a 0.5-m layer of crushed aggregate (200 mm minus material) and a 0.15 m layer of fine crushed aggregate (56 mm minus material). In certain locations, the height of the road is required to be greater than the minimum foundation to enable safe operation of heavy equipment. The rockfill and crushed aggregate will be placed with angle of repose side slopes, assumed to be 1.3 horizontal to 1 vertical (1.3H:1V).

Roads will be constructed of non-PAG waste rock from mining operations (i.e., granite). To protect the permafrost, the surficial organic layer, which includes vegetation and organic soil, will not be stripped. Settlement of the road surface, due to consolidation of the foundation soils, will be managed through routine maintenance. The typical road section will be reviewed at later stages of the design to refine the required thickness of the rockfill based on topography, ground conditions, permafrost protection, and road gradients.

At watercourse crossings, cross-drainage structures will be installed to prevent roads from impeding water flows. Where appropriate, culverts will be designed to allow for fish movement. Regular inspections of roads and cross-drainage structures will be performed.

During construction and operation of roads, sediment and erosion control measures will be applied. These mitigation measures will be consistent with those used currently at the Ekati Mine, which are based on experience gained over 16 years of operations. More detailed sediment and erosion control planning will be conducted during detailed design. Regular road maintenance is conducted as required throughout the Ekati Mine operation and these current practices would be extended to the new road areas.

As outlined in Section 2.5.1, the preferred road alignment considered limiting wildlife interactions, limiting effects to wildlife habitat, and limiting the risks of wildlife injury or impediment of movement. Caribou crossings will be incorporated into the final road design in areas where caribou movement has been identified as likely through discussions with Aboriginal communities and wildlife specialists. The strategic use of kimberlite stockpiles is a Project design feature that will allow for periodic and temporary closure of primary road segments if necessary to protect caribou, while maintaining processing plant operations.

The portion of the road crossing the esker is designed as a cut through a naturally occurring narrow section. Esker material will be stockpiled and reserved for reclamation of the esker.

Small lay-down areas will be constructed at the Jay site using granite rock. However, wherever practical, the existing facilities of the Misery workshop facility will be used.

A small laydown area will also be constructed at the Misery site which will be used for warehousing materials and equipment. The area is adjacent to the existing Misery camp pad and will expand the existing pad south and east by an area of approximately 0.14 km^2.

The development of two new temporary kimberlite stockpile areas are proposed as part of the Project, in addition to the existing stockpile area at the processing plant:

- A stockpile west of the south abutment of the containment dike close to the Jay Pit will be developed, which will occupy an area of approximately 0.16 square kilometres (km^2).
- A stockpile occupying an area of approximately 0.4 km^2 will be located at the junction of the existing Misery Road and the proposed Jay Road.
- These temporary storage areas and the existing stockpile area at the Ekati Mine will be used to store kimberlite from the Project before it is processed at the processing plant. These pads will be constructed of granite and built in accordance with practices already implemented at the Ekati Mine. In this way, short-term intermittent road closures for caribou, weather, or other reasons can be accommodated without processing plant disruption.

3.5.1.6 Traffic

The traffic volumes on the Misery and Jay Roads associated with hauling kimberlite between the Jay Pit and the processing plant will vary with the final operational optimizations of truck size and configuration. As is currently the case for the transport of Misery kimberlite to the processing plant, these trucks are different than the rock trucks used in the open pit itself. A conservative approach has been assumed for the EA based on a possible truck size/configuration, which assumes an average of 56 round trips per day by long-haul trucks with a fleet of seven trucks making about eight trips each per day. On a presumed evenly spaced basis, this represents an average of 12 minutes between trips.

About 15 190-tonne rock trucks will cycle between the proposed Jay Pit and proposed Jay WRSA. About seven CAT 777, 90-tonne rock trucks will cycle between the Jay Pit and the proposed ore transfer pads at the Jay and Misery roads. Minor maintenance will be completed at the Jay Pit, and major maintenance will be completed at the truck shop(s).

Other traffic will include the bulk explosives trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks to transport larger equipment, water trucks, emergency vehicles, and light vehicles.

3.5.1.7 Fuel Storage

Because the Project is near the existing Misery fuel storage infrastructure, no additional bulk fuel storage is planned at the Jay Pit. The Misery site has a 9-ML fuel tank with dispensing and offloading facilities. The fuel tank is double-lined and housed within a bermed area on an impervious liner. Mobile heavy equipment will obtain fuel from the Misery dispensing facility per current operating practices and handling procedures. Fuel is hauled to the Misery fuel storage facility by tanker truck fleet from the Ekati main tank farm or the Fox tank farm as necessary. This process will continue and fuel hauling trips will be conducted as required to maintain the required capacity at Misery.

The Misery tank farm storage capacity may be expanded if necessary to optimize the transportation, use, handling, and emissions from diesel fuel for the Project. The increase in capacity could be as much as double the current capacity. No additional land disturbance would be anticipated for such an expansion.

3.5.1.8 Quarries

Granite rock in the order of 8 million m^3 (either blasted or crushed and screened to various engineering specifications) is required for construction of roads, pads, and dikes for the Project. The granite rock for construction will be obtained from a quarry of granite rock located within the footprint of the Jay WRSA and use of granite rock mined from the Lynx Pit. Once the excavation of granite waste rock is underway from the Jay Pit, the mined rock becomes the source of granite for ongoing maintenance of roads or other facilities.

The primary benefit of utilizing granite rock mined from the Lynx Pit is that this rock is available at the start of construction and for immediate use in road construction. The use of this rock also reduces the size of the Lynx addition to the Misery WRSA. The primary benefit of a quarry within the footprint of the Jay WRSA is that it reduces the haulage travel times, and therefore, costs, of road, pad, and dike construction, and it is located such that it will be completely filled and covered by the construction of the Jay WRSA. For both locations, no reclamation of a quarry will be required. The specific volumes of material to be used from each location will be determined during detailed design to best balance cost and efficiencies during construction. Granite rock will be crushed to the size gradations required within each of these quarry locations.

There is no anticipated need for any additional sources of granular material to support the Project. As is the current practice at the Ekati Mine, during Project operations, granite from sources of mine rock including Jay Pit and Panda/Koala WRSA or other WRSAs, would be available for needs at the main camp and for the Project. As such, there are no annual needs for granular material outside of the available mine rock.

3.5.2 Explosives Storage

Up to three, Type 4 explosive magazines are proposed to be located near the Jay open pit for storage of primers, boosters, packaged products, and surface delays. The proposed Jay magazine area has been identified on Map 3.5-2 and may be utilized for the Project based on approval from the Mines Inspector.

3.5.3 Dikes, Sumps, Diversion Channel, and Dewatering Ramps

The dike, sumps, and channel identified below were initially described in Section 2.4.4, and are shown in Maps 3.5-1 and 3.5-2.

3.5.3.1 Jay Dike

The proposed approach for the development of the Jay open pit is to construct a water-retaining dike (Jay Dike) that will isolate the local portion of Lac du Sauvage overlying the Jay pipe. The Jay Dike follows a horseshoe-shaped alignment in plan view, extending from the shoreline into the lake, and back again.

Dike construction will commence during summer 2016 and continue through to 2019. During summer construction, turbidity curtains will be installed near the portion of the alignment where dike construction will occur. The curtains will be removed before ice formation. During winter construction, wind effects acting on the lake surface are absent, and the rockfill placement will proceed at a slow rate and from multiple placements fronts, to minimize turbidity generation.

The water in the diked area will be pumped out to allow access to the kimberlite pipe with mining equipment. The diked area will be approximately 4.2 km^2, and the total volume of water to be removed over approximately six months will be 29.6 million m^3. The diked area will be maintained dewatered through the life of the mining operations by collecting and pumping surface minewater and open pit minewater.

A diversion channel (Sub-Basin B Diversion Channel) will be constructed before dewatering to intercept and divert runoff from Sub-Basin B to Lac du Sauvage south of the Jay Dike. The flow would otherwise report to the dewatered area.

The dike will be design to meet criteria as established following local regulations and the Canadian Dam Association's *Dam Safety Guidelines* (CDA 2007).

Following mining, the diked area will be back-flooded, and after water quality is acceptable, the dike will be breached to allow water flow and fish movement.

The use of dikes to allow mining below lakes has been used at the nearby Diavik Mine to mine the A154 and A418 pipes both located beneath Lac de Gras, and at the Meadowbank Mine near Baker Lake in Nunavut where the Bay-Goose Dike allows mining in the Goose Pit beneath Third Portage Lake. The approach is suited to the natural shape of Lac du Sauvage, which is generally a shallow lake, making it conducive to developing an in-lake dike and exposing the lakebed overlying the Jay pipe. The Diavik Mine and Meadowbank Mine dike designs are both closely tied to a construction sequence that must accommodate a short open water season, logistically complex access for construction equipment and contractors, and a limited source of local natural materials. Both designs require a low permeability element to limit the flow of water.

The Diavik Mine dike design requires the use of specialized equipment. Construction would include dredging the dike footprint, placement of a granular filter layer on the dredged area from a barge, advance of a zoned rockfill shell, densification of the fill by vibrodensification, installation of a plastic concrete diaphragm wall down the centerline of the dike in panels using slurry wall excavation techniques with a hydrofraise, boulder removal, and finally jet grouting the contact between the plastic concrete wall and the bedrock. The Diavik Mine dikes extends from shore to form a partial ring around the kimberlite pipes.

The Meadowbank Mine dike design requires common construction equipment. Construction includes placing a broad rockfill shell along the dike alignment (no dredging), excavation of the central portion of the rockfill, advance of a zoned core into the excavation from the crest of the dike, densification of the core, slurry wall construction along a centreline to create a soil cement bentonite cut-off wall, and grouting of the contact between the bedrock and the cut-off wall. The Meadowbank Mine dikes extend from shore to islands and back again to allow dewatering of a larger area. The dike construction, grouting, and instrumentation are described in Esford et al. (2013), Bonin et al. (2013), and Esford and Julien (2013).

The Project design concept for an isolation dike is similar to the approach used at the Diavik Mine, including a semi-circular ring dike extending from shoreline, with a cross-section and construction technique similar to that used at the Meadowbank Mine.

The Project conceptual dike design includes the following general components:

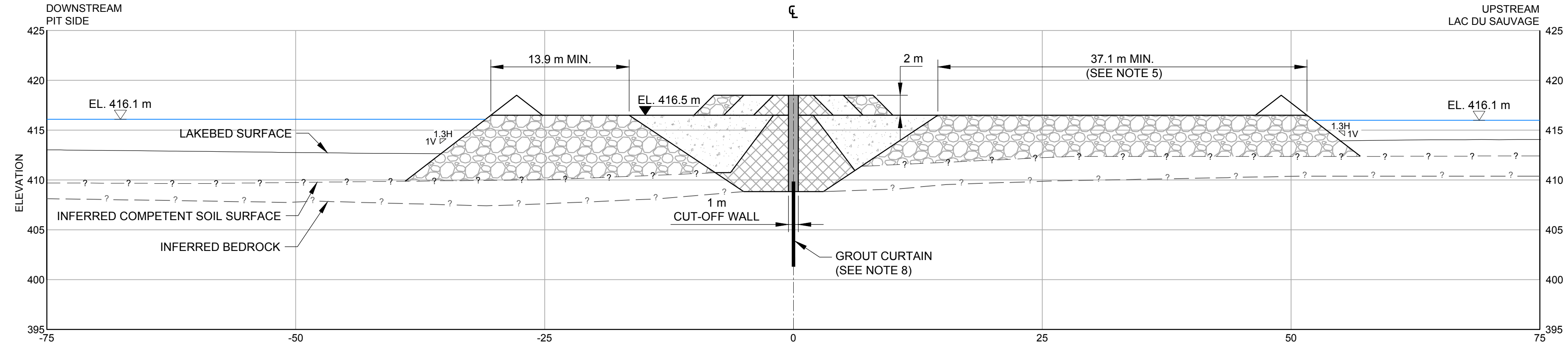
- a broad rockfill shell;
- a central zone of crushed granular fine and coarse filters; and,
- a composite low-permeability element along the centreline of the dike.

The low-permeability element comprises a composite of elements, dependent on the depth to bedrock:

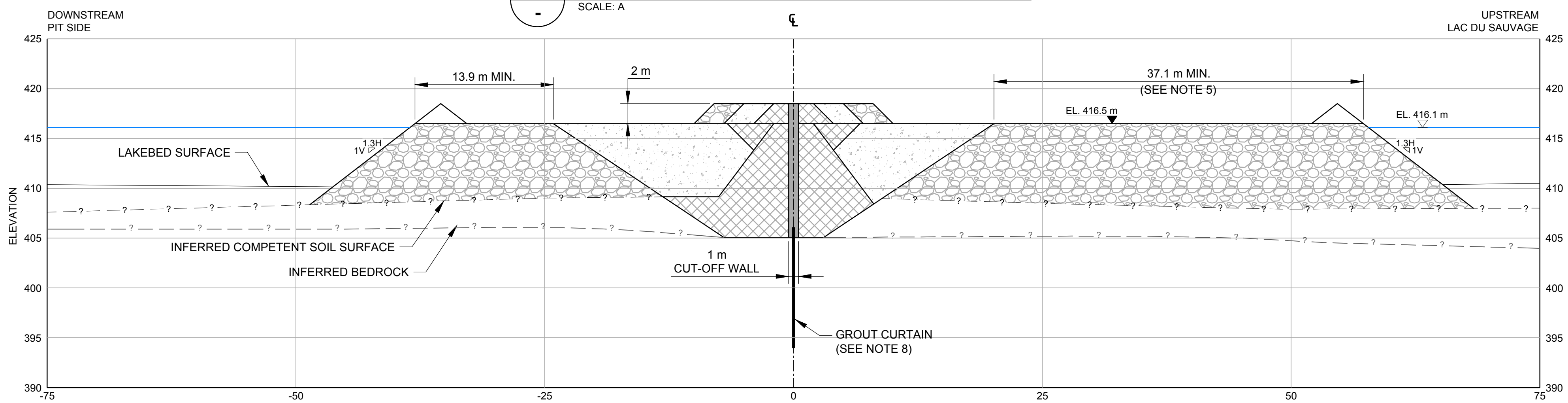
- cement soil bentonite cut-off wall;
- jet grouted columns extending from the base of the cement soil bentonite cut-off wall to the bedrock contact in locations where bedrock is deeper; and,
- grouting of the shallow bedrock and the contact between the bedrock and cut-off wall.

The dike will be constructed within the lake, before any dewatering. Three typical dike sections have been developed for the conceptual design based on the depth to bedrock. Typical sections for the shallow, intermediate, and deep areas are shown in Figure 3.5-1, and are described as follows:

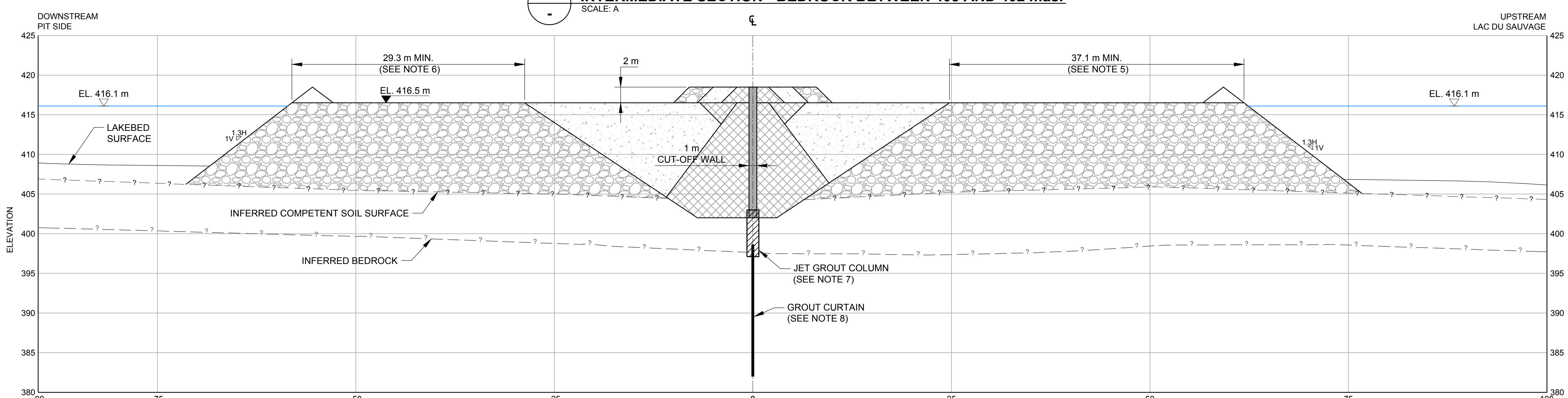
- **Shallow –** is assumed to be constructed where the bedrock surface elevation is above an elevation of 408 metres above sea level (masl) or higher. The central trench will be excavated to bedrock and fine filter will be in contact with the bedrock surface. The base of the cut-off wall will be founded on bedrock. Grouting of the shallow bedrock and the bedrock contact will be conducted.
- **Intermediate –** is assumed to be constructed where the bedrock surface elevation is between an elevation of 408 and 402 masl. The central trench will be excavated to bedrock and fine filter will be in contact with the bedrock surface. The base of the cut-off wall will be founded on bedrock. Grouting of the shallow bedrock and the bedrock contact will be conducted.
- **Deep –** is assumed to be constructed where the bedrock surface is lower than elevation 402 masl. In the central portion of the dike, lakebed sediment will be removed and a granular fine filter will be placed in contact with competent soil. The base of the cut-off wall will be founded on competent soil. Jet grouted columns will be constructed from the base of the cut-off wall to the bedrock contact. Grouting of the shallow bedrock and the bedrock contact will be conducted.



1 - **SHALLOW SECTION - BEDROCK ABOVE 408 masl**
SCALE: A



2 - **INTERMEDIATE SECTION - BEDROCK BETWEEN 408 AND 402 masl**
SCALE: A



3 - **DEEP SECTION - BEDROCK BELOW 402 masl**
SCALE: A

LEGEND

- COARSE FILTER
- FINE FILTER
- ROCKFILL
- SAFETY BERM
- CUT-OFF WALL (CEMENT SOIL BENTONITE)
- JET GROUT COLUMN
- GROUT CURTAIN
- LAKE LEVEL
- LAKEBED SURFACE
- INFERRED COMPETENT SOIL SURFACE
- INFERRED BEDROCK SURFACE

NOTES

1. ALL UNITS IN METRES UNLESS OTHERWISE NOTED.
2. ELEVATION IN METRES ABOVE SEA LEVEL.
3. COMPETENT SOIL AND BEDROCK SURFACES INTERPRETED FROM 2014 GEOTECHNICAL INVESTIGATION AND 2014 GEOPHYSICS SURVEY.
4. UPSTREAM WIDTH OF 37.1 m IS REQUIRED TO ALLOW 2-WAY HAULAGE. DOWNSTREAM WIDTH OF 29.3 m IS REQUIRED FOR THE DOWNSTREAM SIDE OF THE DEEP SECTION TO ALLOW 1-WAY HAULAGE.
5. A 23.4 m WIDE HAUL ROAD WILL BE MAINTAINED AT ALL TIMES.
6. A 15.6 m WIDE HAUL ROAD WILL BE MAINTAINED AT ALL TIMES.
7. JET GROUTING TO TIE INTO CUT-OFF WALL AND BEDROCK BY A MINIMUM OF 1.0 m AND 0.5 m RESPECTIVELY. LENGTH OF JET GROUT COLUMN VARIES BASED ON DEPTH TO BEDROCK.
8. GROUT CURTAIN TO TIE INTO CUT-OFF WALL OR JET GROUTING BY A MINIMUM OF 1.0 m. DEPTH OF GROUT CURTAIN WILL VARY BASED ON HYDRAULIC HEAD AND ROCK QUALITY.

REFERENCE

1. DRAFT JAY PROJECT PRE-FEASIBILITY DIKE DESIGN. GOLDER, 2014.

NOT FOR CONSTRUCTION

0 12 24 36
SCALE: A METRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
TYPICAL SECTIONS FOR SHALLOW, INTERMEDIATE AND DEEP SECTIONS OF THE DIKE

Golder Associates

PROJECT No.		1407256.4070.60	FILE No.	DAR_PD_012_CAD
DESIGN	JB	2014-04-16	SCALE	AS SHOWN REV. 0
CADD	JD	2014-04-16		
CHECK	FA	2014-10-15	**FIGURE 3.5-1**	
REVIEW	JCC	2014-10-15		

Geotechnical instrumentation will be installed within the dike structure and foundation to monitor the performance of the dike during dewatering and operation. The instrumentation will monitor the physical performance of the dike to confirm that the structure is operating according to the design intent. Monitoring with the instrumentation will be continued into back-flooding and closure, until the dike is breached at closure.

3.5.3.2 Sub-Basin B Diversion Channel

The Sub-Basin B Diversion Channel will be constructed to minimize the amount of natural runoff to be managed within the diked area.

The proposed Sub-Basin B Diversion Channel will be constructed to divert inflow from a small drainage area to the west of Lac du Sauvage (Christine Lake outflow). Surface runoff will be intercepted as it drains towards the dewatered area, and diverted to the south of the Project site into the main basin of Lac du Sauvage. The diversion channel is anticipated to be approximately 1.3 km long, with a base width and depth of 1.5 m.

A design flow with a 1-in-100-year return period, plus a minimum 0.3 m of freeboard, was used to design the diversion channel. This design is considered appropriate to mitigate the risk of pit flooding during extreme seasonal peaks. The design concept for the channel is that it will be lined with riprap underlain by a layer of non-woven geotextile. The channel design will allow for fish movement, and will consider requirements for caribou crossing.

3.5.3.3 Sumps

The Jay runoff sump will be located in a natural depression within the diked area to the west of the Jay Pit, which provides a storage capacity of approximately 200,000 m^3. Surface minewater draining towards the diked area will be collected in this sump.

The mine inflow sump will be located in a natural depression near the crest of the Jay Pit, which provides a storage capacity of approximately 100,000 m^3. Mine inflow (groundwater inflows to the pit and direct precipitation) will be pumped to this sump.

3.5.3.4 Dewatering Ramps

Rockfill ramps will be required at the beginning of the dewatering pipeline alignment to provide access to the low spots within the isolated portion of Lac du Sauvage. The ramps will provide access to pump barges, and will serve as benches for the dewatering pipelines. The pump barges will be required in the deeper portions of the dewatered area. The ramps will extend from the dike to the barge locations. The typical dewatering ramp in cross-section will consist of a crest of 25 m, which will allow for one-way haul traffic for CAT 777 90-tonne haul trucks.

3.5.3.5 Fish-Out

Dominion Diamond will work with Fisheries and Oceans Canada and local Aboriginal communities to develop a fish-out plan for the diked area within Lac du Sauvage. A conceptual fish-out plan has been developed (Appendix 9B). A detailed fish-out plan for the Project will be developed in consultation with Fisheries and Oceans Canada, and with input from communities during the permitting phase of the Project and before the implementation of the fish-out.

3.5.4 Open-Pit Mine

Mining is planned at an overall materials movement rate of 40 million tonnes per year. The rate is based on an average of 350 operating days per year, with the remaining 15 days accounting for shut-downs due to weather. The total material moved by type is listed in Table 3.5-1.

Table 3.5-1 Jay Pit Materials Balance

Material Type	Dry Mass (tonnes)	Wet Mass (tonnes)
Overburden	12,831,000	15,089,000
Granite	125,859,000	125,859,000
Metasediment	43,371,000	43,371,000
Kimberlite	45,629,000	49,956,000
Total	**227,690,000**	**234,275,000**

The Jay Pit development is anticipated to proceed to a depth of approximately 370 m below grade. The anticipated pit dimensions are shown in Figure 3.3-1.

3.5.4.1 Pit Geometry

The Jay Pipe is a carrot shape with a vertical orientation. The open pit is excavated in benches to create a conical shape that includes the pipe. The majority of material moved to create the pit is waste rock, which has no value and is simply stored on surface. The pit shape is designed to minimize the quantity of waste rock. The pit design is based on the orientation of the ore body, and the maximum slope of the pit walls allowed by the strength of the walls. Where rock is stronger, the walls may be steeper.

The three major components of open-pit slope design are the bench configuration, the inter-ramp slope, and the overall slope. Geotechnical design domains, or areas of the pit walls, are determined from geotechnical mapping, core logging, in situ testing, and laboratory testing data, where available. Pit wall designs are reviewed using commercially available software to assess if the proposed pit slope configurations meet the design acceptance criteria for bench-scale, inter-ramp slope, and overall slope stability. The existing geotechnical and hydrogeological information for the Project area described in Sections 3.3.3 and 3.3.4, respectively, was used to develop the pre-feasibility slope design for the Jay Pit.

The geotechnical data collected during the 2014 field investigation indicate that the north, east, and south walls of the planned Jay Pit will be excavated in granitoid rocks, and the west wall is expected to be mined in metasediments. The proposed slope configurations for the granitoid, metasediments, and kimberlite domains are summarized in Table 3.5-2. These slope configurations are based on the results of the slope stability assessments that were conducted as part of the pre-feasibility Jay Pit slope design study.

Table 3.5-2 Recommended Design Configuration for Rock Slopes

Design Domain	Wall Dip Direction (°)	Bench Height (m)	Catch Berm Width (m)	Bench Face Angle (°)	Inter-Ramp Angle (°)
Granitoid	180 to 330	30	11.5	75	57
	330 to 060	30	11.5	65	50
	060 to 120	30	12.0	65	49
	120 to 180	30	12.0	75	56
Metasediments	n/a	30	11.5	60	46
Kimberlite	n/a	15	12	60	36

° = degree; m = metre; n/a = not applicable.

The footprint of the designed Jay Pit, at the intersection with the topography, is approximately 960 m x 960 m, and has an approximate surface area of 700,000 square metres (70 ha).

3.5.4.2 Mining Method

Once the fish-out and dewatering has been completed and the pit can be accessed by heavy equipment, the first step in open-pit mining is to remove the overburden material including lakebed sediments and overburden soils that lie within the designed pit perimeter. These lakebed sediments and overburden soils will be mined through the use of explosives (if necessary), and standard truck and shovel techniques. This material will then be hauled to the WRSA. Benches in overburden would be 10 m high.

The remainder of the Jay Pit will be mined using conventional open-pit truck-shovel operations in a 15 m bench height, with a double bench configuration. A single circular access ramp that is designed at 29.5 m in width is sufficient for two-way traffic, a safety berm, ditch, and to allow for dewatering pipes to be placed along the edge of the road. The ramp will be designed to accommodate 190-tonne CAT 789 haul trucks.

The mining main activities include drilling, blasting, excavation, and hauling. Drilling includes advancing boreholes on a regular pattern in the rock to be removed. The drill holes are loaded with a heavy emulsion containing ammonium nitrate fuel oil and charged with blasting caps to allow detonation in a specific sequence designed to fracture the intact rock. In preparation for blasting, all people are removed from the area, and the area is guarded against inadvertent entry. The blast is detonated, resulting in a mass of fractured rock that can be loaded by excavators and shovels into haul trucks. Drilling equipment is operated in the pit, and specialty bulk explosives trucks are used to haul and load the blast patterns with explosives stored at existing facilities at the Ekati Mine (bulk emulsion storage) and Misery (blast initiation systems) site.

Trucks will be loaded at the pit using two (2) 26 m^3 bucket sized hydraulic shovels (CAT 6050s) and two (2) 17 m^3 bucket sized wheel loaders (CAT 994s), and a 16 m^3 bucket sized Hitachi EX1900 hydraulic shovel, or similar. The 17 m^3 bucket sized loaders will be used for loading waste into the 190-tonne haul trucks and ore into the 90-tonne haul trucks, whereas the shovels are assumed to only load waste into the 190-tonne haul trucks.

Waste rock will be hauled from the pit to the WRSA by CAT 789 haul trucks with a 190-tonne payload, or similar. The trucks will cycle between the pit and the WRSA. Kimberlite will be hauled from the pit to ore transfer pads near the Jay WRSA and Misery WRSA by CAT 777 haul trucks with a payload capacity of 90 tonnes, or similar. The maximum number of CAT 789 trucks during the mine life is 15, and the maximum number of CAT 789 off-road haul trucks is 7.

The kimberlite ore is re-handled at the Jay and Misery road stockpiles, and then loaded into road trains, or similar, for hauling to the processing plant. Mining is expected to be completed in approximately 10.5 years.

3.5.4.3 Potential for Underground Mining

Geological and resource information is currently limited in terms of diamond grade, pipe size and shape, and rock strength below the proposed pit bottom for the Jay pipe. However, as per typical mining practices, additional economic resource may be identified as the resource becomes better defined during the open-pit mining. Should economics be favourable, the Jay open-pit mining could be followed by underground operations consistent with other Ekati Mine pits (e.g., Panda and Koala pits). Additional drilling continues to define potential additional resources, and subsequent drilling throughout the operations will determine resources. Conceptual information regarding underground mining is summarized below.

If underground mining is considered feasible for the Jay pipe, block caving would be an appropriate mining method due to the combination of high wall rock strength, low kimberlite strength, and steeply dipping sides. Main ramps would be collared and driven down to the extraction level, 200 to 300 m below the pit floor. Safety bays to allow safe passage for personnel on foot meeting rolling equipment, muck bays, and temporary sumps would be developed along the ramp. Ventilation raises would be developed in stages as the ramps are advanced, and will be used to supply fresh air during development, and later on during production. A short distance before the ramp reaches the extraction level, an uphill ramp would connect to the undercut level.

An underground crusher station would be excavated and connected via a flat conveyor drift to a hoisting shaft drilled from surface. Undercut drifts and haulage drifts would be developed simultaneously. The undercut, draw point, and draw bells would be sequenced so that the undercut is developed slightly ahead of the draw points and draw bells. Underground workshops, refuge stations, explosive magazines, sumps, and pump stations would complete the underground development.

Surface installations would include substations, a dry at the Jay site, exhaust fans, and fresh air fans with oil-fired air heating. In addition, the Jay site would have a head frame with a load out facility.

If the geology and economics prove favourable for underground mining, a detailed design of the underground mining facilities would be developed, along with the details on mining methods, construction practices, and operations of the underground.

3.5.5 Dewatering and Mine Water Management

The goal of the dewatering and mine water management is to minimize the impact of the Project on the aquatic ecosystem surrounding the Project area, in terms of both water quantity and quality.

The Mine Water Management Plan (Appendix 3A) for the Project encompasses all stages of the mine development plan:

- construction, spanning a duration of approximately three years, when activities are focused on construction of mine facilities and dewatering the portion of Lac du Sauvage within the containment dike;
- operations, spanning a duration of approximately 10 years, when activities are focused on mining the Jay Pit;
- closure, following the completion of Jay Pit mining and spanning approximately four years, mainly for back-flooding the pits and diked area; and,
- post-closure, focused on monitoring.

The proposed water management infrastructure was designed to first reduce the amount of minewater by intercepting and diverting runoff water away from the mine site. It was also designed to minimize the quantity of minewater that requires management, to collect runoff and minewater and store it for management and monitoring before discharge to the environment, and to implement monitoring plans to allow for the identification and development of adaptive management strategies as required. The main water management infrastructure includes:

- turbidity curtains during construction;
- a diversion channel;
- collection sumps within the diked area of Lac du Sauvage;
- pumps and pipelines; and,
- mined-out Lynx and Misery pits, which will be used for water management.

During the Project, from the construction to the closure phase, the number of discharge points from the mine site to the receiving environment is limited to the following:

- two discharge locations (total of three pipes, two discharging in one location, and one discharging in the other location) to Lac du Sauvage for the early stages of dewatering of the diked area, when TSS concentrations are suitable for direct discharge to the environment (Map 3.5-1); and,
- one diffuser outfall location in Lac du Sauvage for the discharge of water from the Misery Pit during the second part of the mine operations (i.e., after water within the Misery Pit has reached storage capacity) (Map 3.5-2).

3.5.5.1 Dewatering

Operating experience at the Ekati Mine and other mines suggests that TSS concentrations during dewatering from within the diked area may increase beyond acceptable levels during the late stages of dewatering. The time at which the TSS concentration crosses the acceptable threshold varies depending on site-specific circumstances. For the area within the proposed Jay Dike, it is conservatively estimated that the second 50% of the dewatering volume will contain elevated TSS concentrations. Therefore, dewatering of the diked area within Lac du Sauvage will occur in the following two stages, which are based on regular measurements of the TSS concentrations in the pumped water:

- Water will be pumped from the dewatered area over the dike into the main basin of Lac du Sauvage to the extent that TSS concentrations are acceptably low. It is conservatively estimated that TSS concentrations will be acceptable for the first 50% of the dewatering volume, corresponding to water elevations higher than 411 masl. Lake elevation is currently 416.1 m.
- Water will be pumped to the Lynx Pit or the Misery Pit for settlement of solids when TSS concentrations are greater than the acceptable concentration. It is conservatively estimated that TSS concentrations will be greater than the acceptable limit for 50% of the dewatering volume, corresponding to water elevations below 411 masl.

The acceptable limit for TSS concentrations in dewatering water is anticipated to be addressed during the regulatory stage of the Project following successful completion of the environmental assessment review process. The TSS concentrations threshold is envisioned to be consistent with past experience and current requirements of the Ekati Mine water licence. The estimated volume of water to be pumped from the dewatered portion of Lac du Sauvage during the construction phase of the Project is 29.6 million m^3. The total duration of diked area dewatering is assumed to be six months, equivalent to an average dewatering rate of approximately 6,500 cubic metres per hour (m^3/hr).

The Lynx and Misery pits will allow for the natural settlement of suspended solids over time. Water within the Lynx Pit will remain in the pit for closure. As an operating contingency, consideration may be given to lowering water levels in the Lynx Pit by releasing water meeting discharge criteria to the receiving environment to make room for additional storage.

A final Dewatering Plan, envisioned to be consistent with the current requirements of the Ekati Mine Water Licence, is anticipated to be a requirement of the Water Licence issued by the WLWB during the regulatory phase of the Project subsequent to successful completion of the environmental assessment review process.

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3.5.5.2 Minewater Management

The Mine Water Management Plan provides for secure storage of minewater in the mined-out Misery Pit, and defers the need for discharge to the local receiving environment for approximately five years into the open pit operation. This approach eliminates the need for construction of a large, new minewater management facility and reduces aquatic cumulative effects in Lac de Gras (given the current published shut down of the Diavik Mine in 2023).

The Mine Water Management Plan for operations consists of the following essential components:

- minewater from the Jay open pit (i.e., inflows to the Jay Pit containing chloride-rich groundwater) will be pumped to the bottom of the Misery Pit;
- surface minewater (surface runoff and Jay Dike seepage) reporting to the dewatered area within the dike will be pumped to the top of the Misery Pit; and,
- when the water level in the Misery Pit approaches maximum operating levels (anticipated five years into open pit operations), water from the surface of the Misery Pit will be pumped to the discharge location in Lac du Sauvage at a rate that maintains a safe freeboard within the Misery Pit.

This approach promotes the development of a TDS profile within the Misery Pit wherein the more chemically dense, high TDS minewater would be in the lower layers of Misery Pit and the chemically 'lighter' water would be in the upper layer of Misery Pit. This approach also facilitates closure of the Misery Pit lake by providing the opportunity for permanent stratification (meromixis) within the final pit lake.

Water management pipelines will be constructed from the open pit and diked area to the water management facilities (Lynx and Misery pits). The pipelines will be operated year-round and used during construction (i.e., dewatering), operations, and closure. The associated pumping systems required for the Mine Water Management Plan are discussed in Section 3.5.1.4.

During the operational phase of the Project, the anticipated annual volume to be managed would increase from approximately 5.93 million m^3 to 9.76 million m^3 throughout the Project life. A preliminary summary of the annual discharge volumes anticipated during operations for the Jay Project is shown in Table 3.5-3 for mean annual climatic conditions. The peak discharge volumes projected for late in the open-pit mine life are consistent with annual volumes of effluent that have typically been discharged from the LLCF during past and current operations of the Ekati Mine.

Table 3.5-3 Preliminary Annual Discharge Volumes During Operations for the Jay Project

Year	Mine Inflows to Misery Pit (million m^3)[(a)]	Jay Runoff Sump to Misery Pit (million m^3)	Misery Pit to Receiving Environment (million m^3)
Stripping	0.95	4.05	0.00
1	3.02	2.91	0.00
2	3.66	1.67	0.00
3	4.11	1.73	0.00

Table 3.5-3 Preliminary Annual Discharge Volumes During Operations for the Jay Project

Year	Mine Inflows to Misery Pit (million m^3)[(a)]	Jay Runoff Sump to Misery Pit (million m^3)	Misery Pit to Receiving Environment (million m^3)
4	4.61	1.78	0.00
5	5.43	1.79	2.14
6	5.93	1.79	7.80
7	6.04	1.79	7.92
8	6.40	1.79	8.28
9	6.79	1.79	8.66
10	7.97	1.79	9.83

a) Groundwater inflow values are based on preliminary estimates throughout mine life. Mine operations commence in Year 2.
m^3 = cubic metres.

Water licence effluent discharge criteria for the Project will be derived on a site-specific basis using the site-specific water quality objectives, as applicable, that are already in place for the Ekati Mine. This is anticipated to be addressed as part of the regulatory process following successful completion of environmental assessment.

3.5.5.2.1 Minewater Monitoring and Adaptive Management

Minewater monitoring will be established to monitor the water quantity and quality of main minewater sources. The program's objective is to verify assumptions made during the development of the water quantity and quality models and apply targeted adaptive management strategies where required to meet established performance standards. Data will be collected, compiled, and managed internally by Dominion Diamond and will be reported to the WLWB.

Data collected as part of the minewater monitoring program will be used to assess the need for adaptive management should trends in minewater quantity and quality differ from expectations. Adaptive management strategies may involve improvement or modifications of the proposed Mine Water Management Plan, or temporary use of the contingency allowances included in the design of the water management facilities. Adaptive management and contingency measures are discussed further in the Mine Water Management Plan (Appendix 3A).

Monitoring will include minewater sources and effluent (through internal programs and expansion of the Water Licence Surveillance Network Program), and receiving environment monitoring (through expansion of the Water Licence Aquatic Effects Monitoring Program). The Ekati Mine Aquatic Response Framework will also be expanded to incorporate the Project to provide a mechanism for ensuring review of monitoring information against pre-defined thresholds, and implementation of adaptive management response actions as appropriate.

3.5.6 Waste Rock Storage Area

Waste rock and overburden excavated from the Jay Pit and during dike construction will be stored at the Jay WRSA, which is located west of Lac du Sauvage. The existing Ekati Mine WROMP, including seepage monitoring, will be expanded to incorporate the Jay WRSA.

The key design and construction objectives for the WRSAs at the Ekati Mine are as follows:

- designed and constructed to be inherently, physically stable structures, both during mine operations and in the long term;
- designed as permanent structures that will remain in place following the completion of mining;
- constructed to promote permafrost aggradation; and,
- designed to achieve a reasonable balance between surface footprint area and height.

The Jay WRSA will be located west of Lac du Sauvage (as discussed in Section 2.5.2 and shown in Map 3.5-1). The Project is located within a region of continuous permafrost. The permanently frozen subsoil and rock is generally deep, and it is overlain by a relatively thin active layer that thaws during the summer. The ground ice content is relatively low in the region at 0 to 10% (Section 2.5.2). The WRSAs at the Ekati Mine are constructed to minimize runoff and encourage permafrost formation. The intent is that water infiltrating the WRSA will encounter permafrost and freeze within the pile, restricting long-term runoff and seepage to the active layer.

Jay WRSA design features include the following:

- Placement of a layer of non-PAG granite rock (nominally 2 m thick) over the tundra before construction of the WRSA to promote early aggradation of permafrost into the base of the WRSA and to prevent contact of potentially reactive waste rock with surface water flow over tundra soils, which can be naturally acidic;
- Encapsulation of potentially reactive materials (e.g., metasediment) within a thermally protective and geochemically non-reactive cover so that the potentially reactive materials remain at freezing conditions, thereby promoting stable storage over time;
- Construction of WRSAs with setbacks from receiving waterbodies as a mitigation measure to allow for attenuation of drainage by tundra soils and to allow space for contingency measures, if required.

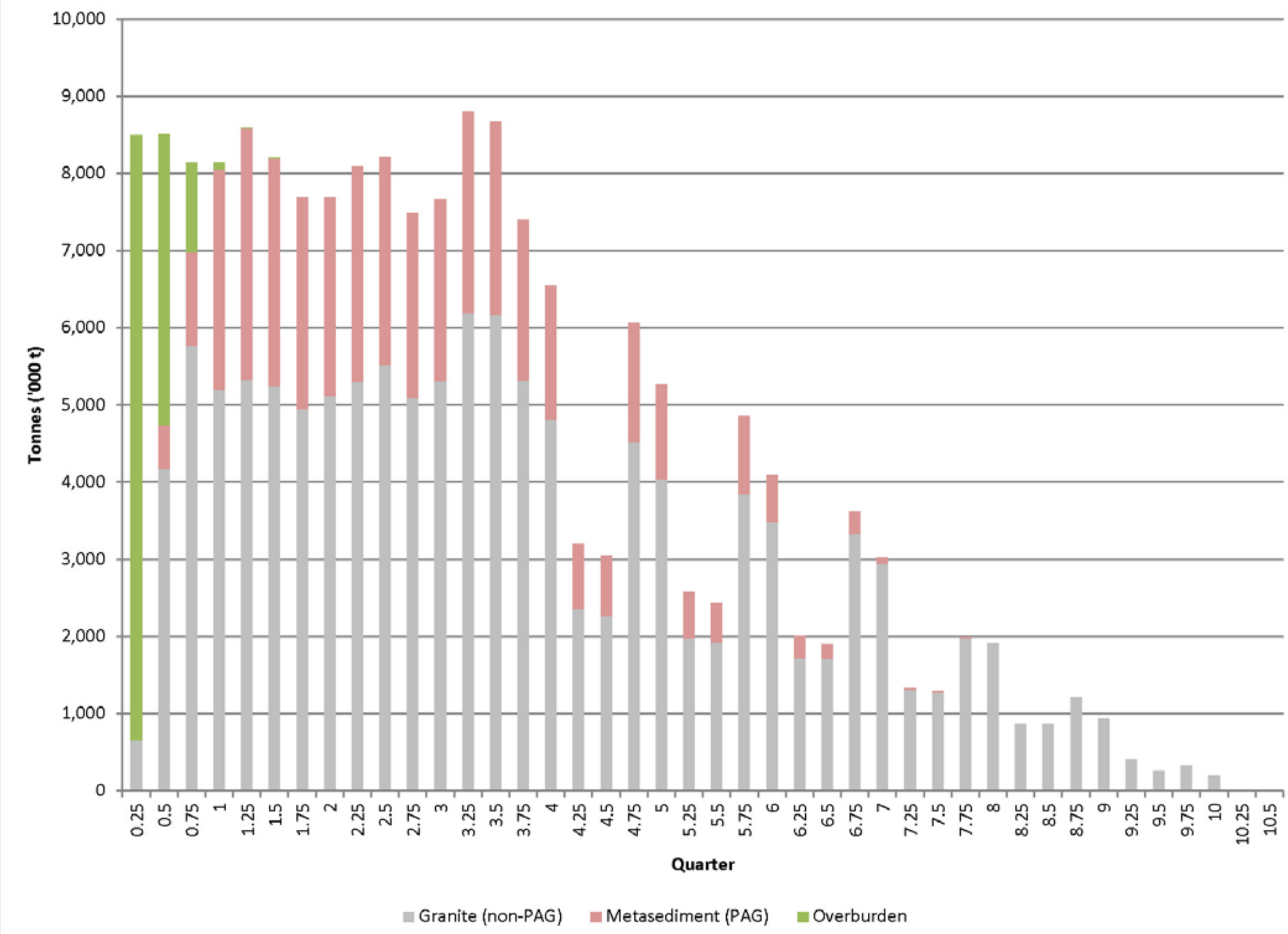
The annual volumes of waste rock and overburden to be stored in the Jay WRSA are summarized in Table 3.5-4. This information is displayed graphically for each quarter in Figure 3.5-2.

Table 3.5-4 Jay Annual Schedule of Waste Rock Production

By end of Year	Mass Overburden (tonnes)	Mass Granite (tonnes)	Mass Metasediment (tonnes)
2020	12,831,000	21,158,532	7,888,476
2021	-	20,609,209	11,057,541
2022	-	22,113,574	10,063,454
2023	-	18,640,257	7,170,387
2024	-	12,808,764	4,150,368
2025	-	10,959,372	2,441,854
2026	-	9,300,616	572,299
2027	-	6,037,945	27,018
2028	-	3,425,750	-
2029	-	804,986	-
Total	**12,831,000**	**125,859,005**	**43,371,397**

Note: 2020 includes last 2 months of 2019.
- = not applicable.

Figure 3.5-2 Quarterly Jay Open Pit Waste Rock and Overburden Tonnage by Rock Type



The Jay WRSA has been designed to accommodate a volume of 120 million m^3, which includes approximately 11 million m^3 for contingency. The Jay WRSA will cover an area of 251.1 ha. The planned elevation for the WRSA to accommodate the 108,699,000 m^3 of waste rock is approximately 492 m, which is a maximum height of approximately 57 m over the average tundra elevation. Providing for the contingency storage, the elevation of the last lift of the Jay WRSA would be 500 m, and the maximum height 65 m over the average elevation of the tundra. The Jay WRSA overall height is higher than the target of 50 m set out in the Ekati Mine WROMP; this is due to several desired setback distances. The development of the pile will be a minimum of 100 m from Lac du Sauvage, a minimum of 30 m from other smaller waterbodies and streams, and a minimum of 200 m from the adjacent esker.

Waste rock from the Jay Pit will be mainly non-potentially acid generating granite (estimated 70%), with the remainder metasediments and overburden.

All of the metasediment mined from the Jay Pit will be managed as potentially acid generating material because, as with other open pits at the Ekati Mine such as Misery, there is no practical means of separating the portion of metasediment that is PAG (on average approximately 50%) from that portion which is not. Metasediment from the Jay open pit will be placed in the WRSA along with the non-potentially acid generating granite waste rock, followed by placement of an encapsulating cover of granite that is at least 5 m thick. Preferentially freezing the reactive materials into permafrost provides an additional long-term environmental risk reduction, and is the approach that is already in use and effective at the Ekati Mine. The proportions of granite versus metasediment to be mined from the Jay Pit provide ample granite for this cover layer.

A waste rock material balance is provided in Table 3.5-5.

Table 3.5-5 Waste Rock Material Balance

Construction Component/Material Type	Estimated Quantity (m^3)	Total (m^3)
2-m non-potentially acid generating foundation	5,022,000	75,819,000
Volume of non- potentially acid generating waste rock for mixed deposition	58,497,000	
5-m non- potentially acid generating cover	12,300,000	
Volume of potentially acid generating waste rock	26,127,000	26,127,000

m = metre; m^3 = cubic metres.

Monitoring seepage from the Jay WRSA will be included in the WROMP (Section 3.4.3.1) which is a requirement under the water licence. As a condition of the water licence, annual monitoring and reporting of WRSA seepage quality, and ongoing validation of waste rock geochemical characterization are required.

3.5.7 Fine Processed Kimberlite Deposition

Processing of the Jay kimberlite is estimated to generate in the order of 25 to 30 Mt of FPK. The Panda and Koala open pits are the primary deposition locations for FPK resulting from the Project. The use of mined-out open pits for FPK deposition has been generally acknowledged as a preferred approach dating back to the original EA for the Ekati Mine in 1996. The concept has been demonstrated viable and beneficial through the current use of the mined-out Beartooth Pit for this purpose. The Panda and Koala pits (with associated underground workings) provide more than adequate storage capacity for FPK from the Project with a combined storage volume in the order of 55 Mm^3 to an elevation 30 m below the planned ultimate overflow for closure.

The design constraint for in-pit deposition of processed kimberlite will remain at a maximum elevation of 30 m below the final pit lake overflow elevation. This design constraint is taken from the initial description of the concept in the original Ekati Mine EA in 1996. During permitting by the WLWB of processed kimberlite deposition into the mined-out Beartooth Pit in 2012, the Ekati Mine's technical consultant (Robertson Geoconsultants) considered 30 m to possibly be unnecessarily overly conservative. Therefore, Dominion Diamond could conduct additional technical studies in the future to optimize a site-specific depth of water required over FPK for closure and reclamation.

Cell D of the LLCF will continue to be used as a contingency deposition location for FPK. This plan is an essential back-up measure that prevents mine shutdown if a line blockage or breakage occurs between the processing plant and the primary deposition locations, or other reasons.

As is the case for current management of FPK deposition into the Beartooth pit, excess minewater will accumulate in the Panda and Koala pits that will be managed by strategically pumping water to the LLCF for discharge to maintain the desired water level in the pits. This may begin around Year 5 of the Project, once the in-pit minewater level reaches an operationally effective elevation (i.e., high enough for safe access for pumping). In a similar manner to the use of the Misery pit as a minewater management pond for Project minewater, the use of the Panda and Koala pits for FPK deposition substantively defers the discharge of processing plant minewater.

Future operational planning will optimize the pit filling strategy (i.e., preferentially filling one pit ahead of the other, optimum in-pit pumping elevation). This is anticipated to be developed as part of the future update of the Ekati Mine WPKMP, which already anticipates the possible future use of Panda and Koala open pits for FPK deposition.

3.5.8 Closure and Reclamation

The Ekati Mine is required under its Water Licence and Environmental Agreement to have a closure plan. Version 2.4 of the Ekati Mine ICRP was approved by the WLWB in November 2011 (BHP Billiton 2011). The Water Licence requires that a Final Closure and Reclamation Plan be prepared two years before mine closure. An annual reclamation update report is provided to the WLWB.

The ICRP describes the Ekati Mine reclamation goal, reclamation objectives, reclamation methods, and required reclamation research that encompass the entire Ekati Mine and all reclamation requirements. The reclamation goal is to return the Ekati Mine site to viable, and wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment, human activities, and the surrounding environment. Reclamation of the Project will be designed to fit into this established framework.

Reclamation activities are described in the ICRP according to the following six categories:

- open pits;
- underground workings;
- waste rock storage areas;
- processed kimberlite containment areas (surface impoundments and mined-out open pits);
- dams, dikes, and channels; and,
- buildings and infrastructure.

The Ekati Mine ICRP also outlines the reclamation research plans that address key uncertainties related to mine closure, such as water quality, wildlife safety, and sustainability of vegetation cover at the LLCF. A closure monitoring plan will also be in place at the time of closure as a method of observing and tracking the performance of reclamation work against closure criteria to establish if reclamation activities have been successful or if further work is required.

The Jay Project introduces necessary changes to the Ekati Mine ICRP, primarily the new reclamation activities at Lac du Sauvage, and the amended pit back-flooding approach for the Lynx, Misery, Panda, and Koala open pits. The ICRP will be amended to include these activities. Community and regulatory engagement will continue to be an important component for closure and reclamation planning.

During the extended life of operations at the Ekati Mine with the Project, reclamation of some facilities may take place as progressive reclamation where those facilities have no further operational value. For example, reclamation and reclamation research will continue for competed areas of the LLCF (i.e., Cells A, B, and C).

The approach to reclamation of the primary components of the Project, and the conceptual changes to the Ekati Mine ICRP resulting from the Project are described below and in Appendix 3B, Jay Project Conceptual Closure and Reclamation Plan. Amendment of the ICRP and the associated amendment in reclamation security are anticipated to be addressed as requirements of the Water Licence issued by the WLWB as part of the regulatory process following successful completion of the EA review process.

3.5.8.1 Jay Open Pit

Reclamation of the Jay Pit will involve removal of buoyant or hazardous materials, and submergence beneath Lac du Sauvage. Removal of equipment from the open pit can begin upon completion of open-pit mining activities, and flooding with water can begin upon completion of equipment removal.

At completion of Jay pipe mining, a portion of the minewater contained within the Misery Pit (approximately 16.75 million m^3 to lower the water in Misery Pit to 60 m below the final elevation) will be pumped to the bottom of the Jay Pit and subsequently covered with freshwater from Lac du Sauvage. The shape and location of the Jay open pit, as a very deep hole in the bottom of a much larger lake creates the conditions for long-term meromixis within the submerged open pit. That is, an area of ionically dense water in the deeper parts of the open pit that does not mix with the overlying lake water. The primary cause of this occurrence is the presence of sub-permafrost connate (ancient) groundwater and minewater pumped from the Misery Pit, which will contain elevated chloride relative to the overlying lake water. Additionally, the absence of other key drivers of seasonal lake mixing such as penetrating wave turbulence and sunlight will also support meromixis. Because meromixis would result in this denser water remaining within the submerged open pit, this water would be prevented from having a negative influence on water quality in overlying Lac du Sauvage.

The objectives for reclamation of the Lac du Sauvage dewatered area include the following:

- natural lake water levels will be re-established; the dewatered area will be re-established to approximately 416 masl;
- Lac du Sauvage will be the primary source for back-flooding the dewatered diked area;
- back-flooding time will be reduced based on a reasonable balancing of time/costs with environmental protection;
- water quality within the back-flooded diked area will meet pre-defined acceptability criteria before permanent breaching of the dike or return to natural flow paths;
- the Sub-Basin B Diversion Channel will be re-graded to promote natural drainage;
- local fish will be able to naturally re-enter the back-flooded area of Lac du Sauvage after the dike has been breached; and,
- local navigation will be re-established as required.

The predicted total volume of water required to back-flood the dewatered area is 120.48 million m^3: 93.84 million m^3 for the Jay Pit itself, and 26.64 million m^3 for the dewatered area of Lac du Sauvage. Water from Lac du Sauvage will be pumped over the dike in a manner to control the generation of TSS; available pumping rates are the same as operational capacity, as no additional pumping systems are proposed for reclamation. Back-flooding is anticipated to take approximately four years.

3.5.8.2 Misery Open Pit

The Misery open pit will be utilized as a water management facility during the Project. The pit will be reclaimed according to the methods described in the Ekati Mine ICRP. Removal of equipment from the open pit will be undertaken before water is pumped from the Jay Project.

At completion of the Project, a portion of the minewater contained within the Misery Pit will be pumped to the bottom of the Jay Pit, and the remaining water within the pit will be covered by 60 m of freshwater from a combination of precipitation, runoff, and lake water from Lac du Sauvage. The density gradient thus created would provide for long-term stable stratification (meromixis) within the final pit lake, and improved water quality for overflow from the surface of the pit lake. Once the freshwater cover has been created, a connection to the natural channel to Lac de Gras will be re-established to allow overflow from the surface of the Misery Pit lake to the environment. Other aspects of reclamation of the Misery Pit will proceed as described in the Ekati Mine ICRP.

3.5.8.3 Lynx Open Pit

The Lynx open pit will be used for the storage and management of lake water containing elevated TSS pumped from Lac du Sauvage during the dewatering phase of the Project. Removal of equipment from the open pit will be undertaken before water being pumped from the diked area of Lac du Sauvage. The suspended sediment will settle out and the pit will be monitored to confirm water quality is suitable for discharge before the Lynx Pit lake overflow to Lac de Gras is re-established. Other aspects of reclamation of the Lynx Pit would proceed as described in the Ekati Mine ICRP.

3.5.8.4 Roads and Pads

The reclamation of these facilities will be carried out following procedures described in the existing approved Ekati Mine ICRP. Roads will be decommissioned once they are no longer required for post-closure monitoring and maintenance. Access roads will be re-graded to promote natural drainage, and culverts will be removed. The on-land portions of the dike will be reclaimed as roads, as described in the Ekati Mine ICRP.

The reclamation of roads and pads will allow for the surface to be safe for wildlife use.

3.5.8.5 Waste Rock Storage Areas

The Jay WRSA will be reclaimed according to the methods described in the Ekati Mine ICRP. Reclamation will focus on providing a relatively flat upper surface that discourages snow accumulation, and providing for wildlife safety through caribou emergency egress ramps.

As described in Section 3.5.5, the WRSA was designed as a permanent structure that will remain in place following the completion of mining and to be physically stable for the long term. Stability assessments indicate that the WRSA will be stable in the long term.

3.5.8.6 Processed Kimberlite Containment Areas

The Panda and Koala open pits are the primary deposition locations for processed kimberlite resulting from the Project. As described in Section 3.5.6, the use of mined-out open pits for processed kimberlite deposition has been generally acknowledged as a preferred approach dating back to the original Ekati Mine EA in 1996. The concept has been demonstrated viable and beneficial through the current use of the mined-out Beartooth Pit for this purpose.

Reclamation of the Panda and Koala open pits would proceed by pumping freshwater into the pits as a "cap" overlying the processed kimberlite and, possibly, residual minewater. This pumping scenario is an improvement over the current Ekati Mine ICRP because substantively less freshwater is required (i.e., approximately 19 million m^3 versus the current approximately 80 million m^3), which reduces requirements from the source lakes. Other aspects of reclamation of the Panda and Koala open pits would proceed as described in the Ekati Mine ICRP.

Cell D of the LLCF will serve as a contingency deposition location for processed kimberlite from the Project. Any residual processed kimberlite beaches in Cell D would be relatively small in extent and would be reclaimed according to the methods described in the Ekati Mine ICRP.

3.5.8.7 Dams, Dikes, and Channels

The Jay Dike will be strategically breached based on the following approach:

- The water level on the Lac du Sauvage side of the dike cannot be lowered to enable the breaching work to be completed "in-the-dry." Therefore, water levels will be approximately equalized on both sides of the dike by re-flooding the dewatered area in a controlled manner before the dike is breached. This method is an established engineering approach for this nature of work.
- Monitoring will be conducted during back-flooding to confirm that water quality within the back-flooded diked area will meet closure criteria before breaching of the dike or return to natural flow paths.
- During excavation of the breaches, silt curtains or other sediment/turbidity mitigation measures will be utilized as necessary to reduce risks to water quality.
- The dike will be breached at several locations to approximately 2 to 3 m below the minimum water level at Lac du Sauvage. Excavated materials (crushed granite rock) will be locally placed to extend shallower areas on the residual sides of the dike and breaches.
- Placement of excavated rockfill material or other appropriate erosion mitigation measures will be installed as necessary to provide for long-term physical stability of the dike breach slopes.

The riparian (shoreline) and littoral (shallow) areas within the diked area will be reclaimed where necessary to enable natural regrowth of riparian and aquatic vegetation. The reclamation work is envisioned to include localized repair of erosion, and re-vegetation of select areas with aquatic and riparian plants. This work will be based on experience gained through operations and closure of other areas of the Ekati Mine.

The Sub-Basin B Diversion Channel will be reclaimed such that water flows through the natural drainage pattern to Lac du Sauvage. The reclaimed diversion will be made safe for movement of wildlife, particularly caribou, and people.

3.5.8.8 Buildings and Infrastructure

Buildings and infrastructure will be reclaimed according to the methods described in the Ekati Mine ICRP. This will include removal of the overhead power line and power poles. The surface will be made safe for wildlife use.

3.5.8.9 Monitoring and Maintenance

Monitoring for physical and chemical stability, and maintenance of the reclaimed facilities will be required after closure and post-closure until closure objectives and criteria are met. The specific schedule and program for monitoring, maintenance, and engagement will be prepared as part of the anticipated amendment of the Ekati Mine ICRP that would take place as part of the regulatory process following completion of the EA.

The environmental monitoring programs developed during operations will be used as the basis for post-closure monitoring. Monitoring of water quality within the previously diked area is anticipated. Monitoring during closure will be designed to track reasonably foreseeable post-closure contamination pathways, and to allow for the identification of any specific post-closure monitoring to address potential effects through adaptive management.

3.5.8.10 Sequencing

The schedule for reclamation of certain existing facilities at the Ekati Mine will change as a result of the Project. The primary changes to the timing of reclamation of existing Ekati Mine facilities will be the following:

- Reclamation of the Ekati Mine camp, processing plant, airstrip, tank farm, Misery road, certain components of the Misery site infrastructure, and other required operating facilities cannot be undertaken until the completion of mining and processing related to the Project. At that time, reclamation would proceed as described in the Ekati Mine ICRP.
- Filling of the Panda and Koala open pits with freshwater cannot be undertaken until in-pit deposition of processed kimberlite is completed. At that time, final filling with freshwater can proceed.
- Reclamation of the Lynx Pit with freshwater is linked to dewatering of the diked area of Lac du Sauvage.
- Filling the Misery Pit with freshwater cannot be undertaken until the pit is no longer required as a water management facility as part of the Project.

- Reclamation of the upper areas of the LLCF (Cells A, B, and C) can proceed as described in the Ekati Mine ICRP in conjunction with the Project. The continuation of Ekati Mine operations in the absence of processed kimberlite deposition into these areas is a positive factor for reclamation of these areas. The ongoing availability of operational resources will improve Dominion Diamond's ability to undertake the necessary research, reclamation, and monitoring/adaptive management activities at an appropriately staged pace and with the full support of those operational resources.
- Reclamation of the lower areas of the LLCF (Cells D and E) cannot be undertaken until the completion of mining and processing related to the Project. Cells D and E are required for contingency processed kimberlite deposition (Cell D only), and for minewater management/discharge. At that time, reclamation can proceed as described in the Ekati Mine ICRP.

The timeframe for completion of reclamation activities related to or dependent on the Project is envisioned to be approximately four years after completion of mining and processing activities, and after a determination that there is no remaining, economically viable kimberlite resource. This would be followed by the post-closure monitoring period.

The general sequence of events is envisioned as follows:

- Initial Work:
  - reclamation of Jay open pit (removal of equipment);
  - reclamation of pump stations and facilities within the dewatered area Lac du Sauvage;
  - installation of Lac du Sauvage water recharge equipment (e.g., pipes, pumps);
  - installation of Panda and Koala open pits freshwater pumping equipment; and,
  - initiation of reclamation of surface facilities not needed for ongoing monitoring.
- Water Recharge and Reclamation Work:
  - pumping of minewater from the Misery Pit to the Jay Pit;
  - back-flooding of the isolated portion of Lac du Sauvage within the dike;
  - pumping of freshwater into Panda/Koala and Misery open pits; and,
  - reclamation of surface facilities not needed for ongoing monitoring.
- Breaching of Jay Dike and Completion of Reclamation Work:
  - strategic local breaching of in-lake dike;
  - reclamation of the Sub-Basin B Diversion Channel; and,
  - completion of reclamation of surface facilities not needed for ongoing monitoring.
- Post-Closure Monitoring and Progressive Relinquishment of Liabilities.

3.6 Accidents and Malfunctions

The methods and results of the risk assessment that was developed for the evaluation of accidents and malfunctions associated with the Project is presented in Appendix 3C, Risk Assessment for Accidents and Malfunctions of the Jay Project. The evaluation of accidents and malfunctions during the construction, operation, and closure phases has been developed to fulfill the requirements of the TOR.

The assessment methods for accidents and malfunctions were based on the Systems Failure Modes and Effects Criticality Analysis approach, which is a standard risk assessment method. Hazard scenarios were identified for each major Project component and considered accidents and malfunctions that result in risks to the environment and public health and safety. A total of 36 scenarios were classified as posing either moderate or low risks to the environment and five scenarios were classified as high risks for the environment. One moderate risk to public health and safety was identified for the post-closure phase, but was not considered to be an incremental risk associated to the Project development. Recommended controls for high risk scenarios are presented in Appendix 3C.

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DOMINION DIAMOND

3.8 Glossary

Term	Definition
Acid rock drainage	Acidic pH rock drainage due to the oxidation of sulphide minerals that includes natural acidic drainage from rock not related to mining activity; an acidic pH is defined as a value less than 6.0.
Acidity	Amount of both weak and strong acids expressed as milliequivalents of a strong base necessary to neutralize those acids.
Alluvium, alluvial deposit	A general term for all detrital material deposited or in transit by streams, including gravel, sand, silt, clay, and organic debris, and all variations and mixtures of these.
Base Case	The assessment case that includes existing environmental conditions as well as existing and approved projects or activities, before the construction of the Project in question, acts as reference against which data from construction and operational phases of development will be compared.
Baseline	Background or reference; conditions before Project development.
Basin	A large area that is lower in elevation than surrounding areas and contains water. Basins are separated by land or shallow channels.
Bedrock	The solid rock (harder than 3 on Moh's scale of hardness) underlying soils and the regolith in depths ranging from zero (where exposed to erosion) to several hundred metres.
Berm	A mound or wall of earth.
Biotite	Common phyllosilicate mineral within the mica group, with the approximate chemical formula $K(Mg,Fe)_3AlSi_3O_{10}(F,OH)_2$.
Breccia	A fragmental rock whose fragments are angular.
Claim block	Publicly owned land that has been leased from the government of the Northwest Territories.
Conductivity	A measure of the capacity of water to conduct an electrical current. It is the reciprocal of resistance. This measurement provides an estimate of the total concentration of dissolved ions in the water.
Connate groundwater	Water entrapped in the interstices of a sedimentary rock at the time the rock was deposited
Craton	Part of the Earth's crust that has been stable and little deformed for a prolonged period of time.
Dewatering	Removal of water from a natural waterbody by pumping or draining.
Diabase	A dark coloured, fine- to medium-grained igneous intrusive rock.
Dike	An embankment built to hold semi-solids or fluids.
Discharge	The volumetric rate of flow of water in a watercourse at a specified point, expressed in units of cubic metres per second or equivalent.
Dyke	Sheet of rock that formed in a crack in a pre-existing rock body.
Dyke Swarm	See *Mafic dyke swarm.*
Ecosystem	A relatively homogeneous area of organisms interacting with their environment.
Effluent	Outflowing of water or other liquids from a man-made structure.
Erosion	i) The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. (ii) Detachment and movement of soil or rock by water, wind, ice, or gravity.
Eskers	An esker is a long, winding ridge of stratified sand and gravel believed to form in ice-walled tunnels by streams which flowed within and under glaciers. After the retaining ice walls melt away, stream deposits remain as long winding ridges.
Fault	Planar fracture or discontinuity in a volume of rock, across which there has been displacement along the fractures as a result of earth movement.
Feldspar	Group of rock-forming tectosilicate minerals that make up as much as 60% of the Earth's crust. Feldspars crystallize from magma as veins in both intrusive and extrusive igneous rocks and are also present in many types of metamorphic rock.

Term	Definition
Flocculant	A reagent added to a dispersion of solids in a liquid to bring together the fine particles to form flocs.
Foliation	Repetitive layering in metamorphic rocks. Each layer may be as thin as a sheet of paper, or over a metre in thickness. The word comes from the Latin *folium*, meaning "leaf," and refers to the sheet-like planar structure.
Footprint	The proposed development area that directly affects the soil and vegetation components of the landscape.
Freeboard	The distance between the water level and the top of a containing structure such as a dike crest or channel top of bank.
Geochemistry	The chemistry of the composition and alterations of solid matter such as sediments or soil.
Geology	The study of the Earth's crust, its structure, the chemical composition and the physical properties of its components.
Glaciofluvial deposit	Deposit pertaining to a stream or river deriving its water from the melting of ice. The water reworks sedimentary material originally carried by the ice, and deposits it in valleys.
Granite	A coarsely crystalline igneous intrusive rock composed of quartz, potassium feldspar, mica, and/or hornblende.
Granitoid	Rocks with a composition the same as, or similar to granite.
Granodiorite	A group of coarse-grained plutonic rocks intermediate in composition between quartz diorite and quartz monzonite.
Groundwater	Water that is passing through or standing in the soil and the underlying strata in the zone of saturation. It is free to move by gravity.
Groundwater – deep	Ancient fossil or connate water that occupies pores and crevices in the bedrock below the permafrost layer.
Headwater	The source and upper reaches of a stream; also the upper reaches of a reservoir. The water upstream from a structure or point on a stream. The small streams that come together to form a river. Also may be thought of as any and all parts of a river basin except the mainstem river and main tributaries.
Hummocky	A very complex sequence of slopes extending from somewhat rounded depression or kettles or various sizes to irregular to conical knolls or knobs. There is a general lack of concordance between knolls and depressions.
Hydraulic conductivity	The ability of a porous medium to conduct a fluid (e.g., water). It is the combined property of a porous medium and the fluid moving through it in saturated flow, which determines the relationship, called Darcy's Law, between the specific discharge and the head gradient causing it.
Hydrogeology	The scientific study of occurrence and flow of groundwater and its effects on earth materials.
Hypabyssal	Applied to medium-grained, intrusive igneous rocks that have crystallized at shallow depth below the Earth's surface.
In situ	In place.
Infrastructure	Basic facilities, such as transportation, communications, power supplies and buildings, which enable an organization, project or community to function.
Intrusive rock	Also called plutonic rock, is an igneous rock formed from magma forced into older rocks at depths within the Earth's crust, which then slowly solidifies below the Earth's surface, though it may later be exposed by erosion.
Joint set	Group of joints showing near parallel orientation.
Kimberlite	Igneous rocks that originate deep in the mantle, and intrude the Earth's crust. These rocks typically form narrow pipe-like deposits that sometimes contain diamonds.
Kimberlite pipe	Vertical structures on which kimberlites occur in the Earth's crust.
Lacustrine	Sediment that have been transported or deposited by water or wave action. Generally consisting of stratified sand, silt or clay deposited on a lake bed or moderately well sorted and stratified sand and coarser material.

Term	Definition
Landfarm	A lined facility designed with a leachate collection system and side berm to control runoff. The landfarm uses bio-remediation to manage hydrocarbon-impacted soil generated as a result of operational spills of hydrocarbon-based products.
Littoral	The zone in a lake that is closest to the shore. It includes the part of the lake bottom, and its overlying water, between the highest water level and the depth where there is enough light (approximately 1% of the surface light) for rooted aquatic plants and algae to colonize the bottom sediments.
Long Lake Containment Facility (LLCF)	The processed kimberlite containment basin(s) and the associated engineering structures that are designed to contain processed kimberlite and that are regulated through the Water Licence. The LLCF has been divided into a series of cells modified to contain processed kimberlite after completion of the diamond extraction process.
Mafic	A term to describe minerals that contain iron and magnesium.
Mafic dyke swarm	Large geological structure consisting of a major group of parallel, linear, or radially oriented dykes intruded within continental crust. They consist of several to hundreds of dykes emplaced more or less contemporaneously during a single intrusive event and are magmatic and stratigraphic. Such dyke swarms may form a large igneous province and are the roots of a volcanic province.
Mean	Arithmetic average value in a distribution.
Metal leaching	Removal of metals by dissolution, desorption, or other chemical reaction from a solid matrix by passing liquids through the material.
Metasediments	Sedimentary rocks that have been modified by metamorphic processes.
Minewater	Includes runoff from facilities associated with mine development and all water pumped or flowing out of any pit or underground mine. Minewater will need to be managed and monitored prior to discharge to the environment.
Mudstone	Fine grained sedimentary rock whose original constituents were clays or muds. Grain size is up to 0.0625 millimetres (0.0025 inches) with individual grains too small to be distinguished without a microscope. With increased pressure over time the platey clay minerals may become aligned, with the appearance of fissility or parallel layering.
Ore	The naturally occurring material from which a mineral or minerals of economic value can be extracted.
Outflow	Water flowing out of a lake.
Overburden	Materials of any nature, consolidated or unconsolidated, that overlie a deposit of useful materials. In the present situation, overburden refers to the soil and rock strata that overlie kimberlite deposits.
Oxidation	A chemical process involving a reaction(s) that produces an increase in the oxidation state of elements such as iron and sulfur.
Parameter	A particular physical, chemical, or biological property that is being measured.
Pegmatite	An exceptionally coarse-grained igneous rock, with interlocking crystals, usually found as irregular dykes, lenses, or veins, especially at the margins of batholiths.
Permafrost	Ground (soil or rock and included ice and organic material) that remains at or below 0°C for at least two consecutive years. Permafrost is defined on the basis of temperature. It is not necessarily frozen, because the freezing point of the included water may be depressed several degrees below 0°C; moisture in the form of water or ice may or may not be present.
Permeability	The capacity of porous rock, sediment, soil or a medium for transmitting a fluid.
Plagioclase	Important series of tectosilicate minerals within the feldspar family. Rather than referring to a particular mineral with a specific chemical composition, plagioclase is a solid solution series, more properly known as the plagioclase feldspar series (from the Greek "oblique fracture," in reference to its two cleavage angles).
Settling pond	A pond where final sedimentation takes place before discharge.
Processed kimberlite	The residual material left behind when the processing of kimberlite has been completed to extract the diamonds.

Term	Definition
Processing Plant	A facility where the kimberlite is physically processed. The process involves size reduction (crushing); washing (also referred to as scrubbing); screening (filtering the material by size); and primary and secondary concentration (separating the material by density).
Quartz	The second most abundant mineral in the Earth's continental crust, after feldspar. It is made up of a continuous framework of SiO_4 silicon–oxygen tetrahedra, with each oxygen being shared between two tetrahedra, giving an overall formula SiO_2.
Reclamation	The process of reconverting disturbed land to its former or other productive uses.
Riparian	Relating to the banks or shoreline area of a stream or lake often referring to nearshore vegetation.
Runoff	The portion of water from rain and snow that flows over land to streams, ponds or other surface waterbodies. It is the portion of water from precipitation that does not infiltrate into the ground, or evaporate.
Saline water	Non-potable salty water not fit for human consumption or agricultural use (also called brackish water).
Sediment	Solid material that is transported by, suspended in, or deposited from water. It originates mostly from disintegrated rocks; it also includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope soil characteristics, land usage and quantity and intensity of precipitation.
Seepage	Slow water movement in subsurface. Flow of water from man-made retaining structures. A spot or zone, where water exits the ground, often forming the source of a small spring.
Shale	Fine-grained, clastic sedimentary rock composed of mud that is a mix of flakes of clay minerals and tiny fragments (silt-sized particles) of other minerals, especially quartz and calcite.
Slave Structural Province	Archean granite-greenstone terrane covering 190,000 km^2 in the Northwest Territories of Canada.
Software	A set of instructions to program a computer or other 'smart' device.
Stockpile	Pile or storage location for bulk materials, forming part of the bulk material handling process.
Sulphate	A measure of the oxidized species of sulphur, which typically exists as SO_4^{2-}.
Sulphide	A measure of the reduced species of sulphur, or S_{2-}.
Sump	A well or pit in which liquids collect below floor level.
Talik	Zone of unfrozen ground that occurs beneath waterbodies. It originates mainly under deep lakes, rivers and other places where the mean annual soil temperature is above zero.
Tectonic	Pertaining to the internal forces involved in deforming the Earth's crust.
Terms of Reference	The Terms of Reference identify the information required by government agencies for an Environmental Assessment.
Thermistor	A device whose electrical resistance, or ability to conduct electricity, is controlled by temperature.
Till	Till is an unsorted glacial sediment. Glacial drift is a general term for the coarsely graded and extremely heterogeneous sediments of glacial origin. Glacial till is that part of glacial drift which was deposited directly by the glacier. It may vary from clays to mixtures of clay, sand, gravel, and boulders.
Tonalite	Igneous, plutonic (intrusive) rock, of felsic composition, with phaneritic texture. Feldspar is present as plagioclase (typically oligoclase or andesine) with 10% or less alkali feldspar. Quartz is present as more than 20% of the rock. Amphiboles and pyroxenes are common accessory minerals.
Topography	The physical features of a district or region, such as those represented on a map, taken collectively; especially the relief and contours of the land. On most soil maps topography may also mean topography classes that describe slopes according to standard ranges of percent gradient.
Total Dissolved Solids	The total concentration of all dissolved materials found in a water sample.

Term	Definition
Total Suspended Solids	The amount of suspended substances in a water sample. Solids, found in wastewater or in a stream, which can be removed by filtration. The origin of suspended matter may be artificial or anthropogenic wastes or natural sources such as silt.
Treeline	An area of transition between the tundra and boreal forest to the south.
Veneer	Unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer ranges from 10 cm to 1 m in thickness and possesses no form typical of the materials' genesis.
Volcaniclastic	Clastic rock chiefly composed of volcanic materials.
Waste Rock	Rock moved and discarded in order to access resources.
Waterbody	An area of water such as a river, stream, lake, or sea.
Watercourse	Riverine systems such as creeks, brooks, streams and rivers.
Watershed	The area drained by a river or stream; see also drainage basin.
Wildlife	A term to describe all undomesticated animals living in the wild.
Winter Road	Roads which are built over frozen lakes and tundra. Compacted snow and/or ice is used for embankment construction.
Xenolith	Rock fragment which becomes enveloped in a larger rock during the latter's development and hardening. In geology, the term xenolith is almost exclusively used to describe inclusions in igneous rock during magma emplacement and eruption. Xenoliths may be engulfed along the margins of a magma chamber, torn loose from the walls of an erupting lava conduit or explosive diatreme or picked up along the base of a flowing lava on Earth's surface.