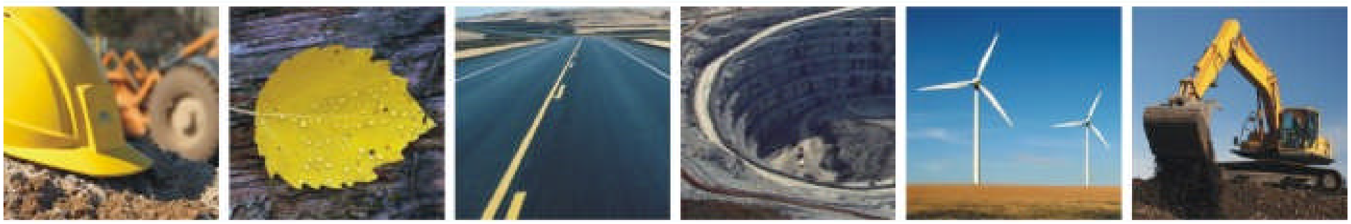
SHEAR DIAMONDS LTD.

OPERATIONS, MAINTENANCE, & SURVEILLANCE MANUAL
PKCA DAMS
JERICHO DIAMOND MINE, NUNAVUT



MANUAL

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Appendix A Weekly Geotechnical Inspection Summary

ACRONYMS & ABBREVIATIONS

AA	Atomic Absorption Spectrophotometry
ABA	Acid Base Accounting
ACM	Asbestos-containing Material
AEM	Aquatic Effects Monitoring
AIA	Aquatic Impact Assessment
AIRS	Adaptation and Impacts Research Section
ANCOVA	Analysis of Covariance
ANFO	Ammonium Nitrate Fuel Oil Explosives
ANOVA	Analysis of Variance
APEC	Areas of Potential Environmental Concern
ARD	Acid Rock Drainage
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
BACI	Before-after-control-impact
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CDA	Canadian Dam Association
CPK	Coarse Processed Kimberlite
DIAND	Department of Indian Affairs and Northern Development
DFO	Department of Fisheries and Oceans
DO	Dissolved Oxygen
EBA	EBA, A Tetra Tech Company
EC	Electric Conductivity
EIS	Environmental Impact Statement
EOC	Emergency Operations Centre
EPP	Emergency Preparedness Plan
ERP	Emergency Response Plan
ESA	Environmental Site Assessment
FSCF	Fuel Storage Containment Facility
FPK	Fine Processed Kimberlite
GC/FID	Gas Chromatograph - Flame Ionization Detector
GTC	Ground Temperature Cable
Hazmat	Hazardous Materials
HDPE	High Density Polyethylene
HVAS	High Volume Air Sampling
HWTA	Hazardous Waste Transfer Area
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry
IDLH	Immediately Dangerous to Life and Health
INAC	Indian and Northern Affairs Canada
KIA	Kitikmeot Inuit Association
LBP	Lead-based Paint
LPRM	Long-term Post-reclamation Monitoring
MANOVA	Multivariate Analysis of Variance

MSDS	Material Safety Data Sheets
NIRB	Nunavut Impact Review Board
NP	Neutralization Potential
NWB	Nunavut Water Board
PHC	Petroleum Hydrocarbons
PKCA	Processed Kimberlite Containment Area
PPE	Personal Protection Equipment
QA	Quality Assurance
QC	Quality Control
RBC	Rotating Biological Contactor
RCM	Reclamation Construction Monitoring
ROM	Run of Mine
RPD	Relative Percent Difference
RRPK	Recovery Rejects Processed Kimberlite
SCBA	Self-contained Breathing Aparatus
Shear	Shear Diamonds (Nunavut) Corp.
SOP	Standard Operating Procedure
SPRM	Short-term Post-reclamation Monitoring
TDC	Tahera Diamonds Corporation
TDGR	Transportation of Dangerous Goods Act (RSNWT 1988) and Regulations
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
WSCC	Workers' Safety and Compensation Commission of the Northwest Territories and Nunavut
WHMIS	Workplace Hazardous Materials Information System
WWTP	Wastewater Treatment Plant

2011 Water Licence Renewal Documents

AEMP	Aquatic Effects Monitoring Plan
AQMP	Air Quality Management Plan
CAMP	Care and Maintenance Plan
CMP	Contingency Management Plan
EP-RP	Emergency Preparedness and Response Plan for Dam Emergencies
GMP	General Monitoring Plan
ICRP	Interim Closure and Reclamation Plan
LDP	Preliminary Landfill Design Plan
LMP	Landfill Management Plan
LFDP	Preliminary Landfarm Design Plan
LFMP	Landfarm Management Plan
OMS	Operations, Maintenance, and Surveillance Manual
PKMP	PKCA Management Plan
SWMP	Site Water Management Plan
WEMP	Wildlife Effects Management Plan

WMP	Waste Management Plan
WRMP	Waste Rock Management Plan
WTMP	Wastewater Treatment Management Plan

1.0 INTRODUCTION

1.1 Purpose/Scope

1.1.1 Project Background Information

The Jericho Diamond Mine (Jericho) is located approximately 260 km southeast of Kugluktuk, NU, and 30 km north of Lupin Mine. The Jericho Mine was constructed and operated by Tahera Diamond Corporation (TDC) between 2004 and 2008. In January 2008, mining operations were suspended by TDC and the site was placed under care and maintenance. Shortly thereafter, Indian and Northern Affairs Canada (INAC) assumed control of the care and maintenance activities for the site. In August 2010, Shear purchased the Jericho Mine and its assets and assumed the responsibility for the site.

Presently, the mine remains under care and maintenance as Shear evaluates the mineral resource. Once this evaluation is complete, a mine plan and operations schedule for the project will be established.

1.1.2 PKCA Background Information

The Jericho Processed Kimberlite Containment Area (PKCA) Dams are owned by Shear Diamonds (Nunavut) Corp. (Shear) and operated by mine personnel at the Jericho Diamond Mine, NU. The PKCA facility is designed to contain fine processed kimberlite (FPK) generated during processing operations as well as effluent water from the Process Plant and Wastewater Treatment Plant (WWTP), and water from site water management activities. Water and/or FPK is impounded in the PKCA by four dams (Figures 1 and 2):

- West Dam;
- East Dam;
- Southeast Dam; and
- North Dam.

Only the East and Southeast Dams are complete. The West Dam is partially constructed, and the North Dam does not yet exist. A temporary coffer dam was constructed across the North Dam saddle but the structure is not designed to impound water. It was intended to prevent waves or splashing water from entering the receiving environment.

The PKCA catchment area is approximately 53 ha with containment provided by the dams and high ground. The pond depth depends on the time of year and other operational considerations but in general ranges from a minimum elevation of 514 m to a maximum of 517 m. The maximum design operating level of the PKCA once the West and North Dams are completed will be 523 m.

The PKCA Pond is not located on a river, and no tributaries flow into the pond; however, accumulated water in adjacent mining and processing operations is pumped into the pond.

1.1.3 Operations, Maintenance, and Surveillance Overview

The purpose of this document is to define the requirements for operation, monitoring, and surveillance (OMS) of the Jericho PKCA dams so that Shear can safely operate the facility, maintain it in good condition, and monitor its performance to be able to provide early warning of any developing distress that could affect the safety of the dams.

The format for this document is based on the Canadian Dam Association Dam Safety Guidelines (CDA 2007) and a template provided by Alberta Environment. Submitting this document to the Nunavut Water Board will satisfy the requirements relating to dam operations and safety issues including stated in:

- Part F, Item 1 and Schedule F
- Part H, Item 1 and Schedule H
- Part J, Item 1 and Schedule J

It is Shear's intention that the OMS Manual will be merged with the Processed Kimberlite Management Plan (PKMP, EBA 2011h) when the PKMP is revised for the resumption of mining operations. The joint document will constitute a central reference document that will provide a complete set of operating protocols for the dams and appurtenant structures.

The most recent version of this document must be kept in any archive of operational procedures on site, within the offices of the individuals responsible for operation of the PKCA, and elsewhere within the Shear organization as deemed necessary by Shear.

1.1.4 Linkages to Other Plans

The OMS Manual is part of the site wide management system. Other management and emergency plans that are related to or refer to the OMS Manual include:

- General Monitoring Plan (GMP);
- Processed Kimberlite Management Plan (PKMP);
- Site Water Management Plan (SWMP);
- Wastewater Treatment Management Plan (WTMP); and
- Emergency Preparedness and Response Plan for Dam Emergencies (EP-RP)

1.1.5 Signed Authorizations and Assigned Administrator

The following individuals or entities have reviewed and authorized this manual.

Table 1 OMS Manual Summary Report Chain of Command Requirements

	Name	Position	Signature	Date
Prepared by	Jason Porter, P.Eng.	Senior Project Engineer		
Reviewed by				
Approved by				
OMS Administrator				

1.1.6 Record of OMS Manual Holders

The following individuals or entities have been issued copies of this document.

Table 2 Record of OMS Manual Holders

Name	Position	Organization	Location of Report	Contact Information

1.1.7 Record of OMS Revisions

This document has been subject to the following revisions:

Table 3 Record of Revisions

Date of Revision	Reason	Person Requesting Change	Position	Signature

1.2 Organizational Chart and Reporting Lines

The organizational chart and reporting lines for the operation, maintenance, and surveillance of the Jericho facility and the associated dams during care and maintenance are presented in Figure 7.

1.3 Access

Jericho is a remote mine and access to the site (and the PKCA) is restricted to air travel throughout most of the year, except for the short period when the seasonal ice road is open. The facility is regularly monitored by operations personnel and/or site security.

1.4 Basin/Watershed Characteristics

1.4.1 Basin Maps

Figure 3 presents a basin map of the hydrologic catchments for the PKCA, mine site, and surrounding areas that provide inflows to the PKCA either directly or through site water management activities.

1.4.2 Key Tributaries and Other Inflow Sources

No tributaries flow into the Jericho PKCA; however, accumulated site water from mining operations is pumped into the pond.

1.4.3 Weather Stations

Shear gathers and logs weather data while personnel are on site. Parameters monitored include:

- Precipitation,
- Wind speed and direction,
- Relative humidity, and
- Temperature.

Shear is investigating installing a weather monitoring station with data logging capabilities for future operations.

1.5 Water Management Overview

1.5.1 Ownership

The Jericho PKCA reservoir, dams, and associated infrastructure are owned and operated by Shear Diamonds Ltd.

1.5.2 General Description of Facility

1.5.2.1 Description of PKCA Dams

The three dams that provide impoundment for the PKCA are:

- West Dam (constructed to a partial elevation of 520 m),
- East Dam, and
- Southeast Dam.

A fourth dam (North Dam) will need to be constructed, and the West Dam completed, before the PKCA can be operated at maximum capacity. The locations of these dams are presented in Figures 1 through 4. Each dam is briefly described in Table 6 (Section 1.5.6).

1.5.2.2 Appurtenant Structures

A divider dyke is used to retain FPK solids in Cell A while allowing supernatant water to flow into Cell B/C. The dyke does not serve to impound water and, therefore, is considered an appurtenant structure within the containment area. Divider Dyke A divides Cell A from Cell B/C. The dyke is partially complete and not yet at design elevation. The dyke is briefly described in Table 6 (Section 1.5.6).

A second divider dyke (Divider Dyke B) is to be constructed once mining processing operations resume. Divider Dyke B will be constructed between Divider Dyke A and the West Dam, and will allow FPK placement in Cell B. No FPK will be placed in Cell C.

Presently, a failure of Divider Dyke A would allow FPK solids into Cell B/C. Similarly, a failure of the proposed Divider Dyke B would allow FPK solids into Cell C. In either case, the release would be retained by the West Dam and not pose a risk to human safety or to the receiving environment.

The locations of the appurtenant structures are presented on Figure 1.

1.5.2.3 Operation of Facility

FPK slurry is pumped from the process plant and discharged along the eastern boundary of Cell A using spigot points. The solids from the spigotted slurry settle out to form a beach deposit, and the expelled supernatant water, together with some suspended solids, flows westwards towards and is impounded against Divider Dyke A. FPK is prevented from flowing eastwards into the receiving environment by the East and Southeast dams.

Water flow between Cell A and Cell B is controlled by the seepage rate through the internal Divider Dyke A. The filter material is much finer than the transition material and run-of-mine waste rock zones, and therefore dictates the rate. As deposition continues and Cell A becomes full, Divider Dyke B will be constructed between Cell B and Cell C.

As the water passes through a divider dyke, the FPK sediments and turbidity are removed and the water impounds against the West Dam. Once the water is confirmed to meet the discharge criteria in the Water Licence, it will be pumped over the West Dam and released into Stream C3. Further discussions on the controlled release of PKCA water can be found in the Jericho PKMP (EBA 2011h) and the water quality aspects are covered in the Jericho GMP (EBA 2011d).

In addition to FPK effluents, site water and treated wastewater are pumped into Cell A for treatment and eventual discharge from Cell B/C.

1.5.3 Consequence Classification

1.5.3.1 General

The CDA Guidelines suggest that the classification of a dam be conducted in terms of the reasonably foreseeable incremental consequences of failure. The loss of life consequences should be evaluated separately from the socio-economic, financial, and environmental consequences, and the higher of the two classifications shall be used. The classification system suggested by the CDA Guidelines is presented in Table 4.

Table 4: Dam Classification

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

[1] Definitions for population at risk:

- **None** – No identifiable population at risk, so no possibility of loss of life other than through unforeseeable misadventure.
- **Temporary** – People are only temporarily in the dam-breach inundation zone (e.g., seasonal cottage use, passing through on transportation routes, participating in recreational activities)
- **Permanent** – The population at risk is ordinarily located in the dam-breach inundation zone (e.g., as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out)

[2] Implications for loss of life:

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

The consequences from a release of FPK or a direct release of water from the PKCA vary from dam to dam. A plan of the area is presented in Figure 2. The classification and the consequences of failure for each structure are presented in the Table 5.

Table 5: Jericho Dam Classification

Structure	Classification	Consequences of failure
West Dam	High Consequence	Uncontrolled release of PKCA water into Stream C3 system
East Dam	High Consequence	Uncontrolled release of FPK and supernatant water into the unnamed pond and/or the Lynne Lake Group watershed
Southeast Dam	High Consequence	

1.5.4 Key Operating Structures, Elevations and Capacities

Key attributes of the operating structures that control inflow and discharges from the PKCA are described in the following sections.

1.5.4.1 West Dam

The West Dam extends across the west end of the PKCA. The dam is approximately 190 m in length and has a maximum core height of 9 m and a maximum dam height of 13 m from the original ground surface. The main water retention element in the dam is a frozen core overlying a frozen foundation. An effective frozen core dam requires that the central core and foundation remain frozen year-round to act as an impervious barrier against seepage. The core and foundation must be nearly saturated with ice to produce a well-bonded and impermeable mass, and the permafrost must be sustained. A geosynthetic liner on the upstream face of the frozen core provides a secondary seepage barrier.

The upstream shell consists primarily of rockfill. A small till zone has been placed at lower elevations to reduce convective water movement through the open graded rockfill. The downstream shell of the dam is constructed of rockfill. The rockfill shells are designed to be constructed with 3H:1V outside slopes.

A cross-section of the West Dam is presented in Figure 5, and the location of the structure is presented in Figure 1.

1.5.4.2 East and Southeast Dams

The East and Southeast dams are located along the eastern perimeter of the PKCA. Both dams are approximately 250 m in length and have a maximum height of approximately 7 m from the original ground surface. The main water retention element in the dams is the geomembrane liner. The liner is keyed into the ground using frozen saturated fill. Additional water retention is provided by FPK and coarse processed kimberlite (CPK) and till placed upstream of the liner. The dam foundation is designed to remain in a frozen condition, thereby minimizing or eliminating seepage through the foundation.

Cross-sections of the East and Southeast dams are presented in Figure 5, and the location of the structure is presented in Figure 1.

1.5.4.3 Divider Dyke

The purpose of Divider Dyke A is to filter and retain FPK solids within Cell A while allowing supernatant water to flow into Cell B/C. A cross-section of Divider Dyke A is presented in Figure 6, and the location of the structure is presented in Figure 1.

The key features of this structure are described as follows:

- The hydraulic conductivity of a dyke filter material sample tested in EBA's laboratory was 1.3×10^{-2} cm/s. This value will be used as the average hydraulic conductivity for the filter material in estimating seepage volume through Dykes A and B.
- The estimated quantity of seepage moving through Divider Dyke A is approximately 100,000 m^3/month at its current operating level.

1.5.4.4 FPK Discharge

FPK and process water are discharged to the PKCA during kimberlite processing operations. The mine is currently under care and maintenance and therefore will not be discharging FPK into the PKCA. Before processing operations recommence, details of the processing schedule and FPK management will be developed.

1.5.4.5 Site and Wastewater Management

Accumulated site water and effluent from the Wastewater Treatment Plant are discharged into Cell A of the PKCA. The estimated volumes are presented in Table 3 of the Jericho Site Water Management Plan – Care and Maintenance (EBA 2011i).

1.5.4.6 Reclaim Water Intake

Water will be reclaimed from Cell B/C and used for process operations. The mine is currently under care and maintenance and therefore will not require reclaim water. Before operations begin, details of the expected processing schedule and process water requirements will be developed.

1.5.4.7 Discharge from PKCA

Water that meets licence discharge criteria will be annually discharged from the PKCA over the West Dam to Stream C3. The annual outflow from the PKCA will maintain water levels in Cells B and C at a lower level than the pre-existing natural level. The minimum operating pond surface elevation in Cell C will be 513.5 m to provide a sufficient water depth to avoid disturbing the lake bottom sediment.

The discharge rate from the PKCA will be managed to achieve minimum 10:1 dilution at the edge of the mixing zone in Lake C3. The water balance analyses assume that a discharge schedule and monthly distribution objectives would be applied to achieve the dilution ratio. Monthly percentage of the total discharge to Stream C3 was assumed to be 40%, 25%, 15%, and 20% from June to September.

The discharge and pumping rates will be revised annually to meet the operational requirements of the mine and the limits of Stream C3.

1.5.5 Partnerships

No partnerships are associated with the operation of the dams.

1.5.6 Brief History of Project

A brief chronology of PKCA infrastructure and the status of each structure are presented in Table 6.

Table 6: Summary and Status of PKCA Dams and Dykes

Structure	Status	Design Crest (m)	As-Built Crest (approx) (m)	Function	Construction Period*	Design Reference
West Dam	Partially complete	528 Crest 524 Core	525 (min) Crest 520 (min) Core	Water control at outlet of PKCA	2005-2007, 2012	EBA 2005c
East Dam	Complete	524.5 Crest 523.5 Liner	524.5 Crest 523.5 Liner	Containment of FPK	2005-2006	EBA 2005a
Southeast Dam	Complete	524.5 Crest 523.5 Liner	524.5 Crest 523.5 Liner	Containment of FPK	2006-2007	EBA 2005a
Divider Dyke A	Partially complete	524	Varies – low point 521.5	Containment of FPK – flow through structure	2005-2007, 2012	EBA 2005b
Divider Dyke B	Not in place	524	-	Containment of FPK – flow through structure	2012	To be prepared
North Dam	Not in place	528 Crest 524 Core	-	Water control	2012	EBA 2007
Cell A CPK Perimeter Dyke	Not in place	528.5	-	Containment of FPK	Stage 1 2012-2013 Stage 2 2014-2015	To be prepared
West Settling Pond Dam	Optional	-	-	Water control	Optional	To be prepared
*Construction period is estimated and is based on processing resuming mid-2012.						

1.5.7 Short-term Operational Concerns for the PKCA

Since the West Dam is incomplete and the North Dam has not been constructed, the PKCA has a lower capacity than designed. As such, water must be discharged before June to avoid exceeding the maximum allowable freeboard when freshet waters enter the PKCA. If water is not discharged before June, the consequences could be serious given that the current capacity is equal to the predicted mean year monthly runoff for June.

In addition, the Jericho pit will need to be dewatered during 2011 to allow Shear to conduct a resource evaluation. The quantity and quality of the pit water will be determined in February 2011. The information will be used to produce a discharge schedule, which will be submitted as an addendum at least 30 days prior to commencing discharge. Discharge is expected to have to continue throughout the open water season to dewater the pit and to achieve the desired elevation of 514.0 m in the PKCA.

1.6 Utilities and Significant Infrastructure

The Jericho PKCA has several utilities and pieces of infrastructure adjacent to the facility that are associated with its operation. These items are:

- FPK discharge pipeline and spigot points;
- Wastewater Treatment Plant discharge pipeline;
- Process water reclaim pipeline;
- Process water reclaim pump electrical line; and
- PKCA access and perimeter road.

An unplanned release of water from the facility from the West Dam is not expected to affect any utilities or significant infrastructure. A release of FPK from the East or Southeast Dam may affect the FPK discharge pipeline and spigot points depending on the location and severity of the release.

2.0 FACILITY OPERATIONS

2.1 General

A summary of key criteria and parameters is provided in the following sections, which also include references to details in other documents.

2.1.1 Design Engineers

EBA Engineering Consultations Ltd. (now EBA, A Tetra Tech Company) was the designer of record for the PKCA dams. A reference list of documents, including site investigation, design, construction, instrumentation, and post-impoundment performance monitoring and maintenance, is provided in the references section.

2.1.2 Water Management Overview

A detailed discussion of the PKCA Water Management can be found in the Jericho PKMP – Care and Maintenance (EBA 2011h) under Section 5.0 – Operational Water Management.

2.1.3 Information Management

Shear will be developing a comprehensive document and information management system during care and maintenance activities in 2011. The system will address the need to control both electronic and hard copy documentation.

2.2 Normal Operations

2.2.1 Operational Logs

Pond level data should be recorded weekly while there is open water in the PKCA. Ice level surveys should be completed while there is ice cover on the pond area. Readings should be taken daily in the two weeks preceding the expected freshet date and should continue on a daily basis for at least two weeks after freshet has passed.

2.2.2 Flow Regulation

Inflows and discharges from the PKCA are regulated based on the pond's elevation. The PKCA does not have a spillway or other pond elevation control structure; therefore, water level control in the facility requires active measures. Currently, the only options are limiting process and site water flows into the PKCA and discharge of compliant water into Stream C3.

Pond elevations are presently measured using a staff gauge installed downstream of Divider Dyke A.

2.2.3 Ice Management

Ice management is generally not an issue at the PKCA facility, as long as sufficient care is taken during FPK discharge. Spigot points must be managed so that water does not collect and freeze on the FPK surface but instead flows to Divider Dyke A. The formation of ice lenses in the PKCA can significantly reduce the storage volume of the facility.

Shifting ice on the pond could cause damage to the rip-rap along the dams or dykes; however, no damage has been observed to date.

2.3 General Flood Operating Procedures

For the purposes of the PKCA, a Flood Event is defined as an unanticipated rise in water level such that the pond nears or exceeds the 1 m freeboard limit set forth in the Jericho Water Licence. The PKCA dams are not equipped with any type of overflow structure and water has to be pumped from the facility to lower the pond elevation (excluding evaporation). If the rise in recorded pond elevations exceeds the predictions in the PKMP and are at risk of exceeding the allowable freeboard, the following steps should be taken:

1. If discharging water into Stream C3, increase the pumping rate to the maximum allowable discharge rate specified in the Operational Water Management section of the PKMP.
2. If it is predicted that the increase in pumping rate will not prevent the pond elevation from exceeding the freeboard, all site water management discharges into the PKCA should be suspended.
3. If, after increasing pumping to Stream C3 and suspending site water inflows to the PKCA, it is still predicted that pond elevations may exceed freeboard, any processing activities should be suspended.
4. If, in extreme cases, steps 1 through 3 are not able to control the rise in pond elevations, and it is expected that that the water will exceed 0 m freeboard, the discharge of water into Stream 3 should be increased to the maximum possible rate (pump limited). If the decision to exceed the maximum allowable discharge rate is made, the NWB must be notified immediately. Detailed records of the

volume discharged, the flowrate, and the length of time the discharge exceeded the maximum allowable rate is to be recorded and submitted to the NWB.

2.4 Emergency Preparedness and Response

An Emergency Preparedness and Response Plan for the PKCA dams (EBA 2011r) is in place. A copy of the manual will be kept in the Mine, Environment and Process Plant Managers' site offices as well as the Process Plant control room and the Shear Head Office.

3.0 FACILITY MAINTENANCE

3.1 General

Three types of maintenance are undertaken at the PKCA facility: routine, predictive, and event-driven. The following sections present general examples of the three types of maintenance, as well as details of maintenance documenting and reporting procedures.

3.2 Routine Maintenance

Routine maintenance of the PKCA dams involves small-scale activities to repair or prevent deterioration of the facilities infrastructure. These activities include, but are not limited to:

- Keeping geotechnical instrumentation in working order;
- Making sure the dam access roads remain open and in usable condition; and
- Replacing settling rip-rap or eroded material.

Additional routine maintenance activities may be undertaken as Shear becomes more familiar with the operations.

3.3 Predictive Maintenance

Predictive maintenance is based on the expected operating conditions of the facility in the future. These tasks are typically non-recurring work items that are scheduled months in advance. Predictive maintenance activities that will be conducted include, but are not limited to:

- Raising the elevations of the dam crests to accommodate future volumes of FPK material; and
- Installing and commissioning the thermosyphon system in the West Dam if dam core temperature conditions fail to meet the thermal predictions.

3.4 Event-driven Maintenance

Event-driven maintenance is the result of an event that results in unanticipated repairs to the facility. These events may be naturally occurring, such as high levels of rainfall or seismic activity, but may also include repairing damage to the facility and equipment due to operational errors. No event-driven maintenance was required at the time of the last geotechnical inspection (September 2010).

Event-driven maintenance should be conducted as soon as possible, within days of the event or observation of the condition that caused the need for maintenance.

3.5 Maintenance Documentation, Records, and Reporting

Any repair or modifications to the infrastructure of the Jericho PKCA should be documented through photographs and reporting by qualified personnel and maintained in Shear's document management system. Hard copies of the reports and photographs will be kept in a binder for review by the engineer during the annual Formal Geotechnical Inspection. Any changes that could affect the integrity of the facility should be reviewed and documented by a qualified geotechnical engineer.

4.0 FACILITY STRUCTURE SURVEILLANCE AND MONITORING

4.1 Surveillance Requirements

Surveillance measures employed for the dams should consist of:

- Regular, documented visual inspections;
- Regular review of pond level data collected from daily or weekly manual readings using the staff gauge located in Cell B/C;
- Regular reading of Ground Temperature Cables (GTCs) installed to monitor the thermal regime of the dams;
- Monitor long-term weather forecasts and winter snow pack to provide advance warning of upcoming flood events by facility operators and management; and
- Inspect dams and appurtenances after a significant flood event or after a noticeable seismic event (ground motions felt at plant site).

Individual surveillance tasks are described in Section 4.2.

4.2 Surveillance Procedures

4.2.1 General

Regular visual monitoring of site infrastructure is a critical component of PKCA management activities at Jericho. Inspections are completed regularly to identify potential problems with these earth structures before they risk damaging human health and the environment. Visual inspections are completed on both the dam structures and surrounding landforms.

Inspections are broken into two categories: operational inspections and formal inspections.

4.2.2 Operational Geotechnical Inspections

Weekly Operational Geotechnical Inspections are to be performed by site personnel. The purpose of the operational inspection is to identify and document any hazards and damage to or deterioration of the structure. If a condition is deemed to be serious, a qualified geotechnical engineer will be brought to site to inspect the structure. More frequent geotechnical inspections may be required under certain conditions, as identified by the geotechnical engineer.

All site personnel tasked with the operational inspections will be trained in the identification of hazards and will be provided with an inspection form prepared by a qualified geotechnical engineer to assist with the identification of maintenance issues and hazardous conditions. An example of an operational geotechnical inspection form is included in Appendix A. Observations made during the inspection will be photographed and recorded. Photographs of the general condition of each structure are to be taken to track year by year changes in each structure.

A copy of each operational inspection form and the associated photographs will be stored in Shear's document management system. Additionally, a hard copy will be maintained in a binder on site for review by the geotechnical engineer during the formal inspection. Any identified deficiencies or features should be highlighted in the inspection forms so the geotechnical engineer can assess whether conditions are deteriorating. Shear expects that the inspection process and form will evolve as more information about the structures and their condition become available during care and maintenance activities.

4.2.3 Formal Geotechnical Inspections

As discussed in the Jericho GMP (EBA 2011d), the annual Formal Geotechnical Inspection will be conducted by a qualified Geotechnical Engineer familiar with dam engineering as well as the design and construction of the dams and appurtenance structures. In the past, the inspections have taken place in the late summer or early fall; however, in 2011 the annual inspection will be conducted in the spring to coincide with freshet.

The following specific tasks should be completed during the formal inspections:

- Visually examine each structure and surrounding area for signs distress including:
  - Cracking (longitudinal, transverse, or centred in a localized area in a circular pattern),
  - Settlement or slumping along the dam crest or slopes,
  - Seepage from the slope or toe of the dam,
  - Deflection of linear features such as the crest of the dam,
  - Evidence of erosion,
  - Any other signs of distress, and
  - Any change in the state of the dams or appurtenant structures that cannot be explained.
- Photograph and document all deficiencies.
- Take photographs of each dam from a wide aspect to monitor year on year changes to the dams. Attempt to take the photograph from a similar aspect to the previous year's formal inspection.
- Read dam instrumentation.

Following the inspection, a report will be prepared summarizing the assessment and monitoring data, a copy of which will be submitted to the NWB for review and approval.

4.2.4 Impounded Water Level Data

Shear should monitor pond levels regularly during normal operating conditions and during flood events. This data can be used to trigger an inspection if monitoring indicates water has exceeded the freeboard limits.

4.2.5 Instrumentation

GTCs have been installed in the West, East, and Southeast dams to monitor ground temperatures within these structures. Temperature readings will be collected monthly while personnel are on site. Monthly inspections will continue until a clear pattern has been established, at which point the geotechnical engineer may recommend reducing the reading frequency to quarterly. In addition, a full set of readings will be taken during the annual Formal Geotechnical Inspection.

The equipment for obtaining readings from the GTCs consists of a multimeter and a 16 channel switchbox. Significant care should be taken when handling the instrumentation cables because they can be easily damaged. The threaded connection between the cable and the switchbox should be smooth and must not be forced. The cable number must be recorded along with each set of readings. If the numbering label is missing from the cable it should be replaced without delay. Each reading must be cross-referenced to the bead number indicated on the switchbox. Often, malfunctioning beads may give an erroneous reading or no reading at all. Such readings should be noted as a null reading on the record sheet. The typical range of readings is somewhere between 10 and 30 kilo-ohms (kΩ) but can vary depending on the season. In general, if the bead is giving a reading in kilo-ohms, the unit is operating correctly. Sometimes the readings may “float” and not provide an exact measurement for a considerable time. In such cases, the operator should wait at least one minute to allow time for the reading to settle. If the reading continues to float, an estimated reading should be recorded and an “F” placed next to the value on the record sheet. Upon completion of the readings, gently remove the cable from the switch box and ensure that the cable is replaced and adequately protected from the weather and wildlife.

All personnel who are assigned to read the GTCs must be suitably trained.

4.2.6 Surveys

Settlement monitoring points have been installed on the dams or will be installed at the end of construction. The elevation and location of the monitoring points should be measured monthly during the summer providing personnel are on site. The monitoring schedule will be reviewed by the geotechnical engineer if there are no signs of significant movement.

Settlement and topographic surveys of the dam crest will be carried out annually as part of the Formal Geotechnical Inspection. The topographic survey will be carried out to identify any settlement areas or deterioration on the surface of the dams.

4.2.7 Surveillance Schedule

The following schedule should be followed during ongoing dam operation:

- Operations Inspections – Brief operations inspections of the dams should be undertaken once per week. These inspections should be conducted during or immediately after a significant flood event or after a noticeable seismic event.
- Engineering Inspections - A qualified geotechnical engineer with experience in dam engineering shall conduct an annual Formal Geotechnical Inspection of all dams and appurtenant structures. Additional inspections may be required after a significant flood event or a noticeable seismic event.
- Dam Safety Reviews – Dam Safety Reviews should be undertaken at a frequency recommended in the latest Dam Safety Review/Audit Reports.
- Pond Water Level – During normal operating conditions, readings should be taken, at a minimum, weekly with a staff gauge or by pond level instrumentation in the process plant control room or by using a datalogger. Before and during freshet, or during high rainfall events, reading should be taken daily. These values should be recorded as part of the control room record.
- Instrumentation – As discussed in the Jericho GMP and Section 4.2.5, GTCs are to be read monthly while personnel are on site. Monthly readings are to continue until a clear pattern has been established, at which point the geotechnical engineer may recommend reducing the reading frequency to quarterly. An additional set of readings will be taken yearly as part of the Formal Geotechnical Inspection.

4.3 Collation and Analysis of Data

4.3.1 General

The collation and analysis of operation, maintenance, and surveillance data will be shared between site staff and an engineering consultant retained by Shear (presently EBA). Shear is responsible for performing and documenting Operational Inspections as well as collecting ground temperature data. EBA will review the weekly inspections annually during the Formal Geotechnical Inspection or more frequently if required. EBA will enter the ground temperature data collected by Shear into a database. Plots of the ground temperature data will be generated as part of the Formal Geotechnical Inspection process.

4.3.2 Documentation, Analysis, and Reporting

Inspection reports are to be prepared and submitted to Shear after each inspection is complete. The results of the inspection will be used in Shear's monthly and annual reports to the NWB.

5.0 CLOSURE

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Environment Manager
Shear Diamonds Ltd.

Allison Rippin Armstrong
Director of Environment and Permitting
Shear Diamonds Ltd.

2011 WATER LICENCE RENEWAL DOCUMENTS

Management Plans

EBA, A Tetra Tech Company (EBA), 2011a. Aquatic Effects Monitoring Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011b. Care and Maintenance Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011c. Contingency Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011d. General Monitoring Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011e. Interim Closure and Reclamation Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011f. Landfarm Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011g. Landfill Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011h. Processed Kimberlite Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011i. Site Water Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011j. Waste Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011k. Waste Rock Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011l. Wastewater Treatment Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

Design Reports

EBA, A Tetra Tech Company (EBA), 2011m. C1 Diversion Construction Summary, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011n. Fuel Storage Containment Facility Design Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011o. Preliminary Landfarm Design Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011p. Preliminary Landfill Design Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

Additional Plans

EBA, A Tetra Tech Company (EBA), 2011q. Operations, Surveillance, and Maintenance Manual, PCKA Dams, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011r. Emergency Preparedness and Emergency Response Plan for Dam Emergencies at the Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

REFERENCES

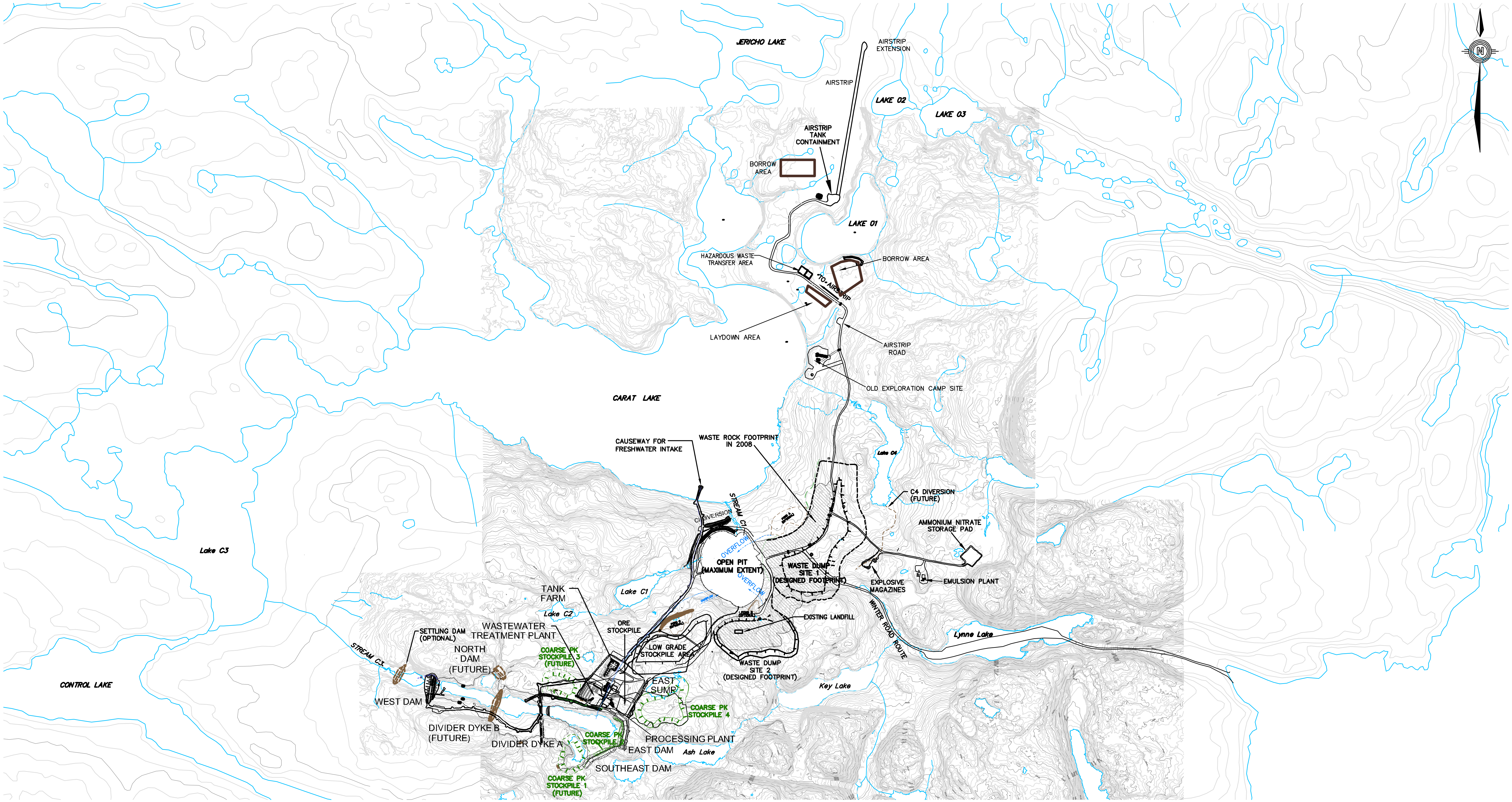
Canadian Dam Association (CDA), 2007. Dam Safety Guidelines.

Alberta Environment, 2003. Emergency Preparedness for Flood Emergencies at Dams – Guideline

FIGURES

Figure 1	General Site Plan
Figure 2	Site Infrastructure Plan
Figure 3	Catchment Areas Plan
Figure 4	Existing PKCA Plan
Figure 5	West/East/Southeast Dam Typical Cross-Section Design Drawing
Figure 6	Divider Dyke Typical Cross-Section Design Drawing
Figure 7	Communication Organization Chart

Q:\Edmonton\Drafting\CIVIL3D\E141\E14101118\Civil 3D\OMS Manual\ACAD\E14101118_Figure 1_OMS Manual.dwg [FIGURE 1] February 25, 2011 - 1:36:59 pm (BY: KIROS, TIGISTI)



NOTES:

1. LAYOUTS ARE APPROXIMATE, AND MAY NOT REFLECT ACTUAL SIZE AND LOCATIONS
2. FOOTPRINTS OF WASTE ROCK PILES, COARSE PK STOCKPILES, AND ORE STOCKPILES ARE SHOWN IN MAXIMUM LIMITS, ACTUAL FOOTPRINTS MAY VARY

0 1 000

Scale: 1: 25 000 (metres)

STATUS
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GENERAL SITE PLAN

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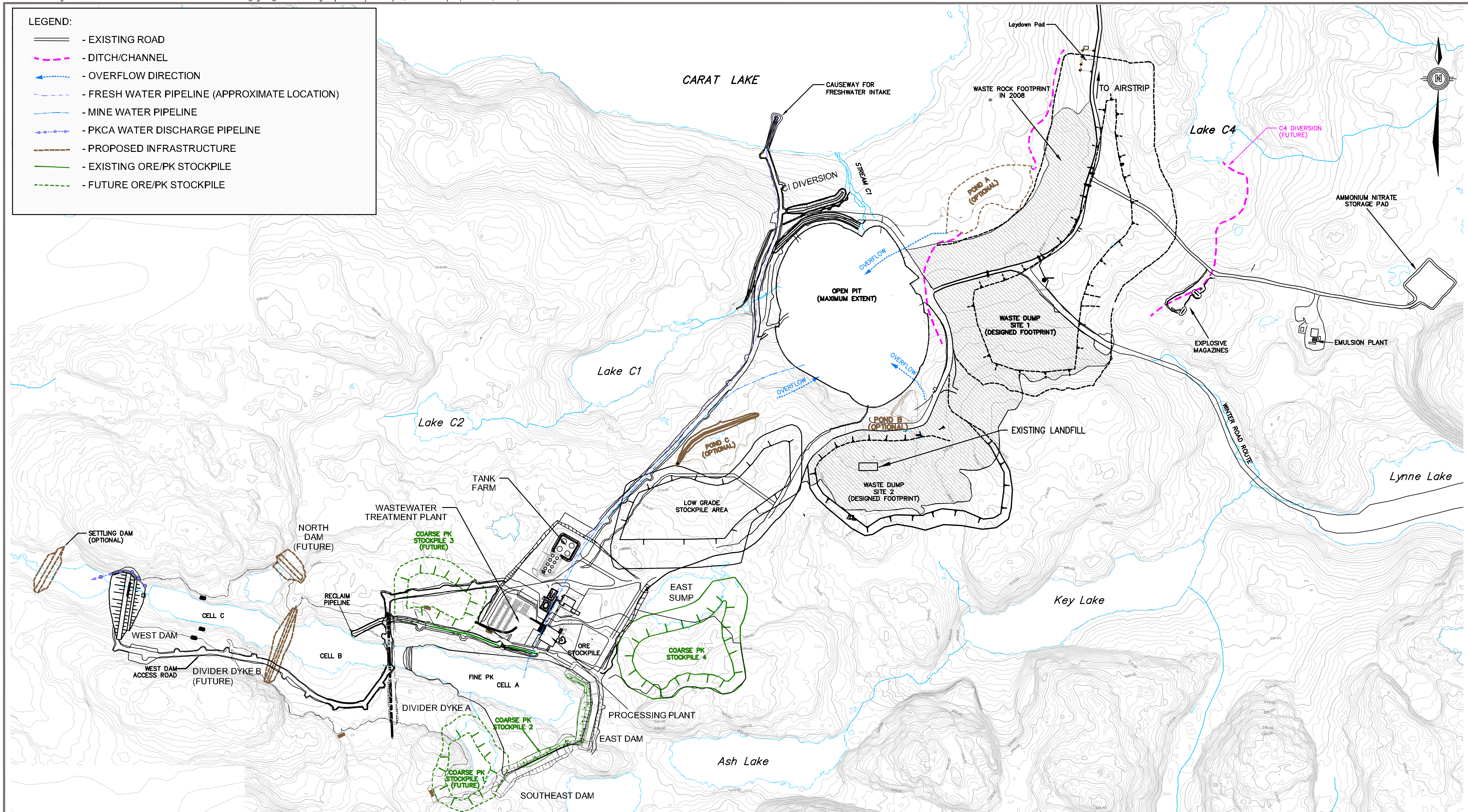
Figure 1



NOTES:

1. LAYOUTS ARE APPROXIMATE, AND MAY NOT REFLECT ACTUAL SIZE AND LOCATIONS
2. FOOTPRINTS OF WASTE ROCK PILES, COARSE PK STOCKPILES, AND ORE STOCKPILES ARE SHOWN IN MAXIMUM LIMITS, ACTUAL FOOTPRINTS MAY VARY

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SITE INFRASTRUCTURE PLAN

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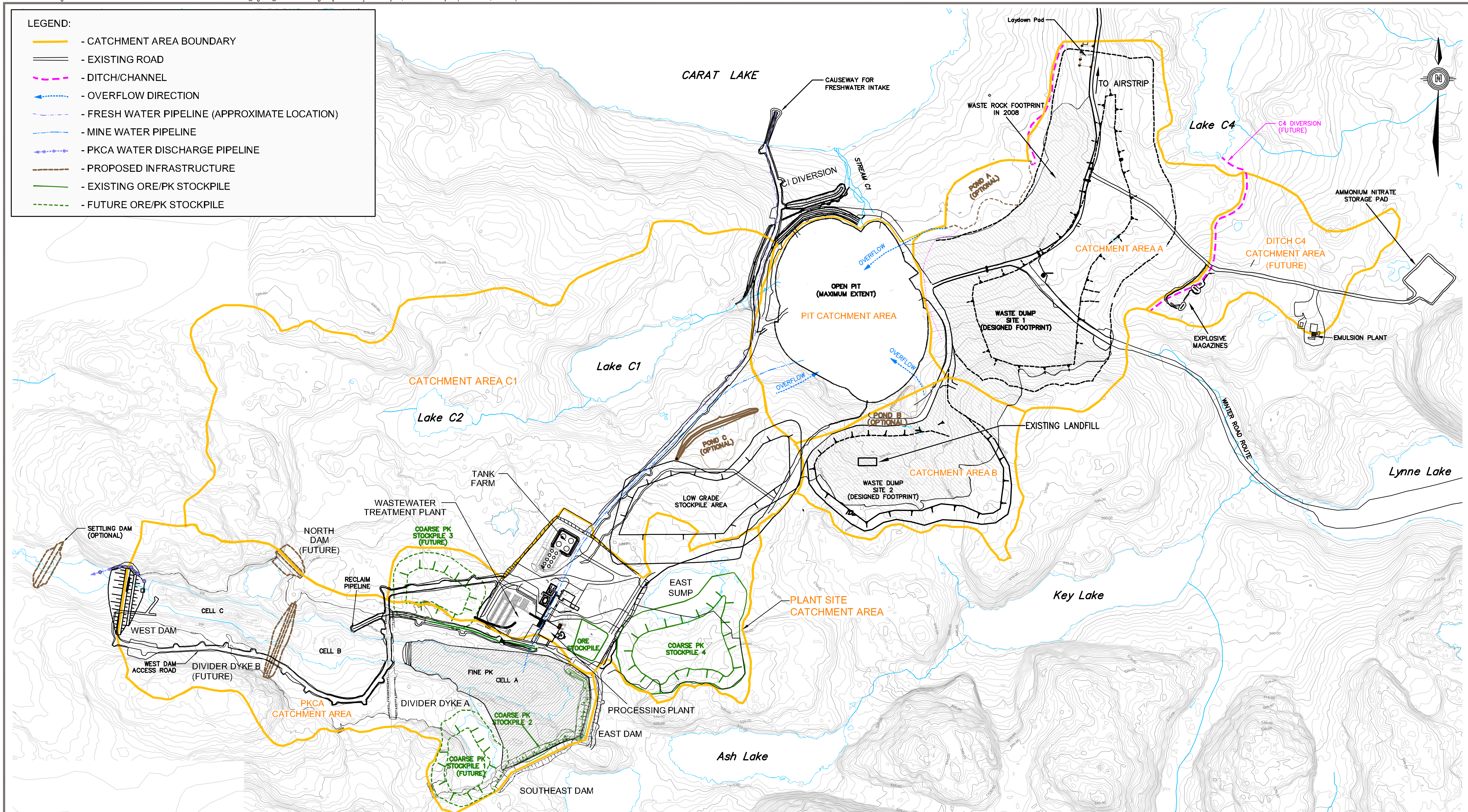
Figure 2



NOTES:

1. LAYOUTS ARE APPROXIMATE, AND MAY NOT REFLECT ACTUAL SIZE AND LOCATIONS
2. FOOTPRINTS OF WASTE ROCK PILES, COARSE PK STOCKPILES, AND ORE STOCKPILES ARE SHOWN IN MAXIMUM LIMITS, ACTUAL FOOTPRINTS MAY VARY

0 500

Scale: 1: 10 000 (metres)

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CATCHMENT AREAS PLAN

PROJECT NO.	DWN	CKD	REV
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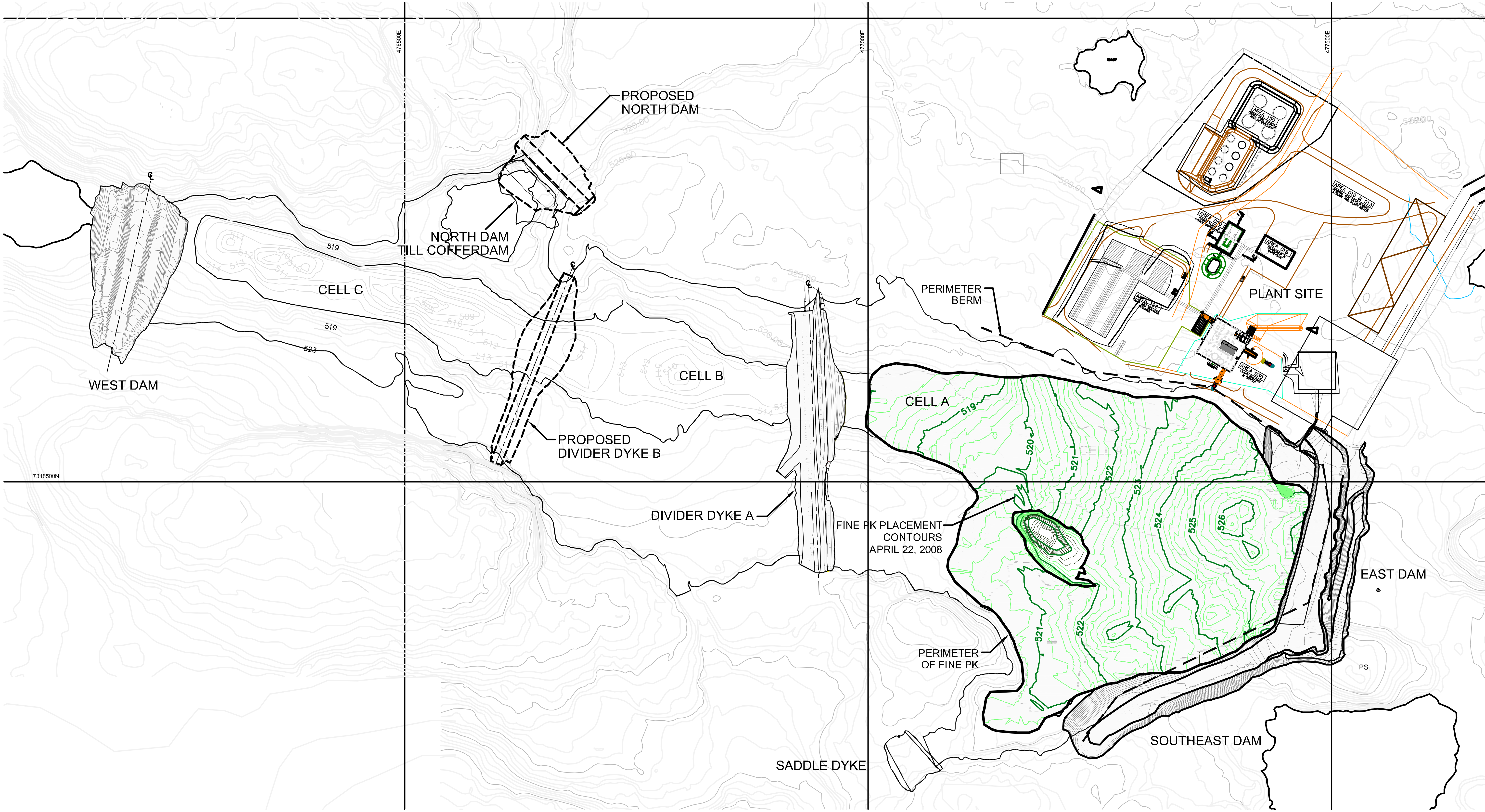
Figure 3



NOTE:
PROCESSED KIMBERLITE CONTOURS EXTRAPOLATED FROM APRIL 22, 2008 SURVEY.

0 200
Scale: 1: 4 000 (metres)

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EXISTING PKCA PLAN

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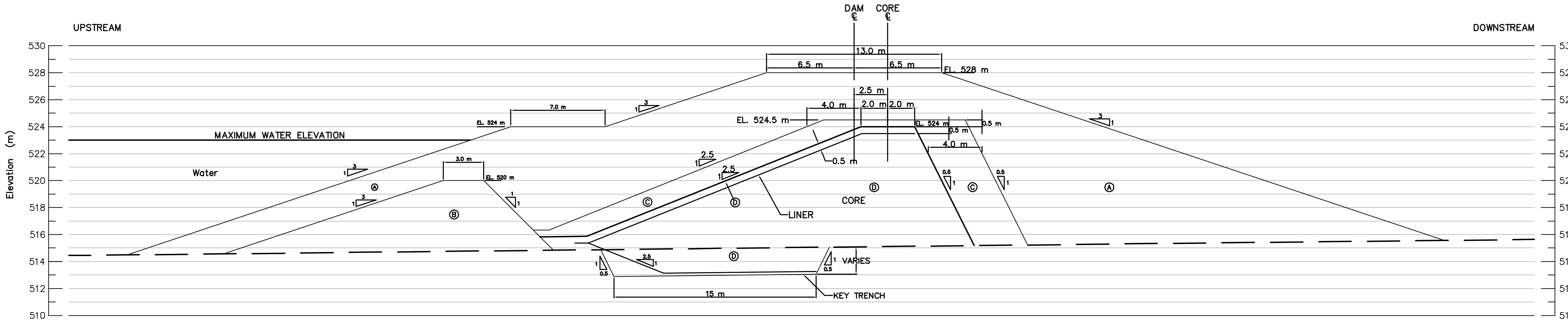
Figure 4



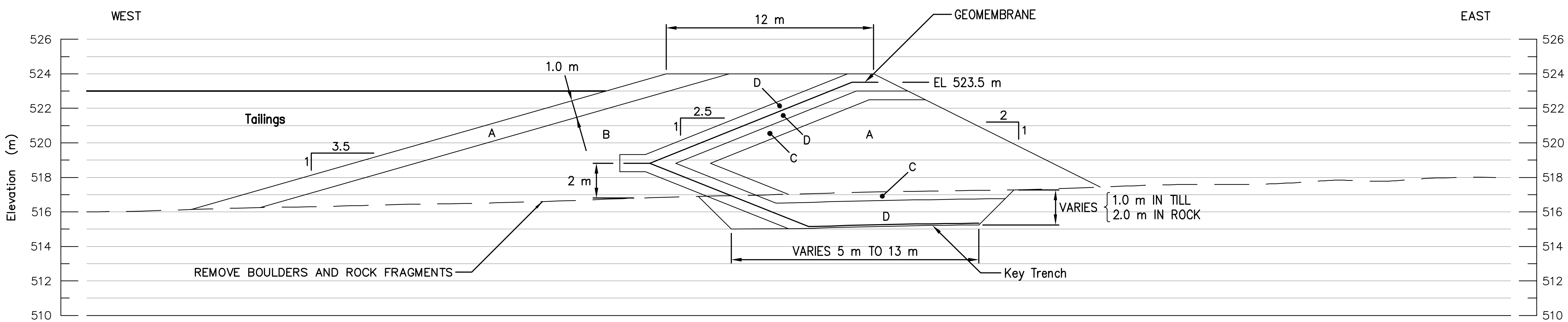
TYPICAL SECTION

NOTES
MATERIAL TYPES

A. RUN-OF-MINE
B. TILL
C. 200 mm MINUS
D. 20 mm

0 10
Scale: 1: 300 (metres)

WEST DAM TYPICAL CROSS-SECTION



NOTES
MATERIAL TYPES

A. RUN-OF-MINE
B. TILL
C. 200 MM MINUS
D. BEDDING (SCREENED ESKER OR 20 MM MINUS)

0 10
Scale: 1: 250 (metres)

EAST DAM AND SOUTHEAST DAM TYPICAL CROSS-SECTION

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WEST/EAST/SOUTHEAST DAM TYPICAL CROSS-SECTION DESIGN DRAWING

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OFFICE	DATE			
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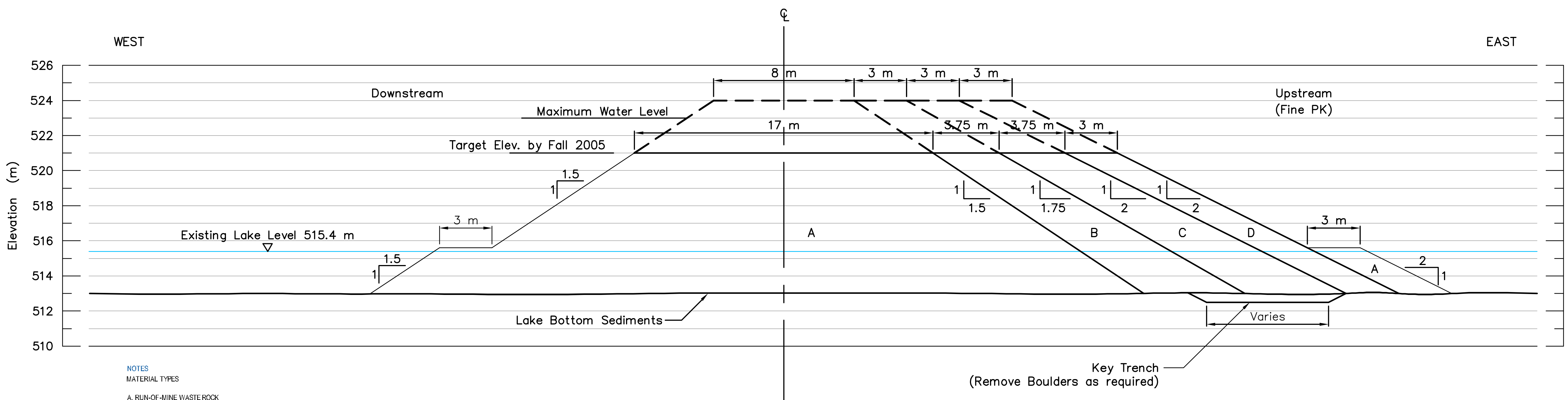

NOTES
MATERIAL TYPES

A. RUN-OF-MINE WASTE ROCK
B. TRANSITION ZONE (MINUS 200 mm WASTE ROCK)
C. FILTER ZONE (ESKER ZONE)
D. RIP RAP

CROSS–SECTION

0 10
Scale: 1: 250 (metres)

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DIVIDER DYKE TYPICAL CROSS-SECTION DESIGN DRAWING

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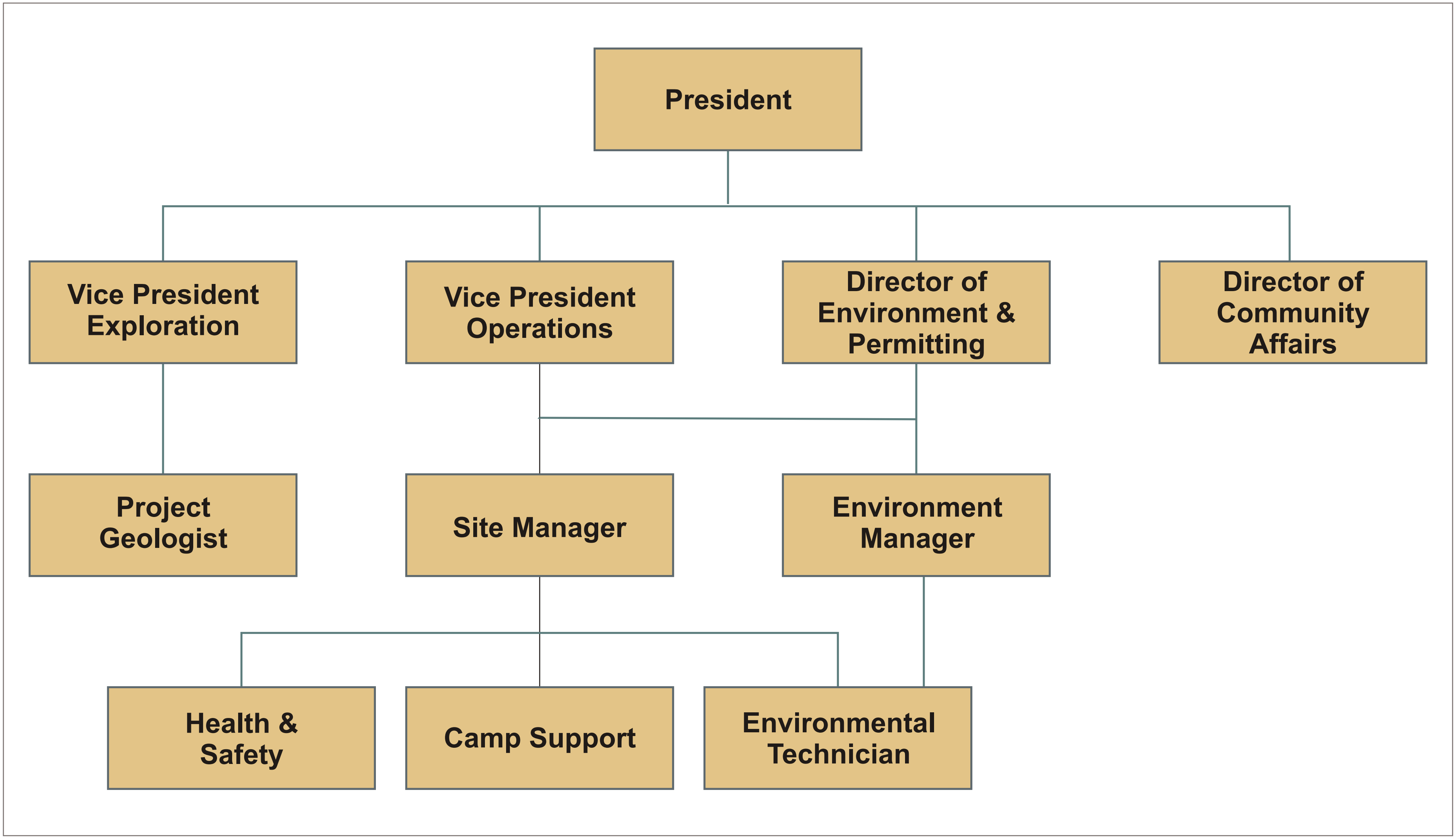
EBA-EDM	February 25, 2011

Figure 6



LEGEND

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Communication Organization Chart

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Figure 7

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APPENDIX A

APPENDIX A WEEKLY GEOTECHNICAL INSPECTION SUMMARY

WEEKLY GEOTECHNICAL INSPECTION SUMMARY

Observation Date: ______________________ **Weather:** ______________________

Time (Start/Finish): ______________________ **Inspected by:** ______________________

West Dam

Y/N Seepage Y/N Cracking Y/N Erosion Y/N Instruments Read

Y/N Settlement or Slumping Y/N Ponded Water Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

East Dam

Y/N Seepage Y/N Cracking Y/N Erosion Y/N Instruments Read

Y/N Settlement or Slumping Y/N Ponded Water Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

Southeast Dam

Y/N Seepage Y/N Cracking Y/N Erosion Y/N Instruments Read

Y/N Settlement or Slumping Y/N Ponded Water Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

Divider Dyke A

Y/N Downstream Turbidity Y/N Cracking Y/N Erosion Cell B/C water level

Y/N Settlement or Slumping Y/N Ponded Water Y/N Damage by equipment ______ m

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

Fuel Tank Farm

Y/N Seepage Y/N Cracking Y/N Erosion Y/N Evidence of Spillage

Y/N Settlement or Slumping Y/N Ponded Water Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

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Generator Containment Area

Y/N Seepage | Y/N Cracking | Y/N Erosion | Y/N Evidence of Spillage

Y/N Settlement or Slumping | Y/N Ponded Water | Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

Airstrip Containment Area

Y/N Seepage | Y/N Cracking | Y/N Erosion | Y/N Evidence of Spillage

Y/N Settlement or Slumping | Y/N Ponded Water | Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

Landfill

Y/N Seepage | Y/N Cracking | Y/N Erosion

Y/N Settlement or Slumping | Y/N Ponded Water | Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

Waste Transfer Area

Y/N Seepage | Y/N Cracking | Y/N Erosion

Y/N Settlement or Slumping | Y/N Ponded Water | Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

C1 Diversion Channel

Y/N Water Flowing | Y/N Cracking | Y/N Erosion/Sloughing | Y/N Culverts Open

Y/N Settlement or Slumping | Y/N Ponded Water | Y/N Free of Snow

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

East Sump

Y/N Seepage/Over topping   Y/N Cracking   Y/N Damage by equipment   Pond water level

Y/N Settlement or Slumping   Y/N Erosion   ____ m

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

Collector Ditches and Culverts

Y/N Water Flowing   Y/N Cracking   Y/N Erosion   Y/N Culverts Open

Y/N Settlement or Slumping   Y/N Ponded Water   Y/N Damage by equipment

Notes: (Location/description, extent, dimensions of feature)

Y/N Require Inspection by Engineer

Additional Notes:

Photo List:

SITE MAP to be included