EBA Engineering

Micro-Deval Abrasion of Fine Aggregate
CAN/CSA A23.2 - 23A

Project No: 1100060.004
Project: Jericho Project
Client : Tahera Diamond Corporation

Attention: Harold Gates Fax:

Date Sampled: 31-Jan-06
Sampled By: JP
Date Tested: 8-Feb-06
Tested By: RR

Sample:
Sample Description: 12.5 mm crushed aggregate
Source: Coarse PK #1
Sample Location:

Initial Weight (g):	501.8
Final Weight (g):	427.4
Weight Loss (g):	74.4
Loss (%):	14.8%

Comments: CSA A23.2, Table 12: Maximum Abrasion Loss 20%

Reviewed By: _____ P. Eng.

EBA Engineering Consultants Ltd.

Micro-Deval Abrasion of Coarse Aggregate
CAN/CSA A23.2 - 29A

Project No: 1100060.004
Project: Jericho Project
Client : Tahera Diamond Corporation

Attention: Harold Gates Fax:

Date Sampled: 31-Jan-06
Sampled By: JP
Date Tested: 8-Feb-06
Tested By: RR

Sample: # 739
Sample Description: 12.5 mm crushed aggrgate
Source: Coarse PK # 1
Sample Location:

Initial Weight (g):	1504.6
Final Weight (g):	1340
Weight Loss (g):	164.6
Loss (%):	10.9%

Comments: CSA A23.2-04, Table 12: Maximum Abrasion Loss 17%

Reviewed By: _____ P. Eng.

EBA Engineering Consultants Ltd.

CONSTANT HEAD PERMEABILITY TEST **JERICHO DIAMOND MINE**

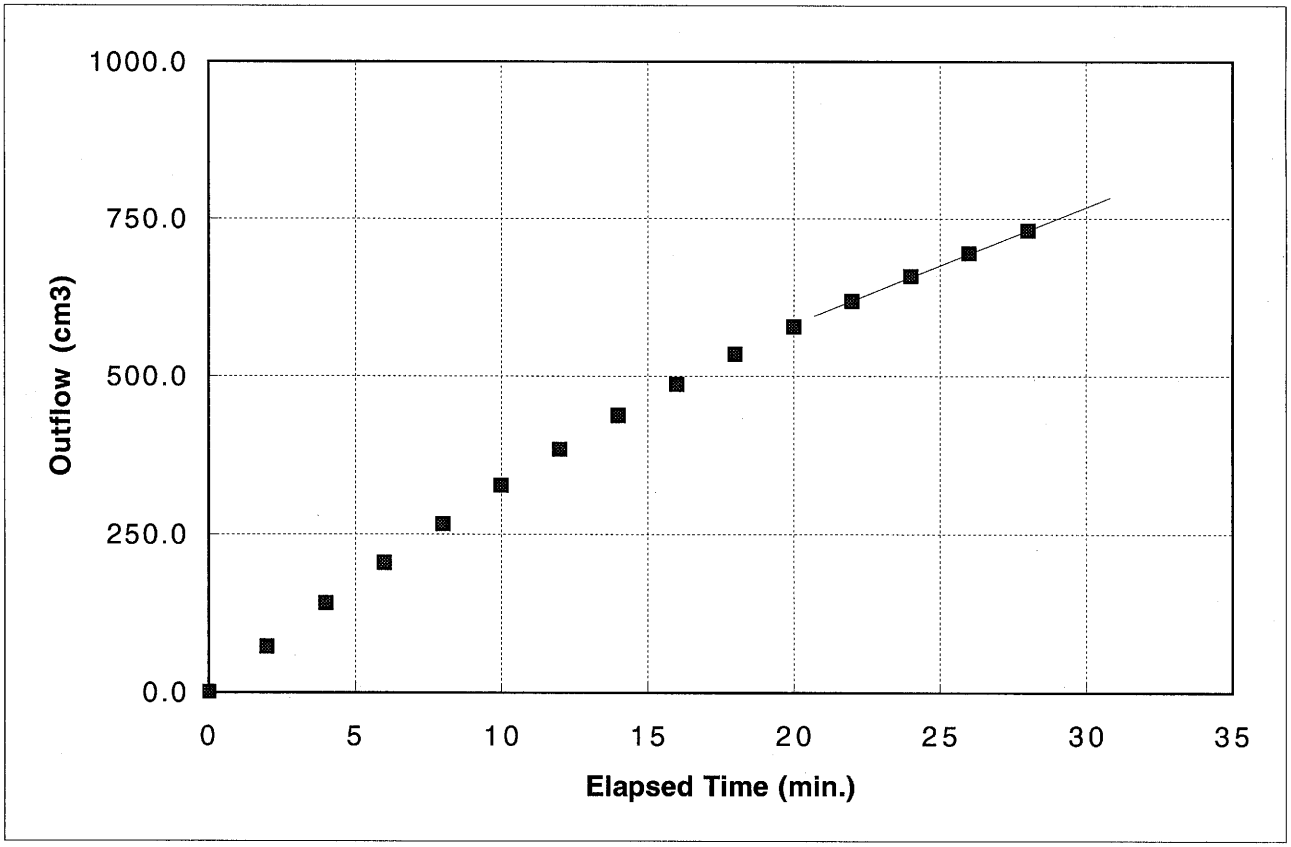
Job Number: 1100060.004
Sample No.: 739 Coarse PK #1

Date: 06-02-20
Test No: P-1

Time	Buret (cc)	Elap. (min)	Outflow (cc)
9:22	0.0	0	0.0
9:24	71.5	2	71.5
9:26	140.7	4	140.7
9:28	204.1	6	204.1
9:30	266.3	8	266.3
9:32	326.6	10	326.6
9:34	383.7	12	383.7
9:36	437.4	14	437.4
9:38	487.3	16	487.3
9:40	534.3	18	534.3
9:42	578.1	20	578.1
9:44	618.8	22	618.8
9:46	657.5	24	657.5
9:48	694.6	26	694.6
9:50	730.5	28	730.5

Diameter=	88.9	mm
Height=	88.6	mm
Volume=	549.95	cm^3
Head Diff.=	0.044	psi
Q=	0.31	cm^3/sec
i=	0.35	
A=	62.07	cm^2

K= 1.43E-02 cm/sec



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MOISTURE - DENSITY RELATIONSHIP

ASTM D698, D1557, or D2049

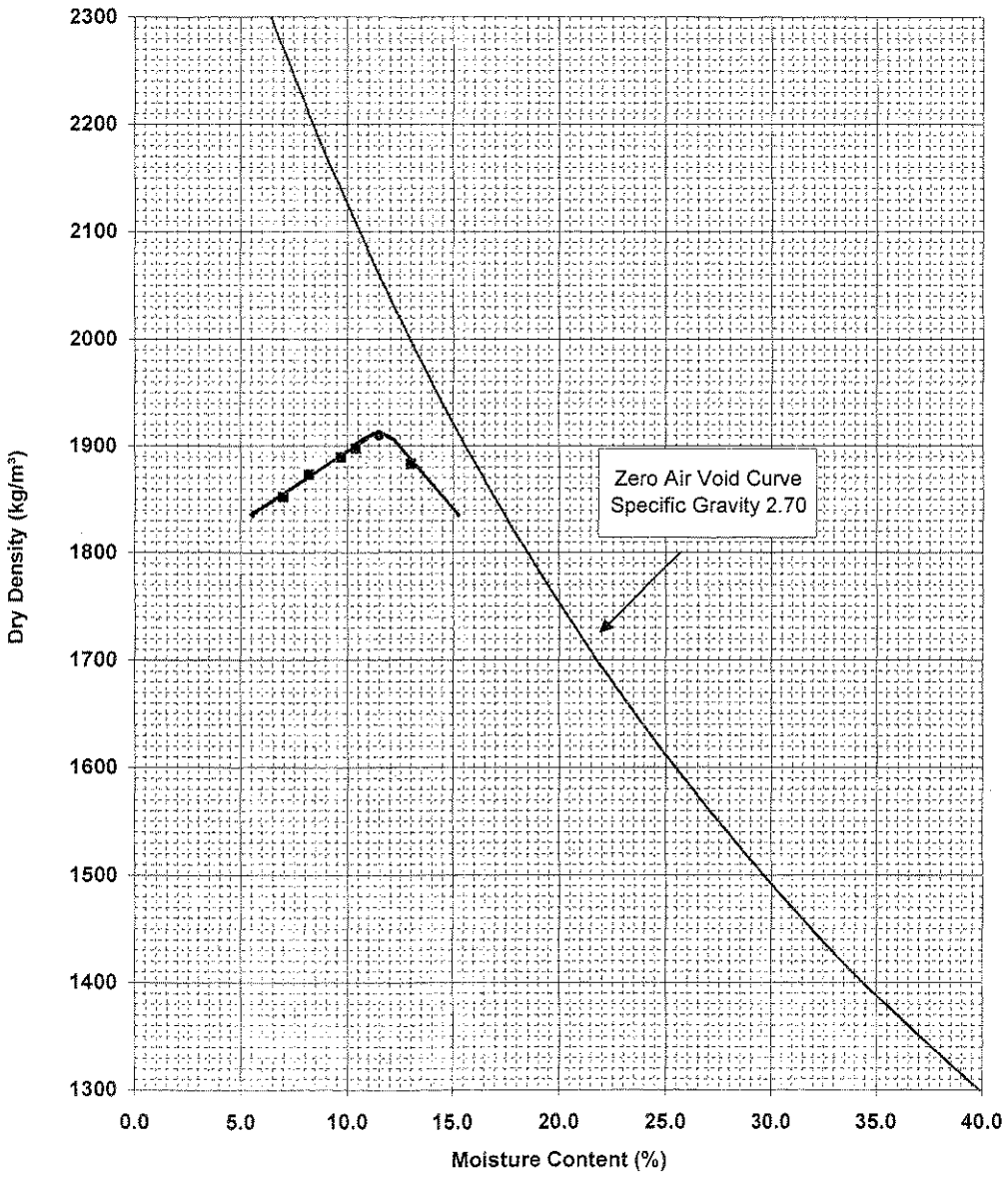
Project: Dam and Diversion Earthworks Monitoring Service - Jericho Project Site, NWT **Sample Number:** 739

Project No.: 0101-1100060.007 **Date Tested:** 06/02/13

Client: Tahera Diamond Corporation c/o Nuna Logistics **Moisture Content (as received):** N/A

Soil Description: SAND, gravelly (12.5mm max.), tr. silt - grey **Maximum Dry Density:** 1910 kg/m³

Sample Location: Coarse Pk #1 **Optimum Moisture Content:** 11.5%



STANDARD PROCTOR

ASTM D698

Hammer Mass: 2.494 kg

Hammer Drop: 304.8 mm

Number of Layers: 3

Number of Blows/Layer: 56

Diameter of Mould: 152.3 mm

Height of Mould: 116.5 mm

Mould Volume: 0.00212 m³

Compactive Effort: 590.3 kJ/m³

REVIEWED BY:

REMARKS:

APPENDIX D

APPENDIX D OPERATIONS, MAINTENANCE, AND SURVEILLANCE MANUAL

SHEAR DIAMONDS (NUNAVUT) CORP.

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

REPORT

AUGUST 2011
ISSUED FOR USE
EBA FILE: E14101140

shear diamonds

eba
A TETRA TECH COMPANY

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Shear Diamonds (Nunavut) Corp. and their agents. EBA, A Tetra Tech Company, does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Shear Diamonds (Nunavut) Corp., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user.

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ACRONYMS & ABBREVIATIONS

CDA	Canadian Dam Association
CPK	Coarse Processed Kimberlite
EBA	EBA, A Tetra Tech Company
EP-RP	Emergency Preparedness and Response Plan for Dam Emergencies
FPK	Fine Processed Kimberlite
GMP	General Monitoring Plan
GTC	Ground Temperature Cable
NWB	Nunavut Water Board
OMS	Operations, Maintenance, and Surveillance Manual
PKCA	Processed Kimberlite Containment Area
PKMP	PKCA Management Plan
Shear	Shear Diamonds (Nunavut) Corp.
SWMP	Site Water Management Plan
TDC	Tahera Diamonds Corporation
WTMP	Wastewater Treatment Management Plan

1.0 INTRODUCTION

1.1 Purpose/Scope

The purpose of this manual is to define the requirements for operation, monitoring, and surveillance (OMS) of the Jericho PKCA dams so that Shear Diamonds Ltd. (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 (NWB) will satisfy the requirements relating to dam operations and safety issues stated in:

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

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 Processed Kimberlite Containment Area (PKCA), and elsewhere within the Shear organization as deemed necessary by Shear.

1.2 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)

1.2.1 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	Nigel Goldup, P.Eng.	Project Director		
Reviewed by				
Approved by				
OMS Administrator				

1.2.2 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

1.2.3 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
August 15, 2011	Merge with PKMP	Julie Lassonde	CEO, Shear	

1.3 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 are presented in Figure 7.

1.4 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.

1.5 Basin/Watershed Characteristics

1.5.1 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.

1.5.2 Key Tributaries and Other Inflow Sources

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

1.5.3 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.

1.6 Water Management Overview

1.6.1 Ownership

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

1.6.2 General Description of Facility

1.6.2.1 Description of PKCA Dams

The three dams that provide impoundment for the PKCA are:

- West Dam (constructed to a partial elevation; crest at 525 m and core at 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 1.6.6).

1.6.2.2 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 1.6.6).

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.

1.6.2.3 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 PKMP (EBA 2011) and the water quality aspects are covered in the Jericho GMP (EBA 2011). In addition to FPK effluents, site water and treated wastewater are pumped into either Cell A or Cell B.

1.6.3 Consequence Classification

1.6.3.1 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	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility,