Jericho Mine Wastewater Treatment Plant Design Plan - Addendum
Tahera Diamond Corporation

January 30, 2006

Our File: 05-5605-0100

Submitted to:

Tahera Diamond Corporation
Jericho Project
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Box 2341
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Attention: Mr. Mike Tanguay and Ms. Cheryl Wray

Dear Sir and Madam:

Jericho Mine Wastewater Treatment Plant Design Plan - Addendum

Attached please find the final report for the above-noted project.

This report was prepared for the Tahera Diamond Corporation (Tahera) in order to fulfill certain requirements of Nunavut Water Board (NWB) Water Licence Number NWB1JER0410. The report represents an addendum prepared to address deficiencies identified by NWB and INAC during their reviews of the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera; April, 2005).

We conclude that – together with previous reports, and Tahera's commitment to update the Operation and Maintenance Manual for the wastewater treatment plant and to conduct influent and effluent monitoring – this present report:

- Corrects inconsistencies in design parameters, and addresses INAC and NWB queries and concerns relating to Design Plan deficiencies.
- Fulfills requirements of Schedule D Item 8 of the Licence.
- Confirms, under a valid NAPEGG stamp, that the Jericho Mine sewage wastewater treatment plant is designed to handle and treat the sewage from the camp to levels compliant with the Licence requirements.

We hope that the attached report meets your present needs. It has been a pleasure to work with Tahera on this present assignment, and we look forward to now turning our attention to the WWTP Operation and Maintenance Manual update.

Please contact the undersigned if you have any questions or require further information.

Sincerely,
Dillon Consulting Limited

John Hart, P.Eng.
Associate, Project Manager

REGISTERED PROFESSIONAL ENGINEER
G. STRONG

Gary Strong, P.Eng.
Partner, Technical Reviewer

TABLE OF CONTENTS

FIGURES (attached in Appendix A)

APPENDICES

1.0 Introduction

This report was prepared for the Tahera Diamond Corporation (Tahera) in order to fulfill the requirements of Nunavut Water Board (NWB) Water Licence Number NWB1JER0410. Part D Item 8 of NWB Licence states that:

> *The Licensee shall submit to the Board for approval, a detailed Waste Water Treatment Plant Design Plan (...) including drawings stamped by an Engineer. The plan shall be developed in accordance with Schedule D, Item 8.*

Schedule D Item 8 of the NWB Licence refers to essential items to be included in the wastewater treatment plant (WWTP) design plan, and Tahera submitted to the NWB the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera, April 2005).

Following the Indian and Northern Affairs Canada (INAC) May 25, 2005 review, NWB requested in their July 28, 2005 correspondence that Tahera prepare a re-submission, and confirm within it the following items:

- That identified deficient items from Schedule D Item 9 have been satisfied, namely:
  - b. Design criteria/parameters.
  - e. Treatment efficiency expectations.
- Corrections to any inconsistencies in design parameters and expectancies already raised by the parties and/or Board's Technical Advisor.
- Include a thorough understanding of flow and waste constituent loading to the plant.
- Treatment mechanics of the RBC.
- Verification that treatment efficiency will meet requirements of Licence Part G Item 6(a)(i).

Thus, this present report is an addendum to the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera, April 2005), prepared in order to address the above-noted re-submission requirements. As such, and for clarity's sake, some limited information has been restated in this present report regarding the mine and the WWTP in question. For additional details regarding this WWTP, refer to the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera, April 2005).

1.1 Background

Benachee Resources Inc., a wholly owned subsidiary of Tahera, has constructed and operates the Jericho Diamond Project near the north end of Contwoyto Lake in Nunavut Territory (NT), 65°59'50" N Latitude, 111°28'30" W Longitude.

Operations will commence with an open pit mine at the north end of Contwoyto Lake in West Kitikmeot. Ore will be mined and processed year round. With current resources the mine and processing plant will have an 8-year life and employ a total of approximately 105 to 175 people (including employees and contractors), with approximately half that number on site at any rotation. The camp is designed to accommodate 100 people in a single occupancy arrangement. However, if required to run at double occupancy the camp could hold 192.

A WWTP package system was installed at the mine site in the early construction phase, at the same time as the camp. It is housed in a stand alone, metal clad, insulated building located next to the accommodations complex at the mine site (refer to Figures 1 and 2). The WWTP building was founded on a prepared pad of crushed rock under rig mats for ground insulation, and is supplied heat from baseboard electrical heaters. The WWTP is sized to service 200 people, and will be operated by site maintenance personnel.

2.0 Wastewater Treatment

2.1 Wastewater Sources

The WWTP was designed to treat domestic sewage and grey water originating at the camp. Wastewater sources include the following:

- Laundry facilities.
- Washroom/shower facilities.
- Kitchen (equipped with grease trap).
- Two 1000 L sewage holding tanks: one located at the Emulsion building; and one in the construction office trailers (to be decommissioned shortly).

Note that the contents of the floor drainage sump within the Emulsion building will be trucked via vacuum truck to the main mill site, and drained into the plant process water system. The WWTP design is incapable of handling either the volume (~16 m^3/week) or expected elevated ammonia and nitrate concentrations from the Emulsion building sump water.

2.2 Estimated Flows and Loadings

Design parameters for the plant were estimated using 200 people as the maximum camp occupancy. A per-capita daily wastewater generation rate of 227 L/person-day was selected to estimate the average daily flowrate to the plant. This value was obtained from the BC Sewerage System Standard Practice Manual, and is the value provided for a work camp. The Harmon Equation was used to estimate peak flow. Design flowrates are summarized in Table 1 below, and process calculations are presented in Worksheet #1 in Appendix A.

Table 1: Theoretical Flowrates

Parameter	Value
Design Average Daily Flowrate (184 persons)	45.4 m^3/day
Theoretical Peak Hourly Flowrate	7.85 m^3/hr

Flows through the treatment system are equilibrated, so the flowrate into the RBC is equal to the flowrate out of the RBC.

In their May 25, 2005 correspondence to NWB, INAC queried regarding the "impacts of operating the WWTP at 50% (or less) of design capacity." Since RBC technology is typically well-suited in applications with dilute flows, and per discussion in sections 3.1 and 3.2 regarding loadings to this WWTP, we do not anticipate any negative impacts from dilute sewage or reduced flowrates.

Referring to early monitoring data from Jan.13 to 15, 2006 (refer to Worksheet #2 in Appendix B), note that the current metered flowrates to the WWTP (current occupancy 180 people) are roughly half of the anticipated flows at full camp occupancy (192 people). Because of this, and since the camp population will drop to approximately 100 occupants within the coming months, we have utilized the maximum Design Average Daily Flowrate, and not peak flows, in calculating the design capacity of this WWTP. Given the current body of meter data, we believe that utilizing the maximum Design Average Daily Flowrate is appropriate for the present exercise.

Wastewater composition was estimated using typical industry parameters. Refer to Worksheet #1 in Appendix B, and the summary in Table 2 below.

Table 2: Wastewater Influent Composition

Parameter	Concentration
BOD_5	375 mg/L
Total Suspended Solids (TSS)	400 mg/L
Total Nitrogen	40 mg/L
Total Phosphorous	8 mg/L
Fats, oils, grease	150 mg/L
Faecal Coliform	1,000,000 to 10,000,000 units/100 mL
Wastewater Temperature	13°C minimum

There are two grease traps installed in the camp kitchen; Tahera cleans these traps weekly and ships the grease off site for disposal. Information was not available regarding whether the grease traps were installed per the P.J. Hannah's specifications in section 1.2.3 of the Operation and Maintenance Instructions manual. P.J. Hannah was provided with the "Nishi-Khon/SNC Lavalin Specifications" that cites an influent O&G loading of 175 mg/L (refer to Worksheet #1 in Appendix B) and, therefore, was aware that the WWTP should be designed to handle such loadings. Notwithstanding the above, Tahera will monitor WWTP influent and effluent O&G; refer to section 4.3 below.

2.3 *Effluent Requirements*

Refer to section 3 of this present report for additional details regarding the wastewater treatment process; from the design review herein, we generally conclude that this WWTP is properly designed and adequately sized to handle the expected loadings from the sewage sources identified.

Given the expected loadings to this WWTP during normal operation (refer to Tables 1 and 2), we expect that the WWTP's design specifications (refer to Appendix B) will result in an effluent with a quality as summarized in Table 3 below.

Table 3: Average Wastewater Effluent Composition

Parameter	Concentration
BOD_5	<10 mg/L
Total Suspended Solids (TSS)	<10 mg/L
Total Nitrogen	20 mg/L
$NH_3 - N$	20 mg/L
Total Phosphorous (without precipitation)	6 mg/L
Oil and Grease	<15 mg/L
Faecal Coliform	<100 units/100 mL
Clarifier Sludge Production (1-2% solids m/m)	2.1 m^3/day

Calculating the anticipated WWTP effluent concentrations for O&G and coliforms with certainty is difficult; the values stated in Table 3 are reasonable estimates. Note that the environment in the PKCA is inhospitable for faecal coliform growth due to the low temperature, sun light during summer months, and lack of organics growth substrate. Consequently, and in addition to dilution, there will be further decay of the bacterial count prior to PKCA discharge to Stream C3.

The WWTP discharge is directed to the PKCA. Part G 6(a)i of the Jericho Diamond Mine Water Licence NWB1JER0410 requires that the main PKCA discharge to Stream C3 meets the effluent quality requirements summarized in Table 4 below.

Table 4: Effluent Quality Requirements, Stream C3 when WWTP in Operation

Parameter	Maximum Average Concentration	Maximum Concentration of any Grab Sample
BOD_5	15.0 mg/L	25.0 mg/L
Oil and Grease	3.0 mg/L	5.0 mg/L
Faecal Coliforms	10 CFU/100 ml	20 CFU/100 ml

The WWTP discharge is a relatively small component of the total flows to the PKCA; notwithstanding that the concentrations in the WWTP discharge exceed the values stipulated in Part G 6(a)(i) of the Licence, we think it unlikely that the Licence requirements will be exceeded for these values at the point of sampling (PKCA discharge to Stream C3). Monitoring shall confirm this; refer to section 4.3 below.

The Table 4 requirements are in addition to the requirements of Part G 6(a) of the water licence, which specifies effluent quality requirements for all PKCA discharges to Stream C3. Several of the parameters cited in Part G 6(a) may also be influenced by discharges from the WWTP; these are summarized in Table 5 below.

Table 5: Effluent Quality Requirements, Stream C3, General

Parameter	Maximum Average Concentration	Maximum Concentration of any Grab Sample
Total Ammonia - N	6 mg/L	12 mg/L
Nitrate - N	28 mg/L	56 mg/L
Nitrite - N	2.5 mg/L	5.0 mg/L
Phosphorous - P	0.2 mg/L	0.4 mg/L
TSS	15.0 mg/L	25.0 mg/L

Predicted phosphorous loadings from the WWTP effluent to the PKCA, when phosphorous removal is not used, could be sufficiently high that discharges from the PKCA to stream C3 may exceed the maximum concentrations specified in the water licence. This speculation is based upon the water balance data provided to Dillon by Tahera; additional monitoring is required in order to confirm this (refer to section 4.3 of this report).

Tahera will conduct monitoring of other discharges to the PKCA to ensure that the discharges from the WWTP (refer to Table 3), combined with other mine discharges (refer to worksheet #5 in Appendix B), will not result in any exceedences of the NWB Licence requirements (refer to Tables 4 and 5).

3.0 Treatment Process Description

Refer to the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera, April 2005) for a detailed description of the nature and mechanics of waste treatment within Rotating Biological Contactor technology and the associated appurtenances in this WWTP. Utilizing RBC and secondary clarifier technology for the biological and physical treatment of sewage is well understood and accepted within this industry sector. Similarly, dual media filtration and UV disinfection are also widely accepted methods for effluent polishing.

3.1 Pretreatment

Raw wastewater from the camp is collected in a sump and fed to the WWTP using a level activated submersible solids grinding pump. The raw wastewater is pumped into an aerated Equalization Tank.

Refer to the sewage loading and Equalization Tank design calculations within worksheets #1 and #2, respectively, in Appendix A. Calculations in these worksheets confirm that the Equalization Tank is designed to provide adequate volume storage to buffer the WWTP against hydraulic shocks. The Equalization Tank is also expected to buffer the treatment system against variations in influent quality.

3.2 Rotating Biological Contactor Secondary Treatment

A rotating biological contactor (RBC) provides secondary treatment for the wastewater generated at the Tahera camp; a PJ Hannah Model D10BFP RBC package plan was installed.

The RBC is equipped with three rotating discs arranged in two stages: a single disc first stage and a two disc second stage. The discs consist of rigid polypropylene media supported on galvanized steel frames and are rotated using a direct mechanical drive system (3/4 hp motor).

An underflow line from the Equalization Tank feeds wastewater into the first stage of the RBC. A bucket wheel pump assembly connected to the discharge side of the first disc is used to deliver a measured dose of wastewater to the second stage of treatment system.

Refer to the RBC design calculations within worksheet #3 in Appendix B. Note that, in preparing the design calculation and to err on the side of conservatism, Dillon assumed that negligible soluble BOD reduction occurs in the Equalization Tank.

Calculations in worksheet #3 confirm that the RBC units are designed to handle the expected hydraulic, organic, and solids loadings from the sewage. The calculations also confirm that the WWTP design effluent quality – at this stage of the treatment process and given the associated downstream appurtenances – is consistent with the overall treatment requirements in order to meet the relevant requirements of the Licence.

3.3 Effluent Solids Separation and Disinfection

Effluent from the RBCs overflows into a four-hopper clarifier for solids removal. A timer activated pump transfers settled sludge to the aerobic digestor every three hours, with the pump run time currently set to 3 minutes. Clarified effluent overflows to the Wescan filter feed tank.

The plant drawing includes a provision for optional phosphorous removal using alum injection into the RBC's discharge to the secondary clarifiers. This equipment is not present at the Tahera WWTP.

Calculations in worksheet #4 confirm that the clarifier are adequately sized to handle the expected hydraulic and solids loading from the RBCs.

Decant water from the clarifier overflows to a filter feed tank, and is then pumped through a Wescan dual media (sand/gravel) filter for final solids removal. Performance specifications for this unit were unavailable; however, under normal clarifier and filter operating conditions and due to dilution and residence time within the PKCA, we do not expect TSS loadings from the WWTP effluent to pose a problem to the quality of the PKCA discharge to Stream C3.

Effluent from the filter is discharged to the backwash feed tank where it undergoes UV disinfection prior to discharge to the PKCA. Manufacturer performance specifications for this UV unit provide for a minimum 4-log reduction in faecal coliforms.

Filter effluent is also used to backwash the filter, and the backwash effluent from the filter is directed into the Equalization Tank.

Filtered and UV disinfected water is gravity fed to the PKCA when the water level in the backwash tank reaches a pre-determined level.

Digestor aeration is periodically ceased, and decanted digestor water is manually recycled to the Equalization Tank using an airlift pump. The digestor can also overflow into the Equalization Tank during normal operation. Tahera is currently removing approximately 6,000 L per week of settled/digested sludge; this fits well with the calculated values in Table 3 given anticipated solids reduction in the digestor. This sludge is transported to the Waste Rock Dump for disposal via vacuum truck.

A decant line transfers liquid from the top of the aerobic digestor to the Equalization Tank as required to accommodate sludge transfers from the secondary clarifier. An overflow line connects the aerobic digestor with the Equalization Tank in the event that the aerobic digestor is overfilled.

Design calculations for the solids separation processes are summarized in Appendix B.

3.4 Plant Upset Conditions

In the event of a plant upset, untreated wastewater will be discharged via vacuum truck directly to the east end of the PKCA; Tahera will consider installing a WWTP bypass in spring 2006.

Tahera reports that the discharge to Stream C3 is located at the west end of the PKCA. Discharges of untreated wastewater will be diluted with natural lake water and process plant effluent, and flow through the intermediate filter dyke before reaching the discharge point at the west side of the PKCA. Potential impacts of untreated wastewater on Stream C3 water quality should be minor in the event of a WWTP upset, provided the plant is brought back into operation with minimum delay.

Wastewater temperatures lower than 13°C reduce the treatment efficiency of RBCs. Current operating experience indicates that January wastewater temperatures are on the order of 20°C, which are adequate for plant operation.

Additional discussion regarding plant upset conditions is contained within the Operating and Maintenance Instructions (P.J. Hannah), and Dillon will provide to Tahera an update and expansion to this document. Refer also to sections 4.3 and 4.5 below.

4.0 Wastewater Treatment Plant Design

4.1 Wastewater Treatment Plant and Building Layout

The WWTP is located at the south side of the camp, between the camp residential area and the diamond plant (refer to Figures 1 and 2). No WWTP building layout drawing is available. Refer to Figure 3 for the actual WWTP equipment layout.

The building is equipped with 3 dehumidifiers, which drain back into the Equalization Tank, clarifier, and aerobic digestor.

Measured January temperatures were 15°C air temperature in the WWTP building, and 20°C in the process water. Note that these are acceptable temperatures since RBC technology generally requires that process water temperatures remain above 13°C. Tahera will install a make-up air unit with a heater to increase the ambient air temperature in the building during the winter months.

4.2 Influent and Effluent Drainage

Wastewater is transferred from the first stage of the RBC to the second stage using a bucket pump. Flow through the remainder of the system is via gravity, until the clarified effluent is pumped through the tertiary filter. If the tertiary filter pump fails, clarified water overflows into the backwash water tank and to the WWTP effluent, bypassing the sand filter and the UV disinfection.

An overflow weir located several centimeters above the high level mark in the RBC first stage allows wastewater to overflow into the RBC second stage if the water level in the plant exceeds the design high-water level.

The plant is not currently equipped with a by-pass system.

4.3 Plant Operation and Maintenance

The Operating and Maintenance Instructions (P.J. Hannah) discusses the generic operation and control of the WWTP. Dillon will review this document and provide an updated version to Tahera.

We noted in Tahera's correspondence that the Western Canada Waste and Wastewater Association provided a training course for the WWTP operators.

Dillon will recommend a WWTP influent and effluent monitoring regime within the Operation and Maintenance Manual update.

4.4 Instrumentation and Control

The Operating and Maintenance Instructions (P.J. Hannah) contains several drawings related to the configuration of the electrical control panels. Dillon received this manual with insufficient time to incorporate meaningful discussion within this present report; thus, additional discussion regarding the instrumentation and control of the WWTP will be incorporated into the Operation and Maintenance Manual update.

4.5 Plant Contingency Plan

Various contingency planning is discussed above, and in P.J. Hannah and Tahera documentation. As this issues is germane to the Operation and Maintenance Manual, this subject shall also be discussed more at length in Dillon's update to that document.

5.0 References

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P.J. Hannah Equipment Sales Corp., 2005. *Basic Design Criteria – Tahera WWTP*, April 4, 2005, 4 pages.

P.J. Hannah Equipment Sales Corp. *P.J. Hannah Rotating Biological Contractor (RBC) Operating and Maintenance Instructions for P.J. Hannah RBC Model DS10H BFP for 200 Man Camp Wastewater Treatment,* Serial Number K17550.

Tahera Diamond Corporation, 2005. *Jericho Diamond Mine Waste Water Treatment Plant Design Plan, Revision No. 2,* April 2005.

Tahera Diamond Corporation. *Jericho Project, Project Description,* D:\Project Description\Project Description (Final) Jan11.doc.

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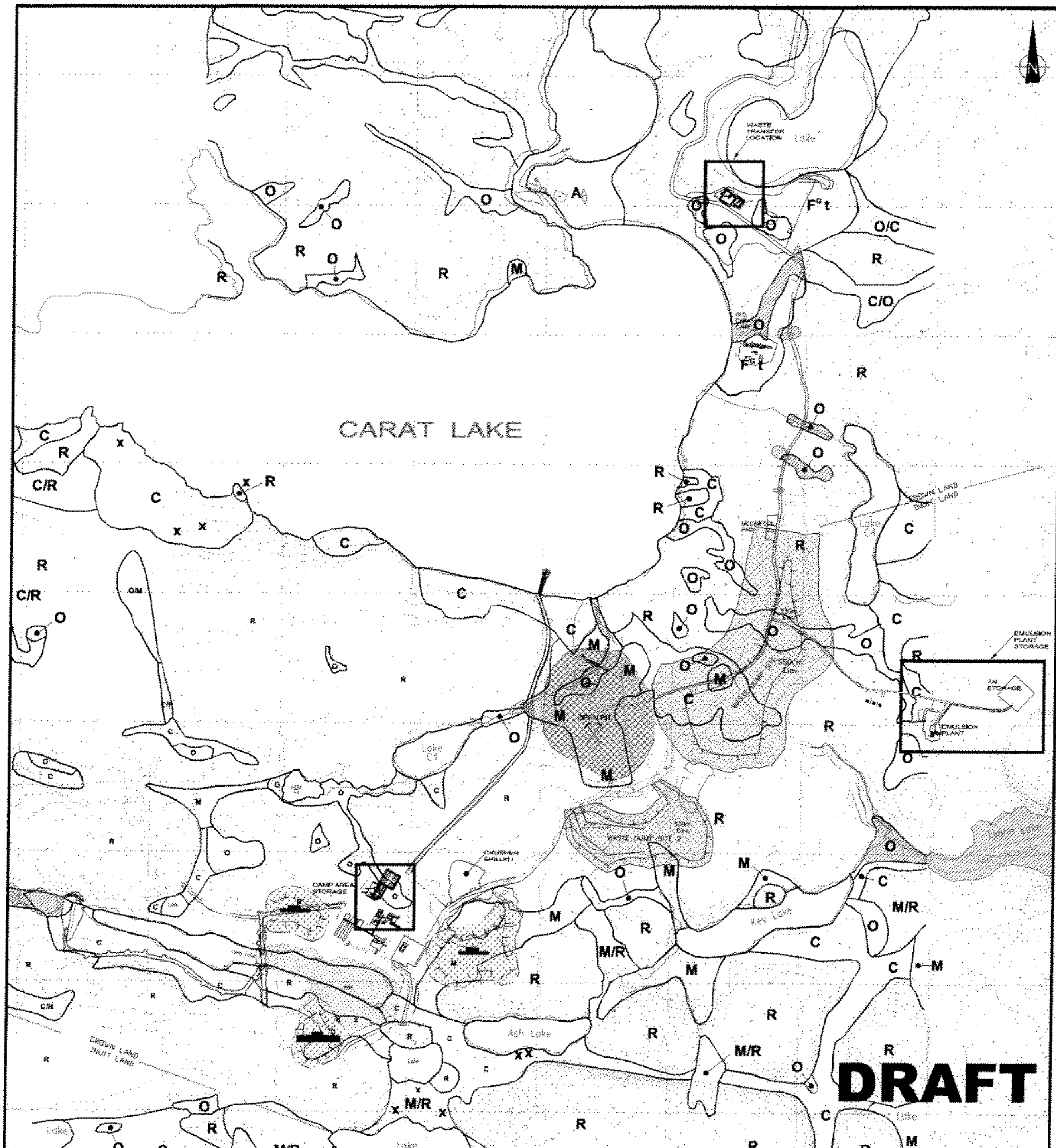
Appendix A: Figures

Figure 1:
Site Map (AMEC "Environmental Site Map" Figure No.1)



Legend

Quaternary Holocene Deposits
A River and creek deposits.
C Colluvium.
O Organic deposits.
F Quaternary Pleistocene Deposits

Fluvioglacial sediments.
M Till, silt, sand, gravel, cobbles and boulders.

Pre-Cambrian Bedrock
R Undifferentiated metamorphic and volcanic bedrock.

Spill Sensitive Area
Stockpile
AN truck route
Explosives truck route
Culvert
Waste Dump
PKCA
Open Pit

NOTE:
Base map provided by Tahera. Stockpiles and PKCA boundary provided by SRK Consulting.

AMEC Earth & Environmental

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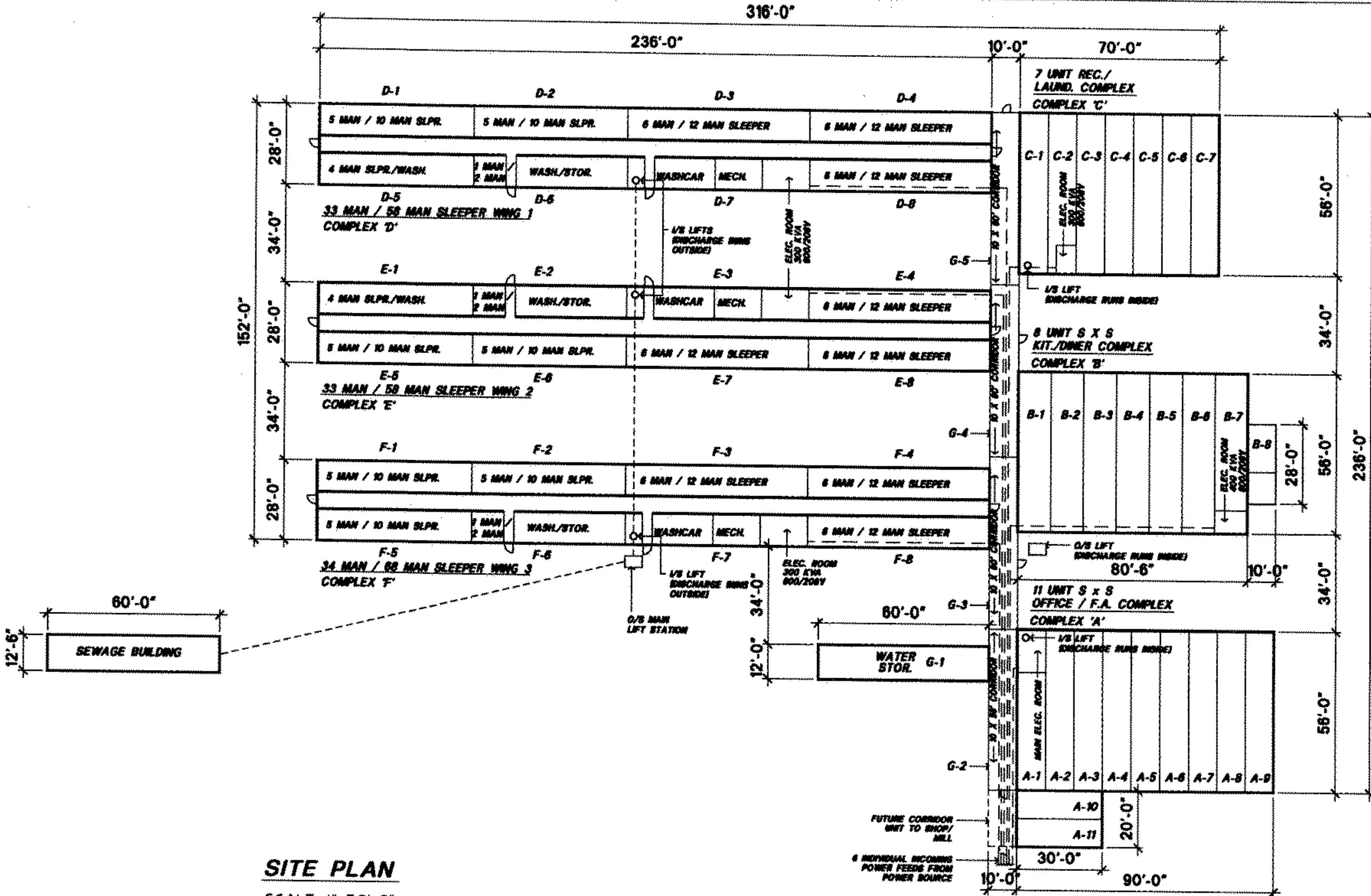
CLIENT			
PROJECT: JERICHO DIAMOND PROJECT	DWN BY: BWS	DATUM: NAD27	DATE: JANUARY 2006
TITLE: ENVIRONMENTAL SITE MAP	CHK'D BY: BO	REV. NO.: A	PROJECT NO: VE51295
	PROJECTION: UTM Zone 12	SCALE: AS SHOWN	FIGURE No. FIGURE 1

Figure 2:
Site Plan (Shanco Sheet No.F-440A)



SITE PLAN

SCALE: 1"=50'-0"

SHANCO
CAMP SERVICES LTD.
"Simply the Best"

by	VIC	date	03-12-2004
scale	1"=50'-0"	sheet number	F-440A

project: NUNA LOGISTICS - TAHERA CAMP

drawing: SITE PLAN