Technical Memorandum M

Waste Rock, Overburden, Low Grade Ore, and Coarse Processed Kimberlite Management Plan

Jericho Project, Nunavut

Report Prepared for

Tahera Diamond Corporation

Report Prepared by

SRK Consulting
Engineers and Scientists

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Executive Summary

General

The Jericho Project is a proposed diamond mine situated in the Canadian Shield, north of Yellowknife. This document, which describes the management plan for Jericho Project's mine waste and stockpile materials exclusive of fine processed kimberlite, has been prepared in support of the Water Licence application to the Nunavut Water Board.

The Jericho kimberlite pipe is approximately 300 m long and 100 m wide and is hosted by granitic bedrock. Pleistocene glacial sediments up to 20 m deep overlie the kimberlite pipe. The terrain at the Jericho site is characterized by subdued relief, numerous small lakes and many small ephemeral streams interspersed among boulder fields, eskers and bedrock outcrops. Permafrost underlies the site except for zones of talik beneath those lakes that don't freeze to the bottom each winter.

Mine Plan

The mine plan, as currently envisaged, spans 9 years and consists of four years of open pit mining followed by one year of processing stockpiled ore, two years of underground mine production and two more years of processing stockpiled ore. Mine waste will consist of waste rock, overburden, low grade ore, coarse and fine processed kimberlite (PK) and recovery plant rejects. Low grade ore is included here because it will not be processed unless testing demonstrates it is economically feasible to do so.

Waste rock, overburden, low grade ore, coarse PK and recovery plant rejects will be handled using conventional earthmoving equipment and are the subject of this technical memorandum. Fine PK will be handled as a slurry, as is discussed in Technical Memorandum P (SRK 2004a).

Mine Waste Quantities and Physical and Geochemical Properties

The life-of-mine waste quantities are provided below along with their general physical and geochemical properties.

The waste rock, of which there will be about 7.1 million m^3, will be comprised of granite, granodiorite and some diabase. The waste rock will be extremely competent and strong. Geochemical testing indicated there are relatively few concerns with respect to ARD and metal leaching from the waste rock.

The overburden, of which there will be 0.9 million m^3, will be comprised mainly of frozen sand and gravel with some zones of silt and glacial till. The main issue associated with the overburden will be control of suspended sediments in runoff from the pile.

The other products discussed in this document consist of kimberlite from various stages of the mining process. Low grade kimberlite, of which there will be about 1.0 million m^3, is reasonably competent and shows no indication of rapid weathering. The coarse PK consists of 1.3 million m^3 of kimberlitic gravely sand. The recovery plant rejects, at 64,000 m^3, are a minor part of the project mine waste and are comprised mainly a medium to coarse sand. Geochemical testing indicated that kimberlite and coarse processed kimberlite has a low potential to generate acidic or strongly alkaline drainage. However, seepage from these materials could contain slightly elevated concentrations of total dissolved salts. The drainage is expected to be slightly alkaline, with pH's in the range of 8.0. The geochemistry of the recovery plant rejects will be determined as part of the proposed monitoring plans. A precautionary approach has been taken to ensure containment of any seepage from this material until this data is available.

Based on experience from other mine sites in the north, ammonia and nitrate from blasting and suspended sediments may be an issue in seepage and runoff from the waste rock dumps and stockpiles. Measures to control blasting residues and suspended sediments are presented in Section 5.

It should be noted that the total amounts of overburden, waste rock, kimberlite and processed kimberlite that will be produced at Jericho are very small compared to the volumes currently being produced at the Ekati Diamond Mine™ and the Diavik Diamond Mine.

Waste Dump and Stockpile Design

There will be two waste dumps (site 1 for waste rock and site 2 for overburden and waste rock), and three stockpiles (one each for low grade ore, coarse PK and recovery plant rejects). The layout of the waste dumps and stockpiles has been optimized in order to minimize the number of catchments affected by the facilities, control seepage, provide a suitable buffer distance with the nearest large lake (Carat Lake), conform generally with the natural relief and minimize haul distances.

Foundation conditions at the waste dumps and stockpiles typically consist of bedrock with isolated small pockets of granular colluvial soils or till with, in some locations, a thin veneer of organic soil.

The dumps and stockpiles will be unlined. Due to uncertainties regarding the geochemistry of the recover plant rejects, this material will be stored on a small lined pad capable of capturing leachate or in a location where the leachate runoff is naturally directed to the PKCA. In addition, due to the likelihood that the overburden will flow if it thaws, a waste rock containment buttress will be constructed around the overburden.

The waste dumps and stockpiles have been designed in order to meet appropriate physical stability criteria and to facilitate access by wildlife. Slopes will, in most cases have 15 m wide benches at 10 m vertical increments, which will provide an overall average slope of about 2.6H:1V. Exceptions to this include the upstream side of waste dump site 1 and the slopes at the recovery plant rejects stockpile. At the upstream side of waste dump site 1, the dump height is lower than its overall average and the natural ground at the dump toe is rising. These factors significantly improve the stability and, as a consequence, the slope angle on the upstream side of the dump will be the angle of repose (about 1.4H:1V). At the recovery plant rejects stockpile, the material is expected to be moved to the coarse PK stockpile once testing has demonstrated the extent to which blending with the coarse PK is required. Due to its temporary nature at this location, the slopes on the recovery plant rejects will be at the angle of repose (about 1.5H:1V).

Control Measures during Construction and Operation

In order to minimize the loss of nitrogen to waste rock, the use of explosives in all aspects of the mining operation will be closely managed. An overview of these measures is provided in section 5.1. Wet blast holes have been identified as one of the primary causes of explosives loss to waste rock due to the soluble nature of the bulk ANFO. Although the potential for wet-holes at Jericho is considered to be low due to the land-based nature of this pit and the presence of permafrost throughout the pit, contingency measures will be available to ensure that any wet holes are charged using appropriate methods for minimizing nitrogen losses.

The dumps and stockpiles will be constructed so as to promote stability and generally encourage the aggradation of permafrost into the respective dump or stockpile. Key actions that will be included during the construction of these facilities include placement of a frozen berm at the toe near dump toes, placement of the initial lift of waste rock in winter to the extent possible; placement of a granitic waste rock layer between any residual organic soils and kimberlitic material.

Seepage from the dumps and stockpiles will be addressed using a series of collector ditches to direct local runoff towards the open pit and/or towards collection ponds. Collector ditches will be designed to pass peak flows from a 200-year event, which will typically be about 0.3 m^3/s. The collector ditches will generally be located on the upslope side of local access and haul roads and will be lined. Erosion protection will be added as required. Any suspended sediment generated by ditch operation will either be directed into the open pit or would be contained within Collection Ponds A, B and C, if water quality data indicates that each of these ponds must be constructed. The collection ponds will generally be kept nearly empty and operated at minimum storage volumes to ensure storage during periods of significant rainfall or snowmelt runoff. Water quality within the ponds will be monitored. In addition, sediment accumulation within the ponds will be monitored and deposited sediment removed, as required, to maintain required storage volumes. Subject to geochemical testing, the excavated sediment will be deposited on the beach area of the PKCA.

Closure and Reclamation of the Waste Dumps and Stockpiles

The target end land use for these areas will be wildlife habitat. Therefore, the aim of the reclamation plan is to promote, to the extent practical, rehabilitation of the land to this use. Key elements of the plan include vegetation prescriptions based on reclamation trials, regrading of most dump slopes to 3H:1V and construction of ramps to allow safe caribou transit across the dump slopes. Other measures that may be implemented, depending on conditions, include the placement of overburden or waste rock on the coarse PK, directing drainage from the dumps and stockpiles to the open pit to increase the rate of filling and placement of boulders on the dump to provide raptor perches.

Water Quality Estimates

Estimates of source concentrations for seepage and discharges from each of the mine components were made to support the assessment of potential impacts on surface water quality and aquatic resources for the Jericho project. Technical Memorandum I (SRK 2003c) presents information on the sources of data used in the estimates, the calculation methods, the approach used to narrow the range of predictions, and the proposed estimated source concentrations for each of the mine components.

Estimates of total dissolved salts (TDS), dissolved metals, total metals, and nutrients from blasting residues are presented for each of the mine waste and stockpile areas, discharges from the processing plant, and runoff from the PKCA. Estimates of TDS, nutrient and metal concentrations for the other mine site components, including runoff in the open pit, fine PK supernatant, ground ice, and runoff from disturbed areas of the site, are also discussed.

It should be noted that the estimates for kimberlite ore, low-grade ore and coarse processed kimberlite may be strongly influenced by the use of calcium chloride salt during bulk sample extraction and drilling, which had lead to potential overestimation of chloride, calcium, and possibly magnesium (due to ion exchange reactions) in these estimates. Experience at the Ekati Diamond Mine™ has indicated that actual chloride concentrations in seepage from these materials are significantly less than indicated by the Jericho testing. Therefore, the concentration estimates for individual components of the TDS should be viewed as conservative upper bounds.

The source concentrations were an input to the site-wide water and load balance (Technical Memorandum F, SRK 2003g), which was used to estimate water quality at various control points, including the discharge from the site during operations and subsequent closure. Minor changes to the design subsequent to the completion of Technical Memorandum F prompted revision to the discharge water quality estimates, The revised discharge water quality estimate are presented in *"Technical Memorandum W: Site Water Management Plan"* (SRK and Clearwater 2004).

In the first few years following reclamation, the nutrient and metal concentrations in seepage from the waste dumps and stockpiles are expected to decrease but closure water quality estimates indicate that concentrations of some metals could exceed CCME guidelines for freshwater aquatic life or CCME/Health Canada guidelines for drinking water. Monitoring of seepage and runoff during operations and the post closure period over which the pit will fill with water will be used to refine the estimates of water quality in the long term. In particular, the updated estimates of pit water quality will be used to resolve final details related to pit water management and, if necessary, contingency measures such as in-pit biological treatment.

Verification and Monitoring Plans

Geochemical monitoring will be carried out to confirm the geochemical properties of the waste rock, low-grade kimberlite ore, coarse PK and fine PK. Results of the solids characterization work would be reported in an annual seepage and waste rock monitoring report.

During mining, blasted rock and freshly blasted rock faces will be examined for presence of significant quantities of ground ice. If present, details will be recorded and samples will be collected for water quality analyses and reporting.

Flows and water quality will be monitored on a monthly basis at key locations in the site water management system, including temporary or permanent collector ditches or Ponds A, B, and C, ore stockpiles and coarse PK stockpile, the pit sump(s), and other inflows to the PKCA. Seepage surveys will be completed annually down-gradient side of waste dumps, stockpiles and any sumps in the plant area. Further details on the site water monitoring program are provided in Technical Memorandum W (SRK and Clearwater 2004).

A program of regular visual inspections, including an annual inspection by a geotechnical or civil engineer registered in Nunavut, will be implemented so as to evaluate the performance and condition of each dump or stockpile. In addition, thermal monitoring will be undertaken at both waste dumps and the coarse PK stockpile for purposes of closure planning.

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1 Introduction

This document presents the Waste Rock, Overburden, Low Grade Ore, and Coarse Processed Kimberlite (PK) Management Plan (WRMP) for the Jericho Diamond Project owned by Tahera Diamond Corporation (Tahera). This document has been prepared as part of the Water Licence application to the Nunavut Water Board (NWB), and is intended for use by Tahera and its contractors to ensure that appropriate management procedures are followed during construction and operation of the mine, and that appropriate information is obtained by Tahera in relation to mine closure planning.

The document is organized as follows:

- Section 2 provides a summary of the site geology, topography and surficial geology, permafrost, the mine plan and the production schedule as well as relevant waste management experience from the Ekati Diamond Mine^{TM}.

- Section 3 summarizes information on the physical and geochemical properties of the waste rock, overburden, low grade ore, and coarse PK (including the recovery plant rejects).

- Section 4 presents the final design of the storage facilities for the waste rock, overburden, low grade ore, coarse PK and the recovery plant rejects.

- Section 5 presents the control measures to minimize impacts to receiving water quality during (i) construction and operations and (ii) post-closure.

- Section 6 summarizes the closure and reclamation plan for the dumps and stockpiles.

- Section 7 presents final water quality estimates.

- Section 8 presents monitoring plans for solids testing, monitoring of ground ice, seepage monitoring, visual inspections and thermal monitoring.

- Section 9 provides a detailed list of references used to compile this technical memorandum.

2 Background Information

2.1 Geology

The Jericho Diamond Project is situated in the northern portion of the Slave Geological Province, within the Canadian Shield. The deposit consists of an elongate kimberlite pipe with a length of approximately 300 metres (m), a width of up to 100 m, and a depth of at least 350 m. The kimberlite is hosted by regionally extensive Archean granitic rocks, which vary locally and over very short distances from granodiorite to syenogranite, with associated pegmatite phases (Figure 2.1). The granitic rocks have been intruded by Proterozoic diabase dykes. Pleistocene glacial sediments occur sporadically throughout the region, and provide a 10 to 20 m cover over the kimberlite pipe.

The Jericho kimberlite was formed from multiple emplacement events, comprising a precursor dyke (JDF2) and three diatreme intrusive stages consisting of a northern (JDF4N), central (JDF6) and southern lobe (JDF4S). The precursor dyke is described as a hypabyssal kimberlite or kimberlite breccia with a finely crystalline, calcite and oxide-rich groundmass hosting macrocrysts of olivine as well as garnet, chrome diopside, ilmenite and mantle xenoliths. The northern and southern lobes are serpentinized, fragmental kimberlites containing olivine macrocrysts, mantle xenoliths as well as xenocrysts and macrocrysts of chrome diopside, phlogopite and ilmenite, and 5 to 10% crustal xenoliths of granodiorite, diabase and limestone. The central lobe is a clast-supported tuffisitic kimberlite, with a serpentinized groundmass hosting olivine macrocrysts, 5 to 10% crustal xenoliths of limestone and granodiorite, and mantle derived material.

The geology in the immediate area of the deposit is illustrated by Figure 2.2, which is based on drilling and mapping. The granitic country rock consists of a biotite +/- muscovite granite with associated pegmatite, which varies from weakly foliated to massive. A large diabase dyke crosses through the east side of the kimberlite, and will be encountered during mining. Minor quantities of andesite, aplitic dykes, and quartz veins are found along with the granite. The relative percentage (by length of drill core) of the rock types from the five 1999/2000 geotechnical drill holes are presented in Table 2.1.

Table 2.1: Rock Types by Percentage in 1999/2000 Geotechnical Drill Holes

Rock Type	Percentage	Length of Core (m)
Granite (both massive and foliated)	47	878
Kimberlite	20	384
Pegmatite	16	292
Diabase	13	240
Other	4	84
TOTAL	100	1,878

Sulphide mineralization is extremely rare in both the granitic rocks and kimberlite, and no occurrences of Yellowknife Supergroup Metasediments have been observed in the drill core or surface outcrops in the vicinity of the Jericho deposit.

2.2 Topography and Surficial Soils

The topography in the vicinity of the deposit is shown in Drawing 1CT004.06-G10. The local relief is subdued as a result of previous glaciations, and is characterised by numerous lakes and many small ephemeral streams interspersed among boulder fields, eskers and bedrock outcrops . The water surface elevation in Carat Lake is approximately 470 m, and the topographic highs in the vicinity of the site facilities typically range from approximately 500 to a maximum of 550 m. More resistant rocks in the nearby Willingham Hills (east of the site) lead to small cliffs and elevations of up to 580 m. In the vicinity of the proposed open pit, slopes are gentle, and drainage is towards Carat Lake.

Drilling results and the surficial geological mapping indicate that the foundation conditions at waste dump sites consist of bedrock with isolated soil deposits. The soil deposits typically range in thickness from 0 to 3.2 m and consist of granular colluvial soils with, in some locations, a thin mantle of organic soil. Both sites are underlain by permafrost.

2.3 Permafrost

Regional permafrost maps, complemented by site-specific thermal data and data from the Lupin Mine, indicate the Jericho Diamond Project lies in a region of continuous permafrost. Permafrost is present everywhere except beneath large lakes. Permafrost extends to a depth of approximately 540 m at the Lupin Mine. The Jericho Project is located approximately 25 km northwest of the Lupin Mine so it is anticipated that the depth of permafrost at Jericho is at least 540 m.

In the surficial soils, the active layer typically ranges in thickness from less than one meter in organic soil to slightly more than three meters where well drained granular soils are present. The active layer thickness in exposed rock locally exceeds three meters.

2.4 Mine Plan

The mine plan, as currently envisaged, is provided below. Adjustments to the mine plan may occur as the project advances to detailed engineering.

Mining will be by conventional open pit methods potentially followed by underground mining using open benching or sub-level caving methods.

The first four years of mining will be by conventional open pit methods with a combination of loaders and off-highway trucks. Trucks will be 86 tonne capacity. Loaders and hydraulic shovels with 5 to 10 m^3 buckets will be used, with a front-end loader for back-up. Kimberlite ore will be initially mined from a starter pit followed by two successive 40 m pushbacks over a period of 4 years. The bench height in the open pit will be 10 m, with double benching to 20 m in granite and single benching in all other materials. Triple benching to 30 m in granite is possible, as 30 m is the standard final benching height at Ekati. The berm widths will typically be 8 m (10 m in overburden). The open pit will be approximately 350 m wide and 400 m long, covering an area of approximately 10 hectares (ha). Permafrost extends to a depth of approximately 540 m. It is assumed that groundwater seepage into the pit will be limited to the active layer and will, therefore, be relatively minor. The open pit mining will be carried out by a mining contractor.

Once open pit mining is complete, an underground decline will be driven at a -15% gradient to access kimberlite ore from elevations of 310 to 230 m. Open benching or sub-level caving will be used to extract the ore. An unheated ventilation system will be used to minimize thawing of permafrost in the underground workings. Operating efficiencies and economics experienced during initial open pit operations will dictate the final level for transfer to underground mining.

Four distinct materials will be produced during mining, including:

- Overburden, comprised of glacial soils overlying the kimberlite and surrounding waste rock
- Waste rock, comprised of granitic country rock, associated pegmatite phases and diabase dykes which host the kimberlite ore
- Low grade kimberlite and inferred resource category kimberlite, comprised of kimberlite facies that contain sub-economic levels of diamonds, or require further testing to estimate their grade and economic value.
- Kimberlite ore reserves, comprised of kimberlite facies that have been demonstrated to contain sufficient quantities of diamonds to warrant processing (Center and North Lobes).

The overburden, waste rock and low grade kimberlite will be stockpiled in a designated waste dumps or stockpiles. Depending on the results of further testing, the low grade kimberlite may be processed.

The kimberlite ore will be processed in a 330,000 tonnes per annum (tpa) processing plant using conventional diamond extraction methods. The process consists of crushing, scrubbing, dense media separation (DMS), x-ray sorting, clean-up and sorting of the diamonds. With the exception of the dense media (ferrosilicon), which is recovered from the residues using high efficiency magnetic separation, the process is entirely mechanical. Waste products will include coarse PK, recovery plant rejects, fine PK and associated slurry water. The coarse PK will be comprised of particles with grain sizes from 0.1 to 19 mm, while the recovery plant rejects will be comprised of particles from 1 to 8 mm (sand to gravel sizes). Therefore, both of these materials will be managed using mechanized equipment and land-based stockpiles. The fine PK and the associated slurry water will be managed in the processed kimberlite storage area (PKCA), which is discussed in the accompanying report *"Design of the Processed Kimberlite Containment Area"* (SRK 2004a).

2.5 Production Schedule

The production rates for the waste dump and stockpile materials have been estimated based on an updated feasibility assessment (SRK 2003a), and are summarized in Table 2.2. The production schedule assumes a nine year schedule, with four years of open pit production, one year of processing stockpiled ore, two years of underground mine production, and two more years of processing stockpiled ore. The schedule in Table 2.2 assumes year 1 is essentially a pre-production year, although a small amount of kimberlite processing may occur in the fourth quarter of Year 1, hence the small amount of fine and coarse PK indicated at that time. Underground mining is planned only for Years 6 and 7. Stockpiles will be used to supply the plant with ore in those years in which there is no mining.

The "split" between waste rock and overburden soil has also been estimated. The actual split between the production of waste rock and overburden soil may differ from what is indicated in Table 2.2.

Table 2.2: Estimated Production Rates for Waste Rock and Stockpile Materials

Year	Annual Production									
	Waste Rock		Overburden		Low Grade		Coarse PK		Recovery Plant Rejects	
	Mt	Mcm	Mt	Mcm	Mt	Mcm	Mt	Mcm	Mt	Mcm
1	0.750	0.417	0.435	0.256	0.044	0.026	0.028	0.017	0.0001	0.001
2	4.893	2.718	1.165	0.685	0.499	0.294	0.269	0.163	0.013	0.008
3	5.489	3.049			0.751	0.442	0.269	0.163	0.013	0.008
4	1.668	0.927			0.338	0.199	0.269	0.163	0.013	0.008
5							0.269	0.163	0.013	0.008
6							0.269	0.163	0.013	0.008
7							0.269	0.163	0.013	0.008
8							0.269	0.163	0.013	0.008
9							0.208	0.126	0.010	0.006
Totals*	12.80	7.111	1.600	0.941	1.632	0.960	2.118	1.284	≤0.015	≤0.063

Notes: Mt = million tonnes; Mcm = million cubic metres

* The "totals" in Table 2.2 reflect the currently estimated totals for each material type but, as a result of rounding, may differ slightly from the sum of the annual amounts shown in the table.

2.6 Regional Waste Management Experience

The Jericho Project will be the third diamond mine in Northern Canada, and has therefore had the opportunity to gain from the knowledge and experience at these other sites in the design and operation of its waste management facilities. Information from the Ekati Diamond Mine™ (2002) is particularly relevant due to similarities in the granitic country rock that surrounds the kimberlite. Key areas of experience at Ekati include:

- Geological features;
- Geochemical characterization;
- Thermal monitoring;
- Hydrological model; and,
- Seepage monitoring.

Geological features of the Ekati Diamond Mine™ that are relevant to waste management planning at Jericho include:

1. observations that the major geological units tend to be distinctive and uniform in their characteristics,
2. contacts between major geological units tend to be sharp,
3. due to the relatively cool temperature and rapid emplacement of the kimberlites, the mineralogy and chemistry of the surrounding rocks have not been significantly affected by the intrusions.

Due to the uniform characteristics and lack of contact effects, geochemical characterization of the surrounding rocks should be possible using a lower number of samples than commonly required to characterize rocks associated with metal mineralization (Ekati Diamond Mine™ 2002). Geochemical testing of waste rock from the Ekati Diamond Mine™'s Panda Pipe at various stages from exploration through mining indicated uniform and low concentrations of sulphide and neutralization potential in the granitic rocks. Locally elevated sulphur concentrations found in some samples were due to accidental inclusion of kimberlite with the waste rock. Kinetic testing indicated the granite has a very low geochemical reactivity (Ekati Diamond Mine™ 2002). Based on the results of geochemical characterization programs for the Jericho project (Section 3.3), the geochemistry of the granitic country rock is expected to be similar to the granitic rock at the Ekati Diamond Mine™.

Thermal monitoring of the dumps at the Ekati Diamond Mine™ indicate the formation of permafrost within the waste rock and the development of supercooled temperatures in the center of the dumps as a result of winter air convection currents (Ekati Diamond Mine™ 2002). As a result of the permafrost aggradation, water infiltrating to the center of the dump as a result of rainfall or snowmelt is expected to freeze and to be retained in the dump as ice. Some precipitation entering the warmer periphery of the dumps runs off side slopes and emerges as seepage. However, large portions of the dumps are effectively unavailable for reaction with infiltrating waters. The thermal conditions at Jericho are slightly cooler than at the Ekati Diamond Mine[TM], so it is expected that the experience at the dumps and stockpiles at the Jericho Project will be similar to that of the Ekati Diamond Mine[TM].

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Seepage monitoring on the tundra adjacent to the Panda/Koala Waste Rock Storage Area (WRSA) has indicated there is relatively little flow from the dumps, likely due to freezing of infiltrating water. Samples from nearby reference sites indicate pH's in surface waters unaffected by mining ranged from less than 4 to greater than 7, reflecting organic acids from the tundra soils. Samples down gradient of the waste rock piles showed varying degrees of effects from leaching of the mine rock, with a similar range of pH's as in the reference sites, trace to moderate concentrations of major ions, and generally low metal and ammonia concentrations. The Ekati seepage data was used in conjunction with extraction test data from Jericho to develop source concentrations for the waste rock at Jericho (Technical Memorandum I, SRK 2003c).

Seepage monitoring data from the Coarse Kimberlite Reject Storage Area (CKRSA) indicated that some seeps had low pH's and elevated sulphate concentrations. The cause of the acidic seepage was thoroughly investigated as part of the 2002 seepage and waste rock monitoring program (Day, Sexsmith and Millard 2003). The study concluded that the acidic seepage was caused by interaction between the acidic soils and the coarse kimberlite under reducing conditions along the base of the pile. This interaction led to the release of ferrous iron into the seepage. As the seepage emerges near the toe of the CKRSA, the ferrous iron oxidizes to form ferric iron, which generates acidity. To prevent this type of interaction between kimberlite and organic soils, the Ekati Diamond Mine[TM] has started to place the coarse kimberlite rejects on inert granite pads. These measures will be adopted at the Jericho Project site (Section 5.1).

3 Waste Dump and Stockpile Materials

3.1 General

The life-of-mine (LOM) quantities of overburden, waste rock, low grade ore, coarse kimberlite and recovery plant rejects are provided in Table 3.1. The density, taken as the estimated dry density following placement in a waste dump or stockpile, is the basis of the volumetric estimates for each material.

Table 3.1: Estimated Quantities of Waste Rock and Stockpile Materials

Material	Approximate Tonnage (tonnes)	Estimated Density (t/m^3)	Approximate Volume (m^3)
Waste rock	12,800,000	1.8	7,110,000
Overburden soils	1,600,000	1.7	940,000
Low grade ore	1,630,000	1.7	960,000
Coarse PK	2,120,000	1.65	1,280,000
Recovery plant rejects	105,000	1.65	64,000

The physical and geochemical properties of these materials are discussed in the following sections.

3.2 Physical Characterization

The physical characterization of waste dump and stockpile materials has been based on data gathered during various drilling and laboratory programs and the construction and assessment of the decline that was completed to obtain bulk samples of the kimberlite.

3.2.1 Waste Rock

Most of the waste rock will be comprised of granite, granodiorite and, to a minor extent, diabase from dykes. Available data suggests that these "country rocks" are quite massive and extremely competent and strong.

Observations of the decline walls exposed in conjunction with the underground bulk sampling and drilling results indicate there is a very limited amount of ice-filled joints within these materials. There appears to be slightly more ice in the contact zone between the country rock and the kimberlite. However, due to the limited occurrences of ice, the quantity of ice as a percentage of the total rock mass was considered too small to be significant.

As noted in Table 3.1, the estimated total tonnage of waste rock is 12.8 million tonnes. At an assumed density of 1.8 t/m^3, the estimated waste rock volume is 7.1 million m^3.

3.2.2 Overburden

Available drilling data suggests the overburden soils comprise mainly sand and gravel, with some zones of silt and till. Cobbles and, occasionally, boulders are also present in the overburden.

Detailed logs from holes drilled in the vicinity of the open pit are included in Technical Memorandum A (SRK 2003b). Holes 96-BGC-12 and 96-BGC-16 were drilled within the pit limits; Holes 96-BGC-11 and 96-BGC-13 were drilled slightly north of the pit limits. The logs of these drill holes suggest the thickness of the overburden typically likely varies from about 10 to 15 m.

The active layer within the overburden is estimated to be less than 1m. Permafrost is present below the active layer. Data from two holes inside the pit limits indicates that the soil particles are well bonded with no excess ice. However, two holes outside the pit limits encountered the occasional ice lens and some stratified ice. It is likely, therefore, that the soil overburden will include some excess ice.

The total tonnage of overburden soils is estimated to be 1.6 million tonnes. The density of these soils after dumping could range from about 1.6 to 1.9 t/m^3. Due to the presence of ice, the settled density has been conservatively estimated to be 1.7 t/m^3, leading to an estimated dump volume of about 0.940 million m^3. A percentage of the overburden soils will be used for the construction of earthen structures related to water management, i.e. berms for collector ditches and some dykes. In addition, it is possible that some of the overburden will be used in conjunction with mine closure activities.

3.2.3 Low Grade Ore

The low grade ore is comprised of kimberlite from the precursor dyke and South Lobes, which require further testing to determine whether they are economic to process. Observations reported in the EIS indicate the kimberlite is reasonably competent and shows no indication of rapid weathering.

Some joints within the kimberlite are ice-filled, based on drill core and underground observation. The volume of ice within this material is thought to be a very small percentage of the low grade ore.

As noted in Table D.2.1, the estimated total tonnage of low grade ore is 1.6 million tonnes. At an assumed density of 1.7 t/m^3, this corresponds to an estimated stockpile volume of about 0.96 million m^3.

3.2.4 Coarse Processed Kimberlite

The coarse PK will comprise a gravely sand made up of about 50 to 93% sand and 7 to 50% fine gravel from mechanical breakdown of the kimberlite ore. Processing plans call for the minimum and maximum particle sizes to be about 0.1 and 19 mm, respectively. The coarse PK is the light fraction from the dense media separation, and therefore is made up of the lighter minerals which comprise the majority of the kimberlite.

The total tonnage of coarse processed kimberlite is estimated to be 2.12 million tonnes. The density of the coarse processed kimberlite is expected to be about 1.65 t/m^3, which corresponds to an estimated volume of 1.3 million m^3. However, a portion of the coarse PK will be used in the construction of several of the earthen structures at the PKCA. Furthermore, current plans call for the coarse PK to be placed over the final surface of the fine PK as part of the PKCA closure. The final stored volume of coarse PK will, therefore, be significantly less than 1.3 million m^3.

3.2.5 Recovery Plant Rejects

The recovery plant rejects, will be produced as a result of kimberlite processing. They will comprise medium to coarse sand with some fine gravel. Particle sizes are expected to range from 1 to 8 mm. This material is the heavy fraction from the dense media separation, minus any diamonds, and is therefore made up of the heavier minerals in the kimberlite, such as ilmenite, chrome diopsite, garnet, and phlogopite.

The total tonnage of recovery plant rejects is estimated to be approximately 0.105 million tonnes. The density of the recovery plant rejects is expected to be similar to that of coarse PK, about 1.65 t/m^3. The volume of the recovery plant rejects is therefore estimated to be about 0.063 million m^3.

3.3 Geochemical Characterization

3.3.1 Sampling and Testing Programs

Detailed geochemical characterization of the waste rock, kimberlite ore, and coarse PK was completed as part of the EIS. The programs included detailed core logging, examination of the development rock, mineralogical characterization, acid base accounting (ABA), solids ICP, leach extraction tests, seepage sampling, and supernatant characterization. Details of the sampling and testing programs were presented in Appendices D.1.3 through D.1.6 of the EIS (Tahera 2003), and Technical Memorandum H of the supplemental EIS submission (SRK 2003d). The following sections summarize key findings of these programs.

3.3.2 Waste Rock

The majority of the waste rock will be comprised of granitic rocks, as described in Section 2.1. Mineralogical observations on hand samples from drill core and the development rock pile indicated that sulphides are extremely rare in the granites, occurring in limited quantities (<0.2%) in only a few sections of core and isolated locations in the development rock. A thin section of granite which contained atypically elevated quantities of sulphide (0.07%) indicated that the sulphides were in the form of pyrite, chalcopyrite and digenite (EIS Appendix D.1.3). Rare veins of chalcopyrite observed in the development pile occurred in association with slickensides. Carbonates were generally not present.

ABA testing on eighteen granite and granodiorite samples (EIS Appendix D.1.3), including one sample that was altered and iron stained (Technical Memorandum H), and total sulphur tests on thirty samples (EIS Appendix D.1.3), indicated that these samples were non-acid generating with low neutralization potential (NP's from 2 to 21 mg $CaCO_3$/tonne) and negligible levels of sulphides (average <0.01% S).

Results of leach extraction testing on sixteen waste rock samples indicated that leachate in contact with the granitic waste rock is likely to have neutral pH's, moderate alkalinity levels, low total dissolved salts, and generally low metal concentrations (EIS Appendices D.1.3 and D.1.6). Results from three rounds of development pile seep sampling at two seep locations (EIS Appendix D.1.3 and Technical Memorandum H) indicated that dissolved metal concentrations were generally low with the exception of copper which slightly exceeded CCME guidelines, and uranium, which exceeded the CCME/Health Canada guidelines for drinking water. Elevated total metals (aluminum, copper, iron, uranium, zinc) on one occasion corresponded with visible suspended sediments.
The presence of uranium in the most recent seep samples was not expected given the lack of uranium mineralization in these samples. Therefore, further testing was completed to characterize the uranium content of the solids. Results of these tests are provided in Attachment A. The test results indicated that granite and pegmatite samples near the Jericho kimberlite had slightly elevated uranium concentrations (6.6 and 5.2 ppm respectively) compared to crustal averages (3 ppm). However, these were consistent with the regional data, and there were no indications of high concentrations in a particular rock type or area of the pit. Furthermore, the uranium concentrations were much lower than typical waste rock associated with uranium mines.

Elevated uranium concentrations in the seepage are thought to be due to the interaction of carbonate from the kimberlite placed on the surface of the development pile, with trace amounts of uranium in the underlying granites. This is consistent with the geochemical behaviour of uranium, which is substantially more mobile in the presence of carbonates. However, because very little kimberlite will be mixed with the waste rock during mining (typically as a result of blasting or near small offshoots of kimberlite), carbonate concentrations in the waste rock piles are expected to be much lower than in the development pile, and uranium is expected to be much less mobile. In addition, it would be possible to segregate any waste rock inadvertently mixed with kimberlite into a designated area in the center of the waste dump to promote freezing and eliminate any seepage from this material.

Attachment A also includes a work plan for supplemental testing to more fully characterize the potential for uranium in seepage from the waste rock dumps. The program includes additional seepage monitoring, solids analyses and interaction testing during the 2004 field season to demonstrate that the reasons why elevated uranium concentrations are occurring in the development pile seeps, but are not expected in the full scale waste rock piles. In addition, although the current data indicates that there is limited potential for waste rock that contains elevated concentrations of uranium, the work plan (Attachment A) includes monitoring activities during the first few years of mining to ensure that any waste rock with anomalously high uranium concentrations could be identified and disposed of in an appropriate manner. These monitoring activities are integrated with the solids monitoring program described in Section 8.1.

In summary, the testing results indicate there are relatively few concerns with respect to ARD and metal leaching from the waste rock. However, based on the observations of isolated sulphides on boulders in the development waste pile, and elevated uranium in the development pile seepage, the waste rock solids will be monitored during mining to ensure that any isolated materials that could require special handling are appropriately identified and managed during mining. Further details on this monitoring program are provided in Section 8.1.

3.3.3 Overburden

Three overburden samples were collected from the development waste pile and nearby vicinity for settling tests to determine the metal content of the suspended sediments for use in estimating total metal concentrations in the discharges (Technical Memorandum H). The results indicated generally low dissolved metal concentrations, however total aluminum and iron concentrations were slightly elevated reflecting the aluminum and iron content of fine suspended particulates present in the samples.

3.3.4 Low-Grade Ore

Petrographic examination of 5 samples from the crushed ore stockpile indicate varying amounts of carbonate (from 0.5 to 25%) and only trace amounts of sulphides, which occur as pyrite when present (EIS Appendix D.1.4). Fizz testing indicated a strong reaction to weak hydrochloric acid, confirming the presence of reactive carbonate minerals (EIS Appendix D.1.4).

Results of ABA analysis of 30 kimberlite samples indicated relatively low sulphide concentrations, high neutralization potentials (NP), and neutral to alkaline paste pH's (EIS Appendix D.1.4).

Shake flask extraction tests performed on 9 samples indicated that runoff in contact with stockpiled kimberlite ore will be alkaline, with pH's in the range of pH 8, and alkalinity in the range of 40 mg $CaCO_3$ eq/L. Seepage from this material is expected to have relatively high total dissolved salts concentrations (EIS Appendix D.1.4), and generally low metal concentrations.

A settling test was completed to characterize the potential sediment load from stockpiled kimberlite ore. TSS results indicated relatively slow removal of fine particles, suggesting that a flocculant may be required to control suspended sediment loads (EIS Appendix D.1.4). Two additional settling tests were performed in order to calculate the suspended metal content that would be present at a TSS level of 10 mg/L (Technical Memorandum H). Results of these tests indicated iron and nickel concentrations could be slightly elevated if there is incomplete removal of suspended sediments.

In summary, the geochemical testing indicated that kimberlite has a low potential to generate acidic or strongly alkaline drainage. The testing also indicates that runoff in contact with stockpiled kimberlite ore, and/or kimberlite waste rock could contain elevated concentrations of total dissolved salts. The drainage is expected to be slightly alkaline, with pH's in the range of 8.0.

3.3.5 Coarse Processed Kimberlite

As discussed previously, the diamond recovery process is essentially mechanical. Therefore, coarse processed kimberlite is expected to be geochemically very similar to the ore. Results of specific tests on this material are summarized as follows:

Mineralogical examination of coarse PK samples indicated that carbonate content ranged from 0.5 to 5% (EIS Appendix D.1 5). One sample had trace levels of disseminated sulphides as pyrite, and the other sample was devoid of sulphides. Results of ABA testing on coarse PK samples indicated that the coarse PK is net acid consuming with an insignificant sulphide content (less than 0.03 percent as S), very low sulphates (0.01 to 0.05 percent as S), and high neutralization potentials (EIS Appendix D.1.5). The neutralization potential ranged from 59 to 275 kg $CaCO_3$ eq./tonne, with five out of six samples exceeding 200 kg $CaCO_3$ eq./tonne. Paste pH's were strongly alkaline, ranging from 9.0 to 9.4.

Although supernatant samples were collected from the fine PK, results are mentioned here as an indication the chemistry of water in contact with PK. The chemistry of six fresh and aged PK supernatant samples was characterized by alkaline pH and moderate to elevated alkalinity, chloride, calcium, magnesium, potassium and sodium concentrations (EIS Appendix D.15). Heavy metal concentrations were generally very low, however barium, copper, manganese, molybdenum, and zinc levels were slightly elevated in some of the samples, and aluminum and nickel exceeded the criteria for freshwater aquatic life in more than one of the samples.

Sequential extraction tests on six samples indicated that alkalinity concentrations remained elevated in a second rinse, indicating that alkalinity levels could remain elevated. None of the metals exceeded the criteria for freshwater aquatic life.

In summary, the test results for coarse PK indicated low sulphide and low soluble metal concentrations, indicating the coarse PK has a low potential for acid generation and metal leaching. The samples are expected to be a long-term source of alkaline drainage, with effluent pH's ranging from 7.9 to 8.5, and alkalinities of up to 125 mg $CaCO_3$ eq/L.

3.3.6 Recovery Plant Rejects

Recovery plant rejects were not characterized in the original geochemical studies for this project, and samples of this material are no longer available for testing. Sulphides were not observed in the recovery plant rejects by SRK (Kelly Sexsmith) in 1999. Nonetheless, it is possible that small amounts of sulphides from the original ore, could accumulate in this material, and that light minerals such as carbonates could become depleted. Therefore, there is a slight potential that this material could be a source of acid generation and/or metal leaching.

As indicated in Table 3.1, the recovery plant rejects comprise a relatively small amount of material (105,000 tonnes). The leachate from this material will be fully contained or flow directly to the

PKCA until there is sufficient testing data available to determine whether there are any ARD and water quality issues associated with this material. Comments on the design of the leachate containment system are provided in Section 4.3.5.

3.4 Other Water Quality Issues

Based on experience from other mine sites in the north, ammonia and nitrate from blasting and suspended sediments may be an issue in seepage and runoff from the waste rock dumps and stockpiles. Measures to control blasting residues and suspended sediments are presented in Section 5.

4 Design of the Waste Rock Dumps and Stockpiles

4.1 General Layout of Waste Dumps and Stockpiles

The layout of the waste dumps and stockpiles is illustrated in Drawing 1CT004.06-M1 and was selected to:

- Minimize the number of catchments potentially affected by drainage from the waste dumps and stockpiles;
- Facilitate the design and operation of seepage control structures related to the waste dumps and stockpiles;
- Maintain an adequate buffer zone (greater than 200 m) between the toe of waste dump site 1 and Carat Lake;
- Optimize the offsetting impacts associated with the minimized project footprint and conformity with the natural relief in the immediate area; and
- Minimize haul distances.

The layout in Drawing 1CT004.06-M1 has been adjusted slightly from the version presented in Technical Memorandum D (SRK 2003e) and during the FEIS hearings in January 2004, for water management reasons. In particular, the following minor changes to the layout have been made:

- The overburden will be stored at waste dump site 2 (previously it was in a waste dump upslope of waste dump site 1). Drainage from the waste dump site 2 will initially flow to a sump (Sump B) in the open pit and subsequently to Pond B. In either case, since collector ditches are not needed for waste dump site 2, collector ditch construction can be deferred until waste deposition commences at waste dump site 1. Since the initial waste rock production will be needed for project development, access and overburden containment, waste rock disposal at waste dump site 1 is scheduled to occur well subsequent to the commencement of overburden deposition at waste dump site 2.
- The location of waste dump site 1 has been shifted slightly upslope so that it now coalesces with the previous location of the overburden dump. In the event that seepage water quality from waste dump site 1 requires the construction of Pond A, this location change will enable Pond A to move upslope, thereby increasing the buffer between it and Carat Lake and making it easier to direct seepage from Pond A to the open pit at closure.

4.2 Foundation Conditions

4.2.1 General

Technical Memorandum A (SRK 2003b) contains the results of surficial geological mapping undertaken using aerial photographs and the logs of relevant drill holes (Thurber 2003). The portion of the surficial geology map and drill hole locations in the vicinity of the dumps and stockpiles are shown in Drawing 1CT004.06-M2.

4.2.2 Waste Dump Site 1

The following boreholes were completed in the immediate vicinity of waste dump site 1:

- Two core holes boreholes completed under the supervision of BGC (1996) near its south and west limit (96-BGC-10 and 96-BGC-15);
- One core hole in 2000, logged by Tahera, near its west limit (SRK Geotech Hole #1); and
- One core hole completed under the supervision of SRK in August 2003 (BH-03-02).

The drilling results and the surficial geological mapping indicate that the foundation conditions at waste dump site 1 consist of bedrock with isolated soil deposits. The soil deposits typically range in thickness from 0 to 3.2m and consist of granular colluvial soils or till with, in some locations, a thin veneer of organic soil. The site is underlain by permafrost (Technical Memorandum B, SRK 2003f).

A series of ephemeral streams flow across the dump site to Carat Lake. In general, these streams occupy broad zones over which the water flows very slowly in the spring and early summer. Grassy vegetation is commonly associated with these streams.

4.2.3 Waste Dump Site 2 and Low Grade Stockpile

Based on site reconnaissance and surficial geological mapping, the foundation conditions at waste dump site 2 and the low grade stockpiles consist primarily of bedrock. The mapping indicates a deposit of till is present at the south edge of waste dump site 2. Local permafrost data (Technical Memorandum B, SRK 2003f) indicates that both these sites are underlain by permafrost.

4.2.4 Coarse PK Stockpile

Site reconnaissance and the surficial geological mapping indicate that the foundation conditions at the coarse PK stockpile consist primarily of bedrock, with till under part of the southern portion of the stockpile. A small, shallow lake with isolated, thin deposits of colluvial soil and some organics are located near the centre of the stockpile. Local permafrost data (Technical Memorandum B, SRK 2003f) indicates the site is underlain by permafrost.

4.2.5 Recovery Plant Rejects

Site reconnaissance and the surficial geological mapping indicate that the foundation conditions at the recovery plant rejects stockpile consist primarily of bedrock. In the area around this stockpile, there are some till deposits and isolated deposits of organic soil. Local permafrost data (Technical Memorandum B) indicates the site is underlain by permafrost.

4.3 Dump and Stockpile Designs

4.3.1 General

The dimensions and storage capacities of the proposed dumps and stockpiles are provided in Table 4.1. Typical sections through select waste dumps and stockpiles are provided in Drawings 1CT004.06-M3 and 1CT004.06-M4.

Table 4.1: General Dimensions and Storage Capacities of the Dumps and Stockpiles

Site	Area (ha)	Approx. Crest Elev. (m)	Approx. Height (m)	Capacity (Mt)	Capacity (Mcm)
Waste Dump Site 1	37.7	520	44	13.930	7.739
Waste Dump Site 2	12.5	520	21	2.382	1.377
Low Grade Stockpile	10.6	525	19	1.722	1.013
Coarse PK Stockpile	12.7	530	15	2.166	1.313
Recovery Plant Rejects Stockpile	See note below			≤0.105	≤0.063

Note: The recovery plant rejects stockpile will be developed in stages, according to the actual rate of recovery plant rejects production.

In accordance with the EIS, the slopes on most dumps and all stockpiles will be benched, with each bench corresponding to a single lift of material (the internal and upstream slopes on waste dump site 1 are the exception, as discussed in section 4.3.2). The thickness of each lift is expected to be approximately 10 m, but depending on the projected height of the structure and the number of benches, the lift thickness may be modified in order to develop relatively uniform bench heights. Similarly, as part of final design, the width of each bench will be optimized in order to develop an overall slope of about 2.6H:1V (21 degrees). During the LOM, the slopes between benches will correspond to the angle of repose of the dump or stockpile material, which is expected to be about 1.4H:1V (35 degrees) for waste rock and 1.5H:1V (33 degrees) for unprocessed kimberlite ore and coarse PK.

Further information regarding each dump and stockpile is provided below. The slope stability assessments and construction methodology are provided in Sections 4.4 and 5.2, respectively.

4.3.2 Waste Dump Site 1

The overall slopes at this waste dump will be about 2.6H:1V (21 degrees), as described in Section 4.3.1, except for internal slopes during the course of dump development and those along the east side of the dump where the slopes will be equal to the angle of repose or approximately 1.4H:1V (35

degrees). This deviation is based on how the dumps will be constructed and the fact that the ground along the east side of the dump toe is rising, which is favourable to dump stability.
Based on these slopes, waste dump site 1 at a crest elevation of 520 m has the capacity to store about all of the waste rock. However, some of the remaining waste rock will be used at waste dump site 2 for confinement of the overburden.

4.3.3 Waste Dump Site 2

Waste dump site 2 will be used primarily to store soil, most of which will be frozen when it reports to the overburden stockpile. Some portion of the overburden stockpile is likely to thaw during the summer months and may require confinement at the dump perimeter. As a consequence, the design of the overburden stockpile is based on the assumption that waste rock will be used at the dump perimeter to provide confinement to the soils in the event they thaw and show a propensity to slump or "run." For planning purposes, it has been assumed that a waste rock buttress will be constructed around the overburden soils using centreline construction methods. The overall downstream slopes on the waste rock would be about 2.6H:1V (21 degrees).

Some of the overburden at waste dump site 2 may be used in conjunction with the mine closure activities.

4.3.4 Low Grade and Coarse PK Stockpiles

The overall slopes at these stockpiles will be about 2.6H:1V (21 degrees), though the bench angles are expected to be about 1.5H:1V (33 degrees).

The low grade stockpile and coarse PK stockpile have slight excess capacity at the specified elevations, 525 and 530 m, respectively.

If economically feasible, the low grade ore may be processed, in which case the low grade stockpile would not exist at closure.

4.3.5 Recovery Plant Rejects Stockpile

The recovery plant rejects represent 4% or less of the total PK generated during the LOM. As noted in Technical Memorandum H, the recovery plant rejects will be placed on a lined pad or in a location that drains naturally to the PKCA in order to address the potential for deleterious water quality from this material (Drawing 1CT004.06-M4). The pad will occupy an area of about 40 m by 40 m, at the location shown in Drawings 1CT004.06-M1 and 1CT004.06-M4).

The foundation pad will be comprised of compacted granitic waste rock, appropriately graded, overlying a bedrock foundation. A high density polyethylene (HDPE) geomembrane, bedded on either side with esker sand, will be installed above the pad. In addition, a seepage collection system will be constructed above the liner in order to capture and test any leachate. Side slopes on the stacked recovery plant rejects are likely to be approximately 1.5H:1V (33 degrees).

Following evaluation of diamond recovery and geochemical characterization of the solids, the recovery plant rejects will, on a staged basis, be either moved to the coarse PK stockpile (if testing indicates there are no ARD/ML concerns) or blended thoroughly with the coarse PK using conveyors and plant equipment (if testing indicates blending with coarse PK is required to minimize ARD/ML concerns).

4.4 Stability Analysis

4.4.1 General

The stability of the waste dumps and stockpiles has been considered in an overall context based on the generally favourable foundation conditions, moderate slope angles and low seismic risk. Stability analyses have been undertaken for the following two structures:

- Waste dump site 1, which at a height of approximately 44 m, will be the highest structure; and
- Low grade stockpile, which at a height of 20 m, is the highest kimberlite structure. I It was analysed because it might develop an elevated phreatic surface if the kimberlite is not processed and weathering of the kimberlite produces significant fines.

4.4.2 Stability Criteria

A typical example of minimum factors of safety for waste rock dumps is provided in Table 4.2, the source of which is the guidelines published by the BC Mine Waste Rock Pile Research Committee in 1991.

The earthquake with a 475-year return period is usually selected for use in stability analyses associated with operations. However, proposed changes to the National Building Code of Canada will recommend the 475-year earthquake be replaced by the earthquake with a 2,475-year return period. Although these changes are not scheduled to take effect until 2005, both earthquake events have been considered in the stability analyses.

It is common to select a larger but less frequent earthquake for purposes of closure. The selection is usually based on the consequences of failure. Given the size, design, failure mechanisms and setting of the proposed waste dumps and stockpiles at Jericho, the consequence category is likely to be low. Assuming this to be the case, the maximum design earthquake for closure is assumed to be the same as the maximum design earthquake for operations.

Table 4.2: Interim Guidelines for Minimum Design Factor of Safety – Waste Rock Dumps

Stability Condition	Case A – more severe	Case B – less severe
Stability of Dump Surface		
Short term (active)	1.0	1.0
Long term (closure)	1.2	1.1
Overall stability (deep-seated)		
Short term (active)	1.3 - 1.5	1.1 - 1.3
Long term (closure)	1.5	1.3
Pseudo-static	1.1 - 1.3	1.0
Case A: Low level of confidence in critical analysis parameters Possibly unconservative interpretation of conditions, assumptions Severe consequences of failure Simplified stability analysis method (charts, method of slices) Stability analysis method poorly simulates physical conditions Poor understanding of potential failure mechanism(s)		
Case B: High level of confidence in critical analysis parameters Conservative interpretation of conditions, assumptions Minimal consequences of failure Rigorous stability analysis method Stability analysis method simulates physical conditions well High level of confidence in critical failure mechanism(s)		

4.4.3 Failure Modes

Given the granular nature of the materials present in the waste dumps and stockpiles, the potential failure surfaces are likely to be relatively shallow and sub-parallel to the slope face. However, a circular, deep-seated failure could potentially occur, particularly in the event the kimberlite in the low grade stockpile was to weather and produce a significant quantity of silt or clay-size fines.

The frozen foundation layer that is required, for geochemical reasons, in the base of the low grade and coarse PK stockpiles and preferred, to the extent practical, in the base of the waste rock dumps is not required for dump stability. Frozen foundation conditions will enhance the dump stability but for purposes of these stability analyses, the foundations were assumed to be unfrozen.

4.4.4 Method of Analysis

The slope stability analyses were performed using 2-dimensional limit equilibrium analyses and the computer program SLOPE/W, which was developed by GEO-SLOPE International. Factors of safety for the various stability cases were determined using the Bishop method of analysis.

4.4.5 Geometry and Input Parameters

The highest sections of the north faces of waste dump site 1 and the low grade stockpile have been analysed. Input parameters have been selected based on judgment and are believed to be at or below typical mean values for the respective material (Table 4.3).

Table 4.3: Input Parameters used in the Stability Analyses

Parameter Kimberlite	Moist Unit Weight (kN/m^3)	Effective Strength Parameters		Water Table	Earthquake for Pseudo-Static Assessment
		c (kPa)	phi (degrees)		
Waste rock	20	0 to 10	39	Low in dump	0.013 and 0.06
Kimberlite	20	0 to 10	30	Elevated in pile	
Till	22	5	32	In dump	
Bedrock	Failure surface prevented from intersecting the bedrock				

The water tables used in the analyses are illustrated in Attachment B. In the case of the waste dump, the water table is assumed to be situated at a low level in the dump due to the expected porosity and durability of the granite and granodiorite waste rock. For purposes of the analysis, the water table in the low grade stockpile is assumed to be elevated due to the potential development of fines from kimberlite weathering.

The earthquakes with 475 and 2,475-year return periods coincide with peak ground accelerations of 0.013g and 0.06g, respectively. Further details regarding the earthquake hazard and peak ground acceleration are provided in Technical Memorandum A (SRK 2003b).

4.4.6 Results of Analysis

The results of the stability analyses for waste dump site 1 and the low grade stockpile are summarized in Tables 4.4 and 4.5, respectively. The detailed results of the stability analyses and graphical output are provided in Attachment B.

The minimum allowable factors of safety have been based on Case B in Table 4.2 for the following reasons:

- Conservative assumptions have been used in the analyses
- The consequences of failure are minimal as they do not involve loss of life or large scale environmental impacts
- The potential failure modes are relatively simple and are well suited to the analytical methods that have been used.

The factor of safety at the dump face is based on a simple infinite slope analysis. Since the material is end dumped, the dump slope will conform to the angle of repose, which in the absence of a water table, means that the dump face has a factor of safety of about 1. At closure, the slope face will be graded to a uniform slope of 18° (3H:1V).

Table 4.4: Summary of Critical Factors of Safety for Waste Dump Site 1

Stability Condition	Suggested Minimum FOS	Calculated Factor of Safety (FOS)	Comments
Dump Surface			
Short Term	1.0	1.0	Bench face, at angle of repose
Long Term	1.1	2.1	Slope graded to 18° for closure
Deep Seated			
Short Term	to 1.3	2.2	Till foundation
Long Term	1.3	2.2	Till foundation, (no change to water table)
Pseudo-static	1.0	2.0	Till foundation, acceleration = 0.013g
Pseudo-static	1.0	1.7	Till foundation, acceleration = 0.06g

Both till and bedrock foundations were considered. The till foundation results were slightly more critical at waste dump site 1 and are reported in Table 4.4. At the low grade stockpile, the bedrock foundation results were slightly more critical.

Table 4.5: Summary of Critical Factors of Safety for Low Grade Stockpile

Stability Condition	Suggested Minimum FOS	Calculated Factor of Safety (FOS)	Comments
Dump Surface			
Short Term	1.0	1.0	Bench face, at angle of repose
Long Term	1.1	1.5	Slope graded to 21° for closure
Deep Seated			
Short Term	to 1.3	>1.6	Bedrock foundation (low water; not run)
Long Term	1.3	1.6	Bedrock foundation, elevated water table
Pseudo-static	1.0	1.5	Bedrock foundation, acceleration = 0.013g
Pseudo-static	1.0	1.3	Bedrock foundation, acceleration = 0.06g

4.4.7 Conclusions

The results of the stability analyses for waste dump site 1 and the low grade stockpile demonstrate that, even with the use of relatively conservative input parameters, the calculated factors of safety exceed the minimum allowable values by significant margins.

5 Control Measures - Construction and Operations

This section describes the measures that will be implemented to minimize environmental impacts associated with mining and the construction and operation of the dumps and stockpiles.

5.1 Mine Operations related to Ammonia Management

Use of explosives in all aspects of the mining operation will be closely managed to reduce nitrogen loss to the waste rock to the greatest practical extent. Details on the measures to minimize loss of nutrients resulting from poor storage and handling techniques, wet conditions in the pit, and overblasting are presented in AMEC 2004a.

Wet holes have been identified as one of the primary causes of explosives loss to waste rock due to the soluble nature of the bulk ANFO. The potential for wet-holes at Jericho is considered to be low due to the land-based nature of this pit and the presence of permafrost throughout the pit. However, even though the pit area is assumed to be dry, contingency measures will be available to ensure that any wet holes are charged using appropriate methods for minimizing nitrogen losses.

Several approaches are available to be taken to ensure proper and complete explosive detonation. One way is to attempt to dewater the hole using a down hole dewatering pump and truck so that a poly borehole liner can be lowered into the hole and ANFO poured inside the bag. Another and progressively more costly alternative is to use a water resistant slurry or emulsion that is manufactured onsite and this is pumped directly into a wet borehole. Finally, and potentially the most expensive alternative, is to use a pre-packaged water-resistant emulsion product lowered directly into a wet hole.

In the initial stage of the development, a precautionary approach will be taken to ensure appropriate means of handling wet holes are available, with a minimum amount of infrastructure until the potential for wet holes can be more accurately evaluated. On this basis, the wet-hole contingency in year 1 will consist of having up to 10% or 90,000 kg of packaged emulsion (water resistant) product available for use on site. The use of this product will be determined by the blaster at the time of blast pattern loading. Should additional packaged product be required as a result of the number of wet holes exceeding 10% through out the first year the product can be supplied and air freighted to site with minimal delay.

In the case that ANFO is loaded into a wet borehole inadvertently and an incomplete detonation of the product occurs, it is likely that an orange colored smoke plume would be observed rising from the affected area. The blaster is required by the regulations to make an inspection of the blasted area, make note of the suspect blast hole and mark its location with flagging. Material considered undetonated or high in ANFO residue would be selectively excavated and hauled to a central core area of the waste dump to be placed in thin lifts to enhance rapid freezing to encapsulate this material.

The percentage of wet holes encountered during the first year of operations will be used as a basis for determining the optimal means of dealing with wet holes during subsequent years when production rates increase. If the net wet hole requirements remain below 10% then hole dewatering may become the primary method of explosives loading during the summer months and packaged product may be used in the winter. In the unlikely event that the wet hole requirement increases above 10%, a bulk manufactured water resistant emulsion may be considered that would almost entirely eliminate the water solubility and contamination issue associated with ANFO in the blasting process. However the costs of this alternative would have to justify this adjustment based on actual field analysis.

Blasting practices would adhere to the highest industry standard under control of the experienced explosive supply and delivery contractor. The role of the blaster is to ensure that the correct explosive product is placed in the hole and adequately documented. The Tahera mine management personnel would play an important role on following up with compliance to the operating practices as well as maintaining the most efficient utilization of the products available.

5.2 Construction and Operation of Waste Dumps and Stockpiles

5.2.1 Waste Dump Site 1

The proposed procedures for the construction of waste dump 1 are illustrated schematically on Drawing 1CT004.06-M5. Waste rock will be hauled to the dump using off-road mine trucks on all-weather mine access roads. At the dump, the waste rock will be end-dumped and spread with a dozer to make a flat surface for the mine trucks to drive on. Dump development will occur in approximately three main stages, with the initial stage starting at the upstream or southeast limit of the dump (Drawing 1CT004.06-G11) and the final stage ending at the downstream or west limit of the dump. Further information regarding the general procedures proposed for the construction of waste dump site 1 is provided below:

- To the extent possible, a frozen foundation layer will be developed at the base of each waste dump stage by placing a blanket of granitic waste rock over the tundra during the winter months. However, as a minimum, a frozen berm will be developed at the toe of each dump stage. Collector ditches, either interim or permanent, will be established downstream of each frozen toe berm.

- As noted above, the initial stage of dump construction will commence at the southeast limit of the dump site. The dump will be advanced as a single lift towards the north and west stage limits. Dump slopes during this and the intermediate stage(s) of construction will be angle of repose over the full lift height. However, the slopes will be monitored by mine staff and depending on their performance, the use of smaller, multiple lifts may be required.

- The surface of the dump will be inclined to direct runoff water off the dump.

- If any potentially reactive rock units are encountered during mining, it should be possible to encapsulate these below the active layer of the dumps where, over time, they will freeze.

- The final dump face will be constructed during the last construction stage, currently envisaged as stage 3. Multiple lifts will be used in this stage to develop the relatively flat downstream slopes described previously.

5.2.2 Waste Dump Site 2

Waste rock and overburden will be hauled to waste dump site 2 using off-road mine trucks on all-weather mine access roads over a two-year period (Years 1 and 2).

To the extent possible, a frozen berm will be developed inside the downstream toe of the waste rock buttress. As a minimum, a blanket of granitic waste rock will be placed over the tundra within the footprint of the final waste rock buttress.

The waste rock buttress will be constructed using centreline construction methods and staged in a way that accounts for the demand for waste rock in Year 1 due to project development requirements, such as access roads and foundation pads. However, to the extent that buttress construction lags somewhat in Year 1, it is noteworthy that sediment which potentially escapes waste dump site 2 will report to the Pond B and/or the open pit. By the end of year 1, there will be an ample supply of waste rock to meet the buttress requirements.

The waste rock will be placed by end dumping and spread with a dozer. It is likely that equipment will be able to traffic on the overburden during the winter while it is frozen. During the summer, it is unlikely that equipment will be able to traffic on thawed overburden until it has adequately drained. There will be periods, therefore, when haul trucks will have to dump from either high ground or the waste rock buttress.

5.2.3 Low Grade and Coarse PK Stockpiles

Low grade kimberlite will be hauled to its stockpile using off-road mine trucks on all-weather mine access roads. The coarse PK will be hauled to its stockpile using a loader or small haul truck. The low grade and coarse PK stockpiles will be developed over four and nine-year periods, respectively, based on the following procedures:

- A granitic waste rock pad will be placed over the tundra to provide physical separation between the organic soils and the stockpile material.

- To the extent practical, this granitic pad will be placed in winter when the tundra is frozen, in order to develop a frozen foundation layer. In addition, where this occurs, the placement of the low grade kimberlite and the coarse PK will be managed to lock in the frozen conditions within the foundation layer.

5.2.4 Recovery Plant Rejects Stockpile

The foundation pad will be constructed using conventional construction equipment. Once constructed, recovery plant rejects will be hauled to the stockpile using a loader or small haul truck. The schedule will be dictated by the processing plant but is expected to occur over an eight-year period.

Based on the small area of this stockpile, the recovery plant rejects will, on a staged basis, be either moved to the coarse PK stockpile or blended thoroughly with the coarse PK using conveyors and plant equipment.

The need for continued use of the recovery plant rejects stockpile will be evaluated during the early stages of plant operation. Depending on the results of evaluations of diamond recovery and geochemical characterization of the solids, a more efficient means of handling the recovery plant rejects may be implemented.

5.3 Water Management related to the Waste Dumps and Stockpiles

The following section is a summary of the site water management as it applies to the various waste dumps and stockpiles proposed for the project.

5.3.1 Existing Pond at the Coarse PK Stockpile

The small, shallow pond within the footprint of the coarse PK stockpile will act as a sump during the initial placement of coarse PK. The pond will be progressively pumped out until such time that the coarse PK placement leads to the required relocation of the pumping system to Pond C. Thereafter, water which does not freeze within the base of the dump will seep out and be handled at Pond C. Water which reports to Pond C will he handled in accordance with Section 5.3.3.

5.3.2 Collector Ditches

The dumps and stockpiles will be graded and incorporate a series of ditches to direct local runoff towards the open pit and/or towards collection ponds. Collector ditches will also be located below (downhill of) the facilities. Preliminary ditch locations are shown on Drawing 1CT004.06-W1 and typical details are shown on Drawings 1CT004.06-W4 and 1CT004.06-W5. Site surveys will be carried out to determine final alignments in conjunction with the final design of all site facilities. The ditches will be designed for peak flows from a 200-year event. Design flows will typically be in the range of 0.2 to 0.4 m^3/s depending on the local catchment area. Ditches will generally be located on the upslope side of local access and haul roads and so will have capacities well in excess of the 200-year flows. Excavated cut sections of ditch will be avoided as much as possible so as to minimize potential impacts on permafrost conditions. Erosion protection will be provided as required. Any suspended sediment generated by ditch operation will either be directed into the open pit or would be contained within the collection ponds, if constructed.

5.3.3 Collection Ponds A, B and C

If required based on observed water quality data, Collection Ponds A, B and/or C would be constructed. The locations and general arrangements of the Ponds are shown on Drawing W1. Cross sections, dimensions and details are shown on Drawings W4 and W5. The function of the ponds is as follows:

- Pond A would collect runoff and potential seepage from Waste Dump Site 1;
- Pond B would collect runoff and potential seepage from Waste Dump Site 2, including the stockpiled overburden; and,
- Pond C would collect runoff from the ore stockpiles, coarse PK area and plant site area.

The collection ponds will generally be kept nearly empty and operated at minimum storage volumes to ensure storage availability in the event of significant rainfall or snowmelt runoff. Water quality within the ponds will be monitored. In addition, sediment accumulation within the ponds will be monitored and deposited sediment removed as required to maintain required storage volumes. Subject to geochemical testing, the excavated sediment will be deposited on the beach area of the PKCA.

6 Closure and Reclamation

Details on closure and reclamation of the waste rock dumps, Coarse PK Stockpile and Low Grade Ore Stockpile are presented in the "*Abandonment and Restoration Plan, Jericho Diamond Project*", (AMEC 2004b).

The target end land use for these areas will be wildlife habitat. Therefore, the aim of the reclamation plan is to promote, to the extent practical, rehabilitation of the land to this use. Key elements of the plan are as follows:

- Vegetation prescriptions will be developed and tested based on the pre-disturbance ecological zones where the disturbed areas are located. The aim will be to provide soil conditions similar to pre-disturbance conditions and to the extent possible, revegetate or encourage native species at the site similar to those that occurred prior to disturbance. Reclamation trials will be completed throughout the mine life to determine what reclamation prescriptions are most likely to be successful in the Jericho Project area.

- Following the open pit mining phase, the dumps and stockpiles will be re-graded to a slope of 3H:1V (18°) or less to ensure long-term stability and improve access to wildlife. Top surfaces will be compacted from traffic use and will be ripped or scarified to loosen the surface and provide microhabitat for plants. Where required, overburden or waste rock will be placed on the Coarse PK Stockpile to prevent erosion and dusting.

- If vegetation trials indicate there is potential for successful re-vegetation of the piles, salvaged soil will be placed on the top or flat surface of the dump to a depth of up to 0.3 m. This soil will be fertilized and seeded. The side slopes, which are expected to be comprised of coarse rock with low moisture retention capability, will remain uncovered to avoid the potential for erosion of fine cover materials.

- Consideration will be given to placement of boulders on the dump top surfaces to provide perches for raptors. Ramps will be built into side slopes to allow safe caribou transit across the dump slopes.

- Drainage from the dumps and stockpiles will be directed into the open pit to increase the rate of filling, and allow sufficient time for further flushing and degradation of any residual blasting products. Depending on the water quality once the pit reaches its spill point, water from the Stream C1 diversion will either be returned to the pit and allowed to discharge via the original Stream C1 channel into Carat Lake, or the Stream C1 diversion will be maintained, and water will be directed through a second channel constructed between the open pit and Carat Lake.

7 Water Quality Estimates

7.1 Operations

Estimates of source concentrations for seepage and discharges from each of the mine components were made to support the assessment of potential impacts on surface water quality and aquatic resources for the Jericho project. Technical Memorandum I (SRK 2003c) presents information on the sources of data used in the estimates, the calculation methods, the approach used to narrow the range of predictions, and the proposed estimated source concentrations for each of the mine components.

Estimates of total dissolved salts (TDS), dissolved metals, total metals, and nutrients from blasting residues were presented for each of the storage areas discussed in this document, discharges from the processing plant, and runoff from the PKCA. Nutrients from sewage were estimated based on information provided by the waste water treatment plant supplier. Estimates of TDS, nutrient and metal concentrations for the other mine site components, including runoff in the open pit, fine PK supernatant, ground ice, and runoff from disturbed areas of the site were also discussed.

The only changes to the storage area designs that could be expected to change the earlier estimates of source concentrations are changes to size or the mass of rock contained in the piles. Consolidation of Waste Dump 1 with the Overburden Pile in the final design resulted in insignificant changes to the combined footprint of these two facilities. Therefore, the changes have a negligible influence on the current set of estimates, and the original source concentrations estimates (Table 7.1) for these areas were not adjusted.

During the final EIS hearings in January 2004, concentration estimates for individual components of the total dissolved solids (TDS) were requested. These were presented for each of the major site components in Technical Memorandum I, but were not included in the original summary table, nor used in the estimates of discharge water quality. The estimated concentrations for each of the major ions are presented in Table 7.2. It should be noted that the estimates for kimberlite ore, low-grade ore and coarse processed kimberlite may be strongly influenced by the use of calcium chloride salt during bulk sample extraction and drilling, which had lead to potential overestimation of chloride, calcium, and possibly magnesium (due to ion exchange reactions) in these estimates. Experience at the Ekati Diamond Mine™ has indicated that actual chloride concentrations in seepage from these materials are significantly less than indicated by the Jericho testing. Therefore, these estimates should be viewed as providing a conservative upper bound on concentrations.

Table 7.1: Summary of Source Concentration Estimates (from Technical Memorandum I, SRK 2003c)

Source		Physical		Nutrients				Dissolved Metals										
		TDS	TSS	NH4-N	NO3-N	NO2-N	P	Al	As	Cd	Cr	Cu	Fe	Pb	Mo	Ni	U	Zn
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Carat Lake Water		11	1.4	0.009	0.18	0.001	0.0077	0.021	0.0001	0.00005	0.00005	0.0024	0.014	0.00005	0.00005	0.0004	0.00005	0.002
Sewage Water		11	10	10	30	1	1	0.021	0.0001	0.00005	0.00005	0.0024	0.014	0.00005	0.00005	0.0004	0.00005	0.002
Runoff Undisturbed Areas		24	3	0.007	0.041	0.001	0.01	0.085	0.0010	0.00005	0.00050	0.0028	0.18	0.0010	0.001	0.0050	0.00098	0.005
Runoff Disturbed Areas		180	3	0.007	0.041	0.001	0.01	0.085	0.0010	0.00005	0.00050	0.0040	0.18	0.0010	0.003	0.005	0.27	0.005
Pit Runoff (sump)		202	10	4.8	12	0.34	0.01	0.085	0.0010	0.00017	0.00073	0.0110	0.18	0.0010	0.010	0.007	0.049	0.005
Plant Runoff		180	3	2.9	7.3	0.21	0.01	0.085	0.0010	0.00005	0.00050	0.004	0.18	0.00100	0.0025	0.005	0.27	0.005
Waste Rock and Overburden	average	667	5	2.9	7.3	0.21	0.01	0.23	0.0016	0.0006	0.0038	0.060	0.32	0.0005	0.038	0.019	0.27	0.024
	max	1394	10	5.8	14.6	0.42	0.01	0.50	0.0031	0.0006	0.0038	0.060	1.5	0.0006	0.078	0.04	2.3	0.085
Tailings Supernatent	average	1221	10	0.08	0.2	0.01	0.01	0.052	0.0007	0.00016	0.0017	0.0025	0.01	0.00070	0.0067	0.026	0.00006	0.012
	max	2570	10	0.17	0.4	0.01	0.01	0.31	0.0010	0.0005	0.005	0.0040	0.02	0.0012	0.014	0.11	0.00012	0.021
Kimberlite Ore and LGO Stockpiles	average	4737	10	1.5	3.7	0.10	0.01	0.018	0.0035	0.0033	0.0025	0.0025	0.21	0.0007	0.15	0.16	0.016	0.024
	max	6206	10	2.9	7.3	0.21	0.01	0.019	0.0058	0.0041	0.0054	0.0040	0.60	0.0012	0.27	0.17	0.033	0.036
Coarse Kimberlite Stockpile	average	4395	10	3.30	8.3	0.24	0.01	0.019	0.0035	0.0042	0.0025	0.0025	0.21	0.0007	0.72	0.16	0.080	0.024
	max	6410	10	6.61	16.5	0.47	0.01	0.020	0.0058	0.0072	0.0054	0.0040	0.60	0.0012	1.30	0.16	0.16	0.036
Groundwater to Pit		2388	10	17.40	24.2	5.10	0.006	6.9	0.0010	0.0012	0.7970	0.0730	24.50	0.0300	0.00	1.62	0.27	0.24

Source		Total Metals										
		Al	As	Cd	Cr	Cu	Fe	Pb	Mo	Ni	U	Zn
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Carat Lake Water		0.052	0.00016	0.00005	0.0025	0.002	0.025	0.00005	0.00005	0.0005	0.0002	0.002
Sewage Water		0.052	0.00016	0.00005	0.0025	0.002	0.025	0.00005	0.00005	0.0005	0.0002	0.002
Runoff Undisturbed Areas		0.093	0.00025	0.00005	0.0005	0.0034	0.31	0.00014	0.000065	0.00073	0.0010	0.0015
Runoff Disturbed Areas		1.63	0.00075	0.00005	0.0005	0.0056	1.19	0.0185	0.0026	0.0034	0.28	0.012
Pit Runoff (sump)		0.11	0.00037	0.00017	0.0013	0.012	0.31	0.00058	0.010	0.007	0.050	0.0053
Plant Runoff		1.63	0.00075	0.00005	0.0005	0.0056	1.19	0.0185	0.0026	0.0034	0.28	0.012
Waste Rock and Overburden	average	0.59	0.0016	0.00061	0.0058	0.064	0.75	0.0030	0.038	0.020	0.28	0.026
	max	0.87	0.0032	0.00061	0.0058	0.064	2.0	0.0031	0.078	0.041	2.3	0.087
Tailings Supernatent	average	0.45	0.00081	0.00016	0.0070	0.0029	0.19	0.0013	0.0068	0.036	0.00014	0.014
	max	2.8	0.0013	0.0005	0.033	0.0066	0.75	0.0026	0.013	0.16	0.00056	0.024
Kimberlite Ore and LGO Stockpiles	average	0.25	0.0037	0.0033	0.012	0.0031	0.64	0.0012	0.15	0.18	0.0165	0.027
	max	0.25	0.0059	0.0041	0.015	0.0045	1.0	0.0017	0.27	0.18	0.03	0.039
Coarse Kimberlite Stockpile	average	0.25	0.0037	0.0042	0.012	0.0031	0.64	0.0012	0.72	0.17	0.080	0.027
	max	0.25	0.0059	0.0072	0.015	0.0045	1.0	0.0017	1.30	0.18	0.16	0.039
Groundwater to Pit		6.9	0.0010	0.0012	0.80	0.073	25	0.030	0.0010	1.62	0.28	0.24

Table 7.2: Summary of Major Ion Estimates

Source	Note		Physical	Major Ions						
			TDS	SO4	Alk	Cl	Ca	Mg	Na	K
Carat Lake Water	1		11	1.2	4.7	3.4	2.3	0.8	2.0	2.0
Sewage Water	2		11	1.2	4.7	3.4	2.3	0.8	2.0	2.0
Runoff Undisturbed Areas	3		24	1	12	0.5	2.85	1.2	2.0	2.0
Runoff Disturbed Areas	4		180	13	31	29	29	6	4.0	2.0
Pit Runoff (sump)	6		214	50	12	68.8	36.1	31.8	8.0	8.3
Plant Runoff	7		180	12.5	31	29	29	6	4	2.0
Waste Rock and Overburden	8	average	667	188	48	109	170	82	40	30
		max	1394	549	125	196	342	88	60	35
Tailings Supernatent	9	average	1221	17	37	541	155	72	34	35
		max	2570	26	84	1300	486	113	81	77
Kimberlite Ore and LGO Stockpiles	11	average	4737	789	129	2506	269	861	37	146
		max	6206	1565	164	2731	353	1025	81	288
Coarse Kimberlite Stockpile	10	average	4395	717	100	2379	155	861	37	146
		max	6410	1019	120	3393	486	1025	81	288
Groundwater to Pit			2388	18	22	1400	673	171	23	34

Notes:
1. Source is water quality data from CL-05, Table 6.3, 1995-2000 Surface Water Quality Summary (Tahera 2003).
2. Source of TSS and nutrient data is letter and personal communications with P.J.Hannah Equipment Sales Corp describing performance of RBC treatment systems, otherwise Carat Lake water
3. Source is 2003 seepage data (average of sites WR1-1, WR1-2, WR2-1, WR2-2)
4. Used higher of 2003 baseline seepage data and 50% of the actual development waste seeps, unless this was higher than the BE overburden predictions, in which case the overburden predictions were used.
5. Overburden pile is 2/3 waste rock, therefore use waste rock values
6. Ions and metals are 20% that of the average of waste rock and kimberlite ore values, nutrients are same as waste rock
7. This will be the same as the disturbed areas value
8. Scaling Calculations
9. Source is pilot plant supernatant, except for nutrients, which are based on realistic powder use and nutrient loss for open pit mines.
10. Scaling Calculations for Coarse Kimberlite
11. Scaling Calculations for Ore (apply to both ore sources)

The source concentrations were an input to the site-wide water and load balance (Technical Memorandum F, SRK 2003g), which was used to estimate water quality at various control points, including the discharge from the site. In addition to the minor changes to the dump footprint, there have been some minor adjustments to the locations of the collection ponds, the Stream C4 diversion, the assumed discharges from the processing plant, and the proposed management of discharges during the first few years of operation. As a result, discharge water quality estimates were revised. These are presented in *"Technical Memorandum W: Site Water Management Plan"* (SRK and Clearwater 2004).

7.2 Post-Closure

In the first few years following reclamation of the overburden, waste rock, kimberlite and coarse processed kimberlite, nutrient and metal concentrations are expected to decrease as permafrost is established, readily soluble metals and nutrients are flushed from the rock, and fine particulates are washed out of major flow pathways. Some additional reduction can be expected due to the removal of the North and Central Lobe stockpiles.

As indicated in Section 6, the closure plan assumes that all discharges from the waste rock dumps and stockpiles will be directed to the open pit following cessation of the underground mining operations. Calculations from the water and load balance indicate that it will take from 15 to 20 years for the pit to fill. This will allow sufficient time for flushing and removal of any blasting residues from the active layers of the pile. Freeze back of the dumps is also expected to occur in the first few years following deposition, which will reduce the exposed surface area and therefore available loading from the rock. These processes are accounted for in the post-closure estimates of waste rock and pit lake water quality presented in Appendix B of the *"Abandonment and Restoration Plan, Jericho Diamond Project"* (AMEC 2004b). The post-closure water quality estimates indicate that concentrations of some metals could exceed CCME guidelines for freshwater aquatic life or CCME/Health Canada guidelines for drinking water.

Monitoring of seepage and runoff during operations and the post closure filling period will be needed to refine the estimates of long term water quality. If the updated estimates indicate the pit water will meet CCME guidelines for freshwater aquatic life or can be demonstrated to have negligible impacts on aquatic life, the diversion will be breached, the upper part of Stream C1 will be allowed to flow into the pit, and the pit will be allowed to spill into the original Stream C1 channel. If the revised estimates indicate the pit will not meet CCME guidelines, but could be discharged without significant impacts at the shore of Carat Lake, the water will be discharged via a constructed channel to the northeast of Stream C1. In the unlikely event that the pit water quality would be unacceptable for discharge, contingency measures such as in-pit biological treatment could be used to reduce concentrations to acceptable levels for discharge (Appendix C of the *"Abandonment and Restoration Plan, Jericho Diamond Project"* (AMEC 2004b)).

8 Verification and Monitoring Plans

8.1 Solids Geochemistry

Geochemical monitoring will be carried out to confirm the geochemical properties of the waste rock, low-grade kimberlite ore, coarse PK and fine PK.

Waste rock and low-grade kimberlite ore samples will be collected as grab samples from the muck pile produced by blasting. In the first two years of the mine operation blasting will occur approximately once per day, with approximately one blast per two days in the next two years of mining. Characterization of the waste rock should include:

- Sample collection during every week for the first year of mining, and, assuming that the testing data indicates minimal variability in the geochemistry of the waste rock, the sample frequency would be reduced to every other week for the remaining years of mining.

- Sample collection from each rock type present in the blast (i.e. granite/granodiorite, pegmatite, diabase, waste kimberlite)

- Geological description of the sample by a geologist, and general geological observations of the blasted rock, such as presence and composition of any xenoliths, occurrence of sulphide minerals etc.

- Testing of paste pH, reaction with HCl, total sulphur, and uranium on every sample. (Uranium analyses may be discontinued after the first year of testing if uniformity can be demonstrated). Full ABA analyses and ICP-metals would be performed on every 10th sample.

- Testing of a duplicate sample every 10th sample.

Coarse PK, fine PK and recovery plant reject samples will be collected once every two weeks during the first year of mining, with the frequency reduced to once per month for the remainder of operations if it can be demonstrated that there is limited variability in the data. Samples would be submitted for testing of paste pH, reactivity with HCl, and total sulphur. Full ABA analyses, ICP-metals and uranium analyses would be performed on every 5th sample.

Results of the solids characterization work would be reported in an annual seepage and waste rock monitoring report.

8.2 Ground Ice

During collection of the waste rock samples, blasted rock and freshly blasted rock faces will be examined for presence of significant quantities of ground ice. If present, the quantity of ice will be estimated, and samples of the ice lenses will be collected and submitted for water quality analyses to characterize the quality of ice melt water that would report to the pit or waste rock dumps. The frequency of sampling would depend on the amount of ice encountered, and the water quality data from the first few samples. However, based on observations from the underground development and drilling, it is considered unlikely that significant amounts of ice will be encountered.

8.3 Monitoring of Seepage and Runoff

Flows and water quality will be monitored on a monthly basis at key locations in the site water management system, including temporary or permanent collector ditches or Ponds A, B, and C, ore stockpiles and coarse PK stockpile, the pit sump(s), and other inflows to the PKCA.

An annual seepage survey will also be completed along the down-gradient side of each of the waste dumps, ore stockpiles, coarse PK stockpile, recovery plant stockpile and any sumps in the plant area to develop a better understanding of variations in source concentrations from different areas of site.

Samples would be submitted for a comprehensive suite of test parameters, including pH, conductivity, ORP, temperature, major ions, acidity, alkalinity, metals and nutrients. Standard QA/QC procedures for water sampling including collection of field, travel and method blanks as well as duplicate samples will be included in the program.

Further details on the site water monitoring program are provided in "*Site Water Management*" (SRK and Clearwater 2004).

8.4 Visual Inspections

During the active development of each of the waste dumps and stockpiles, site staff will carry out daily inspections in relation to the performance and condition of each structure, including slope stability, seepage and conformity to the development footprint. When dump activity ceases on an interim or seasonal basis, the inspection frequency will shift to monthly. Following the completion of a dump or stockpile, inspections will continue on a semi-annual basis to closure.

The water management facilities, which specifically include the collector ditches and ponds at below each dump or stockpile as well as various sumps, will be monitored by site staff on the following basis:

- Daily during the spring freshet;
- Weekly during the summer and fall
- At least once during the winter so that there is time to implement any repairs or actions that might be needed prior to freshet.

The visual inspection frequency described above should be considered the minimum acceptable level. Depending on the performance of each of these facilities, the inspection frequency may have to be increased and possibly supplemented by additional monitoring methods.

Tahera will develop a system for recording and analysing their visual observations, and will assign the responsibility to appropriate personnel for completing and analysing the results of these inspections, for maintaining written records and, where appropriate, for implementing corrective actions.

A geotechnical or civil engineer registered in Nunavut will make an annual inspection of these facilities each summer. His inspection report will be filed in a timely manner so that, if required, construction activity or modifications to these structures can be implemented prior to the next freshet.

8.5 Thermal Monitoring

Thermal monitoring is not critical to the performance of any waste dumps, stockpiles or related water management structures described in this report. However, in order to provide information that will be useful for closure planning and post-closure monitoring, thermistors will be installed in the locations described below.

At waste dump site 1, thermistors will be installed in two layers at two locations within the final stage of the dump, for a total of four thermistors cables. At both locations, the vertical separation between the “upper” and “lower” thermistors cables will be equivalent to at least one 10-m lift. Each thermistor cable will be placed in a suitably bedded ditch that extends from the target location approximately 50 m inside the dump to the dump face. All four cables will end at a monitoring shack between the toe of the dump and Pond A.

Similarly, at waste dump 2, thermistors will be installed in two layers at two locations. However an incremental set of thermistor beads will be attached to each cable so that the temperature within both waste rock buttress and the overburden can be monitored. All four cables will end at a monitoring shack adjacent to the toe of the dyke at Pond B.

At the coarse PK stockpile, thermistors will be installed in two layers at two locations within the stockpile. Like waste dump site 1, the vertical separation between the “upper” and “lower” thermistors cables at both locations will be equivalent to at least one 10-m lift. All four cables will end at a monitoring shack between the toe of the dump and Pond C.

The thermistor readings will be collected on a monthly basis for a period of two years or at least until a clear pattern has been established. Thereafter, the reading frequency can be reduced to quarterly.

9 References

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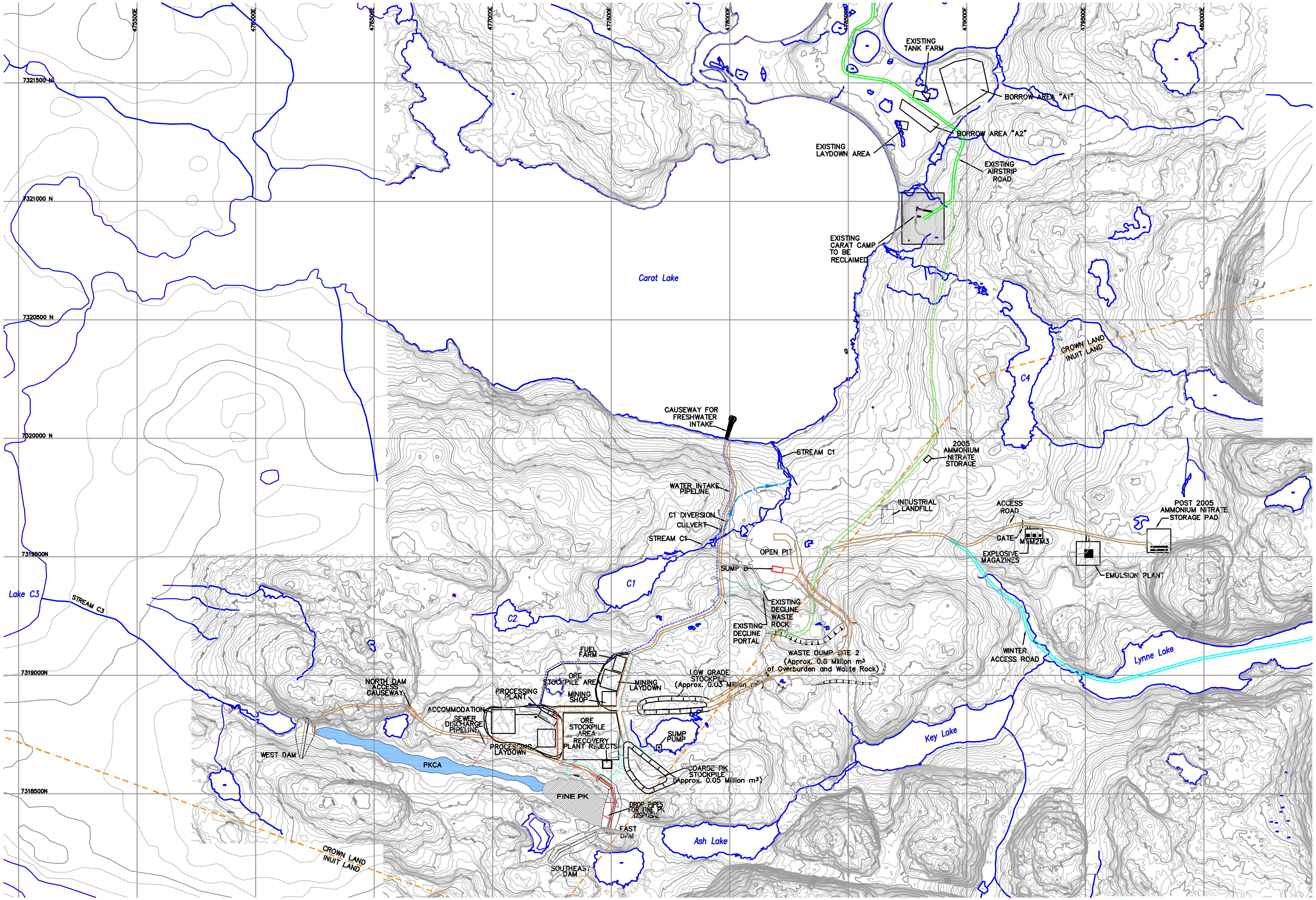
Drawings



LEGEND

- EXISTING ROAD
- EXISTING ROAD (APPROXIMATE LOCATION)
- ROAD REQUIRED BY YEAR 1
- WINTER ROAD
- FRESH WATER PIPELINE
- MINE WATER PIPELINE
- FINE PK DISCHARGE PIPELINE
- RECLAIM PIPELINE
- SEWER PIPELINE
- DITCH

NOTES:

1. LAYOUTS ARE APPROXIMATE AND MAY NOT REFLECT ACTUAL SIZE AND FOOTPRINT LOCATIONS
2. SHOULD THE GRADE OF THE LOW GRADE MATERIAL BE FAVORABLE, THIS MATERIAL MAY GET PROCESSED WHICH WOULD LEAD TO A REDUCTION IN THE SIZE OF THE STOCKPILE
3. THE EAST AND SOUTHEAST DAMS WILL, AT A MINIMUM BE CONSTRUCTED TO PROVIDE STORAGE FOR A FULL YEAR OF PKCA INFLOWS.
4. THE TIMING OF THE CONSTRUCTION AT THE NORTH DAM, AND THE COMPLETION OF OF THE EAST AND SOUTHEAST DAMS WILL BE REVIEWED ANNUALLY UNTIL THE DAMS ARE CONSTRUCTED OR OPERATIONS CEASE.
5. SUMP PUMPS SHOWN DISCHARGE TO THE PKCA.
6. THE FINAL LAYOUT OF THE C1 DIVERSION WILL BE FIELD FIT IN ORDER TO OPTIMIZE THE REQUIRMENTS FOR FISH HABITAT AND FISH PASSAGE

TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION

Date of Photography: August 5, 1995.
Scale of Photography: 1:10 000
Survey control supplied by: Canamera Geological Ltd.
Survey control based on: UTM Projection, NAD 27, Zone 12
Compiled by The ORTHOSHOP, Calgary, October 1995.
WO 7423

0 100 200 300 400 500 METRES
1:8000

DRAWING NO.	DRAWING TITLE	DRAWING NO.	
DRAWING G-9	AMMONIUM NITRATE STORAGE LAYOUT		
DRAWING G-8	BORROW AREAS PLAN & SECTION		
DRAWING G-7	TERRAIN EVALUATION MAP		
DRAWING G-6	BEDROCK GEOLOGY MAP		
DRAWING G-5	QUATERNARY GEOLOGY MAP		
DRAWING G-4	EXISTING THERMISTOR INSTALLATION PLAN	DRAWING G-14	CLOSURE CONCEPTS
DRAWING G-3	SITE INVESTIGATION MAP	DRAWING G-13	GENERAL ARRANGEMENT APRIL 2013
DRAWING G-2	SITE VICINITY MAP	DRAWING G-12	GENERAL ARRANGEMENT APRIL 2008
DRAWING G-1	PROJECT LOCATION AND DRAWING INDEX	DRAWING G-11	GENERAL ARRANGEMENT APRIL 2007

REFERENCE DRAWINGS

No.	DESCRIPTION	CHK'D	APP'D	DATE

REVISIONS

REV.	ISSUE PURPOSE	AUTH.	BY	DATE
A	WATER LICENSE APPLICATION	CCS		JULY 2004

ISSUE AUTHORIZATION

WATER LICENSE APPLICATION

SRK Consulting
Engineers and Scientists

DESIGNED BY: CCS	DRAWN BY: JM
DATE: JULY 2004	DATE: JULY 2004
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DATE: JULY 2004	DATE:
PROJ. MGR:	PROJ. ENGR.
DATE	DATE

SRK PROJECT NUMBER: 1CT004.06

Tahera Diamond Corporation

JERICHO PROJECT

GENERAL ARRANGEMENT AT END OF APRIL 2006

DRAWING NUMBER: 1CT004.06 – G10

REV. A

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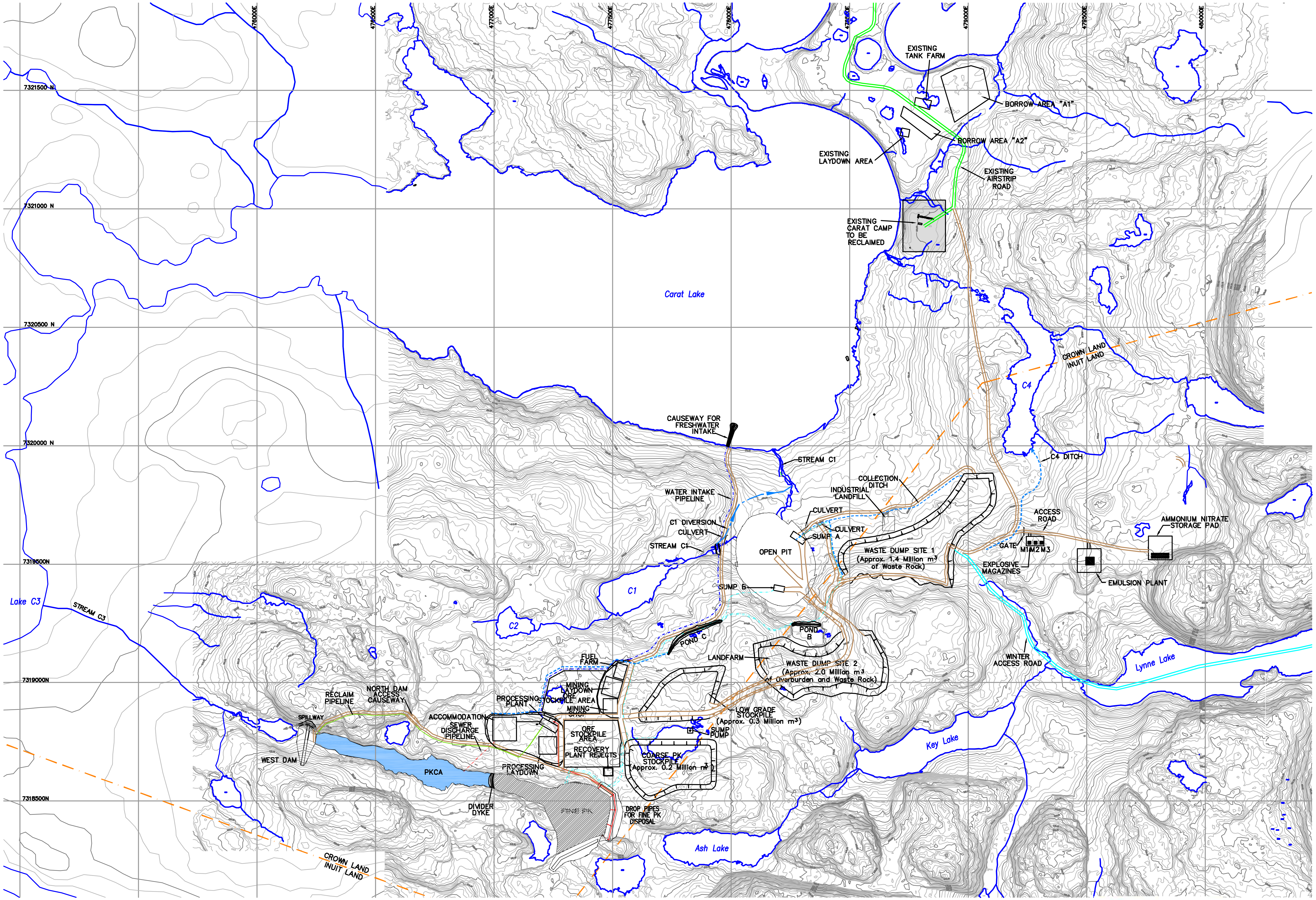

N

LEGEND

- EXISTING ROAD
- EXISTING ROAD (APPROXIMATE LOCATION)
- ROAD REQUIRED BY YEAR 2
- WINTER ROAD
- FRESH WATER PIPELINE
- MINE WATER PIPELINE
- FINE PK DISCHARGE PIPELINE
- RECLAIM PIPELINE
- SEWER PIPELINE
- PKCA DISCHARGE PIPELINE
- DITCH

NOTES:

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4. THE TIMING OF THE CONSTRUCTION OF POND B WILL BE REVIEWED ANNUALLY.
5. SUMP PUMPS SHOWN DISCHARGE TO THE PKCA.

TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION

0 100 200 300 400 500 METRES
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DRAWING NO.	DRAWING TITLE	DRAWING NO.	
DRAWING G–	AMMONIUM NITRATE STORAGE LAYOUT		
DRAWING G–8	BORROW AREAS PLAN & SECTION		
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DRAWING G–3	SITE INVESTIGATION MAP	DRAWING G–13	GENERAL ARRANGEMENT APRIL 2013
DRAWING G–2	SITE VICINITY MAP	DRAWING G–12	GENERAL ARRANGEMENT APRIL 2008
DRAWING G–1	PROJECT LOCATION AND DRAWING INDEX	DRAWING G–10	GENERAL ARRANGEMENT APRIL 2006

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SRK PROJECT NUMBER: 1CT004.06

Tahera Diamond Corporation

JERICHO PROJECT

GENERAL ARRANGEMENT AT END OF APRIL 2007

DRAWING NUMBER: 1CT004.06 – G11

REV. A

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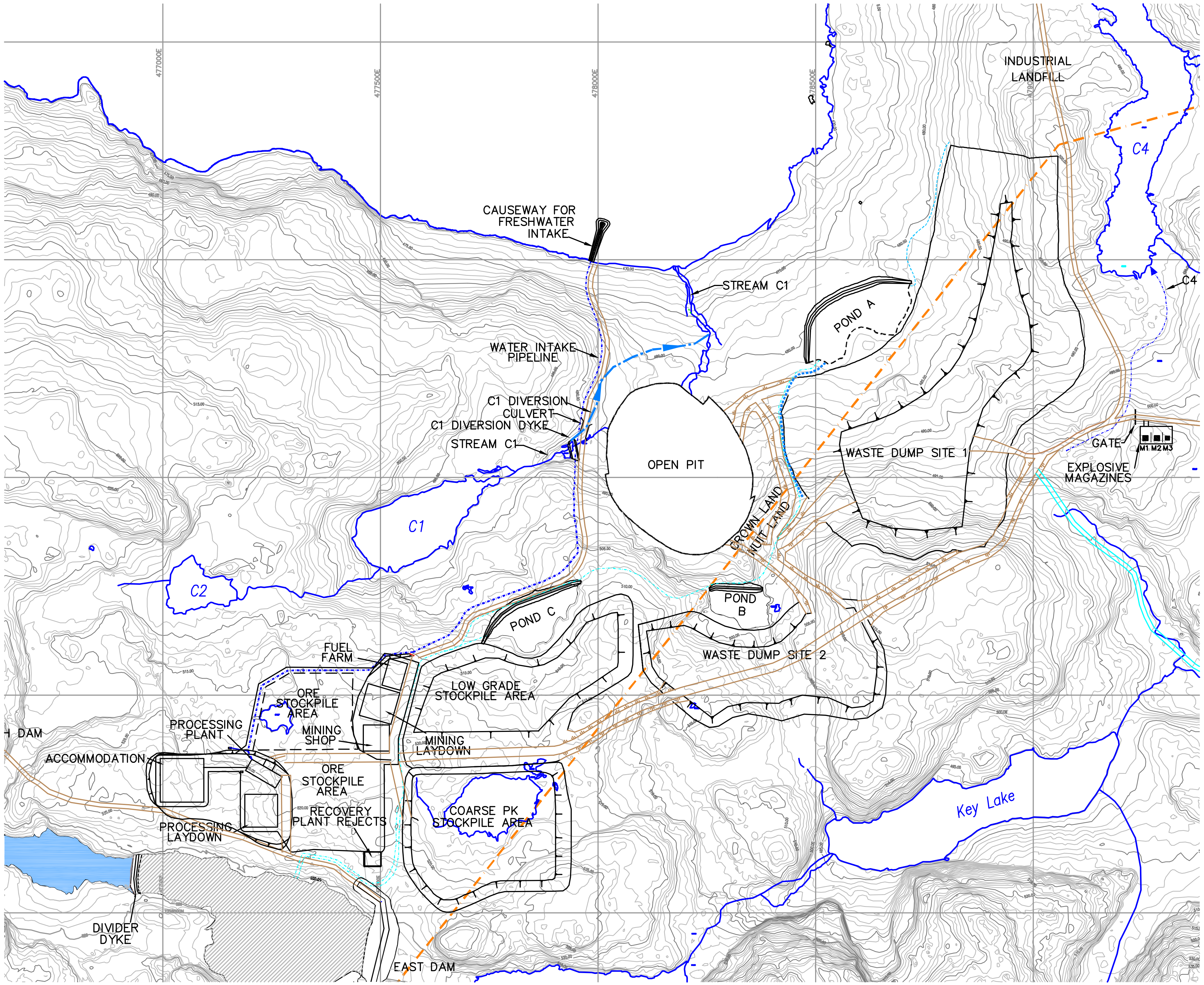

TAHERA CORPORATION
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DRAWING NO.	DRAWING TITLE
DRAWING M-5	TYPICAL CONSTRUCTION SEQUENCE
DRAWING M-4	RECOVERY PLANT REJECTS PLAN AND SECTIONS
DRAWING M-3	WASTE DUMP 1, WASTE DUMP 2, LOW GRADE STOCKPILE AND COARSE TAILINGS STOCKPILE CROSS SECTIONS AND DETAIL
DRAWING M-2	SITE INVESTIGATION AND TERRAIN MAP

REFERENCE DRAWINGS

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SRK PROJECT NUMBER: 1CT004.06

Tahera Diamond Corporation

JERICHO PROJECT

LAYOUT OF WASTE DUMPS AND STOCKPILES

DRAWING NUMBER: 1CT004.06 – M1

REV.: A

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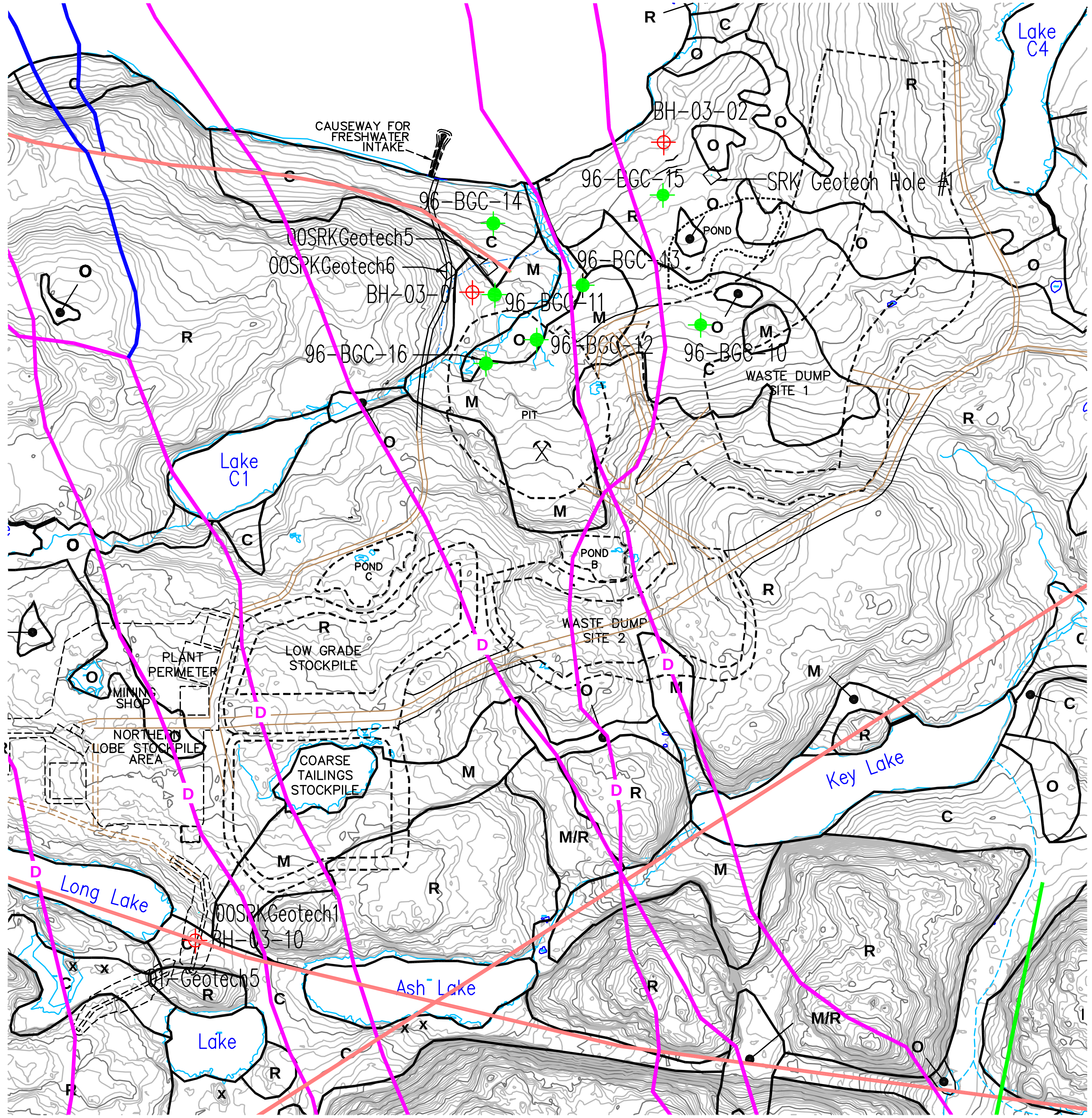

LEGEND

- BGC BOREHOLE LOCATION (1996)
- TAHERA BOREHOLE LOCATION (2000, 2001)
- SRK BOREHOLE LOCATION (2003)

Quaternary Holocene Deposits
A River and creek deposits.
C Colluvium.
O Organic deposits.
Quaternary Pleistocene Deposits
F^G Fluvioglacial sediment.
M Till. Silt, sand, gravel, cobbles and boulders.
Pre-Cambrian Bedrock
R Undifferentiated metamorphic and volcanic bedrock.

- Minor Linear Fault
- Major Linear Fault
- EW Oriented Amphibolite Dykes
- D NNW Oriented Diabase Dykes (Mackenzie)
- Less Magnetic Dykes with Variable Orientation

TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION

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DRAWING NO.	DRAWING TITLE
DRAWING M-5	TYPICAL CONSTRUCTION SEQUENCE
DRAWING M-4	RECOVERY PLANT REJECTS PLAN AND SECTIONS
DRAWING M-3	WASTE DUMP 1, WASTE DUMP 2, LOW GRADE STOCKPILE AND COARSE TAILINGS STOCKPILE CROSS SECTIONS AND DETAILS
DRAWING M-1	LAYOUT OF WASTE DUMPS AND STOCKPILES

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Tahera Diamond Corporation

JERICHO PROJECT

SITE INVESTIGATION AND TERRAIN MAP

DRAWING NUMBER
1CT004.06 – M2

REV.
A

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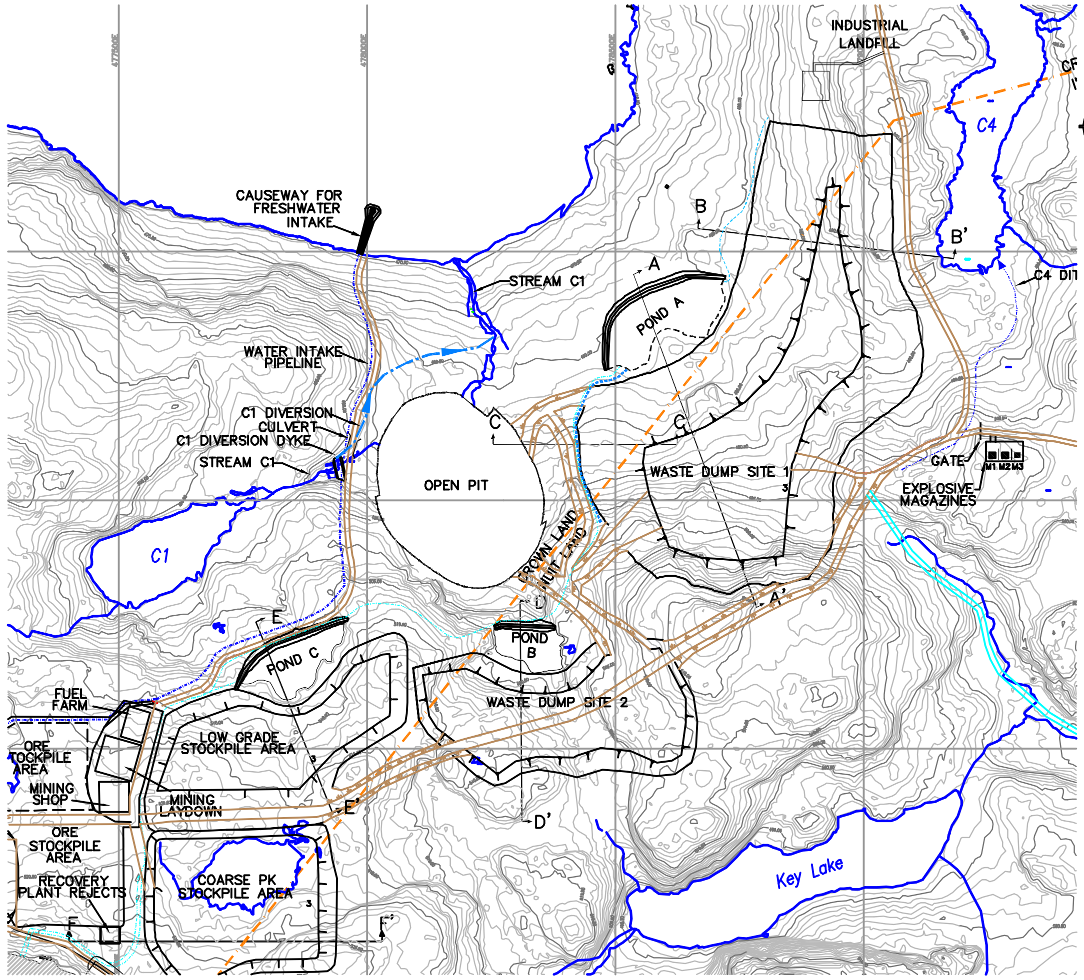

TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION

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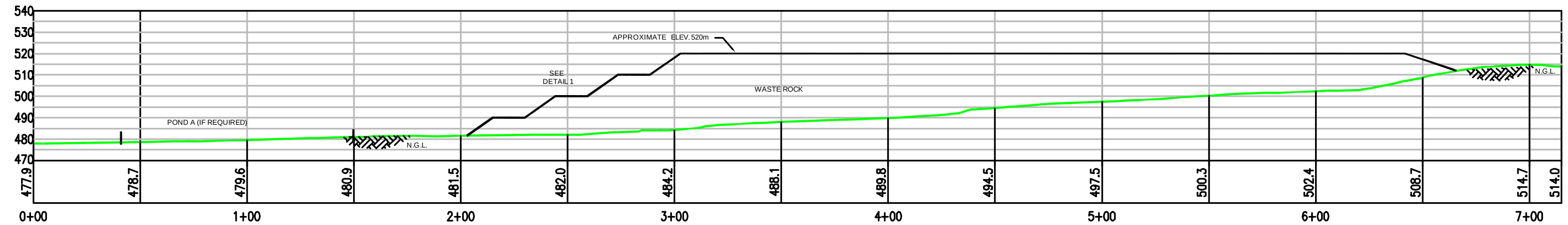

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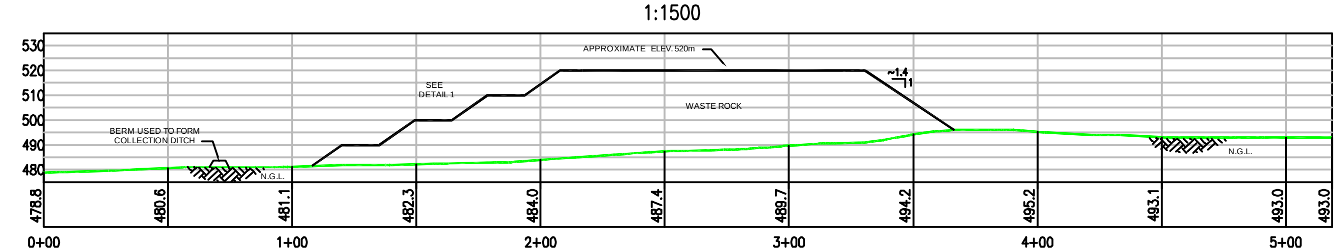

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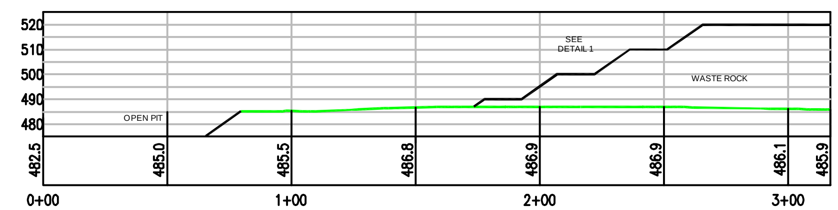

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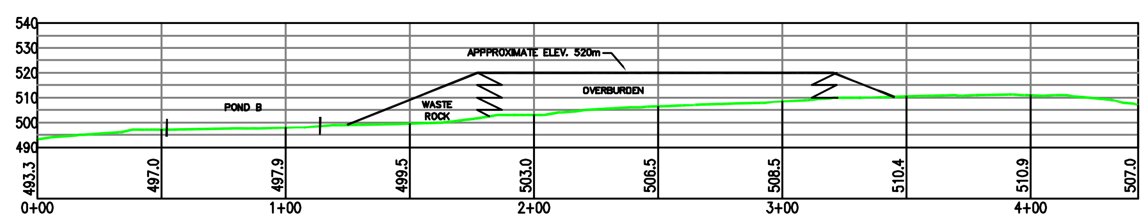

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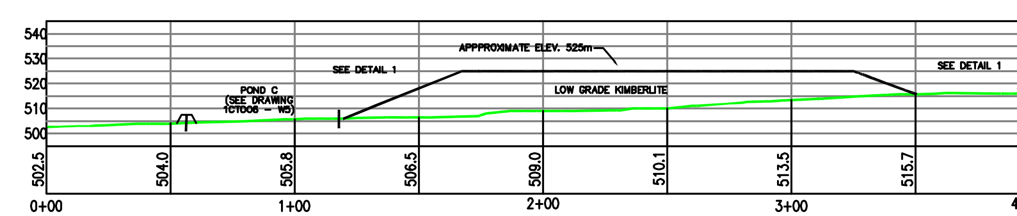

SECTION E – E' (LOW GRADE STOCKPILE)
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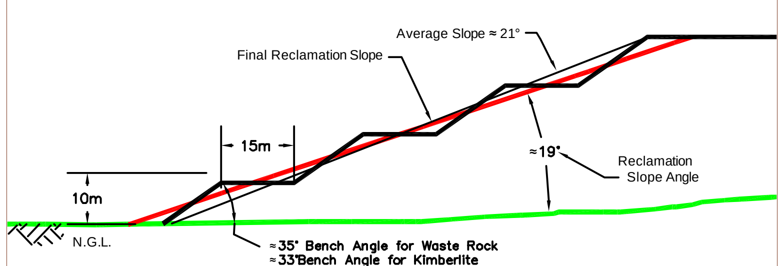
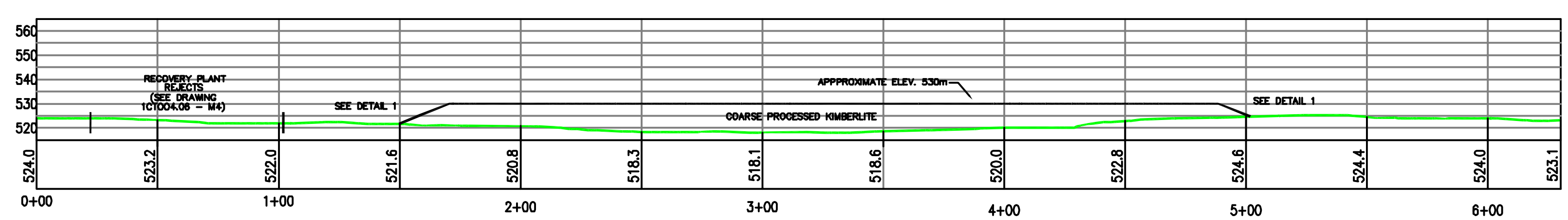


DETAIL 1 - TYPICAL DOWNSTREAM SLOPE



SECTION F – F' (COARSE PK STOCKPILE)
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DRAWING NO.	DRAWING TITLE
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DRAWING W–4	PRELIMINARY LAYOUT OF POND A CROSS SECTIONS AND DETAILS
DRAWING M–5	TYPICAL CONSTRUCTION SEQUENCE
DRAWING M–4	RECOVERY PLANT REJECTS PLAN AND SECTIONS
DRAWING M–2	SITE INVESTIGATION AND TERRAIN MAP
DRAWING M–1	LAYOUT OF WASTE DUMPS AND STOCKPILES

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SRK PROJECT NUMBER: 1CT004.06

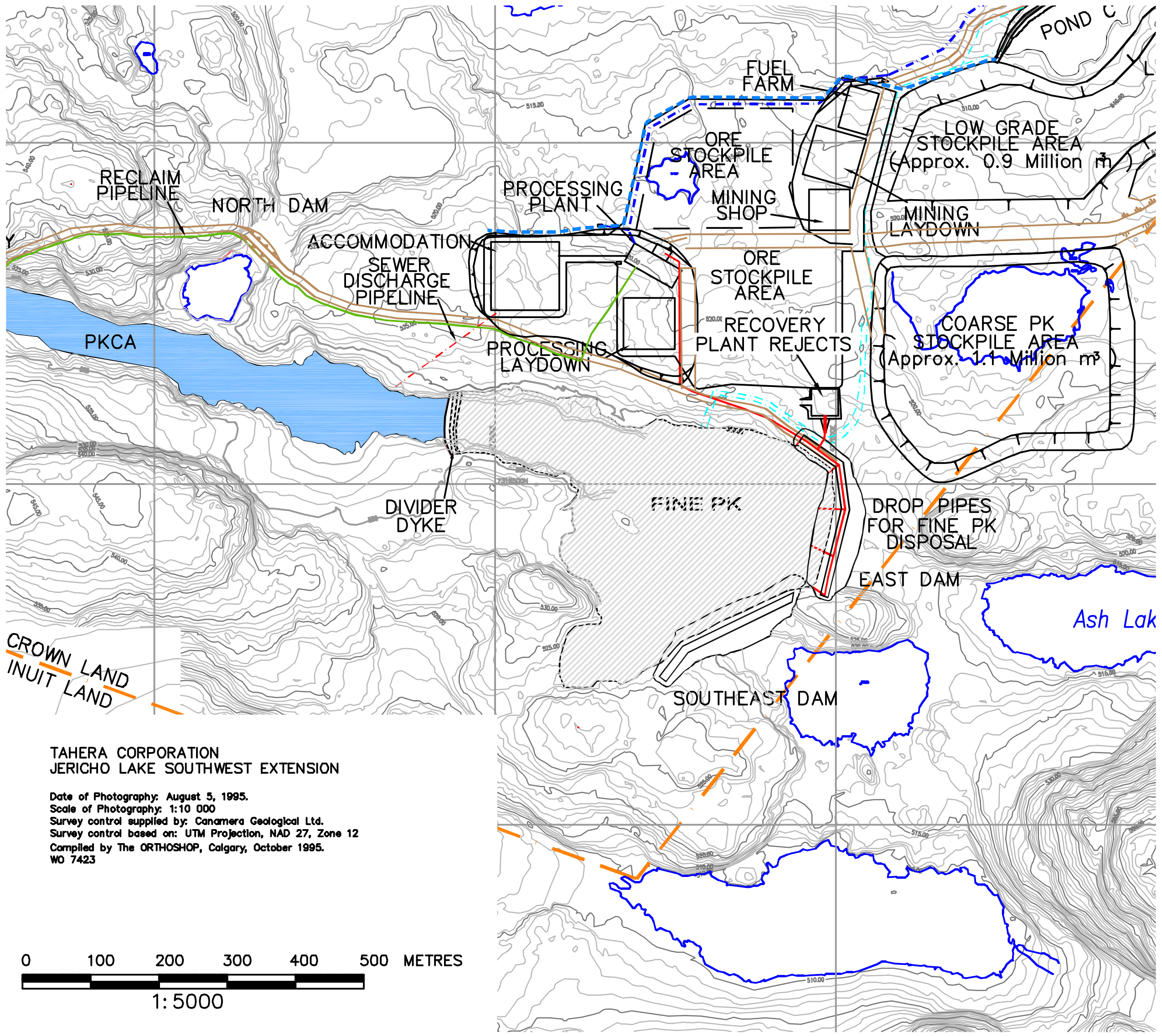
Tahera Diamond Corporation

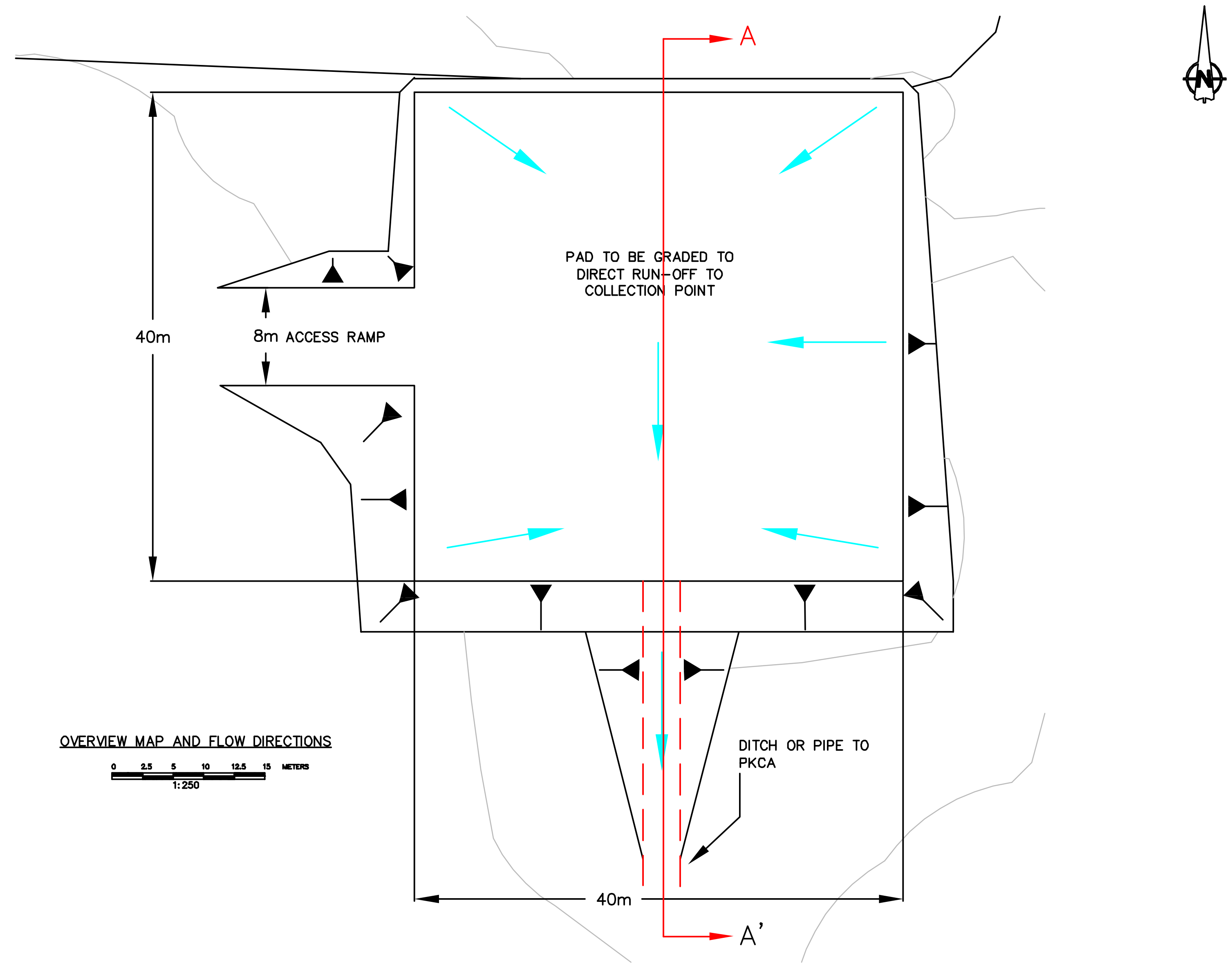
JERICHO PROJECT

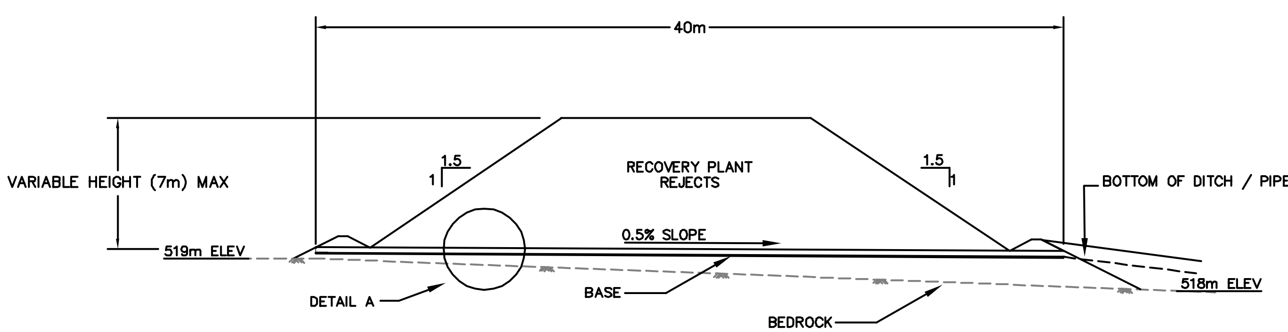
WASTE DUMPS 1 AND 2, LOW GRADE STOCKPILE AND COARSE PK STOCKPILE SECTIONS AND DETAILS

DRAWING NUMBER: 1CT004.06 – M3

REV. A







SECTION A – A'

0 2.5 5 10 12.5 15 METERS
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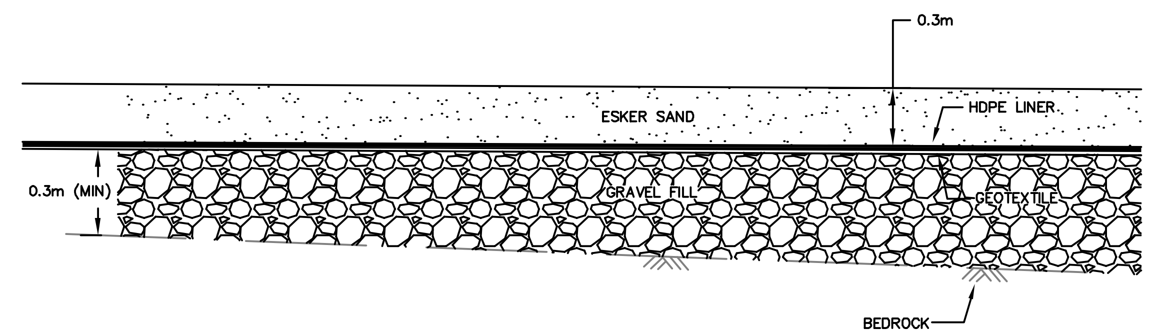

DETAIL A – LINED PAD
N.T.S.

DRAWING NO.	DRAWING TITLE	DRAWING NO.	
DRAWING G-9	AMMONIUM NITRATE STORAGE LAYOUT		
DRAWING G-8	BORROW AREAS PLAN & SECTION		
DRAWING G-7	TERRAIN EVALUATION MAP		
DRAWING G-6	BEDROCK GEOLOGY MAP		
DRAWING G-5	QUATERNARY GEOLOGY MAP		
DRAWING G-4	EXISTING THERMISTOR INSTALLATION PLAN	DRAWING G-14	CLOSURE CONCEPTS
DRAWING G-3	SITE INVESTIGATION MAP	DRAWING G-12	GENERAL ARRANGEMENT APRIL 2008
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DRAWING G-1	PROJECT LOCATION AND DRAWING INDEX	DRAWING G-1	GENERAL ARRANGEMENT APRIL 2006

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SRK PROJECT NUMBER: 1CT004.06	

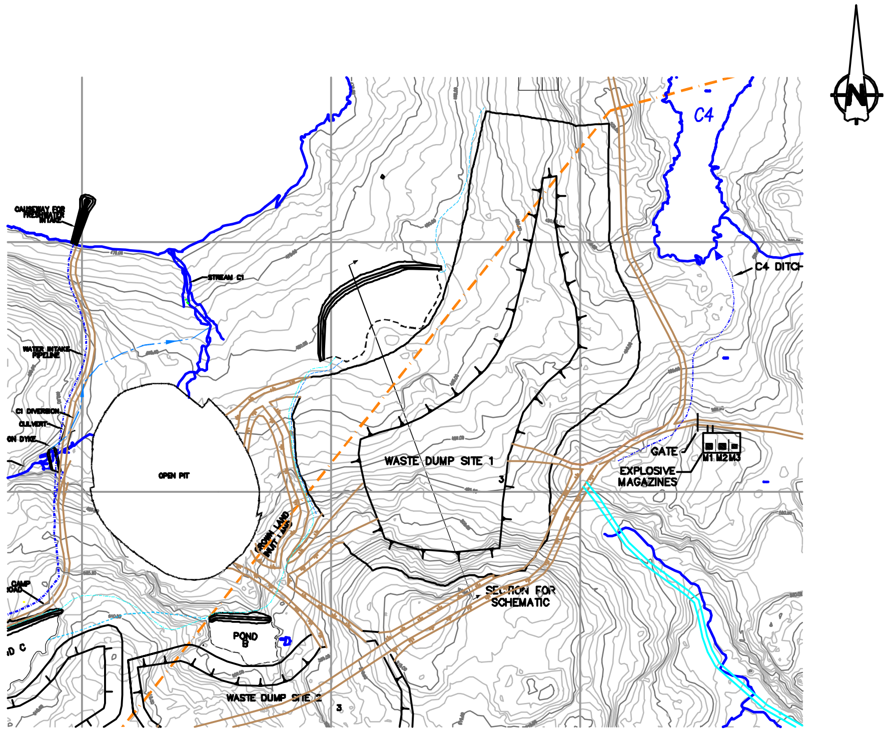
Tahera Diamond Corporation

JERICHO PROJECT

RECOVERY PLANT REJECTS
PLAN AND SECTIONS

DRAWING NUMBER: 1CT004.06 – M4

REV.: A



TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION

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Survey control based on: UTM Projection, NAD 27, Zone 12
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WO 7423

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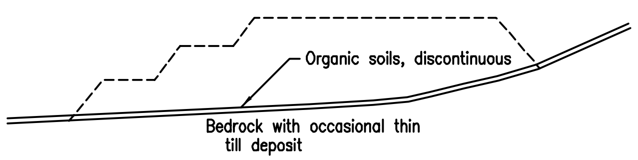
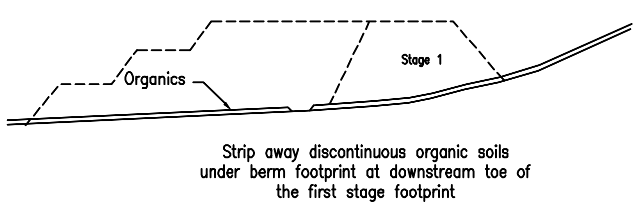
1:7,500

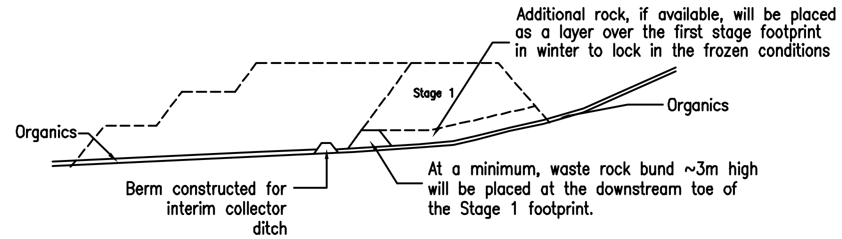
① Pre-construction



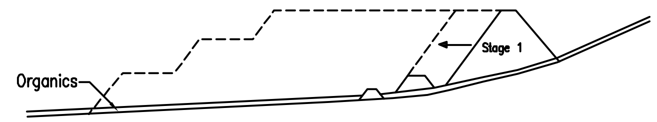
② Footprint preparation



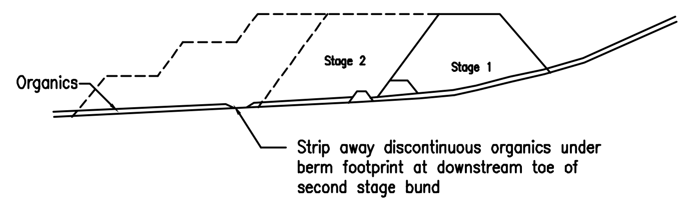
③ Waste rock placement in winter to lock in the frozen conditions within the foundation layer



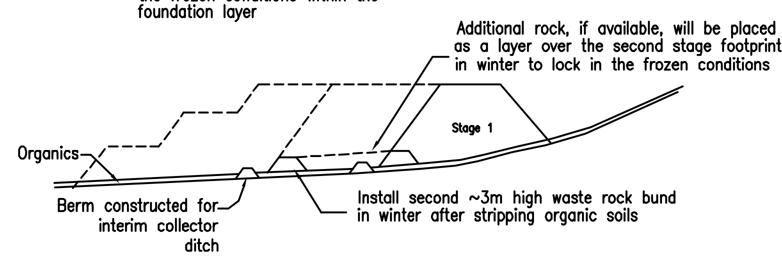
④ First stage of dump construction will consist of end dumping from dump crest towards the bund



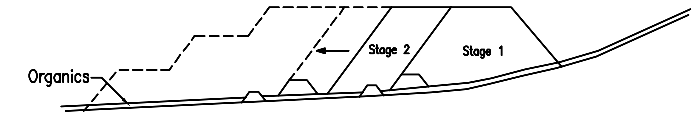
⑤ Second stage foundation preparation



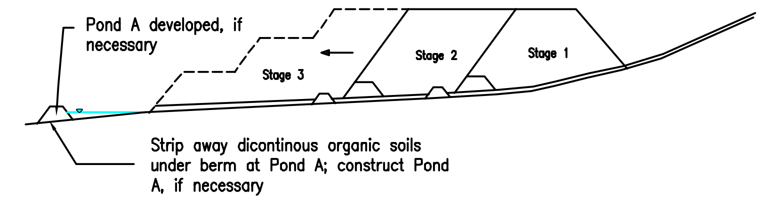
⑥ Waste rock placement in winter to lock in the frozen conditions within the foundation layer



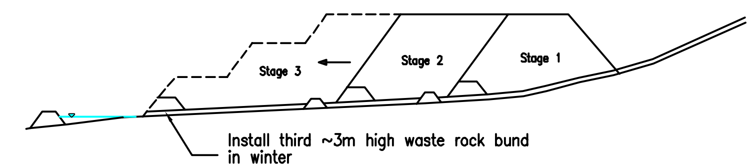
⑦ Second stage advancement at dump face by end dumping



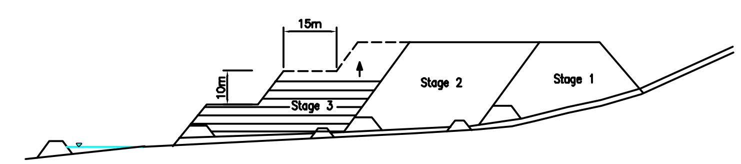
⑧ Third stage foundation preparation



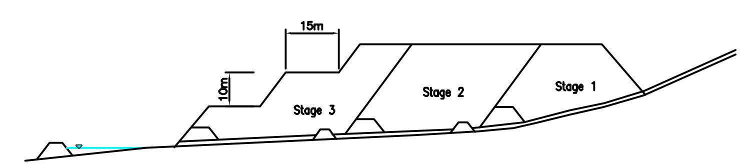
⑨ Waste rock placement in winter to lock in the frozen conditions within the foundation layer



⑩ Third stage of dump to be constructed in horizontal lifts



⑪ Develop benches with 15m setback for each vertical increment of 10m



DRAWING M-4	RECOVERY PLANT REJECTS PLAN AND SECTIONS										
DRAWING M-3	WASTE DUMP 1, WASTE DUMP 2, LOW GRADE STOCKPILE AND COARSE TAILINGS STOCKPILE CROSS SECTIONS AND DETAILS										
DRAWING M-2	SITE INVESTIGATION AND TERRAIN MAP										
DRAWING M-1	LAYOUT OF WASTE DUMPS AND STOCKPILE						A	WATER LICENSE APPLICATION	CSS		JULY 2004
DRAWING NO.	DRAWING TITLE	NO.	DESCRIPTION	CHK'D	APP'D	DATE	REV.	ISSUE PURPOSE	AUTH.	BY	DATE
	REFERENCE DRAWINGS	REVISIONS					ISSUE AUTHORIZATION				

WATER LICENSE APPLICATION

SRK Consulting

DESIGNED BY: PM DATE: JULY 2004	DRAWN BY: JM DATE: JULY 2004
CHECKED BY: CCS DATE: JULY 2004	DISCIP. ENGR. DATE:
PROJ. MGR: DATE	PROJ. ENGR. DATE
SRK PROJECT NUMBER: 1CT004.06	

Tahera Diamond Corporation

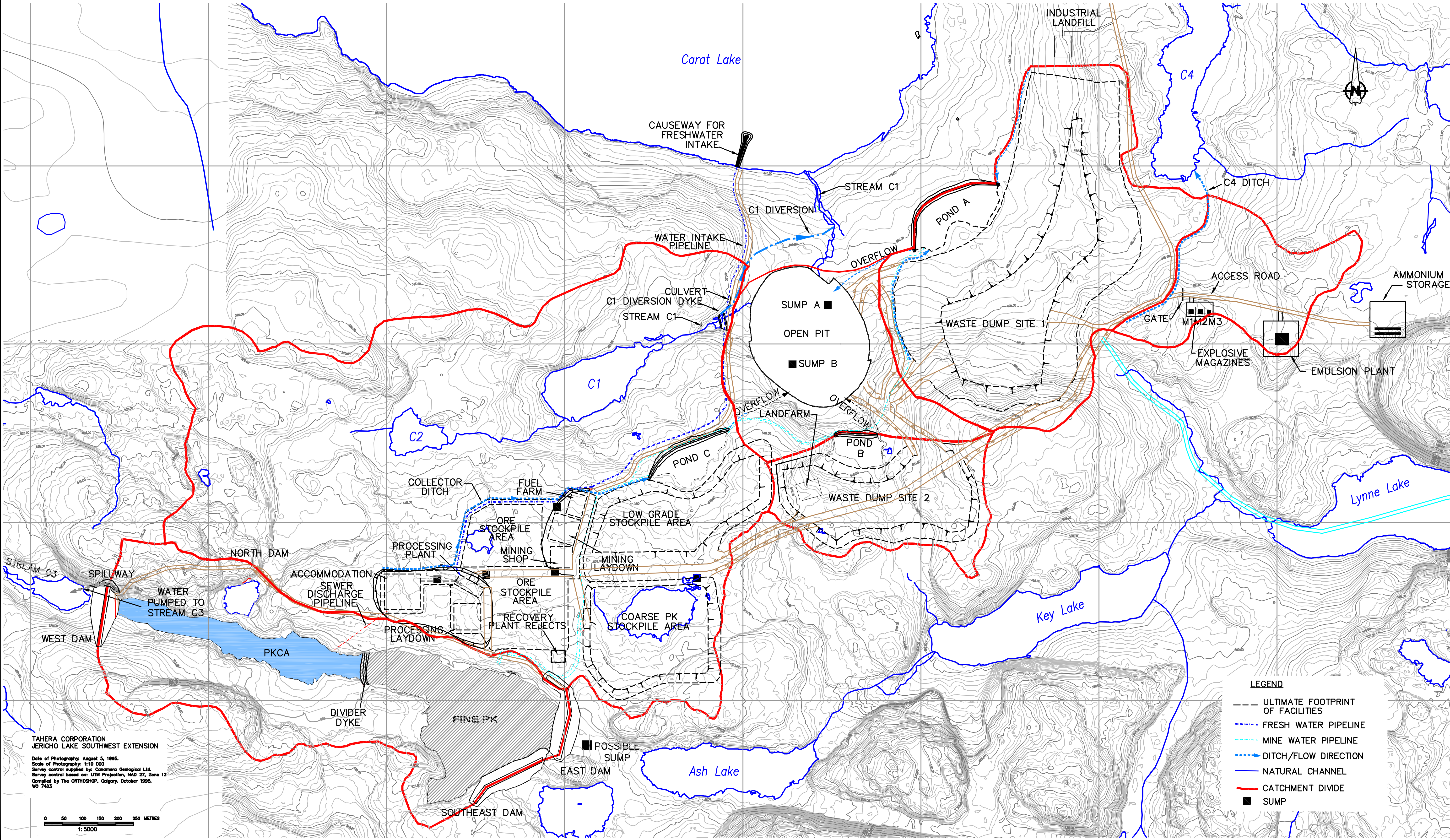
JERICHO PROJECT

SCHEMATIC OF WASTE DUMP 1 CONSTRUCTION SEQUENCE

DRAWING NUMBER: 1CT004.06 – M5

REV.: A

FILE NAME: F:\...\REVISED\FIGUREM-5.DWG



DRAWING NO.	DRAWING TITLE
DRAWING W-6	PRELIMINARY LAYOUT OF CAUSEWAY AND SECTIONS
DRAWING W-5	PRELIMINARY LAYOUT OF PONDS B AND C CROSS SECTIONS AND DETAILS
DRAWING W-4	PRELIMINARY LAYOUT OF POND A CROSS SECTIONS AND DETAILS
DRAWING W-3	C1 DIVERSION DETAILS
DRAWING W-2	C1 DIVERSION PLAN AND SECTIONS

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE

REVISIONS

REV.	ISSUE PURPOSE	AUTH. BY		DATE
A	WATER LICENSE APPLICATION	CCS		JULY 2004

ISSUE AUTHORIZATION

WATER LICENSE APPLICATION

SRK Consulting
Engineers and Scientists

DESIGNED BY: CCS
DATE: JULY 2004
DRAWN BY: JM
DATE: JULY 2004
CHECKED BY: CCS
DATE: JULE 2004
DISCIP. ENGR.
DATE:
PROJ. MGR:
DATE
PROJ. ENGR.
DATE
SRK PROJECT NUMBER:
1CT004.06

Tahera Diamond Corporation

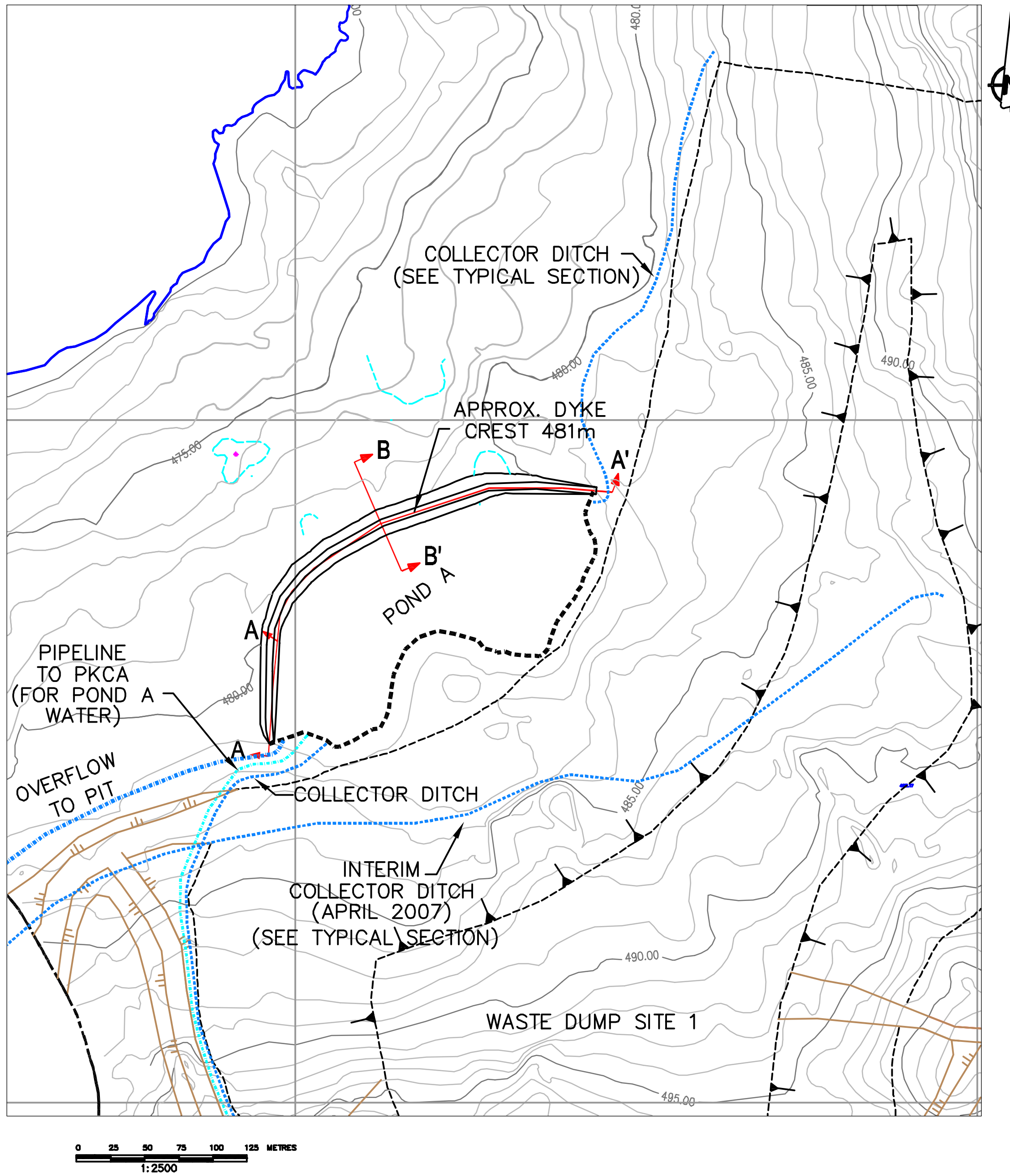
JERICHO PROJECT

LAYOUT OF WATER MANAGEMENT FACILITIES

DRAWING NUMBER
1CT004.06 – W1

REV.
A

FILE NAME: F:\Tahera Corp (Lytton minerals)\Mapping and Drawings-2004 dwgs\general-figures(2004)\figureGA-year1

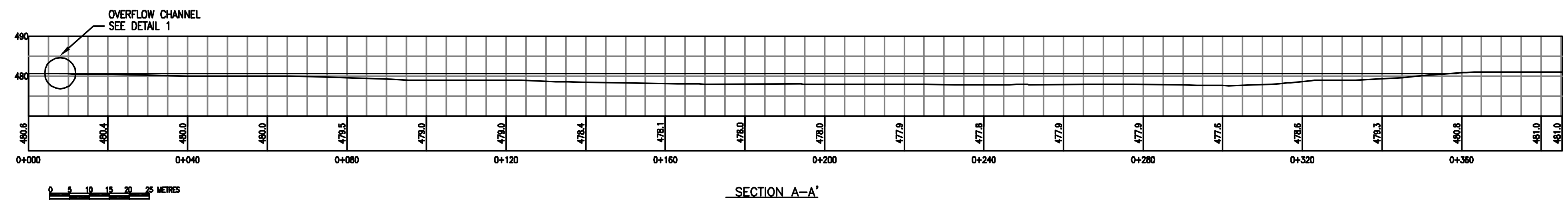


TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION

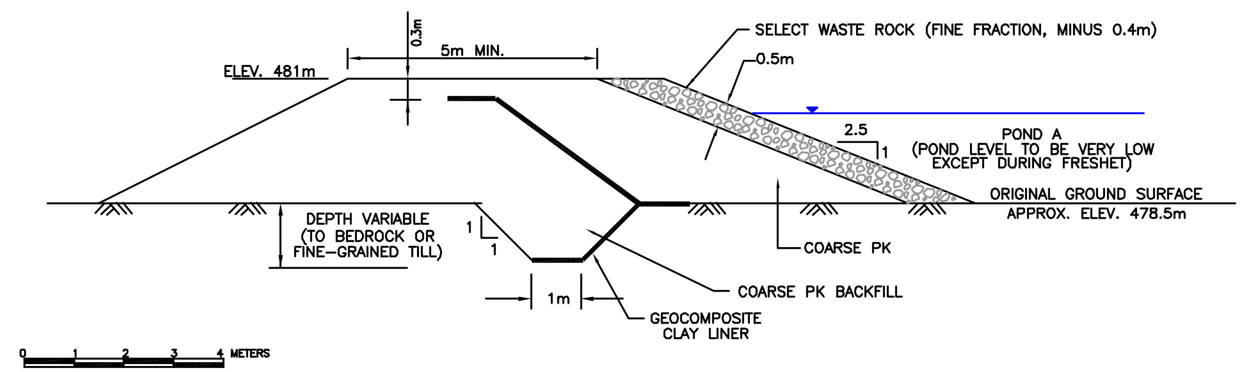
Date of Photography: August 5, 1995.
Scale of Photography: 1:10 000
Survey control supplied by: Canamera Geological Ltd.
Survey control based on: UTM Projection, NAD 27, Zone 12
Compiled by The ORTHOSHOP, Calgary, October 1995.
WO 7423

NOTE:

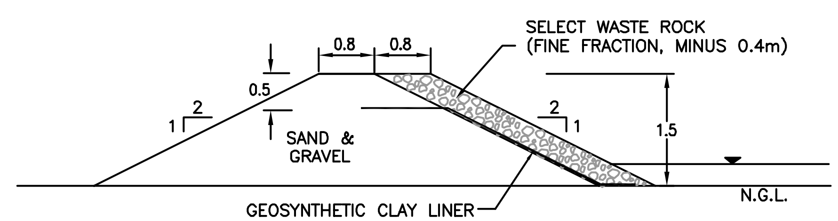
1. DRAWING SHOWS CONCEPTUAL SIZE AND LOCATION OF POND A IF REQUIRED, POND A WILL BE CONSTRUCTED BEFORE APRIL 2008.
2. DITCH ALIGNMENT AND SECTION TO BE FIELD FIT CONSISTENT WITH LOCAL GROUND CONDITIONS



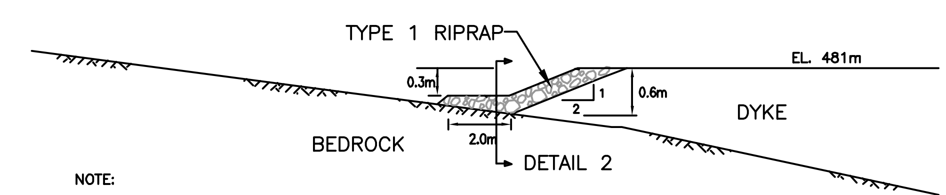
SECTION A-A'
1:750



SECTION B-B' (TYPICAL DYKE SECTION)
1:75



COLLECTOR AND INTERIM COLLECTOR DITCHES – TYPICAL SECTION
NTS



NOTE:

OVERFLOW CHANNEL DOWNSTREAM OF POND A WILL BE CONTROLLED BY A BERM ON BEDROCK SIMILAR TO THE TYPICAL COLLECTOR DITCH SECTION AND/OR A DITCH EXCAVATED IN THE NATURAL SOIL (DETAIL 2 ON DWG.1CT004.06–W5

DETAIL 1 OVERFLOW CHANNEL AT DYKE
N.T.S.

DRAWING NO.	DRAWING TITLE
DRAWING W-6	PRELIMINARY LAYOUT OF CAUSEWAY SECTIONS AND DETAILS
DRAWING W-5	PRELIMINARY LAYOUT OF PONDS B AND C CROSS SECTIONS AND DETAILS
DRAWING W-3	C1 DIVERSION DETAILS
DRAWING W-2	C1 DIVERSION PLAN AND CROSS SECTIONS
DRAWING W-1	LAYOUT OF WATER MANAGEMENT FACILITIES

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE

REVISIONS

REV.	ISSUE PURPOSE	AUTH. BY	DATE
A	WATER LICENSE APPLICATION	CSS	JULY 2004

ISSUE AUTHORIZATION

WATER LICENSE APPLICATION

SRK Consulting

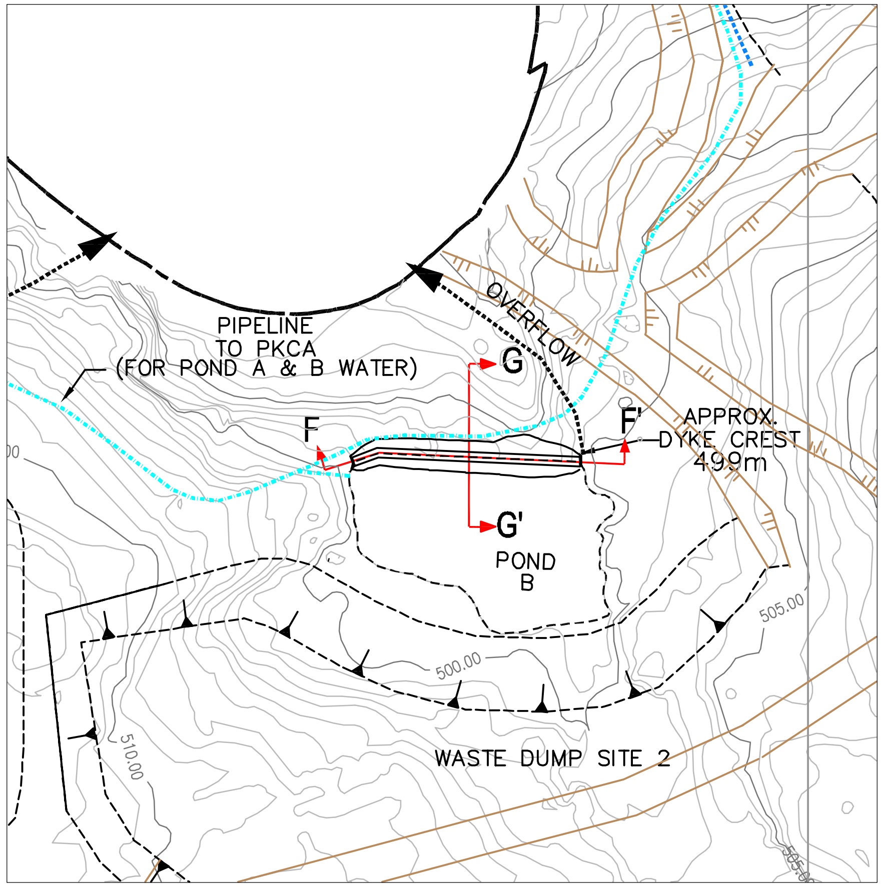
DESIGNED BY: DL — DATE: JULY 2004
DRAWN BY: JM — DATE: JULY 2004
CHECKED BY: CCS — DATE: JULY 2004
DISCIP. ENGR. — DATE:
PROJ. MGR: — DATE
PROJ. ENGR. — DATE
SRK PROJECT NUMBER: 1CT004.06

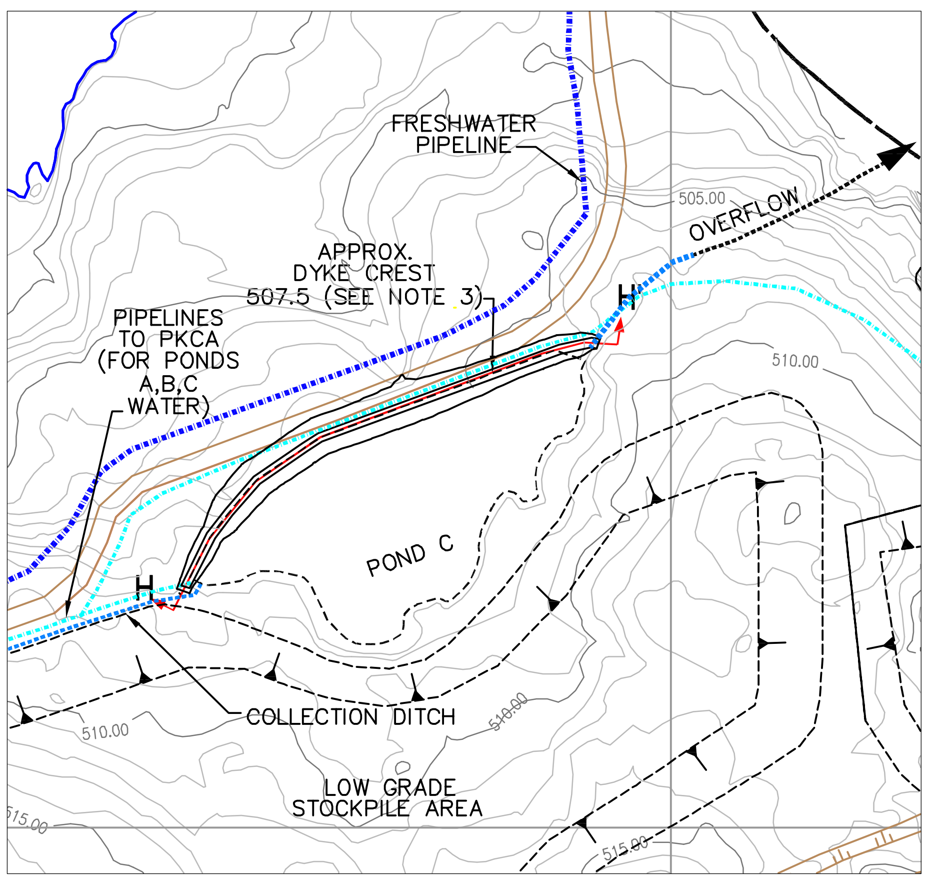
Tahera Diamond Corporation

JERICHO PROJECT

PRELIMINARY LAYOUT OF POND A CROSS SECTIONS & DETAILS

DRAWING NUMBER: 1CT004.06 – W4
REV. A





TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION

Date of Photography: August 5, 1995.
Scale of Photography: 1:10 000
Survey control supplied by: Canamera Geological Ltd.
Survey control based on: UTM Projection, NAD 27, Zone 12
Compiled by The ORTHOSHOP, Calgary, October 1995.
WO 7423

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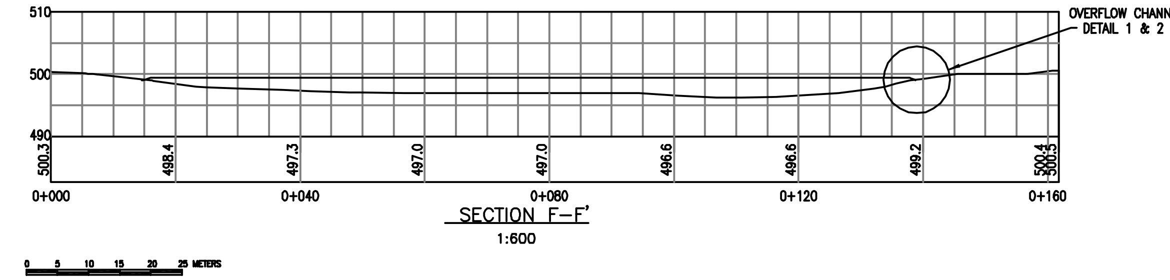

SECTION F–F'
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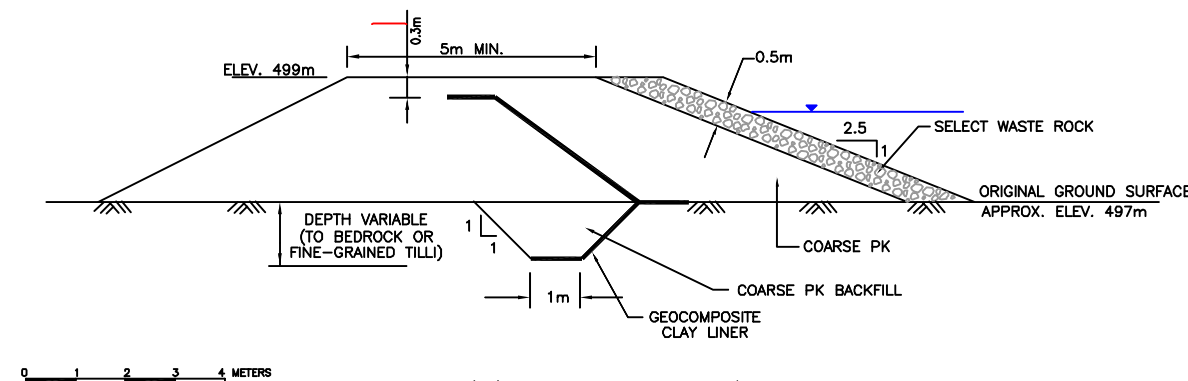
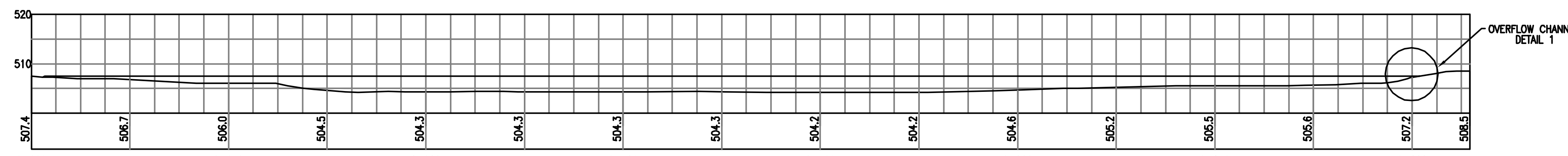


SECTION G–G' (TYPICAL DYKE SECTION)
1:100



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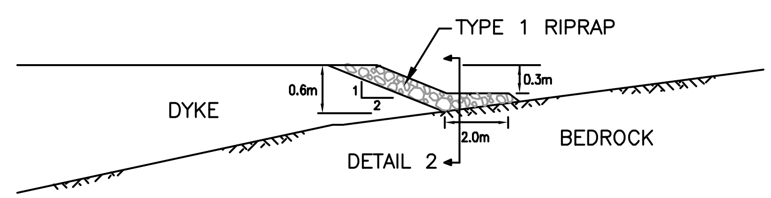
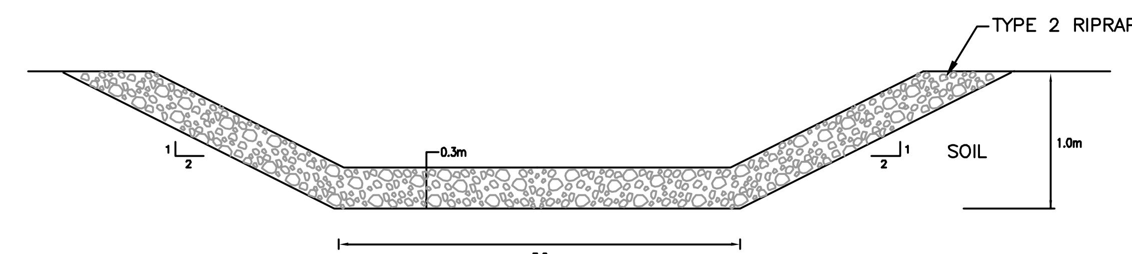


DETAIL 1 (TYPICAL OVERFLOW CHANNEL)
N.T.S.



DETAIL 2 OVERFLOW CHANNEL WHERE SOIL IS >1m THICK
N.T.S.

NOTES:

1. DRAWING SHOWS CONCEPTUAL SIZES AND LOCATIONS.
2. PONDS B & C ARE NOT REQUIRED UNTIL APRIL 2007, FINAL DECISIONS TO BE CONFIRMED IN 2006
3. OVERFLOW CHANNEL DOWNSTREAM OF PONDS B & C WILL BE CONTROLLED BY A BERM ON BEDROCK SIMILAR TO TYPICAL COLLECTOR DITCH SECTION (SEE DWG.1CT004.06–W4) THIS BERM WILL EXTEND ONLY AS FAR AS IS NECCESSARY TO DIRECT OVERFLOW TO NATURAL DRAINAGE PATHS THAT LEAD TO THE OPEN PIT

REFERENCE DRAWINGS

DRAWING NO.	DRAWING TITLE
DRAWING W–6	PRELIMINARY LAYOUT OF CAUSEWAY SECTIONS AND DETAILS
DRAWING W–4	PRELIMINARY LAYOUT OF POND A CROSS SECTIONS AND DETAILS
DRAWING W–2	C1 DIVERSION DETAILS
DRAWING W–2	C1 DIVERSION PLAN AND CROSS SECTIONS
DRAWING W–1	LAYOUT OF WATER MANAGEMENT FACILITIES

REVISIONS

NO.	DESCRIPTION	CHK'D	APP'D	DATE

ISSUE AUTHORIZATION

REV.	ISSUE PURPOSE	AUTH.	BY	DATE
A	WATER LICENSE APPLICATION	CSS		JULY 2004

WATER LICENSE APPLICATION

SRK Consulting

DESIGNED BY: DL	DRAWN BY: JM
DATE: JULY 2004	DATE: JULY 2004
CHECKED BY: CCS	DISCIP. ENGR.
DATE: JULY 2004	DATE:
PROJ. MGR:	PROJ. ENGR.
DATE	DATE
SRK PROJECT NUMBER: 1CT004.06	

Tahera Diamond Corporation

JERICHO PROJECT

PRELIMINARY LAYOUT OF PONDS B AND C CROSS SECTIONS & DETAILS

DRAWING NUMBER: 1CT004.06 – W5

REV. A

FILE NAME: F:\Tahera Corp (Lytton minerals)\Mapping and Drawings–2004 dwgs\general–figures(2004)\FIG–2

Attachment A

Results and Discussion of Uranium Analyses on Waste Rock

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Memo

To:	Greg Missal/Dan Johnson	**Date:**	June 24, 2004
cc:		**From:**	Kelly Sexsmith
Subject:	Supplemental Characterization of Uranium in the Jericho Waste Rock	**Project #:**	1CT004.06

1 Background and Introduction

Elevated uranium concentrations (up to 2.3 mg/L) were detected in the 2003 seep samples from the development waste pile at Jericho. Elevated concentrations in the seepage were unexpected due to the relatively low concentrations in all other testing data for the project. Therefore, further investigation on the source of the uranium in the development seep was recommended to ensure appropriate management strategies can be developed.

A review of existing information for the site indicated that there were no data on uranium concentration in the kimberlite, coarse processed kimberlite or waste rock solids (Appendices D.1.3 to D.1.6 of the EIS, Tahera 2003). Results for supernatant and leach extraction tests on processed kimberlite and kimberlite ore indicated consistently very low concentrations of uranium (typically <0.0001 mg/L, refs), while leach extraction tests on the waste rock indicated average uranium concentrations of 0.0066 mg/L, 90^{th} percentile concentrations of 0.016 mg/L, and maximum uranium concentrations of 0.043 mg/L (ref), indicating that waste rock was the more likely source for uranium in the development pile seepage.

Regional geophysical studies (Legault and Charbonneau 1993) to the south of the project area were used define the regional distribution of uranium in the Contwoyto Batholith. Average "equivalent uranium" (eU) concentrations measured by in-situ gamma-ray spectroscopy were 8.6 ppm (n=270), and average uranium concentrations measured on hand samples by neutron activation were 6.0 ppm (n=50). Graphical presentations of the data indicated eU concentrations varied from approximately 1 ppm to approximately 60 ppm, with most values less than 10 ppm (Figure 4 in Legault and Charbonneau, 1993). Colour radiometric maps for the area (GSC 1988) indicate somewhat lower eU concentrations, with many values greater than 3.5 ppm and some greater than 4.4 ppm. These values are somewhat higher than observed in typical granites (3 ppm, Turekian and Wedpohl 1961), but are well below levels observed in waste rock associated with uranium mines.

2 Testing Program

A testing program was initiated in November 2003 to characterize each of the major rock types that would be exposed during mining of the Jericho kimberlite. A total of 36 samples, including 12 granite, 10 pegmatite, 6 diabase, and 8 kimberlite samples were selected for testing by an SRK geochemist. Of these, 10 granite, 10 pegmatite and 7 kimberlite samples were located and sampled by Tahera. The remaining intervals were in core that was stored on site and inaccessible in November. The samples locations are shown in Figure 1.

The samples were sent to SRC Analytical in Saskatoon for analysis of uranium by the delayed neutron counting (DNC) method.

The test results are provided in Table 1. The results indicate that uranium concentrations ranged from 1.4 to 13.8 ppm, with average concentrations in the granite of 6.6 ppm, average concentrations in the pegmatite of 5.2 ppm, and average concentrations in the kimberlite of 2.1 ppm.

3 Discussion

Granite and pegmatite samples from the Jericho pit area have slightly elevated uranium concentrations compared to crustal averages of 3 ppm. However, the results are consistent with the regional data, and there are no indications of high concentrations in a particular rock type or area within the pit. Uranium concentrations in the solids are also much lower than typical waste rock associated with uranium mines. Based on the regional and local data on uranium occurrences, it appears unlikely that the high concentrations in the development pile seepage are due to high concentrations in the solids. Further sampling of the development waste rock may help to determine whether uranium concentrations in the development waste rock are higher than typical waste rock that will be encountered during mining. However, the results to date indicate this is unlikely.

A possible explanation for elevated uranium in the seepage is enhanced leaching of the waste rock by carbonate originating from kimberlite on the pile surface. Uranyl carbonate is relatively mobile compared to other uranium species, and may enhance uranium mobility in a variety of settings. For example, geochemical equilibrium modelling of the Jericho seepage indicated that the saturation indices for schoepite ($UO_2(OH)_2 . H_2O$) would decrease from 0.22 to -1.3 (indicating an increase in solubility) when alkalinity is increased from 5 mg $CaCO_3$ equivalent/litre to 66 mg $CaCO_3$ equivalent/litre (the actual alkalinity of the seepage). Observations during SRK's 2003 site visit indicated that the kimberlite covered approximately 50 percent of the pile surface, and where present, was typically 10 cm deep, which is sufficient to support the observed alkalinities in the development pile seepage. In contrast, seepage from the waste rock dumps are expected to have relatively low alkalinity due to the low carbonate content of the rock.

If the above explanation is correct, uranium concentrations in the full-scale waste rock piles should be less than the concentrations observed in the development rock pile seeps. Complete segregation of the kimberlite from the waste rock may not be possible, but it would be possible to store any mixed waste rock in one area of the pile where the seepage can be monitored and handled separately if necessary. Uranium is relatively immobile in organic soils, and if needed, pre-treatment of uranium from a small portion of the seepage may be possible using the spray irrigation system proposed as a contingency for water treatment.

4 Work Plan for Additional Studies

Additional work is required to determine the source of the uranium in seepage from the development waste pile. Some of this work can be completed in the 2004 field season so that the information is available prior to initiation of mining activities, the remainder would be incorporated into the solids monitoring plans. The following outlines a work plan and schedule for improving the understanding of uranium distribution and mobility at this site.

Spring/Summer 2004

Additional seep samples would be collected from the development pile in July and August when the exploration camp is in operation. If natural seepage is not observed, the sprinkling method used in the 2003 survey can be repeated. Samples will be tested for pH, conductivity, temperature, redox, TDS, hardness, acidity, alkalinity, chloride, sulphate, nutrients (ammonia, nitrate+nitrite, ortho-phosphate), and a full suite of total and dissolved metals. The data will be used to assess any temporal changes in uranium concentrations and will further complement the existing geochemical database.

Additional waste rock and kimberlite samples will be collected from the drill core that was inaccessible during the November sampling program and from the development waste rock pile. The development pile samples will be collected along the toe of the pile, and by excavating a series of shallow test pits or a trench across the center of the dump (depending on availability of equipment). Based on the construction surveys provided in Attachment H.3 of Technical Memorandum H (SRK 2003), such a trench would encounter all of the types of waste rock encountered during the exploration program. The samples would be submitted for uranium assays. Comparisons of the development pile samples with the drill core samples should provide a better indication of whether any materials in the development pile contain anomalous uranium concentrations compared to the available drill cores samples.

A series of contact tests will also be completed to assess the effects of kimberlite on uranium mobility in the granitic rocks. These will consist of 1 to 2 week long batch tests where different mixtures of kimberlite, granite and de-ionized water are mixed, equilibrated and the leachate is recovered for analysis of major ions and uranium. The results will provide an indication of whether uranium in the granite is more mobile in the presence of kimberlite, and therefore whether complete segregation of any kimberlite that is inadvertently mixed with granite during blasting would be desirable.

The data will be reviewed and presented in the first quarter of 2005, to allow for feedback and comment by interested parties before stripping of the pit commences. Any recommendations for minimizing the extent of uranium leaching from the waste rock dumps or additional testing to further define the issues will be incorporated into waste rock management plan.

First Year of Operations

Uranium analyses will be included on all routine seepage monitoring samples, and uranium analyses will be included on any blast samples collected for acid base accounting tests.

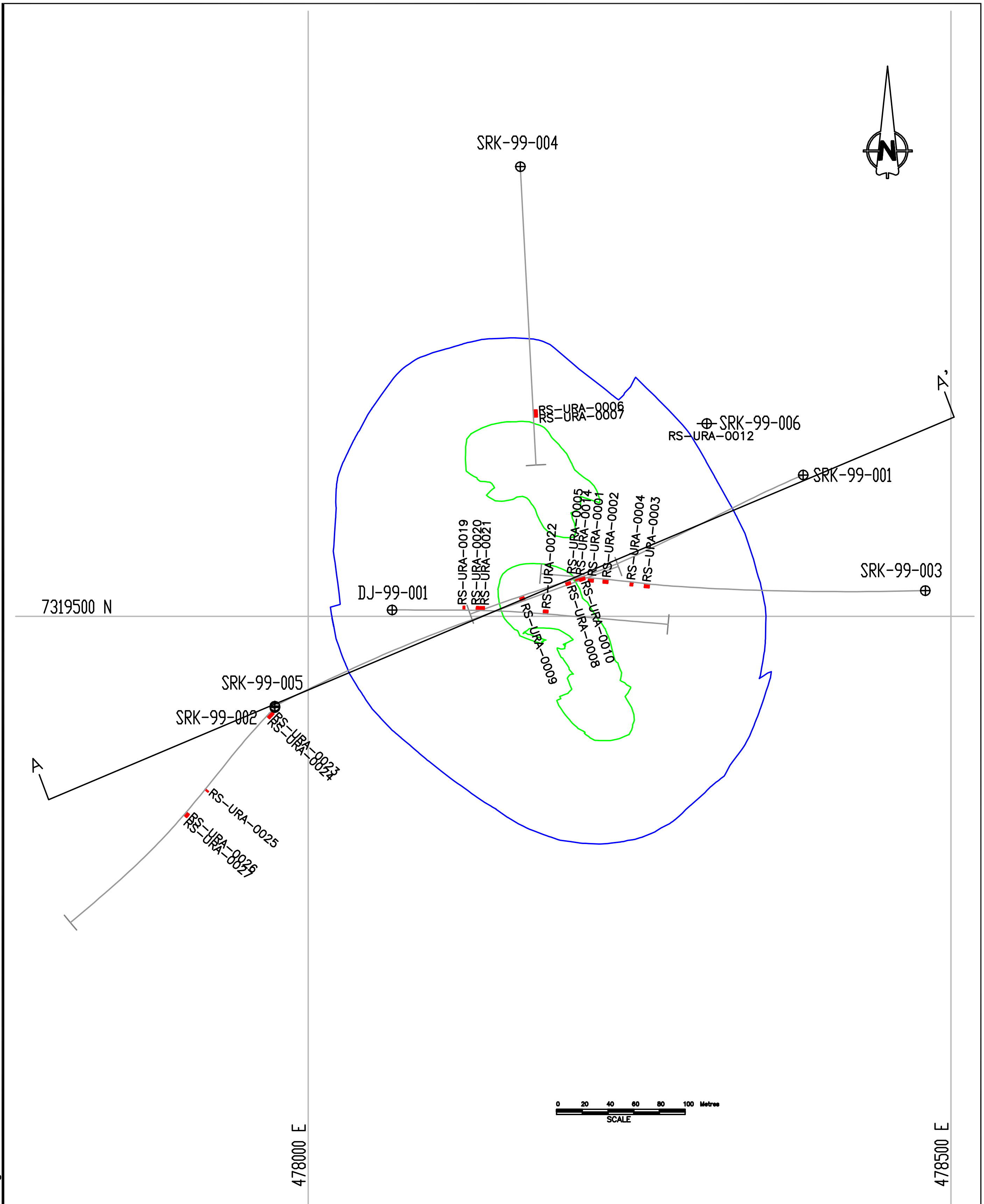
The data will be reviewed and presented in the annual waste rock and seepage monitoring report. At that time, there should be sufficient data to determine whether uranium is randomly distributed in the country rock, or whether some rock types or areas within the pit are more enriched than others. Any additional recommendations for minimizing the extent of uranium leaching from the waste rock dumps will be incorporated into the waste rock management plan.

Subsequent Years of Operation

Uranium will continue to be monitored in the waste rock seepage for the remainder of the mine operations. The need for additional solids testing will be determined in conjunction with other interested parties.

Uranium Analyses on Jericho Drillcore

RS#	dhole_id	geol_from	geol_to	Int_Lngth	rocktype	Sampling notes	Pic #s	U (mg/kg)
RS-URA-0003	SRK-99-003	305	310	5	granite	granite and pegmatite, reddish in color with green silicic alteration	86	8
RS-URA-0004	SRK-99-003	322.8	325.5	2.7	granite	reddish, unfoliated, vuggy granite. Pre-contact zone, altered and poorly compotent granite with calcite filled fractures and vugs	87	8.4
RS-URA-0006	SRK-99-004	268.4	273.4	5	granite	pink and grey granite with some pegmaititc sections	89, 90	2.7
RS-URA-0013	SRK-99-006	232.1	236.82	4.72	granite	granite, pink to white, intensly altered, salmon to red granite with chlorite altn pervaisive, fol 60-70 deg to CA, becomes massive near 236	96	2.3
RS-URA-0014	SRK-99-003	379.9	384.8	4.9	granite	white granite	99, 100	2.9
RS-URA-0015	SRK-99-005	405	410	5	granite	pink granite	98	5.2
RS-URA-0017	SRK-99-006	238.5	274.4	35.9	granite	dissesminated pyrite near contact (small <1mm crystals)	101	13.8
RS-URA-0022	DJ-99-001	182.3	187.3		granite	white, bleached granite, rusty along fractures	107	5.3
RS-URA-0023	SRK-99-005	6.6	10.2	3.6	granite	med-coarse grained weakly foliated to massive white granite which borders on pegmatitic	107-109	6.6
RS-URA-0026	SRK-99-005	167.5	170.5	3	granite	coarses grained pink-white granite - massive to well foliated	112	10.3
RS-URA-0005	SRK-99-003	382.5	382.8	0.3	pegmatite	Peg taken from wrong peg interval, but very close	88	2
RS-URA-0007	SRK-99-004	273.4	276	2.6	pegmatite	white pegmaite, similare to previous pegs, tourmaline?? Observed	89, 90	5.3
RS-URA-0010	SRK-99-001	249.7	254.7	5	pegmatite	orange-red to shite pegmatite, bleached in sections, with small sections of granite	93	5.1
RS-URA-0011	SRK-99-005	403	405	2	pegmatite	granite / pegmatite - pink to red	94, 95	5.8
RS-URA-0019	DJ-99-001	86	88		pegmatite	fresh pegmatite (flspr-qtz-biotite) 86m to 88m		6.7
RS-URA-0020	DJ-99-001	102.1	104.6		pegmatite	broken salmon pink to bleached pegmatite 102.1-104.6	103, 104	1.4
RS-URA-0021	DJ-99-001	106.3	111.3		pegmatite	pegmatitic granite, poor compotency, white to slight pink	105, 106	4
RS-URA-0024	SRK-99-005	10.8	14.8	4	pegmatite	white-pink qtz feldspar tourmaline pegmatite	110	6
RS-URA-0025	SRK-99-005	131.7	132.7	1	pegmatite	pink qtz feldspar tourmaline pegmatite with some minor coarse granite	111	9.6
RS-URA-0027	SRK-99-005	170.5	172.1	1.6	pegmatite	pink qtz feldspar tourmaline pegmatite	112	5.6
RS-URA-0001	SRK-99-003	366	371	5	kimberlite	Gran Xeno partially digested from 361-361-3, 368-368.5 sampled previouly	81, 82, 83	3.2
RS-URA-0002	SRK-99-003	350	355	5	kimberlite	peg xeno (10cm)at 351, 352.2, 40cm poor recovery	84, 85	2
RS-URA-0008	SRK-99-001	264.1	268.25	4.15	kimberlite	contact could not be found, closest interval, gran xeno (10cm) at 267.5	91	1.4
RS-URA-0009	SRK-99-002	297.5	301.8	4.3	kimberlite	10cm xenolith at 299.5m	92	1.4
RS-URA-0012	SRK-99-006	230.3	232.1	1.8	kimberlite	May not be kimberlite, some sort of aphanitic intermediate volcanic (andesite?), with olivine phenocrysts. Tr. pyrite noted near contact, non-magnetic	96, 97	1.7
RS-URA-0016	SRK-99-006	274.8	279.8	5	kimberlite	black kimberlite	101	2.7
RS-URA-0018	SRK-99-005	396.2	398	1.8	kimberlite	black kimberlite near contact	102	2.6



Dwg Ref: Usampling_Plan-Sec.dwg

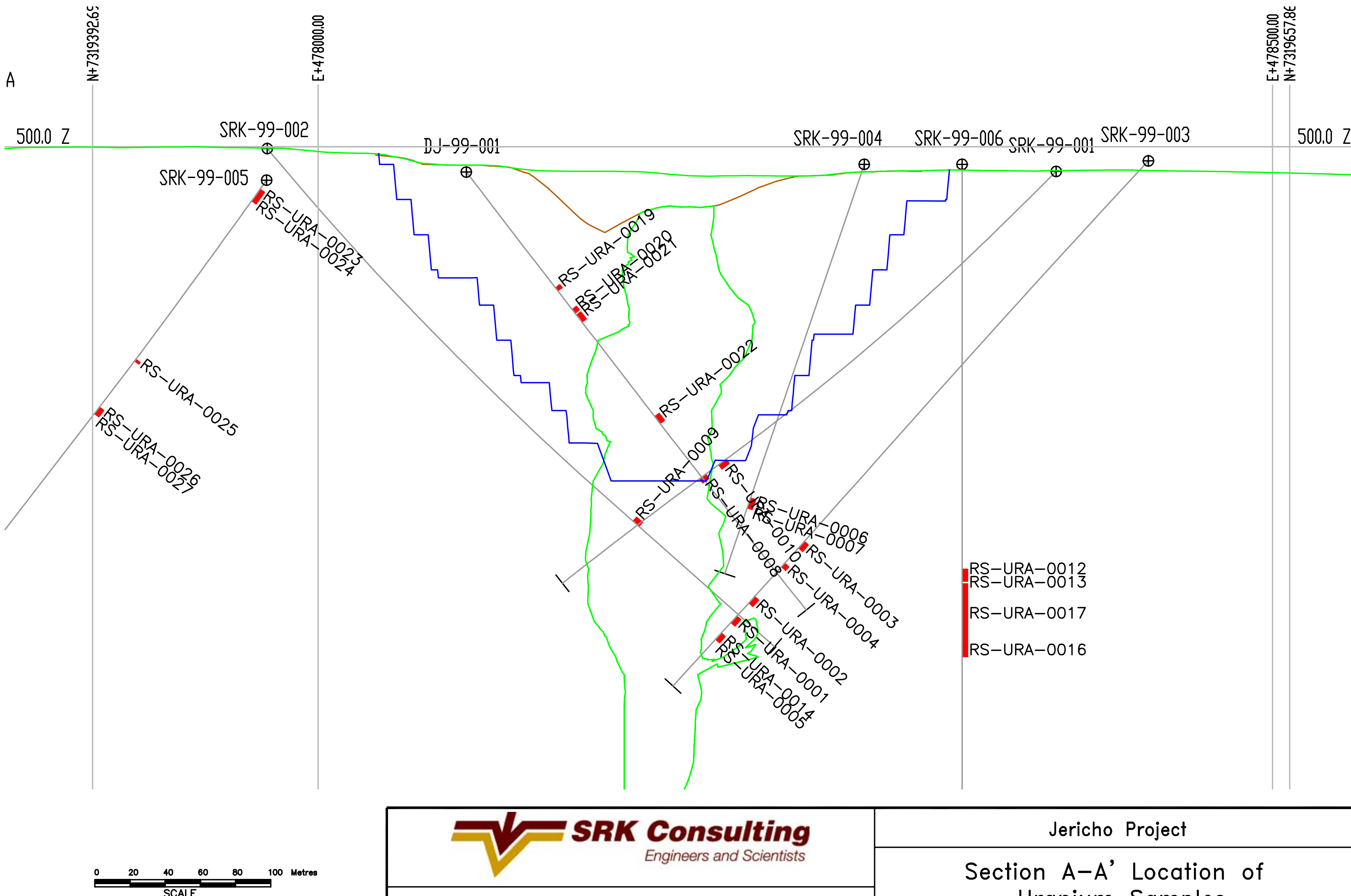
SRK Consulting
Engineers and Scientists

Tahera Corporation

Jericho Project

Plan View of Drillholes Showing Locations of Uranium Samples

PROJECT NO.	DATE	APPROVED	FIGURE
1CT004.06	June 2004		1a



Dwg Ref: Usampling_Plan-Sec.dwg

SRK Consulting
Engineers and Scientists

Tahera Corporation

Jericho Project

Section A–A' Location of Uranium Samples

PROJECT NO.	DATE	APPROVED	FIGURE
1CT004.06	June 2004		1b

Attachment B

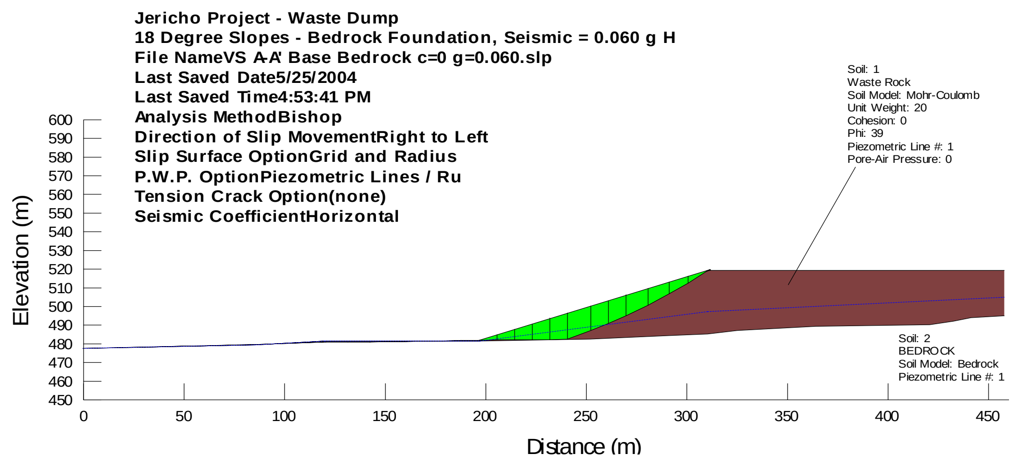
Detailed Results from the Slope Stability Analyses

Jericho Dump Stability Analysis 2004

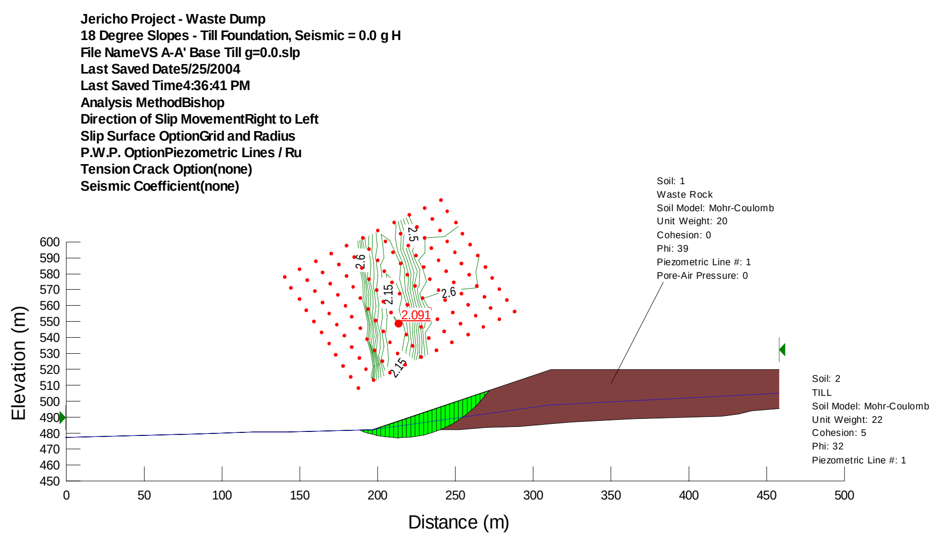
Waste Dump Stockpile

Dump Height (m)	40
Slope	18 deg (3.0H:1V)
Unit Wt. (kN/cu.m.)	20
Phi (waste)	39
Cohesion (kPa)	0,10
Low WT in dump (m)	2

Infinite Slope = 2.110



Case	**Fs**	
Bedrock Foundation		
c = 10, g = 0	2.567	same circle
c = 0, g = 0	2.351	
c = 0, g = 0.013	2.252	
c = 0, g = 0.06	1.948	
Till Foundation		
c = 10, g = 0	2.172	same circle
c = 0, g = 0	2.091	
c = 0, g = 0.013	1.998	
c = 0, g = 0.06	1.711	



Fs = Tan(39)/Tan(18)

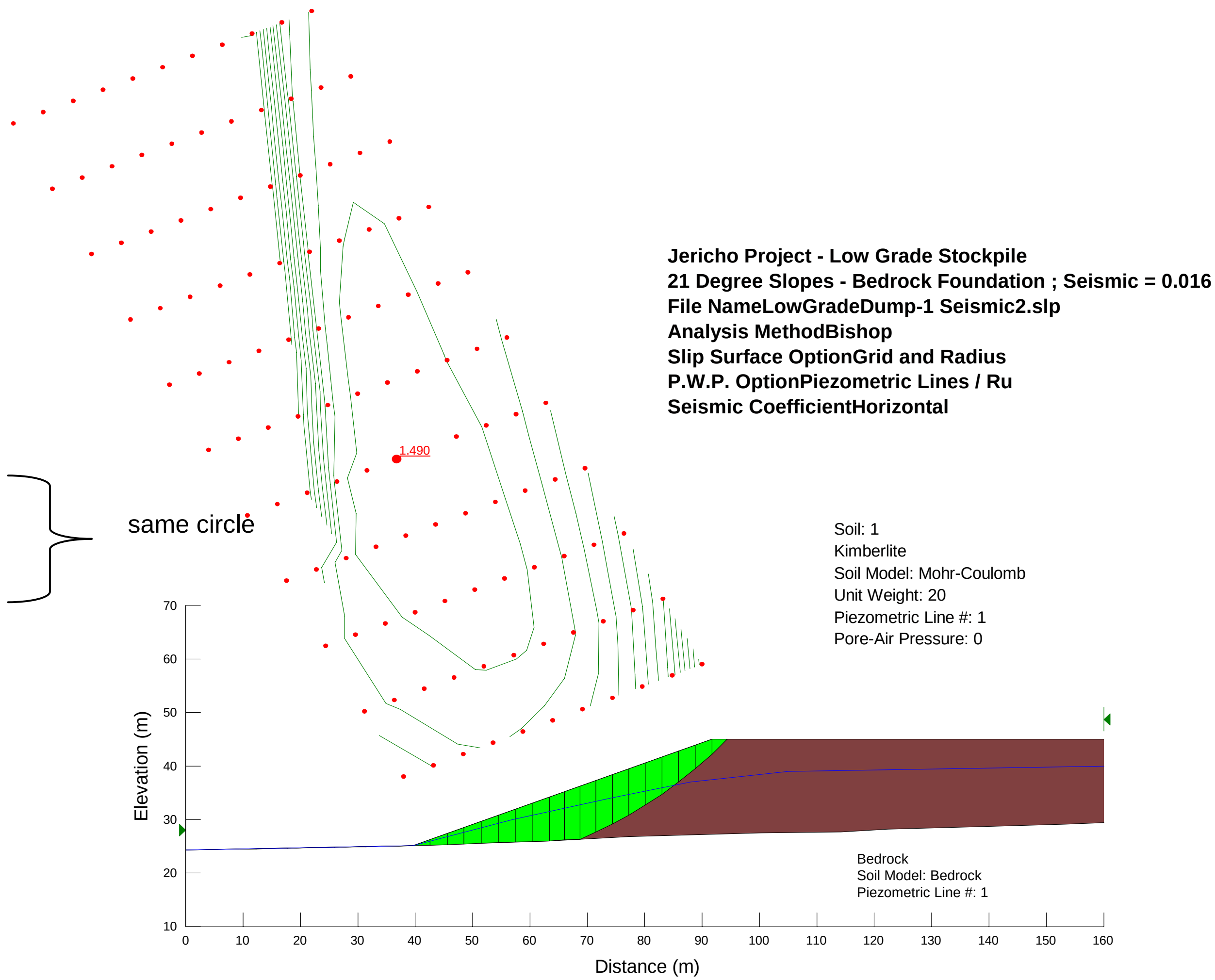
Infinite Slope Fs = 2.49

Jericho Stability Analysis 2004

Low Grade Stockpile

Dump Height (m)	20
Slope	21 deg (2.6H:1V)
Unit Wt. (kN/cu.m.)	20
Phi	30
Cohesion (kPa)	10
High WT in dump	

Case	**Fs**
Bedrock Foundation	
g = 0	1.563
g = 0.013	1.503
g = 0.016	1.490
g = 0.06	1.319
Till Foundation	
g = 0	1.566



Manual Infinite Slope Case Analysis

Slope angle =	21 deg
Kimberlite phi =	30 deg
Fs =	Tan(30)/Tan(21)
Infinite Slope Fs =	1.50