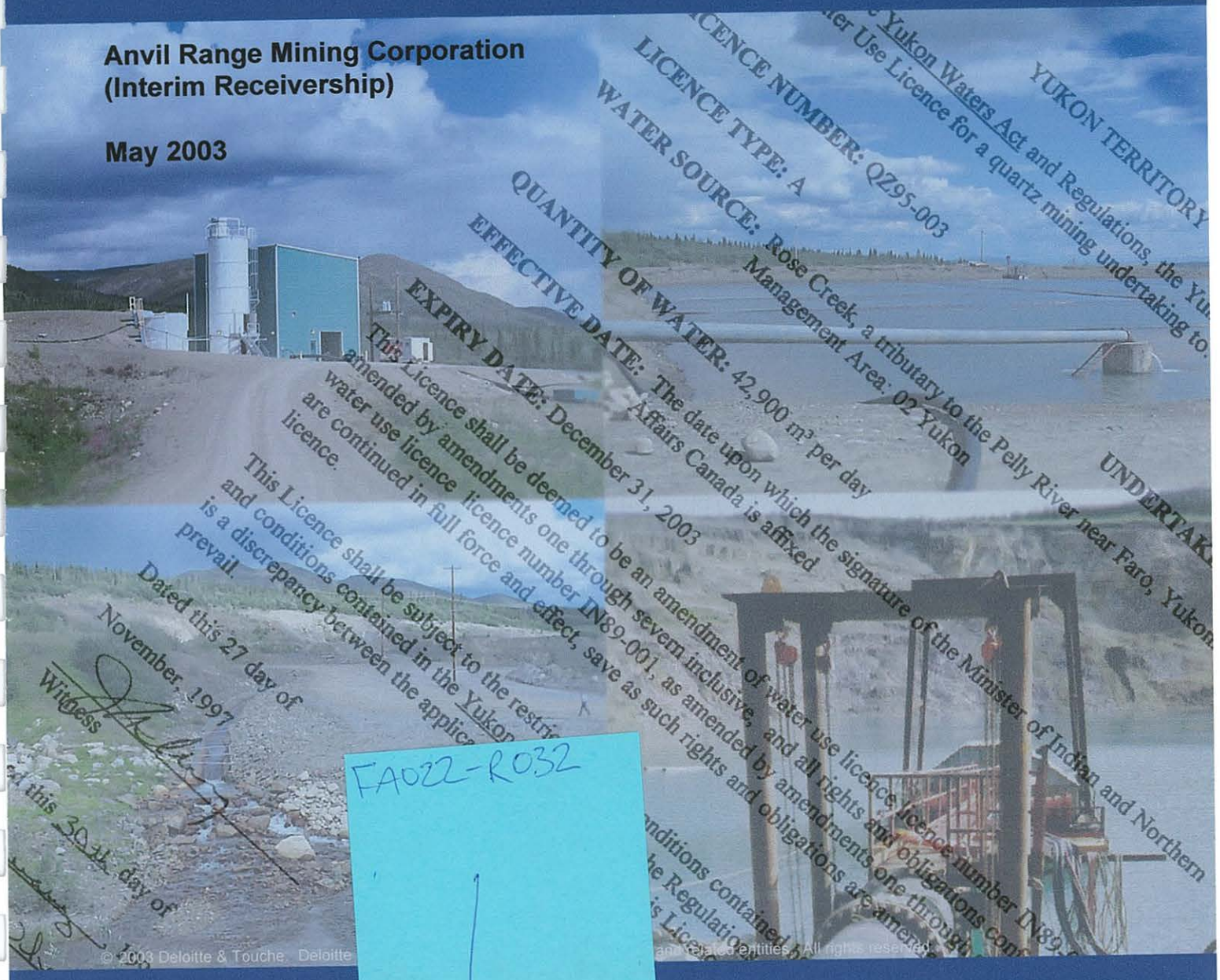
Deloitte & Touche

Anvil Range Mine Complex
2004 to 2008 Water Licence Renewal Application Report

Anvil Range Mining Corporation
(Interim Receivership)

May 2003



FA022-R032

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2004 to 2008 Water Licence Renewal Application Report

Anvil Range Mining Corporation
(Interim Receivership)

Submitted by:
Deloitte & Touche Inc.
In its capacity as Interim Receiver for
Anvil Range Mining Corporation

in association with:
Gartner Lee Limited

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Gartner Lee

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1 INTRODUCTION TO THE WATER LICENCE RENEWAL APPLICATION REPORT

The Anvil Range Mine Complex, located in Faro, Yukon, operated from 1969 to 1998 inclusive of several temporary closures. Mining and milling operations permanently ceased in early 1998 shortly after the owner, Anvil Range Mining Corporation ("Anvil Range"), filed for creditor protection under the Companies' Creditor Arrangement Act. Deloitte & Touche Inc. was appointed Interim Receiver ("Interim Receiver") of Anvil Range pursuant to an order ("Interim Receivership Order") of the Ontario Court (General Division) ("the Court") (now the Superior Court of Justice) in April 1998.

The site is managed by the Court Appointed Interim Receiver, Deloitte & Touche Inc.

The Interim Receiver has overseen the management of the property under the terms of the water licences in addition to the Interim Receiver's mandate to receive, preserve, protect and realize upon Anvil Range's assets. The Interim Receiver has worked with the Department of Indian Affairs and Northern Development ("DIAND"), the Yukon Territorial Government ("YTG"), the Town of Faro, the Ross River Dena Council, and other stakeholders to manage environmental programs that are required to protect the receiving environment.

The mine complex is currently regulated under two water licences, which specify the terms and conditions under which the licence holder (i.e. Anvil Range) can discharge water into the natural environment. The Faro mine site operates under licence QZ95-003 (formerly IN89-001) and the Vangorda Plateau mine site operates under licence IN89-002. The water licences were granted by the Yukon Territory Water Board under the Yukon Waters Act. Both licences will expire December 31, 2003.

The Interim Receivership Order grants the Interim Receiver the authority to "apply for any permits, licences, approvals or permissions on behalf of [Anvil Range] as may be required by any government or regulatory authority". In order to ensure that regulatory licencing that allows for the continued performance of necessary environmental protection activities, remains in place, the Interim Receiver filed documents, in May 2002, to initiate the process for application to the Yukon Territory Water Board for a single integrated licence for the mine complex for the period from January 1, 2004, to December 31, 2008 (5 years).

Steps to renew a licence include CEAA and licence application

Two overall steps are involved in the renewal and integration of the water licences:

1. A review process under the Canadian Environmental Assessment Act ("CEAA") which is required, in part, due to the disbursement of federal funds for the maintenance of this property. The review is focussed on the activities described in an Environmental Assessment Report ("EAR") that is submitted by the proponent following guidelines provided by DIAND; and
2. An application to the Yukon Territory Water Board for a water licence renewal.

The CEAA process was initiated with a Project Description submitted in May 2002

To initiate the CEAA process, the Interim Receiver submitted a Project Description in May 2002 that described the proposed activities for the proposed licence period. A Project Description Supplement was submitted in September 2002 in response to questions raised regarding the Project Description. At that time, preparation of a Final Closure and Reclamation Plan ("FCRP") for the mine complex was included into the Interim Receiver's scope of work.

Guidelines for preparation of the EAR were issued by DIAND in March 2003. The final scope of the project, as described in the Guidelines focussed solely on care and maintenance activities and excluded the development of a Final Closure Plan. This change was based on the announcement by DIAND in January 2003 that the development of an FCRP would be undertaken by a government project team ("closure Project Team") that would be formed for this specific purpose. A letter, dated January 20, 2003 is appended, which acknowledges this responsibility (Appendix A).

The EAR was submitted on April 30, 2003 to the Government of Yukon Executive Council Office Environmental Assessment Unit and was prepared to comply with the Guidelines provided by DIAND and to provide the information necessary to enable a screening decision per the CEAA.

This Water Licence Renewal Report supports the application to renew the water licence for the property. The licence for the property expire December 31 2003.

This document provides supporting information related to our application to renew the water licence for the Anvil Range property. It provides a description of the existing facilities, the proposed activities and the adpative management program.

This report is structured as follows:

- Section 1: Introduction to the report.
- Section 2: A summary of the project, the project background, the project rationale and the management structure.
- Sections 3 and 4: Description of the development history and existing facilities for the Faro and Vangorda Plateau mine sites.
- Sections 5 to 12: Description of the proposed project including new activities, proposed studies, adaptive management plan, accidents and malfunctions and environmental monitoring programs.

2 DEFINITION OF THE PROJECT

2.1 PROJECT SUMMARY

2.1.1 PROJECT OVERVIEW

The Anvil Range Mine Complex is managed by the Court Appointed Interim Receiver, Deloitte & Touche Inc.

The Anvil Range Mine Complex, located in Faro, Yukon, operated from 1969 to 1998 inclusive of several temporary closures (see Figures 1, 2 and 3). Mining and milling operations ceased in early 1998. Deloitte & Touche Inc. was appointed Interim Receiver of the mine owner, Anvil Range, in April 1998. The mine complex is currently regulated under two water licences (QZ95-003 and IN89-002), both of which will expire December 31, 2003.

The Interim Receiver has overseen the management of the property under the terms of the water licences as well as the Interim Receiver's mandate to receive, preserve, protect and realize upon the assets. The Interim Receiver has worked with the DIAND who is the funder of all project activities, YTG, the Town of Faro, the Ross River Dena Council and other stakeholders to manage environmental programs that are required to protect the receiving environment.

The mine complex is currently regulated under two water licences which will expire December 31, 2003

The Interim Receiver plans to continue activities to manage the site in compliance with the water licences (and proposed new licence), including water collection and treatment and monitoring of water quality, as well as with any directives received from regulatory agencies. These activities are consistent with:

1. The mandate of the Interim Receiver to provide maintenance and protection of the property and the environment and to apply for all necessary licences, and;
2. Condition 48 of the Faro water licence and part b, condition 13 of the Vangorda Plateau water licence, which require the operator "to maintain all works of the property in accordance with sound engineering and environmental practices, in particular, the tailings disposal facility, the diversion canals, the freshwater supply reservoir, the waste rock dumps and all associated works."

The context that overarches both the selection of the proposed care and maintenance activities is that the Anvil Range property exists as a property resulting from former mining and milling activities. This property has recognized environmental liabilities. The proposed care and maintenance activities and the timeframe of the proposed licence were selected to allow the property to be maintained while allowing sufficient time for a FCRP to be developed. Therefore, it is important to note that the proponent of the proposed project (the Interim Receiver) is not proposing to start a new mine in the next five years, nor to close the property in the next licence term. As mentioned in the introduction, closure planning is the responsibility of government. A letter, dated January 20, 2003 is appended, which acknowledges this responsibility (Appendix A).

The fundamental objective of the Care and Maintenance Plan is to provide short term mitigation of environmental effects by ensuring that the terms and conditions of the water licence are achieved. Activities are also chosen to prevent, to the extent possible, an increase in long-term liabilities at the site and to not constrain long term closure planning. The risk-based approach that is used to plan the care and maintenance activities has consistently identified water management as the highest priority issue, and the most immediate in nature. Therefore, water management is the priority of the activities proposed for the licence renewal period, focusing on providing treatment of water and maximizing the amount of emergency storage capacity for non-compliant water and unforeseen events.

There are six primary goals for care and maintenance activities proposed for 2004-2008

The routine on-going care and maintenance activities that are proposed to be undertaken from 2004 to 2008 will focus on achieving these specific objectives:

1. to minimize the quantity of clean water that enters or crosses the mine site and subsequently requires treatment;
2. to maximize the capture of water that requires treatment;
3. to provide storage and treatment for water that requires treatment;
4. to assess the efficiencies of the above systems on an ongoing basis and to implement upgrades and maintenance as appropriate;
5. to monitor environmental conditions on the mine site and in the receiving environment and the physical stability of earth structures on an ongoing basis;
6. to interpret and utilize monitoring information on an ongoing basis to improve the water management systems;
7. to provide for efficient management of all activities providing for worker health and safety, public health and safety, contingency and emergency preparedness planning and cost effective management of public funding; and
8. to report on care and maintenance activities on a scheduled basis per the water licences to the Yukon Territory Water Board.

Activities on the Faro and Vangorda sites will center on summer pumping and treatment for pits and ponds

Project activities are proposed to centre on seasonal (summer) water pumping and treatment programs for the Faro Main Pit, the back-filled Faro Zone 2 Pit, the Intermediate Pond and the Vangorda Pit in addition to the maintenance of water diversions and dams. Proposed new activities include the tear down of unused buildings and on-site remediation of hydrocarbon contaminated soil.

The annual risk assessment approach, initiated in 2001, will continue to enable the Interim Receiver to identify and prioritize short-term risks in any given year and to develop mitigative plans for items identified as high risk. In addition, an adaptive management program will be used to provide a staged approach to mitigation of identified environmental effects based on a pre-determined series of triggers and responses.

Deloitte & Touche Inc. consults with Faro & Ross River, as well as other stakeholders

The Interim Receiver consults with stakeholders, including the Town of Faro and the Ross River community on its activities. It contacts leaders from both groups to discuss mine activities and future plans. A key focus is the identification of employment opportunities for members of these communities.

In addition, environmental issues are regularly discussed with other stakeholders. The Interim Receiver maintains close consultation with DIAND and YTG regarding environmental management activities at the site. From a regulatory perspective on a project-by-project basis, Environment Canada and the Department of Fisheries and Oceans ("DFO") have been and will continue to be consulted. Annual meetings of the Technical Advisory Committee ("TAC"), which includes the above-mentioned stakeholders, as well as semi-annual update memos to TAC members help ensure that stakeholders are informed on mine activities.

2.1.2 PROJECT PURPOSE AND NEED

A water licence provides a regulatory framework for necessary environmental protection activities

The existing water licences for the Faro and Vangorda Plateau mine sites will expire December 31, 2003. A water licence is required to provide a regulatory framework for the performance of the necessary environmental protection activities. Therefore, the Interim Receiver intends to apply for renewal of the water licences.

The advantages and disadvantages of applying for one water licence for the entire mine complex that would consolidate the two existing licences have been assessed with DIAND, YTG and other interested parties. These discussions have indicated that one licence is most appropriate for regulating the proposed project activities based on the following rationale:

There are several advantages to combining the two existing water licences into one water licence

1. A single water licence would streamline the process relating to the application, environmental review and the public consultation processes for this licence renewal.
2. A single water licence would maximize the coordination of management and operation of water treatment facilities with resulting benefits in efficiency and effectiveness.
3. The operational benefits of maintaining two water licences will not likely ever be realized given the confirmation from DIAND in January 2003 that mining operations are not expected to be economically viable at any time in the future.

2.1.3 SUMMARY OF WATER USE

Water use for this project has been calculated in two ways:

1. Direct use: water that is directly used in active pumping and treatment systems.
2. Indirect use: water that passes through constructed diversion and collection channels.

Examples of direct use would include: pumping from the Faro Main Pit, pumping from the Faro Zone II Pit, syphoning and overflow from the Intermediate Pond, pumping from the Vangorda Pit, pumping from Little Creek Dam, pumping from the Grum/Vangorda Freshwater Supply Pond and possible future pumping from the Grum Pit. The estimated maximum direct use of water for this project is 65,465 m^3/day from Rose Creek and 22,900 m^3/day from Vangorda Creek, inclusive of an estimated maximum water use of 3,000 m^3/day from the Grum/Vangorda Freshwater Supply Pond.

Examples of indirect use would include: the Faro Creek Diversion, the Rose Creek Diversion Canal, the North Fork of Rose Creek Diversion, the Vangorda Creek Diversion Flume, the Grum Interceptor Ditch, the Vangorda Northeast Diversion Ditch and the Vangorda Northwest Diversion Ditch.

2.1.4 TIMING CONSIDERATIONS

The proposed 5-year term for the water licence will allow time for the development and approval of a FCRP

The proposed term of the water licence (2004 to 2008) was developed to allow adequate time for the research and development of a FCRP for the mine complex. As described above, this task is the responsibility of a government closure Project Team.

Preliminary discussions with the closure Project Team confirm that the rationale for the proposed term of the licence remains valid.

The guiding principle of the proposed licence term, then, is to enable the necessary care and maintenance activities to be conducted while a FCRP is researched and developed by the closure Project Team.

2.1.5 PROJECT MANAGEMENT

Deloitte & Touche Inc. was appointed Interim Receiver for Anvil Range in 1998

Deloitte & Touche Inc. was appointed Interim Receiver of Anvil Range pursuant to the Interim Receivership order of the Court on April 21, 1998. This appointment and the Interim Receivership Order itself were recognized and confirmed by the Supreme Court of the Yukon Territory. As an officer of the Court, the Interim Receiver has overseen the management of the property under the terms of the existing water licences since that time.

The Interim Receiver is responsible for preserving and protecting and for applying for licences.

The rights and responsibilities of the Interim Receiver are set out in the Interim Receivership Order. These include, but are not limited to:

- "to receive, preserve, protect and realize upon the Assets"; and
- "the authority to "apply for any permits, licences, approvals or permissions on behalf of [Anvil Range] as may be required by any government or regulatory authority".

Through the authority granted by the Interim Receivership Order, the Interim Receiver will be applying for a new water licence for the mine site. Anvil Range (as represented by the Interim Receiver) will be legally bound by the terms of the new licence, as it is currently bound by the terms of its existing licences. The Interim Receivership Order provides for other rights and responsibilities related to the administration, but not relating to the physical care of the property.

There are still many outstanding legal issues to be resolved with regard to the property and the administration. It is the wish of DIAND and YTG to have the Interim Receiver stay in place to oversee the management of the site. If the Interim Receiver is discharged by the Court of its responsibility with respect to managing the mine site prior to the end of the next licence period, the Anvil Range property will

become an Abandoned Site under the Devolution Transfer Agreement ("DTA") between the federal and territorial governments.

The Interim Receiver oversees the activities of the Mine Manager. The site employs approximately 30 employees on a seasonal basis

Upon Deloitte & Touche Inc.'s appointment, Mr. Wes Treleaven, a Senior Vice-President, was assigned the overall responsibility for the administration of the estate. Mr. Treleaven has over 25 years experience in dealing with large complex insolvencies. A professional staff team was assigned including senior managers in Toronto and Calgary with appropriate levels of industry and service line experience.

Upon taking possession of the property in April 1998, the Interim Receiver, in accordance with provisions of the Interim Receivership Order, identified and hired a site employee team to oversee the day-to-day operations. These employees were familiar with the site. An organization structure was set up with clearly established lines of authority, responsibilities and reporting levels. Mr. Dana Haggar continues under an employment contract as the Site Manager and reporting to him are four supervisors responsible to ensure that the property is maintained in a safe fashion and in compliance with regulatory requirements. On a seasonal basis, the Interim Receiver employs approximately 30 individuals from the communities of Faro and Ross River. There are six full-time employees who work throughout the year and some part-time employees assist during the off-season when necessary.

The Interim Receiver is committed to continuity to maximize stability at the site and has made efforts to minimize turnover of staff. Within Deloitte & Touche Inc., the engagement partner, senior management and environmental staff on the project have been consistent since 1998. The mine manager has been under contract with the Interim Receiver since 1998 and a majority of the seasonal employees have worked at the site for the past five years.

Contact information for key personnel involved include:

Deloitte & Touche Inc.	Mr. Wes Treleaven (Engagement Partner)	416-601-4482
Deloitte & Touche Inc.	Shannon Glenn (Manager, Environmental Services, Water Licence Renewal contact)	416-601-6454
Anvil Range Mining Corporation (Interim Receivership)	Mr. Dana Hagar, Mine Manager	867-994-2600

The Interim Receiver is committed to maximizing the use of local expertise and suppliers.

The Interim Receiver will ensure that its consulting team has continuity with the engineering and environmental teams that have worked on the site in previous years and will continue to maximize the use of local expertise.

Sixty percent of Anvil Range's expenditures were directed within the Yukon economy in 2002. The Interim Receiver will continue to ensure that services are provided by Yukon suppliers as appropriate and available, to maximize the economic benefit to the Yukon Territory. In addition, with increased activity at the site arising from proposed new activities described in Section 6 of this document, the Interim Receiver will continue to make efforts to increase opportunity for employment to First Nations and, in particular, the community of Ross River.

DIAND funds the activities of the Interim Receiver

DIAND is currently advancing required funding on a secured basis to ensure ongoing care and maintenance activities continue at the mine site. As the mine has no economic value and there are no other present sources of funding to pay for the ongoing protection of the environment, DIAND continues to be the exclusive funder of the Interim Receiver. Therefore, all proposed activities are contingent on funding from DIAND. All accounts are submitted to the Court for review and approval. With the DTA having come into effect April 1 2003, the Interim Receiver will submit its proposed annual care and maintenance budgets to both DIAND and YTG for approval.

Care and maintenance activities are driven by licence requirements and a risk based management approach

The care and maintenance activities of the Interim Receiver will be carried out according to the same model that has been followed since its appointment in 1998. Specifically, care and maintenance objectives are driven by licence requirements and by a risk-based management approach defined in Section 7 of this report. These care and maintenance activities are carried out under the oversight of the regulatory agency relevant to each activity.

Whenever possible, the Interim Receiver addresses all matters in court reports before undertaking activities and obtains Court approval. On occasion, in the case of emergencies where advanced Court approval has not been obtained, the Interim Receiver ensures that such activities are described in detail in its next court report and it obtains DIAND's approval prior to carrying out the proposed work.

2.1.6 CARE AND MAINTENANCE STAKEHOLDER CONSULTATION AND COMMUNICATION

Care and maintenance consultation will build on existing mechanisms

For its care and maintenance activities, the Interim Receiver has established a working relationship with various stakeholders, as described below. The topic of consultation for closure planning is not part of the scope of the care and maintenance project.

The Interim Receiver has and will continue to have regular contact with YTG Water Resources (previously DIAND Water Resources), Environment Canada and DFO on water licence requirement matters and any directives the Interim Receiver may receive from regulatory agencies.

Under the terms of one of its current water licenses (Vangorda IN89-002), the Interim Receiver meets annually with the TAC to review and discuss the ongoing care and maintenance activities at the mine site. The Interim Receiver will continue to maintain lines of care and maintenance consultation through this committee via meetings and updates. The Interim Receiver will advise the TAC of its budget approvals in March of each year. The Interim Receiver will continue to hold an annual site meeting outlining care and maintenance activities with a site tour. Also, mid-year reports will be provided to the TAC members to keep them apprised of site activities.

In addition, on reasonable notice, the Interim Receiver has and will continue to accommodate requests for tours of the mine. The Interim Receiver will also inform, with notice, both the Faro Town Council and the Ross River Dena Council of planned attendance at the mine by the Interim Receiver, with the intent of providing an opportunity to meet if desired by these parties.

Care and maintenance reports are available from the Water Board

The Interim Receiver will continue to file monthly and annual reports on its care and maintenance activities to the Yukon Territory Water Board. These reports are available to interested parties in the Yukon Territory Water Board library. Additional copies of the annual reports will be distributed to the Town of Faro, the Ross River Dena Council and Selkirk First Nations. The topic of availability of reports relating to site characterization and closure planning is not part of the scope of the care and maintenance project.

Identified short to medium term risks will be addressed in collaboration with the closure Project Team.

As a result of the risk-based management approach, short-term risks may be identified in any given year, which will need to be addressed. In addition, the care and maintenance project scope includes an adaptive management plan that includes the North Fork of Rose Creek, the Faro and Vangorda Diversions, the Grum Pit and potential acid drainage from Rose Creek Valley and from the Grum Rock Dump. The adaptive management plan consists of monitoring requirements, triggers and outlines either actions or planning/consultations mechanisms for determining actions.

For items arising either from the risk assessment or from the adaptive management plan that will need to be addressed within the 2004-2008 licence term, the Interim Receiver will work closely with the relevant regulatory agencies, and where appropriate with the closure Project Team. In this manner, actions taken will be determined within the consultation framework adopted for closure planning and will be aligned to the extent possible with closure directions as they exist at the time that the item to be addressed is identified.

Emergencies will be communicated immediately to any affected parties and will be addressed in a timely manner

In case of any emergency at the site, the mine manager has contact numbers to advise potentially affected parties immediately. In addition, all members of the TAC will be advised as soon as practically possible. Emergency reclamation work to preserve and safeguard the environment will be carried out by the Interim Receiver in a timely fashion in consultation with YTG Water Resources and advisory groups as required.

2.1.7 OWNERSHIP HISTORY

2.1.7.1 Mine Development

Mine production was from 1969 to 1982 and from 1986 to 1998

The Faro and Vangorda Plateau mine sites were in production from 1969 to 1982, and from 1986 to 1998, respectively. Production was halted at several times due to low metal prices or changes in ownership. The most recent owner, Anvil Range was placed into receivership in April 1998. The mine sites have been under the management of Deloitte & Touche Inc., acting as the court-appointed Interim Receiver, since that time.

The first exploration work was conducted on the Vangorda deposit between 1953 and 1955 by Prospector Airways, a predecessor of Kerr Addison Mines. The deposit was considered to be too small and remote to be mined at that time.

The Faro deposit was discovered in 1964 and brought into production in 1969 by Anvil Mining Corporation, initially producing 5,000 tonnes per day. The Anvil operation was amongst the world's major producers of lead and zinc concentrates. Additional deposits were subsequently discovered in 1964 (Swim), 1973 (Grum) and 1976 (Grizzly, formerly known as Dy).

The first mine operator was Anvil Mining Corporation

The Faro open pit mine was first operated by Anvil Mining Corporation in 1969, which was later reorganized to form Cyprus Anvil Mining Corporation (CAMC) in 1975. CAMC terminated its mining operations in June of 1982.

Ownership changed again when Curragh Resources ("Curragh") restarted operations in 1986 after approximately four years of inactivity. Production totalled approximately 13,500 tonnes per day. In addition to open pit mining, some underground mining was undertaken starting in 1989. From 1986 to 1992, Curragh mined an estimated 23.4 million tonnes of ore and generated 6 million m^3 of tailings. Curragh Resources initiated development of the Grum and Vangorda ore deposits in 1988. In 1992, Curragh Resources was placed into receivership.

Anvil Range purchased the Faro mining assets from KPMG Inc. in its capacity as Interim Receiver of Curragh Inc. in 1994. Anvil Range acquired the mine for approximately $27 million. Anvil Range's attempts at operating the Mine were troubled from the very beginning. Operations commenced in 1995, however falling metal prices forced the company to shut down mining in late 1996, and milling operations in the spring of 1997. Although operations were reactivated in the fall of 1997, Anvil Range applied for and obtained CCAA protection in January 1998. Mining and milling operations were shut down in 1998.

The Vangorda Plateau mine site was developed in the late 1980's

Development of the Vangorda Plateau mine site began in the late 1980's and ore production began in 1992. Two open pits were developed: Vangorda and Grum. All ore was hauled by truck to the mill at the Faro mine site (approximately 15 km) and all milling activities (including tailings deposition) took place at the Faro mine site. The Vangorda deposit was depleted of economic reserves in 1998. The Anvil Range mining plan for the Grum Pit was only partially completed at the time the mine ceased operations in 1998. However, extraction of the residual ore is not considered to be economically viable as was indicated in a letter released by DIAND in January 2003 and in supporting documents provided by Strathcona Minerals, an engineering consultant retained by the Interim Receiver.

2.1.7.2 Interim Receivership

The Interim Receiver has a mandate to preserve and protect the property

On April 21, 1998, Deloitte & Touche Inc. was appointed Interim Receiver of the Anvil Range Mine Complex by the Ontario Court (General Division) ("the Court") (now the Superior Court of Justice). Among other responsibilities, the Interim Receiver's mandate is to "preserve and protect" the property. The Interim Receiver

has overseen the ongoing care, maintenance and environmental protection activities at the mine site.

Since its appointment the Interim Receiver has successfully maintained compliance with the terms of the water licences by implementing a broad scope of tasks related to environmental protection and environmental monitoring. The objective of the proposed activities for renewal of the water licence is to mirror the 1998-2002 compliance record for the 2004-2008 timeframe. Tasks have included:

1. Pumping and treatment of water from the Faro Main Pit, the Faro Zone 2 Pit and the Vangorda Pit (Vangorda initiated in 2002).
2. Treatment of water in the Intermediate Pond (Rose Creek Tailings Facility).
3. Compliance with the effluent discharge criteria in the water licences.
4. Conversion of equipment in the mill for use as a water treatment plant.
5. Water quality, biological and physical stability monitoring in accordance with and in excess of the terms of the water licences.
6. Preparation and submission to the Yukon Territory Water Board of monthly water quality reports and comprehensive annual environmental reports.
7. Assistance with large-scale DIAND scrap steel reclamation projects.
8. Removal of laboratory and process chemicals, PCB containing equipment and used oil from the mine sites.
9. TAC meetings and stakeholder consultation.
10. Physical maintenance and upgrading of water retention and vdiversion structures including substantial repairs to the Faro and Vangorda Creek Diversion Flume.
11. Completion of a comprehensive environmental study of the Rose Creek Tailings Facility.
12. Initiation of planning for long-term mine reclamation.
13. Completion of a comprehensive risk assessment of all key elements.

2.1.8 REGULATORY HISTORY

2.1.8.1 Land Tenure

The area of the Faro Deposit is held by 12 mineral leases under the Yukon Quartz Mining Act

The Faro mine site occupies mineral leases, which are leased from the Government of Canada under the Yukon Quartz Mining Act. The Vangorda Plateau mine site occupies mining claims but no Federal or Territorial leases.

The area of the Faro Deposit is currently held by 12 mineral leases under the *Yukon Quartz Mining Act*. These leases are due to expire on November 16th, 2009 and are listed in Table 2. All 12 mineral leases are currently held in the name Anvil Range.

Table 1. Mineral Leases Granted under the Yukon Quartz Mining Act for Faro Deposit

Lease No.	Grant No.	Claim Name	Ownership	Expiry Date	Lot No.
3427	92225	FARO 39	Anvil Range Mining Corporation	2009.11.16	39
3428	92227	FARO 41	Anvil Range Mining Corporation	2009.11.16	41
3429	92228	FARO 42	Anvil Range Mining Corporation	2009.11.16	42
3430	92229	FARO 43	Anvil Range Mining Corporation	2009.11.16	43
3431	92230	FARO 44	Anvil Range Mining Corporation	2009.11.16	44
3432	92231	FARO 45	Anvil Range Mining Corporation	2009.11.16	45
3433	92232	FARO 46	Anvil Range Mining Corporation	2009.11.16	46
3434	92239	FARO 53	Anvil Range Mining Corporation	2009.11.16	53
3435	92240	FARO 54	Anvil Range Mining Corporation	2009.11.16	54
3436	92241	FARO 55	Anvil Range Mining Corporation	2009.11.16	55
3437	92242	FARO 56	Anvil Range Mining Corporation	2009.11.16	56
3438	94573	WHI 8 FR	Anvil Range Mining Corporation	2009.11.16	90

There are no current Land Use Permits over the mine site and surrounding area as none are required within the municipality of the Town of Faro. Only a small part of the mine is within the Faro Municipal Boundary.

There are four Federal land leases at Faro

There are four federal land leases at the Faro site:

1. #1646 Map Sheet 105K6 — pit, dumps, plant site, tailings impoundments
2. #1690 Map Sheet 105K6 — freshwater reservoir
3. #1777 Map Sheet 105K6 — Faro Valley rock dump
4. #4945 Map Sheet 105K6 — NE rock dump

The rest of the Faro Deposit and surrounding area is held by mineral claims under the *Yukon Quartz Mining Act*. This package includes the following Quartz Claims:

1. FARO Claims registered to Anvil Range, were to expire March 1St 2001 to November 16th, 2009.
2. BILL Claims registered to Pelly River Mines Ltd., were to expire March 1st, 2001.
3. WHI Claims registered to Anvil Range, were to expired March 1st, 2001.
4. ED Claims registered to Anvil Range, were to expire March 1st, 2001.
5. LO Claims registered to Pelly River Mines Ltd., were to expire March 1st, 2001.
6. GAL Claims registered to Anvil Range, were to expire March 1st, 2001 to March 1st, 2002.

The Interim Receiver is granted relief from representation work on claims

To maintain mining claims in good standing, the holder is to do annual representation work or pay cash *in lieu* of such representation work or seek relief under Section 5.55(1) of the *Yukon Quartz Mining Act*. As the Interim Receiver has limited funding and has set as its priority maintenance and protection of the environment, the Interim Receiver has written to the Minister of DIAND requesting relief under Section 55 (1) of the *Yukon Quartz Mining Act*. Each year, the Interim Receiver has received a letter from the Minister of DIAND granting work relief under the authority provided in subsection 55 (1) of the Act for claims coming due. In the Minister's letter of February 28 2002, it is also stated "the granting of work relief is only applicable to

the claims as long as they are under the control and administration of the Interim Receiver. If conditions change and requirements for representation work falls on a third party by transfer or assignment, this work relief will become null and void".

The Grum deposit is held by mineral leases under the Yukon Quartz Mining Act

The area of the Grum Deposit is currently held by at least 28 mineral leases under the *Yukon Quartz Mining Act*. These leases are due to expire between June 1st, 2006 and August 21st, 2015 and are listed in Table 3. All 28 mineral leases are currently held in the name Anvil Range Mining Corporation. There are no surface leases registered under the Territorial Lands Act associated with the Grum Deposit. In November 1995 several surface leases were applied for, but to date, none have been granted.

Table 2. Mineral Leases Granted under the Yukon Quartz Mining Act for Grum Deposit

Lease No.	Grant No.	Claim Name	Ownership	Expiry Date	Lot No.
3204	66741	FIRTH 6	Anvil Range Mining Corporation	2006.01.28	76
3205	66743	FIRTH 8	Anvil Range Mining Corporation	2006.01.28	75
3206	66760	CHUCK 1	Anvil Range Mining Corporation	2006.01.28	68
3207	66761	CHUCK 2	Anvil Range Mining Corporation	2006.01.28	69
3208	66764	CHUCK 5	Anvil Range Mining Corporation	2006.01.28	67
3209	66765	CHUCK 6	Anvil Range Mining Corporation	2006.01.28	72
3210	66766	CHUCK 7	Anvil Range Mining Corporation	2006.01.28	73
3211	66767	CHUCK 8	Anvil Range Mining Corporation	2006.01.28	74
3195	70440	BIX 2	Anvil Range Mining Corporation	2006.01.28	77
3196	70441	BIX 3	Anvil Range Mining Corporation	2006.01.28	78
3335	66702	CHAMP 3	Anvil Range Mining Corporation	2008.01.25	62
3336	66703	CHAMP 4	Anvil Range Mining Corporation	2008.01.25	61
3337	66704	CHAMP 5	Anvil Range Mining Corporation	2008.01.25	64
3338	66705	CHAMP 6	Anvil Range Mining Corporation	2008.01.25	63
3329	66680	ELLE MAY 1	Anvil Range Mining Corporation	2008.01.25	58
3330	66681	ELLE MAY 2	Anvil Range Mining Corporation	2008.01.25	52
3331	66682	ELLE MAY 3	Anvil Range Mining Corporation	2008.01.25	59
3434	92239	GRUM 1	Anvil Range Mining Corporation	2009.11.16	53
3435	92240	GRUM 2	Anvil Range Mining Corporation	2009.11.16	54
3436	92241	GRUM 3	Anvil Range Mining Corporation	2009.11.16	55
3437	92242	GRUM 5	Anvil Range Mining Corporation	2009.11.16	56
3499	66706	CHAMP 7	Anvil Range Mining Corporation	2011.12.05	120
2125	77899	HANK 2 FR	Anvil Range Mining Corporation	2015.08.21	79
2126	77900	HANK 3 FR	Anvil Range Mining Corporation	2015.08.21	80
2127	77901	HANK 4 FR	Anvil Range Mining Corporation	2015.08.21	81
2128	77902	HANK 5 FR	Anvil Range Mining Corporation	2015.08.21	82
2129	77903	HANK 6 FR	Anvil Range Mining Corporation	2015.08.21	83
2130	77904	HANK 7 FR	Anvil Range Mining Corporation	2015.08.21	84

There are Quartz Claims for the rest of the Grum deposit and surrounding area

The rest of the Grum Deposit and surrounding area is held by mineral claims under the *Yukon Quartz Mining Act*. This package includes the following Quartz Claims:

1. MIAMI Claims, registered to Glamis Gold Inc., were to expire March 1st, 2001.
2. TIE Claims, registered to Pelly River Mines Ltd., were to expire March 1st, 2001.

3. SUN Claims, registered to Anvil Range, were to expire March 1st, 2001 to March 1st, 2002.
4. CHAMP Claims, registered to Anvil Range, are to expire March 1st, 2006 to December 5th, 2011.
5. RICH Claims, registered to Anvil Range, were to expire March 1st, 2001 to March 1st, 2006.
6. SALLY Claims, registered to Anvil Range, are to expire March 1st, 2006.
7. JACK Claims registered to Anvil Range, are to expire March 1st, 2006.
8. ELLE MAY Claims, registered to Anvil Range, are to expire March 1st, 2006 to January 25th 2008.
9. ROCKY Claims, registered to Anvil Range, are to expire January 28th, 2006 to June 1st, 2006.

As for the Faro site claims, the Interim Receiver has been granted work relief under Section 55(1) of the *Yukon Quartz Mining Act*.

The Vangorda Deposit is held by mineral leases under the Yukon Quartz Mining Act

The area of the Vangorda Deposit is currently held by 12 mineral leases under the *Yukon Quartz Mining Act*. These leases are due to expire between January 28th, 2006 and January 25th, 2008 and are listed in Table 4. These 12 mineral leases are currently held in the name Anvil Range.

Table 3. Mineral Leases Granted under the Yukon Quartz Mining Act for Vangorda Deposit

Lease No.	Grant No.	Claim Name	Ownership	Expiry Date	Lot No.
3197	66673	ROCKY 2	Anvil Range Mining Corporation	2006.01.28	51
3212	66674	ROCKY 3	Anvil Range Mining Corporation	2006.06.01	49
3213	66675	ROCKY 4	Anvil Range Mining Corporation	2006.06.01	50
3214	66676	ROCKY 5	Anvil Range Mining Corporation	2006.06.01	47
3327	66677	ROCKY 6	Anvil Range Mining Corporation	2007.08.01	48
3215	66678	ROCKY 7	Anvil Range Mining Corporation	2006.06.01	45
3328	66679	ROCKY 8	Anvil Range Mining Corporation	2007.08.01	46
3198	66684	WYNNE 1	Anvil Range Mining Corporation	2006.01.28	53
3332	66685	WYNNE 2	Anvil Range Mining Corporation	2007.08.01	57
3199	66686	WYNNE 3	Anvil Range Mining Corporation	2006.01.28	54
3333	66687	WYNNE 4	Anvil Range Mining Corporation	2008.01.25	56
3334	66688	WYNNE 5	Anvil Range Mining Corporation	2008.01.28	55

There are no surface leases registered under the *Territorial Lands Act* associated with the Vangorda Deposit. A surface lease was applied for in November of 1995 but has not been granted to date.

There are Quartz Claims for the rest of the Vangorda Deposit and surrounding area

The rest of the Vangorda Deposit and surrounding area is held by mineral claims under the *Yukon Quartz Mining Act*. This package includes the following Quartz Claims:

1. ROCKY Claims, registered to Anvil Range, are to expire January 28th, 2006 to August 1st, 2007.
2. GALE Claims, registered to Pelly River Mines Ltd., are to expire March 1st, 2005.
3. ALICE Claims, registered Anvil Range, are to expire March 1st, 2006.

4. WYNNE Claims, registered to Anvil Range, are to expire March 1st, 2006 to January 25th, 2008.
5. TIM Claims, registered to Anvil Range, are to expire March 1st, 2006.

2.1.8.2 Water Licences and Amendments

The Faro mine site water licence was initially issued in 1975 and was amended to accommodate expansion and to assign new ownership

When Anvil Mining Corporation began operations at the Faro mine site in 1969, there was no regulatory regime in place in the Yukon for mine production. The first water licence was issued to Cyprus Anvil Mining Corporation in February 1975 for the Faro mine and mill site. This licence was renewed on December 1, 1979, and was to expire on November 30, 1984.

In September 1980, Cyprus Anvil requested an amendment to their water licence to accommodate the expansion of the Rose Creek Tailings Facility, which was expanded to include construction of the Intermediate and Cross Valley Dams. The amendment was granted by issuing a new water licence in March 1982. This new water licence was set to expire in March 1989.

Due to low metal prices, mining operations shut down in June of 1982 and did not resume until 1986 under the ownership of Curragh Resources. Curragh Resources Inc. assumed ownership of the Faro mine site in October 1985. An emergency amendment was granted on October 4, 1985, which assigned the water licence to that company.

Two amendments to this water licence were requested and granted on November 18, 1988 and September 22, 1989, respectively. The latter was a Renewal Interim Order of the water licence with an expiry date of January 31, 1990.

A new water licence (1989) included a Trust Fund clause and was amended to allow the use of the Faro Pit for tailings disposal, to include the Trusteed Environment Fund and to incorporate an abandonment plan

Curragh Resources then applied for a new water licence. A proposal was put forward to the Water Board to include a Trust Fund clause in the licence to build up $7,500,000 over 25 years for reclamation. On December 21, 1989, the water licence was granted. This licence, number IN89-001, had an expiry date of January 30, 1997.

The first amendment to Curragh Resources' Faro mine site water licence was made in October 1991, in order to allow the use of the Faro Pit for tailings disposal. The next amendment included the Trusteed Environmental Fund, which described the transfer of $368,229 into the fund, as well as incorporation of the above-noted monies.

In 1992, DIAND began the scoping for the Integrated & Comprehensive Abandonment Plan (ICAP) for Faro and Vangorda Plateau mine sites. Curragh Resources produced an abandonment plan with various options and introduced an option that was incorporated in the third amendment, which was approved in July 1993. This alternative required a final abandonment plan to be produced within two years of the expiry of the water licence in January 1997.

The Vangorda Plateau mine site water licence was initially issued in 1990

A water licence (IN89-002) for the Vangorda Plateau mine site was granted to Curragh Resources in September 1990. This licence is valid until December 31, 2003.

The Faro and Vangorda Plateau water licences were assigned to Anvil Range on November 8, 1994, including the provisions for security funding. Anvil Range signed a Reclamation Security Agreement with DIAND, which provided for reclamation funding based on metal prices and mining revenues.

In March 1995, Anvil Range set up a Reclamation Trust Indenture and signed an Economic Agreement with Ross River Dena Development Corporation. Further to this, an application for an amendment and extension to the Faro water licence was submitted to the Water Board in August of 1995.

A series of brief amendments (numbers four to seven) to the Faro mine site were issued, extending the term of the existing licence for brief periods until a new licence (QZ95-003) was issued in January 1998. The new licence has an expiry date of December 31, 2003, which corresponds to the expiry date of the Vangorda Plateau water licence. Licence QZ95-003 includes some re-organization of the reclamation security funds and the introduction of the Reclamation Trust Indenture.

There is no approved "closure plan" for the mine complex

When operations at the Faro and Vangorda mine sites were shut down in February 1998, an abandonment plan had still not been approved. Anvil Range had filed an ICAP with the Yukon Territory Water Board in November 1996, but this document was not approved. Closure measures for different components of the mine sites are described in the water licences.

Table 5 summarizes all operators of the Faro and Vangorda Plateau mine sites, water licences held and amendments made, and the start and expiry dates of all licences and amendments.

Table 4. Chronology of Operators, Water Licences and Amendments

Operators	Water Licence/Amendment #	Date	Expiry Date
Cyprus Anvil Mining Corp.	Y-2L3-0005	Feb 4, 1975	Nov 30, 1979
	Y-2L3-2098	Dec 1, 1979	Nov 30, 1984
	Y-2L3-2226	Mar 24, 1982	Mar 24, 1989
Curragh Resources Inc.	YIN85-05AL (amendment to Y-2L3-2226	Oct 4, 1985	Mar 24, 1989
	YIN85-05A (amendment to Y-2L3-2226)	Sep 21, 1987	Mar 24, 1989
	Amendment #88-1 to YIN85-05A	Nov 18, 1988	Mar 24, 1989
	Amendment #89-1 to YIN85-05A	Sept 22, 1989	Jan 31, 1990
	IN89-001 (Faro)	Jan 23, 1990	Jan 30, 1997
	IN89-002 (Vangorda)	Oct 25, 1990	Dec 31, 2003
	Amendment #1 to IN89-001	Oct 2, 1991	Jan 30, 1997
	Amendment #2 to IN89-001	Dec 11, 1991	Jan 30, 1997
	Amendment #3 to IN89-001	Jul 23, 1993	Jan 30, 1997
Anvil Range Mining Corp.	IN89-001 & IN89-002 assigned to Anvil Range Mining Corporation	Nov 8, 1994	
	Submitted Application QZ95-003 to YTWB	Aug, 1995	
	Submitted Application to amend IN89-002 to YTWB	Aug, 1995	
	Amendment #4 IN89-001	Sept 9, 1993	Jan 30, 1997

Operators	Water Licence/Amendment #	Date	Expiry Date
	Amendment #5	Jan 8, 1997	May 30, 1997
	Amendment #6	May 28, 1997	Sept 30, 1997
	Amendment #7	Oct 7, 1997	Dec 31, 1997
	QZ95-003 (amendment to IN89-001)	Jan 30, 1998	Dec 31, 2003

2.1.8.3 Security

Security for the site includes two reclamation trusts and Water Licence security

Trusts

Curragh in September 1991 was required, pursuant to the terms of its water licence issued under the Northern Inland Waters Act (Canada), to create and fund the trusteed environmental fund ("TEF"). The TEF became a licence term for Anvil Range when the Curragh water licence was subsequently assigned to it. The Reclmation Security Trust Fund ("RTSF") was established in November 1994 by a reclamation security agreement between Anvil Range and the Government of Canada. By the terms of the water licence, all monies held by, and any income receivable to, the TEF was to be immediately paid into the RSTF. For reasons unknown, Anvil Range never paid the TEF funds into the RSTF.

By an order dated November 28, 2002, the Interim Receiver was authorized to transfer the funds in the TEF into the RSTF. The Interim Receiver has obtained the necessary consents from the TEF trustees. However the Interim Receiver, in investigating the steps to actually accomplish this transfer, discovered that the TEF may not satisfy the requirements for a qualified environmental trust under the Income Tax Act (Canada).

Historically, including during the interim receivership, the agent for the TEF trustees filed the TEF's tax returns. While Canada Customs and Revenue Agency ("CCRA") has assessed both the TEF and Anvil Range income tax returns as filed, up to the 2001 fiscal year, it appears that the returns filed on behalf of the TEF may be incorrect, it the TEF is not a qualified environmental trust. Consequently, the TEF may have been paying less tax than was required and the Interim Receiver may have received refundable tax credits that Anvil Range was not otherwise entitled to receive based upon TEF's not being a qualified environmental trust. As a result, Anvil Range may have to repay income tax refunds related to the TEF and received by the Interim Receiver during the interim receivership while the TEF would owe taxes. The Interim Receiver is reviewing this matter with CCRA.

The Interim Receiver is not aware of any issues with respect to the RST but does not want to merge the two trusts in a way that would cause the TEF tax issues to impact on the RST.

Water Licence Security

In 1994, Anvil Range deposited $1,443,700 (the "Water Licence Security Amount") in trust with Meighen Demers (now Ogilvy Renault), counsel to DIAND, as security pursuant to the two water licences for the Mine (Faro – QZ95-003 $500,000,

Vangorda-Grum – IN89-002 $943,700), issued in accordance with the Yukon Waters Act (Canada). Ogilvy Renault held the funds which, with interest, totaled approximately $1.8 million as at March 2003 (the "Total Funds").

Following meetings amongst the Interim Receiver, DIAND and YTG, DIAND and YTG agreed that the Total Funds should be transferred to the Interim Receiver and a corresponding unconditional standby letter of credit for the Water Licence Security Amount should be issued to YTG (the "Letter of Credit").

On March 27, 2003, the Interim Receiver obtained the Total Funds from Ogilvy Renault. The Total Funds were deposited into a new account with the Toronto Dominion Bank ("TD"). On April 1, 2003, the Letter of Credit was received from TD and sent to YTG. The Letter of Credit is subject to an annual service charge of 1%, payable in advance.

Although the Letter of Credit is unconditional, YTG as regulator post-Devolution can make draws only to remedy certain conditions pursuant to the Waters Act.

Although there may be a need, ultimately, to draw on the Letter of Credit, it is highly unlikely that the Letter of Credit would be required on an immediate basis. As a result, the Interim Receiver has invested the Total Funds with TD in low risk, short-term investments. The portion of funds making up the Water Licence Security Amount and the remaining $420,000, net of service charges (the "Surplus Funds"), will be invested separately. The interest earned on the Water Licence Security Amount will be transferred and reinvested with the Surplus Funds. The Surplus Funds will be used to pay the annual service charge of 1% and the balance will be available for use, subject to DIAND's and YTG'S approval, if required in the Anvil Range administration.

The Interim Receiver executed an assignment of its accounts with TD in the amount of $1,443,700 as security for the Letter of Credit. TD registered the assignment given by the Interim Receiver in accordance with the Personal Property Security Act (Ontario).

3 DESCRIPTION OF FACILITIES – FARO SITE

3.1 OVERVIEW OF STRUCTURES

This section of the report describes each of the key facilities at the Faro Mine site and their development and operational history

The Faro Mine site consists of the following primary structures:

1. Faro Main Pit.
2. Faro Zone 2 Pit.
3. Faro Rock Dumps.
4. Rose Creek Tailings Facility including Original, Second and Intermediate Dams.
5. Cross Valley Pond and Dam.
6. Mill and Other Buildings.
7. Water Treatment Facilities.
8. Faro Creek Diversions.
9. Fresh Water Supply Dam and Reservoir.
10. Pumphouse Pond and Dam.
11. North Fork Rose Creek Diversion.
12. North Wall Interceptor Ditch.
13. Rose Creek Diversion Canal.

This section of the report discusses the development and operational history of the Faro Mine site and provides a description of each of the key facilities. A general arrangement plan of the site is provided in Figure 2. Some information regarding earth structures and water diversions contained in this section was provided by BGC Engineering Inc.

3.2 DEVELOPMENT AND OPERATIONS HISTORY

The Faro mine started production in 1969

Stripping of the Faro Pit began in 1968 and commercial milling of ore began in September 1969. The initial production rate was 5,000 tonnes of ore per day, increasing to 6,000 tonnes in 1970 and 9,300 tonnes in 1974. The Faro Pit was mined as a conventional truck and shovel operation. Initially, 58.5 tonne trucks were utilized, which were replaced with 108 tonne trucks in 1977.

The first pit mined was Zone 1, from which waste rock was dumped in the Faro Valley and Northwest Dumps. The pit was initially developed as a narrow, northwesterly elongate cut into the hill slope northwest of Faro Creek. The pit was then broadened to the southwest in the early 1970's, with the waste dumped to the west side of the Northwest Dumps and into the west Main Dump. The pit was extended to the southeast across Faro Creek following establishment of the initial Faro Creek Diversion in the mid 1970's. Waste rock was deposited in the Main Dump and also the Northeast Dumps, which were started at that time. Zone 1 was mined into the early 1980's and was essentially completed by Cyprus Anvil. Curragh Resources mined several small remnants of ore from the pit walls between 1986 and 1992, with waste dumps internal to the pit. Cyprus Anvil deposited several million tonnes of oxidized ore from Zone 1 and Zone 2 near the mill.

The Zone 2 pit was mined in the late 1970's and early 1980's

In the late 1970's and early 1980's, Zone 2 was mined as a smaller, satellite pit and the Intermediate Dumps were started. It is believed that during the initial stripping of oxidized ore, metal-enriched overburden and sulphide waste rock from the Zone 2 Pit were deposited on the Intermediate Dump. Therefore, the lower lift of this dump likely contains a significant quantity of potentially acid generating material.

The Zone 3 area of the Main Pit was a down-dropped block of ore, which required considerable stripping of waste rock. This stripping was begun by Cyprus Anvil in the mid-1970's, in conjunction with mining of Zone 1, using the Northeast Dumps. During the mid-1980's shutdown, Cyprus Anvil conducted a major stripping effort, with waste rock being deposited in the Main and Intermediate Dumps. The southeast slot access to the Zone 3 area of the Main Pit was developed at that time. Non acid generating calc-silicate and schist waste from the Zone 3 stripping was segregated on top of the east Main Dump for possible future use. Waste from the Zone 3 stripping was also deposited by Cyprus Anvil in the mined-out Zones 2 Pit and in the Intermediate Dump.

Curragh Resources mined primarily in the Zone 3 area of the Main Pit

Curragh Resources mined primarily in Zone 3 where considerable stripping was required. Waste rock was deposited in the Main and Intermediate Dumps and the Zone 2 Pit. Curragh Resources deposited most of their sulphide waste rock in a cell on the upper lift of the Intermediate Dump, but later also deposited sulphide waste rock on top of the calc-silicate and schist placed by Cyprus Anvil on the upper lift of the Main Dump. Calc-silicate breccia, stripped from Zone 3, was used for the North Fork of Rose Creek rock drain. Schist, calc-silicate breccia and minor intrusive rock was used to build the haul road to Vangorda Plateau and a haul road to the mill on the southwest side of the Main and Intermediate Dumps. Rock placed in the haul road southeast of the North Fork of Rose Creek was derived from stripping in Zone 3 and, therefore, the southeast section of the haul road is believed to be constructed of non-sulphide waste rock, as that was all that was reportedly being mined in that part of the pit at the time. Curragh Resources also placed a considerable amount of waste rock, much of which was sulphide bearing in the previously mined portions of the Zone 1 and Zone 3 Pits. The Ramp Zone, a small extension of Zone 2, was mined by Curragh Resources in 1986 and then backfilled. The Ramp Zone was located immediately southwest of the southeast slot access to the Zone 3 Pit. Thus the pit wall between the slot and the Ramp Zone is thin.

Curragh Resources deposited low-grade ore (3 to 5% lead and zinc) in two stockpiles, A and C, beside the main haul road from the Zone 1 Pit. Curragh Resources processed the oxidized ore stockpiled by Cyprus Anvil after screening out the fine fraction of the ore. The oxidized fines are still present near the mill.

Curragh Resources mined 1.7 million tonnes of ore from an underground room and pillar mine developed through a portal into the southwest wall of the Main Pit. All openings into this mine were internal to the Faro Pit and are now flooded.

Tailings were deposited into the mined out Faro Main Pit from August 1992 to mine closure in 1998.

3.3 FARO MINE SITE FEATURES

3.3.1 OPEN PITS

3.3.1.1 Faro Main Pit

The Faro ore deposit has been described as an ellipsoidal and somewhat tabular mass that had a major axis of approximately 1,220 m and a minor axis of 370 m. The vertical thickness was up to 100 m. The ore zone was covered by waste rock and alluvium up to a depth of 170 m.

A seasonal pumping program maintains the in-pit water elevation

The Faro Main Pit (Zone 1 and 3) measures approximately 1675 m long by 975 m wide. Its circumference is 4.2 km covering a surface area of approximately 1.06 km^2. The lowest point in the Faro Pit has an elevation of 975 mASL, which is 335 m below the highest point on the west pit wall.

The Faro Pit has two access ramps which constitute low points in the pit perimeter. One access ramp is located in the southwest wall in proximity of the old Faro Creek channel with an invert elevation at 1180.5 mASL. The second access ramp is located in the southeast corner of the pit and has a lower invert at an elevation of 1174.5 mASL.

The pit was allowed to flood from runoff, seepage inflows and tailings inflows from 1992 to 1997. In 1997, the water elevation had reached the desired maximum range, as defined in Kilborn 1991 at approximately 15 m below the lowest overflow elevation. Subsequent to mine shut down in early 1998, the recycle water system has been incorporated into a seasonal pumping program that maintains the in-pit water elevation within the desired range.

The crest of the northeast pit wall is retrogressing toward Faro Creek diversion

The northeast wall of the Main Pit is undergoing a progressive failure of the slope face wherein the crest of the pit wall is retrogressing towards the Faro Creek Diversion. The stability of this pit wall has been professionally assessed (Golder 2002) and the rate of crest retrogression is monitored. It is considered unlikely that the crest of the pit wall will retrogress to the point of compromising the stability of the Faro Creek Diversion channel within the licence period (i.e. to 2008).

3.3.1.2 Zone 2 Pit

The Zone 2 Pit is located immediately southeast of the Faro Main Pit and was excavated into the west valley wall of North Fork Rose Creek to mine a small, faulted extension of the Faro ore body. The ultimate surface area of the excavation was 0.27 km^2 with the pit reaching 100 m at the deepest point and a total volume of 6.8 million m^3 of material removed (total waste rock, ore and overburden). Following excavation, the pit was backfilled with waste rock.

The low point in the pit perimeter is in the southeast area such that uncontrolled filling would result in an overflow of water into the North Fork of Rose Creek.

The Zone 2 Pit is pumped to prevent overflow to Rose Creek

Subsequent to a brief overflow from the pit into North Fork Rose Creek during backfilling in 1983, several control measures were implemented. These included construction of an external rock drain to collect water from the pit with an overflow pipe to provide a discreet discharge towards North Fork Rose Creek, installation of a well to monitor water level and installation of a pumping well to pump water from the backfilled pit to surface.

The pit volume up to the elevation at which overflow would occur to the North Fork of Rose Creek is 1.6 million m^3. Assuming an average porosity of 30% for the backfilled mine rock, the maximum storage capacity available for water collecting in the pit would be approximately 480,000 m^3. The pumping well is utilized to maintain the water elevation in the backfilled pit below the overflow elevation by pumping water to surface and into the Main Pit. The water is then incorporated into the seasonal water pumping/treatment process and, ultimately, discharged to Rose Creek.

3.3.2 ROCK DUMPS

Waste dumps at the Faro Mine site include the Faro Valley and Northwest Dumps, Northeast Dumps, Main and Intermediate Dumps, "Parking Lot Dumps," and Outer Haul Road West Dump

The waste dumps were developed over the sequence of the mining of the Faro pits. Generally, the Faro Valley and the Northwest Dumps were the first to be developed, from 1968 to the early 1970's, receiving waste from the early stripping and mining of the Faro Zone 1 Pit. The other rock piles developed during this period were marginal ore or low grade stockpiles. In the 1970's, the Northeast Dumps were built, primarily with waste from the Zone 1 and Zone 2 pits. The third section of the Northwest Dump, the Lower Northwest Dump, was also built from about 1970 to 1971. The two largest dumps on the Faro site, the Main and the Intermediate Dumps, were also started during the 1970's. These dumps continued to be used until 1990, when mining at Faro was almost finished. The "Parking Lot Dumps" were built in the mid-1970's.

Dump construction in the early 1980's was primarily in the Zone 2 East Dump. In the later 1980's several smaller dumps were built (<10,000 tonnes). The majority of the waste was deposited in the Outer Haul Road West Dump, with continued deposition on the Main and Intermediate Dumps.

In the 1990's, deposition continued on the Main and Intermediate Dumps, and on the low-grade stockpiles. In addition, waste was placed on some of the smaller dumps that were started in the late 1980's.

Tables 6 and 7, repeated from RGC 1996, provide a listing of the individual rock dumps, the years of construction, their dimensions and tonnages. The individual dumps are illustrated on Figures 4 and 5 and a section that illustrates the surface topography around the perimeter of the dumps is provided on Figure 6. RGC 1996 provides a detailed listing of the estimated composition of the individual rock dumps according to rock type, which is not repeated here.

3.3.2.1 Faro Northwest Dumps

The Northwest Dumps were formerly used as "boneyards"

The Northwest Dumps are located northwest of the Main Pit, and north of the plant site area. The dumps were constructed primarily by end-dumping. There are three major lifts to the dump, referred to as the Upper, Middle and Lower Northwest Dumps.

These dumps cover a total area of about 393,000 m^2, and have an average height of 21 m. The total tonnage of waste rock is estimated at about 15 million tonnes.

These dumps were used as "boneyards" for storage of used and spare equipment subsequent to completion of dump construction. These boneyards were the focus of a scrap steel reclamation project funded by DIAND in 1999 and 2000. This project removed the majority of scrap steel from the boneyards on the northwest rock dumps off the mine site and also removed all other garbage and buildings such that the rock benches were left clear of mining debris.

The "Parking Lot Dumps" were also used as "boneyards" over the life of the mine

There are two other dumps located immediately to the north of the mill site and south of Northwest Dumps which are described as the "Lower Parking Lot Dump" and the "Upper Parking Lot Dump". These dumps were constructed between 1975 and 1976. The two dumps are reported to contain about 2.9 million tonnes of rock and cover an area of about 0.1 km^2. The dumps were also used as boneyards over the life of the mine but were not cleared of scrap in the manner of the upper Northwest Dumps.

These dumps were constructed at their angle of repose on moderately sloping well-drained terrain. These dumps have been stable since construction, over 30 years ago, and there are no signs of instability. There is no significant upstream water source that could cause elevated pore pressures in the dumps. Over time, as the surficial rock weathers, some shallow slope creep and slumping of the surficial layers on the angle of repose dump faces may be anticipated. Very little water flows from the dumps and there is no significant erosion from surface water flows.

3.3.2.2 Faro Valley Dump

The Faro Valley Dump is in the original channel of Faro Creek

The Faro Valley Dump was constructed during the same period as the Northwest Dumps, from the early development of the Faro Main Pit. This dump is located north of the open pit, in the original channel of Faro Creek. Faro Creek was diverted around the pit to the northeast to minimize the flow of clean water into the pit during mining. The dump fills the original creek channel and is, in part, draped over the edge of the pit resulting in a variable dump height, with a maximum of 23 m and an average of 11 m. The Faro Valley Dump is described in two sections: the larger Faro Valley North Dump covers an area of approximately 136,000 m^2 and the smaller Faro

Table 5. Period of Construction of Faro Waste Rock Dumps

Dump Symbol	Name	Age of Dump	
		start	end
NWU	Upper Northwest Dump	1968	1969
NWM	Middle Northwest Dump	1969	1970
NWL	Lower Northwest Dump	1970	1971
UPL	Upper Parking Lot Dump	1975	1976
LPL	Lower Parking Lot Dump	1975	1976
FVN	Faro Valley North	1968	1970
FVS	Faro Valley South	1968	1975
MDW	Main Dump West	1974	1990
MDE	Main Dump East	1972	1990
ID	Intermediate Dump	1979	1990
NEU	Upper Northeast Dump	1974	1977
NEL	Lower Northeast Dump	1975	1979
NEO	Outer Northeast Dump	1975	1980
ZIIW	Zone II West	1987	1990
ZIIE	Zone II East	1980	1985
RZD	Ramp Zone Dump	1989	1990
RD	Ranch Dump	1989	1990
SWPWD	Southwest Pit Wall Dump	1990	1991
LGSPA	Low Grade Stockpile A	1987	1990
LGSPC	Low Grade Stockpile C	1987	1990
FTW	Fuel Tank DumpW	1969	1971
FTE	Fuel Tank Dump E	1969	1971
MMW	Mt. Mungly West	1969	1970
MME	Mt. Mungly East	1969	1970
SPB	Stockpiles Base	1969	1975
OXSP	Oxide Fines Stockpile	1969	1974
MGSP	Medium Grade Stockpile	n/a	1998
CHSP	Crusher Stockpile	n/a	1998
OHRW	Outer Haul Road West	1987	1989
OHRE	Outer Haul Road East	1983	1989
NFRD	North Fork Rock Drain	1988	1988

Table 6. Estimated Size of Faro Waste Rock Dumps

Dump Symbol	Name	Area (m^2)	Max Height (m)	Average Height (m)	Volume (m^3)	Tonnage (tonnes)
NWU	Upper Northwest Dump	128,833	15	10	1,332,833	2,665,666
NWM	Middle Northwest Dump	158,069	30	18	2,861,748	5,723,496
NWL	Lower Northwest Dump	105,653	37	31	3,279,066	6,558,131
UPL	Upper Parking Lot Dump	53,716	27	21	1,111,427	2,222,855
LPL	Lower Parking Lot Dump	32,724	12	10	338,540	677,080
FVN	Faro Valley North	135,869	23	13	1,757,025	3,514,051
FVS	Faro Valley South	32,605	18	9	303,583	607,166
MDW	Main Dump West	220,861	76	57	12,566,943	25,133,886
MDE	Main Dump East	436,065	85	78	33,834,525	67,669,051
ID	Intermediate Dump	421,463	82	62	26,161,236	52,322,473
NEU	Upper Northeast Dump	254,309	67	31	7,892,780	15,785,561
NEL	Lower Northeast Dump	290,351	61	39	11,264,246	22,528,492
NEO	Outer Northeast Dump	12,787	9	8	99,211	198,423
ZIIW	Zone II West	89,315	67	34	3,003,004	6,006,008
ZIIE	Zone II East	126,084	137	65	8,152,422	16,304,843
RZD	Ramp Zone Dump	60,265	18	18	1,091,072	2,182,144
RD	Ranch Dump	42,305	8	6	262,597	525,195
SWPWD	Southwest Pit Wall Dump	78,294	15	10	809,981	1,619,962
LGSPA	Low Grade Stockpile A	29,353	18	16	455,502	911,003
LGSPC	Low Grade Stockpile C	34,537	11	11	393,034	786,069
FTW	Fuel Tank DumpW	8,372	6	5	43,308	86,615
FTE	Fuel Tank Dump E	95,879	21	13	1,239,888	2,479,775
MMW	Mt. Mungly West	20,287	8	6	125,927	251,853
MME	Mt. Mungly East	34,130	34	13	441,364	882,728
SPB	Stockpiles Base	91,250	21	16	1,416,028	2,832,056
OXSP	Oxide Fines Stockpile	20,793	9	8	161,335	322,670
MGSP	Medium Grade Stockpile	33,899	-	-	-	-
CHSP	Crusher Stockpile	22,917	-	-	-	-
OHRW	Outer Haul Road West	186,942	46	34	6,285,461	12,570,923
OHRE	Outer Haul Road East	86,644	49	26	2,240,913	4,481,826
NFRD	North Fork Rock Drain		-	-	-	-
	Total	**3,344,570**			**128,925,000**	**257,850,000**

Valley South Dump covers an area of about 32,600 m^2. The two dumps contain a combined total of about 4.1 million tonnes of waste rock.

The Faro Valley Dumps are located on the Faro Valley alluvium immediately adjacent to the Faro Pit north slope. The dump currently acts as a rock drain for the old Faro Creek channel and impounds a shallow pool of water on its upstream side. Stability of the southern slopes of this dump is dependent on the stability of the north wall of Faro Pit in the Faro Valley alluvium. The valley alluvium is an aquifer and has a relatively high water table, which is drawn down as seepage occurs into the Faro Pit. The alluvium has, over time, slumped and raveled into the pit and this may be expected to progress with time. The performance of the Faro Creek Diversion Channel could impact the stability of the dump and the local pit slope since a failure of the diversion could allow a large flow of water which would exacerbate this progressive erosion.

3.3.2.3 Faro Main and Intermediate Dumps

The Faro Main and Intermediate Dumps are the largest at the Faro Mine site

The Main and Intermediate Dumps are the largest waste rock dumps, and were used for waste rock disposal over a period of about 18 years. The Main Dump East was the first to be constructed, beginning in 1972. The Main Dump West was initiated in 1974. Deposition of waste rock in the Intermediate Dump began in 1979. The Main and Intermediate Dumps are located south and southwest of the open pit, covering a total area of about 1.1 km^2. With a combined total of 145 million tonnes, the two dumps together contain over half of the total waste rock on site.

These dumps were constructed at their angle of repose on moderately sloped well-drained terrain. The outer slopes of these dumps have been stable since construction and there are no signs of instability. There is no significant upstream water source that could cause elevated pore pressures in the dumps. Over time, as the surficial rock weathers, some shallow slope creep and slumping of the surficial layers on the angle of repose dump faces may be anticipated. Very little water flows from the dumps and there is no significant erosion from surface water flows.

A portion of these rock dumps overlooks the North Fork of Rose Creek at the upstream side of the haul road rock drain. The physical stability of the dump face is of importance because of the potential for a slope failure to compromise the performance of the rock drain and, as a result, is specifically inspected on an annual basis by a qualified geotechnical engineer. The slope displays signs of minor surficial slumping and settlement.

3.3.2.4 Faro Northeast Dumps

The Northeast Waste Dumps are comprised of the Outer, Upper, and Lower Northeast Dumps

The Northeast Waste Dumps are considered in three areas: the Outer Northeast Dump, the Upper Northeast Dump, and the Lower Northeast Dump. These dumps are located to the southeast of the main pit. The western portion of the Upper and Lower Dumps infill the Zone 2 Pit. The Upper and Lower Northeast Dumps are relatively large, containing a total of 38.3 million tonnes of waste rock. Since these dumps are located within the pit, the dumps are high and average 31 and 39 m,

respectively. They cover an area of approximately 0.5 km^2. The Outer Northeast Dump is small by comparison, containing about 0.2 million tonnes of rock, with an average dump height of 8 m and an area of 0.01 km^2.

These dumps were constructed at angle of repose on moderately sloped well-drained terrain. The outer slopes of these dumps have been generally stable since construction although the slope displays signs of minor surficial slumping and settlement. There is no significant upstream water source that could cause elevated pore pressures in the dumps and surface seepage from the rock dumps is intermittent. Over time, as the surficial rock weathers, some shallow slope creep and slumping of the surficial layers on the angle of repose dump faces may be anticipated.

3.3.2.5 Zone 2 Dumps

The Zone 2 Dumps fill the Zone 2 pit

The Zone 2 Dumps are located mostly within the backfilled Zone 2 Pit, to the southeast of the Main Pit. The dumps were built as the pit was mined, with the Zone 2 East Dump built first in the early 1980's, and the Zone 2 West Dump build in the late 1980's. In total, the two dumps comprise approximately 2.3 million tonnes of waste rock. The Zone 2 East Dump is the larger of the two in terms of tonnage and covers an area of about 0.1 km^2. The Zone 2 West Dump covers a slightly smaller area, at about 0.09 km^2. The difference in the two dumps is the height of each dump, as a result of the configuration of the area of the pit and surrounding topography . The Zone 2 East Dump has a maximum height of 137 m and an average height of 65 m, compared to values 67 m and 34 m, respectively, for the Zone 2 West Dump.

These dumps were constructed at angle of repose. The outer slopes of these dumps have been stable since construction and there are no signs of instability. Over time, as the surficial rock weathers, some shallow slope creep and slumping of the surficial layers on the angle of repose dump faces may be anticipated.

3.3.2.6 Near Pit Dumps

The Near Pit Dumps are composed of the Ramp Zone Dump, Ranch Dump, and Southwest Pit Wall Dump

The Near Pit Dumps are considered to include the Ramp Zone Dump, the Ranch Dump, and the Southwest Pit Wall Dump. Other nearby dumps are included in "Low Grade Stockpiles". The Near Pit Dumps are located immediately to the south and southwest of the pit, and just north of the Main and Intermediate Dumps. The three were constructed between 1989 and 1991 and are relatively small dumps comprising a total of about 4.3 million tonnes of rock. Since the dumps are located at the edge of the pit and on the ramp, the dumps are high with a maximum height of 60 m. The total area of the dumps is comparatively low at about 0.2 km^2.

The Near Pit Dumps were developed on well-drained terrain sloping away from the pit. The outer slopes of these dumps have been stable since construction and there are no signs of instability. There is no significant upstream water source that could cause elevated pore pressures in the dumps. Over time, as the surficial rock weathers, some shallow slope creep and slumping of the surficial layers on the angle of repose dump faces may be anticipated. Very little water flows from the dumps and there is no significant erosion from surface water flows.

3.3.2.7 Low Grade Stockpiles

Six stockpiles composed of various types of low grade ore and high sulphide waste rock are located near the Faro Main Pit

Various types of low grade ore and high sulphide waste rock are located in small piles near the crusher and the Faro Main Pit. These are identified as six stockpiles:

1. low grade 'A'.
2. low grade 'C'.
3. Crusher Stockpile Base.
4. Mt. Mungley Dumps.
5. Oxide Fines Dumps.
6. Fuel Tank Dumps.

Two large stockpiles have been developed near the main haul entrance to the Faro Pit. These stockpiles, low grade "A" and "C", are between the lube shack and the Ranch Dump, and behind the lube shack, respectively. These stockpiles were built from 1987 to 1990 with low grade ore from the Zone 3 Pit. Some of the material originally placed in these stockpiles has been removed and milled, and the stockpiles currently contain an estimated 1.7 million tonnes. The residual material is now oxidized and was determined by Anvil Range to be unsuitable for processing through the mill.

An active ore stockpile was maintained near the mill during mine operations. Ore that was economic to process was passed through the mill prior to mine shut down in 1998. The crusher stockpile base remains, however, as a wide ramp that was used to dump ore and is thought to be constructed of various rock types that may include low grade and regular grade ore.

About 400 m northeast of the Crusher Stockpile in the west Mt. Mungly Dump is material brought from the concentrate storage facility in Skagway during a cleanup of that site. The material was delivered by Curragh and characterized as "concentrate contaminated with soil returned for reprocessing". The material appears to consist of sand, gravel and cobbles but also contains lead and zinc concentrates and plastic sheet remnants. The concentrates would have originated from the Faro mine site and were likely accepted onto the mine site by Curragh for that reason.

Immediately east of the Crusher Stockpile are several piles of fines originating from the processing of a former large stockpile of oxidized ore from the sub-crop of the Faro Deposit. The oxidized ore was screened with the coarse fraction processed through the mill. A small amount of this fine material is also present across the Main Haul road in the west Fuel Tank Dump.

All of these Low Grade Stockpiles Dumps are small relative to the other rock dumps, are internal to the area encompassed by the major rock dumps, are generally located on flat ground and the physical stability of these piles is not a substantial concern.

3.3.2.8 Haul Road, Haul Road Dumps and Rock Drain

The haul road joins the Faro and Vangorda Plateau Mine sites and is constructed from mine rock

The North Fork Rock Drain was built between 1986 and 1988 and forms part of the haul road between the Faro and the Vangorda Plateau Mine sites. The haul road is constructed from mine rock and has similar stability characteristics to small rock dumps. No substantial stability problems have been experienced on the haul road since construction although surface cracking is visible in some locations and some slopes display signs of minor surficial slumping and settlement.

The two Haul Road Dumps were built between 1983 (East Dump) and 1989 (West Dump). The Outer Haul Road East Dump is located between the Intermediate Dump and the North Fork Rock Drain and the Outer Haul Road West Dump forms the haul road around the south of the Intermediate and Main Dumps. These dumps are commonly considered to be a part of the Main/Intermediate rock dump assemblage.

Long term permeability of the rock drain is key to stability

The physical stability of the rock drain will depend on the long term maintenance of permeability through the drain. The drain was formed by end dumping coarse durable mine rock from the top of the haul road embankment as it was advanced over the North Fork of Rose Creek according to a design provided by Golder Associates. The performance of the rock drain is considered to be acceptable. A head pond is present on the upstream side of the rock drain.

3.3.3 TAILINGS IMPOUNDMENTS

3.3.3.1 Rose Creek Surface Impoundments

An estimated 54.4 million tonnes of tailings is included in three separate surface impoundments at Rose Creek

Mill tailings were deposited in three separate surface impoundments: the Original Impoundment, the Second Impoundment and the Intermediate Impoundment as follows:

1. The Original Impoundment contains tailings that were deposited between 1969 and 1975.
2. Tailings were deposited in the Second Impoundment from 1975 until 1982, and for approximately 5 months in 1986. Mine production was suspended from 1982 to 1986 and, therefore, no tailings were deposited.
3. The Intermediate Impoundment contains tailings that were deposited between 1986 and 1992. From 1992 to mine closure in 1998, tailings were deposited under water in the mined-out Faro Pit and not in the surface impoundments. Beginning in 1997, the Intermediate Impoundment has been used, periodically, for settlement and storage of lime treatment sediments generated from lime treatment of water pumped from the Main pit.

In total, the surface impoundments contain an estimated 54.4 million tonnes of tailings (28.6 million cubic metres), as listed in Table 8, repeated from RGC, 1996. The tailings are up to 25 metres thick and overlie native soils comprised largely of sand/gravel of glacial outwash origin with some glaciolacustrine sediments. Native soils may extend to 60 m below ground surface. A basal silt till overlies bedrock beneath the sand and gravel.

Table 7. Rose Creek Tailings Facility, Tailings Volumes and Impoundment Surface Areas

Impoundment	Periods of Tailings Deposition	Surface Area (ha)		Tailings Volume (m^3)	
		As of Sept. 1990	Estimated Current	As of Sept. 1990	Estimated Current
Original	1969 to 1975	41.7	41.7	6,300,000	6,300,000
Secondary	mid 1975 to June 1982, June 1986 to Oct. 1986	54.5	54.5	10,400,000	10,400,000
Intermediate Dam	Oct. 1986 to July 1992	88	99	7,600,000	11,900,000
Total		**184.3**	**195.7**	**24,300,000**	**28,600,000**

Original Tailings Impoundment

The Original Tailings Impoundment operated from 1969-1975

The Original Impoundment covers an area of approximately 42 ha, located on the north side of Rose Creek at the mouth of the old Faro Creek channel. It was initially developed by raising a 7.5 to 9 m high waste rock starter dyke. The initial decant system consisted of a vertical riser leading to a 1.2 m diameter pre-stressed concrete pipe culvert placed in the space of the starter dyke. The starter dyke was raised in the winter of 1969 using un-compacted pit run waste rock with no impervious core. Dyke raising continued each summer until 1975, when a breach occurred. After a survey by DIAND was concluded following the breach, it was estimated that 247,000 m^3 of frozen slurry, containing approximately 12,300 m^3 of tailings solids, had been deposited between the tailings impoundment and the mouth of Rose Creek (RGC, 1996).

Second Tailings Impoundment

The Second Tailings Impoundment operated from 1974 – 1986

The Second Impoundment was constructed in 1974 by building a second dam around the perimeter of the original dam using, in part, spilled tailings. Construction on this impoundment began in 1974 and was completed in 1975 after the breach in the original tailings impoundment. The second tailings impoundment consists of a west dam, with a height of nearly 27 m and an east dam, with a typical height of 4.3 m.

During winter months, tailings were deposited into the Second Impoundment from a single point discharge originating from various locations along the Original Tailings Dam. Excess surface water was decanted via a surface decant spillway located at the right abutment of the West Dam. During summer months, tailings were spigotted from multipoint discharges along the crest of the new (Second) tailings dam, until 1978. From 1978 to 1982, tailings were deposited from the hillside to the north of the impoundment, or from the Original Tailings Dam. Tailings deposition was suspended in June 1982, when the mine halted operations, and resumed in June 1986 when the mine reopened. For a few months afterward, tailings were deposited in the Second Tailings Impoundment. Following that, tailings were placed in the Intermediate Dam Impoundment, with only occasional (emergency) discharge into the Second Impoundment.

Tailings were deposited in 1986 in the western part of the impoundment and have been shown (SRK, 1991) to grade in thickness from about 1m to 0m. An east/west

cross-section of the Second Impoundment would show the 1986 tailings pinching out toward the east. Thus, the eastern half of the impoundment contains surface tailings at least six years older than the western area.

Intermediate Tailings Impoundment

The Intermediate Tailings Impoundment operated from 1981 – 1992

A third dam was built downstream of the Second Impoundment across the valley of Rose Creek. This dam, the Intermediate Dam, retains seepage water and tailings solids. Native ground on the north, the Rose Creek Diversion channel on the south, and the Intermediate Dam on the west contain the Intermediate Impoundment. Beached tails below the downstream toe of the Secondary Tailings Dam forms the eastern portion of the impoundment. Submerged tailings extend to the upstream toe of the Intermediate Dam. Water is passed by siphons or spillway overflow from the Intermediate Pond into a polishing pond that is retained by the Cross Valley Dam.

The Intermediate Dam was initially constructed in 1981 and was raised in 1988, 1989 and 1991 to its current maximum vertical height of approximately 34.4 m. Upstream and downstream slopes were constructed at 2H:1V. The downstream slope also includes a 20 m wide bench at the toe that provides an overall slope of 2.1H:1V at its maximum section.

As a result of mine shutdown in 1982, no tailings were placed in the Intermediate Impoundment until October 1986 and deposition continued until 1992. Tailings were deposited in the Intermediate Dam Impoundment from a single discharge at the northeast corner of the impoundment (near the north abutment of the Second Tailings Dam). This resulted in a sloped tailings surface, with the apex at the discharge point and the low point at the Intermediate Dam. Baffles were constructed across the tailings surface in 1990 and 1991 to steepen the tailings surface, but these were later covered with tailings.

Cross Valley Pond

The Cross Valley Dam creates a polishing pond for water coming from the Intermediate Impoundment, before release into Rose Creek

The Cross Valley Dam was constructed during 1980 and 1981 approximately 500 m downstream of the Intermediate Dam. The dam is a zoned earthfill dam with a low permeability core that is founded on permeable valley bottom sands and gravels and that incorporates both a low permeability core and an upstream blanket of glacial till to control seepage. The dam has a maximum vertical height of approximately 19 m. It has a 6 m crest width, and upstream and downstream slopes of 2H:1V. The crest elevation is approximately 1033.4 mASL. A granular toe drain was added in 1991.

The purpose of the dam is to create a polishing pond for water discharged from the Intermediate Impoundment prior to release into Rose Creek. The polishing pond contains lime treatment sediments but does not hold tailings.

The Cross Valley Dam is equipped with a riprap-lined outflow spillway on the north abutment. Water is released as required via syphon pipes or spillway overflow into Rose Creek.

3.3.3.2 Faro Main Pit Tailings Impoundment

Tailings from the Grum and Vangorda deposits were deposited in the Main pit between 1992 and 1998

The Faro Pit was used between August 1992 and April 1993 and again from August 1995 until shutdown in 1998 for tailings deposition from the Grum and Vangorda deposits. Tailings entered the pit near the southern corner. The distribution of tailings at depth in the pit bottom has not been accurately determined but settlement was observed to be rapid (pers. comm., Anvil Range). A water pumping station was operated beginning in 1997 to provide process water to the mill and this pumping station did not experience problems with silt in the intake.

The water elevation within the Faro Main Pit is controlled by a seasonal pumping program

Since the shutdown in 1998, the Main Pit has undergone a seasonal dewatering program that maintains the water level within an acceptable range. Inflow to the Main Pit comes from several sources, such as rock dump seepage, surface run-off, groundwater inflow and water pumped from the Zone 2 Pit. The water level management plan is to draw down the Main Pit water elevation during the summer to such a level that the water does not rise to a critical elevation by the start of the following season.

3.3.4 BUILDINGS AND INFRASTRUCTURE

The Faro Mill produced lead and zinc concentrates

The Faro Mill was designed to produce lead and zinc concentrates. The concentrator began operation in September 1969 with a capacity of 5,000 tonnes of ore per day. This was increased to 6,000 tonnes in 1970, to 9,300 tonnes in 1974 and to 13,500 tonnes in 1986.

The facilities located at the Faro mill site include:

1. Primary crusher and coarse ore storage.
2. Mill and concentrate loadout.
3. Offices and warehouses.
4. Heavy duty equipment repair shops.
5. Guardhouse and administration building.
6. Tire shop and light vehicle repair shops.
7. Electrical substation belonging to the regional supplier.
8. Electrical distribution and switch gear belonging to the mine.

In addition, a lube station and core shacks are located near the Faro Pit. Other buildings not located directly at the mill site include the Copper Sulphate Plant, the Bulk Explosives Plant and the Pump House, located on the mine access road.

3.3.4.1 Process Buildings

Primary crushing was the first stage of ore processing

The primary crusher was originally fed directly by dump trucks hauling from the pits. During the mining of the Grum Deposit, tractor/trailer combinations were used to haul the ore to the crusher. Difficulties associated with dumping the trailers necessitated the use of an ore stockpile adjacent to the crusher. The ore was then fed to the crusher by a front-end-loader.

The primary crusher is a 1.37 m x 1.88 m gyratory crusher, crushing material to a size of minus 15 cm. The crusher discharge was screened, with the minus 1.27 cm material conveyed directly to the fine ore bins. Oversize material was conveyed to the coarse ore storage building, which had a live capacity of 14,400 tonnes. An estimated 8,000 to 10,000 wet metric tonnes of crushed ore remains in the coarse ore building.

Secondary crushing and screening reduced particle size to minus 1.27 cm

Ore was withdrawn from the bottom of the coarse ore storage by vibrating feeders and fed by conveyor to the 17.8 cm Simon shorthead secondary cone crusherset at 3.175 cm. The crushed product was screened, with the minus 1.27 cm material conveyed to the fine ore bin and the oversize material fed to the two 17.8 cm Simon shorthead tertiary crushers set at 0.95 cm. Discharge from the tertiary crushers was screened, with the undersize material conveyed to the fine ore bin and the oversize material recycled. The fine ore bin consists of three circular silos each with a capacity of 1,550 tonnes.

Feed from the three fine ore bin silos was delivered to three parallel grinding circuits. Each circuit consisted of a rod mill, ball mill and a tertiary ball mill.

Concentrates were separated by flotation

Flotation equipment consists of conventional flotation cells, column flotation cell, air compressors, pumps, pipes and regrind (ball) mills. The general flotation process that was employed was the addition of pH modifiers and various reagents that promoted the formation of a surface froth containing the minerals of economic interest. Residual solids ("tailings") passed out the bottom of the flotation cells and, ultimately, to the tailings impoundments. Some flotation equipment was converted and some additional equipment was added in 2001 to serve as a water treatment system for water pumped from the Faro Main Pit. This treatment process is described in Section 3.3.5 of this volume.

The lead and zinc concentrates were thickened in four large rake thickeners, using Percol 351 (1975) as a settling aid. This was followed by filtering through disc filters.

Rotary kiln dryers were used to dry the concentrates

The concentrates were dried in five rotary kilns. Four of these kilns were originally coal fired. The coal was mined near Ross River and Carmacks and hauled to the mill as required. The other kiln was originally oil fired. The kilns were converted to combination oil and propane burner systems in 1995/96. The rotary kiln dryers were equipped with wet scrubbers and exterior discharge with the discharges and filtrates pumped to the appropriate thickeners.

A lime mixing and distribution system is contained within the mill, which consists of an external dump bin for dry lime, a storage silo for dry lime, a ball mill for pulverizing coarse lime, a mixing system to slake lime and two lime slurry distribution tanks.

A boiler/heat plant, metallurgical laboratory and sample preparation/bucking room are located within the mill. A reagent storage and mixing building is attached to the mill. It is currently empty of residual reagents except for those that may be required for environmental protection purposes.

Concentrates were shipped to Skagway Alaska

Mineral concentrates were conveyed to a storage building where they were placed onto piles. Originally a front-end loader was used to load truck mounted containers that were transported to the railway in Whitehorse. Following closure of the railway, the concentrates were trucked to Skagway, Alaska using tractor-trailer combinations with a capacity of about 50 tonnes ("muffin trucks"). These trucks were loaded through a conveyor/bin system, with the trucks weighed during loading on a horizontal truck scale. From Skagway, the concentrates were shipped by ocean going vessel to various international smelters.

3.3.4.2 Offices, Warehouse, Storage and Shops

An office and warehouse facility is adjacent to the mill

An office and warehouse facility is located adjacent to the mill. This office and warehouse facility was utilized by technical and administrative staff but has been largely unused since mine shut down in 1998. All warehouse inventory and office supplies that were not directly required for care and maintenance activities or that were not directly related to the fixed equipment in the mill were removed from the site in 1998 and 1999 and sold.

The warehouse and office complex is constructed mainly from structural steel with lesser amounts of dimension lumber and other building materials. Reinforced concrete was used for foundation footings and basement walls and floors. The warehouse has a floor space of approximately 18,000 ft^2, with 4,000 ft^2 of second floor office space.

A heavy equipment shop, repair shop, tire shop, guardhouse and a few shacks are located at the Faro Mine site

A heavy equipment shop, used for repairing haul trucks and other heavy equipment, is semi-attached to the office/warehouse facility. A second equipment repair shop, utilized for lighter-duty trucks and construction equipment, is located near the office and warehouse building to the south.

The repair shop consists of 10 bays for mobile equipment, including two lubrication bays. A general shop located in a 13,400 ft^2 housing includes an electric shop, a welding bay, a carpenter shop and a machine shop. The "Wabco repair shop" consists of 6 bays on 10,000 ft^2. Southwest of the heavy duty equipment repair shops is the tire shop, a steel framed, two storage metal clad building with a concrete slab.

The Guardhouse is located at the entrance to Faro Mine's main operational area. This facility is currently utilized as the mine office.

There are a few buildings outside of the mill area, including the lube shack near the Main Pit Haul Road entrance.

Scrap yards are present on various rock dumps

Some scrap yards are present on the tops of various dumps around the Faro site. The scrap includes materials from mill expansions, old mobile equipment (shovels, trucks), old light vehicles, tires, etc. The major sites include the east Main Dump, the north end of the west Main Dump (possibly a long term parking area), the east Tank Farm Dump and the upper and lower Parking Lot Dumps.

Two contractor owned plants are present

Two contractor-owned buildings are present at a small yard located immediately upstream of the Rose Creek Tailings Facility. One building is a bulk explosives (ANFO) plant that consists of one large and two smaller metal pre-fabricated buildings which housed chemicals and machinery utilized for the manufacture and delivery of bulk explosives. One building is a copper sulphate plant that consists of several reactor tanks used to manufacture copper sulphate (mill reagent). A small, lined collection pond is located between the copper sulphate plant and the North Fork Rose Creek Diversion.

There are several above ground storage tanks on the mine site that were used to store diesel and gasoline. The tanks are inactive except for one tank that is utilized for storage and dispensing of diesel fuel and one tank that is utilized for storage and dispensing of gasoline.

Power is supplied from the regional hydroelectric grid

Electrical power is supplied to the Faro site via a 38 kV power line connected to the Whitehorse-Aishihik-Faro Grid. Transformers at the Faro Mill step the power down for on-site distribution. A standby EMD diesel generator is available to provide an emergency power supply. A 27 kV overhead power line runs from the Faro mill site to the Vangorda Plateau site.

3.3.4.3 Landfill

A landfill is located on the Main/Intermediate Rock Dump that was initiated and largely developed during past mining activities. The incremental volume of waste that has been deposited into the landfill since mine closure in 1998 is small. The specific contents of the landfill are unknown and no inventory or operating procedures related to past mining activities are available.

A fire started at the landfill in January 1997. Attempts were made in 1997 to manually extinguish the fire but the source quickly migrated underground and these attempts were unsuccessful (pers. comm., Anvil Range). The active waste dumping location during the interim receivership period has been a higher area away from the previous dumping location. There is currently no active burning (pers. comm. Anvil Range).

3.3.5 WATER TREATMENT FACILITIES

3.3.5.1 Water Treatment - General

Water treatment in the Rose Creek Valley began in 1992 due to a general increase in zinc concentrations

The Intermediate Impoundment was used for tailings deposition from 1986 to 1992. Following the cessation of tailings deposition in 1992 and until 1997, there was a general increase in the concentration of zinc in water flowing through the Intermediate Pond. This was the anticipated trend attributed to:

1. The removal of a large inflow of alkalinity that previously entered the pond via the tailings slurry.
2. The continued inflow of contaminated rock dump seepage water via location X23.
3. The continued flushing of contaminants by run off over beached (exposed) tailings in the upstream portion of the Intermediate Impoundment.

Treatment was accomplished by various methods of pH modification

Water treatment in the Rose Creek Valley was started in 1992 to ensure that surface outflow from the Cross Valley Pond met the allowable discharge limits. Water treatment has continued, on an as-required basis, since that time. The methods employed for the treatment have involved raising the pH of the Intermediate Pond effluent with lime or sodium hydroxide and subsequently utilizing the Cross Valley Pond for settlement of the treatment sediments. The pH modification has been accomplished at various times by:

1. Hauling lime slurry mixed in the mill to a gravity feed tank for addition into the outflow spillway.
2. Delivering lime slurry mixed in the mill to the outflow spillway via an overland pipeline.
3. Hauling lime slurry mixed in the Grum/Vangorda Water Treatment Plant to the south abutment of the dam for addition into a syphon line.
4. Adding sodium hydroxide into a syphon line at the south abutment.
5. Inflow into the upstream end of the Intermediate Pond of water pumped from the Faro Main Pit that was pre-treated with lime at the mill.

The latter method, inflow of pre-treated water from the Faro Main Pit, began in fall 1997 and continued in 2001 in conjunction with lime treatment in the outflow spillway.

The Faro pit pumping system was installed in 1997

The Faro Pit pumping/treatment program was initiated in 1997 and has been established as an annual seasonal (summer) program. The program utilizes a water pumping system that was installed in 1997 to provide an estimated minimum 95% of the water required for processing while the mill was operating prior to February 1998. Since mine shut down in 1998, the system has been used exclusively to pump water from the Faro Main Pit to the mill for treatment to maintain the in-pit water level within the pre-determined range. The recycle water system is made up of the following primary components:

1. Three electric pumps mounted on a floating barge in the pit rated at providing 5,000 USgpm each to the mill (only one or occasionally two pumps are utilized for effluent discharge).
2. A 30" sclair pipeline from the barge to the mill with flexible sections near the barge to prevent damage to the pipeline which might otherwise result from vertical movement of the barge.

3.3.5.2 2001 Mill Conversion

The mill was converted for use as a water treatment system in 2001

Certain fixed equipment in the mill was converted for use as a water treatment system in 2001. New equipment was also installed, where necessary. The purpose of the new system was to provide efficient treatment of water pumped from the Faro Main Pit such that the effluent can be released to the Polishing Pond or to Rose Creek. The system was successfully operated in 2001 and 2002.

Components of the new water treatment system are primarily pre-existing equipment

The system consists of these primary components:

1. A 24-inch influent pipeline.
2. Existing lime handling, storage and mixing system.
3. Lime conditioning in two sets of flotation cells operated in parallel with automated control on lime addition.
4. A 24-inch pipeline to settlement tanks.
5. Two settlement tanks (previous thickeners) operated in series or in parallel with optional lime and flocculent addition.
6. Instrumentation and control systems.
7. Flocculent mixing and distribution system.
8. Sediment pump and re-circulation pipe.
9. A 24-inch effluent pipeline with optional discharge into the Cross Valley Pond or the Cross Valley Dam outflow spillway.

This new system provides many benefits over the previous treatment methods including:

1. Reduction in lime consumption (and resultant cost savings).
2. Increased confidence in achieving objectives.
3. Improved control on operating parameters including automated controls.
4. Incorporation of contingency/emergency procedures.
5. Reduction in deposition of treatment sediments in Cross Valley Pond.
6. Productive use of existing infrastructure.
7. Substantial reduction in the volume of water requiring treatment at the Cross Valley Pond.

3.3.6 DAMS AND DIVERSIONS

3.3.6.1 Faro Creek Diversion

The Faro Creek Diversion Channel diverts water around the northeast side of the Main Pit and into the North Fork of Rose Creek

The original channel of Faro Creek passed through the center of the Faro Main Pit, past the mill site, and joined Rose Creek at what is currently the toe of the Original Tailings Embankment. As part of mine development, the Faro Creek Diversion Channel was constructed.

The Faro Creek Diversion Channel collects water from the original Faro Creek channel upstream of the Main Pit and diverts the water around the northeast side of the Main Pit and into the North Fork of Rose Creek. Some flow in the old Faro Creek drainage area upstream of the Faro Valley rock dumps cannot be collected by gravity into the Faro Creek Diversion and continues to flow directly into the Faro Main Pit. During operations, this excess flow was pumped around the pit perimeter.

The diversion starts approximately 1,370 m upstream of the Main Pit, follows the eastern side of the Faro Creek valley, passes along the northern crest of the pit past the Northeast Waste Dumps and empties into the North Fork of Rose Creek, approximately 2,100 m upstream of the Vangorda Haul Road near the upstream toe of the Northeast Rock Dumps. The total length of the diversion is approximately 3,350 m.

The diversion has an average bottom width of approximately 3.7 m and an average gradient (from the inlet to the point where it passes the Northeast Waste Dumps) of approximately 0.5%. In the upper portion of the channel (from its origin to the Faro Valley Rock Dump), the downgradient bank is formed by a dyke constructed of rock fill placed at an angle of approximately 1.5H:1V and the upgradient bank by shallow excavation into native soil cut to an angle generally around 2H:1V. Downgradient of the Faro Valley Rock Dump, the depth of cut increases reaching a maximum depth of approximately 7.6 m. Side slopes are typically excavated at 1H:2V in rock, and 2H:1V in soil. Beyond the Northeast Waste Rock Dumps, the gradient increases sharply (to as steep as 35%) as it plunges into the valley of the North Fork of Rose Creek.

The initial diversion channel directed water into the North Fork of Rose Creek immediately below the Zone 2 Pit. This operation is believed to have resulted in the deposition of some mineralized surface rock in the area between the Zone 2 Pit and the North Fork of Rose Creek. This temporary diversion was replaced shortly afterwards by the current Faro Creek Diversion.

The Faro Creek Diversion is known to leak water into the Main pit along the northeast wall of the pit due to the nature of the soils and the ditch construction. The flow loss is estimated to be in the order of 24%.

3.3.6.2 Faro Valley Interceptor Ditch

Runoff from the hillsides north and northwest of the Faro Valley Rock Dump is intercepted by the Faro Valley Interceptor Ditch and directed into the Faro Creek Diversion. No reviewed records identify the design, construction, or as-built details of the Faro Valley Interceptor Ditch. The ditch consists of a small excavation into surficial soils.

3.3.6.3 Fresh Water Supply Dam and Reservoir

The Fresh Water Supply Dam and Reservoir were redundant after installation of the recycle pumping system from the Main Pit in 1997

The Fresh Water Supply Dam ("FWSD") and Reservoir are original (1969) mine structures that were required prior to 1997 to provide water for ore processing. The Reservoir was used to store fresh water for use in the milling process through the winter season. A recycle water system constructed in 1997 replaced the FWSD Reservoir as the primary supply of water to the processing plant.

The Interim Receiver received a directive from the DFO, as a separate project, to remove the FWSD by excavating a channel through the dam to original ground. This project to breach the dam is undergoing an approval process that includes assessment under the *Canadian Environmental Assessment Act* and, therefore, is not described in this report for water licence renewal.

The new channel is proposed, in that project description, to be completed by March 2004 and, therefore, the FWSD and Reservoir and associated water control and monitoring programs are considered to be absent in the context of this proposal for care and maintenance activities from 2004 to 2008.

3.3.6.4 Pumphouse Pond Dam

The pumphouse pond dam was rebuilt after construction of the Second Tailings Impoundment in 1974

During 1969, a pumphouse pond was constructed by building a small dam in the Rose Creek channel just downstream of the confluence of the North and South Fork of Rose Creek. The pumphouse supplied water from this pond to the mill via a 2 km long insulated steel pipe.

Construction of the Second Tailings Impoundment in 1974, necessitated raising the tailwater elevation at the pumphouse dam. This required diversion of the North Fork of Rose Creek and rebuilding of the pumphouse and pumphouse pond dam.

3.3.6.5 North Fork Rose Creek Diversion

The North Fork of Rose Creek consists of a primary and a secondary channel

The North Fork of Rose Creek downstream of the mine access road crossing consists of two separate channels.

The primary flow channel approximately follows the natural stream course through a series of small, constructed ponds prior to joining with the South Fork of Rose Creek immediately upstream of the pumphouse pond. The small ponds are intended to allow surface water to recharge the groundwater system through the sand/gravel surface soils. This was an operating concern for the mine because groundwater wells

local for that area were utilized during the winter season to augment the supply of water for processing (prior to 1997).

A secondary channel passes high flow water around the groundwater recharge ponds and into the South Fork of Rose Creek immediately downstream of the pumphouse pond. This channel was constructed in response to previous mine operating concerns regarding excess sediment entering the pumphouse pond during freshet and to allow fish passage to the North Fork (possible only prior to construction of the haul road rock drain in 1986). A common operating practice (prior to 1997) was to open up this secondary channel in the spring to avoid sedimentation and to close this secondary channel in the fall in order to maximize the water supply to the pumphouse pond through winter. There have not been any recent (post 1996) alterations to the channel configuration.

3.3.6.6 Intermediate Dam

The Intermediate Dam retains tailings and non compliant water

The primary purpose of the Intermediate Dam is to retain tailings. The dam was initially constructed in 1981 to an elevation of 1068 mASL, approximately 20 m higher than the underlying native ground. The entire foundation area beneath the ultimate dam footprint was prepared and raised to 1064 mASL at that time as preparation for scheduled future raising of the dam. The dam was raised in 1988 (to 1073 m) and the emergency spillway situated at the south abutment was moved to the north abutment. The dam was further raised in 1989 to 1078 m and in 1991 to 1081.7 m, resulting in a height of approximately 34 m.

The dam is a zoned earthfill dam and initially, included a vertical, low permeability core excavated down into the foundation. The core is provided with granular filter zones on either side and a drainage blanket extends under the entire downstream side. A portion of the Intermediate Dam was located on terrace material and a 5 m wide blanket of till was placed on the excavation slopes to assist with seepage reduction. After the initial construction, the dam was raised in a downstream manner such that the vertical core became a sloping element. Upstream and downstream slopes were constructed at 2H:1V. The downstream slope also includes a 20m wide bench at 1064 m elevation to give it an overall slope of 2.1H:1V at its maximum section (Figure 7).

The Intermediate Dam is performing satisfactorily

Little information currently exists with regard to stability assessments for the Intermediate Dam. By extension of the initial design work in 1980 for the Cross Valley Dam, it is assumed that the dam was designed to the same seismic criteria (1 in 200-year event) as that dam. Upstream sloping core elements can represent increased stability concerns and this is a consideration regarding the portion of the dam above the initial height.

The Intermediate Dam is equipped with a riprap-lined spillway channel on the north abutment with a bottom width of 30 m and a depth of 1.5 m (to top of riprap). Golder Associates Ltd. (1992) note that this spillway has a discharge capacity of approximately 100 m^3/s, equivalent to a 1:500 year flood event.

The Intermediate Dam appears to be performing in a satisfactory manner. Some cracking has occurred on the crest, likely in reaction to either frost action on the core or due to saturation effects in wet years, which is scheduled to be remediated in 2003 as part of the routine care and maintenance activities. Visual seepage has been observed at the toe of the dam, at its south abutment. The seepage is considered to be related to seepage originating from the uphill Rose Creek Diversion Canal and to the presence of the backfilled initial spillway channel at this abutment.

The Intermediate Dam is instrumented with thermistors and pneumatic piezometers that are routinely monitored on a twice per year basis. The monitoring results are reviewed by a qualified geotechnical engineer.

3.3.6.7 Cross Valley Dam

The Cross Valley Dam creates a polishing pond for water released from the Intermediate Pond

The Cross Valley Dam is a water retaining structure built to contain water discharged from the Intermediate Impoundment. The retention pond formed by the dam, also referred to as the polishing pond, was designed to contain 1.4 million m^3 of water. The pond contains no tailings but it does contain lime treatment sediments. Compliant water is released from the pond via syphon pipes or spillway overflow.

The Cross Valley Dam was constructed in 1981 to a maximum vertical height of approximately 20 to 21 metres (Figure 8). The dam is a zoned earthfill dam with a low permeability core of silty till, a downstream chimney drain/filter and a downstream side blanket drain. In addition, an upstream side low permeability blanket was placed to approximately 60 m upstream from the upstream toe. A new toe drain and a toe berm configuration were designed and constructed by Golder Associates Ltd. in 1991 to reduce the heavy seepage that was observed along the toe of the dam. The work included widening of collector ditches, installation of drains, construction of berms and installation of monitoring weirs.

The dam is founded on permeable valley bottom sands and gravels. Some fine-grained permafrost existed in a small portion of the footprint. The dam has a crest width of 6 m and the upstream and downstream slopes are 2H:1V. Stability analyses were undertaken by Golder Associates Ltd. and reported in the 1980 design document. A 200-year return event of 0.097g was used as the PGA for the pseudo-static analyses and the following Factors of Safety were provided:

Stability Aspect	Factors of Safety for the Upstream Side	Factors of Safety for the Downstream Side
Static	2.4 to >3	1.46 to 2.0
Pseudo-static (PGA = 0.097g)	1.5 to 2.2	1.05 to 1.6

The stability of the dam under MDE conditions (PGA=0.13g) has not been assessed.

The dam is performing satisfactorily

The Cross Valley Dam is equipped with a riprap-lined emergency spillway (and smaller pilot channel) on the north abutment of similar dimensions and capacity as the Intermediate Dam spillway. The 1992 as-built report by Golder Associates Ltd.

notes that the discharge capacity of the 1991 Intermediate Dam spillway was 100 m^3/s, approximately the discharge expected from the 1:500 year flood.

The dam has performed in a satisfactory manner over its history. The higher level of seepage encountered after construction was handled with the construction of a toe berm with drainage. The seepage amount measured by the weir system at the toe appears to be decreasing over time. Some minor cracking of the crest has occurred, possibly induced by frost, which is scheduled to be remediated in 2003 as part of the routine care and maintenance activities.

The Cross Valley Dam is instrumented with thermistors and pneumatic piezometers that are routinely monitored on a twice per year basis. The monitoring results are reviewed by a qualified geotechnical engineer.

3.3.6.8 North Wall Interceptor Ditch

The North Wall Interceptor Ditch diversion consists of three segments

The North Wall Interceptor Ditch intercepts clean runoff from the north side of the Rose Creek Valley and diverts it around the north abutment of the Cross Valley Dam.

The diversion consists of three segments:

1. The "mine leg" begins just north of the guardhouse within the drainage of Upper Guardhouse Creek and diverts flow from that drainage area into the adjacent drainage to the west.
2. The "Borrow Area F leg" conveys the flow to the northwest above the Intermediate Impoundment.
3. The outfall section conveys the flow under the mine site access road and around the north abutment of the Cross Valley Dam.

The North Wall Interceptor Ditch is excavated in a variety of materials, ranging from silty sand and gravel till to coarse sand and gravel alluvium and bedrock. The ditch was not lined with erosion protection measures. The ditch has performed reasonably well although erosion and sedimentation have caused partial blocking of this ditch at times. Periodic maintenance and repairs have been completed as follows:

1. The containment berm on the downstream side of the ditch was upgraded (height and width increased) in 2000 near its upper portion just north of the mine heavy equipment shops.
2. The containment berm near a corner just below the borrow area was upgraded in 2001 to prevent potential seepage from occurring.
3. The two culverts placed under the haul road are prone to icing in the winter and, as a result, these culverts are closely monitored and icing is removed as required. The culverts are scheduled for replacement in 2003.

3.3.6.9 Rose Creek Diversion Canal

The Rose Creek Diversion Canal passes Rose Creek water around the Rose Creek Tailings Facility

The Rose Creek Diversion Canal passes Rose Creek water around the Rose Creek Tailings Facility. The Diversion was developed in two stages, referred to as the Upper and Lower Diversions. The Upper Diversion was constructed in 1974 in conjunction with the development of the Second Tailings Impoundment. The Lower Diversion is an extension of the Upper Diversion. It was constructed in 1980-81 in conjunction with the development of the Intermediate Impoundment.

Water from both the South and North Forks of Rose Creek enters the upper section of the Rose Creek Diversion Channel. The upper section is a predominantly straight channel that is constrained by natural slopes on the south side and by a constructed dyke augmented by tailings on the north side. The channel was excavated with a bottom width of 15 m, and side slopes of 2H:1V and lined with riprap for erosion protection. The channel has an initial gradient of 0.23% that increases to 2% and the channel includes a number of drop weirs in addition to riprap for erosion protection. Initially, the gradient increased to 5% where it rejoined the original channel of Rose Creek below the toe of the Second Tailings Embankment. This last section was abandoned with the development of Lower Diversion.

The lower section passes water along the south side of the Intermediate Impoundment and returns flow into the natural Rose Creek Channel downstream of the Cross Valley Dam. The lower section includes a series of boulder-lined drop structures and a sharp corner at the downstream end. The lower section is constrained by natural slopes on the south side and by a till dyke on the north side. Most of the Lower Diversion channel has a gradient of 0.19%, with two drop weir sections with a 5% gradient. The channel has a bottom width of 12.2 m and side slopes of 2H:1V in soil and 0.5H:1V in rock. The low gradient (0.19%) sections of the channel included a pilot channel 3.65 m wide by 0.6 m deep to control glaciation during low winter flows. The crest of the diversion dam, which diverts the flow from the upper section into the lower section, was constructed approximately 1 m lower than the crest of the adjacent diversion canal dyke, and armoured with riprap. This was done to ensure that any flows in excess of the design flow overtop the diversion dam at that location into the Intermediate Impoundment. The Lower Section is designed to pass the 1:50 year flood event safely (Golder, 1980) and to pass the 1:500 year flood event with no freeboard. The design value provided by Hydrocon (1980) was 160 m^3/s.

The water level in the lower section of the diversion canal is higher than the water level in the Intermediate and Cross Valley Ponds. Water seeps through and/or under the containment dyke into the ponds at two locations.

There is one primary tributary (natural drainage) that enters the upper section of the canal from the south side, just downstream of the pumphouse pond. Another primary tributary enters the lower section of the canal from the south side near the downstream end.

The canal is prone to ice build up over the winter

The canal is prone to ice build up over the winter and clearing of ice has been required on occasion. The water licence requires the provision of a minimum flow

(controlled via manual operation of the low level outlet pipe at the FWSD through the winter with the intention of preserving flow for fisheries habitat. The provision of winter flow also minimizes the risk of ice damming in the channel (complete freezing to bottom). Visual inspection and instrumentation have been used to monitor the condition of the canal. Generally, most of the permafrost in the backslope has been thawed and no significant deformations have occurred. One portion of the canal dike just upstream from the Intermediate Dam is still underlain by permafrost. As a result of continued thawing of the ice lens, cracking and deformations still occur within this area of the dike. Repairs to the backslope were completed in 2002 in an area of surface deformation related to thawing of permafrost.

The Rose Creek Diversion Canal containment dyke and backslope are instrumented with themistors, pneumatic piezometers and slope indicators that are routinely monitored on a twice per year basis. The monitoring results are reviewed by a qualified geotechnical engineer.

4 DESCRIPTION OF FACILITIES – VANGORDA PLATEAU SITE

4.1 OVERVIEW OF STRUCTURES

Facilities associated with the Vangorda Plateau Mine Site

The Vangorda Plateau Mine site consists of these facilities:

1. Vangorda Pit.
2. Vangorda Rock Dump including Seepage Collection System.
3. Grum Pit.
4. Grum Rock Dump and Overburden Dump.
5. Little Creek Dam.
6. Vangorda Creek Diversion.
7. Water Treatment Plant and the Sludge Pond Embankments.
8. Office, Heavy Equipment Shop and Other Buildings.
9. Grum Interceptor Ditch.
10. Sheep Pad Sediment Ponds.
11. Electrical substation and control gear.

This section of the report discusses the development and operational history of the Vangorda Plateau Mine site and provides a description of each of the key facilities. A general arrangement plan of the site is provided on Figure 3. Some information regarding earth structures and water diversions contained in this section was provided directly by Steffen Robertson Kirsten (Canada) Inc.

4.2 DEVELOPMENT AND OPERATIONS HISTORY

The Vangorda deposit was discovered in 1953. Other occurrences, Champ, Firth and Grum, were also discovered

The Vangorda Deposit was discovered in 1953 and drilled on several occasions through to the late 1980's when it was developed for production. During that time, two small occurrences, Champ and Firth, were also discovered. The Grum Deposit was later found between these two minor occurrences. From 1975 to 1977, extensive work programs were carried out at Grum to delineate the deposit, including an underground exploration program. The deposit was accessed by a ramp from a portal elevation of about 1265 m and twin declines followed the ore zone for 700 m. Extensive definition drilling was done from these declines.

Development of the Vangorda Plateau site was initiated with surface pond dewatering in 1988

Development of the Vangorda Plateau site for mine operation was initiated in 1988 with dewatering of surface ponds. Several drainage ditches were dug at Vangorda and Doal Lake, a shallow pond overlying the (future) Grum Pit, was drained. Stripping at the Grum site began first with the wet soils from the vicinity of Doal Lake being placed in the "wet dump" area of the Grum Rock Dump, immediately southwest of the pit area.

Mining in the Vangorda Pit was commenced in 1990 by Curragh Inc.

Mining in the Vangorda Pit commenced in 1990 following issuance of a Water Licence from the Yukon Territory Government. Between 1990 and 1993, Curragh Inc. mined 5.7 million tonnes of ore from the Vangorda Pit. Stripping was carried out intermittently at Grum during this time, resulting in the excavation of approximately 22 million tonnes of glacial till overburden and rock and 52,000 tonnes of ore. Waste rock from the Vangorda Pit was placed at the Vangorda Rock

Dump. The rock dump was redesigned from the initial application to accommodate increased volumes of waste rock and reduced volumes of till.

DIAND commissioned construction of the Vangorda Seepage Collector Ditch in 1993 while mining activities were suspended

Mining activities were suspended from 1993 to late 1994 due to insolvency of the mine owner. During this time, DIAND commissioned the construction of the Vangorda Seepage Collector Ditch, re-sloped a 200 m section of the Vangorda Rock Dump and installed five groundwater monitoring wells at the toe of the Vangorda Rock Dump. A 2-m thick cover of compacted glacial till was placed on a 75 m section of the re-sloped area of the dump.

Anvil Range took ownership of the mine site in November 1994 and resumed pre-production stripping at Grum. Loose soil and broken rock was placed in the Overburden Dump located on the southeast side of the Grum Pit. The Grum Rock Dump was redesigned in response to higher than anticipated amounts of waste rock and sulphide bearing material. Mining at the Grum and Vangorda Open Pits were suspended in January 1998 and the shut down has continued since that time. Known economic ore reserves in the Vangorda open pit had been depleted at the time of the shut down.

All ore was trucked to the Faro concentrator plant

Ore from all phases of mining on the Vangorda Plateau Mine site was trucked approximately 13 km via the haul road to the Faro concentrator plant from the Ore Transfer Pad. There have been no milling operations and no tailings deposition at the Vangorda Plateau Mine site.

4.3 VANGORDA PLATEAU MINE SITE FEATURES

4.3.1 OPEN PITS

4.3.1.1 Vangorda Pit

The Vangorda Pit is 1.15 km in length, 200 to 350 m wide and 150 m at the deepest point. The longitudinal axis of the pit is approximately northwest/southeast with the deepest portion to the northwest end of the pit. The southeast half of the pit is a narrower slot about 200 m wide and only 50 m deep. Access to the pit was by a ramp. The entrance was at the southeast end of the pit and led to the deeper northwest area where the thickest ore was located.

Vangorda Creek, which originally passed directly over the thickest part of the ore body, is diverted around the north perimeter of the pit in an open 2.4 m diameter corrugated metal pipe half round flume.

Two rock dumps were placed in the Vangorda Pit

Two small rock dumps were placed in the pit by Anvil Range on either side of the haul road near the pit entrance. The size of these dumps is estimated to be in the order of a few tens of thousands of tonnes each (RGC, 1996). The dumps are estimated to contain 50% sulphides and 50% phyllites.

The Vangorda Pit walls have experienced local bench scale instability that is largely associated with faults in the northwest and west areas. A professional assessment of wall stability was carried out by SRK Consulting (SRK 2002) that assessed the physical stability of the northwest wall along the Vangorda Creek Diversion Flume. The assessment concluded that it is unlikely that any mode of large scale failure of the pit wall below the flume will affect the performance of the flume for a timeframe in excess of 50 years. The assessment also concluded that several areas along the bench face overlooking the Vangorda Creek Diversion Flume were of high risk of localized bench scale failures that could damage the flume and short term remediation work was recommended for these areas, as described in Section 4.3.6 of this volume.

Economic reserves were depleted in 1998

Economic ore reserves in the Vangorda Pit were depleted in early 1998. The pit was not dewatered subsequent to the completion of mining activities and the in-pit water level rose to the maximum desired elevation early in 2002. The sources of water entering the pit are runoff and precipitation, groundwater inflows and water pumped or syphoned into the pit from external sources. A seasonal water pumping and treatment program commenced in 2002.

ARD is occurring on the pit walls

Sulphide-bearing rock is exposed in the Vangorda Pit walls and is observed to be highly oxidized in some locations. For example, copper precipitates and iron staining are visible on the north walls. The effects of acid rock drainage (ARD) from the pit walls are mitigated by diversion of uncontaminated water around the pit. No other in-pit mitigative measures have been implemented to date.

A cleared area at the southern end of the pit was used for temporary storage and transfer of ore through the life of the operation. Economic quantities of ore were removed and processed during the mine operation. However, residual ore remains in the area and the area has been demonstrated as a source of contaminants entering the pit pond.

4.3.1.2 Grum Pit

The Grum Pit is located approximately 2 km northwest of the Vangorda Pit. The Grum Deposit consists of several horizons that form a complex fold pattern. Due to the local geometry of the deposit, there are two separate zones that comprise the surface mineable Grum Deposit: the Main Zone and the Champ Zone. The Champ Zone was not mined and the Main Zone was partially mined at the time of mine shut down in 1998.

Phase 1 of 3 to 4 planned phases of mining in the Grum pit was completed in 1998

The Anvil Range mine plan provided for mining of the Grum Pit in 3 or 4 phases. The Phase 1 Pit was essentially completed at the time of mine shut down in 1998 and the Phase 2 expansion was underway with some pre-stripping completed. An estimated 3-6 years of mine life remained in the Anvil Range mine plan. However, extraction of the residual ore is not considered to be economically viable as was indicated in a report to the Interim Receiver by and engineering firm, Strathcona Minerals.

The ultimate pit was designed, by Anvil Range, to be approximately 1,100 m long, 700 m wide and up to 200 m deep, with a volume of 42.6 million m^3 or 47 million m^3 with mining of the Champ Zone. A new access slot (nearly complete at the time of mine shutdown) was excavated at the southeast end of the pit that would have provided more efficient access to the pit.

Mining in the Grum pit intersected old underground workings

Mining of the lower benches of the Phase 1 Pit intersected the underground exploration workings. This created a direct hydraulic connection such that the water level in the pit controls the water elevation in the underground workings. The elevation of the adit above the elevation of the pit perimeter precludes any future discharge of water from the adit provided that the hydraulic connection remains.

Rocks exposed on the walls and the floor of the Grum Pit are largely calcareous phyllite with minor exposed sulphides. This provides better physical stability of rock walls and better water quality than observed in the Vangorda Pit.

The Phase 1 Grum Pit has a well-developed slope failure on the northeast till wall. The Grum Pit intersected a bedrock valley that is infilled with glacial till at this location that is up to approximately 100 m in depth. Water flow at the base of the till is thought to be the cause of the instability. Till has slumped into the pit bottom that currently prevents access to the Phase 1 Pit bottom.

Surface water is diverted around the pit

Surface water is diverted around the Grum Pit via the Grum Interceptor Ditch. Although there was not a well defined creek passing over the Grum Pit prior to development, the area was generally "wet" and supported Doal Lake and is thought to have contained shallow groundwater flow. Dewatering of the Grum Pit has not taken place since mine shut down in 1998 and water from intercepted shallow groundwater flow, runoff and precipitation has accumulated. The in-pit water elevation is monitored and has increased more slowly than the Vangorda Pit due to the large storage volume and low inflow volumes.

4.3.2 ROCK DUMPS

4.3.2.1 Vangorda Rock Dump

The Vangorda Rock Dump is located directly southwest of the Vangorda Pit. The rock dump is located on a topographic high with the original ground surface sloping west toward Shrimp Creek and northwest toward Vangorda Creek. The southern area of the rock dump is underlain by shallow soil or bedrock. The soil thickness increases towards the west and northwest and can be greater than 35 m thick at the toe of the dump. The soil profile consists of a thin veneer of organic soil overlying a fine grained glacial till and a thin basal sand unit overlying bedrock.

All rock is potentially acid generating

The Vangorda Rock Dump was constructed from May 1990 to January 1998 and contains glacial till overburden and waste rock excavated from the Vangorda Pit. A stockpile of till overburden is located in the southeast area of the rock dump. Waste rock was classified as either "sulphide" or "phyllite" for placement into the rock dump. Geochemical analyses indicated that both of these rock groups are potentially acid generating as described in Volume II, Description of the Existing Environment.

The Vangorda main dump contains approximately 16 million tonnes of rock (Table 9). A plan view of the dump is illustrated on Figure 9 and a perimeter section is provided on Figure 10.

Sulphide rock has a higher potential for acid generation than phyllite and the design of the rock dump called for the segregation of sulphides into a sulphide cell. The arrangement provided for a more direct collection of seepage from the sulphide cell into Little Creek Dam storage pond. It is thought that the segregation of the two rock classifications was largely followed through the life of the operation.

Original closure plan was resloping and covering

The original closure plan for the facility required the resloping and encapsulation of the mined rock with glacial till that would be stripped during development of the pit. The closure plan was to be implemented progressively as the rock pile expanded. The design required a starter dyke to be constructed from compacted glacial till, to 1135 m elevation. Till berms were to be constructed as extensions to the starter dyke around the perimeter of the rock pile. The berms were to be located to ensure an overall slope of 3H:1V. A till cap would then be placed over the top of the pile. Construction of the starter dyke was initiated in May 1990 and completed in the same year. No additional lifts were constructed.

The design of the dump was modified in 1992 to accommodate changes to the projected volumes of rock and overburden. A greater quantity of rock and a reduced quantity of overburden were predicted in a revised mine plan. The footprint of the dump was not enlarged but the height was increased to the current elevation.

The near surface zone of the Vangorda Deposit was oxidized and could not be economically processed in its entirety. This oxidized ore was screened such that the coarse fraction was processed and the fine fraction, which contained the majority of the oxidation products, was placed into the rock dump in an area of shallow bedrock east of the extensive till blanket that underlies the bulk of the Vangorda dump. This material (approximately 225,000 tonnes) is generally referred to as "oxidized fines" and occupies an area of the sulphide cell where some of the material is exposed to surface and some is covered with waste rock. This material has been shown to generate and release substantial concentrations of contaminants.

Rehabilitation of the dump seepage collection system, test resloping and capping and groundwater quality monitoring was instituted in 1993/94

In November 1993 during the "Curragh receivership", Government Services of Canada commissioned Pelly Construction Limited to rehabilitate the Vangorda Dump seepage collection system and initiate work on the resloping and capping of the rock dump. Steffen Robertson Kirsten (Canada) Inc. was retained to provide engineering consulting services for the work.

The work involved the upgrading of the existing seepage collection system located around the perimeter of the containment facility, recontouring rock slopes within a section of the rock pile, and providing instrumentation to monitor both the physical stability of the rock pile and any impact on the groundwater quality. The work took place from March 1994 to June 1994. The configuration of the rock dump and collection facility has not changed since that time.

Table 8. Composition of Vangorda Plateau Mine Site Dumps

Dump	Composition	As-built (tonnes)	% of Total
Vangorda Main	**Phyllites**		
	Phyllite, including calcareous, non-calcareous and chloritic	213,200	1%
	carbonaceous phyllite	882,700	6%
	Vangorda Formation	1,095,900	7%
	Mt. Mye non-calcareous phyllite	7,295,600	46%
	altered phyllites	4,608,500	29%
	subtotal phyllites	***13,000,000***	***81%***
	Sulphides		
	massive pyritic quartzite	422,577	0%
	pyritic quartzites	845,155	1%
	banded carbonaceous quartzites	1,732,268	1%
	subtotal sulphides	***3,000,000***	***19%***
	Total Main Dump	**16,000,000**	
Vangorda North Pit Dump	Phyllite	10,000	50%
	Sulphide	10,000	50%
	Total North Pit Dump	**20,000**	
Vangorda South Pit Dump	Phyllite	25,000	50%
	Sulphide	25,000	50%
	Total North Pit Dump	**50,000**	
Vangorda Pit Stockpile	Sulphide	510,000	100%
Oxide Fines	Vangorda Oxide Fines	225,000	100%
Grum Main	**Phyllites**		
	Phyllite, including calcareous, non-calcareous and chloritic	76,053,018	
	carbonaceous phyllite	15,906,892	
	Vangorda Formation	91,959,910	85%
	Mt. Mye non-calcareous phyllite	10,146,190	9%
	altered phyllites	2,193,370	2%
	subtotal phyllites	***104,299,470***	***96%***
	Sulphides		
	massive pyritic quartzite	164,020	0%
	pyritic quartzites	688,850	1%
	banded carbonaceous quartzites	2,969,360	3%
	subtotal sulphides	***3,822,230***	***4%***
	Total Grum Main Dump	**108,121,700**	
Southwest Dump	calcareous phyllites	42,000,000	100%

Six transverse gravel drains were installed beneath the till starter dyke during its construction in 1994 to allow release of water from the dump and to allow sampling of seepage flow. The drains were equipped with V-notch weirs for flow measurement. Five of the weirs remain operational and three of the weirs consistently have flow. However, the observed seepage flow rates are substantially less than predicted from water balance calculations, which may be related to high rates of water storage and evaporation from dump surfaces.

In 1994, five groundwater monitoring wells were installed around the perimeter of the dump in order to monitor the quality of the groundwater seepage at the toe of the dump. Four of these wells remain operational. In 2001, two additional monitoring wells were installed, one at bedrock. The wells were located at a location of deep bedrock as identified from a surface seismic reflection survey. Additional details are described in Section 4.

4.3.2.2 Grum Dumps

Grum Waste Dumps: Overburden Dump, Southwest Rock Dump, and Main Rock Dump

There are three Grum Waste Dumps: the Overburden Dump, the Southwest Rock Dump and the Main Rock Dump. The Main and Overburden Dumps are being built on the moderate northwest slope of the Vangorda Creek valley and the Southwest Dump is in a relatively flat saddle on the crest of the ridge between the two branches of Vangorda Creek southwest of the Grum Pit. The composition of each dump is described below . The rock dumps are illustrated in plan on Figure 13 and a section view at the toe is provided on Figure 14.

Overburden Dump

The Overburden Dump contains glacial till stripped from Phase 1 of the Grum Pit. The dump has been built in five 15 m lifts with setbacks resulting in gentle slopes suitable for resloping to 3H to 1V. A portion of the northeast side of the dump was resloped by Anvil Range Mining Corporation. The Overburden Dump contains approximately 24 million tonnes of glacial till.

Southwest Rock Dump

Southwest Rock Dump contains only calcareous phyllites

The Southwest Dump consists of mainly calcareous phyllite with about one third of the dump designed to contain non-calcareous phyllite. The volume of the dump is approximately 20 million m^3. This dump drains primarily to the south towards the main stem of Vangorda Creek. However, the west edge of the dump extends into the drainage of the West Fork of Vangorda Creek. Only rock from the pre-stripping of Phase 3 of the Grum Pit is located in this dump, which is believed to consist entirely of calcareous phyllite and include no sulphide waste. The design for the Southwest Rock Dump was enlarged from the initial design by extending 200 m to the west and increasing the height by approximately 10 m.

Main Rock Dump

The largest of the three dumps, the Main Rock Dump was built on a moderate slope dipping 6 to 10 degrees southeast to south. Local areas vary from as steep as 12

3. Vangorda Pit pumping.
4. Mill water treatment system.
5. Grum/Vangorda water treatment plant.

The contingency plan that is in place for a general loss of power is to conduct an operational check of equipment status such that equipment is configured appropriately for restart, contact with the regional power supplier to confirm status and ascertain restart timeframe, arrangement with the regional power supplier that power can be re-instated to the mine from the Town of Faro diesel generator if an environmental emergency was imminent and maintenance of the on site EMD emergency generator such that it can be utilized in an environmental emergency situation.

8.5 PUMP FAILURE AT A MAJOR PUMPING STATION

Pump failure at a major pumping station such as the Main Pit, the Zone 2 Pit or the Vangorda Pit could be caused by mechanical failure or loss of power locally or regionally. The pump failure would cause an operational disruption and the implications of the disruption would be dependent on the duration.

If the cause of the failure was loss of power from the regional grid, then the contingencies described for "General loss of electrical power" would apply.

If the cause of the failure was loss of power locally (i.e. on the mine site), then the contingency plan that is in place is to have a qualified electrician employed at the site or readily available from off site to identify and resolve the problem. Standard electrical replacement gear is either on hand or an off site source has been identified.

If the cause of the failure was mechanical failure, then the contingency plan that is in place is perform routine maintenance on the pumps, to have an experienced mechanic employed at the site or readily available from off site to identify and resolve the problem. Standard mechanical replacement parts are either on hand or an off site source has been identified.

In the extreme event where repairs could not be made in a timely manner and an environmental emergency was imminent, then a substitute pump would be expedited from an off site source and installed on an emergency rush basis. The timeframe for implementing this action would depend on the circumstances surrounding the pit water levels and would be at the discretion of the site manager.

8.6 GASOLINE AND DIESEL FUEL SPILLS

Spills of gasoline and diesel fuel can occur due to operator error, malfunctioning dispensing equipment, overfilling of storage tanks, leaking/damaged storage tanks or leaking/damaged mobile and heavy equipment. Even relatively small spills can have an environmental implication if they occur near a stream or other environmental receptor.

The contingency plan that is in place includes the following:

1. Only one storage tank for gasoline and one for diesel fuel are to be utilized.
2. The active storage tanks are located within containment berms with capacity to contain the full tank volume.
3. The secondary containment berms are visually monitored and clean water is removed periodically to maintain storage capacity.
4. The storage tanks were registered with DIAND Lands Department.
5. Operating procedures are in place that provide for monitoring of storage tank levels and for security control on dispensing.
6. Operator awareness training is provided regarding the environmental implications of spills.
7. A spill response kit is maintained at the mine site that includes dry absorbent and floating absorbent booms and pads.
8. A spill response plan is in place that provides for notification to site management as well as to the Yukon 24-hour spill reporting office.

8.7 LOSS OF ROAD ACCESS

Loss of road access to the mine site could be caused by a flood that erodes the roadway, washout due to culvert failure or exceedance of culvert capacity or by heavy snowfall. The implications of loss of road access could be substantial depending on the time of the occurrence. For example, if the road was lost due to a flood event, then even a brief inability to inspect and repair damage to mine facilities, particularly dams and ditches, could result in an environmental impact.

Therefore, regardless of the cause of the loss of road access, it would be important to restore access quickly. The contingency plan that is in place includes the following:

1. Park a grader or plow truck in the Town of Faro during winter periods when the road is not being cleared regularly.
2. Maintain a grader, plow truck, front-end loader and gravel truck on-site or maintain contact with off site contractors for emergency provision of road repair services.
3. Aggressively steam ice from culverts and clear ice from roadside ditches through the winter and spring as required to maintain flow and prevent road washout.
4. Maintain contact with the YTG highways maintenance department as regards joint monitoring, maintenance and repairs to the access road.

8.8 LOSS OF COMMUNICATION

Loss of communication to the mine site could be caused by the loss of telephone lines from the Town of Faro to the mine site. The implications of loss of communication could be substantial if contingency measures were not in place due to the time delay that would be introduced into communicating and arranging responses to emergency events.

Therefore, the following contingency measures are in place:

1. Portable satellite phones are carried by senior site managers and would be used in a general loss of communications.
2. A state-of-the-art telephone system is scheduled for installation at the mine site in 2003.

3. The "Guest House" in the Town of Faro is equipped with an operable fax machine and telephone.

8.9 COMPLETE BREACH OF THE FARO CREEK DIVERSION

8.9.1 EVENT

A complete breach of the Faro Creek Diversion into the Main Pit could be the result of failure of the northeast Faro Pit wall.

8.9.2 ENVIRONMENTAL CONSEQUENCES

The first consequence of filling would be damage to the pumping system

If the pit water elevation were to increase because pumping could not be undertaken at a rate to match inflows, then physical damage to the pumping system would be expected to be the first consequence. Ultimately, if the excess inflow were not controlled, then the pit water elevation would reach the point overflow into the Zone 2 Pit and, subsequently, into the North Fork of Rose Creek. This would represent an uncontrolled release of non-compliant water into the environment.

The elevations at which these events would be expected to occur are as follows:

1. physical damage to the barge anchor point and pipeline: 3866 feet mine datum
2. water damage to the electrical switchgear and transformer: 3877 feet mine datum
3. overflow to Zone 2 Pit: 3910 feet mine datum

The timeframes for reaction to prevent these consequences from occurring will depend on the rate of inflow, the rate of pumping outflow and the water elevation in the Main Pit at the time of the breach. Several hypothetical examples are listed in Table 14:

Table 14. Hypothetical Timeframes for Reaction to Prevent Consequences from a Complete Breach of the Faro Creek Diversion

Event	Inflow (Breach)	Outflow (Pumping)	Initial Water Elevation	Time to damage piping	Time to flood electrical gear	Time to overflow
7-day PMF	7.44	0.28 (4500gpm)	3862	1 day	4 days	13 days
7-day PMF	7.44	0.56 (9000gpm)	3862	1 day	4 days	13 days
"Normal" inflows	0.155	0.28 (4500gpm)	3862	never	never	never
"Freshet-level" inflows	0.360	0.28 (4500gpm)	3862	96 days	362 days	3 years

Notes: flows are m3/s (except where noted otherwise)
elevations are feet

8.9.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.9.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess inflows into the Main Pit and immediately implement pumping from the pit if such is necessary to prevent or delay damage to equipment. Initial notification to the water inspector and to the Yukon Territory Water Board will be made at this time.

The rates of inflow and outflow will be assessed and an assessment made of the ability of the pit pumping program to prevent a continued increase in the pit water level and, if necessary, a projection made of the anticipated increase in the pit water level, with the pumping program underway.

Mitigation for various pumping rates

If pumping from the pit can be undertaken at a rate equivalent to or in excess of the rate of inflow while providing adequate treatment of the pumped water, then this rate of pumping will be undertaken and maintained such that the water elevation in the pit does not increase.

If pumping from the pit can not match the inflow rate due to pumping capability, inability to maintain compliance for effluent released to Rose Creek or other reasons, then the maximum possible pumping rate will be implemented such that the rate of rise of the pit water elevation is slowed. The high pumping rates that have been achieved to date while maintaining compliance with the effluent discharge criteria in the licence is in the order of 0.384 m^3/s (6,100 USgpm).

Alternatives for increasing the pumping rate to greater than typical rates

There are several potential alternatives for increasing the pumping rate to greater than the typical rates while maintaining compliance with the discharge criteria of the water licence and these will be investigated, if necessary. The potential alternatives might include:

1. Re-initiating the past practice (pre-2001) of treating water with lime slurry in a "drop box" outside of the mill and utilizing the Intermediate Pond for settlement of treatment sediments. This would also likely require initiation of lime treatment at the Intermediate Dam outflow spillway; and
2. The addition of a second treatment "circuit" in the mill utilizing additional flotation cells and clarifiers. This might require in the order of 3 months and $1M to make operational.

8.9.3.2 Secondary Response

The breach location will be assessed for access and a plan will be made and implemented for short term reduction or prevention of inflows into the Main Pit while a long term mitigation plan is implemented. The options for accomplishing this short term mitigation goal may include: ditching around the breach, berming the upstream side of the breach to direct water into a pipe spanning or circumventing the

Options for accomplishing short term mitigation goals

breach and installation of a pumping sump to enable pumping water across or around the breach.

This measure will be implemented as quickly as possible with the intention of preventing damage to the pumping and electrical systems by preventing the water elevation from rising to those elevations.

Mitigation measures for various pit water elevations

If the pit water elevation rises to the elevation at which the barge anchor point and pipeline will be damaged, then the anchor point will be dismantled and the on shore pipeline will be progressively blocked and raised to enable the barge to float higher without breaking the pipeline.

If the water elevation rises to the elevation where the safe operation of the electrical switchgear or transformer is compromised, then power to the transformer will be disconnected at the main substation at the mill. At this time, no further pumping from the Main Pit would be possible until a generator of approximately 1 MW capacity was installed (for start up of a single pump). This might be accomplished by activating the EMD (on-site 2.7 MW diesel emergency generator) or installing a rental 1 MW diesel generator. In either case, a substantial pumping down time will be experienced.

If the water elevation rises to the elevation where overflow into the Zone 2 Pit is imminent, then an assessment of the most effective means of minimizing impacts to Rose Creek will be made. This might include: allowing overflow into the North Fork of Rose Creek via the Zone 2 Pit or implementing increased pumping from the Main Pit to Rose Creek in the absence of the ability to adequately treat the water.

8.9.3.3 Long Term Response

Timeframe and mitigation methods

Subsequent to implementation of the Secondary Response, a long term mitigation plan will be designed, permitted and implemented. This would be designed to provide security until the scheduled implementation of the Final Reclamation Plan. This is likely to involve construction of a new channel or a new channel to bypass the breach. A study is scheduled for completion in summer 2003 that will provide preliminary engineering designs for alternative methods of relocating the diversion channel (Golder 2002) and these designs will provide a starting point for a new design for restoring flow.

8.9.3.4 Monitoring and Management Review

Site monitoring protocol and review of information

The type of monitoring information required to identify this event is visual observation of the Faro Creek Diversion and the northeast wall of the Faro Main Pit. The site general monitoring protocol provides for the routine documented observation of this area on a minimum weekly basis throughout the year and the site physical monitoring protocol provides for an annual professional engineering review of the area. Monitoring of the water level in the Faro Main Pit is complementary to the required observational information and is also collected routinely throughout the year as part of the site water monitoring protocol.

A management review of the required information will be conducted initially during preparation of the monthly site status reports and subsequently during the professional engineering site inspection and, ultimately, during preparation of the annual geotechnical inspection report.

8.10 BREACH OF THE ROSE CREEK DIVERSION CANAL INTO THE INTERMEDIATE OR CROSS VALLEY PONDS

8.10.1 EVENT

A breach of the Rose Creek Diversion Canal into the Intermediate or Cross Valley Ponds could be the result of a large flood event (say 1:500 years or greater) that overtops or erodes the containment dyke or the result of freshet runoff flows that travel on top of the winter ice and overtop or breach the containment dyke.

8.10.2 ENVIRONMENTAL CONSEQUENCES

The environmental consequences of a breach of the Rose Creek Diversion Canal would be dependent on the location and extent of the breach and the magnitude of the inflows from Rose Creek.

Consequences dependent on the location and extent of the breach and magnitude of the inflows

A complete breach of the canal during a flood event wherein all of Rose Creek passed into the Intermediate Pond could result in complete or partial failure of the Intermediate Dam and the release of sediment, tailings solids and non compliant water into the receiving environment. Similarly, a breach into the Cross Valley Pond could result in a partial or complete failure of the Cross Valley Dam and the release of sediment and lime treatment sludge into the receiving environment.

A smaller but substantial inflow of water into the Intermediate Pond could result in an exceedance of the treatment capability installed at the Intermediate Dam outflow spillway and the release of non compliant water. A smaller still inflow of water into the Intermediate Pond could result in the need for unscheduled operation of the treatment system requiring unscheduled expenditures and increased environmental risks.

8.10.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.10.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess inflows into the Intermediate and/or Cross Valley Ponds. Initial notification to the water inspector and to the Water Board will be made at this time.

Mitigation depending on the inflow

If the inflow rate is sufficiently low, an appropriate water management plan will be immediately implemented in the ponds to ensure that water is adequately treated prior to release to the environment. This might include activation or increased

operation of the water treatment system, pumping from Cross Valley Pond to Intermediate Pond or cessation of effluent discharge.

If the inflow rate is high such that there is a risk to the integrity of the dam, then the geotechnical engineer will be immediately contacted and emergency protection for the integrity of the dams will be immediately implemented.

8.10.3.2 Secondary Response

Options for accomplishing short term mitigation goals

The breach location will be assessed for access and a plan will be made and implemented for short term reduction or prevention of inflows into the pond(s) while a longer term mitigation plan is implemented. The options for accomplishing this short term mitigation goal may include: ditching around the breach, berming the upstream side of the breach to direct water into a pipe spanning or circumventing the breach and installation of a pumping sump to enable pumping water across or around the breach.

This measure will be implemented as quickly as possible with the intention of minimizing the volume of water entering the pond(s).

If sediment, tailings solids or non compliant were released, then an environmental effects monitoring program will be initiated to determine impacts in the receiving environment and assess the needs for remedial work.

8.10.3.3 Long Term Response

Timeframe and mitigation measure

Subsequent to implementation of the Secondary Response, a long term mitigation plan will be implemented such that security is provided until the scheduled implementation of the Final Reclamation Plan. This is likely to involve construction of a new channel section to bypass the breach.

8.10.3.4 Monitoring and management REview

Site physical monitoring protocol, water level, water quality monitoring, and review of information

The type of monitoring information required to identify this event is visual observation of the Rose Creek Diversion Canal and monitoring of geotechnical instrumentation. The site general monitoring protocol provides for the routine documented observation of this area on a minimum weekly basis throughout the year and on a daily basis through freshet. The site physical monitoring protocol provides for an annual professional engineering inspection of the containment dyke and for the monitoring of geotechnical instrumentation in the containment dyke. Monitoring of water quality and water levels in the Intermediate and Cross Valley Ponds is complementary to the required observational information and is also collected routinely throughout the year as part of the site water monitoring protocol.

A management review of the required information will be conducted initially during preparation of the monthly site status reports and subsequently during the professional engineering site inspection and, ultimately, during preparation of the annual geotechnical inspection report.

8.11 COMPLETE BREACH OF VANGORDA CREEK DIVERSION

8.11.1 EVENT

A complete breach of the Vangorda Creek Diversion into the Vangorda Pit could be the result of failure of the north pit wall.

8.11.2 ENVIRONMENTAL CONSEQUENCES

Timeframes for reaction to prevent uncontrolled release of non-compliant pit water into the environment

If the pit water elevation were to increase because pumping could not be undertaken at a rate to match inflows, then the pit water elevation would ultimately reach the point of overflow into Vangorda Creek. This would represent an uncontrolled release of non-compliant water into the environment. The elevations at which overflow would be anticipated is 1122.5 m ASL versus the maximum desired operating elevation of 1092 m ASL.

The timeframes for reaction to prevent these consequences from occurring will depend on the rate and duration of inflow and the water elevation in the Main Pit at the time of the breach. The outflow pumping rate is currently fixed at 2,000 USgpm. Several hypothetical timeframe examples are listed Table 15:

Table 15. Hypothetical Timeframes for Reaction to Prevent Consequences from a Complete Breach of the Vangorda Creek Diversion

Event	Inflow (Breach) (m^3/s)	Outflow (Pumping) (m^3/s)	Initial Water Elevation (m ASL)	Time to overflow
50% of 7-day PMF	5.1	0.12 (2000gpm)	1092	7 days
7-day PMF	10.2	0.12 (2000gpm)	1092	4 days

8.11.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.11.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess inflows into the Vangorda Pit and immediately implement pumping from the pit if such is necessary to prevent the pit water level from exceeding the maximum desired operating elevation. Initial notification to the water inspector and to the Water Board will be made at this time.

Mitigation depending on the pumping rate from the pit

The rates of inflow and outflow will be assessed and an assessment made of the ability of the pit pumping program to prevent a continued increase in the pit water level and, if necessary, a projection made of the anticipated increase in the pit water level, with the pumping program underway.

If the rate of pumping from the pit is equivalent to or in excess of the rate of inflow while providing adequate treatment of the pumped water, then pumping will be undertaken and maintained such that the water elevation in the pit does not increase.

If pumping from the pit does not match the inflow rate due to pumping capability, inability to maintain compliance for effluent released to Vangorda Creek or other reasons, then the maximum possible pumping rate will be implemented such that the rate of rise of the pit water elevation is slowed.

8.11.3.2 Secondary Response

Options for accomplishing short term mitigation goals

The breach location will be assessed for access and a plan will be made and implemented for short term reduction or prevention of inflows into the pit while a longer term mitigation plan is implemented. The options for accomplishing this short term mitigation goal may include: ditching around the breach, berming the upstream side of the breach to direct water into a pipe spanning or circumventing the breach and installation of a pumping sump to enable pumping water across or around the breach.

This measure will be implemented as quickly as possible with the intention of minimizing the rise in the pit water elevation.

Mitigation for various pumping rates

The electrical switchgear and transformer for the Vangorda Pit pump are located out of the pit perimeter and, therefore, are at risk of a rising pit water elevation. If the pit water elevation rises to the elevation at which the barge anchor point will be damaged, then the anchor point will be dismantled and the on shore pipeline will be progressively blocked and raised to enable the barge to float higher without breaking the pipeline.

If the water elevation rises to the elevation where overflow into Vangorda Creek is imminent, then an assessment of the most effective means of minimizing impacts to Vangorda Creek will be made. This might include: allowing overflow into Vangorda Creek or implementing direct pumping from the Vangorda Pit to Vangorda Creek even in the absence of the ability to adequately treat the water as a means of minimizing erosion and sedimentation at the outflow location.

8.11.3.3 Long Term Response

Timeframe and mitigation methods

Subsequent to implementation of the Secondary Response, a long term mitigation plan will be implemented such that security is provided until the scheduled implementation of the FCRP. This is likely to involve construction of a new channel or a new channel to bypass the breach. A study was completed in 2002 that provides preliminary engineering designs for alternative methods of relocating the diversion channel (SRK 2002) and these designs will provide a starting point for a new design for restoring flow.

8.11.3.4 Monitoring and Management Review

Site monitoring protocol and review of information

The type of monitoring information required to identify this event is visual observation of the Vangorda Creek Diversion and the north wall of the Vangorda Pit. The site general monitoring protocol provides for the routine documented observation of this area on a minimum weekly basis throughout the year and the site physical monitoring protocol provides for an annual professional engineering review of the area. Monitoring of the water level in the Vangorda Pit is complementary to the required observational information and is also collected routinely throughout the year as part of the site water monitoring protocol.

A management review of the required information will be conducted initially during preparation of the monthly site status reports and subsequently during the professional engineering site inspection and, ultimately, during preparation of the annual geotechnical inspection report.

8.12 FAILURE OF THE VANGORDA CREEK HAUL ROAD CULVERTS

8.12.1 EVENT

A failure of the Vangorda Creek haul road crossing could be the result of collapse, rusting or separation of joints of one of the two buried culverts or the vertical drop box that passes Vangorda Creek through the haul road.

8.12.2 ENVIRONMENTAL CONSEQUENCES

If leakage from the buried culverts caused partial or complete failure of the haul road embankment, this would result in sedimentation directly into Vangorda Creek, which could expose aquatic resources, terrestrial resources and human resource users to increased levels of sediment in Vangorda Creek.

8.12.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.12.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess the stability of the road embankment and degree of sedimentation into Vangorda Creek. Initial notification to the water inspector and to the Water Board will be made at this time.

The geotechnical engineer will be immediately contacted and emergency remediation to stabilize the road embankment and the rate of sedimentation into the creek will be immediately implemented.

8.12.3.2 Secondary Response

The area will be assessed for access and a plan will be made and implemented for short term stabilization of the road embankment and creek passage and the

Options for accomplishing short term mitigation goals

prevention of further release of sediment into the environment. The options for accomplishing this short term mitigation goal may include backfilling or rip rap (erosion protection) in the failed location or excavation of the residual roadfill to allow a straight stream channel to be constructed.

An environmental effects monitoring program will be initiated to determine impacts in the receiving environment and assess the needs for remedial work.

These measures will be implemented as quickly as possible.

8.12.3.3 Long Term Response

Timeframe and mitigation measures

Subsequent to implementation of the Secondary Response, a long term (5 to 10 years life) remediation plan will be designed and implemented such that security is provided until the scheduled implementation of the Final Reclamation Plan. This is likely to involve some channel and road/bridge construction and any required restorative work in the receiving environment.

8.12.3.4 Monitoring and management REview

Site monitoring protocol and review of information

The type of monitoring information required to identify this event is visual observation of the Vangorda Creek haul road crossing. The site general monitoring protocol provides for the routine documented observation of this area on a minimum weekly basis throughout the year.

A management review of the required information will be conducted during preparation of the monthly site status reports.

8.13 FAILURE OF THE INTERMEDIATE DAM

8.13.1 EVENT

The proposed action trigger

A failure of the Intermediate Dam could be the result of flood inflows from a breach of the Rose Creek Diversion Canal and other upstream sources, an earthquake, slumping/caving of embankment or foundation soils, "piping" through the embankment or another unforeseen event.

8.13.2 ENVIRONMENTAL CONSEQUENCES

Assuming that failure of the Intermediate Dam causes a failure of the Cross Valley Dam

The environmental consequences of a failure of the Intermediate Dam would the release of sediment, tailings solids and non-compliant water into the receiving environment of Rose Creek and the exposure of aquatic resources, terrestrial resources and human resource users to increased levels of contaminants in Rose Creek, Anvil Creek and the Pelly River. This assumes that a failure of the Intermediate Dam will cause a failure of the Cross Valley Dam.

8.13.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.13.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess the state of the dams and provide initial notification to the water inspector and to the Water Board.

The geotechnical engineer will be immediately contacted and emergency remediation to stabilize the dam and the release of contaminants will be immediately implemented.

8.13.3.2 Secondary Response

Options for accomplishing the short term mitigation goal

The breach location will be assessed for access and a plan will be made and implemented for short term stabilization of the dams and the prevention of further release of contaminants into the environment. The options for accomplishing this short term mitigation goal may include backfilling or rip rap (erosion protection) in the breach location.

An environmental effects monitoring program will be initiated to determine impacts in the receiving environment and assess the needs for remedial work.

These measures will be implemented as quickly as possible.

8.13.3.3 Long Term Response

Timeframe and mitigation measures

Subsequent to implementation of the Secondary Response, a long term mitigation plan will be designed and implemented such that security is provided until the scheduled implementation of the Final Reclamation Plan. This is likely to involve some dam construction and any required restorative work in the receiving environment.

8.13.3.4 Monitoring and Management Review

Site monitoring protocol, water level, water quality monitoring and review of information

The type of monitoring information required is visual observation of the Intermediate Dam and monitoring of geotechnical instrumentation. The site general monitoring protocol provides for the routine documented observation of the dam on a weekly basis throughout the year and the site physical monitoring protocol provides for an annual professional engineering inspection of the dam and for monitoring of geotechnical instrumentation in the dam. Monitoring of water quality and water levels in the Intermediate and Cross Valley Ponds is complementary to the required observational information and is also collected routinely throughout the year as part of the site water monitoring protocol.

A management review of the required information will be conducted initially during preparation of the monthly site status reports and subsequently during the

professional engineering site inspection and, ultimately, during preparation of the annual geotechnical inspection report.

9 PROPOSED AMENDMENTS TO THE WATER LICENCES

Four primary topic areas for which changes are proposed to the existing terms and conditions of the two water licences

The Faro and Vangorda Plateau water licences (QZ95-003 and IN89-002, respectively) were issued at a time when mining activities were underway and many of the terms and conditions reflect mine operations activities. The nature of the activities proposed for the term of the licence renewal (i.e. care and maintenance) and the announcement by DIAND in January 2003 that the mine is not considered to be economically viable (Appendix A) suggest that modifications to some of the terms and conditions in the water licence are appropriate.

A suggested draft water licence, that is an appendix to the Water Licence Application to which this report is attached, provides suggested wordings and changes for the amalgamated licence. The application also includes tables of concordance that identify which clauses of the existing licences were moved, removed or edited with suggested wording.

9.1 AMENDMENTS RELATED TO CARE AND MAINTENANCE ACTIVITIES

There are three primary topic areas for which changes are proposed to the existing terms and conditions of the two water licences:

1. Proposed consolidation of the two existing "mine operating licences into one "care and maintenance" water licence. The rationale for this is presented in Section 2 of this volume and a suggested form for the new licence is appended to the Water Licence Application.
2. Adoption of the Adaptive Management Plan described in this report in place of references to various contingency plans that were developed at various times in the past for conditions when the mine was actively operating.
3. Adoption of the site water monitoring protocols described in this report in place of the schedules for "normal operations" and "temporary cessation of operations" (Schedule A of each current water licence). A rationale for the proposed changes is provided in Section 12 of this report.

9.2 AMENDMENTS REGARDING MINE CLOSURE

In January 2003, an announcement was made by DIAND that the development of an FCRP would be undertaken by a government project team that would be formed for this specific purpose. A letter, dated January 20, 2003 is appended, which acknowledges this responsibility (Appendix A).

Development of a new FCRP for the mine complex, as planned by the project Closure Team, is necessary to:

- provide a comprehensive plan that integrates all aspects of the mine complex into the one cohesive plan;
- take advantage of advancements in mine reclamation technology that have occurred since previous closure measures were proposed; and
- resolve information gaps.

The planned development of the FCRP by the closure Project Team has two primary implications for the existing water licences.

The first implication involves clauses that require the licencee to implement closure measures according to timeframes that do not correspond to the proposed timeframe for the FCRP and that may not correspond to the closure measures that are ultimately proposed in the FCRP. These clauses are proposed to be held in abeyance for the duration of the new water licence. That is, these clauses would remain in the licence but would be specifically stated as not having effect for the duration of the licence. In this way, these clauses could come into effect again at the expiry of the licence, if necessary.

The second implication involves closure related studies. Studies related to developing reclamation and closure measures are under the direct management of the closure Project Team and will be executed as appropriate to develop the FCRP. Therefore, the closure related studies that are in the current water licences are proposed to be removed.

The closure design criteria that are specified in the current water licences are not immediately affected by the activities of the closure Project Team and, therefore, no changes are proposed to these clauses.

9.3 WATER USE

The existing water licences contain estimated water use volumes that were based on the needs of mine operations. However, the needs and uses of water are fundamentally different for the care and maintenance activities.

For example, the Faro Water Licence (QZ95-003) currently provides for the withdrawal of 42,900 m^3/day of water from Rose Creek whereas the care and maintenance activities that have been underway since 1998 (and as they are proposed to be continued to 2008) do not require any fresh water from Rose Creek.

Similarly, the Vangorda Plateau Water Licence (IN89-002) currently provides for the withdrawal of 6,000 Imperial gallons per day from water wells whereas the care and maintenance activities that have been underway since 1998 (and as they are proposed to be continued to 2008) do not require any water withdrawal from water wells. However, freshwater withdrawal from the Grum/Vangorda Freshwater Supply Pond is required for operation of the Grum/Vangorda Water Treatment Plant.

Therefore, clauses in the existing water licences that relate directly to water uses that are not required for the proposed care and maintenance activities have been suggested to be deleted or modified per the wording in the suggested draft licence.

Also, the current requirement for the licencee to maintain a minimum flow in Rose Creek is suggested for removal from the licence. This requirement relates directly to mine operations and requires the presence of the Fresh Water Supply Dam as the means of controlling flow in Rose Creek. Since the Fresh Water Supply dam is scheduled for removal by March 2004 (as a separate project), the licencee will have

no means of controlling flow in Rose Creek and this requirement would be unachievable without substantial in-stream earthworks being constructed.

The water use volumes that are provided in the Water Licence Application and the suggested draft licence are representative of the direct water uses that are listed in section 5.4 of this report. Section 5.4 lists the estimated typical annual volumes for each direct water use and these were extrapolated to estimated maximum daily volumes for provision in the Water Licence Application in the form utilized by the Yukon Waters Act.

10 PROPOSED STUDIES

10.1 ASSESSMENT OF TERRESTRIAL EFFECTS RELATED TO THE FARO MINE COMPLEX

Metal concentrations in soil and vegetation are elevated relative to background concentrations

The 2002 study of contaminant concentrations in the terrestrial environment (C.E. Jones 2003) provided information concerning the presence of metals in some samples of soil and vegetation in concentrations that are greater than concentrations present at local background reference locations. The results of this preliminary study are consistent with the long term (1969 to 1998) mining and milling operations.

The 2002 study results complement local and traditional knowledge regarding the potential for metal contamination in the terrestrial environment. The 2002 study represents the first scientific study that attempts to quantify the degree and extent of metal dispersion and should be considered to be a "reconnaissance" level study. The following still needs to be understood: 1) detailed spatial distribution of observed concentrations; 2) whether the wind dispersion of contaminants is on-going or whether dispersion was restricted to past mine operating activities; 3) what the human health and ecological implications of observations are and, following from items 3 and 4 above, 5) whether short-term dust control mitigation is required while the FCRP is being developed and implemented.

A proposed follow up study of environmental effects in the terrestrial environment pertains to the proposed "care and maintenance" licence renewal because of: 1) the possibility that wind dispersion of tailings from the Rose Creek Tailings Facility is an on-going and current source of contamination; and 2) the consequent need to confirm whether or not short-term dust-control mitigation is required. This possibility is the focus of the study described here and is specifically included into the Adaptive Management Plan.

A multi-year study is proposed for continued investigation of the terrestrial environment

The follow up study program is proposed to be a multi-year study culminating in a characterization and mitigation report by the end of 2005, with annual updates circulated to interested parties and the Technical Advisory Committee. The exact scope of the proposed study and the detailed study workplan would be developed, based on both community and scientific objectives, prior to the initiation of work in consultation with interested parties and with the closure Project Team. The proposed objectives include:

Study objectives

1. Gather and use traditional knowledge throughout the study design, execution and reporting.
2. Determine and delineate contaminants in the terrestrial environment following from the indications of the preliminary (2002) study.
3. Estimate proportional contributions of contaminants from various possible sources, both historical and current (i.e. Rose Creek Tailings Facility, concentrator plant when operating, rock dumps, roads, etc.).
4. Compare the data collected to appropriate regulatory benchmarks and evaluate the data through the Human Health and Ecological Risk Assessment screening

level study in order to determine the significance of the observed contaminant levels on the health of the land and users of the land.
5. Provide recommendations for short term mitigation measures, if required.

Traditional knowledge program

The gathering and use of traditional knowledge would primarily be based on information provided through the Ross River Dena Council. The workplan would include field trips with elders and community members, coordinated design of the study parameters and routine discussion of results throughout the project.

Components of the characterization of effects

In addition to the traditional knowledge program, the characterization of effects is likely to include the components listed below:
1. Sampling of vegetation, including leaves, roots and lichen, and soil in locations that repeat key 2002 sample locations and that extend the area covered in the preliminary (2002) study; analysis for both metal concentrations and geochemical speciation to estimate the proportions of the total metal content that is bioavailable.
2. Sampling of air quality for determination of total particulate matter and metal concentrations in select particulate samples.
3. Sampling of tissues of mammals, likely to include both large and small mammals.
4. Interviews with Yukon Territorial Government staff, local outfitters and local recreational resources users.
5. Aerial or satellite imagery.

Study report

A study report will be prepared, proposed by the end of 2005, that provides all of the results of the study and recommendations for mitigative actions that will ensure the protection of the biophysical environment, traditional land users and recreational land users in the short term while the FCRP is being developed and implemented.

10.2 GRUM PIT MANAGEMENT STUDY

The water level in the Grum Pit has increased progressively and may reach an action level during the proposed term of the water licence

Runoff water has been allowed to accumulate in the Grum Pit since the mine shut down in 1998 and this water is currently non compliant with the water licence. As compared to the Vangorda Pit which filled from empty to the action level from 1998 to 2002, the Grum Pit is larger and the inflows are less such that the rate of filling has been substantially lower. Nonetheless, the water elevation in the Grum Pit has increased on a progressive basis and may reach an action level during the proposed term of the water licence renewal as described in the Adaptive Management Plan.

A one year study is proposed to project the rate of filling and determine a short term management plan

A study to more precisely project the rate of filling and to determine an appropriate short term (life of 10 years) management plan is of interest to provide diligent environmental management during the period of development of a Final Closure Plan. This is proposed to be a 1-year study to be completed in 2003.

Study objectives

The specific study objectives are proposed to be:

1. Review the rate of filling and develop a filling projection.

2. Determine a maximum desired water elevation for the purpose of diligent management through the care and maintenance timeframe modeled on similar determinations for the Faro Main Pit and Vangorda Pit.
3. Assess management options at a conceptual engineering level including in-pit treatment, pumping to the Grum/Vangorda water treatment plant and any other relevant alternatives.

A preliminary study workplan is described below. A detailed study workplan would be developed prior to the initiation of work.

Workplan components

The work required to complete this study is likely to include the following components:

1. Surveying of the pit by ground or aerial methods.
2. Review of hydrologic data and groundwater flow estimates.
3. Water sampling and water column profiling in the pit.
4. Treatability testing for lime consumption rates and effluent quality predictions.
5. Conceptual design of a pumping/piping system.

Study report

A study report will be prepared that provides all of the results of the study, a projection of the anticipated timeframe for filling of the pit to the maximum recommended elevation and a comparison of management alternatives for the care and maintenance timeframe.

10.3 TREATMENT SEDIMENT MANAGEMENT PLAN

Treatment sediment ("sludge") is produced each year form the mill water treatment system (approximately 200 tonnes per year) and the Grum/Vangorda water treatment plant (estimated 100 tonnes per year).

The long term strategy for operation of water treatment systems and management of sludge is anticipated to be a component of the FCRP. However, a sludge management plan is required for the duration of care and maintenance activities to ensure that sludge is managed in an appropriate manner that does not compromise the environmental protection measures being implemented while the FCRP is being developed and implemented.

The study proposes to accomplish two specific objectives:

1. Provide a baseline environmental characterization of the sediments, with due consideration to the available interim management options.
2. Provide a Sediment Management Plan, with consideration of a timeframe of 5-years (i.e. to 2008).

The specific tasks that would likely be completed are as follows:

1. Review of information collected by Canmet during a 2001/2002 study of sediment from the Cross Valley Pond and the mill water treatment system.
2. Sample collection and shipment for analysis.

3. Field assessment of sediment characteristics including photos, observations and volume/density estimates.
4. Laboratory chemical analyses.
5. Laboratory physical properties testing.
6. Definition of management options to minimize potential environmental impacts (based on the chemical and physical properties characterization).
7. Evaluation of management options including consideration of past practices, best practices, licence requirements and site conditions.

A treatment sediment management plan would then be finalized and, ultimately, implemented in consultation with regulators and other interested parties according to the design and intent of the consultation and communication processes described in Section 2.1.5.

10.4 INVESTIGATION OF TAILINGS OUTSIDE OF THE ROSE CREEK TAILINGS FACILITY

10.4.1 AREAS OF INVESTIGATION

There are several areas where tailings have been deposited on land during past mining activities outside of the Rose Creek Tailings Facility. These include:

1. The emergency tailings area.
2. The 1970's spill area downgradient of the Cross Valley Dam.
3. The upgradient extent of the Rose Creek Tailings facility near the copper sulphate and bulk explosives plants.
4. The north side of the upper length of the Rose Creek Diversion Canal.

The emergency tailings area should be excavated and hauled to the Faro Main pit as an interim reclamation measure

The emergency tailings area, adjacent to the mill and mine access road in the old Faro Creek channel, is assumed to contain tailings produced from all generations of mine operations. The tailings are acid generating and are known to be producing highly contaminated seepage derived from surface infiltration as well as, possibly, subsurface flow originating in the old Faro Creek channel. This seepage is suspected to largely report to the Intermediate Pond of the Rose Creek tailings facility but may also contribute to contaminant loading in the Rose Creek Valley aquifer. These tailings are isolated from the Rose Creek Tailings Facility.

Residual tailings from the 1970's surface spill are contained between the Cross Valley Dam and Rose Creek

The area of land generally between the Cross Valley Dam and Rose Creek contains residual tailings from the 1970's tailings spill on surface. Further, residual patches of dead vegetation remain in the area. These tailings have not been specifically characterized to date but are assumed to comprise a relatively thin surface layer overlying native soils and to be acid generating or potentially acid generating. The 2002 Water Balance study (Gartner Lee 2002) indicated a possible unquantified source of sulphate in Rose Creek that might be related, in part, to these tailings.

The area generally between the copper sulphate and bulk explosives plants and the Rose Creek Tailings Facility and the flat area on the north side of the upper length of the Rose Creek Diversion Canal are observed to have tailings on surface that were deposited during past mining activities. The extent, depth, specific geochemical

characteristics and possible impacts on surface water quality of these tailings is unknown.

10.4.2 STUDY RATIONALE AND DESIGN

A characterization study is necessary

A study to characterize the physical extent, specific geochemical characteristics and possible impacts on water quality of these tailings areas is necessary to determine whether these areas are having a current and ongoing impact on water quality and to determine whether short term mitigation is necessary while the FCRP is being developed and implemented.

The investigation is proposed to be a one-year study that would be conducted in 2004 intended to accomplish these objectives:

1. Delineate the extent and depth of the tailings in the areas described.
2. Provide a geochemical characterization of the tailings.
3. Evaluate the current impacts on water quality and recommend short term mitigation measures.

The work tasks that would likely be involved in the study would include:

Test pitting program

1. A test pitting program to delineate the extent and depth of the tailings. A visual distinction between native soils and tailings is anticipated to be possible and this will be the basis of the delineation. Field tests might also be used, where necessary. This will allow for a delineation map and volume estimate to be developed.
2. Drilling may be required in the emergency tailings area in order to delineate and sample tailings and soils at depth if the thickness of tailings exceeds the effective depth of test pit excavation. In this case, drilling would be linked, if possible, to other drill projects that are carried out at the mine site from time to time.

Sample collection

3. Samples of tailings and native soils will be collected during the test pitting program and a representative subset of the samples will be selected for analysis. The analyses will include acid base accounting, trace metal concentrations and contaminant leaching. These test will allow for an assessment of the geochemical characteristics of the tailings.
4. Review of the site water balance to evaluate current impacts on water quality.

A project report would, ultimately, be prepared that provides recommended short term mitigation measures. Any proposed mitigation measures would be implemented in consultation with regulators and other interested parties according to the design and intent of the consultation and communication processes described in Section 2.1.5.

11 PROJECT SCHEDULE

All the project schedule events will be assessed by the site manager

The project schedule revolves around scheduled annual events as listed in Table 16, which represents the targeted timing of activities. All of the events will be assessed on an ongoing basis by the site manager to ensure that the targeted timeframes will achieve the desired environmental protection objectives.

Modification of the target dates is possible where appropriate

If specific climatic or other conditions indicate that modifying the targeted dates is more appropriate for management of environmental risks, then a more optimal time could be implemented. For example, if early freshet conditions result in an earlier than targeted response in the water level in the backfilled Zone 2 Pit, then pumping from the pit will be initiated earlier than the target date.

The site monitoring protocols provide for the collection of monitoring information that will allow the site manager to assess conditions and make determinations regarding the optimal timeframes for executing the care and maintenance activities.

Provisions of the overall schedule

The overall schedule provides for:

1. A site preparation period during which time access is opened for inspection and maintenance through freshet.
2. An active summer season during which time all of the water pumping and treatment activities and physical maintenance activities are scheduled to be completed.
3. A non-active winter season during which time minimal activities are scheduled beyond site security, maintenance/repairs to mobile equipment and site monitoring.

Table 16. Summary Schedule of Annual Scheduled Activities

Type of Activity	Activity	Target Timing
Site Preparation	Clear road accesses	All year
	Ditch maintenance & ice clearing	All year
	Mechanical and electrical maintenance and checks	April to May
Pumping & Treatment	Zone 2 Pit pumping	June to October – intermittent
	Main Pit pumping and treatment	June to August – continuous
	Intermediate Pond treatment	June to October – intermittent
	Vangorda Pit pumping ad treatment	July to August – continuous
	Little Creek Dam pumping	June and September – two events
	Sludge disposal	Mill: throughout pumping season Grum/Vangorda: September Cross Valley Pond : winter as required
Effluent Release	Effluent release from Cross Valley Pond	June to October – intermittent
	Effluent release from Grum/Vangorda water treatment plant	July to August – continuous
Monitoring	Surface water quality	Weekly, monthly, quarterly, annually per the site water monitoring protocol
	Groundwater quality	Twice per year (spring and fall)
	Benthic Invertebrates/Stream sediments	Alternating years: Rose Creek and Vangorda Creek:

Type of Activity	Activity	Target Timing
		Place colonization baskets – July Retrieve colonization baskets – August
	Reading geotechnical instrumentation	Twice per year (spring and fall) or more frequently per recommendations of the engineer
	Monitoring rock drain head pond	Monthly photographic record
	Professional geotechnical inspection	Vangorda Plateau site – June Faro site – September
Reporting to Yukon Territory Water Board	Monthly water reports	End of the subsequent month
	Annual Environmental Report (inclusive of geotechnical inspection reports)	March 1 of the subsequent year
Site Security & Road Maintenance	24-hour guardhouse attendant	Full time during operating season
	Day guardhouse attendant	Winter season when road is cleared – intermittent November to March
	Culvert opening/steaming	Late winter and freshet – as required March to April
	Grading, resurfacing & snow clearing	As required – intermittent

One time event activities will be optimized

Activities that are one time events through the licence timeframe (such as establishment of the demolition waste landfill) or are special projects that will operate under a project specific schedule (such as tear down of buildings) will be scheduled and executed on the basis of optimizing those activities.

12 ENVIRONMENTAL MONITORING AND PROTECTION

12.1 SITE WATER MONITORING PROTOCOL

The protocols include surface and groundwater monitoring for Faro and Vangorda Plateau Sites

The initial site water monitoring protocol was established in 2000 to include the requirements of the water licence plus additional water monitoring for site management purposes. The revised protocols appended to this report (Appendix C) include surface and groundwater monitoring for the Faro and Vangorda Plateau sites and are proposed to be incorporated into the new water licence for care and maintenance activities from 2004 to 2008 in place of the existing Schedule A of each licence.

The proposed water monitoring protocols generally increase the monitoring requirements above those required in the existing Schedules for "Temporary Cessation of Operations". This was done in recognition of the needs for monitoring:

- upstream reference locations;
- effluent quality entering the receiving environment;
- the receiving environment in the effluent mixing zone and at downstream locations; and
- groundwater quality.

The protocols also provide for the continuation of the established annual spring "seep" surveys at established locations to provide monitoring data focussed on contaminants sourcing from rock dumps.

The monitoring data is proposed to be reported to the Yukon Territory Water Board on a monthly basis for data reports and on an annual basis for a comprehensive interpretation using the standards and requirements of the current water licences.

12.2 SITE GENERAL MONITORING PROTOCOL

The protocol includes the facilities to be observed and the nature of the information to be documented

The site general monitoring protocol was established in 1999 as a means of establishing a standard methodology for visual inspection of the mine facilities that could be conducted by on-site personnel. The protocol appended (Appendix D) includes the facilities to be observed and the nature of the information to be documented. The information is recorded in a log book that is kept on-site.

12.3 SITE BIOLOGICAL MONITORING PROTOCOL

The protocol is unchanged from the current water licence

The proposed biological monitoring protocol (Appendix E) is proposed to be included into the new water licence as Schedule B, replacing the existing requirements for biological monitoring. The proposed protocol continues the established locations, schedules and sampling requirements as per the existing water licences.

The exception to the above is the proposed removal of the requirement to analyse water samples for cyanide at locations R2, R3 and R4 in Rose Creek. This proposed

removal is based on the history of cyanide concentrations at these locations that are at or near detection limit.

Sampling of stream sediments in conjunction with sampling of benthic invertebrates is currently a requirement of the Vangorda Water Licence but not the Faro Water Licence. The proposed new draft licence expands the current requirement to include sampling of stream sediment in Rose Creek as well as in Vangorda Creek.

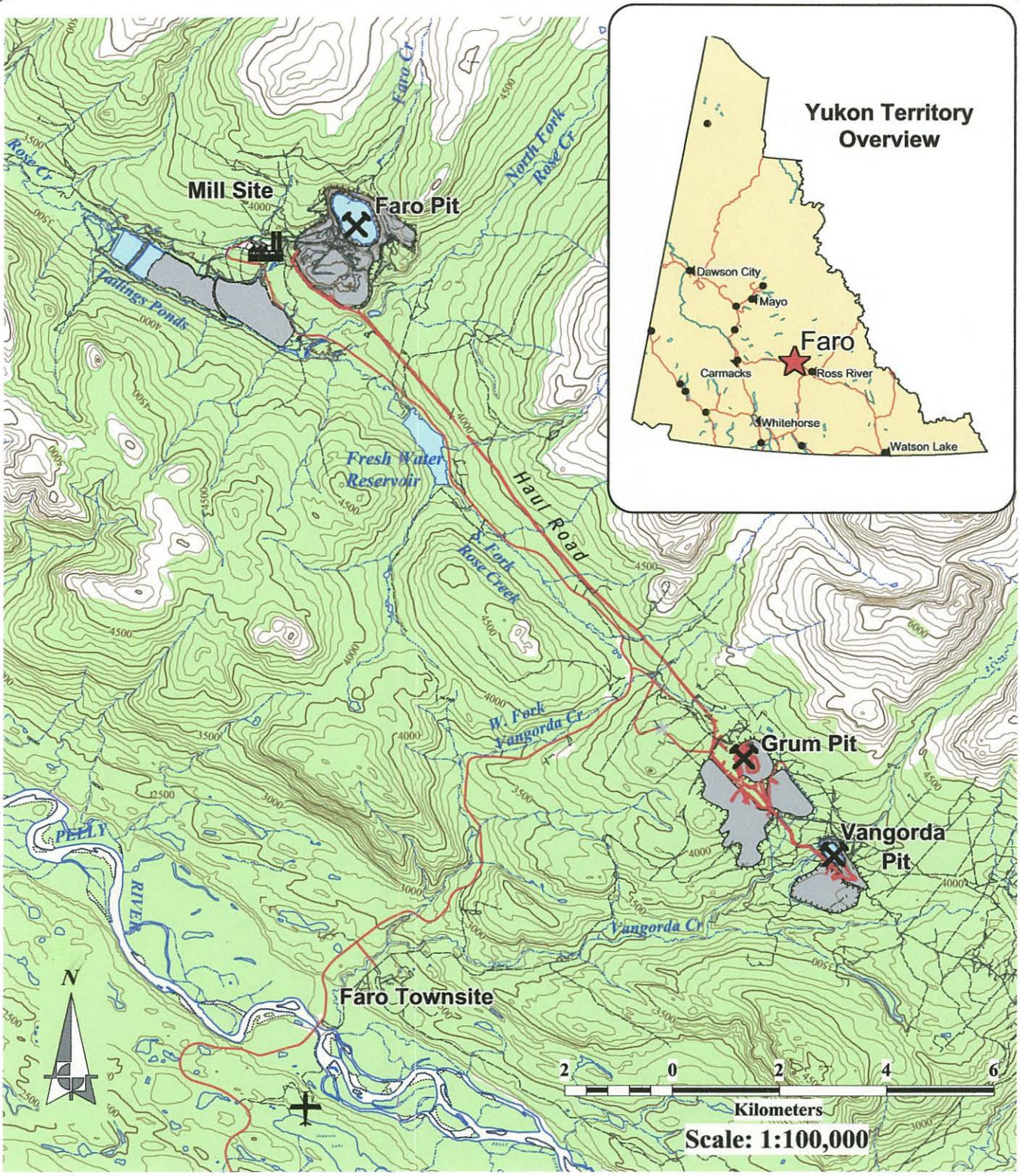
12.4 SITE PHYSICAL MONITORING PROTOCOL

The protocol is unchanged from the current water licence

The proposed physical monitoring protocol (Appendix F) is proposed to be included into the new water licence as Schedule C, replacing the existing requirements for physical monitoring. The proposed protocol continues the established practice of an annual inspection of earthworks and data review by a professional geotechnical engineer registered to practice in the Yukon Territory.

One requirement of the current Faro Water Licence is proposed for removal regarding the need for an annual survey of several cross sections along the Rose Creek Diversion Canal to monitor for accumulation of sediment. The professional engineer for the Faro mine site has not recommended that this work is necessary given the history of inspection and monitoring that does not indicate a concenr regarding sedimentation in the canal.

Figures



Site Name: FARO File : 23376-D1-FIG1.PDF Gartner Lee Limited Scale: 1: 100,000	DELOITTE & TOUCHE INC. **Project Location Map**	Project No: 23-376 Date Issued: MAY 2003 Figure 1

3. Vangorda Pit pumping.
4. Mill water treatment system.
5. Grum/Vangorda water treatment plant.

The contingency plan that is in place for a general loss of power is to conduct an operational check of equipment status such that equipment is configured appropriately for restart, contact with the regional power supplier to confirm status and ascertain restart timeframe, arrangement with the regional power supplier that power can be re-instated to the mine from the Town of Faro diesel generator if an environmental emergency was imminent and maintenance of the on site EMD emergency generator such that it can be utilized in an environmental emergency situation.

8.5 PUMP FAILURE AT A MAJOR PUMPING STATION

Pump failure at a major pumping station such as the Main Pit, the Zone 2 Pit or the Vangorda Pit could be caused by mechanical failure or loss of power locally or regionally. The pump failure would cause an operational disruption and the implications of the disruption would be dependent on the duration.

If the cause of the failure was loss of power from the regional grid, then the contingencies described for "General loss of electrical power" would apply.

If the cause of the failure was loss of power locally (i.e. on the mine site), then the contingency plan that is in place is to have a qualified electrician employed at the site or readily available from off site to identify and resolve the problem. Standard electrical replacement gear is either on hand or an off site source has been identified.

If the cause of the failure was mechanical failure, then the contingency plan that is in place is perform routine maintenance on the pumps, to have an experienced mechanic employed at the site or readily available from off site to identify and resolve the problem. Standard mechanical replacement parts are either on hand or an off site source has been identified.

In the extreme event where repairs could not be made in a timely manner and an environmental emergency was imminent, then a substitute pump would be expedited from an off site source and installed on an emergency rush basis. The timeframe for implementing this action would depend on the circumstances surrounding the pit water levels and would be at the discretion of the site manager.

8.6 GASOLINE AND DIESEL FUEL SPILLS

Spills of gasoline and diesel fuel can occur due to operator error, malfunctioning dispensing equipment, overfilling of storage tanks, leaking/damaged storage tanks or leaking/damaged mobile and heavy equipment. Even relatively small spills can have an environmental implication if they occur near a stream or other environmental receptor.

The contingency plan that is in place includes the following:

1. Only one storage tank for gasoline and one for diesel fuel are to be utilized.
2. The active storage tanks are located within containment berms with capacity to contain the full tank volume.
3. The secondary containment berms are visually monitored and clean water is removed periodically to maintain storage capacity.
4. The storage tanks were registered with DIAND Lands Department.
5. Operating procedures are in place that provide for monitoring of storage tank levels and for security control on dispensing.
6. Operator awareness training is provided regarding the environmental implications of spills.
7. A spill response kit is maintained at the mine site that includes dry absorbent and floating absorbent booms and pads.
8. A spill response plan is in place that provides for notification to site management as well as to the Yukon 24-hour spill reporting office.

8.7 LOSS OF ROAD ACCESS

Loss of road access to the mine site could be caused by a flood that erodes the roadway, washout due to culvert failure or exceedance of culvert capacity or by heavy snowfall. The implications of loss of road access could be substantial depending on the time of the occurrence. For example, if the road was lost due to a flood event, then even a brief inability to inspect and repair damage to mine facilities, particularly dams and ditches, could result in an environmental impact.

Therefore, regardless of the cause of the loss of road access, it would be important to restore access quickly. The contingency plan that is in place includes the following:

1. Park a grader or plow truck in the Town of Faro during winter periods when the road is not being cleared regularly.
2. Maintain a grader, plow truck, front-end loader and gravel truck on-site or maintain contact with off site contractors for emergency provision of road repair services.
3. Aggressively steam ice from culverts and clear ice from roadside ditches through the winter and spring as required to maintain flow and prevent road washout.
4. Maintain contact with the YTG highways maintenance department as regards joint monitoring, maintenance and repairs to the access road.

8.8 LOSS OF COMMUNICATION

Loss of communication to the mine site could be caused by the loss of telephone lines from the Town of Faro to the mine site. The implications of loss of communication could be substantial if contingency measures were not in place due to the time delay that would be introduced into communicating and arranging responses to emergency events.

Therefore, the following contingency measures are in place:

1. Portable satellite phones are carried by senior site managers and would be used in a general loss of communications.
2. A state-of-the-art telephone system is scheduled for installation at the mine site in 2003.

3. The "Guest House" in the Town of Faro is equipped with an operable fax machine and telephone.

8.9 COMPLETE BREACH OF THE FARO CREEK DIVERSION

8.9.1 EVENT

A complete breach of the Faro Creek Diversion into the Main Pit could be the result of failure of the northeast Faro Pit wall.

8.9.2 ENVIRONMENTAL CONSEQUENCES

The first consequence of filling would be damage to the pumping system

If the pit water elevation were to increase because pumping could not be undertaken at a rate to match inflows, then physical damage to the pumping system would be expected to be the first consequence. Ultimately, if the excess inflow were not controlled, then the pit water elevation would reach the point overflow into the Zone 2 Pit and, subsequently, into the North Fork of Rose Creek. This would represent an uncontrolled release of non-compliant water into the environment.

The elevations at which these events would be expected to occur are as follows:

1. physical damage to the barge anchor point and pipeline: 3866 feet mine datum
2. water damage to the electrical switchgear and transformer: 3877 feet mine datum
3. overflow to Zone 2 Pit: 3910 feet mine datum

The timeframes for reaction to prevent these consequences from occurring will depend on the rate of inflow, the rate of pumping outflow and the water elevation in the Main Pit at the time of the breach. Several hypothetical examples are listed in Table 14:

Table 14. Hypothetical Timeframes for Reaction to Prevent Consequences from a Complete Breach of the Faro Creek Diversion

Event	Inflow (Breach)	Outflow (Pumping)	Initial Water Elevation	Time to damage piping	Time to flood electrical gear	Time to overflow
7-day PMF	7.44	0.28 (4500gpm)	3862	1 day	4 days	13 days
7-day PMF	7.44	0.56 (9000gpm)	3862	1 day	4 days	13 days
"Normal" inflows	0.155	0.28 (4500gpm)	3862	never	never	never
"Freshet-level" inflows	0.360	0.28 (4500gpm)	3862	96 days	362 days	3 years

Notes: flows are m3/s (except where noted otherwise)
elevations are feet

8.9.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.9.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess inflows into the Main Pit and immediately implement pumping from the pit if such is necessary to prevent or delay damage to equipment. Initial notification to the water inspector and to the Yukon Territory Water Board will be made at this time.

The rates of inflow and outflow will be assessed and an assessment made of the ability of the pit pumping program to prevent a continued increase in the pit water level and, if necessary, a projection made of the anticipated increase in the pit water level, with the pumping program underway.

Mitigation for various pumping rates

If pumping from the pit can be undertaken at a rate equivalent to or in excess of the rate of inflow while providing adequate treatment of the pumped water, then this rate of pumping will be undertaken and maintained such that the water elevation in the pit does not increase.

If pumping from the pit can not match the inflow rate due to pumping capability, inability to maintain compliance for effluent released to Rose Creek or other reasons, then the maximum possible pumping rate will be implemented such that the rate of rise of the pit water elevation is slowed. The high pumping rates that have been achieved to date while maintaining compliance with the effluent discharge criteria in the licence is in the order of 0.384 m^3/s (6,100 USgpm).

Alternatives for increasing the pumping rate to greater than typical rates

There are several potential alternatives for increasing the pumping rate to greater than the typical rates while maintaining compliance with the discharge criteria of the water licence and these will be investigated, if necessary. The potential alternatives might include:

1. Re-initiating the past practice (pre-2001) of treating water with lime slurry in a "drop box" outside of the mill and utilizing the Intermediate Pond for settlement of treatment sediments. This would also likely require initiation of lime treatment at the Intermediate Dam outflow spillway; and
2. The addition of a second treatment "circuit" in the mill utilizing additional flotation cells and clarifiers. This might require in the order of 3 months and $1M to make operational.

8.9.3.2 Secondary Response

The breach location will be assessed for access and a plan will be made and implemented for short term reduction or prevention of inflows into the Main Pit while a long term mitigation plan is implemented. The options for accomplishing this short term mitigation goal may include: ditching around the breach, berming the upstream side of the breach to direct water into a pipe spanning or circumventing the

Options for accomplishing short term mitigation goals

breach and installation of a pumping sump to enable pumping water across or around the breach.

This measure will be implemented as quickly as possible with the intention of preventing damage to the pumping and electrical systems by preventing the water elevation from rising to those elevations.

Mitigation measures for various pit water elevations

If the pit water elevation rises to the elevation at which the barge anchor point and pipeline will be damaged, then the anchor point will be dismantled and the on shore pipeline will be progressively blocked and raised to enable the barge to float higher without breaking the pipeline.

If the water elevation rises to the elevation where the safe operation of the electrical switchgear or transformer is compromised, then power to the transformer will be disconnected at the main substation at the mill. At this time, no further pumping from the Main Pit would be possible until a generator of approximately 1 MW capacity was installed (for start up of a single pump). This might be accomplished by activating the EMD (on-site 2.7 MW diesel emergency generator) or installing a rental 1 MW diesel generator. In either case, a substantial pumping down time will be experienced.

If the water elevation rises to the elevation where overflow into the Zone 2 Pit is imminent, then an assessment of the most effective means of minimizing impacts to Rose Creek will be made. This might include: allowing overflow into the North Fork of Rose Creek via the Zone 2 Pit or implementing increased pumping from the Main Pit to Rose Creek in the absence of the ability to adequately treat the water.

8.9.3.3 Long Term Response

Timeframe and mitigation methods

Subsequent to implementation of the Secondary Response, a long term mitigation plan will be designed, permitted and implemented. This would be designed to provide security until the scheduled implementation of the Final Reclamation Plan. This is likely to involve construction of a new channel or a new channel to bypass the breach. A study is scheduled for completion in summer 2003 that will provide preliminary engineering designs for alternative methods of relocating the diversion channel (Golder 2002) and these designs will provide a starting point for a new design for restoring flow.

8.9.3.4 Monitoring and Management Review

Site monitoring protocol and review of information

The type of monitoring information required to identify this event is visual observation of the Faro Creek Diversion and the northeast wall of the Faro Main Pit. The site general monitoring protocol provides for the routine documented observation of this area on a minimum weekly basis throughout the year and the site physical monitoring protocol provides for an annual professional engineering review of the area. Monitoring of the water level in the Faro Main Pit is complementary to the required observational information and is also collected routinely throughout the year as part of the site water monitoring protocol.

A management review of the required information will be conducted initially during preparation of the monthly site status reports and subsequently during the professional engineering site inspection and, ultimately, during preparation of the annual geotechnical inspection report.

8.10 BREACH OF THE ROSE CREEK DIVERSION CANAL INTO THE INTERMEDIATE OR CROSS VALLEY PONDS

8.10.1 EVENT

A breach of the Rose Creek Diversion Canal into the Intermediate or Cross Valley Ponds could be the result of a large flood event (say 1:500 years or greater) that overtops or erodes the containment dyke or the result of freshet runoff flows that travel on top of the winter ice and overtop or breach the containment dyke.

8.10.2 ENVIRONMENTAL CONSEQUENCES

The environmental consequences of a breach of the Rose Creek Diversion Canal would be dependent on the location and extent of the breach and the magnitude of the inflows from Rose Creek.

Consequences dependent on the location and extent of the breach and magnitude of the inflows

A complete breach of the canal during a flood event wherein all of Rose Creek passed into the Intermediate Pond could result in complete or partial failure of the Intermediate Dam and the release of sediment, tailings solids and non compliant water into the receiving environment. Similarly, a breach into the Cross Valley Pond could result in a partial or complete failure of the Cross Valley Dam and the release of sediment and lime treatment sludge into the receiving environment.

A smaller but substantial inflow of water into the Intermediate Pond could result in an exceedance of the treatment capability installed at the Intermediate Dam outflow spillway and the release of non compliant water. A smaller still inflow of water into the Intermediate Pond could result in the need for unscheduled operation of the treatment system requiring unscheduled expenditures and increased environmental risks.

8.10.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.10.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess inflows into the Intermediate and/or Cross Valley Ponds. Initial notification to the water inspector and to the Water Board will be made at this time.

Mitigation depending on the inflow

If the inflow rate is sufficiently low, an appropriate water management plan will be immediately implemented in the ponds to ensure that water is adequately treated prior to release to the environment. This might include activation or increased

operation of the water treatment system, pumping from Cross Valley Pond to Intermediate Pond or cessation of effluent discharge.

If the inflow rate is high such that there is a risk to the integrity of the dam, then the geotechnical engineer will be immediately contacted and emergency protection for the integrity of the dams will be immediately implemented.

8.10.3.2 Secondary Response

Options for accomplishing short term mitigation goals

The breach location will be assessed for access and a plan will be made and implemented for short term reduction or prevention of inflows into the pond(s) while a longer term mitigation plan is implemented. The options for accomplishing this short term mitigation goal may include: ditching around the breach, berming the upstream side of the breach to direct water into a pipe spanning or circumventing the breach and installation of a pumping sump to enable pumping water across or around the breach.

This measure will be implemented as quickly as possible with the intention of minimizing the volume of water entering the pond(s).

If sediment, tailings solids or non compliant were released, then an environmental effects monitoring program will be initiated to determine impacts in the receiving environment and assess the needs for remedial work.

8.10.3.3 Long Term Response

Timeframe and mitigation measure

Subsequent to implementation of the Secondary Response, a long term mitigation plan will be implemented such that security is provided until the scheduled implementation of the Final Reclamation Plan. This is likely to involve construction of a new channel section to bypass the breach.

8.10.3.4 Monitoring and management REview

Site physical monitoring protocol, water level, water quality monitoring, and review of information

The type of monitoring information required to identify this event is visual observation of the Rose Creek Diversion Canal and monitoring of geotechnical instrumentation. The site general monitoring protocol provides for the routine documented observation of this area on a minimum weekly basis throughout the year and on a daily basis through freshet. The site physical monitoring protocol provides for an annual professional engineering inspection of the containment dyke and for the monitoring of geotechnical instrumentation in the containment dyke. Monitoring of water quality and water levels in the Intermediate and Cross Valley Ponds is complementary to the required observational information and is also collected routinely throughout the year as part of the site water monitoring protocol.

A management review of the required information will be conducted initially during preparation of the monthly site status reports and subsequently during the professional engineering site inspection and, ultimately, during preparation of the annual geotechnical inspection report.

8.11 COMPLETE BREACH OF VANGORDA CREEK DIVERSION

8.11.1 EVENT

A complete breach of the Vangorda Creek Diversion into the Vangorda Pit could be the result of failure of the north pit wall.

8.11.2 ENVIRONMENTAL CONSEQUENCES

Timeframes for reaction to prevent uncontrolled release of non-compliant pit water into the environment

If the pit water elevation were to increase because pumping could not be undertaken at a rate to match inflows, then the pit water elevation would ultimately reach the point of overflow into Vangorda Creek. This would represent an uncontrolled release of non-compliant water into the environment. The elevations at which overflow would be anticipated is 1122.5 m ASL versus the maximum desired operating elevation of 1092 m ASL.

The timeframes for reaction to prevent these consequences from occurring will depend on the rate and duration of inflow and the water elevation in the Main Pit at the time of the breach. The outflow pumping rate is currently fixed at 2,000 USgpm. Several hypothetical timeframe examples are listed Table 15:

Table 15. Hypothetical Timeframes for Reaction to Prevent Consequences from a Complete Breach of the Vangorda Creek Diversion

Event	Inflow (Breach) (m^3/s)	Outflow (Pumping) (m^3/s)	Initial Water Elevation (m ASL)	Time to overflow
50% of 7-day PMF	5.1	0.12 (2000gpm)	1092	7 days
7-day PMF	10.2	0.12 (2000gpm)	1092	4 days

8.11.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.11.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess inflows into the Vangorda Pit and immediately implement pumping from the pit if such is necessary to prevent the pit water level from exceeding the maximum desired operating elevation. Initial notification to the water inspector and to the Water Board will be made at this time.

Mitigation depending on the pumping rate from the pit

The rates of inflow and outflow will be assessed and an assessment made of the ability of the pit pumping program to prevent a continued increase in the pit water level and, if necessary, a projection made of the anticipated increase in the pit water level, with the pumping program underway.

If the rate of pumping from the pit is equivalent to or in excess of the rate of inflow while providing adequate treatment of the pumped water, then pumping will be undertaken and maintained such that the water elevation in the pit does not increase.

If pumping from the pit does not match the inflow rate due to pumping capability, inability to maintain compliance for effluent released to Vangorda Creek or other reasons, then the maximum possible pumping rate will be implemented such that the rate of rise of the pit water elevation is slowed.

8.11.3.2 Secondary Response

Options for accomplishing short term mitigation goals

The breach location will be assessed for access and a plan will be made and implemented for short term reduction or prevention of inflows into the pit while a longer term mitigation plan is implemented. The options for accomplishing this short term mitigation goal may include: ditching around the breach, berming the upstream side of the breach to direct water into a pipe spanning or circumventing the breach and installation of a pumping sump to enable pumping water across or around the breach.

This measure will be implemented as quickly as possible with the intention of minimizing the rise in the pit water elevation.

Mitigation for various pumping rates

The electrical switchgear and transformer for the Vangorda Pit pump are located out of the pit perimeter and, therefore, are at risk of a rising pit water elevation. If the pit water elevation rises to the elevation at which the barge anchor point will be damaged, then the anchor point will be dismantled and the on shore pipeline will be progressively blocked and raised to enable the barge to float higher without breaking the pipeline.

If the water elevation rises to the elevation where overflow into Vangorda Creek is imminent, then an assessment of the most effective means of minimizing impacts to Vangorda Creek will be made. This might include: allowing overflow into Vangorda Creek or implementing direct pumping from the Vangorda Pit to Vangorda Creek even in the absence of the ability to adequately treat the water as a means of minimizing erosion and sedimentation at the outflow location.

8.11.3.3 Long Term Response

Timeframe and mitigation methods

Subsequent to implementation of the Secondary Response, a long term mitigation plan will be implemented such that security is provided until the scheduled implementation of the FCRP. This is likely to involve construction of a new channel or a new channel to bypass the breach. A study was completed in 2002 that provides preliminary engineering designs for alternative methods of relocating the diversion channel (SRK 2002) and these designs will provide a starting point for a new design for restoring flow.

8.11.3.4 Monitoring and Management Review

Site monitoring protocol and review of information

The type of monitoring information required to identify this event is visual observation of the Vangorda Creek Diversion and the north wall of the Vangorda Pit. The site general monitoring protocol provides for the routine documented observation of this area on a minimum weekly basis throughout the year and the site physical monitoring protocol provides for an annual professional engineering review of the area. Monitoring of the water level in the Vangorda Pit is complementary to the required observational information and is also collected routinely throughout the year as part of the site water monitoring protocol.

A management review of the required information will be conducted initially during preparation of the monthly site status reports and subsequently during the professional engineering site inspection and, ultimately, during preparation of the annual geotechnical inspection report.

8.12 FAILURE OF THE VANGORDA CREEK HAUL ROAD CULVERTS

8.12.1 EVENT

A failure of the Vangorda Creek haul road crossing could be the result of collapse, rusting or separation of joints of one of the two buried culverts or the vertical drop box that passes Vangorda Creek through the haul road.

8.12.2 ENVIRONMENTAL CONSEQUENCES

If leakage from the buried culverts caused partial or complete failure of the haul road embankment, this would result in sedimentation directly into Vangorda Creek, which could expose aquatic resources, terrestrial resources and human resource users to increased levels of sediment in Vangorda Creek.

8.12.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.12.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess the stability of the road embankment and degree of sedimentation into Vangorda Creek. Initial notification to the water inspector and to the Water Board will be made at this time.

The geotechnical engineer will be immediately contacted and emergency remediation to stabilize the road embankment and the rate of sedimentation into the creek will be immediately implemented.

8.12.3.2 Secondary Response

The area will be assessed for access and a plan will be made and implemented for short term stabilization of the road embankment and creek passage and the

Options for accomplishing short term mitigation goals

prevention of further release of sediment into the environment. The options for accomplishing this short term mitigation goal may include backfilling or rip rap (erosion protection) in the failed location or excavation of the residual roadfill to allow a straight stream channel to be constructed.

An environmental effects monitoring program will be initiated to determine impacts in the receiving environment and assess the needs for remedial work.

These measures will be implemented as quickly as possible.

8.12.3.3 Long Term Response

Timeframe and mitigation measures

Subsequent to implementation of the Secondary Response, a long term (5 to 10 years life) remediation plan will be designed and implemented such that security is provided until the scheduled implementation of the Final Reclamation Plan. This is likely to involve some channel and road/bridge construction and any required restorative work in the receiving environment.

8.12.3.4 Monitoring and management REview

Site monitoring protocol and review of information

The type of monitoring information required to identify this event is visual observation of the Vangorda Creek haul road crossing. The site general monitoring protocol provides for the routine documented observation of this area on a minimum weekly basis throughout the year.

A management review of the required information will be conducted during preparation of the monthly site status reports.

8.13 FAILURE OF THE INTERMEDIATE DAM

8.13.1 EVENT

The proposed action trigger

A failure of the Intermediate Dam could be the result of flood inflows from a breach of the Rose Creek Diversion Canal and other upstream sources, an earthquake, slumping/caving of embankment or foundation soils, "piping" through the embankment or another unforeseen event.

8.13.2 ENVIRONMENTAL CONSEQUENCES

Assuming that failure of the Intermediate Dam causes a failure of the Cross Valley Dam

The environmental consequences of a failure of the Intermediate Dam would the release of sediment, tailings solids and non-compliant water into the receiving environment of Rose Creek and the exposure of aquatic resources, terrestrial resources and human resource users to increased levels of contaminants in Rose Creek, Anvil Creek and the Pelly River. This assumes that a failure of the Intermediate Dam will cause a failure of the Cross Valley Dam.

8.13.3 CONTINGENCY PLAN

A staged contingency plan will be implemented if this event occurs.

8.13.3.1 Immediate Response

Initial response

The initial response to the event will be to immediately assess the state of the dams and provide initial notification to the water inspector and to the Water Board.

The geotechnical engineer will be immediately contacted and emergency remediation to stabilize the dam and the release of contaminants will be immediately implemented.

8.13.3.2 Secondary Response

Options for accomplishing the short term mitigation goal

The breach location will be assessed for access and a plan will be made and implemented for short term stabilization of the dams and the prevention of further release of contaminants into the environment. The options for accomplishing this short term mitigation goal may include backfilling or rip rap (erosion protection) in the breach location.

An environmental effects monitoring program will be initiated to determine impacts in the receiving environment and assess the needs for remedial work.

These measures will be implemented as quickly as possible.

8.13.3.3 Long Term Response

Timeframe and mitigation measures

Subsequent to implementation of the Secondary Response, a long term mitigation plan will be designed and implemented such that security is provided until the scheduled implementation of the Final Reclamation Plan. This is likely to involve some dam construction and any required restorative work in the receiving environment.

8.13.3.4 Monitoring and Management Review

Site monitoring protocol, water level, water quality monitoring and review of information

The type of monitoring information required is visual observation of the Intermediate Dam and monitoring of geotechnical instrumentation. The site general monitoring protocol provides for the routine documented observation of the dam on a weekly basis throughout the year and the site physical monitoring protocol provides for an annual professional engineering inspection of the dam and for monitoring of geotechnical instrumentation in the dam. Monitoring of water quality and water levels in the Intermediate and Cross Valley Ponds is complementary to the required observational information and is also collected routinely throughout the year as part of the site water monitoring protocol.

A management review of the required information will be conducted initially during preparation of the monthly site status reports and subsequently during the

professional engineering site inspection and, ultimately, during preparation of the annual geotechnical inspection report.

9 PROPOSED AMENDMENTS TO THE WATER LICENCES

Four primary topic areas for which changes are proposed to the existing terms and conditions of the two water licences

The Faro and Vangorda Plateau water licences (QZ95-003 and IN89-002, respectively) were issued at a time when mining activities were underway and many of the terms and conditions reflect mine operations activities. The nature of the activities proposed for the term of the licence renewal (i.e. care and maintenance) and the announcement by DIAND in January 2003 that the mine is not considered to be economically viable (Appendix A) suggest that modifications to some of the terms and conditions in the water licence are appropriate.

A suggested draft water licence, that is an appendix to the Water Licence Application to which this report is attached, provides suggested wordings and changes for the amalgamated licence. The application also includes tables of concordance that identify which clauses of the existing licences were moved, removed or edited with suggested wording.

9.1 AMENDMENTS RELATED TO CARE AND MAINTENANCE ACTIVITIES

There are three primary topic areas for which changes are proposed to the existing terms and conditions of the two water licences:

1. Proposed consolidation of the two existing "mine operating licences into one "care and maintenance" water licence. The rationale for this is presented in Section 2 of this volume and a suggested form for the new licence is appended to the Water Licence Application.
2. Adoption of the Adaptive Management Plan described in this report in place of references to various contingency plans that were developed at various times in the past for conditions when the mine was actively operating.
3. Adoption of the site water monitoring protocols described in this report in place of the schedules for "normal operations" and "temporary cessation of operations" (Schedule A of each current water licence). A rationale for the proposed changes is provided in Section 12 of this report.

9.2 AMENDMENTS REGARDING MINE CLOSURE

In January 2003, an announcement was made by DIAND that the development of an FCRP would be undertaken by a government project team that would be formed for this specific purpose. A letter, dated January 20, 2003 is appended, which acknowledges this responsibility (Appendix A).

Development of a new FCRP for the mine complex, as planned by the project Closure Team, is necessary to:

- provide a comprehensive plan that integrates all aspects of the mine complex into the one cohesive plan;
- take advantage of advancements in mine reclamation technology that have occurred since previous closure measures were proposed; and
- resolve information gaps.

The planned development of the FCRP by the closure Project Team has two primary implications for the existing water licences.

The first implication involves clauses that require the licencee to implement closure measures according to timeframes that do not correspond to the proposed timeframe for the FCRP and that may not correspond to the closure measures that are ultimately proposed in the FCRP. These clauses are proposed to be held in abeyance for the duration of the new water licence. That is, these clauses would remain in the licence but would be specifically stated as not having effect for the duration of the licence. In this way, these clauses could come into effect again at the expiry of the licence, if necessary.

The second implication involves closure related studies. Studies related to developing reclamation and closure measures are under the direct management of the closure Project Team and will be executed as appropriate to develop the FCRP. Therefore, the closure related studies that are in the current water licences are proposed to be removed.

The closure design criteria that are specified in the current water licences are not immediately affected by the activities of the closure Project Team and, therefore, no changes are proposed to these clauses.

9.3 WATER USE

The existing water licences contain estimated water use volumes that were based on the needs of mine operations. However, the needs and uses of water are fundamentally different for the care and maintenance activities.

For example, the Faro Water Licence (QZ95-003) currently provides for the withdrawal of 42,900 m^3/day of water from Rose Creek whereas the care and maintenance activities that have been underway since 1998 (and as they are proposed to be continued to 2008) do not require any fresh water from Rose Creek.

Similarly, the Vangorda Plateau Water Licence (IN89-002) currently provides for the withdrawal of 6,000 Imperial gallons per day from water wells whereas the care and maintenance activities that have been underway since 1998 (and as they are proposed to be continued to 2008) do not require any water withdrawal from water wells. However, freshwater withdrawal from the Grum/Vangorda Freshwater Supply Pond is required for operation of the Grum/Vangorda Water Treatment Plant.

Therefore, clauses in the existing water licences that relate directly to water uses that are not required for the proposed care and maintenance activities have been suggested to be deleted or modified per the wording in the suggested draft licence.

Also, the current requirement for the licencee to maintain a minimum flow in Rose Creek is suggested for removal from the licence. This requirement relates directly to mine operations and requires the presence of the Fresh Water Supply Dam as the means of controlling flow in Rose Creek. Since the Fresh Water Supply dam is scheduled for removal by March 2004 (as a separate project), the licencee will have

no means of controlling flow in Rose Creek and this requirement would be unachievable without substantial in-stream earthworks being constructed.

The water use volumes that are provided in the Water Licence Application and the suggested draft licence are representative of the direct water uses that are listed in section 5.4 of this report. Section 5.4 lists the estimated typical annual volumes for each direct water use and these were extrapolated to estimated maximum daily volumes for provision in the Water Licence Application in the form utilized by the Yukon Waters Act.

10 PROPOSED STUDIES

10.1 ASSESSMENT OF TERRESTRIAL EFFECTS RELATED TO THE FARO MINE COMPLEX

Metal concentrations in soil and vegetation are elevated relative to background concentrations

The 2002 study of contaminant concentrations in the terrestrial environment (C.E. Jones 2003) provided information concerning the presence of metals in some samples of soil and vegetation in concentrations that are greater than concentrations present at local background reference locations. The results of this preliminary study are consistent with the long term (1969 to 1998) mining and milling operations.

The 2002 study results complement local and traditional knowledge regarding the potential for metal contamination in the terrestrial environment. The 2002 study represents the first scientific study that attempts to quantify the degree and extent of metal dispersion and should be considered to be a "reconnaissance" level study. The following still needs to be understood: 1) detailed spatial distribution of observed concentrations; 2) whether the wind dispersion of contaminants is on-going or whether dispersion was restricted to past mine operating activities; 3) what the human health and ecological implications of observations are and, following from items 3 and 4 above, 5) whether short-term dust control mitigation is required while the FCRP is being developed and implemented.

A proposed follow up study of environmental effects in the terrestrial environment pertains to the proposed "care and maintenance" licence renewal because of: 1) the possibility that wind dispersion of tailings from the Rose Creek Tailings Facility is an on-going and current source of contamination; and 2) the consequent need to confirm whether or not short-term dust-control mitigation is required. This possibility is the focus of the study described here and is specifically included into the Adaptive Management Plan.

A multi-year study is proposed for continued investigation of the terrestrial environment

The follow up study program is proposed to be a multi-year study culminating in a characterization and mitigation report by the end of 2005, with annual updates circulated to interested parties and the Technical Advisory Committee. The exact scope of the proposed study and the detailed study workplan would be developed, based on both community and scientific objectives, prior to the initiation of work in consultation with interested parties and with the closure Project Team. The proposed objectives include:

Study objectives

1. Gather and use traditional knowledge throughout the study design, execution and reporting.
2. Determine and delineate contaminants in the terrestrial environment following from the indications of the preliminary (2002) study.
3. Estimate proportional contributions of contaminants from various possible sources, both historical and current (i.e. Rose Creek Tailings Facility, concentrator plant when operating, rock dumps, roads, etc.).
4. Compare the data collected to appropriate regulatory benchmarks and evaluate the data through the Human Health and Ecological Risk Assessment screening

level study in order to determine the significance of the observed contaminant levels on the health of the land and users of the land.
5. Provide recommendations for short term mitigation measures, if required.

Traditional knowledge program

The gathering and use of traditional knowledge would primarily be based on information provided through the Ross River Dena Council. The workplan would include field trips with elders and community members, coordinated design of the study parameters and routine discussion of results throughout the project.

Components of the characterization of effects

In addition to the traditional knowledge program, the characterization of effects is likely to include the components listed below:
1. Sampling of vegetation, including leaves, roots and lichen, and soil in locations that repeat key 2002 sample locations and that extend the area covered in the preliminary (2002) study; analysis for both metal concentrations and geochemical speciation to estimate the proportions of the total metal content that is bioavailable.
2. Sampling of air quality for determination of total particulate matter and metal concentrations in select particulate samples.
3. Sampling of tissues of mammals, likely to include both large and small mammals.
4. Interviews with Yukon Territorial Government staff, local outfitters and local recreational resources users.
5. Aerial or satellite imagery.

Study report

A study report will be prepared, proposed by the end of 2005, that provides all of the results of the study and recommendations for mitigative actions that will ensure the protection of the biophysical environment, traditional land users and recreational land users in the short term while the FCRP is being developed and implemented.

10.2 GRUM PIT MANAGEMENT STUDY

The water level in the Grum Pit has increased progressively and may reach an action level during the proposed term of the water licence

Runoff water has been allowed to accumulate in the Grum Pit since the mine shut down in 1998 and this water is currently non compliant with the water licence. As compared to the Vangorda Pit which filled from empty to the action level from 1998 to 2002, the Grum Pit is larger and the inflows are less such that the rate of filling has been substantially lower. Nonetheless, the water elevation in the Grum Pit has increased on a progressive basis and may reach an action level during the proposed term of the water licence renewal as described in the Adaptive Management Plan.

A one year study is proposed to project the rate of filling and determine a short term management plan

A study to more precisely project the rate of filling and to determine an appropriate short term (life of 10 years) management plan is of interest to provide diligent environmental management during the period of development of a Final Closure Plan. This is proposed to be a 1-year study to be completed in 2003.

Study objectives

The specific study objectives are proposed to be:

1. Review the rate of filling and develop a filling projection.

2. Determine a maximum desired water elevation for the purpose of diligent management through the care and maintenance timeframe modeled on similar determinations for the Faro Main Pit and Vangorda Pit.
3. Assess management options at a conceptual engineering level including in-pit treatment, pumping to the Grum/Vangorda water treatment plant and any other relevant alternatives.

A preliminary study workplan is described below. A detailed study workplan would be developed prior to the initiation of work.

Workplan components

The work required to complete this study is likely to include the following components:

1. Surveying of the pit by ground or aerial methods.
2. Review of hydrologic data and groundwater flow estimates.
3. Water sampling and water column profiling in the pit.
4. Treatability testing for lime consumption rates and effluent quality predictions.
5. Conceptual design of a pumping/piping system.

Study report

A study report will be prepared that provides all of the results of the study, a projection of the anticipated timeframe for filling of the pit to the maximum recommended elevation and a comparison of management alternatives for the care and maintenance timeframe.

10.3 TREATMENT SEDIMENT MANAGEMENT PLAN

Treatment sediment ("sludge") is produced each year form the mill water treatment system (approximately 200 tonnes per year) and the Grum/Vangorda water treatment plant (estimated 100 tonnes per year).

The long term strategy for operation of water treatment systems and management of sludge is anticipated to be a component of the FCRP. However, a sludge management plan is required for the duration of care and maintenance activities to ensure that sludge is managed in an appropriate manner that does not compromise the environmental protection measures being implemented while the FCRP is being developed and implemented.

The study proposes to accomplish two specific objectives:

1. Provide a baseline environmental characterization of the sediments, with due consideration to the available interim management options.
2. Provide a Sediment Management Plan, with consideration of a timeframe of 5-years (i.e. to 2008).

The specific tasks that would likely be completed are as follows:

1. Review of information collected by Canmet during a 2001/2002 study of sediment from the Cross Valley Pond and the mill water treatment system.
2. Sample collection and shipment for analysis.

3. Field assessment of sediment characteristics including photos, observations and volume/density estimates.
4. Laboratory chemical analyses.
5. Laboratory physical properties testing.
6. Definition of management options to minimize potential environmental impacts (based on the chemical and physical properties characterization).
7. Evaluation of management options including consideration of past practices, best practices, licence requirements and site conditions.

A treatment sediment management plan would then be finalized and, ultimately, implemented in consultation with regulators and other interested parties according to the design and intent of the consultation and communication processes described in Section 2.1.5.

10.4 INVESTIGATION OF TAILINGS OUTSIDE OF THE ROSE CREEK TAILINGS FACILITY

10.4.1 AREAS OF INVESTIGATION

There are several areas where tailings have been deposited on land during past mining activities outside of the Rose Creek Tailings Facility. These include:

1. The emergency tailings area.
2. The 1970's spill area downgradient of the Cross Valley Dam.
3. The upgradient extent of the Rose Creek Tailings facility near the copper sulphate and bulk explosives plants.
4. The north side of the upper length of the Rose Creek Diversion Canal.

The emergency tailings area should be excavated and hauled to the Faro Main pit as an interim reclamation measure

The emergency tailings area, adjacent to the mill and mine access road in the old Faro Creek channel, is assumed to contain tailings produced from all generations of mine operations. The tailings are acid generating and are known to be producing highly contaminated seepage derived from surface infiltration as well as, possibly, subsurface flow originating in the old Faro Creek channel. This seepage is suspected to largely report to the Intermediate Pond of the Rose Creek tailings facility but may also contribute to contaminant loading in the Rose Creek Valley aquifer. These tailings are isolated from the Rose Creek Tailings Facility.

Residual tailings from the 1970's surface spill are contained between the Cross Valley Dam and Rose Creek

The area of land generally between the Cross Valley Dam and Rose Creek contains residual tailings from the 1970's tailings spill on surface. Further, residual patches of dead vegetation remain in the area. These tailings have not been specifically characterized to date but are assumed to comprise a relatively thin surface layer overlying native soils and to be acid generating or potentially acid generating. The 2002 Water Balance study (Gartner Lee 2002) indicated a possible unquantified source of sulphate in Rose Creek that might be related, in part, to these tailings.

The area generally between the copper sulphate and bulk explosives plants and the Rose Creek Tailings Facility and the flat area on the north side of the upper length of the Rose Creek Diversion Canal are observed to have tailings on surface that were deposited during past mining activities. The extent, depth, specific geochemical

characteristics and possible impacts on surface water quality of these tailings is unknown.

10.4.2 STUDY RATIONALE AND DESIGN

A characterization study is necessary

A study to characterize the physical extent, specific geochemical characteristics and possible impacts on water quality of these tailings areas is necessary to determine whether these areas are having a current and ongoing impact on water quality and to determine whether short term mitigation is necessary while the FCRP is being developed and implemented.

The investigation is proposed to be a one-year study that would be conducted in 2004 intended to accomplish these objectives:

1. Delineate the extent and depth of the tailings in the areas described.
2. Provide a geochemical characterization of the tailings.
3. Evaluate the current impacts on water quality and recommend short term mitigation measures.

The work tasks that would likely be involved in the study would include:

Test pitting program

1. A test pitting program to delineate the extent and depth of the tailings. A visual distinction between native soils and tailings is anticipated to be possible and this will be the basis of the delineation. Field tests might also be used, where necessary. This will allow for a delineation map and volume estimate to be developed.
2. Drilling may be required in the emergency tailings area in order to delineate and sample tailings and soils at depth if the thickness of tailings exceeds the effective depth of test pit excavation. In this case, drilling would be linked, if possible, to other drill projects that are carried out at the mine site from time to time.

Sample collection

3. Samples of tailings and native soils will be collected during the test pitting program and a representative subset of the samples will be selected for analysis. The analyses will include acid base accounting, trace metal concentrations and contaminant leaching. These test will allow for an assessment of the geochemical characteristics of the tailings.
4. Review of the site water balance to evaluate current impacts on water quality.

A project report would, ultimately, be prepared that provides recommended short term mitigation measures. Any proposed mitigation measures would be implemented in consultation with regulators and other interested parties according to the design and intent of the consultation and communication processes described in Section 2.1.5.

11 PROJECT SCHEDULE

All the project schedule events will be assessed by the site manager

The project schedule revolves around scheduled annual events as listed in Table 16, which represents the targeted timing of activities. All of the events will be assessed on an ongoing basis by the site manager to ensure that the targeted timeframes will achieve the desired environmental protection objectives.

Modification of the target dates is possible where appropriate

If specific climatic or other conditions indicate that modifying the targeted dates is more appropriate for management of environmental risks, then a more optimal time could be implemented. For example, if early freshet conditions result in an earlier than targeted response in the water level in the backfilled Zone 2 Pit, then pumping from the pit will be initiated earlier than the target date.

The site monitoring protocols provide for the collection of monitoring information that will allow the site manager to assess conditions and make determinations regarding the optimal timeframes for executing the care and maintenance activities.

Provisions of the overall schedule

The overall schedule provides for:

1. A site preparation period during which time access is opened for inspection and maintenance through freshet.
2. An active summer season during which time all of the water pumping and treatment activities and physical maintenance activities are scheduled to be completed.
3. A non-active winter season during which time minimal activities are scheduled beyond site security, maintenance/repairs to mobile equipment and site monitoring.

Table 16. Summary Schedule of Annual Scheduled Activities

Type of Activity	Activity	Target Timing
Site Preparation	Clear road accesses	All year
	Ditch maintenance & ice clearing	All year
	Mechanical and electrical maintenance and checks	April to May
Pumping & Treatment	Zone 2 Pit pumping	June to October – intermittent
	Main Pit pumping and treatment	June to August – continuous
	Intermediate Pond treatment	June to October – intermittent
	Vangorda Pit pumping ad treatment	July to August – continuous
	Little Creek Dam pumping	June and September – two events
	Sludge disposal	Mill: throughout pumping season Grum/Vangorda: September Cross Valley Pond : winter as required
Effluent Release	Effluent release from Cross Valley Pond	June to October – intermittent
	Effluent release from Grum/Vangorda water treatment plant	July to August – continuous
Monitoring	Surface water quality	Weekly, monthly, quarterly, annually per the site water monitoring protocol
	Groundwater quality	Twice per year (spring and fall)
	Benthic Invertebrates/Stream sediments	Alternating years: Rose Creek and Vangorda Creek:

Type of Activity	Activity	Target Timing
		Place colonization baskets – July Retrieve colonization baskets – August
	Reading geotechnical instrumentation	Twice per year (spring and fall) or more frequently per recommendations of the engineer
	Monitoring rock drain head pond	Monthly photographic record
	Professional geotechnical inspection	Vangorda Plateau site – June Faro site – September
Reporting to Yukon Territory Water Board	Monthly water reports	End of the subsequent month
	Annual Environmental Report (inclusive of geotechnical inspection reports)	March 1 of the subsequent year
Site Security & Road Maintenance	24-hour guardhouse attendant	Full time during operating season
	Day guardhouse attendant	Winter season when road is cleared – intermittent November to March
	Culvert opening/steaming	Late winter and freshet – as required March to April
	Grading, resurfacing & snow clearing	As required – intermittent

One time event activities will be optimized

Activities that are one time events through the licence timeframe (such as establishment of the demolition waste landfill) or are special projects that will operate under a project specific schedule (such as tear down of buildings) will be scheduled and executed on the basis of optimizing those activities.

12 ENVIRONMENTAL MONITORING AND PROTECTION

12.1 SITE WATER MONITORING PROTOCOL

The protocols include surface and groundwater monitoring for Faro and Vangorda Plateau Sites

The initial site water monitoring protocol was established in 2000 to include the requirements of the water licence plus additional water monitoring for site management purposes. The revised protocols appended to this report (Appendix C) include surface and groundwater monitoring for the Faro and Vangorda Plateau sites and are proposed to be incorporated into the new water licence for care and maintenance activities from 2004 to 2008 in place of the existing Schedule A of each licence.

The proposed water monitoring protocols generally increase the monitoring requirements above those required in the existing Schedules for "Temporary Cessation of Operations". This was done in recognition of the needs for monitoring:

- upstream reference locations;
- effluent quality entering the receiving environment;
- the receiving environment in the effluent mixing zone and at downstream locations; and
- groundwater quality.

The protocols also provide for the continuation of the established annual spring "seep" surveys at established locations to provide monitoring data focussed on contaminants sourcing from rock dumps.

The monitoring data is proposed to be reported to the Yukon Territory Water Board on a monthly basis for data reports and on an annual basis for a comprehensive interpretation using the standards and requirements of the current water licences.

12.2 SITE GENERAL MONITORING PROTOCOL

The protocol includes the facilities to be observed and the nature of the information to be documented

The site general monitoring protocol was established in 1999 as a means of establishing a standard methodology for visual inspection of the mine facilities that could be conducted by on-site personnel. The protocol appended (Appendix D) includes the facilities to be observed and the nature of the information to be documented. The information is recorded in a log book that is kept on-site.

12.3 SITE BIOLOGICAL MONITORING PROTOCOL

The protocol is unchanged from the current water licence

The proposed biological monitoring protocol (Appendix E) is proposed to be included into the new water licence as Schedule B, replacing the existing requirements for biological monitoring. The proposed protocol continues the established locations, schedules and sampling requirements as per the existing water licences.

The exception to the above is the proposed removal of the requirement to analyse water samples for cyanide at locations R2, R3 and R4 in Rose Creek. This proposed

removal is based on the history of cyanide concentrations at these locations that are at or near detection limit.

Sampling of stream sediments in conjunction with sampling of benthic invertebrates is currently a requirement of the Vangorda Water Licence but not the Faro Water Licence. The proposed new draft licence expands the current requirement to include sampling of stream sediment in Rose Creek as well as in Vangorda Creek.

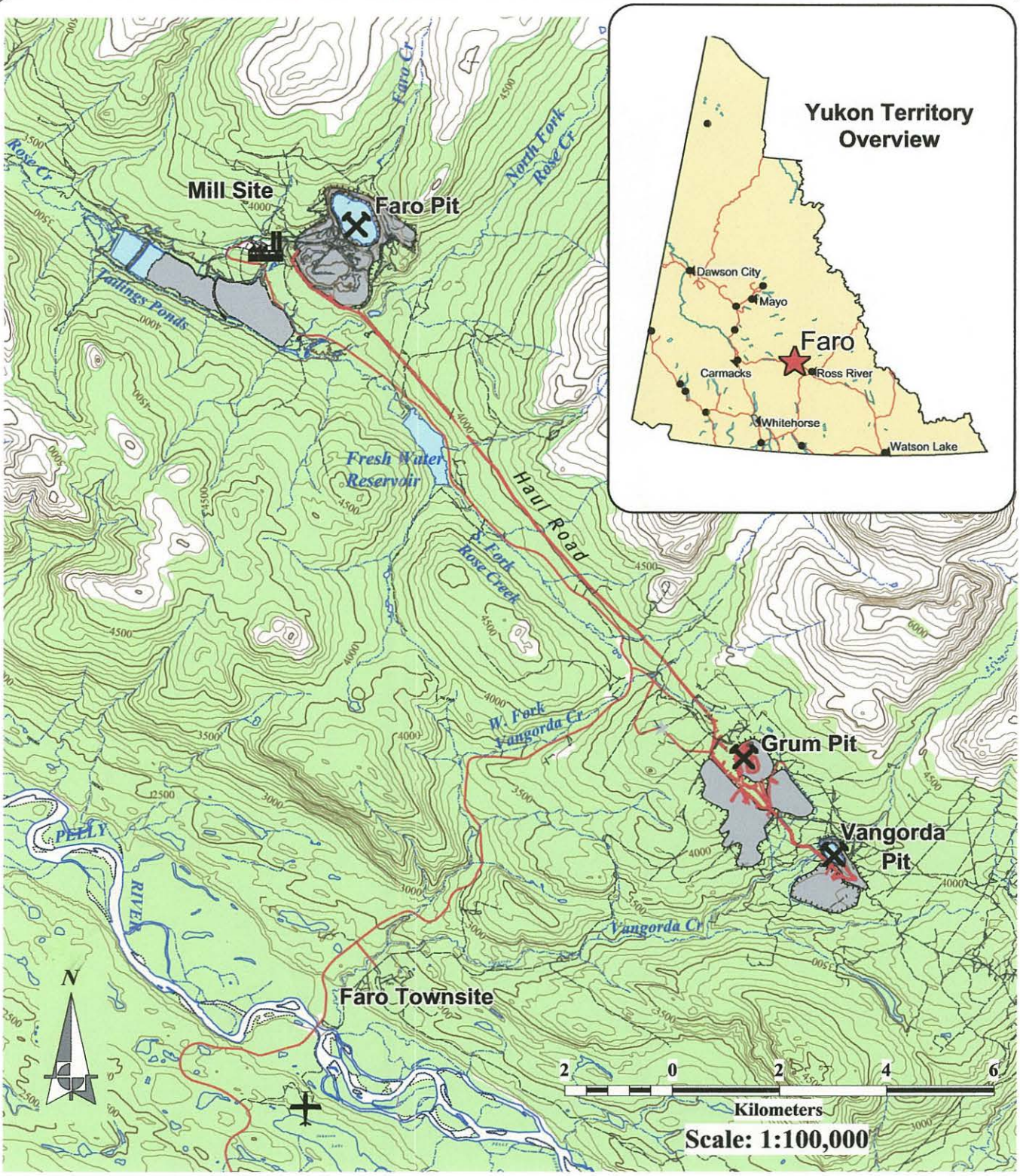
12.4 SITE PHYSICAL MONITORING PROTOCOL

The protocol is unchanged from the current water licence

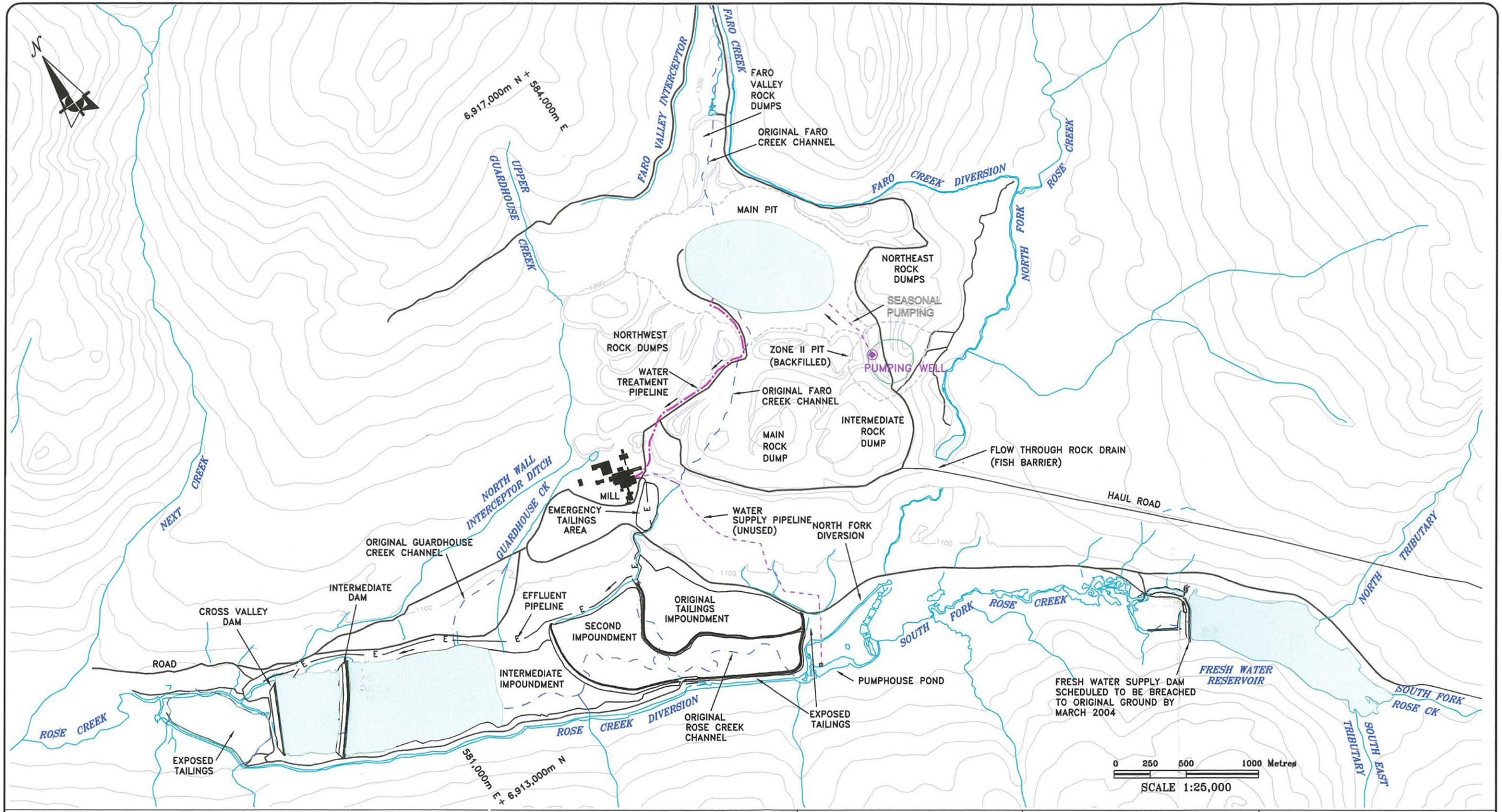
The proposed physical monitoring protocol (Appendix F) is proposed to be included into the new water licence as Schedule C, replacing the existing requirements for physical monitoring. The proposed protocol continues the established practice of an annual inspection of earthworks and data review by a professional geotechnical engineer registered to practice in the Yukon Territory.

One requirement of the current Faro Water Licence is proposed for removal regarding the need for an annual survey of several cross sections along the Rose Creek Diversion Canal to monitor for accumulation of sediment. The professional engineer for the Faro mine site has not recommended that this work is necessary given the history of inspection and monitoring that does not indicate a concenr regarding sedimentation in the canal.

Figures



Site Name: FARO File : 23376-D1-FIG1.PDF Gartner Lee Limited Scale: 1: 100,000	DELOITTE & TOUCHE INC. **Project Location Map**	Project No: 23-376 Date Issued: MAY 2003 Figure 1



LEGEND:

- ROADS
- EXISTING SURFACE DRAINAGE
- PRE-MINE DRAINAGE
- E — EFFLUENT PIPELINE
- PIPELINE
- WATER TREATMENT PIPELINE
- SURFACE WATER

SOURCES OF INFORMATION:

1. DIGITAL COPY OF 1:50,000 TOPOGRAPHIC MAP SUPPLIED BY SRK CONSULTING.
2. MAP COORDINATES ARE UTM NAD83 ZONE 8; CONTOUR INTERVAL 100 FT.
3. FARO MINE DETAILS ADAPTED FROM DRAWINGS BY ROBERTSON GEOCONSULTANTS INC.

DRAWING INFORMATION:	
REVIEWED BY:	LH/ED
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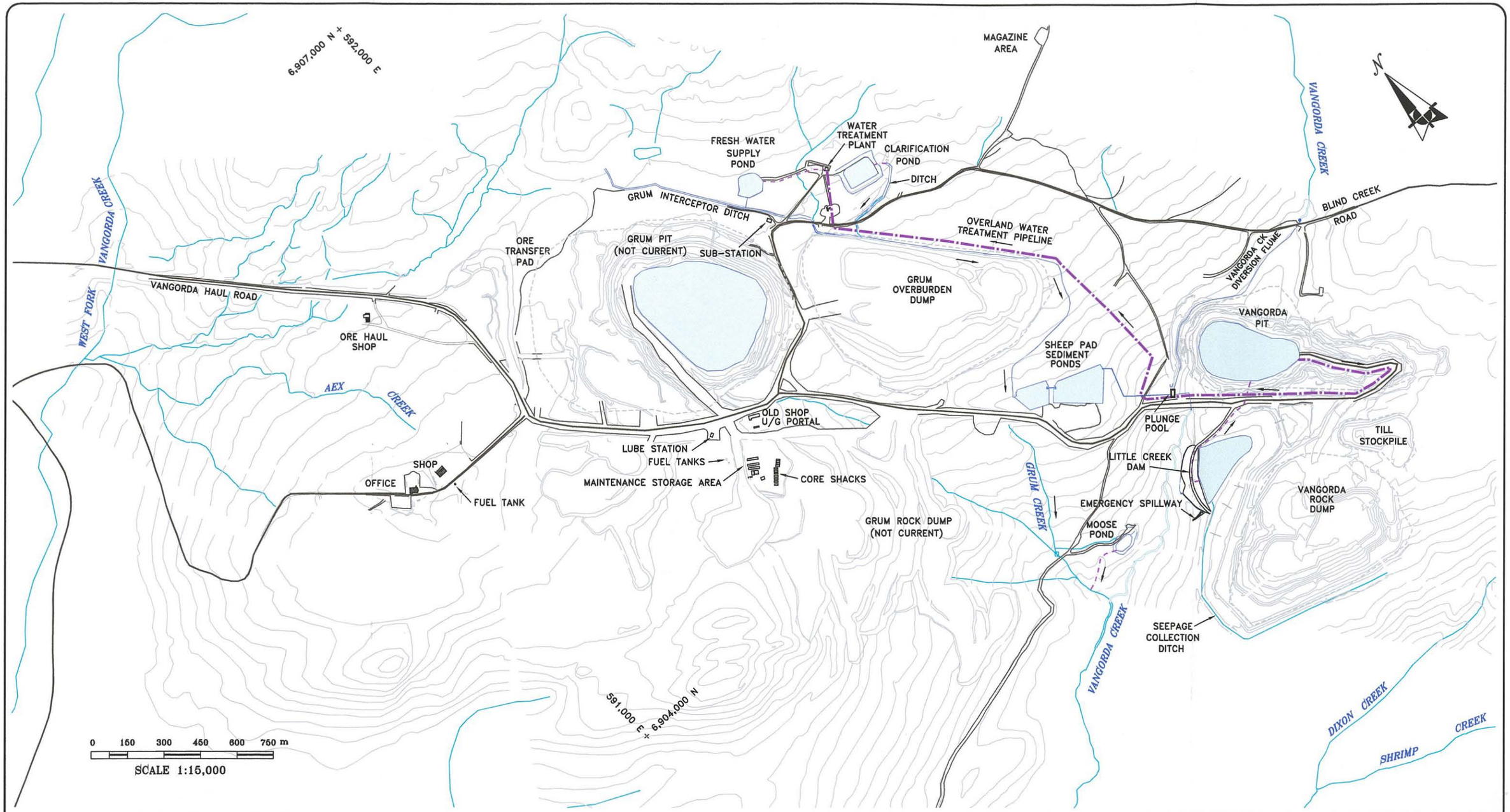
ANVIL RANGE MINING CORPORATION
(INTERIM RECEIVER)
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

FARO MINE SITE OVERVIEW

Gartner Lee | Deloitte & Touche

FIGURE NO. 2



LEGEND:

- ROADS
- EXISTING SURFACE DRAINAGE
- PRE-MINE DRAINAGE
- E — EFFLUENT PIPELINE
- PIPELINE
- WATER TREATMENT PIPELINE
- SURFACE WATER

SOURCES OF INFORMATION:

1. DIGITAL COPY OF 1:50,000 TOPOGRAPHIC MAP SUPPLIED BY SRK CONSULTING.
2. FARO MINE DETAILS ADAPTED FROM DRAWINGS BY ROBERTSON GEOCONSULTANTS INC.

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ANVIL RANGE MINING CORPORATION
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2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

VANGORDA PLATEAU MINE SITE OVERVIEW

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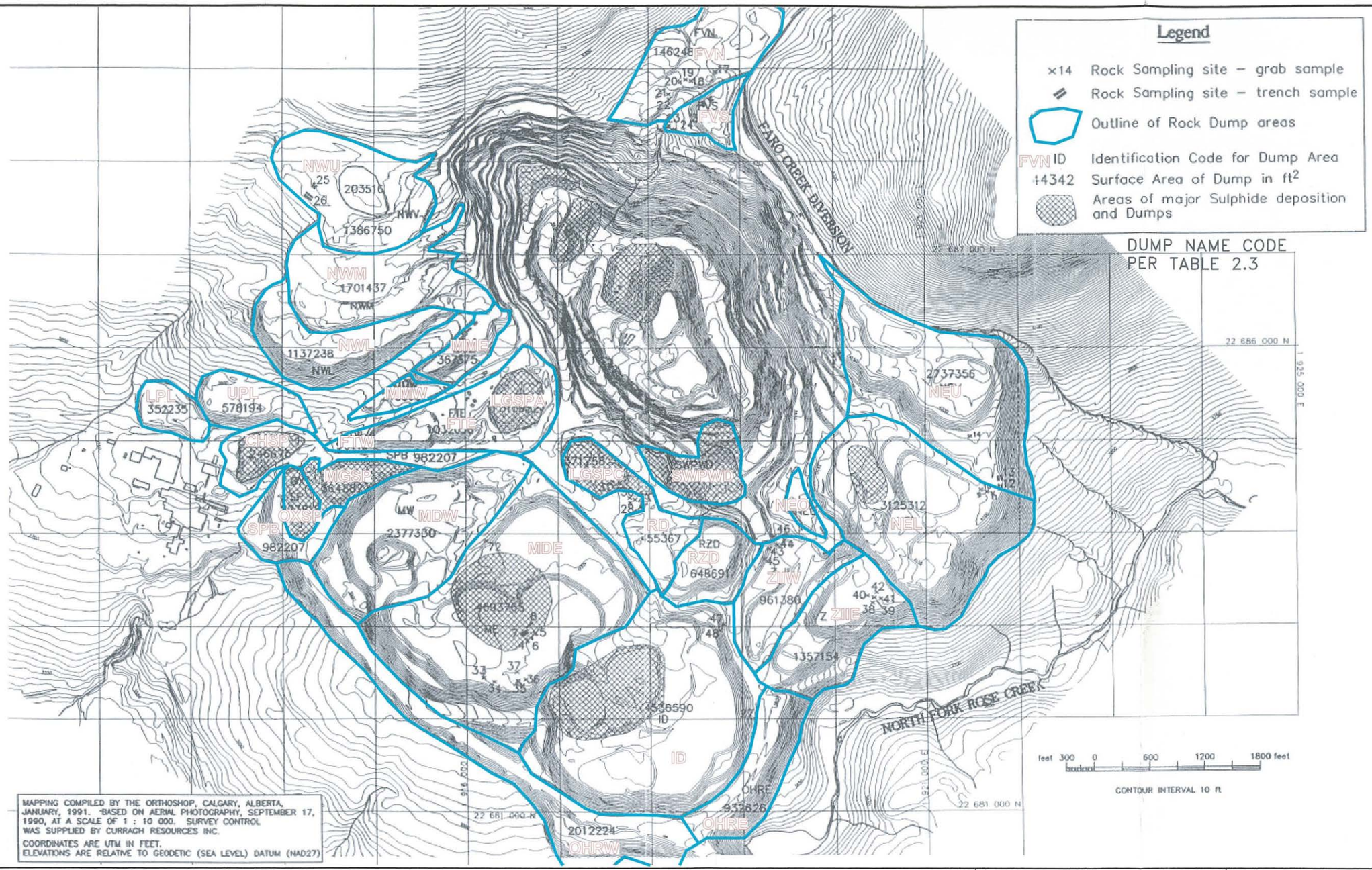
FIGURE NO. 3



SOURCE OF FIGURE:
DRAWING SHOWN BELOW DRAWN FROM REPORT BY ROBERTSON GEOCONSULTANTS INC.
REPORT NO. 033001/3 DATED NOVEMBER 1996
"ANVIL RANGE MINING COMPLEX – INTEGRATED COMPREHENSIVE ABANDONMENT PLAN"

ROBERTSON GEOCONSULTANTS INC.
Consulting Geotechnical and Environmental Engineers

Anvil Range Mining Corporation

Anvil Complex Closure Plan

Faro Dumps
Sampling Sites and Dump Classification

PROJECT NO. 033001 | DATE Oct. 1996 | APPROVED | FIGURE 4-5

DRAWING INFORMATION:	
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ANVIL RANGE MINING CORPORTATION
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2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

FARO DUMPS NAMING CONVENTION

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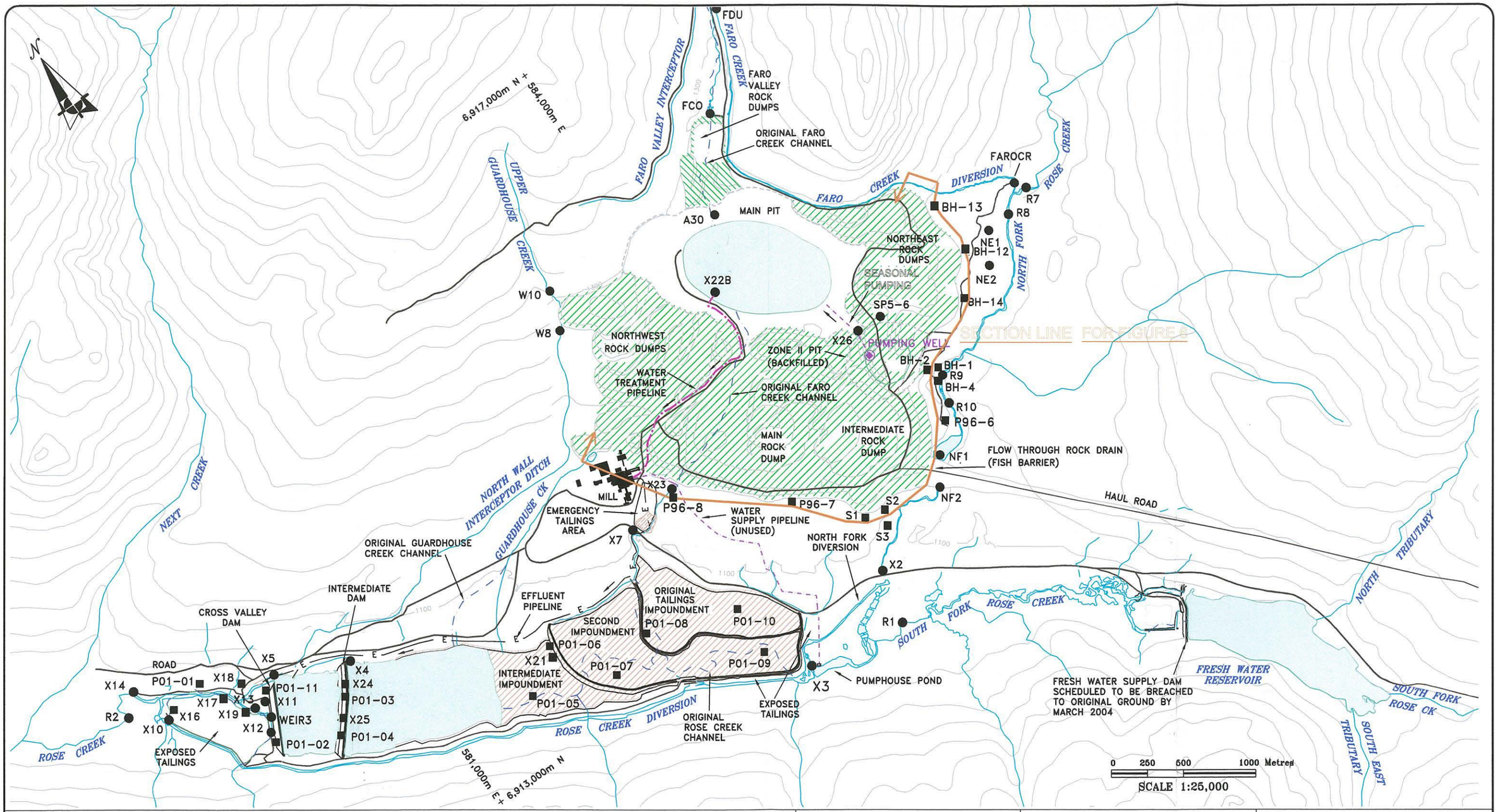
FIGURE NO. 4



LEGEND:

- ROADS
- EXISTING SURFACE DRAINAGE
- PRE-MINE DRAINAGE
- E — EFFLUENT PIPELINE
- PIPELINE
- WATER TREATMENT PIPELINE
- SURFACE WATER
- WASTE DUMPS
- TAILINGS IMPOUNDMENT
- GROUNDWATER SAMPLING LOCATION
- SURFACE WATER SAMPLING LOCATION
- SECTION LINE FOR FIGURE 6

SOURCES OF INFORMATION:

1. DIGITAL COPY OF 1:50,000 TOPOGRAPHIC MAP SUPPLIED BY SRK CONSULTING.
2. MAP COORDINATES ARE UTM NAD83 ZONE 8; CONTOUR INTERVAL 100 FT.
3. FARO MINE DETAILS ADAPTED FROM DRAWINGS BY ROBERTSON GEOCONSULTANTS INC.

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ANVIL RANGE MINING CORPORTATION (INTERIM RECEIVER)
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

FARO MINESITE DETAILS

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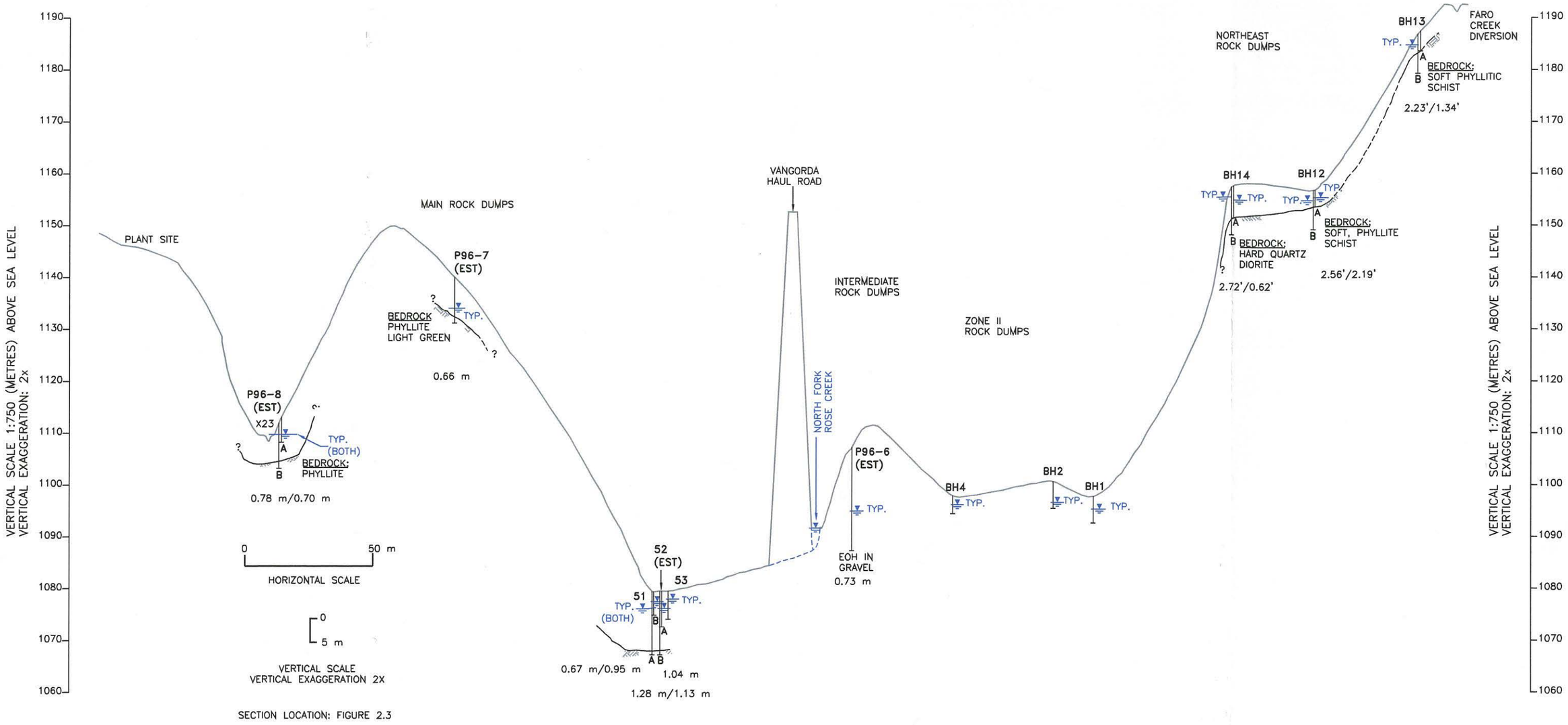
FIGURE NO. 5



SOURCE OF FIGURE:
SKETCH BY ERIC DENHOLM, GARTNER LEE LIMITED

MEASURED GROUNDWATER (m)

STRATIGRAPHY BOUNDARY

INTERPRETED STRATIGRAPHY BOUNDARY

P96-8
(EST)

0.78 m/0.70 m ← STICKUP ABOVE GROUND FOR EACH WELL

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ANVIL RANGE MINING CORPORTATION
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2004 TO 2008 WATER LICENCE RENEWAL
APPLICATION REPORT

FARO DUMPS PERIMETER SECTION

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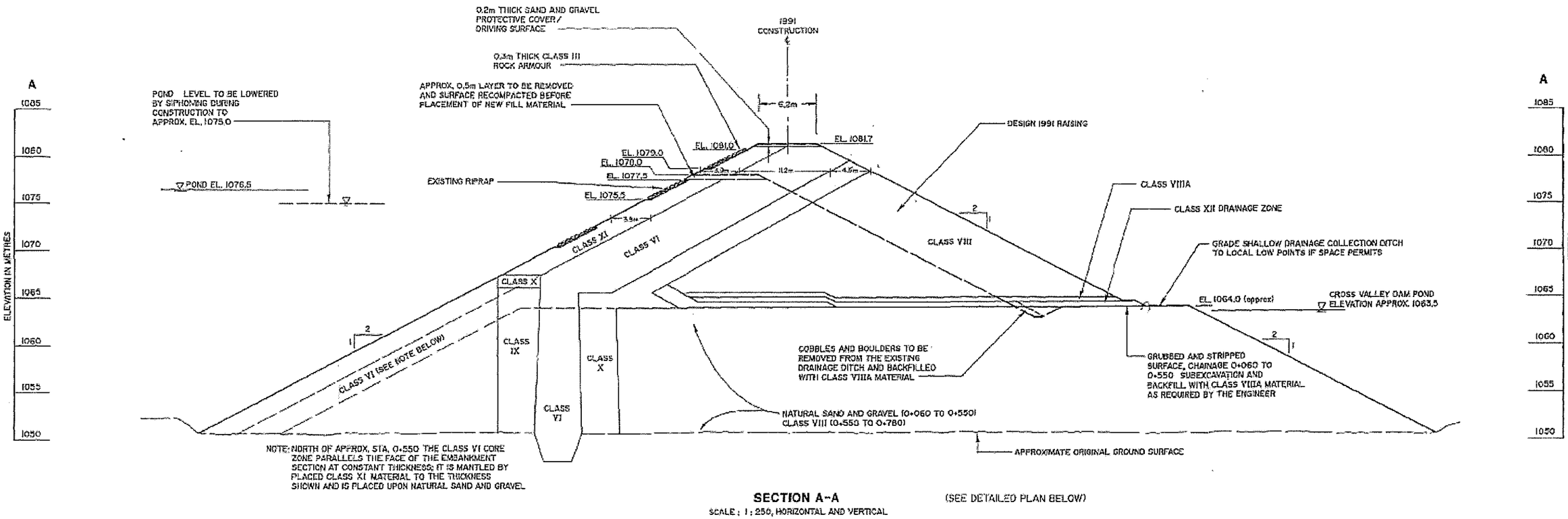
FIGURE NO. 6



NOTE: NORTH OF APPROX. STA. 0+550 THE CLASS VI CORE ZONE PARALLELS THE FACE OF THE EMBANKMENT SECTION AT CONSTANT THICKNESS; IT IS MANTLED BY PLACED CLASS XI MATERIAL TO THE THICKNESS SHOWN AND IS PLACED UPON NATURAL SAND AND GRAVEL

SECTION A-A (SEE DETAILED PLAN BELOW)

SCALE : 1 : 250, HORIZONTAL AND VERTICAL

SOURCE OF FIGURE:
DRAWING SHOWN BELOW DRAWN FROM REPORT BY GOLDER ASSOCIATES LTD.
REPORT NO. 912-2402
DATED: JULY 1991
"INT. DAM RAISING & CV DAM TOE DRAIN"

Scale — as shown Job No. 23-376 Drawing No. 912-2402-7 Drawn by: CPW Date: JULY 03 Reviewed by: LH/ED Date: JULY 03	CURRAGH RESOURCES INC Faro Yukon Territory	CROSS SECTION AND DETAILED PLAN INT. DAM RAISING & CV DAM TOE DRAIN	Golder Associates Ltd Sheet 3 of 3

DRAWING INFORMATION:	
REVIEWED BY:	LH/ED
DRAWN BY:	CPW
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FILE NAME:	23376-01-06.DWG
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ANVIL RANGE MINING CORPORTATION
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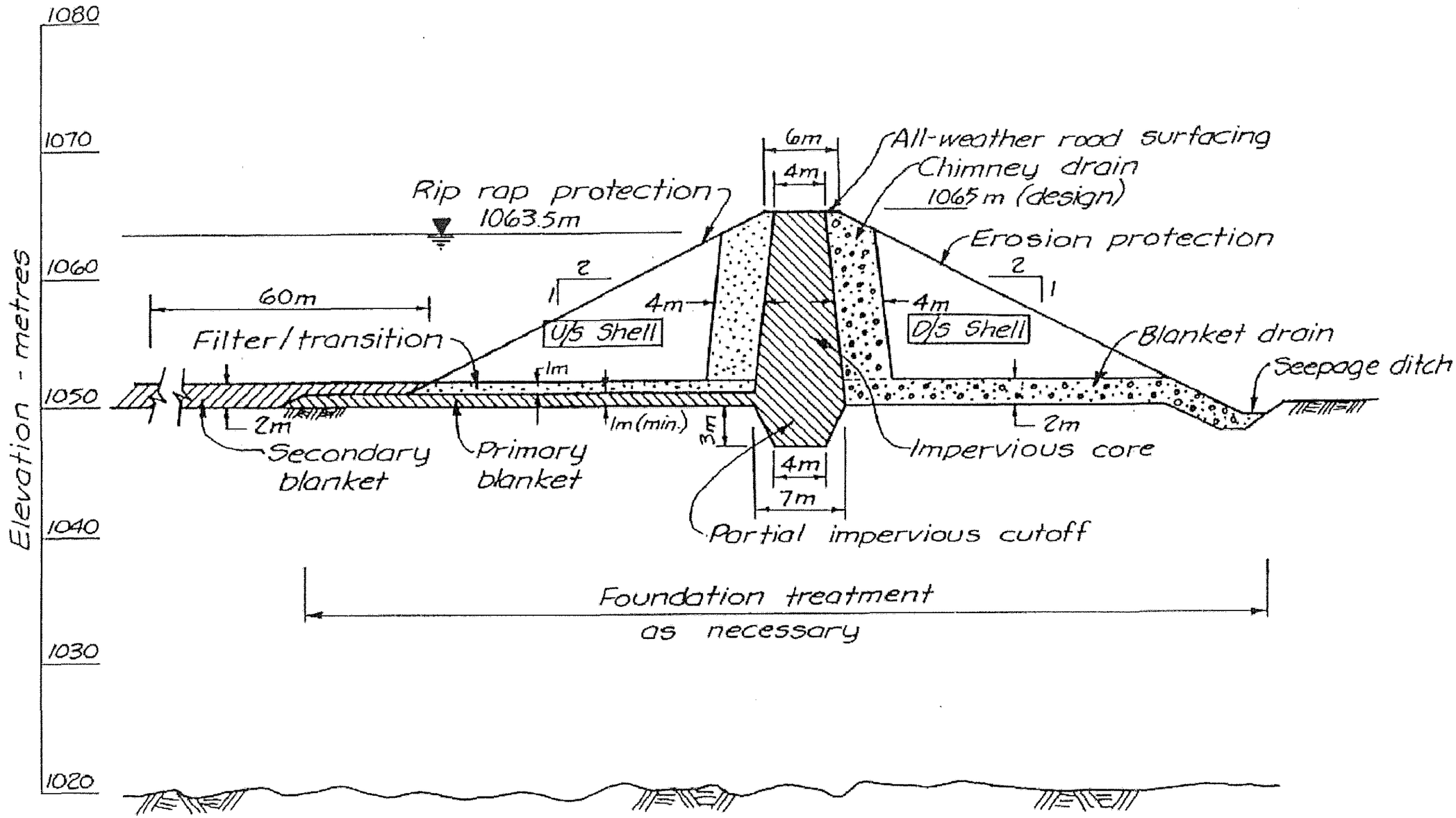
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

INTERMEDIATE DAM SECTION

Gartner Lee | Deloitte & Touche

FIGURE NO. 7



SOURCE OF FIGURE:
GOLDER GEOTECHNICAL CONSULTANTS LTD., 1980
REPORT TITLED "DOWN-VALLEY TAILINGS CONTAINMENT FACILITY
REPORT TO CYPRUS ANVIL MINING LTD." JUNE 6, 1980 3 VOLS.

DRAWING INFORMATION:	
REVIEWED BY:	LH/ED
DRAWN BY:	CPW
DATE ISSUED:	MAY, 2003
PROJECT NUMBER:	23-376
FILE NAME:	23376-D1-07.DWG
REVISION:	0

ANVIL RANGE MINING CORPORTATION
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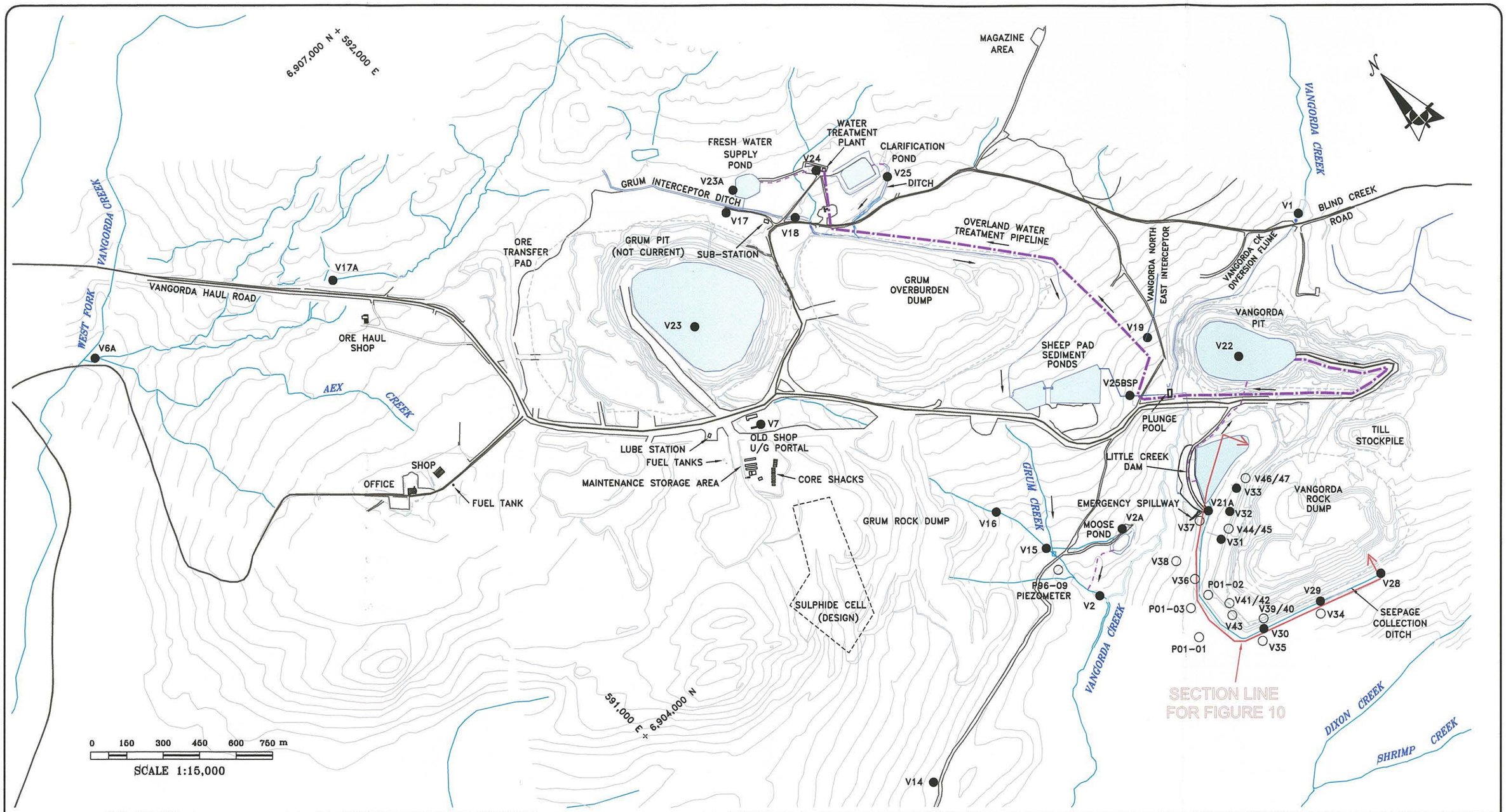
2004 TO 2008 WATER LICENCE RENEWAL
APPLICATION REPORT

CROSS VALLEY DAM
SECTION

Gartner Lee | Deloitte & Touche

FIGURE NO. 8



LEGEND:

- ROADS
- EXISTING SURFACE DRAINAGE
- PRE-MINE DRAINAGE
- EFFLUENT PIPELINE
- PIPELINE
- WATER TREATMENT PIPELINE
- SURFACE WATER
- GROUND WATER SAMPLING LOCATION
- SURFACE WATER SAMPLING LOCATION

DRAIN #1 = V28
DRAIN #2 = V29
DRAIN #3 = V30
DRAIN #4 = V31
DRAIN #5 = V32
DRAIN #6 = V33

GROUNDWATER WELLS = V34 TO V38
PIEZOS. IN TOE BERM = V39 TO V47

SOURCES OF INFORMATION:

1. DIGITAL COPY OF 1:50,000 TOPOGRAPHIC MAP SUPPLIED BY SRK CONSULTING.
2. FARO MINE DETAILS ADAPTED FROM DRAWINGS BY ROBERTSON GEOCONSULTANTS INC.

DRAWING INFORMATION:	
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FILE NAME:	23376-D1-08.DWG
REVISION:	0

ANVIL RANGE MINING CORPORATION
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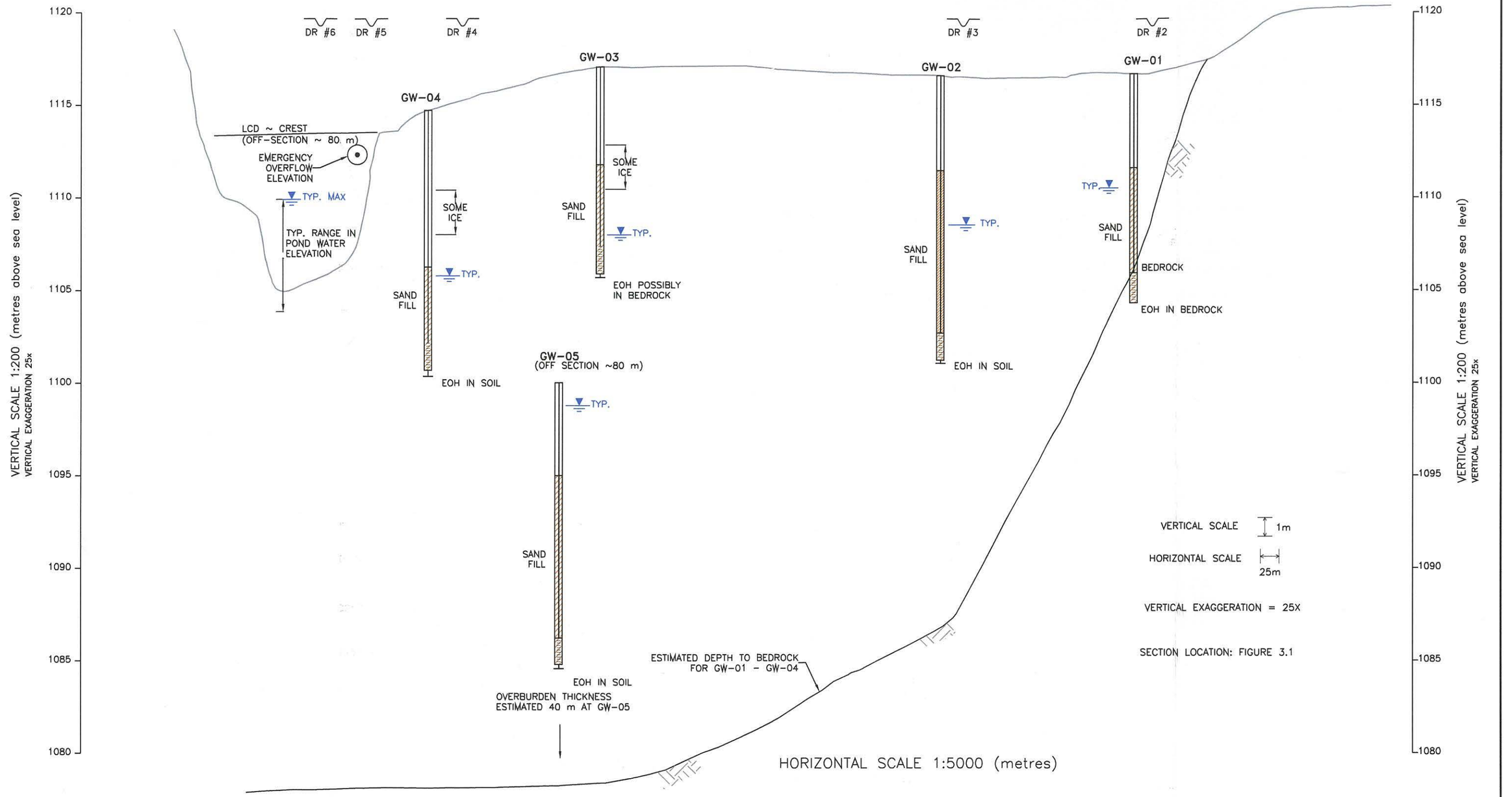
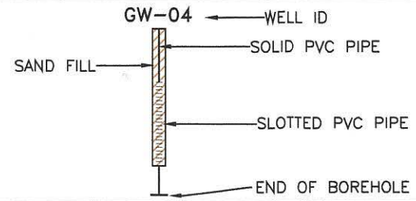
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

VANGORDA ROCK DUMP DETAIL

Gartner Lee | Deloitte & Touche

FIGURE NO. 9





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ANVIL RANGE MINING CORPORTATION
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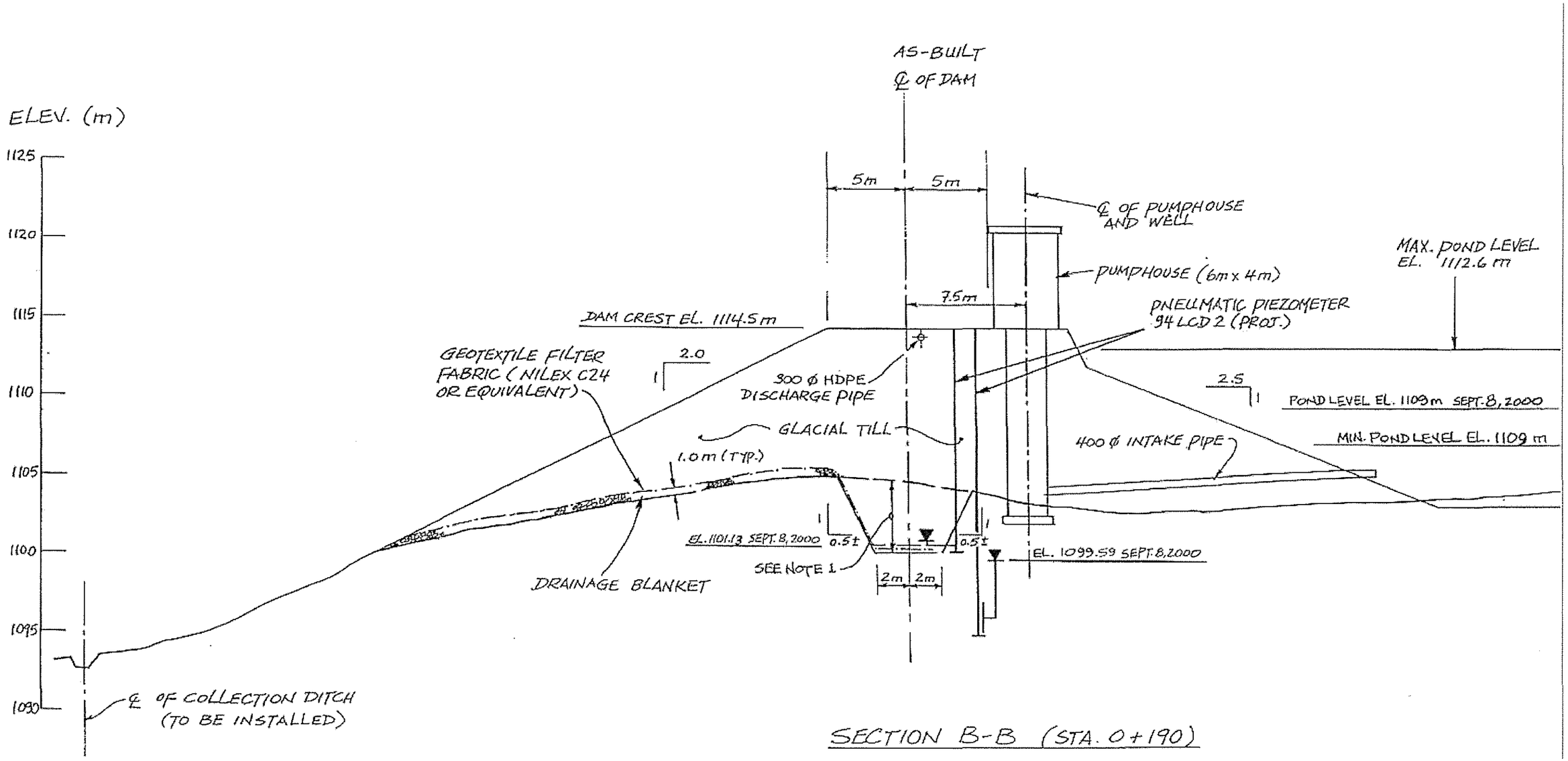
2004 TO 2008 WATER LICENCE RENEWAL
APPLICATION REPORT

VANGORDA ROCK DUMP PERIMETER SECTION

Gartner Lee | Deloitte & Touche

FIGURE NO. 10



SECTION B-B (STA. 0+190)

SOURCE OF FIGURE:
DRAWING SHOWN BELOW DRAWN FROM REPORT BY STEFFEN, ROBERTSON KIRSTEN (CANADA) INC. (SRK, 2002)

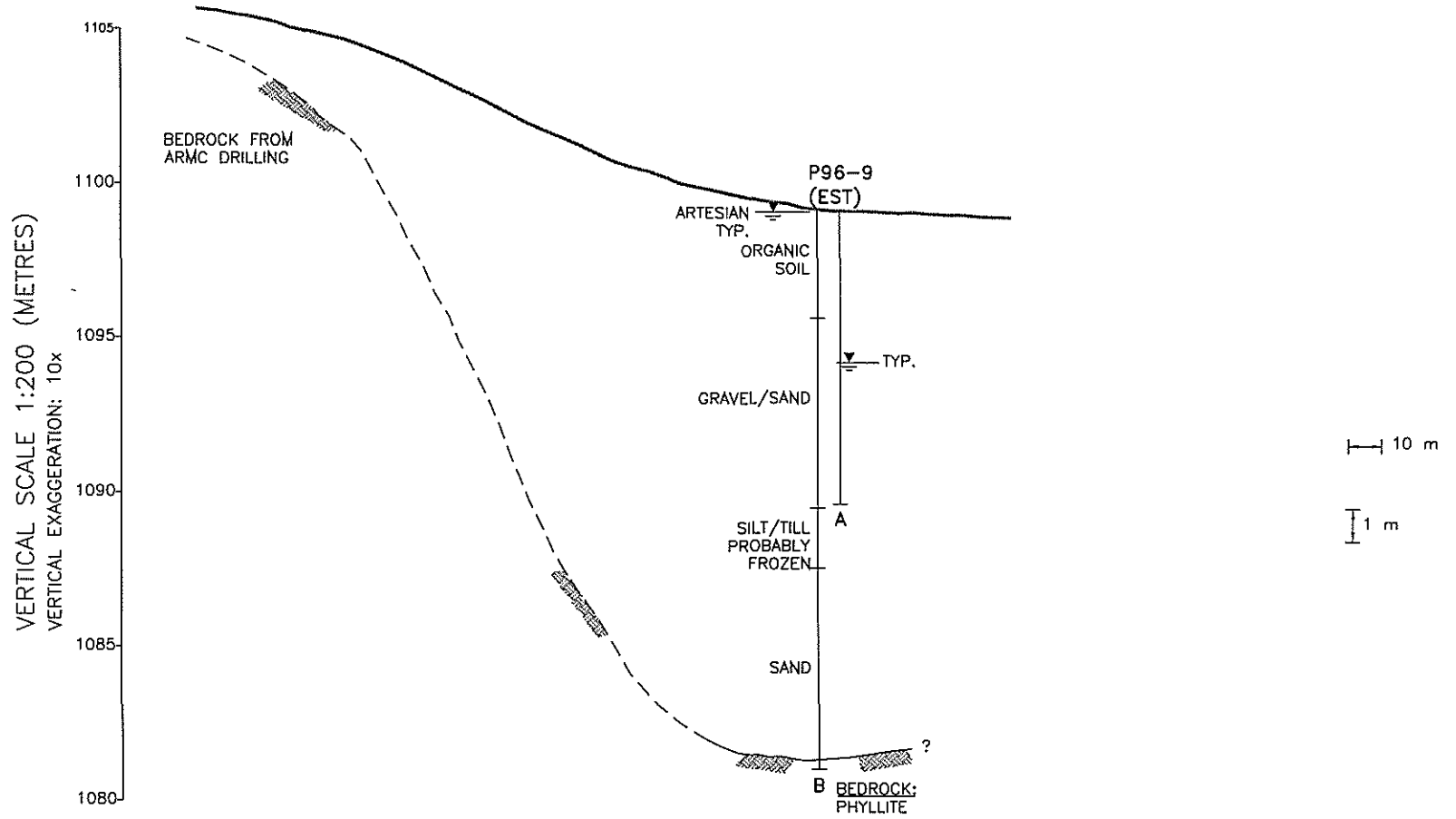
DRAWING INFORMATION:	
REVIEWED BY:	LH/ED
DRAWN BY:	CPW
DATE ISSUED:	MAY, 2003
PROJECT NUMBER:	23-376
FILE NAME:	23376-D1-13.DWG
REVISION:	0

ANVIL RANGE MINING CORPORTATION
(INTERIM RECEIVER)
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

LITTLE CREEK DAM
SECTION

Gartner Lee | Deloitte & Touche

FIGURE NO. 14



SOURCE OF FIGURE:
SKETCH BY ERIC DENHOLM, GARTNER LEE LIMITED

MEASURED GROUNDWATER ELEVATION (m)

STRATIGRAPHY BOUNDARY

INTERPRETED STRATIGRAPHY BOUNDARY

P96-9 (EST)

NOTES:
1. SECTION LOCATION: FIGURE 3.3
2. ELEVATIONS ARE IN METRES ABOVE SEA LEVEL

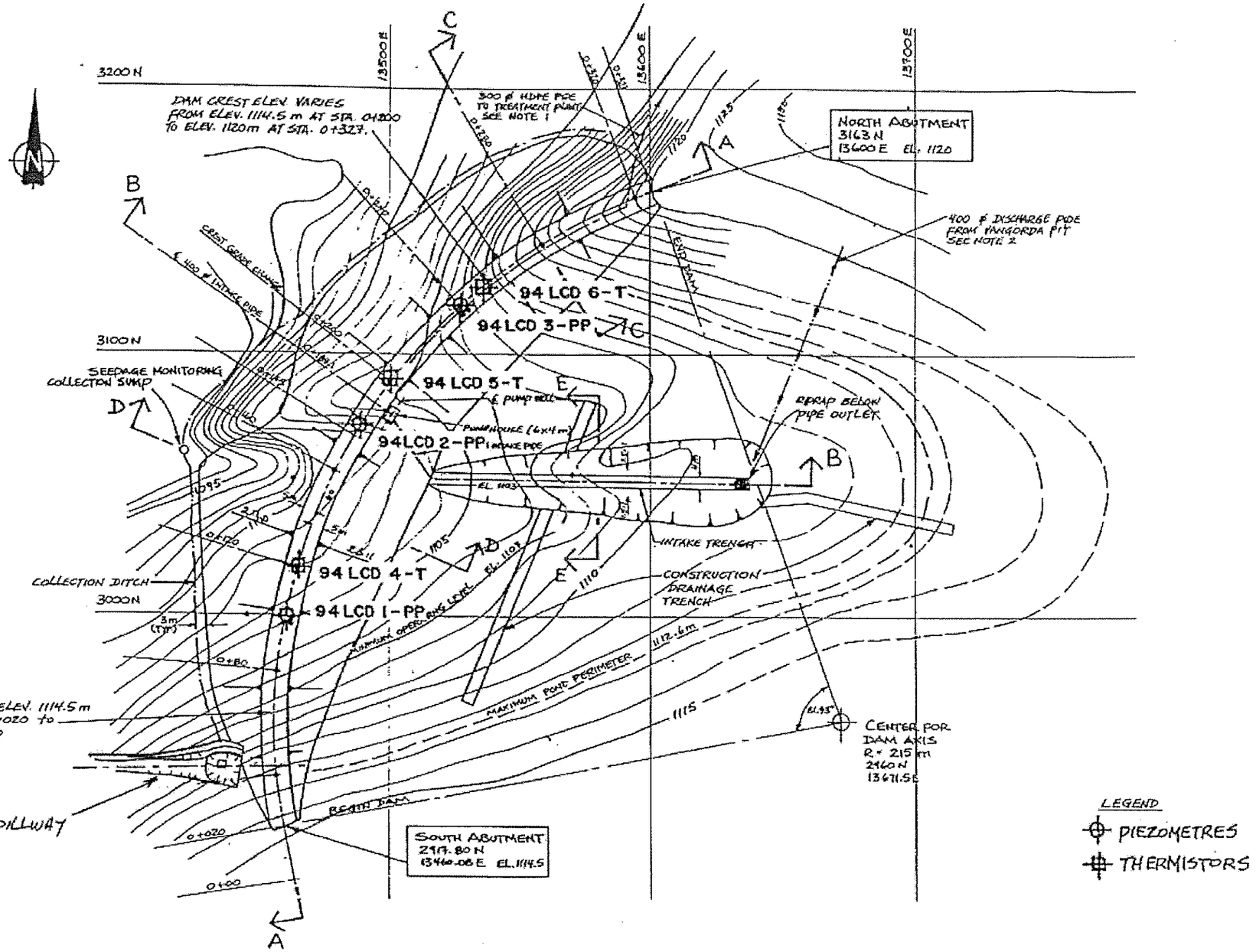
DRAWING INFORMATION:	
REVIEWED BY:	LH/ED
DRAWN BY:	CPW
DATE ISSUED:	MAY, 2003
PROJECT NUMBER:	23-376
FILE NAME:	23376-D1-11.DWG
REVISION:	0

ANVIL RANGE MINING CORPORTATION
(INTERIM RECEIVER)
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

GRUM ROCK DUMP TOE SECTION

Gartner Lee | Deloitte & Touche

FIGURE NO. 12



GENERAL ARRANGEMENT PLAN

SOURCE OF FIGURE:
DRAWING SHOWN BELOW DRAWN FROM REPORT BY STEFFEN, ROBERTSON KIRSTEN (CANADA) INC. (SRK, 2002)

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REVIEWED BY:	LH/ED
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DATE ISSUED:	MAY, 2003
PROJECT NUMBER:	23-376
FILE NAME:	23376-D1-12.DWG
REVISION:	0

ANVIL RANGE MINING CORPORTATION
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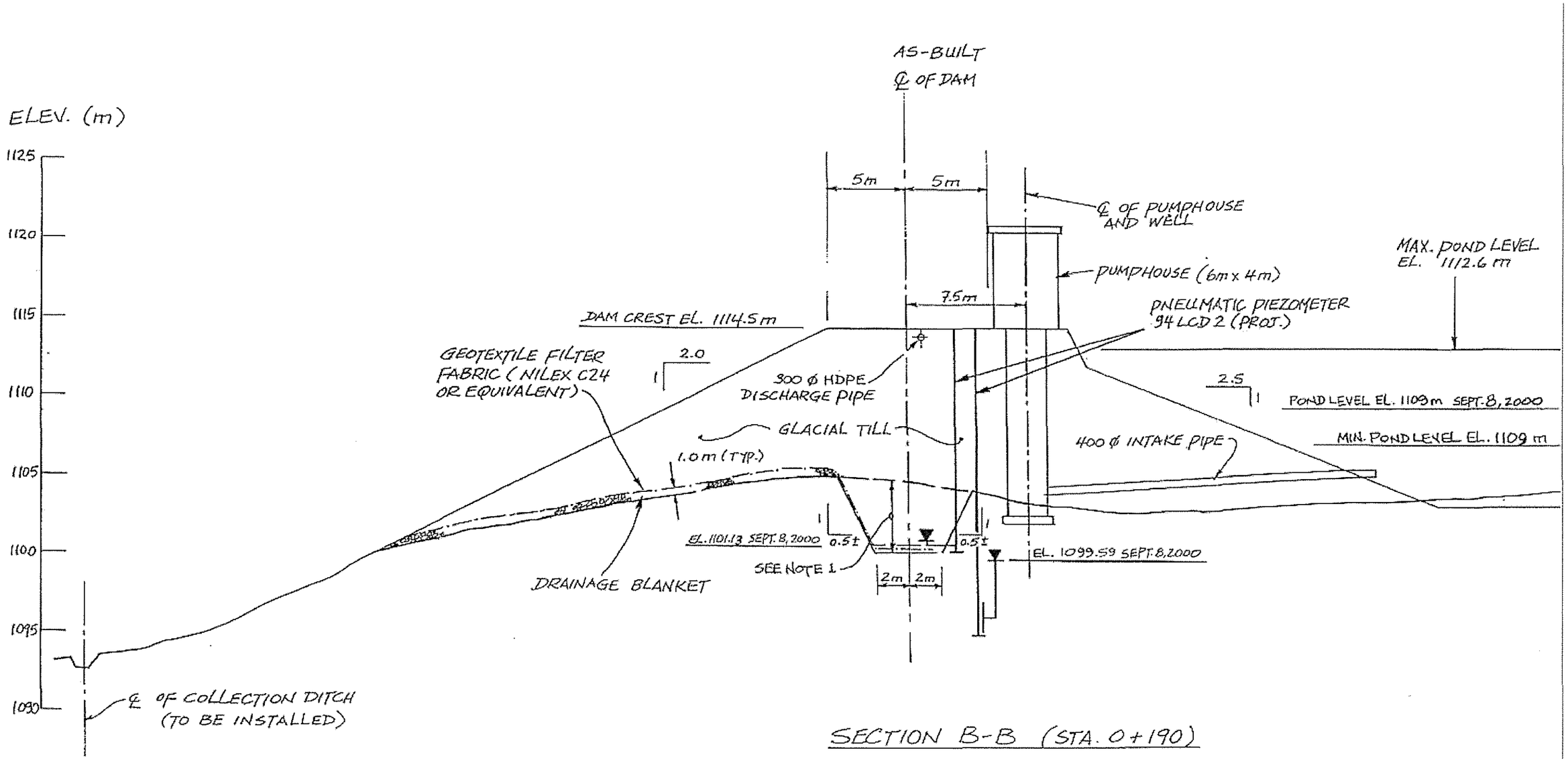
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

LITTLE CREEK DAM PLAN

Gartner Lee | Deloitte & Touche

FIGURE NO. 13



SECTION B-B (STA. 0+190)

SOURCE OF FIGURE:
DRAWING SHOWN BELOW DRAWN FROM REPORT BY STEFFEN, ROBERTSON KIRSTEN (CANADA) INC. (SRK, 2002)

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REVIEWED BY:	LH/ED
DRAWN BY:	CPW
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FILE NAME:	23376-D1-13.DWG
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ANVIL RANGE MINING CORPORTATION
(INTERIM RECEIVER)
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

LITTLE CREEK DAM
SECTION

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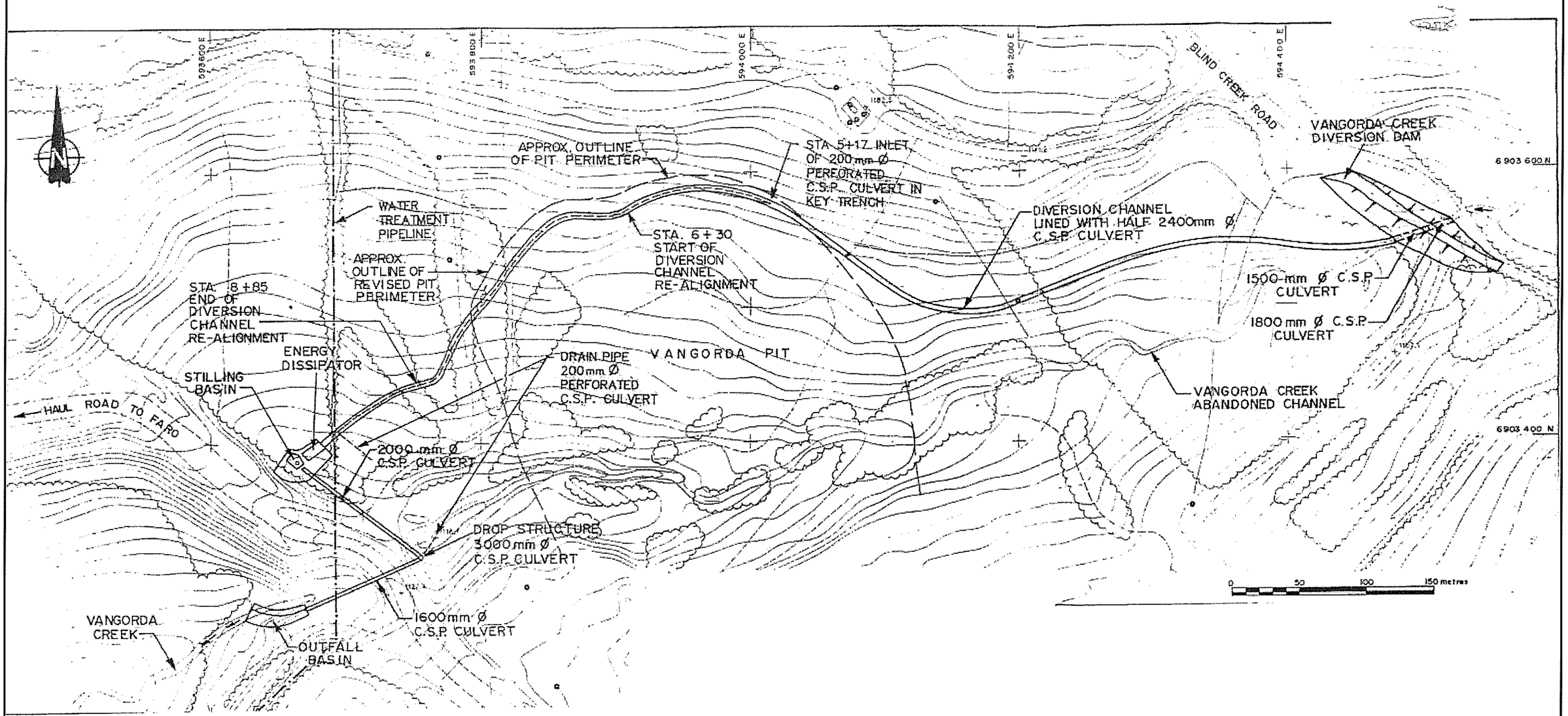
FIGURE NO. 14



SOURCE OF FIGURE:
DRAWING SHOWN BELOW DRAWN FROM REPORT BY STEFFEN, ROBERTSON KIRSTEN (CANADA) INC.
REPORT NO. 60647 DATED MAY 1992
"CONSTRUCTION REPORT VANGORDA CREEK DIVERSION REALIGNMENT VANGORDA PLATEAU DEVELOPMENT"

CURRAGH RESOURCES INC.	VANGORDA CREEK DIVERSION	DATE APRIL 1992
GENERAL ARRANGEMENT		PROJECT NO. 60647
STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers		FIG. NO. 2

NOTES:

1. BASE TOPOGRAPHIC PLAN IS TAKEN FROM CURRAGH RESOURCES LTD. 1:2000 SCALE DRAWING ENTITLED " FARO PLATEAU ".
2. LOCATION OF WATER TREATMENT PIPELINE IS TAKEN FROM COMINCO ENGINEERING SERVICES LTD. CONSTRUCTION DRAWING P682-B-130 Rev. 1 ENTITLED " VANGORDA DEWATERING PROJECT, W.T. PLANT TO VANGORDA SUMP - PLAN AND SECTIONS " DATED 90/05/07.
3. LOCATION OF VANGORDA CREEK DIVERSION RELOCATION IS TAKEN FROM SURVEY DATA PROVIDED BY CURRAGH RESOURCES, APRIL 1992.

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ANVIL RANGE MINING CORPORTATION
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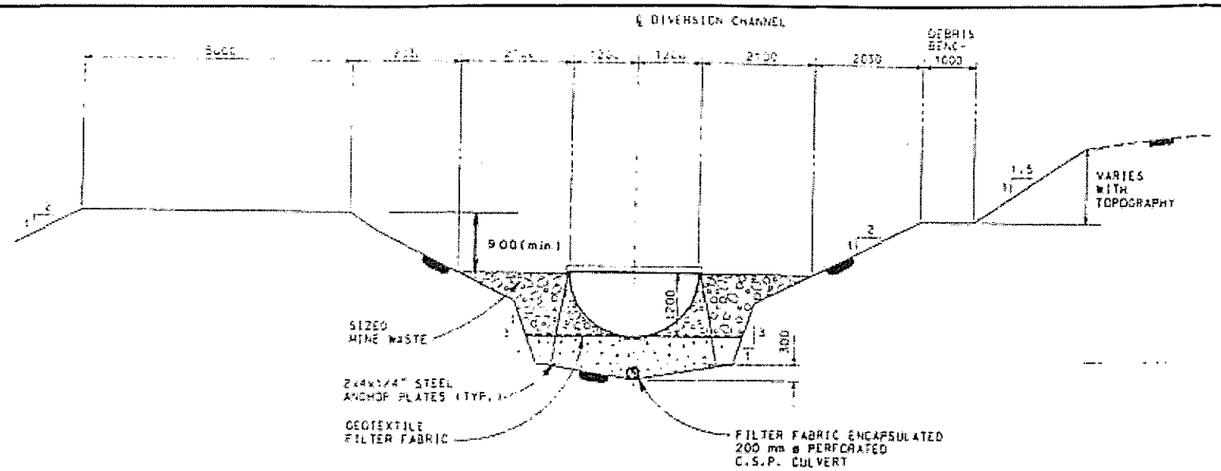
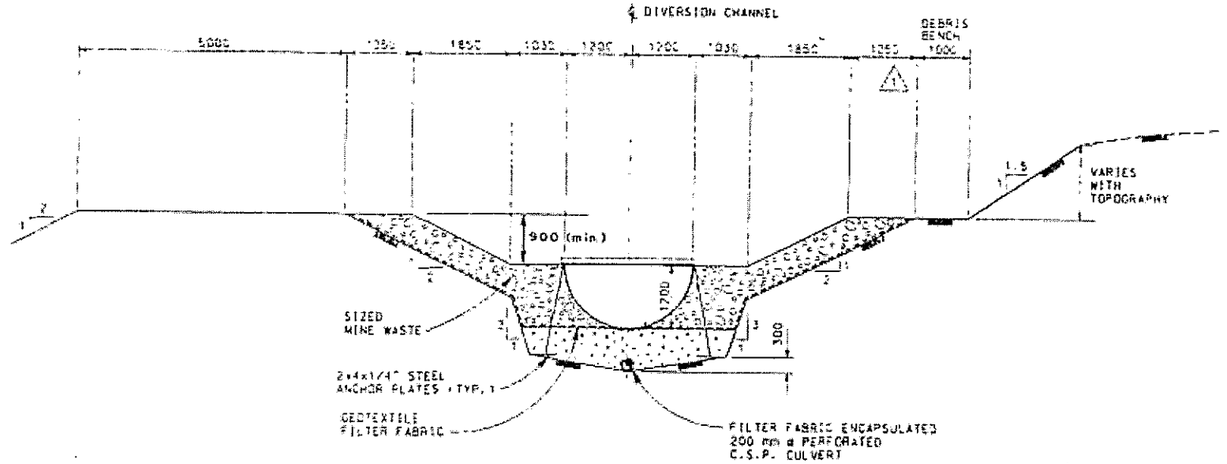
2004 TO 2008 WATER LICENCE RENEWAL
APPLICATION REPORT

VANGORDA CREEK DIVERSION FLUME PLAN

Gartner Lee | Deloitte & Touche | FIGURE NO. 15



TYPICAL SECTION ON ROCK CUT
FROM STA. 6+30 TO 7+50
TO STA. 7+90 TO 8+30



TYPICAL SECTION ON SOIL CUT
FROM STA. 7+50 TO 7+90
TO STA. 8+30 TO 8+85

SECTION A/06
SCALE: 1:50

SOURCE OF FIGURE:
DRAWING SHOWN BELOW DRAWN FROM REPORT BY STEFFEN, ROBERTSON KIRSTEN (CANADA) INC.
REPORT NO. 60647 DATED MAY 1992
"CONSTRUCTION REPORT VANGORDA CREEK DIVERSION REALIGNMENT VANGORDA PLATEAU DEVELOPMENT"

CLIENT: CURRAGH RESOURCES INC	TITLE: VANGORDA CREEK DIVERSION TYPICAL SECTIONS AND DETAILS SHEET 2	ACCT No: 1003509.DGN	
LOCATION: FARO, YUKON TERRITORY		PROJECT No: B444	DIVISION No: 21
KILBORN		DRAWING NUMBER: 100-35-09	REV: 2

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ANVIL RANGE MINING CORPORTATION
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VANGORDA CREEK DIVERSION
FLUME SECTIONS

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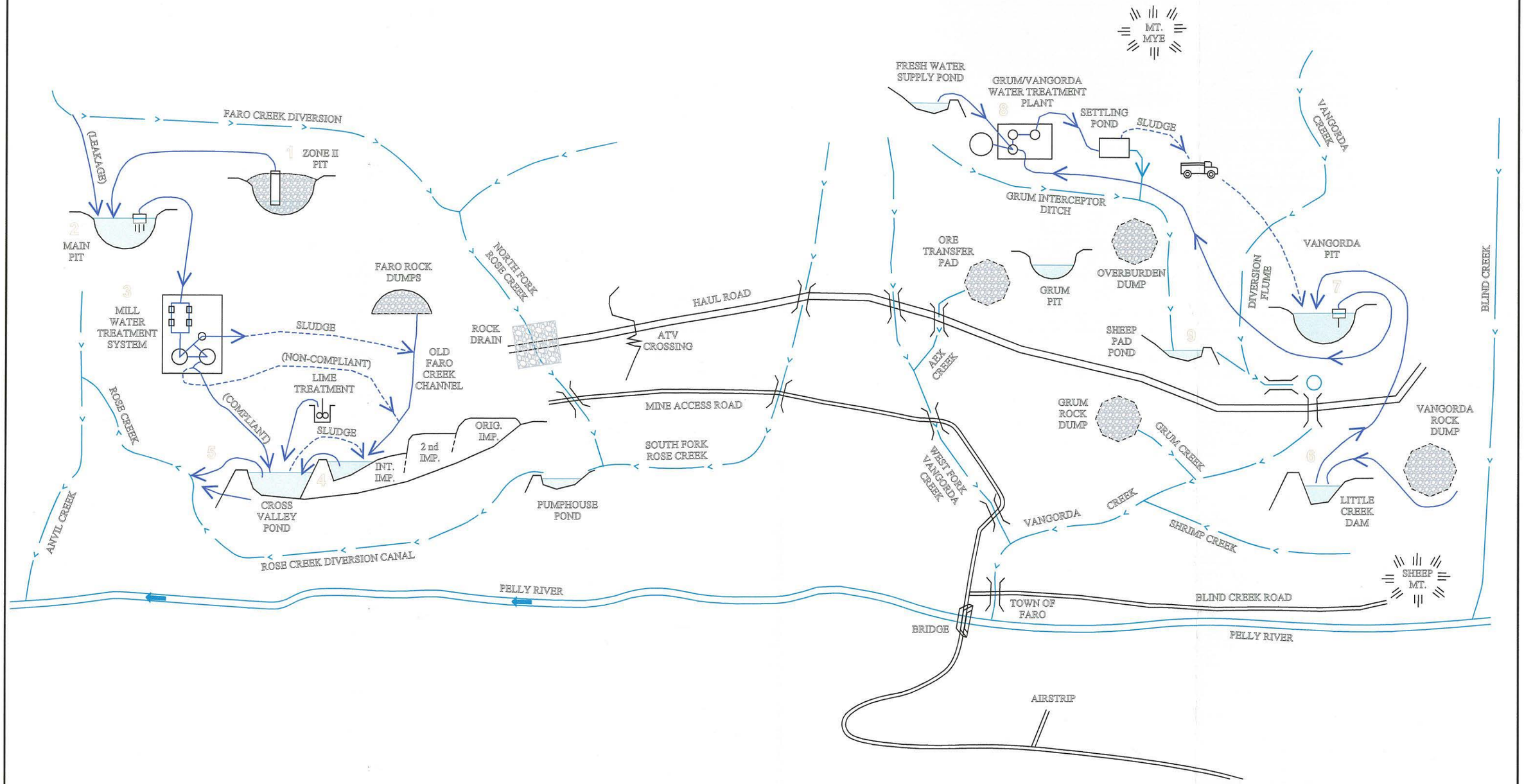
FIGURE NO. 16



PROPOSED ACTIVITIES:

1. PUMP ZONE II PIT
2. PUMP MAIN PIT
3. MILL WATER TREATMENT SYSTEM
4. INTERMEDIATE POND LIME TREATMENT
5. DISCHARGE WATER TO ROSE CREEK
6. PUMP LITTLE CREEK DAM
7. PUMP VANGORDA PIT
8. GRUM/VANGORDA WATER TREATMENT PLANT
9. DISCHARGE WATER TO VANGORDA CREEK

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ANVIL RANGE MINING CORPORATION
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2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

SUMMARY OF PROPOSED CARE AND MAINTENANCE ACTIVITIES
FARO AND VANGORDA PLATEAU SITES

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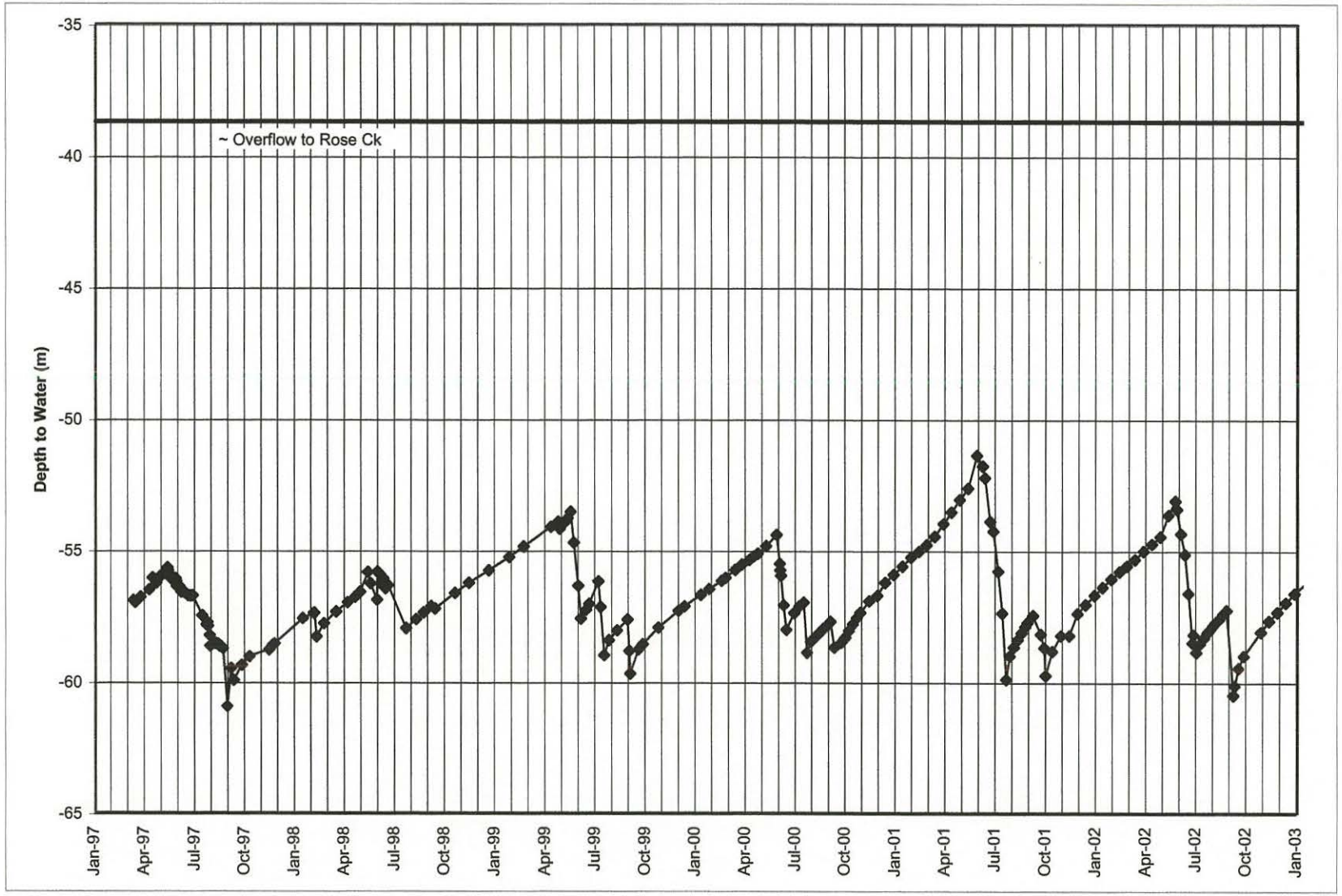
FIGURE NO. 17



Project Number: 23-376
Date: May, 2003

Figure 18. Zone II Pit Water Elevations, 1997 to 2002

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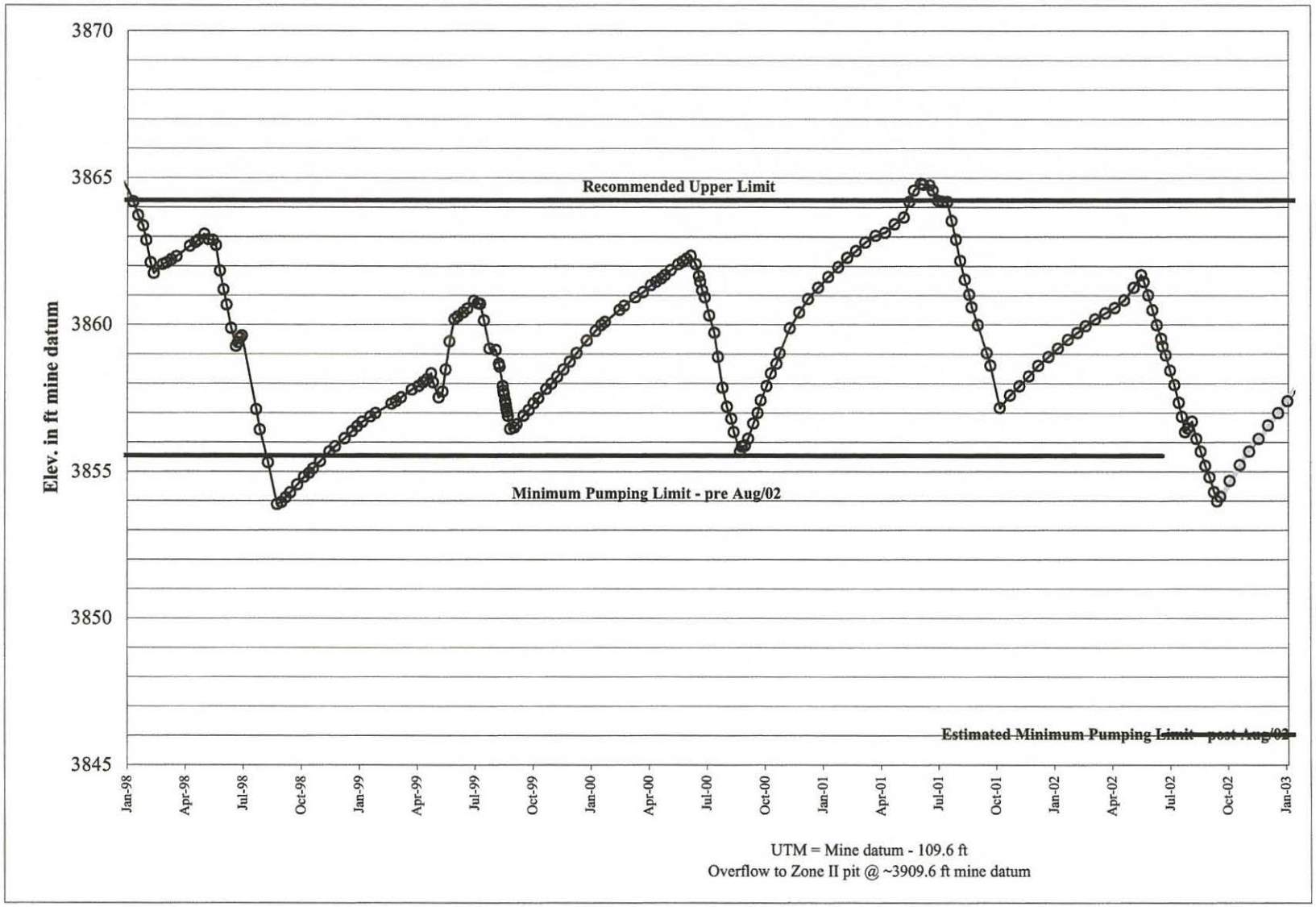
23376-D1-Fig18.xls



Project Number: 23376
Date: May, 2003

Figure 19. Main Pit Water Elevations, 1998 to 2002

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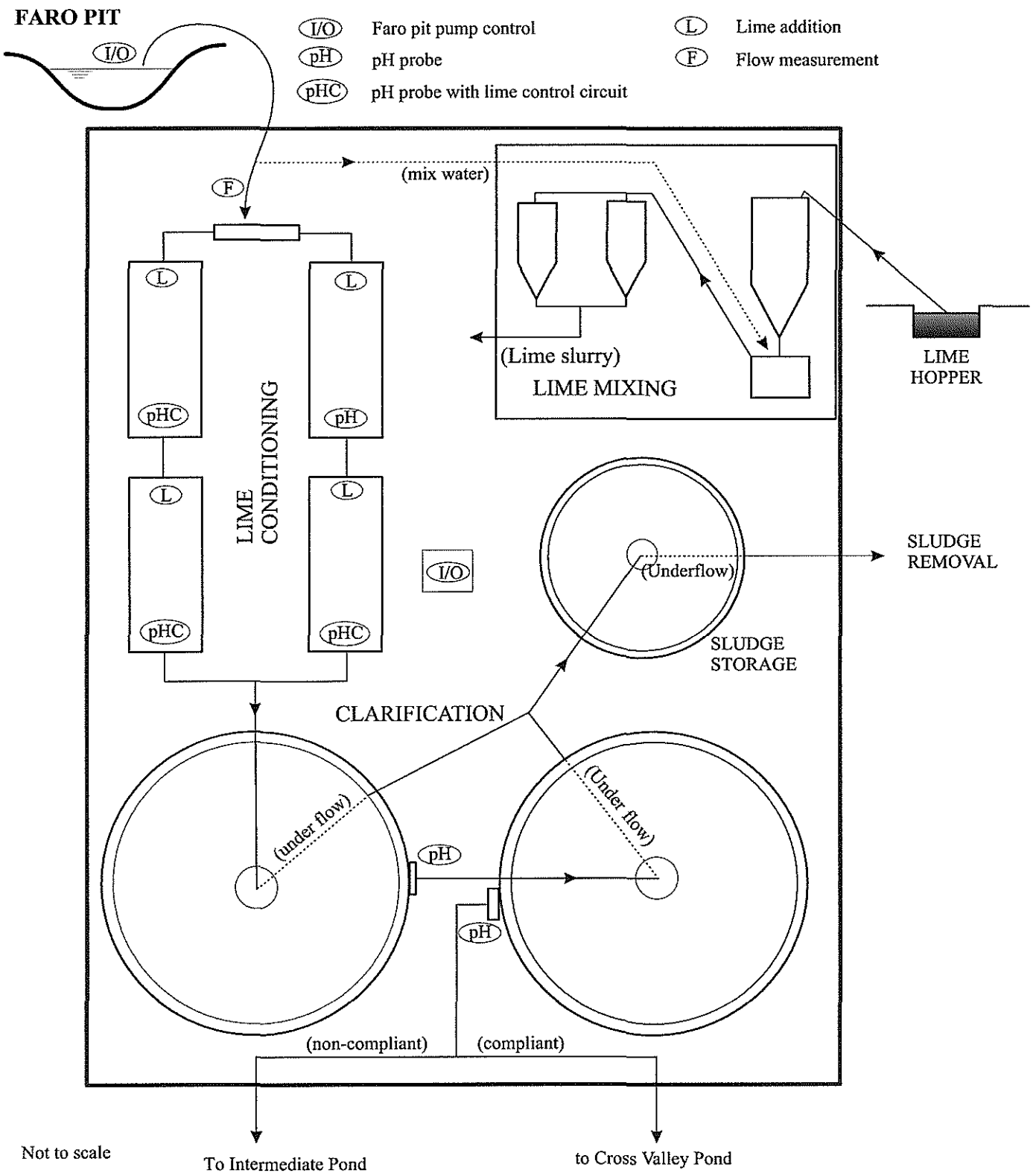
23376-D1-Fig19.xls



Project Number:23-376
Date: May, 2003

Figure 20. Schematic Flowsheet - Mill Water Treatment System

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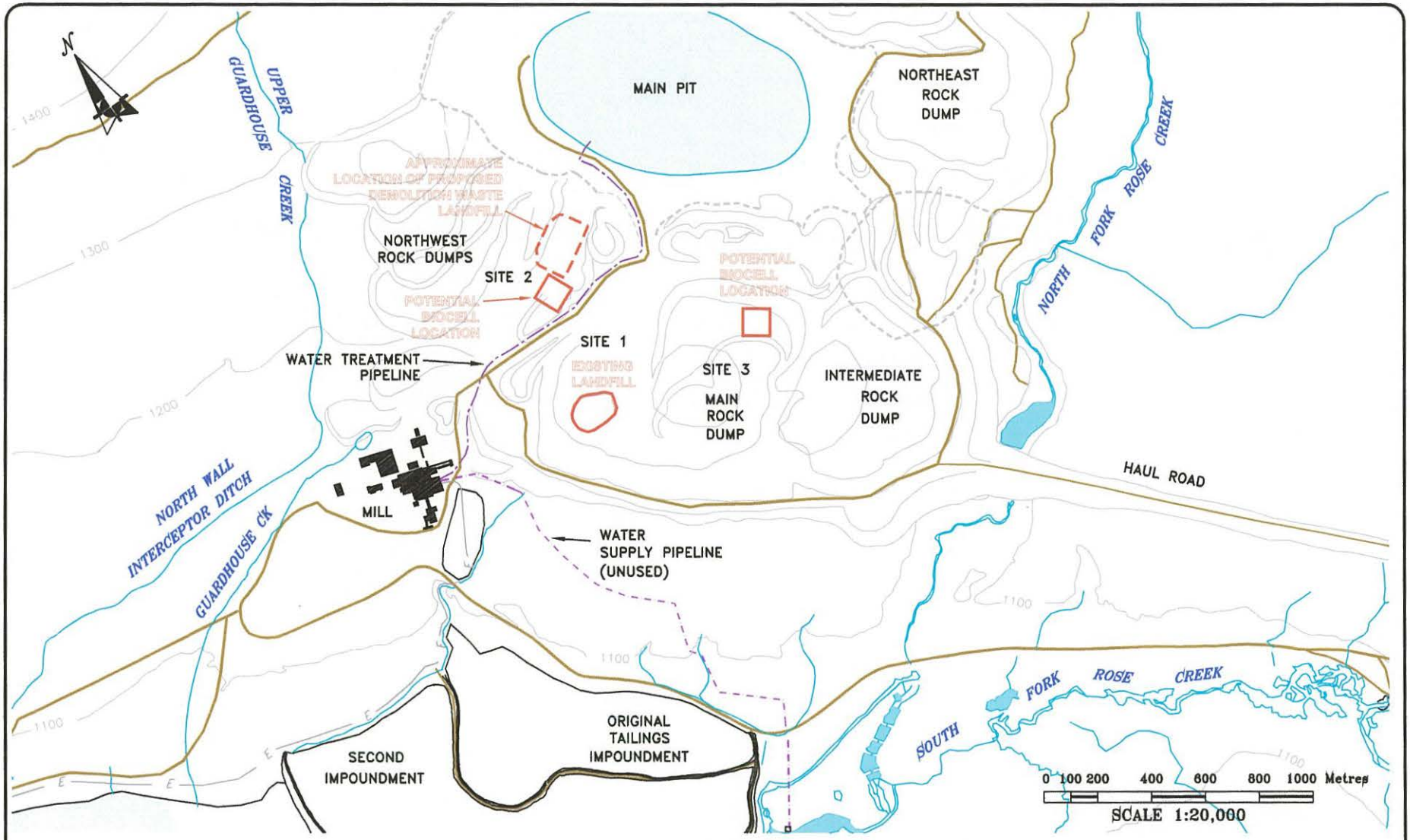
23376-D1-Fig20.CDR



LEGEND:

- ROADS
- EXISTING SURFACE DRAINAGE
- E — EFFLUENT PIPELINE
- PIPELINE

COORDINATES ARE UTM NAD83 ZONE 8
CONTOUR INTERVAL 100 m

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ANVIL RANGE MINING CORPORTATION
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POTENTIAL LANDFILL AND BIOCELL LOCATIONS - FARO SITE

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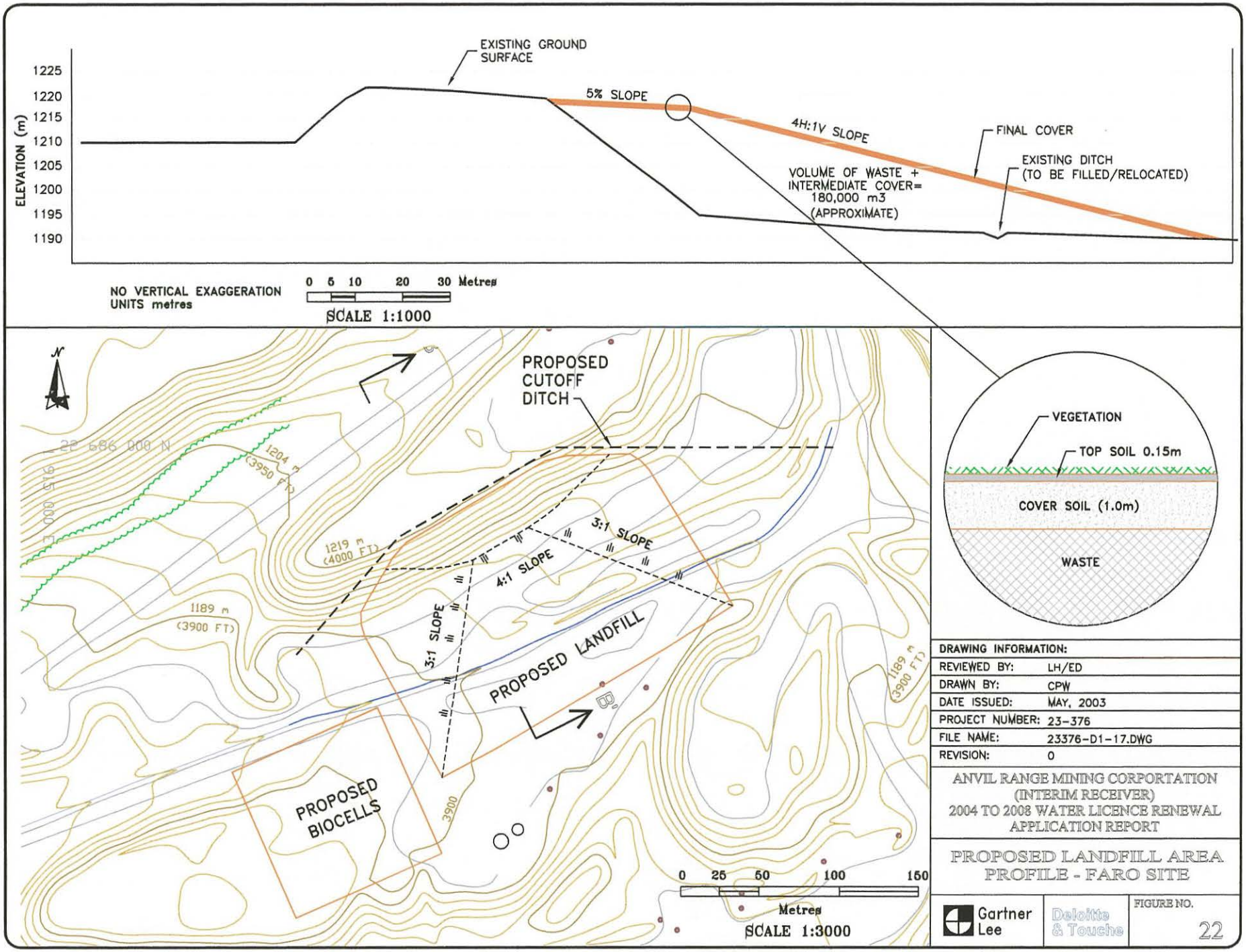
FIGURE NO. 21



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ANVIL RANGE MINING CORPORTATION
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PROPOSED LANDFILL AREA PROFILE - FARO SITE

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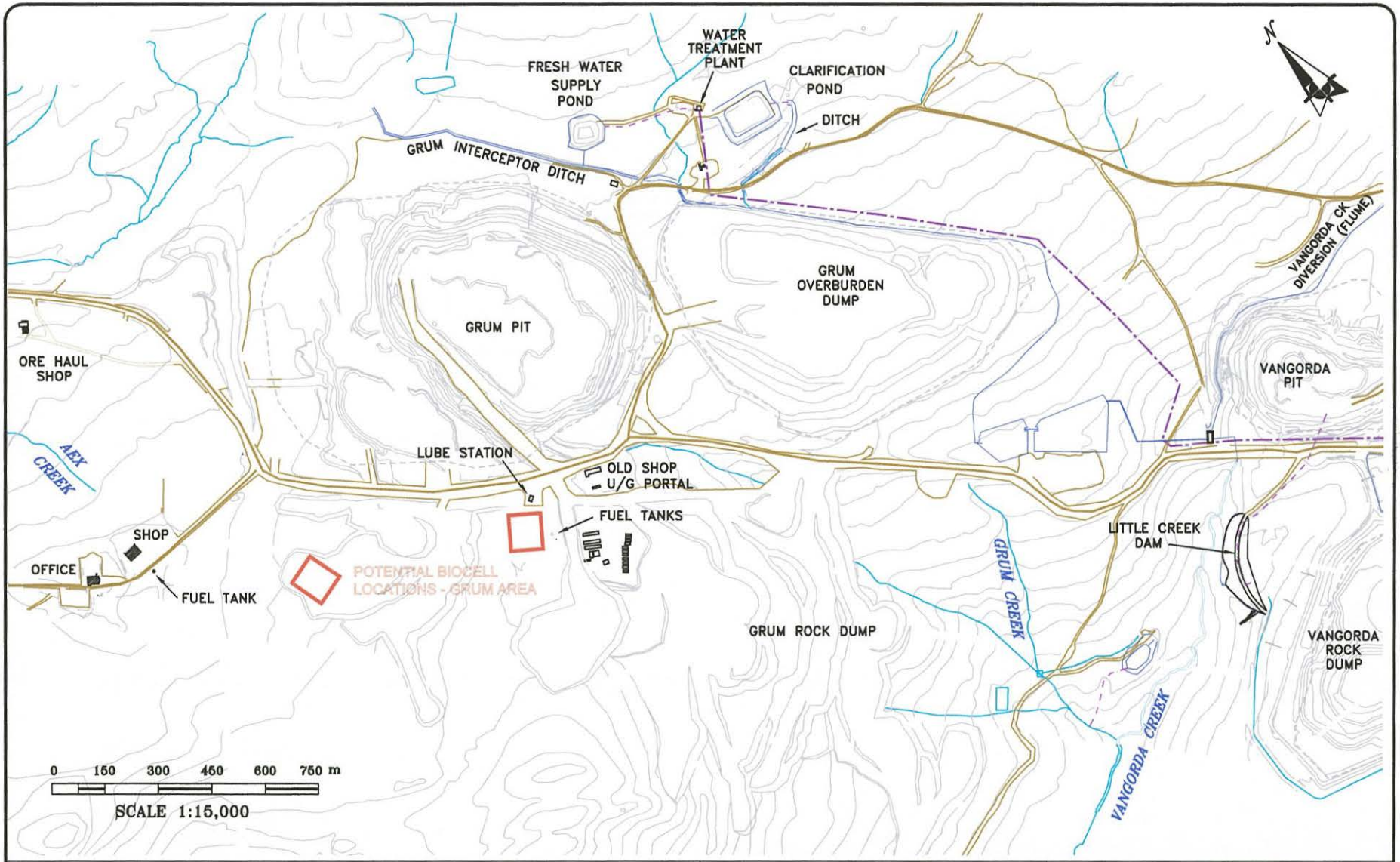
FIGURE NO. 22



LEGEND:

- ROADS
- EXISTING SURFACE DRAINAGE
- PRE-MINE DRAINAGE
- PIPELINE
- WATER TREATMENT PIPELINE

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ANVIL RANGE MINING CORPORTATION
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POTENTIAL BIOCELL LOCATION - GRUM SITE

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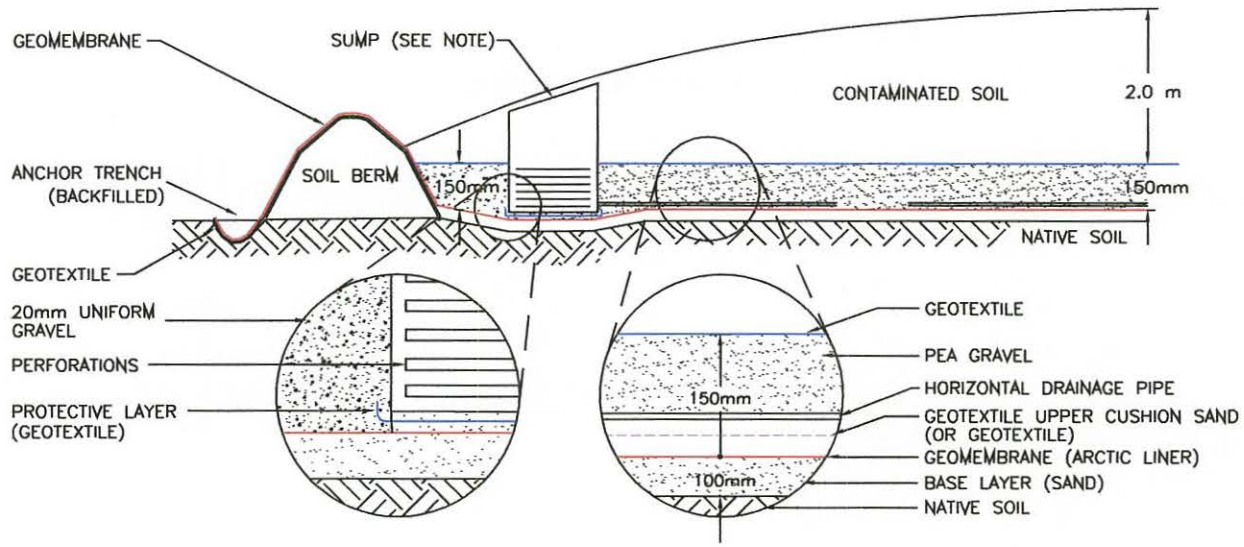
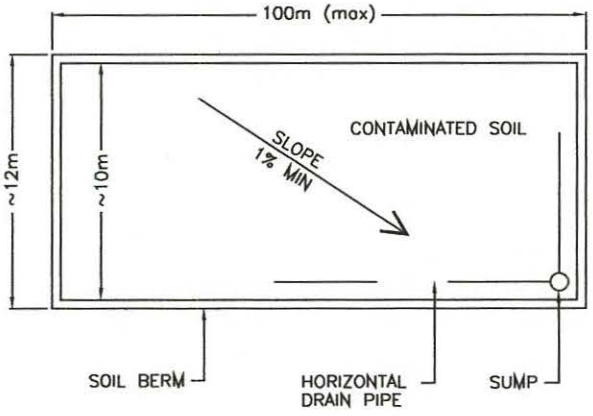
FIGURE NO. 23



NOTE: BASE LAYER SAND LOWERED AT SUMP LOCATION

SECTION VIEW OF TYPICAL SOIL BIOTREATMENT CELL

NOT TO SCALE



PLAN VIEW OF TYPICAL SOIL BIOTREATMENT CELL

NOT TO SCALE

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ANVIL RANGE MINING CORPORTATION (INTERIM RECEIVER)
2004 TO 2008 WATER LICENCE RENEWAL APPLICATION REPORT

CONCEPTUAL DESIGN OF TYPICAL SOIL BIOTREATMENT CELLS

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FIGURE NO. 24

Appendices

Appendix A

Update Anvil Range Mining Properties (Faro Mine), Indian and Northern Affairs Canada, January 20, 2003

Appendix B

Summary of Proposed Care and Maintenance Activities

Summary of Proposed Care and Maintenance Activities

Location	Physical Works or Activity	Class (Monitoring, Mtce, Action)	Timing	Rationale	Current Licence Requirement	EAR Reference
Zone 2 Pit	Dewatering into Faro Main Pit	Action	Summer - intermittently	Water is non-compliant - metal leaching from rock dumps and pit walls	Y	5.2.1.1
Main Pit	Dewatering to Mill Water Treatment Plant	Action	Summer - 3 months (typically)	Water is non-compliant - metal leaching from rock dumps and pit walls	N	5.2.1.2
Mill Water Treatment System	Treat water pumped from Faro Main Pit and discharge to Rose Creek, Cross-Valley Pond or Intermediate Pond	Action	Summer - 3 months (typically)	Achieve compliance with water licence	N	5.2.1.3
Mill Water Treatment System	Sludge disposal into Intermediate Pond	Action	As required	Ensure performance; secure storage and established practice	N	5.2.1.4
Intermediate and Cross Valley Ponds seepage	Lime treatment of water from the Intermediate Pond and discharge to Cross Valley Pond	Action	Summer - intermittently	Achieve compliance with water licence	Y	5.2.4.1
Intermediate and Cross Valley Ponds seepage	Release of water from Cross Valley Pond to Rose Creek	Action	Summer - intermittently	Achieve compliance with water licence	Y	5.2.4.1
Intermediate and Cross Valley Ponds seepage	Sludge disposal into Intermediate Pond	Action	As required	Ensure performance; secure storage and established practice	N	5.2.4.2
Main Pit	Monitor water elevation	Monitoring	ongoing	Ensure water elevation does not rise above desired range	Y	5.2.1.2
Rock Dump seepage to North Fork Rose Creek	Ongoing surface and groundwater water quality monitoring	Monitoring	Surface - Annual during freshet; groundwater - semi-annual spring and fall	Assess seepage water quality	Y	5.2.2.1
Rock Dump seepage to Rose Creek Tailings Facility	Ongoing surface and groundwater water quality monitoring	Monitoring	Surface - Annual during freshet; groundwater - semi-annual spring and fall	Assess seepage water quality	Y	5.2.2.2
Rock Dump seepage to Upper Guardhouse Creek	Ongoing surface water quality monitoring	Monitoring	Annual during freshet	Assess seepage water quality	Y	5.2.2.3
Plant Site seepage to Rose Creek Tailings Facility	Surface water quality monitoring	Monitoring	Annual during freshet	Assess seepage water quality	Y	5.2.3
Intermediate and Cross Valley Ponds seepage	Monitor discharge volume and water level in ponds	Monitoring	discharge - during release; water levels - weekly	Water balance requirement	Y	5.2.4.1
Intermediate and Cross Valley Dams	Geotechnical monitoring	Monitoring	Annual inspection by professional engineer; Semi-annual reading of instrumentation	Assess performance	Y	5.2.4.3
Intermediate and Cross Valley Dams	Monitor seepage flow from Cross Valley Dam	Monitoring	Monthly	Assess stability of dam	Y	5.2.4.3
Tailings Impoundment	Investigation of source areas of contamination, pathways and impact on terrestrial environmental receptors	Monitoring	2003 to 2005; mitigation report by end 2005	To identify source areas, pathways and receptor impacts	N	5.2.4.5
Rose Creek Valley Aquifer	Groundwater quality monitoring	Monitoring	Semi-annual (spring and fall)	Assess seepage water quality	Y	5.2.4.7
Main Pit Northeast Wall	Monitor Pit Wall stability	Monitoring	As required	Assess stability with respect to integrity of diversion channel	N	5.2.5.2
North Fork Rose Creek	Surface water quality monitoring (R7)	Monitoring	Quarterly	Trigger for contingency	N	5.2.6.1
North Fork Rose Creek	Benthic community monitoring (R7)	Monitoring	2004, 2006, 2008	Receiving environment - reference monitoring	Y	5.2.6.1
North Fork Rose Creek	Continuous flow monitoring	Monitoring	Continuous	Water balance requirement	N	5.2.6.1

Summary of Proposed Care and Maintenance Activities

Location	Physical Works or Activity	Class (Monitoring, Mtce, Action)	Timing	Rationale	Current Licence Requirement	EAR Reference
North Fork Rose Creek	Rock drain performance monitoring at haul road	Monitoring	Monthly	Assess performance	Y	5.2.6.1
South Fork Rose Creek	Bridge and culvert monitoring	Monitoring	ongoing	Assess performance	N	5.2.6.2
South Fork Rose Creek	Monitor haul road drainage	Monitoring	ongoing	Assess potential sediment sources into creeks	N	5.2.6.2
South Fork Rose Creek	Benthic community monitoring (R1)	Monitoring	2004, 2006, 2008	Receiving environment monitoring	Y	5.2.6.2
Pumphouse Pond	Monitor spillway	Monitoring	ongoing	Assess performance	Y	5.2.6.3
Rose Creek Diversion Canal	Geotechnical monitoring	Monitoring	Annual inspection by professional engineer; Semi-annual reading of instrumentation	Assess performance	Y	5.2.6.4
Rose Creek downstream of Mine Facilities	Continuous flow monitoring	Monitoring	Continuous	Water balance requirement	N	5.2.6.5
Rose Creek downstream of Mine Facilities	Benthic community monitoring (R2, R3, R4)	Monitoring	2004, 2006, 2008	Receiving environment monitoring	Y	5.2.6.5
Rose Creek downstream of Mine Facilities	Surface water quality monitoring	Monitoring	semi-annual to monthly, depending on site	Receiving environment monitoring	N	5.2.6.5
Anvil Creek	Surface water quality monitoring (R5, R6)	Monitoring	2004, 2006, 2008	Receiving environment monitoring	Y	5.2.6.6
Anvil Creek	Benthic community monitoring (R5, R6)	Monitoring	2004, 2006, 2008	Receiving environment monitoring	Y	5.2.6.6
Zone 2 Pit	Associated maintenance	Mtce	As required	Ensure performance	Y	5.2.1.1
Main Pit	Associated maintenance	Mtce	As required	Ensure performance	N	5.2.1.2
Mill Water Treatment System	Associated maintenance	Mtce	As required	Ensure performance	N	5.2.1.4
Mill Water Treatment System	System improvements	Mtce	Opportunistic	Improved performance	N	5.2.1.4
Plant Site seepage to Rose Creek Tailings Facility	Maintenance of surface water control ditches	Mtce	As required	Ensure performance	N	5.2.3
Intermediate and Cross Valley Dams	Maintenance	Mtce	As required	Ensure performance	Y	5.2.4.3
Original and Second Tailings Impoundments and Dams	Maintenance of Second Impoundment Dam	Mtce	As required	Maintain road access	Y	5.2.4.4
North Wall Interceptor Ditch	Maintenance	Mtce	As required	Ensure performance	Y	5.2.4.6
Faro Creek Diversion	Maintain diversion channel	Mtce	As required	Ensure performance	Y	5.2.5.1
North Fork Rose Creek	Rock drain maintenance	Mtce	As required	Ensure performance	Y	5.2.6.1
South Fork Rose Creek	Bridge and culvert maintenance	Mtce	As required	Ensure performance	N	5.2.6.2
South Fork Rose Creek	Maintain haul road drainage	Mtce	As required	Prevent sediment load into creek	N	5.2.6.2
Pumphouse Pond	Spillway maintenance	Mtce	As required	Ensure performance	Y	5.2.6.3
Rose Creek Diversion Canal	maintenance	Mtce	As required	Ensure performance	Y	5.2.6.4
Vangorda Pit	Dewatering to Grum/Vangorda Water Treatment Plant	Action	Summer - 1 month (typically)	Water is non-compliant - metal leaching from developed areas and pit walls	N	5.3.1.1
Water treatment system	Treat water pumped from Vangorda Pit and discharge to Grum Interceptor Ditch	Action	Summer - 1 month (typically)	Achieve compliance with water licence	Y	5.3.1.2
Water treatment system	Sludge disposal into Vangorda Pit	Action	As required	Ensure performance; secure storage and established practice	N	5.3.1.3
Little Creek Dam	Dewatering to Vangorda Pit	Action	Summer - intermittently	Water is non-compliant - metal leaching from Vangorda Rock Dump	N	5.3.2.1

Summary of Proposed Care and Maintenance Activities

Location	Physical Works or Activity	Class (Monitoring, Mtce, Action)	Timing	Rationale	Current Licence Requirement	EAR Reference
Vangorda Pit	Monitor water elevation	Monitoring	ongoing	Ensure water elevation does not rise above desired range	N	5.3.1.1
Grum Pit	Monitor water elevation	Monitoring	ongoing	Ensure water elevation does not rise above desired range	N	5.3.1.4
Grum Pit	Monitor water quality	Monitoring	quarterly	To determine water treatment requirement	Y	5.3.1.4
Little Creek Dam	Geotechnical monitoring	Monitoring	Annual inspection by professional engineer; Semi-annual reading of instrumentation	Assess performance	Y	5.3.2.1
Vangorda Rock Dump seepage	Groundwater quality monitoring	Monitoring	Semi-annual spring and fall	Assess seepage water quality	N	5.3.2.2
Grum Creek	Ongoing surface and groundwater quality monitoring	Monitoring	Surface - quarterly and annual during freshet; groundwater - semi-annual spring and fall	Assess seepage water quality	Y	5.3.2.3
Grum and Vangorda Rock Dumps	Geotechnical monitoring	Monitoring	Annual inspection by professional engineer; Semi-annual reading of instrumentation	Assess stability	Y	5.3.2.4
Grum Overburden Dump	Monitor erosion potential	Monitoring	ongoing	Assess potential sediment sources into Sheep Pad Pond	N	5.3.2.5
Grum Ore Transfer Pad	Surface water quality monitoring (V17A)	Monitoring	quarterly	Assess seepage water quality	N	5.3.2.6
Grum Interceptor Ditch	Monitor erosion potential	Monitoring	ongoing	Assess potential sediment sources into Sheep Pad Pond	N	5.3.3
Vangorda Creek Diversion	Geotechnical monitoring	Monitoring	Annual inspection by professional engineer	Assess stability	Y	5.3.4.1
Vangorda Creek Diversion	Surface water quality monitoring (V1)	Monitoring	quarterly	Receiving environment - reference monitoring	Y	5.3.4.1
Vangorda Creek Diversion	Monitor stream sediment quality and benthic community monitoring (V1)	Monitoring	2005, 2007	Receiving environment - reference monitoring	Y	5.3.4.1
Main Stem Vangorda Creek	Surface water quality monitoring (V27)	Monitoring	spring, summer, fall	Receiving environment monitoring	Y	5.3.4.2
Main Stem Vangorda Creek	Monitor stream sediment quality and benthic community (V27)	Monitoring	2005, 2007	Receiving environment monitoring	Y	5.3.4.2
AEX Creek	Surface water quality monitoring (V6A)	Monitoring	Quarterly	Receiving environment monitoring	Y	5.3.4.3
Haul Road	Monitor haul road drainage	Monitoring	ongoing	Assess potential sediment sources into creeks	N	5.3.4.4
West Fork Vangorda Creek	Surface water quality monitoring (V5)	Monitoring	quarterly	Receiving environment monitoring	Y	5.3.4.5
West Fork Vangorda Creek	Monitor stream sediment quality and benthic community (V5)	Monitoring	2005, 2007	Receiving environment monitoring	Y	5.3.4.5
Lower Vangorda Creek	Monitor flow	Monitoring	Continuous	Water balance	N	5.3.4.7
Lower Vangorda Creek	Surface water quality monitoring (V8)	Monitoring	quarterly	Receiving environment monitoring	Y	5.3.4.7
Lower Vangorda Creek	Monitor stream sediment quality and benthic community (V8)	Monitoring	2005, 2007	Receiving environment monitoring	Y	5.3.4.7
Vangorda Pit	Associated maintenance	Mtce	As required	Ensure performance	N	5.3.1.1
Water treatment system	Associated maintenance	Mtce	As required	Ensure performance	N	5.3.1.2
Little Creek Dam	Maintenance	Mtce	As required	Ensure performance	Y	5.3.2.1
Vangorda Creek Diversion	Maintain diversion channel	Mtce	As required	Ensure performance	Y	5.3.4.1
Haul Road	Maintain haul road drainage	Mtce	As required	Prevent sediment load into creek	N	5.3.4.4
Mine Access Road	maintenance	Mtce	As required	Ensure performance	N	5.4

Summary of Proposed Care and Maintenance Activities

Location	Physical Works or Activity	Class (Monitoring, Mtce, Action)	Timing	Rationale	Current Licence Requirement	EAR Reference
Mine access points	restrict public access to potentially unsafe areas	Action	Continuous	Ensure public safety	N	5.4
Haul Road	maintenance	Mtce	As required	Ensure performance	N	5.4
Haul Road	Maintain ATV access ramp	Mtce	As required	Provide controlled public passage	N	5.4
Mine Sites	Provide safe transortation and storage for materials	Action	As required	Environmental protection, public health, protection of assets	N	5.5
Mine Sites	Securing and safely storing highly contaminated soils	Action	As required	Progressive reclamation - Environmental protection	N	5.6
Mine Sites	Removal of buildings that represent a health or safety hazard and placement in existing landfill	Action	As required	Progressive reclamation - Public safety	N	5.6
Mine Sites	Materials salvage	Action	As required	Progressive reclamation - Asset management	N	5.6
Faro/Vangorda Plateau	Tear down / demolition of buildings	Action	2004 - 2008	progressive reclamation	N	6.1
Demolition Waste Landfill	Site establishment - excavate surface water control ditches	Action	2004 - 2008	disposal of demolition debris from bulding tear down	N	6.1
Demolition Waste Landfill	Site operations	Action	2004 - 2008	disposal of demolition debris from bulding tear down	N	6.1
Bioremediation Cell	Site establishment - berm and liner	Action	2004 - 2008	remediaiton of hydrocarbon contaminated soil	N	6.2
Bioremediation Cell	Site operations - place soil and operate	Action	2004 - 2008	remediaiton of hydrocarbon contaminated soil	N	6.2
Oxidized fines near the Crusher Stockpile	Consolidate and cover with compacted silt or clay	Action	2004	Reduces water treatment requirements; human and environmental protection	N	6.3.3
Oxidized fines near the Vangorda Rock Dump	Cover with compacted silt or clay	Action	2004	Reduces water treatment requirements; human and environmental protection	N	6.3.4

Appendix C

Proposed Site Water Monitoring Protocol

SCHEDULE A - SURVEILLANCE NETWORK PROGRAM
FARO MINE SITE

Codes: C=continuously; W=weekly; WD=weekly when discharging; M=monthly; SF=spring and fall; WS=winter and summer; A=annually freshet
OTHER=field pH, field temperature, field conductivity, TSS, SO4, NH_3
For Groundwater Samples: "OTHER" to include purge volume, purge rate, purge time and sampling time
For flows read by staff gauge or weir: staff gauges to be verified by survey and/or manual flow measurement at least once per year

Sample	Location	Sample	ICP-T	ICP-D	OTHER	HARDNESS	FLOW/LEVEL
Routine Surface Samples							
X2	N. Fork at access road	M	Y	Y	Y	Y	M
X3	pumphouse pond	M	Y	Y	Y	Y	N
X4	Intermediate Pond at spillway	M	Y	Y	Y	N	M
X5	Cross Valley Pond surface outflow	WD	Y	Y	Y	Y	WD
X5P	Cross Valley Pond at spillway	M	Y	Y	Y	N	M
X11	Cross Valley Dam N. seep	WS	Y	Y	Y	N	W
X12	Cross Valley Dam S. seep	WS	Y	Y	Y	N	W
WEIR3	Cross Valley Dam central seep	WS	Y	Y	Y	N	W
X13	Cross Valley Dam total seepage	M	Y	Y	Y	Y	W
X14	Rose Creek d.s. mixing zone	WD / M	Y	Y	Y	Y	C
X22B	Faro Main pit at pumping barge	M	Y	Y	Y	N	M
X23	Old Faro Creek at toe of rock dumps	M	Y	Y	Y	N	M
X26	Faro Zone 2 pit pumped discharge	MD	Y	Y	Y	N	M
R1	S. Fork u.s. pumphouse pond	WS	Y	Y	Y	Y	WS
R2	Rose Creek d.s. mixing zone	-	-	-	-	-	-
R3	Rose Creek mid length	WS	Y	Y	Y	Y	WS
R4	Rose Creek u.s. Anvil Creek	WS	Y	Y	Y	Y	WS
R5	Anvil Creek d.s. Rose Creek	WS	Y	Y	Y	Y	WS
R6	Anvil Creek u.s. Rose Creek	WS	Y	Y	Y	Y	WS
FAROCR	outlet of Faro Creek diversion	M	Y	Y	Y	N	N
R7	N. Fork u.s. Faro Creek diversion	M	Y	Y	Y	N	C
R8	N. Fork d.s. Faro creek diversion	M	Y	Y	Y	N	N
R9	N. Fork adjacent Zone 2 rock dumps	M	Y	Y	Y	N	N
R10	N. Fork d.s. Zone 2 rock dumps	M	Y	Y	Y	N	N
Groundwater Samples							
X16	d.s. Rose Creek Tailings Facility	SF	N	Y	Y	N	SF
X17	d.s. Rose Creek Tailings Facility	SF	N	Y	Y	N	SF
X18	d.s. Rose Creek Tailings Facility	SF	N	Y	Y	N	SF
X21-96	Rose Creek Tailings Facility	SF	N	Y	Y	N	SF
X24-96	Rose Creek Tailings Facility	SF	N	Y	Y	N	SF
X25-96	Rose Creek Tailings Facility	SF	N	Y	Y	N	SF
P01-01 to 11	Rose Creek Tailings Facility	SF	N	Y	Y	N	SF
TH86-26	u.s. Rose Creek Tailings Facility	SF	N	Y	Y	N	SF
BH1	Zone 2 rock dumps	SF	N	Y	Y	N	SF
BH2	Zone 2 rock dumps	SF	N	Y	Y	N	SF
BH4	Zone 2 rock dumps	SF	N	Y	Y	N	SF
BH12	NE rock dumps	SF	N	Y	Y	N	SF
BH13	NE rock dumps	SF	N	Y	Y	N	SF
BH14	NE rock dumps	SF	N	Y	Y	N	SF
P96-6	Main/Int rock dumps	SF	N	Y	Y	N	SF
P96-7	Main/Int rock dumps	SF	N	Y	Y	N	SF
P96-8	Main/Int rock dumps	SF	N	Y	Y	N	SF
S1	Main/Int rock dumps	SF	N	Y	Y	N	SF
S2	Main/Int rock dumps	SF	N	Y	Y	N	SF
S3	Main/Int rock dumps	SF	N	Y	Y	N	SF
Annual Seep Samples (to include these locations at a minimum plus other observed freshet surface seeps at toe of rock dumps)							
FDU	Faro creek diversion u.s. end	A	Y	Y	Y	N	A
FDL	Faro Creek Diversion	A	Y	Y	Y	N	A
FCO	Old Faro Creek u.s. Faro Valley dump	A	Y	Y	Y	N	A
A30	Flow to Main pit from Faro Valley dump	A	Y	Y	Y	N	A
A25	Main Pit northwest wall	A	Y	Y	Y	N	A
SP5/6	Internal surface flow on Faro rock dump	A	Y	Y	Y	N	A
NE1	N. seep to N. Fork from NE dumps	A	Y	Y	Y	N	A
NE2	Central seep to N. Fork from NE dumps	A	Y	Y	Y	N	A
NE3	S. seep to N. Fork from NE dumps	A	Y	Y	Y	N	A
NF1	u.s. side rock drain	A	Y	Y	Y	N	A
NF2	d.s. side rock drain	A	Y	Y	Y	N	A
W5	east dump	A	Y	Y	Y	N	A
W8	Upper Guardhouse Creek d.s. NW dump	A	Y	Y	Y	N	A
W10	Upper Guardhouse Creek u.s. NW dump	A	Y	Y	Y	N	A
GDHSECK	Guardhouse Creek at Intermediate pond	A	Y	Y	Y	N	A
IDSEEP	Intermediate Dam toe seep, S. side	A	Y	Y	Y	N	A
X7	seep d.s. emergency tailings area	A	Y	Y	Y	N	A

VANGORDA PLATEAU MINE SITE

Codes: C=continuously; WD=weekly when discharging; M=monthly; SF=spring and fall; SSF-spring, summer andf fall; Q=quarterly
OTHER=field pH, field temperature, field conductivity, TSS, SO4, NH_3
For Groundwater Samples: "OTHER" to include purge volume, purge rate, purge time and sampling time
For flows read by staff gauge or weir: staff gauges to be verified by survey and/or manual flow measurement at least once per year

Sample	Location	Sample	ICP-T	ICP-D	OTHER	HARDNESS	FLOW/LEVEL
Routine Surface Samples							
V1	Main Stem u.s. VG pit	Q	Y	Y	Y	Y	Q
V2	Grum creek to VG Creek	M	Y	Y	Y	Y	M
V2A	Grum Creek to Moose Pond	M	Y	Y	Y	N	M
V4	Shrimp Creek	SSF	Y	Y	Y	Y	N
V5	West Fork at gravel pit	M	Y	Y	Y	Y	Q
V6A	AEX Creek	Q	Y	Y	Y	Y	Q
VGMAIN	Main Stem at Town of Faro	M	Y	Y	Y	Y	N
V8	Lower VG Creek	M	Y	Y	Y	Y	C
V14	Grum rock dump N. toe seep	SF	Y	Y	Y	N	SF
V15	Grum rock dump central toe seep	M	Y	Y	Y	N	M
V16	Grum rock dump S. toe seep	SF	Y	Y	Y	N	SF
V17A	creek from Grum ore transfer pad	SF	Y	Y	Y	N	SF
V19	VG pit NW diversion ditch	SF	Y	Y	Y	N	SF
V20	VG pit NE diversion ditch	SF	Y	Y	Y	N	SF
LCD	Little Creek Dam pond at old pumphouse	SF	Y	Y	Y	N	M
V22	VG pit at pumping barge	Q	Y	Y	Y	N	M
V23	Grum pit at haul road	Q	Y	Y	Y	N	M
V24	influent to water treatment plant	WD	Y	Y	Y	N	WD
V25	effluent from clarification pond	WD	Y	Y	Y	Y	WD
V25BSP	Grum Interceptor Ditch below Sheep Pad Pond	WD / M	Y	Y	Y	Y	WD / M
V27	Main Stem u.s. Shrimp Creek	SSF	Y	Y	Y	Y	N
V29	VG dump drain #2	SF	N	Y	Y	N	SF
V30	VG dump drain #3	SF	N	Y	Y	N	SF
V31	VG dump drain #4	SF	N	Y	Y	N	SF
V32	VG dump drain #5	SF	N	Y	Y	N	SF
V33	VG dump drain #6	SF	N	Y	Y	N	SF
Groundwater Samples							
V37	VG rock dump, GW94-01	SF	N	Y	Y	N	SF
V38	VG rock dump, GW94-02	SF	N	Y	Y	N	SF
V39	VG rock dump, GW94-03	SF	N	Y	Y	N	SF
V40	VG rock dump, GW94-04	SF	N	Y	Y	N	SF
P96-9	Grum rock dump	SF	N	Y	Y	N	SF
P01-01 to 03	Vangorda rock dump	SF	N	Y	Y	N	SF
Annual Seep Samples (to include observed freshet surface seeps at toe of rock dumps that are not included above)							

Appendix D

Proposed Site General Monitoring Protocol

SITE GENERAL MONITORING PROTOCOL

SUMMARY

This inspection guide outlines the effort to be spent on routine environmental inspections of the Faro and Vangorda Plateau minesites during the period of shut down in excess of work required to comply with the terms of the water licences or other legal requirements.

These inspections will assist in demonstrating diligent management of the minesites and are intended to meet the intent of the Mining Association of Canada Guide for Management of Tailings Facilities, September 1998.

The weekly inspections are intended to provide observations of critical facilities sufficient to ensure that unusual or emergency events can be managed in a timely fashion.

The monthly inspections are to be performed in addition to the weekly inspections and are intended to provide a more rigorous inspection of the earth dams and dykes and a routine inspection of several other facilities which are not included in the weekly schedule.

Many of the facilities listed here will undergo more frequent inspection particularly during the spring season or during periods of active pumping and treatment of water.

The inspections as described here will typically be performed and documented by the environmental technicians. The inspections may, however, be performed and documented by any person working under the direction of the site manager who is reasonably knowledgeable regarding the environmental and geotechnical aspects of the minesites.

The inspections will be documented in a log book specific for this purpose. Unless specifically documented otherwise, it will be assumed that the person who has signed off on the inspection has conducted the inspection per this guide and that all facilities were observed with no concerns.

SITE GENERAL MONITORING PROTOCOL

FARO MINESITE - WEEKLY (Page 1 of 2)

1. EMERGENCY TAILINGS AREA AND DITCH TO INTERMEDIATE POND

- observe pipeline and ditch from mine access road below millsite
- is the pipeline performing acceptably?
- does the ditch downstream side dyke appear stable?
- is ditch flow channeling appropriately?

2. TREATED EFFLUENT PIPELINE FROM MILL

- observe pipeline from access roads
- is the pipeline performing acceptably?
- is the pipeline flow discharging appropriately?

3. ORIGINAL AND SECOND DAMS

- observe from the roads on the north and south sides
- do the structures appear "normal"
- is there any water presence/flow?

4. INTERMEDIATE DAM

- observe from the roads on the north and south sides
- is the pond water level acceptable?
- are the spillway and syphons functioning appropriately?
- is the lime treatment system functioning appropriately?-any visible damage?
- does the dam appear stable (i.e. erosion, cracking, bulging, wet spots)?

5. CROSS VALLEY DAM

- observe from the roads on the north and south and west (downstream) sides
- is the pond water level acceptable?
- are the spillway and syphons functioning appropriately?
- does the dam appear stable (i.e. erosion, cracking, bulging, wet spots)?
- does seepage appear "normal" (three streams)?

6. ROSE CREEK DIVERSION CANAL

- drive length of canal including lower section and observe dyke, backslope and bottom
- is any cracking or sloughing visible along backslope?
- is any significant erosion or are any significant depressions apparent in the dyke?
- is water channeling appropriately?

7. PUMPHOUSE POND

- observe the pumphouse pond from the canal dyke road
- is flow visible exiting the pumphouse pond (winter) and is it channeling appropriately?

8. NORTH FORK ROSE CREEK BELOW MINE ROAD CROSSING

- observe the creek culvert crossing from mine access road
- is flow channeling appropriately?
- is the diversion structure below the road performing acceptably?

SITE GENERAL MONITORING PROTOCOL

9. FARO MAIN PIT

- observe the pit & pumping station from the pumping station
- does the pit NE wall appear "normal"
- does the inflow via the Faro Valley rock dump appear "normal"?
- is the pumping station functioning appropriately?
- is there any physical damage visible to the pumping barge or pipeline?

10. FARO ZONE II PIT

- observe the Zone II pit from the access road near the pump installation
- are the pump and pipeline operating appropriately?
- is there any visible physical damage to the pump/pipeline installation?

11. NORTH FORK OF ROSE CREEK ROCK DRAIN

- observe the rock drain from the edges of the Vangorda haul road
- does the pond on the upstream side of the drain appear acceptable/normal?
- does the stream exiting the downstream side of the drain appear acceptable/normal?
- does the rock dump adjacent to the upstream pond appear stable (i.e. bulging, sloughing)?
- is there any apparent deformation of the roadway over the rock drain (i.e. settlement, depressions, sideslope erosion/deformation, check against angle of hydro poles)?

12. MINE ACCESS ROAD WATER CROSSINGS

- observe water crossings during drive to from Town of Faro to Faro minesite
- are ditches and culverts performing acceptably?

SITE GENERAL MONITORING PROTOCOL

FARO MINESITE - MONTHLY (Page 1 of 1)

1. EMERGENCY TAILINGS AREA, DITCH TO INTERMEDIATE POND AND MILL EFFLUENT PIPELINE

- detailed inspection of pipelines and ditches by driving and/or walking

2. INTERMEDIATE AND CROSS VALLEY DAMS

- perform detailed inspection of crests and toes by driving and/or walking each
- note any significant cracking, erosion, sloughing, etc.
- record seepage flow estimates or weir staff gauge readings and pond levels
- record any significant observations

3. FARO MAIN AND ZONE II PITS

- measure and record in-pit water levels

4. FARO CREEK DIVERSION

- drive the length of the diversion channel at least as far upstream as the Faro Valley rock dump
- is water flow channeling appropriately (i.e. flow over top of ice, ice jam)?
- is leakage from the channel excessive or visibly increased?
- are there visible indications of increased wall instability along the crest of the NE pit wall?

5. NORTH FORK OF ROSE CREEK ROCK DRAIN

- record upstream pond level (typ. by photograph)

SITE GENERAL MONITORING PROTOCOL

VANGORDA PLATEAU MINESITE - WEEKLY (Page 1 of 1)

1. VANGORDA HAUL ROAD DRAINAGE PUSHOUTS

- observe the critical drainage pushouts above or near creeks
- is water flow causing sedimentation into any creeks?
- have any new pushouts been made in critical locations?
- have any previously filled pushouts in critical locations been re-opened?

2. SHEEP PAD PONDS

- observe the ponds from the haul road or drive onto the pond dykes
- are the pond water levels acceptable?
- do the dykes appear stable (i.e. erosion, cracking, bulging, wet spots)?
- is the outflow channeling appropriately? (viewed from the road above the plunge pool)

3. LITTLE CREEK DAM

- drive the crest of the dam
- is the pond level appropriate/acceptable?
- does the dam appear stable (i.e. erosion, cracking, bulging, wet spots)?
- is there any visible damage to the pumphouse?

4. VANGORDA CREEK DIVERSION

- drive along the diversion flume
- is the flume performing acceptably?
- is water channeling appropriately (i.e. flow over top of ice, ice jam)?
- are there signs of excessive or new damage or deformation to the flume or channel?
- are there signs of instability of the rock and soil slopes overlooking the flume?

5. WATER TREATMENT PLANT

- observe the Clarification Pond dyke from the Blind Creek road and drive around the treatment plant
- is the water level in the Clarification Pond acceptable?
- are the plant building and storage sheds secure?
- does the dyke appear stable (i.e. erosion, cracking, bulging, wet spots)?

6. FRESHWATER SUPPLY POND

- drive to and/or around the pond
- is the water level acceptable?
- does the dyke appear stable (i.e. erosion, cracking, bulging, wet spots)?

7. MOOSE POND

- drive to the pond
- is there any accumulated water?
- is inflow water channeling appropriately?

8. WEST FORK OF VANGORDA CREEK CROSSING OF ACCESS ROAD

- observe the creek crossing from the access road
- are the ditch and culvert performing acceptably?

SITE GENERAL MONITORING PROTOCOL

VANGORDA PLATEAU MINESITE - MONTHLY (Page 1 of 1)

1. SHEEP PAD PONDS, LITTLE CREEK DAM, CLARIFICATION POND AND GROUCHO POND
   - estimate and record the pond water levels
   - inspect the crests and toes of the dam/dykes for signs of deterioration and document any seepage observed

2. GRUM CREEK/MOOSE POND
   - inspect the Moose Pond diversion. -is water channeling appropriately?
   - is the Grum Creek road crossing functioning acceptably?
   - is any water accumulating in the Moose Pond?

3. VANGORDA ROCK DUMP
   - drive the toe of the dump
   - do the till berm and rock benches appear stable and secure?

4. GRUM AND VANGORDA PITS
   - record estimates of water levels and other significant observations

5. VANGORDA CREEK DIVERSION FLUME
   - is the inlet to the culvert at the upstream end of the flume performing acceptably?
   - is the outflow structure at the downstream end of the flume performing acceptably?

Appendix E

Proposed Site Biological Monitoring Protocol

SCHEDULE B – BIOLOGICAL MONITORING PROGRAM

1. Sampling Points

   Rose Creek

   (a) R1: Above the confluence of the North Fork and South Fork of Rose Creek

   (b) R2: In the mixing zone downstream of the intersection of the Rose Creek diversion canal

   (c) R3: Rose Creek about one-half way to Anvil Creek

   (d) R4: Rose Creek just above Anvil Creek

   (e) R5: Anvil Creek just below the confluence of Rose Creek

   (f) R6: Anvil Creek immediately upstream of Rose Creek

   (g) R7: North Fork of Rose Creek upstream of the confluence with the Faro Creek diversion

   Vangorda Creek

   (h) V1: Vangorda Creek upstream from the mine and Blind Creek Road

   (i) V5: West Fork of Vangorda Creek upstream of mine access road

   (j) V8: Vangorda Creek near bridge to Faro town water supply

   (k) V27: Main stem of Vangorda Creek just upstream of confluence with Shrimp Creek

2. The Licensee shall collect three replicate samples of benthic invertebrates every second year from each station using an artificial substrate sampler for approximately five (5) weeks

3. (a) Water samples shall be collected and analyzed for total hardness, alkalinity, sulphate, suspended solids, ammonia and for a complete ICP scan of total and dissolved metals that includes copper, iron, lead, and zinc

   (b) In addition to the analysis required by 3(a), samples taken at sites R2, R3, and R4 shall be analyzed for total cyanide

   (c) Water samples shall be collected according to standard sampling protocols and field measurements of pH, temperature and conductivity will be recorded.

   (d) Flow will be measured at each location except that one of locations R4, R5, or R6 may be calculated

4. Samples shall be collected by an independent consultant

5. Sample identification, enumeration and data interpretation shall be done by independent qualified personnel

6. The Licensee shall compile a report of all data collected and shall submit this report to the Board as a component of the annual report

Appendix F

Proposed Site Physical Monitoring Protocol

Schedule C – Physical Monitoring Program

Annual Inspection

1. The Licensee shall ensure that all earthworks are inspected during the summer of each year by a professional geotechnical engineer registered to practice in the Yukon Territory (the "engineer"). The earthworks to be inspected shall include but not be limited to:

   Faro Mine Site

   a) Intermediate Dam
   b) Cross Valley Dam
   c) Rose Creek Diversion Canal including containment dyke and backslope
   d) North Fork Rock Drain including the crest and slope of the local rock dump
   e) Faro Creek diversion channel

   Vangorda Plateau Mine Site

   f) Vangorda Creek Diversion Flume including the rock and soil slopes above the flume
   g) Vangorda Rock Dump
   h) Grum Rock Dump
   i) Grum Interceptor Ditch/Sheep Pad Pond
   j) Grum/Vangorda Water Treatment Plant Freshwater Supply Pond
   k) Grum/Vangorda Water Treatment Plant Clarification Pond

2. The engineer shall provide the Licensee with a field memo within 2 weeks of the inspections that documents the engineer's immediate concerns and the licensee shall file this memo with the Water Board within one week of receipt.

3. Within two weeks of receipt of the field memo from the engineer, the licensee shall initiate maintenance or repair work that is recommended for mitigation of immediate concerns or the licensee shall notify the Water Board of a rationale for not initiating work. In initiating maintenance or repair work, the licensee shall comply with the requirements for notification and submission to the Water Board of design information as described in this license.

4. The licensee shall submit a complete report prepared by the engineer on all physical monitoring activities as part of the Annual Report required by this license.

Geotechnical Performance Monitoring Instrumentation

5. The licencee shall read geotechnical performance monitoring instrumentation at least twice per year (spring and fall) and shall, within two weeks of data collection, forward the results to the engineer for review. The engineer shall provide a brief written comment on the data within two weeks of receipt and the licensee shall file this memo with the Water Board within two weeks of receipt.

6. The monitoring schedule and locations will be follow the recommendations of the professional engineer, which will be a component of the engineer's annual inspection reports.

7. The licencee may repair, maintain or install additional performance monitoring instrumentation according to the recommendations of the engineer.

Rose Creek Diversion Canal

8. (a) The Rose Creek diversion canal shall be monitored visually and through the instrumentation installed. Gathered data shall be analyzed by a professional engineer registered to practice in the Yukon Territory to determine:

(i) Thermal regime and degradation of the permafrost;

(ii) Stability of the excavated canal wall;

(iii) Settlement and stability of the canal dyke;

(iv) Areas and rates of seepage from the diversion canal;

(v) Performance of the waste piles adjacent to the canal;

(vi) Other areas of concern

(b) If the analysis referred to in 8(a) above demonstrates that design objectives for geotechnical performance and project safety have not been met, the Licensee shall propose remedial measures to the Board and implement those measures unless, within sixty days of receiving the proposed remedial measures, the Board notifies the Licensee that a public hearing shall be held to amend the license so as to incorporate the remedial measures into the license, and the notice includes a direction that the Licensee shall not implement the remedial measures until the public hearing has been held and the Board has concluded deliberations. However, the Board may, in the notification of the Licensee, direct the Licensee to implement the remedial measures on an interim basis.

(c) The network of monitoring instrumentation, as amended from time to time, shall be monitored at least twice per year (spring and fall) and according to the recommendations of the engineer.

(d) Glaciation within the diversion canal shall be monitored during the winter season as follows:

(i) Monthly inspections of build up
(ii) All corrective or preventative action shall be documented

(e) Any erosion activity within the diversion canal shall be studied and documented and preventative measures taken to stabilize the activity

(f) Several selected cross sections and profiles shall be surveyed every second year to measure the amount of sedimentation build-up within the diversion canal between the point of original diversion and site X10.

Intermediate and Cross Valley Dams

9. The Intermediate and Cross Valley dams shall be monitored visually and through the instrumentation installed. Gathered data shall be analyzed by a professional engineer registered to practice in the Yukon Territory.

Rock Drain

10. The causeway section and performance of rock drains and culverts should be examined annually and records of upstream water levels versus North Fork flows made annually in February and June.