2002 Vangorda Plateau Annual Environmental Report Water Licence IN89-002

prepared for:
Yukon Territory Water Board

prepared by:
Gartner Lee Limited

on behalf of:
Deloitte & Touche Inc.
(as Interim Receiver for Anvil Range Mining Corporation)

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Gartner Lee Limited

February 28, 2003

Yukon Territory Water Board
Suite 106 - 419 Range Road
Whitehorse, Yukon
Y1A 3V1

Dear Board:

Re: 2002 Vangorda Plateau Annual Environmental Report

We are pleased to submit five bound copies and one unbound original of the report 2002 Vangorda Plateau Annual Environmental Report, Water Licence IN89-002. Gartner Lee Limited has prepared this report on behalf of Deloitte & Touche Inc., in their capacity as Interim Receiver for Anvil Range Mining Corp. The body of the report and Appendix 1 are also enclosed in electronic format.

This report fulfills the annual reporting requirement for Water Licence IN89-002 for 2002.

I trust that this information is self-explanatory. However, if you have any questions please do not hesitate to contact us.

Yours very truly,
GARTNER LEE LIMITED

Eric Denholm
Senior Mining Consultant

c.c.: Mr. Wes Treleaven, *Deloitte & Touche Inc.*
Mr. Doug Sedgwick, *Deloitte & Touche Inc.*
Mr. Greg Stevens, *Deloitte & Touche Inc.*
Mr. Dana Haggar, *Anvil Range Mining Corp. (Interim Receivership)*

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Summary

Water quality and physical monitoring programs were performed during 2002 in accordance with Water Licence IN89-002 (the "Licence") and the site water monitoring protocol. This report presents the data that was gathered and an overview interpretation of the information.

Anvil Range Mining Corporation ("ARMC") entered into receivership in April 1998 and, since that time, management of the mine site has been under the direction of Deloitte and Touche Inc. acting as court appointed interim receiver.

Surface and ground water monitoring was conducted by ARMC according to or in excess of the schedule for "temporary cessation of operations", as appropriate, and the results are presented in this report. The biological and sediment monitoring program which is required every second year was not required in 2002, but is scheduled for 2003. The annual geotechnical inspection was completed SRK (Canada) Inc. and their full report is appended. The water treatment plant was reactivated in 2002 (the first year of operation since 1997) and a performance review of the water treatment plant for 2002 is provided.

Mining activities in the Grum and Vangorda Open Pits were suspended in January 1998 and the shut down continued through 2002. Known economic ore reserves in the Vangorda open pit had been depleted at the time of the shut down. Water was pumped from the Vangorda pit during the summer of 2002 for treatment and release to the environment. Little Creek dam pond was dewatered into the Vangorda pit as per the established care and maintenance procedure. The water level in the Grum pit was monitored and was observed to rise due to precipitation and other inflows.

Water quality entering Vangorda Creek was in compliance with the Licence with the exception of one isolated sample (total suspended solids) that is described in this report. Seepage from the Grum rock dump continued to flow into either Grum Creek or the Moose pond and seepage from the Vangorda rock dump continued to be collected in Little Creek Dam.

Several physical maintenance tasks were completed in 2002 including the removal of sloughed soil from the Vangorda Creek diversion flume.

One technical advisory committee meeting was held in 2002 at the minesite that included tours of the minesites. The primary topics discussed at the meeting included current environmental issues and on-going environmental management through the shut down period. A licence amendment application that is primarily composed of "housekeeping" issues was outstanding at year-end.

Table of Contents

List of Figures

List of Tables

Appendices

1. 2002 Water Quality Listing
2. Steffen Robertson and Kirsten (Canada) Inc., *2002 Annual Inspection, Waste and Water Management Facilities, Vangorda Mine, Yukon Territory*, February 2003
3. 2002 Technical Advisory Committee Meeting: Agenda, Summary , Attendees

1. Introduction

1.1 General Introduction

This annual environmental report has been prepared as required by Part A Section 9 of Water Licence IN89-002 (the "Licence"). This report provides estimated water quantities used during 2002 and an interpretation of trends and variations in water quality data. Anvil Range Mining Corporation entered into receivership in April 1998 and, since that time, the mine site has been under the management of Deloitte and Touche Inc. as court appointed Interim Receiver of Anvil Range Mining Corp. ("Deloitte & Touche"). This report, including all data presentations and interpretations, was prepared by Gartner Lee Limited ("Gartner Lee") based on information provided by Anvil Range Mining Corp. ("ARMC"), Laberge Environmental Services and Steffen Robertson and Kirsten (Canada) Inc. ("SRK").

Since their appointment in April 1998, the Interim Receiver has successfully maintained compliance with the terms of the water licenses by implementing a broad scope of tasks related to environmental protection and environmental monitoring, which have included:

- Pumping and treatment of water from the Vangorda pit and Little Creek Dam pond (treatment initiated in 2002).
- Compliance with the effluent discharge criteria in the water licenses.
- Water quality, biological and physical stability monitoring in accordance with and in excess of terms of the water licences.
- Preparation and submission to the Yukon Territory Water Board of monthly water quality reports and annual environmental reports.
- Removal of PCB containing equipment and used oil from the mine sites.
- Technical Advisory Committee (TAC) meetings and stakeholder consultation.
- Physical maintenance and upgrading of water retention and diversion structures.
- Initiation of planning for long-term mine reclamation.

This report presents results of surface and ground water quality monitoring per the Licence. All of the field information, unless stated otherwise, was gathered by ARMC. The biological monitoring and sediment sampling program in Vangorda Creek was not required in 2002. The physical monitoring program described in the Licence was performed in 2002 by SRK and their full report is appended.

Open pit mining activities were suspended in January 1998 and remained suspended through 2002. At the time when mining activities were suspended, the known economic ore reserves in the Vangorda open pit had been depleted. During previous mine operations, ore from the Vangorda and Grum open pits was trucked approximately 13 km to the Faro concentrator plant where tailings were deposited in the mined out Faro pit. There has been no tailings deposition at the Vangorda Plateau minesite. Activities at the Faro site are reported separately under Water Licence QZ95-003.

No water was pumped from either the Grum pit during 2002. The water treatment plant was reactivated in the summer of 2002 to treat water pumped from the Vangorda pit via the overland pump and pipe system that was installed in 2001. This was the first year operation of the water treatment plant since the January 1998 mine shut down. Some minesite surface run off water entered Vangorda Creek via the Grum interceptor ditch and Grum Creek.

Water quality monitoring locations are illustrated on Figures 1 and 2 and are listed on Table 1. Analytical results for 2002 for all parameters analysed are listed in Appendix 1 with statistical summaries.

Two earthquakes, one centred in Alaska and one centred a few 10's of kilometres north of the town of Faro, took place on November 3rd and 10th. All dams and earth structures were inspected immediately following each event in consultation with the professional geotechnical engineer and no immediate concerns were noted. The ice in the Vangorda pit was broken as a result of the November 5th event, however, and the position of the floating barge had shifted.

An environmental compliance and occupational health and safety review was conducted in the summer of 2002 by Deloitte and Touche Risk Management Services group. The audit resulted in a number of recommendations and an action plan was prepared in response to the recommendations.

A third party professional review of all water retention dams on the mine property, including Little Creek Dam, was conducted by Klohn-Crippen following protocols described by the Canadian Dam Association. No issues of critical concern were identified although a number of recommendations were provided including the development of an updated emergency response plan, which was under development at the time of writing of this report.

1.2 Overview Of Mine Water Management Systems

The mine water management system is illustrated on Figure 2.

Clean water is diverted around the Grum pit via the Grum interceptor ditch. The interceptor ditch collects water from the slopes above the Grum Pit as well as water pumped from the deep wells (during mine operations pre-1998) along the eastern perimeter of the pit. In addition, water discharged from the water treatment plant clarification pond enters the interceptor ditch

Water from the Grum interceptor ditch passes into two settlement ponds referred to as the Sheep Pad Ponds. A smaller pond allows for initial settlement of coarser heavier particles and for dissipation of flow energy. The main pond (Sheep Pad Pond) provides retention time for settlement of finer particles. The Sheep Pond outflow passes into Vangorda Creek at the plunge pool above the haul road.

During previous mine operations, dewatering of the Grum pit was accomplished in several ways. Water was pumped from deep wells located around the eastern perimeter of the pit in an attempt to intercept groundwater prior to its' entering the pit. Water pumped from these deep wells was directed into the

Grum interceptor ditch. Dewatering of the underground exploration workings below the Grum pit was performed via wells into the workings drilled from within the pit. In 1997 and 1998, some of the underground workings were intercepted by pit development and dewatering of the underground workings in isolation from the pit was no longer possible. Water pumped from the underground exploration workings and any other water that accumulated in the pit was pumped to the water treatment plant holding pond prior to pumping into the plant for treatment.

Grum Creek contains water from only a portion of its' original watershed due to re-routing of surface water and interception of groundwater in the Grum open pit. A portion of the remaining Grum Creek flow has been diverted, since 1996, towards a settlement pond referred to as the Moose Pond which is a natural swale in sandy gravely soil that is bermed at the downstream end. Use of this diversion is intended to minimize suspended sediment loadings entering Vangorda Creek via Grum Creek. To date when the Moose Pond diversion has been in-place, the diverted Grum Creek water has seeped into the ground and there has been no accumulation of water in the Moose Pond.

Water is diverted around the Vangorda Pit via the Vangorda north east and north west interceptor ditches as well as through a diversion of Vangorda Creek. The Vangorda north east interceptor ditch passes water from the slopes to the north east of the pit into Shrimp Creek which, in turn, reports to the Main Fork of Vangorda Creek. The north west interceptor ditch diverts water from the north west slopes into a settlement/groundwater recharge basin with overflow from the basin entering the plunge pool above the haul road. Vangorda Creek is diverted around its' natural channel via a half culvert flume which discharges into the plunge pool above the haul road. Vangorda Creek is then returned into its' original channel below the haul road.

Prior to the depletion of economic ore reserves in the Vangorda open pit in 1998, the Vangorda open pit was dewatered into Little Creek Dam from which location water was subsequently pumped to the water treatment plant. Since the depletion of known economic ore reserves and during the current cessation of mining activities, run off water which accumulates in Little Creek Dam has been pumped into the mined out Vangorda open pit in order to maintain an appropriate water level in Little Creek Dam. The run off water which accumulates in Little Creek Dam is typically non-compliant for zinc and other parameters due, in part, to the presence of surface run off and seepage from the Vangorda rock dump which enters Little Creek Dam via a dump seepage collector ditch. Beginning in 2002, water that accumulates in the Vangorda pit is pumped to the water treatment plant where it is released (based on achieving compliance with the Licence) into Vangorda Creek via the Grum Interceptor Ditch.

Figure 1: Vangorda Plateau Drainage and Monitoring Locations

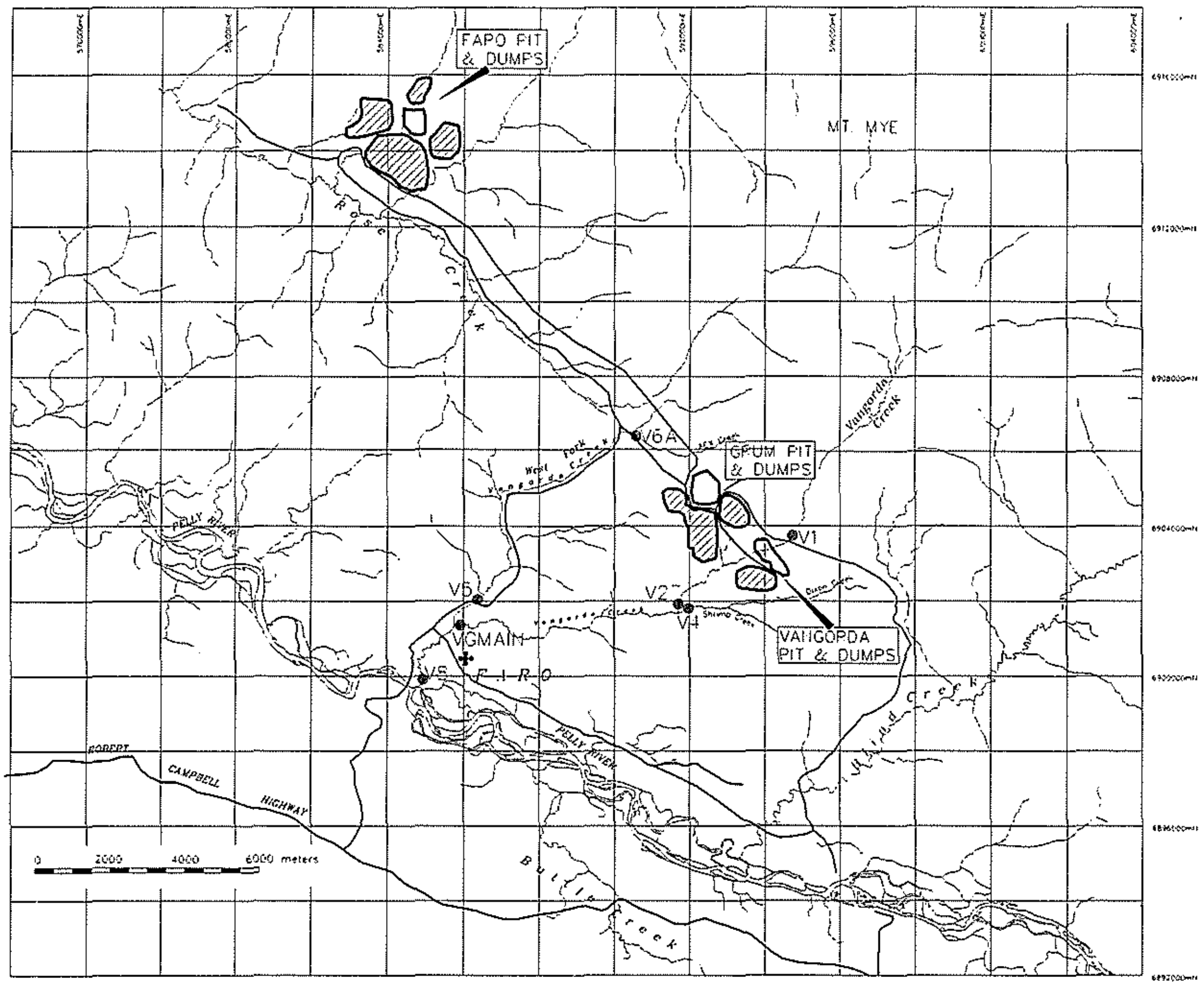


Figure 2: Water Quality Monitoring Locations

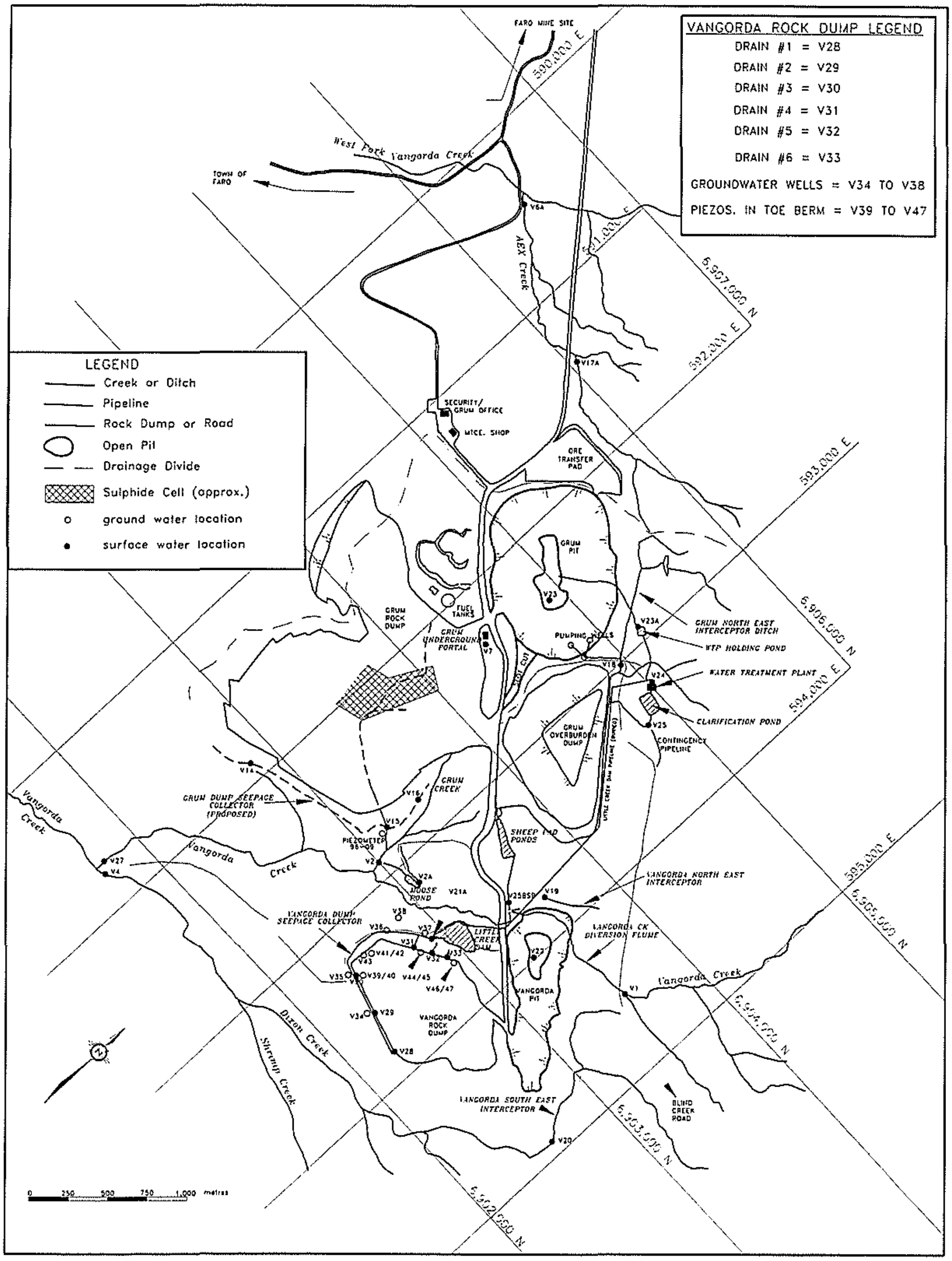


Table 1: Water Quality Monitoring Locations

V1	Vangorda Creek, upstream from the mine and Blind Creek road.
V2	Grum Creek, upstream from its confluence with Vangorda Creek.
V2A	Grum Creek diversion to Moose Pond.
V4	Shrimp Creek, upstream from its confluence with Vangorda Creek.
V5	West Fork of Vangorda Creek upstream of mine access road.
V6A	A small tributary (AEX Creek) to the west fork of Vangorda Creek.
V7	Overflow from the Grum portal.
V8	Vangorda Creek near the bridge to Faro town water supply.
V14	Southwest sump Grum main waste dump.
V15	Sulphide cell sump Grum main waste dump.
V16	Southeast sump Grum main waste dump.
V17	Grum Interceptor Ditch when interceptor wells are pumping.
V17A	Surface drainage from the northern side of the Ore Transfer Pad at the upstream side of the Vangorda haul road.
V18	Grum southeast interceptor ditch, when interceptor wells are pumping.
V19	Vangorda pit northwest interceptor ditch.
V20	Vangorda pit southeast interceptor ditch.
V21	Vangorda Waste Dump collector sump (middle).
V21A	Vangorda waste dump collector ditch at the discharge into Little Creek Dam.
V22	Vangorda pit water and Vangorda Lake at closure.
V23	Grum pit water and Grum Lake at closure.
V23A	Grum Pit water in the Grum external sump
V24	Influent to treatment plant.
V25	Effluent from treatment plant at clarification pond outflow.
V25BSP	Outflow from the Sheep Pad Pond just above the Vangorda Creek plunge pool.
V26	"Little Creek" between Vangorda pit and waste dumps.
V27	Main stem of Vangorda Creek upstream of the confluence with Shrimp Creek.
V28 to V33	Vangorda Rock Dump Drains #1 through #6.
V34 to V38	Groundwater wells GW94-01 through GW94-05 below Vangorda rock dump.
V39, V40	Piezometers P94-01a and P94-01b on Vangorda dump toe berm.
V41, V42, V43	Piezometers P94-02a, P94-02b and P94-02c on Vangorda dump toe berm.
V44, V45	Piezometers P94-03a and P94-03b on Vangorda dump toe berm.
V46, V47	Piezometers P94-04a and P94-04b on Vangorda dump toe berm.

2. Water Use

Water Licence IN89-002 permits the use of up to 3.5 million Igpd (Imperial gallons per day) or 5.8 million m^3 per year of water for storage, diversion and return. The total water usage includes water passed through the water treatment plant, water diverted in the Vangorda Creek diversion flume, water diverted in the Grum interceptor ditch, and water accumulated ("stored") in the Grum and Vangorda open pits.

In total, the water estimated for these purposes during 2002 was less than the allowable quantity as summarized on Table 2. This apparent under use of water is unusual for the Vangorda Plateau since the flow in the Vangorda Creek diversion flume, which is out of the control of mine management, is typically greater than the allowable quantity. Since the flow through the Vangorda Creek diversion flume and the Grum Interceptor Ditch were not directly measured frequently enough to allow an accurate calculation of annual flow, the estimated "normal" flow calculated from hydrology data was used (the annual precipitation for 2002 was 81% of "normal").

The quantity of water that was pumped from the Vangorda pit is estimated at 894,000 m^3, based on the installed pumping rate of 2,000 USgpm. This quantity includes local area runoff and net groundwater inflows captured into the pit plus water pumped from Little Creek Dam.

During 2002, run off water which accumulated in Little Creek Dam was pumped into the Vangorda pit. There were two periods of pumping in 2002 during May and August when an estimated total of 35,000 m^3 of water was pumped into the Vangorda pit at an estimated pumping rate of 34 litres per second (540 USgpm). A portable submersible pump was utilized operating from a portable diesel generator.

The quantity of water that accumulated in the Grum open pit in 2002 is roughly estimated at 175,000 m^3, based on annual average hydrologic data. The water elevation in the Grum pit is estimated from local benchmarks and a more precise system of water elevation measurement is planned for implementation in 2003. The water elevation in the Grum pit remained well below the pit perimeter in 2002.

Table 2: 2002 Estimated Water Use

Use for Storage, Diversion and Return in 2002	Estimated Quantity ('000 m^3)
Vangorda Creek diversion[1]	3,462
Location V25BSP below Sheep Pad pond[1]	539
Pumped from Vangorda pit	894
Stored in Grum pit[1]	175
Total Water Use	5,070
Other Water Quantities in 2002	**Estimated Quantity ('000 m^3)**
Net Uncontrolled Inflows into Vangorda pit[2]	389
Pumped from Little Creek Dam into Vangorda Pit[2]	35

NOTE: 1. These quantities estimated as "average annual flows" from hydrologic data.
2. These quantities included in the quantity "Pumped from Vangorda pit".

3. Open Pits and Rock Dumps Water Quality

The Interim Receiver, in consultation with Gartner Lee Limited, have established a site-specific water quality monitoring program which provides for:

Routine collection of the data specified in the water licences for temporary cessation of operations.
Routine collection of data that is beneficial for efficiently managing the environmental protection programs and monitoring of local environmental effects.
Flexibility to adapt to immediate information needs through the short-term incorporation of additional sampling locations.

As an example of data collected in excess of the requirements of the water licences, the monitoring program includes routine sampling in lower Vangorda Creek to provide information regarding water quality in the area of fish habitat just prior to entry into the Pelly River.

The monitoring program also makes extensive use of the unique capability for high-quality, on-site zinc analyses to provide immediate feedback to site managers regarding effluent quality. On-site analyses of effluent zinc concentrations are conducted on a daily, or more frequent, basis when treated effluent is being released.

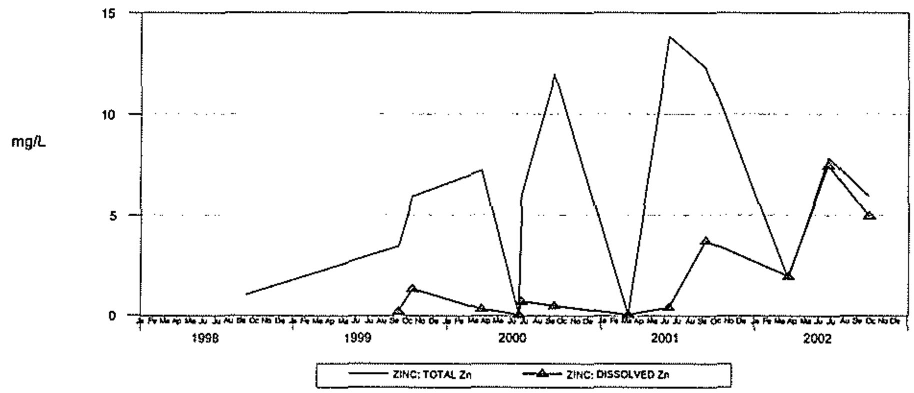
3.1 Grum Open Pit (V7, V17, V23, V23A)

Location V7 is outflow from the underground exploration workings. There was no flow at this location during 2002 and no samples were collected. The deep dewatering wells at the perimeter of the Grum open pit were not installed and, therefore, no samples were collected at location V17 during 2002.

Water quality in the Grum open pit has been monitored at both location V23 (pit pond) and location V23A (Grum pit water holding pond). Location V23A was monitored routinely during mine operations because it represented the combination of all sources in the pit such as various collection sumps and the underground workings. Location V23 has been routinely monitored since mine shut down (February 1998) because it represents the accumulation of water in the pit in the absence of dewatering activities.

Three samples were collected at location V23 (pit pond) in 2002, in March, June and September. The samples were collected as grab samples from the surface of the pond. The concentrations of total and dissolved zinc ranged from 1.81 mg/L to 7.82 mg/L and from 1.93 mg/L to 7.44 mg/L, respectively. The concentrations of total and dissolved zinc continued, in 2002, a general increasing trend that has been occurring since mine shut down in 1998. Of particular note is that the difference between concentrations of total and dissolved zinc has been reduced such that, in 2002, they were very close (Figure 3). An increase in zinc is considered reasonable and is attributed to the flushing of residual contaminants from broken mineralized material in the lower pit benches as the water elevation rises. The concentration of sulphate ranged from 133 mg/L to 459 mg/L in 2002, which continues a stable trend since 1998 with no apparent increasing or decreasing trends.

Figure 3: Grum Pit Pond (V23) Total and Dissolved Zinc



3.2 Grum Rock Dump (V14, V15, V16, P96-A/B)

3.2.1 Seepage

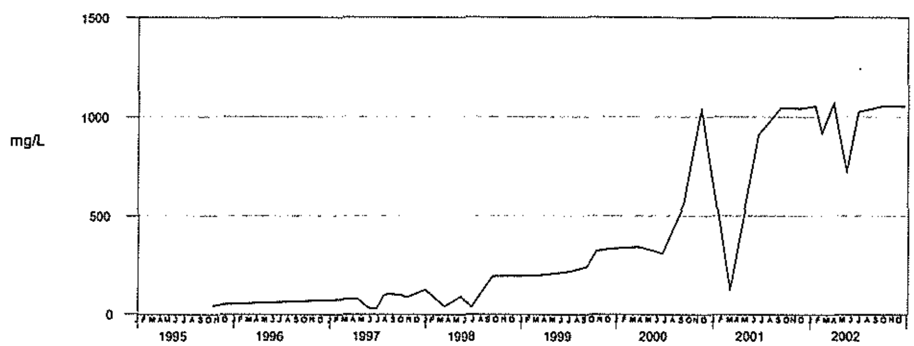
Locations V14, V15 and V16 are surface seepages at the toe of the ultimate (per design) Grum rock dump area. Locations V14 and V16 are not currently specifically located in the field but would become defined as part of possible future construction of a toe seepage collector ditch.

Nonetheless, one sample was collected at each of V14 and V16 in June 2002 as part of a spring seep survey at their assumed locations. Locations V14 and V16 returned concentrations of total zinc and dissolved zinc of 0.003 mg/L and 0.019 mg/L, respectively and <0.001 mg/L each. The sulphate concentrations at locations V14 and V16 were 1,619 mg/L and 556 mg/L, respectively.

Location V15 is located in a small draw which naturally collects some surface flow below the rock dump including the area occupied by the sulphide cell. A small sump or "sediment trap" was constructed at this location in the past to collect flow and encourage some settlement of suspended sediments. Flow from this location enters Grum Creek upstream of monitoring location V2.

Eight samples were collected at location V15 in 2002. The concentrations of total and dissolved zinc were relatively low and ranged from <0.001 mg/L to 0.37 mg/L each. The peak concentration of total suspended solids (42 mg/L in September) was modest compared to previous years and did not correspond to the peak concentrations of zinc. The concentration of sulphate ranged from 717 mg/L to 1,067 mg/L in 2002 (Figure 4). A general increasing trend in the concentration of sulphate is evident from 1995 (beginning of sample record) to 2002, which could be related to the influences of run off from the rock dump or to natural ground water that may discharge to surface in the general area. There has been neither a corresponding increase in the concentrations of total or dissolved zinc.

Figure 4: Grum Rock Dump Seepage (V15) Sulphate



3.2.2 Ground Water

Groundwater wells P96-9A and P96-9B are nested in one drill hole in a bedrock valley at least 20 m deep near surface monitoring location V15. The ground water wells allow monitoring of ground water flow that is assumed to originate, in part, from the portion of the Grum rock dump that includes the sulphide cell. The deeper installation (P96-9B) which is screened over the interval from 16.5 to 18.0 m below surface initially flowed during summer and fall (i.e. piezometric head higher than the ground elevation) but was inoperable in 2002 due to presumed damage to the standpipe related to ground movement or collapse of the hole.

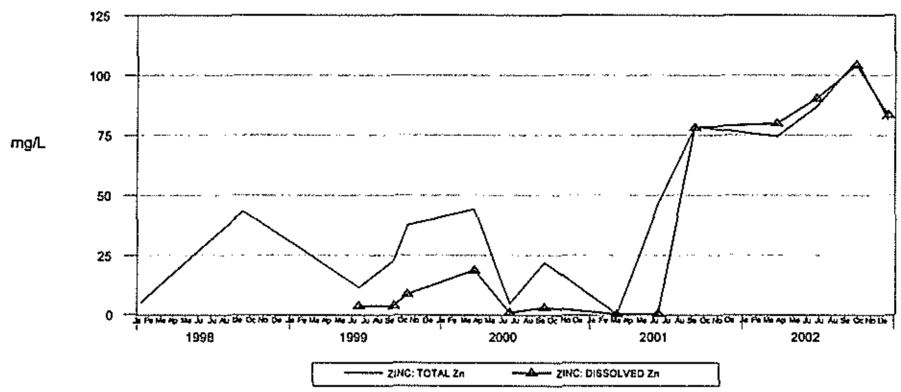
Piezometer P96-A (shallow) was sampled twice in 2002, in June and September. The concentrations of dissolved zinc were both less than 0.03 mg/L the concentrations of sulphate were 1,420 mg/L and 1,280 mg/L, in June and September, respectively. An increasing trend in sulphate in well A (shallow) is apparent from 2000 through 2002.

3.3 Vangorda Open Pit (V22)

Vangorda pit water is monitored at location V22. During the period of active mining (pre-1998) when pit dewatering was underway, location V22 was sampled at the outflow of the dewatering pipe. Following the suspension of mining activities (and dewatering) in February 1998, location V22 has been sampled in the pit pond. The water that has accumulated in the Vangorda open pit since mine shut down has included natural inflows, water pumped periodically from Little Creek Dam and water syphoned periodically from the Sheep Pad pond.

Four samples (quarterly) were collected at location V22 in 2002. These samples were collected as grab samples from the surface of the pit pond. The concentrations of total and dissolved zinc ranged from 74.1 mg/L to 106.1 mg/L and from 79.7 mg/L to 104.2mg/L, respectively. The concentrations of sulphate ranged from 734 mg/L to 869 mg/L, in 2002. Elevated concentrations of zinc began to be observed in late 2001 (Figure 5) that could, possibly, be related to the interception, at that time, of clean water inflows from the old Vangorda Creek channel. The concentrations of sulphate, in 2002, were within the ranges observed since 1998. Zinc concentrations were observed to increase with depth in a 2000 pit survey and it is possible that the wide range in zinc concentrations in surface grab samples may be affected by seasonal effects such as pond turnover.

Figure 5: Vangorda Pit Pond (V22) Total and Dissolved Zinc



The water level in the Vangorda pit reached the maximum desired elevation early in 2002, as anticipated. This elevation provides for emergency storage below the overflow elevation to accommodate unforeseen events. In response to the pit pond water elevation, water was pumped from the pit to the water treatment plant and, subsequently, released to Vangorda Creek such that the pit pond water level was lowered by approximately 40 feet from July to September. The pumping and release of water is further described in the Water Treatment Plant Performance Review that is documented in Section 8 of this report.

3.4 Vangorda Rock Dump (V28 to V47, LCD, V21, V21A, V26, LCD)

3.4.1 Seepage

Six transverse drains were constructed in 1994 that pass toe seepage from the Vangorda rock dump through the till containment berm that rings the dump. These six drains represent monitoring locations V28 through V33. The quantity of water flowing from the drains in 2002 continued to be low with a maximum measured flow in 2002 of only 0.1 Lps. Water quality in the drains that were sampled continued to show high metal concentrations and sulphate at continued neutral pH with the exception of drain #5 where pH was acidic (3.3 in June 2002).

Seepage flow was sampled, in 2002, once (June) at drain #2 and twice (June and September) at drains #3, #5 and #6. No flow was present at drain #1 (V28) and this drain is considered inoperable. No flow was observed at drain #4 (V31). Flow at drain #2 (V29) has typically been intermittent and present only during some freshets and has not been sampled regularly. The flows observed at drain #3 and drain#5 (V32) are typically consistent through the spring/summer/fall season but winter flows are erratic. The flow at drain #6 (V33) has been erratic in the past. However, maintenance/ cleaning of sloughed soil in the vicinity of the drain from 1999 to 2001 has improved the flow characteristics.

Water quality at drain #5 was poorest, in 2002, and water quality at drain #2 (June) and drain #3 (September) was best, as has been observed consistently in recent years. The poorer water quality that has been consistently observed at drains #5 and #6 relative to drains #2 and #3 is attributed, in part, to the location of the drains wherein drains #5 and #6 are located in the (assumed) seepage path of the sulphide cell area of the Vangorda rock dump and drains #2 and #3 are located predominantly in the (assumed) seepage path of the phyllite cell.

The concentrations of dissolved zinc at drains #2, #3, #5 and #6 were 88 mg/L, 412 mg/L, 6,370 mg/L and 1,650 mg/L, respectively, in June 2002 and the concentrations of sulphate were 2,170 mg/L, 4,400 mg/L, 30,500 mg/L and 13,700 mg/L, respectively. The concentrations of dissolved zinc at drains #3, #5 and #6 were 350 mg/L, 6,990 mg/L and 2,850 mg/L, respectively, in September 2002 and the concentrations of sulphate were 4,070 mg/L, 33,100 mg/L and 23,000 mg/L, respectively.

Little Creek Dam is the collection point for local area run off and precipitation, surface run off from the Vangorda rock dump and toe seepage from the Vangorda rock dump. Prior to the shut down of mining activities in February 1998, the Vangorda pit was dewatered directly into Little Creek Dam and all water was pumped from Little Creek Dam to the water treatment plant for treatment and discharge. Since the mine shut down, including in 2002, water from Little Creek Dam has been pumped into the Vangorda pit. This has been required in a seasonal basis and has occurred once or twice per summer. The water that has accumulated in Little Creek Dam has been non-compliant for total zinc and, therefore, has not been discharged into Vangorda Creek. The pumping procedure has maintained an appropriate water elevation in Little Creek Dam such that the risk of release of non-compliant water was minimized. No water samples were collected from Little Creek Dam in 2002 and the water was assumed to remain non-compliant as was observed in previous years. Water was pumped from Little Creek Dam to the Vangorda pit on two occasions in 2002, in May and July as a means of maintaining the pond water level below the maximum desired elevation.

Location V21A is the discharge end of the Vangorda Dump seepage collector ditch where the ditch empties into Little Creek Dam. Flow at this location is typically nil except during freshet in some previous years. Sampling location V21A has been used in previous years as a substitute for location V21 which is located near the middle of the seepage collector ditch because the likelihood of obtaining sufficient water to sample is greater at the discharge end of the ditch. No samples were collected at either V21 or V21A in 2002.

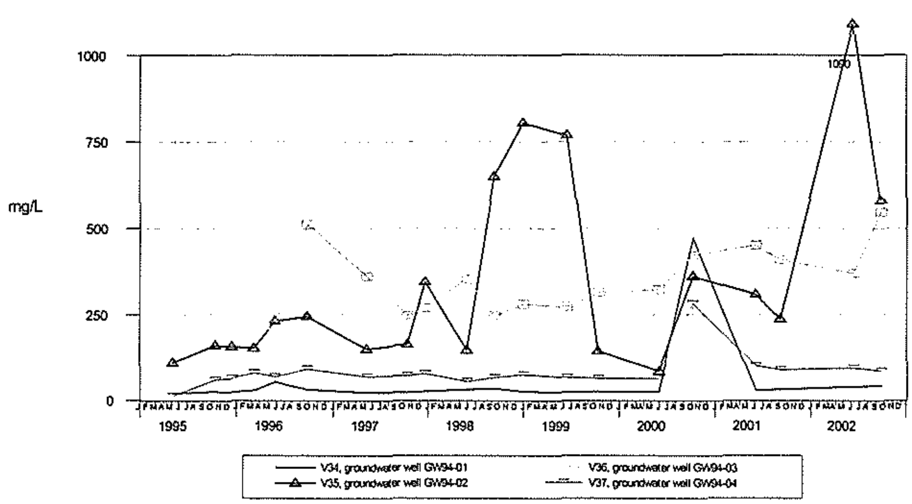
Location V26 is a "Little Creek" between the Vangorda pit and rock dump. This location does not exist and, therefore, no samples were collected.

3.4.2 Ground Water

Standpipe piezometers labeled GW94-01 through GW94-04 (V34 through V37) are located around the toe of the Vangorda rock dump and allow monitoring of ground water seeping below the collector ditch. Each of these piezometers was sampled twice during 2002, in June and September. Piezometer GW94-05 (V38) was not sampled and the reliability of the installation is of concern at this time.

Ground water quality in piezometers GW94-01 through GW94-04 continued, in 2002, to show relatively low metal concentrations. The concentrations of dissolved zinc were all less than 0.03 mg/L in 2002. The concentrations of sulphate in piezometers GW94-01 to GW94-04 ranged from 40 mg/L to 1,090 mg/L in 2002 but remained within or close to the ranges observed since 1994 with no clear increasing or decreasing trends (Figure 6). The concentrations of sulphate in piezometers GW94-02 and GW94-03 continued, in 2002, to be greater than in GW94-01 and GW94-04.

Figure 6: Vangorda Rock Dump Groundwater (V34 to V37) Sulphate



A series of piezometers (P94-01 through P94-04, V39 to V47) are installed in the till berm which surrounds the base of the rock dump and through which the transverse drains pass seepage water. Static water levels in these piezometers were monitored for physical stability assessments but no water quality monitoring was performed in 2002.

Standpipe piezometers P2001-02B and P2001-03 were installed in 2001 below the "nose" of the dump and these were sampled twice in 2002, in June and September. The screened interval in P2001-03 is at the bedrock interface at 61.6 m depth.

Water quality in the initial samples (September 2001) of these wells was relatively good with low concentrations of dissolved zinc (all reported as less than 0.01 mg/L). The concentrations of sulphate in June and September 2002 in the deep well at P2001-03 were 190 mg/L and 143 mg/L, respectively, and were slightly higher in P2001-02B (installed at 13.9 metres) at 175 mg/L and 231 mg/L, respectively. Additional sampling will be required to determine consistency or trends at these locations.

4. Water Quality Entering Vangorda Creek

4.1 Grum Pit Dewatering (V18)

Location V18 is in the Grum interceptor ditch immediately below the point of entry of water pumped from a series of deep dewatering wells around the eastern perimeter of the Grum pit. The dewatering wells were not installed in 2001 and no samples were collected at location V18.

4.2 Water Treatment Plant (V24, V25)

The water treatment plant located near the Grum pit is a conventional lime plant. The treatment process consists of pH modification using lime followed by enhanced settlement of treatment sediments with the aid of flocculant. This process does not reduce ammonia concentrations except, possibly, via retention time in the clarification pond. During periods of past mining operations, the plant has been operated on an as-required basis to maintain acceptable water levels in in-pit sumps, Little Creek Dam pond and the Grum holding pond and the plant performed acceptable well when it was operated.

The water treatment system was operated in 2002 for the first time since mine closure in early 1998. Water was pumped to the plant from the Vangorda pit via the overland pump and pipe system that was installed in 2001. No other sources of water were treated. A large portion of the preparatory work required for reactivation of the water treatment system, including installation of the pumping system and rehabilitation of the Clarification pond, was completed in 2001 as documented in Section 8 of this report.

Location V24 is the inflow to the treatment plant, which consisted only of water pumped from the Vangorda pit in 2002. Water quality described for the Vangorda pit pond (location V22) is representative of water quality entering the treatment plant in 2002.

Location V25 is the outlet of the Clarification Pond (i.e. immediately upon settlement of treatment sediments). One sample was reported from the external laboratory for location V25, in June, which was collected as a check on water quality exiting the Clarification Pond. This sample returned compliant results (0.16 mg/L total zinc) and passed the 96-hour LC_{50} bioassay test (Appendix 1).

In addition, to the chemical analysis at the external laboratory, at least two samples per day were collected and analysed for total zinc at location V25 to verify compliance at this location. All samples were compliant (i.e. less than 0.5 mg/L zinc) during periods of effluent release. Analysis for total zinc is appropriate because site-specific experience has shown that total zinc is the critical parameter for achieving compliance. The in-house analyses utilized professional level AA (atomic absorption) equipment operated by trained assayers. The individual results are available at the mine site and were reviewed on a regular basis by DIAND Water Resources personnel.

In agreement with DIAND Water Resources, location V25BSP was used as the sampling location for external analyses of treated mine effluent for 2002 as being representative of effluent entering Vangorda Creek. Weekly analyses at the external laboratory were undertaken at location V25BSP during periods in 2002 when effluent was being released.

4.3 Grum Creek (V2, V2A)

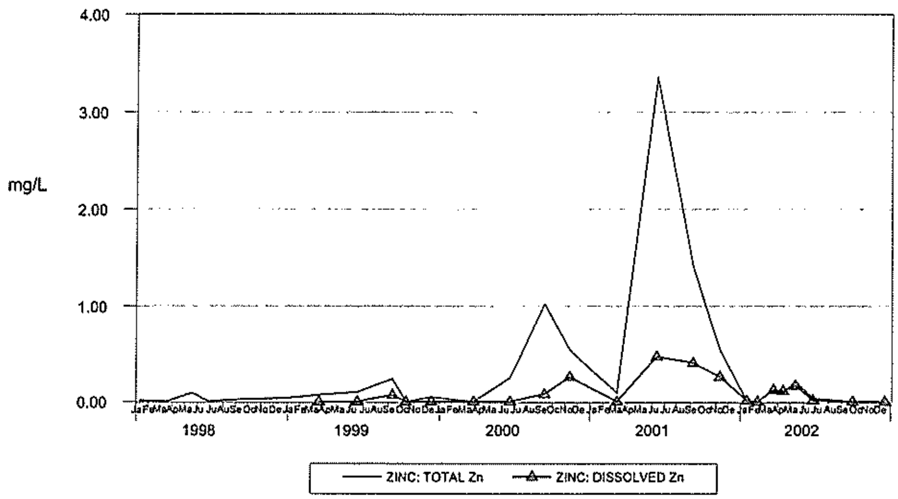
Location V2 is in Grum Creek upstream of entry into Vangorda Creek. The changes to the water management system implemented during 1995 and 1996 diverted a large portion of the Grum Creek catchment area into the Sheep Pad Pond and this, in combination with the interception of shallow ground water by the Grum open pit, reduced the flow in Grum Creek substantially from its original (i.e. pre-mine development) levels.

The changes to the water management system implemented during 1995 and 1996 also allowed the diversion of a portion of the remaining Grum Creek water into the Moose pond where the water is observed to seep into the ground and enter the ground water regime. This diversion was put into place as part of the mitigation plan for reducing suspended sediment loadings entering Vangorda Creek via Grum Creek and remained in place through 2002. The diverted Grum Creek water is sampled at location V2A prior to entry into the Moose pond.

Location V2 was sampled on eight occasions (monthly in ice free months) in 2002. The concentration of total suspended solids at location V2 continued to be improved over previous years prior to about 1996. The concentrations of total suspended solids ranged from 5 mg/L to 24 mg/L in 2002 with the highest concentration reported for December when low flow winter conditions may have resulted in sample contamination with bottom sediments.

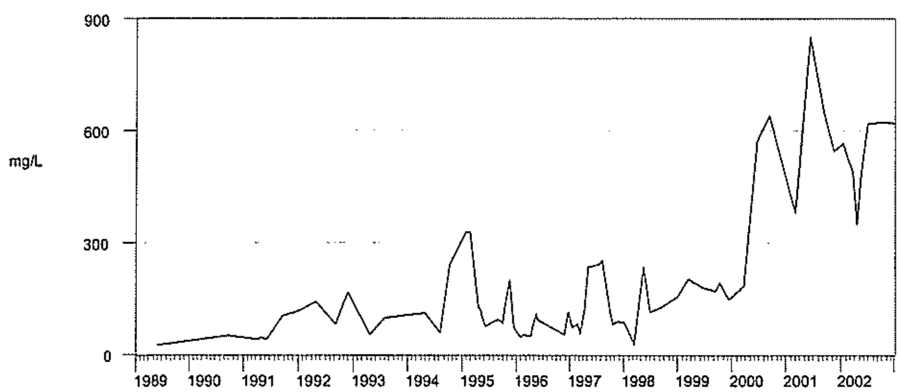
The concentrations of total zinc and sulphate at location V2 in 2002 ranged from 0.01 mg/L to 0.22 mg/L and from 349 mg/L to 622 mg/L, respectively. The concentrations of dissolved zinc were similar to total zinc and ranged from 0.007 to 0.17 mg/L in 2002. The peak concentrations of total zinc and dissolved zinc were all observed in May and were followed by decreasing concentrations in June, September and December. Since mine shut down in 1998, the concentrations of total and dissolved zinc have consistently displayed this trend of peak concentrations in mid-year with the highest peak concentrations reported in 2001 (Figure 7).

Figure 7: Grum Creek (V2) Total and Dissolved Zinc



Conversely to zinc concentrations, the concentrations of sulphate at location V2 were at a minimum in early summer 2002 (April and May) and increased through the remainder of the year (June, September and December). Over the period of record from 1988, sulphate has shown a general increasing trend with one sharp increase having taken place in 2000 (Figure 8).

Figure 8: Grum Creek (V2) Sulphate



Location V2A was sampled on five occasions in 2002 (approximately monthly when flowing). In previous years, water quality entering the Moose Pond via location V2A was similar to that observed at location V2 in Grum Creek. In 2002, this same trend was observed for sulphate but not for zinc and higher concentrations of zinc were observed entering the Moose Pond via location V2A. This is attributed to a new seep from the toe of the Grum rock dump that is captured entirely into the Moose Pond. The concentrations of sulphate at location V2A in 2002 ranged from 512 mg/L to 696 mg/L, which were similar to those observed at location V2. The concentrations of total and dissolved zinc at location V2A in 2002 ranged from 0.32 mg/L to 1.10 mg/L and from 0.28 mg/L to 1.01 mg/L, respectively. The highest zinc concentrations (greater than 0.35 mg/L) were observed in June and July and were followed by decreasing concentrations through the remainder of the year (September, October and December). In agreement with DIAND Water Resources, this water was managed by enabling it to go to ground in the Moose Pond while undertaking additional data collection to assess trends and consistency.

4.4 Vangorda Creek Plunge Pool (V19, V25BSP)

Location V19 is the Vangorda north west interceptor ditch which drains into Vangorda Creek at the plunge pool. A sump was built in 1996 near the discharge end of the V19 ditch that allows the low flows of ditch water to seep into the ground, thereby eliminating a flow of potentially high suspended sediment into Vangorda Creek. No outflow from the sump was observed in 2002 and no samples were collected at location V19.

Location V25BSP ("Below Sheep Pond") consists of all water that enters Vangorda Creek via the Sheep Pad Pond including water discharged from the water treatment plant/clarification pond. Location V25BSP is not currently included in the Licence but is necessary to monitor water quality entering Vangorda Creek from the Sheep Pad pond.

In agreement with DIAND Water Resources, location V25BSP was used as the sampling location for external analyses of treated mine effluent for 2002 as being representative of effluent entering Vangorda Creek. Therefore, weekly sampling was undertaken at location V25BSP during periods in 2002 when effluent was being released.

There was no outflow at location V25BSP early in 2002 (winter season) to about mid-May, as is typical for this location, and there was no flow after about mid-November, which is also typical for this location. However, water was pumped from the Sheep Pad Pond in February as a preventative measure to create storage volume and increase retention time for the initial freshet inflows that might contain elevated levels of suspended solids. In-House analyses of total suspended solids were conducted on a daily basis at that time to confirm that concentrations were compliant with the Licence discharge criteria (i.e. less than 15 mg/L) and these analyses are available at the mine site and were reviewed by DIAND Water Resources personnel.

A total of 13 samples were collected at location V265BSP from mid-May to mid-November for analysis at the external laboratory (Appendix 1) as described below.

The concentration of total suspended solids at location V25BSP was slightly elevated above the Licence maximum allowable discharge limit of 15 mg/L on one occasion in 2002 (June 12 when the concentration of total suspended solids was 17 mg/L). This continued a general improvement that has taken place in recent years regarding suspended sediments levels which is attributed, to a large degree, to the upgrade to the Grum Interceptor Ditch that was implemented in 2001. The concentrations of total and dissolved zinc at location V25BSP ranged from 0.06 mg/L to 0.34 mg/L and from 0.03 mg/L to 0.34 mg/L, respectively, in 2002, which were all less than the License discharge criteria of 0.5 mg/L (Figure 9). The concentrations of sulphate ranged from 54 mg/L to 810 mg/L, which tracked the presence of water treatment plant effluent as slightly elevated sulphate levels (Figure 10).

Figure 9: Below Sheep Pad Pond (V25BSP) 2002 Total and Dissolved Zinc

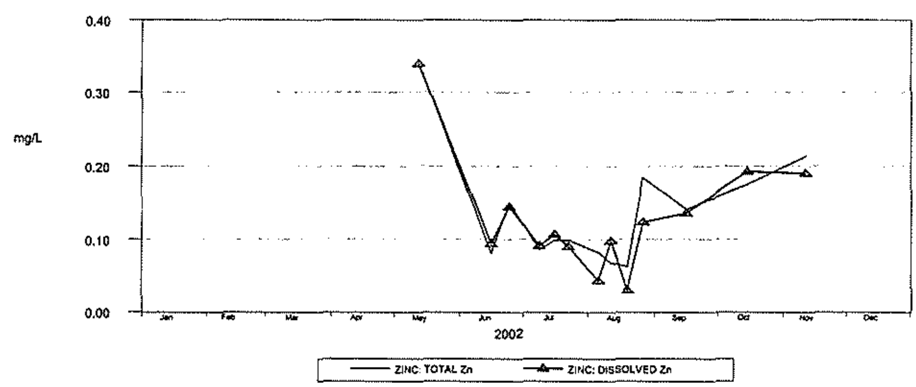
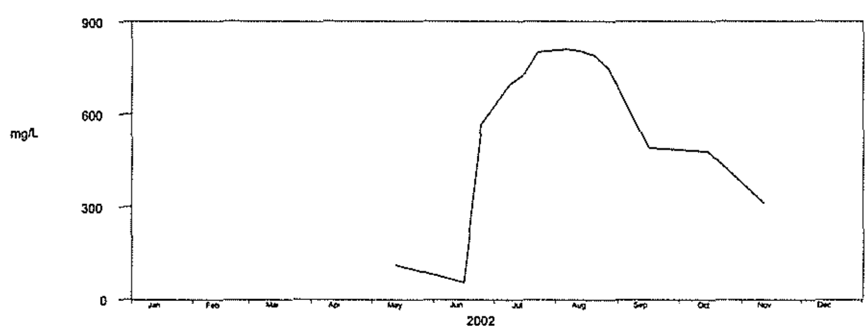


Figure 10: Below Sheep Pond (V25BSP) 2002 Sulphate



4.5 AEX Creek (V17A, V6A)

Location V17A is not currently included in the Water Licence but is sampled at a small stream that contains natural run off from the slopes north of the Grum pit as well as surface run off from the north side of the Ore Transfer Pad. This stream then passes into AEX Creek.

Three samples were collected at location V17A in 2002, in June, September and December. The concentrations of total zinc and sulphate continued, in 2002, to be relatively low and ranged from 0.01 mg/L to 0.02 mg/L and from 11 mg/L to 57 mg/L, respectively.

Location V6A is AEX Creek immediately upstream of its entry into the West Fork of Vangorda Creek. This water includes the tributary sampled at location V17A. Location V6A was sampled on three occasions in 2002, in June, September and December. The concentrations of total zinc were all less than 0.013 mg/L and the concentration of sulphate ranged from 19 mg/L to 50 mg/L. These concentrations were similar to those observed since mine shut down in 1998.

5. Receiving And Background Water Quality

5.1 Shrimp Creek (V4, V20)

Location V4 is Shrimp Creek upstream of the confluence with the Main Fork of Vangorda Creek. This location provides reference information regarding background water quality.

Location V4 was sampled on two occasions in 2002, in June and September. The concentrations of total and dissolved zinc remained in the established low range and were all less than 0.022 mg/L. The concentrations of sulphate were less than 49 mg/L.

Location V20 is near the downstream end of the Vangorda northeast interceptor ditch, which passes clean run off water that would originally have flowed directly into Vangorda Creek around the east and south sides of the Vangorda pit and rock dump area. This diverted water enters Shrimp Creek upstream of monitoring location V4. Flow at location V20 has, in recent years, been intermittent and an investigation conducted in 2002 identified the cause of this poor performance as ditch leakage into the Vangorda pit. In response to identifying this poor ditch performance, physical maintenance work was performed to the ditch in the summer of 2002, which resulted in the effective diversion of all water around the Vangorda pit, per the design intent for the ditch. This maintenance work is anticipated to provide for more consistent flow at location V20 in the future.

Two water samples were collected at location V20 in 2002, in June and September. The concentrations of total and dissolved zinc continued, in 2002, to be low and were all less than 0.018 mg/L with the exception of one anomalous high value of 0.074 mg/L dissolved zinc, which is considered to be inaccurate. The concentrations of sulphate remained, in 2002, very low and were less than 13 mg/L.

5.2 Upper Vangorda Creek (V1, V27)

"Upper" Vangorda Creek is the primary receiving water for mine site discharges and is sampled upstream of mine activities at V1, and locally downstream of mine activities at V27 above the confluence with Shrimp Creek. There is no known fish habitat in "upper" Vangorda Creek due to downstream impasses near the town of Faro.

Location V1 is the Main Fork of Vangorda Creek immediately upstream of mine activities. This location provides information regarding background water quality upstream of the mine site.

There were four samples (quarterly) collected at location V1 during 2002. The concentrations of sulphate and hardness ranged from 5 mg/L to 13 mg/L and from 22 mg/L $CaCO_3$ to 66 mg/L $CaCO_3$, respectively. Water at location V1 is typically softer than at the other upstream reference location in Shrimp Creek (location V4) due to the characteristics of certain rock types (esp. calcareous phyllite) in the drainage area and this trend continued in 2002. The concentration of total zinc at location V1 was measurable on two of the four sampling occasions and was less than 0.04 mg/L. The concentrations of total zinc and sulphate in 2002 were within the ranges observed at this location since 1990.

Location V27 is the Main Fork of Vangorda Creek upstream of the confluence with Shrimp Creek and provides information regarding the impact on Vangorda Creek from mining activities on the Vangorda Plateau. All surface water from the Grum rock dump, the Grum interceptor ditch/Sheep Pad Pond, and the Vangorda north east interceptor ditch reports to location V27 via Grum Creek or the Vangorda Creek plunge pool. Extremely steep terrain creates unsafe access to this sampling location at some times of the year (especially winter and freshet) and water sampling is conducted accordingly, with maximum recognition of worker safety.

There were two samples collected at location V27 during 2002, in June and September. The concentrations of total zinc and dissolved zinc were 0.18 / 0.11 mg/L and 0.15 / 0.10 mg/L, in June / September and the concentrations of sulphate were 125 / 46 mg/L. These concentrations were within the ranges observed since 1991 although the zinc concentrations were slightly elevated above the ranged observed since mine closure in 1998.

5.3 Lower Vangorda Creek (V5, VGMAIN, V8)

"Lower" Vangorda Creek is defined here as the juvenile fish rearing habitat in the first 1 to 2 km above the Pelly River and downstream of the confluence of the West and Main Forks. Water quality in lower Vangorda Creek is monitored at location V8.

The West Fork of Vangorda Creek represents natural run off and some minesite drainage originating from location V6A in AEX Creek, the Vangorda ore haul road and a calcareous phyllite portion of the Grum rock dump. Water quality in the West Fork of Vangorda Creek is monitored at location V5.

The Main Fork of Vangorda Creek represents natural run off including Shrimp Creek via location V4 plus drainage from the mine site via location V27. Water quality in the Main Fork of Vangorda Creek is monitored at location VGMAIN.

Water quality information that was collected in 2002 for each of locations V5, VGMAIN and V8 is described in the following sections 5.3.1 to 5.3.3, respectively. Additional information regarding water quality in Lower Vangorda Creek in a longer-term context is described in Section 5.4.

5.3.1 West Fork (V5)

Location V5 is the West Fork of Vangorda Creek just upstream of the confluence with the Main Fork. Location V5 receives drainage from AEX Creek (location V6A) and, thereby, potential influences from surface drainage from the north portion of the Ore Transfer Pad. Both AEX Creek and the West Fork of Vangorda Creek receive run off from the Vangorda ore haul road and the mine access road. Road maintenance activities such as re-surfacing or application of dust suppression products or spills could potentially affect water quality at V5. There is a small portion of the Grum calcareous phyllite rock dump that drains into the West Fork of Vangorda Creek between AEX Creek and location V5. This portion of the Grum rock dump does not include any part of the sulphide cell.

There were 14 samples collected at location V5 during 2002, approximately monthly. The concentration of total suspended solids ("TSS") ranged from 3 mg/L to 195 mg/L, which was within the range observed in previous years and the peak value was lower than was observed in 1999 and 2000. Elevated concentrations of TSS through freshet or due to specific events have been observed at location V5 in previous years that are attributed primarily to natural sources such as the debris flow that entered the creek in 2000 near the "old ski hill". For example, exclusion of the two peak concentrations (May and mid-June) of TSS from the 2002 data, then the next highest concentration is 31 mg/L in late June.

Concentrations of total and dissolved zinc at location V5 were not elevated in 2002 in concert with the elevated TSS, indicating that the source of the total suspended solids is not also releasing zinc into the creek. The concentrations of total and dissolved zinc were all less than 0.04 mg/L, which is within and at the low end of the range observed in previous recent years.

The concentrations of sulphate and hardness at location V5 continued to exhibit a general seasonal trend during 2002 in which these concentrations were greater during the winter season when surface run off was at a minimum. This trend is attributed to the presence in the West Fork catchment area of certain rock types (esp. Red River, Earn Group and Vangorda Formation) that influence surface run off and ground water discharge to surface. The concentrations of sulphate and hardness at location V5 ranged from 43 mg/L to 266 mg/L and from 170 mg/L $CaCO_3$ to 685 mg/L $CaCO_3$, respectively, in 2002.

5.3.2 Main Fork (VGMAIN)

Location VGMAIN is an informal sampling location (not included in the Licence) that is located in the Main Fork of Vangorda Creek immediately upstream of the confluence with the West Fork. This location provides important information regarding the relative impacts of the Main and West Forks on the fish rearing habitat in lower Vangorda Creek. Although Licence location V27 is also in the Main Fork, location V27 is over 6 kilometres upstream of the fish rearing habitat and it is difficult to apply water chemistry data from location V27 in an analysis of lower Vangorda Creek because of the potential for numerous and unquantified impacts on the Main Fork downstream of location V27.

A total of 11 samples (approximately monthly) were collected at location VGMAIN in 2002. The concentration of total suspended solids ("TSS") at location VGMAIN remained relatively low (<31 mg/L in 2002) with respect to previous recent years. With the exclusion of the peak concentration (mid-May) from the 2002 data, the concentrations of TSS are all less than 5 mg/L.

The concentrations of total and dissolved zinc at location VGMAIN ranged from 0.03 mg/L to 0.08 mg/L and from 0.03 mg/L to 0.09 mg/L, respectively, in 2002, which were within the ranges observed in previous recent years.

The concentrations of sulphate and hardness at location VGMAIN continued the seasonal trend that has been established at this location and at location V5 with higher concentrations observed in the winter season. The concentrations of sulphate and hardness ranged from 34 mg/L to 278 mg/L and from 101 mg/L $CaCO_3$ to 380 mg/L $CaCO_3$, respectively, in 2002.

5.3.3 Lower Vangorda Creek (V8)

Location V8 is in the fish rearing habitat in lower Vangorda Creek downstream of the confluence of the West (location V5) and Main (location VGMAIN) Forks. There were 16 samples collected at location V8 during 2002.

The concentration of total suspended solids ("TSS") at location V8 was elevated above 12 mg/L on only one sampling occasion in 2002 at 45 mg/L in mid-May. The peak concentration in 2002 corresponded to the peak concentrations reported for upstream locations V5 and VGMAIN.

The concentrations of total and dissolved zinc at location V8 ranged from 0.02 mg/L to 0.06 mg/L and from 0.01 mg/L to 0.07 mg/L, respectively, in 2002. This is excepting one anomalous high result for dissolved zinc which was reported at 0.12 mg/L in September, which is considered to be inaccurate given the much lower concentration reported for total zinc (0.02 mg/L) and the absence of other corrolating high concentrations. The zinc concentrations, excepting that one high value, were within the ranges observed in previous years.

The concentrations of sulphate and hardness at location V8 continued, in 2002, to mirror the trend observed at upstream locations V5 and VGMAIN with greater concentrations observed in the winter season when surface flows were at a minimum. The concentrations of sulphate and hardness at location V8 ranged from 37 mg/L to 239 mg/L and from 121 mg/L $CaCO_3$ to 467 mg/L $CaCO_3$, respectively, in 2002, which were within the ranges observed in previous years.

5.4 Long Term Trends In Lower Vangorda Creek

The long-term trends in water quality in lower Vangorda Creek (location V8) from 1988 to 2002 indicate that mining activities on the Vangorda Plateau have had an observable influence on concentrations of total suspended solids, total zinc, total lead and ammonia in lower Vangorda Creek. It is also evident that water quality in the West Fork has a significant effect on water quality in the fish-rearing habitat, particularly in terms of total suspended solids and sulphate. The information also confirms that there are significant concentrations of suspended sediments that can enter the Main Fork of Vangorda Creek downstream of the mine site that are not related to mine activities.

Concentrations of total suspended solids ("TSS"), total zinc and sulphate for locations V5 and V8 (for which the monitoring records extend back to 1988) are illustrated on Figures 11 through 13, respectively, for the period from 1988 to 2002.

During the period from 1988 to 1990 (3 years), there was a relatively small amount of work done in overburden stripping for the Grum Open Pit. Although relatively few water samples were collected during this period, water quality at location V8 during this period could be taken as representative of conditions largely unaffected by mine operations. This is evident through relatively low concentrations of total suspended solids, total zinc, ammonia, total lead and arsenic although the concentration of total zinc was recorded at or just greater than the federal recommended guideline for the protection of freshwater aquatic life (CCME) on two occasions. The average concentration of total suspended solids during this period was 12 mg/L with a peak value of 30 mg/L. The average and peak concentrations of total zinc were 0.02 mg/L and 0.04 mg/L, respectively.

During 1991 and 1992, a substantial overburden stripping program was carried out on the Vangorda Plateau, mining was performed in the Vangorda Open Pit and the Vangorda ore haul road was constructed. The mining activity is reflected in the water quality in lower Vangorda Creek. The concentrations of total suspended solids, total zinc, total lead and ammonia all show an increase in average and peak values during this period. The average concentration of total suspended solids during this period was 62 mg/L with a peak value of 590 mg/L. The average and peak concentrations of total zinc were 0.06 mg/L and 0.36 mg/L, respectively.

During 1993 and 1994, no mining operations were performed on the Vangorda Plateau. Although fewer water samples were collected during this period than during the previous operating period, reduced levels of total suspended solids and total zinc were observed in lower Vangorda Creek although the reduced levels were generally greater than those observed during the period preceding mine activities (1988 to 1990). The average concentration of total suspended solids during 1993 and 1994 was 40 mg/L with a peak value of 112 mg/L. The average and peak concentrations of total zinc were 0.03 mg/L and 0.11 mg/L, respectively.

During 1995, 1996 and 1997, mining activities on the Vangorda Plateau were resumed including discharge of treated effluent from the water treatment plant. Even in light of the resumption of mine operations, water chemistry in lower Vangorda Creek during this period did not show a return to the chemistry observed during the previous period of mine operations on the Vangorda Plateau (1991 and 1992). The concentrations of total suspended solids, total zinc, total lead, ammonia and arsenic observed from 1995 through 1997 remained similar to those observed during the shut down period of 1993 and 1994 with the exception of a peak concentration of total suspended solids. During the period from 1995 to 1997, the average concentration of total suspended solids was 29 mg/L with a peak value of 271 mg/L. The average and peak concentrations of total zinc were 0.04 mg/L and 0.12 mg/L, respectively.

During the period from 1998 to 2002, mining activities were again suspended. There was no discharge of effluent from the water treatment plant until the summer of 2002. Water quality in lower Vangorda Creek from 1998 to 2002 was generally similar to that observed during the two preceding periods (mine shut down in 1993/1994 and mine operation from 1995 to 1997) although some isolated high peak concentrations of total suspended solids, total zinc and total arsenic were observed. During the period from 1998 to 2002, the average concentration of total suspended solids was 14 mg/L with a peak value of 184 mg/L. The average and peak concentrations of total zinc were 0.04 mg/L and 0.26 mg/L, respectively, excluding the unexplained extreme result reported for March 2001.

Measured flow volumes in the West Fork (V5) and lower Vangorda Creek (V8) indicate that, on average, the West Fork contributes 33% of flow to lower Vangorda Creek with a range from 21% to 49%. Corresponding flow measurements at locations V5 and V8 spanning 1991 to 1999 are listed in Table 3.

Table 3: Listing of Corresponding Flow Measurements at Locations V5 and V8

STATION: V5		STATION: V8		% V5/V8	
Date	Flow (Lps)	Date	Flow (Lps)		
07/05/91	1358	07/05/91	2778		49%
22/08/91	249	15/08/91	1116		22%
11/10/91	334	04/10/91	1182		28%
26/11/91	131	25/11/91	372		35%
28/02/92	51	28/02/92	153		33%
28/04/92	280	28/04/92	634		44%
26/04/93	243	26/04/93	533		46%
02/08/93	207	02/08/93	620		33%
09/05/95	230	09/05/95	1096		21%
12/09/95	224	12/09/95	960		23%
11/06/96	195.3	11/06/96	801		24%
11/09/96	191.6	11/09/96	687		28%
19/12/96	35	05/12/96	110		32%
10/03/97	7	10/03/97	15		47%
05/05/97	892	05/05/97	1873		48%
30/06/97	185	30/06/97	566		33%
24/07/97	379	24/07/97	1007		38%
28/08/97	162	28/08/97	541		30%
10/06/98	152	10/06/98	594		26%
29/07/99	364	29/07/99	1101		33%
31/08/99	144	30/08/99	484		30%
				AVG	33%

Figure 11: Long Term Lower Vangorda Creek (V5, V8) Total Suspended Solids

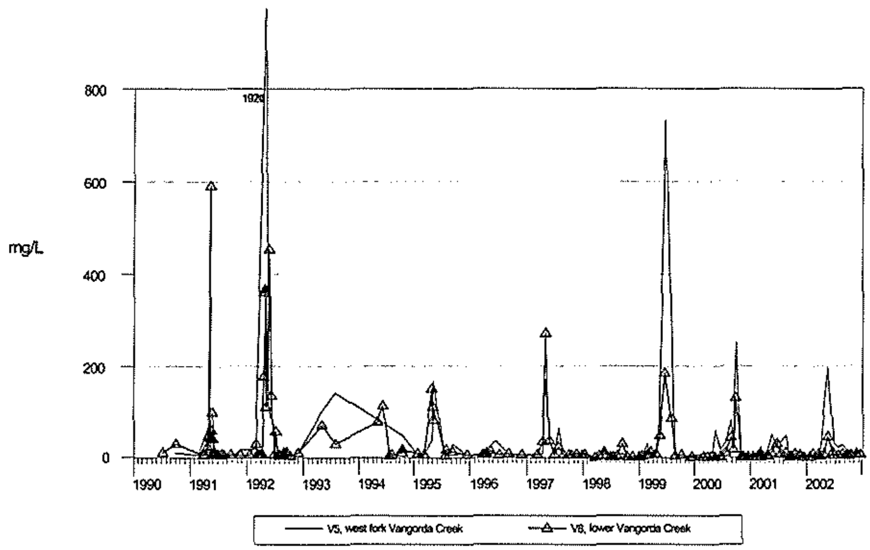


Figure 12: Long Term Lower Vangorda Creek (V5, V8) Total Zinc

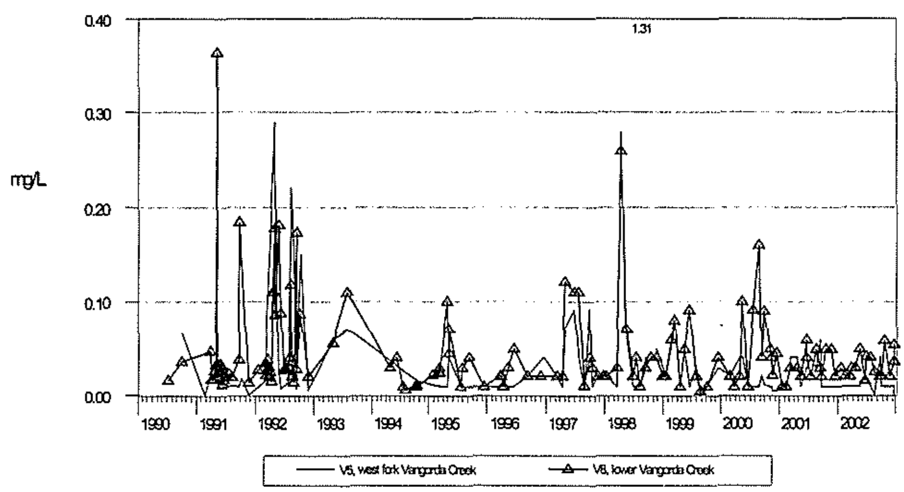
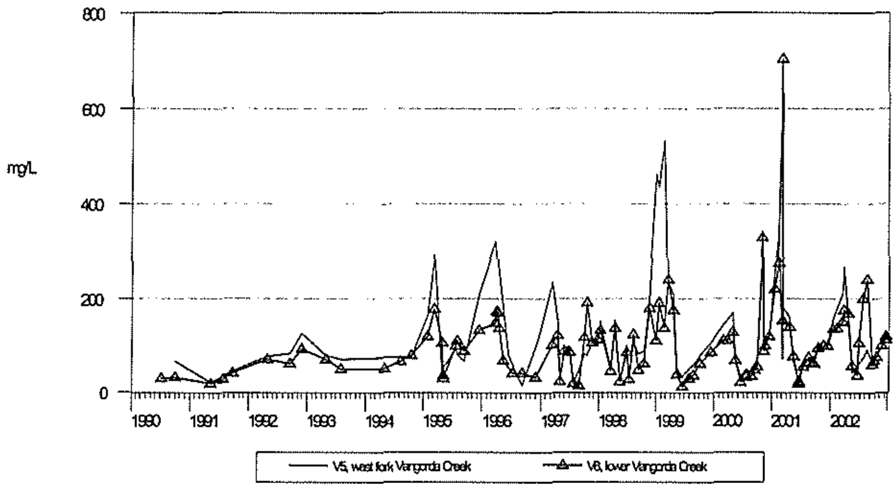


Figure 13: Long Term Lower Vangorda Creek (V5, V8) Sulphate



6. Stream Sediment and Macroinvertebrate Monitoring

Water licence IN89-002 requires monitoring of benthic invertebrates and metal levels in sediments in Vangorda Creek every two years and this monitoring program was not required in 2002.

The program was conducted in 2001 and is scheduled to be conducted next in 2003.

7. Geotechnical Monitoring

The annual geotechnical/physical monitoring program described in Part D Section 6 of the Licence was performed, in 2002, by Steffen, Robertson and Kirsten (Canada) Inc. ("SRK") who have conducted all of these inspections in the past. The SRK report is provided as Appendix 3 and the following summary is provided.

Mr. Peter Healey, P. Eng., of SRK conducted a site inspection in July. The inspection looked at the geotechnical performance and stability of the following structures: Vangorda rock dump and seepage collection system, Little Creek Dam, Vangorda Creek diversion, Clarification Pond, Grum Interceptor Ditch and Sheep Pad Ponds.

SRK also reviewed all available data collected from monitoring of piezometers and thermistors related to the Vangorda rock dump and Little Creek Dam. No significant trends were identified and no concerns were noted.

The recommendations resulting from the inspection are summarized as follows:

- monitor for and remove as necessary silt build-up in the drainage ditch above drains #5 and 6.
- Continue monitoring of geotechnical instrumentation.
- Monitor for and fill cracks in the crests of the rock piles, dams and dykes.
- Construct erosion resistant channels in erosion gullies on Little Creek Dam approach road.
- Place rip rap along the Vangorda Creek diversion flume where rip rap has settled below the rim of the steel sections.
- Maintain the water level in the water treatment plant clarification pond at least 2 m below the crest of the containment dyke.
- Maintain the water level in the water treatment plant fresh water feed pond at least 1 m below the crest of the containment dyke.
- Investigate the physical stability of the slope between the Moose Pond and Vangorda Creek.

Some physical maintenance tasks were completed in 2002 in response to recommendations in the 2001 geotechnical inspection report. These included:

- Placement of rip rap and geotextile along one section of the downstream face of the water treatment plant clarification pond containment dyke.
- Excavation of sediment from the sediment trap below the Grum rock dump.

A third party professional review of all water retention dams on the mine property, including Little Creek Dam, was conducted by Klohn-Crippen following protocols described by the Canadian Dam Association. No issues of critical concern were identified although a number of recommendations were provided including the development of an updated emergency response plan, which was under development at the time of writing of this report.

8. Water Treatment Plant Performance

8.1 Overview

The Grum/Vangorda Water Treatment Plant (the "WTP") was reactivated in 2002 for the first time since the mine shut down in early 1998. The plant was operated fundamentally as it had been during mine operations (pre-1998) although some mechanical and electrical upgrades were installed. Water was pumped to the WTP from the Vangorda pit after pre-treatment with lime in the pit. The influent was agitated with lime slurry and flocculant and then passed through a settlement pond.

The need for operation of the WTP stemmed from the level of water in the Vangorda pit pond. In early 2002, the water elevation had reached the maximum desired elevation and, therefore, the water level needed to be drawn down in order to maintain adequate emergency storage capacity. The maximum desired water elevation was suggested to be 1091.8 m in a memo prepared by Gartner Lee Limited dated February 13, 2001. This memo brings hydrologic data forward from the 1996 Integrated Comprehensive Abandonment Plan that provided a rationale for emergency storage of 3.1 million m^3 as representative of a breach of Vangorda Creek equivalent to 50% of the probable maximum flood over a 1-week period. The elevation of 1091.8 m is approximately 30.7 m below the assumed overflow elevation out of the pit and approximately 51.8 m above the pit bottom.

An estimated 894,000 m^3 (2,000 USgpm for 82 days) was treated through the WTP from May 30 to August 24. All effluent released to the environment was compliant with the discharge criteria in the Licence, with a single minor exceedance for total suspended solids. A total of 180 short tons (163 tonnes) of lime was utilized for an overall lime useage rate of 0.18 g/L (grams per litre) inclusive of pre-treatment in the pit.

The water level in the Vangorda pit was lowered by approximately 12.2 m (40 feet) in 2002 from an estimated starting point of 1091.8 m. The storage volume created is adequate to contain the anticipated inflows until the scheduled restart of pumping in summer 2003.

8.2 Changes from Previous Operations

There are several substantial changes to the current water pumping and treatment systems as compared to previous operations (i.e. pre-1998). The most significant of those are summarized as follows:

Influent Water Quality: The general quality of the current influent is substantially poorer than pre-1988 due to the source of the water. Prior to 1998, the source of influent was a combination of water from the Vangorda pit/Little Creek Dam and the Grum pit whereas the single source of influent in 2002 was the Vangorda pit, which has historically (and currently) contained poorer quality water than Grum pit. For example, the average concentration of total zinc in WTP influent through 1996 and 1997 was 18.6 mg/L as compared to the concentration of total zinc in the Vangorda Pit in June 2002 of 86.8 mg/L.

Pumping System: The 2002 pumping system is an overland system from the Vangorda pit installed in 2001 that replaces the previously utilized buried pipeline from Little Creek Dam. The new system reduces the risk of environmental contamination due to pipeline breaks by providing for visual inspection of the pipeline and, specifically, by eliminating the buried haul road crossing where the pipeline of raw WTP influent lay directly atop the culvert passing clean Vangorda Creek water in the opposite direction. Additionally, the new system is capable of delivering 2,000 USgpm to the WTP whereas the previous system could deliver an estimated 1,200 USgpm (which was acceptable at that time given that WTP influent was also sourced from the Grum pit).

WTP Operators: Dedicated operator attention was provided in 2002. During previous operations, the WTP was operated by the pit dewatering crew, who also had numerous other duties around the mine site (related primarily to dewatering the pits). In 2002, a dedicated crew of two, operator and supervisor, were fully dedicated to operating the system on a 24-hour basis. Additionally, a "Vangorda foreman" was dedicated to managing the WTP operating crews and other maintenance activities required for successful operation of the WTP.

8.3 2001 Preparatory Work

A large portion of the preparatory work for reactivation of the WTP was completed in 2001, in anticipation of the need for operation in 2002. This work was documented in the 2001 Vangorda Plateau Annual Environmental Report and is repeated here for ease of reference:

- design and installation of an overland pipeline from the Vangorda pit to the Grum/Vangorda Water Treatment Plant;
- installation of an overhead powerline to the pumping station in the Vangorda pit;
- design, construction and installation of a barge with primary pump station in the Vangorda pit;
- design and installation of a booster pump station near the top of the pit perimeter;
- excavation of treatment sediments from the clarification pond to the Vangorda pit;
- cleaning of sloughed soil and placement of rip rap in the Grum Interceptor Ditch;
- placement of a rip rap apron at the inflow to the Sheep Pad Pond;
- mechanical end electrical checks and maintenance in the Water Treatment Plant;
- installation of a new inlet header into the Clarification Pond;
- modifications to Groucho pond for enhanced use as a fresh water supply to the treatment plant; and
- in-pit field testing of lime treatment of Vangorda pit water.

8.4 2002 WTP Operations

Prior to the commencement of pumping to the WTP, pit water was pre-treated with lime. This was accomplished by circulating pit water from the pumping barge in the south end of the pit to just past the booster station and allowing the water to drain back into the northwest area of the pit from the pipeline drain valve. Lime was added into the pipeline near the booster station using the venturi effect to draw lime into the pipeline of flowing water. The results of pre-treatment testing in 2001 demonstrated the effectiveness of a minor pH modification in enabling the initial settlement of a portion of the contained metal load and this procedure was utilized, in 2002, to reduce the requirement for sludge storage capacity at the WTP.

The pump barge was relocated to deeper water periodically through the pumping period as the water level in the pit was drawn down and additional depth for the pump intakes was required. Clean water was pumped from the old Vangorda Creek channel just above the Vangorda pit into the Vangorda Creek diversion flume using a portable gas powered pump throughout the ice free season as a means of minimizing the amount of clean water entering the pit.

The operating procedure for the WTP in 2002 provided for 24-hour dedicated operator attendance to ensure that lime mixing and other activities continued smoothly. Plant operators maintained a logbook of activities and routine manual readings of pH at strategic locations that was reviewed for this report. PH readings were routinely recorded according to or in excess of the following schedule (pH readings were recorded on a more frequent basis on an as-required basis):

1. Clarification Pond near Discharge: every 4 hours
2. Discharge from Clarification Pond: every 24 hours
3. Grum Interceptor Ditch lower culvert: every 4 hours
4. V25BSP ("Below Sheep Pond"): every 12 hours

Water samples were collected generally at the time of manual pH checks by the WTP operators according to or in excess of the schedule listed above. These samples were analysed in-house for total zinc to verify compliance and to serve as a management control tool for plant operations. The analytical procedures for the on-site analyses have been established and in practice since 1998 and use professional grade AA (atomic absorption) equipment operated by trained and experienced assayers utilizing standard procedures to provide high quality analyses of total zinc. A logbook of total zinc analyses was maintained by the assayers and the zinc analyses were fully compliant (i.e. less than 0.5 mg/L total zinc) during periods of effluent release.

Treatment sludge for the entire year's operations was retained in the Clarification pond. The sludge was observed to settle during the final dewatering of the Clarification pond at the end of the treatment period such that it would be anticipated that another similar year's volume could be retained without compromising effluent quality. Nonetheless, a plan for excavation and disposal of the treatment sludge was being developed at the time of writing of this report and would be implemented prior to 2003 operations pending any required approvals.

In agreement with DIAND Water Resources, location V25BSP was used as the sampling location for external analyses of treated mine effluent for 2002 as being representative of effluent entering Vangorda Creek. Weekly water samples were collected at location V25BSP and analysed at the external laboratory. These samples returned water quality results (Appendix 1) that were fully compliant with the discharge criteria in the Licence, with the single exception of one concentration of total suspended solids that was reported at 17 mg/L (June 25) versus the discharge criteria of 15 mg/L. The range in the concentration of total zinc during the period of discharge was from 0.06 mg/L to 0.18 mg/L, versus the discharge criteria of 0.5 mg/L.

A water sample from location V25 (Appendix 1) was analysed at the external laboratory, which was collected as a check on water quality exiting the Clarification Pond at the commencement of discharge in June. This sample returned compliant results (0.16 mg/L total zinc) and passed the 96-hour LC_{50} bioassay test (Appendix 1) with no mortalities.

8.5 2002 Chronology of Events

The general chronology of events for 2002 is summarized as follows:

April: The pumping barge was installed (after winter storage on dry ground) and tested. Hatch Engineering (designers of the overland pump and pipe system) were utilized to resolve problems with the logic control circuit for the shut down sequence.
May: Pre-treatment in the Vangorda pit was conducted in May. Pumping to the WTP commenced on May 30 and initial filling of the Clarification Pond commenced.
June: The pump barge was relocated twice due to drawdown of the water level in the pit. Release of water from the Clarification pond commenced in mid-June subsequent to the receipt of compliant analyses from the external laboratory.
July: The pump barge was relocated twice due to drawdown of the water level in the pit. Pumping was suspended for 3 days to allow installation of a fixed point land anchor for the barge. At that time, a modified discharge header was installed in the Clarification pond that was lower and provided for a more uniform draw of water from the pond surface.
August: The pump system and WTP were shut down for the season on August 24 and the Clarification pond was dewatered. Winterization of the system and equipment commenced.
September: Winterization activities were completed.

8.6 2002 Vangorda Pit Water Balance

The annual water balance for the Vangorda pit could be described as follows:

net uncontrolled inflows – volume pumped to WTP + volume pumped from LCD = net volume change in pit level
and, for 2002: 389,000 – 894,000 + 35,000 = -470,000 (m^3)

A more detailed breakdown of the 2002 water balance for the Vangorda pit is provided in Table 3.

Table 3: Detailed 2002 Water Balance for Vangorda Pit

Period	Elevation Change (m)	Net Volume Change	Water Pumped Out	Water Pumped from Little Creek Dam	Net Uncontrolled Inflows
Jan01-May30 (150)	1088.8 – 1091.8 (+20 mm/day)	+150,000 m^3 (+1,000m^3/day)	nil	+17,500 m^3 (+135 m^3/day)	+132,500 m^3 (+883m^3/day)
June 1-Aug24 (85)	1091.8 – 1079.6 (-144 mm/day)	-750,000 m^3 (-8,824m^3/day)	-894,000 m^3 (-10,518m^3/day) (-1,930 USgpm)	+17,500 m^3 (+206 m^3/day)	+126,500 m^3 (+1,488m^3/day)
Aug25-Dec31 (130)	1079.6 – 1081.8 (+22 mm/day)	+130,000 m^3 (+1,000m^3/day)	nil	Nil	+130,000 m^3 (+1,000m^3/day)
Total 2002	1088.8 – 1081.8 (-19 mm/day)	-470,000 m^3 (-1,288m^3/day)	-894,000 m^3 (-2,449m^3/day)	+35,000 m^3 (+96 m^3/day)	+389,000m^3 (+1,063m^3/day)

NOTES : 1. Elevations are estimated.
2. Height-Capacity Curve as developed by SRK (July 1999) based on as-built pit survey.

The following water balance notes apply specifically for 2002:

1. The total estimated volume of water pumped in 2002 is 894,000 m^3, based on the rated capacity of the pumping system (2,000 USgpm) and the number of operating days for the WTP (82 days).
2. The net volume change during the pumping period in the pit level was from the estimated starting point of 1091.8 m to 1079.6 m (-12.2 m or -40 feet); the height capacity curve for the Vangorda pit gives this as a volume change of (1.70 – 0.95) = 0.75 million m^3.
3. The volume pumped from Little Creek Dam in 2002 is estimated at 35,000 m^3
4. The estimated volume of net uncontrolled inflows (inclusive of direct precipitation, net groundwater inflow/outflow, surface inflows, evaporation, etc.) of 389,000 m^3 is in general agreement with the observations of uncontrolled inflows for 1998 to 2001 that ranged from 200,000 to 817,000 m^3 inclusive of two major inflows that were diverted in 2002 (old Vangorda Creek channel and northeast diversion ditch).

9. Technical Advisory Committee

One Technical Advisory Committee meeting was held in 2002, in July. The meeting was held in Faro and involved tours of the Faro and Vangorda Plateau minesites. The meeting was attended by representatives of:

- Anvil Range Mining Corp. (Interim Receivership)
- Deloitte & Touche Inc. as Interim Receiver for Anvil Range Mining Corporation
- DIAND - Environment
- DIAND - Indian Affairs Program Environment
- DIAND - Land and Water (HQ)
- DIAND - Mining (HQ)
- DIAND - Mining Land Use
- DIAND - Mineral Resources
- DIAND - Water Resources
- Department of Fisheries and Oceans
- Environment Canada
- Gartner Lee Limited
- Kaska First Nations
- Ross River Dena Council
- Ross River Council - Teslin
- Town of Faro
- SRK
- Yukon Conservation Society
- Yukon Salmon Committee
- YTG - Energy, Mines and Resources
- YTG - Environment
- YTG - Cabinet MLA

The topics discussed at the meeting were primarily concerned with current environmental issues and on-going environmental management of the minesites during the interim receivership.

The agenda, summary notes and list of attendees for the meeting are included in Appendix 3.

10. Physical Maintenance Work

10.1 Vangorda Creek Diversion Flume

A slope failure occurred in late April that resulted in blockage of the flume with loose soil and rock. The sloughed material was immediately excavated and normal creek flow was restored. The blockage did not result in overtopping of the flume. The slide area was resloped and a catchment berm was established with sandbags to prevent future small scale events in this location from entering the flume. The sloughing caused some minor damage to the flume culvert sections in this location but not to the degree where normal performance of the flume was hampered.

In May, it was observed that some flume culvert sections had shifted position due, likely, to the rapid onset of freshet flows at the end of May. The flume sections were repositioned to as close as possible to their design configuration with the use of a hydraulic excavator and additional loose fill was placed to buttress the sides of the flume culvert sections.

In September, several additional locations of the flume culvert sections were repositioned to as near as possible their design configuration and several "patches" were applied as a means of extending flume life and minimizing leakage losses.

The initial ice formation in October and November was observed to restrict flow in some locations and the ice was excavated in those locations such that normal creek flow was restored.

Substantial maintenance work is scheduled to be undertaken in 2003 at the Vangorda Creek Diversion Flume. The planned work includes replacement of damaged flume culvert sections and flattening of the backslope in certain areas.

10.2 Little Creek Dam

In response to recommendations of the professional geotechnical engineer, a trash rack was installed at the inlet to the emergency overflow culvert on Little Creek Dam.

The fencing installed around the substation on Little Creek Dam was upgraded to meet all applicable regulations in September, in response to observations of an on-site safety review.

10.3 Grum Rock Dump

Surface water management on the Grum rock dump was improved by grading of some of the outer dump surfaces on the lower lifts of the dump to reduce the opportunities for channelization and ponding of surface runoff. Additionally, maintenance work was completed on the ditch along the outer side of the Vangorda haul road along the Grum rock dump that restored the ditch's capacity to capture all road run off water and prevent channelized flow from running onto the lower lifts of the Grum rock dump. This work was undertaken in response to observed erosion gullies that had formed in several locations on the lower crest of the Grum rock dump.

10.4 Vangorda Pit Northeast Diversion Ditch

Maintenance work was carried out on the Vangorda pit northeast diversion ditch in response to observations of ditch failure that was allowing clean surface water to flow into the Vangorda pit. The ditch was cleared of sloughed material and generally re-established to it's terminus at Dixon Creek. Yukon Engineering Service of Whitehorse was contracted to provide survey control for maintaining positive drainage in the ditch. Site personnel subsequently utilized the control points to set and check for a positive ditch gradient.

10.5 Grum Adit

The adit to the Grum underground workings was sealed with steel plates in order to improve the public and worker safety protection.

10.6 Water Treatment Pant Clarification Pond

In response to recommendations of the professional geotechnical engineer, fine granular material was placed on the downstream face of the north leg of the water treatment plant clarification pond. The material was compacted with the hydraulic excavator. This work was conducted in September, subsequent to shut down of the water treatment plant for the season and weather conditions prevented optimal compaction of the soil. Therefore, additional compaction, likely with a drum roller is scheduled for 2003.

11. Regulatory Issues

11.1 Licence Amendment

An application for amendment to Water Licence IN89-002 was outstanding at year-end. The application was filed by Anvil Range Mining Corporation prior to the current Interim Receivership period. The proposed amendments are primarily "housekeeping" issues.

Appendices

Appendix 1

2002 Water Quality Listing

Gartner Lee	Station	V1					V2									V2A						V4	
	Description	Vangorda Creek, upstrm of mine & Blind Cr. Rd					Grum Creek, upstr. of Vangorda Ck									Grum Creek Diversion to Moose Pond						Shrimp Creek, upstr. of Vangorda Creek	
	Sample Date	21/03/02	25/06/02	27/09/02	14/12/02	15/12/02	15/01/02	12/2/2002	21/03/02	15/04/02	13/05/02	25/06/02	27/09/02	14/12/02	15/12/02	25/06/02	16/07/02	27/09/02	15/10/02	14/12/02	15/12/02	25/06/02	27/09/02
Parameter	Units																						
Physical																							
PH-F	pH unit			8.3	8.2					7.8			8	7.8				8.2		7.8			8.2
TEMP-C				3.3	0.6					-0.2			3.2	0.4				4.9		0.3			3.2
SO_4-T	mg/L	13	5	9		12	564	527	488	349	482	615	622		620	663	696	536	512		636	49	47
TSS	mg/L	2	<1	2		3	11	10	5	6	11	6	7		24	8	9	10	5		14	6	5
HARD-T	mg/L	66	22	33		51	887															306	331
ALK-T	mg/L																						
COND-L	µS/cm																						
NH_3-N	mg/L						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05								
CN-T	mg/L																						
Total Metals																							
AG-T	mg/L	<0.001	2.1	3.7		<0.2	<0.001	<0.001	0.001	0.001	<0.001	0.8	0.5		0.7	1.6	2.3	1.3	1		0.3	<0.2	<0.2
AL-T	mg/L	0.05	0.128	0.074		0.057	0.15	0.14	0.06	0.05	0.22	0.113	0.063		0.398	0.115	0.143	0.095	0.061		0.18	0.149	0.049
AS-T	mg/L	<0.005	<0.003	<0.003		<0.003	<0.005	0.005	<0.005	<0.005	<0.005	0.052	0.034		0.028	0.026	0.011	0.031	0.005		0.018	0.019	0.01
B-T	mg/L	<0.05	0.12	0.09		0.23	<0.05	<0.05	<0.05	<0.05	0.06	0.11	0.09		0.22	0.11	<0.05	0.1	0.11		0.21	0.1	0.09
BA-T	mg/L	0.151	0.155	0.137		0.15	0.293	0.219	0.198	0.158	0.172	0.202	0.2		0.177	0.201	0.166	0.166	0.172		0.139	0.208	0.165
BE-T	mg/L	<0.001	0.4	<0.2		<0.2	<0.001	<0.001	<0.001	<0.001	<0.001	0.8	<0.2		<0.2	0.4	0.5	<0.2	<0.2		0.2	0.4	<0.2
BI-T	mg/L	<0.05	0.01	0.03		0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.03		<0.01	<0.01	<0.01	0.03	0.01		<0.01	<0.01	0.03
CA-T	mg/L	20.6	8.1	12.1		19.1	202	206.9	188.8	150.7	162.8	216.9	211.4		219.5	222.9	220.5	191.9	191.3		219.4	75.9	79.9
CD-T	mg/L	<0.001	1.3	<0.2		0.4	<0.001	<0.001	<0.001	<0.001	<0.001	<0.2	<0.2		1.3	<0.2	2.5	0.2	0.3		1.8	<0.2	<0.2
CO-T	mg/L	<0.005	0.002	0.002		<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001		<0.001	0.002	0.001	0.001	0.001		0.001	0.002	<0.001
CR-T	mg/L	<0.005	0.007	0.003		0.006	<0.005	<0.005	<0.005	<0.005	<0.005	0.004	<0.001		0.004	0.003	<0.001	0.001	0.001		0.004	0.028	0.001
CU-T	mg/L	<0.002	0.021	0.042		0.012	0.003	0.004	<0.002	0.004	0.01	0.013	0.017		0.016	0.015	0.017	0.021	0.021		0.018	0.016	0.018
FE-T	mg/L	0.04	0.064	0.309		0.075	0.19	0.15	<0.01	<0.01	0.28	0.143	0.083		0.524	0.094	0.014	0.091	0.029		0.261	0.359	0.151
K-T	mg/L	1	0.5	0.4		0.6	3	3	4	3	5	2.7	3.5		3.3	4.7	4.7	4.3	4.1		4.2	1.2	1.3
LA-T	mg/L		<0.001	0.002		<0.001						<0.001	0.003		<0.001	<0.001	0.004	0.003	<0.001		<0.001	0.009	0.006
MG-T	mg/L	3.2	1.2	1.8		2.8	86.2	80.5	71.2	51.4	74.5	91	92.9		96.7	101	106.9	83.3	81.5		106	26.2	29
MN-T	mg/L	<0.01	0.003	0.004		0.005	0.02	0.02	0.02	0.02	0.06	0.031	0.019		0.023	0.03	0.028	0.019	0.015		0.022	0.039	0.031
MO-T	mg/L	0.005	0.007	0.001		<0.001	<0.002	0.005	0.006	<0.002	0.003	0.008	0.005		0.004	0.013	0.007	0.005	0.003		0.005	0.007	0.003
NA-T	mg/L	4	1.1	1.4		1.1	12	12	10	9	8	9.8	10.3		10.3	9.8	9.1	9	10.3		9	3.2	3.6
NI-T	mg/L	<0.005	0.005	0.002		<0.001	<0.005	<0.005	0.008	<0.005	0.017	0.008	0.002		0.002	0.062	0.059	0.031	0.027		0.022	0.021	0.002
P-T	mg/L	0.01	<0.01	<0.01		<0.01	<0.01	0.04	<0.01	<0.01	0.08	<0.01	<0.01		<0.01	0.02	0.07	0.01	<0.01		0.02	0.01	<0.01
PB-T	mg/L	<0.01	<0.002	0.008		0.006	<0.01	<0.01	0.03	<0.01	0.01	0.006	0.006		<0.002	0.011	0.012	0.005	0.005		<0.002	<0.002	0.005
S-T	mg/L	4	1.9	3		4	184	159	157	109	155	197.8	192.8		201.1	215.7	220.2	168.2	164.5		209.9	15.9	14.9
SB-T	mg/L	<0.03	0.006	0.019		<0.002	<0.03	<0.03	<0.03	<0.03	<0.03	0.007	0.009		0.01	0.013	0.065	0.004	0.017		0.022	0.011	0.023
SE-T	mg/L	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005
SI-T	mg/L	5.5	3.8	4.5		5	7.3	6.9	6.7	5.3	5.1	7.9	6.8		7.3	6.7	6.4	5.7	6.1		6.6	5.7	4.9
SN-T	mg/L	0.01	0.005	0.035		<0.002	0.06	0.04	0.04	0.01	0.01	0.008	0.014		<0.002	0.006	0.004	<0.002	0.002		<0.002	0.006	<0.002
SR-T	mg/L	0.099	0.041	0.06		0.084	0.838	0.783	0.7	0.536	0.579	0.737	0.75		0.743	0.77	0.729	0.705	0.711		0.726	0.313	0.332
TI-T	mg/L	<0.005	<0.001	0.003		<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	0.001	<0.001		0.008	<0.001	<0.001	0.001	<0.001		0.003	0.002	0.001
V-T	mg/L	<0.005	<0.001	<0.001		<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	0.001	0.003		0.002	0.001	<0.001	0.003	0.001		0.002	<0.001	<0.001
W-T	mg/L	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03
ZN-T	mg/L	<0.01	0.002	0.043		<0.001	0.02	<0.01	0.12	0.1	0.22	0.038	0.011		0.011	1.096	0.952	0.344	0.332		0.317	0.022	0.009
Dissolved Metals																							
AG-D	mg/L	<0.001	0.5	<0.2		<0.2	0.001	<0.001	<0.001	0.001	<0.001	0.5	0.8		<0.2	0.5	0.7	<0.2	0.7		0.3	<0.2	<0.2
AL-D	mg/L	<0.05	0.058	0.059		0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.001	<0.001		0.045	<0.001	0.004	0.009	0.036		0.046	0.036	0.003
AS-D	mg/L	<0.005	0.004	0.005		<0.003	<0.005	0.029	<0.005	<0.005	<0.005	0.027	0.048		0.033	0.011	0.015	0.044	0.007		0.021	0.046	0.005
B-D	mg/L	<0.05	0.06	0.08		0.16	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.09		0.17	0.08	<0.05	0.14	0.13		0.18	0.06	0.12
BA-D	mg/L	0.162	0.108	0.109		0.17	0.246	0.043	0.109	0.114	0.069	0.108	0.119		0.081	0.085	0.095	0.115	0.075		0.067	0.15	0.133
BE-D	mg/L	<0.001	0.3	<0.2		<0.2	<0.001	<0.001	<0.001	<0.001	<0.001	0.9	0.4		<0.2	0.9	0.7	0.4	<0.2		0.2	0.4	0.3
BI-D	mg/L	<0.05	<0.01	<0.01		<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01		0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	0.01
CA-D	mg/L	21.5	7.6	11.5		18.5	207.2	218.8	198.3	161.9	171.2	215.7	220.7		228.5	224.5	231.9	199.4	203.1		228	79.5	85.7
CD-D	mg/L	<0.001	0.9	0.2		0.7	<0.001	<0.001	<0.001	0.002	<0.001	0.8	<0.2		0.9	<0.2	1.1	0.3	<0.2		<0.2	<0.2	<0.2
CO-D	mg/L	<0.005	<0.001	<0.001		<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001		<0.001	<0.001	0.002	<0.001	<0.001		<0.001	<0.001	<0.001
CR-D	mg/L	<0.005	<0.001	<0.001		0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001		0.004	0.001	0.002	<0.001	0.003		0.002	0.013	<0.001
CU-D	mg/L	0.011	0.012	0.022		0.026	<0.002	<0.002	0.014	0.002	0.004	0.006	0.011		0.009	0.01	0.005	0.013	0.025		0.014	0.016	0.02
FE-D	mg/L	0.01	0.024	0.023		0.072	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	<0.002		0.031	<0.002	<0.002	<0.002	<0.002		0.018	0.069	0.031
K-D	mg/L	1	0.5	0.6		0.8	3	3	5	4	5	3	3.9		3.4	5.1	5.2	4.9	4.7		4.5	1.3	1.5
LA-D	mg/L		<0.001	0.002		<0.001						<0.001	<0.001		<0.001	<0.001	0.001	<0.001	<0.001		<0.001	0.004	0.006
MG-D	mg/L	3.3	1.1	1.7		2.7	89.5	85.1	74.9	54.9	73.1	93.1	98.7		99.6	108.8	120.4	91.3	87.9		108.6	26.6	32
MN-D	mg/L	0.01	0.003	0.004		0.004	0.02	0.02	0.02	0.02	0.06	0.028	0.018		0.017	0.028	0.029	0.021	0.015		0.016	0.031	0.03
MO-D	mg/L	0.003	<0.001	0.001		<0.001	0.005	0.004	0.005	0.004	0.004	0.004	0.006		0.005	0.002	0.008	0.005	0.003		0.006	0.004	0.003
NA-D	mg/L	4	0.9	2.2		1.3	12	13	11	9	8	10	10.3		10.8	9.8	9	9.6	11.3		9.8	3.3	4.1
NI-D	mg/L	<0.005	0.003	0.002		<0.001	<0.005	<0.005	0.009	<0.005	0.014	0.027	0.004		0.002	0.065	0.075	0.033	0.028		0.022	0.001	<0.001
P-D	mg/L	0.03	0.03	0.01		0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.03	<0.01		0.02	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
PB-D	mg/L	<0.01	<0.002	0.004		<0.002	<0.01	<0.01	<0.01	<0.01	<0.01	0.004	<0.002		<0.002	0.01	<0.002	<0.002	<0.002		0.005	0.01	0.005
S-D	mg/L	4	2	3.2		4.2	188	168	165	116	155	210.2	203.4		207	226.3	231.3	179	179.3		215.5	16.8	16.3
SB-D	mg/L	<0.03	<0.002	0.007		0.009	<0.03	<0.03	<0.03	<0.03	<0.03	<0.002	0.01		<0.002	<0.002	0.024	0.004	0.011		<0.002	0.032	0.03
SE-D	mg/L	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	0.006	<0.005
SI-D	mg/L	5.6	4	4.3		5.3	7.5	7	6.8	5.7	5	8.3	7.1		7.3	6.9	6.3	5.9	6.2		6.9	6	5.3
SN-D	mg/L	<0.01	<0.002	0.017		<0.002	0.05	0.05	0.01	0.05	0.03	0.005	0.008		<0.002	0.005	<0.002	<0.002	<0.002		<0.002	0.003	<0.002
SR-D	mg/L		0.037	0.058		0.084						0.764	0.788		0.773	0.789	0.821	0.732	0.756		0.756	0.323	0.344
TI-D	mg/L	<0.005	<0.001	0.001		<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	<0.001		<0.001	<0.001	0.001	0.002	<0.001		<0.001	<0.001	0.001
V-D	mg/L	<0.005	<0.001	<0.001		<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	0.003		0.001	0.001	0.003	0.003	0.002		0.002	<0.001	0.001
W-D	mg/L	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03
ZN-D	mg/L	<0.01	0.008	0.07		<0.001	0.02	<0.01	0.13	0.12	0.17	0.018	0.007		0.011	1.012	0.905	0.294	0.329		0.285	<0.001	0.007

Gartner Lee

Station		V5															
Description		west fork Vangorda Creek															
Parameter	Units	15/01/02	12/3/2002	21/03/02	13/05/02	16/06/02	25/06/02	16/07/02	12/8/2002	16/09/02	27/09/02	15/10/02	11/11/2002	12/11/2002	10/12/2002	14/12/02	15/12/02
Physical																	
PH-F	pH unit										8.2		8.1		7.9	7.7	
TEMP-C											4		0.5		-0.2	0.4	
SO_4-T	mg/L	155	211	266	43	45	62	72	90	62	68	77		95	125		118
TSS	mg/L	3	4	5	195	68	31	23	28	13	14	9		13	15		9
HARD-T	mg/L	460	622	685	170	178	222	260		241	256	289		333	392		358
ALK-T	mg/L																
COND-L	µS/cm																
NH_3-N	mg/L																
CN-T	mg/L																
Total Metals																	
AG-T	mg/L	<0.001	<0.001	<0.001	<0.001	0.8	1.3	1.1	0.4	<0.2	0.3	1.9		<0.2	<0.2		<0.2
AL-T	mg/L	0.09	0.1	0.05	4.41	0.694	0.655	0.488	0.381	0.117	0.097	0.149		0.291	0.165		0.158
AS-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.003	0.044	<0.003	0.007	<0.003	<0.003	<0.003		<0.003	0.011		0.023
B-T	mg/L	<0.05	0.08	<0.05	0.05	<0.05	0.1	<0.05	0.07	0.09	0.08	0.12		0.13	0.12		0.21
BA-T	mg/L	0.234	0.331	0.176	0.215	0.218	0.194	0.185	0.134	0.166	0.159	0.154		0.149	0.151		0.168
BE-T	mg/L	<0.001	<0.001	<0.001	<0.001	0.3	0.2	0.4	0.4	<0.2	<0.2	<0.2		<0.2	0.3		<0.2
BI-T	mg/L	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.02		<0.01	<0.01		<0.01
CA-T	mg/L	101.2	128.4	142.9	48.3	43.2	55.2	57	68.2	60.6	60.4	67.2		82.1	86.2		90.2
CD-T	mg/L	<0.001	<0.001	<0.001	<0.001	<0.2	1.1	<0.2	<0.2	0.2	<0.2	0.2		<0.2	<0.2		<0.2
CO-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	0.003	0.002	0.002	<0.001	<0.001	0.001		0.001	0.002		<0.001
CR-T	mg/L	<0.005	<0.005	<0.005	0.015	0.006	0.006	0.002	0.007	0.004	0.004	0.01		0.002	<0.001		0.003
CU-T	mg/L	0.005	0.005	<0.002	0.018	0.014	0.021	0.023	0.016	0.025	0.015	0.019		0.017	0.023		0.017
FE-T	mg/L	0.11	0.05	0.04	7.74	1.381	0.864	0.739	0.627	0.199	0.153	0.241		0.418	0.324		0.249
K-T	mg/L	2	2	3	3	1.1	1.2	1	1.3	1.2	1.1	1.3		1.6	1.8		1.5
LA-T	mg/L					0.005	0.004	0.013	0.006	0.004	0.005	0.004		0.004	0.003		0.002
MG-T	mg/L	47.1	58.7	71.3	18.3	16.2	19.4	22	28.1	23.1	23.8	26.1		32.6	39.3		36.7
MN-T	mg/L	0.02	0.03	0.02	0.17	0.05	0.043	0.038	0.04	0.034	0.018	0.02		0.036	0.033		0.028
MO-T	mg/L	0.004	0.006	0.007	0.01	<0.001	0.011	0.003	0.002	0.002	0.003	0.003		0.002	0.003		0.003
NA-T	mg/L	7	8	8	4	3.7	3.7	3.2	5.2	3.4	3.7	4.7		5.8	5.1		4.4
NI-T	mg/L	<0.005	<0.005	<0.005	0.019	0.011	0.011	0.002	0.004	<0.001	0.002	0.002		<0.001	0.004		0.002
P-T	mg/L	0.01	<0.01	<0.01	0.19	0.13	0.08	0.03	0.08	<0.01	<0.01	0.04		0.01	0.02		0.01
PB-T	mg/L	<0.01	<0.01	<0.01	0.02	0.016	0.011	0.009	0.015	0.003	0.008	0.004		<0.002	0.004		<0.002
S-T	mg/L	51	64	84	14	14.9	20.6	22.2	27.7	21.3	20.9	23.4		31.9	40.1		39.2
SB-T	mg/L	<0.03	0.04	<0.03	0.06	0.019	<0.002	0.013	0.003	<0.002	0.011	<0.002		<0.002	0.011		<0.002
SE-T	mg/L	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005		<0.005
SI-T	mg/L	5.6	6	6.9	9.1	5.2	5.7	5.6	5.1	4.9	4.7	5.1		6.1	6.7		5.5
SN-T	mg/L	0.02	0.01	0.03	0.07	0.004	0.005	0.004	0.009	<0.002	0.027	0.004		<0.002	<0.002		<0.002
SR-T	mg/L	0.427	0.506	0.558	0.173	0.184	0.216	0.224	0.284	0.232	0.247	0.267		0.331	0.357		0.347
TI-T	mg/L	<0.005	<0.005	<0.005	0.115	0.018	0.011	0.01	0.023	0.002	0.003	0.003		0.009	0.004		0.003
V-T	mg/L	<0.005	<0.005	<0.005	0.013	0.002	<0.001	0.001	<0.001	<0.001	0.001	<0.001		0.001	<0.001		<0.001
W-T	mg/L	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03		<0.03
ZN-T	mg/L	<0.01	<0.01	<0.01	<0.01	0.022	0.017	0.011	0.001	0.041	0.01	0.009		0.01	0.011		<0.001
Dissolved Metals																	
AG-D	mg/L	<0.001	<0.001	<0.001	<0.001	0.4	0.2	0.8	0.6	<0.2	<0.2	<0.2		<0.2	<0.2		<0.2
AL-D	mg/L	<0.05	<0.05	<0.05	0.2	0.112	0.076	0.097	0.116	0.094	0.033	0.034		0.058	0.046		0.059
AS-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.003	0.01	0.003	<0.003	<0.003	<0.003	<0.003		<0.003	0.018		0.028
B-D	mg/L	<0.05	0.06	<0.05	0.06	0.09	0.05	<0.05	<0.05	0.14	0.11	0.13		0.15	0.12		0.16
BA-D	mg/L	0.171	0.214	0.171	0.13	0.156	0.129	0.155	0.065	0.178	0.111	0.125		0.108	0.116		0.139
BE-D	mg/L	<0.001	<0.001	<0.001	<0.001	<0.2	0.4	<0.2	0.3	<0.2	0.3	<0.2		<0.2	0.2		<0.2
BI-D	mg/L	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01		0.03	<0.01		<0.01
CA-D	mg/L	103	136.2	146.3	42.4	43.5	51.9	63.1	68.5	58	64	68.3		80.1	84.5		95.2
CD-D	mg/L	<0.001	<0.001	<0.001	<0.001	0.6	<0.2	0.4	1	<0.2	<0.2	0.3		<0.2	0.3		0.9
CO-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	0.002	<0.001	<0.001	<0.001	0.001	<0.001		0.001	<0.001		<0.001
CR-D	mg/L	<0.005	<0.005	<0.005	0.005	0.001	0.002	0.003	0.003	0.004	0.005	0.003		<0.001	<0.001		0.003
CU-D	mg/L	<0.002	0.012	0.01	0.011	0.017	0.012	0.01	0.015	0.018	0.015	0.021		0.025	0.023		0.017
FE-D	mg/L	<0.01	<0.01	<0.01	0.36	0.084	0.064	0.036	0.029	0.045	0.025	<0.002		0.007	0.042		0.031
K-D	mg/L	2	3	3	2	1.1	1.2	1.1	1.4	1.4	1.3	1.5		1.6	1.8		1.7
LA-D	mg/L					0.006	<0.001	0.001	0.003	0.004	0.006	0.004		0.005	0.002		0.003
MG-D	mg/L	49.2	65.2	75.2	15.5	16.2	19.5	23.4	27.7	22.8	25.2	27.1		32.1	39.5		38.5
MN-D	mg/L	0.03	0.02	0.02	0.04	0.019	0.014	0.023	0.017	0.02	0.016	0.009		0.019	0.022		0.02
MO-D	mg/L	0.005	0.005	0.007	0.003	<0.001	<0.001	0.006	0.001	0.003	0.003	<0.001		0.003	<0.001		0.003
NA-D	mg/L	6	9	9	4	4.1	3.2	3.5	6.1	3.8	4.4	5.4		6.9	5.2		4.9
NI-D	mg/L	<0.005	<0.005	0.02	0.008	<0.001	0.005	0.002	0.005	0.001	0.001	0.001		0.003	<0.001		<0.001
P-D	mg/L	<0.01	<0.01	<0.01	0.14	0.08	0.04	0.05	0.05	0.01	<0.01	<0.01		<0.01	<0.01		<0.01
PB-D	mg/L	<0.01	<0.01	<0.01	<0.01	<0.002	0.005	<0.002	0.011	<0.002	0.006	0.005		<0.002	0.006		<0.002
S-D	mg/L	52	69	89	14	15.5	20.1	24.1	27.8	21.3	23	27.9		31.2	41.1		40.4
SB-D	mg/L	<0.03	<0.03	<0.03	<0.03	0.013	<0.002	0.019	<0.002	<0.002	0.004	<0.002		0.013	0.016		<0.002
SE-D	mg/L	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005		<0.005
SI-D	mg/L	5.9	6.7	7	3.5	4.9	5.3	5.3	4.7	5	4.9	5.5		5.5	6.3		5.8
SN-D	mg/L	0.02	<0.01	0.01	0.01	<0.002	<0.002	<0.002	0.007	<0.002	0.013	0.002		<0.002	<0.002		<0.002
SR-D	mg/L					0.182	0.211	0.248	0.286	0.227	0.26	0.273		0.323	0.349		0.36
TI-D	mg/L	<0.005	<0.005	<0.005	0.01	0.003	<0.001	<0.001	<0.001	<0.001	0.003	<0.001		0.001	<0.001		<0.001
V-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001		<0.001
W-D	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03		<0.03
ZN-D	mg/L	0.04	<0.01	<0.01	<0.01	0.023	0.018	0.009	<0.001	0.028	0.004	0.003		0.016	0.014		0.002

Station		V6A			
Description		AEX Creek			
Parameter	Units	25/06/02	27/09/02	14/12/02	15/12/02
Physical					
PH-F	pH unit		8	7.9	
TEMP-C			4.4	0.3	
SO_4-T	mg/L	19	25		50
TSS	mg/L	8	4		3
HARD-T	mg/L				
ALK-T	mg/L				
COND-L	µS/cm				
NH_3-N	mg/L	<0.05	<0.05		<0.05
CN-T	mg/L				
Total Metals					
AG-T	mg/L	<0.2	<0.2		<0.2
AL-T	mg/L	0.177	0.081		0.077
AS-T	mg/L	0.014	<0.003		0.015
B-T	mg/L	0.1	0.1		0.21
BA-T	mg/L	0.149	0.135		0.137
BE-T	mg/L	0.4	<0.2		<0.2
BI-T	mg/L	<0.01	0.03		<0.01
CA-T	mg/L	20.7	30.3		49.7
CD-T	mg/L	1.3	<0.2		1.3
CO-T	mg/L	<0.001	<0.001		0.001
CR-T	mg/L	0.007	0.002		0.002
CU-T	mg/L	0.012	0.016		0.011
FE-T	mg/L	0.252	0.158		0.18
K-T	mg/L	0.6	0.5		0.7
LA-T	mg/L	0.005	0.004		0.002
MG-T	mg/L	4.2	5.3		9.9
MN-T	mg/L	0.011	0.01		0.022
MO-T	mg/L	<0.001	0.002		<0.001
NA-T	mg/L	1.2	2.2		1.9
NI-T	mg/L	0.006	0.003		<0.001
P-T	mg/L	0.1	<0.01		<0.01
PB-T	mg/L	0.014	0.005		0.002
S-T	mg/L	5.7	8		16.2
SB-T	mg/L	<0.002	0.013		0.016
SE-T	mg/L	<0.005	<0.005		<0.005
SI-T	mg/L	4.6	4.5		5.3
SN-T	mg/L	<0.002	0.021		<0.002
SR-T	mg/L	0.102	0.127		0.207
TI-T	mg/L	0.003	0.001		<0.001
V-T	mg/L	<0.001	<0.001		<0.001
W-T	mg/L	<0.03	<0.03		<0.03
ZN-T	mg/L	0.01	0.012		0.013
Dissolved Metals					
AG-D	mg/L	0.3	<0.2		<0.2
AL-D	mg/L	0.057	0.042		0.066
AS-D	mg/L	<0.003	<0.003		0.012
B-D	mg/L	<0.05	0.13		0.14
BA-D	mg/L	0.132	0.129		0.16
BE-D	mg/L	0.5	0.2		<0.2
BI-D	mg/L	<0.01	<0.01		0.03
CA-D	mg/L	22.9	30.2		48.7
CD-D	mg/L	<0.2	<0.2		<0.2
CO-D	mg/L	0.003	<0.001		0.002
CR-D	mg/L	0.001	0.001		0.002
CU-D	mg/L	0.017	0.019		0.021
FE-D	mg/L	0.066	0.059		0.106
K-D	mg/L	0.7	0.6		0.8
LA-D	mg/L	0.008	0.004		0.001
MG-D	mg/L	4.3	5.5		9.9
MN-D	mg/L	0.008	0.009		0.018
MO-D	mg/L	<0.001	<0.001		<0.001
NA-D	mg/L	2	2.5		2.2
NI-D	mg/L	0.008	<0.001		<0.001
P-D	mg/L	<0.01	<0.01		<0.01
PB-D	mg/L	0.004	0.007		0.008
S-D	mg/L	6.2	8.5		16.6
SB-D	mg/L	<0.002	<0.002		0.012
SE-D	mg/L	<0.005	<0.005		<0.005
SI-D	mg/L	4.7	4.6		5.5
SN-D	mg/L	0.002	<0.002		<0.002
SR-D	mg/L	0.103	0.133		0.204
TI-D	mg/L	<0.001	0.001		<0.001
V-D	mg/L	<0.001	<0.001		0.001
W-D	mg/L	<0.03	<0.03		<0.03
ZN-D	mg/L	0.015	0.023		0.007

Station		VGMAIN											
Description		Main Fork Vangorda Creek											
Parameter	Units	15/01/02	12/2/2002	15/04/02	13/05/02	16/06/02	16/07/02	12/8/2002	16/09/02	15/10/02	11/11/2002	12/11/2002	10/12/2002
Physical													
PH-F	pH unit			8.2							8.1		8
TEMP-C				-0.4							0.4		0
SO_4-T	mg/L	119	116	144	67	34	234	278	57	73		99	109
TSS	mg/L	1	4	<1	31	2	3	5	4	2		1	2
HARD-T	mg/L	320	353	380	190	101	337		162	207		270	288
ALK-T	mg/L												
COND-L	µS/cm												
NH_3-N	mg/L												
CN-T	mg/L												
Total Metals													
AG-T	mg/L	<0.001	<0.001	<0.001	<0.001	0.6	0.4	<0.2	<0.2	1.2		0.2	0.6
AL-T	mg/L	0.29	<0.05	0.09	0.91	0.129	0.119	0.076	0.054	0.064		0.049	0.037
AS-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.003	0.005	<0.003	<0.003	<0.003		<0.003	0.011
B-T	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	0.08	0.13		0.14	0.11
BA-T	mg/L	0.234	0.201	0.171	0.145	0.178	0.219	0.156	0.154	0.141		0.13	0.139
BE-T	mg/L	<0.001	<0.001	<0.001	<0.001	<0.2	0.5	<0.2	<0.2	<0.2		<0.2	0.2
BI-T	mg/L	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
CA-T	mg/L	73.6	80.4	91	45.9	27	91.4	108.9	41.2	52.5		66.7	65.8
CD-T	mg/L	<0.001	<0.001	<0.001	0.002	<0.2	1.3	<0.2	0.7	0.6		0.4	0.3
CO-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	0.002	0.001	0.001	0.001		<0.001	<0.001
CR-T	mg/L	<0.005	<0.005	<0.005	0.007	0.005	0.003	0.007	0.002	0.009		0.003	0.002
CU-T	mg/L	0.046	<0.002	0.004	0.007	0.018	0.015	0.104	0.014	0.027		0.013	0.022
FE-T	mg/L	0.05	<0.01	<0.01	1.46	0.108	0.029	0.032	0.052	0.091		0.021	0.04
K-T	mg/L	1	1	2	2	0.8	1.3	1.5	0.9	1		1.1	1.3
LA-T	mg/L					0.003	0.004	0.004	0.005	0.005		0.004	0.004
MG-T	mg/L	29.8	30	34	16.5	8.3	22.9	25.3	12.8	17.6		23	26.5
MN-T	mg/L	0.02	0.02	0.02	0.05	0.019	0.024	0.022	0.012	0.012		0.014	0.017
MO-T	mg/L	0.003	0.002	0.003	<0.002	<0.001	0.002	0.005	0.002	<0.001		<0.001	0.002
NA-T	mg/L	5	6	6	4	2.4	2.8	6.4	2.8	3.9		4.5	3.8
NI-T	mg/L	<0.005	<0.005	<0.005	0.01	0.002	0.009	0.004	<0.001	0.003		<0.001	0.003
P-T	mg/L	<0.01	0.04	0.02	<0.01	0.06	0.04	<0.01	<0.01	<0.01		<0.01	<0.01
PB-T	mg/L	<0.01	<0.01	<0.01	0.02	0.004	<0.002	0.009	<0.002	<0.002		0.004	0.008
S-T	mg/L	38	35	47	20	11	75.2	89.8	18.2	23.1		31.3	34
SB-T	mg/L	<0.03	<0.03	<0.03	<0.03	0.002	0.005	0.003	<0.002	<0.002		0.005	<0.002
SE-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005
SI-T	mg/L	5	5.3	5.1	4.5	3.7	4.7	4	4.4	4.7		5	5.6
SN-T	mg/L	<0.01	0.03	0.04	<0.01	0.006	<0.002	<0.002	<0.002	0.007		0.003	<0.002
SR-T	mg/L	0.328	0.329	0.354	0.175	0.111	0.373	0.434	0.162	0.211		0.268	0.278
TI-T	mg/L	<0.005	<0.005	<0.005	0.022	0.002	<0.001	<0.001	<0.001	0.001		<0.001	<0.001
V-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	0.002	<0.001	<0.001	<0.001		<0.001	<0.001
W-T	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03
ZN-T	mg/L	0.05	0.03	0.04	0.05	0.051	0.054	0.046	0.03	0.073		0.03	0.076
Dissolved Metals													
AG-D	mg/L	<0.001	<0.001	<0.001	<0.001	<0.2	0.3	<0.2	<0.2	0.4		<0.2	0.2
AL-D	mg/L	<0.05	<0.05	<0.05	0.06	0.09	0.063	0.084	0.074	0.043		0.03	0.036
AS-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.003	0.007	0.005	<0.003	<0.003		0.007	0.017
B-D	mg/L	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	0.12	0.12		0.12	0.08
BA-D	mg/L	0.185	0.127	0.125	0.115	0.141	0.073	0.098	0.157	0.123		0.099	0.12
BE-D	mg/L	<0.001	<0.001	<0.001	<0.001	<0.2	0.4	0.2	<0.2	<0.2		<0.2	0.3
BI-D	mg/L	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	0.01
CA-D	mg/L	76.2	82.3	93.8	46.8	26.1	96.9	110.1	41.3	53.3		68.2	65.7
CD-D	mg/L	<0.001	<0.001	0.004	0.001	0.5	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2
CO-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	0.002	0.003	<0.001	<0.001		0.001	0.002
CR-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	0.002	0.007	<0.001	0.003		0.004	0.005
CU-D	mg/L	<0.002	<0.002	<0.002	<0.002	0.014	0.008	0.018	0.018	0.031		0.014	0.02
FE-D	mg/L	<0.01	<0.01	<0.01	0.08	0.046	<0.002	0.012	0.022	0.013		<0.002	0.03
K-D	mg/L	2	2	2	2	0.8	1.4	1.7	1	1.2		1.2	1.4
LA-D	mg/L					0.005	0.012	0.003	0.004	0.005		0.004	0.005
MG-D	mg/L	31.4	30.9	35.3	16.7	8.3	23.8	26.7	13.1	18.3		23.5	26.3
MN-D	mg/L	0.02	0.02	0.02	0.03	0.008	0.023	0.021	0.012	0.012		0.013	0.021
MO-D	mg/L	<0.002	0.003	0.002	<0.002	<0.001	0.007	<0.001	0.001	<0.001		0.002	0.002
NA-D	mg/L	5	7	6	4	3.1	3.5	6.2	2.4	4.7		4.8	4.1
NI-D	mg/L	<0.005	<0.005	<0.005	0.005	<0.001	0.004	0.004	<0.001	0.001		<0.001	0.003
P-D	mg/L	<0.01	<0.01	<0.01	<0.01	0.03	0.06	0.01	<0.01	0.03		<0.01	0.04
PB-D	mg/L	<0.01	0.12	<0.01	<0.01	0.009	<0.002	0.008	<0.002	<0.002		<0.002	0.004
S-D	mg/L	40	36	48	21	11.4	79.4	93.7	19.3	26.2		32.5	35.6
SB-D	mg/L	<0.03	<0.03	<0.03	<0.03	<0.002	0.005	<0.002	<0.002	<0.002		<0.002	<0.002
SE-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005
SI-D	mg/L	5.4	5.1	5.3	3.8	3.9	4.4	3.9	4.5	5.1		5.1	5.7
SN-D	mg/L	<0.01	0.02	0.04	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002		0.004	0.005
SR-D	mg/L					0.108	0.385	0.457	0.162	0.215		0.275	0.273
TI-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001
V-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001
W-D	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03
ZN-D	mg/L	0.03	0.08	0.03	0.03	0.054	0.056	0.047	0.028	0.089		0.036	0.067

Gartner Lee

Station		V8																	
Description		lower Vangorda Creek																	
Sample Date		15/01/02	12/2/2002	12/3/2002	21/03/02	15/04/02	13/05/02	16/06/02	25/06/02	16/07/02	12/8/2002	16/09/02	27/09/02	15/10/02	11/11/2002	12/11/2002	10/12/2002	14/12/02	15/12/02
Parameter	**Units**																		
Physical																			
PH-F	pH unit					8.1							8.2		8.2		8	7.8	
TEMP-C						-0.2							4.6		0.5		-0.2	0.5	
SO_4-T	mg/L	135	136	150	175	168	56	37	105	200	239	60	66	74		100	119		113
TSS	mg/L	<1	7	7	4	8	45	12	5	6	8	6	3	5		7	5		6
HARD-T	mg/L	378	419	458	463	467	178	121	205	335		192	206	237		303	334		306
ALK-T	mg/L				270				92				127						
COND-L	µS/cm																		
NH_3-N	mg/L				<0.05				<0.05				<0.05						<0.05
CN-T	mg/L																		190
Total Metals																			
AG-T	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.2	0.9	0.7	0.3	0.6	<0.2	0.5		<0.2	0.4		<0.2
AL-T	mg/L	0.07	<0.05	0.07	0.06	0.06	1	0.213	0.175	0.158	0.096	0.062	0.125	0.1		0.069	0.06		0.089
AS-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	0.004	0.013	<0.003	0.014	<0.003		<0.003	0.009		<0.003
B-T	mg/L	<0.05	<0.05	0.07	0.05	<0.05	<0.05	<0.05	0.09	<0.05	0.07	0.09	0.07	0.14		0.12	0.12		0.21
BA-T	mg/L	0.255	0.195	0.303	0.183	0.162	0.157	0.178	0.177	0.213	0.151	0.151	0.169	0.161		0.138	0.141		0.157
BE-T	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.2	0.3	0.4	0.3	<0.2	<0.2	<0.2		<0.2	0.2		<0.2
BI-T	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02		0.01	<0.01		<0.01
CA-T	mg/L	87.5	91.6	100.5	104.1	100.5	47.2	31.1	54.1	82.3	94	48	51	59.2		75.3	77.8		76.2
CD-T	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.2	<0.2	1.9	<0.2	<0.2	<0.2	0.2		<0.2	<0.2		1.1
CO-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	0.001	0.003	0.002	<0.001	0.001	<0.001		<0.001	<0.001		<0.001
CR-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.004	0.004	0.005	0.01	0.004	0.005	0.007		0.002	<0.001		0.001
CU-T	mg/L	0.003	0.016	0.005	<0.002	0.003	0.008	0.007	0.012	0.016	0.016	0.021	0.021	0.025		0.024	0.023		0.014
FE-T	mg/L	0.1	0.06	0.1	0.13	0.08	1.62	0.326	0.201	0.149	0.09	0.105	0.155	0.161		0.094	0.171		0.216
K-T	mg/L	2	2	2	2	2	2	0.8	1.1	1.3	1.5	0.9	1	1.4		1.3	1.6		1.4
LA-T	mg/L							0.006	0.004	0.003	0.005	0.004	0.005	0.005		0.003	0.006		0.002
MG-T	mg/L	39.4	39.3	41.5	47.4	43.1	17.9	10.7	15.9	23.3	27.3	16.7	18.7	21.6		28.5	33.2		30.9
MN-T	mg/L	0.06	0.06	0.09	0.09	0.09	0.08	0.026	0.032	0.039	0.037	0.026	0.024	0.028		0.038	0.045		0.04
MO-T	mg/L	0.003	0.003	0.004	0.003	0.003	<0.002	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.002		0.003	0.002		0.002
NA-T	mg/L	6	7	7	7	7	3	2.9	2.7	3.5	5.5	2.8	2.9	4.9		5.4	4.6		4.1
NI-T	mg/L	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	0.002	0.005	0.004	<0.001	0.002	0.003	0.004		0.002	0.003		0.001
P-T	mg/L	<0.01	0.05	0.03	<0.01	<0.01	<0.01	0.07	<0.01	0.04	0.09	<0.01	0.02	0.22		0.01	<0.01		<0.01
PB-T	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	0.01	0.006	0.009	0.006	0.006	0.004		0.005	0.007		<0.002
S-T	mg/L	44	41	46	55	53	19	11.9	32.6	62.8	73.5	19.5	20.4	24.3		33.4	39.4		35.8
SB-T	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.002	<0.002	0.015	<0.002	<0.002	0.01	<0.002		0.005	0.018		<0.002
SE-T	mg/L	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005		<0.005
SI-T	mg/L	5.5	5.5	5.6	6.2	5.2	5	4.1	4.6	4.7	4.2	4.5	4.5	4.8		5.4	6.1		5.1
SN-T	mg/L	0.03	0.02	0.01	0.03	0.03	0.02	<0.002	<0.002	0.002	<0.002	0.002	0.028	0.004		0.011	<0.002		0.006
SR-T	mg/L	0.388	0.387	0.426	0.442	0.409	0.183	0.134	0.219	0.317	0.411	0.189	0.214	0.24		0.316	0.321		0.311
TI-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.027	0.005	0.002	0.002	<0.001	<0.001	0.002	0.001		<0.001	0.001		0.002
V-T	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001		0.001	<0.001		<0.001
W-T	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03		<0.03
ZN-T	mg/L	0.03	0.02	0.02	0.03	0.03	0.05	0.016	0.042	0.041	0.025	0.021	0.021	0.058		0.02	0.036		0.054
Dissolved Metals																			
AG-D	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.2	<0.2	0.4	<0.2	<0.2	<0.2	0.7		<0.2	0.4		<0.2
AL-D	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.09	0.046	0.094	0.082	0.088	0.044	0.065		0.059	0.038		0.05
AS-D	mg/L	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.003	0.009	<0.003	<0.003	<0.003	0.012	<0.003		0.011	0.01		<0.003
B-D	mg/L	<0.05	<0.05	0.05	<0.05	<0.05	0.06	0.08	<0.05	<0.05	<0.05	0.13	0.13	0.14		0.14	0.09		0.11
BA-D	mg/L	0.193	0.131	0.255	0.144	0.128	0.13	0.143	0.113	0.081	0.09	0.156	0.11	0.126		0.105	0.117		0.129
BE-D	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.2	0.4	0.2	<0.2	<0.2	0.3	<0.2		<0.2	0.3		<0.2
BI-D	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.02	<0.01	<0.01	<0.01	<0.01	0.01	<0.01		0.02	<0.01		<0.01
CA-D	mg/L	85.6	99	106.6	108.5	106.1	47.2	31	59.4	89.5	103	49.4	54.3	60.2		75.8	75.4		81.5
CD-D	mg/L	<0.001	0.003	<0.001	<0.001	0.005	<0.001	<0.2	1.7	1.4	1	<0.2	37.6	0.4		<0.2	0.3		0.6
CO-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001		0.001	0.002		<0.001
CR-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.001	0.003	<0.001	0.005	0.003	0.004	0.006		0.001	<0.001		<0.001
CU-D	mg/L	<0.002	0.003	0.011	0.009	<0.002	0.004	0.015	0.016	0.014	0.017	0.018	0.018	0.024		0.029	0.024		0.012
FE-D	mg/L	0.03	<0.01	<0.01	<0.01	<0.01	0.19	0.063	0.033	0.016	0.031	0.058	0.041	0.038		0.028	0.076		0.064
K-D	mg/L	2	2	2	3	2	2	0.9	1.2	1.4	1.7	1.1	1.2	1.4		1.5	1.6		1.5
LA-D	mg/L							0.008	0.01	0.018	0.003	0.005	0.005	0.005		0.004	0.006		0.003
MG-D	mg/L	39.8	41.7	43.6	48	49	17.7	10.7	16	24.5	27.4	17.2	19.7	22.2		28.2	32.4		31.4
MN-D	mg/L	0.06	0.07	0.09	0.09	0.1	0.05	0.021	0.031	0.037	0.035	0.025	0.023	0.029		0.038	0.041		0.034
MO-D	mg/L	0.003	<0.002	0.003	<0.002	0.003	<0.002	<0.001	0.004	0.006	<0.001	0.002	0.002	<0.001		0.002	0.003		0.002
NA-D	mg/L	6	7	8	8	8	4	3.5	3.2	4	6	2.9	3.5	5.3		5.8	5		4.2
NI-D	mg/L	<0.005	<0.005	<0.005	0.005	<0.005	0.019	<0.001	0.004	0.009	0.004	<0.001	0.001	0.001		<0.001	0.003		0.002
P-D	mg/L	<0.01	0.03	<0.01	0.03	<0.01	<0.01	0.09	0.1	0.08	0.03	<0.01	<0.01	0.04		0.04	<0.01		0.05
PB-D	mg/L	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	0.006	<0.002	<0.002	0.01	<0.002	0.007	0.004		0.009	0.011		0.006
S-D	mg/L	45	44	49	58	56	20	12.9	37.1	66.9	80.8	21	22.1	28.6		33.6	39.1		38
SB-D	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.002	<0.002	0.008	0.002	<0.002	0.017	<0.002		<0.002	0.009		<0.002
SE-D	mg/L	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005		<0.005
SI-D	mg/L	5.6	5.5	5.9	6.2	5.6	3.8	4.1	4.8	4.7	4.3	4.7	4.8	5.3		5.3	5.9		5.4
SN-D	mg/L	0.02	0.02	<0.01	<0.01	0.04	<0.01	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002		0.002	0.005		0.004
SR-D	mg/L							0.135	0.225	0.355	0.415	0.191	0.221	0.241		0.31	0.322		0.307
TI-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001		<0.001
V-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	0.002	<0.001	0.001	<0.001		<0.001	<0.001		<0.001
W-D	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03		<0.03
ZN-D	mg/L	0.04	0.05	0.02	0.03	0.03	0.03	0.016	0.074	0.056	0.029	0.023	0.124	0.05		0.019	0.037		0.007

Station	V14	V15									V16	V17A			
Description	Grum Dump southwest sump	Sulphide cell sump, Grum Dump									Grum Dump, southeast sump	Runoff from ore transfer pad			
Sample Date	11/6/2002	15/01/02	12/2/2002	21/03/02	15/04/02	13/05/02	25/06/02	27/09/02	14/12/02	15/12/02	11/6/2002	25/06/02	27/09/02	14/12/02	15/12/02
Parameter															
Physical															
PH-F					7.7			7.6	7.4				8.1	7.5	
TEMP-C					-0.2			3.6	0.9				4.3	0.3	
SO_4-T	1619	1052	916	1067	921	717	1022	1052		1051	556	11	25		57
TSS	4	13	15	17	11	8	10	42		19	15	1	1		2
HARD-T		1497										40	72		142
ALK-T			407	442	403	165	443	471				26	43		
COND-L															
NH_3-N		<0.05	<0.05	<0.05	2200	<0.05	<0.05	<0.05		<0.05		<0.05	<0.05		0.08
CN-T										445					79
Total Metals															
AG-T	2.6	<0.001	<0.001	0.002	<0.001	<0.001	1.1	0.9		0.3	0.8	2.2	<0.2		0.5
AL-T	0.176	0.07	0.09	0.1	0.08	0.09	0.102	0.271		0.203	0.186	0.645	0.079		0.067
AS-T	0.02	0.014	0.022	<0.005	<0.005	<0.005	0.034	0.044		0.05	0.012	<0.003	<0.003		<0.003
B-T	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	0.11		0.2	<0.05	0.06	0.07		0.18
BA-T	0.189	0.199	0.159	0.138	0.133	0.121	0.182	0.146		0.124	0.199	0.152	0.145		0.142
BE-T	0.8	<0.001	<0.001	<0.001	<0.001	<0.001	0.6	0.2		0.3	0.6	<0.2	<0.2		<0.2
BI-T	0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.03		<0.01	<0.01	<0.01	0.03		0.02
CA-T	341.1	289.4	286	293.2	265.1	140.3	316.5	298.1		308.3	202.5	13.6	23.7		43.6
CD-T	<0.2	<0.001	<0.001	<0.001	<0.001	0.004	<0.2	0.2		1	2	2.4	<0.2		<0.2
CO-T	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001		<0.001	<0.001	0.001	<0.001		<0.001
CR-T	0.006	<0.005	0.007	<0.005	<0.005	0.006	0.005	0.005		0.006	0.004	0.007	0.001		0.001
CU-T	0.005	0.006	0.004	<0.002	0.006	0.016	0.029	0.015		0.013	0.005	0.031	0.019		0.014
FE-T	0.157	0.09	0.1	0.16	0.03	0.08	0.166	0.198		0.274	0.26	1.006	0.231		0.476
K-T	7.8	5	5	6	5	7	4.4	5.9		5.9	2.8	0.5	0.5		0.7
LA-T	<0.001						<0.001	<0.001		<0.001	<0.001	0.002	0.004		0.002
MG-T	256	184.5	168.1	179.5	160.6	124.9	168.4	184.3		196.9	67.8	2.6	4.1		8.8
MN-T	0.04	0.02	0.02	0.02	0.03	0.03	0.033	0.025		0.022	0.041	0.026	0.017		0.102
MO-T	0.008	0.005	0.004	0.005	<0.002	0.011	0.009	0.006		0.004	0.011	0.002	0.002		0.001
NA-T	18.6	15	15	15	14	9	13.5	13.5		13.8	9.8	0.9	2.4		2
NI-T	0.007	<0.005	<0.005	0.018	<0.005	0.024	0.007	0.006		0.003	0.005	0.001	0.002		<0.001
P-T	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01		<0.01	0.09	0.08	<0.01		0.02
PB-T	0.006	<0.01	<0.01	<0.01	<0.01	<0.01	0.006	0.005		<0.002	0.003	0.006	0.007		<0.002
S-T	518.5	346	292	341	287	225	338.8	346.4		362.9	171.8	3.8	7.4		17.8
SB-T	0.091	<0.03	<0.03	<0.03	<0.03	<0.03	0.024	0.021		0.002	0.007	0.002	<0.002		0.012
SE-T	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	0.007	<0.005	<0.005		<0.005
SI-T	8.8	9.4	9	9.8	8.1	3.1	10.5	9.4		9.4	6.5	5.3	4.4		5.6
SN-T	0.006	0.07	0.05	0.05	0.03	0.01	0.006	0.023		<0.002	0.005	0.004	0.035		<0.002
SR-T	1.121	1.14	1.045	1.079	0.935	0.584	1.041	1.07		1.058	0.714	0.06	0.104		0.17
TI-T	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	0.004		0.004	0.004	0.028	0.001		<0.001
V-T	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	0.003	0.003		0.002	0.003	<0.001	<0.001		<0.001
W-T	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03	<0.03		<0.03
ZN-T	0.003	0.01	<0.01	0.01	<0.01	0.37	<0.001	0.02		0.006	0.019	0.012	0.021		0.014
Dissolved Metals															
AG-D	1.4	0.001	0.001	0.001	0.001	<0.001	1.4	1.1		0.7	0.6	<0.2	<0.2		<0.2
AL-D	<0.001	<0.05	<0.05	<0.05	<0.05	<0.05	<0.001	0.016		0.064	0.039	0.071	0.061		0.066
AS-D	0.02	0.009	0.025	<0.005	<0.005	<0.005	0.049	0.055		0.053	0.015	<0.003	<0.003		<0.003
B-D	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12		0.1	<0.05	0.06	0.08		0.18
BA-D	0.096	0.144	0.043	0.106	0.089	0.055	0.083	0.086		0.063	0.089	0.127	0.127		0.153
BE-D	1.2	<0.001	<0.001	<0.001	<0.001	<0.001	1	0.4		0.3	0.8	0.3	<0.2		<0.2
BI-D	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01		0.02
CA-D	336.2	291.2	297.3	308	282.1	152.7	297.5	304.7		318.7	195.6	13.2	24.6		44.5
CD-D	<0.2	<0.001	<0.001	<0.001	0.001	0.001	0.6	0.4		0.6	1.6	1.1	<0.2		0.8
CO-D	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001		<0.001	0.003	0.002	<0.001		<0.001
CR-D	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	0.003		0.006	<0.001	0.002	<0.001		<0.001
CU-D	<0.001	<0.002	<0.002	<0.002	<0.002	0.002	0.007	0.01		0.015	<0.001	0.012	0.023		0.008
FE-D	<0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	<0.002		0.016	<0.002	0.162	0.117		0.389
K-D	8.2	6	5	7	5	8	4.7	6.3		6.2	3.1	0.5	0.6		0.8
LA-D	<0.001						<0.001	<0.001		<0.001	<0.001	0.002	0.004		0.002
MG-D	252.5	186.7	175.6	189.2	156.9	135.1	175.7	191.8		200.8	68.7	2.4	4		9
MN-D	0.032	0.02	0.02	0.02	0.02	0.03	0.029	0.022		0.019	0.037	0.012	0.019		0.105
MO-D	0.007	0.004	0.004	0.007	<0.002	0.009	0.003	0.006		0.006	0.005	<0.001	<0.001		<0.001
NA-D	18.3	15	16	16	14	9	13.5	13.6		14.6	9.6	1.4	2.5		1.9
NI-D	0.008	<0.005	0.01	0.022	<0.005	0.019	0.013	0.006		0.003	<0.001	0.004	<0.001		<0.001
P-D	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01		<0.01
PB-D	<0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	0.004		<0.002	<0.002	0.004	0.006		<0.002
S-D	510.5	351	302	358	307	236	344.7	356.6		372.6	176.4	3.9	7.8		18.7
SB-D	0.057	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	0.024		0.004	<0.002	<0.002	0.002		<0.002
SE-D	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	0.005	<0.005	<0.005		<0.005
SI-D	8.2	9.5	9.2	10	8.5	2.9	10.7	9.2		9.6	6.6	4.8	4.7		5.8
SN-D	0.006	0.06	0.05	0.06	0.06	0.03	0.005	<0.002		<0.002	0.003	0.003	0.014		<0.002
SR-D	1.11						1.06	1.085		1.095	0.721	0.058	0.105		0.173
TI-D	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001		<0.001
V-D	0.002	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	0.004		0.003	<0.001	<0.001	<0.001		<0.001
W-D	<0.03	<0.03	0.05	0.11	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03	<0.03		<0.03
ZN-D	<0.001	0.03	0.01	0.02	<0.01	0.37	<0.001	0.038		0.015	<0.001	0.02	0.014		0.024

Gartner Lee

Station		V20		V22				V23			V25	V25 BSP	
Description		Vangorda pit, NE interceptor ditch		Vangorda pit water				Grum Pit Water			Effluent from treatment plant, clarification	Below Sheep Pond at the weir	
Sample Date		25/06/02	27/09/02	21/03/02	25/06/02	27/09/02	15/12/02	21/03/02	25/06/02	27/09/02	9/6/2002	13/05/02	16/06/02
Parameter	Units												
Physical													
PH-F	pH unit		8.2			7.1	7.2			7.9			
TEMP-C			4.9			5.9	0.5			7.1			
SO_4-T	mg/L	4	13	734	798	862	869	133	419	459	596	110	54
TSS	mg/L	3	5	8	4	13	12	4	8	12	10	6	4
HARD-T	mg/L												
ALK-T	mg/L			31	30	43		236	123	136			
COND-L	µS/cm												
NH_3-N	mg/L										0.19		
CN-T	mg/L						53				<0.01		
Total Metals													
AG-T	mg/L	1.7	<0.2	<0.001	<0.2	1.5	0.6	0.001	2	0.9	0.4	<0.001	<0.2
AL-T	mg/L	0.225	0.136	<0.05	0.091	0.04	0.035	0.06	0.128	0.065	0.172	0.35	0.374
AS-T	mg/L	<0.003	<0.003	<0.005	0.02	0.04	0.055	<0.005	0.02	0.019	0.004	<0.005	<0.003
B-T	mg/L	0.09	0.1	<0.05	0.09	0.12	0.2	<0.05	0.08	0.08	0.31	<0.05	<0.05
BA-T	mg/L	0.191	0.124	0.111	0.15	0.116	0.1	0.213	0.189	0.154	0.091	0.166	0.198
BE-T	mg/L	<0.2	<0.2	<0.001	0.5	0.2	0.3	<0.001	0.6	<0.2	0.4	<0.001	<0.2
BI-T	mg/L	<0.01	0.03	<0.05	<0.01	0.02	<0.01	<0.05	<0.01	0.02	0.01	<0.05	<0.01
CA-T	mg/L	26	35.9	142	165.6	176.4	189.4	89	107.1	122.7	191.8	53.4	37
CD-T	mg/L	<0.2	<0.2	0.101	109.9	98.8	99.7	0.002	14.2	15.5	0.5	0.001	<0.2
CO-T	mg/L	<0.001	0.005	0.446	0.475	0.494	0.51	0.01	0.053	0.051	0.004	<0.005	<0.001
CR-T	mg/L	0.006	0.002	<0.005	0.017	0.002	0.001	<0.005	0.012	0.002	0.008	<0.005	0.006
CU-T	mg/L	0.015	0.019	0.003	0.018	0.059	0.047	<0.002	0.03	0.02	0.007	0.016	0.015
FE-T	mg/L	0.196	0.212	0.08	0.566	0.107	1.006	0.02	0.069	0.077	0.221	0.31	0.373
K-T	mg/L	0.7	0.7	4	3	3.8	4.1	4	3.5	4.3	2.8	2	1.2
LA-T	mg/L	0.002	0.005		<0.001	0.004	<0.001		0.003	0.006	0.017		0.006
MG-T	mg/L	6.1	9.7	59.4	59.9	67	72.7	30.4	60.2	67.6	36	10.5	6.4
MN-T	mg/L	0.02	0.036	19.57	19.965	22.259	23.433	0.18	0.63	0.577	0.202	0.03	0.033
MO-T	mg/L	<0.001	0.001	0.017	0.018	0.019	0.016	0.007	0.005	0.008	0.003	<0.002	0.002
NA-T	mg/L	2	2.7	6	5.6	6.1	6.6	13	10.5	11.9	5.3	5	3
NI-T	mg/L	0.004	0.005	0.348	0.345	0.397	0.426	0.042	0.191	0.179	0.01	<0.005	<0.001
P-T	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.01	<0.01	0.08	0.06
PB-T	mg/L	0.004	0.005	<0.01	0.014	0.02	0.014	<0.01	0.004	0.002	<0.002	0.01	0.017
S-T	mg/L	1.2	4	227	264.7	265.3	288.8	41	135.3	142.1	206.9	34	18
SB-T	mg/L	<0.002	0.029	<0.03	<0.002	0.006	<0.002	<0.03	0.038	0.016	0.042	<0.03	<0.002
SE-T	mg/L	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SI-T	mg/L	7.5	5.4	4.7	4.4	4.3	4.7	8.7	4.3	4	2.4	3.6	5
SN-T	mg/L	0.004	0.03	0.06	0.007	0.006	<0.002	0.03	<0.002	0.015	<0.002	<0.01	<0.002
SR-T	mg/L	0.125	0.175	0.909	0.882	1.05	1.098	0.628	0.788	0.867	0.856	0.205	0.155
TI-T	mg/L	<0.001	0.004	<0.005	0.002	<0.001	<0.001	<0.005	<0.001	0.001	0.008	0.01	0.01
V-T	mg/L	<0.001	<0.001	<0.005	<0.001	0.002	<0.001	<0.005	<0.001	0.003	<0.001	<0.005	0.001
W-T	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
ZN-T	mg/L	<0.001	0.018	74.09	86.758	106.099	81.243	1.81	7.822	5.923	0.156	0.34	0.081
Dissolved Metals													
AG-D	mg/L	1.4	<0.2	<0.001	<0.2	1.5	0.9	<0.001	0.8	0.8	0.3	<0.001	0.6
AL-D	mg/L	0.068	0.086	<0.05	0.003	0.009	0.028	<0.05	0.037	0.03	0.063	<0.05	0.21
AS-D	mg/L	0.007	<0.003	<0.005	0.058	0.048	0.063	<0.005	<0.003	0.033	<0.003	<0.005	<0.003
B-D	mg/L	0.05	0.14	<0.05	0.06	0.15	0.08	<0.05	<0.05	0.13	0.1	0.05	0.07
BA-D	mg/L	0.162	0.12	0.055	0.034	0.035	0.048	0.136	0.04	0.058	0.061	0.095	0.163
BE-D	mg/L	0.3	0.2	<0.001	0.7	0.2	0.3	<0.001	0.4	0.3	0.3	<0.001	<0.2
BI-D	mg/L	0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.05	0.02
CA-D	mg/L	27.1	35.7	150.2	186.4	190.1	193.9	96.7	116.5	127.4	217.2	57	36.6
CD-D	mg/L	1.9	<0.2	0.108	116.1	108.8	105.4	0.003	18.3	16	0.6	<0.001	0.2
CO-D	mg/L	<0.001	0.005	0.471	0.486	0.532	0.517	0.01	0.054	0.051	<0.001	<0.005	<0.001
CR-D	mg/L	0.001	<0.001	<0.005	0.001	<0.001	0.002	<0.005	0.001	<0.001	0.007	<0.005	<0.001
CU-D	mg/L	0.015	0.022	0.003	0.021	0.055	0.043	0.009	0.01	0.015	0.004	0.004	0.018
FE-D	mg/L	0.026	0.049	0.01	0.014	<0.002	0.135	<0.01	0.009	<0.002	0.066	<0.01	0.151
K-D	mg/L	0.8	0.9	5	3.3	4.4	4.5	4	3.8	4.9	3.1	2	1.3
LA-D	mg/L	0.003	0.004		<0.001	0.003	<0.001		0.003	0.003	0.015		0.007
MG-D	mg/L	6.3	9.9	63.6	60.1	73.5	75	33.2	61.3	70.3	37.3	10.3	6.4
MN-D	mg/L	0.016	0.035	20.45	20.392	24.337	24.009	0.2	0.609	0.599	0.067	0.03	0.029
MO-D	mg/L	0.003	0.001	0.018	0.016	0.018	0.017	0.007	0.002	0.007	0.004	0.006	<0.001
NA-D	mg/L	2.4	3	8	5.4	7	7.2	14	11	12.3	6.3	5	3.9
NI-D	mg/L	0.002	0.006	0.369	0.36	0.422	0.433	0.042	0.188	0.18	0.002	<0.005	<0.001
P-D	mg/L	<0.01	0.01	0.01	<0.01	<0.01	0.02	0.05	<0.01	0.01	0.01	0.05	<0.01
PB-D	mg/L	0.004	<0.002	0.03	0.002	0.003	<0.002	<0.01	0.014	0.003	<0.002	0.01	0.011
S-D	mg/L	1.4	4.1	243	275	293	296.3	46	143.1	152.2	217.1	36	18.3
SB-D	mg/L	<0.002	0.009	<0.03	<0.002	<0.002	0.004	<0.03	0.005	0.016	0.01	<0.03	<0.002
SE-D	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SI-D	mg/L	8.1	5.4	4.7	4.3	4.7	4.8	9.2	4.2	4.1	2	2.9	5.2
SN-D	mg/L	<0.002	<0.002	0.03	0.006	<0.002	<0.002	0.01	0.006	<0.002	<0.002	0.03	0.003
SR-D	mg/L	0.125	0.176		0.913	1.115	1.111		0.799	0.898	0.883		0.154
TI-D	mg/L	<0.001	0.002	<0.005	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	0.001	<0.005	0.005
V-D	mg/L	<0.001	0.001	<0.005	<0.001	<0.001	0.004	<0.005	<0.001	0.002	<0.001	<0.005	<0.001
W-D	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
ZN-D	mg/L	0.074	0.018	79.69	90.198	104.164	83.323	1.93	7.439	4.95	0.031	0.34	0.094

Station	V25 BSP												V27		V29	V30		V32	
Description	Below Sheep Pond at the weir												Vangorda Creek, just upstr. of Shrimp		Vangorda Dump drain #2	Vangorda Dump drain #3		Vangorda Dump drain #5	
Sample Date	25/06/02	9/7/2002	16/07/02	23/07/02	6/8/2002	12/8/2002	20/08/02	27/08/02	16/09/02	15/10/02	11/11/2002	12/11/2002	25/06/02	27/09/02	10/6/2002	10/6/2002	12/9/2002	10/6/2002	12/9/2002
Parameter																			
Physical																			
PH-F											8			8.3	6.17	6.03	6.22	3.3	3.43
TEMP-C											0.4			4.2	8.8				
SO_4-T	563	693	729	799	810	803	790	747	490	476		309	125	46	2170	4400	4070	30500	33100
TSS	17	5	8	6	6	9	7	2	2	4		16	2	1					
HARD-T		739	815	773	847	<0.1	778	755					174	96					
ALK-T	39	31	30	33	31	29	31	33					39	47	289	187	124	<1	7
COND-L															3180	5220	5140	21400	22300
NH_3-N	0.11	0.07	0.07	<0.05	0.11	0.1	0.15	0.05											
CN-T	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01											
Total Metals																			
AG-T	42.7	0.6	1.6	<0.2	<0.2	0.5	<0.2	0.3	0.2	1		<0.2	<0.2	<0.2					
AL-T	0.4	0.148	0.121	0.071	0.061	0.151	0.084	0.098	0.084	0.117		0.404	0.224	0.063					
AS-T	0.016	0.008	0.008	0.004	0.006	0.022	<0.003	<0.003	0.005	0.003		0.007	0.007	0.009					
B-T	0.13	0.81	0.05	0.38	0.2	0.08	0.23	0.08	0.08	0.14		0.12	0.07	0.09					
BA-T	0.217	0.174	0.173	0.159	0.113	0.104	0.117	0.123	0.131	0.138		0.121	0.185	0.142					
BE-T	0.5	0.4	0.7	0.3	0.5	<0.2	0.3	<0.2	<0.2	<0.2		<0.2	0.3	<0.2					
BI-T	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02		<0.01	<0.01	0.03					
CA-T	174	237.2	227.3	232.9	252.2	252	232.3	213.2	170.8	164.7		126.4	53.1	28					
CD-T	12.7	0.2	0.6	<0.2	0.5	0.7	0.5	0.4	0.6	1		0.4	2.9	<0.2					
CO-T	0.005	<0.001	0.004	0.006	<0.001	0.002	0.003	0.002	0.006	0.011		0.015	0.003	0.001					
CR-T	0.019	0.013	0.011	0.011	<0.001	0.003	0.007	0.004	<0.001	0.003		0.007	0.01	0.002					
CU-T	0.02	0.008	0.017	0.008	0.004	0.011	0.004	0.022	0.023	0.025		0.03	0.029	0.017					
FE-T	0.601	0.181	0.032	0.127	0.039	0.08	0.104	0.1	0.019	0.021		0.367	0.261	0.183					
K-T	2.5	2.8	3	3.4	3.4	3.4	3.5	3.7	2.8	2.7		2.4	1.1	0.6					
LA-T	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.004		0.004	<0.001	0.005					
MG-T	32.5	37.7	43.9	47.1	51.6	44.3	45.4	40.8	31.6	31.2		24.1	10.9	7.1					
MN-T	0.311	0.077	0.129	0.127	0.107	0.075	0.11	0.074	0.063	0.098		0.146	0.038	0.013					
MO-T	0.003	0.011	0.005	0.006	0.002	0.005	<0.001	<0.001	0.002	0.002		0.002	0.003	0.001					
NA-T	5.2	6.4	6.2	7.9	4.8	9.1	5.5	6.6	5.8	7.8		8.5	2.1	1.9					
NI-T	0.007	0.004	0.002	0.008	<0.001	0.005	<0.001	0.003	0.003	0.005		0.003	0.006	0.004					
P-T	<0.01	<0.01	0.05	<0.01	<0.01	0.03	<0.01	0.06	<0.01	<0.01		0.02	0.05	<0.01					
PB-T	0.014	0.019	0.012	0.017	<0.002	0.006	<0.002	<0.002	0.006	0.01		0.027	0.011	0.006					
S-T	180.8	225.9	237.3	254.5	262.4	258	258.2	230.4	161.7	154		99.8	41.9	14.5					
SB-T	<0.002	0.006	0.059	0.007	0.006	0.004	<0.002	0.012	0.011	0.019		<0.002	0.002	0.017					
SE-T	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005					
SI-T	3.8	3.2	3.1	3	3.2	3.1	2.9	3.5	4.7	4.8		6.8	4.1	4.4					
SN-T	0.007	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002		0.008	0.003	0.028					
SR-T	0.741	0.897	0.896	0.987	1.023	1.038	1.068	0.949	0.671	0.661		0.462	0.217	0.116					
TI-T	0.009	0.002	0.001	<0.001	<0.001	0.003	0.004	0.002	<0.001	<0.001		0.008	0.001	<0.001					
V-T	0.001	0.002	0.001	<0.001	0.003	0.002	<0.001	0.001	0.002	0.002		<0.001	<0.001	<0.001					
W-T	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03					
ZN-T	0.149	0.085	0.098	0.098	0.082	0.067	0.062	0.184	0.14	0.174		0.213	0.175	0.107					
Dissolved Metals																			
AG-D	<0.2	0.8	1.2	<0.2	<0.2	0.6	<0.2	<0.2	0.9	1.1		<0.2	<0.2	<0.2	<0.01	<0.02	<0.02	<0.4	<0.3
AL-D	0.052	0.056	0.077	0.004	<0.001	0.161	<0.001	0.074	0.092	0.078		0.092	0.067	0.046	<0.2	<0.4	<0.4	20	22
AS-D	0.038	0.005	0.01	<0.003	0.006	0.02	<0.003	<0.003	<0.003	0.005		0.007	0.015	0.008	<0.2	<0.4	<0.4	<8	<6
B-D	0.05	0.68	<0.05	0.44	0.16	0.06	0.15	0.08	0.11	0.11		0.16	0.05	0.11	<0.1	<0.2	<0.2	<4	<3
BA-D	0.048	0.054	0.034	0.037	0.069	0.046	0.072	0.089	0.106	0.046		0.065	0.094	0.116	<0.01	0.02	<0.02	<0.4	<0.3
BE-D	0.6	0.4	0.6	0.2	<0.2	0.4	<0.2	<0.2	<0.2	<0.2		0.2	0.3	<0.2	<0.005	<0.01	<0.01	<0.2	<0.2
BI-D	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.3	<0.6	<0.4	<20	<6
CA-D	199.7	227.5	232.7	233.7	257.3	250.1	235.2	238.5	173.4	174.6		125	53.4	28.9	393	435	431	467	456
CD-D	0.5	<0.2	0.4	<0.2	0.8	<0.2	0.3	0.4	0.8	0.8		<0.2	1.5	<0.2	0.08	0.11	0.06	6.8	8.1
CO-D	0.003	<0.001	0.003	0.011	0.002	0.003	0.003	<0.001	0.006	0.012		0.012	<0.001	<0.001	0.81	2.99	2.86	22.3	22.3
CR-D	0.012	0.012	0.01	0.005	<0.001	0.005	0.003	<0.001	<0.001	<0.001		0.008	0.002	<0.001	<0.01	<0.02	<0.02	<0.4	<0.3
CU-D	0.014	0.007	0.017	0.008	<0.001	0.034	0.002	0.011	0.023	0.031		0.029	0.015	0.015	<0.01	<0.02	<0.02	<0.4	<0.3
FE-D	0.076	0.014	0.002	0.014	<0.002	0.096	0.004	0.033	<0.002	0.027		0.02	0.033	0.068	5.48	93.7	127	1160	1030
K-D	2.8	3	3.3	3.6	3.6	4	3.7	4.2	3.1	3.2		2.5	1.1	0.7	11	13	12	<80	<60
LA-D	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.002		0.005	0.004	0.004					
MG-D	34.1	39.5	45.7	47.3	49.5	45.4	46.1	45.3	32.9	32.5		24.3	10.9	7.4	257	551	558	3180	3490
MN-D	0.291	0.069	0.13	0.118	0.102	0.066	0.098	0.078	0.062	0.102		0.104	0.035	0.014	36	139	135	2350	2600
MO-D	0.007	0.004	0.006	<0.001	0.002	<0.001	0.001	<0.001	0.003	<0.001		<0.001	0.002	0.002	<0.03	<0.06	<0.06	<2	<0.9
NA-D	6	6.8	6.9	7.8	5.8	9.4	6.2	7	6.7	8.7		9.1	2.5	2.5	10	13	13	<80	<60
NI-D	0.004	0.004	0.004	<0.001	<0.001	0.005	0.001	0.004	0.003	0.003		0.007	0.003	0.002	2	5.3	5	17	17
P-D	<0.01	<0.01	0.06	<0.01	0.01	0.03	<0.01	<0.01	0.01	<0.01		0.02	<0.01	<0.01	<0.3	<0.6	<0.6	<20	<9
PB-D	0.008	0.021	<0.002	0.004	<0.002	0.003	<0.002	<0.002	0.004	<0.002		0.007	<0.002	<0.002	<0.05	<0.1	<0.1	<2	<2
S-D	194.2	237.7	249.5	261.8	270.1	260.3	263.3	249	166.7	172.1		98.5	44.2	15.5					
SB-D	<0.002	0.002	0.018	0.005	0.004	0.005	<0.002	0.007	0.025	0.01		0.004	0.005	0.003	<0.2	<0.4	<0.4	<8	<6
SE-D	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.2	<0.4	<0.4	<8	<6
SI-D	3.5	3.2	2.9	2.9	3.3	3	3	3.9	4.8	5		6.6	4.4	4.7	5.25	7.5	7.8	21	20
SN-D	0.004	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	0.003	<0.002	0.04	<0.06	<0.06	<2	<0.9
SR-D	0.767	0.922	0.918	0.97	1.02	1.04	1.051	1.188	0.675	0.697		0.459	0.219	0.116	1.48	1.87	1.77	1	1.1
TI-D	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.3	<0.4	<0.4	<8	<6
V-D	<0.001	0.002	0.002	0.001	0.002	0.002	0.004	0.003	0.002	<0.001		0.002	<0.001	<0.001	<0.03	<0.06	<0.08	<2	<0.9
W-D	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03					
ZN-D	0.144	0.09	0.106	0.089	0.043	0.097	0.03	0.123	0.135	0.192		0.189	0.154	0.105	88.3	412	350	6370	6990

Gartner Lee	Station	V33		V34		V35		V36		V37		96-9A		P2001-02B		P2001-03	
	Description	Vangorda Dump drain #6		groundwater well GW94-01		groundwater well GW94-02		groundwater well GW94-03		groundwater well GW94-04		Groundwater at the toe of Grum dump		Groundwater monitoring well (13.9m)		Groundwater monitoring well (61.6m)	
	Sample Date	10/6/2002	12/9/2002	11/6/2002	24/09/02	11/6/2002	24/09/02	11/6/2002	24/09/02	11/6/2002	24/09/02	11/6/2002	24/09/02	11/6/2002	24/09/02	11/6/2002	24/09/02
Parameter	**Units**																
Physical																	
PH-F	pH unit	6.21	5.93	6.9	8.13	6.6	8	7.6	7.95	8.2	8.13	7.4	7.69	7.5	8.06	7	8.13
TEMP-C				2.8		2.6		2.5		3.1		3.4		2		3.6	
SO_4-T	mg/L	13700	23000	40	42	1090	579	369	545	93	84		1280	175	231	190	143
TSS	mg/L																
HARD-T	mg/L			470	474	1280	868	805	938	449	437		1920	575	643	495	500
ALK-T	mg/L	160	119	448	441	487	402	414	390	426	429		469	471	456	408	431
COND-L	µS/cm	11700	1730	796	757	2190	1340	1250	1400	844	815		2490	1060	1090	1010	902
NH_3-N	mg/L																
CN-T	mg/L																
Total Metals																	
AG-T	mg/L																
AL-T	mg/L																
AS-T	mg/L																
B-T	mg/L																
BA-T	mg/L																
BE-T	mg/L																
BI-T	mg/L																
CA-T	mg/L																
CD-T	mg/L																
CO-T	mg/L																
CR-T	mg/L																
CU-T	mg/L																
FE-T	mg/L																
K-T	mg/L																
LA-T	mg/L																
MG-T	mg/L																
MN-T	mg/L																
MO-T	mg/L																
NA-T	mg/L																
NI-T	mg/L																
P-T	mg/L																
PB-T	mg/L																
S-T	mg/L																
SB-T	mg/L																
SE-T	mg/L																
SI-T	mg/L																
SN-T	mg/L																
SR-T	mg/L																
TI-T	mg/L																
V-T	mg/L																
W-T	mg/L																
ZN-T	mg/L																
Dissolved Metals																	
AG-D	mg/L	<0.1	<0.2	<0.0001	<0.00002	<0.0001	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004		<0.0001	<0.00004	<0.00004	<0.00004	<0.00004
AL-D	mg/L	<2	<4	<0.03	0.542	<0.03	<0.01	0.02	<0.01	<0.01	0.12		<0.03	<0.01	1	<0.01	<0.01
AS-D	mg/L	<2	<4	<0.003	0.0025	<0.003	<0.001	0.08	0.069	0.004	0.002		<0.003	0.013	0.033	0.01	0.006
B-D	mg/L	<1	<2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1
BA-D	mg/L	<0.1	<0.2	0.11	0.15	0.03	0.02	<0.02	0.02	0.11	0.17		0.07	0.04	0.07	0.05	0.04
BE-D	mg/L	<0.05	<0.1	<0.005	<0.001	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002		<0.005	<0.002	<0.002	<0.002	<0.002
BI-D	mg/L	<4	<4														
CA-D	mg/L	442	440	62.8	65	262	187	158	190	61.6	60		409	114	133	99.2	97.5
CD-D	mg/L	0.7	1.1	<0.0003	<0.00005	<0.0003	<0.0001	<0.0001	0.0001	<0.0001	0.0001		0.0014	<0.0001	0.0001	<0.0001	<0.0001
CO-D	mg/L	10.3	15.6	<0.002	0.0008	<0.002	<0.0006	0.0006	0.0009	<0.0006	<0.0006		<0.002	<0.0006	0.0015	<0.0006	<0.0006
CR-D	mg/L	<0.1	<0.2	<0.005	<0.003	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002		<0.005	<0.002	<0.003	<0.002	<0.002
CU-D	mg/L	<0.2	<0.2	<0.005	0.001	0.006	<0.002	<0.002	<0.002	<0.002	<0.002		<0.005	<0.002	0.003	<0.002	<0.002
FE-D	mg/L	243	807	0.68	1.43	<0.03	<0.03	0.58	0.51	0.16	0.32		<0.03	1.13	2.72	0.51	0.61
K-D	mg/L	<20	<40	6	7	4	4	5	5	7	7		5	7	5	4	3
LA-D	mg/L																
MG-D	mg/L	1880	3170	76	75.7	152	97.1	99.7	112	71.7	69.8		219	70.3	75.6	60	62.2
MN-D	mg/L	1000	1600	0.097	0.091	0.055	0.0175	0.11	0.156	0.139	0.113		0.366	0.524	0.599	0.716	0.721
MO-D	mg/L	<0.3	<0.6	0.005	0.004	<0.005	<0.002	0.004	0.003	0.027	0.025		<0.005	<0.002	0.007	0.029	0.017
NA-D	mg/L	<20	<40	5	5	8	6	8	8	28	26		14	37	14	62	43
NI-D	mg/L	7.2	12	<0.005	0.002	<0.005	<0.002	0.004	0.004	0.003	0.003		0.014	<0.002	0.003	0.003	<0.002
P-D	mg/L	<3	<6														
PB-D	mg/L	<0.5	<1	<0.003	0.0012	<0.003	<0.001	0.001	0.002	<0.001	<0.001		<0.003	<0.001	0.017	<0.001	<0.001
S-D	mg/L																
SB-D	mg/L	<2	<4	<0.003	<0.0005	<0.003	<0.001	0.005	<0.001	0.006	<0.001		<0.003	<0.001	<0.001	0.006	<0.001
SE-D	mg/L	<2	<4	<0.005	<0.001	<0.005	0.003	<0.002	<0.002	<0.002	<0.002		<0.005	0.004	<0.002	<0.002	<0.002
SI-D	mg/L	9.5	11														
SN-D	mg/L	<0.4	<0.6	<0.003	<0.0005	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001		<0.003	<0.001	<0.001	<0.001	<0.001
SR-D	mg/L	2.15	3														
TI-D	mg/L	<2	<4	<0.001	<0.0002	<0.001	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004		<0.001	<0.0004	<0.0004	<0.0004	<0.0004
V-D	mg/L	<0.3	<0.6	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03	<0.03	<0.03	<0.03
W-D	mg/L																
ZN-D	mg/L	1650	2850	<0.03	0.006	<0.03	<0.01	0.01	<0.01	<0.01	<0.01		<0.03	<0.01	0.01	<0.01	<0.01

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To: Anvil Range Mining
Postal Bag 1000
Faro Yukon Canada
Attention: Mr. Dana Haggar
Project: 6-Jun-02

Samples: 1
Date Received: 6/10/2002
Date Out: 6/13/2002

Certificate of Analysis: 020610B

Sample Type: Water No prep

BIOASSAY

SAMPLE NAME	CLARIFICATION POND
SAMPLE DATE	June 6 - 2002
DATE RECEIVED	June 10 - 2002
ANALYSIS	96 HOUR Rainbow trout TOXICITY
96 HOUR RESULTS	100% trout alive in all concentrations. The 96 hour LC50 was greater than 100%

FAXED

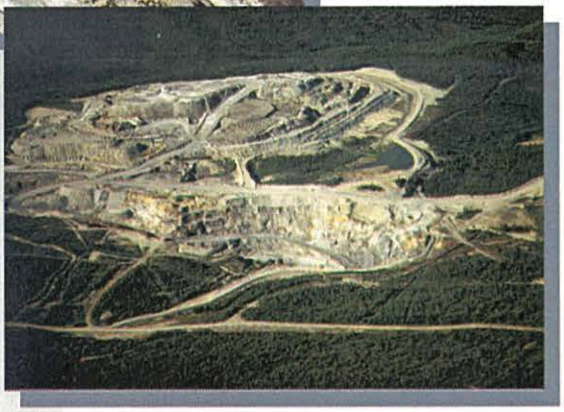
Analyst: Wade Reeves QC by: [illegible]

Appendix 2

Steffen Robertson and Kirsten (Canada) Inc.,
***2002 Annual Inspection, Waste and Waste Water Management Facilities Vangorda Mine, Yukon Territory*, February 2003**

Deloitte & Touche

2002 Annual Inspection Waste and Water Management Facilities Vangorda Mine Yukon Territory



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Project Reference Number:
SRK 1CD003.08

February 2003

1CD003.08

2002 ANNUAL INSPECTION
WASTE AND WATER MANAGEMENT FACILITIES
VANGORDA MINE
YUKON TERRITORY

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FEBRUARY, 2003

1CD003.08

2002 ANNUAL INSPECTION
WASTE AND WATER MANAGEMENT FACILITIES
VANGORDA MINE
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1CD003.08

2002 ANNUAL INSPECTION
WASTE AND WATER MANAGEMENT FACILITIES
VANGORDA MINE
YUKON TERRITORIES

1. Introduction

At the request of Deloitte and Touche (DT), Mr. Peter Healey of Steffen Robertson and Kirsten (Canada) Inc. (SRK) completed an inspection of the waste and water management facilities at Vangorda Plateau Mine on July 11 and 12, 2002. The Vangorda mine is located 16 km south of the Faro Mine, Yukon Territory as shown on Figure 1. The purpose of this inspection was to evaluate the geotechnical performance and stability of the following structures:

- Vangorda Waste Rock Containment Facility (Photo 1) including the seepage collection system ;
- Little Creek Dam;
- Vangorda Creek Diversion;
- Sludge Pond Embankments at the Water Treatment Plant,
- Grum Settling Pond;
- The Grum Interceptor Ditch; and
- The Sheep Pad Sediment Ponds below the Overburden Stockpile.

A plan of the Vangorda Plateau area and the above components are shown in Figure 2.

This report presents our observations and comments on the performance and stability of the structures and provides recommendations for any remediation, where appropriate.

2. Vangorda Waste Rock Pile

2.1 Observations

2.1.1 Seepage Collection System

2.1.1.1 Transverse Drains and Weirs

During construction of the original till starter berm, six transverse drains were installed beneath the berm to allow seepage to drain from the waste dump. These drains were connected to the seepage collection channel during the 1994 upgrading. V-Notch weirs were installed in four of the drains to monitor the flow.

During this year's inspection, seepage flow was observed at Weirs 2 (Photo 11), 3 (Photos 9 and 10), 5 (Photo 6) and 6 (Photo 5). The flow in each of the weirs varied from a trace to less then 0.5L/min.

2.1.1.2 Starter Dyke Diversion Ditch

In September 1999, the mine attempted to control runoff and instability of the area above the weir at Drain 6, by excavating a drainage ditch along the crest of the till starter dyke. The details of this ditch are discussed in the 2001 inspection report.

Following an the inspection on July 12, 2001, SRK considered the existing diversion ditch to be inadequate and believed there was a high degree of risk of further subsidence in the short term, which would have a negative impact on the structural integrity of the starter dyke. Furthermore, it was our opinion that it was very likely that the #6 drain will be blocked off by the subsidence. Consequently, SRK recommended to DT that remediation of this area be initiated during the 2001 construction season. DT completed the remediation between August and September, 2001 (Photo 2, 3 and 4). The work involved:

- Removal of the saturated soil within the drainage ditch;
- Pulling back the loose material from the upper half of the till dyke and round-off the crest to provide a flatter more stable condition;
- Resloping the downstream face of the end-dumped till stockpile above the starter dyke and backfilling the ditch.

- Regrading the upper surface of the till stockpiles above the starter dyke to improve drainage;
- Removing the saturated soil at the bottom of the slope above the #6 drain;
- Placing geotextile filter fabric and a shotrock buttress half way up the slope above drain #6 (Photo 5).

The resloping work was carried out in accordance with the recommendations and has greatly improved the drainage condition in this area. The till slope above Drain #6 is now much more stable and the additional riprap above the weir has reduced the need for regular clean out of the silt build-up behind the steel plate.

2.1.1.3 Seepage Channel

The seepage channel around the Vangorda Waste dump (Photo 8) is functioning normally and no instability of the sideslopes of the seepage channel was observed. Staining along the base of the ditch indicated that there had been some flow in the channel during in 2002. During the inspection, however there was no measurable flow observed in the ditch.

2.1.2 Starter Dyke and Till Cover

The sideslopes of the till starter dyke remain susceptible to erosion. There is one area that lies just below the 1994 resloping and till cover placement that is particularly susceptible to erosion (Photo 12). Runoff concentrates in-between the till cover and the resloped rock causing erosion gullies and silt spill into the seepage channel at the toe of the dyke.

The 2m thick till cover installed in 1994 continues to perform well (Photo 13).

2.1.3 Instrumentation

DT has been taking water level readings from the nine piezometers and four of the five groundwater wells around and within the facility. A summary of the water level readings taken to date in both the piezometers and the groundwater wells is presented in Table 1. Water levels, as recorded on September 04, 2002 in Piezometers P94-01A, 01B, 02A and 02B, are shown in Figures 3 and 4.
The levels in these piezometers are consistent with levels recorded since 1994 and do not indicate any potential instability.

SRK understands that Gartner Lee installed additional groundwater wells around the Vangorda Waste dump in 2001. Data from these wells is not included in this report.

2.1.4 Rock Pile

Tension cracks are still evident in places along the crest at the northeast end of the dump. The cracks have not widened since SRK last inspected the rock pile in 2001.

TABLE 1 - Water Levels in Piezometers and Groundwater Wells - Vangorda Rock Pile

Measured Static Water Level (meters)

underlined readings (begin in 1998) indicate that no water was identified (hole was dry or frozen).
readings post Sep/98 given as metres below top of plastic piezometer pipe.
readings prior to Nov/98 could be metres below to top of piezo. pipe or steel casing.

Date	V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47
	GW-94-01	GW-94-02	GW-94-03	GW-94-04	GW-94-05*	P-94-01A	P-94-01B	P-94-02A	P-94-02B	P-94-02C	P-94-03A	P-94-03B	P-94-04A	P-94-04B
3-May-94	8.28	14.33	11.28	14.33	11.56	12.37	6.05	10.57	6.12	13.08	14.10	9.80	12.17	8.99
21-Jun-94	7.45	8.65	9.15	9.65										
30-Jun-95						7.79	5.62	8.02	6.11	9.02	13.91	9.80	11.35	8.99
13-Jul-95						7.80	5.59							
30-Jul-95						7.86	5.48	7.99	6.12	8.81	13.68	9.80	11.83	8.99
26-Aug-95	6.89	8.47		9.05										
31-Aug-95	7.36					7.93	4.85	7.97	6.06	8.66	13.62		12.60	
17-Oct-95	7.14	8.26		9.37		7.90	4.23	8.70	5.76	8.54	13.41		11.88	
20-Nov-95	7.10	8.18		9.19										
13-Mar-96	7.44	9.23		9.39										
28-May-96	7.50	9.34	10.00	10.25		8.34	5.38	9.94	6.12	9.37	14.12		12.77	
24-Sep-96	7.50	7.43	7.95	9.17		10.40	5.30	8.30	6.12	8.66	13.68	9.88	12.80	8.99
13-May-97	6.84	9.42	9.96	9.53		9.17	5.67	7.74	6.40	9.51	12.78	9.96	12.78	9.62
11-Jul-97						9.80	5.90	7.92	6.12	8.97	14.10	9.80	9.97	9.00
11-Aug-97	6.75	8.38	8.41	8.81	1.99	9.59	5.25	8.10	6.25	8.77	12.84	9.96	12.62	9.21
14-Oct-97	6.76	8.58	9.15	8.99		9.51	4.96	7.99	6.23	8.94	12.96	9.96	12.73	9.21
23-Dec-97	6.70	9.05	9.53	9.13		9.25	4.76	7.68	6.07	8.95	12.70	9.81	12.66	9.02
31-May-98	6.72	8.60	9.73	9.59	1.86	9.52	5.25	8.05	6.24	9.20	12.87	9.95	12.77	9.20
25-Jul-98						10.20	5.22	8.04	6.20	9.11	12.58	9.92	12.79	9.18
15-Sep-98	6.67	8.85	9.52	9.10	2.40	10.02	5.22	7.98	6.20	9.22	12.54	9.92	12.83	9.19
16-Nov-98						10.32	5.11	7.93	6.11	9.06	12.45	9.78	12.70	8.99
31-Dec-98	6.70	9.06	9.91	9.23										
18-Jun-99	6.88	9.24	10.24	10.18		9.96	5.09	8.35	6.11	9.48	12.48	9.77	12.70	8.99
12-Oct-99	6.61	7.58	8.81	8.79		10.01	5.10	8.16	5.73	8.82	12.49	9.78	12.71	8.97
31-May-00	5.75	8.68	8.26	9.33	1.84	10.20	5.10	7.85	5.93	8.97	12.48	9.78	12.66	8.88
5-Sep-00	6.66													
9-Oct-00	4.98	3.96	6.90	8.35	0.93									
9-Jul-01						10.42	4.84	8.86	7.72	5.46	12.84	9.78	10.84	8.88
4-Sep-02						10.75	5.30	7.99	6.02	9.33	13.53	9.78		8.91

*: depth to bottom of hole GW-94-05 (V38) checked as 14.7m on Sep 15/98.

Top of Pipe Elevations (masl)

V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47
GW-94-01	GW-94-02	GW-94-03	GW-94-04	GW-94-05	P-94-01A	P-94-01B	P-94-02A	P-94-02B	P-94-02C	P-94-03A	P-94-03B	P-94-04A	P-94-04B
1117.445	1117.405	1118.431	1116.165	1101.673	1136.555	1136.493	1138.41	1138.332	1129.84	1134.373	1134.459	1134.609	1134.327

Piezometric Elevation (masl)

Date	V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47
	GW-94-01	GW-94-02	GW-94-03	GW-94-04	GW-94-05	P-94-01A	P-94-01B	P-94-02A	P-94-02B	P-94-02C	P-94-03A	P-94-03B	P-94-04A	P-94-04B
3-May-94	1109.165	1103.075	1107.151	1101.835	1090.113	1124.165	1130.443	1127.84	1132.212	1116.76	1120.273	1124.659	1122.439	1125.337
21-Jun-94	1109.995	1108.755	1109.281	1106.515										
30-Jun-95						1128.765	1130.873	1130.39	1132.222	1120.82	1120.463	1124.659	1123.259	1125.337
13-Jul-95						1128.755	1130.903							
30-Jul-95						1128.695	1131.013	1130.42	1132.212	1121.03	1120.693	1124.659	1122.779	1125.337
26-Aug-95	1110.555	1108.935		1107.115										
31-Aug-95	1110.085					1128.625	1131.643	1130.44	1132.272	1121.18	1120.753		1122.009	
17-Oct-95	1110.305	1109.145		1106.795		1128.655	1132.263	1129.71	1132.572	1121.3	1120.963		1122.729	
20-Nov-95	1110.345	1109.225		1106.975										
13-Mar-96	1110.005	1108.175		1106.775										
28-May-96	1109.945	1108.065	1108.431	1105.915		1128.215	1131.113	1128.47	1132.212	1120.47	1120.253		1121.839	
24-Sep-96	1109.945	1109.975	1110.481	1106.995		1126.155	1131.193	1130.11	1132.212	1121.18	1120.693	1124.579	1121.809	1125.337
13-May-97	1110.605	1107.99	1108.476	1106.635		1127.385	1130.823	1130.67	1131.932	1120.33	1121.593	1124.499	1121.829	1124.707
11-Jul-97						1126.755	1130.593	1130.49	1132.212	1120.87	1120.273	1124.659	1124.639	1125.327
11-Aug-97	1110.695	1109.025	1110.021	1107.355	1099.683	1126.965	1131.243	1130.31	1132.082	1121.07	1121.533	1124.499	1121.989	1125.117
14-Oct-97	1110.685	1108.825	1109.281	1107.175		1127.045	1131.533	1130.42	1132.102	1120.9	1121.413	1124.499	1121.879	1125.117
23-Dec-97	1110.745	1108.355	1108.901	1107.035		1127.305	1131.733	1130.73	1132.262	1120.89	1121.673	1124.649	1121.949	1125.307
31-May-98	1110.725	1108.805	1108.701	1106.575	1099.813	1127.035		1130.36		1120.64		1124.509	1121.839	1125.127
25-Jul-98						1126.355		1130.37		1120.73			1121.819	
15-Sep-98	1110.775	1108.555	1108.911	1107.065	1099.273	1126.535		1130.43		1120.62			1121.779	
16-Nov-98						1126.235		1130.48		1120.78				
31-Dec-98	1110.745	1108.345	1108.521	1106.935										
18-Jun-99	1110.565	1108.165	1108.191	1105.985		1126.595		1130.06		1120.36				
12-Oct-99	1110.835	1109.825	1109.621	1107.375		1126.545		1130.25		1121.02				
31-May-00	1111.695	1108.725	1110.171	1106.835	1099.833	1126.355		1130.56	1132.402	1120.87			1121.949	1125.447
5-Sep-00	1110.765													
9-Oct-00	1112.465	1113.445	1111.531	1107.815	1100.743									
9-Jul-01						1126.135	1131.653	1129.55	1130.612	1124.38	1121.533	1124.679	1123.769	1125.447
4-Sep-02						1125.81	1131.19	1130.42	1132.31	1120.52	1120.85	1124.68	1134.61	1125.42

2.2 Recommendations

2.2.1 Till Covers and Berms

Although the 2001 reloping of the till starter dyke and berms above drains #5 and #6 has significantly improved the drainage, there is one low lying area at the top of the slope as shown on Photo 3 that would collect runoff and cause ponding. This depression does not present any short term concerns but should be filled in with compacted till during final covering of the waste dump.

In the upper reaches of the seepage collection channel below the till cover, DT should remove any silt that has accumulated in the channel. Assuming the dump will eventually be covered with till, this area would likely be recontoured and the sediment problem would be reduced. In the meantime, DT should continue to monitor the silt build-up and periodically remove the material.

2.2.2 Instrumentation

Water level readings should continue to be taken from both the groundwater wells and the standpipe piezometers in the till berm around the rock pile. These readings should be taken at least semi-annually.

Water quality samples should continue to be taken from the groundwater wells around the Vangorda Waste dump.

2.2.3 Rock pile

DT should continue to inspect, monthly, the surface of the Vangorda rock fill for any signs of widening of these cracks.

3. Little Creek Dam

3.1 Observations

A view of the Little Creek dam and the new emergency spillway are shown in Photos 14 and 15. Runoff from the eastern approach road continues to cause erosion and the formation of gullies upstream of the dam.

Water level in the pond during our inspection was recorded at about 1109m which is 3.6 m below the maximum operating level. DT periodically pumps water from the pond to Vangorda Pit. At the time of our inspection no water was being pumped from the pond. No cracks or major settlement of the dam were observed and no seepage was observed along the downstream toe. Erosion rills are evident on both the upstream and downstream slopes of the dam.

The upstream and downstream faces of the dam show no evidence of surficial movement, bulging or instability. The loose, uncompacted material at the toe of the dam, which was deposited during it's construction in 1991, has not moved.

In 1994, six pneumatic piezometers and three thermistors were installed along the crest of the Little Creek dam. The six piezometers are located at three separate locations; two piezometers, one deep and one shallow, at each location. The location of the piezometers and thermistors are shown on Figure 5 and the 2002 piezometric levels are shown in section on Figures 6, 7 & 8. Actual readings are presented in Appendix B.

The condition of 900mm CMP emergency spillway (Photo 16) is satisfactory given that the pipe, the plunge pool and the exit chute were designed and built for the 200 year flood event with a peak flow of $0.8m^3/s$. The current layout for the plunge pool and the exit chute meet the design criteria for this event and we are of the opinion that the current layout is adequate for the short-term life of the pond.

If the Little Creek pond is to become a long term structure to collect seepage from the Vangorda Dump or to function as a polishing pond for the treatment plant, the spillway would need to be modified to accommodate a larger flood event and should possibly be relocated to the north end of the dam in an open channel.

In July 2002, Klohn Crippen carried out an independent dam safety review of the Little Creek Dam. The review included a site visit by Mr. Brian Rogers, P.Eng., and Mr. Stan Williams, P.Eng. The review followed the intent of the CDA Dam Safety Guidelines with the objective of comparing technical design and ongoing operations for the mining complex with good practice.

3.2 Recommendations

DT should continue to regularly monitor the crest of the dam for any cracks, settlement or surficial movement of the slope.

The piezometric levels are consistent with the water levels recorded in the impoundment and are in accordance with the design safety factors associated with the stability of the dam.

SRK recommends that the pneumatic piezometers and thermistors are monitored on a semi-annual basis and the results compiled and forwarded to SRK.

It is recommended that DT construct either a riprapped or CMP lined channel down through the erosion gullies on both sides of the approach road to minimize the erosion and the potential for sediment entering Vangorda Creek.

DT should also remove any build-up of debris at the inlet end of the culvert spillway.

4. Vangorda Creek Diversion

4.1 Observations

The half-round culvert in the upper reaches (Photos 17, 18 and 19) has performed well but the flume does not weather well along the lower reaches (Photo 20). The potential still remains for slide debris to enter the flume at certain locations along the channel. The crossbars are badly bent and the flume is buckled in places. In several areas along the flume, riprap has settled to below the lip of the culvert.

SRK understands that the flume experienced minor shifting due to a rapid increase of water in the flume on May 28, 2002. The flume was re-secured using local materials at the time and further maintenance was carried out on the flume in October 2002. We also understand that there was a mudslide on the slope above the flume which blocked the passage of water for a short period of time.

There are no signs of instability or settlement of the headwork's dam.

DT continues to pump water from a small seepage collection pond in the old Vangorda Creek ditch back into the flume. This is part of an overall plan to reduce flow of clean water into the Vangorda Pit.

The plunge pool at the outfall of the flume (Photo 21) is slowly filling with sediment but continues to function satisfactorily. The new riprap placed around the area that had been excavated to allow water trucks to be filled remains in stable condition.

The exit culvert from the drop box structure (Photo 22) remains intact and is also functioning satisfactorily.

In a recent engineering analysis of the stability of the Vangorda Pit wall performed by SRK, it was concluded that the northwest pit wall is currently stable, with no signs of large-scale movements in the recent past. However, sloughing and ravelling of the pit walls along the Northwest Fault Line is expected to continue over time and may ultimately progress back to the current location of the flume if left unchecked. An engineering and fault tree analyses showed that the overall probability of a pit wall failure that would breach the Vangorda Creek diversion is relatively low at 0.25% or 1:400. Several options were considered to further reduce the probability of failure including the placement of rock buttress at toe of the pit wall below the flume. The long-term effect of seismicity was considered to be negligible, with the probability of a pit wall failure due to seismicity over the next 500 years of 0.25% compared to 0.23% for current static conditions.

The study also concluded that the potential for damage to the flume or blocking of the water flow due to rock falls or sloughing from the upper pit bench was considered to be moderate to high in some zones of the upper pit bench, based on the rock fall hazard rating system developed for highways.

4.2 Recommendations

DT should continue to monitor the sideslopes above the flume for sloughing and areas of instability and should top-up riprap along flume where the material has settled below the rim of the culvert sections. Remedial work to reduce the hazard in the two zones identified in above study could include slope flattening, scaling and construction of a catchment space adjacent to the flume.

SRK understand that DT has been given approval to carry out a major rehabilitation of the flume this year (2003).

5. Sludge Pond Embankment-Vangorda Water Treatment Plant

5.1 Observations

At the time of our inspection, the water level in the sludge pond was about 2m below the crest of the embankment (Photo 23).

Since the last inspection, DT has installed a floating walkway out into the pond and a series of floating booms to control the wave action.

Along the toe of the southern leg of the embankment, seepage was observed along the downstream of the dyke (Photo 24). The seepage is not unusual considering the high level of the water in the pond. However SRK recommended to DT that riprap be placed over the seepage zone at the toe of the south dyke to protect the toe from possible erosion. SRK understands that this work was completed soon after the site visit this year.

Seepage was also noted at the north end of the pond, where erosion protection had been placed several years ago (Photo 25).

5.2 Recommendations

The following actions should be taken at the Water Treatment Plant:

- Ensure that the pond level does not exceed 2m. below crest;
- Continue to monitor on a monthly basis, the crest and sideslopes for cracking or any signs of sloughing;
- Fill in or blade over tension cracks both in the crest and along the upstream face to prevent entry from runoff and precipitation;
- Weekly inspection of the upstream face and the crest for further development of the cracks is recommended; and

6. Grum Settling Pond

6.1 Observations

At the northwest corner of the Grum Settling pond, DT has and constructed a riprapped open channel spillway which conveys flow to the Grum Interceptor ditch.

6.2 Recommendations

The crest of the embankment around the pond should be monitored monthly for cracks and the pond level should be maintained no higher than 1.0 m below crest. Seepage into and out of the pond should also be monitored.

Monthly inspections along the toe of the embankment for seepage are recommended.

7. Grum Interceptor Ditch and Sheep Pad Settling Pond

7.1 Observations

In the upper reaches of the GID, the ditch slopes have performed well and the vegetation continues to provide effective erosion control of the ditch sideslopes. Below the treatment plant, DT has carried out major rehabilitation by placing additional riprap on the ditch sideslopes which has provided increased erosion protection to reduce the sediment build-up in the Sheep Pad settling ponds. SRK understands that since the following placement of the additional riprap, the level of suspended solids in the discharge from the settling pond (Photo 32) has been significantly reduced allowing direct discharge into Vangorda Creek.

7.2 Recommendations

The following actions are recommended:

- Monitor monthly the crest of the settling pond dykes for any cracks;
- Monitor monthly the toe of the dykes for any seeps;

8. Grum Dump

8.1 Observations

During the July 11 and 12, 2002 site inspection by SRK, two erosion gullies (Photo 27) were identified on the slopes of the lowest bench of the Grum Dumps (Photo 28). It is our understanding that these gullies had formed several years ago and had contributed to the sediment that is visible in the bush below the dump (Memorandum GLL, June 25, 2002).

In 1995, the mine constructed a sediment trap on a tributary (A) of Grum Creek (see Figure 2) to enable sampling of the V15 sampling station. The location of this trap (Photo 26) and V15 are shown on Figure 2. Sampling from V15 was intended to monitor the seepage from the sulphide waste located within the Grum Dump.

In the same year, the mine also made provision for the diversion of drainage from the main stem of Grum Creek to a temporary sedimentation holding area located just above Vangorda Creek called Moose Pond. The location of this pond is also shown on Figure 2. The base of Moose Pond is highly permeable and any water that may accumulate in the pond rapidly infiltrates into the ground. The mine also installed a siphon pipeline from the pond to the V2 sampling station, which was intended to drain any water that may accumulate in the pond. The siphon pipe has never been used because there has not been any significant accumulation of water in the pond. DT plans is to maintain the Moose Pond sediment basin for drainage from the Main stem of Grum Creek.

In January of this year, DT cleaned out the sediment from the trap on tributary A, which was at full capacity and last year initiated a work program to provide better control of the runoff onto the Grum Dump. This work involved the construction of a diversion ditch (Photos 29 and 30) along the main haul road adjacent to the Grum Dump. The ditch is intended to divert runoff away from the dump and into the Vangorda Pit, in an attempt to reduce further erosion of the dump slopes.

During our inspection, SRK also noted an area on one of the benches of the Grum Dump that had experienced some settlement (See Photo 28 and 31).

8.2 Recommendations

It is SRK's opinion that, the current practice of diverting the main stem of Grum Creek drainage to Moose pond is acceptable as a short-term measure. However, it is recommended that the physical stability of the downstream slope below the Moose Pond be investigated. DT should continue to collect water quality samples from seeps along the toe of the dump.

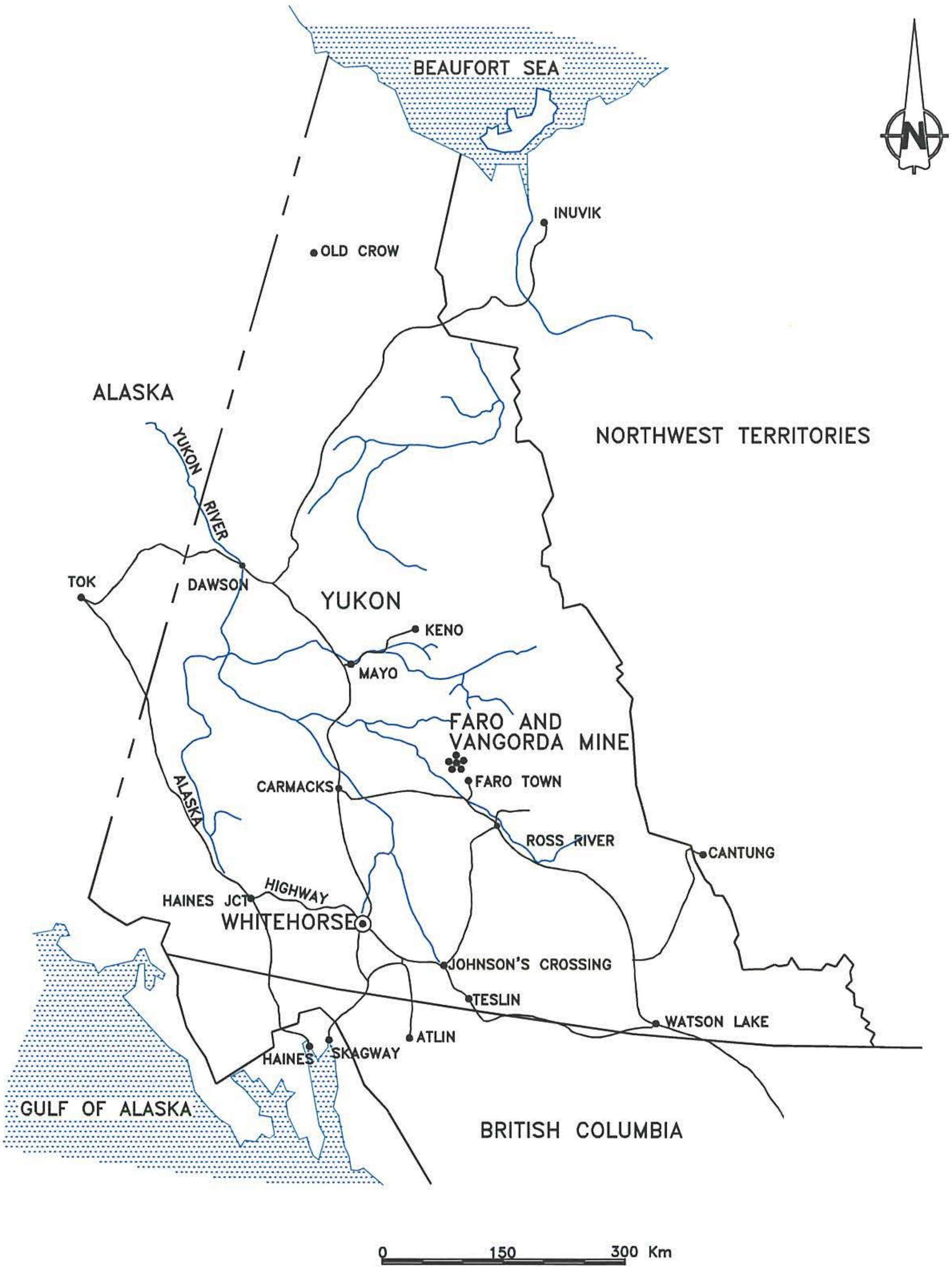
DT should also monitor the settlement area on the Grum Dump for signs of further movement.

This Report, **1CD003.08 - 2002 Annual Inspection Waste and Water Management Facilities Vangorda Mine, Yukon Territories** has been prepared by:

STEFFEN ROBERTSON AND KIRSTEN (CANADA) INC.

Peter Healey, P.Eng.
Principal

Figures



SRK Consulting
Engineers and Scientists

DELOITTE & TOUCHE

VANGORDA PLATEAU MINE

LOCATION MAP

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.08	Feb. 2003		1

Dwg Ref: Yukon.dwg

0 100 200 300 400 500 600 700 800 900 1000m

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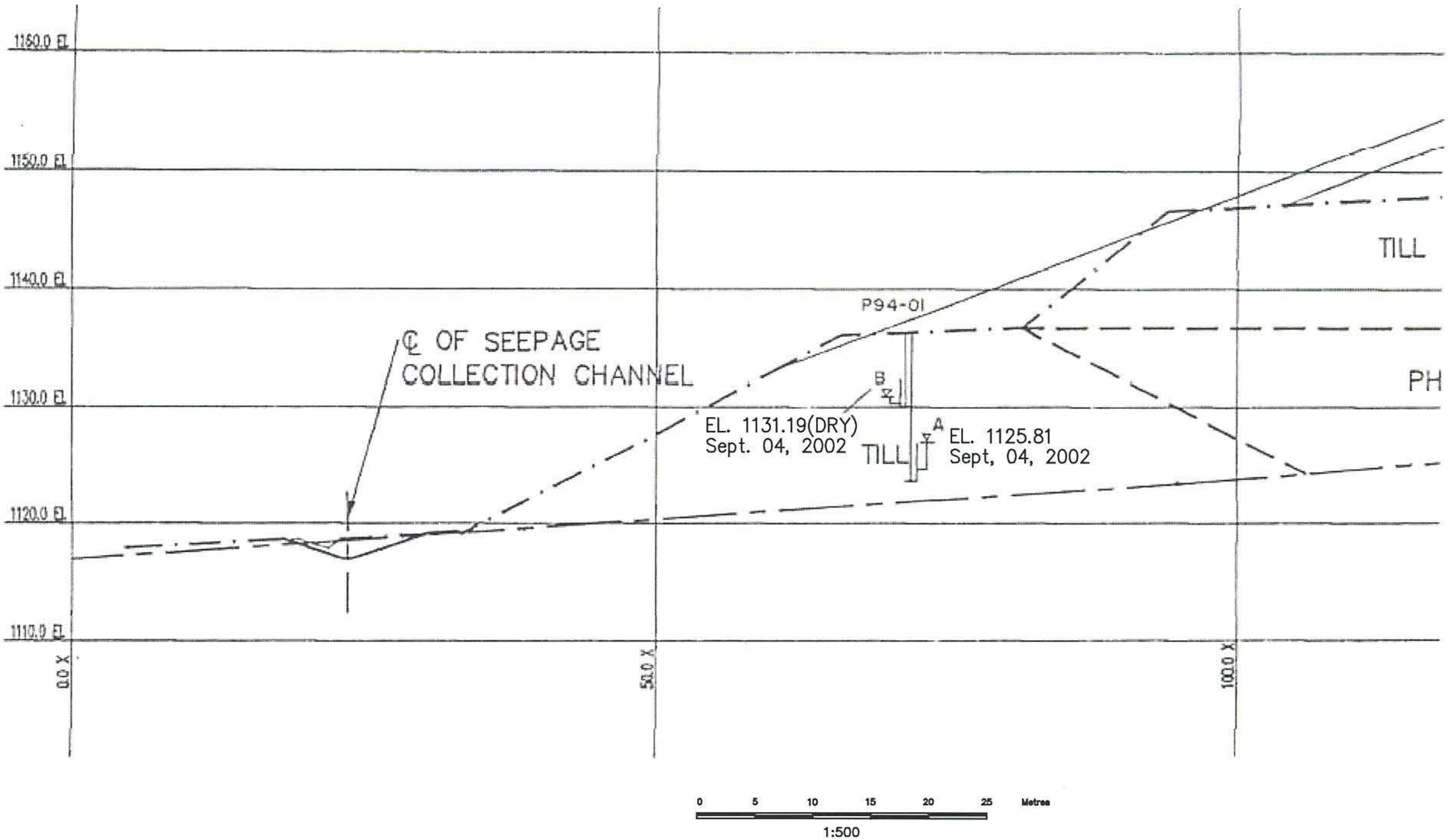
VANGORDA PLATEAU MINE

Site Plan

PROJECT NO.	DATE	APPROVED	FIG.
1CD003.08	Feb. 2003		2



FILE REF: FIG-3.dwg

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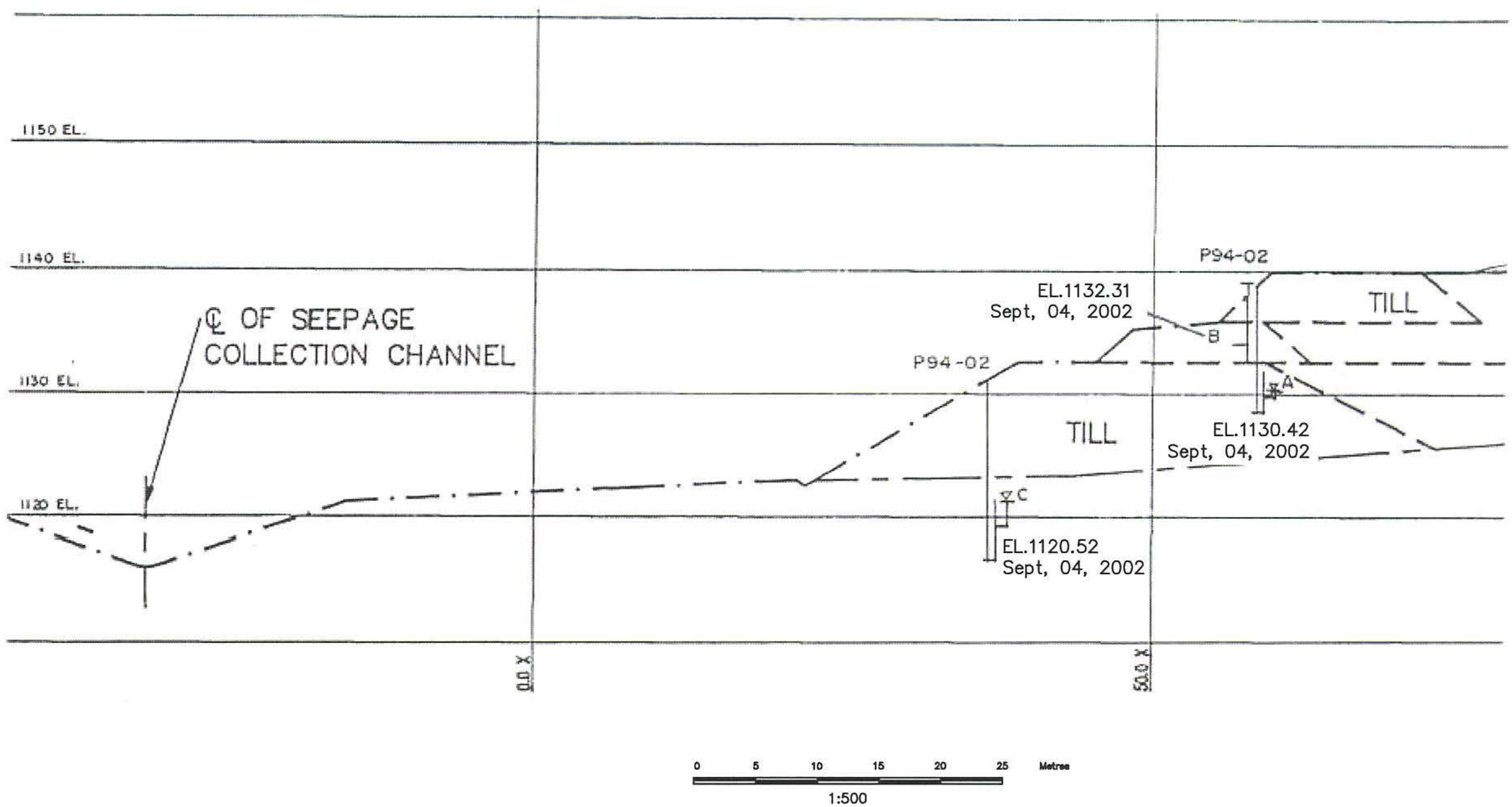
VANGORDA PLATEAU MINE

SECTION D-3
CHANNEL STA. 4+80

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.08	Feb. 2003		3



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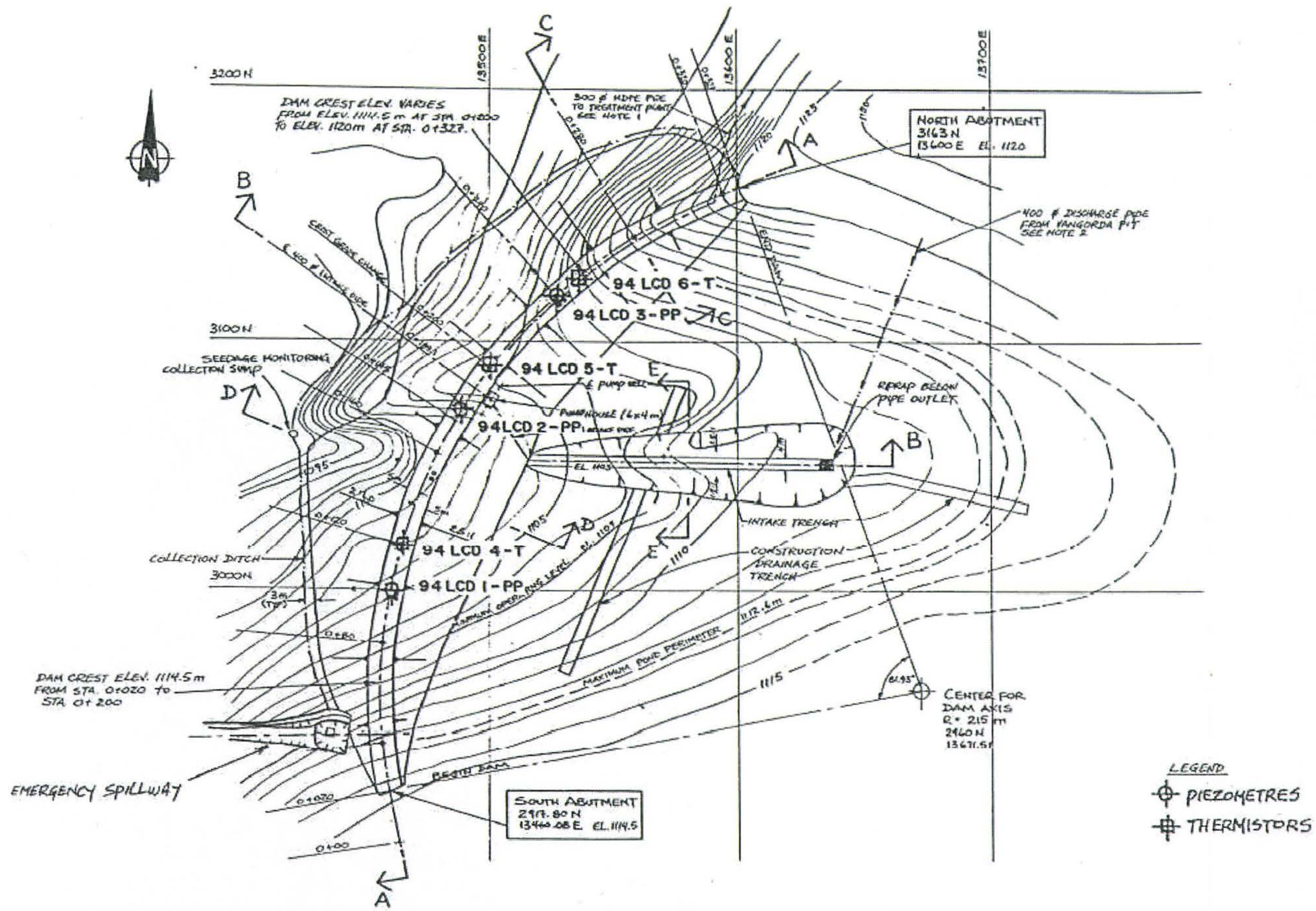
VANGORDA PLATEAU MINE

SECTION D–4
CHANNEL STA. 9+00

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.08	Feb. 2003		4

FILE REF: FIG-4.dwg



GENERAL ARRANGEMENT PLAN

SCALE - 1:2000

0 10 20 30 40 50 metres 1:2000

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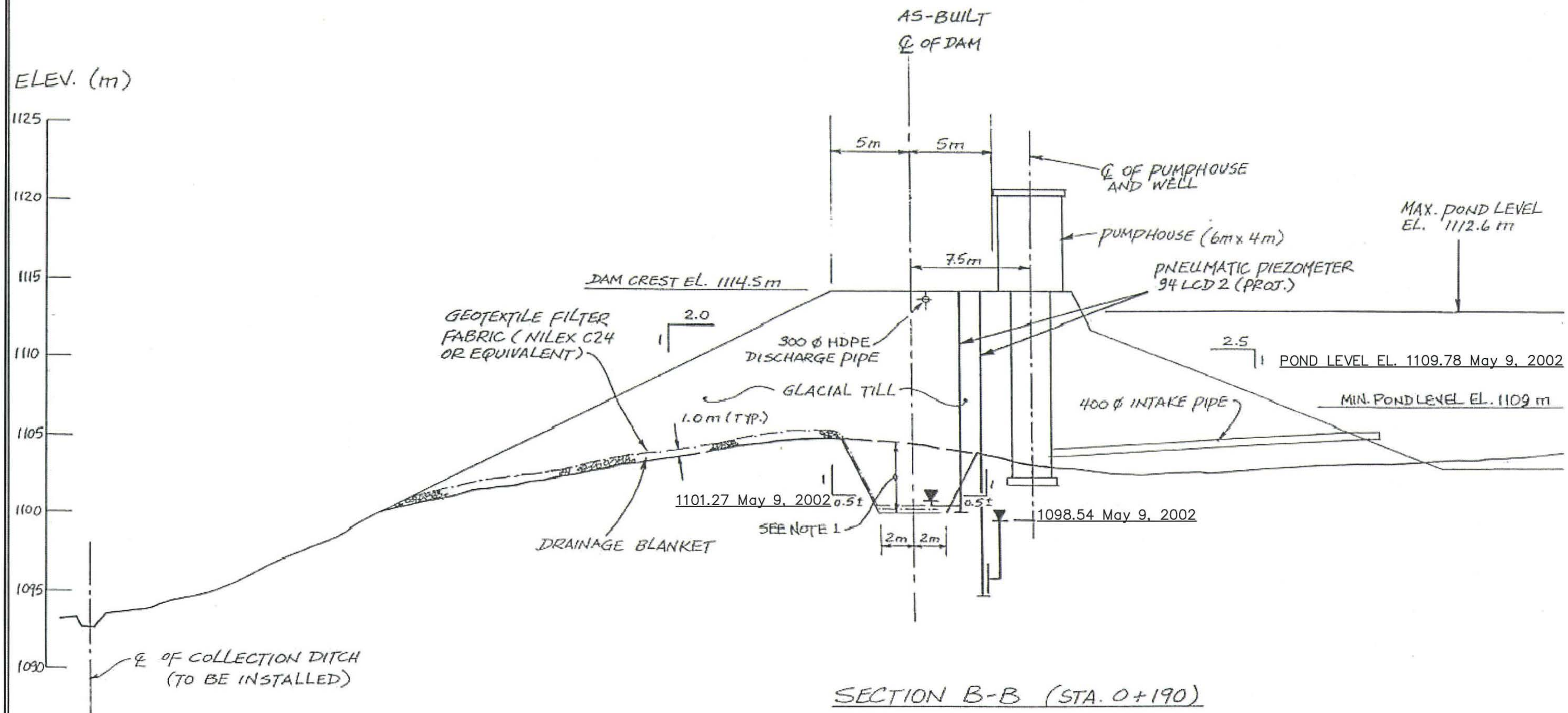
VANGORDA PLATEAU MINE

LITTLE CREEK DAM
GENERAL ARRANGEMENT PLAN

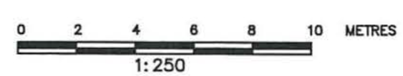
PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.08	Feb. 2003		5

File Ref: FIG-5.DWG



SECTION B-B (STA. 0+190)

SCALE – 1:250



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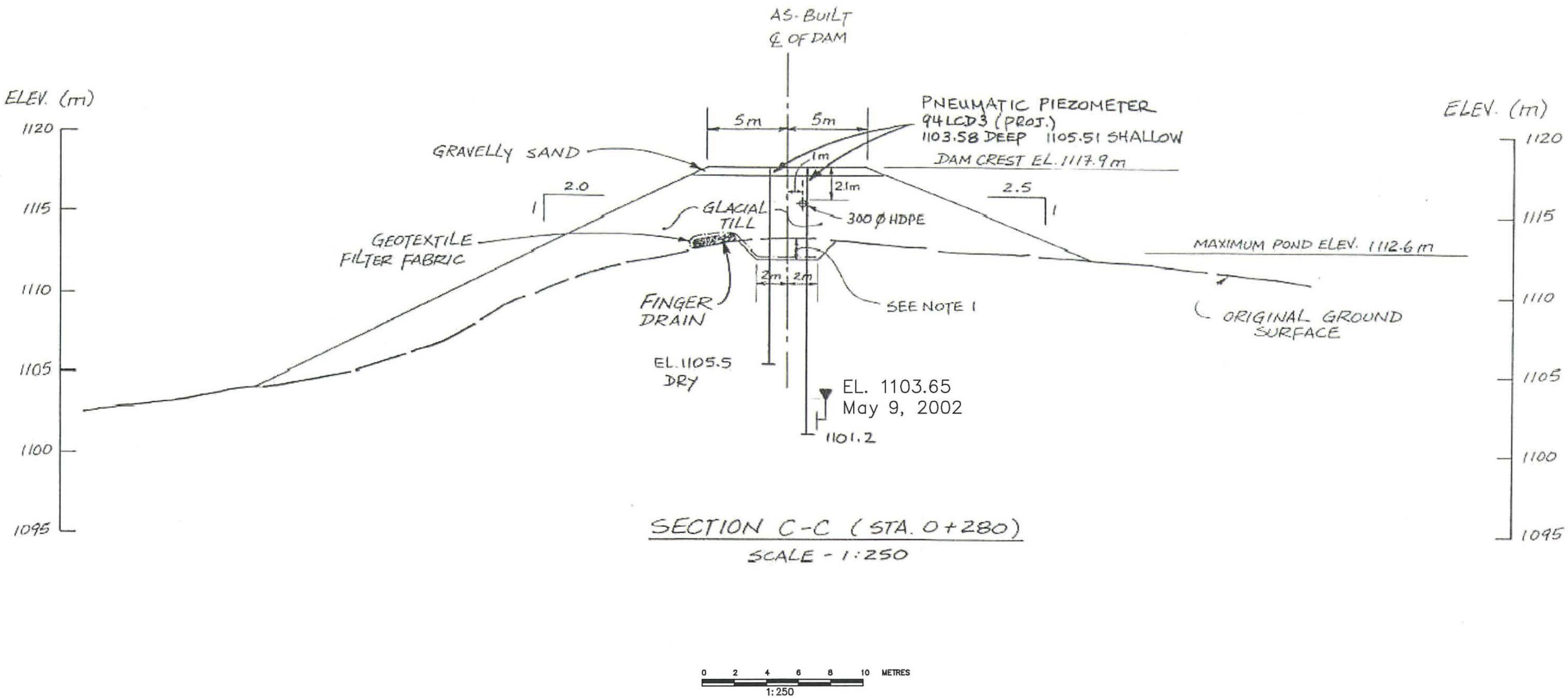
VANGORDA PLATEAU MINE

LITTLE CREEK DAM
SECTION B–B

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.08	Feb. 2003		6

File Ref: Fig–6.DWG



SECTION C-C (STA. 0+280)

SCALE - 1:250

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DELOITTE & TOUCHE	VANGORDA PLATEAU MINE
	LITTLE CREEK DAM SECTION C–C

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.08	Feb, 2003		8

File Ref: Fig-12.DWG

APPENDIX A

Photos

Photo 1: Vangorda Waste Rock Containment Facility with Little Creek Pond in the foreground

Photo 2: View looking south of the resloped area of the till starter dyke

Photo 3: Recontoured section of the Till dyke on the north side of the Vangorda waste Dump

Photo 4: Resloped areas of the Starter Dyke

Photo 5 : Drain #6 at toe of the starter Dyke on North side of Vangorda Waste Dump

Photo 6: Weir 5

Photo 7: Drain #4

Photo 8: Vangorda Seepage Collection Ditch

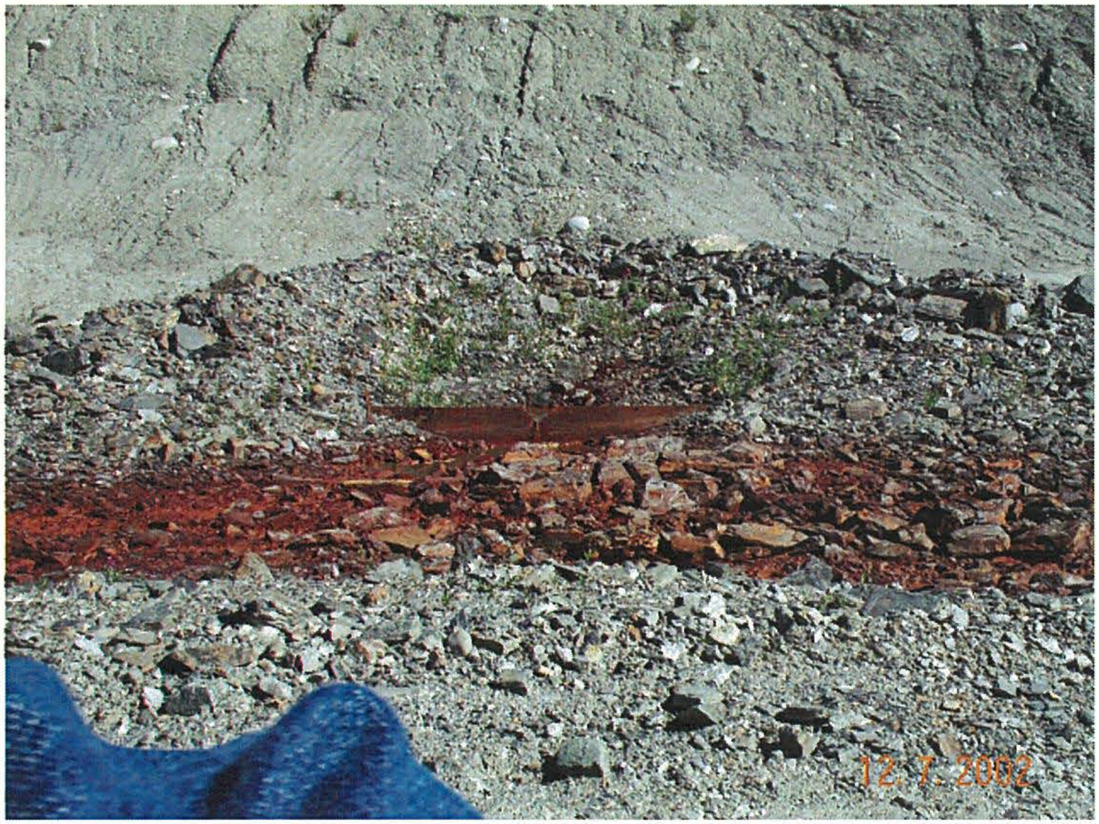


Photo 9: Weir 3

Photo 10: Weir 3

Photo 11: Weir 2

Photo 12: Erosion gullies at toe of till cover on south side of the Vangorda Dump

Photo 13: Till cover over waste rock on the resloped section of the Vangorda Waste dump

Photo 14: Little Creek Pond

Photo 15: Downstream slope of Little Creek Dam

Photo 16: Emergency Spillway at Little Creek Dam

Photo 17: Trash rack at headwaters of the Vangorda Creek Diversion.

Photo 18: Upper Reaches of Vangorda Creek Diversion

Photo 19: View of the headworks of the Vangorda Creek diversion

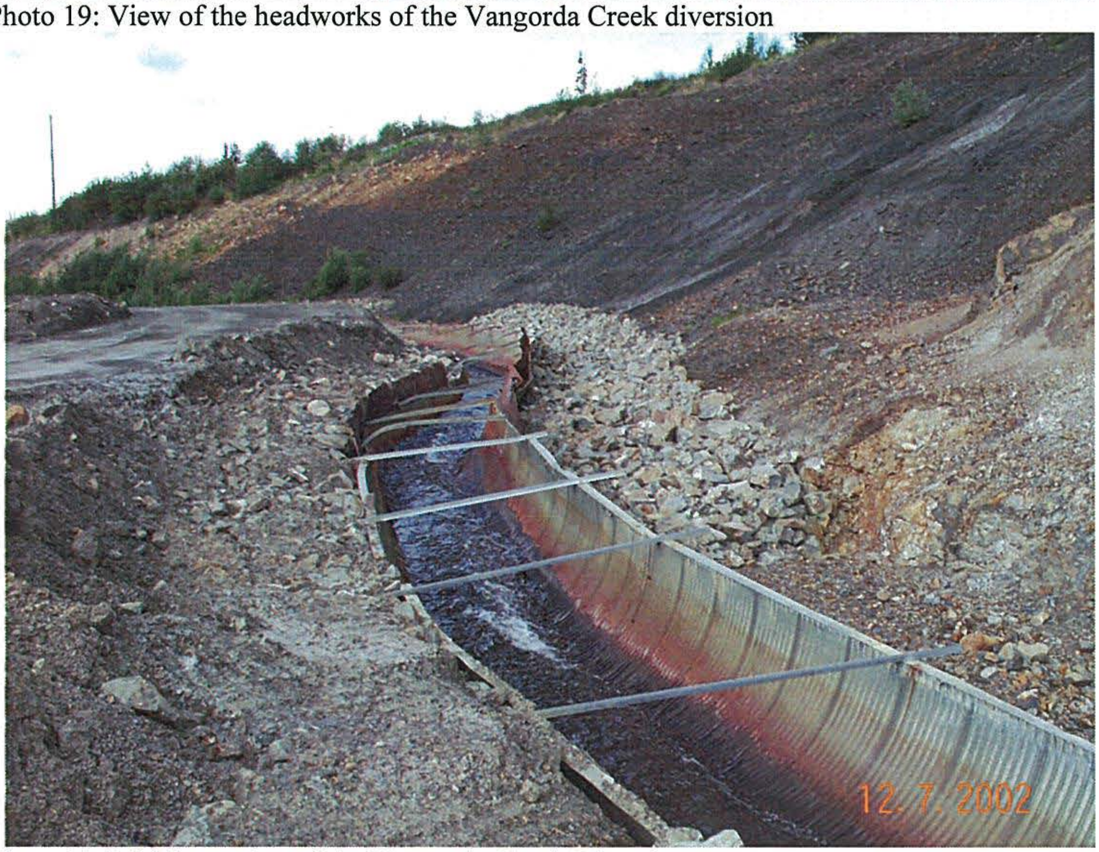


Photo 20: Middle reaches of the Vangorda Creek Diversion

Photo 21: Plunge Pool on Vangorda Creek Diversion

Photo 22: Outfall from the Drop Box Structure with the Vangorda Pit in the background.

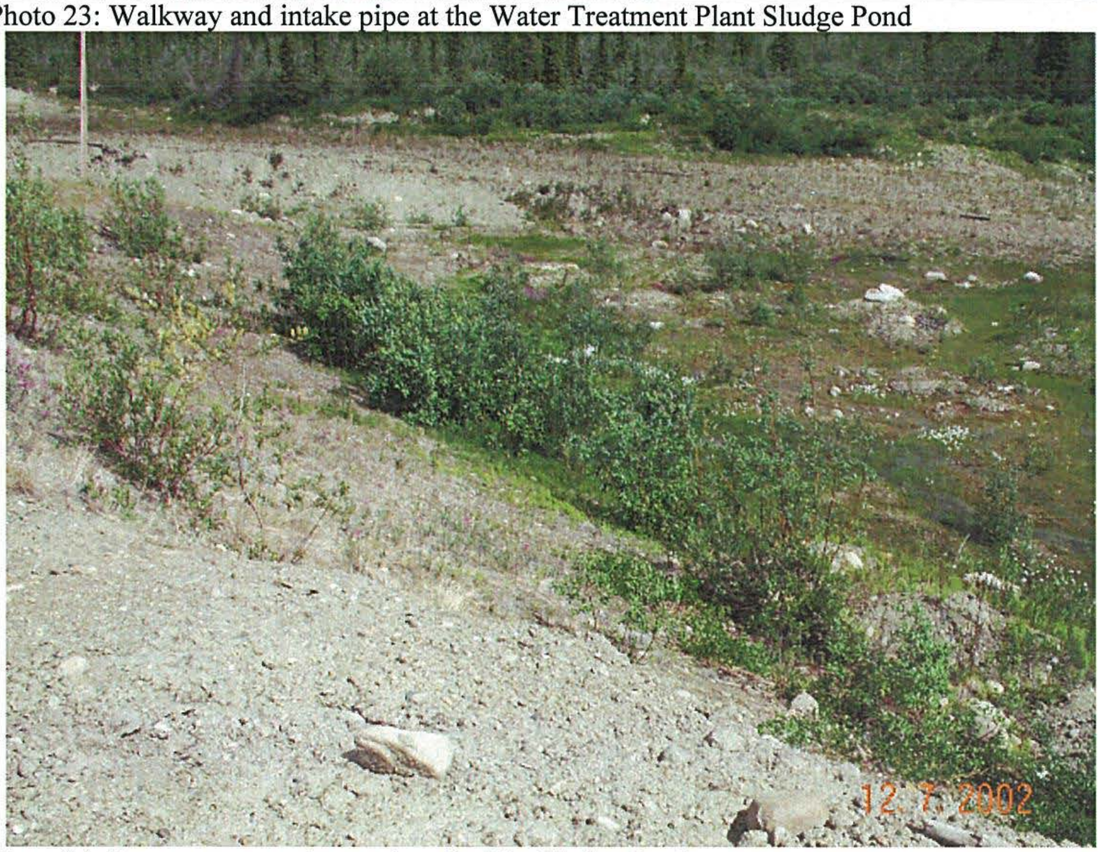
Photo 23: Walkway and intake pipe at the Water Treatment Plant Sludge Pond


Photo 24: Seepage area at the south end of the Sludge Pond

Photo 25: Seepage zone at the north toe of the sludge dyke.

Photo 26: Sediment basin at the toe of the Grum Dump

Photo 27: Erosion gully in lower bench of the Grum waste dump above Seep #1

Photo 28: Grum Waste Rock Dump

Photo 29: New water collection ditch along haul road

Photo 30: Collection Ditch along the Haul Road at Vangorda

Photo 31: Settlement of the waste rock on Grum Dump

Photo 32: Sheep Pad Settling Pond.

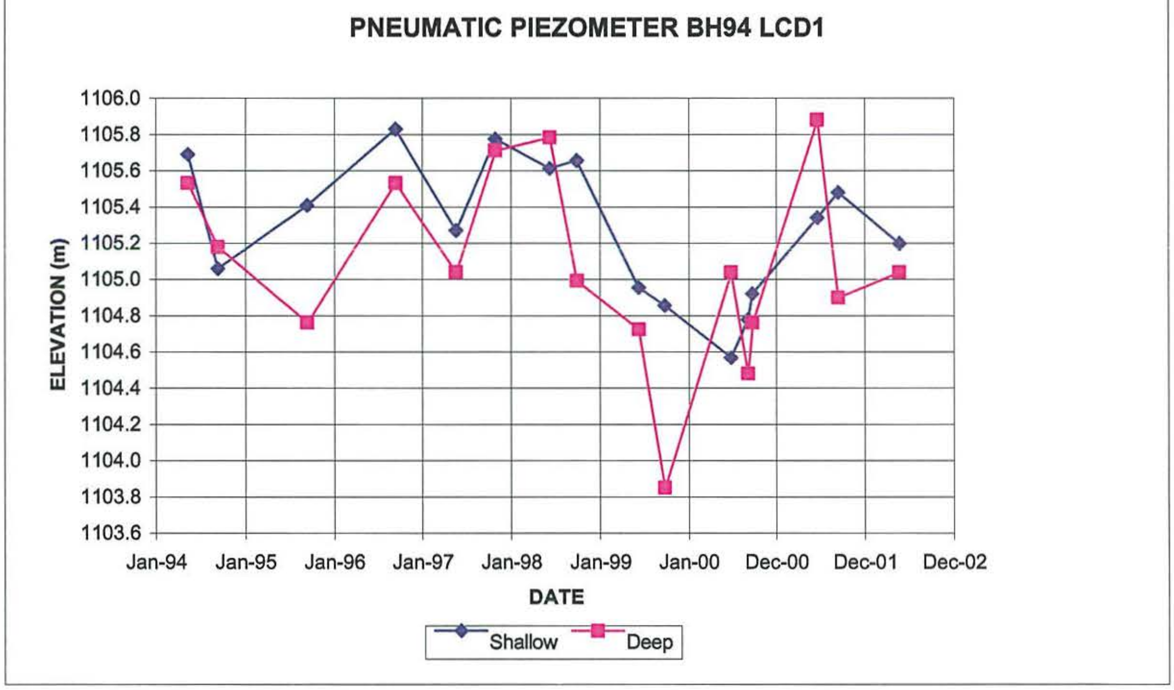
APPENDIX B

Pneumatic Piezometer and Thermistor Readings Readings Little Creek Dam

Little Creek Dam Pneumatic Piezometers

BH94 LCD1	**Location:** Little Creek Dam Crest	**Ground Elevation:** 1114.5m	**Coordinates:** 3000N, 13460E
	Date Installed: June '94	**Shallow Tip Elevation:** 1103.6 **Deep Tip Elevation :** 1097.0	**Surface Protector:** yes

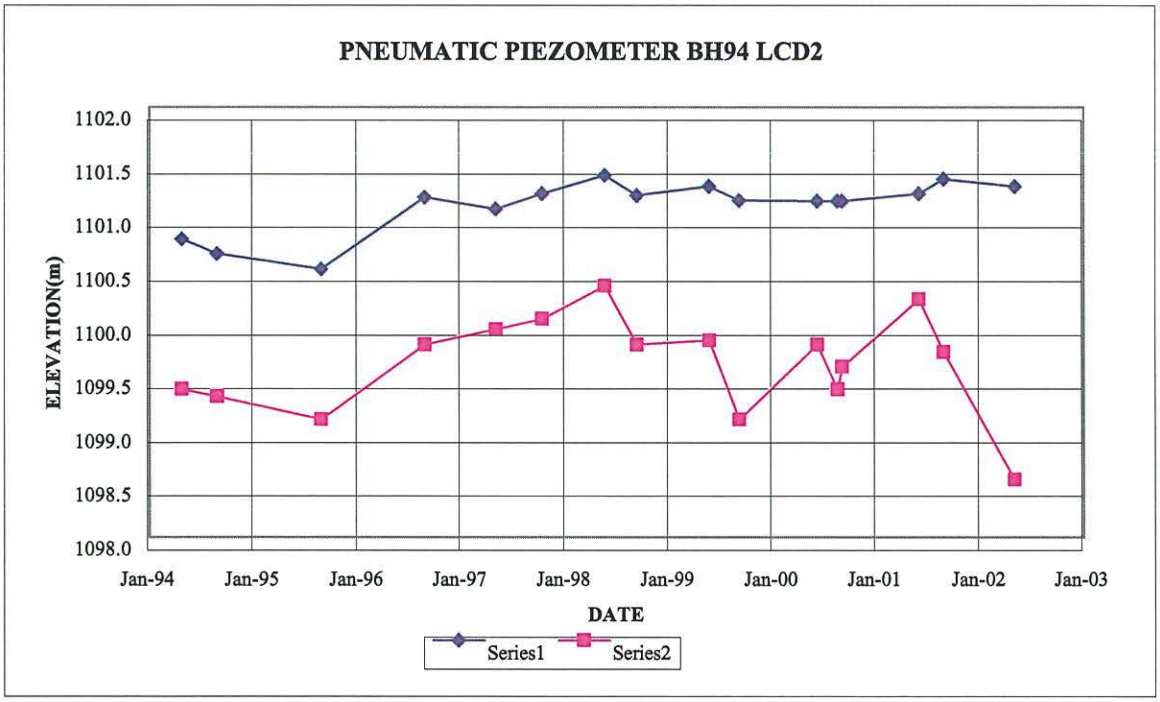
Date	Reading (psi)		Piezometric Elevation (m)		Pond
	Shallow	Deep	Shallow	Deep	Level
May-94	2.9	12.1	1105.63	1105.47	
Sep-94	2.0	11.6	1105.00	1105.12	
Sep-95	2.5	11.0	1105.35	1104.70	
Sep-96	3.1	12.1	1105.77	1105.47	
May-97	2.3	11.4	1105.21	1104.98	
Oct-97	3.02	12.36	1105.71	1105.65	
May-98	2.79	12.46	1105.55	1105.72	
Sep-98	2.85	11.33	1105.60	1104.93	~1109.5
May-99	1.85	10.95	1104.90	1104.67	
Sep-99	1.71	9.70	1104.80	1103.79	~1105
Jun-00	1.30	11.40	1104.51	1104.98	
Aug-00	1.60	10.60	1104.72	1104.42	
Sep-00	1.80	11.00	1104.86	1104.70	
5-Jun-01	2.40	12.60	1105.28	1105.82	1109.33
30-Aug-01	2.60	11.20	1105.42	1104.84	1108.55
9-May-02	2.20	11.40	1105.14	1104.98	1109.78



Little Creek Dam Pneumatic Piezometers

BH94 LCD2	**Location:** Little Creek Dam Crest	**Ground Elevation:** 1114.5m	**Coordinates:** 3065N,13485E
	Date Installed: June '94	**Shallow Tip Elevation:** 1100.5 **Deep Tip Elevation :** 1094.9	**Surface Protector:** yes

Date	Reading (psi) Shallow	Reading (psi) Deep	Piezometric Elevation (m) Shallow	Piezometric Elevation (m) Deep	Pond Level
May-94	0.4	6.4	1100.78	1099.38	
Sep-94	0.2	6.3	1100.64	1099.31	
Sep-95	0.0	6.0	1100.50	1099.10	
Sep-96	0.95	7.0	1101.17	1099.80	
May-97	0.8	7.2	1101.06	1099.94	
Oct-97	1.00	7.34	1101.20	1100.04	
May-98	1.25	7.78	1101.38	1100.35	
Sep-98	0.98	7.00	1101.19	1099.80	~1109.5
May-99	1.10	7.05	1101.27	1099.84	
Sep-99	0.91	6.00	1101.14	1099.10	~1105
12-Jun-00	0.90	7.00	1101.13	1099.80	
23-Aug-00	0.90	6.40	1101.13	1099.38	
8-Sep-00	0.90	6.70	1101.13	1099.59	
5-Jun-01	1.00	7.60	1101.20	1100.22	
30-Aug-01	1.20	6.90	1101.34	1099.73	
9-May-02	1.10	5.20	1101.27	1098.54	

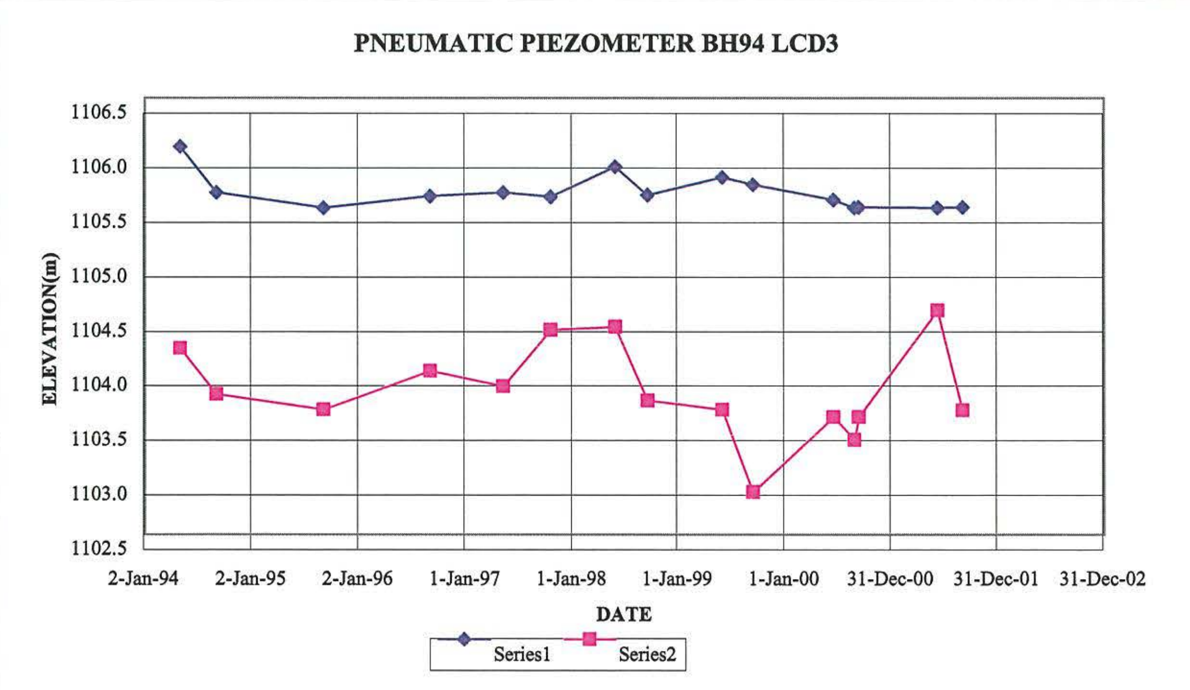


LCDPIEZ_may02 LCD2

Little Creek Dam Pneumatic Piezometers

BH94 LCD3	**Location:** Little Creek Dam Crest	**Ground Elevation:** 1114.5m		**Coordinates:** 3115N, 13525E
	Date Installed: June '94	**Shallow Tip Elevation:** 1105.5		**Surface Protector:** yes
		Deep Tip Elevation : 1101.2		

Date	Reading (psi)		Piezometric Elevation (m)	
	Shallow	Deep	Shallow	Deep
May-94	0.8	4.3	1106.06	1104.21
Sep-94	0.2	3.7	1105.64	1103.79
Sep-95	0.0	3.5	1105.50	1103.65
Sep-96	0.15	4.0	1105.61	1104.00
May-97	0.2	3.8	1105.64	1103.86
Oct-97	0.14	4.54	1105.60	1104.38
May-98	0.54	4.58	1105.88	1104.41
17-Sep-98	0.17	3.62	1105.62	1103.73
29-May-99	0.40	3.50	1105.78	1103.65
12-Sep-99	0.30	2.42	1105.71	1102.89
12-Jun-00	0.10	3.40	1105.57	1103.58
23-Aug-00	0.00	3.10	1105.50	1103.37
8-Sep-00	0.01	3.40	1105.51	1103.58
5-Jun-01	0.00	4.80	1105.50	1104.56
30-Aug-01	0.01	3.49	1105.51	1103.64
9-May-02	0.01	3.50	1105.51	1103.65



Little Creek Dam Thermistors

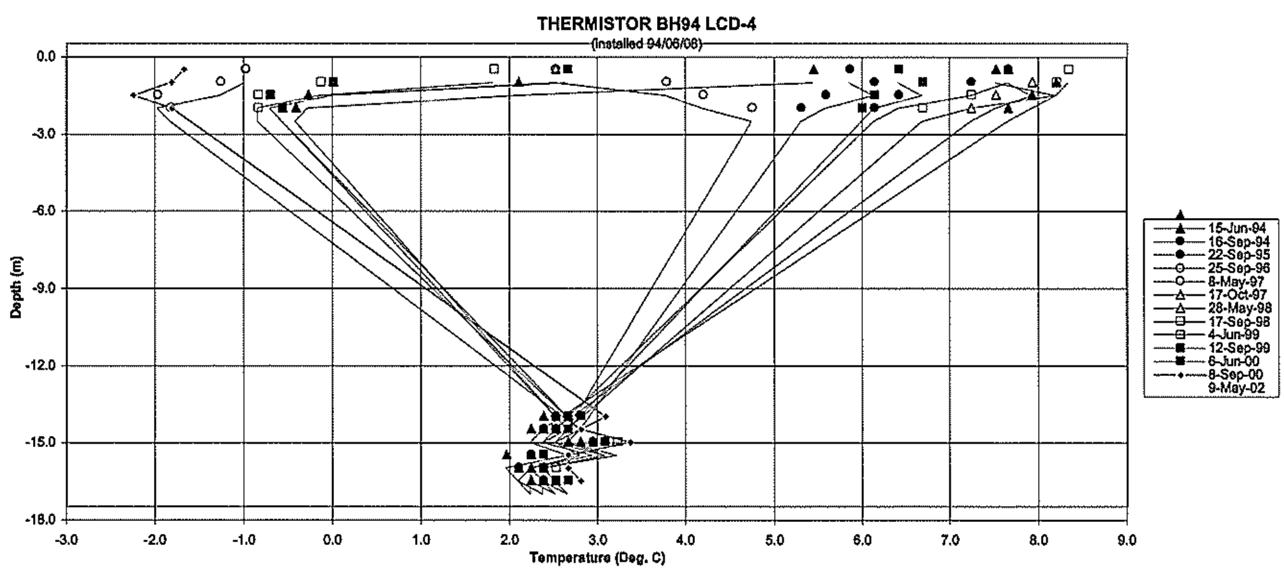
BH94 LCD-4 | **Location:** Little Creek Dam Crest | **Elevation:** 1114.5m | **Coordinates:** 3015N, 13465E

Date Installed: 8-Jun-94 | **Thermistor Type:** SINCA RTD's | **Ice-Bath Calibration:** not applied | **Surface Protector:** yes

Depth Correction 0 | Ro (Ohms)= 1854

Depth on String (m)	Actual Depth (m)	Resistivity (Ohms) 15-Jun-94	Resistivity (Ohms) 16-Sep-94	Resistivity (Ohms) 22-Sep-95	Resistivity (Ohms) 25-Sep-96	Resistivity (Ohms) 8-May-97	Resistivity (Ohms) 17-Oct-97	Resistivity (Ohms) 28-May-98	Resistivity (Ohms) 17-Sep-98	Resistivity (Ohms) 4-Jun-99	Resistivity (Ohms) 12-Sep-99	Resistivity (Ohms) 6-Jun-00	Resistivity (Ohms) 8-Sep-00	Resistivity (Ohms) 9-May-02
1.0	-1.0	1893	1908	1909	1896	1847	1872	1872	1909	1867	1914	1873	1900	1842
1.5	-1.5	1869	1913	1906	1898	1845	1881	1854	1911	1853	1913	1854	1902	1841
2.0	-2.0	1852	1911	1900	1894	1840	1884	1849	1908	1848	1906	1849	1898	1838
2.5	-2.5	1851	1909	1898	1892	1841	1888	1850	1906	1848	1902	1850	1897	1841
14.5	-14.5	1873	1871	1872	1874	1874	1873	1873	1872	1874	1873	1874	1873	1876
15.0	-15.0	1872	1870	1871	1872	1872	1871	1871	1871	1873	1872	1873	1872	1874
15.5	-15.5	1874	1873	1875	1876	1876	1875	1875	1875	1877	1876	1876	1876	1878
16.0	-16.0	1870	1868	1870	1871	1871	1870	1870	1870	1871	1871	1871	1871	1873
16.5	-16.5	1870	1869	1869	1871	1871	1871	1870	1871	1872	1871	1871	1871	1873
17.0	-17.0	1870	1870	1871	1872	1872	1872	1872	1871	1873	1872	1873	1872	1874

Depth on String (m)	Actual Depth (m)	Temperature (C) 15-Jun-94	Temperature (C) 16-Sep-94	Temperature (C) 22-Sep-95	Temperature (C) 25-Sep-96	Temperature (C) 8-May-97	Temperature (C) 17-Oct-97	Temperature (C) 28-May-98	Temperature (C) 17-Sep-98	Temperature (C) 4-Jun-99	Temperature (C) 12-Sep-99	Temperature (C) 6-Jun-00	Temperature (C) 8-Sep-00	Temperature (C) 9-May-02
1.0	-1.0	5.4	7.5	7.7	5.9	-1.0	2.5	2.5	7.7	1.8	8.3	2.7	6.4	-1.7
1.5	-1.5	2.1	8.2	7.2	6.1	-1.3	3.8	0.0	7.9	-0.1	8.2	0.0	6.7	-1.8
2.0	-2.0	-0.3	7.9	6.4	5.6	-2.0	4.2	-0.7	7.5	-0.8	7.2	-0.7	6.1	-2.3
2.5	-2.5	-0.4	7.7	6.1	5.3	-1.8	4.7	-0.6	7.2	-0.8	6.7	-0.6	6.0	-1.8
14.5	-14.5	2.7	2.4	2.5	2.8	2.8	2.7	2.7	2.5	2.8	2.7	2.8	2.7	3.1
15.0	-15.0	2.5	2.2	2.4	2.5	2.5	2.4	2.4	2.4	2.7	2.5	2.7	2.5	2.8
15.5	-15.5	2.6	2.7	2.9	3.1	3.1	2.9	2.9	2.9	3.2	3.1	3.1	3.1	3.4
16.0	-16.0	2.2	2.0	2.2	2.4	2.4	2.2	2.2	2.2	2.4	2.4	2.4	2.4	2.7
16.5	-16.5	2.2	2.1	2.1	2.4	2.4	2.4	2.2	2.4	2.5	2.4	2.4	2.4	2.7
17.0	-17.0	2.2	2.2	2.4	2.5	2.5	2.5	2.5	2.4	2.7	2.5	2.7	2.5	2.8

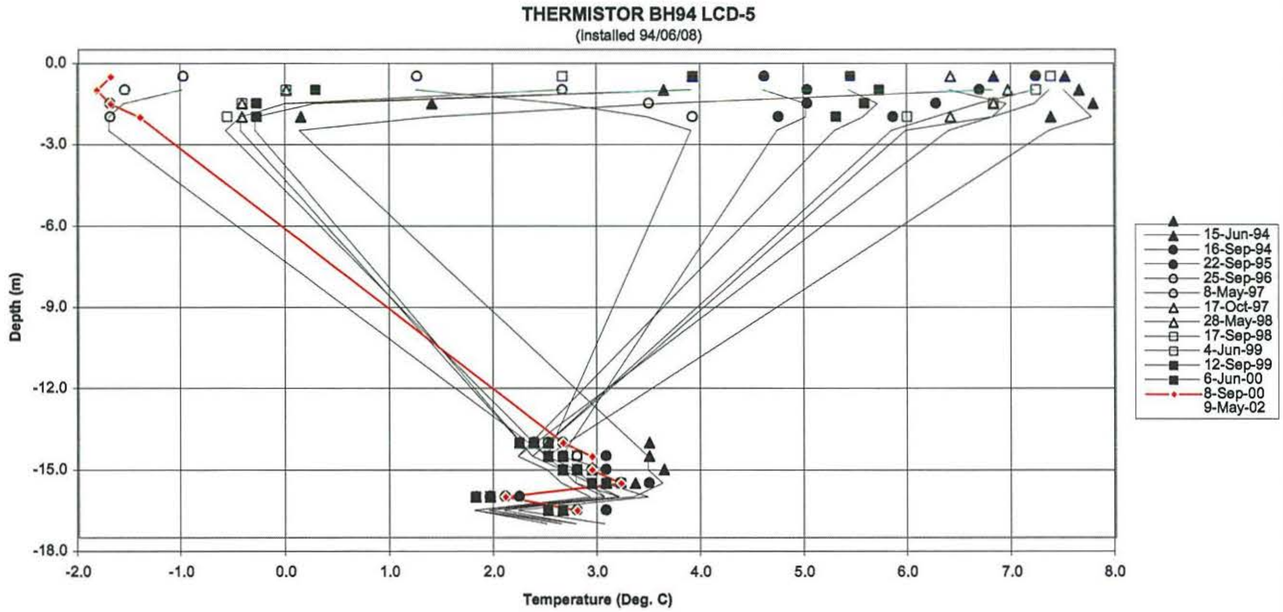


Little Creek Dam Thermistors

BH94 LCD-5	Location:	Little Creek Dam Crest	Elevation:	1114.5m	Coordinates 3090N, 13500E
	Date Installed:	8-Jun-94	Thermistor Type:	SINCA RTD's	Ice-Bath Calibration: not applied
	Surface Protector:	yes			
Depth Correction	0		Ro (Ohms)=	1854	

Depth on String (m)	Actual Depth (m)	Resistivity (Ohms) 15-Jun-94	Resistivity (Ohms) 16-Sep-94	Resistivity (Ohms) 22-Sep-95	Resistivity (Ohms) 25-Sep-96	Resistivity (Ohms) 8-May-97	Resistivity (Ohms) 17-Oct-97	Resistivity (Ohms) 28-May-98	Resistivity (Ohms) 17-Sep-98	Resistivity (Ohms) 4-Jun-99	Resistivity (Ohms) 12-Sep-99	Resistivity (Ohms) 6-Jun-00	Resistivity (Ohms) 8-Sep-00	Resistivity (Ohms) 9-May-02
1.0	-1.0	1903	1908	1906	1887	1847	1863	1882	1900	1873	1907	1882	1893	1842
1.5	-1.5	1880	1909	1902	1890	1843	1873	1854	1904	1854	1906	1856	1895	1841
2.0	-2.0	1864	1910	1899	1890	1842	1879	1851	1903	1851	1903	1852	1894	1842
2.5	-2.5	1855	1907	1896	1888	1842	1882	1851	1900	1850	1897	1852	1892	1844
14.5	-14.5	1879	1872	1871	1873	1872	1872	1871	1870	1872	1871	1871	1870	1873
15.0	-15.0	1879	1873	1873	1876	1874	1874	1873	1872	1874	1873	1873	1872	1875
15.5	-15.5	1880	1875	1874	1876	1875	1875	1874	1873	1874	1874	1874	1873	1875
16.0	-16.0	1878	1876	1877	1879	1877	1877	1876	1875	1877	1876	1876	1875	1877
16.5	-16.5	1868	1868	1868	1870	1869	1869	1867	1867	1868	1868	1868	1867	1869
17.0	-17.0	1873	1873	1874	1876	1874	1874	1873	1872	1873	1873	1873	1872	1874

Depth on String (m)	Actual Depth (m)	Temperature (C) 15-Jun-94	Temperature (C) 16-Sep-94	Temperature (C) 22-Sep-95	Temperature (C) 25-Sep-96	Temperature (C) 8-May-97	Temperature (C) 17-Oct-97	Temperature (C) 28-May-98	Temperature (C) 17-Sep-98	Temperature (C) 4-Jun-99	Temperature (C) 12-Sep-99	Temperature (C) 6-Jun-00	Temperature (C) 8-Sep-00	Temperature (C) 9-May-02
1.0	-1.0	6.8	7.5	7.2	4.6	-1.0	1.3	3.9	6.4	2.7	7.4	3.9	5.4	-1.7
1.5	-1.5	3.6	7.7	6.7	5.0	-1.5	2.7	0.0	7.0	0.0	7.2	0.3	5.7	-1.8
2.0	-2.0	1.4	7.8	6.3	5.0	-1.7	3.5	-0.4	6.8	-0.4	6.8	-0.3	5.6	-1.7
2.5	-2.5	0.1	7.4	5.9	4.7	-1.7	3.9	-0.4	6.4	-0.6	6.0	-0.3	5.3	-1.4
14.5	-14.5	3.5	2.5	2.4	2.7	2.5	2.5	2.4	2.2	2.5	2.4	2.4	2.2	2.7
15.0	-15.0	3.5	2.7	2.7	3.1	2.8	2.8	2.7	2.5	2.8	2.7	2.7	2.5	2.9
15.5	-15.5	3.6	2.9	2.8	3.1	2.9	2.9	2.8	2.7	2.8	2.8	2.8	2.7	2.9
16.0	-16.0	3.4	3.1	3.2	3.5	3.2	3.2	3.1	2.9	3.2	3.1	3.1	2.9	3.2
16.5	-16.5	2.0	2.0	2.0	2.2	2.1	2.1	1.8	1.8	2.0	2.0	2.0	1.8	2.1
17.0	-17.0	2.7	2.7	2.8	3.1	2.8	2.8	2.7	2.5	2.7	2.7	2.7	2.5	2.8

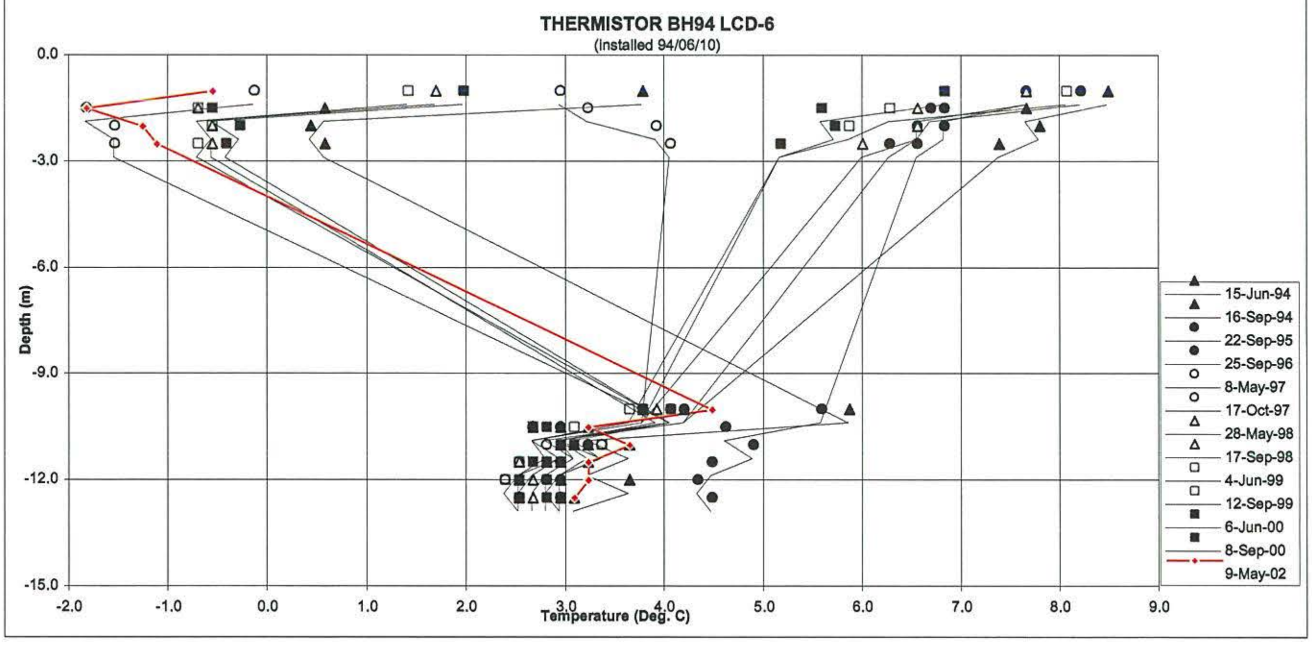


Little Creek Dam Thermistors

BH94 LCD-6	**Location:**	Little Creek Dam Crest	**Elevation:**	1114.5m	**Coordinates** 3125N, 13535E		
	Date Installed:	10-Jun-94	**Thermistor Type:**	SINCA RTD's	**Ice-Bath Calibration:** not applied	**Surface Protector:**	yes
Depth Correction	0.4		Ro (Ohms)=	1854			

Depth on String (m)	Actual Depth (m)	Resistivity (Ohms) 15-Jun-94	Resistivity (Ohms) 16-Sep-94	Resistivity (Ohms) 22-Sep-95	Resistivity (Ohms) 25-Sep-96	Resistivity (Ohms) 8-May-97	Resistivity (Ohms) 17-Oct-97	Resistivity (Ohms) 28-May-98	Resistivity (Ohms) 17-Sep-98	Resistivity (Ohms) 4-Jun-99	Resistivity (Ohms) 12-Sep-99	Resistivity (Ohms) 6-Jun-00	Resistivity (Ohms) 8-Sep-00	Resistivity (Ohms) 9-May-02
1.0	-1.4	1881	1915	1913	1909	1853	1875	1866	1909	1864	1912	1868	1903	1850
1.5	-1.9	1858	1909	1902	1903	1841	1877	1849	1901	1849	1899	1850	1894	1841
2.0	-2.4	1857	1910	1901	1903	1843	1882	1850	1901	1850	1896	1852	1895	1845
2.5	-2.9	1858	1907	1899	1901	1843	1883	1850	1897	1849	1891	1851	1891	1846
10.0	-10.4	1896	1884	1884	1894	1883	1881	1882	1881	1883	1880	1883	1881	1886
10.5	-10.9	1877	1875	1875	1887	1875	1873	1875	1873	1876	1873	1874	1873	1877
11.0	-11.4	1880	1877	1877	1889	1878	1874	1876	1875	1878	1875	1876	1875	1880
11.5	-11.9	1877	1875	1875	1886	1875	1872	1874	1872	1875	1872	1874	1873	1877
12.0	-12.4	1880	1875	1875	1885	1874	1871	1873	1872	1874	1871	1874	1872	1877
12.5	-12.9	1876	1875	1875	1886	1875	1872	1873	1872	1875	1872	1874	1872	1876

Depth on String (m)	Actual Depth (m)	Temperature (C) 15-Jun-94	Temperature (C) 16-Sep-94	Temperature (C) 22-Sep-95	Temperature (C) 25-Sep-96	Temperature (C) 8-May-97	Temperature (C) 17-Oct-97	Temperature (C) 28-May-98	Temperature (C) 17-Sep-98	Temperature (C) 4-Jun-99	Temperature (C) 12-Sep-99	Temperatur e (C) 6-Jun-00	Temperatur e (C) 8-Sep-00	Temperature (C) 9-May-02
1.0	-1.4	3.8	8.5	8.2	7.7	-0.1	2.9	1.7	7.7	1.4	8.1	2.0	6.8	-0.6
1.5	-1.9	0.6	7.7	6.7	6.8	-1.8	3.2	-0.7	6.5	-0.7	6.3	-0.6	5.6	-1.8
2.0	-2.4	0.4	7.8	6.5	6.8	-1.5	3.9	-0.6	6.5	-0.6	5.9	-0.3	5.7	-1.3
2.5	-2.9	0.6	7.4	6.3	6.5	-1.5	4.1	-0.6	6.0	-0.7	5.2	-0.4	5.2	-1.1
10.0	-10.4	5.9	4.2	4.2	5.6	4.1	3.8	3.9	3.8	4.1	3.6	4.1	3.8	4.5
10.5	-10.9	3.2	2.9	2.9	4.6	2.9	2.7	2.9	2.7	3.1	2.7	2.8	2.7	3.2
11.0	-11.4	3.6	3.2	3.2	4.9	3.4	2.8	3.1	2.9	3.4	2.9	3.1	2.9	3.6
11.5	-11.9	3.2	2.9	2.9	4.5	2.9	2.5	2.8	2.5	2.9	2.5	2.8	2.7	3.2
12.0	-12.4	3.6	2.9	2.9	4.3	2.8	2.4	2.7	2.5	2.8	2.4	2.8	2.5	3.2
12.5	-12.9	3.1	2.9	2.9	4.5	2.9	2.5	2.7	2.5	2.9	2.5	2.8	2.5	3.1



Appendix 3

2002 Technical Advisory Committee Meeting: Agenda, Summary, Attendees

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Memo

Deloitte & Touche

Date: August 16, 2002

To: Technical Advisory Committee

From: Deloitte & Touche, Interim Receiver for Anvil Range Mining Corporation

Subject: TAC Meeting Minutes - July 17, 2002

On Wednesday, July 17, 2002 a meeting of the Technical Advisory Committee (TAC) of Anvil Range Mining Corporation, as established under the terms of water licence IN89-002 for the Anvil Range Mine Site, was held at the Faro Recreation Centre, Faro, Yukon. The list of attendees can be found in Appendix A.

The meeting was arranged in two parts. In the morning, verbal presentations were made of the activities of the Interim Receiver and of the mine site, followed by a question and answer period and discussion of the future role of the TAC. A tour of the mine site was undertaken during the afternoon. The agenda for the meeting was as follows:

9:00 am through 12:00 noon

1. Welcome
2. Overview - Status of the Receivership
3. Introduction to Deloitte & Touche's Risk Based Management Approach
4. Review Environmental projects and ongoing care and maintenance activities for 2001 through 2002
5. Overview – Water Licence renewal process
6. Overview – Canadian Environmental Assessment Act (CEAA) process
7. Review – Project Description
8. Question and Answer session
9. Stakeholder discussion on the role of the TAC

12:00 noon – 1:00 pm: Lunch

1:00 pm – 1:30 pm: Drive to mine site

1:30 pm – 4:00 pm: Site Tour

4:00 pm – 5:00 pm: Question and Answer session at mine site

5:00 pm onwards: Continued discussion on the role of the TAC at mine site

In addition, the TAC was honoured to have Chief Jack Caesar, Ross River First Nation Band, lead the group in a closing prayer prior to commencing the site tour.

1. Welcome

Wes Treleaven, Senior Vice President, Deloitte & Touche Inc. ("D&T") and partner responsible for the Anvil Range Interim Receivership administration, opened the TAC meeting by welcoming all the participants, introducing the team from Deloitte & Touche (Valerie Chort, National Leader, Environment, Health and Safety (EHS) Services, Doug Sedgwick, Director, EHS Services, Shannon Glenn, Manager EHS Services, Kristine MacPhee, Senior Consultant, EHS Services, and Dana Haggar, Site Operations Manager, Anvil Range Mining Corporation (Interim Receivership)). All attendees were invited to introduce themselves and their organization affiliation.

Mr. Treleaven advised that he was going to refer to comments and action steps outlined at last year's TAC meeting held on July 10, 2001 as well as those made in the mid term report which was sent out in early March 2002.

Mr. Treleaven confirmed that, in preparation for this meeting, D&T had forwarded documentation to members of the TAC. This included 1) a copy of the Project Description filed to initiate a review under the Canadian Environmental Assessment Act (CEAA) as a first step in the water license renewal process and 2) the environmental section of the Interim Receiver's 28th Court Report filed on May 17, 2002.

2. Overview – Status of the Receivership

Presented by: Wes Treleaven

Anvil Range Mining Corporation ("Anvil Range") filed for protection under the Companies' Creditors Arrangement Act ("CCAA") in January 1998. An application to appoint Deloitte & Touche Inc. as Interim Receiver under the Bankruptcy and Insolvency Act was heard by the Ontario Court and the Company was placed into receivership on April 21, 1998. Deloitte & Touche Inc. was ordered to take possession, preserve and protect the assets of Anvil Range.

The Interim Receiver has filed 28 court reports since its initial appointment date. Initially, certain stakeholders believed that mining operations could be resumed at the Anvil Range mine site. The Interim Receiver completed extensive investigations and determined that the mine was not viable. These findings were presented to the Court. Mr. Treleaven advised the meeting attendees that, in the opinion of the Interim Receiver, mining operations would never resume at the mine site.

After a detailed inventory was taken and after various stakeholder negotiations had been completed, an asset realization program was commenced. Sales of the mobile equipment were completed, outstanding receivables were collected and miscellaneous assets were realized upon. To date, the realization program has produced approximately $9 million. These monies ultimately will be distributed to certain secured creditors in accordance with an approved Plan of Arrangement under the Companies' Creditors Arrangement Act.

The Interim Receiver believes that the total secured debt of Anvil Range is in excess of $100 million and this includes a $50 million reclamation claim filed by the Department of Indian Affairs and Northern Development ("DIAND"). Also, there is approximately $18 million due and owing to various creditors who, pursuant to the Miners' Lien Act, are elevated to the status of a secured creditor in accordance with terms of the Act. Also, Cominco Inc. has a secured position of approximately $24 million. The Ontario Court ordered the Interim Receiver to act as a Monitor under the CCAA and to attempt to facilitate a Plan of Arrangement, which would be approved by the affected creditors.

This administration has a number of complex legal issues to be resolved, and, in an effort to prevent protracted litigation, extensive negotiations were carried out among the affected creditors being DIAND, YTG, Cominco and the lien creditors. These negotiations resulted in a final Settlement Agreement, which was incorporated into a Plan of Arrangement. The Plan of Arrangement was unanimously accepted, wherein Cominco and the lien creditors would receive the realization proceeds secured by the Interim Receiver to date and would release the governments. In turn, the governments would release Cominco and the lien creditors and would take possession of the mining leases, mining claims and buildings on the Anvil Range mine site.

A small group of bondholders referred to as the Cumberland Group appealed the lower Court's approval of the Plan of Arrangement. In July of this year, the Ontario Court of Appeal denied the Cumberland Group's application to set aside Justice Farley's approval of the Plan of Arrangement. Mr. Treleaven advised that the bondholders may appeal the Ontario Court of Appeal's decision to the Supreme Court of Canada and they have 60 days from the initial date to file such an appeal. Mr. Treleaven indicated that he would not speculate as to the possibility of a further appeal. However, he did indicate that the Cumberland Group has taken another separate matter all the way to the Supreme Court of Canada and he would not be surprised if they also appealed this decision.

Mr. Treleaven also advised that during the early stages of the Interim Receiver, DIAND, the Yukon Territorial Government ("YTG"), and Cominco Inc. entered into a Memorandum of Understanding ("MOU"), the intent of which was to have Cominco oversee the property via a new vehicle often referred to as 'Trustco'. Mr. Treleaven advised that the parties acted in good faith and conducted various studies to advance certain terms and conditions under the MOU. However, world market prices for the metal concentrates have fallen significantly and consequently, the viability of reopening the mine being unlikely, the parties agreed earlier this year to terminate the MOU.

At the commencement of the Interim Receivership, the Interim Receiver was required to report to the Court quarterly. In 1999, it became apparent that longer term planning was necessary to ensure the stable and effective ongoing maintenance of the mine site. To that end, the Interim Receiver began generating annual plans and is currently reporting to the court semi-annually. These reports coincide with the Government's fiscal year. The early spring report outlines the programs for the current year and also reports on the overall financial results for the past year. The fall report outlines the results of the various studies during the past field season and sets the stage for various programs that the Interim Receiver plans to conduct during the following year. The Interim Receiver is now also taking steps to plan using a three to five year horizon to ensure that the government is aware of the various proposed programs that will be taking place. This will assist in ensuring longer term stable funding to manage the Anvil Range mine site. Mr. Treleaven advised that the Interim Receiver intends to maintain possession and responsibility of the site, in accordance with the intent described in the Project Description on the renewal of the water license.

Questions:

Q: Does Deloitte & Touche report all stakeholder concerns (i.e. other perspectives), as well as issues other than water treatment in their reports?

A: The Interim Receiver's court reports highlight many topics and issues over and above those reported in the environmental section of each report. It is the Interim Receiver position that the court is made fully aware of known stakeholder concerns. To this end, Justice Farley, who is handling this file, is well versed with the site and its history, as he was also the judge who oversaw the Curragh Receivership.

Q. Can you confirm that the TrustCo is no longer being considered? And if the structure is still viable who becomes a responsible party?

A. TrustCo was a concept proposed under the MOU, which has now been terminated. The concept may still have some appropriateness in the future.

Q. Why do you believe the bondholders will appeal to the Supreme Court?

A. This opinion is based on the historical actions of the Cumberland Group.

3. Deloitte & Touche's Risk Based Management Approach

Presented by: Valerie Chort

Initially the Interim Receiver's planning process focused on short-term compliance and management issues to minimize risk to the surrounding environment. It was soon recognized that a proactive, longer-term perspective was essential in managing environmental and risk issues at the site. To this end, D&T applied their risk-based assessment approach to the site as a means to identify and prioritize environmental issues based on risk, such that they could be managed in a timely, efficient and cost-effective manner. This methodology was developed using best practices from the mining industry and general risk management.

The process of risk characterization, assessment and management is dynamic. As such, the risk framework developed for the mine is continuously updated and evaluated by D&T to ensure that the work being performed at the site is relevant and addresses the issues in order of highest priority. The initial step in this process is the creation of a comprehensive risk assessment matrix. This is a complete listing of all critical elements of the mine site and their relative risk ranking with respect to the likelihood and overall impact (with respect to the environment, community, financial and First Nations) of the critical event for that element occurring. Once developed, the matrix highlights the most critical risks as well as opportunities for efficient risk mitigation for elements with lower overall rankings. Management decisions regarding activities and projects outside the scope of ongoing maintenance are based on the results of this classification.

4. 2001 – 2002 Projects and Site Activities

Presented by: Wes Treleaven

a) Fresh Water Supply Dam

The Fresh Water Supply Dam (FWSD) was identified in the Comprehensive Risk Assessment Matrix as the highest risk element at the site. With this knowledge, the Interim Receiver initiated investigations to fully understand the issues relating to the dam and began a program of risk mitigation and dam remediation to respond to the issues that engineers have highlighted.

In 2001, the Interim Receiver engaged professional divers to complete a comprehensive inspection of the low level pipe[1] using both ultrasound and visual inspections. The results showed the pipe had deteriorated by 50%, and a 1.5 m slump was identified along a 20 m section of the pipe in the centre of the dam. The water level in the Fresh Water Reservoir was immediately lowered following these findings to reduce the overall pressure on the dam and on the pipe. Additionally, a sediment-monitoring program was established at the low-level pipe outfall to identify changes in seeps occurring at the dam face. Such changes should they occur may indicate a loss of integrity of the pipe.

Phases of Risk Mitigation

A risk mitigation plan was developed, with Phase I and Phase II for immediate implementation. The objective of these two phases is the mitigation of the risk presented by the deterioration of the low level pipe. For clarity, the definitions for each of the three phases are listed below:

- Phase I – involves the lowering of the water level in the Fresh Water Reservoir by approximately six meters and the creation of a lowered spillway in the Fresh Water Supply Dam (FWSD). This work phase is planned for Fall 2002.

- Phase II – involves mitigation of the risk posed by the low-level pipe. Pending further engineering studies and risk comparisons, it may involve the removal or the rehabilitation of the pipe. The engineering assessment will be completed in Fall 2002 and any work that is shown to be necessary to mitigate risks will be completed in 2003.

- Phase III – involves the determination of the final configuration of the FWSD. This phase is linked to the final disposition of the tailings and the closure criteria established for the downstream structures, all of which are components of the Final Closure and Reclamation Plan, to be submitted for approval in 2006.

Rationale for a Phased Approach

The rationale for a phased approach is that the purpose of Phase I – the lowering of the spillway – is required because of the mechanics involved in lowering the reservoir. It provides certainty that Phase II can be completed in a single construction season. In addition, Phase I also reduces the likelihood of different failures mechanisms of the dam, in particular:

- Potential for piping along the low-level pipe: Based on a prior risk assessment, lowering of the reservoir will reduce the average hydraulic gradient, likely the main mechanism responsible, by 33% and hence, reduce the potential for piping. This is a risk reduction in the likelihood of a piping event occurring.

- Piping within the frost-affected zone: Based on the new, lowered spillway configuration, the pond will never again be retained within this zone of the dam, unless an event approaching the PMF size is retained.

[1] The low-level pipe is a 42 inch pipe that runs perpendicularly through the dam extending roughly 40 metres into the Fresh Water Reservoir.

- Ability to handle extreme precipitation events: Based on the new lowered spillway, the additive abilities of the two spillways and the extra storage capacity behind the dam, it is now possible that the FWS Dam could handle the inflow of PMF event without overtopping.

The purpose of Phase II – the removal or remediation of the low level pipe – is to meet the objective of mitigating the risk presented by the current status of the low level pipe. It is currently the intent of the Interim Receiver to proceed with Phase II in the year immediately following Phase I. However, further engineering studies that are now underway may conclude that the risks remaining after Phase I do not require immediate removal or rehabilitation of the low level pipe. It is therefore desirable that all Phase II options be kept open until the engineering studies are completed.

The decisions relating to the final use of this structure are separate from the decisions for the design of Phases I & II. As mentioned above, the final use of the structure will ultimately be decided as part of the Final Closure and Reclamation Plan, to be developed during 2003-2008, as proposed in the Project Description recently submitted to DIAND Environment.

Questions:

Q: What was the conclusion of the Failure Modes and Effects Analysis? Does the dam need to remain in the long term?

A: The long-term status of the Fresh Water Supply Dam has not been resolved at this time. This decision will be in concert with the overall plan for site closure and will be closely tied to the determination of the final disposition of the down valley tailings.

Q: What risk category will the Fresh Water Supply Dam be ranked after the slot cut is complete?

A: As described above, the slot cut is part of Phase I, which involves lowering the water level in the Fresh Water Reservoir by approximately six meters and the creation of a lowered spillway in the Fresh Water Supply Dam (FWSD). The purpose of Phase I is to provide certainty that Phase II can be completed in a single construction season. In addition, Phase I also reduces the likelihood of different failures mechanisms of the dam. Mitigation of the risk posed by the low level pipe will be achieved in Phase II. Therefore the FWSD will still be rated as "Very High" after Phase I. A significant risk reduction will be achieved after Phase II, which will be completed in 2003.

Q: What was the fish habitat impact during mine operations?

A: The Interim Receiver has no records of fish monitoring during the operations of the mine. With respect to water level of the reservoir, the mill did have occasion in the 1980's to cease operations during the winter as the water levels had been drained so low that there was no water available from the reservoir for use in the mill.

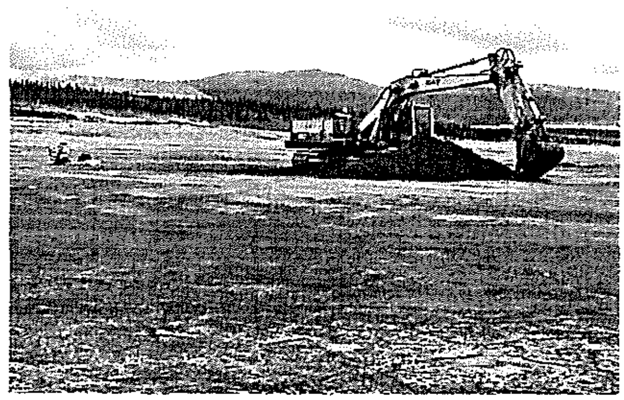
Q: If the object is to mitigate failure of the dam, why not open the valve all the way and let the water drain through the pipe rather than build a slot cut?

A: The Interim Receiver has been advised by engineering consultants that fully opening the valve on the pipe is a high risk action that would result in: 1) excess water draining into the down valley via channels not designed for that volume of flow; and 2) excess vibration on the pipe would occur thus potentially causing structural issues with the pipe. In addition, the capacity of the pipe in relation to inflows into the reservoir is not sufficient to drain the reservoir.

Q: Why not replace the 40 metres of iron pipe in the reservoir with a shorter PVC pipe?

A: The remediation of the dam will be a phased project. Initially, the slot cut will be constructed as a means to effectively and efficiently control water levels behind the dam. The second phase will consist of remediation of the pipe. All options will be reviewed upon the commencement of the second phase.

b) Tailing Impoundment

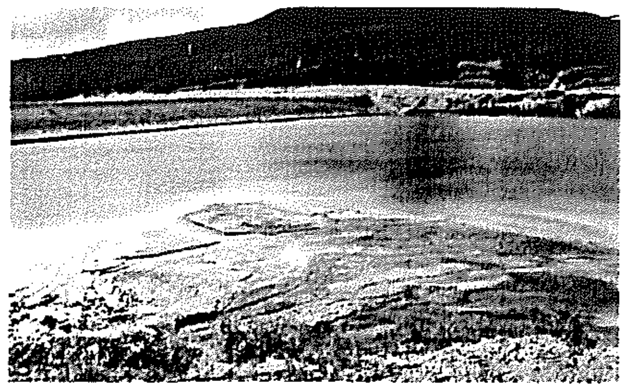


In 2001 an application by Environment Canada and the Department of Fisheries and Oceans was made to the Yukon Water Board for the removal of the tailings from the down valley to the Faro Pit. The Interim Receiver concluded that there was insufficient information to make such a decision and filed a letter with the Water Board. To better understand the issue the Interim Receiver received approval from DIAND to conduct a study of the tailings impoundment. The Interim Receiver worked in collaboration with DIAND and Environment Canada to design a study that adequately addressed the concerns of all parties. In the end, eleven boreholes were drilled, five of which were in locations that mirrored historical borehole locations.

This initial study indicated the presence of contaminants (sourced from the tailings) directly beneath the tailings but not downgradient of the tailings impoundment.

c) *Polishing Pond*

The polishing pond behind the Cross Valley dam is the receiving body for water flowing out of the Intermediate dam impoundment and from the Faro Pit water treatment plant. A large sediment beach had built up over time at the northeast corner of the pond, which limited the effectiveness of the polishing pond.



To resolve this issue, the sediments were removed from the polishing pond and relocated into the Faro Pit. A layer of lime was then placed on the area that had previously been the sediment beach and secured in place by a layer of ice. This ensured the remaining sediments would not be dislodged during spring freshet. The system is now working effectively.

d) *Intermediate Spillway*

In addition to the work done in the Polishing Pond, a new liming system was placed in the middle of the Intermediate Spillway. The water from the Intermediate Impoundment and the Faro Water Treatment Plant is piped into this system. At this point, a lime slurry is added and the water is aerated. This system is working effectively and, as a result, the Intermediate Pond is substantially below the dam crest.

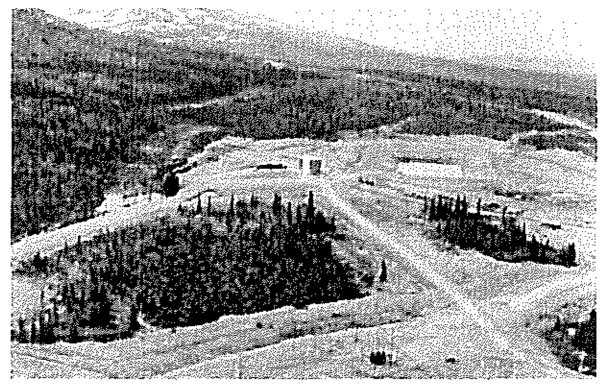
e) *Faro Water Treatment*

Over the last year the Interim Receiver has worked to convert the processing mill into a water treatment plant. Upon start-up, the treatment plant encountered some difficulties, as enough sludge had not built up in the system to adequately act as a zinc absorber. The water was re-circulated in the treatment plant for a period of time until the appropriate amount of sludge had accumulated. The treatment plant is now performing well and treats in excess of 6,000 gallons per minute. The water released from the treatment plant has very low zinc concentrations, 0.14 – 0.20 mg/l. This water is then sent to the polishing pond where it is further treated prior to being discharged into Rose Creek[2].

The next phase of work on the Faro Pit water treatment process will be the construction of a new barge platform in the pit that will allow for double the currently available freeboard.

[2] The Water Licence requirement for zinc concentration of water leaving the property is 0.5mg/l. Our combination of the Faro Water Treatment Plant and water treatment at the Polishing Pond keeps the water leaving the site well in compliance.

f) Vangorda Water Treatment



In 2001 work was carried out to construct a barge piping network, and to upgrade the water treatment plant and settling pond. Via this system, Vangorda Plateau water, which ends up in the Vangorda Pit, is piped up to the treatment plant where it is processed at 2000 gallons per minute.

As a result of excessive sediments build-up in the Vangorda storm water ditch system storm runoff and snow melt water had to be diverted in to the Vangorda Pit. To remediate this sediment issue and eliminate the need to divert water, the ditch system was remediated with new riprap.

The next project with respect to the site element will be the elimination of seeps into the pit.

Q: How will run-off be affected in a wet year and will suspended solids be affected?

A: This is not anticipated to be a problem because of the rehabilitation work completed.

g) Vangorda Rock Dump

In 2001, a groundwater investigation was undertaken at the Vangorda Rock Dump. A borehole was drilled into the heavy clay soil to bedrock, in a location most likely to have groundwater accumulation. The investigation found no groundwater contamination at bedrock.

The till dyke of the Vangorda Rock Dump slumped in during this past year, blocking a seep collection point. The area was subsequently re-sloped to its original condition and the collection system restored.

h) Renewable Energy Study

Over $1,000,000 is spent annually on electricity at the site. To optimize future short and long-term energy use, a renewable energy study was undertaken. The study indicated that wind and micro hydro could be viable alternative sources of energy. As a follow-up a 30 m tower has been located on the Vangorda Plateau to monitor wind conditions. The results of this monitoring will determine if there is adequate wind to generate reliable energy for the site.

Additionally, the study identified immediate opportunities to reduce energy use. The recommended actions were taken and $15,000/month worth of savings in electricity costs are being realized during the operating season.

i) Disposition of Hazardous Wastes

In 2001, all unused reagents and oils were removed from the site. A certified waste hauler completed the removal and disposed materials at a regulated off site location.

j) Site Maintenance Work

Key site maintenance projects included the re-grading and stabilization of the Rose Creek Diversion as well as the rehabilitation of the Vangorda Flume. The latter work was in response to damage caused during spring freshet. Both these projects were completed by Tim Moon from Ross River and his employees.

5. 2002 Projects and Site Activities

Presented by: Wes Treleaven

a) Dams

In accordance to the Canadian Dam Safety Guidelines, the Interim Receiver has contracted Klohn Crippen to complete Dam Safety Review Inspections for the four major dams on the property. This will be the first time in the history of the site that dams have been inspected against this standard. In addition, the Receiver will re-contour and top-up the back slope of the Intermediate and Cross Valley dams.

b) Faro Creek Flume Rehabilitation and Relocation Options

Faro Creek, which originally flowed over the Faro deposit, is diverted around the Faro Pit in the Faro Creek diversion. Today, as a result of slumping and sloughing of the pit wall, the distance between the pit wall and the diversion is reduced. This proximity poses the potential risk of clean surface water flowing into the pit and potentially exceeding the water treatment capability. The following actions are being undertaken to address this issue:

- Firstly, a key section of the diversion ditch which is annually affected by ice jams is being rehabilitated such that it will now be situated within a larger ditch thus discouraging the creation of ice jams. This work will also minimize excessive water leakage from the ditch that has historically occurred.
- Secondly, the Interim Receiver will arrange for an engineering study to identify options for relocation of the Faro Creek Diversion.

Q: How long would it take for the Pit to fill if the wall sloughed away due to some extreme event, e.g. an earthquake and the Faro Creek flowed directly into the Pit over the wall?

A: At the time of the TAC meeting, the Interim Receiver did not have the required information to respond to this question. Following the meeting, the Interim Receiver, revised the request for proposal that had been tendered for the study of Faro Creek relocation options to also include a review of the stability and likelihood of the collapse of the Pit wall in question.

c) Seeps Investigations and Action Steps

The Interim Receiver is currently investigating the origins, contaminant loads and treatment options for the Guardhouse and Emergency Tailings Area seeps.

d) Mobile and Site Equipment

Much of the original equipment that was not sold as part of the asset realization program, but retained for site operations and maintenance work, has become worn beyond the point of repair. To ensure the employees have safe and appropriate tools to complete their necessary tasks, $1,000,000 was spent this year to purchase and lease equipment such as pumps, a generator, backhoe and front loader.

e) Physical Site Maintenance Work

Key tasks that have occurred as part of physical site maintenance include:

- the removal of unused fuel tanks;
- rehabilitation of the spillway culverts at the FWSD;
- the production of rip rap for rehabilitation of the intermediate spillway; and
- determination of the disposition of the concentrate load out facility.

f) Site Studies

- In April of 2002, the Interim Receiver held a technical workshop in Vancouver to identify and define remediation projects that could be proposed as part of the Water Licence renewal (i.e., to be completed 2003 – 2008), and to identify and prioritize site characterization and closure alternatives studies required for the development of a Final Closure and Reclamation Plan as required by the Water Licence Renewal Process.

- In 2002, all site employees were screened for lead exposure. No exceedances were found.

Q: Who was invited to the Workshop? With the special knowledge held by the TAC and by virtue of how the role of the TAC is described in the Water Licence, it is the belief of this participant that the TAC should have been involved.

A: As this was an initial step in our planning for the Water Licence renewal process, key proponents of the project along with technical experts in mining, hydrology, ecology, etc. were involved with the Workshop. In total, eighteen people participated.

6. Water Licence Renewal

Presented by: Shannon Glenn

The current Faro and Vangorda Water Licences will both expire on December 31, 2003. To this end, the Interim Receiver has begun the process of applying for a new licence. The following strategy is proposed:

- To apply for an amalgamated water licence whose terms will apply to both the Faro and Vangorda portions of the property. A "One licence" approach will allow for more flexibility and effectiveness with respect to reclamation and closure planning activities.

- To apply for a licence that will cover a term of five years (2004 through the end of 2008), thus allowing time to develop and obtain regulatory approvals for a Final Closure and Reclamation Plan (FCRP) and to allow for the regulatory transitions and capacity building to occur (i.e. Devolution and YEEA/DAP). With the intended completion of the FCRP in 2006, the Interim Receiver proposes to begin the application process for a final Water Licence that would cover the term of 2009 through the completion of reclamation work on the property.

Currently, with respect the Water Licence being sought for January 1, 2004, the Interim Receiver has issued a Project Description under the requirements of the Canadian Environmental Assessment Act, that outlines the proposed changes to the current Water Licences as well as planned activities during the 2004-2008 time period. As per the guidelines for a CEAA screening, the Project Description Document has been issued to the Regional Environmental Review Committee and all Responsible Authorities and is available for public review. Looking towards the months ahead, the Interim Receiver is anticipating the receipt of the EAR (Environmental Assessment Review) Guidelines back from the Responsible Authorities, participation in public meetings to discuss the project description, and Ministerial review of the document. It is our intention that an application to the Yukon Water Board will be made by Interim Receiver on behalf of the Anvil Range site by May 2003.

Q: Who will be responsible to sign the new water licence?

A: That responsibility has not been assigned yet by the Yukon Government.

Q: Who gave permission for only one licence to be sought?

A: The Interim Receiver, in light of all the information available, is proposing this as a strategy and will be applying for one licence.

Q: How is Chapter 12 of the Umbrella Agreement being addressed in this process? How are First Nations' unique concerns going to be adequately addressed?

A: The Interim Receiver will be involving the First Nations in the Water Licence renewal process. To this end, an initial public meeting was tentatively arranged for August 22, 2002 in Ross River. It was learned however during this TAC meeting that the date would not permit the majority of participants to attend the meeting as it conflicts with the hunting season. To that end, we have asked that the Ross River Band determine a date that would be appropriate to ensure maximum participation. Following the conclusion of the TAC meeting, the date of October 10, 2002 was established as the time for this public meeting. Further meetings will occur as the process continues.

7. Technical Advisory Committee Discussion

Presented by: Valerie Chort

The TAC was established under the Vangorda Water Licence as a means to work with the mine to ensure that all available information and knowledge was obtained and reviewed for key decisions. Since the inception of the TAC, the circumstances at the mine have changed dramatically. In particular, the site has evolved from being an operational to a non-operational site. It is the objective of the Interim Receiver to ensure the role of the TAC in the next Water Licence term clearly reflects the current environment and needs of the stakeholders. To that end, Ms. Chort asked for comments and suggestions from the meeting participants with respect to their thoughts on the design and role of the TAC in the next Water Licence (e.g. membership, type of communications, meeting frequency). In response, the TAC asked to be provided with a draft document from the Interim Receiver outlining a new TAC structure and would comment based on that. As of August 16, 2002 that document is being finalized and will be distributed to the TAC upon its completion.

Appendix A

July 17, 2002 TAC Meeting Attendees

Name	Representing
Mike Boyson	Anvil Range Mining Corporation Interim Receivership
Dana Hagar	Anvil Range Mining Corporation Interim Receivership
Valerie Chort	Deloitte & Touche
Shannon Glenn	Deloitte & Touche
Kristine MacPhee	Deloitte & Touche
Doug Sedgwick	Deloitte & Touche
Wes Treleaven	Deloitte & Touche
Ian Church	DIAND - Environment
Leslie Gomm	DIAND - Environment
Rachel Pugh	DIAND - Indian Affairs Program Environment
Laura Spicer	DIAND - Indian Affairs Program Environment
Chris Cuddy	DIAND - Land & Water (HQ)
Robert Lauer	DIAND - Mining (HQ)
Rick Meyers	DIAND - Mining (HQ)
Allan Carlick	DIAND - Mining Land Use
Bob Holmes	DIAND - Mineral Resources
Karen Pelletier	DIAND - Mineral Resources
David Sherstone	DIAND - Water Resources
Bill Slater	DIAND - Water Resources
Steve Gotch	Department of Fisheries and Oceans
Sandra Orban	Department of Fisheries and Oceans
Eric Soprovich	Environment Canada, EPB Yukon
Eric Denholm	Gartner Lee Limited
Victor Mitanier	Kaska First Nations
Jason Acklack	Ross River Dena Council
Jenny Caesar	Ross River Dena Council
Chief Jack Caesar	Ross River Dena Council
Dorsi Dryer	Ross River Dena Council
Mike Gergel	Ross River Council - Teslin
Derek Ground	Ross River Dena Council
Ann Rheault	Ross River Dena Council

Appendix A (cont'd)

July 17, 2002 TAC Meeting Attendees

Name	Representing
David Power	Town of Faro
Mel Smith	Town of Faro
Daryl Hockley	SRK (on behalf of Deloitte & Touche)
Bob Van Dijken	Yukon Conservation Society
Carl Sidney	Yukon Salmon Committee
Rod Hill	YTG - Energy, Mines & Resources
Chuck Hubert	YTG - Environment
Jim McLachlan	YTG – Cabinet MLA