



BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

DELOITTE & TOUCHE INC.

2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENT REVIEW

VOLUME 1 OF 2

VARIOUS FACILITIES AT FARO MINE, YUKON

FINAL

PROJECT NO.: 0257-051-05
DATE: FEBRUARY 13, 2009

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February 13, 2009

Mr. Doug Sedgwick
Deloitte & Touche Inc., as Interim Receiver for Anvil Range Mining Corporation
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**RE: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENT REVIEW
VARIOUS MINE WASTE FACILITIES AT FARO MINE, YUKON**

Dear Mr. Sedgwick:

Please find attached our final report on the Annual Geotechnical Evaluation and Instrument Review of various mine waste facilities at Faro Mine. This report has been sent to the distribution list shown on the front cover.

If there are any questions regarding this report, please contact the undersigned at your convenience.

Yours truly,
BGC Engineering Inc.
per:

Gerry Ferris, M.Sc., P.Eng.
Geotechnical Engineer

encl.: Final Report

GWF/TMW

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LIMITATIONS OF REPORT

BGC Engineering Inc. (BGC) prepared this report for the account of Deloitte and Touche Inc., as interim receiver for Anvil Range Mining Corporation. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a third party makes of this report, or any reliance on decisions to be based on it are the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

As a mutual protection to our client, the public, and ourselves, all reports and drawings are submitted for the confidential information of our client for a specific project. Authorization for any use and/or publication of this report or any data, statements, conclusions or abstracts from or regarding our reports and drawings, through any form of print or electronic media, including without limitation, posting or reproduction of same on any website, is reserved pending BGC's written approval. If this report is issued in an electronic format, an original paper copy is on file at BGC Engineering Inc. and that copy is the primary reference with precedence over any electronic copy of the document, or any extracts from our documents published by others.

1.0 INTRODUCTION

1.1 Scope of Services

BGC Engineering Inc. (BGC) provided a proposal (No. 08-044) for the annual geotechnical evaluation and instrumentation review work at Faro Mine, dated May 14, 2008, to Mr. Doug Sedgwick of Deloitte & Touche Inc. (Deloitte), Interim Receiver for Anvil Range Mining Corporation. The noted scope of work comprised the following components:

1. Input, review and interpretation of monitoring data collected by site staff on the Cross Valley Dam, Intermediate Dam, Secondary Tailings Dam, Rose Creek Diversion Canal (RCDC), North Fork Rose Creek Flow Through Causeway, K8 Creek Rock Drain, and Faro Creek Diversion Canal.
2. A late May/early June site visit by Mr. Gerry Ferris to examine site conditions on major dams and canals following spring thaw.
3. Early September site visit by Mr. Gerry Ferris to examine site conditions for annual inspection report.
4. Prepare presentation materials for site staff training seminar and provide seminar during the September site visit.
5. Prepare and submit Annual Geotechnical Inspection report for submission in February 2009.

This annual inspection report does not include the Fresh Water Supply (FWS) Dam Breach Project. As detailed in Section 1.2, this dam was breached in 2003 and inspection of the breach and channel works constructed is reported under a separate water licence and inspection report.

Two separate site inspections visits were performed in 2008; in May 29th through June 1st and September 9th-11th. The purpose of the May/June inspection was to examine site conditions of the major structures immediately following the spring freshet. The September inspection coincided with the timing of the annual inspection visits that have been performed for over 20 years. The structures listed above were assessed.

In addition to the annual inspection and assessment work, BGC was responsible for the preparation of a training seminar for site staff. During the September inspection, a seminar was given to provide site staff with continued training related to the site Operations, Maintenance, and Surveillance (OMS) and Emergency Response Plan (ERP).

1.2 General Background Relating to Inspection and Instrumentation

Golder Geotechnical Consultants provided design recommendations for the Down Valley Tailings Disposal Project (Golder 1980). Following the subsequent construction of the facilities (Golder 1982), an extensive geotechnical monitoring program was initiated and is continuing to-date. Golder Associates was responsible for the annual inspection and instrumentation review of the Down Valley Tailings project between 1981 and 1999. Beginning in 2000, BGC has conducted the annual geotechnical inspection and instrumentation review duties.

The report provided herein presents an assessment of the monitoring data collected in 2008. Monitoring data from piezometers, slope inclinometers, thermistors and seepage weirs is collected by site staff. The data is forwarded to BGC for review and inclusion in this report. In addition to reviewing the instrumentation data, visual inspections of the various facilities were undertaken by BGC personnel. This report compiles and reviews the instrumentation and inspection components in order to assess the physical performance of the noted structures.

As noted earlier, the FWS Dam was breached in November/December 2003, in accordance with the terms and conditions provide in the Yukon Water Board Licence Number QZ03-058. This licence was in effect until December 31, 2008 and provided details on reporting, effluent quality standards, monitoring and surveillance required for this specific project. The requirements provided in that licence are supplemental to those provided in Water Licence QZ03-059, which were applicable to the Faro Site.

The following components of Faro Mine are included within the present report, and are shown in Figures 1, 2 and 3:

- **The Rose Creek Diversion Canal** – The Canal Dike was built as part of the former Down Valley Tailings Project in 1980-81, it was constructed as an expansion of the existing canal which diverted water around the Secondary Impoundment. The Canal Dike separates the diversion canal from the Polishing Pond, the Intermediate Dam pond and tailings deposit. Structures associated with the Rose Creek Diversion Canal include the Canal Dike, the Spoil Piles and the Back Slope.
- **The Intermediate Dam** – The Intermediate Dam was designed to retain tailings solids, supernatant water and run-off water. It was built as part of the Down Valley Tailings Project in 1980-81, and underwent crest raisings in 1988, 1989 and 1991.
- **The Cross Valley Dam** – The Cross Valley Dam was designed to have capacity for 60-day retention of seepage/discharge water from the Intermediate Dam. It was originally used as a polishing pond and later for water treatment residue retention. Built as part of the former Down Valley Tailings Project, it was constructed in 1980-81.
- **North-Fork Rose Creek Flow-Through Causeway (“North Fork Rock Drain”)** - The causeway was built of waste rock in 1987. The causeway was advanced by dumping waste rock from the causeway grade to provide a zone of preferentially larger particles in the lower portion of the fill. This zone conveys creek flows through the structure; the driving head being provided by a small pond of water on the upstream side of the causeway.
- **Faro Creek Diversion Canal and East Wall of Faro Pit** – Faro Creek was diverted around the top of the Faro Pit through the construction of a diversion channel, in 1967/68. The stability of the east wall of the Faro pit has been a concern throughout the lifetime of the pit operation. A number of structural discontinuities within the east pit wall, coupled with seepage from the Faro Creek diversion canal along the top of this pit wall, contribute to the slope instability that has occurred along this pit wall.
- **Faro Waste Rock Dumps** – The Waste Rock dumps were built throughout the operating life of the Faro Pit. These dumps were generally constructed by end dumping

and spreading from the final bench elevation of the dump. Portions of the Faro Waste Rock Dumps are adjacent to the North Fork of Rose Creek. Generally, the physical stability of waste dumps are of concern during construction and the first few years following construction. However, given their location adjacent to a creek, these portions of the waste dumps are reviewed on a two-year cycle.

- **Secondary Tailings Impoundment** – Built in 1974 to accommodate expanding tailings storage requirements. The stability of the eastern portion (east of the Diversion Dam) of the secondary tailings component is a concern since it is retaining tailings from the upper section of the Rose Creek Diversion Canal.
- **K8 Creek Rock Drain** – This causeway was built overtop of the K8 Creek in 1987 using mine waste rock. The causeway was advanced by dumping waste rock from the causeway grade to provide a zone of preferentially larger particles in the lower portion of the fill. This zone conveys creek flows through the structure; the driving head being provided by a small pond of water on the upstream side of the causeway.

1.3 Additional Relevant Studies

In addition to instrumentation monitoring and visual inspections, Deloitte and the Faro Project Management Team (FPMT) have completed a number of assessment studies relevant to structures and facilities at Faro Mine that are discussed in this annual report. These additional studies are documented in the following reports:

1. BGC (2008a) wrote an ERP for potential failure of the dams at the Faro Mine.
2. BGC (2008b), with input from SRK, prepared an OMS for the dams at the Faro Mine site (including Little Creek Dam near the Vangorda/Grum mining area).
3. Klohn Crippen Berger (2008) performed a dam safety review for the Intermediate and Cross Valley Dams and channels at the Faro Mine site. This report presented information on dam classification and methods to improve the dam safety program at Faro Mine.
4. Golder (2008) reported on the performance of the stability of the soil slope between the Faro Pit and the Faro Creek Diversion Canal. Report attached.
5. BGC (2008c) wrote an investigation report on the Faro Creek Diversion Channel based on test pits excavated in the dike, carried out in September 2008. Report attached.

These reports, particularly the 2008 OMS, ERP, and Faro Creek Diversion Channel investigation reports, should be reviewed in conjunction with the assessment provided herein. Each report provides conclusions and recommendations that are relevant to structures and facilities at Faro Mine and the Down Valley Tailings Project.

2.0 2008 MONITORING PROGRAM

2.1 Introduction

Historically, the monitoring program has been comprised of a specific schedule for reading the instrumentation, which depended on the type of instrument, its location and the performance trend indicated by the accumulated data. In those areas where good performance of the structures was demonstrated over time, the frequency of readings was reduced for reasons of economy or irrelevance of additional data, or because the installations became non-functional. Conversely, there have been some instances where instrumentation and visual observation justified more frequent readings and installation of additional instrumentation. The recommended instrumentation monitoring schedule for 2008 was provided as Figure 37 of the 2007 Annual Geotechnical Inspection report (BGC 2008d).

Instruments in the Rose Creek Diversion Canal (canal dike and spoil piles), Intermediate Dam, Cross Valley Dam, and Secondary Tailings Impoundment Dam were scheduled for monitoring in May or June and September. The proposed schedule was followed with minor changes. All of the instruments within the Down Valley tailings area monitored as part of this evaluation are shown in Figures 2 and 3.

As a complement to the instrumentation data obtained, various components of the Faro Mine were visually inspected by BGC personnel during the periods between May 29 to June 1 and September 9 to 11, 2008. Details of the visual inspection are discussed in Section 4.0.

2.2 Elevations within the Down Valley Project Area

Elevations within the Down Valley project were originally documented with respect to the Down Valley Project Datum (DVPD). The DVPD is 32.3 m above the mean sea level datum (m amsl), thus to convert elevation from dvpd to amsl 32.3 m needs to be subtracted from the original elevation. The Interim Receiver has completed a program to present information concerning the facilities in terms of metres above mean sea level (or a geodetic datum) rather than in DVPD or mine datum.

All elevations documented in this report concerning structures and instrumentation are reported with respect to geodetic datum. An elevation survey of all instruments at the Cross Valley and Intermediate Dams was performed in 2004, allowing the data to be presented in terms of the geodetic datum. Surveys of crest and instrument collar elevations for the Diversion Canal (Canal Dike, Back Slope, and Spoil Piles) and the Secondary Tailings Dam were performed in 2005. These surveys have allowed all the instrumentation data collected at the Faro Mine to be presented in terms of the geodetic datum.

2.3 2008 Water Management

Water pumped from the Faro Pit passes through the mill water treatment plant and then flows to a dissipation chamber located at the toe of the Intermediate Dam, discharging to the Cross Valley Pond ("the Polishing Pond"). Water is pumped from the Intermediate Dam pond to the mill water treatment plant, following treatment this water is discharged with the Faro Pit water at the toe of the Intermediate Dam. Occasionally decant siphons are used to convey water from the Intermediate Pond over the Intermediate Dam into the Cross Valley Pond. Water from the Cross Valley pond is then discharged to the environment over the Cross Valley Dam by siphon pipes.

The Intermediate and Cross Valley Pond water levels are measured with respect to a geodetic datum using survey from a local benchmark. Figures 4 and 5 provide a summary of the Cross Valley Pond and Intermediate Pond water levels throughout the year. Table 1 contains the 2008 water level data from the Intermediate and Cross Valley Ponds in tabular format. The water level information is used to aid in the interpretation of the instrumentation response in the following sections.

In 2008, similar to the past few years, the pond levels in both the Intermediate Pond and Cross Valley Pond were kept low since the water quality was suitable for discharge. The Cross Valley Pond fluctuated from a high of 1030.25 m on April 10 down to a low of 1027.14 m on October 22. The Intermediate Pond level ranged from a high of approximately 1047.27 m on April 3 to a low of 1045.96 m on June 5.

2.4 Precipitation Information

Yearly climatic conditions can significantly affect the performance of water retaining and water conveying earth structures. Table 2 provides a summary, on a month-by-month basis, of the total precipitation at the Faro Airport from 1978 to 2008. At the bottom of the table, the minimum, mean and maximum monthly precipitation values are also provided. Precipitation data from the Faro Airport was only available for four months of the year. The average annual precipitation at the Faro Airport is 309 mm.

2.5 Air Temperature Information

Yearly climatic conditions can significantly affect the performance of water retaining and water conveying earth structures. Table 3 provides a summary, on a month-by-month basis, of the air temperature at the Faro Airport from 1977 to 2008. At the bottom of the table, the minimum, mean and maximum values are provided. In 2008, the average monthly temperature was slightly lower than the average. The average monthly temperature in 2008 was -3.0°C or 0.8°C cooler than the mean annual value -2.2°C . Overall, 2008 had lower than average temperatures for each month, having the coldest July on record.

2.6 Measured Flow in Rose Creek Diversion Canal

The amount of flow within the Rose Creek Diversion Canal (RCDC) affects the performance of the diversion structure and the expected results in the instruments used to monitor the performance of the Canal Dike. Figure 6 provides a summary of the measured daily flows near the inlet of the Rose Creek Diversion Canal. The flows are determined based on a daily reading (normally early morning) of a staff gauge located about 50 m downstream of the inlet to the Canal. The staff gauge readings are converted to flow based on a rating curve. The peak flow measured in 2008 was 35.9 m³/sec. Also included in Figure 6 is a summary plot of the peak daily flows measured at this location in the last couple of years (since monitoring began), plus a data point from 1975 (Sigma 1975). The 2008 peak flow value is higher than the average peak flow of 21 m³/sec.

2.7 Faro Creek Diversion Channel Investigation

Following a seepage event that occurred in May 2007 in the Faro Creek Diversion Channel (FCDC), it was recommended that a test pitting program be carried out in 2008 (BGC 2007c). The details of the seepage event and repair recommendations are summarized two memos created in 2007 (BGC 2007a & BGC 2007b). A Failure Modes and Effects Analysis (FMEA) risk assessment was conducted on the FCDC. The FMEA analysis was performed by an expert group which reviewed the known information related to the FCDC and consisted of personnel from BGC, Deloitte, ARMC and the FPMT. This risk assessment identified eight moderately high risks (BGC 2007c). For each of these risks, a program of either further assessment, quantification or construction activities were prescribed. In September of 2007 BGC personnel, Mr. Gerry Ferris and Mr. Brad Russell, were on site to monitor the construction of remedial repairs that were recommended earlier in the year (BGC 2007d). The construction was completed by site staff and equipment. Prior to BGC's arrival on site, all materials were ordered, brought to the construction site and prepared by site staff. Immediately prior to construction activities, the FCDC was diverted using a system of pumps and pipes. An as-built report was prepared to document the construction completed (BGC 2007d). The construction was completed immediately prior to the onset of winter conditions at the site.

As a follow up to the repair, a test pitting program was undertaken by BGC in the summer of 2008 in order to investigate the dyke and develop further understanding of the seepage event that took place. The investigation was completed during the September Faro inspection trip by Mr. Gerry Ferris, P. Eng. and Mr. Ashton Friesen, EIT. A total of 9 test pits were excavated and the information gathered from them has provided strong evidence that the canal was not constructed to current engineering standards. The test pit locations were chosen to be in known seepage areas and during all the excavations standing or seeping water and soft, wet soil was encountered. The results of these test pits highlight that poor construction can yield results like the 2007 seepage event, along with two relatively large slides, both near the Faro Valley Dumps. It is not clear at this time whether the performance of the dike will revert to its relatively benign performance of a few years ago or if the events of 2007 are indicative of future performance. The investigation report is included in Appendix I.

Based on this investigation, and considering the results of the FMEA risk analysis, past recommendations from Denholm and Golder, and the current closure planning, the following recommendations have been made in the investigation report:

- Test pitting locations on the dike should be monitored throughout the fall and spring as these areas were disturbed and may be subject to instability in the future (slumping, settlement, etc.).
- Continue monitoring the flow in the FCDC using the installed staff gauges.
- The FCDC should be either moved to a new position or repaired as a priority item within the next 2 or 3 years.

3.0 INSPECTION CONDITIONS AND APPROACH

Mr. Gerry Ferris, P.Eng., from BGC undertook the two site inspections of the selected structures. Mr. Ferris was on site in May/June and then again in September to perform the annual inspection.

Each of the selected structures was inspected in a walking tour. Pertinent observations concerning both condition and seepage (or lack thereof) were recorded by camera and dictaphone.

In general, during the June inspections, the site appeared in good condition with no major concerns noted, only minor maintenance and monitoring was recommended. The findings were reviewed verbally with Mr. Dana Haggart, Site Manager, before BGC personnel left site. A summary memo pertaining to the conditions and maintenance items was prepared for Deloitte; a copy is attached in Appendix II.

During the September inspection, the inspected facilities appeared in satisfactory condition and the recommendations made for some repairs were related to minor maintenance and monitoring. A summary memo pertaining to the conditions and maintenance items was prepared for Deloitte; a copy is attached in Appendix II.

4.0 FINDINGS AND CONCLUSIONS

The results of the inspections of each of the structures are presented on the following pages in standardized format, complemented by a selection of site photographs. Please refer to Figure 1 for the general location of each structure and to Figures 2 and 3 for the locations of individual instruments within the Down Valley Project Area. Specific maintenance requirements are documented on the individual structure summary sheets and in the summary memos provided in Appendix II. Instrumentation data reviewed on the summary sheets are attached in Appendix III.

In general, the structures appeared in good condition and the instruments appeared in good working order.

There are a total of 87 active subsurface instruments at the Faro Mine site, which includes 64 piezometers, 12 thermistors, and 11 slope inclinometers. In addition to these subsurface instruments, staff gauges and data loggers are used to monitor the flow in various canal reaches. In total 7 staff gauges and 2 data loggers are in current use. Site staff also perform water elevation surveys of the different pond elevations at the Intermediate and Cross Valley Ponds as well as at the North Fork Rock Drain.

Visual monitoring and reading of instrumentation (as recommended) should be continued and the instrumentation data immediately conveyed to BGC for review. Should any atypical or deteriorating conditions be observed or recorded, BGC should be contacted immediately for comment. Protocols for anomalous readings were reviewed in the OMS Manual and in the ERP (BGC 2008a, b).

ROSE CREEK DIVERSION CANAL (RCDC) – CANAL DIKE

LOCATION:	Borders the southern edge of the tailings impoundments (see Figures 2 and 3). The Canal Dike is considered to start at the 1981 Diversion Dam.
FUNCTION:	The Canal Dike separates the diversion canal from the Polishing Pond, the Intermediate Dam pond and tailings deposit. Figures 7 through 9 provide photographs of the RCDC Canal Dike and Backslope.
LENGTH:	3,800 m +/-
MAX HEIGHT:	4 m +/- above downstream toe/native ground.
CREST ELEVATION:	1063.1 m at the start of the dike, grading downwards at 0.3% to the start of the upper weirs, where the crest elevation is 1052.4 m. The dike then grades at 4.6% through the weir sections to an elevation of 1024.9 m. After the weir section, the dike grades at 2.2% to a final elevation of 1014.8 m.
CREST WIDTH AND CONDITION:	5 m +/- wide; No signs of cracking or settlement were noted on the Canal Dike crest.
FLOW	Figure 6 presents the flow quantity (measured at a staff gauge once per day) in the Rose Creek Diversion during 2008. The measured maximum daily flow in 2008 occurred in early June and was 35.9 m ³ /sec, as compared to the average peak of 21 m ³ /s. The flow in the canal was consistently at a higher flow than typical for the entire year.
RIPRAP:	The rip rap is in satisfactory condition.
WEIRS:	Central boulders have been displaced downstream slightly, Figure 9. Overall, the weir sections appeared in satisfactory condition.
INSTRUMENTATION:	Readings of the Canal Dike instruments for 2008 were obtained in June and September. Tabulated data and plotted records are presented in Appendix III and summarised in Tables 4, 5 and 6.
PIEZOMETERS:	The observed piezometric pressures generally reflect the anticipated conditions. Figure 10 provides a longitudinal section of the piezometric conditions observed within the canal dike observed during 2008. Additional observations with regards to the 2008 Canal Dike piezometric monitoring data include the following:

ROSE CREEK DIVERSION CANAL (RCDC) – CANAL DIKE CONTINUED

- Data collected from piezometers CD-21, CD-26 and BGC05-06 indicates a downward hydraulic gradient, and low pore pressures at depth indicate that the subsurface is essentially free draining. These pressures are lower than the adjacent water levels in the Intermediate Pond.
- Data collected from CD-13 and CD-15 indicates that a weak upward hydraulic gradient exists at these locations. The upward hydraulic gradient at CD-15 has been consistent since 2002.

During 2008, the water level in the tailings pond retained by the Intermediate Dam was about 0.5 m below full supply in the first part of the year, and then was lowered from the beginning of May till the end of June, with a gradual increase during the rest of the year. The average pond level for 2008 is 1046.6 m.

The Canal Dike crest elevation opposite the south abutment of the Intermediate Dam is approximately 1052.9 m. The invert of the 0.6 m deep pilot channel (of the diversion canal) is at approximately 1048.9 m. Fall flows typically just inundate the bench adjacent to the pilot channel, suggesting a diversion canal water surface elevation of about 1049.6 to 1049.7 m, i.e., an elevation approximately two and a half metres above the level of the tailings pond at the Intermediate Dam. The gradient of the Diversion Canal is 0.19%. The tails beach limit, when the pond is at its full supply level, is about 1100 m upstream of the Intermediate Dam. In addition, higher spring and summer flows in the canal will produce a higher driving head for potential seepage.

Based on the above, the difference in elevation between the surface of the water in the Diversion Canal and the base level (water or tailings) upstream of the Intermediate Dam ranges from about 2 m at the Intermediate Dam to approximately 4 m at the beach limit. Upstream of the beach limit, the difference in elevation is about 4 m.

Under these conditions, and a uniform head loss between the Diversion Canal and the tailings pond, piezometric levels recorded by piezometers installed in the Canal Dike should range from about 1049.2 m just upstream of the Intermediate Dam (Sta 2+500), to about 1051.2 m at the limit of the tailings beach (Sta 1+400). The geometry and piezometric assumptions reviewed here are graphically displayed on Figure 11. In general, the piezometer readings are

ROSE CREEK DIVERSION CANAL (RCDC) – CANAL DIKE CONTINUED

within the expected range, however as can be seen on Figure 10, a few exceptions occur, particularly for deep piezometers located near the Intermediate Dam. Those piezometers do not appear to be part of the same groundwater regime, but more influenced by hillside drainage to the Polishing Pond. With the exception of the piezometers installed in 2005, which are at the historical maximum, the piezometers were within the historical range.

THERMISTORS:

The data continues to indicate a slight warming trend at depth at thermistor locations CD-10, CD-21, CD-26, and BGC01-02. Thermistors located at BGC05-04 and BGC05-07 were recently installed and will need further readings to determine any trends. In general, readings from the thermistors in 2008 were slightly warmer than the range measured in previous years.

- At thermistor location CD-15, the cooling trend at 10 m depth measured since 1999 reversed and warming was measured. No permafrost can be detected within the 9 m depth that the instrument measures.
- A thermistor string was installed in Borehole BGC05-04 to verify the geothermal conditions indicated by installation CD-19. The data collected in 2008 indicates that permafrost no longer exists within 11.9 m of the ground surface.

SLOPE

INCLINOMETERS:

The slope inclinometer indicated only minor movements in 2008. The majority of the movement, when encountered, was surficial and appeared to be creep. Many instruments showed past evidence of settlement.

In 2007 it appeared that minor shear movements were occurring between depths of 4 and 5 m at CD-10. Following the 2008 readings, it appears that this may have been an error in the data or the reading. However, continuing monitoring should be done at this location, along with visual inspection of the surface area by a geotechnical engineer during 2009 to ensure there are no problems.

In addition to these general comments, the plots for slope inclinometer at BGC01-01 show significant variation to other installations. When installed, this casing was 14 m deep (below the ground) but can be only measured in its upper 10 m in 2008. This is likely due to freezing at depth and gradual build up of ice in the

ROSE CREEK DIVERSION CANAL (RCDC) – CANAL DIKE CONTINUED

casing. This has made on going comparison difficult. With the 2005 installations near this location, the SI no longer should be read as it is not providing useful information.

MAINTENANCE

RECOMMENDATIONS: As part of the on-going maintenance, the crest of the Canal Dike should be graded each September or October after the annual inspection to cover areas where cracks and potholes have developed. The purpose of this treatment is to prevent ingress of surface run-off water that may be concentrated in the settled areas, potentially reducing stability. Blading should be used to accomplish this work. Care must be taken not to disturb the existing instrumentation that has been installed to monitor performance of the dike.

During the 2008 inspections it was noted that there was excessive tree growth in the RCDC. This growth within the canal will begin to affect the integrity of the clay liner that retains water in the canal. This growth should be removed in 2009. For this removal it is preferable that the removal of the growth should include removal of the roots, rather than just removing the surface growth. If the root growth is deep and affects the clay liner repairs should be undertaken on the clay liner.

The upper nodes of the thermistor at BGC01-02 have malfunctioned, and this instrument should be replaced in 2009.

It is recommended that a series of staff gauges be installed within the Rose Creek Diversion Canal to help quantify locations of seepage loss, especially related to the seepage through the spoil pile.

CONCLUSIONS:

The majority of the permafrost that was originally in the Canal Dike has degraded beyond the depth of instrumentation. Given the above summary of monitoring results, it is recommended that selected instruments be monitored in 2009. The select instruments are located in the area of 2004 dike crest raise and the piezometers throughout the dike crest. Monitoring of all working instruments should be moved to a two year cycle outside of this 1 km zone.

RCDC – SPOIL PILES

- LOCATION:** Downslope of the diversion canal dike, on the southern edge of the tailings impoundments (see Figures 2 and 3).
- FUNCTION:** The construction waste of the diversion canal dike formed the spoil piles. Figure 12 provides photographs of the toe area of the Spoil Pile adjacent to the Cross Valley Pond.
- LENGTH:** Discontinuous over the approximate 3,800 m length of the Canal Dike.
- MAX HEIGHT:** Variable heights, ranging from approximately 1 m to 8 m above downstream toe/native ground.
- SEEPAGE:** Increased seepage quantity and sloughing occurring at the toe of one portion of the spoil piles, located between the Cross Valley and Intermediate Dams. Seepage and related sloughing is caused by very low polishing pond level. This sloughing has been noted since 2005 and appears to be worsening over time. Significant sloughing is occurring and appears to be extending further up the slope, with several head scarps present. The deteriorating conditions should be visually monitored and a study should be carried out to determine the best method to repair the area. In the east zone 12 seepage discharge locations were noted at an estimated rate of 8-9 L/min. There were 13 noted seepage discharge location in the west zone at an estimated rate of 5-6 L/min.
- It is recommended that two piezometers be installed through the spoil pile to record the piezometric conditions within this known seepage area.
- INSTRUMENTATION:** Readings for the spoil pile instruments for 2008 were obtained in June and September. Tabulated data and plotted records are presented in Appendix III and summarised in Tables 7 and 8.
- THERMISTORS:** Thermistors SP-2, SP-3, and SP-5 indicate that there is no longer any permafrost above a depth of 10 m at this location. A slight warming trend is apparent in the data.
- SLOPE INDICATORS:** Inclinator SP-2 showed some significant downslope creep movement in 2008. The spoil pile has settled in the vicinity of Station 1+530, based on the distinctive shape of the deflection versus depth curves for data obtained from SP-2. This area should be continually monitored and inspected by a geotechnical engineer in 2009.

RCDC – SPOIL PILES CONTINUED

MAINTENANCE

RECOMMENDATIONS: Increased seepage quantity and sloughing occurring at the toe of the spoil piles, located between the Cross Valley and Intermediate Dams, likely caused by low polishing pond levels. Visually monitor sloughing and retrogression for the short term and a study should be undertaken in 2009 to determine the best method to repair the affected area. The area shows signs of active failure and remediation work should be done to ensure long term acceptable performance.

Visually monitor the area of the spoil pile where slope indicator SP-2 is located. Attempt to determine if movement is occurring or if the 2008 readings are inaccurate.

CONCLUSIONS:

Continued monitoring is required along the toe of the Spoil Piles between the two dams. Based on visual assessments it appears that the seepage in this area is increasing. The seepage loss from the canal can be approximated from the proposed staff gauges recommended for the Rose Creek Diversion. In addition, two piezometers are recommended to be installed in the spoil pile above the seepage area to monitor the pressures in the slope.

The spoil pile is experiencing some on-going creep movements near SP-2, which are located downslope from areas of the canal dike that have moved in the past. There is no measured permafrost remaining in the foundations of the spoil piles. Monitoring of the spoil pile thermistors currently is on a two year cycle; this schedule should be continued. Monitoring of the slope indicators should be completed on a yearly basis. The newly recommended piezometers should be monitored on a twice yearly basis.

RCDC – BACKSLOPE

- LOCATION:** Upslope of the Canal Dike, on the southern edge of the tailings impoundments (see Figures 2 and 3).
- FUNCTION:** Forms part of the canal excavation above the elevation at which water will flow. The Canal Backslope was constructed when the Canal was excavated. Figures 7 to 8 provide photographs of the Canal Backslope.
- LENGTH:** 3,800 m +/-, the entire length of the Canal Dike
- INSTRUMENTATION:** Readings of the Canal Dike Backslope instruments for 2008 were only obtained in June. Due to access issues, readings could not be taken in September. The full explanation of the missed September readings is documented in a letter from BGC to Deloitte and is included in Appendix IV. Tabulated data and plotted records are presented in Appendix III and summarised in Tables 9, 10 and 11. No readings were collected from the backslope instrumentation during 2007, as per the recommendations in the 2006 Annual report (BGC 2007f).
- PIEZOMETERS:** Two piezometers located in the Backslope, BS-5 and BS-9, were read. Pore pressures measured at both locations are generally in the historical range, increasing slightly from the 2006 readings.
- THERMISTORS:** Steady temperatures were noted at the instrument in BS-12, while the instrument in BS-10 appears to be showing a warming trend. No frozen conditions were measured at BS-12, while the depth to permafrost at BS-10 was steady at approximately 8 m, although it was noted to be approximately 6.5 m in depth 4 years ago. BS-5 yielded poor readings with only one responding node. The one functioning node indicated freezing temperatures at a depth of approximately 7.5 m.
- SLOPE INDICATORS:** No significant movement was measured in the 2006 to 2008 period, although some minor creep movement was measured in the upper 1.5 m at BS-9.
- OBSERVATIONS:** Approx. 2H:1V slope and in good condition with no signs of settlement. A new slump of the back slope was noted this year. This slump is located approximately at the Intermediate dam. This small headscarp should be visually monitored to ensure that it does not become more significant. This slough is likely a result of surficial saturation of the backslope materials. It should be noted that the Backslope area was not inspected by foot in 2008 due to access limitations. These limitations are summarised in a letter included in Appendix IV.

RCDC – BACKSLOPE CONTINUED

MAINTENANCE

RECOMMENDATIONS: Monitor sloughing on backslope and assess for deteriorating conditions.

CONCLUSIONS: The Canal Backslope is performing satisfactorily with some minor occurrences of local sloughing within the granular material and erosion. Although the Canal Backslope is supposed to be monitored every two years, the 2008 readings were not fully completed. The reasons for the missing September 2008 readings are summarised in a letter included in Appendix IV. Consequently, readings should be taken in June and September of 2009, and the historical two year reading cycle should be offset to odd number years (i.e. 2009, 2011, 2013etc). The Backslope area should also be inspected on foot in 2009, as limited access prevented a walking inspection in 2008. This 2 year inspection cycle should also be offset to odd number years.

NORTH VALLEY WALL INTERCEPTOR DITCH (NVWID)

- LOCATION:** North side of the valley containing the tailings impoundments, along the north side of Rose Creek Valley (see Figure 1).
- FUNCTION:** The NVWID diverts the water from the Upper Guardhouse Creek around the tailings and polishing ponds. The NVWID was constructed in 1980/81 as part of the Down Valley Tailings Project. The design flood for the ditch was the 50 year return period flood with one half (0.5) meter freeboard above the design flood level (Golder, 1980). Figure 13 provides photographs of the NVWID.
- LENGTH:** 3,000 m +/-
- GRADIENT:** 1.25 to 2.5% in the Mine Leg; 1.5% in the Borrow Area "F" Segment; and 4.5 to 5% at the north abutment of the Cross Valley Dam (the "Outfall Section").
- INSTRUMENTATION:** None.
- OBSERVATIONS:** The culvert located in the outfall section continues to experience icing problems. The timing of when the icing occurs varies with the stream flow and temperature. Blockage of a culvert in this area has been an on-going issue throughout mine life.
- MAINTENANCE**
- RECOMMENDATIONS:** Continue "steaming" of the culvert within the Outfall section to ensure passage of water throughout the winter. Depending on the performance of the culvert during the winter of 2009, additional work may be warranted.
- CONCLUSIONS:** Selected sections were inspected, including the Outfall Section at the access road, and no concerns were noted. Overall, the NVWID appears to be performing acceptably.
- In an attempt to reduce culvert icing, a wooden cover can be placed over the inlet and outlet ends of the culvert. This method has only met with limited success in the past

INTERMEDIATE DAM

LOCATION:	Located at the west end of the Intermediate Pond, immediately east of the Polishing Pond (see Figure 2).
FUNCTION:	Retain tailings solids, supernatant water and run-off water. Figures 14 to 17 provide photographs of the Intermediate Dam.
LENGTH:	650 m.
MAX HEIGHT:	32 m.
CREST ELEVATION:	1049.2 m; spillway elevation: 1047.7 m.
CREST WIDTH AND CONDITION:	<p>Crest width 6–7 m. The crest was repaired in 2003. The repairs consisted of the recommended crack filling and regrading which entailed the placement of about 250 mm of granular material on the crest. Cracking has not been evident in 2008 as it had been in previous years.</p> <p>Small shrubs and trees were removed from the crest in 2007. A small amount of re-growth has started to occur, but it is not currently of concern.</p>
SPILLWAY:	At the time of the inspections, the pond level in the Intermediate Reservoir was lower than the spillway inlet. The capacity of the spillway was calculated in 2006 (NHC 2006) based on survey information collected in 2004 and 2005. The calculated capacity of the spillway was 32 m ³ /sec (reservoir water level at top of dam core). The lower drop weir section of the spillway was re-graded in 2007; this section appears to be in good repair.
RIPRAP:	The water elevation in the Intermediate Pond continues to be maintained below the elevation originally intended; this is done for water treatment purposes. Deformation and sloughing of the rip rap was noted in 2006 and repairs were recommended. Repairs to the rip rap were undertaken in 2007. The repaired area appears to be performing satisfactorily. On the polishing pond side of the lower road there is evidence of wave erosion occurring where the rip rap has been disturbed. This area should be monitored by site staff during the regular visual inspections. The Downstream face experienced fairly significant rilling erosion in 2008 and some minor slumping has occurred. It is recommended that this area should not be repaired, unless by hand placement of “clean” angular gravel. From a physical stability standpoint, the water level in the pond should be maintained such that the water level is within the zone protected by rip rap. If the pond is maintained lower than the area now protected by rip rap (for

INTERMEDIATE DAM CONTINUED

water treatment purposes), additional future maintenance of the rip rap will be required.

DOWNSTREAM SLOPE: 2:1 slope angle, 2.1:1 overall, including 20 m berm. The downstream slope of the dam was rehabilitated in 2003. The surface of the downstream face of the dam was generally smooth; only minor rilling was noted in the site inspections. The gullies and minor sloughing should be monitored next spring following runoff and thaw.

Small shrubs and trees were noted during 2006. They were removed in 2007 by site staff.

The granular material collected on the road surface (eroded down the face of the dam in previous years) should be removed in order to expose the gravel drain.

SEEPAGE: A significant seepage point was encountered at the right (south) abutment, directly below the PVC pipe. The amount of seepage was significantly greater than ever encountered in the past. The initial concern was it being seepage from the tailings reservoir, but field temperature and pH testing indicated that this is more likely seepage from the RCDC. Site staff should check the seepage amount and pH on a regular basis and record for review as part of the annual inspection.

INSTRUMENTATION: Readings of the ID instruments for 2008 were obtained in June and September. Tabulated data and plotted records are presented in Appendix III and summarised in Table 12. The positions of these instruments are shown in the section in Figures 2 and 18.

PIEZOMETERS: The deep piezometer located in 91-ID3 previously indicated an overall trend of declining pore pressures with time, although 2008 readings show a slight increase. This small increase could be related to the higher canal elevations experienced in 2008. It is inferred that the piezometer data reflects abutment conditions dominated by drainage from upslope, not the level of the tailings pond upstream of the dam. That inference is supported by the sudden increase in piezometric level of 2 m recorded by both tips in June 1992, which would be coincident with the spring freshet in the adjacent diversion channel. Therefore, the previous decline in piezometric pressure recorded by 91-ID3 may be related to better drainage associated with ongoing loss of permafrost in the abutment downstream of the dam.

INTERMEDIATE DAM CONTINUED

Additional general observations about the 2008 Intermediate Dam piezometric monitoring data include the following:

- Similar conditions to historical readings were observed in 96-2.
- Normal readings were observed in 96-ID3, 96-ID4, 96-ID6, 96-ID7, 96-1, 96-3, 96-4, 94-IDC-1, P01-03, and P01-04.
- The data from the pneumatic piezometer 91-ID4, 91-ID6 and P01-04 indicates the presence of a downward hydraulic gradient.
- Hydrostatic conditions exist within the nested standpipe piezometers located at P96-3, and P96-4.
- The piezometric information from P01-04 indicates pore pressures within the foundation of the dam and not the pore pressures within the dam itself.
- Piezometer BKS04-06 and 94-IDC-1 are dry.

MAINTENANCE

RECOMMENDATIONS: The following maintenance / monitoring requirements are recommended:

- Monitor the wave erosion occurring on the polishing pond side of the lower road.
- Monitor the erosion gullies that have formed on the downstream slope.
- Monitor the seepage discharge at the south abutment. Test pH levels and report results back to BGC.
- Remove granular material that has collected on the road surface in order to expose the gravel drain.

CONCLUSIONS:

Overall, the Intermediate Dam appears to be performing in an acceptable manner. The piezometers and monitoring wells along the toe of the dam indicate a piezometric surface ranging between 2.2 and 4.3 m below ground surface (bgs). The piezometers and monitoring wells installed at the crest of the dam indicate a piezometric surface ranging from approximately 19 to 21 m bgs. The piezometer in the south abutment of the dam indicates drained conditions in the upper 7 m. The deep tip (15.2 m bgs) in the south abutment indicates pore pressures at depth are continuing a declining trend. It is recommended that monitoring of all functional piezometers and monitoring wells in the Intermediate Dam continue in 2009.

CROSS VALLEY DAM

- LOCATION:** Immediately west of the Polishing Pond, at the downstream (western) limit of the Rose Creek Tailings Area (see Figure 2).
- FUNCTION:** Designed to have capacity for 60-day retention of seepage/discharge water from the Intermediate Dam. Used as a polishing pond and later for treatment residue retention. Figures 19 through 21 provide photographs of the Cross Valley Dam (CVD).
- LENGTH:** 500 m.
- MAX HEIGHT:** 17 m.
- CREST ELEVATION:** 1033.1 m
- CREST WIDTH AND CONDITION:** 6–7 m. Tension cracks and a faint backscarp are evident on the upstream crest of the dam, in the soil material directly above the rip rap. These tension cracks are apparent on the crest of the dam near the old access road. This area should be watched carefully, and if conditions worsen repairs may be needed. There is a section of the downstream side that needs to be re-graded to match the design crest width due to removal of material during the 2007 vegetation removal, see photo in Figure 20. It appears that the material removed was shell, which consists of sand and gravel, and should be replaced (and compacted) in kind. If during this repair work, it is discovered that some of the core material was disturbed, different repairs will be required and geotechnical advice should be sought.
- The small trees and shrubs that were beginning to grow on the crest of the dam were removed during 2007. A small amount of re-growth has occurred, but is not presently of concern.
- SPILLWAY:** Elevation: 1031.7 m. During the site inspections, the upstream pond was lower than the inlet elevation of the spillway. During the inspections, no water was being transferred from the polishing pond. The inlet to both the spillway and pilot channel were in satisfactory condition, based on the visual inspection. The capacity of the spillway was calculated in 2006 (NHC 2006) based on survey information collected in 2004 and 2005. The calculated capacity of the spillway was 300 m³/s (reservoir water at the top of the dam core).
- RIPRAP:** The 2007 spot repairs appear to be performing adequately and the dam's riprap is in good condition.
- DOWNSTREAM SLOPE:** 2:1 slope angle. The downstream face appears to be in satisfactory condition, with no seepage, cracking or deformation noted.

CROSS VALLEY DAM CONTINUED

The trees and shrubs that were growing on the downstream face of the dam and at the toe of the dam were removed in 2007. During the 2008 inspection it was observed that further vegetation removal is needed at the toe of the dam. The remaining vegetation should be removed, from the upstream portion of the spillway, the south abutment and the surface of the seepage blanket.

SEEPAGE:

The 2008 data and the historic summary of weir flows are presented in Tables 13 and 14. Weir flows for 2008 are summarised on Figure 22. The Weir X13 quantity is slightly more than the combined flow volumes of X11, X12 and W3, but a difference exists between the calculated combined flow rates and the flow rate, as presented in Table 13. This difference is due to contributing surface run-off or from additional groundwater flow which comes to surface downstream of the seepage trench.

The north portion of the seepage collection trench, as measured by Weir X-11, produces the majority of the seepage water. Additionally, this area has artesian pressures at depth, which is consistent with past performance. It is thought that this area experiences high pressures and seepage since it is near the location of the creek prior to the construction of the dam.

The average 2008 flow rate at Weir X13 is 27.6 l/s, which is comparable to the 26.5 l/s average flow rate recorded in 2007. This continues the trend, seen in Figure 23 and detailed in Table 14, of decreasing average seepage over the years, although 2008 had the highest flow since 2004. This recent increase in flow is most likely due to the increased average pond elevation as shown in Table 14. There are three main potential causes for the long term reduction of seepage flows; lower pond levels, "fines" accumulation on the base of the Polishing Pond and clogging of the drains in the downstream toe. The upper plot on Figure 23 shows a comparison of the measured flow at X13 to the pond elevations. This shows the decreasing seepage flow trend, despite having similar pond elevations for the period 1988, 1999 and 2000. There has been no measured increase in the pore water pressures at the downstream toe and clogged drains would cause the pore water pressure to increase in this area. Therefore, the most probable explanation of the reduced seepage is that the fines and sludge that are pumped into the Polishing Pond are settling and decreasing the hydraulic conductivity along the seepage path. The rating curves for the four weirs were checked in 2008 by

CROSS VALLEY DAM CONTINUED

Laberge. Based on the checks the rating curves appear to be relatively accurate with a only couple small diversions. These curves should be checked again in 2 to 3 years. These weir rating curves must be checked for accuracy regularly because they are an important indicator of the performance of the Cross Valley Dam. The email correspondence between BGC and Laberge regarding the weir check is included in Appendix V.

INSTRUMENTATION: Readings of the CVD instruments for 2008 were obtained in June and September. Tabulated data and plotted records are presented in Appendix III and summarised in Tables 15 and 16. The positions of these instruments are shown in section in Figures 2 and 24.

PIEZOMETERS: Low pore pressures within the foundation and cut-off trench of the dam are indicated by readings taken at instruments CVDC-4, CVDC-7 and CVDP-6. Slightly higher pore pressures are observed at instrument CVDC-9. Higher pore pressures recorded at CVDC-9 are likely related to the fact that the instrument is located in the approximate area of the former Rose Creek channel. Instruments CVDP-1, CVDP-3, CVDP-5, CVDT-1 and P01-11 along the dam toe indicate artesian or near artesian pressures, as observed in previous years monitoring.

Additional general observations with regards to the 2008 Cross Valley Dam piezometric monitoring data include the following:

- Instrument 94CVDC-1 indicates the piezometric surface within the core of the dam is approximately 10 m below the crest surface of the dam. Similar to past performance.
- Piezometer CVDP-2 has ceased to be operational and should be abandoned.
- Upward gradient conditions exist in the crest at the location of the nested standpipe piezometer CVDC-7. Similar to past performance.

THERMISTORS: The 2008 readings indicate the ground temperatures at depth appear to be stable in Thermistors CVDC-6 and BH-88-4T. The thermistor beads at 21 and 29 m depth in CVDC-6 appear to be malfunctioning and therefore have been ignored.

Data collected in the spring from piezometer BH-88-4 indicates that winter frost penetration extended to a depth of approximately 4 m at this location.

CROSS VALLEY DAM CONTINUED

MAINTENANCE

RECOMMENDATIONS: The following maintenance/monitoring requirements are recommended:

- Carefully monitor the cracking in the crest of the dam following spring thaw, and repair if conditions worsen.
- The water level in the pond should be maintained such that the water is within the zone protected by riprap. Continue monitoring for small scarps forming in the riprap.
- Vegetation should be removed from the upstream portion of the spillway, the south abutment and the surface of the seepage blanket.
- The crest of the dam that was modified during the 2007 vegetation removal should be repaired.

CONCLUSIONS:

The piezometric pressures recorded from the instrumentation in the Cross Valley Dam indicate that pore pressures remain consistent with previous years' readings. Instrument 94CVDC-1 indicates the piezometric surface within the core of the dam is approximately 10 m below the surface of the dam (approximately 1023.3).

Geothermal instrumentation within the Cross Valley Dam indicates that no permafrost is encountered within the foundation of the dam and winter frost penetration is observed to be approximately 3.5 to 4 m below the crest.

Overall, the dam is exhibiting acceptable performance which is consistent with the historical monitoring at this dam. Continued monitoring of the seepage weirs and functioning instruments in the Cross Valley Dam is recommended for 2009.

NORTH FORK ROCK DRAIN (NFRD)

- LOCATION:** West of the waste rock piles, part of the haul road that extends to the Vangorda mining area (see Figure 1).
- FUNCTION:** The NFRD was designed to transmit the water flow of the North Fork Rose Creek through the haul road. Figures 25 and 26 provide photographs of the rock drain. Figure 29 provides the location of the NFRD and its instruments and monitoring locations.
- MAX HEIGHT:** 55 m +/-
- CREST ELEVATION:** 1143.9 m
- CREST WIDTH AND CONDITION:** 25 m +/-, no signs of cracking or settlement evident.
- UPSTREAM FACE:** Minor channelized erosion and related sloughing has occurred on the upstream side of the rock drain. Some woody debris and silty materials have collected at the base of the upstream face.
- DOWNSTREAM FACE:** Channelized erosion and related sloughing has occurred on the downstream side of the rock drain due to runoff from the crest haul road. The road protection berm has been breached and is now allowing run-off water to flow down the face, which has formed an erosion gully. So far this does not appear to significantly affect the performance of the drain, but this gap should be repaired. If an outlet for surface water is needed, the gap in the safety berm should be moved so that it is not directly above the drain outlet.
- SEEPAGE:** Head pond level was normal during the inspections and the drain appears to be passing the flows in a satisfactory manner.
- INSTRUMENTATION:** The pond data logger experienced problems in the winter of 2007 period (draining the battery) and a detailed check of the data logger was undertaken in the spring of 2008. No problems were encountered with the data logger. But during this inspection the battery was completely drained and non-functional. It appears that the problem is likely due to the instrument. A new vented pressure gauge is recommended for this location. A careful examination of the external batteries will be needed to ensure that these are useable.
- POND WATER LEVEL:** A sensor and datalogger are located in the pond to measure pond water elevations. A benchmark was established on the upstream side of the pond to allow regular pond elevation surveys as a check on the sensor readings. The measured pond water levels from 2008 (based on surveying of the pond level) and the toe discharge quantities are shown on Figure 27 and in Appendix III.

NORTH FORK ROCK DRAIN (NFRD) CONTINUED

By combining the pond water elevation on the upstream face, the elevation of water discharge on the downstream face, and the dimension of the drain, the hydraulic gradient through the drain can be estimated. Comparison of the hydraulic gradient in 2008 to the past few years (the period when data has been collected) indicates that the performance was similar, see Figure 28 and in Appendix III. This indicates that the capacity of the drain has not reduced in this time period. Further evaluation of the hydraulic gradient based on future monitoring is recommended to evaluate the possibility of the drain clogging.

FLOW: Two staff gauges and a sensor with datalogger are located near the main access road, at Station X2, to measure the discharge in the creek via a rating curve. The flow measurements from 2008 are presented on Figure 28.

MAINTENANCE RECOMMENDATIONS: The haul road protection berm breach should be repaired in order to stop the progression of the erosion gully on the downstream face. The pond data logger also needs to be repaired so it is functional.

CONCLUSIONS: The flow-through rock drain was observed during the site inspections. The discharge area was observed to be flowing clear water from the downstream side. There was also no evidence of significant instability on the slope above the discharge area. On this basis, it appeared that the downstream portion of the causeway section was functioning as intended, and that its performance is not deteriorating.

Monitoring via visual inspection and via the surveying at the pond level, downstream toe should be continued on a twice per month basis (weekly during freshet period). Similarly, the monitoring of the creek flows at X2 and NFRD23 staff gauges should continue on a daily basis.

Confirmation of the rating curve at the flow monitoring station used to convert staff gauge readings to flow should be undertaken in 2009. The sensor at the pond should be replaced, and pond level monitoring should be continued.

FARO CREEK DIVERSION CHANNEL

- LOCATION:** Top of the east wall of the Faro Pit (see Figure 1).
- FUNCTION:** The channel transmits creek water, which previously flowed directly through the pit area, over to the North Fork Rose Creek upstream of the rock drain. Figures 30 through 32 provide photographs of the diversion channel. Figure 33 provides the locations of the instruments located on the Faro Creek Diversion Channel.
- LENGTH:** 1,500 m +/-, with an elevation loss of approximately 21 m.
- INSTRUMENTATION:** Four staff gauges were installed in 2007 to monitor the flow in the diversion. Initially, two staff gauges were installed; one near the inlet to the diversion and the second upstream of the transition to the steep gradient section. These staff gauges were installed by Laberge and a rating curve developed. Following recommendations made (BGC 2007d) two additional staff gauges were installed within the Faro Creek Diversion. Throughout 2008, each of these staff gauges were read eight times.
- Data from the monitoring at the staff gauges is included in Appendix III. Flows could only be calculated for the two gauges that had previously had rating curves developed, FCD-1 and FCD-2. The 2008 average flow at FCD-1 was 664 L/s and the average at FCD-2 was 1427 L/s. Rating curves need to be developed in 2009 for the newer staff gauges, FCD-3 and FCD-4.
- OBSERVATIONS:** In 2007, a number of slumps occurred in the slope above the diversion and also on the downstream side of the road. Repair of the major slump in the hill side at the corner appears to have been undertaken adequately. As part of this repair, rip rap has been placed on the hill side edge of the channel. This rip rap placement has restricted the flow in the channel, and should be re-adjusted so as to remove the restriction.
- The section of the channel repaired last year through the addition of bituminous liner and rip rap appears to be performing adequately. In this area there is no need to cover the bituminous liner. In one location, marked by a rock with flagging, the joint in the liner has come loose. This joint should be closed using a patch.
- During the 2007 inspections, one of the key findings was that there was seepage loss through the canal. As a result, a test pitting program was developed and carried out in 2008 in order to better understand the behaviour of the canal. Test pitting in the road adjacent to the diversion channel was completed and the results were

FARO CREEK DIVERSION CHANNEL CONTINUED

discussed in Section 2.7. The program report is located in Appendix I.

Golder Associates has issued a report (Golder 2008) on the east wall of the Faro Pit, which is in the vicinity of the Faro Creek Diversion Channel. The report concludes that crest recession appears to be evolving at a slower than expected rate, but nonetheless, remains as a long term threat to the FCDC due to the unpredictable nature of the erosion process. This report also describes the current status of the Faro Pit rock slope and provides details related to a visual inspection and monitoring program undertaken in this area. This report is attached as Appendix VI.

RIPRAP:

Some minor rip rap movement has occurred in select locations, exposing the underlying geotextile. This was likely caused by ice action this past winter. The rip rap should be reinstated.

MAINTENANCE

RECOMMENDATIONS:

A number of maintenance recommendations have been made for the Faro Creek Diversion channel, in both the Spring and Fall inspection memos, as well as the test pitting report. The riprap at the toe of the repaired slump zone should be adjusted so that the flow of the channel is not restricted. The exposed geotextile should be recovered with riprap in the select locations that were affected by ice action.

The recommendations for 2009 are:

- Test pitting locations on the dike should be monitored throughout the fall and spring as these areas were disturbed and may be subject to instability in the future (slumping, settlement, etc.).
- Continue monitoring the flow in the FCDC using the installed staff gauges.
- The FCDC should be either moved to a new position or repaired as a priority item within the next 2 or 3 years.

CONCLUSIONS:

The canal experienced a significant departure from its typical good behaviour in 2007. It is thought that the extreme cold of November 2006 along with the poor dike foundation condition, were responsible for the deterioration in the performance. The repairs made last year appear to have been effective, as the canal performed in a satisfactory manner in 2008.

FARO CREEK DIVERSION CHANNEL CONTINUED

Following the test pit investigation recommendations, the canal dike should be closely monitored throughout 2009. Although the canal performed adequately in 2008, there is still a high potential for another significant seepage or failure event to occur due to the poor soil and foundation conditions. A large scale repair effort of replacement of the structure should be investigated in the near future. More understanding of the behaviour of the seepage losses is also needed, so it is important that staff gauges be monitored and rating curves be developed for FCD-3 and FCD-4. The monitoring program outlined by Golder (Appendix VI) should be followed for the monitoring of the pit wall slopes and erosion of the slope on the downstream side of the diversion channel.

SELECTED WASTE ROCK DUMPS

LOCATION: Southeast of the Faro Main Pit (see Figure 1), overlooking North Fork of Rose Creek.

MAX HEIGHT: Variable

INSTRUMENTATION: None.

MAINTENANCE

RECOMMENDATIONS: Structures were not inspected in 2008.

CONCLUSIONS: The review of these dumps is on a two year cycle. Visual inspection of the waste dumps should be performed again in 2009.

SECONDARY TAILINGS IMPOUNDMENT (EAST OF DIVERSION DAM)

LOCATION:	Located on the east side of the Down Valley project area. The east leg of the Secondary Tailings Dam is directly adjacent to either the North Fork of Rose Creek or the original portion of the RCDC. See Figure 3.
FUNCTION:	Retain tailings solids, supernatant water and run-off water from flowing into the Rose Creek Diversion Canal. Figures 34 and 35 provide photographs of the Secondary Dam and Tailings Impoundment.
LENGTH:	Approximately 1120 m.
MAX HEIGHT:	Approximately 28 m.
CREST ELEVATION:	Varies from 1060.2 m to 1063.3 m.
CREST WIDTH AND CONDITION:	Approximately 6 m, capped with a protective layer of sand and gravel fill. No concerns were noted with the crest of the road.
LOWER ROAD	No concerns were noted.
SPILLWAY:	N/A
BACKSLOPE:	2:1 slope angle.
SEEPAGE:	During this year's inspections, no signs of seepage were noted at the toe of the Secondary Dam.
INSTRUMENTATION:	Readings of the Secondary Tailings Impoundment instruments for 2008 were obtained in June and September. Tabulated data and plotted records are presented in Appendix III and summarised in Table 17.
PIEZOMETERS:	<p>Readings were collected from the piezometers in the Secondary Dam and Secondary Impoundment Areas.</p> <p>Two of the piezometers within the Secondary Dam: P81-06 and P81-08, recorded dry conditions in 2008.</p> <p>The three piezometers within the tailings impoundment and near to the eastern portion of the secondary dam, P03-01, P03-02, and P03-03, indicated conditions at or near hydrostatic at an elevation of approximately 1054 m to 1055 m amsl, are shown on Figure 35.</p>
MAINTENANCE RECOMMENDATIONS:	None required

SECONDARY TAILINGS IMPOUNDMENT (EAST OF DIVERSION DAM) CONTINUED

CONCLUSIONS:

Based on the piezometric information available, the elevation of the water table in the secondary tailings impoundment ranges from approximately 1054.4 m to 1055.3 m, depending on seasonal variability. The elevation of Rose Creek in the Diversion Canal along the east arm of the Secondary Dam is approximately 1054.1 m. Under these conditions, and assuming a uniform head loss between the tailings and the water levels in the Diversion Canal, the piezometric levels in the Secondary Dam should be at an elevation of approximately 1054.3 m, but were dry since the piezometers terminate above this elevation. The geometry and piezometric assumptions mentioned above are conceptually illustrated on Figure 35.

The low piezometric levels in the secondary tailings impoundment is a result of the long term "drain down" in the tailings area and appears to be reflective of the overall tailings deposit piezometric conditions.

Overall, the Secondary Tailings Impoundment is performing in an acceptable manner. The piezometers and monitoring wells installed at the crest of the dam indicate dry, well drained conditions. It is recommended that monitoring of all functional piezometers and monitoring wells in the Secondary Tailings Impoundment continue in 2009.

K8 CREEK ROCK DRAIN

LOCATION:	Approximately 2.5 km west of the North Fork Rock Drain, part of the haul road that extends to the Vangorda pit (see Figure 1).
FUNCTION:	The K8 Creek Rock Drain was designed to transmit the water flow of the K8 Creek through the haul road. Figure 37 provides inspection photographs of the rock drain.
MAX HEIGHT:	55 m +/-.
CREST ELEVATION:	Approximately 1155 m.
CREST WIDTH AND CONDITION:	25 m +/-, no concerns noted.
UPSTREAM FACE:	Face appears to be in good condition, with no cracking or sloughing evident. Some woody debris and silty materials have collected at the base of the upstream face.
DOWNSTREAM FACE:	Face appears to be in good condition.
SEEPAGE:	Head pond level was normal during the inspections and the drain appears to be passing the flows in a satisfactory manner.
INSTRUMENTATION:	None.
POND WATER LEVEL:	Should be determined in 2009.
FLOW:	Should be determined in 2009.
MAINTENANCE RECOMMENDATIONS:	It is recommended that a sensor and a data logger be installed to measure the pond water elevations in 2009. Flow through the rock drain should also be determined by using staff gauges or other means at the K8 culvert (potentially a data logger).
CONCLUSIONS:	The flow-through rock drain was observed during the site inspections. The discharge area was observed to be flowing clear water from the downstream side. There was also no evidence of significant instability on the slope above the discharge area. On this basis, it appeared that the downstream portion of the causeway section was functioning as intended.

5.0 INSTRUMENTATION, MONITORING AND ANNUAL REVIEW

5.1 Instrumentation Readings

The frequency of readings of the instrumentation has been greatly reduced from the initial practice of quarterly observations because confidence in the performance of the structures has been substantiated by accumulated data. Figure 38 provides a schedule of readings for 2009 for the major structures, broken down by month. As has been the case over the last several years, all instrumentation data collected by site staff should be forwarded to BGC for review.

If any rapid lowering of either reservoir in the Down Valley is expected, then BGC should be consulted and changes to the monitoring program may be made.

It is recommended that the pond levels on the upstream side of the flow-through causeway be measured and correlated to measured flow in the North Fork of Rose Creek. In the past few years, this has included monitoring by data loggers and manual readings. In 2009, the data loggers should continue to be used. Monitoring of the rock drain should be continued at the pond, downstream toe and at Station X2 using the existing staff gauges. A new sensor is needed at the pond on the upstream side of the North Fork Rock Drain.

It is recommended that new staff gauges be installed within the Rose Creek Diversion Canal in 2009. The purpose of the new staff gauges would be to monitor the amount of seepage loss in the different reaches of the canal, but particularly near the Intermediate Dam. The new staff gauges should be installed and rating curves developed for each of the new instruments. Given this program of staff gauge installation, a supplemental staff gauge should be installed in the flat section between the upper and lower weir sections.

It is recommended that two new piezometers be installed in the spoil pile above the seepage that is occurring into the Cross Valley dam pond.

A check of the rating curve for NFRC 23 is required. This involves collecting direct stream flow measurements and staff gauge readings. Between four and eight readings should be taken throughout the year to confirm the rating curve. This procedure should also be carried out for the Rose Creek rating curves as well.

Rating curves need to be developed for staff gauges FD-3 and FD-4, which were installed in the Faro Creek Diversion Channel in 2007.

A sensor is recommended to be installed in the upstream pond at the K8 Creek Rock Drain. Provision to measure flows near the K8 Creek culvert should be made.

5.2 Routine Inspections by On-Site Personnel

Any change in condition that is noted as a consequence of this program of routine inspection must be brought immediately to the attention of the inspector's superiors. BGC must also be notified so that the condition can be evaluated in light of the prior performance history of the structures, and to provide any necessary geotechnical advice related to the concern at hand. Photos of the changed condition should be taken and forwarded to BGC.

5.2.1 Rose Creek Diversion Canal

It is important that current site staff continue with their inspection program as described below, and that a log of observations be maintained:

1. To inspect the Rose Creek Diversion Channel before run-off to ensure any snow and/or ice blockages are removed.
2. To inspect, on a monthly basis, the 400 m reach of the Diversion Canal dike crest immediately upstream of the Intermediate Dam for evidence of cracking.
3. To view on a monthly basis, the opposite side of the Diversion Canal from the canal dike looking for change to the top profile of the gravelly backslope, possible narrowing of the flow channel, and other changes which might be attributed to sloughing of the backslope.
4. To inspect in June, just after spring runoff is completed, the top of the thermal liner on the backslope of the Diversion Canal at the location situated about 500 m upstream of the Intermediate Dam; such inspection to determine if new (sharp-edged) cracking has developed.
5. Visually monitor the sloughing of the Spoil Pile at the Polishing Pond shoreline.
6. Monitor the NFRD-4 (Rose Creek Staff Gauge) on a daily basis. Monitor the proposed staff gauges in the Rose Creek Diversion Canal according to the schedule shown in Figure 38.

5.2.2 Intermediate Dam

Weekly inspections should continue at the abutments of the Intermediate Dam for evidence of: changing conditions (sloughing of the embankment fill and/or the adjacent slopes); active crest cracking; sloughing of the riprap; and for evidence of changing seepage rates (especially the south abutment toe seepage) and locations.

The Intermediate Dam Pond levels should be noted and recorded on a weekly basis.

5.2.3 Cross Valley Dam

Weekly inspections should continue at the Cross Valley Dam's abutments and downstream toe berm culverts. The abutments should be inspected for evidence of: changing conditions (sloughing of the embankment fill and/or the adjacent slopes); sloughing of the riprap; active crest cracking; and for evidence of changing seepage rates and locations. The downstream toe berm culverts should be inspected for consistency of flow rate.

The Polishing Pond levels should be noted and recorded on a weekly basis.

5.2.4 North Fork Rose Creek Flow-Through Causeway

Additional data should be collected in 2009 as detailed in Section 5.1. This additional data should include pond levels, water levels at the downstream toe of the drain, and flow downstream of the drain. Data during periods of high flow is particularly important and, as a minimum, the head pond should be viewed and surveyed weekly in the late afternoon for the period from about April 15th until June 30th.

The upstream and downstream faces of the rock drain should also be inspected monthly for any signs of instability or sloughing.

Monitoring of the staff gauge at X2, and NFRC23 should be continued on a daily basis.

5.2.5 Faro Creek Diversion Canal

Continue with both visual and survey monitoring of the overburden ravelling proximal to the access road and diversion channel. Assess if the average ravelling rate noted by Golder (2008) is appropriate or if conditions have changed following rehabilitation of the channel. The monitoring program recommended by Golder should be continued.

Visual inspection of the access road and channel sections for cracks and for overburden ravelling overlooking the Faro Pit should be undertaken monthly from May until October. Any signs of deformation should be forwarded to BGC for comment.

5.2.6 Faro Waste Rock Dumps

Continue visual monitoring of dump slopes by site staff.

5.2.7 Secondary Tailings Impoundments – East Leg

Continue visual monitoring of the crest and the toe of this dam on a weekly basis by site staff. Monitoring of the instrumentation within this structure should continue.

5.3 Annual Reviews

As has been noted in previous annual reports, the performance monitoring and annual inspections of facilities has served as a basis for:

- a. judging current performance of the facilities;
- b. providing some forewarning of any trends towards potentially troublesome performance;
- c. adjusting the frequency of observation of instrumentation;
- d. recommending the installation of additional instrumentation; and
- e. undertaking maintenance work.

In keeping with the important nature of these facilities, and the inherent value of keeping a comprehensive performance record, it remains prudent to continue with the data acquisition. As such, Figure 38 provides a proposed schedule of instrumentation monitoring for 2009. The collection of current data is of both immediate and ongoing value, to review such data in relation to the existing database, complemented by annual inspection of the works for evidence of deteriorating or deficient performance.

Annual inspections in 2009 should be performed in May/June (near the freshet period) and early September, in keeping with the schedules held for previous inspections, and for the advantage of consistency of conditions.

6.0 CLOSURE

This report summarizes the physical conditions as observed by BGC and the instrumentation results as collected by site staff on various mine waste facilities and structures at Faro Mine. Thank you for the opportunity to be of service to Deloitte & Touche and Faro Mine. Should you have any questions on this report, please contact BGC at your convenience.

Respectfully submitted,
BGC ENGINEERING INC.

Per:

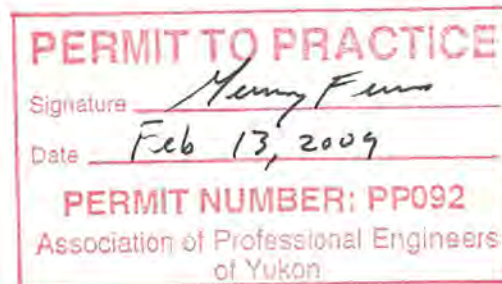


A handwritten signature in blue ink, appearing to read "Travis Wierenga".

Travis Wierenga, E.I.T.
Mining Geotechnical Engineer

Gerry Ferris, M.Sc., P.Eng.
Geotechnical Engineer

Reviewed by:

A handwritten signature in blue ink, appearing to read "Holger Hartmaier".
Per: Holger Hartmaier, M.Eng., P.Eng.
Senior Geotechnical Engineer

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TABLES

Table 1 Summary of Polishing Pond and Intermediate Pond Levels

DATE	Cross Valley Pond Elevation (m amsl)	Intermediate Dam Pond Elevation (m amsl)
January 4, 2007	1028.950	1046.620
January 18, 2007	1029.090	1046.640
February 1, 2007	1029.200	1046.678
February 15, 2007	1029.308	1046.717
March 8, 2007	1029.480	1046.660
March 29, 2007	1029.632	1046.610
April 2, 2007	1029.650	
April 12, 2007	1028.750	1046.723
April 18, 2007		1046.715
April 23, 2007		1046.790
April 26, 2007	1029.100	1046.830
April 30, 2007		1046.800
May 3, 2007	1029.358	1046.800
May 7, 2007	1029.498	1046.812
May 9, 2007	1029.295	
May 10, 2007	1029.191	1046.809
May 14, 2007	1028.770	1046.772
May 17, 2007	1028.980	1046.795
May 22, 2007	1028.933	1046.781
May 24, 2007	1028.837	1046.705
May 28, 2007	1028.846	1046.638
May 31, 2007	1028.840	1046.570
June 4, 2007	1028.661	1046.490
June 7, 2007		1046.437
June 11, 2007	1028.626	1046.341
June 14, 2007	1028.605	1046.287
June 18, 2007	1028.561	1046.211
June 21, 2007	1028.560	1046.113
June 25, 2007	1028.880	1046.120
June 28, 2007	1028.850	1046.120
July 3, 2007	1028.787	1046.112
July 5, 2007	1028.789	1046.088
July 9, 2007	1028.846	1046.030
July 12, 2007	1028.800	1046.037
July 19, 2007	1028.763	1046.085
July 26, 2007	1028.692	1046.082
August 2, 2007	1028.608	1046.142

Continued on Next Page

Table 1 Summary of Polishing Pond and Intermediate Pond Levels (Continued)

DATE	Cross Valley Pond Elevation (m amsl)	Intermediate Dam Pond Elevation (m amsl)
August 9, 2007	1028.547	1046.110
August 16, 2007	1028.374	1046.140
August 23, 2007	1028.085	1046.152
August 27, 2007		1046.150
August 30, 2007	1028.038	1046.191
September 6, 2007	1028.025	1046.268
September 11, 2007	1028.025	
September 12, 2007	1027.910	
September 13, 2007	1027.845	1046.375
September 17, 2007	1027.559	
September 24, 2007	1027.755	
September 27, 2007	1027.840	1046.543
October 15, 2007	1028.295	1046.689
October 18, 2007	1028.358	1046.710
October 22, 2007	1028.442	
October 25, 2007	1028.220	1046.736
October 29, 2007	1027.997	
November 8, 2007	1028.268	1046.831
November 22, 2007	1028.551	1046.890
December 6, 2007	1028.802	1046.920

Table 2 Total Monthly Precipitation (mm) At Faro Airport, Yukon

Year	Jan	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (mm)
1978	0.4	miss.	trace	4.1	11.6	27.0	38.1	41.6	7.8	32.4	20.2	19.0	
1979	8.9	18.3	20.2	6.7	10.5	68.2	55.4	13.8	13.4	11.6	12.4	34.4	273.8
1980	19.7	2.4	11.7	12.5	10.5	11.1	95.4	33.2	46.7	miss.	21.3	13.3	
1981	6.5	23.1	4.0	4.5	7.8	42.8	41.3	22.5	41.9	21.5	17.0	5.4	238.3
1982	10.2	18.0	9.5	4.1	18.2	14.3	58.3	47.3	47.2	42.3	11.8	13.6	294.8
1983	35.7	6.6	9.8	2.2	20.6	55.6	49.1	65.8	21.2	16.3	11.4	3.9	298.2
1984	27.6	24.1	5.9	2.4	38.8	49.0	16.6	64.9	5.5	10.8	10.7	22.5	278.8
1985	22.5	24.8	2.2	13.8	17.2	28.1	62.6	80.8	46.3	20.0	22.2	26.1	366.6
1986	8.4	4.7	34.6	12.9	35.1	12.8	81.8	77.4	44.4	22.7	15.9	5.6	356.3
1987	3.1	14.0	2.8	10	40.1	50.8	92.4	63.5	30.2	26.6	17.8	6.2	357.5
1988	7.0	10.4	17.2	8.2	38.0	37.3	97.2	25.5	43.8	29.0	17.9	16.5	348.0
1989	19.8	3.6	19.8	2.0	17.9	41.0	51.7	16.9	30.8	46.3	39.8	13.8	303.4
1990	14.4	25.8	5.0	7.0	23.4	45.4	30.0	64.4	66.2	22.7	25.4	24.8	354.5
1991	17.2	22.6	16.6	2.8	22.4	30.2	115.4	33.0	48.2	49.6	43.4	40.0	441.4
1992	22.8	24.6	7.6	15.8	14.4	11.4	66.1	34.4	47.8	13.8	18.8	13.0	290.5
1993	22.2	15.0	1.6	6.0	76.7	48.6	50.2	56.0	50.8	35.7	miss.	miss.	362.8
1994	20.2	8.4	11.4	5.0	39.8	24.2	19.6	25.2	45.6	41.6	24.4	8.0	273.4
1995	8.4	7.8	18.4	5.2	10.9	33.9	73.4	63.4	28.8	12.2	22.3	15.4	300.1
1996	10.2	9.1	27.1	7.2	13.4	20.0	64.4	70.8	52.7	34.8	3.5	5.9	319.1
1997	6.6	8.7	1.4	14	16.5	39.3	86.4	33.2	trace	25.2	6.4	12.4	250.1
1998	7.0	2.8	4.8	4.2	14.4	29.6	19.2	24.2	23.4	24.0	4.6	8.2	166.4
1999	24.4	10.0	15.4	1.8	44.4	64.8	42.0	33.8	27.0	22.4	12.8	21.6	320.4
2000	12.2	2.0	trace	6.0	9.6	39.6	48.1	116.2	102.2	8.6	19.4	5.8	369.7
2001	7.4	3.0	4.0	14.6	30.8	35	58.4	14.2	44.6	28.6	12.2	15.4	268.2
2002	9.2	5.8	9.0	7.0	19.6	19.4	34.9	64.1	38.4	18.2	9.6	9.4	244.6
2003	22.4	8.0	16.0	0.4	7.6	45.2	63.2	30.4	30.8	12.8	32.8	19.9	289.5
2004	31.1	11.4	45.0	4.0	15.6	34.0	13.5	38.0	48.5	33.6	9.8	45.0	329.5
2005	26.7	12.4	2.6	19.5	58.6	41.0	83.8	38.6	36.6	13.0	30.0	10.8	373.6
2006	11.0	7.0	18.5	21.6	16.2	38.0	33.4	33.3	35.6	21.0	33.1	8.3	277.0
2007	16.4	16.4	14.4	3.6	11.4	52.0	43.5	33.5	41.1	39.6	13.4	28.0	313.3
2008	miss.	miss.	miss.	miss.	miss.	68.6	74.8	99.0	27.2	miss.	miss.	miss.	269.6
Max	35.7	25.8	45	21.6	76.7	68.6	115.4	116.2	102.2	49.6	43.4	45.0	
Year	1983	1990	2004	2005	1993	2008	1991	2000	2000	1991	1991	2004	
Mean	15.3	12.1	12.7	7.6	23.7	37.4	56.8	47.1	39.2	25.4	18.6	16.3	309.3
Min	0.4	2	1.4	0.4	7.6	11.1	13.5	13.8	5.5	8.6	3.5	3.9	
Year	1978	2000	1978	2003	2003	1980	2004	1979	1997	2000	1996	1983	
St.Dev	8.9	7.7	10.4	5.5	16.3	15.8	25.9	25.1	18.2	11.4	9.9	10.6	

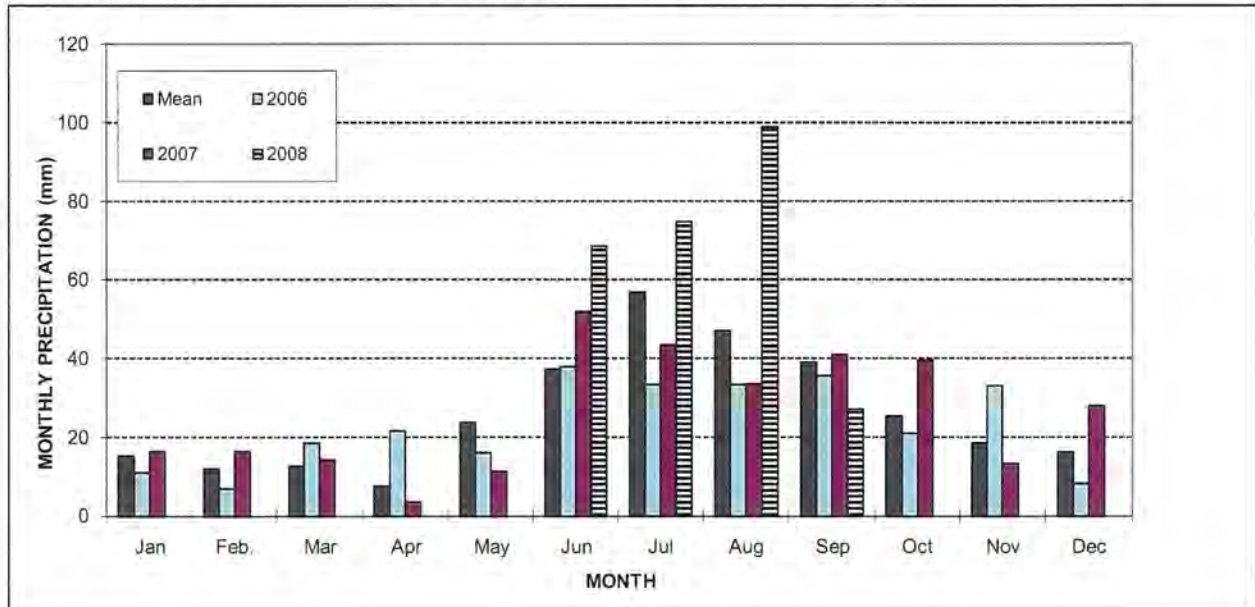


Table 3 Monthly Average Temperature (°C) At Faro Airport, Yukon

Year	Jan	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1977	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	-30.5
1978	-21.9	-13.9	-7.3	0.3	7.4	12.8	15.3	13.2	8.6	1.6	-15.7	-19.9	-1.6
1979	-26.7	-30.6	-5.1	-0.7	6.5	11.7	15.1	14.1	8.7	1.3	-8.2	-21.6	-3.0
1980	-26.6	-11.1	-8.6	2.6	8.6	14.5	14.4	11.3	5.1	2.6	-7.6	-34.6	-2.5
1981	-8.9	-15.8	-4.0	-3.3	10.0	11.0	14.8	12.8	5.5	-1.2	-8.8	-24.7	-1.1
1982	-37.3	-21.2	-13.4	-2.0	5.6	13.9	15.9	11.7	7.6	-3.8	-17.6	-19.0	-5.0
1983	-22.7	-15.8	-10.0	1.4	7.7	13.3	14.6	11.0	3.7	-1.9	-14.7	-32.0	-3.8
1984	-18.6	-9.7	-3.1	2.4	6.8	11.7	13.7	11.5	5.9	-3.6	-16.6	-24.0	-2.0
1985	-9.0	-21.2	-8.5	-1.9	6.2	10.6	14.4	10.4	5.9	-3.9	-24.2	-12.5	-2.8
1986	-12.1	-15.6	-8.2	-4.9	5.7	12.3	15.5	10.8	6.4	0.6	-18.6	-12.9	-1.8
1987	-14.4	-11.5	-12.4	0.5	7.2	12.1	15.2	12.2	6.4	1.9	-8.4	-14.5	-0.5
1988	-21.5	-12.0	-4.4	1.8	8.3	13.3	14.0	12.2	6.0	-1.8	-11.7	-16.1	-1.0
1989	-26.4	-19.3	-14.6	1.5	8.9	13.7	16.4	15.0	7.2	-2.6	miss.	miss.	-13.1
1990	-20.8	-24.0	-6.0	1.6	8.8	12.8	15.6	13.5	8.2	-3.1	-23.8	-23.1	-3.4
1991	-20.0	-11.2	-9.2	1.8	8.5	13.3	14.2	11.0	7.7	-4.6	-13.2	-16.5	-1.5
1992	-13.3	-13.8	-5.6	-0.7	5.0	13.0	15.3	12.1	1.4	-4.2	-9.0	miss.	
1993	-21.3	-16.1	-7.2	2.6	8.8	13.3	14.4	12.0	6.9	0.4	-11.6	-14.2	-1.0
1994	-23.9	-25.6	-4.4	2.9	7.2	13.1	16.2	16.1	5.5	0.1	-17.3	-20.0	-2.5
1995	-20.1	-14.8	-11.1	3.5	10.0	14.4	14.6	11.3	9.9	-0.9	-17.2	-21.2	-1.8
1996	-34.8	-15.0	-11.8	-1.2	5.7	12.2	14.7	10.5	5.7	-6.4	-18.9	-23.9	-5.3
1997	-25.6	-10.7	-12.7	1.2	7.5	13.5	16.0	13.0	8.3	-5.9	-10.4	-11.7	-1.5
1998	-25.2	-10.8	-8.1	2.6	9.5	14.1	15.7	11.9	6.3	-1.3	-14.3	-19.8	-1.6
1999	-23.3	-17.7	-7.7	1.1	5.7	14.2	14.0	14.1	7.4	0.1	-13.1	-12.6	-1.5
2000	-18.7	-10.2	-4.8	-1.1	5.7	13.6	14.1	10.6	5.1	-1.4	-10.3	miss.	
2001	-10.8	-16.4	-8.6	0.9	5.6	13.3	14.7	14.0	7.5	-2.0	-13.9	-21.2	-1.4
2002	-17.8	-14.8	-14.4	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	-14.9
2003	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	
2004	-9.2	-8.7	1.6	8.4	17.1	15.9	13.7	4.5	-1.9	miss.	miss.	miss.	
2005	-22.4	-15.8	-3.3	2.0	11.1	14.8	14.5	13.7	7.4	-0.1	-9.3	-13.6	-0.1
2006	-20.1	-14.1	-11.8	0.5	7.7	15.0	16.4	12.5	7.8	-1.4	-26.4	-14.7	-2.4
2007	-16.2	-22.0	-14.6	0.3	7.6	14.0	15.8	14.4	6.0	-2.2	-11.4	-21.6	-2.5
2008	-24.1	-18.9	-8.0	0.4	9.2	12.8	13.3	11.7	6.4	-1.8	-10.9	-26.0	-3.0
Max	-8.9	-8.7	1.6	8.4	17.1	15.9	16.4	16.1	9.9	2.6	-7.6	-11.7	
Year	1981	2004	2004	2004	2004	2004	2006	1994	1995	1980	1980	1997	
Mean	-20.5	-15.9	-8.2	0.8	7.9	13.2	14.9	12.2	6.3	-1.6	-14.2	-19.7	-2.1
Min	-37.3	-30.6	-14.6	-4.9	5.0	10.6	13.3	4.5	-1.9	-6.4	-26.4	-34.6	
Year	1982	1979	1989	1986	1992	1985	2008	2004	2004	1996	2006	1996	
St.Dev	7.0	5.1	3.9	2.5	2.4	1.2	0.8	2.1	2.4	2.4	5.2	6.3	

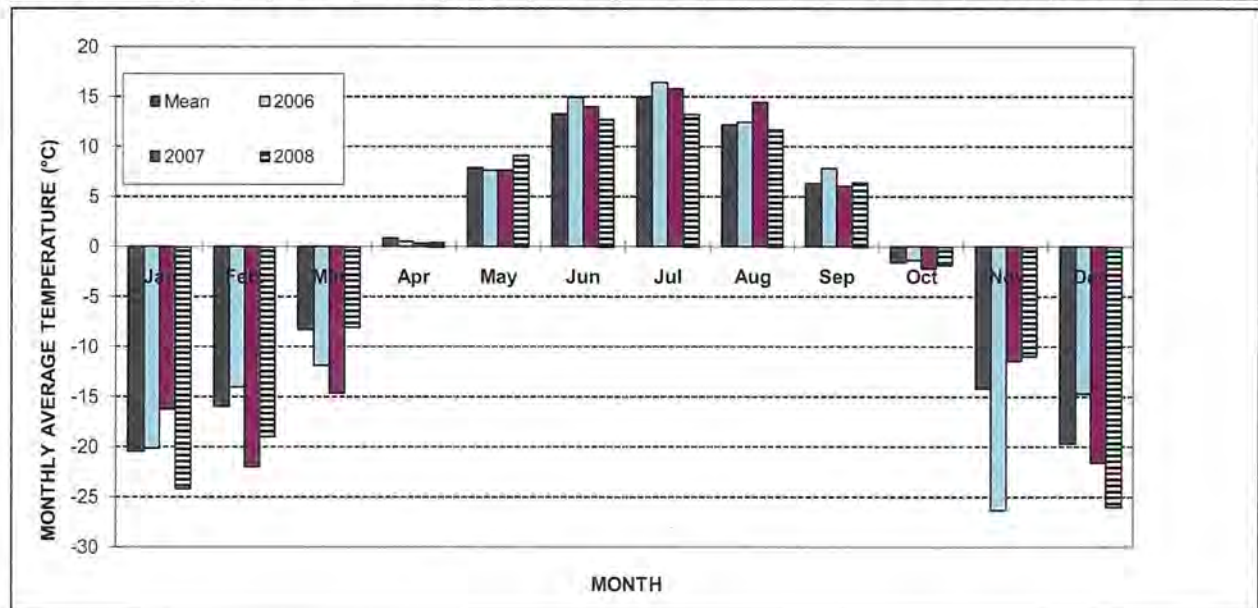


Table 4 Diversion Canal - Canal Dike - Piezometers

Installation	Date Installed	Standpipe (S) or Pneumatic (P)	# of Readings in 2008	Ground Elevation (m amsl)	Tip Elev. (m amsl)	Historic Low Reading/ Date	Historic High Reading/ Date	2008 Low / Reading Date (Compared to 2007 Low)	2008 High / Reading Date (Compared to 2007 High)	Comments
CD-10	1981	P	3	1056.4	1045.3	1045.97/ Mar 1982	1050.48/ Sep 1992	1049.71/ Jun 24 (+0.63)	1050.41/ Jun 25 (+1.05)	Readings increasing in comparison to 2007 data. Slightly below historic high. Corresponds to high water in the canal.
CD-13	1981	P	2	1055.2	1048.7/ 1044.7	1049.05/ Sep 1995 1047.57/ May 1982	1051.64/ Jun 2000, Jun 2001 1051.35/ Jun 2007	1050.94 / Jun 24 (+0.91) 1050.72/ Sep 24 (+0.21)	1051.22 / Sep 24 (-0.21) 1050.79/ Jun 24 (-0.63)	Shallow piezometer may still not be functioning properly, but it is giving readings.
CD-15	1981	P	2	1054.9	1048.10/ 1043.30	dry/Sep 2007 1043.31/ Dec, 1981	1051.25/ Oct 1985 1050.96/ Sep 2000	1048.80 / Jun 24 (+0.63) 1043.44/ Jun 24 (-2.59)	1048.94/ Sep 24 (+0.77) 1050.16/ Sep 24 (+1.82)	Normally an upward hydraulic gradient. Sub-zero temperatures at depth (thermistor CD-15) correlate with variable pressures at depth.
CD-21	1981	P	3	1053.45	1047.50/ 1042.00	1047.92/ Apr 1991 1042.28/ Nov 1988, May 1982 to Sep 1983	1052.26/ Jun 1992 1047.51/ Jun 1992	1048.90 / Sep 24 (+0.63)	1049.04 / Sep 24 (+0.35)	Historically downward gradient, likely free drainage at depth. Pressures dropped in shallow piezometer from 1999 to 2003, stable from 2003 to 2005. Deep tip piezometer destroyed in 2005.
CD-26	1981	P	0	1053.1	1048.2/ 1042.0	1048.2/ Sep 1995, Sep 2007 1042.0/ Sep 1995	1049.81/ Jul 1988 1043.61/ Jul 1988	NA NA	NA NA	Downward gradient, likely free drainage at depth. Readings have been very consistent since 2001. Instrument was not read in 2008.
BGC05-03 BGC05-02	2005	P	2	1054.68 1054.1	1050.64 1044.65	1050.64 /Sep 2007 1045.21 / Sep 2007	1050.99 /Oct 2006, Jun 2007, Sep 2008 1046.75 / Sep 2008	1050.92 /Jun 24 (+0.28) 1046.40 / Jun 24 (+1.19)	1050.99 / Sep 24 (0.00) 1046.75 / Sep 24 (+0.70)	Replaced former piezometer CD-19. Downward gradient, likely free draining at depth. Deep tip at historic high elevation.
BGC05-06	2005	P	2	1050.31	1046.78 1041.50	1046.78/ Sep 2007 1041.50/ Sep 2007	1046.99/ Jun 2007 1041.78/ Jun 2007	1046.99 / Sep 24 (+0.21) 1041.64 / Sep 24 (+0.14)	1046.99/ Jun 24 (0.00) 1041.64 / Jun 24 (-0.14)	Downward gradient, likely free drainage at depth to dry condition. Replaced former piezometers 88-11. Shallow tip recording similar conditions to historic high.

Note: Bold values correspond to deep tip readings.

Table 5 Diversion Canal - Canal Dike - Thermistors

Installation	Date Installed	Length of String (m)	# of Readings in 2008	Depth to Permafrost 2007 (depth below ground surface (m))	Depth to Permafrost 2008 (depth below ground surface (m))	Comments
CD-10	1981	10	2	Not observed within 9.9 m of ground surface.	Not observed within 9.9 m of ground surface.	Warming trend indicated at depth, readings appear to be highly inconsistent.
CD-15	1981	10	2	Not observed within 9 m of ground surface.	Not observed within 9 m of ground surface.	Data from a node at 3m depth was not included in the analysis
CD-21	1981	13	3	Not observed within 13.0 m of ground surface.	Not observed within 13.0 m of ground surface.	Warming trend indicated at depth.
CD-26	1981	10	0	Not observed within upper 9.6 m of ground surface.	No readings available.	Previous readings indicate a warming trend at depth.
BGC01-02	2001	13.9	2	Not observed within upper 13 m of ground surface.	No readings available.	Upper nodes malfunctioning. Previous readings indicate a warming trend at depth.
BGC05-04	2005	11.9	2	No readings available.	Not observed within 11.9 m of ground surface.	More readings must be taken in order to determine any temperature trends. Replaced thermistor CD-19.
BGC05-07	2005	11.4	1	No readings available.	Not observed within 13.9 m of ground surface.	More readings are needed to develop trends. Replaced thermistor 88-11.

Table 6 Diversion Canal - Canal Dike - Slope Indicators

Installation	Date Installed	Length of Casing (m)	# of Readings in 2008	Comments
CD-10	1981	10	2	Movement previously detected between 4 and 5 m depth appears to have ceased.
CD-15	1981	10	2	Negligible subsurface movement since 1996. Minor surficial movement in upper 2 m.
91CD-1	1991	11	2	Negligible movement since 1996.
CD-19	1981	10	2	Some movement was detected in readings prior to 1998. This movement has previously been attributed to settlement of the dike and settlement of the SI casing in the borehole.
CD-21	1981	10	2	Some movement was detected in readings prior to 1998. This movement has been attributed to settlement of the dike and settlement of the SI casing in the borehole. Indications of settlement have been observed at surface during the annual inspection since 1991. Minor surficial movement in upper 2 m.
BGC01-01 (88-10 replacement)	2001	11	2	Original depth of casing was 14 m bgs, frozen to 11.8 m in 2004. Frozen to 10 m in 2006. Makes interpretation difficult. Only minor movements in casing. Stop reading in 2009.
94CD-1	1994	14	2	Negligible subsurface movement since 1996. Minor surficial movements in upper 2 m.
BGC05-05	2005	11.5	2	Negligible movement in 2008, movement likely due to grout settlement. Poor June reading led to high apparent movements, but upon comparison to 2007 data and September reading, the movement is negligible. This reading is not included in the slope inclinometer charts due to its erratic nature.
BGC05-08	2005	12.5	2	Negligible surface movement in 2008.

Table 7 Diversion Canal - Spoil Piles - Thermistors

Installation	Date Installed	Length of String (m)	# of Readings in 2008	Depth to Permafrost 2007 (m below surface)	Depth to Permafrost 2008 (m below surface)	Comments
SP-2	1981	10	1	Not observed with 10 m of ground surface	Not observed with 10 m of ground surface	Warming trend at depth
SP-3	1981	10	2	Not observed with 10 m of ground surface	Not observed with 10 m of ground surface	Apparent warming trend at depth.
SP-5	1981	10	2	Not observed with 10 m of ground surface	Not observed with 10 m of ground surface	Previously, permafrost was noted at 9 m depth, but now is not present

Table 8 Diversion Canal - Spoil Piles - Slope Inclinerometers

Installation	Date Installed	Length of Casing (m)	# of Readings in 2008	Comments
SP-2	1981	7.5	2	Some settlement in the vicinity of SP-2, based on the distinctive shape of the deflection versus depth curves. Also some negligible downslope movement noted in upper 2 m. Note that the June 2008 reading at 3.3 m is likely a data error.
SP-5	1981	10	2	No movement at depth has been recorded since 1994. Minor surface displacements have been occurring in the upper 2 m since September 2000.

Table 9 Canal Backslope Piezometers

Installation	Date Installed	Standpipe (S) or Pneumatic (P)	# of Readings in 2008	Ground Elevation (m amsl)	Tip Elev. (m amsl)	Historic Low Reading/ Date	Historic High Reading/ Date	2008 Low Reading/ Date (Compared to 2006 Low)	2008 High Reading/ Date (Compared to 2006 High)	Comments
BS-5	1981	P	1	1060.2	1053.0	1053.28/ Sep 2006	1057.69/ May 1994	1055.38 (+2.10)	1055.38 (+1.47)	Historically low in 2006
BS-9	1981	P	1	1056.3	1045.0	1047.73/ May 1982	1051.65/ Oct 1986. Oct 1990	1050.95 (+2.52)	1050.95 (+0.64)	

Table 10 Canal Backslope Thermistors

Installation	Date Installed	Length of String (m)	# of Readings in 2008	Depth to Permafrost 2006 (m below surface)	Depth to Permafrost 2008 (m below surface)	Comments
BS-5	1981	10	1	6.5	N/A	Poor readings, only one node gave a response. The node that was read shows freezing temperatures at a depth of 7.5 m.
BS-10	1981	10	1	8	8	Depth to permafrost steady at approximately 7 to 8 m from 2002 to 2008. Some cooling at depth.
BS-12	1981	10	1	N/A	N/A	Completely thawed profile to 10 m depth in 2008

Table 11 Canal Backslope - Slope Inclinometers

Installation	Date Installed	Length of Casing (m)	# of Readings in 2008	Comments
BS-5	1981	10	1	No movements since 2004
BS-9	1981	10	1	No movements since 2004
BS-10	1981	10	1	Poor 2008 reading

Table 12 Intermediate Dam - Piezometers

Installation	Date Installed	Standpipe (S) or Pneumatic (P)	# of Readings in 2008	Ground Elevation (m amsl)	Tip Elev. (m amsl)	Historic Low Reading/ Date	Historic High Reading/ Date	2008 Low Reading/ Date (Compared to 2007)	2008 High Reading/ Date (Compared to 2007)	Comments
BH91-ID3	1991	P	1	1043.82	1036.82/ 1028.62	1036.82/ Sep 95, Dec 98, Sep 00, Sep 02, Sep 03, May 05, Sep 05, May 07 1030.93/ Mar 2006	1039.23/ Jun 1992 1038.04/ Jun 1992	1036.89/ Sep 24 (+0.07) 1032.89/ Sep 24 (+1.05)	1036.89/ Sep 24 (0.00) 1032.89/ Sep 24 (+0.28)	Shallow tip readings dry or almost dry in 2006. Deep tip indicates declining pore pressures with high seasonal fluctuation. Historically low readings. Downward gradient. Only one reading taken in 2008.
BH91-ID4	1991	P	3	1031.8	1024.22/ 1017.08	1028.28/ Sep 2007 1027.23/ Mar 2006	1034.58/ Jun 1992 1031.85/ Sep 1992	1029.75/ Sep 24 (+1.47) 1028.56/ Sep 24 (+0.98)	1030.66/ May 20 (+0.70) 1029.33/ May 20 (+0.49)	Downward gradient, declining pore pressures since 2002.
BH91-ID5	1991	P	0	1031.64	1024.3/ 1017.08			N/A N/A	N/A N/A	Both tips are leaking, making the instrument inoperable. Pore pressure has been increasing for the last few years.
BH91-ID6	1991	P	3	1031.36	1024.8/ 1016.9	1026.83/ May 1997 1028.17/ Mar 2006	1031.74/ Jun 1992 1034.96/ Jun 1992	1028.44/ Sep 24 (+1.12) 1029.43/ Sep 24 (+0.49)	1029.07/ May 20 (0.49) 1030.13/ May 20 (+0.56)	Downward gradient. Pore pressures has been increasing over the last few years.
BH91-ID7	1991	P	3	1032.42	1025.95	1029.17/ Mar 2006	1032.20/ Feb 1992	1030.43/ Sep 24 (+0.63)	1031.06/ May 20 (+0.70)	Pore pressures have been increasing over the past few years.
BH94-IDC-1	1994	S	0	1049.21	1035.1 (approx)					Has recorded dry conditions since initial monitoring in 1994
BH96-1	1996	S	3	1049.15	1027.35	1027.85/ Oct 2006	1031.65/ Jun 1999	1028.86/ Sep 24 (+0.68)	1028.86/ Sep 24 (+0.68)	Piezometric Elev. Approx. 20 - 22 m bgs. The first two 2008 readings had frozen water in the piezo.
BH96-2	1996	S	3	1049.22	1028.87	1028.27/ May 10, 2004	1031.94/ Jun 1999	1029.36/ Sep 24 (+0.82)	1030.06/ May 20 (+0.45)	Piezometric Elev. Approx. 18 - 20 m bgs.
BH96-3	1996	S	3	1031.48	1022.43/ 1012.23	1027.37/ Mar 2006 1027.48/ Mar 2006	1031.38/ Jun 1999 1031.45/ Jun 1999	1028.77/ Sep 24 (+0.70) 1028.82/ Sep 24 (+0.69)	1029.57/ May 20 (-0.27) 1029.59/ May 20 (+0.40)	Piezometric Elev. Approx. 3.0 - 5.0 m bgs. Historically low values were recorded in 2006
BH96-4	1996	S	3	1032.16	1025.68 1020.86 1015.69 1003.82	1027.61/ Mar 2006 1028.41/ Jun 2006, May 2007 1027.74/ Mar 2006 1027.73/ Mar 2006	1032.04/ Jun 2002 1032.08/ Jun 2002 1031.64/ Jun 1999 1031.75/ Jun 1999	1028.88/ Sep 24 (+0.68) 1028.41/ Sep 24 (0.00) 1028.92/ Sep 24 (+0.69) 1029.03/ Sep 24 (+0.69)	1029.88/ May 20 (-0.31) 1028.79/ May 20 (+0.37) 1029.68/ May 20 (-1.87) 1030.44/ May 20 (+0.51)	Piezometric Elev. Approx. 2.5 - 4.5 m bgs.
P01-03	2001	S	3	1031.52	1022.35	1027.75/ Mar 2006	1030.63/ Sep 2001	1029.02/ Sep 24 (+0.89)	1030.28/ May 20 (+0.89)	Piezometric Elev. Approx. 2.5 - 3.5 m bgs.
P01-04	2001	S	3	1032.32	998.17/ 978.89	1029.55/ Sep 2003 1029.06/ Mar 2006	1032.24/ May 2005 1032.17/ May 2005	1031.13/ Sep 24 (+0.80) 1030.51/ Sep 24 (+0.74)	1032.09/ May 20 (+0.13) 1031.21/ May 20 (+0.57)	Piezometric Elev. Approx. 0 - 3.0 m bgs. Gradient small downward
BKS04-06	2004	S	3	1049.1	1036	1036.46/ Sep 2005	1036.60/ May 2005	1036.45/ Sep 24 (-0.01)	1036.45/ Sep 24 (-0.31)	Dry
BKS04-07	2004	S	3	1049.2	1037.3	1036.55/ Mar 2006	1037.72/ Sep 2005	1037.41/ Sep 24 (-0.38)	1037.31/ Sep 24 (-0.38)	Dry

Note: Bold values correspond to deep piezometer tips

Table 13 Cross Valley Dam 2008 Weir Flows

DATE	X13 (comb.) FLOW* (Lps)	X11 (North) FLOW* (Lps)	X12 (South) FLOW* (Lps)	W3 (Central) FLOW* (Lps)	X13-(X11+X12+W3) FLOW (Lps)
3-Jan-08	25.31	12.54	0.77	5.49	7
10-Jan-08	25.31	12.74	0.77	5.49	6
17-Jan-08	25.31	12.13	0.97	6.14	6
24-Jan-08					In Calgary on a course
31-Jan-08					Temp °C -48 to-52
7-Feb-08					Temp °C -48 to-52
14-Feb-08	24.69	12.95	0.97	6.41	4
21-Feb-08	24.69	12.95	0.97	6.55	4
28-Feb-08	24.69	12.95	1.02	6.55	4
6-Mar-08	26.57	14.91	1.02	6.55	4
13-Mar-08	27.20	14.91	1.02	6.14	5
20-Mar-08	28.49	15.14	1.02	5.88	6
27-Mar-08	28.49	15.14	1.02	5.88	6
3-Apr-08	29.79	15.60	1.02	5.62	8
10-Apr-08	29.79	15.37	1.02	5.01	8
17-Apr-08	27.20	14.91	1.02	4.22	7
24-Apr-08	25.94	14.02	0.97	3.81	7
1-May-08	25.31	12.74	0.93	3.81	8
8-May-08	29.14	13.37	1.11	4.89	10
15-May-08	29.79	12.95	1.11	4.22	12
22-May-09	29.14	13.59	2.11	3.30	10
29-May-08	28.49	13.59	1.21	3.33	10
5-Jun-08	29.79	14.69	1.42	4.12	10
12-Jun-08	29.79	12.95	1.31	4.12	11
19-Jun-08	31.12	12.95	1.65	4.22	12
26-Jun-08	31.12	10.77	1.78	4.33	14
3-Jul-08	27.84	9.69	1.47	4.33	12
10-Jul-08	30.45	8.34	1.47	4.33	16
17-Jul-08	30.45	8.34	1.78	4.66	16
24-Jul-08	28.49	9.51	1.90	4.89	12
31-Jul-08	29.79	9.17	1.71	4.55	14
07-Aug-08	27.84	10.04	1.47	4.44	12
14-Aug-08	27.84	10.04	1.47	4.44	12
21-Aug-08	31.12	10.04	1.47	4.44	15
28-Aug-08	27.84	9.51	1.68	4.66	12
04-Sep-08	31.12	11.93	1.78	5.37	12
11-Sep-08	34.51	13.37	2.11	5.37	14
18-Sep-08	35.20	12.33	1.90	5.49	15
25-Sep-08	31.79	11.93	1.78	4.33	14

Continued on next page

Table 13 Cross Valley Dam 2007 Weir Flows (Continued)

DATE	X13 (comb.) FLOW* (Lps)	X11 (North) FLOW* (Lps)	X12 (South) FLOW* (Lps)	W3 (Central) FLOW* (Lps)	X13-(X11+X12+W3) FLOW (Lps)
02-Oct-08	29.14	10.96	1.47	4.12	13
09-Oct-08	25.94	9.51	1.21	3.81	11
16-Oct-08	25.94	8.34	0.89	3.52	13
23-Oct-08	25.94	6.83	0.77	3.33	15
30-Oct-08	23.47	7.56	0.77	3.33	12
06-Nov-08	22.87	7.12	0.77	3.33	12
13-Nov-08	23.47	8.03	0.77	3.33	11
20-Nov-08	23.47	8.50	0.84	3.52	11
27-Nov-08	22.87	8.50	0.84	3.52	10
04-Dec-08	23.47	10.04	0.84	3.52	9
11-Dec-08	24.08	10.96	0.84	3.52	9
18-Dec-08	24.69	11.54	0.89	3.81	8
25-Dec-08	24.69	11.54	0.89	3.81	8
*Flows calculated from standard weir formulas and applied to staff gauge levels. Staff levels prior to September 2, 2005 corrected according to Laberge Environmental Services (2005). The difference of flow at X13 less (X11+X12+W3) is due additional seepage discharge beyond the other three weirs					
Average	27.58	11.58	1.22	4.57	10
Max	35.20	15.60	2.11	6.55	16
Min	22.87	6.83	0.77	3.30	4

Table 14 Cross Valley Dam Seepage Flows - Weir X13 (1982 - 2008)

YEAR	MEAN POND ELEVATION (m amsl)	MINIMUM FLOW RATE (month recorded) (L/s)	MAXIMUM FLOW RATE (month recorded) (L/s)	AVERAGE YEARLY FLOW RATE (L/s)
1982	1026.25	75.9 (Sept)	277.6 (June)	115.3
1984	1027.55	67.8 (Oct)	84.9 (Dec)	76.3
1985	1029.69	83.9 (Sept - Dec)	113.6 (Jul)	93.2
1986	1030.9	79.8 (May)	113.2 (Sept)	93.8
1987	~1030.9	77.0 (May)	106.1 (Aug - Sept)	94.4
1988	~1030.9	78.9 (Jun)	110.4 (Aug)	95.5
1989	~1030.9	72.3 (Mar)	97.9 (Aug)	85.7
1990	~1030.9	64.9 (Mar)	102.9 (Sept)	82.8
1991	~1030.9	66.6 (Oct)	91.0 (Jun)	81.6
1992	N/A	53.8 (Nov)	90.8	68.4
1995	1031.2	29.1 (Dec)	52.8 (Jun)	50.2
1996	1029.9 (Sep)	15.8 (Apr)	58.3 (Sep)	34.8
1997	N/A	30.0 (Apr)	109.9 (Sep)	28.6
1998	1030.5	49.0 (Dec)	119.0 (Sep)	52.7
1999	1030.7	44.0 (Feb - Sep)	82.0 (July)	53.6
2000	1031.5	35.0 (Nov)	78.0 (June 26)	48.7
2001	N/A	35.0 (Jan - Feb)	49 (Jun to Sep)	48.0
2002	N/A	38 (Oct - Nov)	49 (May to Sep)	46.4
2003	1029.7	28 (Sept - Oct)	46 (Jan to Mar)	38.1
2004	1029.8	31.6 (Apr, Sep to Dec)	49.5 (June)	35.3
2005	1028.0	16.0 (Mar - Apr)	49.2 (May)	27.3
2006	1027.8	18.8 (Mar)	44.61 (May)	26.0
2007	1028.7	21.7 (Sept-Oct)	34.5 (June)	26.4
2008	1029.7	22.9 (Nov)	35.2 (June)	27.6

- Notes:
1. For locations of weirs see Figure 2.
 2. Flows for 1983, 1984 and 1985 based on records for period June to December and flow for 1991 based on records for period January to November.
 3. High flow through Weir 3 in June, 1982 due to siphon discharge above weir.
 4. Weir 3 was replaced by X13 as a consequence of the seepage filter construction conducted in the summer of 1991.
 5. Drainage from west of south abutment road crossed to berm drainage collector during 1995 and perhaps in 1996; therefore some readings may higher than expected.
 6. Insufficient data for average pond level in 2001 - 2002 as water level was below staff gauge.
 7. Weir plates at X-11 and X-13 were replaced in August 2003.
 8. Weir maintenance and calibrations conducted in 2005.
 9. Mean pond elevation data from 1982-2003 converted from m advd to m amsl.

Table 15 Cross Valley Dam - Piezometers

Installation	Date Installed	Standpipe (S) or Pneumatic (P)	# of Readings in 2008	Ground Elevation (m amsl)	Tip Elev. (m amsl)	Historic Low Reading/ Date	Historic High Reading/ Date	2008 Low Reading/ Date (Compared to 2007 Low)	2008 High Reading/ Date (Compared to 2007 High)	Comments
CVDC-4	1981	S	10	1033.30	1007.9/ 999.7	1016.68/ Apr 1984 1016.72/ Apr 1984	1018.44/ Oct 1986 1019.05/ Jun 1992	N/A 1018.74/ May 5 (+0.35)	N/A 1018.79/ Sep 4 (+0.05)	Shallow piezometer blocked 7.6 m below top of pipe since 1987. Deep piezometer has been very consistent since 1992.
CVDC-7	1981	S	10	1033.24	1007.80/ 1002.90	1015.14/ Mar 2006 1017.17/ Mar 2006	1016.30/ Sep 1992 1019.21/ Jun 1992	1015.40/ May 26 (+0.06) 1017.71/ May 26 (+0.21)	1015.55/ Sep 24 (+0.18) 1017.92/ Apr 8 (+0.25)	Very consistent readings in both piezometers. Upward gradient.
CVDC-9	1981	S	10	1033.28	1007.70/ 1000.70	1019.91/ Aug 1983 1021.18/ Jun 1984	1024.74/ Aug 1982 1025.61/ Jun 1992	1021.06/ Apr 28 (+0.27) 1023.72/ May 12 (+0.41)	1021.45/ Apr 9 (+0.42) 1024.29/ Apr 9 (+0.65)	Moderately higher pore pressures than in other parts of the dam. Slight upward gradient.
CVDP-1	1982	P	10	1016.86	1014.51	1017.38/ Aug 1983	1019.55/ Sep 1992	1018.43/ May 20 (+0.91)	1018.71/ Apr 9 (+0.28)	Minor seasonal fluctuations, artesian conditions
CVDP-2	1982	P	0	1016.86	1014.51	1015.14/ Mar 2006	1019.44/ Oct 1986	N/A	N/A	Piezometer stopped function, no return readings. Stop Reading.
CVDP-3	1982	P	10	1016.86	1014.71	1014.99/ Sep 1992	1018.07/ May 1991	1016.53/ Apr 21 (+0.42)	1016.67/ Sep 24 (+0.28)	Minor seasonal fluctuations, pore pressures just below grade.
CVDP-5	1982	P	10	1019.18	1014.28	1018.13/ Aug 1983	1021.21/ Sep 1992	1020.58/ Jun 24 (+1.05)	1020.93/ Apr 9 (+0.21)	Artesian conditions
CVDP-6	1982	P	10	1019.18	1014.37	1016.99/ May 1998	1018.99/ Sep 1992	1017.80/ Apr 28 (+0.42)	1017.94/ May 12 (+0.21)	Stable seasonally, Low pore pressures in the shallow foundation area.
CVDT-1	1994	S	10	1018.30	1007.9	1017.13/ May 1994	1018.32/ Aug 2004	1017.82/ Apr 8 (-0.07)	1017.85/ Sep 24 (-0.40)	Minor seasonal fluctuation. Pressure slightly below grade.
CVDT-2	1994	S	10	1019.50	1006.2	1015.33/ Mar 2006	1016.49/ Oct 2000	1015.61/ Apr 28 (+0.06)	1015.82/ Jun 24 (+0.23)	Minor seasonal fluctuation, 3.5 m below grade.
94CVDC-1	1994	S	2	1033.38	1020.4	1022.73/ Mar 2006	1024.58/ Sep 1995	1023.33/ Sep 24 (+0.33)	1023.92/ Apr 9 (+0.44)	Minor seasonal fluctuation.
P01-11	2001	S	2	1017.21	1006.61	1016.71/ Mar 2006	1017.83/ Jul 2003	1016.95/ Apr 9 (+0.12)	1017.21/ Apr 14 (+0.37)	Piezometric elevation located just below ground surface. Minor seasonal fluctuation. Frozen until May 2008.

Note: Bold values correspond to deep tip readings

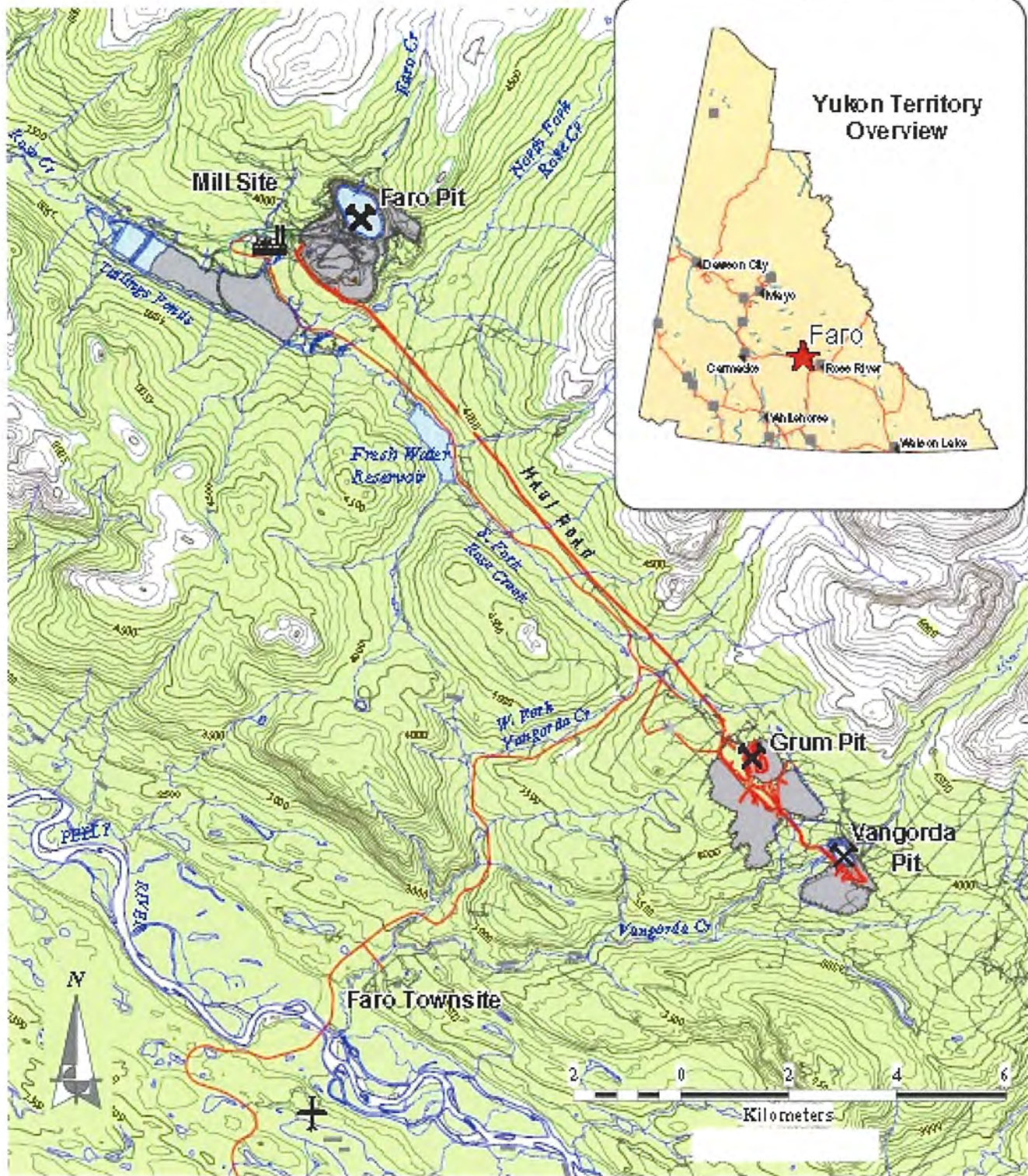
Table 16 Cross Valley Dam - Thermistors

Installation	Date Installed	Length of String (m)	# of Readings in 2008	Depth to Permafrost 2007 (m below ground surface)	Depth to Permafrost 2008 (m below ground surface)	Comments
CVDC-6	1981	29	2	N/A	N/A	Readings at 21 and 29 m are unavailable. Temperatures in the whole profile have been between 2 and 3°C since 1995
88-4-4T	1988	4.2	2	N/A	N/A	Depth of winter frost extends to approximately 4 m.

Table 17 Secondary Dam - Piezometers

Installation	Date Installed	Standpipe (S) or Pneumatic (P)	# of Readings in 2008	Ground Elevation (m amsl)	Tip Elev. (m amsl)	Historic Low Reading/ Date	Historic High Reading/ Date	2008 Low Reading/ Date (Compared to 2007)	2008 High Reading/ Date (Compared to 2007)	Comments
P03-01	2003	S	2	1060.58	9 Tips, Variable Depths	1054.54/ Sep 2007	1055.06/ Jun 2005	1054.83/ Sep 25 (+0.28)	1054.90/ Jun 25 (+0.24)	Gartner Lee monitoring well, 9 tips at varying elevations. Hydrostatic conditions.
P03-02	2003	S	2	1059.91	9 Tips, Variable Depths	1054.72/ Oct 2006	1058.35/ Jun 2007	1054.70/ Jun 8 (+0.06)	1054.84/ Sep 25 (-3.52)	Gartner Lee monitoring well, 9 tips at varying elevations. Hydrostatic conditions.
P03-03	2003	S	2	1060.67	9 Tips, Variable Depths	1057.87/ Oct 2006	1060.27/ Jun & Sep 2007	1054.54/ Jun 25 (-5.73)	1056.02/ Sep 25 (-4.25)	Gartner Lee monitoring well, 9 tips at varying elevations. Hydrostatic conditions.
P03-04	2003		2	1060.43		1055.70/ Sep 2008	1059.55/ Jun 2005	1055.70/ Sep 25 (-1.77)	1055.96/ Jun 25 (-1.51)	
P81-06	1981	S	2	1060.74	1054.71	1054.71/ Aug 2005	1054.74/ Jun & Sep 2007	1054.73/ Sep 25 (-0.01)	1054.74/ Jun 25 (0.00)	Piezometric levels near bottom of standpipe or dry.
P81-07	1981	S	2	1063.31	1057.17	1057.17/ 2005, 2006, 2007, & Sep 2008	1057.18/ Sep 2007 & Jun 2008	1057.17/ Sep 25 (0.00)	1057.18/ Jun 25 (0.00)	Piezometer dry.
P81-08	1981	S	2	1063.26	1055.8	1055.80/ Aug 2005, Jun & Sep 2007	1055.81/ 2005 and 2006	1055.81/ Jun 25, Sep 25 (+0.01)	1055.81/ Jun 25, Sep 25 (+0.01)	Piezometric levels near bottom of standpipe or dry.

FIGURES



Note: Base map figure provided by Gartner Lee Limited.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW

TITLE: SITE LOCATION PLAN

CLIENT: **Deloitte & Touche**

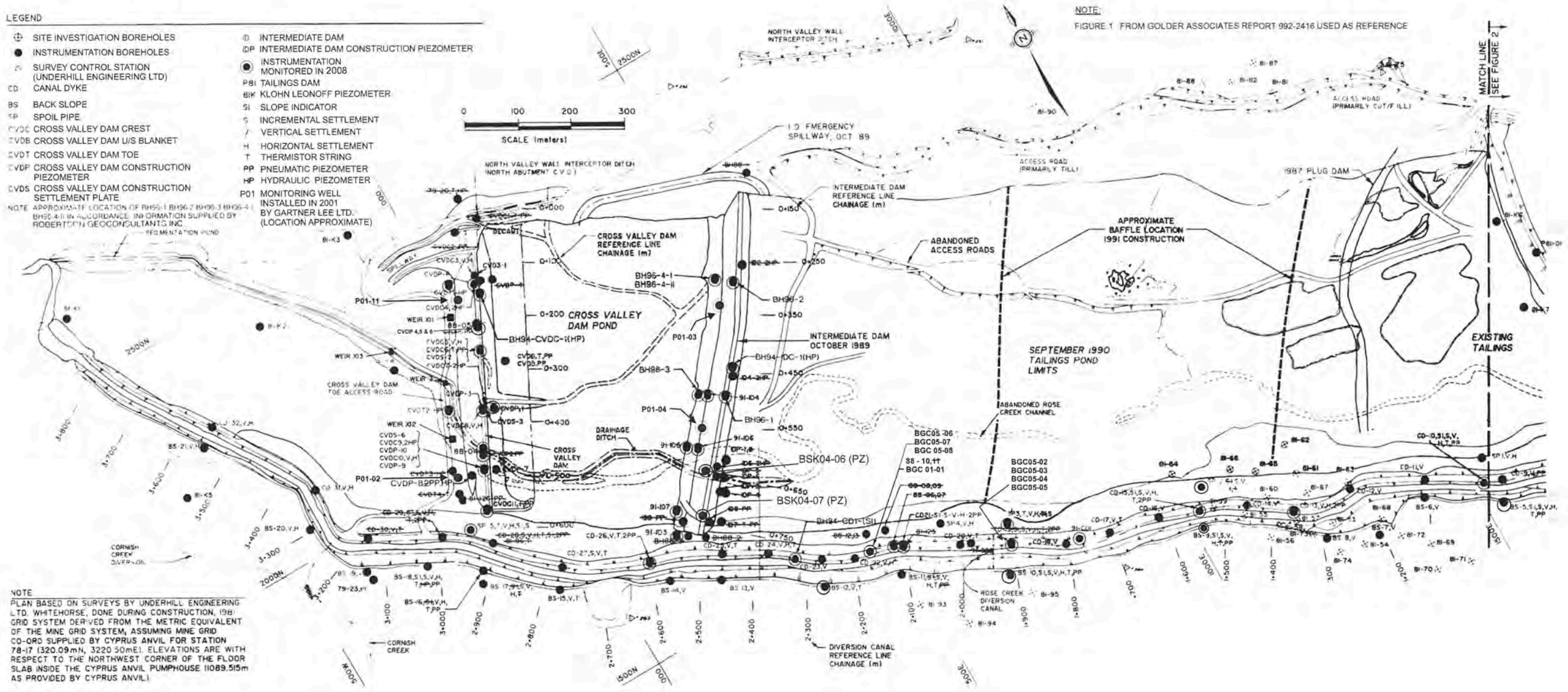
PROJECT No.:	FIGURE No.:	REV.:
0257-051-05	1	0

LEGEND

- ⊕ SITE INVESTIGATION BOREHOLES
- INSTRUMENTATION BOREHOLES
- ⊙ SURVEY CONTROL STATION (UNDERHILL ENGINEERING LTD)
- CD CANAL DYKE
- BS BACK SLOPE
- SP SPOIL PIPE
- CVDC CROSS VALLEY DAM CREST
- CVDB CROSS VALLEY DAM U/S BLANKET
- CVDT CROSS VALLEY DAM TOE
- CVDF CROSS VALLEY DAM CONSTRUCTION PIEZOMETER
- CVDS CROSS VALLEY DAM CONSTRUCTION SETTLEMENT PLATE
- ID INTERMEDIATE DAM
- IDP INTERMEDIATE DAM CONSTRUCTION PIEZOMETER
- INSTRUMENTATION MONITORED IN 2008
- P8I TAILINGS DAM
- BKIK KLOHN LEONOFF PIEZOMETER
- SI SLOPE INDICATOR
- ⊕ INCREMENTAL SETTLEMENT
- ⊖ VERTICAL SETTLEMENT
- ⊘ HORIZONTAL SETTLEMENT
- T THERMISTOR STRING
- PP PNEUMATIC PIEZOMETER
- HP HYDRAULIC PIEZOMETER
- P01 MONITORING WELL INSTALLED IN 2001 BY GARTNER LEE LTD. (LOCATION APPROXIMATE)

NOTE APPROXIMATE LOCATION OF BH55-1, BH56-2, BH59-3, BH59-4, BH59-4-B BY ACCORDANCE WITH INFORMATION SUPPLIED BY ROBERTSON GEOTECHNICALS INC. (SEGMENTATION POND)

NOTE PLAN BASED ON SURVEYS BY UNDERHILL ENGINEERING LTD. WHITEHORSE, DONE DURING CONSTRUCTION, 1981. GRID SYSTEM DERIVED FROM THE METRIC EQUIVALENT OF THE MINE GRID SYSTEM, ASSUMING MINE GRID CO-ORD SUPPLIED BY CYPRUS ANVIL FOR STATION 78-17 (320.09mN, 3220.50mE). ELEVATIONS ARE WITH RESPECT TO THE NORTHWEST CORNER OF THE FLOOR SLAB INSIDE THE CYPRUS ANVIL PUMPHOUSE (1089.515m AS PROVIDED BY CYPRUS ANVIL).



NOTE: FIGURE 1 FROM GOLDER ASSOCIATES REPORT 992-2416 USED AS REFERENCE

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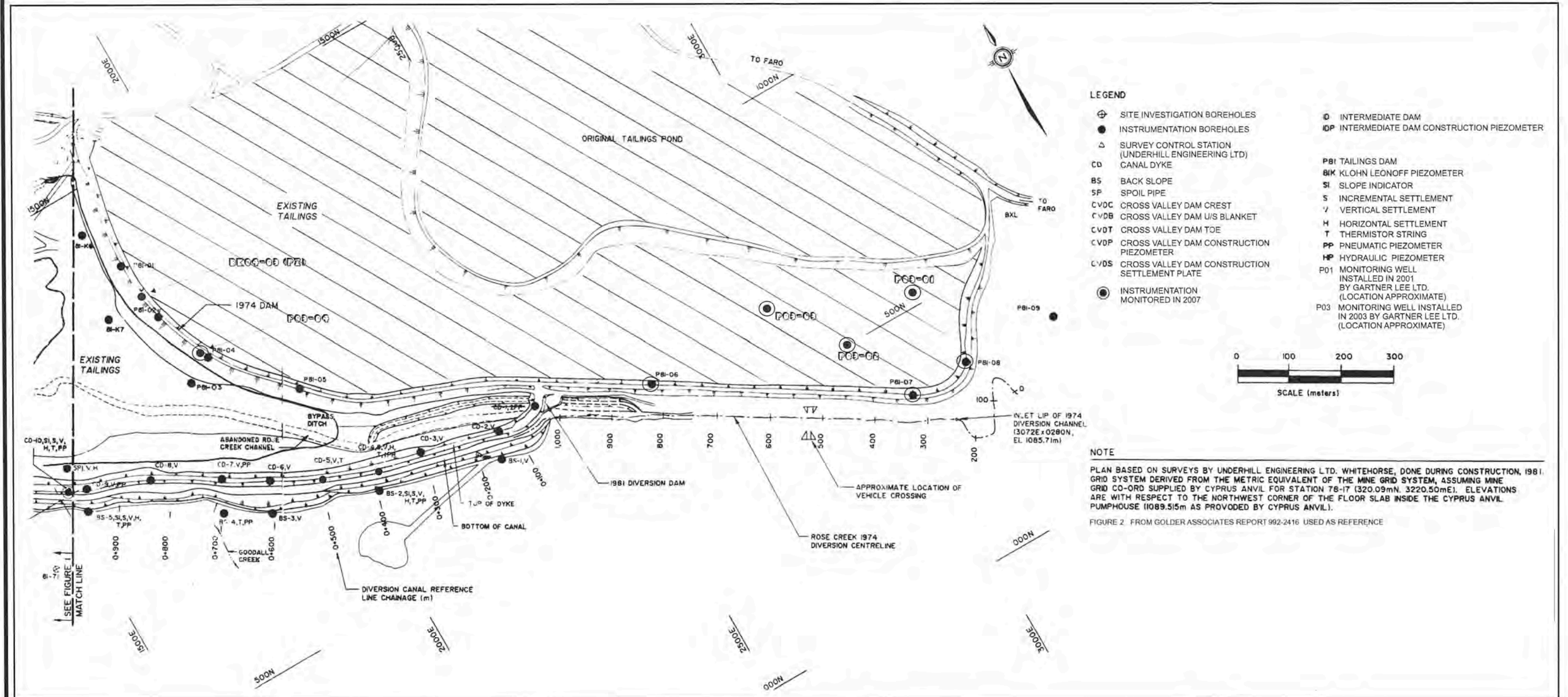
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PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE:	DOWN VALLEY TAILINGS CONTAINMENT INSTRUMENT LOCATION 1 OF 2		
PROJECT No.:	0257-051-05	FIGURE No.:	2
REV.:			0



- LEGEND**
- ⊕ SITE INVESTIGATION BOREHOLES
 - INSTRUMENTATION BOREHOLES
 - △ SURVEY CONTROL STATION (UNDERHILL ENGINEERING LTD)
 - CD CANAL DYKE
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 - ⊙ INTERMEDIATE DAM
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 - PBI TAILINGS DAM
 - BK KLOHN LEONOFF PIEZOMETER
 - SI SLOPE INDICATOR
 - S INCREMENTAL SETTLEMENT
 - V VERTICAL SETTLEMENT
 - H HORIZONTAL SETTLEMENT
 - T THERMISTOR STRING
 - PP PNEUMATIC PIEZOMETER
 - HP HYDRAULIC PIEZOMETER
 - P01 MONITORING WELL INSTALLED IN 2001 BY GARTNER LEE LTD. (LOCATION APPROXIMATE)
 - P03 MONITORING WELL INSTALLED IN 2003 BY GARTNER LEE LTD. (LOCATION APPROXIMATE)

NOTE

PLAN BASED ON SURVEYS BY UNDERHILL ENGINEERING LTD. WHITEHORSE, DONE DURING CONSTRUCTION, 1981. GRID SYSTEM DERIVED FROM THE METRIC EQUIVALENT OF THE MINE GRID SYSTEM, ASSUMING MINE GRID CO-000 SUPPLIED BY CYPRUS ANVIL FOR STATION 78-17 (320.09mN, 3220.50mE). ELEVATIONS ARE WITH RESPECT TO THE NORTHWEST CORNER OF THE FLOOR SLAB INSIDE THE CYPRUS ANVIL PUMPHOUSE (1089.515m AS PROVIDED BY CYPRUS ANVIL).

FIGURE 2. FROM GOLDER ASSOCIATES REPORT 992-2416 USED AS REFERENCE

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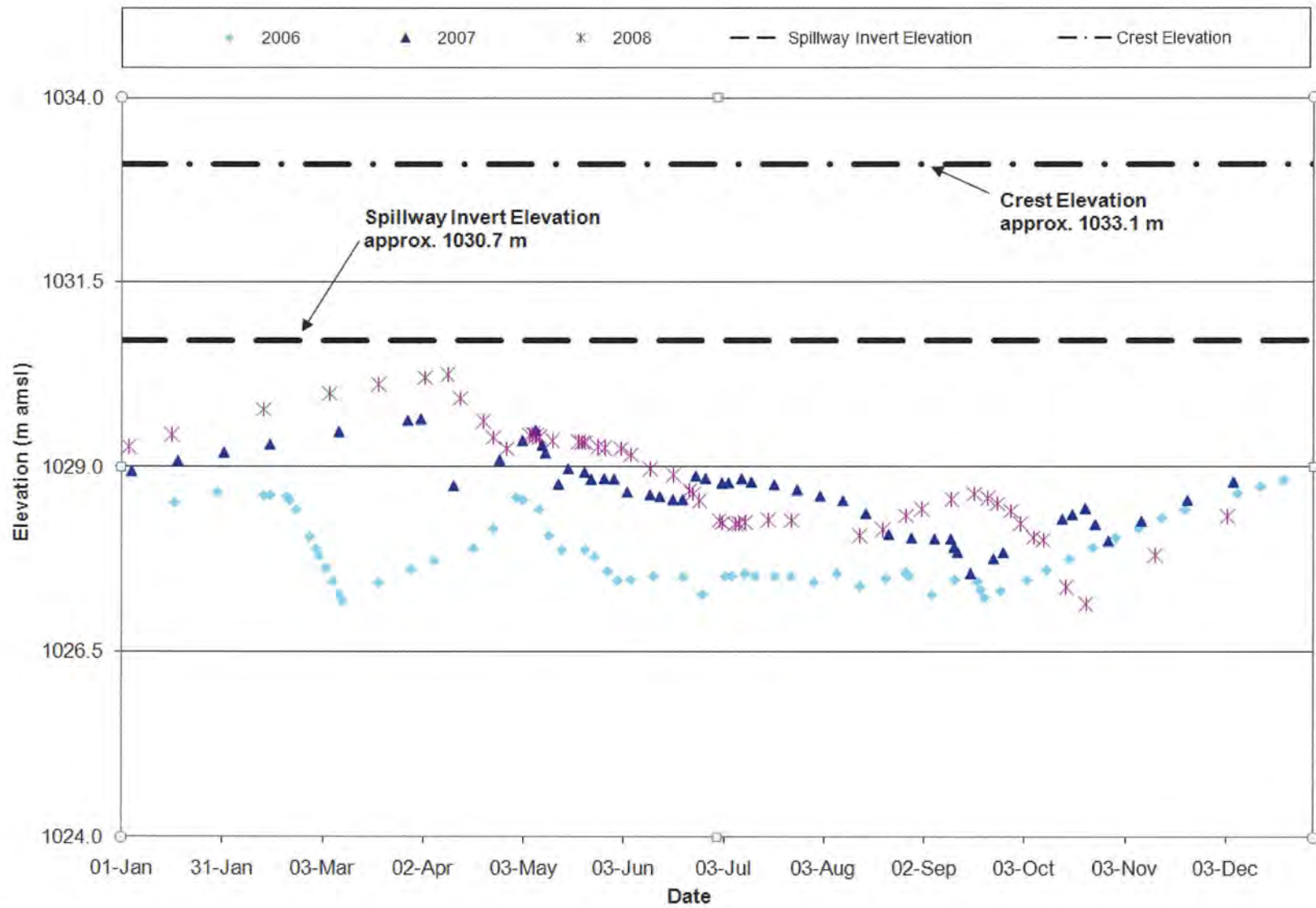
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TITLE: DOWN VALLEY TAILINGS CONTAINMENT INSTRUMENT LOCATION 2 OF 2		
PROJECT No.: 0257-051-05	FIGURE No.: 3	REV.: 0



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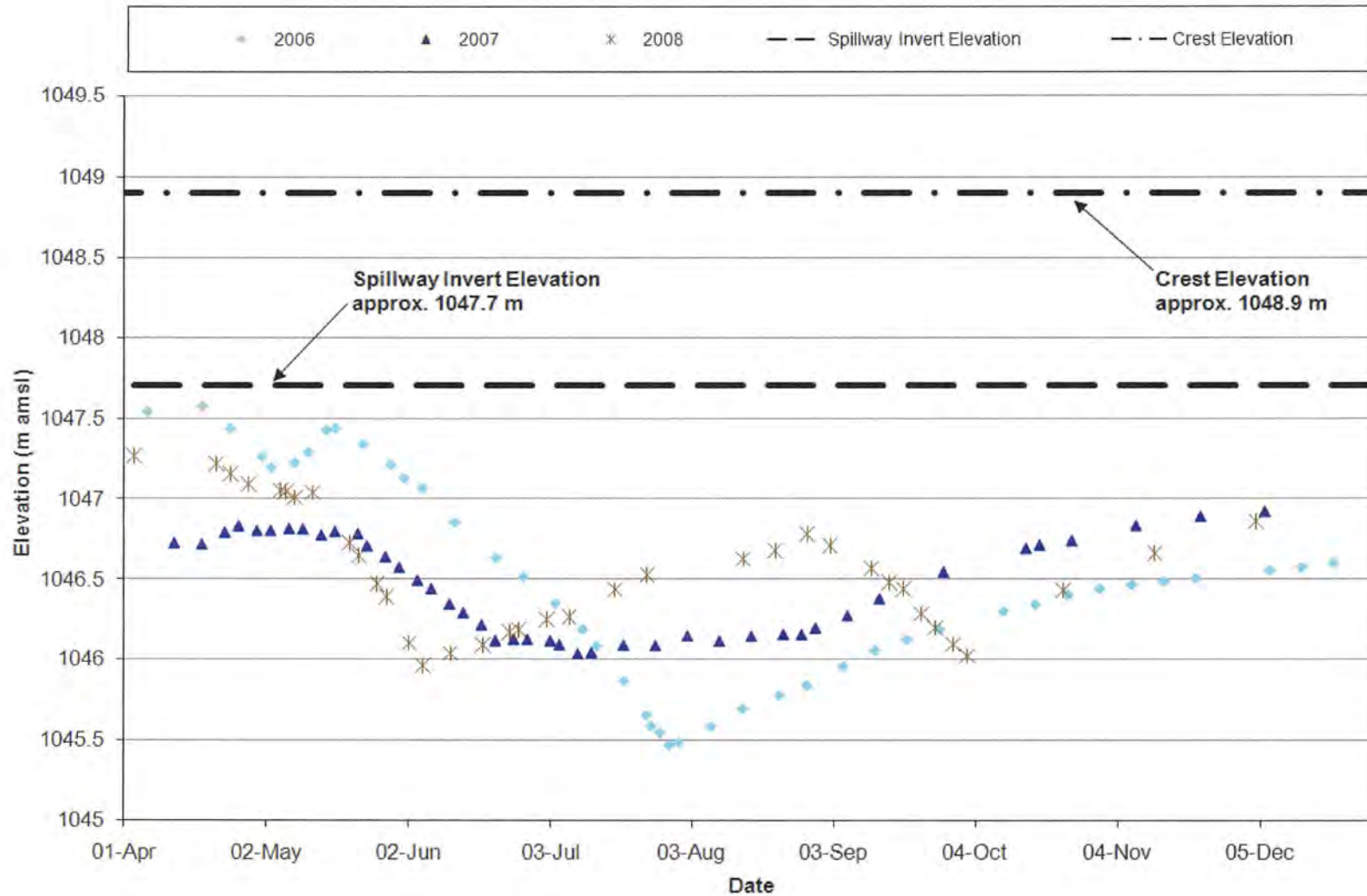
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PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE:	CROSS VALLEY DAM POND ELEVATIONS (2006-2008)		

PROJECT No.:	FIGURE No.:	REV.:
0257-051-05	4	0

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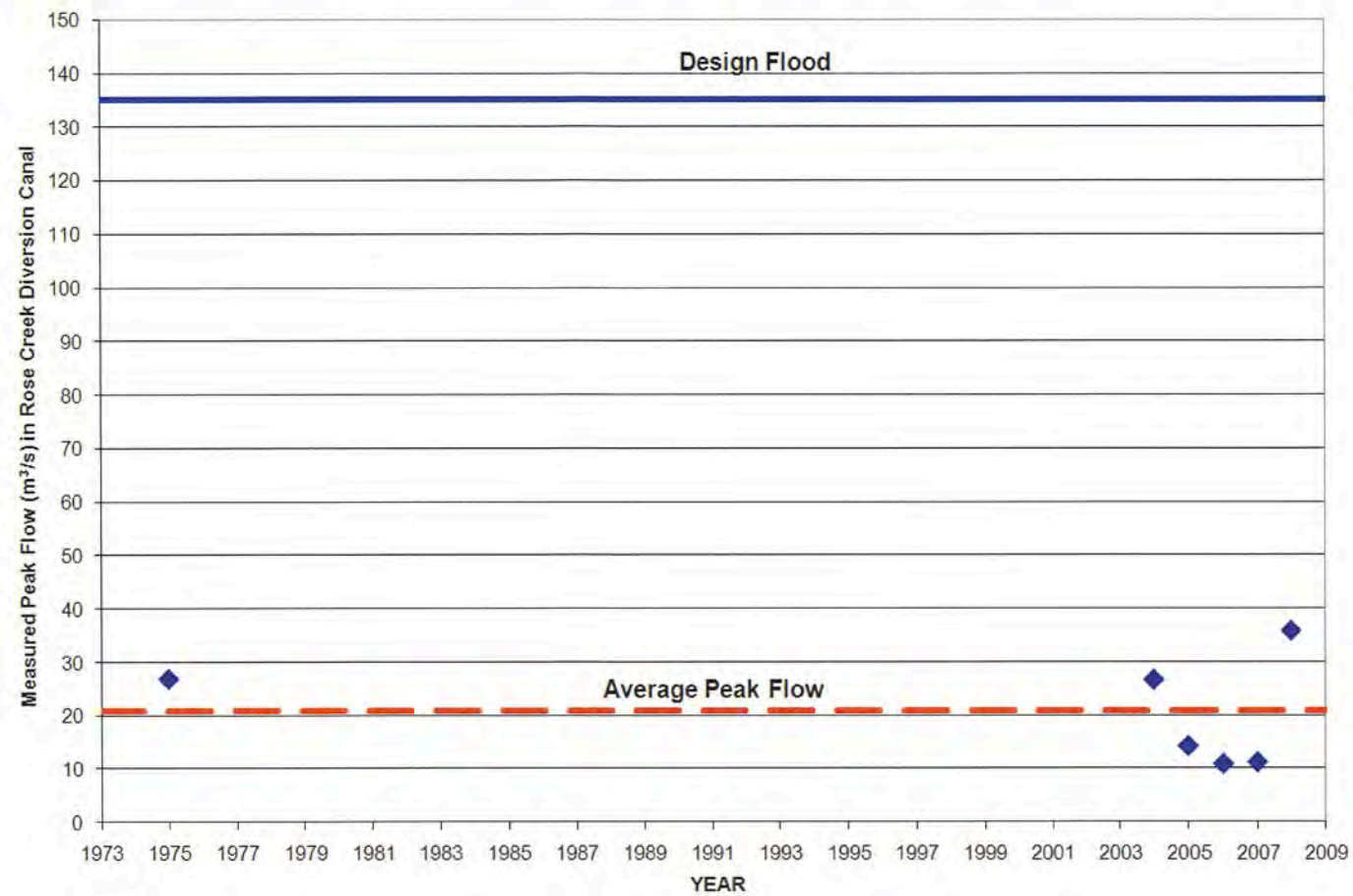

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TITLE:	INTERMEDIATE DAM POND ELEVATIONS (2006-2008)		

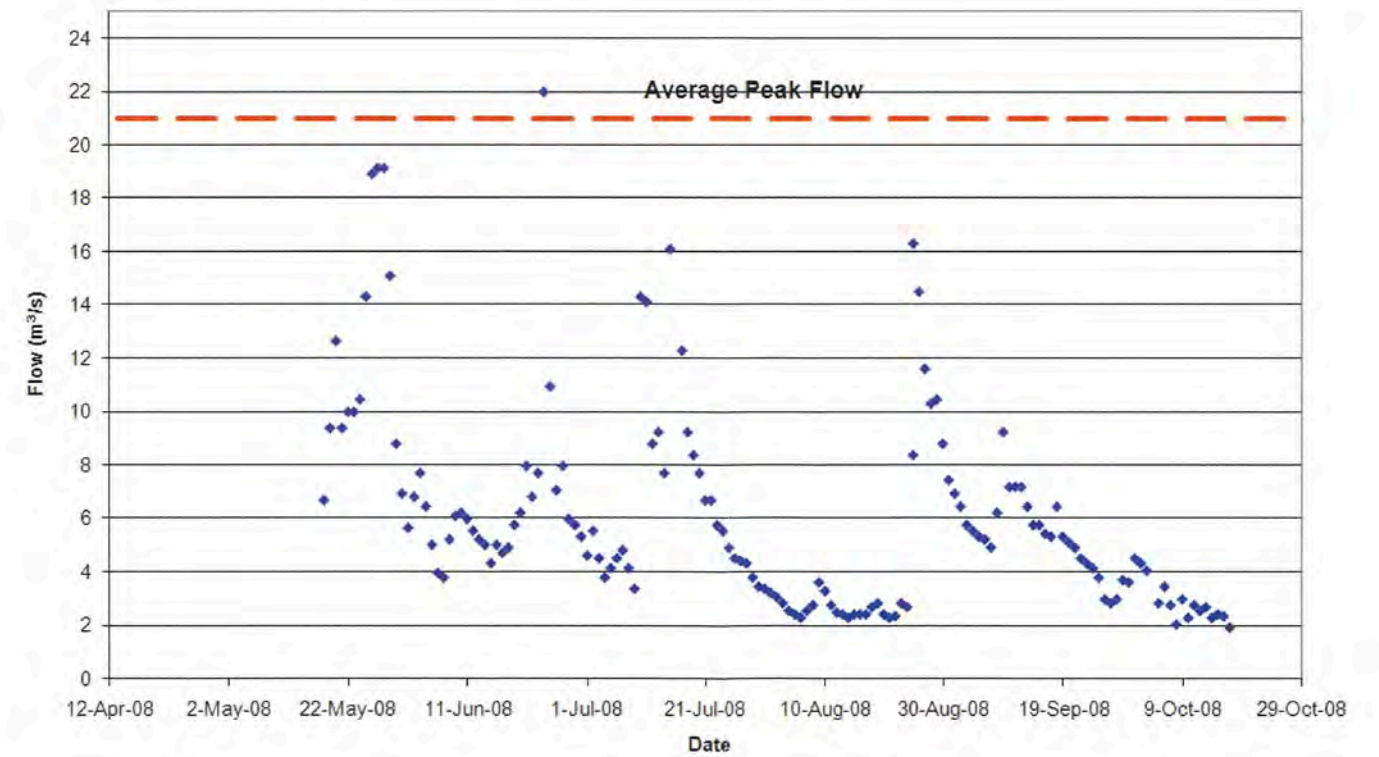
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PROJECT No.:	FIGURE No.:	REV.:
0257-051-05	5	0



Rose Creek Diversion Canal
2008 Measured Flows (Based on staff guage reading)



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PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE:	ROSE CREEK DIVERSION FLOW		
PROJECT No.:	0257-051-05	FIGURE No.:	6
REV.:	0		



September: shows the water flowing in the channel section, looking in the downstream direction from downstream of the Diversion Dam.



May: shows a view of the slump in the backslope of the Diversion Channel.



September: shows Goodall Creek discharge into the canal.



June: a view of the Diversion looking downstream. Note the bedrock outcrop on the left bank.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: DIVERSION CANAL DIKE INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 7	REV.: 0



September: shows a tension crack that has formed on the upstream crest. The crack extends approximately 20 m and should be observed for further propagation and repair. Trees on the upstream slope should be removed next year.



September: shows a slump area that has had some advancement over the past year. Repair is not yet needed.



May: shows an upstream view of the upper weir section of the canal, looking towards Cornish Creek.



May: shows a view of some erosion gullies in the backslope of the canal.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: DIVERSION CANAL DIKE INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 8	REV.: 0



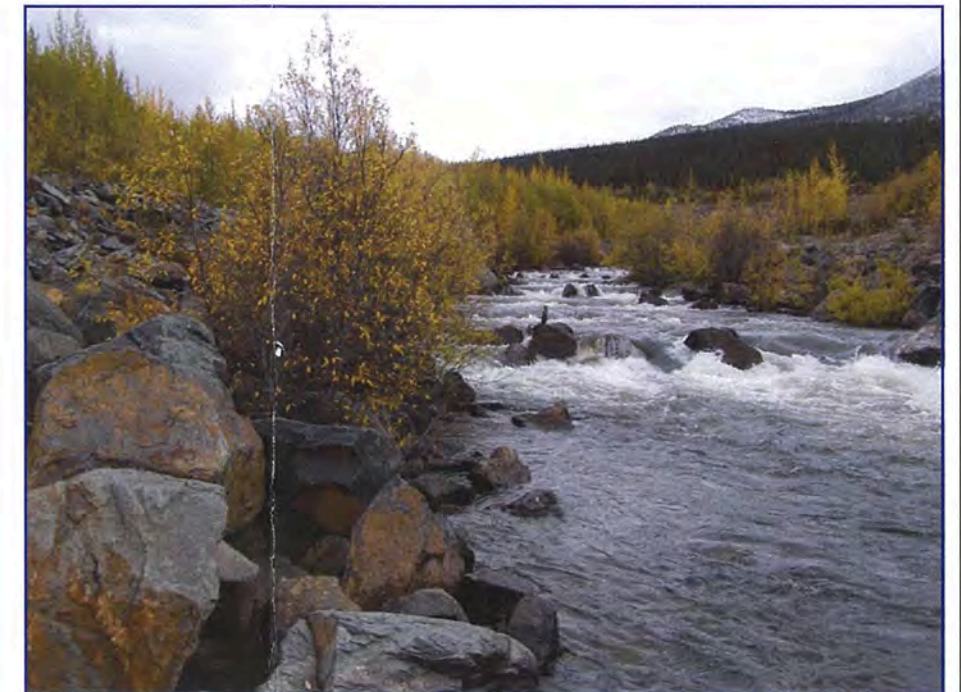
September: view of the left bank riprap in lower weir section, this is where Severin Creek enters the Diversion Canal.



September: view of the upper weir section, looking upstream from Cornish Creek.



September: shows the upper weir section, looking downstream



September: a view looking upstream from the lower end of the upper weir section.

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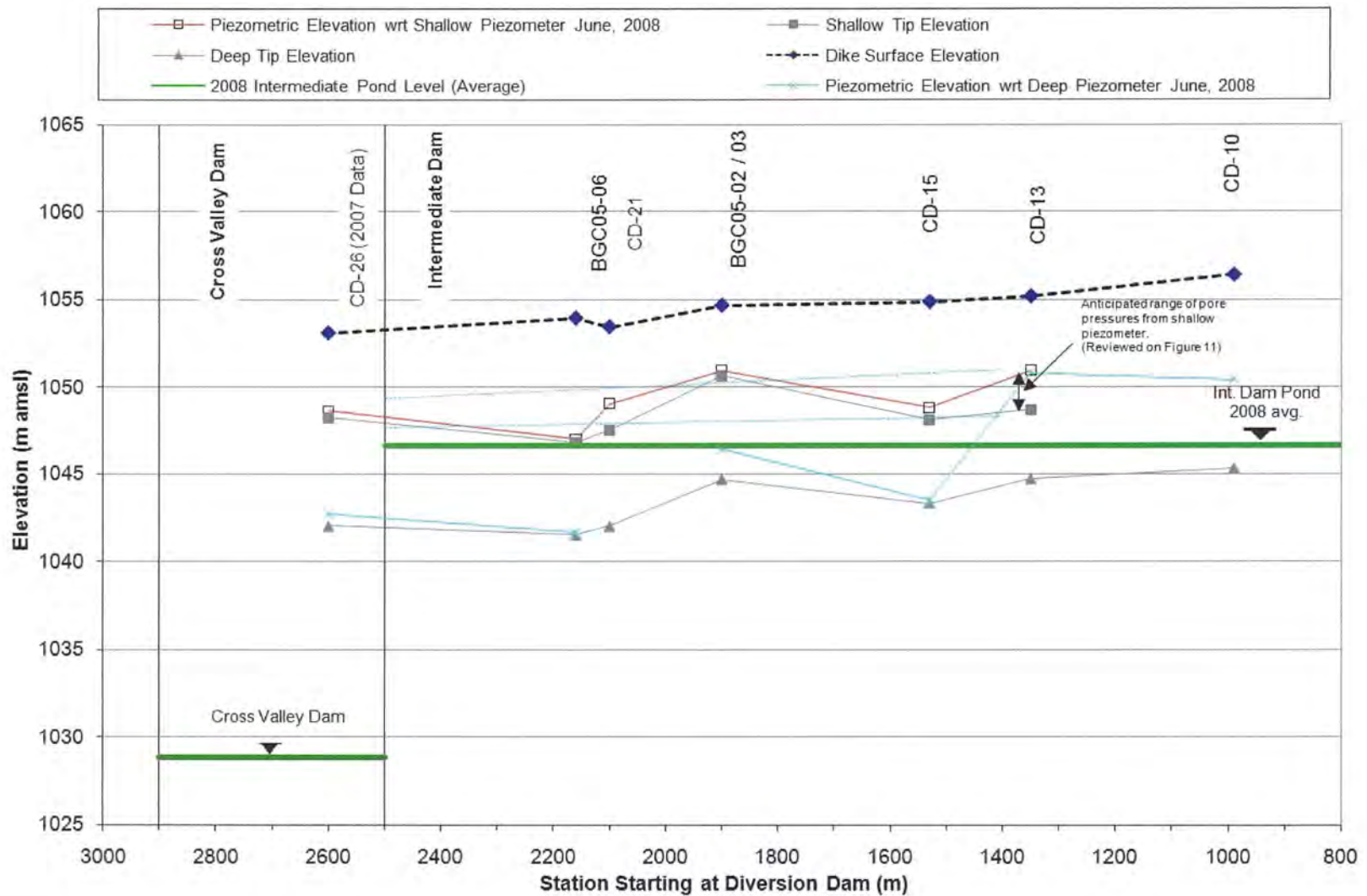
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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: DIVERSION CANAL INSPECTION PHOTOS-WEIR SECTIONS		
PROJECT No.: 0257-051-05	FIGURE No.: 9	REV.: 0



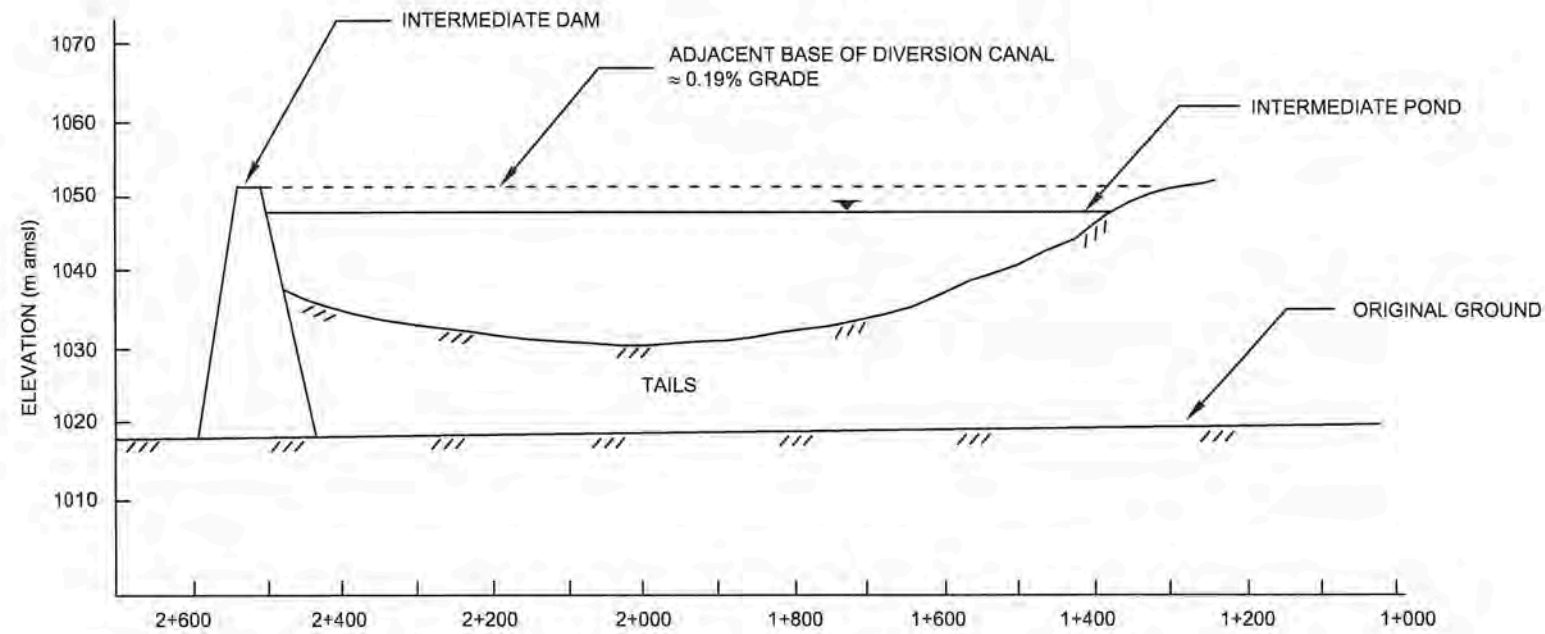
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DATE:	FEB 2009	CHECKED:	HHH
DRAWN:	ADW	APPROVED:	GWF



PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW	
TITLE:	CANAL DIKE, CURRENT PIEZOMETRIC CONDITIONS	

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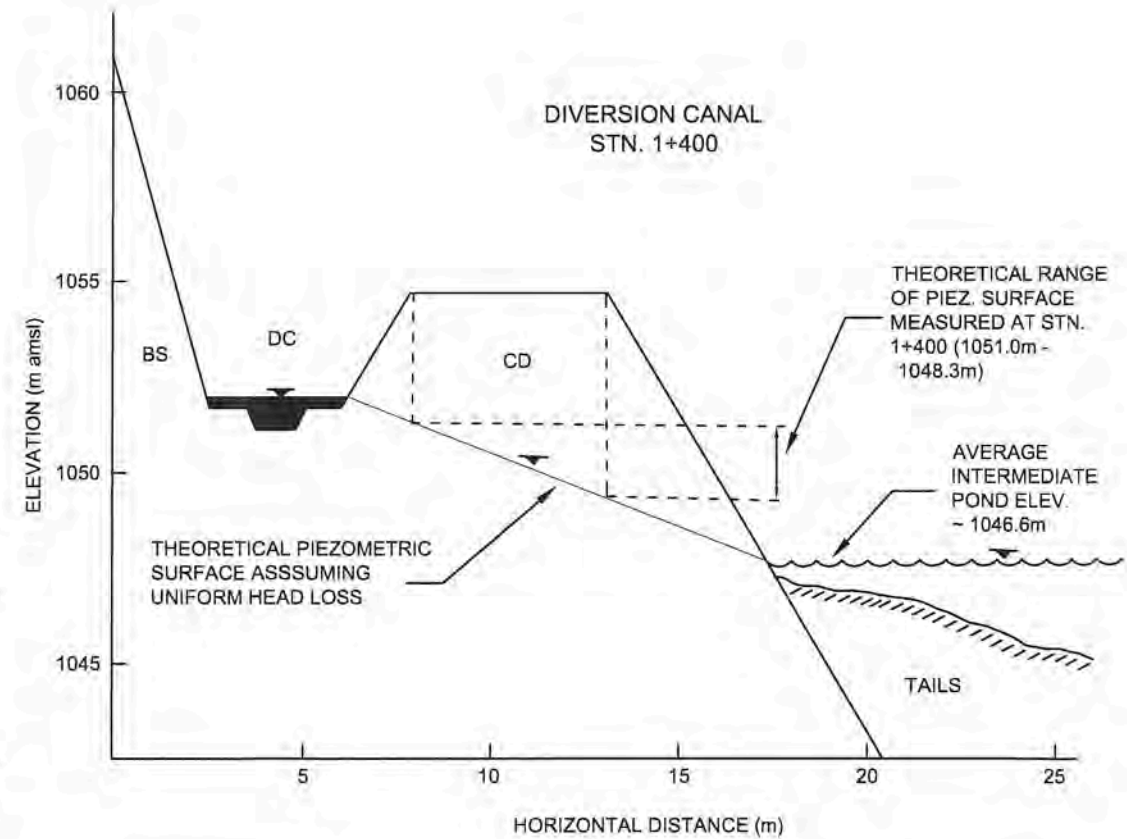
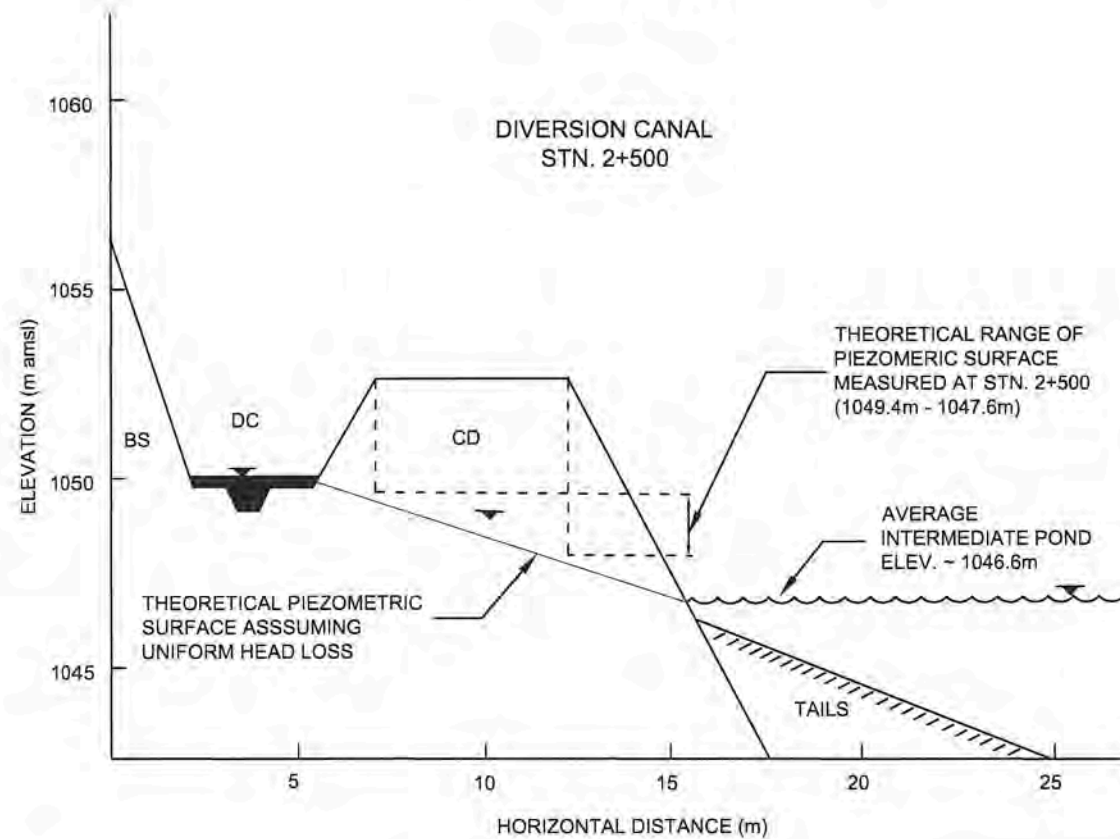
PROJECT No.:	0257-051-05	FIGURE No.:	10	REV.:	0
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- NOTES: 1) DRAWING IS A SCHEMATIC, CONSTRUCTED FOR ILLUSTRATIVE PURPOSES ONLY.
- 2) ALL ELEVATIONS ARE APPROXIMATE AND ARE BASED ON AVAILABLE INFORMATION.
- 3) LOCATION OF TAILINGS IN THE INTERMEDIATE POND IS APPROXIMATE. NO BATHYMETRIC INFORMATION IS AVAILABLE.

LEGEND
 BS BACK SLOPE
 DC DIVERSION CANAL
 CD CANAL DIKE

NOTE: 10X VERTICAL EXAGGERATION



K:\Projects\0257 D&T\051 2008 Fero Annual\05 Annual Geotech Inspection Report\Graphics\Drawings\0257-051-05 Fig 11.dwg Layout: Figure 11 Plot Date Feb 11 09 Time: 9:04 AM

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CLIENT: **Deloitte & Touche**

PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE:	CANAL DIKE / INTERMEDIATE POND HYDRAULIC CONNECTIVITY		
PROJECT No.:	0257-051-05	FIGURE No.:	11
REV.:			0



September: a view of the toe of the spoil pile. There were 25 seepage discharge locations. The pond level is 1.9 m lower than usual.



May: view of the polishing pond shoreline, which is formed by the spoil pile base. Note that this is an area of slumping and seepage.



May: view of the headscrap formed by the slumping area, was noted in last year's inspection.



May: shows retrogression of bank in seepage discharge area.

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PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE:	SPOIL PILE INSPECTION PHOTOS		
PROJECT No.:	0257-051-05	FIGURE No.:	12
REV.:			0



September: shows the start of the north Valley Interceptor Ditch just uphill from the guard house gate. This is the area the dike was repaired before and the riprap is obvious on the right hand side of the photo. After inspection of this section, it appears that the channel is flowing quite well with no signs of erosion or blockages.



September: shows where the Interceptor Ditch comes up against the berm located proximal to the access road. We can see here that the water is adequately deflected and there does not appear to be any signs of erosion or deformation on this berm.



May: a downstream view of the North Valley Interceptor Ditch, downstream from the culvert.



May: an upstream view of the North Valley Interceptor Ditch towards the culvert.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: NORTH VALLEY INTERCEPTOR DITCH INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 13	REV.: 0



September: shows a view of the upstream face of the dam.



May: a view looking south along the upstream face. Note that the pond level appears to be close to the high water mark.



September: shows a view of the upstream face which was repaired in July 2007. Appears to be in good condition with no wave erosion occurring.



May: shows the shoreline of the pond from the left abutment. Canal Dike is on the extreme right of this photo.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: INTERMEDIATE DAM INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 14	REV.: 0



May: showing a view looking south along the downstream dam face.



May: looking downstream in the dam spillway.



September: a view from the crest of the Intermediate dam looking at the downstream face.



September: a view from the crest of the Intermediate Dam looking at the downstream face. Note the appearance of the erosion rills on the face.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: INTERMEDIATE DAM INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 15	REV.: 0



May: shows a view of erosion on the downstream face of the dam. This area should be repaired by removing the fines from the road surface.



May: shows a view of the toe of the dam at the lower road. Note slough material at the toe.



September: shows the intersection of the downstream face with the north abutment. Vegetation was removed and the area was graded for construction access in 2007.



September: a view of the dam crest, note that there is a small amount of vegetation growing after removal in 2007.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: INTERMEDIATE DAM INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 16	REV.: 0



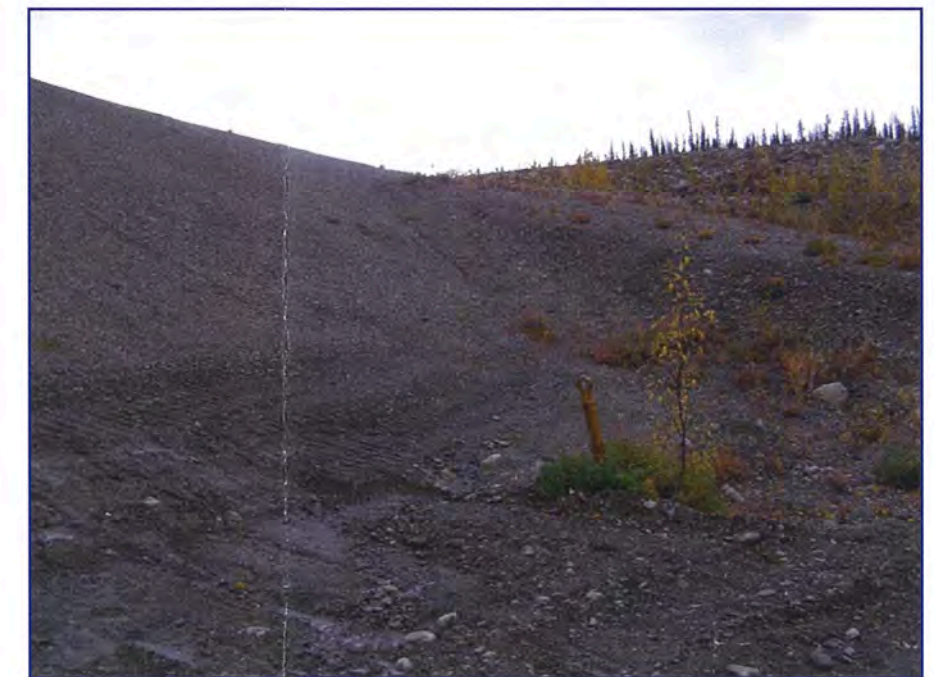
May: a view of minor cracking occurring at the edge of the polishing pond. Note that cracking has historically been seen in this area.



May: shows a view of the edge of the polishing pond. Note that some rilling and wave erosion is evident.



September: shows a view looking towards the right abutment down the lower road.



September: a view of the left abutment on the Intermediate Dam.

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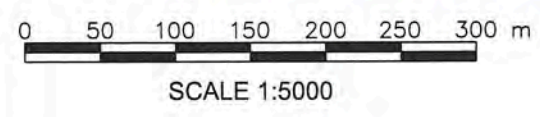
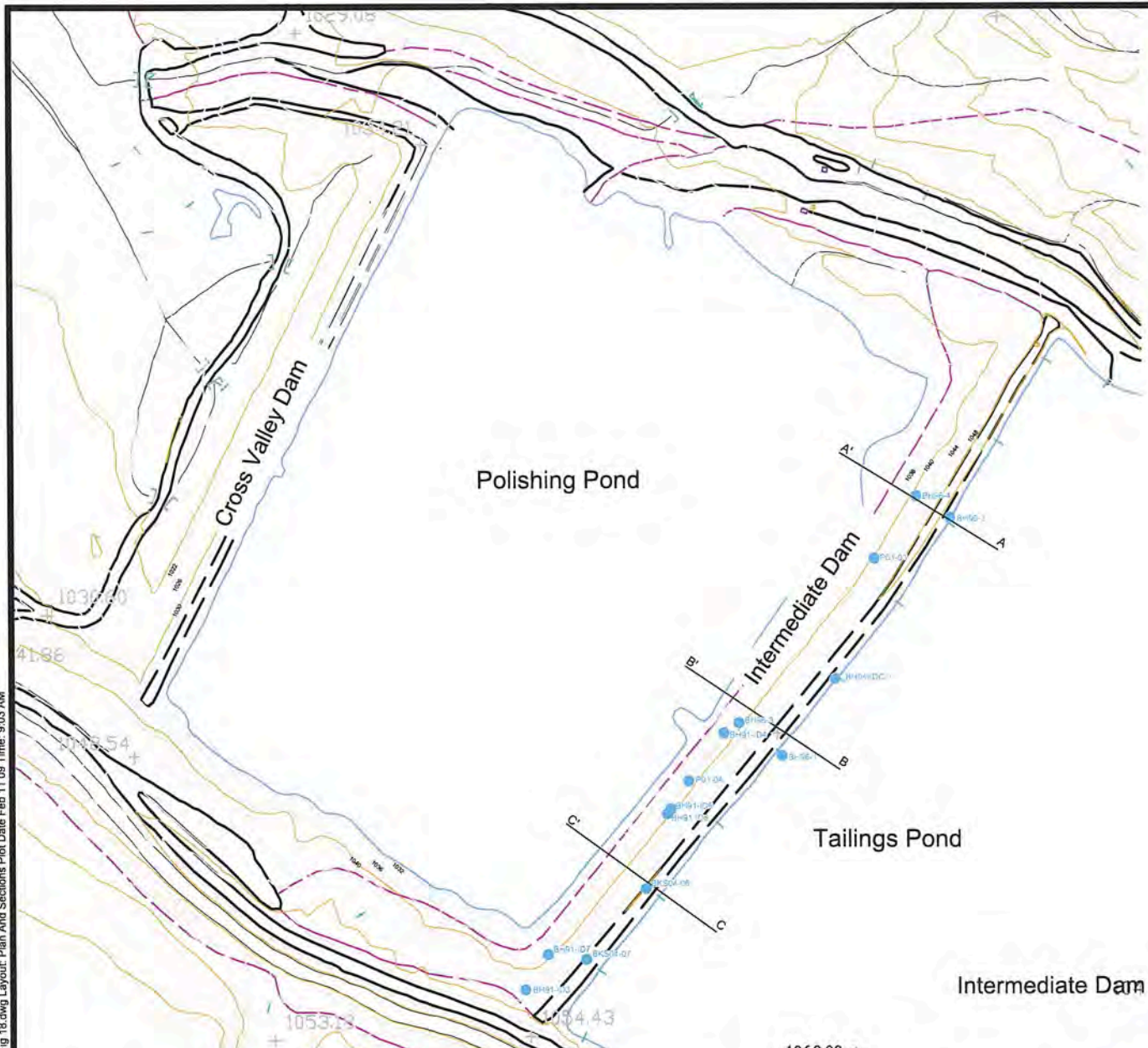
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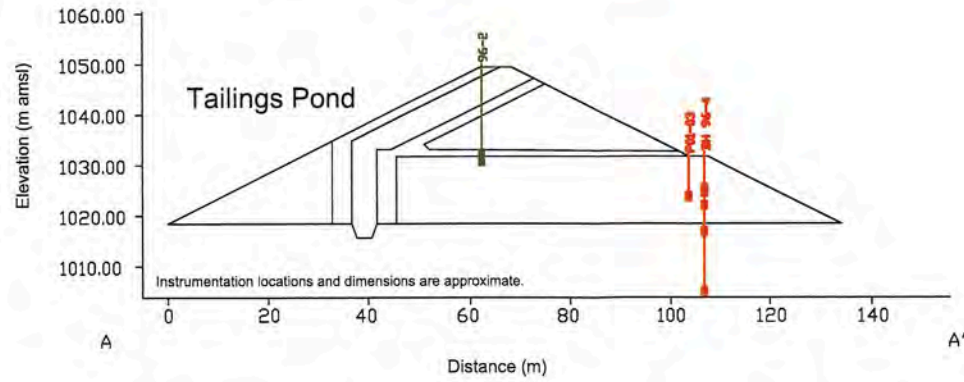
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TITLE:	INTERMEDIATE DAM INSPECTION PHOTOS		
PROJECT No.:	FIGURE No.:	REV.:	
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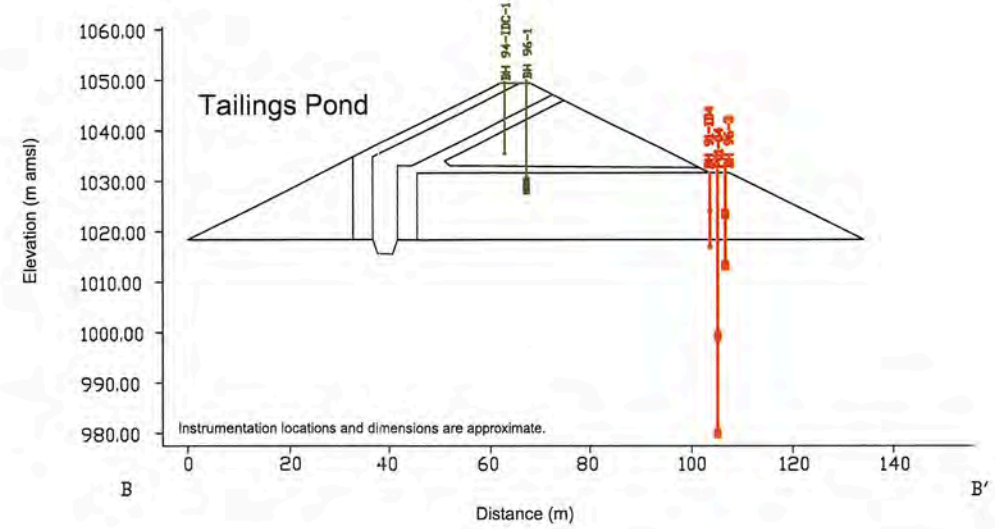


- Screened Intervals of Standpipe Piezometers
- ▲ Bottom of Standpipe Piezometers
- Pneumatic Piezometer Tips
- Crest Piezometers
- Downstream Toe Piezometers

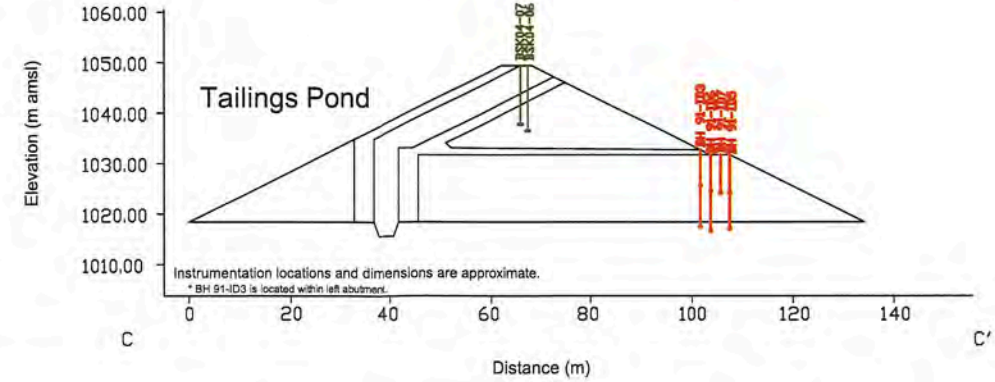
Intermediate Dam - Cross-Section A - A'



Intermediate Dam - Cross-Section B - B'



Intermediate Dam - Cross-Section C - C'



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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: SECTION VIEW OF INTERMEDIATE DAM		
PROJECT No.: 0257-051-05	FIGURE No.: 18	REV.: 0



May: shows the upstream face of the Cross Valley Dam



May: shows a view of the crest of the dam, with a faint crack in the road.



May: looking at the downstream face of the dam from the right abutment.



May: shows a view of the toe of the downstream side of the dam with some water loving plants present, which likely indicated seepage. Note that the ground appears to be softer at the intersection of the dam and the drain.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: CROSS VALLEY DAM INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 19	REV.: 0



September: shows a view of the downstream shell of the Cross Valley Dam.



September: shows a view of the upstream face riprap and pond level.



September: shows a view of some of the minor erosion that is occurring at the intersection of the crest and the left bank of the emergency spillway.



September: shows a view of the crest and downstream face with an area that needs to be filled in to re-establish the design crest width.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: CROSS VALLEY DAM INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 20	REV.: 0



September: shows a view of the downstream toe, some vegetation remains after the 2007 removal, but is low priority to be removed.



September: shows the crest of the dam, note that vegetation was removed in 2007.

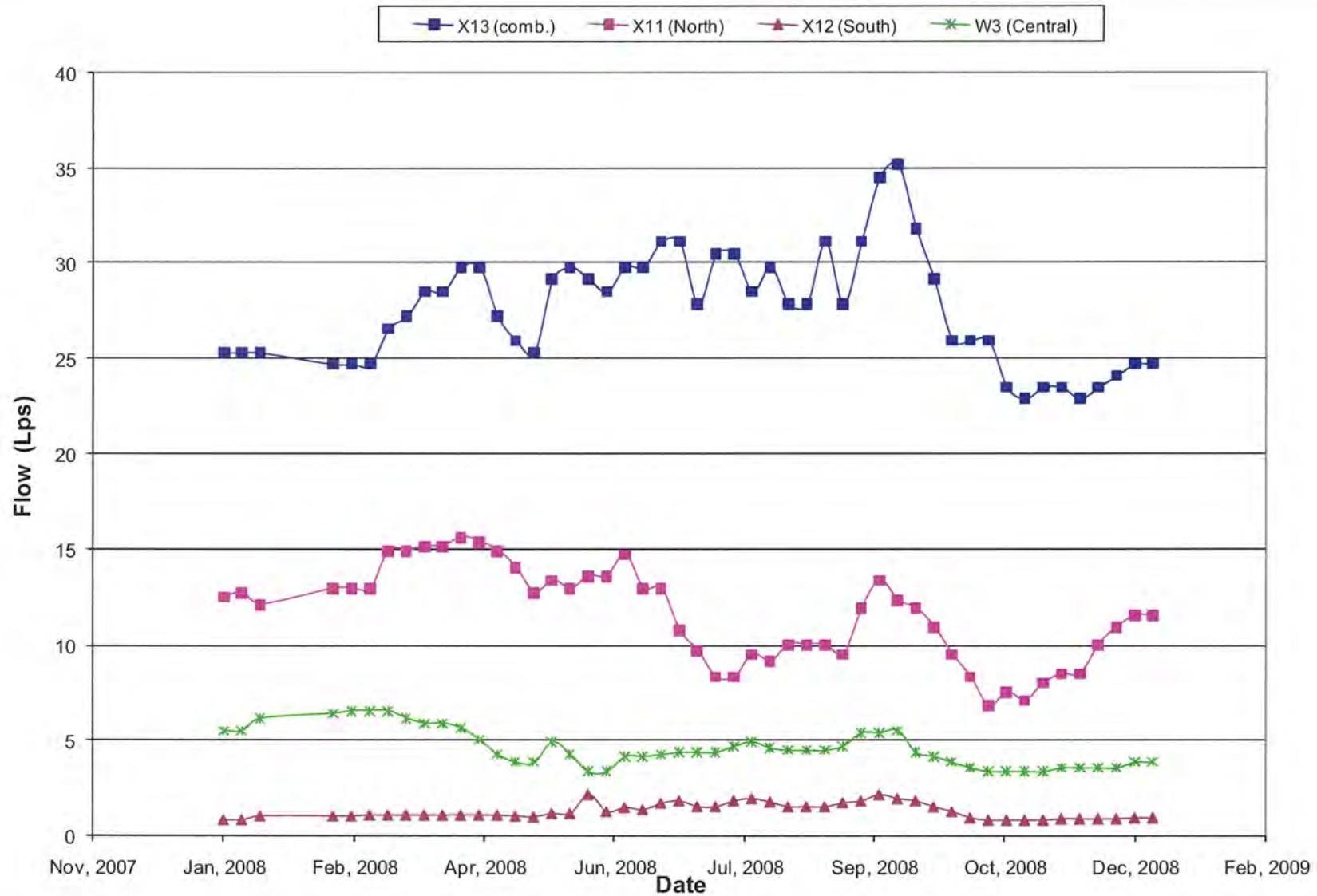


September: shows seepage water exiting the downstream toe about 12-14 m downstream of the seepage collection ditch. This area is slightly lower in elevation than the main channel containing seepage water but likely part of the same seepage path. Site staff to watch this area carefully in the winter.



September: shows the seepage discharge weir and staff gauge. Staff gauge read 0.072 m.

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						DRAWN:	ADW		PROJECT No.:		0257-051-05	FIGURE No.:	21	REV.:	0
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						CHECKED:	HHH								
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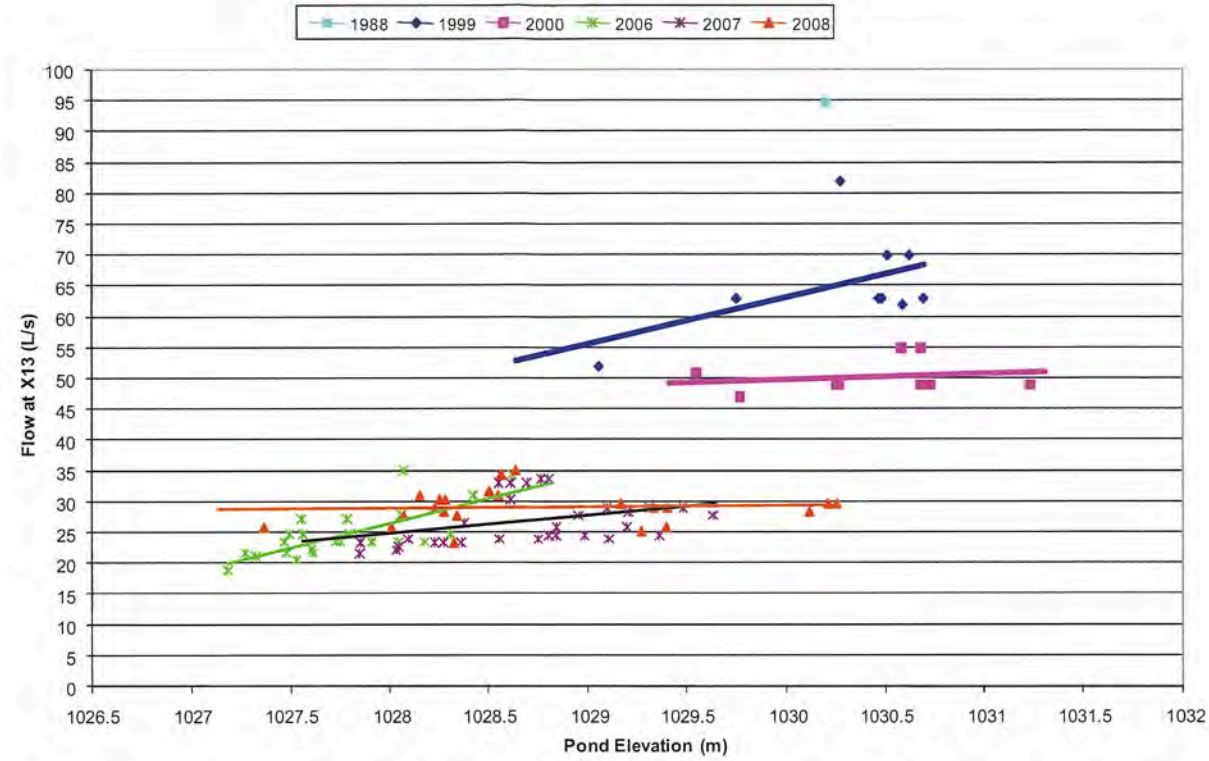
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TITLE:	CROSS VALLEY DAM 2008 WEIR FLOWS		

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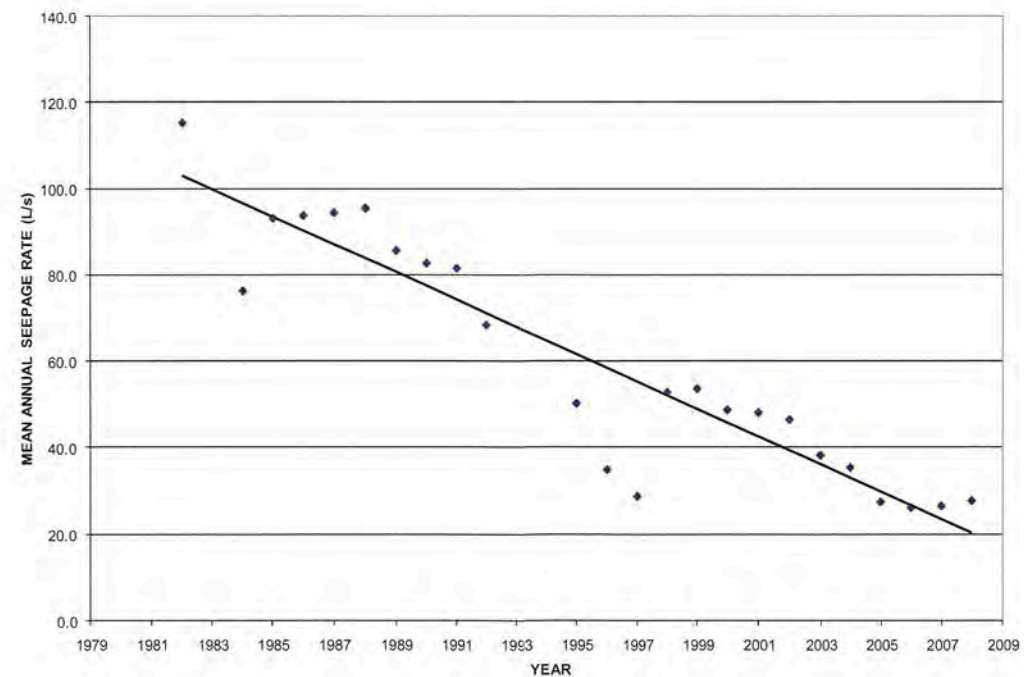
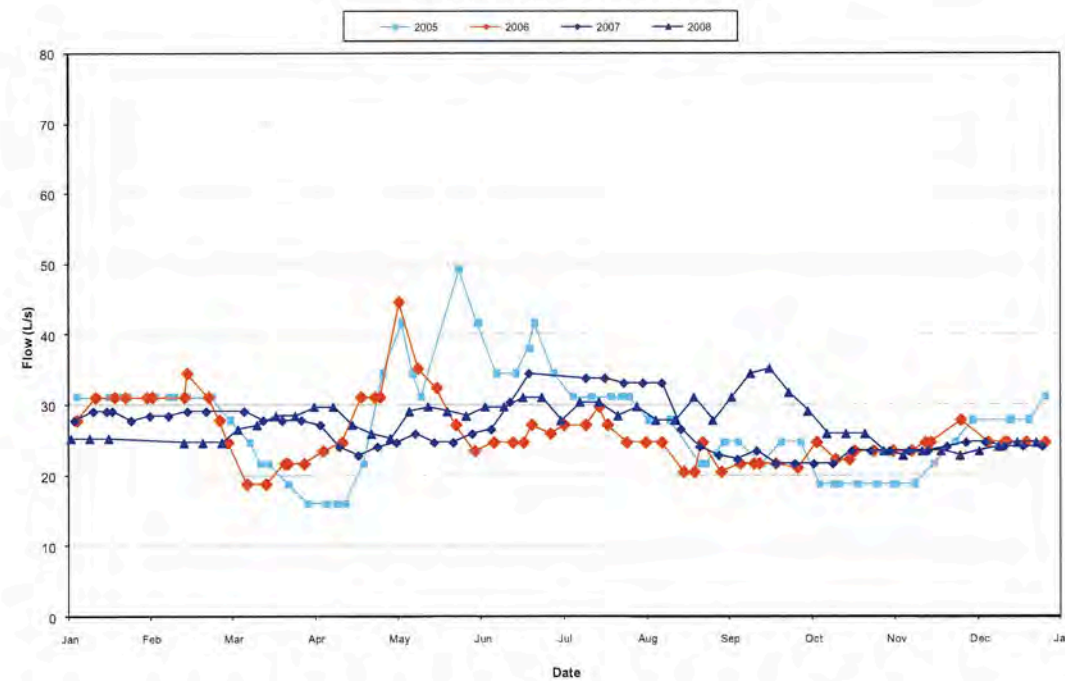
CLIENT: **Deloitte & Touche**

PROJECT No.:	0257-051-05	FIGURE No.:	22	REV.:	0
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Cross Valley Pond Elevation vs. Flow Rate at X13



MEASURED FLOW RATES AT X13 (L/s)



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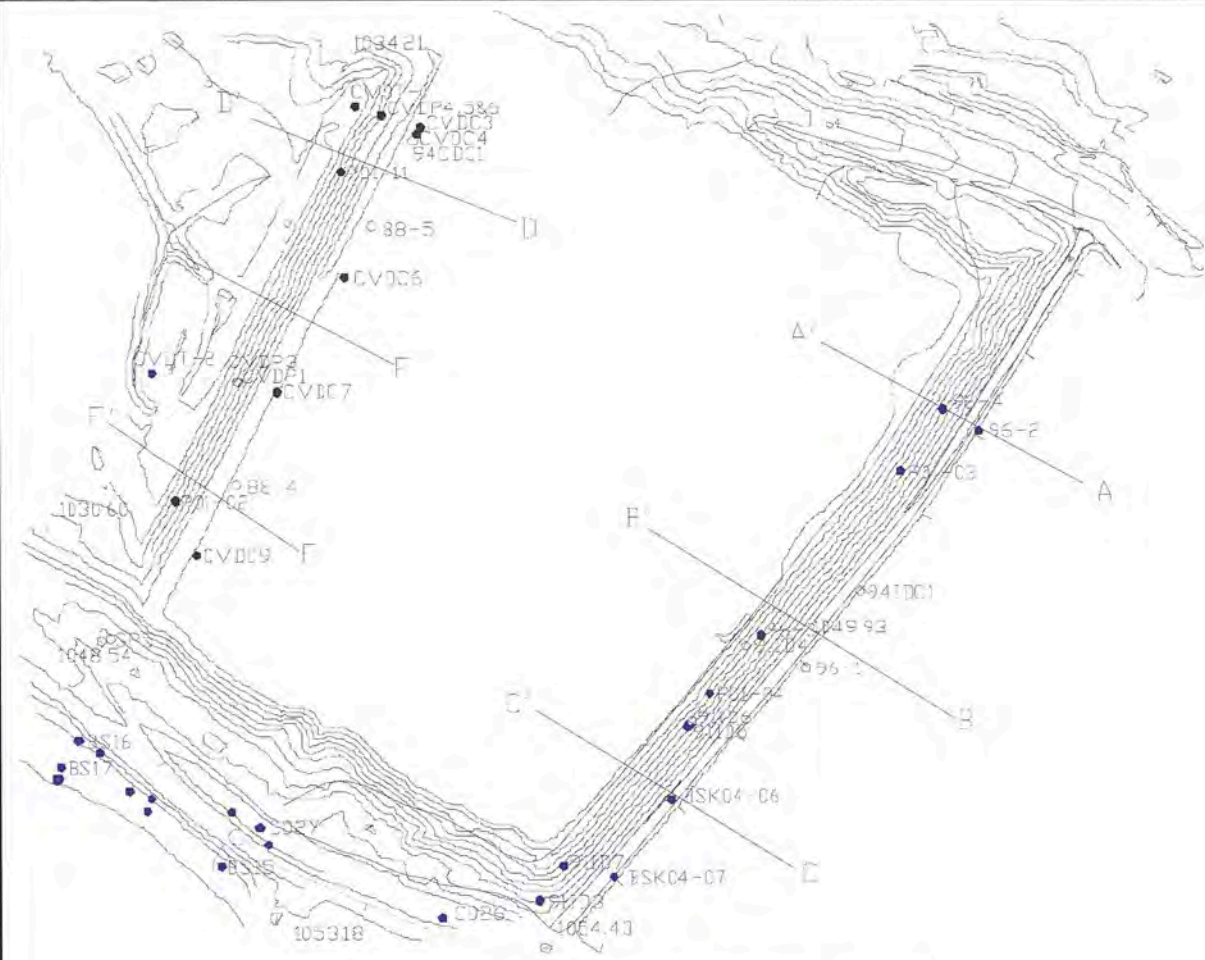
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APPROVED:	GWf

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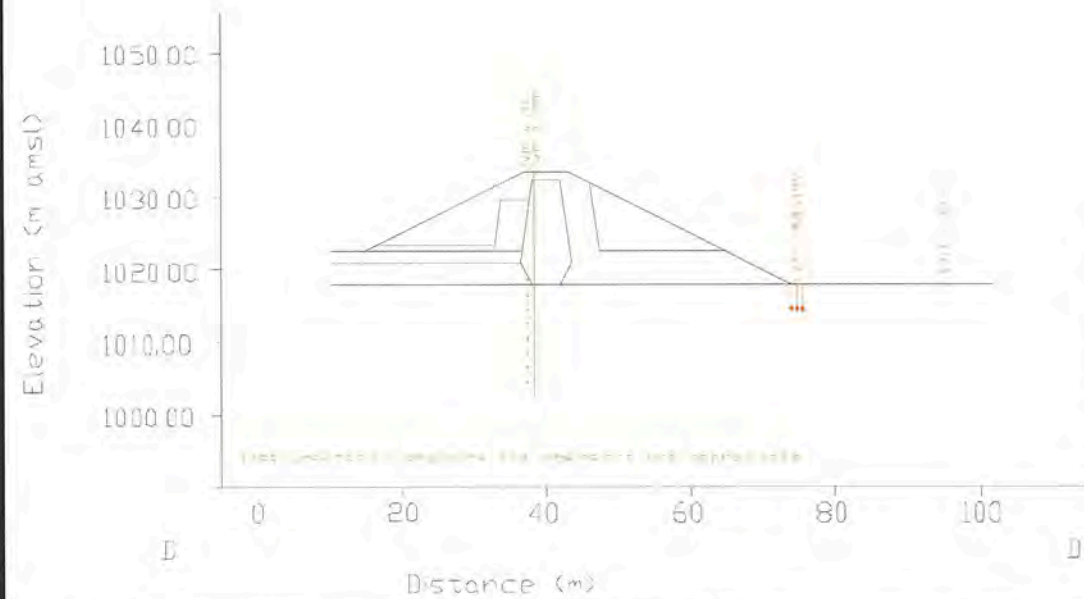
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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: CROSS VALLEY DAM MEASURED FLOW RATES AT X13		
PROJECT No.: 0257-051-05	FIGURE No.: 23	REV.: 0

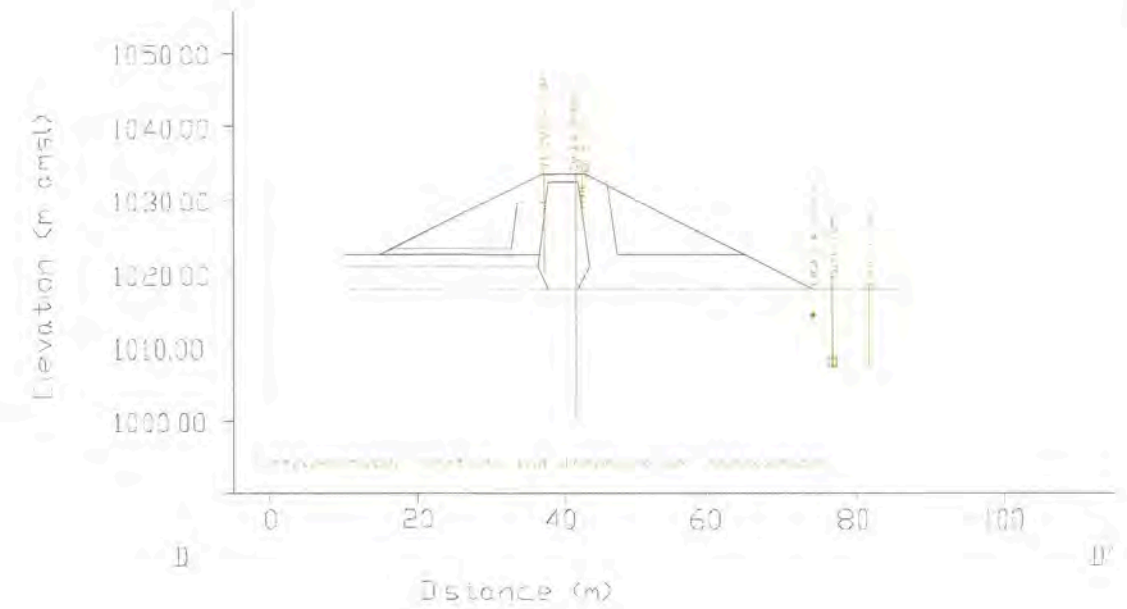


Cross Valley Dam - Cross-Section E - E



- Standpipe Piezometers
- Pneumatic Piezometers
- Thermistor Cables
- Screened Intervals of Standpipe Piezometers
- Bottom of Standpipe Piezometers
- Pneumatic Piezometer Tips
- Thermistor Nodes

Cross Valley Dam - Cross-Section D - D



Cross Valley Dam - Cross-Section F - F



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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: SECTION VIEW OF CROSS VALLEY DAM		
PROJECT No.: 0257-051-05	FIGURE No.: 24	REV.: 0



May: shows a panorama view of the upstream head pond of the North Fork Rock Drain.



September: shows a panorama view of the downstream side of the North Fork Rock Drain

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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: NORTH FORK ROCK DRAIN INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 25	REV.: 0



May: shows an overview of the downstream side of the North Fork Rock Drain. Note the erosion gully on the face.



May: a view looking down from the crest at the discharge of the Rock Drain.



September: looking towards the east limit of the upstream pond. Note that the water level is approximately 3 m below the high water mark that is indicated by debris deposited on the face of the drain.



September: a view of the side slope of the drain and the erosion channel cutting through it. This erosion gap in the protection berm should be repaired to prevent further erosion on the face.

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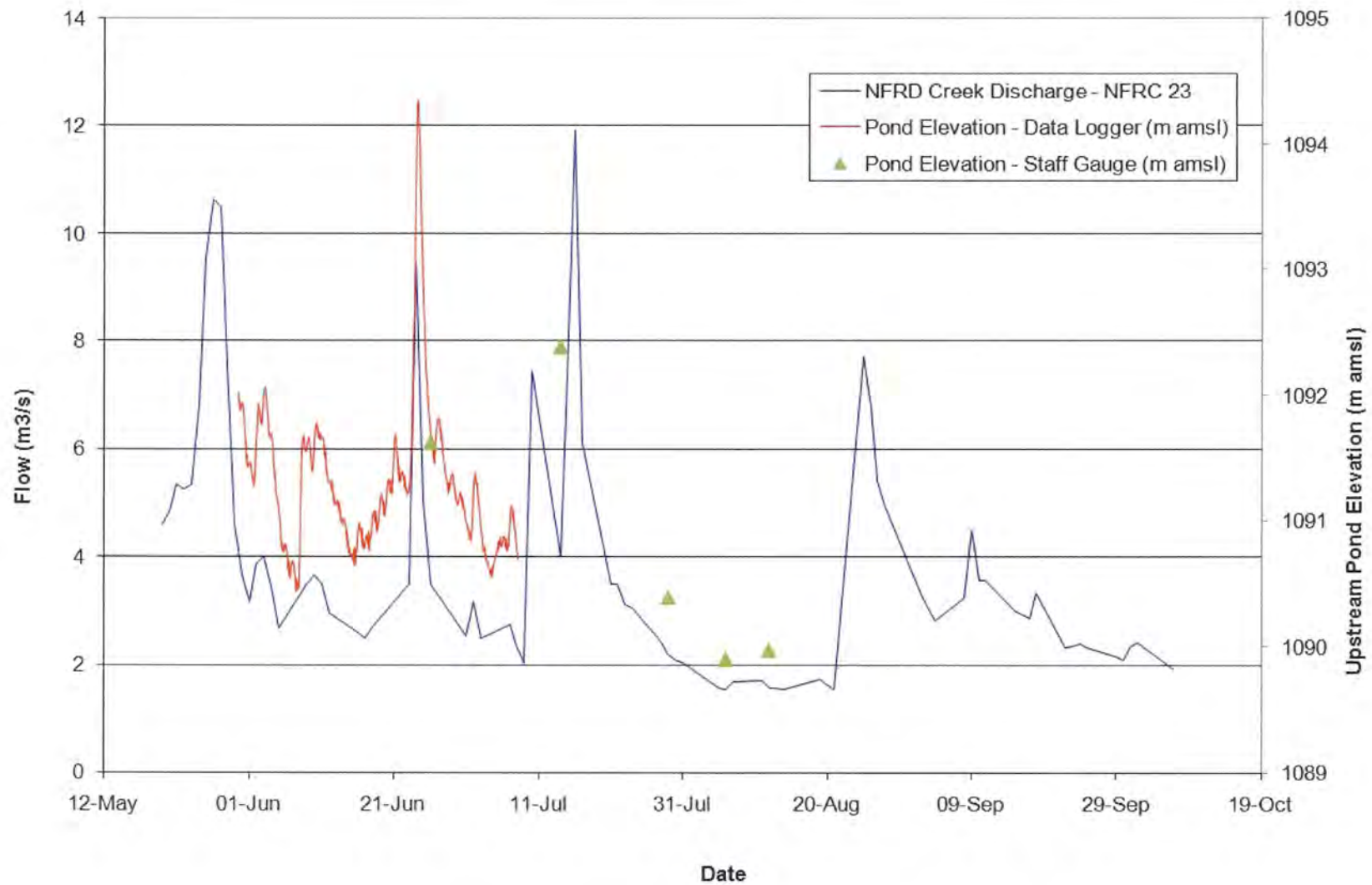
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DATE:	FEB 2009
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APPROVED:	GWF

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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: NORTH FORK ROCK DRAIN INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 26	REV.: 0



SCALE:	N/A	DESIGNED:	TMW
DATE:	FEB 2009	CHECKED:	HHH
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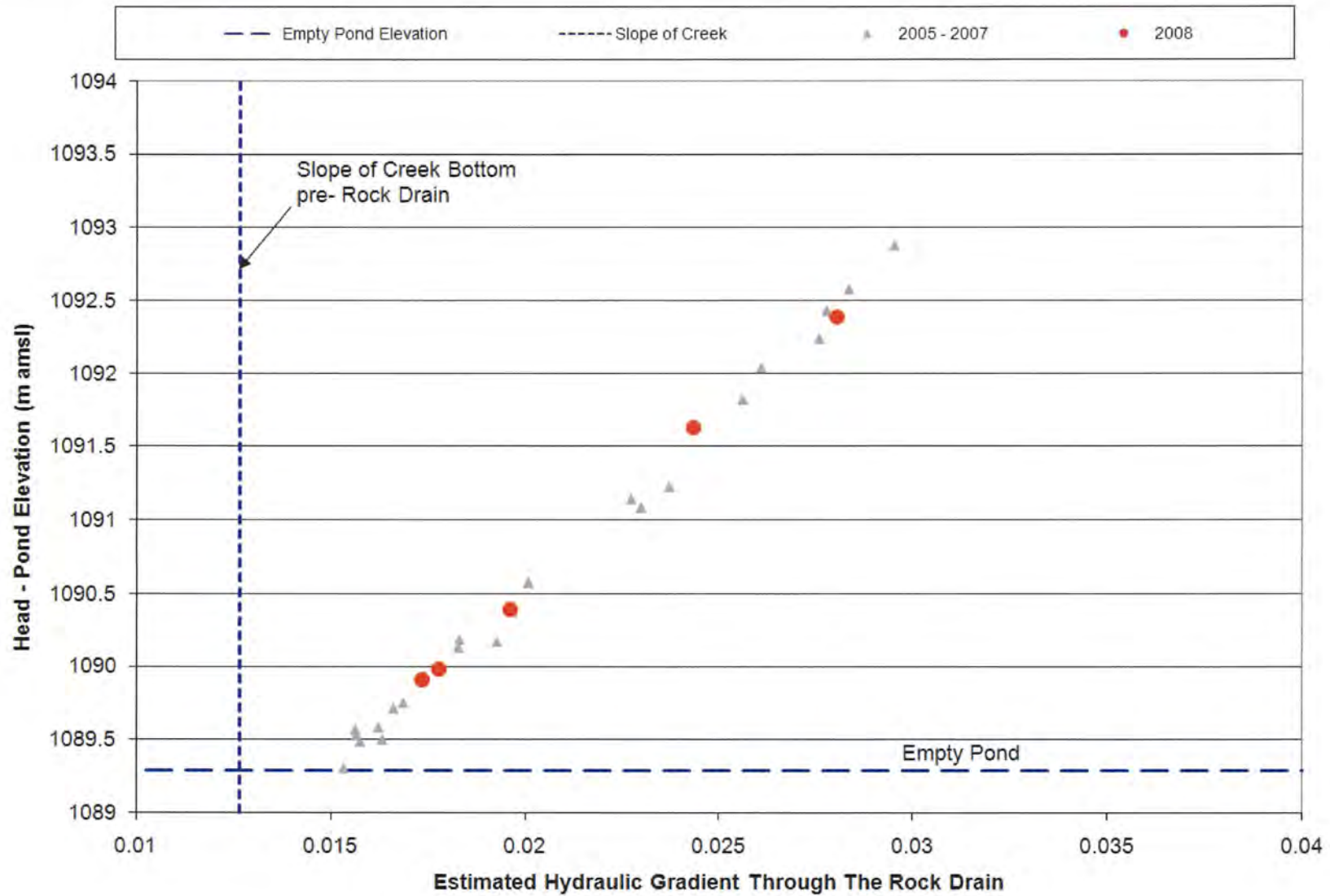
BGC BGC ENGINEERING INC.
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PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW	
TITLE:	NORTH FORK ROCK DRAIN MEASURED POND ELEVATION AND CREEK DISCHARGE	

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CLIENT: **Deloitte & Touche**

PROJECT No.:	FIGURE No.:	REV.:
0257-051-05	27	0



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DATE:	FEB 2009	CHECKED:	GKC
DRAWN:	ADW	APPROVED:	GWF



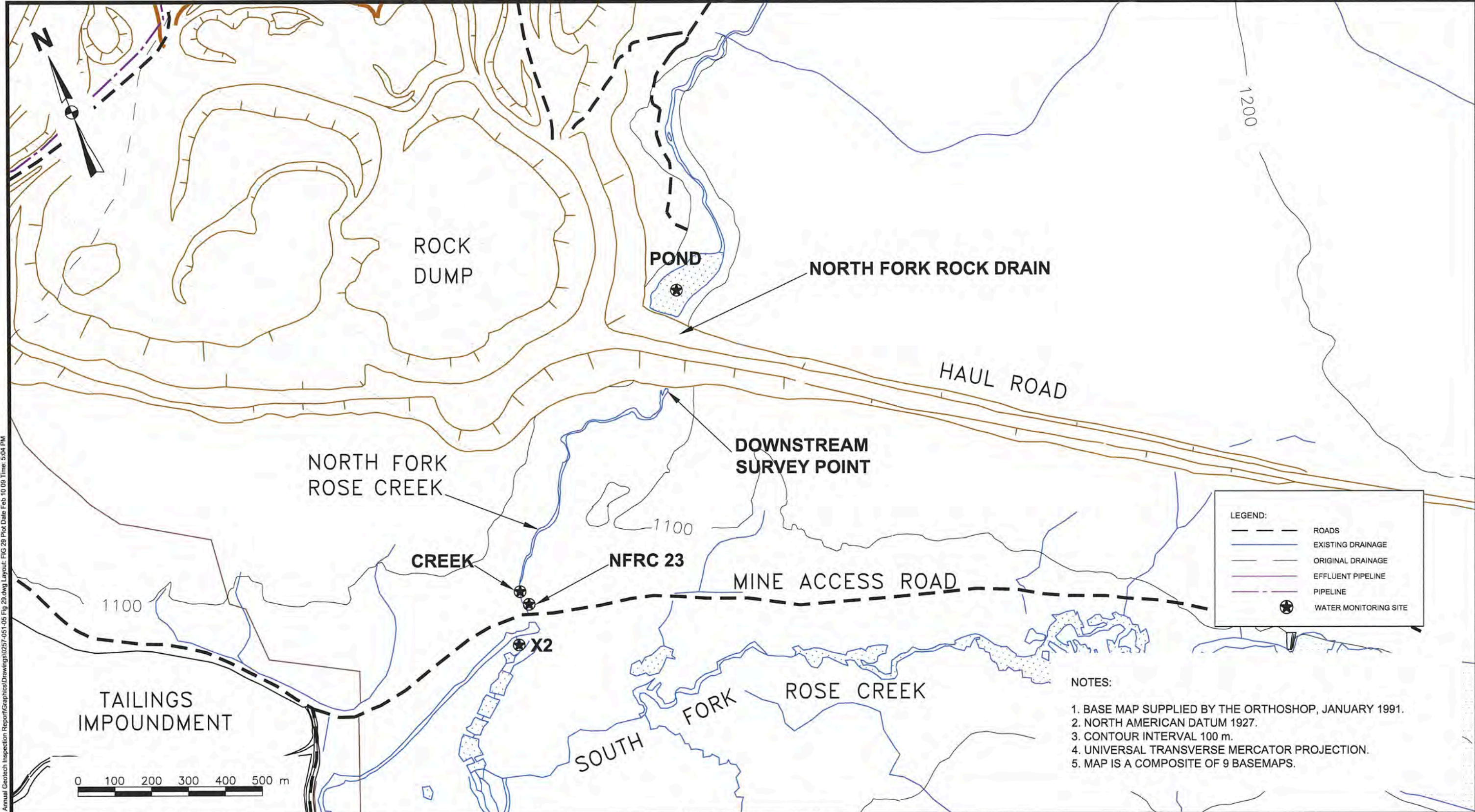
CLIENT:



PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE:	NORTH FORK ROCK DRAIN FLOW THROUGH PERFORMANCE		

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PROJECT No.:	FIGURE No.:	REV.:
0257-051-05	28	0



LEGEND:

- ROADS
- EXISTING DRAINAGE
- ORIGINAL DRAINAGE
- EFFLUENT PIPELINE
- PIPELINE
- WATER MONITORING SITE

- NOTES:**
1. BASE MAP SUPPLIED BY THE ORTHOSHOP, JANUARY 1991.
 2. NORTH AMERICAN DATUM 1927.
 3. CONTOUR INTERVAL 100 m.
 4. UNIVERSAL TRANSVERSE MERCATOR PROJECTION.
 5. MAP IS A COMPOSITE OF 9 BASEMAPS.

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APPROVED:	GWF

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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION		
TITLE: NORTH FORK ROCK DRAIN INSTRUMENT & MONITORING LOCATIONS		
PROJECT No.: 0257-051-05	FIGURE No.: 29	REV.: 0

K:\Projects\0257 D&T\051-2008-08-Annual-Geotech-Inspection-Report\Graphics\Drawings\0257-051-05-Fig 29.dwg Layout: FIG 29 Plot Date Feb 10 09 Time: 5:04 PM



May: an upstream view of the starting area of the diversion.



May: shows an upstream view of an area with geotextile exposure.



May: shows an downstream view of the area that was repaired in 2007. Note that some of the fill is soft and cracking.



May: an upstream view of the channel, banks appear to be in good condition.

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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: FARO CREEK DIVERSION CHANNEL INSPECTION PHOTOS		
PROJECT No.:	FIGURE No.:	REV.:
0257-051-05	30	0



September: shows a view of Faro Creek Diversion Channel looking downstream.



September: shows the toe of the road in the repair area. Note the ponded water in the toe area.



September: shows the backslope above the repair area. Note the slumping of the disturbed ground.



September: shows a view of Faro Creek Diversion looking upstream.

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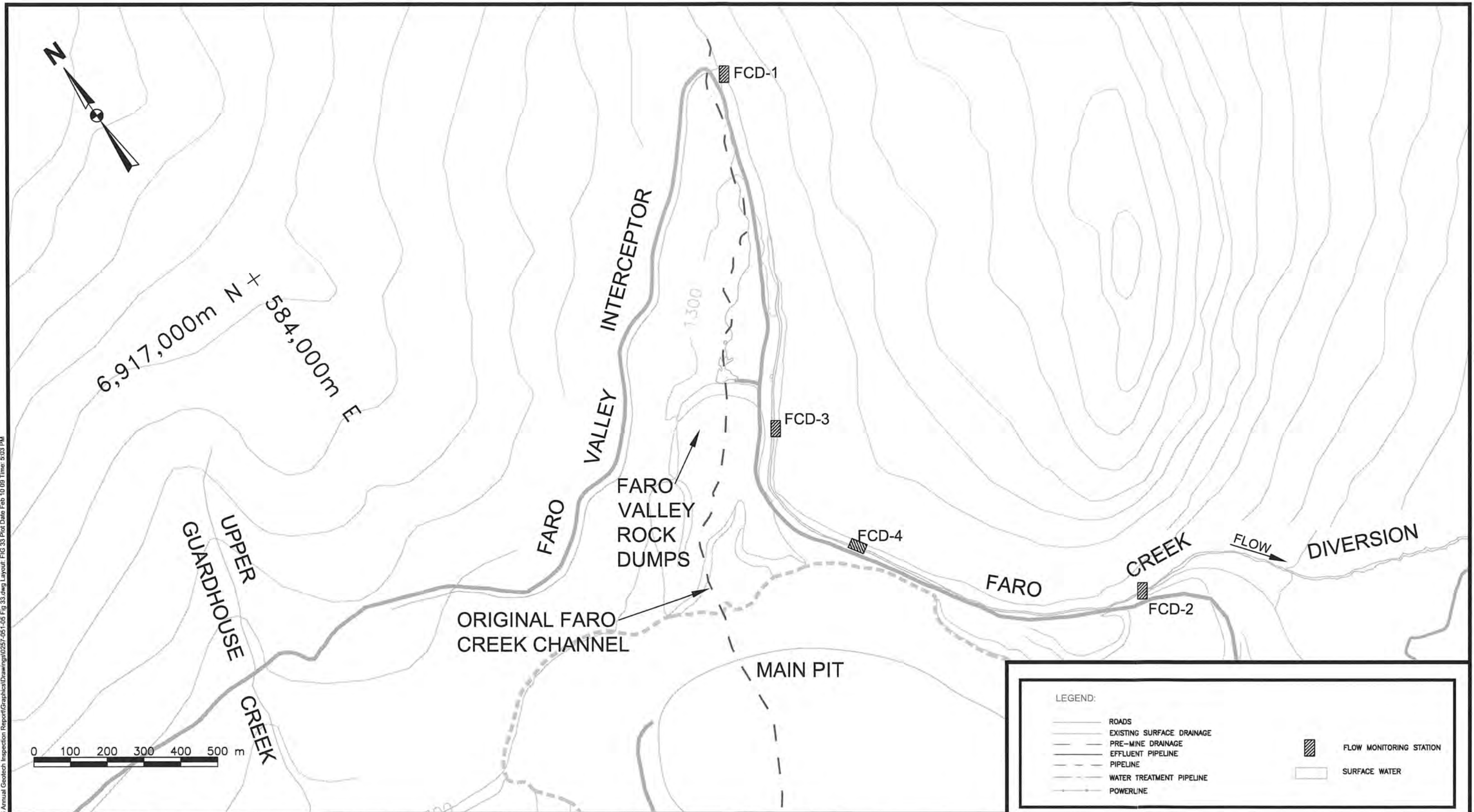
PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: FARO DIVERSION CHANNEL INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 31	REV.: 0



May: a panoramic view of the repaired slough area which was caused partially by over steepened banks. The area is still restricting the flow through the channel.

SCALE:	N/A	DESIGNED:	TMW		PROJECT:	2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
DATE:	FEB 2009	CHECKED:	HHH		TITLE:	FARO CREEK DIVERSION CHANNEL INSPECTION PHOTO		
DRAWN:	ADW	APPROVED:	GWF		PROJECT No.:	FIGURE No.:	REV.:	
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					0257-051-05	32	0	

K:\Projects\0257 D&T\051 2008 Faro Annual Geotech Inspection Report\Graphics\Drawings\0257-051-05 Fig 33.dwg Layout: FIG 33 Plot Date Feb 10 09 Time: 6:03 PM



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PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION		
TITLE: FARO CREEK DIVERSION MONITORING STATIONS		
PROJECT No.: 0257-051-05	FIGURE No. 33	REV.: 0

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.



June: shows a view of the crest of the Secondary Dam.



June: a view of the downstream face of the dam with the diversion channel on the left side of the photo.



June: shows a view of the Primary tailings dam crest.



June: looking down the upstream face from the crest of the dam.

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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: SECONDARY DAM INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 34	REV.: 0



September: shows the upstream side of the Secondary Dam. Note the water ponded near the small berm on the upstream side of the crest.



September: shows the downstream face of the Secondary Dam.



September: a view of the crest of the dam. Note that some settlement holes are forming and erosion is evident.



September: shows the upstream side of the dam with a piled tailings.

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APPROVED:	GWG

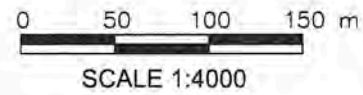
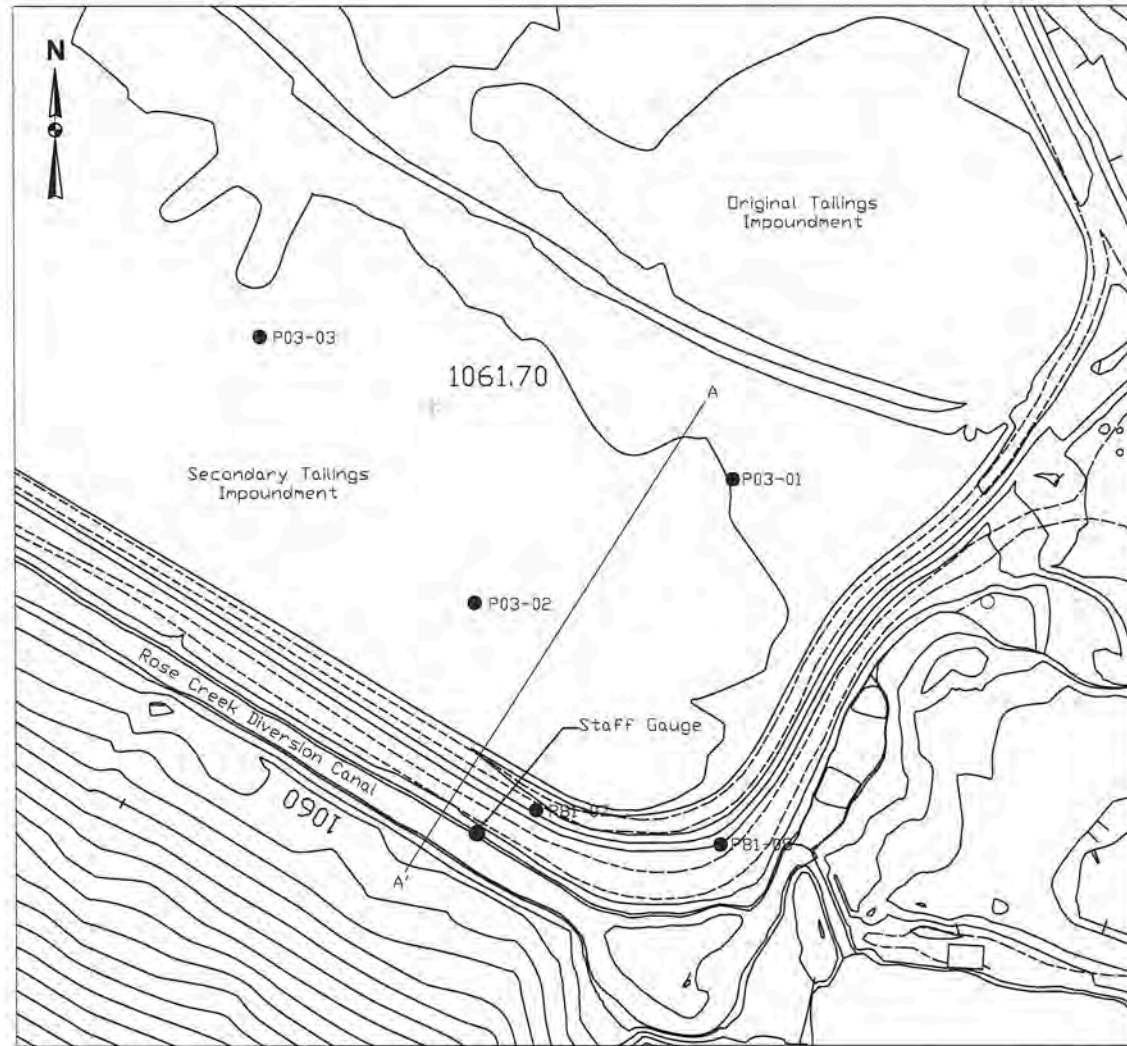
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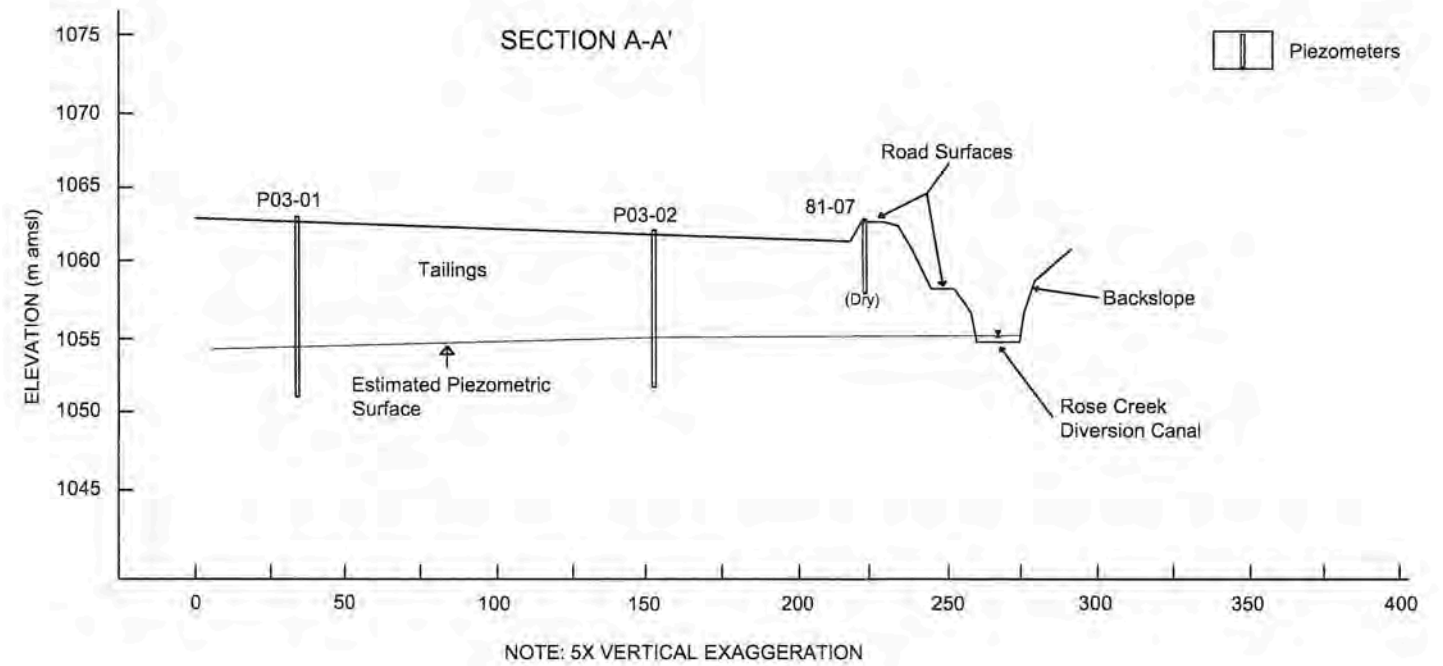
CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: SECONDARY DAM INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 35	REV.: 0

K:\Projects\0257 D&T\051 2008 Faro Annual\05 Annual Geotech Inspection Report\Graphics\Drawings\0257-051-05 Fig 36.dwg Layout: Figure 36 Plot Date Feb 11 09 Time: 9:54 AM



NOTES: 1) DRAWING IS A SCHEMATIC, CONSTRUCTED FOR ILLUSTRATIVE PURPOSES ONLY.
2) ALL ELEVATIONS ARE APPROXIMATE.



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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW
TITLE: SECONDARY DAM CURRENT PIEZOMETRIC CONDITIONS

PROJECT No.	FIGURE No.	REV.:
0257-051-05	36	0



June: shows the overall slope of the downstream side of the rock drain



September: a view of the sediment and grass that is present on the upstream face of the rock drain.



June: a view looking down the upstream face of the rock drain at the upstream pond.



September: shows the downstream face of the rock drain with water flowing clearly from the toe.

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CLIENT: **Deloitte & Touche**

PROJECT: 2008 ANNUAL GEOTECHNICAL EVALUATION AND INSTRUMENTATION REVIEW		
TITLE: K8 CREEK ROCK DRAIN INSPECTION PHOTOS		
PROJECT No.: 0257-051-05	FIGURE No.: 37	REV.: 0

2009 INSTRUMENTATION READINGS SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	09	09	09	09	09	09	09	09	09	09	09	09
1. Diversion Canal												
THERMISTORS												
- Canal Dyke: CD-15, CD-21, BGC05-04, BGC05-07, CD-26					***	***			***			
- Spoil Pile: SP-3, SP-5						***						
Backslope: BS-5, BS-9, BS-10, BS-12						***			***			
SLOPE INDICATORS												
- Canal Dike: CD-10, CD-15, CD-19, CD-21, BH94CD-1, BH91-CD1, BGC05-05, BGC05-08					***				***			
- Spoil Pile: SP-2, SP-5						***						
Backslope: BS-5, BS-9, BS-10						***						
PIEZOMETERS												
- Canal Dyke: CD-13, CD-15, CD-21 BGC05-02, BGC05-03, BGC05-06, CD-26					***	***			***			
Backslope: BS-5, BS-9						***			***			
STAFF GAUGE: RCDC-4, New Staff Gauges⁵				daily	daily	daily	daily	daily	daily			
2. Cross Valley Dam												
THERMISTORS - CVDC-6, BH88-4					***	***			***			
PIEZOMETERS: CVDC-4, CVDC-7, CVDC-9, CVDT-1, CVDT-2, CVDP-1, CVDP-3, CVDP-5, CVDP-6, 94 CVDC-1, P01-11²					***	***			***			
WEIR FLOWS¹: X-11, X-12, W3³	***	***	***	***	***	***	***	***	***	***	***	***
WEIR FLOWS¹: X-13	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly
POLISHING POND WATER LEVEL	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly
3. Intermediate Dam												
PIEZOMETERS: 91ID-4, 91-ID-6, 91-ID-7, 94-IDC-1, 96-1, 96-2, 96-3, 96-4, P01-03², P01-04², BKS04-06, BKS04-07					***	***			***			
91-ID3 (with seepage observations near south abutment)					***	***		***	***			
RETAINED POND WATER LEVEL	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly
4. Secondary Tailings Dam												
PIEZOMETERS: P81-6, P81-7, P81-8; P03-01⁴, P03-02⁴, P03-03⁴					***	***			***			
5. North Fork Rock Drain												
DATALOGGERS (automatic): can be removed in 2008												
STAFF GAUGES¹: NFRD23 and X2				daily	daily	daily	weekly	weekly	weekly	weekly		
Survey or Staff Gauge: Pond, Toe of drain					weekly	weekly	weekly	bi-weekly	bi-weekly			
6. Faro Creek Diversion Channel												
STAFF GAUGES: FCD-1, FCD-2, FD-3⁶, FD-4⁶				bi-weekly	bi-weekly	bi-weekly	bi-weekly	bi-weekly	bi-weekly	bi-weekly		
NOTES:												
1 Confirm accuracy of monitoring techniques.												
2 Before monitoring P01 series monitoring wells, confirm with AECOM staff in Whitehorse that it is alright to do so.												
3 Monitor Instrumentation twice per month												
4 Monitored as part of Environmental Monitoring Program, provide elevation data to BGC												
5 Scheduled for installation in 2009, need to develop rating curves for new instruments.												
6 Need to establish rating curve for these staff gauges.												

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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.	CLIENT: 	PROJECT No.: 0257-051-05	FIGURE No.: 38	REV.: 0