B.Y.G.
NATURAL RESOURCES INC.

VISTA
ENGINEERING

MT. NANSEN GOLD MINE

1998 EFFLUENT QUALITY ANALYSIS REPORT

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Prepared For:
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General Delivery
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290- 08
July 15, 1998

MN 056-R26
1998 Effllluent Quality Analysis Report
BYG Natural Resources
Bvista Engineering 1
5-Jul-98

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1.0 INTRODUCTION

B.Y.G. Natural Resources operates a gold mine at Mt. Nansen, located west of Carmacks, YT with water use and waste disposal regulated under water licence QZ94-004 issued by the Yukon Territory Water Board.

Amendment number three was issued on February 25, 1998 to provide temporary relief from the fish toxicity standard for effluent from the water treatment plant. Part J, Items 53 and 54 of the amendment included the following reporting conditions:

53. No later than June 30, 1998, the Licensee shall submit a "1998 Effluent Quality Analysis Report to the Board. The report shall be prepared by an independent qualified part and shall be certified by an engineer who is certified to practice in the Yukon.

54. The report shall be sufficiently detailed so as to provide assurance of compliance with all of the effluent quality standards enumerated in Part E of this licence, for the duration of this licence and shall include at a minimum:

    i) A detailed analysis of the conditions, actions, factors and circumstances that culminated in the emergency application for relief from the LC_{50} fish toxicity standard and

    ii) Details of the actions that have been taken and recommendations for actions that can be taken to ensure that all effluent standards in the licence will be met for the duration of the licence and to minimize inflows to the tailings pond and

iii) Clear statements of the actions that will be taken, including schedules for completion and detailed explanations for any actions that are recommended but will not be implemented.

Vista Engineering in conjunction with Conestoga-Rovers and Associates of Waterloo, Ontario were retained in October 1997 to assist B.Y.G. Natural Resources Inc. to evaluate the existing water treatment plant and provide recommendations for improvements for generating compliant effluent on a consistent basis. Vista Engineering was also retained to undertake an engineering evaluation of methods to reduce to surface water inflow to the tailings pond.

In partial fulfillment of the above noted water licence amendment conditions, the following reports were submitted by Vista Engineering:

Mt. Nansen Gold Mine Water Treatment Plant Upgrade Final Report, March 10, 1998 (appendix 1) and

Mt. Nansen Gold Mine Tailings Impoundment Drainage Control Evaluation, February 24, 1998 (appendix 2).

B.Y.G. Natural Resources Inc. has also submitted regular reports which include effluent quality data and other environmental information (appendix 3).

The report on the water treatment plant documents the events leading up to the request for the amendment and provides a technical analysis of the water treatment plant to determine the reasons why the effluent did not meet the LC50 toxicity test. The report also summarizes the improvements that had been made to the plant and operational recommendations for improving effluent quality.

The Drainage Control Evaluation report provided an engineering analysis of the performance of the tailings impoundment. Specifically, the intent of the analysis was to determine the reasons for the unexpected high volumes of water entering the impoundment. The report developed alternatives for reducing the amount of runoff entering the impoundment.

Vista Engineering was requested by B.Y.G. Natural Resources Inc. on July 2, 1998 to summarize available information in a report that specifically addressed the requirements of licence amendment number three.

This report is organized into sections which address each item of the licence amendment as follows:

1.0 Introduction

2.0 Background for Licence Amendment Request

3.0 Evaluation of Causes for Water Treatment Plant Effluent Toxicity

4.0 Summary of Improvements to Improve Effluent Quality

5.0 Summary of Improvements to Reduce Inflows into Tailings Pond

6.0 Future Actions and Schedules

The reader is referred to the information contained in the appendices for additional information on these items.

2.0 BACKGROUND FOR LICENCE AMMENDMENT REQUEST

A 270,000 cubic meter capacity impoundment facility provides storage of tailings and process water for the Mt. Nansen Mine mill. By the end of 1997, the tailings impoundment had received approximately 90,000 cubic of tailings.

The tailings facility was commissioned in October 1996 and began collecting tailings and surface runoff waters. During the 1997 spring melt, it became apparent that considerable surface runoff waters were entering the tailings impoundment and could reduce volume available to store tailings.

Analysis of the tailings impoundment water balance model identified that the original model did not account for seepage from the diversion ditches. It was estimated that this seepage could result in an additional 100,000 to 200,000 cubic meters of surface water entering the tailings impoundment.

B.Y.G. Natural Resources Inc. originally planned to construct a water treatment plant during the third year of operation to treat water in the tailings pond. The rate of increase of water level during the spring of 1997 was high enough that company officials made the decision to begin construction of a water treatment plant ahead of schedule as a contingency in the event that water levels kept increasing over summer months.

Monitoring of water levels during the summer of 1997 confirmed the need for treatment and an application was made to the Yukon Territory Water to commission the water treatment plant.

The Water Board approved this request with the requirement that the effluent from the plant met discharge criteria as identified in the water license.

The plant was commissioned but it was found that it was difficult to meet effluent criteria for biotoxicity using tests prescribed in the water license. The company retained the services of consultants from Inco, Connestoga Rovers and Associates and Vista Engineering to assist with trouble shooting the plant.

Connestoga Rovers and Associates modeled the treatment process in their laboratory. Based on tests using tailings pond water, it was determined that the process would not be capable of meeting the biotoxicity standards as required in the water licence without dilution. This conclusion was confirmed by process engineers from INCO Canada, the patent holders of the INCO SO_2 – Air process used in the water treatment plant.

The consultants also identified that the most likely cause for toxicity was either cyanates or ammonia in the effluent, both of which are by-products of the cyanide destruction process. Alternatives for removal of these by-products were not considered feasible for application at the Mt. Nansen site due to the potential for environmental impact and safety concerns associated with the processes.

It was also identified that both cyanates and ammonia are non-persistent compounds and readily volatize when exposed to the atmosphere. Due to the length of drainage channel which conveyed the effluent prior to entering any fish bearing waters, it was identified that the concentrations of these compounds would be reduced significantly by volatilization. As well, significant dilution was available in the downstream channel which would further reduce any potential impact on fish.

The evaluation of the water treatment plant also generated recommendations for improving efficiency and reliability of the plant to meet other effluent requirements. These recommendations were implemented resulting in an extensive over-haul and upgrading to the water treatment plant.

By early 1998, it became apparent that there was significant potential for water level to exceed the spillway invert elevation if measures were not implemented to treat and discharge water to the environment.

Officials from the Water Resources Division of the Department of Indian and Northern Affairs initially supported the operation of the water treatment plant using Victoria Creek water to dilute the final effluent in order to meet bio-toxicity tests. After an initial period of operation, the Water Board ruled that the existing water licence did not allow for company to use dilution water and an amendment was required.

B.Y.G. Natural Resources Inc. applied to the Water Board for an emergency amendment to waive the requirements of the bio-toxicity test. The Water Board issued amendment number three which allowed for the discharge of treated water with the requirement that the discharge meet all effluent criteria with the exception of the bio-toxicity test for a limited period of time.

During the operation of the water treatment plant during the term of the amendment, fish toxicity tests were undertaken on a regular basis. It was found that the toxicity of the effluent was decreasing and at the present time the effluent meets all licence parameters including fish bio-toxicity.

The decrease in toxicity has been linked to a reduction in cyanide concentrations in the tailings impoundment and the on-set of warmer weather. The decrease in cyanide concentrations is a result of improvements to the cyanide destruction process for the mill circuit completed during the work to upgrade the water treatment plant. Warmer weather has had the impact of improving water treatment plant efficiency and reducing levels of ammonia and cyanates in the tailings pond as well as promoting natural destruction of cyanide.

The water treatment plant has since been in operation with effluent meeting all licence parameters on a consistent basis. It is expected that the quality of the water contained in the tailings impoundment will continue to improve over the open water season.

3.0 DETERMINATION OF EFFLUENT TOXICITY

Complete technical details of the determination of fish toxicity is contained in the reports included in appendix one to this report. The following provides a summary of the technical analysis.

The water treatment plant utilizes the INCO sulfur dioxide – air process for cyanide destruction followed by conventional coagulation – flocculation for removal of heavy metals and particulate matter.

The plant consists of three, 25 cubic meter reactors in series followed by a lamella clarifier. All reactors are mechanically mixed with compressed air supplied to the first two reactors.

In the first reactor, sulfur dioxide and air are added in conjunction with lime slurry to effect reduction of cyanide to ammonia at a pH of 9 in the presence of cupric sulfate as a catalyst.

The second tank is mixed and aerated to provide additional contact time for the effluent from the first reactor.

Ferric sulfate is added to the third reactor to coagulate particulate matter and heavy metals including zinc, copper, arsenic and silver. Lime slurry is added to maintain an optimum process pH of 8.

Polymer is added by flash mixing at the inlet to the lamella clarifier after which larger flocs are created by slow mixing. The flocs are settled by gravity in the lamella clarifier prior to discharge from an overflow weir.

A 1600 cubic meter detention pond provides final polishing and allows for the effluent to be diverted back to the tailings pond in the event of a process upset.

The technical evaluation of the water treatment plant completed by Vista Engineering and Connestoga Rovers and Associates provided recommendations for changes to the process to improve treatment efficiency and reliability of the plant. Review of available effluent quality data and additional water quality testing completed during the initial review did not indicate the cause for fish toxicity.

It was decided that Connestoga Rovers and Associates would undertake detailed bench scale testing of the system processes while upgrades to the water treatment plant were completed.

CRA ran numerous bench scale tests of the processes used in the plant with bio-toxicity and detailed water chemistry tests completed on effluent from various test runs. Based on this work, it was determined that the most likely cause for toxicity to fish was either cyanates or ammonia. Both of these compounds are a by-product of the INCO SO_2 air cyanide destruction process.

CRA identified potential unit processes which could destroy both cyanate and ammonia but it was determined that these process could have adverse environmental and/ or safety impacts themselves.

The laboratory tests also identified improvements to the processes which would reduce the ammonia and cyanate concentrations. These improvements were implemented resulting a reduction of the dilution water required to meet the fish bio-assay from 1:5 to 1:2.

The analytical work also identified that there were relatively high levels of cyanates and ammonia in the tailings pond water. This would add to the cyanates and ammonia created during the cyanide destruction process and increase the toxicity of the effluent. It was identified that a significant reduction of cyanates and ammonia could be expected with warmer temperatures and open water conditions.

4.0 SUMMARY OF CHANGES TO IMPROVE EFFLUENT QUALITY

Based on the engineering evaluation of the water treatment plant, B.Y.G. Natural Resources Inc. undertook an extensive program of modifications and upgrades to the water treatment plant. These changes are summarized in the following table.

Item	*Change or Addition*	*Effect*
Influent Supply	New supply line	Increase supply capacity, improve reliability
	Insulate lines	Reduce potential for freezing
	Additional pumps	Increase supply capacity, improve reliability
	Steam pre-tempering	Increase influent temperature to increase treatment efficiency
	Constant head tank	Compensates for influent supply fluctuations
SO_2 Supply	All fittings welded or flanged	Improve reliability, reduce potential for leaks
	Thermal flow meter	Improve metering of SO_2 supply and allows accurate estimates of SO_2 remaining in bulk tank
	Bypass piping	Allow quick removal and servicing of control components
	SS piping	Reduce potential for corrosion
	Low emission valves	Reduce potential for leaks
	Metering valves	Improve accuracy of metering SO_2
PH Control	PID Controller	Maintain constant pH
		Automatically compensate lime feed to maintain constant pH in the event of changes to process variables
		Provide high and low pH alarms to automatically divert effluent to tails in the event of process upsets
	Pneumatic slurry pumps	Improve reliability of lime slurry supply
Process Chemicals	Industrial grade chemical metering pumps	Improve reliability of supply of ferric sulfate and polymer. Provide precise metering of process chemicals.
	Optimize chemical type	Improve efficiency, reduce preparation required
Reactor Mixing	New motors	Increase reliability, reduce downtime with on-shelf spare
Chemical Mixing	New mixers	Increase reliability, reduce downtime with on-shelf spare
Effluent Polishing	2 GAC columns @ 2.5 tonnes each	Remove residual metals Reduce residual cyanides by 50%
Clarifier Enclosure	Enclose and heat clarifier and GAC tanks	Improve process efficiency. Reduce potential for freezing.
Hydrolysis	Hydrolysis reactor	Reduce cyanate concentrations Reduce toxicity of ammonia in effluent
Analytical	In-line turbidity meter	Continual monitoring of effluent turbidity Automatic diversion of effluent to tails in event of process upset

		Improve fine tuning of coagulation – flocculation process
	Hach DR-2000	Allows on site analysis of key effluent parameters
	Ion-specific probe & meter	Rapid measurement of ammonia, cyanate & cyanide
Effluent Control	Automatic valves	Automatic diversion of effluent in the event of process upset
Mill Cyanide Destruction	Improve SO2 supply & mixing	Reduce cyanide levels in discharge to pond. Residual SO2 will reduce cyanide levels in pond.
Documentation	O&M manuals	Reduce maintenance time, improves reliability
Operator Training		Improve system reliability & reduce down time

A significant drop in cyanide, cyanate and ammonia levels has been observed in the tailings pond due to the improvements in the mill circuit cyanide destruction process, the on-set of warmer weather and open water conditions. This has resulted in a decrease in loading on the water treatment plant which has also improved effluent quality considerably.

These changes have resulted in an improvement of effluent quality where it is reported by the company that all licence parameters, including the fish bio-toxicity test, are being met on a consistent basis.

5.0 SUMMARY OF IMPROVEMENTS TO REDUCE TAILINGS POND INFLOWS

The following summarizes the details of the engineering evaluation of drainage control for the tailings impoundment contained in the report included in appendix B.

The report identified that the primary cause for excessive water levels in the tailings pond was as a result of high permeability in the ditches which divert water from entering the tailings pond. Measurement of water flows in the ditches in the fall of 1997 identified that up to 50% of the water which entered these ditches would report to the tailings impoundment by seepage through underlying sandy soils.

Seepage from the diversion ditches was not included in the initial water balance analysis completed for B.Y.G. Natural Resources Inc. by the consultants retained for the design and construction of the tailings impoundment.

The drainage control evaluation recommended that runoff from the spring 1998 freshet be collected in a sump and pumped around the tailings impoundment. The report also recommended that the ditches be lined with an impermeable liner to provide long term seepage control.

The pumping system was installed and operated successfully. An application has been made to the Water Board to line the ditches and the material has been ordered and is on site. The liners will be installed once approvals have been granted and the ditches have dried sufficiently to allow for construction.

6.0 FUTURE ACTIONS AND SCHEDULES

Recommended improvements and changes to the water treatment plant and the cyanide destruction process on the mill circuit have been completed. The water treatment plant is producing compliant effluent on a consistent basis.

The liners for the tailings impoundment diversion ditches have been purchased and are on site. The liners will be installed once requisite approvals from the Water Board have been received and soils are sufficiently dry to allow for controlled placement. Water is being diverted from the diversion ditches by pumping at this time.

Cyanide levels in the tailings pond have dropped considerably and are expected to continue to decrease as the mill circuit cyanide destruction process continues to operate. Cyanate and ammonia levels have also been reduced and are expected to remain low as there will be less natural degradation of cyanide. The decreasing loading on the water treatment plant is expected to result in increasing effluent quality.

Water levels in the pond have decreased and the company plans to operate the water treatment plant until the water volume is reduced to that required for mill operation. The installation of the liners will limit surface water runoff entering the pond in the future.

Once the volume of impounded water in the tailing pond has been reduced to an acceptable level, it is expected that the operation of the treatment plant can be curtailed significantly.

B.Y.G.
NATURAL RESOURCES INC.

VISTA
ENGINEERING

MT. NANSEN GOLD MINE

WATER TREATMENT PLANT UPGRADE
FINAL REPORT

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Prepared For:
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290-08
March 10, 1998

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VISTA ENGINEERING

Our File: 290-08

March 10, 1998

B.Y.G. Natural Resources Inc.
General Delivery
Carmacks, YT
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Attention: Mr. Graham Dickson

Re: Mt. Nansen Water Treatment Plant Upgrade – Final Report

Please find enclosed seven copies of the above noted report.

Based on the results of this work, the Mt. Nansen water treatment plant is capable of producing compliant effluent on a consistent basis for all parameters. The fish biotoxicity test was passed when the plant effluent was conditioned with two parts dilution water to one part effluent.

The cause for fish toxicity has been identified to be the presence of cyanates or ammonia, both of which are by-products of the Inco SO_2 – air cyanide destruction process.

Practical alternatives for reducing toxicity to fish are limited to superchlorination – dechlorination or conditioning by dilution. Due to the potential environmental impacts and safety concerns associated with using gaseous chlorine, it is recommended that dilution be used to meet this licence requirement.

If you should have any questions or require additional information, please contact us at 393-3458.

Yours truly,

Vista Engineering

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1.0 INTRODUCTION

This report summarizes the results of the upgrading program completed on the water treatment plant at the Mt. Nansen Mine from October 1997 to January 1998.

Vista Engineering was retained in October 1997 to assist B.Y.G. Natural Resources Inc. to evaluate the existing water treatment plant and provide recommendations for improvements for generating compliant effluent on a consistent basis. Conestoga-Rovers and Associates of Waterloo, Ontario provided expert technical and analytical support for the project.

2.0 BACKGROUND

2.1 General

A 270,000 cubic meter capacity impoundment facility provides storage of tailings and process water for the Mt. Nansen Mine mill. Since commissioning, the tailings impoundment has received approximately 90,000 cubic of tailings. The tailings impoundment has also received considerable runoff water which has resulted in an accumulation in excess of 200,000 cubic meters of water in addition to the tailings.

Original forecasts predicted that the pond would have sufficient volume to contain tailings production as well as surface water runoff for two to three years. Water levels were observed to be considerably in excess of that predicted after spring runoff in 1998. Based on these observations, B.Y.G. Natural Resources Inc. made the decision to construct and operate a water treatment plant in an attempt to

reduce water levels. It was originally planned to construct the water treatment plant during the third or at the earliest, second year of operation.

A 70 cubic meter per hour water treatment plant was constructed during the spring and summer of 1998 utilizing primary components from a mine which had similar tailings water to treat. Plant effluent was compliant with all licence requirements except for the fish bio-assay test and discharge was not permitted by the Water Resources Division of DIAND.

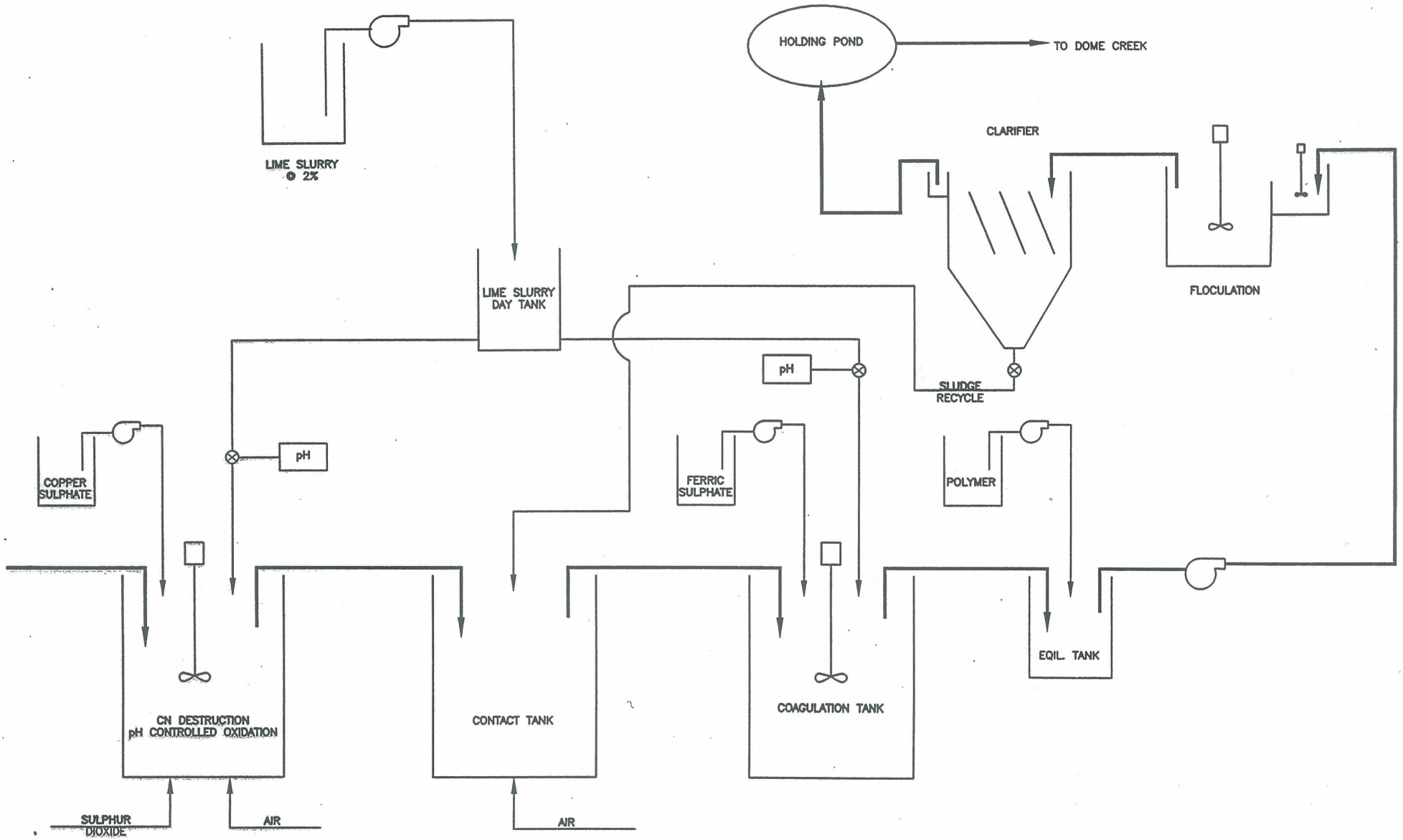
Vista Engineering and Conestoga-Rovers and Associates were retained in October to undertake a technical evaluation of the plant to determine the reason for fish toxicity in the effluent and to provide recommendations for changes to the plant to generate compliant effluent.

2.2 Plant Description

The original Mt. Nansen water treatment plant layout is depicted on the accompanying schematic diagram and described as follows.

The water treatment plant utilizes the INCO sulfur dioxide – air process for cyanide destruction followed by conventional coagulation – flocculation for removal of heavy metals and particulate matter.

The plant consists of three, 25 cubic meter reactors in series followed by a lamella clarifier. All reactors are mechanically mixed with compressed air supplied to the first two reactors.



TAILINGS FACILITY SPILLWAY
PLAN VIEW

B.Y.G.
NATURAL RESOURCES INC.

VISTA ENGINEERING

DATE: JANUARY 19, 1997	FIGURE: 2.1
BY: VM	SCALE: AS SHOWN

In the first reactor, sulfur dioxide and air are added in conjunction with lime slurry to effect reduction of cyanide to ammonia at a pH of 9 in the presence of cupric sulfate as a catalyst.

The second tank is mixed and aerated to provide additional contact time for the effluent from the first reactor.

Ferric sulfate is added to the third reactor to coagulate particulate matter and heavy metals including zinc, copper, arsenic and silver. Lime slurry is added to maintain an optimum process pH of 8.

Polymer is added by flash mixing at the inlet to the lamella clarifier after which larger flocs are created by slow mixing. The flocs are settled by gravity in the lamella clarifier prior to discharge from an overflow weir.

A 1600 cubic meter detention pond provides final polishing and allows for the effluent to be diverted back to the tailings pond in the event of a process upset.

3.0 INITIAL EVALUATION

An initial evaluation of water treatment plant effluent data provided by B.Y.G. Natural Resources Inc. did not reveal any readily identifiable cause for fish toxicity.

Andrew Lugowski, P.Eng. of Conestoga Rovers and Associates and Victor Menkal, P.Eng. of Vista Engineering traveled to Mt. Nansen mine site to undertake to inspect the process and undertake additional process testing on October 30, 1997.

B.Y.G. Natural Resources Inc. staff had indicated that the water treatment plant had produced effluent which was compliant with licence limits, although the duration of operation was limited.

Table 3.1 identifies tailings pond water quality, licence limits and removal efficiencies required to meet limits. Tailings pond water quality is based on an arithmetic mean of samples collected during this project.

Parameter	Units	Influent	Licence Limits	% Reduction Required
pH	mg/L	9.29	6.0 - 8.5	9.2
Total Cyanide	mg/L	99.43	0.3	99.7
Weak Acid Diss CN	mg/L	55.9	0.1	99.8
Antimony (total)	mg/L	0.094	0.15	0.0
Arsenic (dissolved)	mg/L	0.709	0.15	78.8
Barium (total)	mg/L	0.023	1.0	0.0
Cadmium (total)	mg/L	0.392	0.02	94.9
Chromium (total)	mg/L	0.00124	0.04	0.0
Copper (total)	mg/L	18.3	0.2	98.9
Iron (total)	mg/L	1.158	1	13.6
Lead	mg/L	0.0036	0.1	0.0
Manganese	mg/L	0.300	0.5	0.0
Mercury	mg/L	0.00122	0.005	0.0
Nickel (total)	mg/L	0.105	0.3	0.0
Silver (total)	mg/L	1.059	0.1	90.6
Zinc (total)	mg/L	32.8	0.3	99.1

Table 3.1

It can be seen that extremely high removal efficiencies are required to meet licence limits for key parameters. For example, treatment efficiency in excess of 99% is required for cyanides and some heavy metals.

On site testing of key parameters identified that it was difficult to maintain effluent quality which would consistently meet licence requirements. Any changes to process parameters such as influent flow rates, influent quality, temperature, chemical feed rates or chemical feed concentrations would result in non-compliant effluent.

The water treatment plant is rated at 70 cubic meters per hour. Allowing for down time and maintenance requirements, it is expected that the actual treatment rate will be approximately 50 cubic meters per hour. In order to provide sufficient reduction in tailings pond levels prior to spring freshet in 1998, the plant will be required to operate on a continual 24 hour basis and reliability becomes critical.

It was identified that conventional maintenance of the system could result in unacceptable down time considering the long lead time to order and receive parts at the location of the mine.

Based on the initial evaluation the scope of work was expanded to include the following:

- Improvements to control of key process parameters including automated process to generate compliant effluent on a consistent basis,
- Upgrading of key plant components to improve system reliability and
- Bench scale testing of tailings pond water to determine cause for toxicity to fish and to determine process required to reduce this toxicity.

Bulk samples of tailings pond water were collected and shipped to Conestoga-Rovers and Associates labs in order to undertake the bench scale testing.

4.0 BENCH SCALE TESTING

Conestoga-Rovers and Associates undertook extensive bench scale testing to model the treatment processes at the Mt. Nansen water treatment plant. The objective of this work was to determine the cause of toxicity to fish during bio-assay tests and to test various unit processes to reduce this toxicity. The results of their work are included in appendix A and summarized as follows.

Analysis of effluent from the water treatment plant as well as effluent from the bench scale model of the plant indicated that the most likely cause for toxicity to fish was from cyanates and ammonia. Both of these compounds are created during the destruction of cyanide during the Inco SO_2 – air process as well as during natural degradation of cyanide in the tailings pond.

Communication with Inco (E. Devuyst, 97/12/3) confirmed that the process was not capable of passing fish toxicity tests without diluting effluent at a factor of two to four times.

A number of unit processes were tested in an effort to remove these compounds. It was found that the only feasible method for destruction of cyanates and ammonia was by super chlorination. Using gaseous chlorine, it is estimated that approximately 40 cubic meters per week of compressed chlorine gas would be required to treat the effluent.

Although chlorination is a common method of reducing nitrogen based compounds in southern locations, safety and environmental considerations prevent the application of this technology at the Mount Nansen mine site.

Potential safety problems include the transportation and handling of a hazardous gas under pressure. Further, if chlorine and sulfur dioxide gas are mixed, the resultant gas is

extremely toxic at very low concentrations. Transportation of the volume of chlorine required would be hazardous over the 70km access road to the site, which has numerous sharp turns, steep grades and poor sight distances.

The use of chlorine could also have an environmental impact due to the formation of chloro-organics or due to residual chlorine in the effluent.

The testing work also identified that partial reduction in the concentration of cyanates could be achieved by a reduction in pH to between 6.0 and 6.3 which would result in hydrolysis. The reduction in effluent pH was also identified to be effective in reducing the toxicity of ammonia.

As well it was identified that granular activated carbon (GAC) was extremely effective at removing heavy metals and would provide a 50% reduction in cyanides at low concentration.

In consultation with officials from the Water Resources Division, it was decided that the chlorination of effluent was not feasible at the Mt. Nansen mine site due to the environmental and safety risks associated with its use.

It was concluded that viable improvements were limited to the installation of GAC columns and the addition of a hydrolysis reactor where the pH would be adjusted to 6.0 – 6.3 and heavily aerated.

5.0 PLANT IMPROVEMENTS

5.1 Process Control Upgrading

It was noted during the preliminary analysis of the plant that it was difficult to control pH and SO_2 flow in the primary cyanide destruction reactor. As control of these process parameters is critical in generating compliant effluent, a complete upgrade of the control systems was undertaken.

The original "bang – bang" pH controller was replaced with a Baily Type TB701 analytical controlling transmitter which could provide full proportional, integral derivative control of pH. The original electric centrifugal pumps were replaced with pneumatic positive displacement pumps. As well, the entire SO_2 supply system was overhauled with new stainless steel piping, a Baily 10A6100 "Purgemaster" flow meter (later replaced with a thermal flow meter/ totalizer), stainless needle valves and low emission isolation valves.

The pH controller was observed to be maintaining pH levels within a hysteresis of approximately 0.5 to 0.7 pH units with the pH controller operating in a high/low set point mode. In an attempt to attain more precise pH control, the control unit was reprogrammed to operate in full proportional, derivative, integral (PID) control mode. In this mode of operation, the controller mathematically attempts to predict the effect of changes to process variables and adjusts inputs automatically to compensate for the lag time due to hydraulic retention time and other factors.

Tuning was accomplished by manual iteration using various control algorithm coefficients. Initial set points were determined by calculation of process variables

including hydraulic retention time, valve operation, etc. The control parameters were subsequently tuned by observation of the response curve and changes to the initial settings.

Final pH control was established within 0.1 to 0.2 pH units of the set point. This level of hysteresis is considered to be acceptable for the type of process controlled. Final set points for process parameters are listed as follows:

Process Data:	Influent WAD CN^-	60 ppm
	Influent flow rate	25 m^3/hr
	Influent temperature	4°c
	Lime slurry conc.	2%
Process set points:	SO2	0.12 L/min
	pH set point	9 +/- 0.2
	Band (proportional) coef.	15%
	Reset (integral) coef.	0.1/min
	Derivative coef.	0

Effluent Data Process Reactor No. 1, 15/11/97 2000 hours

WAD CN^-	0.10 ppm
WAD CN^- (duplicate)	0.10 ppm
Nitrogen Ammonia	3.5 ppm

Further improvements to the plant as outlined in the next section as well as ongoing fine tuning to the control systems improved cyanide destruction where WAD cyanide levels could be maintained below 0.10 ppm on a consistent basis.

5.2 Physical Improvements

Extensive improvements and modifications were undertaken at the water treatment plant from October 1997 to January 1997 to improve the efficiency and reliability of the system. These improvements are summarized in table 5.2 with a schematic of the final plant depicted on the accompanying diagram.

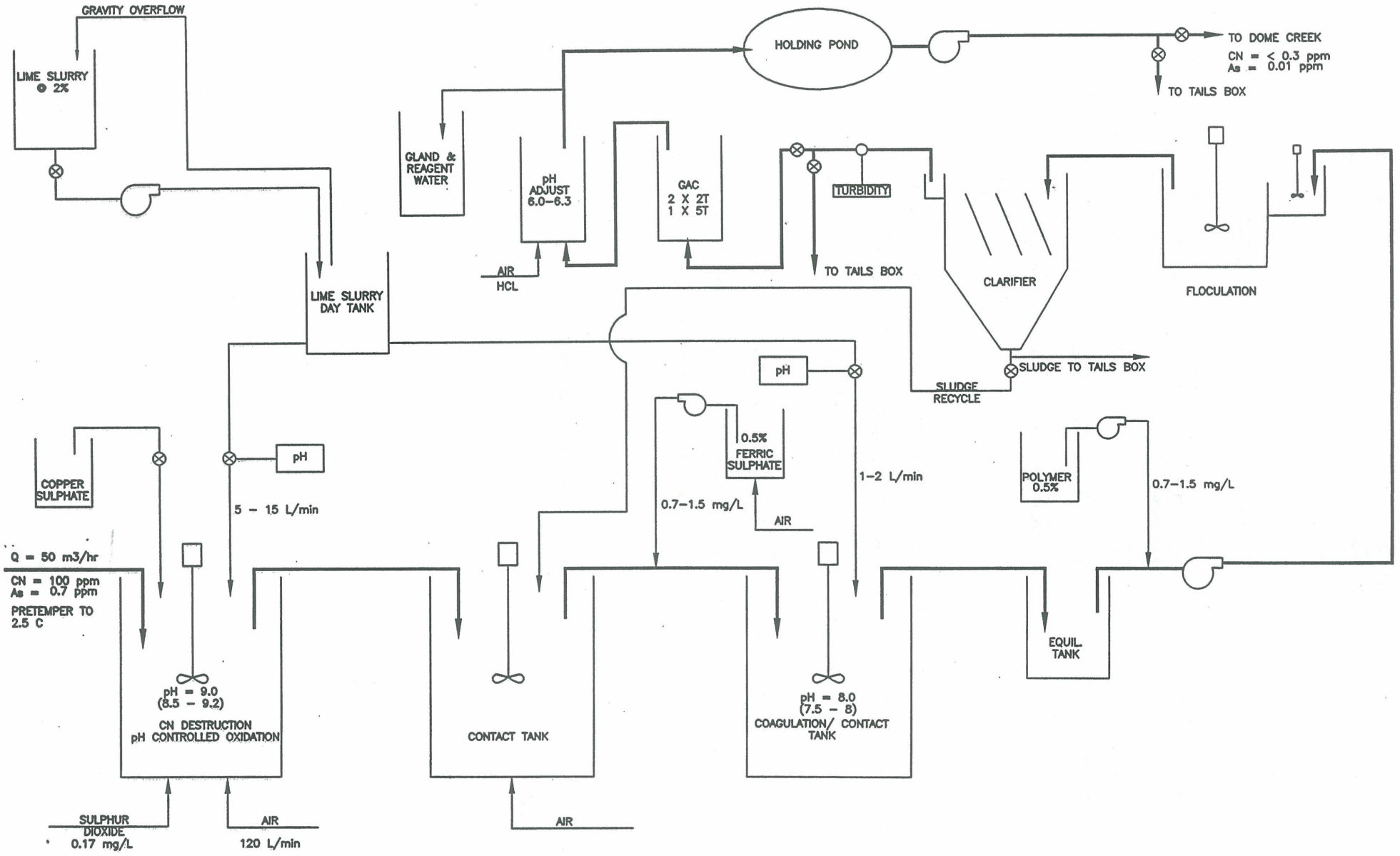
Item	*Change or Addition*	*Effect*
Influent Supply	New supply line	Increase supply capacity, improve reliability
	Insulate lines	Reduce potential for freezing
	Additional pumps	Increase supply capacity, improve reliability
	Steam pre-tempering	Increase influent temperature to increase treatment efficiency
	Constant head tank	Compensates for influent supply fluctuations
SO_2 Supply	All fittings welded or flanged	Improve reliability, reduce potential for leaks
	Thermal flow meter	Improve metering of SO_2 supply and allows accurate estimates of SO_2 remaining in bulk tank
	Bypass piping	Allow quick removal and servicing of control components
	SS piping	Reduce potential for corrosion
	Low emission valves	Reduce potential for leaks
	Metering valves	Improve accuracy of metering SO_2
PH Control	PID Controller	Maintain constant pH
		Automatically compensate lime feed to maintain constant pH in the event of changes to process variables
		Provide high and low pH alarms to automatically divert effluent to tails in the event of process upsets
	Pneumatic slurry pumps	Improve reliability of lime slurry supply
Process Chemicals	Industrial grade chemical metering pumps	Improve reliability of supply of ferric sulfate and polymer. Provide precise metering of process chemicals.
	Optimize chemical type	Improve efficiency, reduce preparation required
Reactor Mixing	New motors	Increase reliability, reduce downtime with on-shelf spare
Chemical Mixing	New mixers	Increase reliability, reduce downtime with on-shelf spare
Effluent Polishing	2 GAC columns @ 2.5 tonnes each	Remove residual metals Reduce residual cyanides by 50%
Clarifier Enclosure	Enclose and heat clarifier and GAC tanks	Improve process efficiency. Reduce potential for freezing.
Hydrolysis	Hydrolysis reactor	Reduce cyanate concentrations Reduce toxicity of ammonia in effluent
Analytical	In-line turbidity meter	Continual monitoring of effluent turbidity

		Automatic diversion of effluent to tails in event of process upset Improve fine tuning of coagulation – flocculation process
	Hach DR-2000	Allows on site analysis of key effluent parameters
	Ion-specific probe & meter	Rapid measurement of ammonia, cyanate & cyanide
Effluent Control	Automatic valves	Automatic diversion of effluent in the event of process upset
Documentation	O&M manuals	Reduce maintenance time, improves reliability
Operator Training		Improve system reliability & reduce down time

The installation of automated process control equipment and improvements in chemical metering and influent flow rates resulted in WAD cyanide levels being reduced to below licence limits on a consistent basis.

The reliability of the operation of the water treatment plant was also noted to improve with improvements to control and metering. With the upgrades in place, the plant has been operated by mill personal for an extended period of time with few problems.

Analytical results of the performance of the plant are presented in the following sections.



MT. NANSEN MINE
WATER TREATMENT FLOW SHEET

B.Y.G. NATURAL RESOURCES INC.

VISTA ENGINEERING

DATE: JANUARY 19, 1998	FIGURE: 5.1
BY: VM	SCALE: NTS

6.0 ANALYTICAL RESULTS

On-site analytical work was completed at the mines lab to aid in process tuning and improvements. After data from these analysis indicated adequate performance of the system, water samples were sent to Norwest Labs in Edmonton for detailed analysis. Norwest Labs also undertook 96 hour LC_{50} fish bio-assay tests through out the project.

Analytical results from Norwest Labs are appended to this report and summarized below.

6.1 Unit Processes

Tables 6.1, 6.2 and figures 6.1 to 6.3 depict analytical results for water licence parameters through the water treatment plant. Samples were collected at time intervals equivalent to the retention time of the reactors in order that the effect of various unit processes on the same slug of water could be determined.

The data indicates an extremely high level of removal efficiency for all parameters with all concentrations below licence limits. For parameters which exceeded licence limits at the influent to the plant, removal efficiencies were measured to be from 98.6 to 100.0%.

The SO_2 supply was turned off by water treatment plant operators prior to collection of the last sample in order to replace the lime slurry mixer. This resulted in the high cyanide levels reported for the sample collected at 2100 hours in table 5.2.

WATER TREATMENT PLANT
UNIT PROCESS LICENCE PARAMETER CONCENTRATIONS

Parameter	*Units*	*Influent*	*R1*	*R2*	*Clarifier*	*GAC*	*Licence Limits*	*% Reduction Achieved*
pH	mg/L	9.29	8.91	8.93	7.54	9.11	6.0 - 8.5	na
Total Cyanide	mg/L	99.43	15	15.5	18.5	0.27	0.3	99.7
Weak Acid Diss CN	mg/L	55.9	0.27	0.314	0.11	0.018	0.1	100.0
Antimony (total)	mg/L	0.094	0.099	0.094	0.033	0.027	0.15	71.4
Arsenic (dissolved)	mg/L	0.709	0.530	0.500	0.010	0.010	0.15	98.6
Barium (total)	mg/L	0.023	0.025	0.025	0.022	0.030	1.0	-27.8
Cadmium (total)	mg/L	0.392	0.399	0.378	0.137	0.001	0.02	99.9
Chromium (total)	mg/L	0.00124	0.002	0.0023	0.0014	0.0008	0.04	35.5
Copper (total)	mg/L	18.3	13.0	12.3	0.315	0.001	0.2	100.0
Iron (total)	mg/L	1.158	0.968	1.42	0.085	0.003	1	99.7
Lead	mg/L	0.0036	0.003	0.01	0.002	0.002	0.1	44.4
Manganese	mg/L	0.300	0.362	0.345	0.625	0.203	0.5	32.2
Mercury	mg/L	0.00122	0.0012	0.0011	0.0008	0.0001	0.005	91.8
Nickel (total)	mg/L	0.105	0.239	0.107	0.051	0.001	0.3	99.0
Silver (total)	mg/L	1.059	0.628	0.413	0.032	0.001	0.1	99.9
Zinc (total)	mg/L	32.8	34.2	32.1	5.35	0.0005	0.3	100.0

Notes: Influent conc are arithmatic mean of seven influent samples

indicates influent below licence limits

Table 6.1

WATER TREATMENT PLANT
EFFLUENT LICENCE PARAMETER CONCENTRATIONS

Parameter	Units	GAC Effl. 21/12/97 1600	GAC Effl. 21/12/97 1700	GAC Effl. 21/12/97 1745	GAC Effl. 21/12/97 1800	GAC Effl. 21/12/97 2000	GAC Effl. 21/12/97 2100	*Licence Limits*
pH		9.02	9.11	9.11	9.14	9.16	9.17	6.0 - 8.5
Total CN	mg/L	0.130	0.170	0.27	0.250	0.960	71	0.3
Weak Acid Diss CN	mg/L	0.015	0.021	0.018	0.025	0.050	0.960	0.1
Antimony	mg/L	0.034	0.031	0.027	0.030	0.030	0.032	0.15
Arsenic (diss)	mg/L	0.0036	0.0024	0.01	0.0020	0.0014	0.0016	0.15
Arsenic (total)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Barium (total)	mg/L	0.0318	0.0321	0.0299	0.0311	0.0315	0.0324	1.0
Cadmium (total)	mg/L	<0.0005	0.0006	0.0005	0.0009	0.0015	0.0016	0.02
Chromium (total)	mg/L	<0.0008	0.0014	0.0008	0.0015	<0.0008	<0.0008	0.04
Copper (total)	mg/L	<0.001	0.053	0.001	<0.001	<0.001	<0.001	0.2
Iron (total)	mg/L	0.054	<0.003	0.003	<0.003	0.003	<0.003	1
Lead (total)	mg/L	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.1
Manganese (total)	mg/L	0.076	0.121	0.203	0.115	0.303	4680	0.5
Mercury (total)	mg/L	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.005
Nickel (total)	mg/L	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.3
Silver (total)	mg/L	0.003	0.002	0.001	0.002	0.001	<0.001	0.1
Zinc (total)	mg/L	0.0061	0.0300	0.0005	<0.0005	0.0008	<0.0005	0.3

Notes: SO_2 turned off during sample 2100 hours

Table 6.2

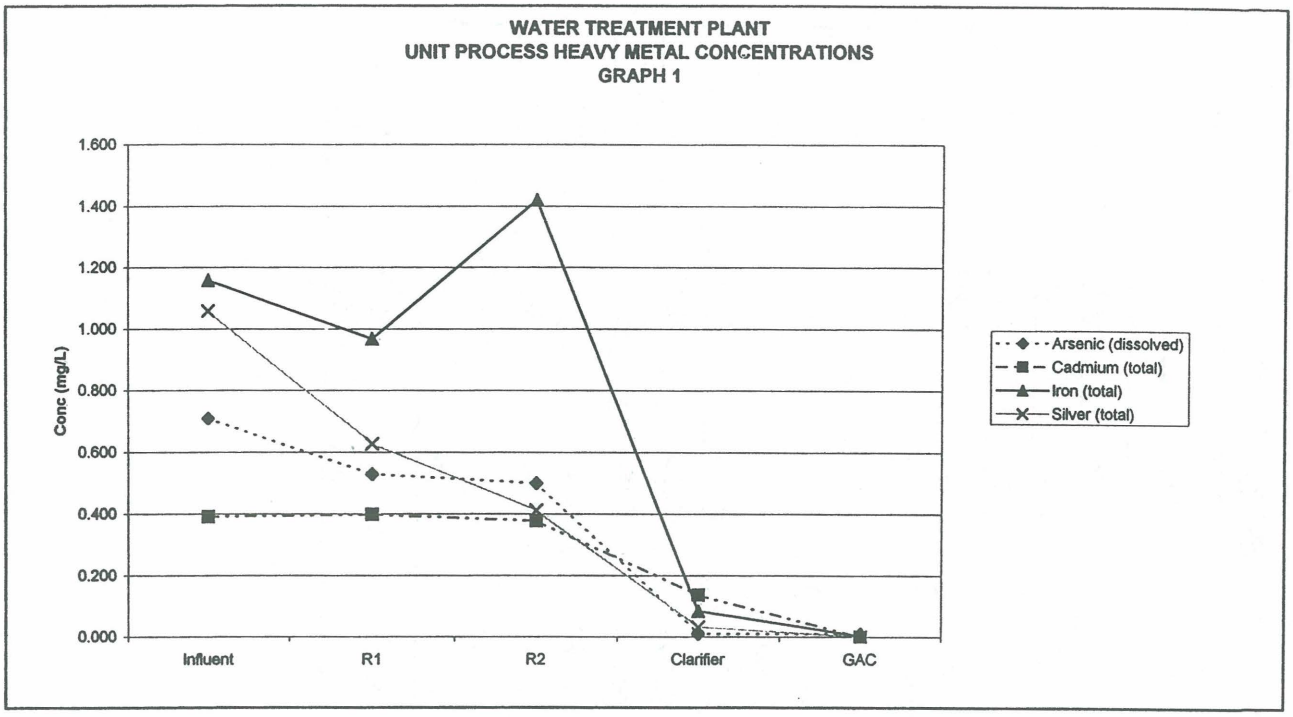


Figure 6.1

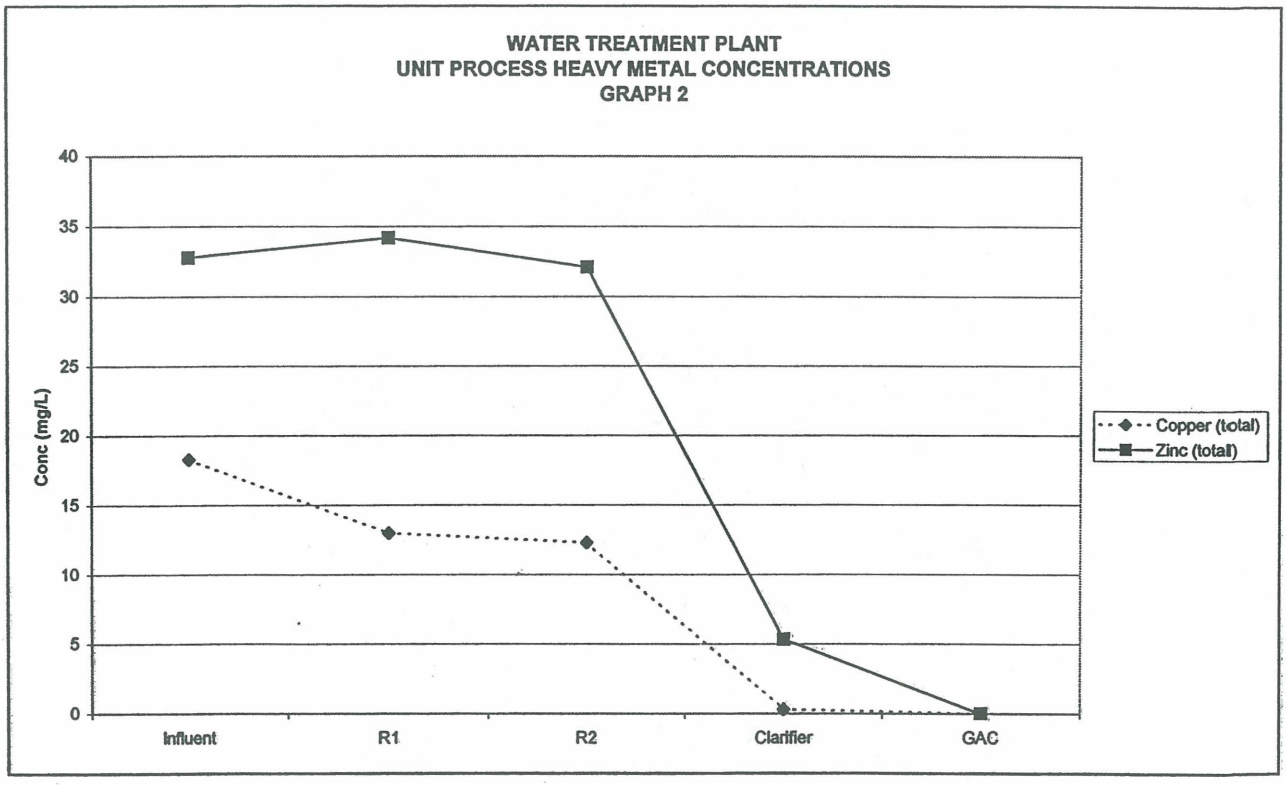


Figure 6.2

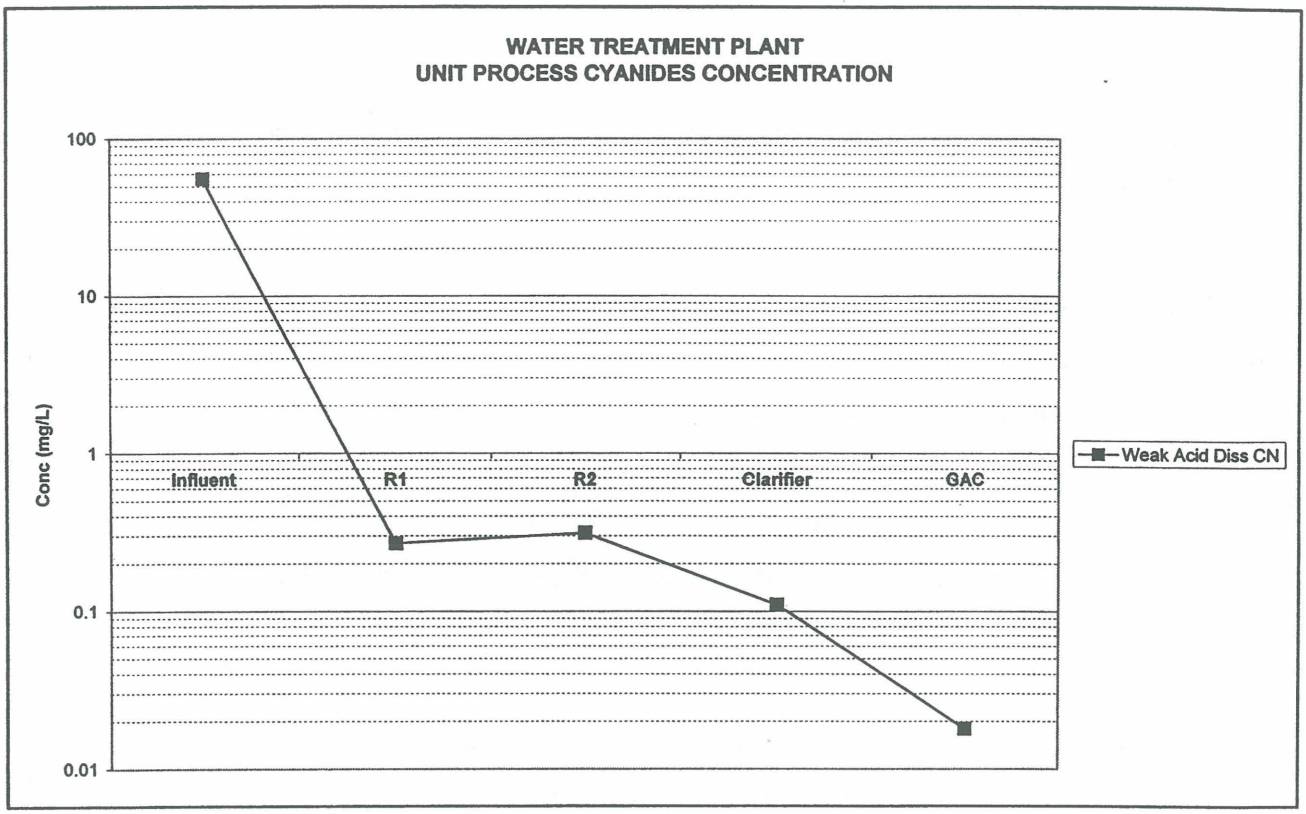

WATER TREATMENT PLANT
UNIT PROCESS CYANIDES CONCENTRATION
100
10
1
0.1
0.01
Conc (mg/L)
Influent
R1
R2
Clarifier
GAC
Weak Acid Diss CN

Figure 6.3

The data indicates that the majority of cyanide removal occurs at the first reactor with final polishing provided by the activated carbon columns.

Although total cyanide levels reported by Norwest Labs were below licence limits, it was noted that there were some discrepancies in these data compared to concentrations determined by calculation.

Norwest Labs has indicated (appended) that the total cyanide analysis may not be accurate due to interference's from other constituents present in the water. Weak acid dissociable cyanide analysis is not affected by this interference.

It is recommended that weak acid dissociable cyanide tests be used in the future for process evaluation and compliance purposes and that total cyanide concentrations be determined by calculation.

Most heavy metals were removed during the coagulation – flocculation process and almost complete removal of residual metals was obtained in the activated carbon columns.

Based on these data, it can be concluded that the improvements to the treatment plant have been successful in producing a high quality effluent on a consistent basis.

It was initially estimated that the 5 tonnes of carbon would provide a service life of 14 to 20 days. The carbon columns were operated with approximately 3 tonnes of carbon during these tests and provided approximately two weeks of service. Once the carbon columns are filled to capacity, a service life of two weeks can be expected with a reasonable margin of safety. The carbon should be acid washed or replaced after this time.

6.2 96 Hour Fish Bio-Assay Results

Figures 6.4 to 6.8 depict the results of the 96 hour LC50 fish bio-assay tests. Each test was run with various dilutions to determine the concentration at which the effluent would be toxic to fish.

Figures 6.4 and 6.5 depict the bio-assay results with effluent collected directly after the activated carbon column. These data indicate that the effluent from the treatment would be toxic to fish.

A reduction in toxicity was noted after the carbon columns had operated for approximately 24 hours. This can be attributed to the development of steady state conditions in the tanks after they had been filled with carbon.

Control tests on Victoria Creek well water indicated that this water is non-toxic to fish and is suitable for condition of water treatment plant effluent.

Bench scale analysis had indicated that the most likely cause of toxicity to fish was either cyanates or ammonia. These tests also indicated that cyanates could be reduced by hydrolysis by lowering the pH to 6.0 to 6.3.

This process was initially introduced at the second reactor using sulfur dioxide gas to depress pH. On-site analysis of the effluent from the reactor indicated an increase in WAD cyanide to levels above licence limits and the process was discontinued. This result can be linked to the disassociation of cyanide complexes which would normally be removed in the coagulation – flocculation reactor.

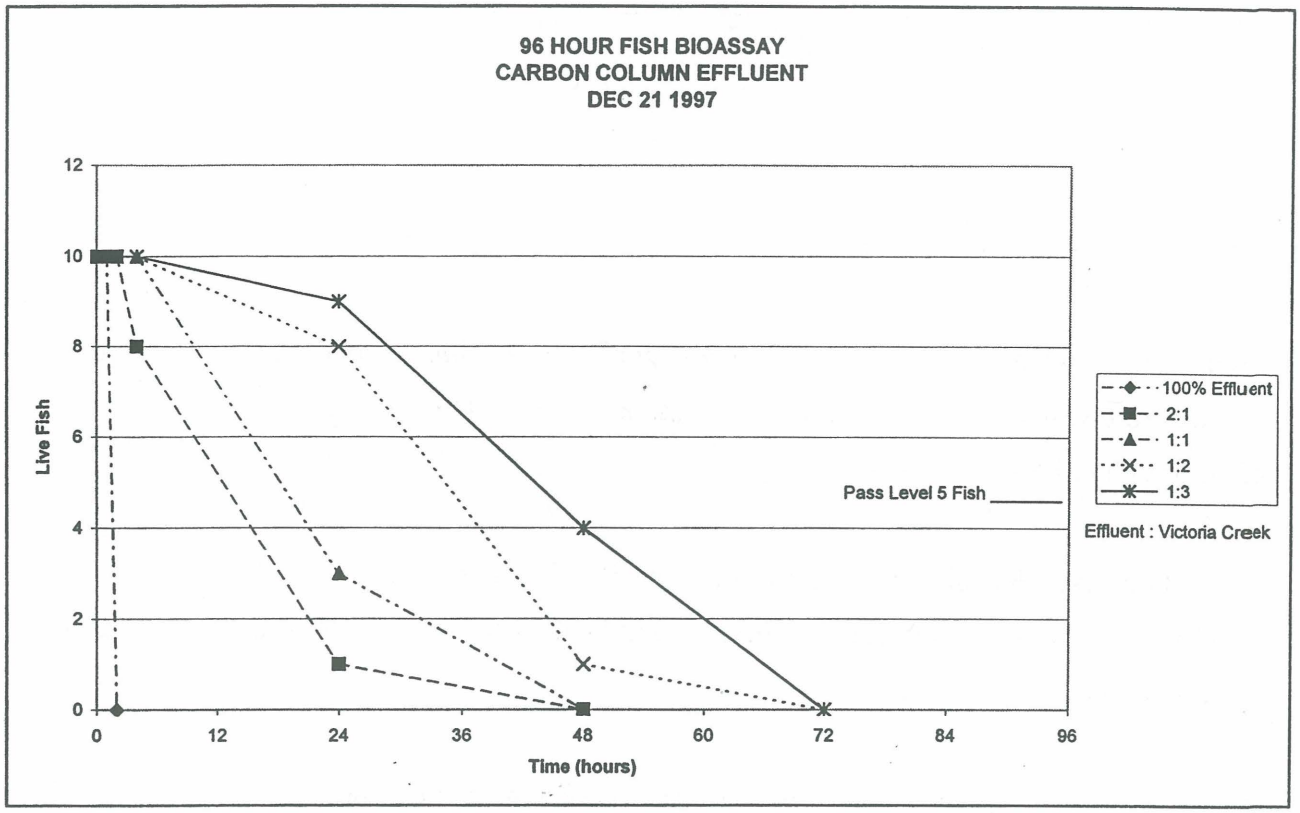


Figure 6.4

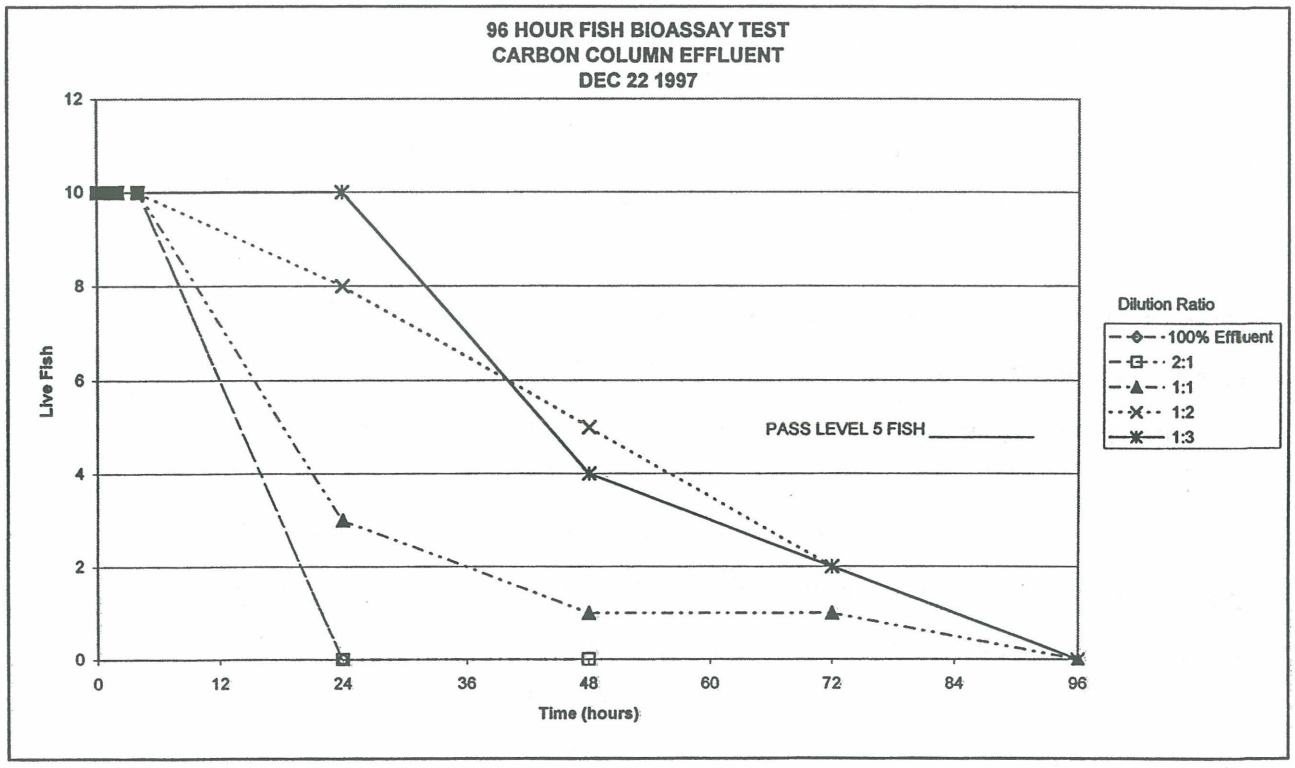


Figure 6.5

It was decided to introduce a cyanate destruction reactor as the last process in the water treatment plant where most of the constituents in the waste stream had been removed. Figure 6.6 indicates that this reactor provided a significant increase in fish survival rates although a pass level was not reached.

It was identified that the sulfur dioxide feed to the cyanide destruction reactor had been throttled to 0.1 liters per minute by ice build up on a temporary rotameter that was being used to calibrate the thermal flow meter.

The obstruction was bypassed and the sulfur dioxide flow rate increased to 0.2 liters per minute. Fish bio-assay analysis performed on the plant effluent were positive with all tests at a 1:2 dilution or higher passing the test.

Analysis of effluent before and after the cyanate destruction reactor indicated that there was not a significant decrease in cyanates. The decrease in toxicity has been attributed to the lowering of pH from an initial value of 9.0 after the carbon columns to approximately 7.0 after the cyanate destruction tank. This would have the effect of decreasing the toxicity of ammonia in the water by a factor of ten.

Based on these analysis, the water treatment plant is capable of producing effluent which will pass the fish bio-assay test if the water is conditioned at a rate of one part effluent to two parts dilution water at pH is adjusted to 6.3 prior to discharge.

environmental impacts of chlorine due to the formation of chloro-organic compounds or residual chlorine as well as significant safety problems associated with handling gaseous chlorine, the use of this method is not recommended at Mt. Nansen. Dilution of effluent is recommended as the most practical method for generating compliant effluent with the lowest environmental impact.

9. Interferences during standard laboratory analysis for total cyanide may result in the anomalies in the data produced. It is recommended that weak acid dissociable testing for cyanide be used for evaluating plant performance and compliance monitoring. If required, total cyanide can be calculated by formula based on WAD cyanide and metallic complexed cyanides.

LAVIS & COMPANY

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December 10, 1997

PRIVILEGED AND CONFIDENTIAL

DELIVERED BY HAND

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, Yukon
Y1A 2T9

Attention: Graham Dickson

Dear Sirs/Mesdames:

Re: Report of Conestoga-Rovers & Associates dated December 10, 1997

We enclose the above-noted report, received today from Conestoga-Rovers & Associates. We will be relying on this report in connection with our on-going provision of legal advice to you regarding potential charges under the *Yukon Waters Act*.

Please provide us with comments on the report.

Yours truly,

DAVIS & COMPANY

Per:

Encl.

CRA

CONESTOGA ROVERS & ASSOCIATES
651 Colby Drive
Waterloo, Ontario, Canada N2V 1C2
(519) 884-0510 Colby Office Fax: (519) 884-0525
(519) 725-3313 Bathurst Office (519) 725-1394

December 10, 1997 Reference No. 11366

PRIVILEGED AND CONFIDENTIAL

Mr. Rodney Snow
David & Company
304 Jarvis Street, Suite 200
Whitehorse, YT Y1A 2H2

Dear Mr. Snow:

Re: Mt. Nansen Water Treatment Plant – Progress Report No. 2

1.0 Introduction

As per the directions of Mr. Graham Dickson of B.Y.G. Natural Resources, we are forwarding our second progress report detailing the work undertaken by Conestoga-Rovers & Associates (CRA) in connection with the treatment of tailing pond effluents at Mt. Nansen Mine. While the previous progress report dated November 26, 1997 focused on the Water Treatment Plant (WTP) influents collected on October 16 and November 11, this report presents the analytical results and the treatability studies conducted on the following three samples: WTP effluents collected on November 15 and 21, and WTP influent collected on November 21, 1997.

CRA conducted detailed chemical analysis of all samples received and performed treatability studies not only aimed at mitigating the toxicity of the WTP effluent but also at simulating the on-Site treatment system to provide better understanding of the ongoing complex physiochemical processes and hence optimize the treatment system.

2.0 WTP Influent and Effluent Characterization

It has been indicated in the previous report that difficulties with the separation of nitrite and cyanate peaks in chromatograms were experienced. Subsequent to resolution of the nitrite and cyanate peaks, the WTP effluent collected on November 15, 1997 was reanalyzed with the results being presented in Table 1, while Table 2 presents analytical data from the WTP influent and effluent collected on November 21, 1997. Scrutiny of the data in Tables 1 and 2 reveals the following:

gas is necessary to ensure that the effluent is non-toxic to fish. It must be asserted that this phenomenon of incomplete oxidation was not anticipated at the beginning of the study, as it was postulated that cyanide and heavy metals were primarily responsible for causing toxicity. However, effluent analytical data both on November 15 and November 21, 1997 reflect the excellent removal efficiency of cyanides and metals achieved by the treatment system, with all respective parameters well below any reported toxicity levels. Accordingly, significant emphasis must be placed on modifying the INCO treatment process to ensure complete oxidation to preclude effluent toxicity.

3.0 Treatability Studies

The treatability studies were conducted on both the WTP influent and effluent samples. Studies performed on the WTP effluent were primarily aimed at alleviating toxicity, while studies on the WTP effluent addressed the impact of the various process variables and focused on improved understanding of the complex reactions occurring throughout the treatment system. Having determined the importance of ammonia and cyanates in effluent toxicity, these parameters were added to the analytes list. Additionally free cyanide, determined by the weak acid extraction method, was also added to provide a common ground for assessing comparability with Site conditions, since it is used by Site staff for determination of treatment system efficiency and process control.

Table 3 lists the relevant parameters for the treatability studies performed on the WTP influent collected on November 21, 1997. A three-step sequential treatment approach was employed. The first step involved oxidation with sulfur dioxide and simulation of reactions taking place in the first tank of the INCO treatment system. Sulfur dioxide (SO_2) was added, as sodium sulfite, at doses of 300, 500, and 700 mg/L (as SO_2) at pH of 9 to 9.2, and temperature of 5°C. The water was then aerated with air at a flow rate of 1 to 24 L/min for a period of 30 minutes to simulate the actual contact time at the Site.

The second step involved pH adjustments of the first step egress to 6.3 to 6.5 to promote hydrolysis at the ambient temperature of 5°C for another 30 minutes. This mimics conditions in the second tank except that the pH is not reduced to 6.3 to 6.5, but rather maintained at around

pH 8. It is widely known that hydrolysis of cyanates is much more efficient at pH 6.3 than at pH 8.

It is conspicuous from Table 3 that oxidation with SO_2 reduced cyanides by 39 to 75 percent depending on SO_2 dose, with removal efficiency increasing with SO_2 dose. Simultaneously, both cyanate and ammonia concentrations increased with cyanide destruction, thus corroborating our earlier postulations. The highest reduction in overall total nitrogen in the three predominant forms, i.e., cyanide, cyanate, and ammonia of 12.5 percent from 88 to 77 mg/L, was observed at an SO_2 dose of 700 mg/L. During the hydrolysis step, cyanide decreased further by 60 to 93.4 percent, with the reduction directly proportional to the SO_2 dose. It is evident that the cyanide reductions achieved in the first stage agree well with the observations reported in the first progress report for the WTP influent on November 11, 1997. Furthermore, the low cyanides after the hydrolysis step confirm the WTP effluent concentrations of cyanides measured at the Site.

The third treatment step involved superchlorination to oxidize both ammonia and cyanates formed during treatment. A chlorine dose of 500 mg/L of sodium hypochlorite (NaOCl) (238 mg/L as Cl) was added to the effluent from the second step, and aerated for 30 minutes. Further oxidation of cyanides took place in addition to the oxidation of cyanates and ammonia, as attested by effluent cyanides of 0.06 mg/L. Cyanides and ammonia reductions of 14 to 92 percent, and 96 to 98 percent, respectively, were achieved.

The effluent collected on November 16 was treated with 50 percent hydrogen peroxide in conjunction with 10 percent ferric sulfate solutions at doses of 4 ml and 1 ml per liter, respectively, at pH 7.8, and aerated for a 24-hour period. The treated effluent was subsequently treated with NaOCl at a dose of 100 mg/liter, and then passed through GAC columns for further polishing prior to bioassay tests. The WTP effluent collected on November 21, 1997 was treated with 500 mg NaOCl/L at 5°C for 30 minutes. Table 4 presents a summary of the analytical data for the various treated effluents along with the fully treated WTP influent on November 21, 1997. The data indicates that oxidation with hydrogen peroxide, though effecting a good reduction of cyanates, increased ammonia concentrations, which increased further during hydrolysis. This necessitated the use of chlorine to oxidize ammonia and activated

carbon to remove residual chlorine. The activated carbon application is intended also to mimic site conditions where GAC is used for effluent polishing.

Interestingly, while chlorination of the fully treated WTP influent achieved effluent cyanates and ammonia of 1.8 and 2.1 mg/L, chlorination of the WTP effluent did not reduce cyanates and ammonia to the decreased levels to avert toxicity, despite a final residual chlorine concentration of 2 to 3 mg/L. The reasons for this unexpected behavior are currently being investigated.

4.0 Toxicity

The acute toxicity of the raw and treated samples, as determined by Microtox, is presented in Table 5. The reported toxicity is expressed as percentage reduction in light output after 5 minutes and 30 minutes exposure. It is apparent that the toxicity of the WTP effluent collected on November 16, 1997 decreased continuously throughout the various treatments. The effluent sample that was oxidized, hydrolyzed, chlorinated, and treated with GAC in fact did pass the LC50 chronic toxicity test on rainbow trout with flying colors, as indicated by the Beak International report enclosed herewith. The undiluted sample caused only a 20 percent mortality of rainbow trout after 96 hours of exposure.

It is interesting to note the strong correlation between the percent toxicity after 15 minutes and the total cyanate and ammonia nitrogen. Generally toxicity increased with total nitrogen, and currently we are working on the development of a correlation between these two parameters.

5.0 Summary and Conclusions

The analytical data indicated that partial oxidation of cyanides is occurring in the Tailing Pond, as reflected by the temporal increase in concentrations of cyanates and ammonia. Optimization of in-situ processes in the Tailing Pond can lower the cyanides loading into the WTP.

WTP effluent sample treated with hydrogen peroxide, chlorination, and granular activated carbon has passed both acute chronic toxicity tests as well as chronic bioassay toxicity tests on rainbow trout.

On-site processes involving cyanide destruction have been successfully simulated in the lab with comparable cyanide removal efficiencies. However, both lab results as well as analysis of plant effluent data indicate that incomplete oxidation of cyanides to cyanates and ammonia is prevalent with only 10 to 12.5 percent reduction in the total nitrogen attributable to the three predominant species, i.e., cyanide, cyanate, and ammonia. Accordingly, current efforts are focused on closing the nitrogen balance as not only cyanide but also cyanates and ammonia are highly toxic to fish. Superchlorination of the treated WTP influent by CRA significantly reduced ammonia and cyanates, while identical treatment of the WTP effluent showed relatively higher concentrations resulting in higher toxicity.

Microtox was used to assess acute toxicity of various samples, and a general correlation between relative toxicity, measured as percentage reduction in light output of specific photoluminescent bacteria after specific exposure time, and total nitrogen was observed.

CRA is currently working around the clock to optimize the treatment system to ensure production of innocuous non-toxic effluent. We are committing all our resources to this project and at this stage we have a clear understanding of the complex processes taking place at the site and the preferred remedial alternatives. It is through our thorough understanding of the processes involved that we can provide innovative cost-effective solutions to minimize the toxicity of the treated effluent and optimize the performance of the treatment plant.

December 10, 1997 Reference No. 11366

I trust that this report and the results achieved so far are satisfactory. In the mean time, should you have any questions, please do not hesitate to call the undersigned or my associate, George Nakhla.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

G.F. Nakhla

Andrew Lugowski, P. Eng.

GN/dm/2
Encl.

Table 1
BYG Mt. Nansen Site
Analytical Data for WTP Influent & Effluent

Parameter	Units	WTP Influent	WTP Influent	WTP Effluent	WTP Influent after GAC
		10/16/97	Tentative Date 11/11/97	11/16/97	11/18/97
GENERAL CHEMISTRY					
COD	mg/L	139	143	74	78
TOC	mg/L	57.5	59.2	31.6	33.3
TIC	mg/L	18	19	45	21
NH_3-N	mg/L	1.27	2.95	4.97	2.58
NO_3-N	mg/L	1.28	1.14	1.15	1.04
CN	mg/L	68.9	90	0.181	46.2
CNO	mg/L	-	-	24	
SO_4	mg/L	281	1396	2493	1298
pH	std. units	9.6	10.02	8.16	10.68
NO_2-N	mg/L	23.8	< 0.10	2.3	< 0.10
ORP	mV	+ 144	108	230	
METALS					
Mo	mg/L	0.197	0.054	1.31	0.642
Cu	mg/L	0.893	14.2	< 0.001	8.38
Mg	mg/L	2.17	5.39	1.48	5.50
Sr	mg/L	< 0.050	1.02	< 0.050	1.42
Ba	mg/L	< 0.050	< 0.050	< 0.050	< 0.050
Ni	mg/L	0.141	0.091	0.266	0.019
B	mg/L	0.148	0.37	< 0.050	0.382
Fe	mg/L	0.075	0.891	0.117	0.994
Na	mg/L	24.4	509	1.70	364
Mn	mg/L	0.089	< 0.015	0.023	< 0.015
Cr	mg/L	< 0.010	< 0.010	0.160	0.013
Be	mg/L	< 0.000092	< 0.000092	< 0.000092	0.06171
Ca	mg/L	3.19	594	2.71	635
Si	mg/L	0.635	8.44		4.8
Zn	mg/L	1.57	30.7	0.023	16.7
Sb	mg/L	< 0.050	< 0.050	< 0.050	< 0.050
K	mg/L	4.99	66.8	2.45	40.5
Al	mg/L	< 0.050	0.119	< 0.050	0.18
V	mg/L	0.132	0.015	< 0.007	0.0196
Tl	mg/L	0.0077	0.064	0.0539	2.72
Sl	mg/L	0.169	0.047	< 0.005	0.006
Hg	mg/L	< 0.0001		< 0.0001	< 0.0001
As	mg/L	0.378	0.366	0.159	0.642
Cd	mg/L	0.291	0.435	0.0331	0.1605
Pb	mg/L	0.007	0.636	0.060	< 0.001
Co	mg/L	0.077	0.0768	< 0.0004	0.0527
Ag	mg/L	2.34	5.17	< 0.0001	0.0033

TABLE 2

BYG MT. NANSEN MINE
ANALYTICAL DATA FOR WATER TREATMENT PLANT

Parameter	*Units*	Influent Nov. 21/97	Effluent Nov. 21/97
General Chemistry			
pH	St Units	9.78	8.16
Alkalinity	mg/L	210	110
COD	mg/L	152	78
TOC	mg/L	63	33
TIC	mg/L	21	44
NH3-N	mg/L	29	60
NO3-N	mg/L	1.26	1.08
NO2-N	mg/L	<0.1	<0.1
Total CN	mg/L	98	0.18
Free CN (WAD)	mg/L	84	0.1
CNO	mg/L	20	57
SO4	mg/L	1540	3770
Cl	mg/L	42	84
Metals			
Mo	mg/L	0.89	3.13
Cu	mg/L	14.4	0.44
Mg	mg/L	6.42	8.15
Al	mg/L	2.6	2.32
Sr	mg/L	1.57	2.17
Ba	mg/L	<0.05	<0.05
Ni	mg/L	0.095	<0.01
B	mg/L	0.93	0.27
Fe	mg/L	0.48	0.057
Na	mg/L	283	1100
Mn	mg/L	0.138	0.53
Cr	mg/L	<0.01	<0.01
Be	mg/L	0.39	0.39
Ca	mg/L	588.0	830
Si	mg/L	5.22	1.95
Zn	mg/L	33.2	2.51
Sb	mg/L	<0.05	<0.05
K	mg/L	30.6	32.5
V	mg/L	<0.005	<0.005
As	mg/L	0.04	0.43
Se	mg/L	<0.05	<0.05
Cd	mg/L	0.38	0.09
Pb	mg/L	<0.001	<0.001
Ag	mg/L	0.95	0.11

TABLE 3

BYG MT NANSEN SITE
INFLUENT TREATABILITY STUDY

Parameters	*Units*	*Sample/Treatment*								
		Raw	*Oxidation (SO2 dose mg/L)*			*Hydrolysis, pH =6.5*			*Chlorination, 500 mg NaOCl/L*	
		12/21/97				*SO2 initial dose (mg/L)*			*SO2 initial dose (mg/L)*	
			300	500	700	300	500	700	300	500	700
pH	St. Units	9.7	9.2	9.2	9	6.3	6.5	6.5	7.8	7.2	7.6
Total CN	mg/L	98	60	42	24	24	4.5	1.6	14	0.5	0.06
Free CN (WAD	mg/L	84	42	38	18	22	3.8	1.2	11	0.3	0.02
Cyanates	mg/L	20	44	26	45	34	15	2.1	2.8	1.6	1.8
NH3-N	mg/L	29	60	66	52	72	114	55	2.2	2.5	2.1

TABLE 4

BYG MT NANSEN SITE
WASTEWATER TREATABILITY STUDY
ANALYSES OF TREATED INFLUENT AND EFFLUENT

		Parameter (mg/L)			
Sample	*pH(St units)*	*Total CN*	*Free CN*	*CNO*	*NH3-N*
Raw Effluent from 11/16/97	8.16	0.18	0.1	24	4.97
Effluent Oxidized with H2O2	7.8	0.12	<0.05	18	7.8
Effluent Oxidized and Hydrolized	6.5	0.05	<0.05	3	18
Effluent Oxidized, Hydrolized and Chlorinated	7.3	0.03	<0.05	2	5.3
Influent from 11/21/97 fully treated	7.6	0.05	<0.05	1.8	2.1
Effluent from 11/21/97, chlorinated	7.2	0.02		7	12

TABLE 5

BYG Mt. NANSEN ST.
WASTEWATER TREATABILITY STUDY
RESULTS OF TOXICITY TESTS (MICROTOX)

Sample	*Toxicity (%)*	
	LC50- 5 min	*LC50- 15 min*
Raw Effluent from 11/16/97	67	8
Effluent Oxidized with H2O2	46	5
Effluent Oxidized and Hydrolized	48	6
Effluent Oxidized, Hydrolized and Chlorinated	24	3
Influent from 11/21/97 fully treated	12	1
Effluent from 11/21/97, chlorinated	43	6

beak international incorporated

14 Abacus Road
Brampton, Ontario
Canada L6T 5B7

Tel (905) 794-2325
Fax (905) 794-2338
1-800-361-BEAK (2325)

Results of 96-hour Rainbow Trout LC50 Test

Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout
Reference Method EPS 1/RM/13.

Rec'd CRA
DEC 08 1997

Client Name:	Conestoga-Rovers & Associates 651 Colby Drive Waterloo, Ontario N2V 1C2
Attention:	**Jan Kochany**
Sample Name:	Treated Effluent
Test Number:	9701193-0
Date Sampled:	27-Nov-97
Date Tested:	28-Nov-97

LC50:	>100%
95% Confidence Interval:	na
Method of Calculation:	na

Comments: 20% mortality was observed in the 100% concentration.
10% mortality was observed in the 50% concentration.
All reported data were cross checked for errors and omissions.
All data generated during testing are held on file as required by the test method applied.

Reference Toxicant Data

Reference Substance:	Potassium Chloride
Date Tested:	14-Nov-97
Batch Tested:	97-17
96hr LC50:	4040 mg/L
95% Confidence Interval:	3580-4560
Method of Calculation:	Probit
Historic Mean LC50:	3650 mg/L
Warning Limits:	3030-4270
Control Limits:	2720-4590

Comments: Reference toxicant results indicate that test reproducibility and sensitivity of organisms are within established limits.

Results Verified By: [signature]

Date: Dec. 2/97

Beak International Incorporated
14 Abacus Rd.
Brampton, Ont.
L6T 5B7

ECOTOXICITY SAMPLE SUBMISSION FORM

Beak Sample Number: 9701193

COMPANY NAME: CONESTOGA-ROVERS & ASSOCIATES
ADDRESS: 651 Colby Dr. Waterloo, ONT N2V 1C2
SAMPLE NAME: TREATED EFFLUENT
SAMPLE TYPE: WATER
DESCRIPTION OF SAMPLING LOCATION:
DATE SAMPLED: Nov. 27/97
TIME SAMPLED: 4:10 pm
SAMPLED BY: George Nakhla
SAMPLING METHOD (e.g. grab, composite):
CONTAINER TYPE (If not supplied by BEAK): Plastic bottles

Freshwater Tests	Marine Tests	Sediment / Soil Tests
[x] Rainbow Trout LC50	[ ] Silverside growth	[ ] Chironomus survival & growth
[ ] Rainbow Trout single conc.	[ ] Sea urchin	[ ] Hyalella survival & growth
[ ] Daphnia magna LC50	[ ] Champia reproduction	[ ] Earthworm survival
[ ] Daphnia magna single conc.	[ ] Blue mussel larval develop.	[ ] Plant emergence and biomass
[ ] Fathead Minnow growth	[ ]	[ ] Sea Urchin larval development
[ ] Ceriodaphnia reproduction	[ ]	[ ] Marine Amphipod survival
[ ] Duckweed growth		[ ] Marine Polychaete survival & growth
[ ] Algal growth		[ ]
[ ] Salmonid early life stage		[ ]
[ ]		

CHAIN OF CUSTODY RECORD:

Sample Storage Prior to Shipping (if any):
Number of Container Shipped: 1
Method of Shipment (e.g. Air Canada, Purolator): Hand Delivered
Date Shipped: Shipped By:

For Lab Use Only

4x -4L containers

Received By: R. Trainor
Date: NOV 27-97 Time: 17:00
Condition Upon Receipt: OK.
Temperature: 21.4°C
Sample Storage Location: 4°C

Treatments:
- composited: [ ] date:
- homogenized: [ ] date:
- extracted: [ ] date:
- other: [ ] date:

elutriate, pore water, leachate ?

Signature :

B.Y.G.
NATURAL RESOURCES INC.

VISTA
ENGINEERING

MT. NANSEN GOLD MINE

TAILINGS IMPOUNDMENT DRAINAGE CONTROL EVALUATION

Prepared By:
Vista Engineering
502 Olgilvie St.
Whitehorse, YT
Y1A 2S7

Prepared For:
B.Y.G. Natural Resources Inc.
General Delivery
Carmacks, YT
YOV 1CO

290- 09
February 24, 1998

VISTA ENGINEERING

Our File: 290-09

February 24, 1998

B.Y.G. Natural Resources Inc.
General Delivery
Carmacks, YT
Y0V 1C0

Attention: Mr. Graham Dickson

Re: Tailings Impoundment Drainage Control – Evaluation of Alternatives

Please find enclosed seven copies of the above noted report.

Based on this evaluation, the most effective method of reducing the amount of runoff entering the tailings impoundment is to line the existing north and west diversion ditches with an impermeable membrane.

Construction of a diversion on the south shore is not recommended due to the presence of shallow permafrost and erodible soils. As well, this diversion would intercept only 2% of the total tailings impoundment watershed area.

Due to the difficulties involved with installation of the liners when soils are frozen, it is recommended that runoff during the 1998 freshet be collected in a sump and diverted around the tailings impoundment by pumping. The liners should be installed once the soils have thawed to a depth of approximately one meter.

The cost of liner installation is estimated at $65,000. An additional $20,000 should be budgeted for the construction of a temporary sump and rental of large capacity pumps.

It has been identified during this analysis that the original water balance model did not account for seepage from the diversion ditches. The water balance model should be updated to reflect this item as well as proposed improvements to the drainage system.

If you should have any questions or require additional information, please contact us at 393-3458.

Yours truly,

Vista Engineering

Victor Menkal, P.Eng.

PROFESSIONAL
YUKON
VICTOR MENKAL
TERRITORY
ENGINEER

Box 30,045 Whitehorse YT Y1A 5M2 (403) 393-3458 (403) 393-3456 fax www.vistaeng.nt.ca

Table of Contents

0.0 INTRODUCTION

Excessive amounts of runoff water have been entering the tailings impoundment at the Mt. Nansen gold mine. This has resulted in the suspension of milling operations and the treatment of large amounts of water from pond to prevent overtopping of the containment structures. As well, there are concerns that there will be insufficient storage to accommodate runoff during spring freshet.

This report evaluates alternatives for reducing the volume of runoff entering the tailings pond during spring freshet and the open water season.

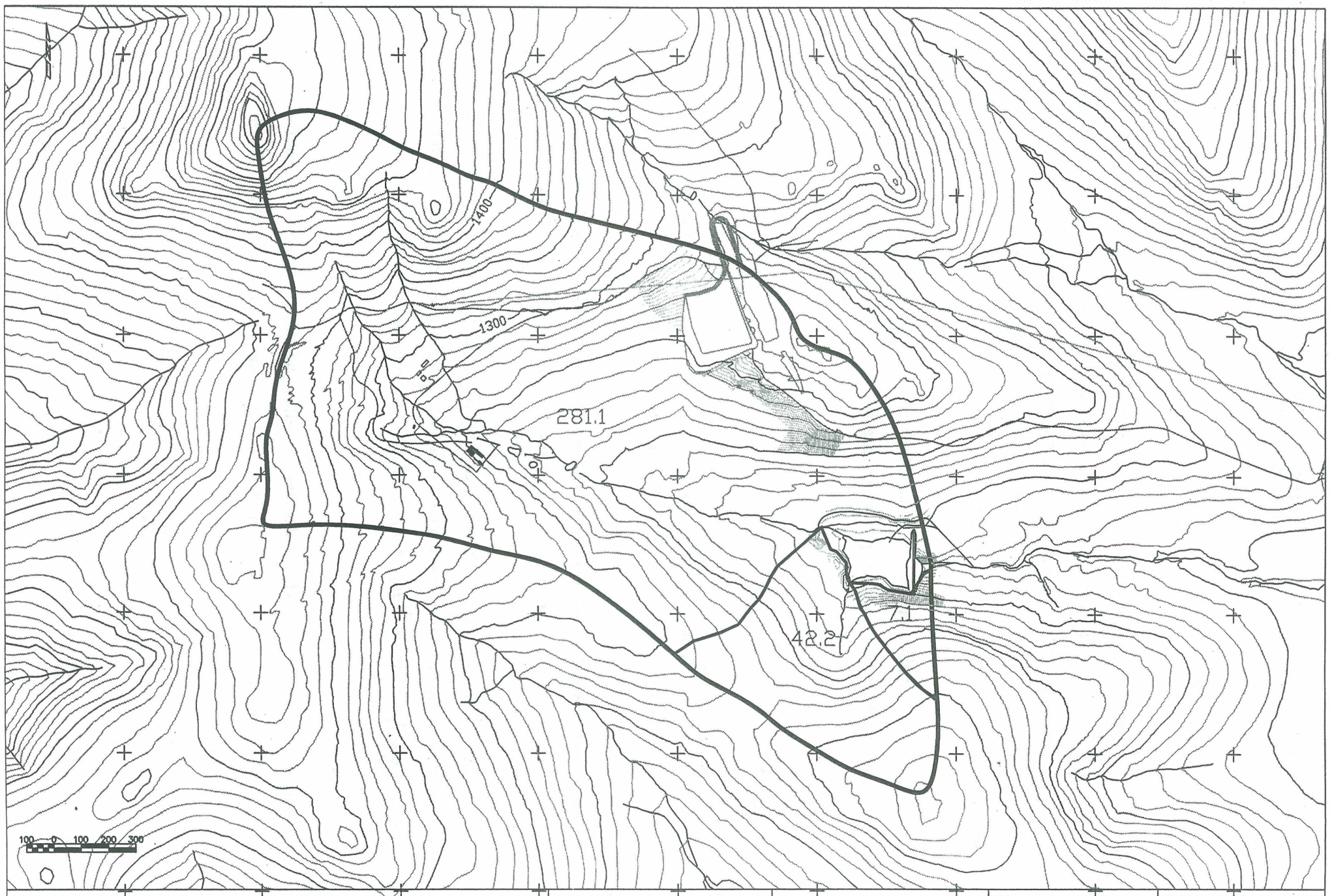
1.0 BACKGROUND

Figure 1 depicts the tailings pond and associated drainage area. Based on this drawing, the total area which drains into the tailings basin is approximately 330.4 hectares.

Surface drainage water is currently diverted by ditches on the north and west shores of the tailings impoundment. There is no diversion on the south shore of the tailings pond.

The north ditch diverts Dome Creek as well as intercepting surface runoff from the area directly north of the tailings impoundment. The total surface area which is serviced by this ditch is 281.1 hectares or approximately 85% of the total tailings impoundment drainage area.

The west diversion ditch extends to intercept the valley and stream located to the south west of the impoundment. This ditch intercepts 42.2 hectares or approximately 13% of the entire drainage area.



MT. NANSEN MINE
TAILINGS POND WATERSHED

B.Y.G.
NATURAL RESOURCES INC.

VISTA ENGINEERING

DATE	FIGURE
FEB 18, 1998	1
BY	SCALE
VM	NTS

Approximately 7.1 hectares or 2% of the watershed located to the south of the tailings pond is not diverted and drains directly into the tailings pond.

The existing ditches are unlined. Based on in-stream measurements completed in September 1997, approximately 50% of the water conveyed by the north diversion ditch enters the tailings pond by seeping through the permeable soils underlying the structure.

The original design brief for the tailings facility had assumed that the soils underlying the diversion ditches would be frozen and remain completely impermeable during spring freshet. Based on field observations of the performance of the structures it appears that there may be some seepage even under fully frozen conditions. This observation has not been confirmed by in-stream measurements.

For the purposes of this analysis, it has been assumed that 25% of water entering the ditches during spring freshet will seep into the tailings pond.

Field measurements of snow pack completed by B.Y.G. Natural Resources Inc. staff indicate that the current water equivalent of the snow pack in the tailings pond drainage basin is 53mm. Last years snow pack prior to spring freshet was 72mm and the design snow pack is 100mm.

Table 1.1 provides an estimate of water volumes generated during spring freshet using current and 1997 snowpack depths. As well the table provides estimates for total runoff including normal year and 200 year return wet year precipitation in addition to snow melt assuming that spring melt occurs in one month.

Table 1.2 provides an estimate of the water volumes which will enter the pond during spring freshet assuming that the diversion ditches will have a seepage rate of 25%. A runoff coefficient of 0.8 is used as it is expected that losses will be low due to frozen subsurface soils

Total Runoff During Spring Freshet
Runoff Coefficent 0.8
m^3

		Snowpack Feb 8 '98	Snowpack 1997	Design Snowpack	Avg year freshet	200 yr freshet
Precip (mm)		50	75	100	130	170
South Catchment (ha)	7.1	2840	4260	5680	7384	9656
West Catchment (ha)	42.2	16880	25320	33760	43888	57392
North Catchment (ha)	281.1	112440	168660	224880	292344	382296
Total		132210	198315	264420	343746	449514

Table 1.1

Runoff Entering Tailings Pond During Spring Freshet
Runoff Coefficent 0.8
25% Ditch Seepage
m^3

		Snowpack Feb 8 '98	Snowpack 1997	Design Snowpack	Avg year freshet	200 yr freshet
Precip (mm)		50	75	100	130	170
South Catchment (ha)	7.1	2840	4260	5680	7384	9656
West Catchment (ha)	42.2	4220	6330	8440	10972	14348
North Catchment (ha)	281.1	28110	42165	56220	73086	95574
Total		35220	52830	70440	91572	119748

Table 1.2

Yearly Runoff Entering Tailings Pond
Runoff Coefficent 0.6
25% Ditch Seepage During Freshet
50% Ditch Seepage During Open Water
m^3

		Avg Year Rainfall	Wet Year Rainfall
Precip (mm		161	310
South Catchment (ha)	7.1	12539	18886
West Catchment (ha)	42.2	28823	47686
North Catchment (ha)	281.1	191991	317643
Total		233514	384525

Table 1.3

Items 1 to 4 should be completed by mid March. The installation of the liners should commence once soils have thawed to a depth of one meter.

Due to the presence of silty and sandy soils along the ditch alignments, it should be possible to place the liner directly on the excavated and trimmed ditch sections. The soils excavated during installation can be used to provide a protective layer on top of the liner with a final backfill of 0.5m of riprap.

4.0 COST ESTIMATES

Table 4.1 presents preliminary cost estimates for lining the north and west ditch. As well, the cost of constructing a diversion berm on the south shore of the tailings impoundment has also been estimated.

It has been assumed that the existing riprap will be salvaged during the installation of the liner in the north diversion. Additional riprap material will be required for the west diversion. Due to the presence of sandy soils along both alignments, it should be possible to place the liner directly on the excavated and trimmed ditch surfaces. These soils can also be used for the protective cover over the liner.

The cost of lining the north and west diversion ditches is estimate at $65,000. An additional $10,000 should be budgeted for sump construction and pump rental.

DIVERSION OPTIONS
PRELIMINARY COST ESTIMATES

Option 1 - Line North Diversion

	Item	*Units*	*Quant*	*Unit Cost*	*Ext*
1	Liner	m2	3000	4	12000
2	Prep Hoe	Hours	30	225	6750
3	Labour	Hours	160	20	3200
4	Fill Hoe	Hours	20	225	4500
5	Dewatering	LS	1	2500	2500
					$28,950
				say	**$30,000**

Option 2 - Line West Diversion Extention

	Item	*Units*	*Quant*	*Unit Cost*	*Ext*
1	Liner	m2	2100	4	8400
2	Prep Hoe	Hours	30	225	6750
3	Labour	Hours	160	20	3200
4	Granular Cover	m3	1500	5	7500
5	Fill Hoe	Hours	20	225	4500
6	Dewatering	LS	1	2500	2500
					$32,850
				say	**$35,000**

Option 3 - Construct South Diversion Berm

	Item	*Units*	*Quant*	*Unit Cost*	*Ext*
1	Liner	m2	4900	4	19600
2	Cat	Hours	100	150	15000
3	Embankment	m3	4200	5	21000
3	Labour	Hours	200	20	4000
4	Granular Cover	m3	2800	5	14000
5	Hoe	Hours	50	225	11250
					$84,850
				say	**$90,000**

Option 4 - Spring Diversion by Pumping from Sumps

	Item	*Units*	*Quant*	*Unit Cost*	*Ext*
1	Sump	LS	1	10000	10000
2	Pump & piping rental	month	2	5000	10000
					$20,000

Table 4.1

5.0 CONCLUSIONS AND RECOMMENDATIONS

1. A considerable volume of water has been entering the tailings impoundment via seepage from the existing diversion ditches. During an average year freshet, this volume could be as high as 90,000 cubic meters assuming a 25% rate of seepage from ditches during spring conditions.

2. Over the open water period, the total seepage into the pond could be in excess of 200,000 cubic meters.

3. It appears that the original water balance model did not account for seepage from the ditches. The water balance should be updated to allow for this seepage as well as any improvements to the diversion structures.

4. Due to the presence of shallow permafrost, readily erodable soils, and relatively small drainage area, the construction of a drainage diversion on the south shore of the tailings impoundment is not recommended.

5. The most effective method of reducing the volume of runoff entering the tailings impoundment is to line the existing north and west diversion ditches with an impermeable lining.

6. Due to the difficulties associated with construction in frozen soils, it is recommended that water from the west diversion and Dome Creek be collected in a sump and pumped past the tailings impoundment during spring freshet.

7. The cost of installing liners in the north and west diversion ditches is estimated at $65,000. An additional $10,000 should be budgeted for the construction of the collection sump and rental of large capacity pumps.

APPENDIX B

NORWEST LABS

9936-67 Avenue
Edmonton, AB
T6E 0P5

Phone : (403) 438-5522 or
1-800-661-7645
Fax: (403) 438-0396

DATE 14-Jan-98
P.O. No.
W.O. No. 147150
PAGE 1

BYG Natural Resources
110 Industrial Road
Whitehorse, YK
Y1A 2T9

Sample ID	Sample Description		TIC mg/L	TOC mg/L	TC mg/L
147150-1	I-1 Plant Effluent	13-30	29.5	37.2	66.7
147150-2	I-2 Plant Effluent	14-30	30	36.6	66.6
147150-3	I-3 Plant Effluent	15-30	28.8	39.9	68.7
147150-4	I-4 Plant Effluent	16-30	29.7	38.8	68.5
147150-5	I-5 Plant Effluent	17-30	28.9	38.1	67.0
147150-6	I-6 Plant Effluent	18-30	28.9	42.2	71.1
147150-7	I-7 Plant Effluent	19-30	29.5	38.3	67.8

NORWEST LABS

9938-67 Avenue
Edmonton, AB
T6E 0P5

Phone : (403) 438-5522 or
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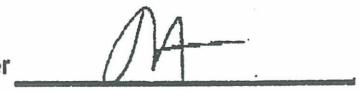
DATE 14-Jan-98
P.O. No.
W.O. No. 147151
PAGE 1

BYG Natural Resources
110 Industrial Road
Whitehorse, YK
Y1A 2T9

[redacted]

Sample ID	Sample Description	TIC mg/L	TOC mg/L	TC mg/L
147151-1	E1 Plant Effluent (GAC)	67.1	9.6	76.7
147151-2	E2 Plant Effluent (GAC)	63.7	9.6	73.3
147151-3	E3 Plant Effluent (GAC)	61.2	9.8	71.0
147151-4	E5 Plant Effluent (GAC)	60	10.2	70.2
147151-5	E6 Plant Effluent (GAC)	59.6	10.4	70.0

Lab Manager 

NORWEST LABS

9938-67 Avenue
Edmonton, AB
T6E 0P5

Phone : (403) 436-5522 or
1-800-661-7645
Fax: (403) 436-0396

DATE 14-Jan-98
P.O. No.
W.O. No. 147152
PAGE 1

BYG Natural Resources
110 Industrial Road
Whitehorse, YK
Y1A 2T9

Total Inorganic Carbon

Sample ID	Sample Description		TIC mg/L	TOC mg/L	TC mg/L
147152-1	R1 Reactor #1 Effluent	13-45	62.1	25.8	87.9
147152-2	R1 Reactor #2 Effluent	14-45	60.3	25.8	86.1
147152-3	R3 Reactor #3 Effluent	15-45	55.0	43.1	98.1
147152-4	R4 Reactor #4 clarified	16-45	65.9	23.9	89.8
147152-5	R5 GAC Effluent	17-45	62.5	9.9	72.4

Lab Manager

NORWEST LABS
EDMONTON PH: (403) 436-5522 FAX (403) 436-0066
CALGARY PH: (403) 291-3077 FAX (403) 291-9021
LANGLEY PH: (604) 514-3322 FAX (604) 514-3323
LETHBRIDGE PH: (403) 329-3446 FAX (403) 327-3577
WINNIPEG PH: (204) 982-5530 FAX (204) 275-0019

DATE 05 JAN 98 16:13
P.O. NO.
W.O. NO. 1 147150
PAGE 2

BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NANSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		1 I-1 PLANT INFLUENT 13-30	2 I-2 PLANT INFLUENT 14-30	3 I-3 PLANT INFLUENT 15-30
TRACE ICP,TOTAL				
ALUMINUM	mg/L	0.119	0.032	0.025
ANTIMONY	mg/L	0.087	0.091	0.090
ARSENIC	mg/L	0.47	0.48	0.48
BARIUM	mg/L	0.0237	0.0227	0.0233
BERYLLIUM	mg/L	<0.0005	<0.0005	<0.0005
BISMUTH	mg/L	<0.007	<0.007	<0.007
BORON	mg/L	0.366	0.368	0.376
CADMIUM	mg/L	0.372	0.379	0.382
CALCIUM	mg/L	590	603	603
CHROMIUM	mg/L	0.0011	<0.0008	<0.0008
COBALT	mg/L	0.0533	0.0513	0.0536
COPPER	mg/L	17.8	17.6	17.6
IRON	mg/L	1.06	0.973	1.01
LEAD	mg/L	0.004	0.002	0.004
LITHIUM	mg/L	0.00282	0.00323	0.00353
MAGNESIUM	mg/L	7.09	7.37	7.56
MANGANESE	mg/L	0.281	0.284	0.296
MOLYBDENUM	mg/L	0.022	0.023	0.024
NICKEL	mg/L	0.095	0.097	0.099
PHOSPHORUS	mg/L	0.026	0.020	0.023
POTASSIUM	mg/L	31.1	27.8	27.8
SELENIUM	mg/L	<0.003	0.008	0.005
SILICON	mg/L	4.69	4.76	4.81
SILVER	mg/L	1.19	1.05	0.937
STRONTIUM	mg/L	1.36	1.37	1.38
SODIUM	mg/L	299	305	305
SULPHUR	mg/L	638	645	657
TITANIUM	mg/L	0.0038	<0.0004	<0.0004
THALLIUM	mg/L	<0.004	<0.004	<0.004
TIN	mg/L	0.006	0.004	0.007
VANADIUM	mg/L	<0.001	<0.001	<0.001
ZINC	mg/L	28.9	30.5	31.4

Lab Manager: _____

NORWEST LABS
EDMONTON PH. (403) 438-5522 FAX (403) 438-0396
CALGARY PH. (403) 291-4021 FAX (403) 291-4021
LANGLEY PH. (604) 530-4344 FAX (604) 534-8390
LETHBRIDGE PH. (403) 328-4188 FAX (403) 327-8537
WINNIPEG PH. (204) 982-8600 FAX (204) 275-0019

DATE 05 JAN 98 16:13
P.O. NO.
W.O. NO. 1 147150
PAGE 3

BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NANSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		4 I-4 PLANT INFLUENT 16-30	5 I-5 PLANT INFLUENT 17-30	6 I-6 PLANT INFLUENT 18-30
ROUTINE WATER				
pH		9.29	9.29	9.28
ELECTRICAL COND	uS/cm	2560	2590	2570
CALCIUM	mg/L	599	596	596
MAGNESIUM	mg/L	7.8	7.6	7.7
SODIUM	mg/L	291	289	293
POTASSIUM	mg/L	28.4	27.7	28.1
IRON	mg/L	1.25	1.23	1.25
MANGANESE	mg/L	0.149	0.145	0.138
SULPHATE	mg/L	1940	1930	1970
CHLORIDE	mg/L	139	137	136
CARBONATE	mg/L	46.0	46.3	45.1
BICARBONATE	mg/L	114	115	116
P ALKALINITY	mg/L	38	39	38
T ALKALINITY	mg/L	170	171	171
HARDNESS	mg/L	1530	1520	1520
T DIS SOLIDS	mg/L	3110	3090	3130
IONIC BALANCE	%	92.4	92.2	91.4
WATER NUTRIENTS				
AMMONIA-N	mg/L	3.27	3.27	3.21
WEAK ACID DI CN	mg/L	40.0	49.0	57.0
CYANATE	mg/L	79.3	79.5	94.1
NO2&NO3-N	mg/L	0.97	0.95	0.96
TOTAL CYANIDE	mg/L	95.0	96.0	90.0
ORGANICS				
CHEM O2 DEMAND	mg/L	152	149	145
TOTAL, COLD VAPO				
MERCURY	mg/L	0.0011	0.0012	0.0013
METALS,DISS,AAS				
ARSENIC	mg/L	0.754	0.813	0.792

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BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NANSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		4 I-4 PLANT INFLUENT 16-30	5 I-5 PLANT INFLUENT 17-30	6 I-6 PLANT INFLUENT 18-30
TRACE ICP, TOTAL				
ALUMINUM	mg/L	0.042	0.033	0.021
ANTIMONY	mg/L	0.098	0.098	0.098
ARSENIC	mg/L	0.52	0.52	0.53
BARIUM	mg/L	0.0241	0.0244	0.0232
BERYLLIUM	mg/L	<0.0005	<0.0005	<0.0005
BISMUTH	mg/L	<0.007	<0.007	<0.007
BORON	mg/L	0.391	0.419	0.472
CADMIUM	mg/L	0.402	0.406	0.407
CALCIUM	mg/L	605	622	599
CHROMIUM	mg/L	0.0008	0.0015	0.0014
COBALT	mg/L	0.0602	0.0614	0.0655
COPPER	mg/L	18.6	18.6	18.6
IRON	mg/L	1.13	1.18	1.24
LEAD	mg/L	0.003	0.004	0.004
LITHIUM	mg/L	0.00372	0.00398	0.00421
MAGNESIUM	mg/L	7.92	8.05	8.09
MANGANESE	mg/L	0.308	0.308	0.300
MOLYBDENUM	mg/L	0.025	0.025	0.026
NICKEL	mg/L	0.104	0.109	0.110
PHOSPHORUS	mg/L	0.023	0.034	0.037
POTASSIUM	mg/L	25.0	31.3	27.2
SELENIUM	mg/L	0.004	0.005	0.007
SILICON	mg/L	5.13	5.14	5.11
SILVER	mg/L	1.11	1.02	1.03
STRONTIUM	mg/L	1.45	1.45	1.45
SODIUM	mg/L	306	317	306
SULPHUR	mg/L	648	673	658
TITANIUM	mg/L	<0.0004	<0.0004	<0.0004
THALLIUM	mg/L	<0.004	<0.004	<0.004
TIN	mg/L	0.006	0.006	0.006
VANADIUM	mg/L	<0.001	<0.001	<0.001
ZINC	mg/L	33.0	34.0	34.7

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BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NANSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		7 I-7 PLANT INFLUENT 19-30
ROUTINE WATER		
pH		9.28
ELECTRICAL COND	uS/cm	2530
CALCIUM	mg/L	598
MAGNESIUM	mg/L	7.7
SODIUM	mg/L	293
POTASSIUM	mg/L	28.3
IRON	mg/L	1.25
MANGANESE	mg/L	0.151
SULPHATE	mg/L	1950
CHLORIDE	mg/L	136
CARBONATE	mg/L	44.0
BICARBONATE	mg/L	120
P ALKALINITY	mg/L	37
T ALKALINITY	mg/L	171
HARDNESS	mg/L	1520
T DIS SOLIDS	mg/L	3110
IONIC BALANCE	%	92.3
WATER NUTRIENTS		
AMMONIA-N	mg/L	3.29
WEAK ACID DI CN	mg/L	64.8
CYANATE	mg/L	88.0
NO2&NO3-N	mg/L	0.96
TOTAL CYANIDE	mg/L	100
ORGANICS		
CHEM O2 DEMAND	mg/L	152
TOTAL, COLD VAPO		
MERCURY	mg/L	0.0013
METALS,DISS,AAS		
ARSENIC	mg/L	0.715

Lab Manager: _____

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BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NANSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE	7
	I-7 PLANT
	INFLUENT 19-30

TRACE ICP, TOTAL

ALUMINUM	mg/L	0.009
ANTIMONY	mg/L	0.098
ARSENIC	mg/L	0.52
BARIUM	mg/L	0.0224
BERYLLIUM	mg/L	<0.0005
BISMUTH	mg/L	<0.007
BORON	mg/L	0.385
CADMIUM	mg/L	0.395
CALCIUM	mg/L	586
CHROMIUM	mg/L	0.0014
COBALT	mg/L	0.0635
COPPER	mg/L	17.9
IRON	mg/L	1.18
LEAD	mg/L	0.003
LITHIUM	mg/L	0.00412
MAGNESIUM	mg/L	7.83
MANGANESE	mg/L	0.301
MOLYBDENUM	mg/L	0.026
NICKEL	mg/L	0.105
PHOSPHORUS	mg/L	0.020
POTASSIUM	mg/L	22.8
SELENIUM	mg/L	0.009
SILICON	mg/L	5.01
SILVER	mg/L	0.946
STRONTIUM	mg/L	1.39
SODIUM	mg/L	300
SULPHUR	mg/L	625
TITANIUM	mg/L	<0.0004
THALLIUM	mg/L	<0.004
TIN	mg/L	<0.003
VANADIUM	mg/L	<0.001
ZINC	mg/L	33.4

Lab Manager: _____

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BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NAWSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		1 R-1 REACTOR #1 EFFLEUNT 13-45	2 R-2 REACTOR #2 EFFLEUNT 14-45	3 R-3 REACTOR #3 EFFLEUNT 15-45
ROUTINE WATER				
pH		8.91	8.93	3.42
ELECTRICAL COND	us/cm	3060	3050	6680
CALCIUM	mg/L	1070	1070	1380
MAGNESIUM	mg/L	7.7	7.7	15.9
SODIUM	mg/L	192	188	184
POTASSIUM	mg/L	25.3	28.7	28.6
IRON	mg/L	0.68	0.63	410
MANGANESE	mg/L	<0.003	<0.003	2.06
SULPHATE	mg/L	2930	3000	2500
CHLORIDE	mg/L	39.1	39.3	29.5
CARBONATE	mg/L	20.0	21.0	
BICARBONATE	mg/L	79	72	<5
P ALKALINITY	mg/L	17	18	
T ALKALINITY	mg/L	98	94	<1
HARDNESS	mg/L	2700	2700	3500
T DIS SOLIDS	mg/L	4330	4380	4140
IONIC BALANCE	%	98.8	96.7	~103
WATER NUTRIENTS				
AMMONIA-N	mg/L	4.56	4.40	62.5
WEAK ACID DI CN	mg/L	0.270	0.314	0.850
CYANATE	mg/L	204	183	214
NO2&NO3-N	mg/L	1.04	1.03	484
TOTAL CYANIDE	mg/L	15.0	15.5	10.5
ORGANICS				
CHEM O2 DEMAND	mg/L	153	131	265
TOTAL, COLD VAPO				
MERCURY	mg/L	0.0012	0.0011	0.0005
METALS,DISS,AAS				
ARSENIC	mg/L	0.0267	0.454	0.0036

Lab Manager: _____

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110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NAWSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		1 R-1 REACTOR #1 EFFLEUNT 13-45	2 R-2 REACTOR #2 EFFLEUNT 14-45	3 R-3 REACTOR #3 EFFLEUNT 15-45
TRACE ICP, TOTAL				
ALUMINUM	mg/L	0.295	0.224	1.53
ANTIMONY	mg/L	0.099	0.094	0.145
ARSENIC	mg/L	0.53	0.50	0.28
BARIUM	mg/L	0.0250	0.0248	0.0417
BERYLLIUM	mg/L	<0.0005	<0.0005	<0.0005
BISMUTH	mg/L	<0.007	<0.007	<0.007
BORON	mg/L	0.385	0.369	0.530
CADMIUM	mg/L	0.399	0.378	2.06
CALCIUM	mg/L	1130	1070	1350
CHROMIUM	mg/L	0.0020	0.0023	0.0123
COBALT	mg/L	0.0291	0.0310	0.0525
COPPER	mg/L	13.0	12.3	64.8
IRON	mg/L	0.968	1.42	218
LEAD	mg/L	0.003	0.010	0.014
LITHIUM	mg/L	0.00673	0.00631	0.00769
MAGNESIUM	mg/L	10.3	9.77	17.5
MANGANESE	mg/L	0.362	0.345	2.18
MOLYBDENUM	mg/L	0.026	0.025	0.004
NICKEL	mg/L	0.239	0.107	0.502
PHOSPHORUS	mg/L	0.100	0.089	0.036
POTASSIUM	mg/L	24.7	29.1	32.7
SELENIUM	mg/L	0.005	0.007	0.071
SILICON	mg/L	5.96	5.55	23.9
SILVER	mg/L	0.628	0.413	0.161
STRONTIUM	mg/L	2.46	2.39	4.01
SODIUM	mg/L	311	302	305
SULPHUR	mg/L	1040	990	1120
TITANIUM	mg/L	0.0058	0.0078	0.505
THALLIUM	mg/L	<0.004	<0.004	<0.004
TIN	mg/L	<0.003	<0.003	<0.003
VANADIUM	mg/L	0.004	0.003	0.009
ZINC	mg/L	34.2	32.1	209

Lab Manager: _____

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BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NAWSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		4 R-4 REACTOR #4 CLARIFIER 16-45	5 R-5 GAC EFFLUENT 17-45
ROUTINE WATER			
pH		7.54	9.11
ELECTRICAL COND	uS/cm	4220	4070
CALCIUM	mg/L	1130	1120
MAGNESIUM	mg/L	9.8	12.5
SODIUM	mg/L	172	186
POTASSIUM	mg/L	33.1	55.5
IRON	mg/L	<0.04	<0.04
MANGANESE	mg/L	0.589	0.100
SULPHATE	mg/L	3120	3130
CHLORIDE	mg/L	39.3	14.9
CARBONATE	mg/L		31.5
BICARBONATE	mg/L	86	45
P ALKALINITY	mg/L		26
T ALKALINITY	mg/L	70	89
HARDNESS	mg/L	2860	2840
T DIS SOLIDS	mg/L	4540	4570
IONIC BALANCE	%	-95.9	-98.6
WATER NUTRIENTS			
AMMONIA-N	mg/L	4.85	3.94
WEAK ACID DI CN	mg/L	0.110	0.018
CYANATE	mg/L	201	208
NO2&NO3-N	mg/L	19.1	0.97
TOTAL CYANIDE	mg/L	18.5	0.270
ORGANICS			
CHEM O2 DEMAND	mg/L	95	47
TOTAL, COLD VAPO			
MERCURY	mg/L	0.0008	<0.0001
METALS,DISS,AAS			
ARSENIC	mg/L	0.0016	0.0022

Lab Manager: _____

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110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NAWSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		4 R-4 REACTOR #4 CLARIFIER 16-45	5 R-5 GAC EFFLUENT 17-45
TRACE ICP,TOTAL			
ALUMINUM	mg/L	<0.008	<0.008
ANTIMONY	mg/L	0.033	0.027
ARSENIC	mg/L	<0.01	<0.01
BARIUM	mg/L	0.0217	0.0299
BERYLLIUM	mg/L	<0.0005	<0.0005
BISMUTH	mg/L	<0.007	<0.007
BORON	mg/L	0.339	0.132
CADMIUM	mg/L	0.137	<0.0005
CALCIUM	mg/L	1090	1030
CHROMIUM	mg/L	0.0014	<0.0008
COBALT	mg/L	0.0783	0.0661
COPPER	mg/L	0.315	<0.001
IRON	mg/L	0.085	<0.003
LEAD	mg/L	<0.002	<0.002
LITHIUM	mg/L	0.00662	0.0151
MAGNESIUM	mg/L	11.2	13.0
MANGANESE	mg/L	0.625	0.203
MOLYBDENUM	mg/L	0.023	0.022
NICKEL	mg/L	0.051	<0.001
PHOSPHORUS	mg/L	<0.006	0.082
POTASSIUM	mg/L	24.5	63.5
SELENIUM	mg/L	0.008	<0.003
SILICON	mg/L	1.49	4.60
SILVER	mg/L	0.032	<0.001
STRONTIUM	mg/L	2.24	2.14
SODIUM	mg/L	303	298
SULPHUR	mg/L	1050	985
TITANIUM	mg/L	<0.0004	<0.0004
THALLIUM	mg/L	<0.004	<0.004
TIN	mg/L	<0.003	<0.003
VANADIUM	mg/L	<0.001	<0.001
ZINC	mg/L	5.35	<0.0005

Lab Manager: _____

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BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NANSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		1 E-1 PLANT EFFLUENT /GAC 16-00	2 E-2 PLANT EFFLUENT /GAC 17-00	3 E-3 PLANT EFFLUENT /GAC 18-00
ROUTINE WATER				
pH		9.02	9.11	9.14
ELECTRICAL COND	uS/cm	3190	3140	3160
CALCIUM	mg/L	1010	1020	1050
MAGNESIUM	mg/L	13.3	13.5	13.4
SODIUM	mg/L	280	238	227
POTASSIUM	mg/L	92.2	71.6	58.6
IRON	mg/L	<0.04	<0.04	<0.04
MANGANESE	mg/L	0.076	0.121	0.115
SULPHATE	mg/L	2940	2910	2970
CHLORIDE	mg/L	15.6	14.9	14.9
CARBONATE	mg/L	36.4	34.6	36.1
BICARBONATE	mg/L	59	50	36
P ALKALINITY	mg/L	30	29	30
T ALKALINITY	mg/L	109	98	90
HARDNESS	mg/L	2570	2600	2680
T DIS SOLIDS	mg/L	4420	4320	4390
IONIC BALANCE	%	-104	-102	-102
WATER NUTRIENTS				
AMMONIA-N	mg/L	3.83	3.88	4.00
WEAK ACID DI CN	mg/L	0.015	0.021	0.025
CYANATE	mg/L	176	172	170
NO2&NO3-N	mg/L	0.81	0.93	0.96
TOTAL CYANIDE	mg/L	0.130	0.170	0.250
ORGANICS				
CHEM O2 DEMAND	mg/L	47	39	40
TOTAL, COLD VAPO				
MERCURY	mg/L	<0.0001	<0.0001	<0.0001
METALS,DISS,ARS				
ARSENIC	mg/L	0.0036	0.0024	0.0020

Lab Manager: 

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BYG NATURAL RESOURCES
110 INDUSTRIAL ROAD
WHITEHORSE, YT
Y1A 2T9

CHRIS CARON
MT NANSEN WATER
TREATMENT
21 12 97

WATER ANALYSIS REPORT

SAMPLE		4 E-5 PLANT EFFLUENT /GAC 20-00	5 E-6 PLANT EFFLUENT /GAC 21-00
ROUTINE WATER			
pH		9.16	9.17
ELECTRICAL COND	uS/cm	3220	3960
CALCIUM	mg/L	1150	1190
MAGNESIUM	mg/L	13.0	12.6
SODIUM	mg/L	213	202
POTASSIUM	mg/L	44.2	42.0
IRON	mg/L	<0.04	<0.04
MANGANESE	mg/L	0.303	0.357
SULPHATE	mg/L	3210	3170
CHLORIDE	mg/L	15.6	15.8
CARBONATE	mg/L	35.7	35.4
BICARBONATE	mg/L	35	35
P ALKALINITY	mg/L	30	29
T ALKALINITY	mg/L	88	87
HARDNESS	mg/L	2920	3010
T DIS SOLIDS	mg/L	4700	4680
IONIC BALANCE	%	-100	-103
WATER NUTRIENTS			
AMMONIA-N	mg/L	4.50	4.35
WEAK ACID DI CN	mg/L	0.050	0.040
CYANATE	mg/L	188	178
NO2&NO3-N	mg/L	1.01	1.00
TOTAL CYANIDE	mg/L	0.960	0.960
ORGANICS			
CHEM O2 DEMAND	mg/L	52	71
TOTAL, COLD VAPO			
MERCURY	mg/L	<0.0001	<0.0001
METALS,DISS,AAS			
ARSENIC	mg/L	0.0014	0.0016

Lab Manager: _____

APPENDIX C

Phone: 438 - 6622
Fax: 438 - 0398

NORWEST SOIL RESEARCH LTD.

To:	Graham Dixon/Victor Menkal	**From:**	Anthony Neumann.
Fax:	867-393-3465	**Date:**	January 22, 1998
Phone:	867-393-3458	**Pages:**	1
Re:	Total Cyanide results on w/o 147287	**CC:**	

☐ **Urgent** ☑ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Graham,

Our strong acid dissociable procedure involves the following steps

1) release of cyanide through digestion with a strong acid
2) distillation and trapping of cyanide into a NaOH solution to remove any interferences
3) reaction of the distilled solution with chloramine T and barbituric acid in pyridine
4) Cyanide forms a red-blue product which is measured by colorimetry.

According to the standard methods procedure, this will remove all the cyanide and separate it from any chemicals that may cause interference. However, chemical extraction mining may produce a lot of sulfites which can react with cyanide to perform thiocyanate. Under strong acid conditions, an oxidant (nitrates) may cause the reverse reaction thereby reforming the cyanide. Under weak acid conditions, nitrates do not cause such a reaction. Our lab did undergo experimentation to determine the thiocyanate concentration in the effluent and if this may have caused the high total cyanide result. In the effluent (labeled PHUCT), thiocyanate concentrations were 25 mg/L and in the sample labeled GAC, thiocyanate concentrations were at 23 mg/L. This is the only cause that I can find for the high total cyanide results and low WAD cyanide results.

Because of this interference, the best method for determination of SAD cyanide in the effluent may be through the calculation used at the plant (2.3(WAD Cyanide)+metallic complexed cyanides).

Thanks

Anthony Neumann

APPENDIX D

9938-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS

Tel: (403) 435-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 98 01 06
P.O. No: N/A
Report No: 147331-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Mt. Nansen Plant Effluent

FISH BIOASSAY REPORT

SAMPLE CHARACTERISTICS

INITIAL OBSERVATIONS

TEMPERATURE (°C): 8.7 pH: 6.9 CONDUCTIVITY: 4.81 mS/cm

PREAERATION D.O.: 10.8 mg/L 93.5 % Saturation

AERATION (RATE/TIME): 6.5 +/-1.0 mL/Min/L FOR 30 MINUTES

TEST OBSERVATIONS

SAMPLE CONCENTRATION	TEMPERATURE (°C)			pH (pH Units)			CONDUCTIVITY (mS/cm)			DISSOLVED OXYGEN (mg/L)		
	0h	96h	Mean	0h	96h	Mean	0h	96h	Mean	0h	96h	Mean
1 part Effluent + 1 part Lab Water	15.7	14.5	14.8	7.5	8.0	7.8	2.73	2.86	2.79	9.36	8.96	9.06
1 part Effluent + 2 parts Lab Water	15.5	14.4	14.6	7.6	7.9	7.8	1.98	2.11	2.04	9.31	8.67	8.92
1 part Effluent + 3 parts Lab Water	15.5	14.4	14.7	7.7	8.0	7.9	1.62	1.69	1.65	9.22	8.86	9.10
1 part Effluent + 4 parts Lab Water	15.5	14.1	14.5	7.8	8.0	7.9	1.36	1.44	1.39	9.14	8.86	9.07
Control (Lab Water)	15.5	14.4	14.6	8.1	7.9	8.0	0.277	0.282	0.278	9.12	8.61	8.91

COMMENTS: The sample concentrations were acclimated to the recommended temperature test range of 15 ±1°C prior to starting the test.

9938-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS
Tel: (403) 436-6522 or 1-800-661-7645
Fax: (403) 436-0396

DATE: 98 01 06
P.O. No: N/A
Report No: 147331-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Mt. Nansen Plant Effluent

FISH BIOASSAY REPORT

BIOASSAY DATA

SAMPLE CONCENTRATION	FISH MORTALITY - NUMBER & PERCENT (# Stressed)									FISH			
	OBSERVATION TIME (h)									Length (cm)		Weight (g)*	
(% BY VOLUME)	0	1	2	4	24	48	72	96	%	Mean	Range	Mean	Range
1 part Effluent + 1 part Lab Water	nil	nil	nil	nil	2 (8s)	4 (6s)	8 (2s)	9 (1s)	90	5.3	4.5-6.2	1.97	1.25-2.99
1 part Effluent + 2 parts Lab Water	nil	nil	nil	nil	nil (5s)	1 (9s)	3 (7s)	3 (7s)	30	5.5	5.0-6.0	1.99	1.42-2.54
1 part Effluent + 3 parts Lab Water	nil	nil	nil	nil	nil (5s)	1 (3s)	3 (7s)	3 (7s)	30	5.3	4.5-5.7	1.76	0.93-2.26
1 part Effluent + 4 parts Lab Water	nil	nil	nil	nil	nil	nil	2 (8s)	3 (7s)	30	5.3	4.8-6.0	1.73	0.96-2.80
Control (Lab Water)	nil	nil	nil	nil	nil	nil	nil	nil	0	5.6	5.1-6.0	1.76	1.37-2.16

*Fish that died before 96 hours appear bloated and may weigh heavy due to absorbed water.

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NORWEST LABS

Tel: (403) 438-5522 or 1-800-661-7645
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DATE: 98 01 06
P.O. No: N/A
Report No: 147331-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Mt. Nansen Plant Effluent

FISH BIOASSAY

BIOASSAY RESULTS

BIOASSAY	ENDPOINT LC50 (% ORIGINAL SAMPLE)	95% CONFIDENCE RANGE	RESULTS
96 Hr., Multi-concentration Static LC50 Bioassay	**32.4% * (i.e. Less than 1 part Effluent + 3 parts Lab Dilution Water)**	**24.5 - 48.8% ***	**"Highly Toxic"**

* This value was calculated using the probit method.

RESULTS INTERPRETATION

1. The test sample was analyzed using the Rainbow trout lethality test for toxicity assessment. The bioassay was performed according to established procedures (see references, page 5).

2. The Mt. Nansen Plant Effluent Sample (December 31, 1997) was determined to be **"Highly Toxic"** with an LC50 value of 32.4% (less than 1 part Effluent and 3 parts Lab Dilution Water).

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T6E 0P5

NORWEST LABS
Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 98 01 06
P.O. No: N/A
Report No: 147331-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Mt. Nansen Plant Effluent

FISH BIOASSAY REPORT

QUALITY CONTROL DATA

TEST SPECIES:	*Oncorhynchus mykiss* (Rainbow Trout), LOT#: 971118
REFERENCE TOXICANT:	PHENOL
TEST DATE:	December 02, 1997
96 HOUR LC50:	10.8 mg/L (95% Confidence Limits: 10.0 - 11.6)
HISTORICAL MEAN:	10.5 +/- 2.4 mg/L
BIOASSAY VALIDITY:	Valid; no fish died or exhibited atypical/ stressed behavior in either control. Stock fish tank mortality was < 2% in the seven days preceding this bioassay. At 0.53 g/L, the loading density exceeds Environment Canada limit of <0.50 g/L. (Note, however, the fish that died prior to 96 hours appeared bloated and may have weighed heavy due to absorbed water.)

BIOASSAY METHODOLOGY REFERENCES:

1. Environment Canada. 1990. Biological Test Method: Acute Lethality Using Rainbow Trout. EPS 1/RM/9.
2. Environment Canada. 1990. Guidance Document for Control of Toxicity Test Precision Using Reference Toxicants. EPS 1/RM/12.
3. Environment Canada. 1990. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS 1/RM/13.
4. Alberta Environmental Centre. 1991. Standard Operating Procedures. Volume 1. Aquatic Biology Branch. AEC 90-M1.
5. American Public Health Association. 1992. Standard Methods for the Examination of Waste and Wastewater. 18th ed.
6. Norwest Labs Test Methods. 1997. TM BIO 035-10. Rainbow Trout *(Oncorhynchus mykiss)* 96 Hour, Multiple Concentration, Acute, Static, LC50 Bioassay. Edmonton, AB.

Analyst: SV Approved: RL Schell

9936-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS

Tel: (403) 438-5522 or 1-800-661-7845
Fax: (403) 438-0396

DATE: 98 01 05
P.O. No: N/A
Report No: 147287-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

28/12/97 CNO REACTOR EFFLUENT

FAIL

ATTENTION: Chris Caron

PROJECT: Plant Effluent (PHUCT)+ Lab Dilution Water

FISH BIOASSAY REPORT

SAMPLE INFORMATION

LAB W/O#: 147287-1

CLIENT ID: Plant effluent (PHUCT)+ Lab Dilution Water

INDUSTRY/LOCATION: BYG Natural Resources / Whitehorse, YK

SAMPLING SITE: Plant Effluent + Lab Dilution Water

DATE SAMPLED: 97 12 28 @ 23:30 by C. Caron - BYG Resources

DATE RECEIVED: 97 12 30.

TYPE: 2 x 20L Effluent containers

DESCRIPTION: Fluid

COLOR: Clear

TURBIDITY: None

TRANSPORT TEMP: Ambient

STORAGE LENGTH/TEMP: N/A

TEST INFORMATION

TYPE: 96 Hr., Multi-concentration, Static LC50 Bioassay (Modified[1] NWL TM BIO 035-10)

SPECIES: Rainbow Trout *Oncorhynchus mykiss*

SOURCE/LOT NO: Sun Valley Trout Farm/971118

NUMBER: RBT-97-EF688

DATE: 97 12 31 to 98 01 04

ORGANISMS: Fingerlings

VOLUME: 25L / Container

CONTAINER (TYPE/SIZE): Plastic / 25L.

LOADING DENSITY: 0.59 g/L*., 10 / Container
*The loading density exceeds the Environment Canada limit of <0.50 g/L

TEMPERATURE: 15±1°C

AERATION: As Per Env. Can. Report EPS1/RM/13

CULTURING/LAB DILUTION WATER SOURCE: Dechlorinated Tap Water (City of Edmonton)

TEST SOLUTIONS/SAMPLE CONCENTRATIONS: Control (Lab Water); 1 part Effluent + 1 part Lab Water; 1 part Effluent + 2 parts Lab Water; 1 part Effluent + 3 parts Lab Water; 1 part Effluent + 4 parts Lab Water, 1 part Effluent + 5 parts Lab Water

FEEDING BEFORE/DURING TEST: No Feeding 16 Hrs. Prior To Test/ None

[1] NWL TM BIO 035-10 modifications:
1) Concentration series tested as requested by client.

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T6E 0P6

NORWEST LABS

Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 98 01 05
P.O. No: N/A
Report No: 147287-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (PHUCT)+ Lab Dilution Water

FISH BIOASSAY REPORT

SAMPLE CHARACTERISTICS

INITIAL OBSERVATIONS

TEMPERATURE (°C): 10.4 pH: 7.2 CONDUCTIVITY: 4.54 mS/cm

PREAERATION D.O.: 10.12 mg/L 90.2 % Saturation

AERATION (RATE/TIME): 6.5 +/-1.0 mL/Min/L FOR 30 MINUTES

TEST OBSERVATIONS

SAMPLE CONCENTRATION	TEMPERATURE (°C)			pH (pH Units)			CONDUCTIVITY (mS/cm)			DISSOLVED OXYGEN (mg/L)		
	0h	96h	Mean	0h	96h	Mean	0h	96h	Mean	0h	96h	Mean
1 part Effluent + 1 part Lab Water	15.9	14.9	15.3	7.7	8.1	7.9	2.54	2.68	2.60	9.09	9.19	9.09
1 part Effluent + 2 parts Lab Water	15.6	15.2	15.3	7.8	8.0	7.9	1.92	2.01	1.96	9.07	9.15	9.06
1 part Effluent + 3 parts Lab Water	15.9	14.8	15.1	7.9	8.1	8.0	1.57	1.63	1.60	9.03	9.26	9.16
1 part Effluent + 4 parts Lab Water	16.0	14.9	15.3	7.9	8.0	7.9	1.39	1.44	1.42	9.02	9.21	9.03
1 part Effluent + 5 parts Lab Water	16.0	14.6	15.2	7.9	8.0	7.9	1.14	1.15	1.14	8.97	9.25	9.06
Control (Lab Water)	16.0	14.7	15.3	8.1	8.0	8.0	0.252	0.278	0.263	8.74	9.10	8.83

COMMENTS: The sample concentrations were acclimated to the recommended temperature test range of 15 ±1 °C prior to starting the test.

9936-67 Avenue
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T6E 0P5

NORWEST LABS
Tel: (403) 436-5522 or 1-800-661-7645
Fax: (403) 436-0396

DATE: 98 01 05
P.O. No: N/A
Report No: 147287-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (PHUCT)+ Lab Dilution Water

FISH BIOASSAY REPORT

BIOASSAY DATA

SAMPLE CONCENTRATION (% BY VOLUME)	FISH MORTALITY - NUMBER & PERCENT (# Stressed) OBSERVATION TIME (h)									FISH			
										Length (cm)		Weight (g)*	
	0	1	2	4	24	48	72	96	%	Mean	Range	Mean	Range
1 part Effluent + 1 part Lab Water	nil	nil	nil	nil	3 (7s)	6 (4s)	6 (4s)	6	60	4.8	3.7-5.5	1.32	0.59-2.07
1 part Effluent + 2 parts Lab Water	nil	nil	nil	nil	1 (9s)	7 (3s)	8 (1s)	8	80	4.9	4.0-6.0	1.55	0.85-2.46
1 part Effluent + 3 parts Lab Water	nil	nil	nil	nil	4 (6s)	9 (1s)	9	9	90	4.5	4.0-5.1	1.18	0.75-1.57
1 part Effluent + 4 parts Lab Water	nil	nil	nil	nil	2 (8s)	5 (5s)	6 (1s)	6 (1s)	60	4.7	4.0-5.0	1.30	0.57-1.89
1 part Effluent + 5 parts Lab Water	nil	nil	nil	nil	2 (8s)	7 (3s)	7	7	70	5.2	4.4-6.2	1.70	0.90-2.71
Control (Lab Water)	nil	nil	nil	nil	nil	nil	nil	nil	0	5.7	5.0-6.4	1.87	1.23-2.66

* Fish that died before 96 hours appear bloated and may weigh heavy due to absorbed water.

Edmonton, AB
T6E 0P5

NORWEST LABS
Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 98 01 05
P.O. No: N/A
Report No: 147287-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (PHUCT)+ Lab Dilution Water

FISH BIOASSAY

BIOASSAY RESULTS

BIOASSAY	ENDPOINT LC50 (% ORIGINAL SAMPLE)	95% CONFIDENCE RANGE	RESULTS
96 Hr., Multi-concentration Static LC50 Bioassay	**Undetermined**	**Not Applicable**	**Toxic**

RESULTS INTERPRETATION

1. The test sample was analyzed using the Rainbow trout lethality test for toxicity assessment. The bioassay was performed according to established procedures (see references, page 5).

2. The Plant Effluent Sample PHUCT (December 28, 1997) was determined to be **"Toxic"**. However, an LC50 value could not be calculated because a concentration-effect relationship had not been demonstrated over the range of effluent concentrations used in the bioassay.

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T6E 0P5

NORWEST LABS
Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 98 01 05
P.O. No: N/A
Report No: 147287-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (PHUCT)+ Lab Dilution Water

FISH BIOASSAY REPORT

QUALITY CONTROL DATA

TEST SPECIES:	*Oncorhynchus mykiss* (Rainbow Trout), LOT#: 971118
REFERENCE TOXICANT:	PHENOL
TEST DATE:	December 02, 1997
96 HOUR LC50:	10.8 mg/L (95% Confidence Limits: 10.0 - 11.6)
HISTORICAL MEAN:	10.5 +/- 2.4 mg/L
BIOASSAY VALIDITY:	Valid; no fish died or exhibited atypical/ stressed behavior in either control. Stock fish tank mortality was < 2% in the seven days preceding this bioassay. At 0.59 g/L, the loading density exceeds Environment Canada limit of <0.50 g/L. (Note, however, the fish that died prior to 96 hours appeared bloated and may have weighed heavy due to absorbed water.)

BIOASSAY METHODOLOGY REFERENCES:

1. Environment Canada. 1990. Biological Test Method: Acute Lethality Using Rainbow Trout. EPS 1/RM/9.
2. Environment Canada. 1990. Guidance Document for Control of Toxicity Test Precision Using Reference Toxicants. EPS 1/RM/12.
3. Environment Canada. 1990. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS 1/RM/13.
4. Alberta Environmental Centre. 1991. Standard Operating Procedures. Volume 1. Aquatic Biology Branch. AEC 90-M1.
6. American Public Health Association. 1992. Standard Methods for the Examination of Waste and Wastewater. 18th ed.
6. Norwest Labs Test Methods. 1997. TM BIO 035-10. Rainbow Trout *(Oncorhynchus mykiss)* 96 Hour, Multiple Concentration, Acute, Static, LC50 Bioassay. Edmonton, AB.

Analyst: SV Approved: RL

9938-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS
Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 97 12 31
P.O. No: N/A
Report No: 147206-1F

GMC #3 Effluent

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (Z-1) + Lab Dilution Water

FISH BIOASSAY REPORT

SAMPLE INFORMATION

LAB W/O#: 147206-1
CLIENT ID: Plant Effluent + Lab Dilution Water

INDUSTRY/LOCATION: BYG Natural Resources / Whitehorse, YK
SAMPLING SITE: Mt. Nansen Mine Water Treatment Plant

DATE SAMPLED: 97 12 23
DATE RECEIVED: 97 12 24

TYPE: 3 x 20L Effluent containers
DESCRIPTION: Fluid

COLOR: Pale Yellow
TURBIDITY: None (Floating granular charcoal present)

TRANSPORT TEMP: Ambient
STORAGE LENGTH/TEMP: N/A

TEST INFORMATION

TYPE: 96 Hr., Multi-concentration, Static LC50 Bioassay (Modified[1] NWL TM BIO 035-10)

SPECIES: Rainbow Trout *Oncorhynchus mykiss*
SOURCE/LOT NO: Sun Valley Trout Farm/971118

NUMBER: RBT-97-EF686
DATE: 97 12 27 to 97 12 31

ORGANISMS: Fingerlings
VOLUME: 25L / Container

CONTAINER (TYPE/SIZE): Plastic / 25L
LOADING DENSITY: 0.62 g/L*., 10 / Container
*The loading density exceeds the Environment Canada limit of <0.50 g/L

TEMPERATURE: 15±1°C
AERATION: As Per Env. Can. Report EPS1/RM/13

CULTURING/LAB DILUTION WATER SOURCE: Dechlorinated Tap Water (City of Edmonton)

TEST SOLUTIONS/SAMPLE CONCENTRATIONS: Control (Lab Water); 100% Effluent; 2 parts Effluent + 1 part Lab Water; 1 part Effluent + 1 part Lab Water; 1 part Effluent + 2 parts Lab Water; 1 part Effluent + 3 parts Lab Water

FEEDING BEFORE/DURING TEST: No Feeding 48 Hrs. Prior To Test/ None

[1] NWL TM BIO 035-10 modifications:
1) Concentration series tested as requested by client.

9936-67 Avenue
Edmonton, AB
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NORWEST LABS

Tel: (403) 436-6522 or 1-800-661-7645
Fax: (403) 436-0396

DATE: 97 12 31
P.O. No: N/A
Report No: 147206-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (Z-1) + Lab Dilution Water

FISH BIOASSAY REPORT

SAMPLE CHARACTERISTICS

INITIAL OBSERVATIONS

TEMPERATURE (°C): 14.8 pH: 9.2 CONDUCTIVITY: 4.37 mS/cm

PREAERATION D.O.: 5.38 mg/L 52.7 % Saturation

AERATION (RATE/TIME): 6.5 +/-1.0 mL/Min/L FOR 30 MINUTES

TEST OBSERVATIONS

SAMPLE CONCENTRATION	TEMPERATURE (°C)			pH (pH Units)			CONDUCTIVITY (mS/cm)			DISSOLVED OXYGEN (mg/L)		
	0h	96h	Mean	0h	96h	Mean	0h	96h	Mean	0h	96h	Mean
100% Effluent	14.9	*	*	9.1	*	*	4.36	*	*	8.96	*	*
2 parts Effluent + 1 part Lab Water	15.3	*	*	8.9	*	*	3.17	*	*	9.30	*	*
1 part Effluent + 1 part Lab Water	15.4	15.1	15.2	8.7	8.1	8.3	2.52	2.60	2.57	9.24	8.77	9.14
1 part Effluent + 2 parts Lab Water	15.5	14.8	15.1	8.6	8.1	8.3	1.80	1.89	1.85	9.25	8.78	9.17
1 part Effluent + 3 parts Lab Water	15.7	14.7	15.1	8.5	8.1	8.2	1.40	1.54	1.47	9.38	8.81	9.22
Control (Lab Water)	15.8	15.0	15.3	8.2	8.0	8.1	0.268	0.287	0.275	9.34	8.52	9.00

COMMENTS: The sample concentrations were acclimated to the recommended temperature test range of 15 ±1°C prior to starting the test.
* 100% mortality occurred before 96 hours.

9938-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS
Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 97 12 31
P.O. No: N/A
Report No: 147206-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (Z-1) + Lab Dilution Water

FISH BIOASSAY REPORT

BIOASSAY DATA

SAMPLE CONCENTRATION (% BY VOLUME)	FISH MORTALITY - NUMBER & PERCENT (# Stressed) OBSERVATION TIME (h)									FISH			
										Length (cm)		Weight (g)*	
	0	1	2	4	24	48	72	96	%	Mean	Range	Mean	Range
100% Effluent	nil	nil (10s)	nil (10s)	nil (10s)	10				100	4.7	4.1-5.1	1.42	0.79-1.85
2 parts Effluent + 1 part Lab Water	nil	nil	nil	nil	10				100	5.0	3.9-6.0	1.69	0.72-3.19
1 part Effluent + 1 part Lab Water	nil	nil	nil	nil	7	9	9	10	100	5.1	4.3-5.6	1.72	1.36-2.13
1 part Effluent + 2 parts Lab Water	nil	nil	nil	nil	2	5	8	10	100	4.7	4.1-5.8	1.36	0.89-2.48
1 part Effluent + 3 parts Lab Water	nil	nil	nil	nil	nil	6	8	10	100	5.2	4.5-6.0	1.67	1.17-2.39
Control (Lab Water)	nil	nil	nil	nil	nil	nil	nil	nil	0	5.1	4.5-6.0	1.40	0.88-2.21

* Fish that died before 96 hours appear bloated and may weigh heavy due to absorbed water.

9938-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS
Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 97 12 31
P.O. No: N/A
Report No: 147206-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (Z-1) + Lab Dilution Water

FISH BIOASSAY

BIOASSAY RESULTS

BIOASSAY	ENDPOINT LC50 (% ORIGINAL SAMPLE)	95% CONFIDENCE RANGE	RESULTS
96 Hr., Multi-concentration Static LC50 Bioassay	**Less than 1 part Effluent + 3 parts Lab Dilution Water (i.e. <25%)**	**Not Applicable**	**Highly Toxic**

RESULTS INTERPRETATION

1. The test sample was analyzed using the Rainbow trout lethality test for toxicity assessment. The bioassay was performed according to established procedures (see references, page 5).

2. The Plant Effluent Sample Z-1(December 23, 1997) was determined to be "Highly - Toxic" with an LC50 < 25% (less than 1 part Effluent + 3 parts Lab Dilution Water)

9938-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS
Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 97 12 31
P.O. No: N/A
Report No: 147206-1F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent (Z-1) + Lab Dilution Water

FISH BIOASSAY REPORT

QUALITY CONTROL DATA

TEST SPECIES:	*Oncorhynchus mykiss* (Rainbow Trout), LOT#: 971118
REFERENCE TOXICANT:	PHENOL
TEST DATE:	December 02, 1997
96 HOUR LC50:	10.8 mg/L (95% Confidence Limits: 10.0 - 11.6)
HISTORICAL MEAN:	10.5 +/- 2.4 mg/L
BIOASSAY VALIDITY:	Valid; no fish died or exhibited atypical/ stressed behavior in either control. Stock fish tank mortality was < 2% in the seven days preceding this bioassay. At 0.56 g/L, the loading density exceeds Environment Canada limit of <0.50 g/L. (Note, however, the fish that died prior to 96 hours appeared bloated and may have weighed heavy due to absorbed water.)

BIOASSAY METHODOLOGY REFERENCES:

1. Environment Canada. 1990. Biological Test Method: Acute Lethality Using Rainbow Trout. EPS 1/RM/9.
2. Environment Canada. 1990. Guidance Document for Control of Toxicity Test Precision Using Reference Toxicants. EPS 1/RM/12.
3. Environment Canada. 1990. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS 1/RM/13.
4. Alberta Environmental Centre. 1991. Standard Operating Procedures. Volume 1. Aquatic Biology Branch. AEC 90-M1.
5. American Public Health Association. 1992. Standard Methods for the Examination of Waste and Wastewater. 18th ed.
6. Norwest Labs Test Methods. 1997. TM BIO 035-10. Rainbow Trout *(Oncorhynchus mykiss)* 96 Hour, Multiple Concentration, Acute, Static, LC50 Bioassay. Edmonton, AB.

Analyst: _____ Approved: _____

9936-67 Avenue
Edmonton, AB
T6E 0P5

NORWEST LABS
Tel: (403) 438-5522 or 1-800-661-7645
Fax: (403) 438-0396

DATE: 97 12 30
P.O. No: N/A
Report No: 147148-1/2F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

21/12/97 GAC # 2 effluent (pm)

ATTENTION: Chris Caron
PROJECT: Plant Effluent + Victoria Creek Dilution Water

FISH BIOASSAY REPORT

SAMPLE INFORMATION

LAB W/O#: 147148-1

CLIENT ID: Plant effluent + Victoria Creek Dilution Water

INDUSTRY/LOCATION: BYG Natural Resources / Whitehorse, YK

SAMPLING SITE: Plant Effluent + Victoria Creek Dilution Water

DATE SAMPLED: 97 12 21

DATE RECEIVED: 97 12 23

TYPE: 3 x 20L Effluent containers
3 x 20L Creek water containers

DESCRIPTION: Fluid

COLOR: Effluent - Colorless
Creek - Pale Yellow

TURBIDITY: Effluent - Slight
Creek - Slight

TRANSPORT TEMP: Ambient

STORAGE LENGTH/TEMP: N/A

TEST INFORMATION

TYPE: 96 Hr., Multi-concentration, Static LC50 Bioassay (Modified[1] NWL TM BIO 035-10)

SPECIES: Rainbow Trout *Oncorhynchus mykiss*

SOURCE/LOT NO: Sun Valley Trout Farm/971118

NUMBER: RBT-97-EF682

DATE: 97 12 24 to 97 12 28

ORGANISMS: Fingerlings

VOLUME: 25L / Container

CONTAINER (TYPE/SIZE): Plastic / 25L

LOADING DENSITY: 0.56 g/L*., 10 / Container
*The loading density exceeds the Environment Canada limit of <0.50 g/L

TEMPERATURE: 15±1°C

AERATION: As Per Env. Can. Report EPS1/RM/13

CULTURING/LAB DILUTION WATER SOURCE: Dechlorinated Tap Water (City of Edmonton)

TEST SOLUTIONS/SAMPLE CONCENTRATIONS: Control (Lab Water); Control (Creek Water); 100% Effluent; 2 parts Effluent + 1 part Creek; 1 part Effluent + 1 part Creek; 1 part Effluent + 2 parts Creek; 1 part Effluent + 3 parts Creek

FEEDING BEFORE/DURING TEST: No Feeding 16 Hrs. Prior To Test/ None

[1] NWL TM BIO 035-10 modifications:
1) Concentration series tested as requested by client.
2) Creek water supplied by client was used to dilute the effluent sample (as requested by the client).
3) Two "control" samples were tested: a) The creek water used to dilute the effluent.
b) Our lab water that is normally used to raise fish and dilute samples.

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DATE: 97 12 30
P.O. No: N/A
Report No: 147148-1/2F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent + Victoria Creek Dilution Water

FISH BIOASSAY REPORT

SAMPLE CHARACTERISTICS

INITIAL OBSERVATIONS

TEMPERATURE (°C): Effluent - 9.1, Creek - 9.0 pH: Effluent - 9.2, Creek - 7.6 CONDUCTIVITY: Effluent - 4.27 mS/cm, Creek - 0.302 mS/cm

PREAERATION D.O.: Effluent - 9.32 mg/L, 80.5 % Saturation; Creek - 9.45 mg/L, 81.6 % Saturation

AERATION (RATE/TIME): 6.5 +/-1.0 mL/Min/L FOR 30 MINUTES

TEST OBSERVATIONS

SAMPLE CONCENTRATION	TEMPERATURE (°C)			pH (pH Units)			CONDUCTIVITY (mS/cm)			DISSOLVED OXYGEN (mg/L)		
	0h	96h	Mean	0h	96h	Mean	0h	96h	Mean	0h	96h	Mean
100% Effluent	15.9	*	*	9.2	*	*	4.11	*	*	8.97	*	*
2 parts Effluent + 1 part Creek	15.7	*	*	8.7	*	*	3.30	*	*	8.89	*	*
1 part Effluent + 1 part Creek	15.6	*	*	8.5	*	*	2.59	*	*	8.49	*	*
1 part Effluent + 2 parts Creek	15.6	*	*	8.3	*	*	1.88	*	*	8.76	*	*
1 part Effluent + 3 parts Creek	15.9	*	*	8.2	*	*	1.51	*	*	8.67	*	*
Control (Creek)	15.8	15.5	15.6	8.0	8.3	8.2	0.451	.0310	0.355	8.79	8.93	8.90
Control (Lab)	16.0	15.7	15.9	8.2	8.0	8.1	0.263	0.281	0.272	9.09	8.89	8.90

COMMENTS: The sample concentrations were acclimated to the recommended temperature test range of 15 ±1°C prior to starting the test.
* 100% mortality occurred before 96 hours.

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P.O. No: N/A
Report No: 147148-1/2F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent + Victoria Creek Dilution Water

FISH BIOASSAY REPORT

BIOASSAY DATA

SAMPLE CONCENTRATION (% BY VOLUME)	FISH MORTALITY - NUMBER & PERCENT (# Stressed) OBSERVATION TIME (h)									FISH Length (cm)		FISH Weight (g)*	
	0	1	2	4	24	48	72	96	%	Mean	Range	Mean	Range
100% Effluent	nil	nil (4)	10						100	5.0	4.4-5.7	1.38	0.94-2.00
2 parts Effluent + 1 part Creek	nil	nil	nil	2 (8)	9 (1)	10			100	5.0	4.4-6.1	1.75	0.88-4.17
1 part Effluent + 1 part Creek	nil	nil	nil	nil	7 (3)	10			100	4.7	4.0-5.4	1.32	1.02-1.98
1 part Effluent + 2 parts Creek	nil	nil	nil	nil	2 (8)	9 (1)	10		100	4.7	3.6-5.5	1.47	0.63-2.25
1 part Effluent + 3 parts Creek	nil	nil	nil	nil	1 (9)	6 (4)	10		100	4.7	3.5-5.5	1.45	0.78-2.50
Control (Creek)	nil	nil	nil	nil	nil	nil	nil	nil	0	4.9	4.3-5.6	1.18	0.70-1.90
Control (Lab)	nil	nil	nil	nil	nil	nil	nil	nil	0	4.9	4.3-6.0	1.25	0.69-2.10

* Fish that died before 96 hours appear bloated and may weigh heavy due to absorbed water.

9938-67 Avenue
Edmonton, AB
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DATE: 97 12 30
P.O. No: N/A
Report No: 147148-1/2F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent + Victoria Creek Dilution Water

FISH BIOASSAY

BIOASSAY RESULTS

BIOASSAY	ENDPOINT LC50 (% ORIGINAL SAMPLE)	95% CONFIDENCE RANGE	RESULTS
96 Hr., Multi-concentration Static LC50 Bioassay	**Less than 1 part Effluent + 3 parts Creek (i.e. <25%)**	**Not Applicable**	**Highly Toxic**

RESULTS INTERPRETATION

1. The test sample was analyzed using the Rainbow trout lethality test for toxicity assessment. The bioassay was performed according to established procedures (see references, page 5).

2. The Plant Effluent Sample (December 21, 1997) was determined to be **"Highly - Toxic"** with an LC50 < 25% (less than 1 part Effluent + 3 parts Creek)

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Edmonton, AB
T6E 0P5

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DATE: 97 12 30
P.O. No: N/A
Report No: 147148-1/2F

BYG Natural Resources Inc.
110 Industrial Road
Whitehorse, YK
Y1A 2T9

ATTENTION: Chris Caron
PROJECT: Plant Effluent + Victoria Creek Dilution Water

FISH BIOASSAY REPORT

QUALITY CONTROL DATA

TEST SPECIES:	*Oncorhynchus mykiss* (Rainbow Trout), LOT#: 971118
REFERENCE TOXICANT:	PHENOL
TEST DATE:	December 02, 1997
96 HOUR LC50:	10.8 mg/L (95% Confidence Limits: 10.0 - 11.6)
HISTORICAL MEAN:	10.5 +/- 2.4 mg/L
BIOASSAY VALIDITY:	Valid; no fish died or exhibited atypical/ stressed behavior in either control. Stock fish tank mortality was < 2% in the seven days preceding this bioassay. At 0.56 g/L, the loading density exceeds Environment Canada limit of <0.50 g/L. (Note, however, that fish that died prior to 96 hours appeared bloated and may have weighed heavy due to absorbed water.)

BIOASSAY METHODOLOGY REFERENCES:

1. Environment Canada. 1990. Biological Test Method: Acute Lethality Using Rainbow Trout. EPS 1/RM/9.
2. Environment Canada. 1990. Guidance Document for Control of Toxicity Test Precision Using Reference Toxicants. EPS 1/RM/12.
3. Environment Canada. 1990. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS 1/RM/13.
4. Alberta Environmental Centre. 1991. Standard Operating Procedures. Volume 1. Aquatic Biology Branch. AEC 90-M1.
5. American Public Health Association. 1992. Standard Methods for the Examination of Waste and Wastewater. 18th ed.
6. Norwest Labs Test Methods. 1997. TM BIO 035-10. Rainbow Trout *(Oncorhynchus mykiss)* 96 Hour, Multiple Concentration, Acute, Static, LC50 Bioassay. Edmonton, AB.

Analyst: _____ Approved: _____

This form's content was typed

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION

FROM: R. STROSHEIN
A/MINE MANAGER, MOUNT NANSEN

RE: WEEKLY WATER USE REPORT: For period ending March 27, 1998.

WATER TREATMENT PLANT

The total water discharge during the period was 239 cubic meters. The cumulative total of discharged water is 32118 cubic meters.

The water treatment plant was shut down on March 21 for cleaning, installation of carbon column discharge pump , and #1 reactor feed-water down comer installation.

Following start up, compliant concentrations for CN and Zn were met on March 23 but could not be sustained and the discharge to Dome Creek was stopped after 15 hours. With the addition of the carbon columns an average flow rate through the plant has been reduced to the current rate of 30 cubic meters per hour.

The plant has been running nearly continuously and returning the treated water to the tailings pond.

The latest sample results of March 20, 1998 indicate the concentration of total cyanide in the tailings pond water is 37.5 mg/l.

TAILINGS IMPOUNDMENT AREA

The latest water elevation measurement on March 24 was at 1149.674 meters.

The flow rate of the discharge from the # 2 seepage dam has been relatively consistent at 6.5 cubic meters/hour.

EBA Engineering is currently installing the piezometer instrumentation along the # 1 dam.

A pumping station for the runoff bypass has been built along the access road near the head of the diversion ditch.

Construction of the access road around the tailings pond began on March 25.

MILL OPERATIONS

The mill has processed 1905 dry tonnes of ore during the period.

B.Y.G.
NATURAL RESOURCES INC.

March 31,1998 April 1

Department of Indian and Northern Affairs Canada
Northern Affairs Program
345-300 Main Street
Whitehorse, Yukon
Y1A-2B5

Attn: Tony Polyck

Re: Water License: QZ94-004, Mt. Nansen Project

As per our discussion March 30,1998 by telephone here is the information that you requested from us, We started milling on February 23,1998 at a rate of 229 tpd and in March the average was increased to 251 tpd. It had taken approximately three days to have any discharge from the mill to the tailings pond. From January 26,1998 when the third amendment, application # QZ97-028 went into effect we were discharging to Dome Creek (please see attached copy of flow rates prepared by Pascal Renardet). I regret to inform you that the daily samples from Jan. 26/98 to Feb.20/98 were not being done reliably, but we have made every effort to ensure that these samples were being taken correctly from Feb. 21/98 onwards. In the month of March we discharged to Dome Creek until the sixteenth, where we had trouble to meet our cyanide parameters, at that time we had discharged 31879 cm^3 to the environment. We also discharged effluent on the 23 & 24th to bring the total up to 32251 cm^3. We are currently not discharging to Dome Creek because of some mechanical difficulties and are doing some modifications to the plant to increase our efficiency at achieving the parameters set forth by the water license. Currently 7828 wet tonnes has been sent to the tailings pond. EBA Engineering completed their installation of the piezometers and thermistors and we will be able to do readings on continual bases, beginning in one week because they take one week to stabilize. Sent with this letter is all the information that I could find, including a current plan. Please feel free to contact myself at the mine site if you need any further information, at 867-863-5913 or fax me at 867-863-6028.

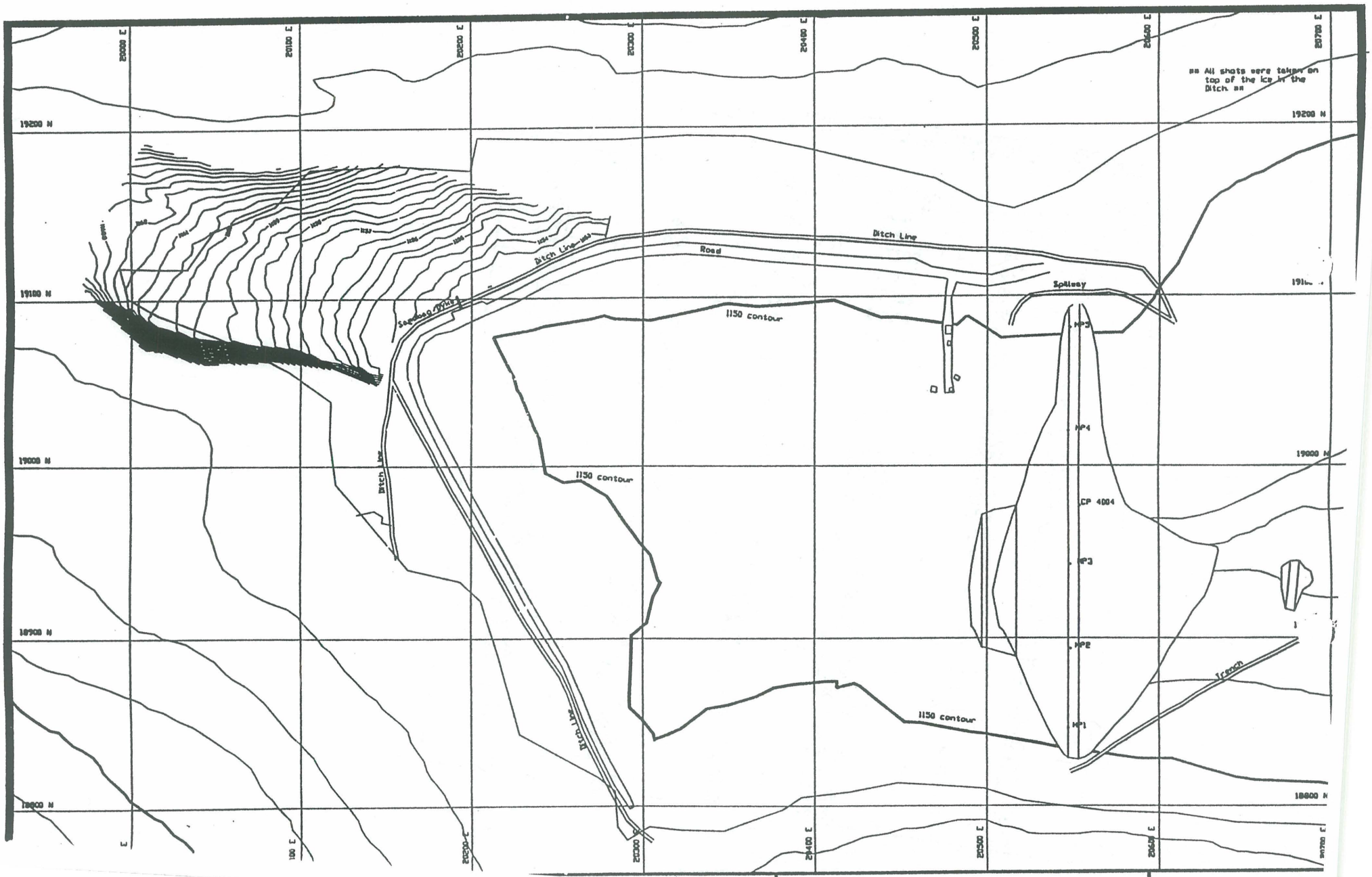
Sincerely

T.C. Franks
Environmental Liaison

110 Industrial Road, Whitehorse, Yukon Y1A 2T9 tel: (403) 668 8060 fax: (403) 668 2300

Water Treatment Discharge

Date:	Time hrs	Rate m3	Daily m3	Cumm Flow
Jan 26/98	8.5	15	127	127
Jan 27/98	24	15	360	487
Jan 28/98	14	15	210	697
Jan 29/98	0	15		697
Jan 30/98	14	15	210	907
Jan31/98	7	15	105	1012
Feb 1/98	0	15		1012
Feb 2/98	21.5	15	322	1334
Feb 3/98	24	20	480	1814
Feb 4/98	24	25	615	2429
Feb 5/98	19	35	665	3094
Feb 6/98	24	35	840	3934
Feb 7/98	20	35	700	4634
Feb 8/98	20	35	700	5334
Feb 9/98	22	40	880	6214
Feb 10/98	11	40	440	6654
Feb 11/98	3	40	120	6774
Feb 12/98	11	40	440	7214
Feb 13/98	21	40	840	8054
Feb 14/98	24	40	960	9014
Feb 15/98	24	40	960	9976
Feb 16/98	24	40	960	10934
Feb 17/98	24	40	960	11894
Feb 18/98	20	40	800	12694
Feb 19/98	0	40		12694
Feb20/98	3	40	120	12814
Feb 21/98	18	40	720	13534
Feb 22/98	24	40	960	14494
Feb 23/98	19.5	36	705	15199
Feb 24/98	24	30	720	15919
Feb 25/98	18.5	25	462	16381
Feb 26/98	24	30	720	17101
Feb 27/98	23	25	575	17676
Feb 28/98	24	30	720	18396


All shots were taken on top of the ice in the Ditch
Ditch Line
Road
Spillway
1150 contour
Seepage Dyke
Ditch Line
MP5
MP4
MP3
MP2
MP1
CP 4004
Trench
19200 N
19100 N
19000 N
18900 N
18800 N

Scale:

MT NANSEN OPERATIONS DAILY SUMMARY - PROCESSING					
Discharge Limits					
DATE	WTP-VOL M3	CUM TOT M3	Wet tonnes	Cum wtonnes	Avge wmtpd
1-Mar-98	840	19236	192	192	192
2	770	20006	186	378	189
3	770	20776	171	549	183
4	840	21616	200	749	187
5	770	22386	138	887	177
6	840	23226	231	1118	186
7	840	24066	274	1392	199
8	960	25026	315	1707	213
9	960	25986	189	1896	211
10	880	26866	200	2096	210
11	760	27626	120	2216	201
12	904	28530	245	2461	205
13	912	29442	228	2689	207
14	925	30367	256	2945	210
15	900	31267	304	3249	217
16	612	31879	255	3504	219
17	0	31879	252	3756	221
18	0	31879	371	4127	229
19	0	31879	289	4416	232
20	0	31879	343	4759	238
21	0	31879	280	5039	240
22	0	31879	266	5305	241
23	276	32155	332	5637	245
24	96	32251	308	5945	248
25	0	32251	308	6253	250
26	0	32251	280	6533	251
27	0	32251	290	6823	253
28	0	32251	245	7068	252
29	0	32251	238	7306	252
30	0	32251	238	7544	251
31	0	32251	284	7828	253

TO: J. ANTHONY POLYCK
CHIEF MANAGEMENT OFFICER
WATER RESOURCES DIVISION

FROM: PASCAL RENARDET
MINE MANAGER, MOUNT NANSEN

RE: WEEKLY WATER USE REPORT: For period ending April 2, 1998.

WATER TREATMENT PLANT

The water treatment plant has been running near continuously, but returning the treated water to the tailings pond. The treated effluent cannot be discharged to the environment as the stringent water licence requirements are not met. Preheating the reclaimed water prior to feeding it to the Water Treatment Plant will help achieve the required treatment levels.

The Daily Average Contaminant Values in ppm achieved by the plant for the period were as follows:

DATE	CN	ZN	CU
27 March 98	0.21	0.03	
28 March 98	0.26	0.03	
29 March 98	0.26		
30 March 98	0.17	0.14	
31 March 98	0.17	0.04	0.14
1 April 98	0.03	0.01	0
2 April 98	0.12	0.02	0.05

TAILINGS IMPOUNDMENT AREA

The water elevation reading during the week was as follows:

1 April 98 1149.712

The flow rate of the discharge from the #2 seepage dam, back into the #1 pond, has remained relatively constant at 8.0 m3/hour.

EBA Engineering and Midnight Sun Drilling have installed the 10 new peizometer and thermistor holes and instrumentation on the impoundment dam. Initial readings have been taken. Readings are expected to take a week or two to stabilize. EBA is preparing detailed conversion formulae for computing temperatures from the thermistor readings and expect to have them to us in about two weeks.

The pumping station set up along the access road near the western extremity of the diversion ditch is being connected to lay flat hose to pump run-off past the pond. Sandbags are being used to provide pump feed water containment and also to construct a suitable settling sump at the hose discharge located beyond the #1 dam.

MILL OPERATIONS

The mill has processed 1593 dry tonnes of ore during the period.

P. Renardet

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC. MOUNT NANSEN

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

4593
FAXED

FROM: PASCAL RENARDET
MINE MANAGER

RE : WEEKLY OPERATIONS REPORT For period ending April 9, 1998

WATER TREATMENT PLANT

The water treatment plant has been running nearly continuously and preheating the reclaimed water prior to feeding it to the Water Treatment Plant helped achieve the required treatment levels.

The daily average contaminant values achieved by the plant for the period were as follows (in ppm) :

DATE	CN	ZN	CU
Discharge limit	0.1 ppm	0.3 ppm	0.2 ppm
April 3, 1998	0.06	0.02	0.04
April 4, 1998	0.07	0.03	0.07
April 5, 1998	0.06	0.01	0.01
April 6, 1998	0.06	0.02	0.04
April 7, 1998	0.04	0.02	0.01
April 8, 1998	0.07	0.06	0.05
April 9, 1998	0.07	0.06	0.04

discharge every day

In order to improve the performance of the Water Treatment Plant, hydrogen peroxide was injected in the reclaimed water and the two carbon columns were used continuously during the period. Water was then discharged to Dome Creek at the approximate rate of 628 m3/h and the cumulative discharged water is, at the end of the week, 36 556 m3. Water samples for fish bioassay were taken and sent to the laboratory. We are still waiting for their report.

TAILINGS IMPOUNDMENT AREA

The water elevation readings during the week were as follows:

3 April 1998 1149.685 m ASL
5 April 1998 1149.690 m ASL

The flow rate of the discharge from the #2 seepage dam, back into the #1 pond, has remained constant at 8.0 m3/hour.

Readings of all new thermisters and piezometers installed in the 10 newly drilled holes were taken but numbers will not be available before we are provided by EBA the individual detailed conversion formulae for computing temperatures and pressures.

The pumping station set up along the access road near the western extremity of the diversion ditch was connected to lay flat hose to pump run-off water past the dam. 1140 sand bags were filled. They were used to provide pump feed water containment and also to construct two suitable settling sumps at the hose discharge located in the spillway beyond the #1 dam.

MILL OPERATIONS

The mill has processed 1515 dry tonnes of ore during this week and the slurry cyanide destruction plant was run continuously. The processed tonnage is limited by the reclaim pumping capacity and by the priority given to the treatment of this reclaimed water.

P. Renardet

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC. MOUNT NANSEN

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

4697
FAXED

FROM: PASCAL RENARDET
MINE MANAGER

RE : WEEKLY OPERATIONS REPORT For period ending April 16, 1998

WATER TREATMENT PLANT

The water treatment plant has been running nearly continuously and preheating the reclaimed water prior to feeding it to the Water Treatment Plant helped achieve the required treatment levels.

The daily average contaminant values achieved by the plant for the period were as follows (in ppm) :

DATE	CN	ZN	CU
Discharge limit	0.1 ppm	0.3 ppm	0.2 ppm
April 10, 1998	0.03	0.04	0.04
April 11, 1998	0.03	0.06	0.02
April 12, 1998	0.07	0.02	0.02
April 13, 1998	0.02	0.03	0.02
April 14, 1998	0.02	0.05	0.05
April 15, 1998	0.04	0.05	0.05
April 16, 1998	0.07	0.07	0.04

no discharge

In order to improve the performance of the Water Treatment Plant, hydrogen peroxide was injected in the reclaimed water, the two carbon columns were used continuously during the period and the polishing pond was flushed out during several days. Water was discharged to Dome Creek at the approximate rate of 615 m3/day during five days and the cumulative discharged water is, at the end of the week, 39 631 m3.

TAILINGS IMPOUNDMENT AREA

The water elevation reading during the week was as follows:

15 April 1998 1149.604 m ASL

The flow rate of the discharge from the #2 seepage dam, back into the #1 pond, has remained constant at 8.0 m3/hour.

Readings of all new thermistors and piezometers installed in the 10 newly drilled holes were taken but numbers will not be available before we are provided by EBA the individual detailed conversion formulae for computing temperatures and pressures.

The pumping station set up along the access road near the western extremity of the diversion ditch was connected to lay flat hose to pump run-off water past the dam but was not yet used as the run-off water was still low (the pump was only tested in the presence of DIAND people).1490 sand bags were filled up

to now. They were used to provide pump feed water containment and also to construct two suitable settling sumps at the hose discharge located in the spillway beyond the #1 dam.

The present pier is being extended and will be used to start a pond detoxification program which includes the addition of hydrogen peroxide into the pond water. It is intended to reduce drastically the cyanide content in this tailings pond.

MILL OPERATIONS

The mill has processed 2847 dry tonnes of ore during this week and the slurry cyanide destruction plant was run continuously. The processed tonnage is limited by the reclaim pumping capacity and by the priority given to the treatment of this reclaimed water.

P Renardet

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC. MOUNT NANSEN

4706

FAXED

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

FROM: PASCAL RENARDET
MINE MANAGER

RE : WEEKLY OPERATIONS REPORT For period ending April 23, 1998

WATER TREATMENT PLANT

The water treatment plant has been running nearly continuously and preheating the reclaimed water prior to feeding it to the Water Treatment Plant helped achieve the required treatment levels.

The daily average contaminant values achieved by the plant for the period were as follows (in ppm) :

DATE	CN	ZN	CU
Discharge limit	0.1 ppm	0.3 ppm	0.2 ppm
April 17, 1998	0.12	na	na
April 18, 1998	0.23	0.03	0.05
April 19, 1998	0.13	0.29	0.12
April 20, 1998	0.23	0.19	0.23
April 21, 1998	0.32	0.20	0.20
April 22, 1998	0.07	0.05	0.06
April 23, 1998	0.18	0.04	0.19

In order to improve the performance of the Water Treatment Plant, hydrogen peroxide was injected in the reclaimed water, the two carbon columns were used continuously during the period and the polishing pond was flushed out during several days. No water was discharged to Dome Creek and the cumulative discharged water is, at the end of the week, unchanged at 39 631 m3.

TAILINGS IMPOUNDMENT AREA

The water elevation readings during the week were as follows:

17 April 1998	1149.623 m ASL
19 April 1998	1149.646 m ASL
22 April 1998	1149.680 m ASL

The flow rate of the discharge from the #2 seepage dam, back into the #1 pond, has remained constant at 8.0 m3/hour.

Readings of all new thermistors and piezometers installed in the 10 newly drilled holes were taken but numbers will not be available before we are provided by EBA the individual detailed conversion formulae for computing temperatures and pressures.

BYG NATURAL RESOURCES INC. MOUNT NANSEN

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

4799
FAXED

FROM: PASCAL RENARDET
MINE MANAGER

RE : OPERATIONS REPORT DATE : April 26, 1998

In addition to my last weekly operations report (for the week ending April 23, 1998) , I have to mention the following points:

1- Pond detoxification program

Due to an important increase of the water run-off and the beginning of the freshet period for Dome Creek upstream the tailings pond, the diesel pump previously used for the pond detoxification program was moved to the diversion ditch and is now used to pump the water flowing from the diversion ditch to a point located in the spillway beyond the #1 dam. There are now two pumps connected to flexible hoses to pump run-off water past the dam.

However the detoxification program is not stopped but suspended for some hours only: the diesel pump will be replaced by an electrical pump connected to our power network. I will let you know as soon as this program is back in operation.

2- Arsenic ground water attenuation program

Under the supervision of Gordana Vicentijevic, the newly appointed Environment Services Manager, the arsenic ground water attenuation program was initiated. A vertical column was built (two meter long and six inch diameter) and filled with soil. In the coming days this column will be fed with reclaim water which will flow through the soil and this water will be sampled periodically for arsenic content.

3- Exploration program

On Saturday, April 25, 1998, an exploration program was initiated by Robert Stroshein, V.P. Exploration. This program includes diamond drilling the Flex zone first and the Brown McDade zone later on with the aim of increasing the mining reserves in both zones.

4- Water treatment plant

We have had by far the best results to date from the water treatment plant. An ammonia adsorption tank was added in the process chain and the water in the polishing pond is now aerated by air coming from a low pressure air compressor. These improvements allow the ammonia levels to drop to 2 ppm only, the other levels in cyanide, zinc, copper... staying far below the water license requirements. Given the above we initiated discharge this week end. We are confident that we can pass the fish bioassay test. We will keep you informed as soon as we have results.

I am sure you appreciate all efforts we make to solve the environmental problems and I look forward seeing you soon in Mount Nansen.

P Renardet

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC. MOUNT NANSEN

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

#1874
FAXED

FROM: PASCAL RENARDET
MINE MANAGER

RE : WEEKLY OPERATIONS REPORT For period ending April 30, 1998

WATER TREATMENT PLANT

The water treatment plant has been running nearly continuously and preheating the reclaimed water prior to feeding it to the Water Treatment Plant helped achieve the required treatment levels.

The daily average contaminant values achieved by the plant for the period were as follows (in ppm) :

DATE Discharge limit	CN 0.1 ppm	ZN 0.3 ppm	CU 0.2 ppm
April 24, 1998	0.06	0.02	0.07
April 25, 1998	0.06	0.03	0.04
April 26, 1998	0.08	0.03	0.03
April 27, 1998	0.08	0.05	0.06
April 28, 1998	0.05	0.03	0.08
April 29, 1998	0.06	0.02	0.02 (No discharge)
April 30, 1998	0.08	0.01	0.01

In order to improve the performance of the Water Treatment Plant, hydrogen peroxide was injected in the reclaimed water, the polishing pond was used during the whole period and an ammonia adsorption tank was added in the process. Water was discharged to Dome Creek at the approximate rate of 21 m3/hr and the cumulative discharged water is, at the end of this week, equal to 42619 m3.

TAILINGS IMPOUNDMENT AREA

The water elevation readings during the week were as follows:

28 April 1998 1149.733 m ASL

The flow rate of the discharge from the # 2 seepage dam, back into the # 1 pond, increased to 10 m3/hour. It is explained by an increase of the run-off water coming from the western slope of this seepage pond.

Readings of all new thermistors and piezometers installed in the 10 newly drilled holes, as part of the New Instrumentation on the Tailings Dam # 1 and # 2, were taken this week as it was done every previous week. E.B.A. sent us a partial report on the New Instrumentation and we were able to plot the temperature readings in each hole. It shows that the permafrost position was not changed since the dam was built almost two years ago. On the other hand we are not yet able to plot any pressure results and we are still waiting for a more complete report from E.B.A. A meeting with E.B.A. people is planned next week followed immediately by a meeting with DIAND people.

BYG NATURAL RESOURCES INC MOUNT NANSEN

TO : TONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

4886
FAXED

FROM : PASCAL RENARDET
MINE MANAGER

RE : OPERATIONS REPORT Date: May,3rd 1998

In addition to my last weekly operations report (for the week ending April, 30th 1998), I am pleased to give you the following information about both the detoxification program in the tailings pond and the instrumentation in the dams # 1 and # 2:

A – Detoxification program in the tailings pond.

1 – We were delivered yesterday 84 drums of hydrogen peroxide.

2 - The diesel pump, which was initially used, was replaced by a new one and water is pumped into the middle of the tailings pond with addition of hydrogen peroxide. The new pump capacity is about 1000 m3/day.

B – Instrumentation in the dams # 1 and # 2

We agreed with EBA to held our meeting this week earlier than initially planned and we will be pleased to meet you in Whitehorse the 8th of May to discuss about the new instrumentation which was put in place on the dams # 1 and # 2.

P. Renardet

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC MOUNT NANSEN

TO : TONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

4886
FAXED

FROM : PASCAL RENARDET
MINE MANAGER

RE : OPERATIONS REPORT Date: May,3rd 1998

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1 – We were delivered yesterday 84 drums of hydrogen peroxide.

2 - The diesel pump, which was initially used, was replaced by a new one and water is pumped into the middle of the tailings pond with addition of hydrogen peroxide. The new pump capacity is about 1000 m3/day.

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P. Renardet

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC. MOUNT NANSEN

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

0044
FAXED

FROM: PASCAL RENARDET
MINE MANAGER

RE : WEEKLY OPERATIONS REPORT For period ending May 7th, 1998

WATER TREATMENT PLANT

The water treatment plant has been running nearly continuously and the major improvements put in place downstream the SO2/Inco plant are the following:

Preheat of the reclaimed water
Installation of two carbon columns
Aeration of the polishing pond
Installation of an ammonia adsorption tank
Control of the pH

These improvements helped achieve the required treatment levels and the daily average contaminant values achieved by the plant, for the period, were as follows (in ppm) :

DATE	CN	ZN	CU
Discharge limit	0.1 ppm	0.3 ppm	0.2 ppm
May 1, 1998	0.08	0.02	0.07
May 2, 1998	0.09	0.07	0.12
May 3, 1998	0.25	0.02	0.02 (No discharge)
May 4, 1998	0.09	0.04	0.10
May 5, 1998	0.04	0.08	0.01
May 6, 1998	0.07	0.02	0.02
May 7, 1998	0.09	0.01	0.03

In order to improve the performance of the Water Treatment Plant, hydrogen peroxide was injected in the reclaimed water. Water was discharged to Dome Creek at the approximate rate of 20 m3/hr and the cumulative discharged water is, at the end of this week, equal to 44,110 m3.

TAILINGS IMPOUNDMENT AREA

The water elevation readings during the week were as follows:

May 1st 1998 1149.753 m ASL
May 6th 1998 1149.809 m ASL

The flow rate of the discharge water line from the # 2 seepage dam, back into the # 1 tailings pond, increased to 11 m3/hr. It is explained by an increase of the run-off water flowing from the southern slope of this seepage pond.

Readings of all new thermistors and piezometers installed in the 10 newly drilled holes, as part of the New Instrumentation on the Tailings Dam # 1 and # 2, were taken this week as it was done every previous week. E.B.A. sent us their final report on the New Instrumentation and we are now able to plot both the temperature and the pressure readings for each hole. It shows that the permafrost levels in the foundation soils beneath the tailings dam have not changed since the dam was built almost two years ago. In fact, some freeze back into the fill appears to have occurred, particularly in boreholes # 1 and # 5, on the southern section of the dam # 1.

The pressure readings confirmed also that the water phreatic surface is higher on the southern slope of the dam, which could be explained both by the freeze back of the permafrost in this part of the dam and by the additional underground water coming from the side of the hill during the spring freshet. The readings are still made on a weekly basis and the results are monitored accordingly.

The pumping station set up along the access road near the western extremity of the diversion ditch was connected to lay flat hose to pump run-off water past the dam and was used as the run-off water flow was well above 100 m3/hr in the warmest hours of the day.

The present pier was being extended and is used to start a pond detoxification program which includes the addition of hydrogen peroxide into the pond water. It is intended to reduce drastically the cyanide content in this tailings pond. The program was run constantly during this period and we expect good results in the near future.

MILL OPERATIONS

The mill has processed 1108 dry tonnes of ore during this week and the slurry cyanide destruction plant was run continuously. The processed tonnage is limited by the reclaim pumping capacity and by the priority given to the treatment of this reclaimed water.

P. Renardet

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC. MOUNT NANSEN

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

#0130
FAXED

FROM: PASCAL RENARDET
MINE MANAGER

RE : WEEKLY OPERATIONS REPORT For period ending May 14th, 1998

WATER TREATMENT PLANT

The water treatment plant has been running nearly continuously and the major improvements put in place downstream the SO2/Inco plant are the following:

Preheat of the reclaimed water
Installation of two carbon columns
Aeration of the polishing pond
Installation of an ammonia adsorption tank
Control of the pH

These improvements helped achieve the required treatment levels and the daily average contaminant values achieved by the plant, for the period, were as follows (in ppm) :

DATE	CN	ZN	CU
Discharge limit	0.1 ppm	0.3 ppm	0.2 ppm
May 8, 1998	0.07	0.03	0.04
May 9, 1998	0.01	0.02	0.02
May 10, 1998	0.02	0.01	0.03
May 11, 1998	0.09	0.03	0.04
May 12, 1998	0.05	0.02	0.05
May 13, 1998	0.06	0.03	0.01
May 14, 1998	0.09	0.07	0.07

In order to improve the performance of the Water Treatment Plant, hydrogen peroxide was injected in the reclaimed water. Water was discharged to Dome Creek at the approximate rate of 21 m3/hr and the cumulative discharged water is, at the end of this week, equal to 46,686 m3.

The last five fish bioassays were passed successfully.

TAILINGS IMPOUNDMENT AREA

The water elevation readings during the week were as follows:

May 8th 1998 1149.819 m ASL
May 11th 1998 1149.805 m ASL

The flow rate of the discharge water line from the # 2 seepage dam, back into the # 1 tailings pond, increased to 13 m3/hr. It is explained by an increase of the run-off water flowing from the southern slope of this seepage pond.

Readings of all new thermistors and piezometers installed in the 10 newly drilled holes, as part of the New Instrumentation on the Tailings Dam # 1 and # 2, were taken this week as it was done every previous week. E.B.A. sent us their final report on the New Instrumentation and we are now able to plot both the temperature and the pressure readings for each hole. It shows that the permafrost levels in the foundation soils beneath the tailings dam have not changed since the dam was built almost two years ago. In fact, some freeze back into the fill appears to have occurred, particularly in boreholes # 1 and # 5, on the southern section of the dam # 1.

The pressure readings confirmed also that the water phreatic surface is higher on the southern slope of the dam, which could be explained both by the freeze back of the permafrost in this part of the dam and by the additional underground water coming from the side of the hill during the spring freshet. The readings are still made on a weekly basis and the results are monitored accordingly.

The pumping station set up along the access road near the western extremity of the diversion ditch was connected to lay flat hose to pump run-off water past the dam and was used as the run-off water flow was well above 100 m3/hr in the warmest hours of the day. The peak of the run-off water is over and the pumped water volume is now decreasing every day.

The present pier was being extended and is used to start a pond detoxification program which includes the addition of hydrogen peroxide into the pond water. It is intended to reduce drastically the cyanide content in this tailings pond. The program was run continuously during this period and we expect good results in the near future.

MILL OPERATIONS

The mill has processed 2196 dry tonnes of ore during this week and the slurry cyanide destruction plant was run continuously. The processed tonnage is limited by the reclaim pumping capacity and by the priority given to the treatment of this reclaimed water.

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC. MOUNT NANSEN

TO: J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

~~4~~ 0204

FAXED

FROM: PASCAL RENARDET
MINE MANAGER

RE : WEEKLY OPERATIONS REPORT For period ending May 21st, 1998

WATER TREATMENT PLANT

The water treatment plant has been running nearly continuously and the major improvements put in place downstream the SO2/Inco plant are the following:

Preheat of the reclaimed water
Installation of two carbon columns
Aeration of the polishing pond
Installation of an ammonia adsorption tank
Control of the pH

These improvements helped achieve the required treatment levels and the daily average contaminant values achieved by the plant, for the period, were as follows (in ppm) :

DATE	CN	ZN	CU
Discharge limit	0.1 ppm	0.3 ppm	0.2 ppm
May 15, 1998	0.08	0.09	0.06
May 16, 1998	0.02	0.09	0.10
May 17, 1998	0.04	0.10	0.05
May 18, 1998	0.03	0.08	0.05
May 19, 1998	0.07	0.19	0.06
May 20, 1998	0.08	0.19	0.09
May 21, 1998	0.19	0.07	0.14 (No discharge)

In order to improve the performance of the Water Treatment Plant, hydrogen peroxide was injected in the reclaimed water. Water was discharged to Dome Creek at the approximate rate of 21 m3/hr and the cumulative discharged water is, at the end of this week, equal to 48,890 m3.

The last fish bioassay was successful (all 10 fish alive).

TAILINGS IMPOUNDMENT AREA

The water elevation readings during the week were as follows:

May 20th 1998 1149.858 m ASL

The flow rate of the discharge water line from the # 2 seepage dam, back into the # 1 tailings pond, increased to 16 m3/hr. It is explained by an increase of the run-off water flowing from the southern slope of this seepage pond.

The thermistors readings are summarized in the following table:

	Depth to the permafrost (in meter)				
Borehole	Initial Permafrost	From Drilling	Readings March 30th	Readings May 28th	
BH 01	13.7	13.6	13.8	13.0	
BH 02	19.2	19.8	20.6	20.3	
BH 03	?	18.2	0.0	4.3	
BH 04	?	3.7	?	?	-0.8°C at -10.7 m
BH 05	7.3	7.2	12.0	10.0	
BH 06	10.0	10.3	10.5	10.3	
BH 07	0.6	7.6	Surface	< 4.0	
BH 08	3.3	3.0	Surface	< 1.0	
BH 09	0.0	7.6	?	?	-0.3°C at -16.8 m
BH 10	3.1	3.1	Surface	< 3.0	

The depth of the permafrost obtained by the last readings confirms the depth obtained from drilling, even these readings are not yet completely stabilized.

The last piezometers readings confirm also that the phreatic surface is still higher on the southern slope of the dam, which could be explained both by the freeze back of the permafrost in this area and by the additional underground water coming from the hill during the spring freshet.

The pumping station set up along the access road near the western extremity of the diversion ditch was connected to lay flat hose to pump run-off water past the dam and was used permanently. Fortunately the peak of the run-off water is over, thanks to a very dry spring.

MILL OPERATIONS

The mill has processed 2429 dry tonnes of ore during this week and the slurry cyanide destruction plant was run continuously. The processed tonnage is still limited by the reclaim pumping capacity and by the priority given to the treatment of this reclaimed water.

P. Renardet

Pascal Renardet, Mine Manager

BYG NATURAL RESOURCES INC MOUNT NANSEN

TO : J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

4 0305

FAXED

FROM : PASCAL RENARDET
MINE MANAGER

RE : WEEKLY OPERATIONS REPORT For period ending May 28th, 1998

WATER TREATMENT PLANT

The water treatment plant has been running nearly continuously and all the improvements put in place downstream the SO2/ Inco plant helped achieve the required treatment levels. The daily average contaminant values achieved by the plant, for the period, were as follows (in ppm):

DATE	CN	Zn	Cu
Discharge limits	0.1 ppm	0.3 ppm	0.2 ppm
May 22, 1998	0.09	0.12	0.15
May 23, 1998	0.05	0.06	0.04
May 24, 1998	0.05	0.03	0.08
May 25, 1998	0.06	0.03	0.13
May 26, 1998	0.09	na	0.12
May 27, 1998	0.08	na	na
May 28, 1998	0.07	0.13	0.09

In order to improve the performance of the water treatment plant, hydrogen peroxide was injected into the reclaimed water. Water was discharged at the approximate rate of 21 m3/hr and the cumulative discharged water is, at the end of the week, equal to 51,806 m3.

TAILINGS IMPOUNDMENT AREA

The water elevation readings during the week were as follows:

May 23rd, 1998	1149.849 m ASL
May 24th, 1998	1149.842 m ASL
May 25th, 1998	1149.842 m ASL

The flowrate of the discharge water line from the # 2 seepage dam, back into the # 1 tailings pond, decreased to 11 m3/hr. It is explained by a drastic decrease of the run-off water flowing from the southern slope of this seepage pond.

The pond detoxification program was run again this week. The discharge point was moved and a new and more powerful pump was installed. The addition of hydrogen peroxide reduces the cyanide content in the pond. The last numbers we have already collected show that the cyanide content in the pond is probably below the 25 ppm limit.

Readings of all thermistors and piezometers installed in the 10 newly drilled holes, as part of the New Instrumentation on the Tailings Dams # 1 and # 2, were taken this week as it was done every previous week.

[redacted]

readings are summarized in the following table:

Depth to the permafrost (in meter)

Initial Permafrost	From Drilling	Readings March 30th	Readings May 28th	
13.7	13.6	13.8	13.0	
19.2	19.8	20.6	20.3	
?	18.2	0.0	4.3	
?	3.7	?	?	-0.8°C at -10.7 m
7.3	7.2	12.0	10.0	
10.0	10.3	10.5	10.3	
0.6	7.6	Surface	< 4.0	
3.3	1.0	Surface	< 1.0	
0.0	7.6	?	?	-0.3°C at -16.8 m
3.1	1.1	Surface	< 3.0	

depth of the permafrost obtained by the last readings confirms the depth obtained from drilling, readings are not yet completely stabilized.

piezometers readings confirm also that the phreatic surface is still higher on the southern slope which could be explained both by the freeze back of the permafrost in this area and by the underground water coming from the hill during the spring freshet.

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ATIONS

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ime Manager

BYG NATURAL RESOURCES INC MOUNT NANSEN

TO : J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

FROM: GRAHAM DICKSON, PRESIDENT

RE: WEEKLY OPERATIONS REPORT For period ending June 4th, 1998

Water Treatment Plant

Reclaim water from the tailings pond was discharged into Dome Creek throughout the whole week. The plant continued to pass all environmental parameters including its fish bio assay tests.

The characteristics and the volumes of the discharge to Dome Creek is given in the Table below:

	Discharge Volume m3	Cyanide ppm	Zinc ppm	Copper ppm	Ammonia ppm
Discharge Limits (ppm)		**0.1**	**0.3**	**0.2**	**no limit**
Date					
29-May	668	0.09	n/a	n/a	6.5
30-May	493	0.04	n/a	n/a	6.5
31-May	559	0.07	n/a	n/a	5.5
1-Jun	502	0.09	n/a	n/a	5.5
2-Jun	560	0.04	n/a	n/a	6.0
3-Jun	444	0.08	0.05	0.08	5.5
4-Jun	519	0.03	0.03	0.06	6.0
Total	3,746	.06	0.04	0.07	6.0

Cumulative discharged water = 55,552 m^3

4-2 Tailings Impoundment Area

The Dome Creek water is still pumped along the diversion ditch to the spillway in order to negate the possibility of run-off water seeping through the diversion ditch bottom and into the tailings pond. The liner for the ditch is now on site.

The water elevation readings during the week were as follows:

May 28th, 1998 1149.849 m ASL
June 4th, 1998 1149.780 m ASL

It is clear that the water elevation in the tailings pond is now dropping.

The pond detoxification program was running again during this week. The discharge point was moved and a new and more powerful pump was installed. The addition of hydrogen peroxide will continue to reduce the cyanide content in the tailings pond. The last numbers we have already collected show that the cyanide content in the pond is probably well below the 25 ppm limit.

Seepage Pond

The average flow rate of seepage water into the # 2 seepage dam, which is then pumped back into the tailings pond, decreased to 8.5 m^3/hr.

Tailings Dam

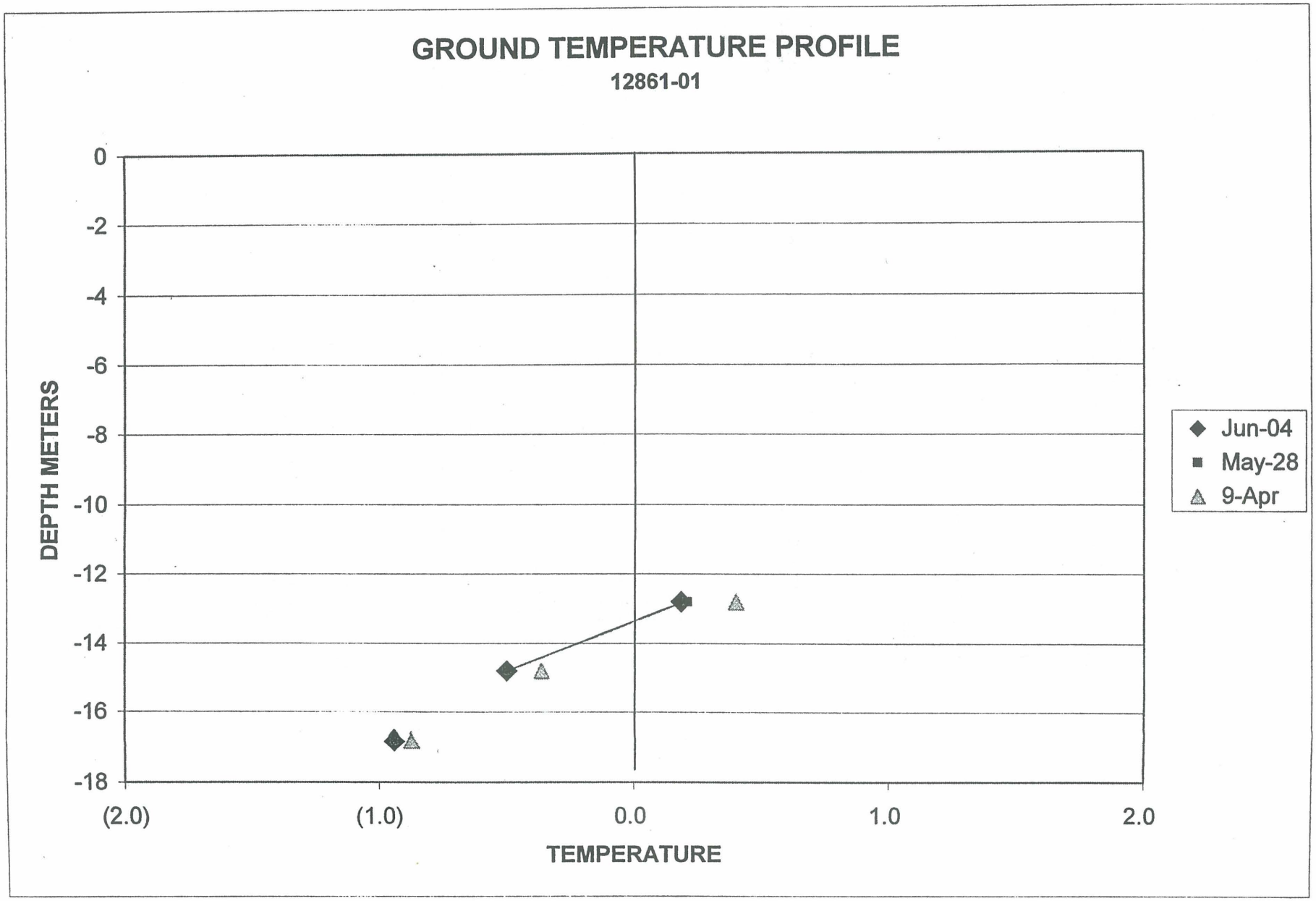
The thermistors readings are summarized in the following table:

Bore Hole	Depth to the Permafrost in meters					
	Initial	Drilling	March 30th	May 28th	June 4th without correction	June 4th with correction
BH 01	13.7	13.6	13.8	13.0	13.8	13.4
BH 02	19.2	19.8	20.6	20.3	20.6	20.4
BH 03	?	18.2	0	4.3	4.3	4.2
BH 04	?	3.7	?	?	?	
BH 05	7.3	7.2	12.0	10.0	10.8	9.8
BH 06	10.0	10.3	10.5	10.3	10.4	10.2
BH 07	.06	7.6	Surface	<4.0	Surface	
BH 08	3.3	3.0	Surface	<1.0	Surface	
BH 09	0.0	7.6	Surface	?	2.0	2.0
BH 10	3.1	3.1	Surface	<3.0	Surface	

Mill Operations

The mill operated continuously this week and processed 3,286 dry tonnes of ore. The slurry cyanide destruction plant operated all week.

Graham Dickson,
President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-4
-6
-8
-10
-12
-14
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(2.0)
(1.0)
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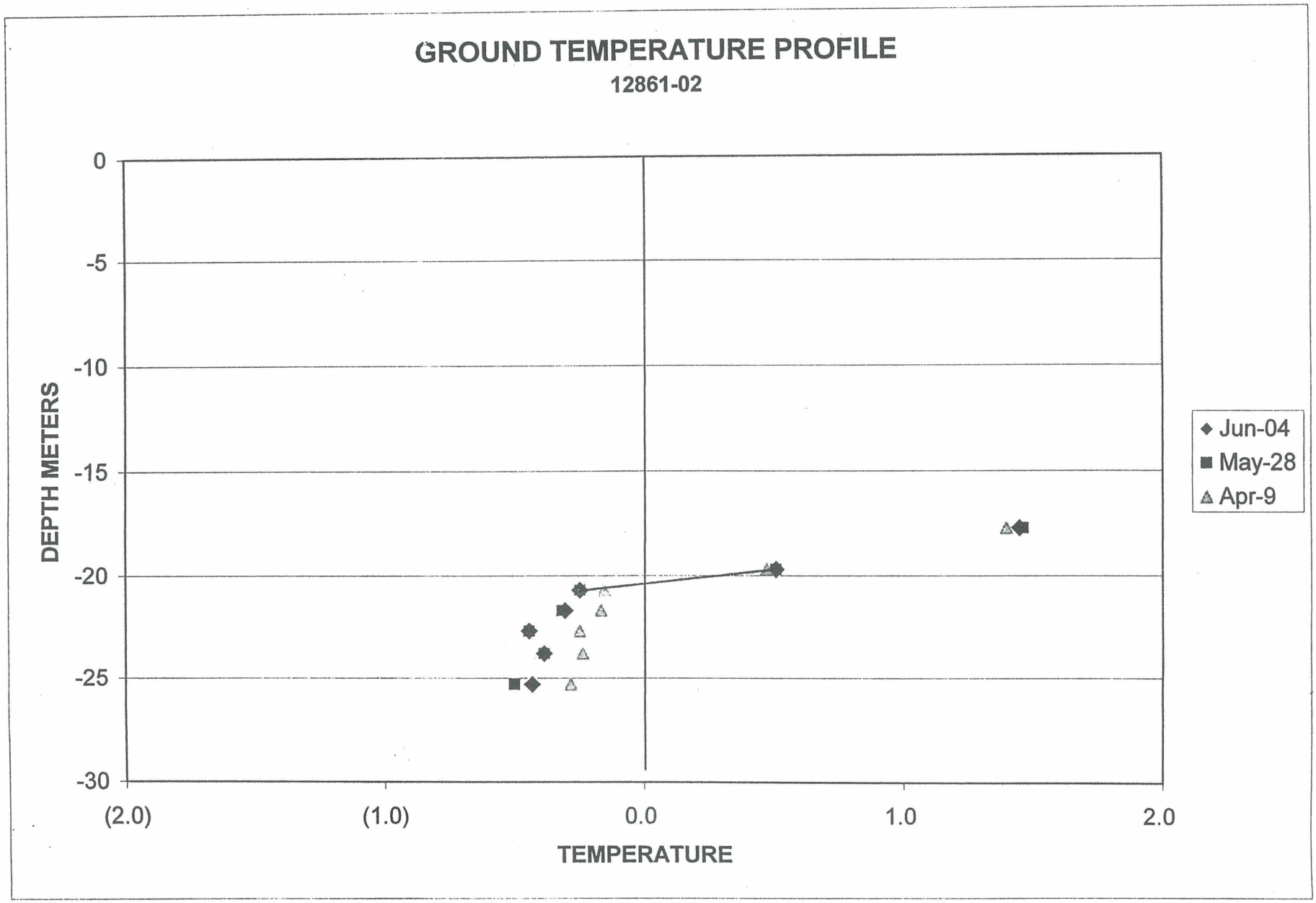
2.0
TEMPERATURE
Jun-04
May-28
9-Apr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12861-02
DEPTH METERS
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-5
-10
-15
-20
-25
-30
(2.0)
(1.0)
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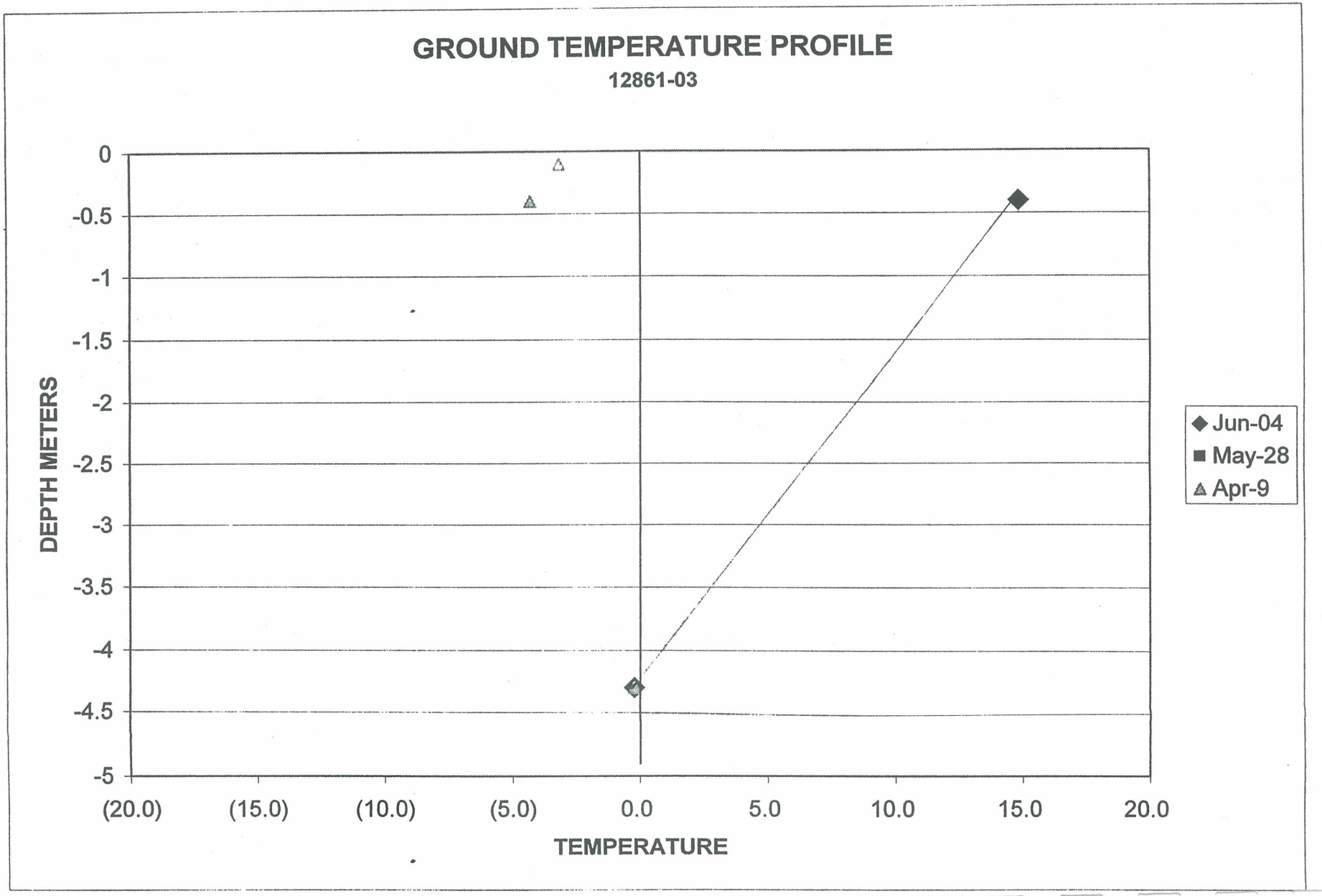
1.0
2.0
TEMPERATURE
Jun-04
May-28
Apr-9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-1
-1.5
-2
-2.5
-3
-3.5
-4
-4.5
-5
(20.0)
(15.0)
(10.0)
(5.0)
0.0
5.0
10.0
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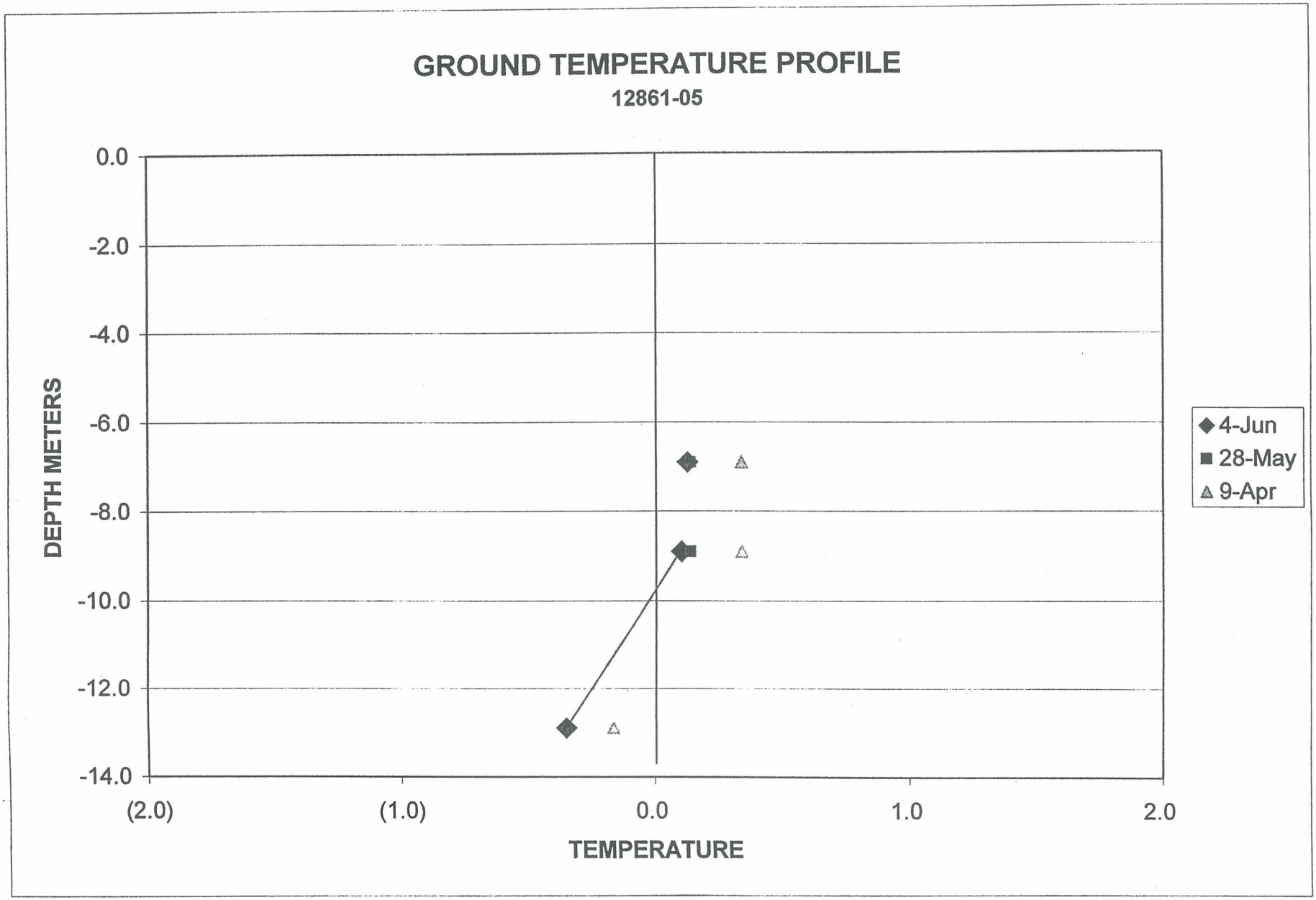
20.0
TEMPERATURE
Jun-04
May-28
Apr-9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DEPTH METERS
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-4.0
-6.0
-8.0
-10.0
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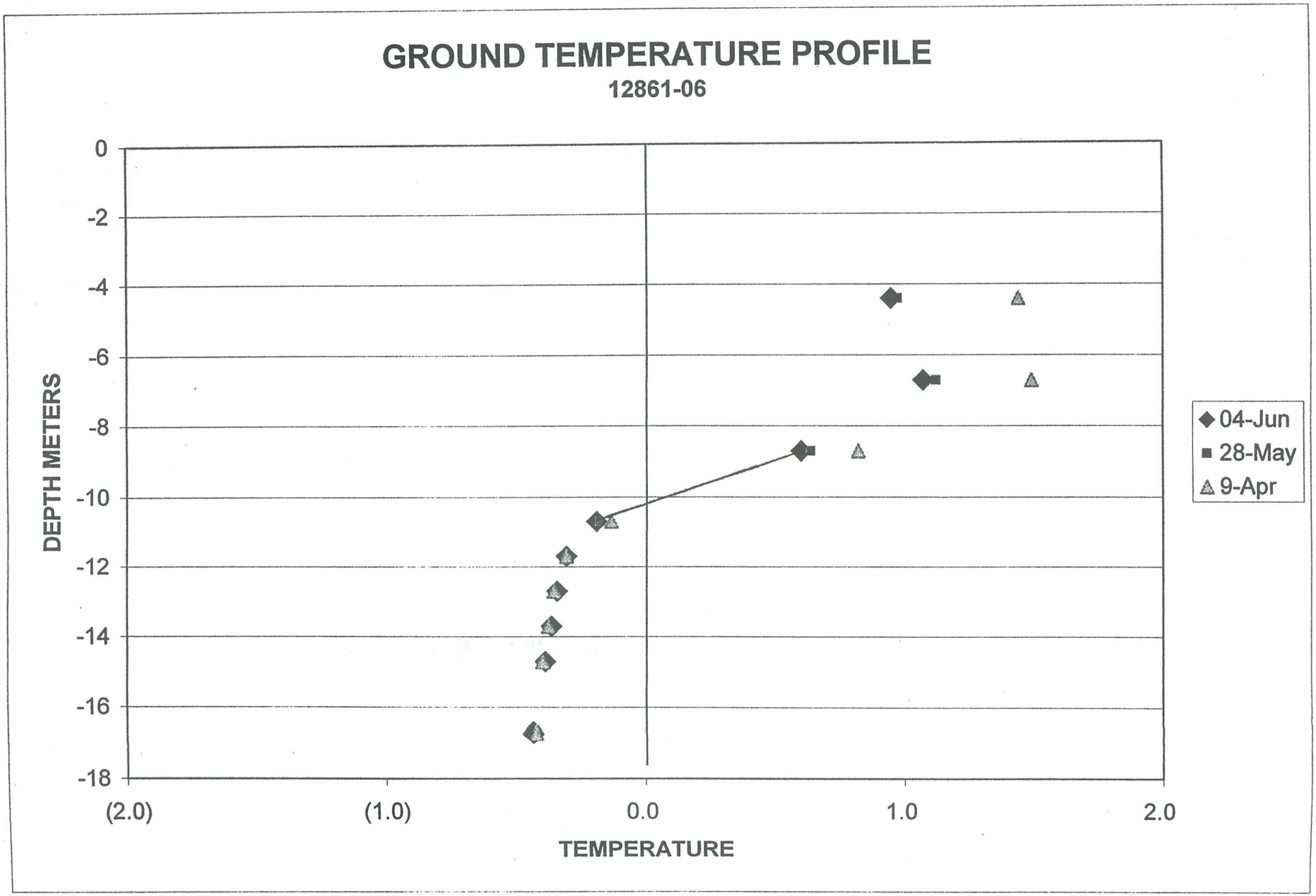
(2.0)
(1.0)
0.0
1.0
2.0
TEMPERATURE
4-Jun
28-May
9-Apr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12861-06
DEPTH METERS
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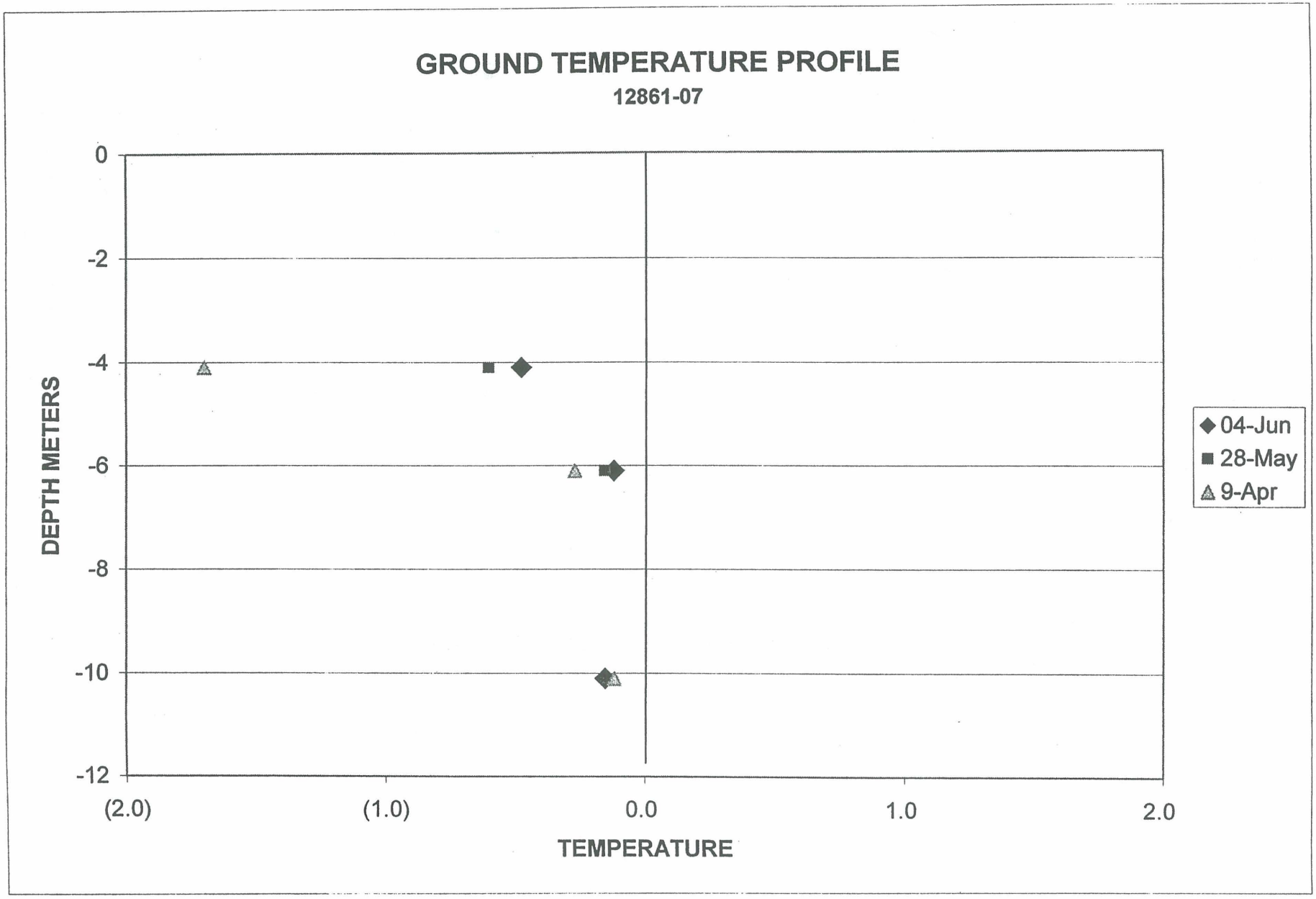
-4
-6
-8
-10
-12
-14
-16
-18
(2.0)
(1.0)
0.0
1.0
2.0
TEMPERATURE
04-Jun
28-May
9-Apr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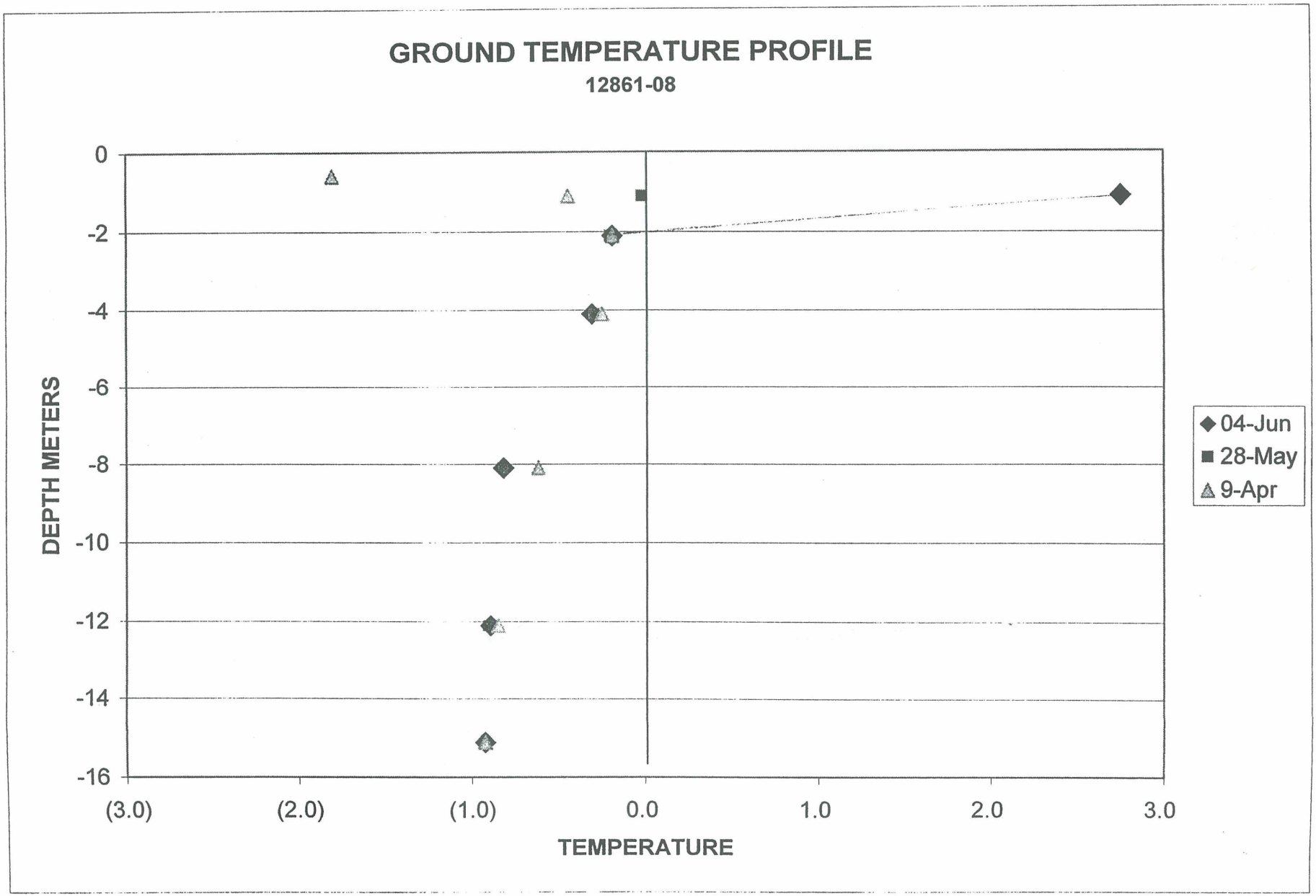
TEMPERATURE
04-Jun
28-May
9-Apr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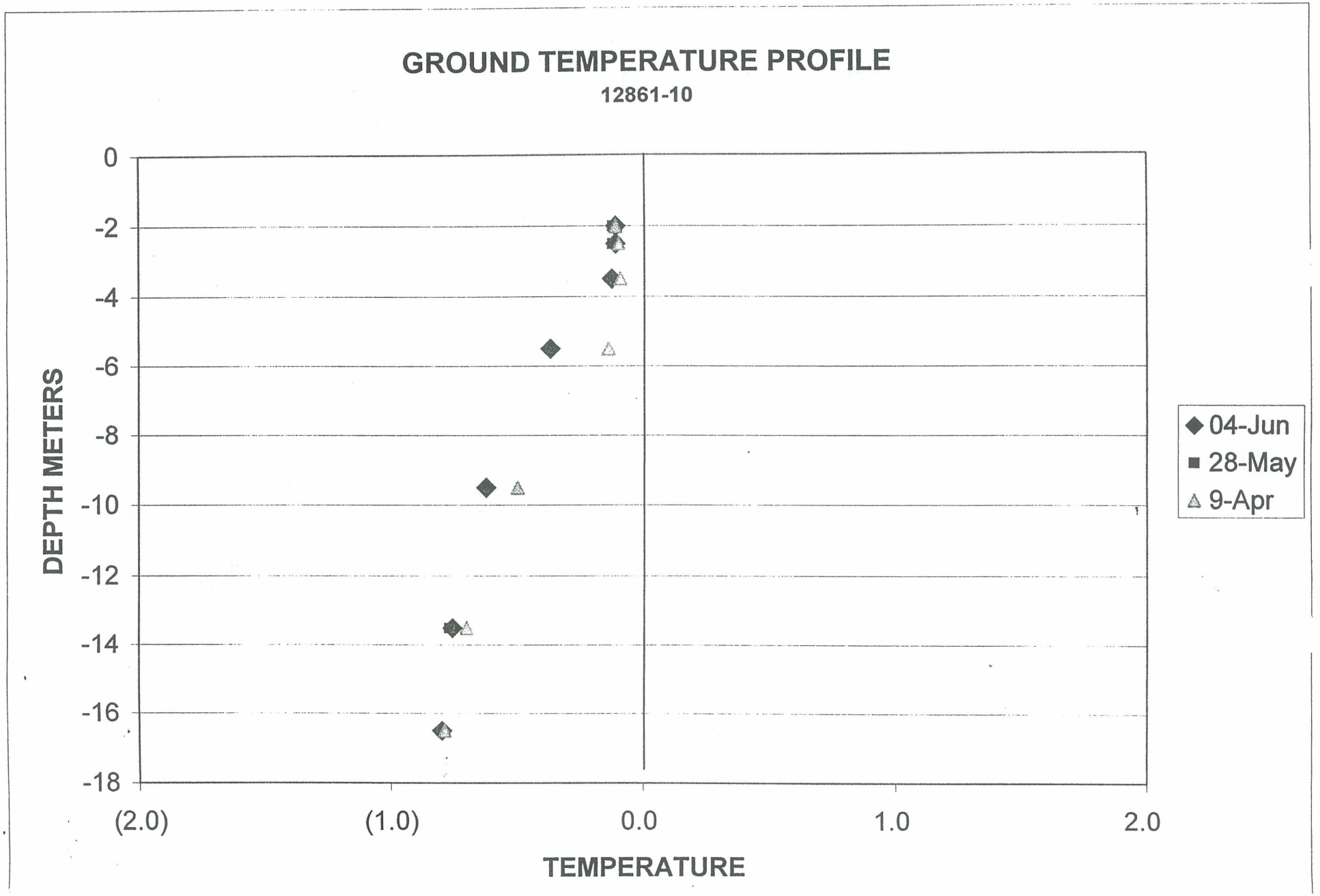
TEMPERATURE
04-Jun
28-May
9-Apr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2.0
TEMPERATURE
04-Jun
28-May
9-Apr

BYG NATURAL RESOURCES INC MOUNT NANSEN

TO : J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

FROM: GRAHAM DICKSON, PRESIDENT

RE: WEEKLY OPERATIONS REPORT For period ending June 11th, 1998

Water Treatment Plant

Reclaim water from the tailings pond was discharged into Dome Creek throughout the whole week. The new booster pump has been installed and was run for the first time this week. Its initial performance matched its specifications its installation will be completed this coming week. This pump will allow us to increase the reclaim water from its present level of $70m^3$ per hour to $120m^3$ per hour.

The characteristics and the volumes of the discharge to Dome Creek is given in the Table below:

	Discharge Volume m3	Cyanide ppm	Zinc ppm	Copper ppm	Ammonia ppm
Discharge Limits (ppm)		**0.1**	**0.3**	**0.2**	**no limit**
Date					
5-Jun	404	0.05	n/a	n/a	6.5
6-Jun	562	0.06	0.03	0.05	6.5
7-Jun	474	0.09	0.08	0.03	6.5
8-Jun	570	0.06	0.05	0.1	4.0
9-Jun	591	0.07	0.05	0.14	5.3
10-Jun	554	0.1	0.06	na	6.0
11-Jun	635	0.06	0.04	0.18	6.6
Total	3,790	0.07	0.05	0.10	5.9

Cumulative discharged water = 59,342 m^3

4-2 Tailings Impoundment Area

The Dome Creek water is still pumped along the diversion ditch to the spillway in order to negate the possibility of run-off water seeping through the diversion ditch bottom and into the tailings pond. The liner for the ditch is now on site and we will be scheduling installation for the beginning of July. The week ended on a wet note with quite a bit of rainfall. An increase in the water being pumped along the ditch was noted for the first time since freshet.

The water elevation readings during the week were as follows:

May 28th, 1998	1149.849 m ASL
June 4th, 1998	1149.780 m ASL
June 10th, 1998	1149.720 m ASL
June 11th, 1998	1149.725 m ASL

It is clear that the water elevation in the tailings pond is still dropping.

The pond detoxification program was running again during this week.

Seepage Pond

The average flow rate of seepage water into the # 2 seepage dam, which is then pumped back into the tailings pond, again decreased to 7.5 m^3/hr average for the whole week.

Tailings Dam

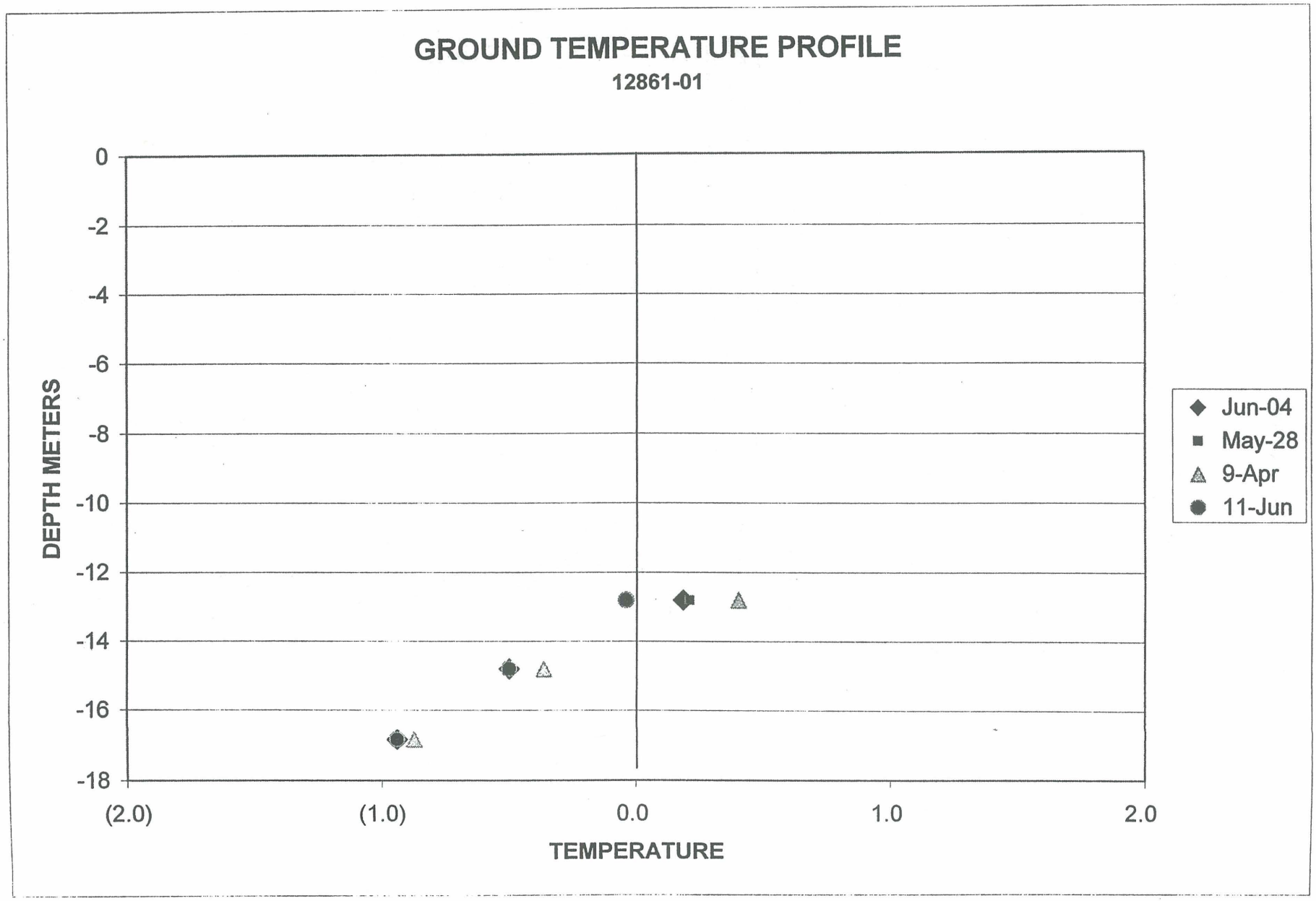
The thermistors readings are summarized in the following table:

Bore Hole	Depth to the Permafrost in meters				
	Initial	Drilling	March 30th	June 4th	June 11th
BH 01	13.7	13.6	13.8	13.8	<13.0
BH 02	19.2	19.8	20.6	20.6	20.4
BH 03	?	18.2	0	4.3	4.2
BH 04	?	3.7	?	?	?
BH 05	7.3	7.2	12.0	10.8	9.8
BH 06	10.0	10.3	10.5	10.4	8.0
BH 07	.06	7.6	Surface	Surface	Surface
BH 08	3.3	3.0	Surface	Surface	Surface
BH 09	0.0	7.6	Surface	Surface	Surface
BH 10	3.1	3.1	Surface	Surface	Surface

Mill Operations

The mill operated continuously this week and processed 3,985 dry tonnes of ore. The slurry cyanide destruction plant operated all week.

Graham Dickson,
President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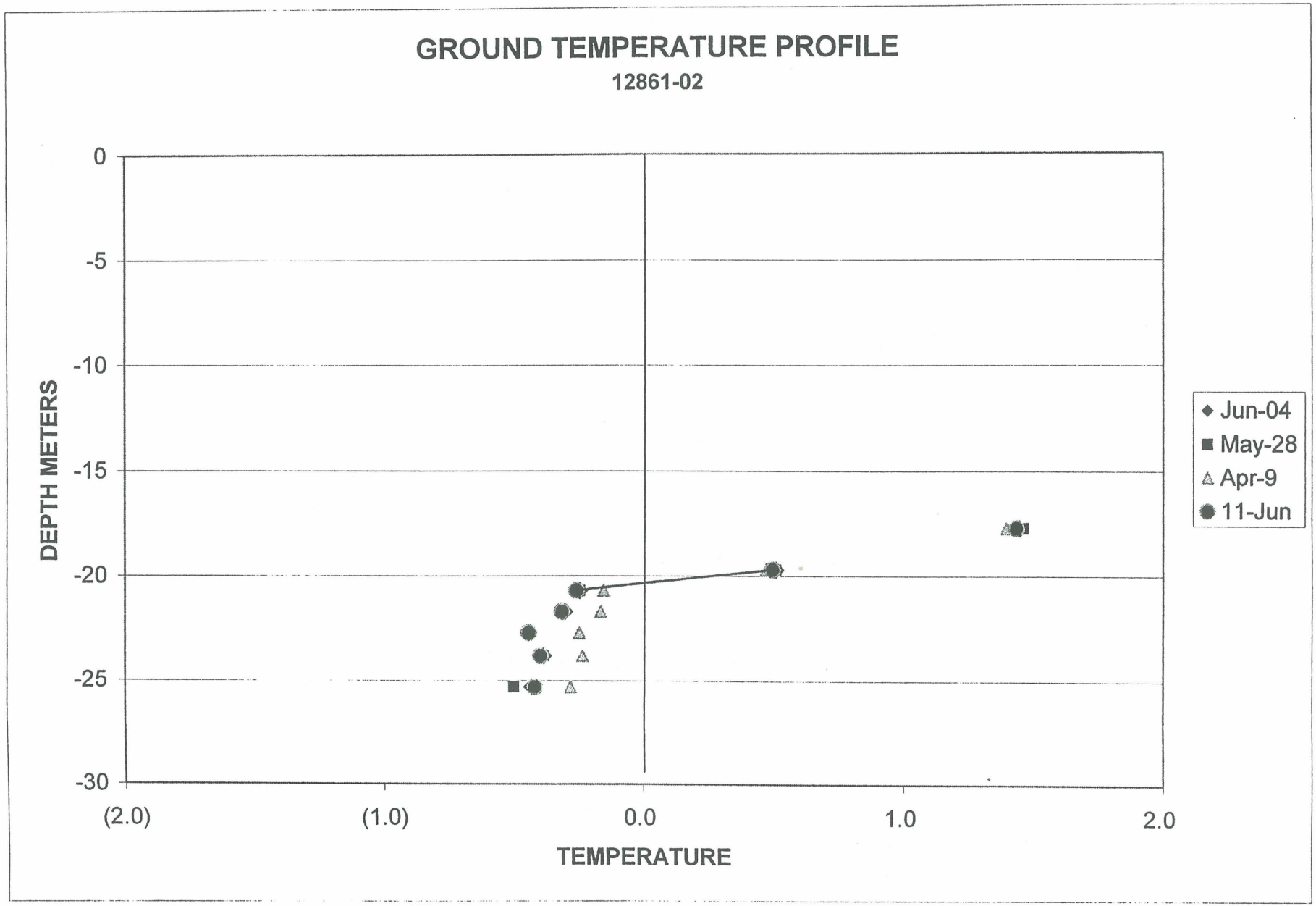
TEMPERATURE
Jun-04
May-28
9-Apr
11-Jun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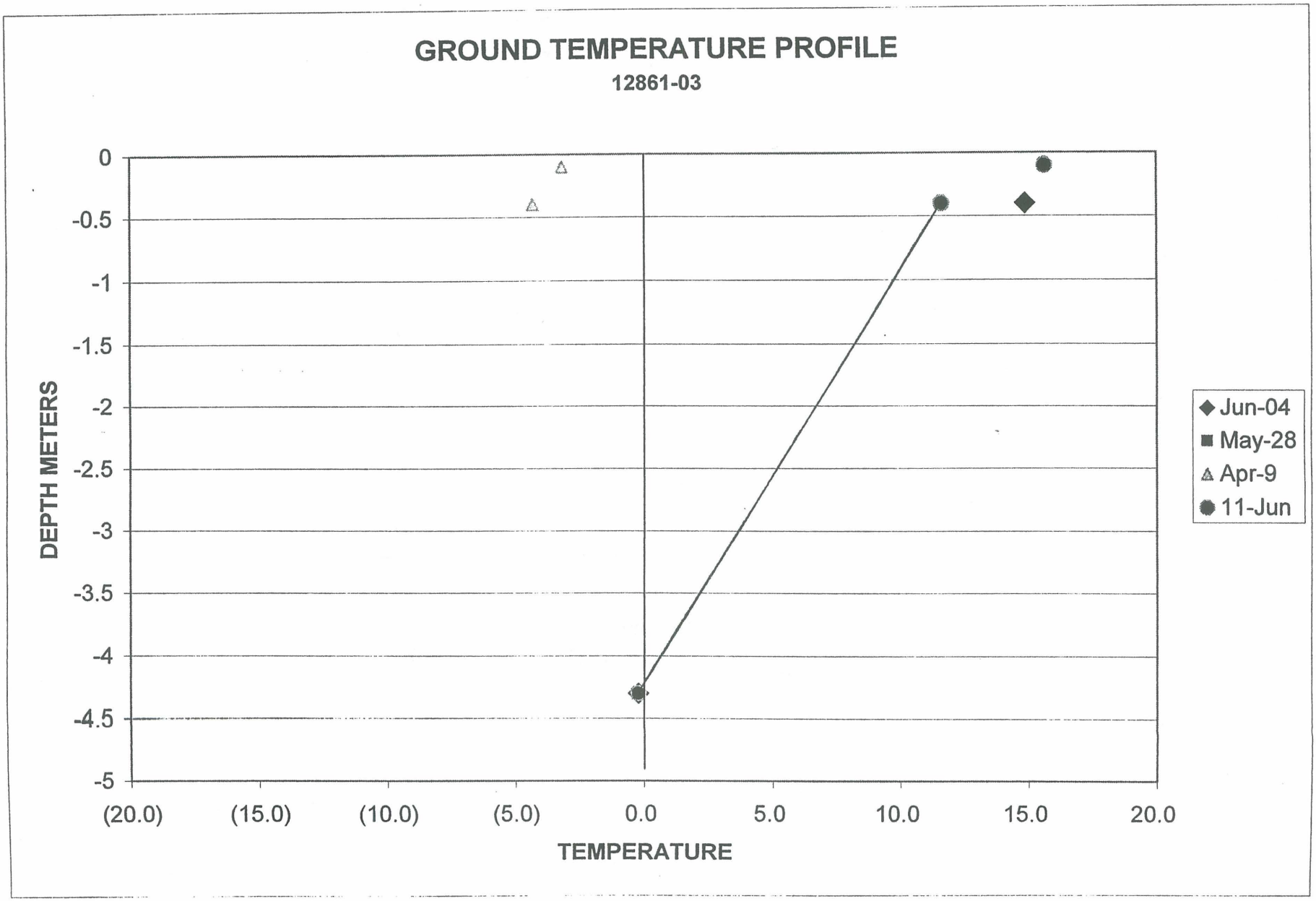
TEMPERATURE
Jun-04
May-28
Apr-9
11-Jun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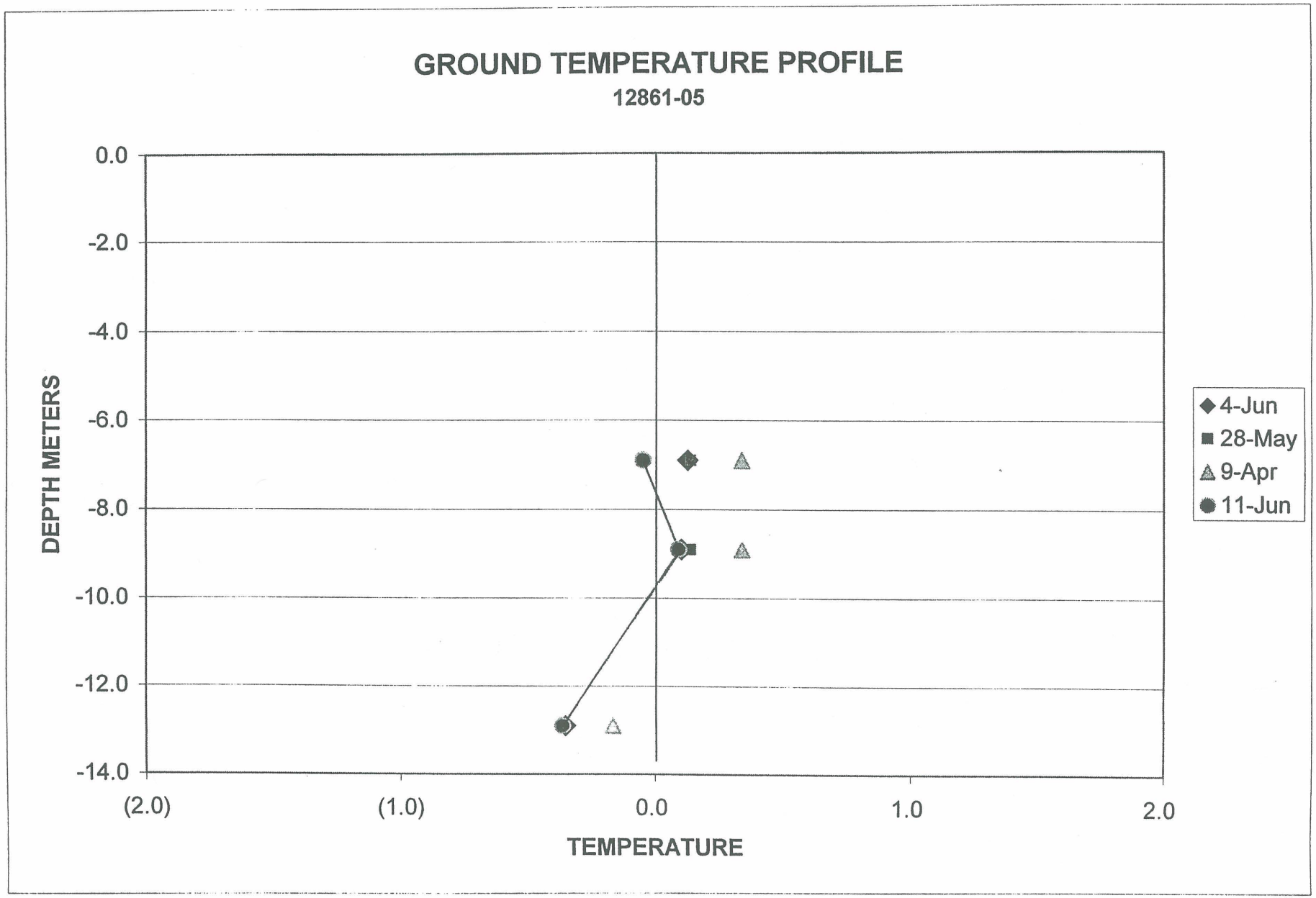
TEMPERATURE
Jun-04
May-28
Apr-9
11-Jun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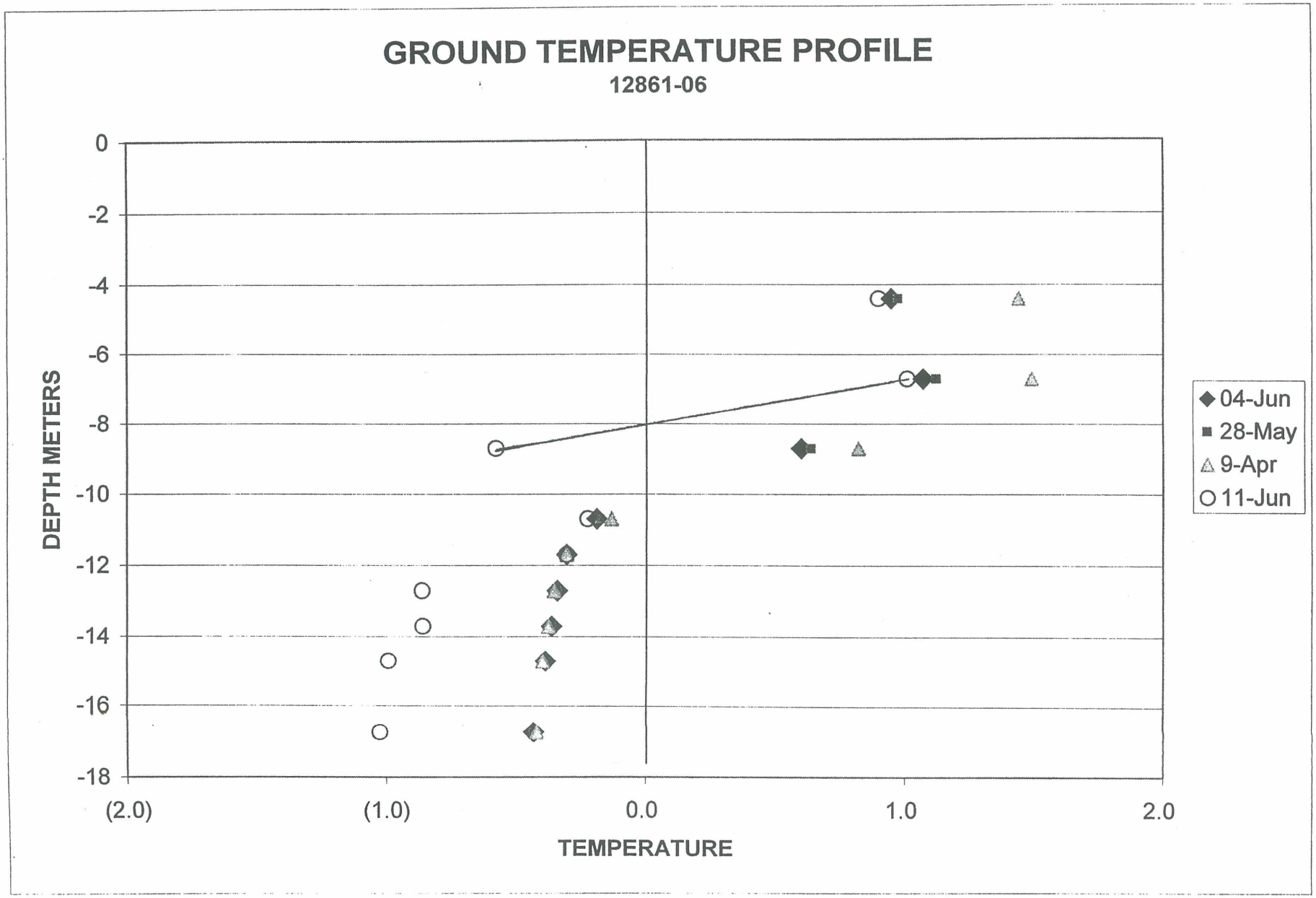
TEMPERATURE
4-Jun
28-May
9-Apr
11-Jun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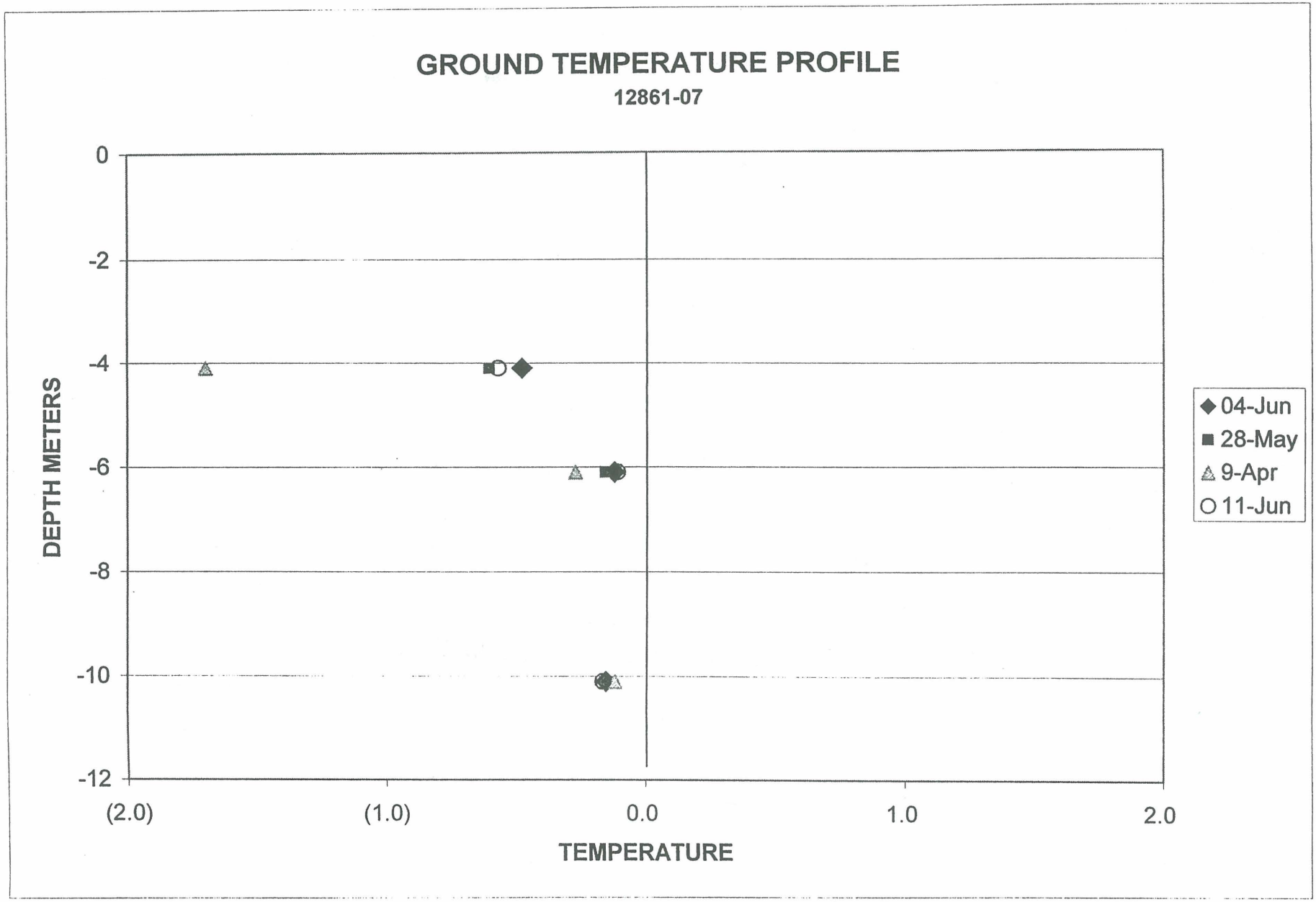
TEMPERATURE
04-Jun
28-May
9-Apr
11-Jun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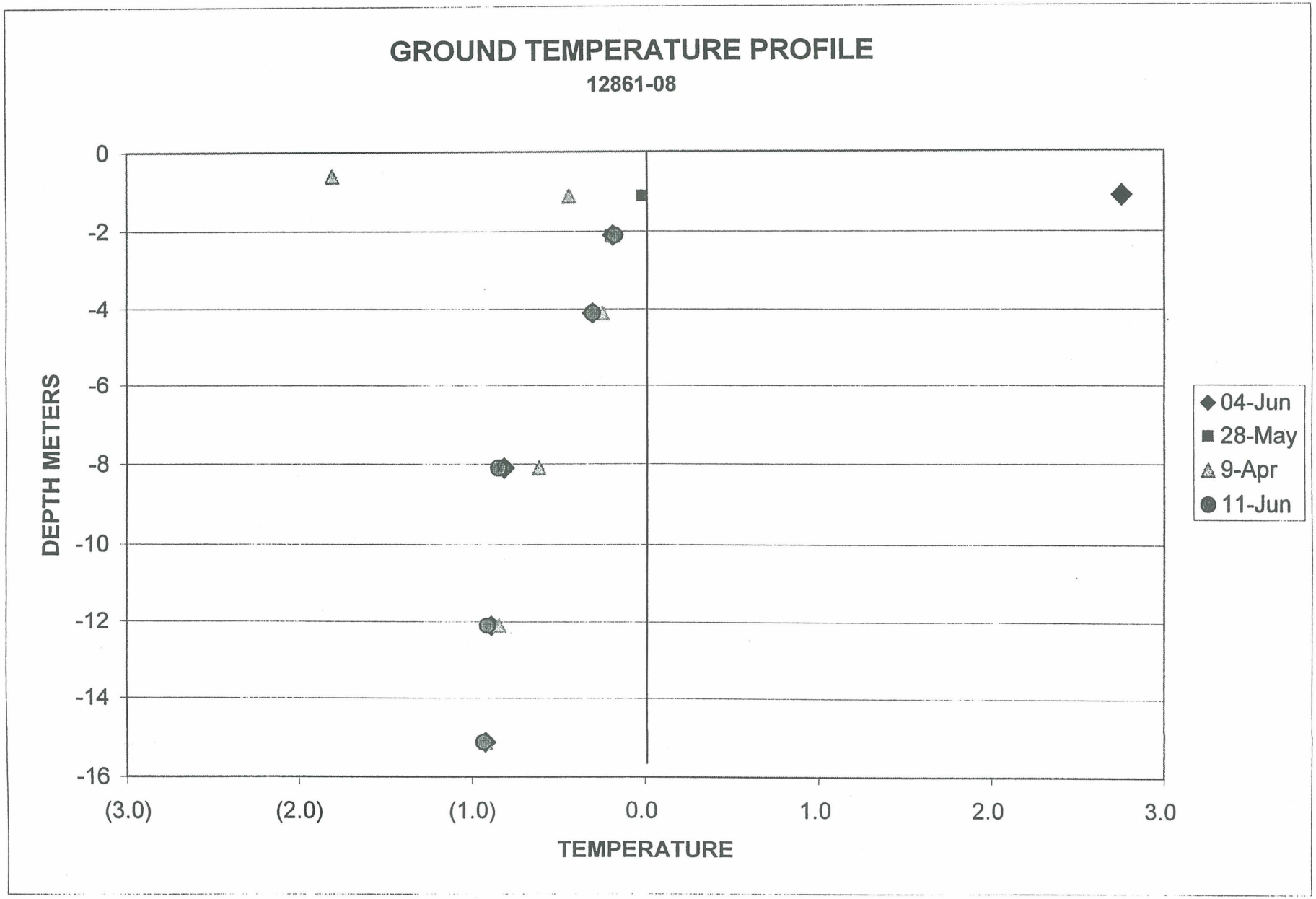
TEMPERATURE
04-Jun
28-May
9-Apr
11-Jun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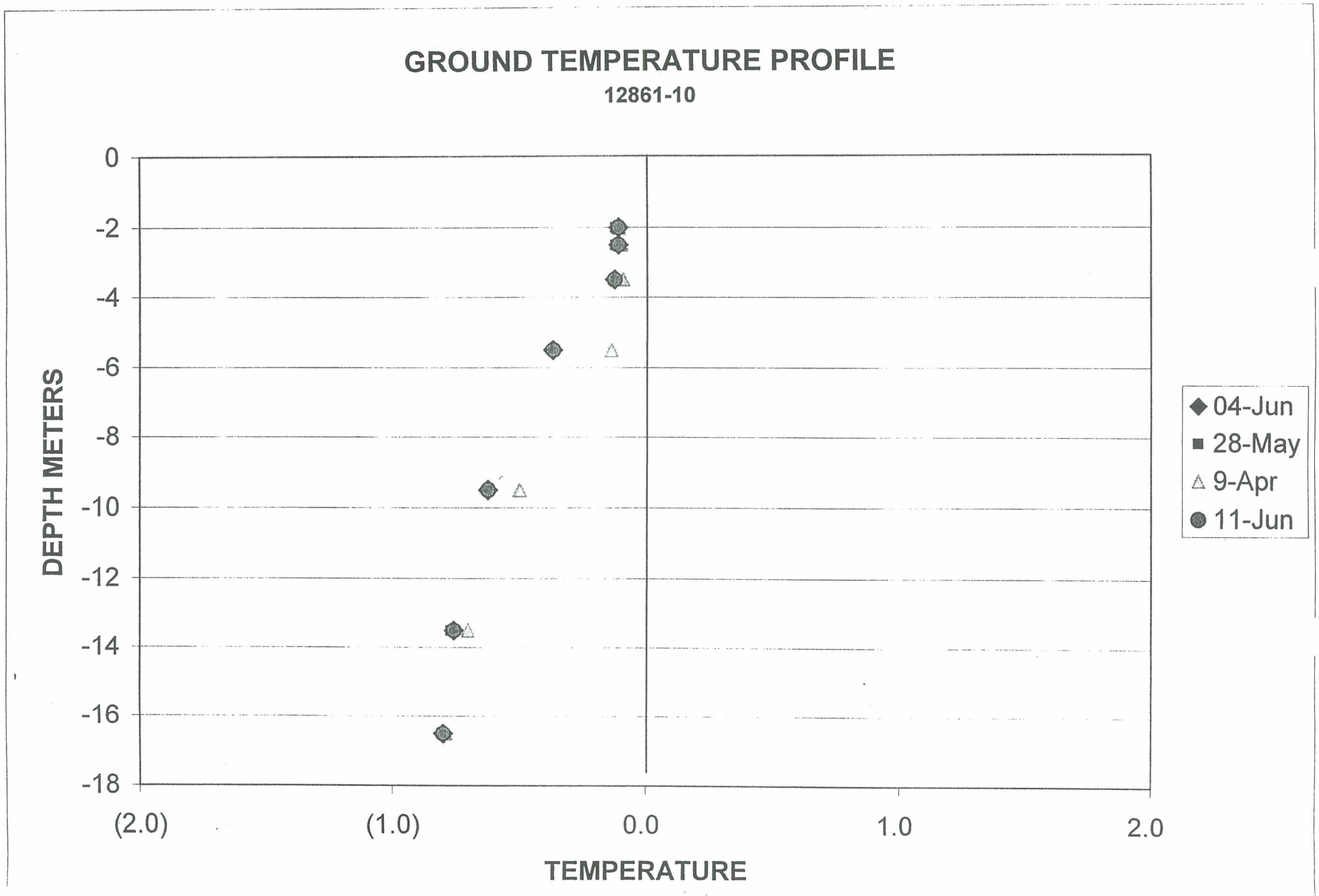
TEMPERATURE
04-Jun
28-May
9-Apr
11-Jun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DEPTH METERS
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-6
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-16
-18
(2.0)
(1.0)
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TEMPERATURE
04-Jun
28-May
9-Apr
11-Jun

BYG NATURAL RESOURCES INC MOUNT NANSEN

TO : J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

FROM: GRAHAM DICKSON, PRESIDENT

RE: WEEKLY OPERATIONS REPORT For period ending June 18th, 1998

Water Treatment Plant

Reclaim water from the tailings pond was discharged into Dome Creek throughout the whole week except for a period of time on Saturday 13th and Sunday 14th June. The new booster pump has been installed and is allowing us to provide enough reclaim water to the mill to allow us to mill at 700 MTPD while also allowing us to increase our rate of feed to the water treatment plant to increase discharge if required.

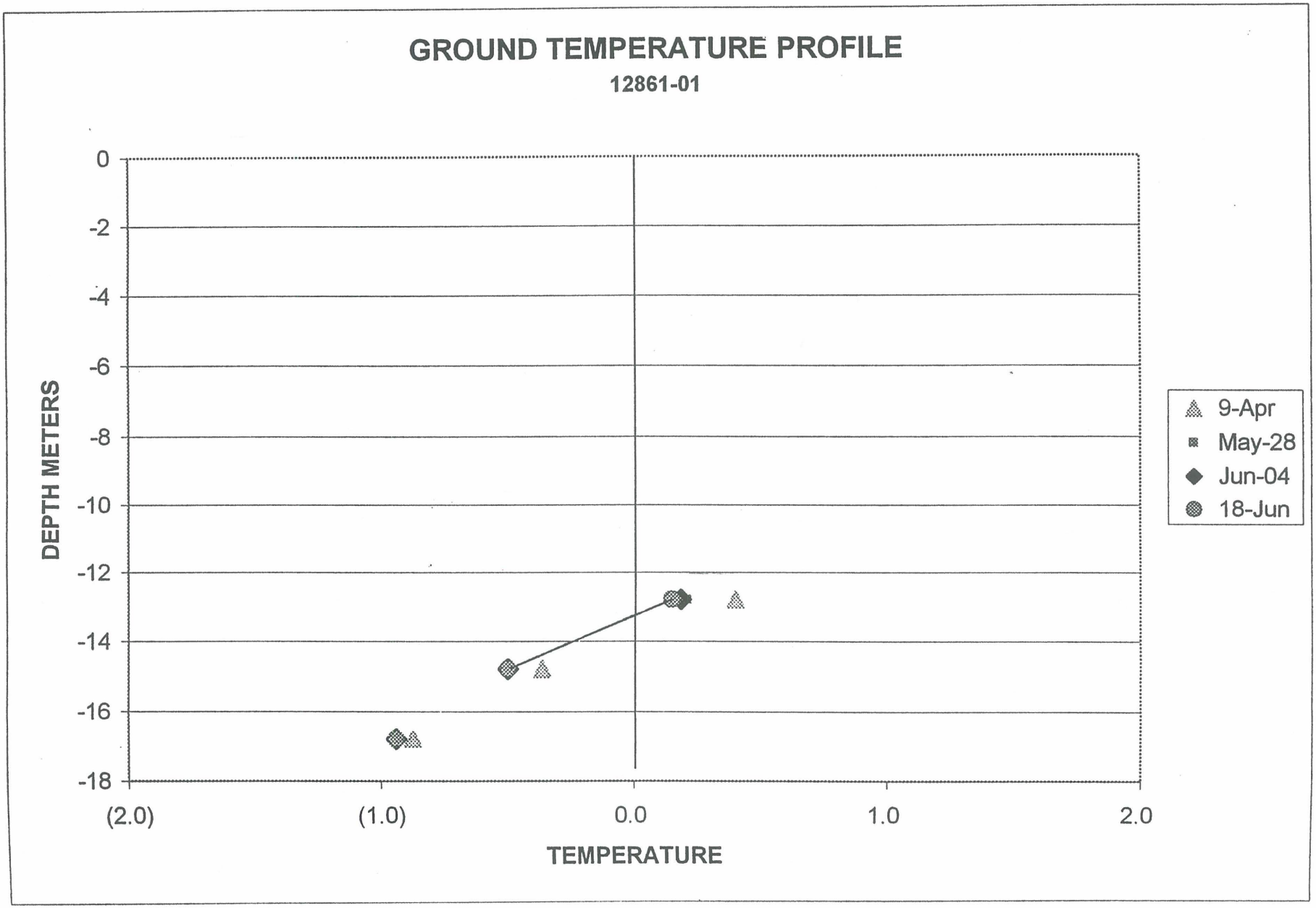
The characteristics and the volumes of the discharge to Dome Creek is given in the Table below:

	Discharge Volume m3	Cyanide ppm	Zinc ppm	Copper ppm	Ammonia ppm
Discharge Limits (ppm)		**0.1**	**0.3**	**0.2**	**no limit**
Date					
12-Jun	570	na	na	na	na
13-Jun	200	na	na	na	na
14-Jun	370	0.04	0.05	na	6.5
15-Jun	418	0.02	na	0.04	na
16-Jun	464	0.07	0.03	0.03	na
17-Jun	685	0.05	0.02	0.02	8.0
18-Jun	495	na	0.01	na	6.0
Total	**3,203**	**0.05**	**0.03**	**0.03**	**7.0**

Cumulative discharged water = 62,545m^3

4-2 Tailings Impoundment Area

The Dome Creek water is still pumped along the diversion ditch to the spillway in order to negate the possibility of run-off water seeping through the diversion ditch bottom and into the tailings pond. The liner for the ditch is now on site and we will be scheduling installation for the beginning of July. The week continued on a wet note with quite a bit of rainfall. An increase in the water being pumped along the ditch was noted for the first time since freshet.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DEPTH METERS
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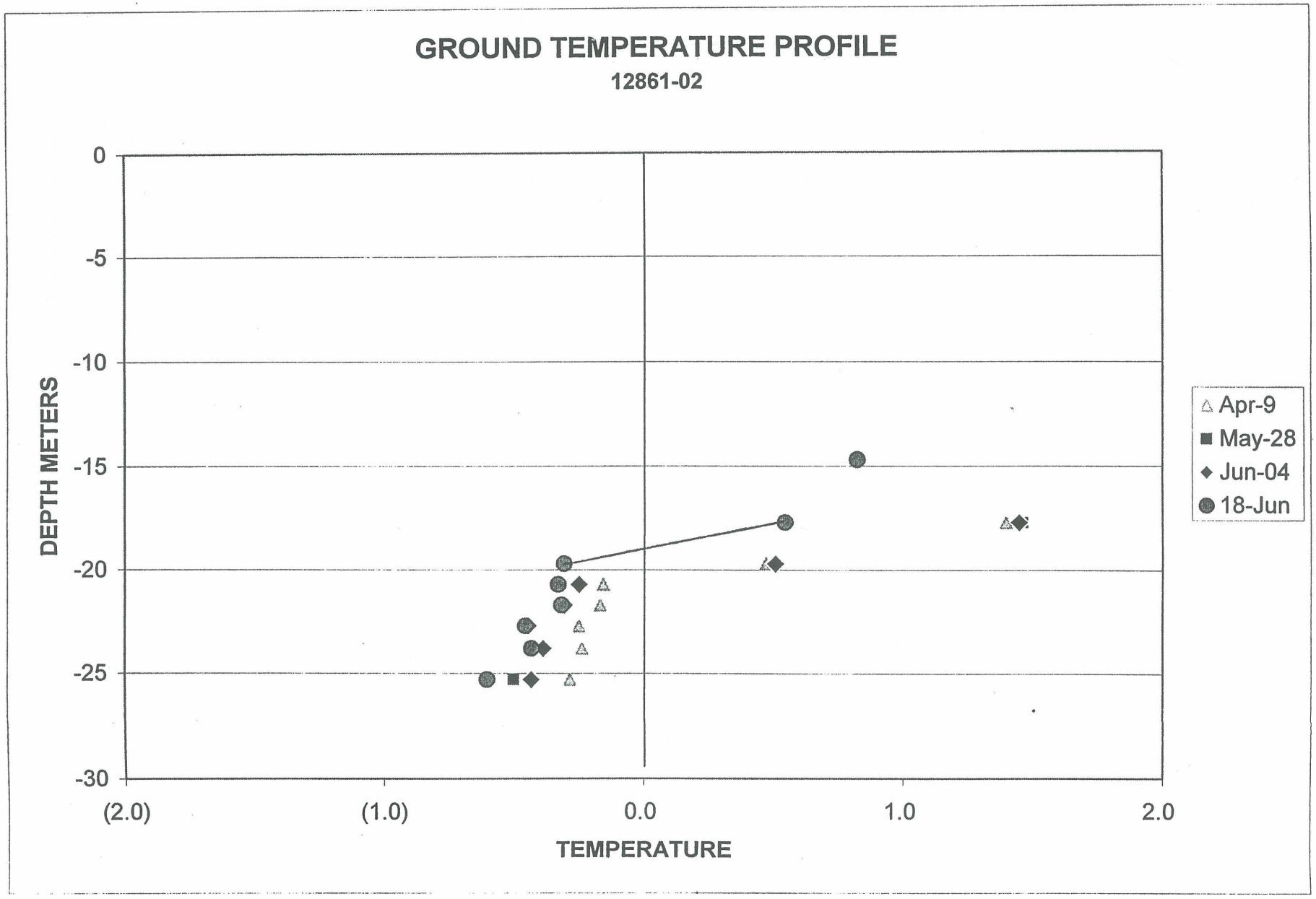
TEMPERATURE
9-Apr
May-28
Jun-04
18-Jun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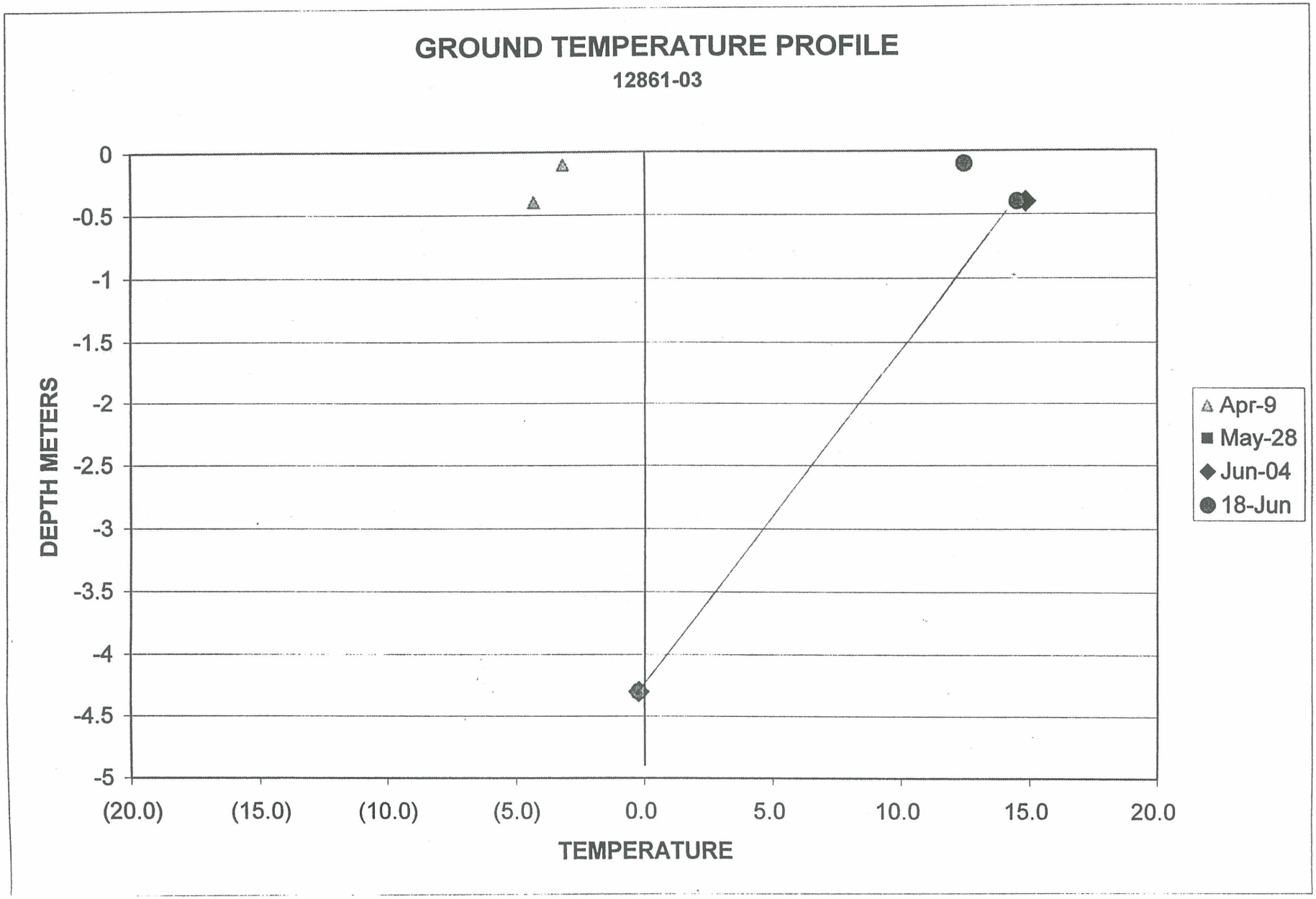
TEMPERATURE
Apr-9
May-28
Jun-04
18-Jun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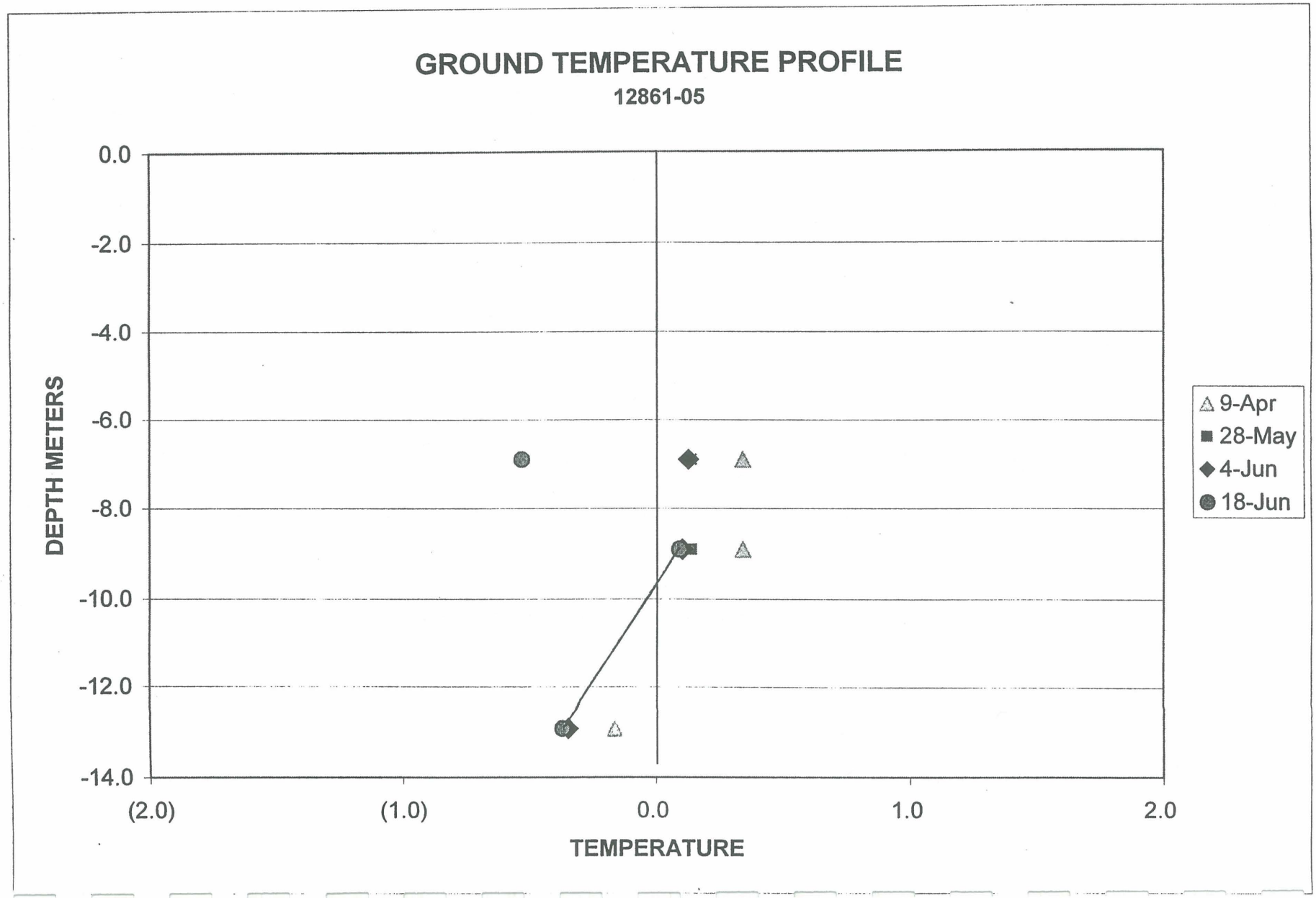
TEMPERATURE
Apr-9
May-28
Jun-04
18-Jun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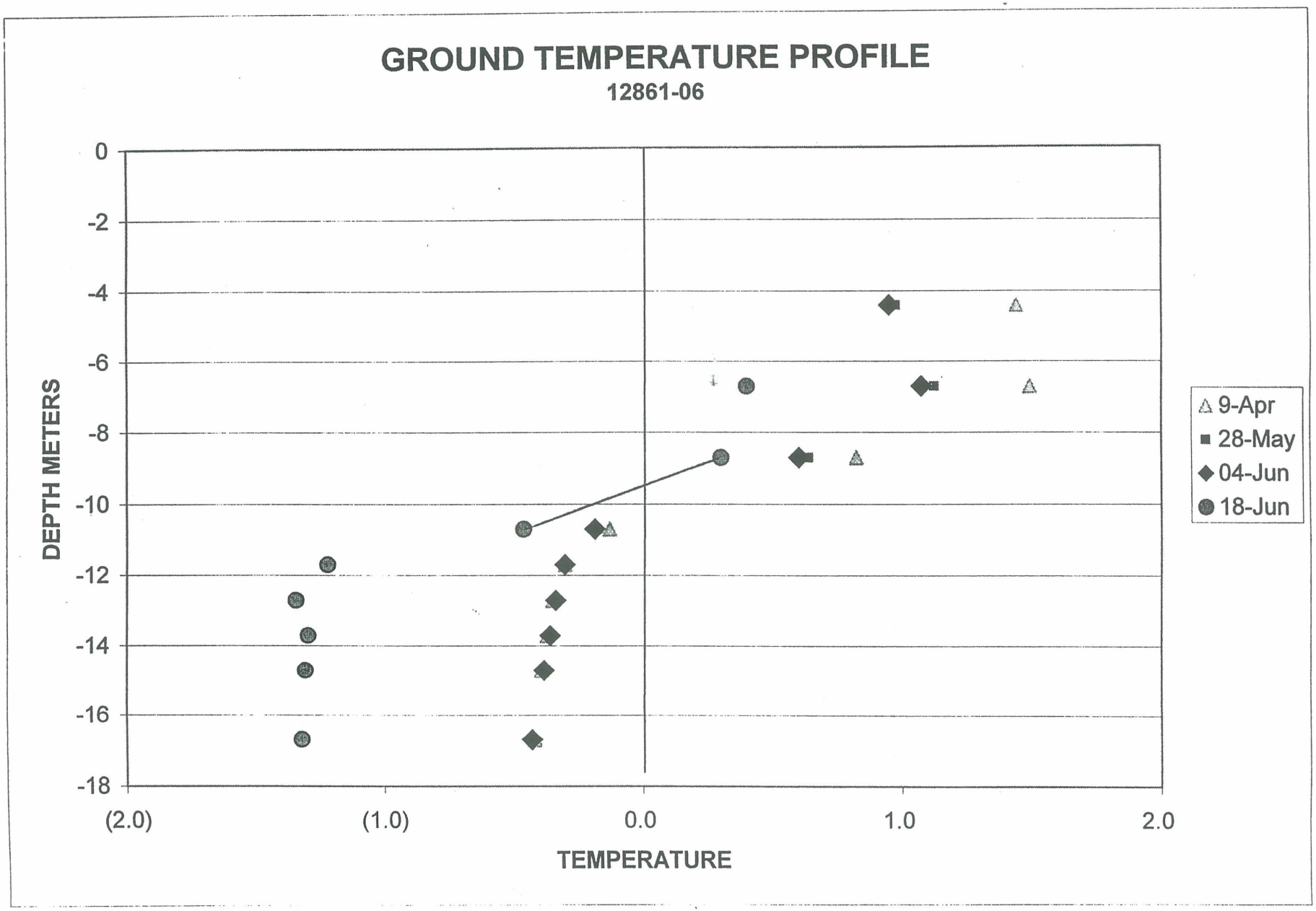
TEMPERATURE
9-Apr
28-May
4-Jun
18-Jun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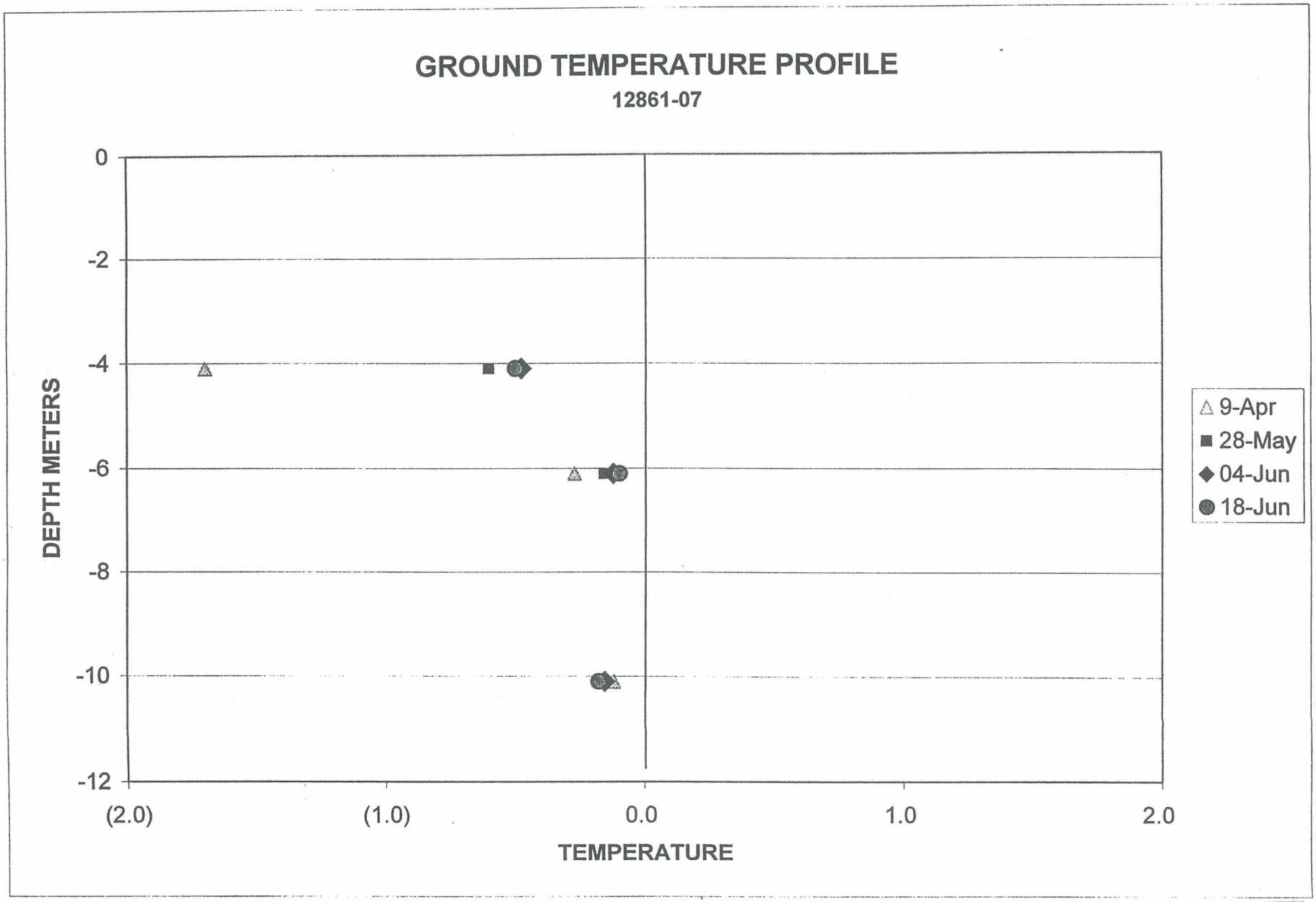
TEMPERATURE
9-Apr
28-May
04-Jun
18-Jun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DEPTH METERS
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(1.0)
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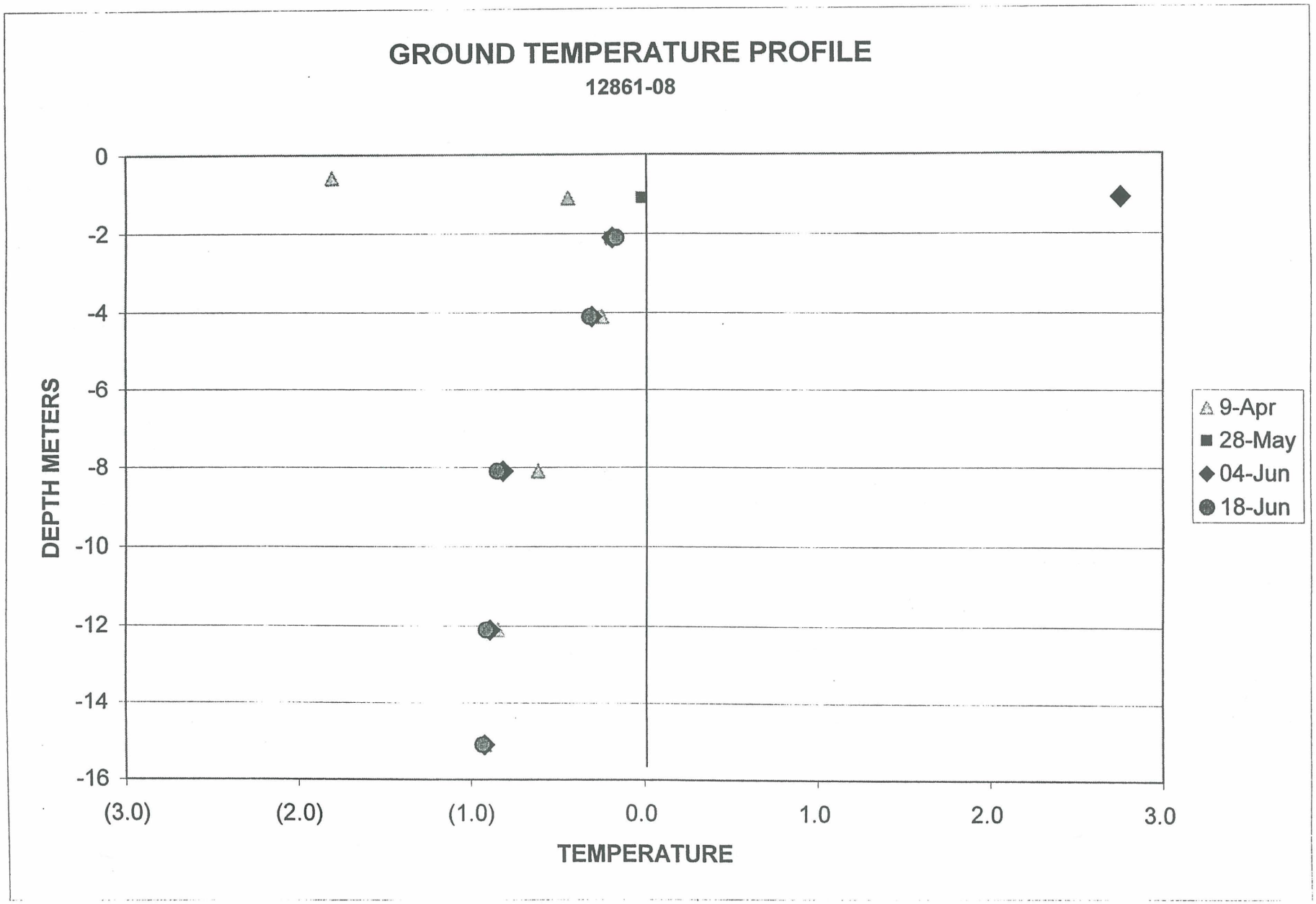
TEMPERATURE
9-Apr
28-May
04-Jun
18-Jun


GROUND TEMPERATURE PROFILE
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DEPTH METERS
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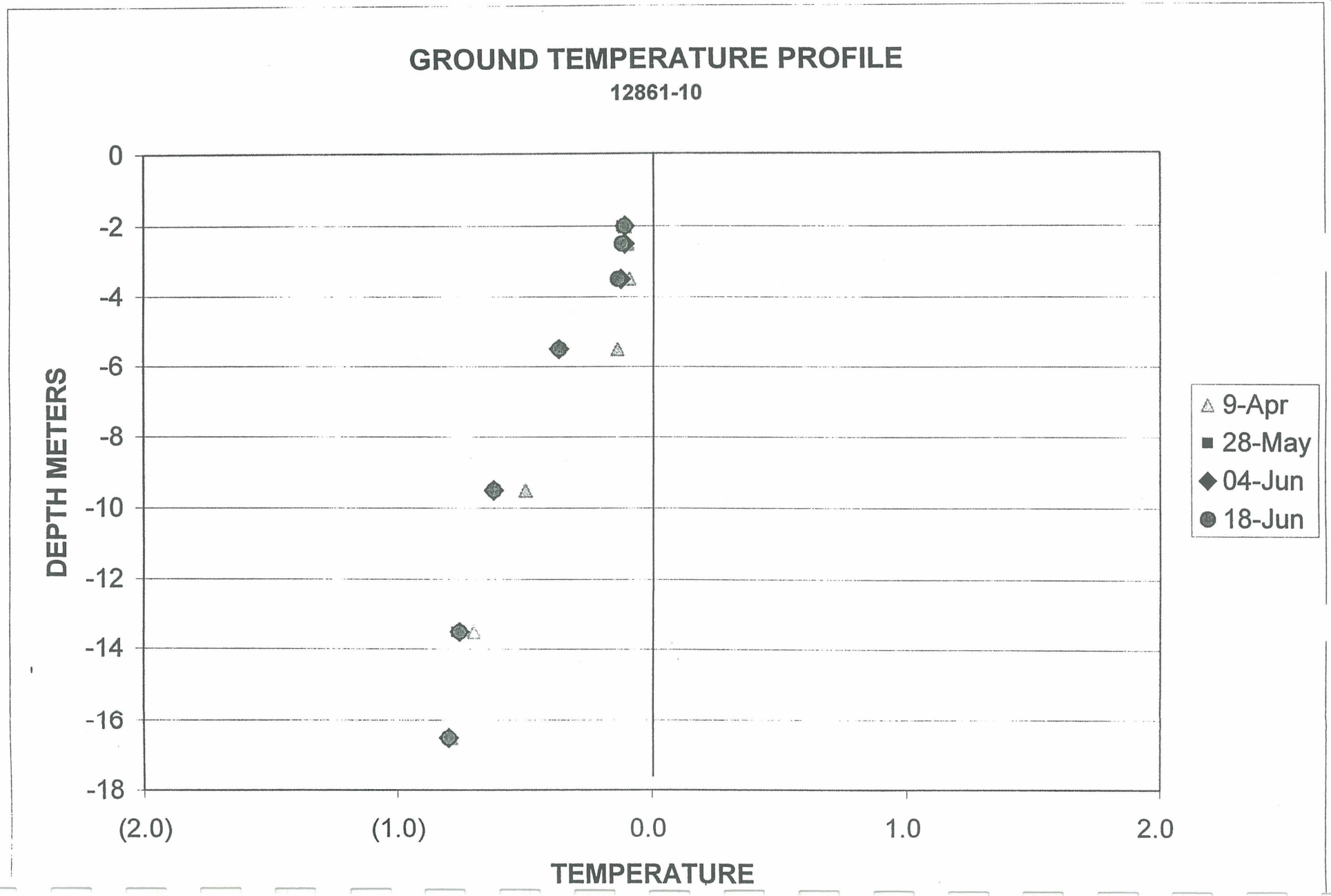
TEMPERATURE
9-Apr
28-May
04-Jun
18-Jun


GROUND TEMPERATURE PROFILE
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DEPTH METERS
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(2.0)
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TEMPERATURE
9-Apr
28-May
04-Jun
18-Jun

BYG NATURAL RESOURCES INC MOUNT NANSEN

TO : J. ANTHONY POLYCK
CHIEF WATER MANAGEMENT OFFICER
WATER RESOURCES DIVISION
NORTHERN AFFAIRS PROGRAM

4 742
FAXED

FROM: PASCAL RENARDET, MINE MANAGER

RE: WEEKLY OPERATIONS REPORT For period ending June 25th, 1998

Water Treatment Plant

Reclaim water from the tailings pond was discharged into Dome Creek throughout almost the whole week. The new booster pump has been installed and is allowing us to provide enough reclaim water to the mill to allow us to mill at 700 MTPD while also allowing us to increase our rate of feed to the water treatment plant to increase discharge when possible.

The characteristics and the volumes of the discharge to Dome Creek is given in the Table below:

	Discharge Volume m3	Cyanide ppm	Zinc ppm	Copper ppm
Discharge Limits (ppm)		**0.1**	**0.3**	**0.2**
Date				
19-Jun	486	0.02	0.03	0.09
20-Jun	528	0.10	0.06	0.05
21-Jun	597	0.05	0.07	0.07
22-Jun	564	0.04	0.06	0.12
23-Jun	515	0.06	0.03	0.07
24-Jun	538	0.08	0.09	0.13
25-Jun	618	0.05	0.05	0.14
Total	**3,846**	**0.06**	**0.06**	**0.10**

Cumulative discharged water = 66,391m^3

4-2 Tailings Impoundment Area

The Dome Creek water is still pumped along the diversion ditch to the spillway in order to negate the possibility of run-off water seeping through the diversion ditch bottom and into the tailings pond. The liner for the ditch is now on site and we will be scheduling installation for the beginning of July. The week continued on a wet note with some rainfall. But fortunately no increase in the water being pumped along the ditch was noted.

The water elevation readings during the week were as follows:

June 21st, 1998 1149.869 m ASL
June 23rd, 1998 1149.881 m ASL

The rise in elevation was due to the wet week we had last week and the weeks prior. This water has now worked its way down the active layer and into the tailings pond.

The pond detoxification program was running again during the beginning of this week and was stopped later on. The discharge point was moved and a new and more powerful pump was installed. The addition of hydrogen peroxide will continue to reduce the cyanide content in the tailings pond. The last numbers we have already collected show that the cyanide content in the pond is probably continuing to be well below the 25 ppm limit.

Seepage Pond

The average flow rate of seepage water into the # 2 seepage dam, which is then pumped back into the tailings pond, was stable at 8.5 m^3/hr. Again this is due to increased run off from the hill side.

Tailings Dam

The thermistors readings are summarized in the following table:

Bore Hole	Depth to the Permafrost in meters				
	Initial	Drilling	Mar 30th	June 18th	June 26th
BH 01	13.7	13.6	13.8	13.2	12.5
BH 02	19.2	19.8	20.6	19.0	20.6
BH 03	?	18.2	Surface	4.2	4.2
BH 04	?	3.7	?	?	?
BH 05	7.3	7.2	12.0	9.7	7.8
BH 06	10.0	10.3	10.5	9.8	10.0
BH 07	0.6	7.6	Surface	< 4.0	< 4.0
BH 08	3.3	3.0	Surface	< 1.0	< 1.0
BH 09	0.0	7.6	?	?	?
BH 10	3.1	3.1	Surface	< 3.0	< 3.0

Mill Operations

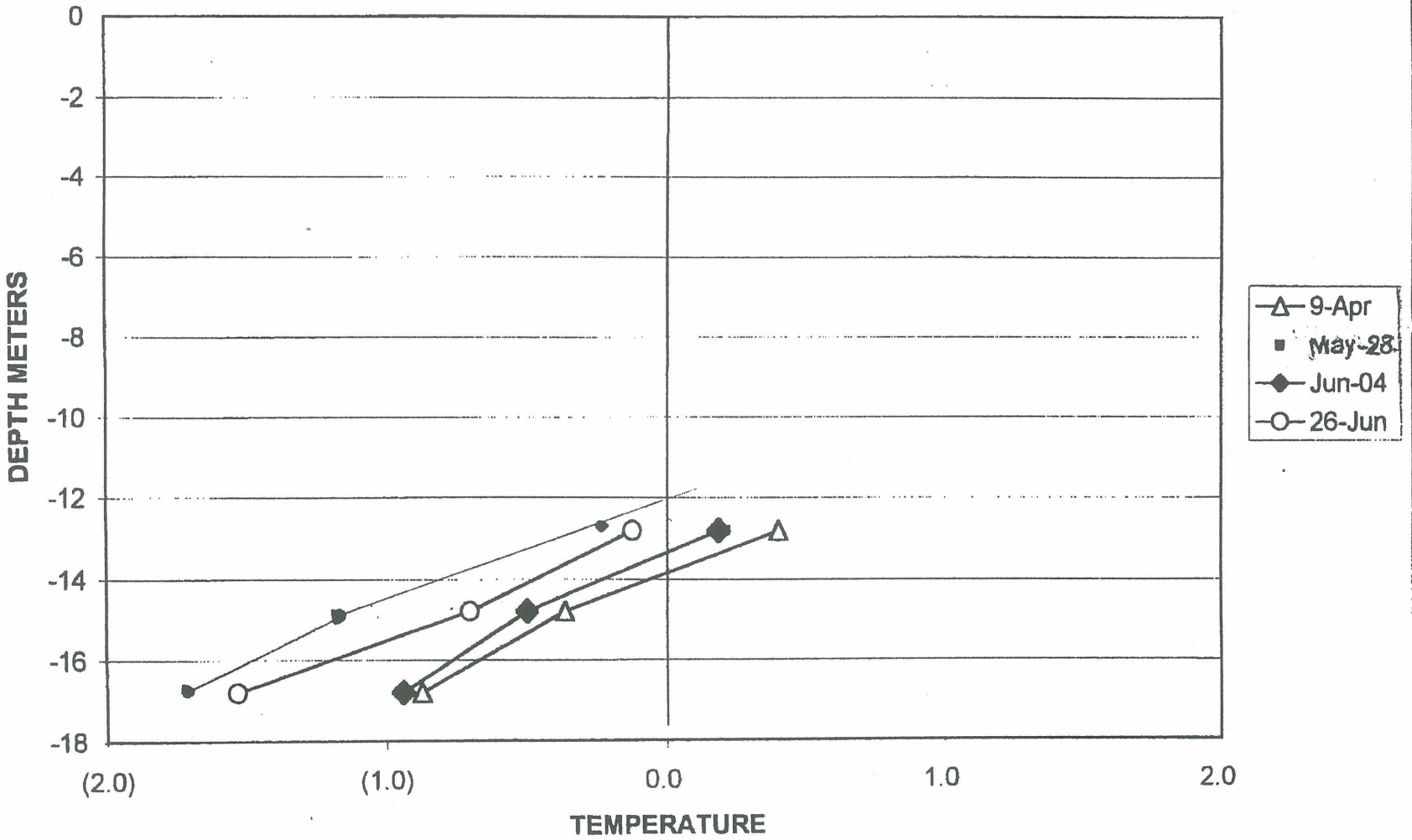
The mill operated continuously this week and processed 4,292 dry tonnes of ore. The slurry cyanide destruction plant operated all week.

Pascal Renardet, Mine Manager

P. Renardet

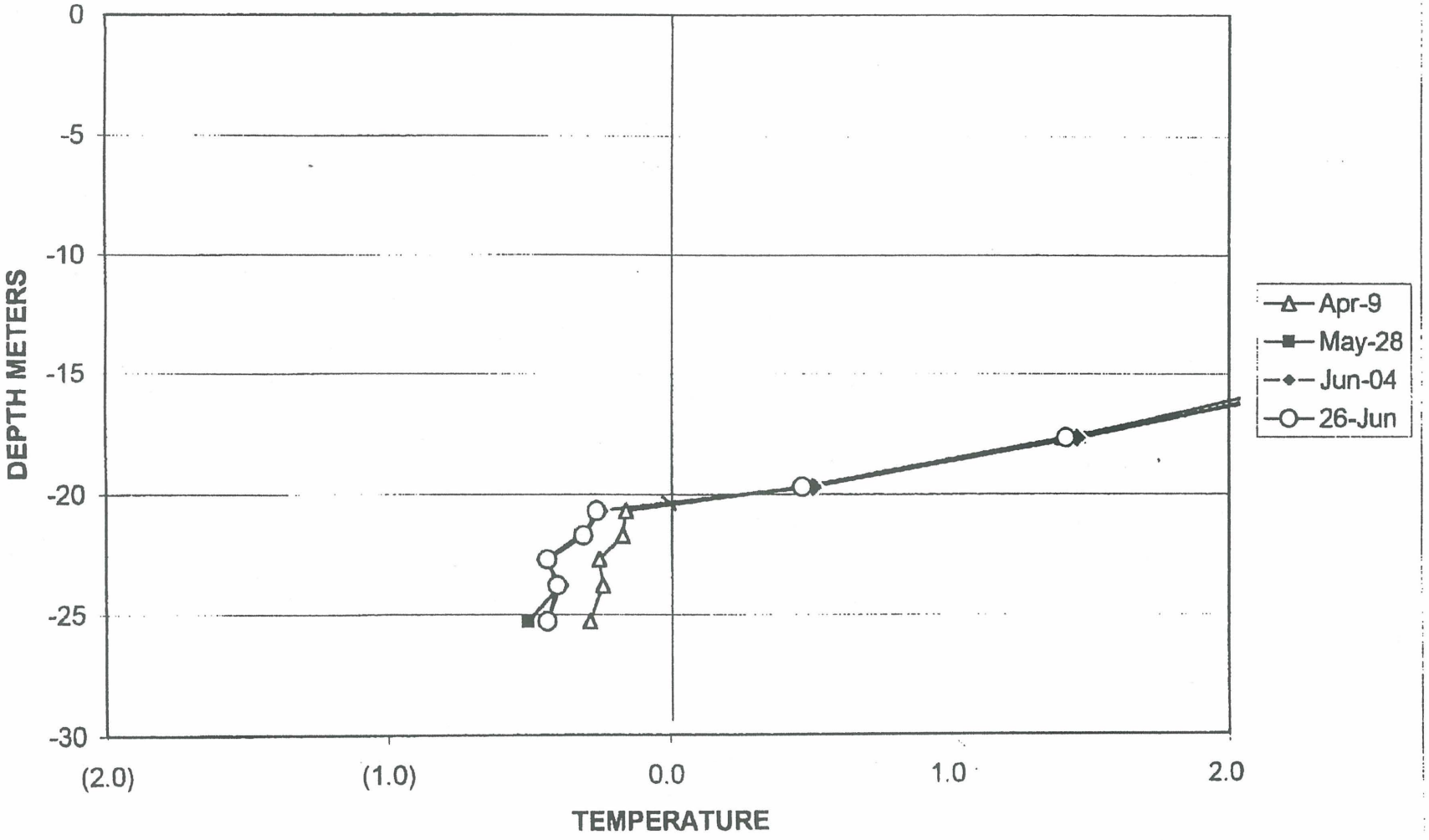
GROUND TEMPERATURE PROFILE

12861-01



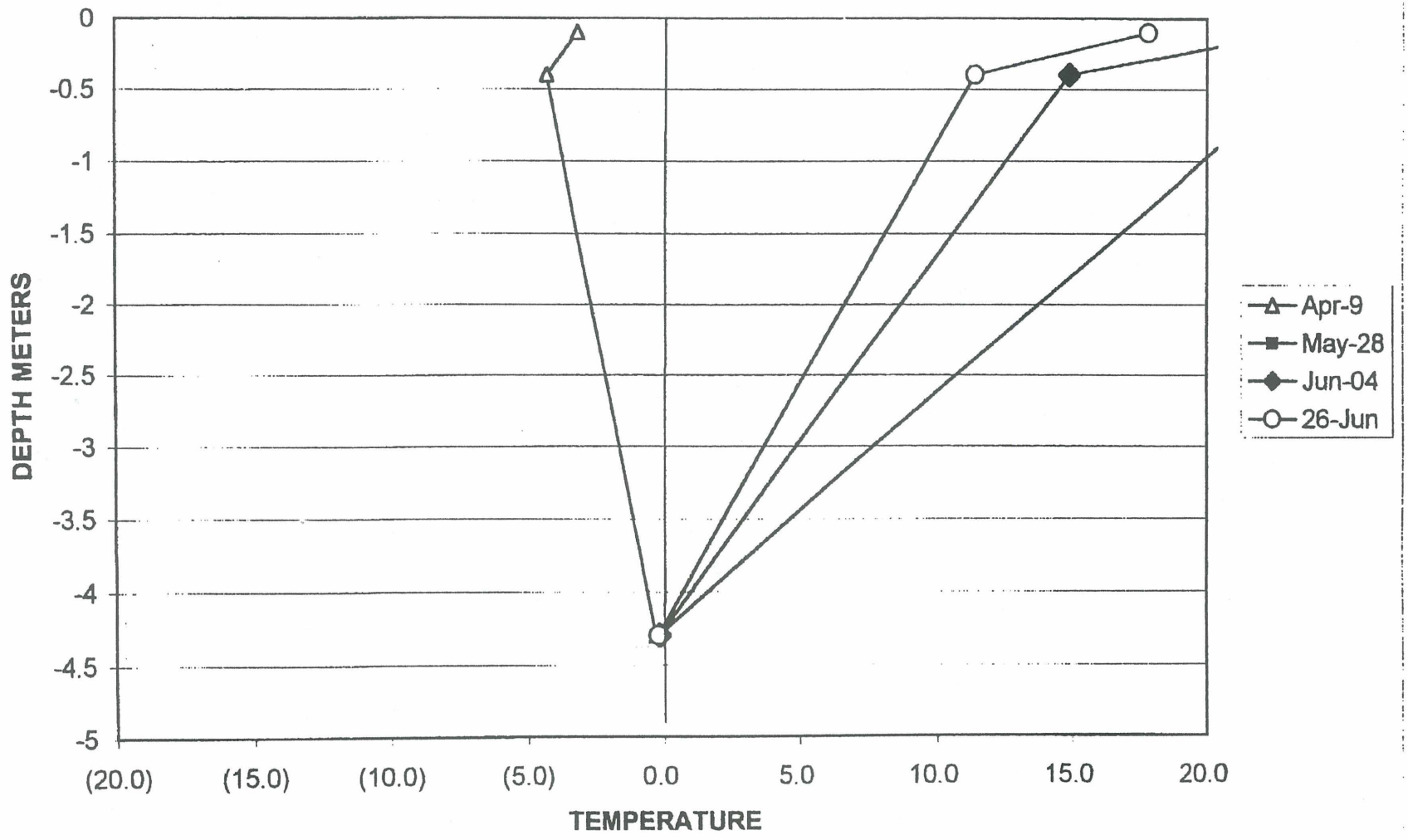
GROUND TEMPERATURE PROFILE

12861-02



GROUND TEMPERATURE PROFILE

12861-03



GROUND TEMPERATURE PROFILE

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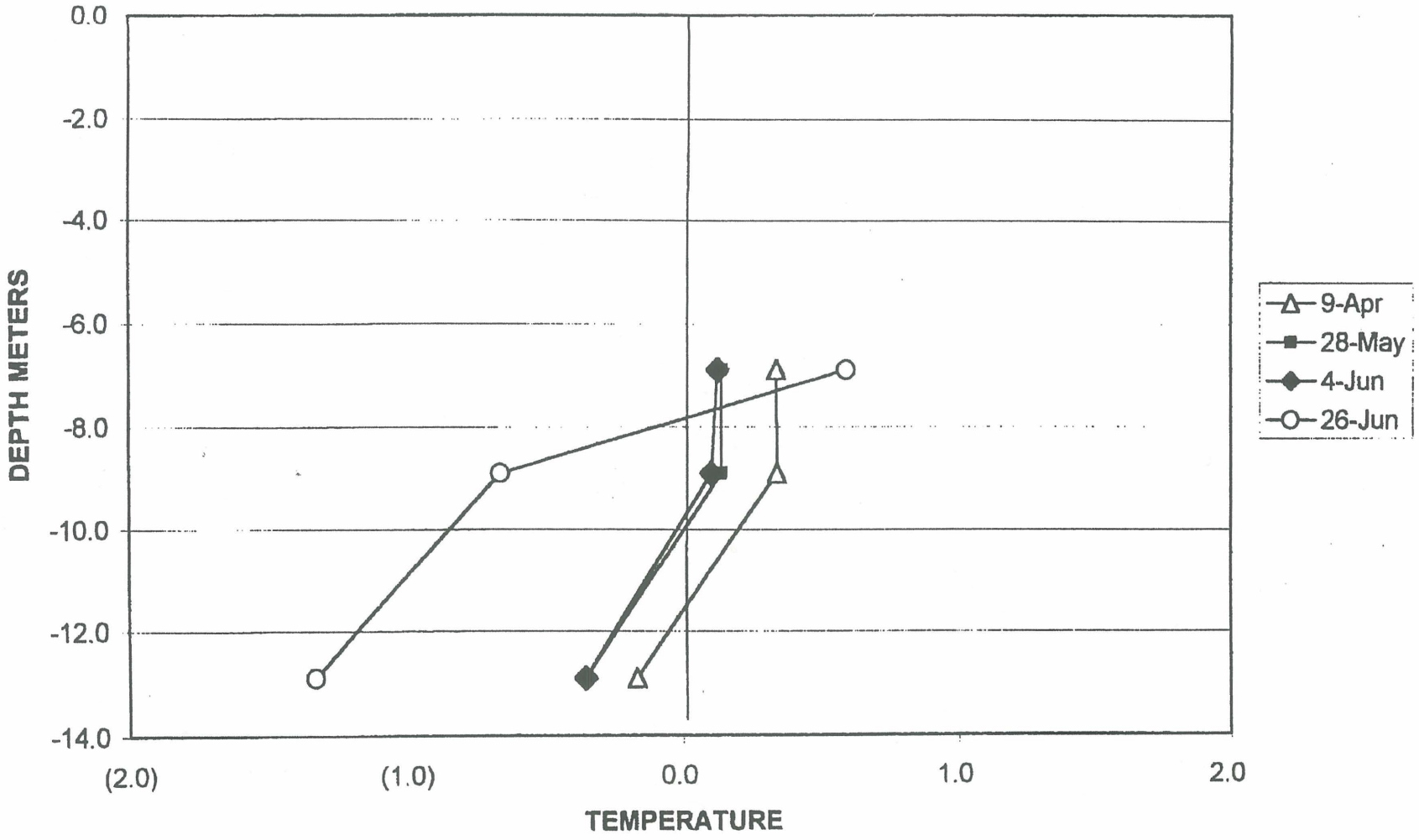
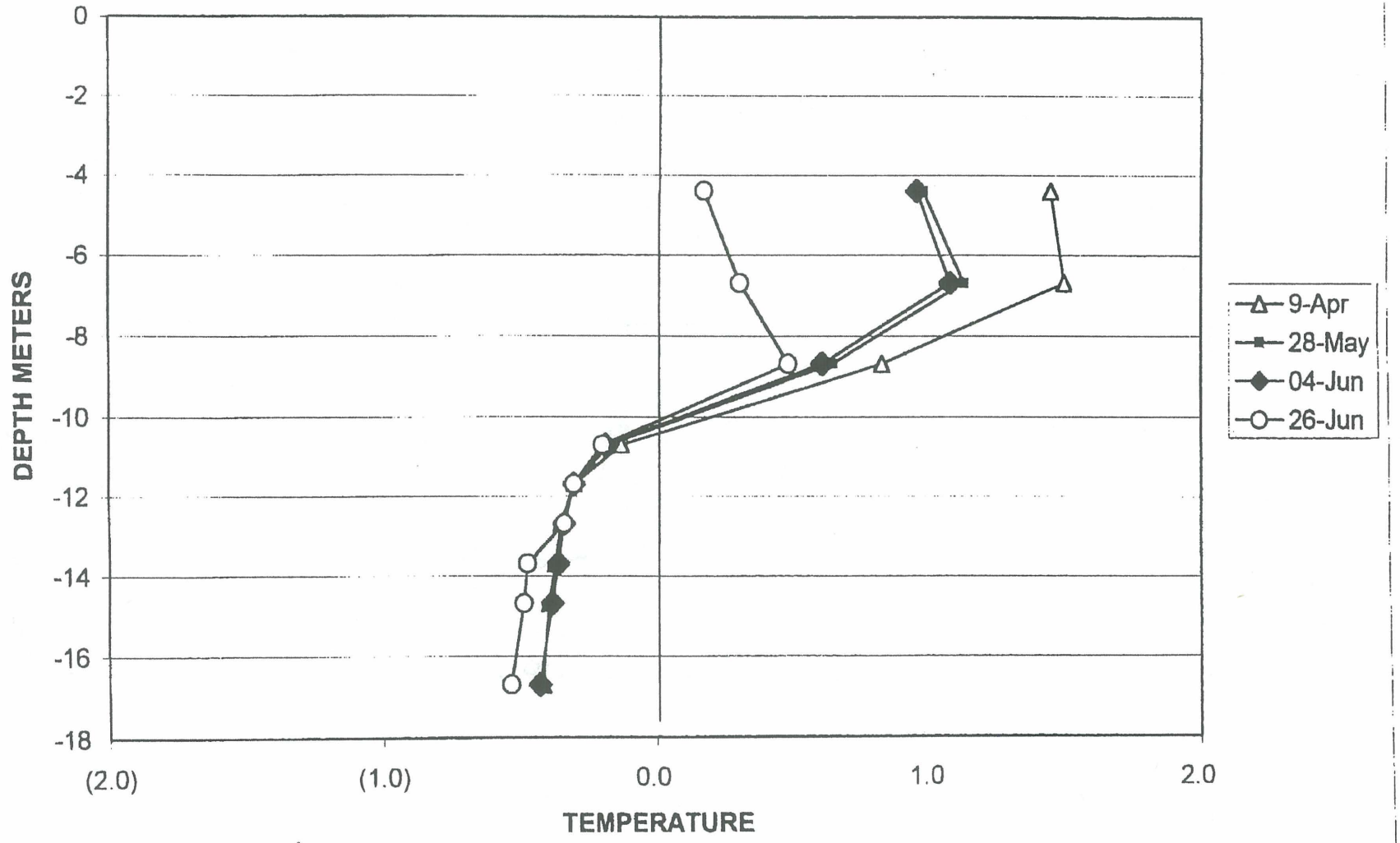
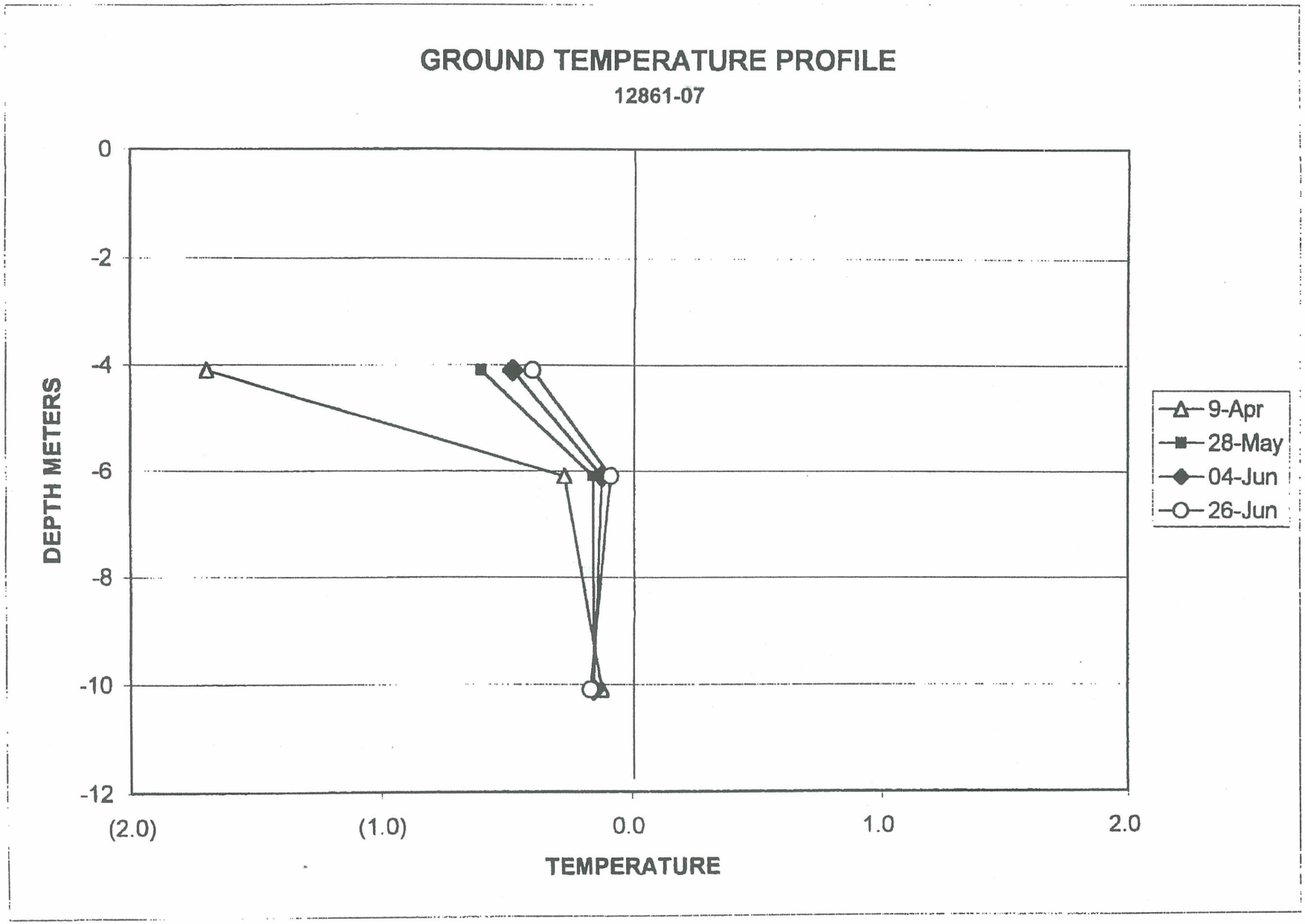


GROUND TEMPERATURE PROFILE

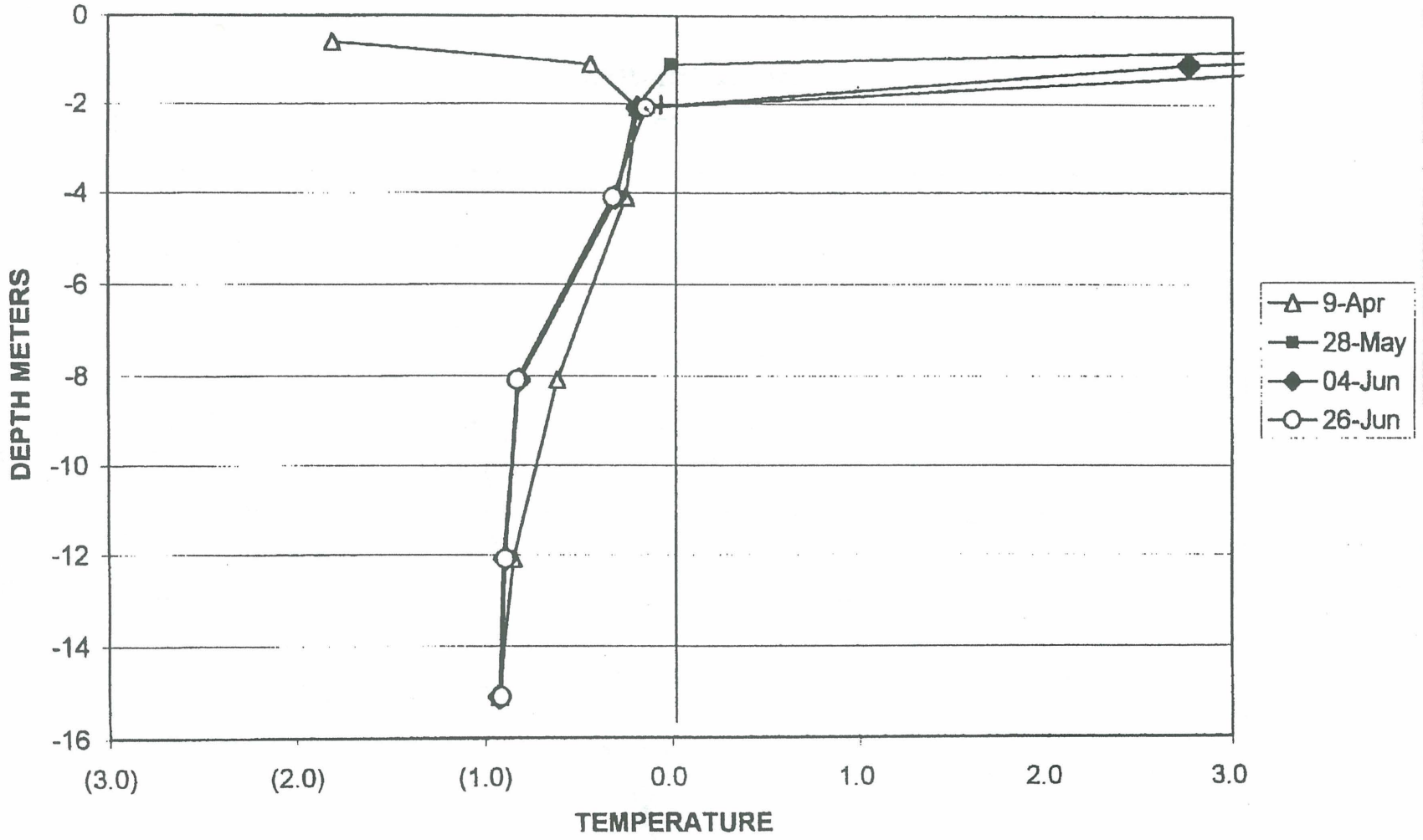
12861-06




GROUND TEMPERATURE PROFILE
12861-07
0
-2
-4
-6
-8
-10
-12
DEPTH METERS
(2.0)
(1.0)
0.0
1.0
2.0
TEMPERATURE
9-Apr
28-May
04-Jun
26-Jun

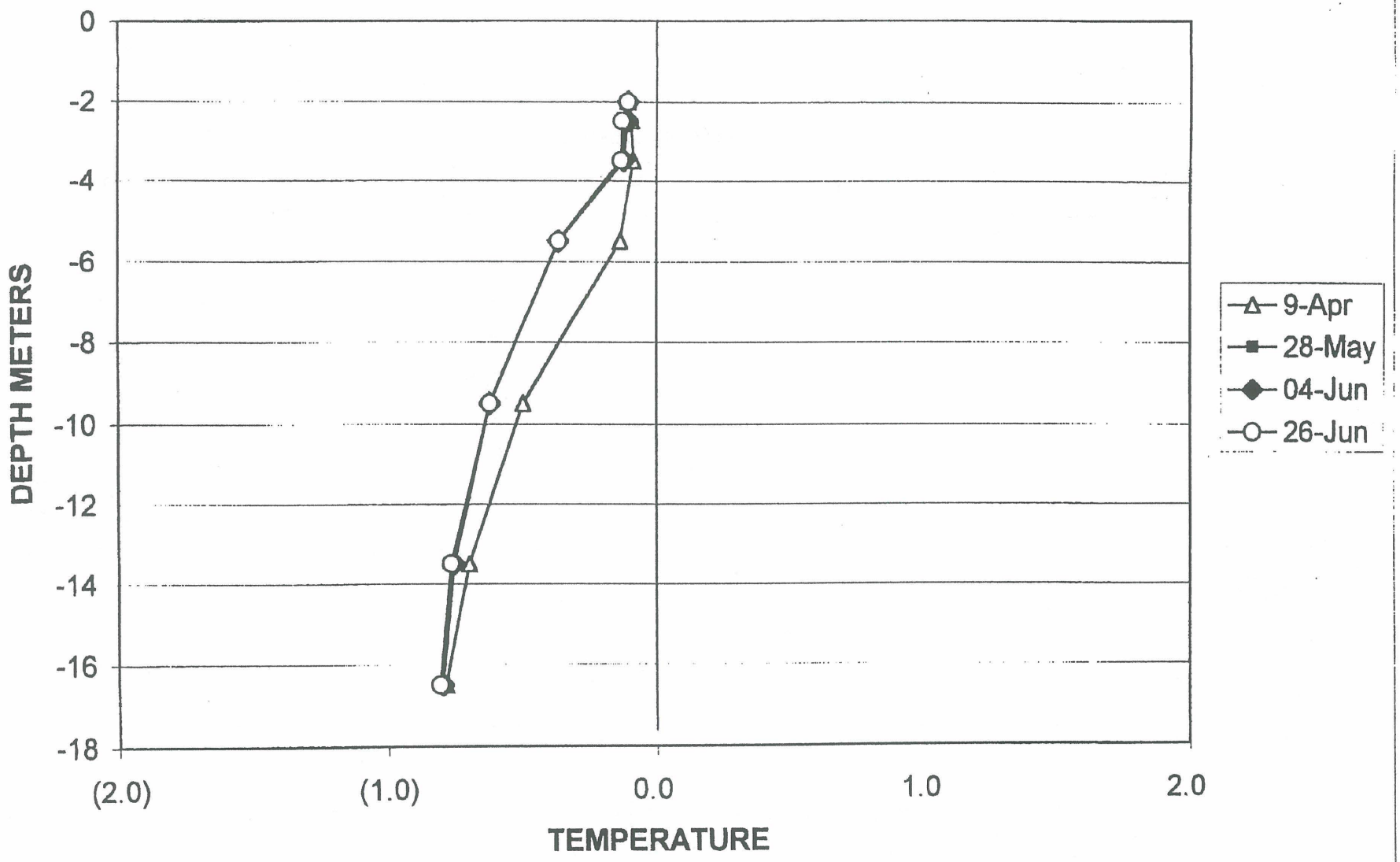
GROUND TEMPERATURE PROFILE

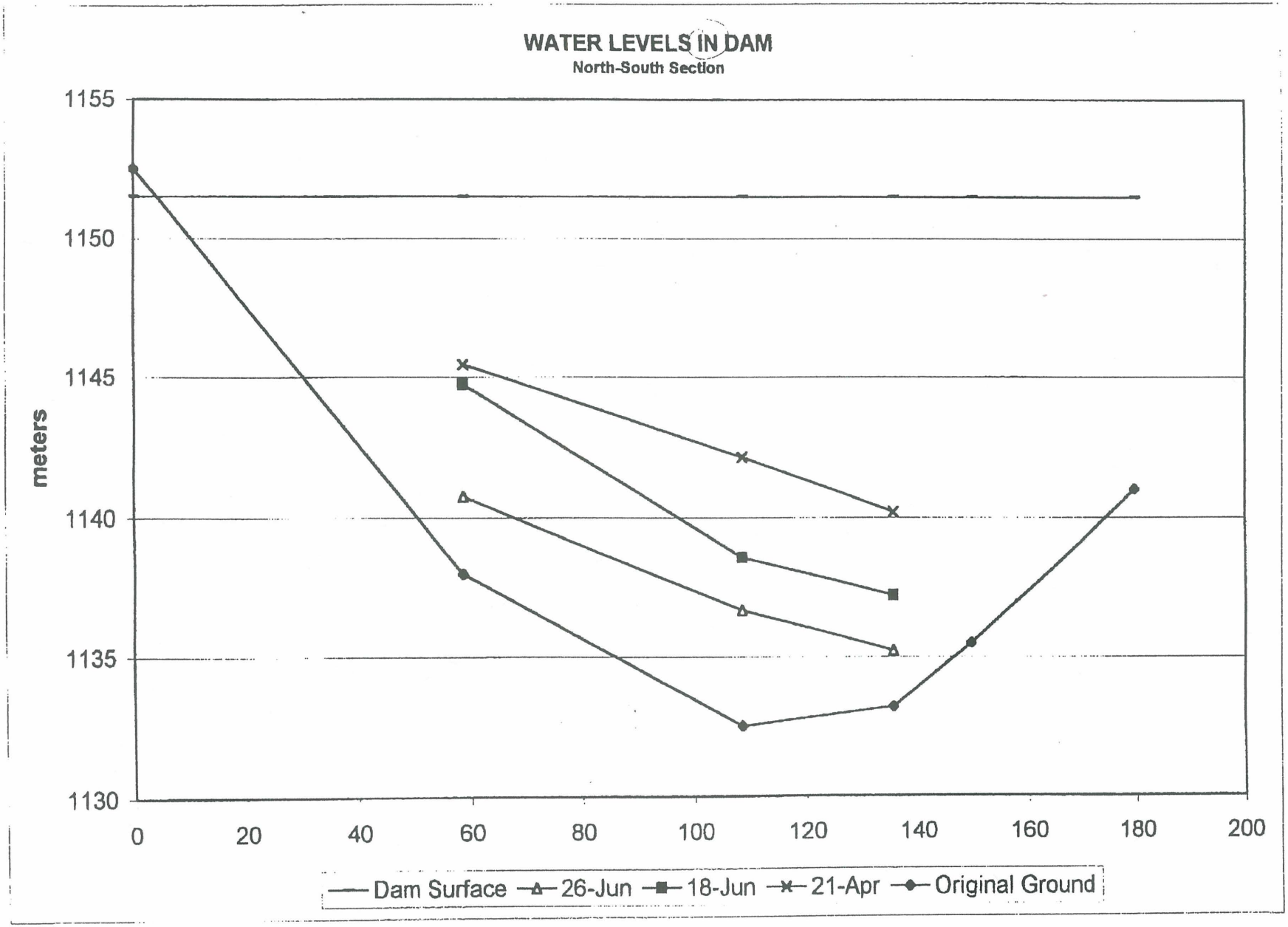
12861-08

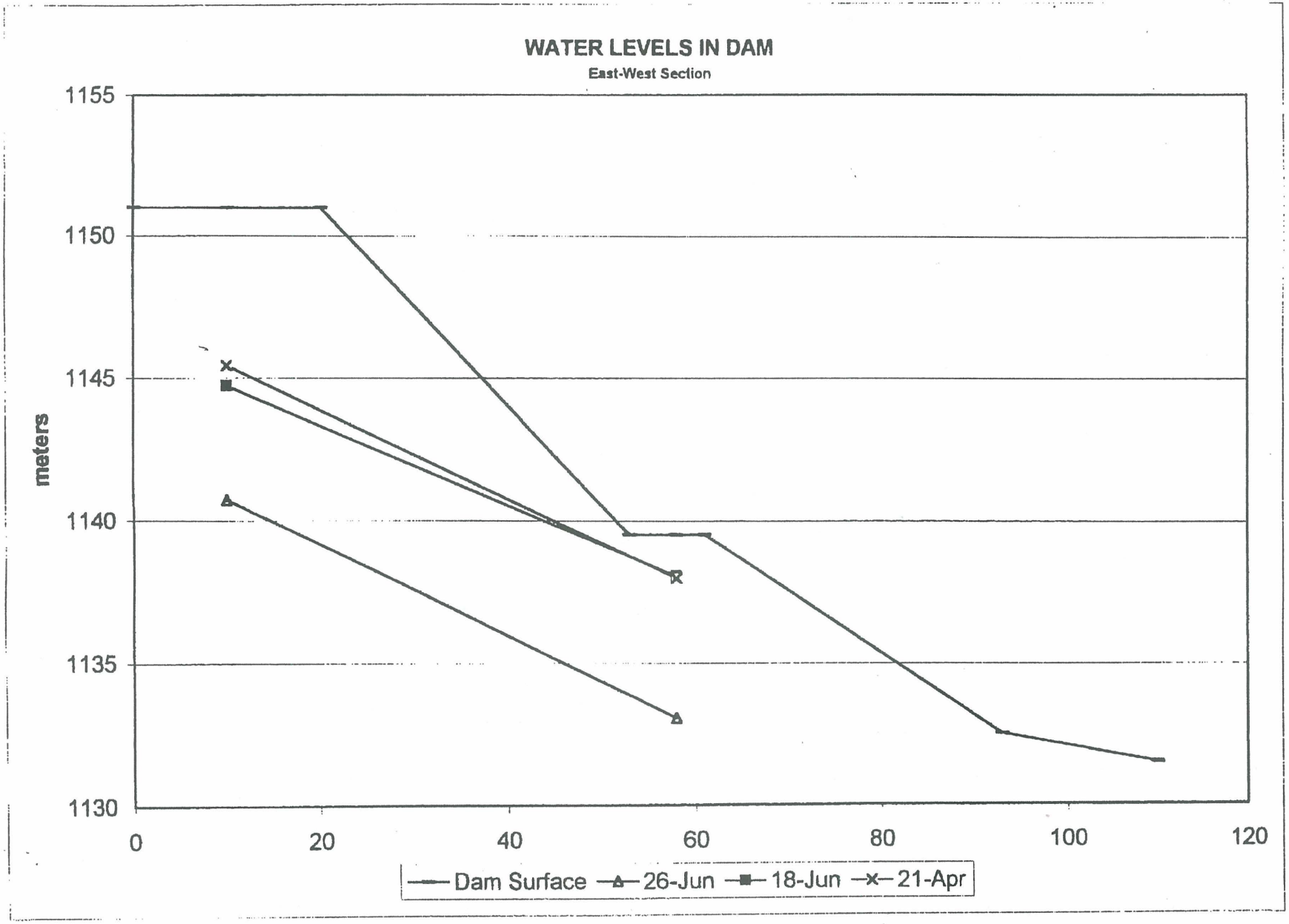


GROUND TEMPERATURE PROFILE

12861-10




WATER LEVELS IN DAM
North-South Section
meters
1155
1150
1145
1140
1135
1130
0
20
40
60
80
100
120
140
160
180
200
Dam Surface
26-Jun
18-Jun
21-Apr
Original Ground


WATER LEVELS IN DAM
East-West Section
1155
1150
1145
1140
1135
1130
meters
0
20
40
60
80
100
120
Dam Surface
26-Jun
18-Jun
21-Apr