Mount Nansen Project

Update to Water Licence Application QZ94-004
Supporting Documentation
Revisions

Volume I of I
Sections I through XIV

Submitted to:

Yukon Territory Water Board

Submitted By:

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December 18th 1995

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(revisions)

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Ref: Exhibit I g) I

Ref: Screening Report Section 6.1
Screening Report Section 6.6.1

Also Ref: Tailings Impoundment
Final Design Report Sections 9, 10 & 11

CONSTRUCTION QUALITY ASSURANCE MANUAL

(Tailings Impoundment Waste Rock and Diversion Channels)

Revisions - December 18, 1995

General

This manual addresses constrcution quality assurance (CQA) for construction of the tailings impoundment and diversion channels and for the disposal and placement of waste rock, for the Mount Nansen Mine, Yukon Territory. This manual is to be used in conjunction with the proper technical specifications and construction drawings. The QA Monitor and all contractors are required to become fully familiar with the technical specifications and contract drawings. Responsibilities of the various parties involved int he construction are defined along with the testing and documentation for the following construction and installation.

Tailings impoundment Site Clearing

Borrow areas Site Clearing

Seepage recovery dam Site Clearing

Diversion ditch Site Clearing

Emergency Spillway Site Clearing

Tailings impoundment Foundation Preparation

Permafrost excavation

Tailings impoundment Embankment Construction

Seepage recovery dam Embankment Construction

Tailings impoundment Geosynthetic Clay Liner Installation

Seepage dam Geosynthetic Clay Liner Installation

Diversion channel Erosion Protection

Tailings impoundment crest Erosion Protection

Tailings impoundment downstream slope Erosion Protection

Seepage dam downstream slope Erosion Protextion

Emergency spillway Erosion Protection

Pneumatic piezometer Insatllation

Thermistor Installation

Waste Rock Placement

Quality control will be the responsibility of the manufacturers, suppliers and installation contractors, all of whom will be responsible to the General Contractor, referred to in the specifications and this manual as the Contractor.

Definition of Operations and Responsiblities

Parties who may be involved in the production, delivery and installation of materials and construction with on-site materials for the project are listed and defined below.

Designers:
Klohn Crippen. Responsible for the design, contract drawings and specifications for the constuction listed above.

Contractor:
Responsible for all the work on the Project. The contract has not yet been let.

Supplier:
Responsible for the manufacture and supply of geosynthetic products to the Installer. Depending on the Installer the supplier may also be the manufacturer and fabricator of the product.

Installer:
Responsible for field handling, storing, placing, seaming and other site specific aspects of geosynthetics. The Installer may also be responsible for transportation to site. Responsible for anchor trenches and all temporary anchoring or loading required to suport the geosynthetics during installation. Installer will be responsible to the Contractor.

Owner:
BYG Natural Resources Inc. is the Owner and will be responsible for operating and maintaining the facility and interfacing with the regulatory agencies. The owner will appoint a representative to coordinate filed activities. The Contractor will be responsible to the Owner's representative.

Engineer:
To be a party hired by and responsible to the Designer, independent of the Owner and the Contractors, responsible for the observation and documentation of activities pertaining to the assurance of the quality of the installation of manufactured products and the construction of on-site products. The Engineer will certify compliance with design.

Quality Assurance Monitors:
working for and reporting to the Engineer.

Communications:
During construction the QA Monitors will report items complying with the specifications to the Engineer and those not complying, to the Engineer and directly to the Owner, who will direct the Contractors in the actions to be taken to enforce compliance. Remedial action will be tracked and reported to theEngineer and to the Owner by the QA Monitors. QA Monitors will report only compliance or non compliance and will not direct or instruct the Contractors.

Meetings:
An initial meeting will be held at site with all parties involved in the construction and quality assurance. This meeting will be used to review critical details in design, construction scheduling, and quality control and quality assurance procedures, responsibilities and authorities of the parties, lines of communication, methods for documenting and reporting and for the distribution of such documents and reports.

The Owner will hold meetings at least once a week with the Contractors, and the QA Monitors to review progress, scheduling, items of concern and the resolution of any outstanding issues relating to Quality Assurance.

Ref: Exhibit I g) III

Ref: Screening Report Section 6.1

Also Ref: Water Licence Application Section 6

OPERATIONAL MONITORING PLAN

Revisions - December 18, 1995

(addendum to Water Licence Application Section 6.)

6.11 Seepage from Pit Floor Through Brown M^{c}Dade Adit

Seepage water from the old Brown McDade adit will be monitored and tested on a monthly basis. The seepage will be tested for pH, Arsenic, ICP Metals, Ammonium, Sulfate and flow rate.

6.12 Thermistors

Thermistors will be installed with sufficient cable to allow the thermistor string to terminate at the downstream toe of the dam. The thermistor strings will be monitored on a monthly basis.

6.13 Piezometers

The piezometers will be installed with sufficient tubing to allow for extension to the downstream toe of the dam. The piezometers will be monitored when the thermistor strings show that the ground around the piezometer has thawed. The piezometers will then be monitored on a monthly basis.

6.14 Settlement Pins

Settlement pins will be driven into the downstream crest of the tailings dam. The settlement pins will protrude 50 mm from the dam crest. The settlement pins will be surveyed on a monthly basis .

6.15 Thermometer

Daily maximumand minimum temperatures will be recorded at the mine site. Comparison of this data with the Carmacks station will aid in long term prediction of temperature variances.

6.16 Rainfall Gauge

Precipitation will be recorded on a daily basis fopr comparison with Carmacks station and to determine runoff inflows.

6.17 Snowpack Monitoring

The Snowpack will be monitored for the four months of February, March, April and May.

6.18 Physical Inspection

A physical inspection will be made of the following sites on a monthly basis:

Diversion Ditch

Spillway

Waste Rock Pile

Tailings Dam

Seepage Dam

The inspection will be to look for unwarranted disturbances, blockages of drainage by ice or vegatation or any other physical manifestation.

6.19 E8 Spillway When Flowing

Flow down the spillway is in fact a discharge to the environment that has not passed through the effluent treatment system prior to discharge. This discharge must then be monitored and analysed as per sample E7. No flow is expected at this point during the life of the mine. The flow will be monitored quarterly if persistent. If intermittent the flow will be monitored when it occurs.

6.20 V3 & V4 Victoria Creek

The effect of the mining operation on the environment can best be judged by its effect on the receiving waters of Victoria Creek. As all drainage from the mining and milling operations end up in dome creek then the monitoring stations are placed above and below the point of discharge of Dome Creek into Victoria Creek. The sampling frequency is quarterly and the samples will be monitored for ICP Metals, Arsenic, Ammonium, Sulfate, Nitrate and phsical parameters such as pH, turbidity etc. as per chart.

6.21 Sedimentation Samples

Annually at summer low flow 3 replicate samples of sediment will be taken from the sedimentaion sample points D1, D2, D3 & P1. The samples will be analysed by ICP for total analysis and also for loss on ignition.

6.22 Sedimentation Program

Sediments will be collected to a depth of 10cm in replicates of three, directly into 500ml HDPE sample jars. Care will be taken to ensure that all fines are retained by sampling opposite stream flow. Sample containers will be labelled inside and out.

ICP Metals, loss on ignition and total oragnic (TOC) will be analyzed on the <63μm fraction of each composite. Particle size analyses will be conducted on each replicate at each site using the Wentworth scale.

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Table 6-1
Proposed Monitoring Schedule - Mount Nansen Project

		Inspect or Survey	Flow Rate	Flow Recording	Sediment Sample	PARAMETERS					CYANIDES						ANIONS						Tot & Diss Metals	Bioassay Pass/Fail
						Pressure	pH	Cond.	Temp	Turbidity	Total	WAD	CNO^-	SCN^-	NFR	FR	Arsenic	Alkaline	SO_4	NH_3	NO_3 & NO_2		
	Effluents																							
E1	Reclaim Water Intake	W	C	Manual			W	W	W	W	W	M	M	M	M		W	M	M	W	M	M	
E2	Tailings Pond Seepage		C	Manual			W	W	W	W	M	BM	BM	BM	M		W	M	M	W	M	M	
E3	Ore Storage Run Off		W	Manual			W	W	W	W					W		W	W	W	W	M	M	
E4	Waste Dump Run Off		W	Manual			W	W	W	W					W		W	W	W	W	M	M	
E5	North Pit Mine Water		W	Manual			W	W	W	W					M		W	W	W	M	M	W	
E6	South Pit Mine Water		W	Manual			W	W	W	W					M		W	W	W	M	M	W	
E7	Polishing Pond Discharge to Dome Creek		C	Automatic			D	D	D	D	D	W	W	W	W	W	W	W	W	W	W	W	2A
E8	Spillway Discharge - Intermittent		D	Manual			D	D	D	D	D	W	W	W	W	W	W	W	W	W	W	W	Q
	Surface Waters																							
D1	Dome Creek - Upstream Control Site		BM	Manual	A		BM	BM	BM	BM	BM				BM	BM	BM	BM	BM	BM	BM	BM	
D2	Dome Creek 0.4 km from mouth		M	Manual	A		M	M	M	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	
D3	Dome Creek 100m down from Tailings Pond		M	Manual	A		M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
P1	Pony Creek 600m from mouth		BM	Manual	A		BM	BM	BM	BM	BM				BM	BM	BM	BM	BM	BM	BM	BM	
P2	Brown-McDade Adit Entrance		M	Manual			M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
V3	Victoria Creek - Pump House		Q	Manual			Q	Q	Q	Q	Q				Q	Q	Q	Q	Q	Q	Q	Q	
V4	Victoria Creek - Downstream of Dome Creek		Q	Manual			Q	Q	Q	Q	Q				Q	Q	Q	Q	Q	Q	Q	Q	
	Instrumentation																							
I1	Outdoor Thermometer								D															
I2	Rainfall Gauge	D																						
I3	Thermistors								M															
I4	Piezometers					M																		
I5	Crest Pins	M																						
I6	Snow Pack- February to May	M																						
	Physical Inspections																							
M1	Tailings Dam	M																						
M2	Seepage Dam	M																						
M3	Waste Rock Pile	M																						
M4	Diversion Ditch	M																						
M5	Spillway	M																						
M6	Tailings Volume	M																						

LEGEND							
C	Continous when flowing	W	Weekly	M	Monthly	2A	Semi-annually
D	Daily	BM	Bimonthly	Q	Quarterly	A	Annually in triplicate

12 OCT /96

Monitoring Schedule Sorted by Category Station	Effluents	Inspect or Survey	Flow Rate	Flow Recording	Sediment Sample	Parameters Pressure	pH	Conduc-tivity	Temp.	Turbidity	CYANIDES Total	WAD	CNO^-	SCN^-	NFR	FR	Arsenic	Alkaline	SO_4	NH_3	NO_2 & NO_3	Total and Dissolved Metals	Toxicity Trout
E1 ✓	Reclaim Water Intake	W	C	Manual			W	W	W	W	W	M	M	M	M		W	M	M	W	M	M	
E2 ✓	Tailings Pond Seepage		C	Manual			W	W	W	W	M	BM	BM	BM	M		W	M	M	W	M	M	
E3 ✓	Ore Storage Run Off		W	Manual			W	W	W	W					W		W	W	W	W	M	M	
E4 ✓	Waste Dump Run Off		W	Manual			W	W	W	W					W		W	W	W	W	M	M	
E5 ✓	Open Pit Mine Water		W	Manual			W	W	W	W					M		W	W	W	M	M	W	
E6	deleted		W	Manual			W	W	W	W					M		W	W	W	M	M	W	
E7	Polishing Pond Discharge to Dome Creek		C	Automatic			D	D	D	D	D	W	W	W	W	W	W	W	W	W	W	W	2A
E8 ✓	Spillway Discharge		D	Manual			D	D	D	D	D	W	W	W	W	W	W	W	W	W	W	W	Q
	Surface Waters																						
D1	Dome Creek Upstream Control Point		BM	Manual	A		BM	BM	BM	BM	BM				BM	BM	BM	BM	BM	BM	BM	BM	
– D2	Dome Creek 0.4 km from mouth		M	Manual	A		M	M	M	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	
D3	Dome Creek 100m down from tailings dam		M	Manual	A		M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
P1	Pony Creek 600m from mouth		BM	Manual	A		BM	BM	BM	BM	BM				BM	BM	BM	BM	BM	BM	BM	BM	
P2	Pony Creek Brown McDade Portal		M	Manual			M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
V3	Victoria Creek at Pumphouse		Q	Manual			Q	Q	Q	Q	Q				Q	Q	Q	Q	Q	Q	Q	Q	
V4	Victoria Creek Downstream of Dome Creek		Q	Manual			Q	Q	Q	Q	Q				Q	Q	Q	Q	Q	Q	Q	Q	
	Instrumentation																						
I1	Outdoor Thermometer								D														
I2	Rain Gauge	D																					
I3	Thermistors								M														
I4	Piezometers					M																	
I5	Crest Pins	M																					
I6	Snow Pack February to May	M																					
	Physical Inspections																						
M1	Tailings Dam	M																					
M2	Seepage Dam	M																					
M3	Waste Rock Pile	M																					
M4	Diversion Ditch	M																					
M5	Spillway	M																					
M6	Tailings Volume	M																					

Rpt Requirements, Format

– take sample when flow is being measured

NAAF =
[illegible] –
[illegible] –
NALKS –

E1-E8, Millipore –

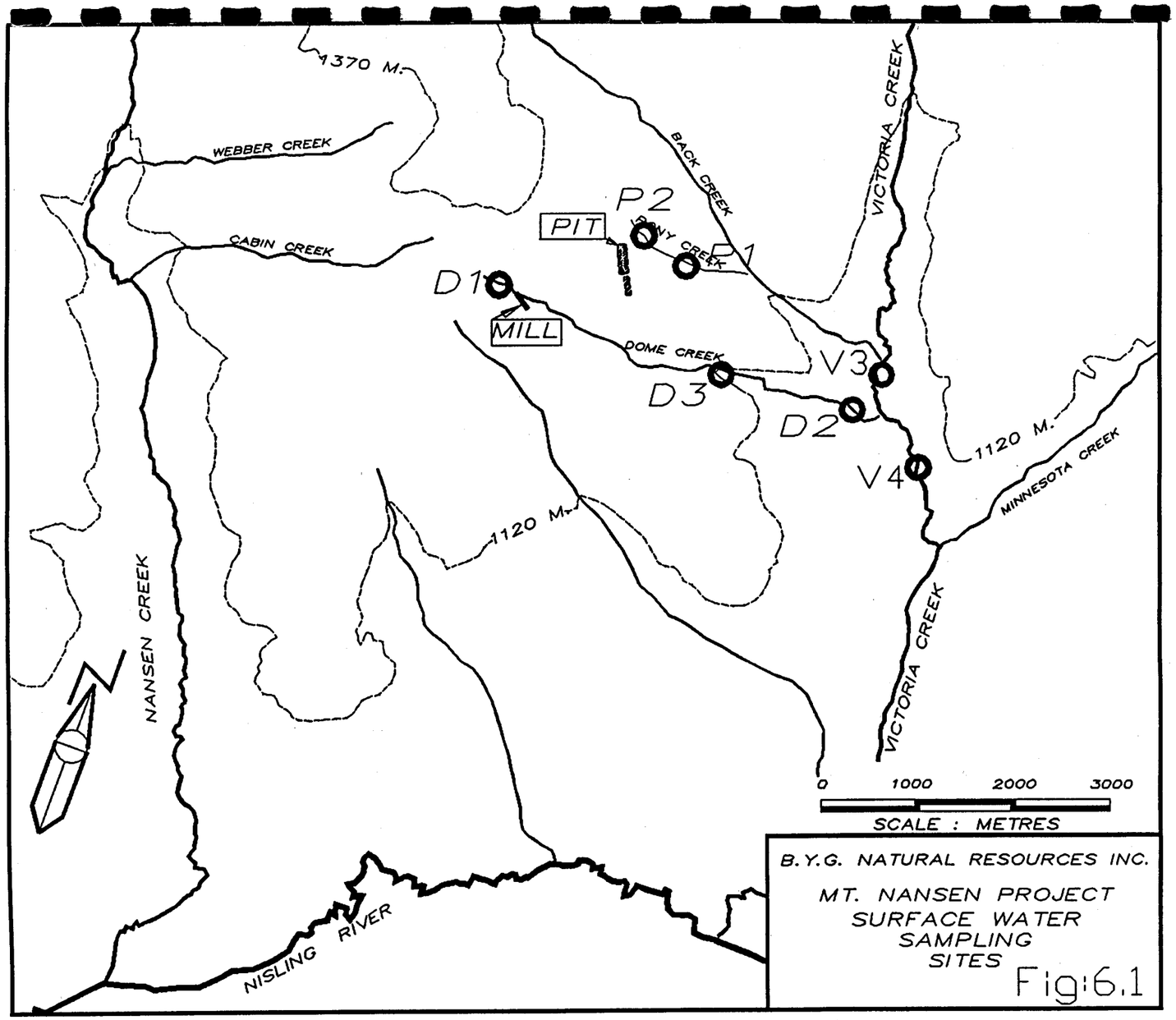
Bi-Monthly - 2x mo.

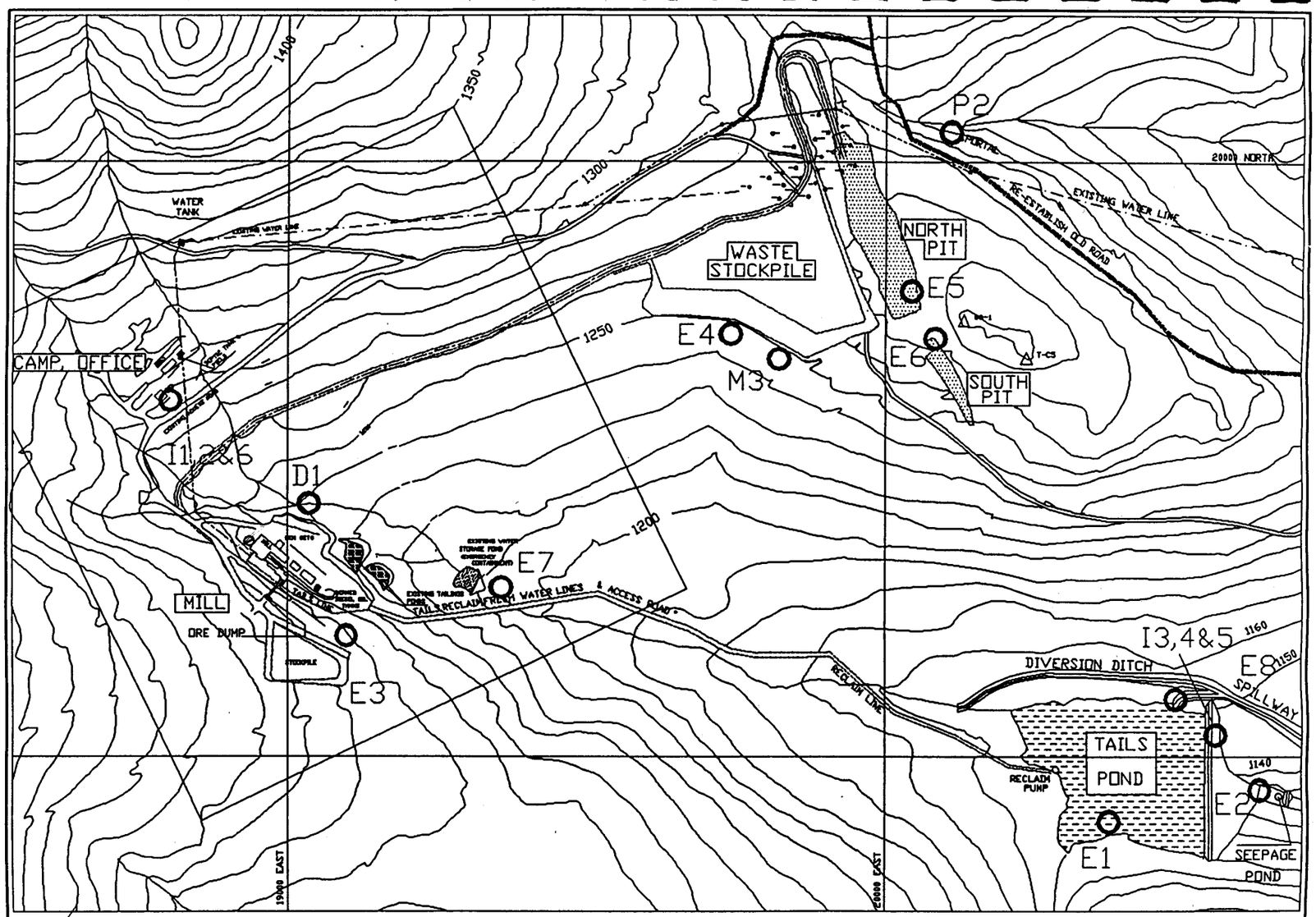
– Weather Stn. – Daily

Weekly - do Tues.

Monthly - 1st Mon. of the Mo.

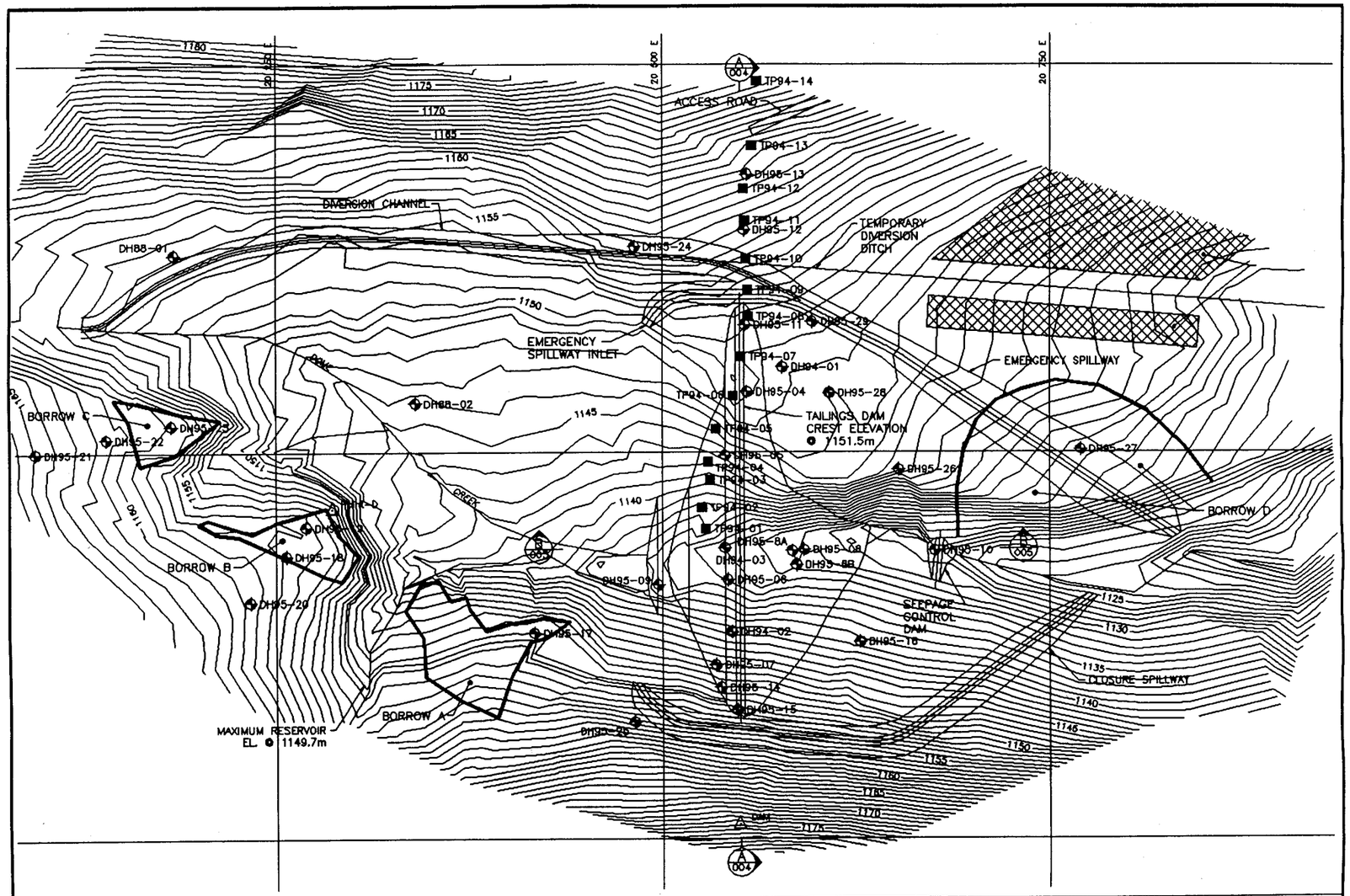
Daily - 1st Thing every AM


1370 M.
WEBBER CREEK
CABIN CREEK
BACK CREEK
VICTORIA CREEK
P2
PIT
D1
MILL
DOME CREEK
D3
V3
D2
V4
1120 M.
MINNESOTA CREEK
1120 M.
NANSEN CREEK
VICTORIA CREEK
NISLING RIVER
0
1000
2000
3000
SCALE : METRES
B.Y.G. NATURAL RESOURCES INC.
MT. NANSEN PROJECT
SURFACE WATER
SAMPLING
SITES
Fig:6.1



SURFACE WATER, EFFLUENT AND INSTRUMENTATION SAMPLING STATIONS

Fig: 6.2



Instrumentation and Sampling Points

Fig. 6.3

Ref: Exhibit I g) IV

Ref: Screening Report Section 6.1
Screening Report Section 6.4

Also Ref: Tailings Impoundment
Final Design Report Section 5

WASTE ROCK ARD AND WASTE ROCK MANAGEMENT PLAN

Revisions - December 18, 1995

5.9.3 Waste Rock ARD

The waste rock from Brown-McDade is generally low in sulphide without significant potential for generation of acidic drainage or release of metals due to leaching. However there were two samples of footwall granodiorite and one sample of lower altered granodiorite with sulphide sulphur above 1% that were analyzed during the 1994 program (PRA, 1994b). Based on the current estimates, the quantity of potentially acid generating waste in the dump will be small - approximately 4% with a Net NP less than 0.

The conclusions drawn from the Waste ARD program, conducted as part of the IEE, will be verified with additional representative samples collected for each rock type.

5.9.3.1 Objectives

The objectives of the Waste Rock ARD program are:

1) Ensure that waste rock used for construction has a high NPR (i.e > 3) and does not pose a risk of ARD.

2) Verify the Waste Rock ARD assessment work completed as part of the IEE program.

3) Collect additional waste rock characterization data to assist in reclamation planning.

4) Identify and segregate material that poses a risk of ARD.

5.9.3.2 Study Methodology

1) The mine superintendent will be responsible for collecting samples of waste rock that are considered representative of each rock type grouping and the overall waste to be deposited in the stockpile.

2) Approximately 30 representative samples will collected during excavation of the pit. The samples will be catalogued according to rock type, location, and physical characteristics.

3) All samples will be assayed for Acid Base Accounting using the Modified Procedure. Analyses on all samples will include Total Sulphur, Sulphide Sulphur, Sulphate and Total Metals via Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES).

4) Variability within each rock type grouping will be assessed using frequency and cumulative distribution plots of Maximum Potential Acidity (MPA) or Percent Sulphide (%$S^{=}$), Neutralization Potential (NP), Net Neutralization Potential (Net NP) and Neutralization Potential Ratio (NPR).

5.9.3.3 Waste Management Plan

The waste management plan will ensure that all handling of waste rock is supervised by a qualified geologist or mining engineer. The plan will dictate the following;

1) All individual rock types will be identified during mining based on a combination of location, visual characteristics, Au assay, ABA and other suitable analyses (depending on location).

2) Detailed records will be maintained for all materials distributed during mining and left on surface. The information will be logged according to quantities, waste characteristic and disposal locations.

3) The waste rock disposal logs will be reviewed by the mine manager on a regular basis to ensure that waste rock with a potential for acid generation are handled so as to eliminate or minimize risk associated with ARD from the waste dump.

5.9.3.4 Schedule

The Waste Rock ARD program will commence with development of the pit prior to the commencing of milling. The samples will be logged on a regular basis as development of the pit proceeds. The primary focus of this program will be to ensure that the construction materials do not have any potential for ARD. Most of the samples and ABA data will be collected during the first year of operation based on the current mine plan.

5.9.3.5 Report Submission

A report will be prepared to present the data 60 days after the first phase of pit development is complete and milling has commenced. This report will assess the potential for ARD occurring in each rock type grouping and compare the data with the waste rock characterization work conducted as part of the IEE.

5.9.3.6 Decision Criteria

The criteria used to assess the potential for ARD from waste rock will be based on the characteristics and quantities of each rock type identified in the above report. The Waste Rock ARD program will verify the assessment completed as part of the IEE.

The decision criteria with therefore consist of drawing comparisons with the IEE predictions. If the waste rock exhibits substantially higher potential for ARD, judged by the fact that the material is in the top 5% percentile for ARD potential it ***will*** be necessary to implement sub-aqueous disposal either in a flooded pit or alternatively by processing the material through the mill and disposing of it in the tailings impoundment.

Ref: Exhibit I g) V

Ref: Screening Report Section 6.1

Also Ref: Water Licence Application Section 7

SPILL CONTINGENCY PLAN

Revisions - December 18, 1995

SECTION C

GOVERNMENT NOTIFICATION PROCEDURE

C.1 MINESITE SPILLS

Although several government agencies at the municipal, provincial and federal levels may ultimately be involved, only one government contact is required to be made by the On-Scene Co-ordinator or his backup for the minesite spills:

Contact:

1. TERRITORIAL 24 HOUR EMERGENCY RESPONSE NUMBER

1-403-667-7244

This is a 24 hour number the Department of the Environment will notify all concerned agencies, including the following, as appropriate:

a. The RCMP.

b. Environmental Protection

c. Any other relevant agencies.

2. WATER RESOURCES INSPECTOR

1-403-667-3145

3. DOWNSTREAM WATER USERS

as required, and listed in Section I of this plan.

C.2 TRANSPORTATION SPILLS

In the case of a transport related accident, "dangerous occurrence" (as defined below) must be reported immediately to:

a. 24 Hour Emergency response number.

b. The nearest R.C.M.P. detachment.

b. The employer.

c. The owner of the transport trucks.

d. The owner or consignor of the dangerous goods.

A "dangerous occurrence" is considered to be:

a. Any loss of dangerous goods in excess of specified amounts or which represents a danger;

b. Damage to any container of dangerous goods;

c. A transportation accident in which radioactive goods are involved;

d. An unintentional explosion or fire involving dangerous goods.

While it is the responsibility of the transporter of the goods to report this type of incident, minesite personnel should ensure that it has been carried out properly.

More information on the reporting of a dangerous occurrence is provided in Appendix 4, Section 9 of the Transportation of Dangerous Goods Regulations.

SECTION G

SPILL RESPONSE

G.1 RESPONSIBILITY CHART

Person Discovering Spill
⇓
Supervisor
⇓
General Manager
⇓
On-Scene Co-ordinator
⇓ ⇓ ⇓
Response Team Leader | Lab Supervisor | Equipment Co-Ordinator
⇓
Safety and Environmental Co-ordinator
⇓
Mine Rescue Team

G.2 ACTION STEPS

a) Report spill to 24 hour spill line, water resources inspector and downstream users if any.

b) Stop source if possible

c) Contain spill materialsd.

d) Protect areae.

e) Remove material

f) Reclaim area

g) Complete spill report

SECTION I

SENSITIVE AREAS AND RESOURCES

I.1 WATERCOURSES

The Mount Nansen Mine property is drained on the north, east, south and west sides by Pony Creek, Back Creek, Dome Creek, Discovery Creek, Dolly Creek, Webber Creek, Cabin Creek and South Fork. All these creeks drain into either Nansen Creek, running north-south on the west of the property, or Victoria Creek running North-south on the east of the property. However the only creeks impacted by the present mine are Pony Creek, Back Creek and Dome Creek. These creeks drain into Victoria Creek which flows into Nansen Creek then into the Nordenskiold River which joins the Yukon River just north of Carmacks. (see location map and site plan).

Site access is via the Mt. Nansen Road which joins the Mt. Freegold Road just north of Carmacks.. There are two significant stream crossings on this road beside the initial crossing of the Nordenskiold River at Carmacks. One crossing is by bailey bridge at 32 km along the road at the crossing of Rowlinson Creek. The other is the crossing of Victoria Creek at 6 km from the mine site. This crossin, a ford at the moment will be upgraded to a causeway with culverting. There are several small drainage ditches that cross the road where there may be some concern in regard to spills.

I.2 WATER LICENCES

Following is a list of Water Licenses on the Quesnel River, near or downstream of the Mine:

None

I.3 GRAZING

None

I.4 INDIAN RESERVATIONS

None

I.5 DOWNSTREAM COMMUNITIES

None

SECTION J

OIL SPILL RECOVERY TECHNIQUES FOR STREAMS

The techniques used for recovery of an oil spill depend on the quantity spilled and its location, and whether or not the oil has reached a stream. The applicability of the techniques to the specific incident should be evaluated by the OSC and applied as appropriate.

Because of the location of, and protection provided by the oil storage facilities at the minesite, an oil spill reaching a watercourse is extremely unlikely from this source. Measures such as dyking and absorption of minor spills with sand, soils, or commercial sorbents are considered to be the most likely responses to such incidents.

The main type of incident which must be planned for is an oil transport incident at or near a watercourse. Spill contingency plan developed by the transporter and/or fuel supplier will be the first line of defence for this event.

Some techniques commonly practised to contain oil spills are listed below. Additional information on spill containment procedures are included in Section 1.

J.1 EARTH DAM

A dam made of earth or other available fill can be quickly constructed to contain and prevent a spill from spreading. If the ground is permeable, it may be necessary to excavate a shallow depression and line it with plastic to prevent the oil from seeping away. Where the spill is being contained in a channel containing flowing water, a section of pipe can be buried beneath the berm created, allowing water to escape while retaining floating oil behind the berm. Floating oil can then be absorbed by straw or commercial absorbents.

J.2 PLANK OR LOG DAM

A barrier may be constructed across a small flowing stream or ditch using a wooden plank or log embedded in opposite banks. With this arrangement, water can flow beneath and floating oil collected behind the plank. Floating oil could then be absorbed.

J.3 NET OR WIRE MESH BARRIER

A technique which lends itself to the collection of thin films of oil on fast flowing water is a net or wire mesh barrier. This consists of netting or wire mesh held in place by stakes, behind which sorbent materials are allowed to float.

J.4 BOOM

Booms are an effective way of limiting the downstream movement of any spilled oil, thereby providing the time required to remove the oil from the stream surface. This is more fully discussed in Section 1- Diesel Fuel.

J.5 SORBENT PADS

Smaller spills that have the potential to migrate to water courses, but are not mobile can be immediately absorbed using commercially available sorbent pads and materials.

SECTION L

NOTIFICATION PROCEDURE FOR DOWNSTREAM WATER USERS

Down stream Users as listed below will be telephoned immediately and notified of the time of the spill, the nature of the spilled material and any possible hazardous consequences.

None at present:

Ref: Exhibit I g) VI

Ref: Screening Report Section 6.2

Also Ref: Water Licence Application Section 5.9

PIT WALL AND FLOOR ARD MITIGATION PLAN

Revisions - December 18, 1995

5.9.2 Pit Wall and Floor Acid Rock Drainage (ARD) Potential

Waste rock characterization work, presented in the IEE, has indicated that portions of the lower pit wall and floor may contain rock with a potential for ARD. Exposure of this rock to oxidation could result in the release of contaminated water to the environment. Therefore additional assessment work will be required to characterize and quantify rock exposed during open pit mining.

5.9.2.1 Objectives

The objective of this program will be to collect sufficient mineralogical and chemical data to determine whether exposure of the pit wall and floor at closure could result in a release of ARD to the environment. If the data demonstrates that there a risk that a release ARD could occur, options for mitigation, proposed in the IEE documents, will be evaluated and implemented as part of Reclamation activities. Selection of the preferred option will be supported by the technical data.

5.9.2.2 Study Methodology

ARD assessment data on the pit wall and floor will be collected as follows:

1) After completion, the pitwall will be sampled directly to determine rock type and ARD characteristics.

2) Approximately 20 samples will be collected from the pit wall and pit floor. These samples will be representative of the individual rock types exposed after mining is complete.

3) The samples will be catalogued according to rock type, location, and physical characteristics. All samples will be assayed for Acid Base Accounting using the Modified Procedure. Analyses on all samples will include Total Sulphur, Sulphide Sulphur, Sulphate and Total Metals via Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES).

4) Variability within each rock type grouping will be assessed using frequency and cumulative distribution plots of Maximum Potential Acidity (MPA) or Percent Sulphide (%$S^{=}$), Neutralization Potential (NP), Net Neutralization Potential (Net NP) and Neutralization Potential Ratio (NPR).

5) Monitoring of seepage from the pitwall will also be conducted during operation to verify the ARD prediction testwork.

5.9.2.3 Schedule

The pit wall sampling and ARD assessment program will be conducted during operation.

5.9.2.4 Report Submission

A report will be prepared to present the data within 60 days of completion of the testwork. This report will assess the potential for ARD occurring in the wall rock for each rock type grouping. The report will also outline proposed mitigation measures (if required) for review and approval.

5.9.2.5 Decision Criteria

The criteria used to assess the potential for ARD from the pitwall and floor after closure will be based on the characteristics and quantities of each rock type identified in the above report. Wall rock with a substantial potential for ARD such as material containing a high percent sulphur, would likely require that the pit be flooded as soon as possible after closure.

In any event the seepage from the pit will be restricted by a plug in the Brown M^{c}Dade adit resulting in a flooded pit. Ther will therefore be no possibility of ARD from any pit wall or floor material.

Ref: Exhibit I g) VII

Ref: Screening Report Section 6.3

Also Ref: Water Licence Application Section 3.1.6

PIT SEEPAGE MITIGATION PLAN

Revisions - December 18, 1995

3.1.6.1 Seepage from the Pit Floor to the Old Underground Adit

B.Y.G. proposes to eliminate all concern regarding seepage from the pit by sealing the adit prior to final abandonment.

Detailed designs will be submitted to YTWB prior to installation of the adit plug.

It is agreed that monitoring and sampling of any flow from the adit will be a condition of the licence.

Ref: Exhibit I g) VIII

Ref: Screening Report Section 6.5.1

THAW SETTLEMENT PROGRAM

Revisions - December 18, 1995

THAW SETTLEMENT PROGRAM

Thaw Settlement

It has been estimated that the zone of thawing in the foundation soils will extend only one-third of the width of the tailings dam from the upstream toe. It has been estimated that this thawing will confined to the upper 1 to 2 m of the foundation soils in the area underlying the upstream slope of the dam and up to 5 m under the pond.

Complete thaw of the foundation soils beneath the dam is not predicted during the operational phase of the impoundment thereby reducing potential thaw-settlements. The rate of freezing can be accelerated by removal of snow on the downstream slope of the dam.

In the event the tailings pond is operated for only three years, complete freeze back of the foundation soils beneath the dam is predicted after approximately 25 years. Extension of the mine life will however increase depths of thaw and the time for freeze back.

In the long-term, complete freezing of the dam is predicted with the final thaw boundary lying within the upstream deposited tailings resulting in a strong and impermeable dam.

The above predictions do not consider the effects of convective heat transfer by seepage beneath the dam. The effects of such seepage will be minimized by the presence of a tailings beach and the geosynthetic clay liner in the dam which will cutoff seepage through the dam and the upper part of the foundation. Seepage under the dam will be restricted by the presently ice-saturated, frozen foundation soils.

Irrespective of the above, the design takes into consideration long term measures which are required in the event of complete thaw of the foundation soils under the worst case condition.

Settlement of the dam will occur in areas where the foundation soils thaw and consolidate under the embankment loading. The area considered to have the greatest potential for thaw settlement is located in the base of the creek valley. Three test holes including DH95-06, DH95-08 and DH95-09 were drilled in this area. The proposed dam cross-section allows for a potential 0.6 m settlement during the first three years based on the estimated thaw settlement in the upper 4 m.

Objectives

The objectives of the Thaw Settlement Program will be:

1. Determine the thermal performance of the dam and underlying foundations.

2. Collect additional data to verify the conclusion that the maximum settlement of the dam crest will be 0.6 m and the conclusion that after closure the regional permafrost will aggrade upwards into the dam resulting in a strong and impermeable structure.

Study Methodology

Stability of the main dam embankment will initially be controlled by the presence of permafrost in the underlying foundation soils. The tailings dam overlying a frozen foundation is expected to behave more than adequately and stability is not an issue of concern.

The Thaw Settlement Program will be conducted as follows:

1. Record temperatures for each of the thermistor installations to determine rate and extent of thaw.

2. Record pore pressures for each of the pneumatic piezometers in embankment and foundation zones which are unfrozen. This will assist in determining seepage through the dam and will allow measurement of actual thaw-induced pore pressures for stability assessment.

3. Record settlements of dam crest by regular surveys of settlement pins. Settlements will be correlated with the depth of thaw and pore pressure dissipation to provide a basis for future settlement estimates.

4. Record daily maximum and minimum temperatures at the Mt. Nansen site. Comparison of data at the site with similar data recorded at the Environment Canada Station at Carmacks will provide a basis for adjustment of temperature data used in long term prediction models.

5. Record precipitation data at the Mt. Nansen site to determine runoff inflows.

6. Record tailings pond levels as well as inflow and outflow volumes. Quantities required for water balance assessment should include reclaim, seepage, evaporation and spillway discharges. Pumping rates should be recorded for determination of spigot, seepage and reclaim volumes. Rainfall records and measurement of snow pack in late winter should be required to assess runoff inflows. Spillway discharges should also be measured during operation to determine volumes of water which are diverted past the tailings pond. Comparison of diversion flows to runoff quantities will also provide an estimate of groundwater seepage inflows through the active zone.

7. Monitor the tailings beach development by survey to determine volume requirements and assist in planning of spigotting operations.

8. Record quantities and measured profiles of settled tailings to determine tailings densities and assess storage volume requirements.

9. Sample and measure the tailings gradation for assessment of the settling rate and permeability.

10. Monitor winter operations and tailings placement methods. Subaqueous deposition has been assumed for winter operations in order to minimize reservoir storage requirements.

Schedule

Collection of data will begin as soon as the tailings dam stucture has been completed and will continue until closure of the mine. Prior to completion of three years of operation, BYG are required to make a decision regarding raising of the dam for additional tailings storage or construction of the closure spillway for long term abandonment of the tailings impoundment. At that time the dam crest height should be reviewed and any additional allowance for longterm settlement made at that time. Should the dam performance and instrument monitoring suggest freezeback will occur after mine closure; then additional raising of the dam may not be required for settlement purposes.

The thermal performance of the dam and underlying foundation and the influence of the tailings will be monitored throughout the operational life of the impoundment to determine which long term solutions are required.

Dependant on the dam foundation performance, a downstream berm may eventually be required, however, construction of the berm can be delayed without serious ramifications until the actual performance of the dam can be monitored by the foundation instrumentation.

Report Submission

Thaw settlement data will be submitted on a quarterly basis and summarized in the Annual Report. The final report detailing the predictions for the long term behaviour of the dam will be produced within three months of closure.

Decision Criteria

The criteria used to assess any potential problem from thaw settlement will be based upon a comparison between the data collected from the instrumentation that will be installed on and in the tailings dam, and the values assumed for the purposes of predicting the dam performance.

This data along with the monthly visual inspections will be used to trigger special reviews of the design and performance of the dam.

More specifically, the special reviews will take place, if the measured settlements are equal to or greater than 450mm (i.e. 75% of the predicted 3-year settlement of 600mm), or if visual inspections by the mine staff identify any signs of potential instability, such as ctacking, bulging, slumping and/or slope movements

Ref: Exhibit I g) IX

Ref: Screening Report Section 6.5.2

TAILINGS IMPOUNDMENT SEEPAGE PROGRAM

Revisions - December 18, 1995

TAILINGS IMPOUNDMENT
SEEPAGE PROGRAM

Seepage

The design of the main tailings dam is intended to minimize seepage of the pond water downstream of the dam into Dome Creek. This will ensure release of water from the tailings pond is controlled through treatment facilities and/or the emergency spillway and will also ensure that piping and loss of material does not occur at the downstream toe of dam due to uncontrolled seepage pressures.

The presence of a geosynthetic barrier on the upstream face of the dam and the presence of an ice saturated frozen foundation will provide initial barriers against seepage, however, the design must account for the long term potential of the foundation thawing with a corresponding increase in foundation permeability.

The limited seepage expected through the embankment and underlying foundation will be collected upstream of the seepage recovery dam where it can be returned to the tailings pond by pumping or released downstream if acceptable water quality is achieved. This small embankment for the seepage recovery dam will also be provided with a geosynthetic liner which will be keyed into the underlying permafrost. Details of the main dam, seepage recovery dam and geosynthetic clay liner are shown on Drawings B-5314-007 and -008.

Seepage analyses were carried out using the two dimensional finite element computer program SEEP/W by Geo-Slope International. The seepage model is shown on Figure A5-1 and the hydraulic parameters are listed below:

MATERIAL	HYDRAULIC CONDUCTIVITY (cm/s)	Kh/Kv
Bedrock	$1x10^{-7}$	1
Frozen Sand Foundation	$1x10^{-7}$	1
Thawed Sand Foundation	$1x10^{-3}$	1
Dam	$1x10^{-3}$	1
Tailings	$1x10^{-5}$	1

The design values of the hydraulic conductivity were based on laboratory testing and assumed values for similar type soils. For comparison, falling head permeability tests on recompacted samples of the foundation sand gave permeability values of $2x10^{-5}$ cm/s to $9x10^{-4}$ cm/s., falling head permeability tests on recompacted samples of the tailings gave permeability values of $1x10^{-5}$ cm/s. All materials were assumed to be isotropic with the ratio of horizontal and vertical permeabilities equal to unity.

Objectives

The objectives of the Seepage Monitoring Program will be:

1. Determine the Seepage through the dam and underlying foundations.

2. Collect additional data to verify the conclusion that the foundations of the dam will remain frozen and that seepage under the dam structure will not occur.

3. Collect additional date to verify the conclusion that the geosynthetic liner and tailings beach reduces the seepage by the required amount.

Study Methodology

The Seepage Monitoring Program will be conducted as follows:

1. Record pore pressures for each of the pneumatic piezometers in embankment and foundation zones which are unfrozen. This will assist in determining seepage through the dam and will allow measurement of actual thaw-induced pore pressures for stability assessment.

2. Sample and measure the tailings gradation for assessment of the settling rate and permeability.

3. measure the flow of seepage into the seepage recovery pond.

Schedule

Collection of data will begin as soon as the tailings dam stucture has been completed and filled with water and as soon as the temperature regime indicates that thawing has occured. The monitoring will then continue until freezing takes place or until closure of the mine.

The seepage performance of the dam and underlying foundation and the influence of the tailings will be monitored throughout the operational life of the impoundment to determine which long term solutions are required.

Dependant on the dam foundation performance, a downstream berm may eventually be required, however, construction of the berm can be delayed without serious ramifications until the actual performance of the dam can be monitored by the foundation instrumentation.

Report Submission

Seepage data will be submitted on a quarterly basis and summarized in the Annual Report. The final report detailing the predictions for the long term behaviour of the dam will be produced within three months of closure.

Decision Criteria

The criteria used to assess any potential problem from seepage will be based upon a comparison between the data collected from the instrumentation that will be installed on and in the tailings dam, and the values assumed for the purposes of predicting the dam performance.

This data along with the monthly visual inspections will be used to trigger special reviews of the design and performance of the dam.

More specifically, the special reviews will take place, if the pore pressures measured by the piezometers approach an equivalent r_μ value of 0.5, or if visual inspections by the mine staff identify any signs of concentrated discharge near the dam toe or along the downstream slope, "sand" boils near the dam toe and/or areas of erosion.

Ref: Exhibit I g) X

Ref: Screening Report Section 6.5.3

LIQUEFACTION MONITORING PROGRAM

Revisions - December 18, 1995

LIQUEFACTION
MONITORING PROGRAM

Liquefaction

It has been suggested that a combination of thawing and seepage could result in liquefaction of the dam foundation during seismic events .

Objectives

The objectives of the Seepage Monitoring Program will be:

1. to develop data concerning the performance of the dam and foundations over the three year lifetime of the structure.

2. to propose actions to be taken based on the data.

Study Methodology

The Liquefaction Monitoring Program will be conducted as follows:

1. Record temperatures for each of the thermistor installations to determine rate and extent of thaw.

2. Record pore pressures for each of the pneumatic piezometers in embankment and foundation zones which are unfrozen. This will assist in determining seepage through the dam and will allow measurement of actual thaw-induced pore pressures for stability assessment.

3. Record settlements of dam crest by regular surveys of settlement pins. Settlements will be correlated with the depth of thaw and pore pressure dissipation to provide a basis for future settlement estimates.

4. Record daily maximum and minimum temperatures at the Mt. Nansen site. Comparison of data at the site with similar data recorded at the Environment Canada Station at Carmacks will provide a basis for adjustment of temperature data used in long term prediction models.

5. If thawing of foundation soils occurs under the dam embankment, then test hole drilling should be carried out for measurement of SPT blow counts or cone penetration resistance. This data will allow assessment of seismic stability.

Schedule

Collection of data will begin as soon as the tailings dam stucture has been completed and filled with water and as soon as the temperature regime indicates that thawing has occured. The monitoring will then continue until freezing takes place or until closure of the mine.

The liquefaction performance of the dam and underlying foundation and the influence of the tailings will be monitored throughout the operational life of the impoundment to determine which long term solutions are required.

Dependant on the dam foundation performance, a downstream berm may eventually be required, however, construction of the berm can be delayed without serious ramifications until the actual performance of the dam can be monitored by the foundation instrumentation.

Report Submission

Liquefaction data will be submitted on a quarterly basis and summarized in the Annual Report. The final report detailing the predictions for the long term behaviour of the dam will be produced within three months of closure.

Decision Criteria

The criteria used to assess any potential problem from liquefaction will be based upon a comparison between the data collected from the instrumentation that will be installed on and in the tailings dam, and the values assumed for the purposes of predicting the dam performance.

This data along with the monthly visual inspections will be used to trigger special reviews of the design and performance of the dam.

More specifically, the special reviews will take place, if the thermistor readings indicate that foundation thawing has occurred to a depth of 2m or more below the prepared dam subgrade.

Ref: Exhibit I g) XI

Ref: Screening Report Section 6.7

Also Ref: Water Licence Application Section 5.9.1.4

TAILINGS ARD MITIGATION PLAN

Revisions - December 18, 1995

5.9.4 Tailings ARD

The tailings from the Brown-McDade oxide ore exhibits a slightly negative Net NP indicating that it has a theoretical potential to generate acid. Based on its low sulphide content and very fine particle size, acid generation from tailings is not expected. This conclusion will require verification during operation using a larger data base than that used to complete the IEE program.

5.9.4.1 Objectives

The objective of the Tailings ARD program will be:

1) Determine the ARD characteristics of the tailings using sufficient data to assess variability and to verify the conclusion that acid generation from the tailings will not occur after closure.

2) Collect additional tailings characterization data to assist in reclamation planning.

5.9.4.2 Study Methodology

The Tailings ARD Program will be conducted as follows:

1) Composite tailings samples will be collected on a monthly basis during operation and assayed for ABA using the Modified Procedure. Analyses on all samples will include Total Sulphur, Sulphide Sulphur, Sulphate and Total Metals via Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES).

2) Variability will be assessed using frequency and cumulative distribution plots of Maximum Potential Acidity (MPA) or Percent Sulphide ($\%S^{=}$), Neutralization Potential (NP), Net Neutralization Potential (Net NP) and Neutralization Potential Ratio (NPR).

3) A kinetic humidity cell test will be conducted on a tailings composite generated after 60 days of operation. A second humidity cell test will commence after the first year of operation using a "worst case" tailings sample. This sample will consist of a composite of tailings which exhibits an elevated theoretical potential for ARD relative to the mean, (i.e. greater than 75 percentile of the group). Each humidity cell test will operate for a total of 30 weeks.

5.9.4.3 Schedule

Collection of tailings samples for ABA will commence at start-up and continue during the life of the mine. The first humidity cell test will commence 60 days after the start of

milling while the second "worst case" humidity cell test will commence one year after the start of operation.

5.9.4.4 Report Submission

ABA tailings data will be submitted on monthly basis and summarized in the Annual Report. The results of the humidity cell tests will also be updated monthly with the final results submitted within 6 weeks of completion of the work.

5.9.4.5 Decision Criteria

The criteria used to assess the potential for ARD from the tailings will be based on a comparison between the data collected during operation with data used to assess ARD potential during the IEE program. If the data indicates that the tailings have a substantial potential for ARD, it will necessary to ensure that the tailings are flooded at closure. Alternatively if the tailings exhibit a low but measurable potential for ARD it may be adequate to cover the tailings at closure with non-acid materials such as overburden. In any event BYG is committed to position the tailings dispersement so that no tailings are deposited at any point that is above one meter below the invert of the emergency spillway. In this way the tailings will always be covered by one metre of water.

Ref: Exhibit I g) XII

Ref: Screening Report Section 6.8

Also Ref: Water Licence Application Section 5.6

TAILINGS ARSENIC MITIGATION PLAN

Revisions - December 18, 1995

5.9.5 Arsenic in Tailings

Distilled water leaching testwork has indicated that the tailings contain minor amounts of leachable arsenic. This arsenic will be stabilized using either direct ferric sulphate addition to the tailings or conventional treatment of excess tailings pond water prior to release to the environment. Arsenopyrite oxidation will be monitored.

5.9.5.1 Objectives

The tailings arsenic stability program will be conducted to:

1) Evaluate alternatives for stabilizing arsenic in the tailings and

2) Assess the attenuation of arsenic in the groundwater if release of contaminated seepage occurs after closure.

3) Provide information on closure options for the tailings pond.

5.9.5.2 Study Methodology

5.9.5.2.1 Tailings Stability Tests

The tailings stability tests will be as follows:

1) A 24 hour composite sample of raw un-treated tailings will be collected within 30 days of mill start-up and, provided that the sample contained a measurable amount of leachable arsenic, subjected to equilibrium tests under both mixed and un-mixed conditions.

   i) The mixed sample will consist of a 4-5 kg sample slurried to 40% solids. The slurry will be placed in a 20 L bottle and placed on roll apparatus. The slurry will be sampled and assayed for dissolved metals after 1, 3, 10 and 30 days.

   ii) The un-mixed sample will be placed in an identical stationary container and sampled and assayed as in (i) above.

2) A 24 hour composite sample of tailings treated using the Inco SO_2-Air process will be collected within 30 days of mill start-up and, provided that the sample contained a measurable amount of leachable arsenic, subjected to equilibrium tests identical to the program for untreated tailings above in 1), i and ii.

3) A sample of treated tailings will subjected to ferric sulfate addition tests as follows:

i) Ferric sulphate solution will be added to a 40% slurry of treated tailings at Fe/As ratios of 5, 10, 20 and 50 based on the soluble As concentration in the slurry. Each sample will be reacted for 10 min.

ii) After ferric sulphate addition the slurry will be neutralized to pH 7.5 with lime (if necessary) and placed on bottle roll apparatus for two 24 h distilled water leaching cycles. The slurries will be dewatered via filtration between cycles.

iii) The starting solutions and the solution after each cycle will be assayed for dissolved metals via ICP-AES.

4) The optimum ferric sulphate dosage would then be selected from the results of Item 3 and used to treat a bulk sample of treated tailings. This sample would then be subjected to equilibrium tests under mixed and un-mixed conditions as outline above in 1).

5) Assuming that work conducted as per Item 4 is successful in stabilizing arsenic in place, direct ferric sulphate addition to treated mill tailings would commence on a full scale basis. Samples of final tailings slurry after ferric sulphate addition would then be collected at 1, 3, 7 days and then weekly for a one month period to verify that arsenic was being fully stabilized. These samples would be subjected to 24h distilled water leaching with the solutions assayed for dissolved metals via ICP-AES. Sampling and assaying of final treated mill tailings for soluble arsenic would continue monthly using the samples collected for ABA assays described in Section 3.0.

5.9.5.2.2 Groundwater Attenuation

5.9.5.2.2.1 Objectives

Evaluation of arsenic attenuation in the ground would be conducted in order to:

1) Assess the attenuation of arsenic in the ground water if release of contaminated seepage occurs after closure.

2) To determine the capacity of the soils to attenuate arsenic in the groundwater.

5.9.5.2.2.2 Sudy Methodology

Evaluation of arsenic attenuation in the ground would be conducted as follows:

1) A large sample of native soils and materials would be collected downstream of the impoundment. Sieve analyses would then be conducted to determine particle size distribution.

2) This native material would be placed in a 100 mm to 150 mm diameter column to a predetermined bed depth. A tailings reclaim solution spiked with soluble arsenic at 5 mg/L would then be fed to the column at a rate of 0.2 to 1.0 $L/m^2/min$.

3) The column leachate would be collected after 1, 3, 7 days and then weekly and assayed for dissolved metals via ICP-AES. The test would be continued until breakthrough.

4) The native material used in the above test would then be subjected to a distilled water leach to see if the arsenic that had been absorbed was able to be remobilised.

5.9.5.3 Schedule

The tailings stability tests would commence within 30 days of mill start-up. Once direct ferric sulphate addition to the tailings has been demonstrated on a bench basis, full-scale implementation would commence - potentially within 60 days of mill start-up.

The groundwater attenuation program would commence within three months of start-up once the reclaim water has reached equilibrium with the tailings.

5.9.5.4 Report Submission

A report on work items listed in part of 4.1.1 sections 1), 2) and 3) above will be completed within 30 days of completion of test program - approximately 60 days after mill start-up.

The report for work outlined in 4.1.2 would be issued 30 days after completion of the work - approximately 7 months after mill start-up.

5.9.5.5 Decision Criteria

The feasibility of direct ferric sulphate addition as a means of stabilizing arsenic in the tailings will be assessed on the following factors:

1) The process successfully stabilizes arsenic and prevents it from re-solubilizing in the longer term tests outlined in Section 4.1.1 Item 4) above.

2) The full-scale trial as outlined Section in 4.1.1 Item 5) demonstrates that full scale implementation is feasible.

If direct sulphate addition is not feasible, it will be necessary to install a secondary system for treatment of reclaim water as described below.

Ref: Exhibit I g) XIII

Ref: Screening Report Section 6.9

Also Ref: Water Licence Application Section 5.5

EFFLUENT TREATMENT PROGRAM

Revisions - December 18, 1995

5.5.1 Final Effluent Treatment System

Selection of the process for treatment of excess reclaim will require additional studies, including the necessary process development work and designs. This scope of this work will be determined by results of both the tailings arsenic stability tests outlined in Section 4.1.1 and chemistry of the actual reclaim water. This work will consist of a series of bench scale tests to evaluate the process alternatives, select the best process based on performance and generate sufficient design data to construct the required facility.

The objective of this program will be to complete the process development work, install the system and test the facility at full scale prior to the discharge of effluent - projected for year two. The program will be conducted as follows:

5.5.1.1 Study Methodology

5.5.1.1.1 Reclaim Water Characterization

Mill tailings and reclaim water will be monitored and analyzed to evaluate natural attenuation of arsenic and cyanide in the tailings pond. Treated mill tailings will be sampled daily and assayed for TCN, DCu, DFe and DZn and also sampled weekly and assayed for WAD-CN, CNO, SCN and NH_3. Monitoring data for reclaim water will be generated as part of the proposed Water Licence Monitoring Program outlined in Section 6.3 of the Water Licence Application Report. The data will used to assess natural attenuation of cyanide and arsenic in the tailings pond and determine whether modifications to the mill tailings treatment system are required. Once equilibrium conditions have been reached, reclaim water will be collected in order to conduct the process development testwork for cyanide and arsenic.

5.5.1.1.2 Bench Tests

Cyanide destruction testwork will be conducted to evaluate the hydrogen peroxide and SO_2-Air processes on a batch basis using varying conditions of reagent dosage, pH and retention time. The treated products will be assayed for the following parameters - pH, conductivity, temperature, turbidity, TCN, WAD-CN, CNO, SCN, alkalinity, sulfate, nitrate plus nitrite and total and dissolved metals. These results will be used to select the process, and determine conditions for continuous testing using a bench scale pilot system. This system will be operated to fully optimize the system and generate design data for installation of a full scale system.

Assuming arsenic is present in the reclaim above discharge limits, a series bench tests will be conducted to evaluate the removal of arsenic using the ferric sulphate - high density sludge process. These tests will consist of batch tests to select optimum dosages and pH conditions

followed by continuous tests using a bench scale piloting system to simulate the high density sludge process.

5.5.1.2 Schedule

The bench tests will commence once the tailings pond has reached an equilibrium or can be seen to be approaching one. In the worst case bench tests will commence six months after start up.

5.5.1.3 Report Submission

Reports on the following parameters - pH, conductivity, temperature, turbidity, TCN, WAD-CN, CNO, SCN, alkalinity, sulfate, nitrate plus nitrite and total and dissolved metals will be submitted on a monthly basis. Reports on the progress of the bench scale tests will be submitted 30 days after completion of the tests. The final design report should be completed within one year of bench test initiation.

5.5.1.4 Decision Criteria

The criteria used to design the final effluent treatment system will be based on a comparison between the data collected during operation with data derived during bench scale testing of the effluents. The design will be such as to allow the final effluent from the facility to meet the standards as shown in the accompanying table of Waste Discharge Standards.

Table 1.
Mount Nansen Project

Proposed Tailings and Discharge Standards and Comparison with CCREM and Canadian Drinking Water Standards

Pond Parameter	Tailings Limit ppm	Discharge Limits [1] ppm	CCREM[2] Freshwater Objectives (Aquatic Life) ppm	Canadian Drinking [2] Standards ppm
pH		6.5 - 8.5	6.50 - 09.0	6.5 - 8.5
Total Suspended Solids		50		
Toxicity (LC_{50})		100%		
Total Cyanide	25	0.3	0.005	0.2
Cyanide (WAD)		0.1		
Metals				
Antimony (total)		0.15		
Arsenic(total)		0.15	0.005 - 0.1	0.05
Barium (total)		1.0		
Cadmium (total)		0.02	0.0002 - 0.0018	0.005
Chromium (total)		0.04	0.002 - 0.02	0.05
Copper (total)		0.2	0.002 - 0.004	1
Iron (total)		1	0.3	0.3
Lead(total)		0.1	0.001 - 0.007	0.05
Manganese (total)		0.5		0.05
Mercury (µg/L)		5.0	0.1	1
Nickel (total)		0.3	0.025 - 0.15	-
Silver		0.10	0.0001	0.05
Zinc (total)		0.30	0.03	5

All concentrations in mg/L unless otherwise specified.

Notes

(1) Proposed Water Licence Limits

(2) Canadian Water Quality Guidelines, 1987, Task Forces on Water Quality Guidelines of the Canadian Council of Resource and Environmental Ministers (CCREM).

Ref: Exhibit I g) XIV

Ref: Screening Report Section 6.11

Also Ref: Water Licence Application Section 3.3.3.7

WATER BALANCE

Revisions - December 18, 1995

3.3.3.7.1 Hydrology

B.Y.G. agrees that commitments regarding site hydrology will be incorporated into the water licence. Site specific data, as listed in Section 3.5.1 of the Application Report, will be collected to revise the water balance on an annual basis. The revised balance will be used to predict when a discharge of excess water would occur. A Water Balance Contingency Plan will be prepared and submitted to the Water Board as a condition of the Water Licence. The Water Balance Contingency Plan would be submitted to the Board by December 31st 1997. Implementation of the Contingency Plan would be triggered by revised water balances that predicted a need to release excess water ahead of schedule.