Indian and Northern Affairs - Canada

FINAL REPORT
Version 2

MOUNT NANSEN MINESITE
HISTORICAL REVIEW, SITE ASSESSMENT AND FIELD SAMPLING PROGRAM

60 KM WEST OF CARMACKS
YUKON

Prepared for:

Indian and Northern Affairs Canada
345 – 300 Main Street
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Attention: **Brett Hartshorne, Manager, Waste Management Program**

Subject: **Historical Review, Site Assessment and Field Sampling Program of the Mount Nansen minesite, Yukon – FINAL REPORT Version 2**

Conor Pacific Environmental Technologies Inc. is pleased to provide you with ten copies of the "Final Report Version 2 - Historical Review, Site Assessment and Field Sampling Program of the Mount Nansen minesite, Yukon."

This report is submitted as a Final Report to Indian and Northern Affairs Canada, Waste Management Division and Water Resources Division, and if appropriate Little Salmon-Carmacks First Nation. The intent of this report is to provide a basis for decision making and determining next steps to reducing outstanding environmental liabilities associated with the Mount Nansen minesite and developing and implementing a mine closure and decommissioning plan.

Should you have any questions, please do not hesitate to contact either of the undersigned at (250) 389-0337 or (604) 738-1100, extension 114 respectively.

Yours truly,

CONOR PACIFIC ENVIRONMENTAL TECHNOLOGIES INC.

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EXECUTIVE SUMMARY

The Mount Nansen Mine was operated by BYG Natural Resources Inc. between November 1997 and February 1999, when mining and milling was stopped. Subsequently, D. Manning and Associates was appointed receiver, who then abandoned the property on July 28, 1999. During operations, several major operational problems were encountered that BYG Natural Resources Inc. was not able to remediate. Specifically, suspected difficulties tying the tailings impoundment foundation into the underlying permafrost combined with the underestimation of the tailings pond water balance has led to excess seepage from the tailings impoundment. A collection pond has intercepted some seepage, however, an unknown amount of seepage has not been captured. This has resulted in environmental impacts to Dome Creek downstream of the tailings impoundment and collection pond system. The tailings impoundment was identified during pre-operational environmental baseline studies as having a high potential to significantly impact the receiving environment, relative to all other components of the mine plan.

Environmental impacts have been further compounded by problems associated with the INCO/SO2-air and ferric sulphate effluent treatment system used by BYG Natural Resources Inc. The system was unable to consistently meet the water license effluent quality standards set for the minesite, in particular the bioassay non-toxicity requirement. BYG Natural Resources Inc. undertook substantial modifications to improve the effluent treatment process but the effluent remained toxic to fish.

BYG Natural Resources was also non-compliant with the conditions of their water license by mining below the oxide zone on the Brown-McDade open pit. A direct consequence of this, is that sulphide oxidation and metal leaching is occurring in the lower pit walls and floor below the oxide zone in the northern portion of the pit. Another direct consequence has been the deposition of sulphide-rich tailings in the tailings impoundment. These tailings were deposited in beached areas in the northwest corner of the tailings impoundment. As a result, these tailings are also undergoing oxidation and metal leaching.

BYG Natural Resources Inc abandoned the minesite in July 1999, leaving a significant environmental liability. Since this time, Indian and Northern Affairs Canada, Water Resources Division has maintained operation of the effluent treatment system to reduce the potential for increased impacts due to tailings impoundment failure or uncontrolled discharge from the emergency spillway.

Conor Pacific was retained by Indian and Northern Affairs Canada, Waste Management Division to undertake a historical information review and preliminary site investigation of the Mount Nansen minesite. The field component of this investigation occurred from September 27 to October 1, 1999.

The Site inventory and hazard assessment has identified that the minesite was poorly maintained and has been left in a state of disrepair. Buildings have been damaged. Chemicals and reagents have been left stored outside exposed to the weather. Chemical packaging has deteriorated or has been damaged, causing some chemicals to be spilled. Other barrels of unidentified waste grease and oil have also been left exposed to the weather. Transformers stored at the polishing pond near the mill have leaked oils containing PCB's into the surrounding soils. While these soils do not exceed the CCME criteria, further sampling and clean-up should be initiated as soon as possible. Other items identified as requiring immediate attention are: repairs to a leak in the propane system supplying the camp and office buildings and removal of excess ammonium nitrate from the Site.

The results of our Acid Rock Drainage and Metal Leaching (ARD/ML) investigation confirm previous studies that the oxide zone of the Brow-McDade open pit has a low potential to generate acid and leach metals. However, as previously mentioned, the lower sulphide zone has a high potential and acid generation and metal leaching are occurring. Seepage of pit water into groundwater could result in impacts to Pony Creek in the future. It is recommended that groundwater monitoring wells be installed to determine the extent of groundwater contamination and migration. The ARD/ML assessment of the tailings along the western end of the tailings impoundment indicate these tailings are also oxidizing and leaching additional metals into the tailings pond and possibly into groundwater below.

Assessment of the physical stability of the pit walls and waste rock dumps indicates they are unstable and that recontouring and resloping of these components is necessary.

A historical evaluation of the key parameters of the water license effluent quality standards on Effluent (Station E7) indicated intermittent exceedances of WAD cyanide, dissolved arsenic, total cadmium, copper, iron, lead and manganse. These exceedances appear to be associated with mill and water treatment plant process changes and malfunctions. Toxicity test data indicate an average 60% pass. Total Ammonia in effluent appears to be directly associated with water treatment plant operations. Based on data from Conor Pacific's preliminary site investigation, concentrations of most effluent quality standard parameters have declined since milling operations have ceased.

Assessment of the spatial occurrence of water quality downstream of the effluent discharge point (Station E7), indicate ammonium, arsenic, copper, manganese and zinc have exceeded CCME Fresh Water Guidelines for the protection of aquatic life or the Yukon Contaminated Sites Regulations Generic Water Quality Standards. This has occurred at several sampling locations in Dome Creek, with stations D2 and D3 exceeding guidelines and/or standards more than other sampling stations.

The results of the screening-level ecological risk assessment indicate that stations D2 and D3 pose a considerable risk to aquatic receptors. However, Dome Creek is classified as a Class IV waterbody and there is no evidence of fish in Dome Creek. Aquatic impacts are localized to this area downstream of the tailings impoundment and effluent discharge point and warrant further field investigations to determine the extent of seepage into groundwater and Dome Creek and the extent of metals attenuation in stream sediments. Ammonia, an unregulated parameter, appears to be a contaminant of high concern in Dome Creek but shows no apparent risk to receptors farther downstream in Victoria Creek and the Nisling River.

It is recommended that reclamation and decommissioning of the minesite commence, once costs estimates are revised and the conceptual reclamation and decommissioning plan is revised and accepted by regulators.

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1.0 INTRODUCTION

This Final Report (Report) presents the findings of a preliminary site investigation and historical site information review of the abandoned Mount Nansen minesite in the Yukon. Findings of the site investigation and historical information review in this report include a screening-level ecological risk assessment.

1.1 BACKGROUND

The Mount Nansen area has been subject to intermittent exploration and mining activities since 1943. BYG Natural Resources Inc. has been part or whole owner of the Mount Nansen property, 60 kilometres west of Carmacks, Yukon since 1985. During the period from 1985 to 1996, BYG Natural Resources Inc. and various mineral exploration partners undertook to explore the Mount Nansen property and to develop a gold-silver mine. The property consists of 247 mineral claims and 30 mineral leases covering a total of 5,300 hectares within the Little Salmon/Carmacks First Nations traditional territory (Figure 1.2-1). Development, environmental baseline studies and regulatory approval for development of the oxide zone of the Brown-McDade deposit on the Mount Nansen property was undertaken in 1985 and realized in April 1996, when regulatory approval and a water license were granted under the *Yukon Waters Act*. Mining and milling commenced in October 1996.

The mill and mine were operated from October 1996 to February 1999. During this operational period, various design flaws and malfunctions contributed to a number of serious environmental concerns and problems. These environmental problems were mainly associated with the tailings impoundment and the treatment of effluent and excess tailings pond water to a standard suitable for discharge according to water license QZ94-004 (effluent quality standards). As a result of these and several other water license violations, Indian and Northern Affairs Canada, Water Resources Division issued a "Cease and/or undertake Certain Actions" letter to B.Y.G Natural Resources Inc. on February 10, 1998. The Mount Nansen mine was abandoned by BYG Natural Resources Inc. shortly thereafter. D. Manning and Associates Inc. was appointed as Receiver for the property on March 22, 1999 but abandoned their Receiver responsibilities on July 28, 1999.

Since abandonment in March 1999, Indian and Northern Affairs Canada, Water Resources Division has retained Ketza Construction Ltd. to maintain operation of the water treatment system for the tailings pond effluent. They have also completed some general site cleanup. Operation of the water treatment plant has been undertaken to:

a) prevent non-compliant discharge of effluent from the tailings impoundment, reduce the potential of tailings impoundment failure by rupture;
b) to prevent potential environmental impacts to the downstream receiving environment; and
c) reduce the pond volume to provide storage for seepage pump back into the tailings impoundment, during the 1999-2000 winter.

1.2 SCOPE OF WORK

Conor Pacific Environmental Technologies Inc. ("Conor Pacific") was retained by Indian and Northern Affairs Canada, Waste Management Program to conducted a Phase I Site Information Assessment and a Phase II Reconnaissance Testing Program of the abandoned Mount Nansen Mine, Yukon (Canadian Council of Ministers of the Environment, Guidance Document on the Management of Contaminated Sites in Canada, April 1997). The Phase II assessment included a screening-level ecological risk assessment based on:

a) First Nations concerns of local mine impacts on traditional land use (fishing, hunting, trapping); and
b) uncertainty regarding the fate of cyanide, arsenic and other metal species in the receiving environment.

Fieldwork as part of this assessment consisted of a preliminary site inspection on September 1, 1999 and a Phase II field program conducted between September 27 to October 1, 1999. The Phase II field program consisted of:

a) Inspection and sampling of the Brown-McDade pit walls and waste rock dumps for acid rock drainage and metal leaching potential with particular focus on the lower sulphide zone materials;
b) Inspection and sampling of tailings in the tailings impoundment for acid rock drainage and metal leaching potential with particular emphasis on exposed tailings;
c) Sampling of mine waters and milling effluents including pit water, tailings pond and water treatment plant effluent;
d) Sampling of the aquatic receiving environment in Dome and Victoria creeks from downstream of the tailings impoundment to the confluence of Victoria Creek with the Nisling River;
e) Sampling of the aquatic receiving environment in Pony Creek from downstream of the Brown-McDade adit to the confluence of Dome and Victoria creeks;

f) Sampling of several upstream reference sites;
g) Sampling of stream sediments at nine sites,
h) Sampling of five identified stained soil areas;
i) Inspection and inventory of chemicals and process reagents;
j) Inspection and inventory of non-hazardous materials (steel, wood, electrical equipment etc.); and
k) Inspection of the physical stability of the mill area infrastructure, camp building, Ketza shop, tailings impoundment area and landfill area.

1.3 OBJECTIVES

The objectives of this Phase I Site Information Assessment were to:

a) Assemble and review available historical and current data to assist in development of our Phase 2 Reconnaissance Testing Program.

In conjunction with Phase 2 to:

b) Provide an overview of the current environmental and ecological condition of the minesite and the surrounding environment;
c) Provide conclusions and recommendations that minimize on-site and receiving environment contamination and impacts, support site decommissioning while minimizing cost, support the devolution process, and
d) If necessary, identify the need for further detailed site investigation studies.

1.4 THIS REPORT

The introduction (Section 1) provides the background, scope and objectives of Conor Pacific's workplan. This is followed by a site description in Section 2. A discussion of the current findings by Conor Pacific of the condition of the minesite as of September 1999 is provided in Section 3. This is followed by a comprehensive historical overview of the exploration and development (Section 4), operation (Section 5) and post-operational (Section 6) phases of the mine life. This spans the period from October 1985, when environmental baseline studies were initiated, to September 1999. The Final Report provides a summary and conclusions regarding the current environmental state as of our Site field program (Section 7) and offers recommendations for further studies, decommissioning and reclamation (Section 8). The extensive compilation of information prepared and reviewed by Conor Pacific is provided in the

Reference List (Section 11). Indian and Northern Affairs Canada, Water Resources Division provided most of this information.

2.0 SITE DESCRIPTION

2.1 STUDY AREA

The Mount Nansen Mine is an abandoned gold-silver mine located 60 kilometres west of Carmacks and 180 kilometres north of Whitehorse, Yukon (Figure 1.2-1-Inset). The property is located within the Dawson Range. The terrain consists of rounded ridges and shallow valleys, with a light cover of vegetation and small trees. Elevations range from 945 metres to 1525 metres. The Nisling River drains the area to the west, which drains into the Yukon River via the Donjek and White Rivers. Drainage from the property flows in two moderate sized tributaries to the Nisling River: Nansen Creek to the west and Victoria Creek to the east (Figure 2.1-1). Back Creek and Dome Creek are tributaries of Victoria Creek on the east side of the property. Historical placer operations are also located along Back Creek and other higher tributaries to Victoria Creek. Dome Creek is directly impacted by the Mount Nansen minesite, primarily by the historical Heustis underground mine workings, the mill facility and the tailings impoundment and potentially exploration trenching and surface stripping. Pony Creek is a tributary of Back Creek that is potentially impacted by the historical Brown-McDade or Pony Creek underground workings, exploration core sheds, public access road and the Brown-McDade open pit. Webber and Cabin creeks are tributaries of Nansen Creek that drain the western side of the property. These creeks are potentially impacted by exploration activities on the Heustis deposit and other areas on the west side of the property. As part of this study, water quality and stream sediment sampling stations followed the downstream course of effluent starting in Dome and Pony creeks, and Victoria Creek to its confluence with the Nisling River to determine potential impacts to the aquatic receiving environment (Figure 2.1-1).

Average monthly temperatures in the Mount Nansen area range from about 15°C in July to –15°C in January. Annual precipitation averages about 25 cm, occurring mostly as rain in summer months. The winter snow pack is normally about 30 to 40 cm. Permafrost is evident at shallow depths (0.4 metres) in valleys and benchlands where surficial sediments and bedrock have an organic or moss cover. Where this cover has been removed permafrost occurs at deeper depths ranging up to 5.0 metres. The permafrost layer is discontinuous and ranges from 30 to 60 metres thick. The active layer is up to 1.5 metres thick. Due to the fineness of surficial sediments accumulated in valley bottoms, changes in heat flux from soil disturbance in these areas will likely initiate permafrost thaw.

The natural weathering of primary minerals to clays in bedrock and surficial sediments creates unstable upper slopes and surficial sediments along valley bottoms. Where subsurface and surface weathering is intense, bedrock is friable and unstable.

The Property lies within the Dawson Range Ecosystem. Vegetation consists of open stands of black spruce (*Picea mariana*) and white spruce (*Picea glauca*) occurring in valley bottoms and benchlands near Dome Creek. Stunted black spruce and trembling aspen (*Populus tremuloides*) occur on lower slopes. Upper slopes are generally devoid of vegetation. Birch (*Betula spp.*) and willow shrubs form an extensive cover from valley bottoms to above treeline. Labrador tea (*Ledum groenlandicum*) is dominant as understorey, and mosses and lichens are common ground vegetation.

2.2 LOCAL GEOLOGY AND DEPOSIT TYPES

Deposits of the Mount Nansen gold-silver mine are located within the Early Mississippian (circa 356 Ma) Yukon Tanana Terrane consisting of metamorphic rocks intruded by Late Triassic (circa 224 Ma), Jurassic (circa 178 Ma) and Mid-Cretaceous (circa 105 Ma) plutonic suites. Coeval with Mid-Cretaceous Coffee Creek Plutonic Suite are intermediate to mafic volcanic flow and tuff rocks of the Mount Nansen Volcanic Suite. Genetically related sub-volcanic feldspar porphyry dikes and plugs intrude all rock types. At the Mount Nansen property, a sub-volcanic feldspar porphyry complex forms an east-west elongate zone about 1.6 kilometres wide by 3.2 kilometres long. This complex hosts disseminated copper-molybdenum mineralization in a diverse assemblage of porphyritic rock; including dikes, small plugs, and breccia bodies. Propylitic alteration, consisting of epidote, calcite, pyrite and magnetite replacement of hornblende, is widespread peripheral to the Mount Nansen porphyry complex and has affected most rocks on the property. The Mount Nansen area was unaffected by recent continental glaciation. Therefore weathering extends to 70 metres depth and includes leaching and oxidation of mineralized zones. Sulphides are commonly altered to limonite or other oxides. A total of nine epithermal style deposits have been identified on B.Y.G Natural Resources Inc.'s Mount Nansen property (Figure 1-2.1).

Precious metal mineralization peripheral to the Mount Nansen porphyry complex, consists of structurally controlled planar veins with clay-rich and bleached alteration envelopes and pipe-like breccia systems. Mineralized vein systems range from simple quartz-sulphide veins to complex anastomosing vein systems that crosscut all rock types. At the Huestis, Webber and Flex zones, veins tend to occupy fractures in metamorphic rocks. At the Orloff King and

Brown–McDade zones, veins invade porphyry dikes, which preferentially intrude zones of structural weakness or intrusive contacts, respectively.

Open pit mining of the Brown-McDade deposit revealed two separate ore mineralization types: (1) gold-silver vein mineralization forming a complex massive vein swarm hosted in a massive feldspar porphyry dike and (2) a siliceous, sulphide-rich breccia in a pipe-like structure. These ore mineralization types are separated by a complex, steeply dipping, northeasterly trending fault that crosscuts the pit north of the Pony Creek adit. The gold-silver mineralization is hosted in a complex vein system composed of planar veins and exposed in the southern two-thirds of the pit. The host rocks consist of foliated diorite intruded feldspar porphyry and metamorphic rocks comprise the. The gold-silver mineralized breccia zone is exposed in the northern one-third of the pit. The host rock exposed in the pit is re-crystallized limestone.

Three main alteration types are present. Silicified and bleached clay (argillic) alteration zones are commonly one to three metres wide. Adjacent to veins and breccia zones, silicification consists of very fine vugs, yellow weathering and drusy quartz lining cavities within the breccia. Within the enclosing phyllic alteration zone, the disseminated pyrite content increases away from the veins. Argillic alteration envelopes the silicification and phyllic alteration zones. Argillic alteration within the feldspar porphyry is identified by the presence of kaolinite and montmorillonite.

The Brown-McDade deposit exhibits a well developed, near surface, oxide gold enrichment zone. Within the oxide zone, gold has been liberated by the oxidation of sulphide minerals and cataclasis. Within the lower sulphide zone, gold and silver bearing sulphides consist of pyrite, arsenopyrite, sphalerite, galena, sulphosalts, bornite, stibnite and chalcopyrite. Gold is genetically related to an early pyrite phase of mineralization, occurring as 5 to 40 micron inclusions within pyrite.

Metallurgical analysis has indicated that breccia-hosted mineralization has a higher gold to silver grade ratio (1:3) than vein-hosted mineralization (1:7). The silver content appears to be related to the base metal content of ore material. Galena and sphalerite are more abundant in vein mineralization.

2.3 MINERAL TENURE

The property consists of 247 mineral claims and 30 mineral leases covering a total of 5,300 hectares, located within the Little Salmon/Carmacks First Nations traditional territory (Figure 2.1-1). A complete list of mineral leases and claims is provided in Appendix B.

2.4 PREVIOUS EXPLORATION, MINING AND MILLING

There has been hard rock and placer mineral exploration and development in the Mount Nansen area since the first discovery of lode gold in 1917. Mining has been the predominant industrial land use in the area. The Fringe claims were first staked around the Brown-McDade property in 1943-44. In 1945, A. Brown and G. McDade sold their claims to Yukon Northwest Exploration Ltd. (Leitch Gold Mining Ltd.). Exploration consisted of trenching and drilling in 1946.

The property was then transferred to Brown-McDade Mining Ltd., who developed the Brown-McDade vein with 609 metres of drifting and crosscutting in 1947 (Figure 1.2-1). During this same period (1946 to 1948), the Webber and Huestis veins were explored by Conwest and Huestis Syndicate, respectively. From 1958 to 1962, various companies of the Mount Nansen Exploration Syndicate carried out further exploration work on the Webber, Huestis and Cabin veins. G. F. Dickson optioned the property to Peso Silver Mining Ltd. in 1963 and control was acquired in the following year through its' subsidiary Mount Nansen Mining Ltd.

In 1967, the Brown-McDade vein was explored by 552 metres of underground drilling and 216 metres of underground development were conducted. Peso Silver Mining Ltd. gained control of the Webber and Huestis properties in 1964. This was followed by four years of exploration. Then in 1968 the Huestis vein was developed with 976 metres of drifting along the new lower 4100 level. A 163 tonne flotation mill was operated from September 1968 to April 1969, producing 85,133 grams gold, 625,116 grams silver and 49,207 kilograms lead from 16,360 tonnes milled. Gold recovery was poor as a result of no cyanidation in the mill circuit. The mine was reopened from 1975 to 1976 and the 4100 level was extended 141 metres. During this period 7451 tonnes were mined and 5844 tonnes, grading 10.3 grams per tonne gold, 240.1 grams per tonne silver, 1 per cent lead and 1 per cent zinc were milled in a five month period.

Property ownership was transferred in 1979 and 1980. Peso had sold its Mount Nansen properties (Brown-McDade, Webber and Huestis) in 1968 to Charter Oil Company Ltd. but regained control in 1978. In 1979, Peso changed its name to Rex Silver Mining Ltd. Its' interest was then sold to Schweizerische Gesellschaft in 1980 and to Mount Nansen Mining Corp. in 1981. Mount Nansen Mining Corp. conducted a feasibility study of the Webber and Huestis

veins in 1983. In 1984 the properties were transferred to BYG Natural Resources Inc. Placer mining operations are currently active on Back Creek to the west and Discovery Creek to the north (Figure 2.1-1).

2.5 HISTORICAL MINE WASTE

Two small tailings ponds were constructed during historical operation of the mill (1968-69 and 1975-76) and contain an estimated 25,000 tonnes of sulphide-rich tailings (Brodie Consulting Ltd., 1998). It is also reported that there were about 41,000 tonnes of sulphide ore stockpiled from previous operations, located southwest of the camp facilities.

3.0 CURRENT FIELD STUDY RESULTS

As previously discussed in Sections 1.2 and 1.3 of this Report, Conor Pacific's scope of work and objectives included a preliminary site investigation, field sampling program and screening-level ecological risk assessment. The finding of this work is discussed below.

3.1 SITE INVENTORY AND HAZARD ASSESSMENT

An inventory and hazard assessment of the Mount Nansen minesite was conducted between September 28, 1999 and October 1, 1999 by Michael Choi, Kevin Himbeault, and Keith Mountjoy of Conor Pacific. The results of this inventory and hazard assessment are discussed below. A detailed inventory list for the site as of October 1, 1999 is attached in Appendix D. Locations of materials identified on the site are shown in Figures 3.1-1a to 3.1-1c.

The inventory assessment identified:

a) Chemicals and reagents (ore process, water treatment and miscellaneous);
b) Fuels, oils, greases and solvents;
c) Sulphur dioxide tank, fuel tanks and pressurised gas cylinders;
d) Transformers;
e) Soil staining and stressed vegetation;
f) Explosives;
g) Surplus and/or scrap materials (metal, drums, wood, refuse, electrical parts);
h) Vehicles;
i) Fill materials and solid waste; and
j) Infrastructure damage

stored on the Mount Nansen minesite as of October 1, 1999. Identification of chemicals, reagents and other substances stored in containers, were identified by product labels and by visual and/or olfactory observations where containers were open and/or the contents were visible. The assessment does not account for changes to consumable materials (such as process chemicals) or for materials that may be hidden, obstructed, or buried on or around the site.

The hazard assessment identified health and safety concerns for various items such as chemicals, contaminated soils, materials and machinery, and infrastructure stability.

Sampling of potentially contaminated soils was conducted during the October 1, 1999 site assessment. However, due to snowfall, a complete survey of stained or potentially contaminated soils could not be completed during the site visit.

Where soil staining was observed, grab samples of soils were collected in sterile 250 mL glass jars using a clean trowel. The samples were packed in coolers at 4° C and shipped to Norwest Laboratories of Surrey, BC for analysis[1].

3.1.1 Chemicals, Reagents, Petroleum Products, Solvents and Materials

Stockpiles of chemicals, reagents and petroleum products were distributed throughout the Mount Nansen minesite. The mill area contained the majority of the mine process chemicals, fuels, greases, and oils used for machinery and vehicles. See Appendix D for a detailed inventory of chemicals at the minesite.

3.1.1.1 Ore Process Chemicals

Two primary types of process chemicals were present on the site; chemicals for ore processing and process chemicals for treatment of mill effluent and tailings pond water. Table 3.1-1 summarises the chemicals stored on the site and their inventory quantities at the time of the visit. The process chemicals situated to the east of the mill building are stored on wood pallets or in wooden bins. Large chemical identification signs noted around the larger chemical stockpiles have been knocked down and/or are in a state of disrepair.

Several pallets of powdered chemicals east of the mill were stored under tarps and/or plastic wrap to prevent hydration and spoiling, however, the tarps and plastic were brittle and cracked, allowing water and/or air to penetrate into the chemicals. Powdered process chemical bags were also perforated or ripped open, allowing material to spill. Spilled chemical powder was noted around the piles (including borax dehydrate, copper sulphate, and dense soda ash piles). A soil stain approximately 2 x 2 metres, was located near the chemical stockpiles (see Photo 2, Appendix A). Grab sample MILL GS2 was taken from a soil stain near the chemical stockpiles. The results of MILL GS2 are discussed in Section 3.1.1.9 below.

Approximately 75 bags of silica flour, 20 bags of sodium nitrate, 100 bags of borax dehydrate, and 36 pails of manganese dioxide are stored to the east of the mill area. Twelve 25 kg cans of

[1] Norwest Laboratories of Surrey, BC is an accredited lab by the Standards Council of Canada (SCC) and the Canadian Association for Environmental Analytical Laboratories (CAEAL).

lead nitrate are stored in an open top wood bin in the centre of the mill storage area. The lead nitrate cans are exposed to the atmosphere with visible signs of rusting.

Sodium cyanide and activated carbon were not encountered on the site grounds, however, it was not determined if these chemicals were stored inside the mill building.

3.1.1.2 Wastewater Treatment Chemicals

The location of the process chemicals on site appeared to be based primarily on point-of-use requirements. Wastewater process chemicals for the INCO/SO_2-air wastewater treatment system are primarily stored east of the mill building but are also stored near the polishing pond, tailings pond, and collection pond.

At the time of the site inventory, the wastewater treatment system was in operation and several chemicals were actively being used in the INCO/SO_2-air water treatment system. The quantities and/or rates of consumption were not determined. Percol 156 (a polymer compound) and ferric sulphate (a precipitation chemical) were identified as reagents used in the water treatment system, but were not observed during the inventory and assessment.

Barrels of hydrogen peroxide are located near the mill area, polishing pond, tailings pond, and collection pond. At the time of the site inventory, hydrogen peroxide was being added at the mill as part of the wastewater treatment process. Hydrogen peroxide was also being added to the tailings pond and collection pond. Automated volumetric dispensers were used at each location. Operations personnel indicated that the rate of addition was one 55 gallon barrel approximately every 24 hours (eight litres per hour).

3.1.1.3 Miscellaneous Chemicals

Miscellaneous chemical, reagent and petroleum product containers were spread throughout the minesite. These included pH solution, sulphuric acid, propylene glycol, batteries (lead-acid), desiccant, and GW Prevent 855 Antiscalant. The containers for the various chemicals ranged in size from small paper boxes to large barrels.

The solid waste refuse dump south of the mill contained chemical storage jars with residual chemicals. The chemical containers are likely from the laboratory in the mill building since the majority of the containers were designed for quantities of less than 1 kg. Other residual chemicals included ferric sulphate, sodium borate dehydrate and diethylenetriamine pentaacetic acid.

The mill building laboratory was inspected during the initial site inspection. Various chemicals and reagents for effluent quality testing were noted in the laboratory. The laboratory was being used for effluent quality testing.

Chemical bottles, refuse, laboratory ceramic crucibles, and glassware were visible at the outflow area of the spigot discharge pipe in the north end of the tailings impoundment (Photo 3, Appendix A).

Insufficient information was available to Conor Pacific regarding the protocols and procedures used by BYG Natural Resources Inc. for chemical storage and disposal.

3.1.1.4 Petroleum Products and Solvents

Petroleum products observed on the site included 55 gallon drums and 20 or 25 L pails of grease, motor oil, transmission oil, heating oil, and other oil and fuel products. A main storage area of at least 60 barrels of lubricant, antifreeze, and heating oil is located beside the above ground storage tanks (AST's) for the main diesel generator, south of the mill warehouse (Figure 3.1-1a). Chemicals at this location include Spartan EP 150 gear oil, heating fuel, varsol, motor oil, and transmission fluid. Chemical storage locations appeared to be based primarily on point-of-use requirements. The majority of the chemicals are stored outside, exposed to the elements.

Approximately six unlabelled waste grease and oil drums were observed on the site north of the mill area (Figure 3.1-1a). The lids of several waste oil/grease and soil drums located north of the SAG mill were loose or open. A black waste oil or grease compound was visible near the top of the open barrels with water floating on the surface (see Photo 1, Appendix A). Several unlabelled drums were also observed to contain soil with black staining and hydrocarbon odour. Grab sample SAG GS1 was taken from the soil and sludge mixture in one of the open barrels. The results of sample SAG GS1 are discussed in Section 3.1.1.9.

Solvents and other petroleum derivatives are also stored in the mill area. These chemicals included antifreeze, propylene glycol, lubricants, gear oil, varsol, coolants, and antiscalant compounds. The petroleum products are stored in various containers ranging in size from 55 gallon steel or plastic drums to 20 or 25 L pails. Several pails stored at the abandoned SAG mill, crusher, and at various garbage/stockpiles have been opened and partially used with varying amounts of product left in each pail.

Information was unavailable to Conor Pacific regarding the protocols and procedures used by BYG Natural Resources Inc. for fuel and petroleum storage and disposal. It was not determined if petroleum products have been buried on the Mount Nansen minesite.

3.1.1.5 Sulphur Dioxide Tank

A large black SO_2 tank (railcar) is situated beside the north end of the mill building. The tank was used for the INCO/SO_2-air treatment process during mill operations. The tank appears to be in good condition with no visible signs of failure and only slight corrosion. However, the tank is not labelled and is no longer permitted or certified for refill or use. The volume of SO_2 remaining in the tank was not determined (a full tank is 36.46 m^3 of SO_2 gas or 52 tonnes at 0^oC). Plant personnel at the time of the Site visit indicated that the tank was empty. It is noted that the SO_2 tank was to be emptied and purged with dry air at mill closure (BYG Natural Resources Inc. 1997. Mt. Nansen Mine, Conceptual Decommissioning and Reclamation Plan).

The stability and condition of the feed and fill lines for the SO_2 tank to the mill building interior were not investigated during the Site visit.

3.1.1.6 Gasoline and Diesel Tanks

Aboveground storage tanks (AST's) for gasoline and diesel were observed at the camp site and the Ketza Construction yard (Figure 3.1-1c).

The camp AST was a double wall gasoline tank of approximately 30,000 - 45,000 litre capacity with a pump island residing on one end. The AST appeared to be in good condition with no signs of corrosion or rust. The pump island was in fair condition and appeared to be older than the AST. All fuel lines appeared to be intact with no signs of leakage. Snow cover prevented a full assessment for potentially contaminated soils in the vicinity of the AST tank and pump island.

The Ketza Construction yard AST consisted of a 45,000 litre gasoline tank, manufactured in 1996. The tank appeared to be in good condition and was connected to an older gravity-feed filler hose in fair condition. A stained soil patch, approximately four square metres, beneath and adjacent to the pump island indicated a fuel spill or chronic leak (Photo 4, Appendix A). A slight hydrocarbon odour emanated from the soil. A grab sample KETZA GS5 was taken of the centre of the stained soil area. The results are discussed in Section 3.1.1.9 below.

A small AST was also located at the tailings pond reclaim station. The tank rested on a steel frame approximately 1.5 m off of the ground. The tank capacity is approximately 500 to 1,000 L. The tank was not connected at the time of the site visit and did not appear to contain any fuel.

Two large diesel AST's located to the south of the mill warehouse were used to fuel the diesel generators for the site. The volume of each tank was not determined at the time of the visit. The two diesel tanks appeared to be in good condition with no visible sign of leakage or corrosion. Cathodic protection plates of zinc and ground wires were visible at the ends of each tank. Both of the AST's rested within a cement spill containment berm. It was not determined if site personnel were spill emergency response-trained.

It was not determined if additional gasoline or diesel AST's or USTs were present at the Mount Nansen minesite. It was not determined if the AST's identified during this site visit have been properly permitted and certified for use. Operation and maintenance records for each AST were not available to determine if current use is compliant with the *Yukon Gasoline Handling Act* (C.O. 1972/137) or the "CCME Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products" (1994).

3.1.1.7 Pressurized Gas Cylinders

Pressurised gas cylinders were observed throughout the site. Oxygen and acetylene gas cylinders at the SAG mill are located in the open and exposed to the atmosphere, with visible rusting near the valves. Unlabeled gas cylinders with unknown gas contents were observed in the mill area and camp garage. Gas cylinders were also observed in the mill laboratory during the initial site inspection.

Large, empty, unlabelled gas cylinders were located to the north of the mill and east of the mill area. Five of the tanks located north of the mill measured approximately 3.3 metres in circumference by 5.5 metres in length.

Approximately ten propane tanks were observed at the camp area. Four large propane tanks connected in parallel just east of the main dormitory building supplied propane to the dormitory building. A propane additive (mercaptan) smell emanating from the tank area indicated a leak in one of the gas lines or tanks. A similar nest of propane tanks is located near the ATCO housing trailers.

3.1.1.8 Transformers - Polychlorinated Biphenyls (PCBs)

Transformer stockpiles were observed in two locations at the Mount Nansen minesite; to the east of the mill near the polishing pond and in the Ketza Construction yard (Figures 3.1-1a and 3.1-1c).

Four transformers were identified in the Ketza Construction yard (Figure 3.1-1c). Three of the transformers appeared to be in good condition with no sign of damage to the casings. Labels on the transformers certified that they did not contain PCB oils. The fourth transformer was older, of unknown origin (see Photo 5, Appendix A), and may contain oil with PCBs.

Twelve transformers were located at the polishing pond adjacent to the roadway access (Figure 3.1-1a). The transformers were different sizes, shapes, ages, and from various manufacturers. Details of the transformers at the polishing pond are summarised in Table 3.1-2. The transformers may be filled with oil containing PCBs. The transformers were located on an eroded soil berm approximately one meter high (see Photo 6, Appendix A).

One of the transformers (Serial #217727) is open at the top. The oil within the transformer is visible, and oil is spilled around the base. Another transformer is resting on its side and leaking oil from the lid, with a soil stain directly below the leak (Photos 6 and 7). Sample POLISH POND GS3 was taken from the stained soil, with the results discussed in Section 6.1.2 below.

Insufficient information was available to Conor Pacific regarding the purchase, use, removal, and decommissioning of the transformers found on the site. It was not determined if any other active or inactive transformers on the site contained PCB.

3.1.1.9 Soil Sample Results

Soil samples were analysed for various parameters based on field observations. These included BTEX (benzene, toluene, ethylbenzene, xylenes), VPH (volatile polyaromatic hydrocarbons), LEPH (light extractable polyaromatic hydrocarbons), HEPH (heavy extractable polyaromatic hydrocarbons), PCB (polychlorinated biphenyls) and metals.

Laboratory results of soil samples were compared to the following pertinent environmental soil criteria from the following sources:

a) The Canadian Council of Ministers of the Environment (CCME) Recommended Canadian Soil Quality Guidelines (1997);

b) Canadian Council of Ministers of the Environment (CCME) Interim Canadian Environmental Quality Criteria for Contaminated Sites (1991); and
c) The Yukon Contaminated Site Regulations (promulgated 1997).

The Yukon Contaminated Sites Regulations, Schedule 2, Matrix Numerical Soil Standards applicable to industrial lands (IL) were used. The most stringent (most conservative) of the following standards was selected:

a) Human Health Protection Standards
   i. Intake of contaminated soil
   ii. Groundwater used for drinking water
b) Environmental Protection Standards
   i. Toxicity to soil invertebrates and plants
   ii. Major microbial functional impairment
   iii. Groundwater flow to surface water used by aquatic life

Where soil standards are pH dependent, the pH of the soil was used to determine the correct applicable standard. The Yukon CSR soil standard for groundwater used for drinking water was applied since Victoria Creek supplies potable water as well as process water to the site.

SAG GS1

Grab sample SAG GS1 was analysed for BTEX, LEPH, HEPH, VPH and metals. The results are shown in Table 3.1-3. SAG GS1 exceeded the CCME soil quality guidelines and the Yukon CSR soil standards for antimony, arsenic, copper, lead, and zinc. SAG GS1 also exceeded the CCME soil quality guidelines for nickel, selenium, silver, sulphur, and thorium. SAG GS1 also exceeded the Yukon CSR soil standards for molybdenum. SAG GS1 exceeded the Yukon CSR soil standards for benzene, LEPH, and HEPH.

MILL GS2

Soil sample MILL GS2 was analysed for LEPH, HEPH, PCB, and metals. MILL GS2 exceeded the CCME soil quality guidelines and the Yukon CSR soil standards for antimony, arsenic, and zinc. MILL GS2 also exceeded the CCME soil quality guidelines for cobalt, copper, lead, nickel, selenium, silver, and sulphur and exceeded the Yukon CSR soil standards for chromium. The results are shown in Table 3.1-3.

POLISH POND GS3

Soil sample POLISH POND GS3 was analysed for LEPH, HEPH, PCB, and metals. POLISH GS3 exceeded the CCME soil quality guidelines and the Yukon CSR soil standards for antimony, arsenic, and zinc. POLISH GS3 also exceeded the CCME soil quality guidelines for cobalt, lead, selenium, silver, and sulphur. POLISH GS3 exceeded the Yukon CSR soil standards for LEPH and HEPH. POLISH GS3 with a result of 0.12 mg/kg PCBs did not exceed the Yukon CSR soil standard for "Ingestion of contaminated soil" (15 mg/kg PCB). The results are shown in Table 3.1-3.

KETZA GS4

KETZA GS4 was analysed for BTEX, VPH, LEPH, HEPH, and metals. KETZA GS4 exceeded the CCME soil quality guidelines and the Yukon CSR soil standards for antimony, arsenic, and zinc. KETZA GS4 also exceeded the CCME soil quality guidelines for copper, lead, selenium, silver, and sulphur. KETZA GS4 exceeded the Yukon CSR soil standards for benzene and HEPH. The results of the laboratory analyses are shown in Table3.1-3.

KETZA GS5

KETZA GS5 was analysed for BTEX, LEPH, HEPH, and metals. KETZA GS5 exceeded the CCME soil quality guidelines and the Yukon CSR soil standards for arsenic. KETZA GS5 exceeded the CCME soil quality guidelines for selenium and sulphur. KETZA GS5 also exceeded the Yukon CSR soil standards for lead, zinc, benzene, LEPH, and HEPH. The results are shown in Table 3.1-3.

Note that some metals may occur naturally in native soils in concentrations above the CCME soil quality guidelines and the Yukon CSR soil standards. It was not determined if background levels of metals naturally exceed these regulations.

3.1.1.10 Stressed Vegetation

Due to snowfall, during the 1 October 1999 site assessment, and a dormant stage of vegetation growth, a complete inventory of stressed vegetation over the entire site could not be conducted. However, a general visual reconnaissance of the site revealed signs of stressed vegetation at the tailings impoundment.

Red staining was observed near a pipe discharge located at the north end of the tailings pond. Plant personnel indicated the discharge was a return pipe for treated water from the water treatment plant. The red staining was visible at the base of the outfall pipe and covered a large area on either side of the outflow. Vegetation consisting of grasses and weeds near the discharge outflow and stained area were stunted and browning (Photo 3, Appendix A). Laboratory ceramic crucibles and refuse were also located in the outflow area.

Along the north end of the tailings pond, several clumps of shrubs and bushes growing on the beached tailings in the tailings impoundment were dead and stunted. Limited vegetation, consisting of sporadic grass cover, was noted growing on the surface of the tailings pond impoundment.

3.1.2 Explosives

Two pallets containing ammonium nitrate manufactured by Titan Explosives were identified in the explosives (ANFO) storage area (Figure 3.1-1c). The pallets were opened with material taken from each pallet (less than the 2000 kg each). The containment, stability, and security of these chemicals were not determined at the time of the site visit.

3.1.3 Materials and Vehicles

3.1.3.1 Metal

Surplus metal components and scrap metal were observed in several places around the Mount Nansen minesite with the majority of the material located in the mill area. Metal components have been left in the open, exposed to the atmosphere. Surplus metal components range from slabs of iron plate and SAG balls to finished steel cabinets and shelves.

Scrap metal piles contained old pieces of discarded equipment including broken machinery, steel frames, fasteners, tanks, motors, pipe, cable, wire, conveyor beds, and structural scaffolding. Piles of metal scrap were unstable, and likely to collapse or tip over. Metal pipes and sheet metal cabinets were also stockpiled with jagged metal edges and fastener parts left lying on the ground.

The largest scrap metal piles to the north and east of the mill are rusting, with rust coloured surface runoff entering Dome Creek immediately east of the mill. The metal pile at one point completely covers a small tributary creek or ditch flowing into Dome Creek.

3.1.3.2 Empty Drums

At least 275 empty drums reside in several locations across the site. A storage area (consisting of a clearing beside a roadway) for empty barrels is located east of the mill at the intersection of the tailings pond road and the main road to Carmacks. Approximately 150 drums are stacked or scattered across the storage area. Many of the drums have labels indicating they were once filled with hydrogen peroxide, sulphuric acid or petroleum products.

The majority of the empty drums at the main storage location and at the mill are plastic and appear to be in satisfactory condition. Chemicals currently in use at the site such as sulphuric acid, hydrogen peroxide, oil, and petroleum products are stored in plastic barrels. Older barrels are largely metal.

Metal drums on the site are observed to be rusting and corroding from exposure. Several empty metal drums were being used as storage bins for scrap parts and equipment. Half-buried and crushed drums were observed near the mill and the SAG mill area indicating drums may have previously been buried in this area. Rusted drums were also observed embedded in the embankment south of the mill area, and in several refuse piles.

Information was unavailable to Conor Pacific regarding the protocols and procedures used by BYG Natural Resources Inc. for barrel storage and disposal. It was not determined if barrels (empty or filled with material) were buried on the Mount Nansen minesite. BYG Natural Resources Inc. initiated a recycling program, however, the program was not fully implemented.

3.1.3.3 Wood

Scrap piles of wood were observed near the mill area, north of the camp, and in the Ketza Construction yard. Burnt wood and refuse piles containing wood pieces were observed to the south of the mill area. Wood frames and pallets were also observed near the mill area. Scrap wood bins and pallets were being used as storage containers for scrap metal and equipment in the storage area surrounding the mill.

Wooden core boxes were observed near the old abandoned core shed east of Pony Creek and at the camp area. The majority of the wood boxes contained bedrock cores from previous exploration drilling. These may belong to BYG Natural Resources Inc.

3.1.3.4 Electrical Parts

Surplus and scrap electrical components were stored throughout the site with the majority of the electrical components stored or discarded north and east of the mill building (Figure 3.1-1a).

Surplus components have been sorted and stored in large wooden bins or on pallets with discarded equipment and placed in with the scrap metal piles. Electrical components included switch boxes and control panels, wiring, spools of wire, transformers, and electrical motors and appliances.

3.1.3.5 Vehicles

Six 4x4 trucks, a two-tonne flat bed truck, and a Caterpillar grader with no engine are located near the mill area. A large Caterpillar bulldozer, tow truck/tanker with trailer vehicle, and dump truck are stored in the Ketza yard. It was not determined if these vehicles are still operational. Insurance papers and identification numbers painted on the side of each vehicle indicate they were the property of or insured by BYG Natural Resources Inc. or Ketza Construction. Several vehicles were still used by Ketza Construction and INAC personnel at the time of Conor Pacific's site inventory.

3.1.3.6 Fill Materials and Solid-Waste Management

BYG Natural Resources Inc. and its historical predecessors have conducted extensive earth moving operations at the site for the purposes of extracting minerals. The site therefore contains large amounts of displaced rock and soils that have been placed in various fill locations. The displaced rock has also been used for structural support, berms, embankments and construction material for roadways. It was not determined to what extent surface disturbance, waste rock dumps and fill or construction materials have impacted the site.

Solid waste, consisting of general camp refuse, laboratory refuse and abandoned operations/construction materials were scattered in piles throughout the minesite or in a dump (pit) located south of the mill area (Figure 3.1-1a). The refuse dump contained partially burnt glass, chemical containers, wood, metal, plastic and debris. Liners or barriers to prevent migration of contaminants from the dump were not observed. Plastic and paper pieces had been blown off of the dump and were scattered on the surrounding ground.

Smaller refuse and debris piles were also observed north of the camp, in the Ketza Construction yard (Figure 3.1-1c), and at the core shed area adjacent to Pony Creek. Refuse to the south of the mill area was spread across and down-slope indicating materials have been historically pushed

from the top of the bank. A small pit filled with recent refuse is located in the hillside indicating the dump was currently being used.

At the base of the embankment near the polishing pond, metal drums, wood waste, and metal rails were visibly protruding out of the sides of the bank. The presence of metal and wood debris embedded in the banks near the mill may indicate the potential for other buried debris and waste material at the site.

It was not determined if BYG Natural Resources Inc. was permitted to burn or bury solid waste refuse at the Mount Nansen minesite.

3.1.4 Infrastructure Stability

Buildings on the Mount Nansen minesite appeared to be in various states of physical condition. The camp office and cookhouse were in use at the time of Conor Pacific's site investigation and showed no visible sign of major physical damage. Entrance to the ATCO mobile trailers was not secured. Several trailers had broken windows and other minor structural damage (dents and holes) to the exterior and interior. Several buildings such as the mill and the crusher have been damaged.

At the time of the initial site inspection the maintenance shop garage doors were missing, leaving the building and its contents unsecured (they have subsequently been re-installed and/or repaired). The shop building exterior is also damaged (dents and holes) near the entranceways.

Loose wood rails and deck panels were observed on the exterior of the SAG mill, ore loadout and crusher buildings. The hydraulic arm at the top of the crusher unit has broken wires and hydraulic hoses. Other damage was noted to the mechanical (panel covers missing) and electrical (unprotected loose wires) equipment and control booths of the SAG mill, ore loadout and crusher buildings. Several doors were missing allowing uncontrolled access into the SAG mill building and the main electrical control room. The large garage access doors to the SAG mill are damaged. At several locations, wood framing material and the corrugated metal panels on the exteriors of buildings were torn, corroded, and loose. Interior insulation was exposed, ripped and hanging from the walls. The floors of the SAG mill and crusher were littered with garbage and debris. Pipes and equipment have also been left on the floors across the walkways and the entrances to the buildings. In the SAG mill, overhead ropes, pulleys, and chains had not been dismantled or secured. A sump was observed below the SAG mill machinery. The sump was approximately 0.6 metres depth and 2 metres square with a chain and pulley above. A thin

layer of heavy oil appeared to be floating on the surface of the water. The sump could not be easily accessed to determine if the sump was leaking into the soil beneath the SAG mill floor.

The mill and water treatment buildings (including buildings at the polishing, tailings, and collection ponds) all show deterioration or damage from weathering, vandalism, and age. The exterior and the doors to the mill building were corroded with loose panels. Holes were noted in the roof of the mill building and above the water treatment plant. Several pillars and corners on the exterior of the mill building are damaged. The doors of the mill building were either not locked or missing at several access points.

The electrical powerhouse contained three diesel-powered 635 kW generators (one working, two broken, and spare parts) plus one small Caterpillar generator. The diesel generators were located beside the mill and powered the site electrical system. The diesel generators also powered the water treatment plant and camp area. The backup generators were partially dismantled at the time of the site inspection.

The main electrical room was noted in the SAG mill. The switch boxes were energized. Other electrical power rooms were also located in the water treatment plant and the tailings pond reclaim barge station. Site personnel indicated the electrical system was prone to brownouts due to overloading of the currently used generator.

The tailings pond reclaim infrastructure consisted of two floating barges and two small buildings adjacent to the tailings pond. The barges were both leaning heavily to one side in the water. The two buildings adjacent to the tailings impoundment are in fair condition. One of the buildings is an electrical power switch room while the other was used to heat reclaim water. Both of the buildings had doors that were not locked. All four buildings contain scrap wiring, hoses and loose insulation that has fallen out of the walls.

The collection pond pumping station consists of two small barges located on the edge of the pond. Several barrels of hydrogen peroxide were located beside the barges. The interiors are littered with debris, insulation, wiring and hoses across the floors.

No physical damage was observed to the Victoria Creek pump station exterior.

The Ketza garage exterior had visible signs of corrosion and weathering.

The camp buildings consisted of a main office/dormitory building, a wood shop/garage, a cafeteria/kitchen and two modular buildings constructed from ATCO trailers.

At the time of the site assessment, the main office/dormitory building was used as the office and dormitory. The building showed minor exterior damage. A domestic sewage septic system was noted to the east of the building.

No physical damage was observed on the exterior of the garage building. Scrap metal and wood were piled along the sides of the garage. The interior floor was covered with soil and wood shavings with several wood platforms covering the ground. Mechanical equipment and tools in the garage were lying on the floor and workbenches. Several large pressure tanks, a gas cylinder and several small propane tanks occupied one end of the garage. Miscellaneous motor oil, grease, paint, and solvents containers were also present in the garage.

The cafeteria/kitchen exterior and interior appeared to no major physical damage. A sewage septic field system was noted to the east of the cafeteria.

Two large ATCO modular trailer systems were located north of the cafeteria/kitchen. The units were vacant and without power. The trailers consisted of two rows of rooms, including sleeping rooms, a recreation room and bathrooms.

3.1.5 Air Quality and Pollution Control Management

Wastewater treatment occurring at the site may generate residual air pollution from de-gassing during chemical reactions. Whether dust is associated with chemical use or handling for the water treatment process was not determined. Signs were posted at several locations within the mill buildings indicating the requirement for use of protective respiratory devices.

It was not determined if any of the Mount Nansen buildings contain or previously contained asbestos, urea formaldehyde, ozone-depleting substances or are impacted by radon. Old fridge hulks, radiators, and heaters in the scrap metal piles at the site may indicate the presence of ozone depleting substances. It was not determined if the radiators and cooling systems at the site were properly drained or still contained freon or other ozone depleting substances.

3.1.6 Wastewater Management

A tailings pond water reclaim and water treatment plant was in operation at the Mount Nansen minesite during the field investigations. Specifics of the tailings pond water treatment system are discussed in attached sections of this report.

Camp wastewater was treated and discharged through several domestic sewage septic systems observed during the site inventory. The condition of the septic systems was not determined. Site personnel currently use two systems.

Surface drainage off-site occurs through soil infiltration and surface run-off. Developed areas of the site, including the camp and the mill areas, direct precipitation into ditches and culverts, which ultimately flows into Dome Creek.

3.1.7 Summary

An inventory assessment of the Mount Nansen minesite identified chemical and material storage practices that may be potentially hazardous to environmental and human health.

Stockpiled chemicals were observed throughout the minesite with the majority of the chemicals stored in the mill area. In addition to the stockpiles beside the mill building, the chemical containers appeared to be stored at point-of-use locations. Chemicals were stored outside, with little protection from the weather.

Several chemical containers left outside were visibly aged and/or torn, allowing chemicals to escape into the environment. A grab sample from a soil stain (MILL GS2) near the stockpiled process chemicals exceeded the CCME soil quality guidelines and Yukon CSR soil standards for several metal parameters.

Barrels of stained soil and waste products were noted north of the SAG mill. Several barrels were left open, allowing the contents to escape down the sides. A sample (SAG GS1), taken from one of the open barrels exceeded the CCME soil quality guidelines and Yukon CSR soil standards for several metal and organic parameters.

Numerous chemical containers were unlabelled or labelled improperly, preventing identification of the contents. Partially used containers of petroleum products and chemicals were left where they were used, with no apparent collection of remaining chemicals, indicating poor chemical management practices.

Chemical containers no longer in use were discarded in refuse piles or placed with surplus materials. Metal containers were visibly buried in several locations around the mill area indicating containers (and potentially any chemical contents) may have been buried at the Mount Nansen minesite for waste disposal.

Transformers were stockpiled at the mill area and the Ketza maintenance yard. Of four transformers inspected in the Ketza maintenance yard, one of the transformers was of unknown manufacture and may contain PCBs. The other three appeared to be newer models and carried labels certifying them as PCB free.

Of twelve transformers at the mill area, one transformer was missing its lid and another was tipped on its side and leaking oil. The transformers may potentially be filled with oil containing PCBs. Sample POLISH GS3, taken from the soil beneath the tipped and leaking transformer, indicated that the soil is not likely impacted by PCBs. However, this does imply that the leaking transformer does not contain PCBs, as transformer oil was not analysed for PCBs.

Gas cylinders were noted throughout the mill and the camp areas. Large unlabelled gas cylinders were stockpiled in the mill area and appear to be surplus or abandoned and the presence of gas was not verified. Several groups of propane tanks were located in the camp area. One set of four large tanks feeding the main office and dormitory building were leaking as evidenced by the strong smell of propane additive (mercaptan) in the air around the tanks.

Refuse, debris, scrap materials, and surplus materials were stockpiled primarily near the mill area but were also observed at the camp and the tailings pond. Refuse and debris in an open earth dump, were spread down the sides of embankments indicating poor solid-waste management practices. Partially buried barrels, scrap metal, and wood were observed in the soil used as fill material in the mill area.

Surplus equipment including wood, metal, electrical equipment, mechanical parts, cables, pipe, and machinery were stacked on pallets or on the ground. Large piles of scrap metal and surplus metal machinery were also noted spread over the ground further down the embankment east of the mill. In addition, several large piles of scrap metal were observed located directly overtop of a small stream or ditch, and may be a source of metals.

Poor solid-waste management practices including refuse dumping, burial of materials, and stockpiling of material may have impacted the soils and groundwater.

The inventory assessment identified building and infrastructure stability issues, which may be potentially hazardous to environmental and human health.

The mill building, the SAG mill, and the crusher were deteriorated and in poor condition, with loose panels and damaged walls. Daily operations, weather, and vandalism have contributes to the buildings poor condition.

At all three locations, abandoned equipment inside was not secured. Loose ropes and chains were abandoned on overhead pulleys, and tools were found lying on the floor. Partially used petroleum products (e.g. greases, oils and solvents) were left in the buildings and were not safely stored. Gas cylinders present in the buildings were not safely secured. On the exterior, missing doors and panels allowed uncontrolled access into the mill building, the SAG mill and the crusher.

The floating pump stations on the polishing pond, tailings pond, and collection pond were in disrepair, contained refuse and empty chemical containers on the floor and were tilted to one side. The pump stations were unlocked, allowing uncontrolled or unauthorised access.

3.2 PIT AND WASTE ROCK DUMP STABILITY

Conor Pacific qualitatively assessed the physical stability of the ultimate pit during the site assessment. There was freeze/thaw action occurring at the pit. Rock fall and unravelling from areas impacted by direct sunlight was common, resulting in a safety hazard working on the floor of the pit. The pit walls and overburden in the vicinity of the pit were observed to be intensely fractured and weathered. Observations were also made of tension fractures along the upper edges of the ultimate pit (Photo 9, Appendix A). These fractures also indicate the pit walls are generally unstable and are a human safety issue in the pit area. An additional sign of physical instability was two drainage holes observed at the junction of the southern access ramp to the Brown-McDade pit and the tailings impoundment access road (Photo 10, Appendix A).

The waste rock dumps were visually inspected to assess their physical and chemical stability. The waste rock dumps are located in two main areas; northeast and west of the northern portion of the Brown-McDade open pit. They were constructed on flatter areas adjacent to the pit on the gentle sideslopes of the north side of the Dome Creek valley. They are constructed using a combination of methods. These include single and terraced, multiple-lift end and top dumping. Limited bulldozer spreading and compaction appears to have occurred between lifts.

Many areas of the waste rock dumps appear to be physically unstable. Dump slopes are moderately steep, with an angle of repose ranging from 20 to 45 degrees. In some areas, tension fractures and sink holes developing on the dump surfaces near the face indicates oversteepened dump slopes are failing (Photo 11, Appendix A).

Overall, the waste rock dumps do not show any visual signs of extensive sulphide-rich rock, either as waste rock or ore stockpiles. There were several isolated pockets of intensely oxidized sulphide-rich (galena and pyrite) waste rock in the lower west waste rock dump (Photo 12, Appendix A). These pockets are less than 1 m^2 and are not likely to have any significant impact on water quality, however no records could be located on Site by Conor Pacific to confirm the internal composition of the waste rock dumps.

3.3 PIT WATER QUALITY AND ARD/ML ASSESSMENT

The north portion of the Brown-McDade pit was observed to be partially flooded (Photo 13, Appendix A). The extent and depth of the pit water could not be properly determined for safety reasons. This pit water also severely limited access to the pit floor and lower pit walls in this portion of the pit.

Previous pre-operational and operational ARD/ML prediction results on Brown-McDade pit materials indicated a low potential for acid generation and metal leaching. However, it was recognized that the potential could increase significantly depending on the depth of open-pit mining and pit wall rock exposure. The requirement for operational ARD/ML sampling and monitoring was incorporated into water license QZ94-004 and partially fulfilled during operations. The results of ARD/ML assessment of samples collected during the September 28 to October 1, 1999 preliminary site field assessment by Conor Pacific are discussed below. Particular emphasis is placed on missing data gaps identified in previous prediction programs and deficiencies in the water license requirements.

During the site assessment by Conor Pacific, the lower pit walls were visually examined for the presence of sulphides, sulphide oxidation and metal leaching, particularly below the oxide zone. A total of six pit wall rock samples were taken from the lower most accessible areas of the pit floor (Figure 3.3-1). These samples were taken to assess the ARD/ML potential of the ultimate pit floor and lower pit walls. Four samples (PF-TP01-01 to PF-TP04-01) were taken from the north end of the Brown-McDade pit. Samples PF-TP01-01 and PF-TP02-01 were taken from the south edge of the flooded portion of the north pit area. These samples were composed of altered

limestone. The other two samples (PF-TP03-01 and PF-TP04-01) were taken from the North pit area near the bottom of the pit access ramp. Sample PF-TP03-01 was composed of foliated diorite and sample PF-TP04-01 was composed of schist and quartzite. Samples were submitted to BC Research Inc. for modified Acid-Base-Accounting and metal leaching analysis. The results are summarized in Table 3.1-2. The raw laboratory data is also provided in Appendix E.

All four samples contained visible sulphides ranging from 1 to greater than 25%. Sulphur analysis confirmed this observation returning total sulphur values ranging from 1.09 to 32.94%. Sulphate values were also high, ranging from 0.35 to 1.62 weight %. Sulphide sulphur values ranged from 0.07 to 18.72 weight %. A comparison between total and sulphide sulphur values is shown in Figure 3.3-2. Figure 3.3-3 shows a comparison of sulphate sulphur versus sulphide sulphur. The results indicate that sulphide content and oxidation are not the controlling processes for sulphate generation in the lower sulphide zone. Excess sulphate generated from previous surface weathering masks sulphate generated from sulphide oxidation in the lower sulphide zone of the Brown-McDade deposit. The moderately strong fizz test observed on samples in the field was also confirmed by laboratory results. Carbonate neutralization potentials (CaNP) determined from inorganic carbon analysis ranged from 24.72 to 85.13 kg $CaCO_3$ / t. Carbonate neutralization potentials were higher than neutralization potential determined by standard back titration (Figure 3.3-4). This is due to abundant carbonate that is incompletely dissolved by the standard NP determination. Of the four samples, two had a negative Net Neutralization Potential (NNP) and three had a Neutralization Potential Ratio (NPR=NP/MPA) less than 2.0 (Figure 3.3-5). Adopted screening criteria are from Price (1997). NPR ratios less than 1.0 are generally considered to be potentially acid generating unless sulphide minerals are non-reactive and ratios between 1.0 and 2.0 are considered to have a possible acid generating potential if NP is insufficiently reactive or depleted at a faster rate than sulphides (Price, 1997). Visible sulphides observed in these samples include moderately to intensely oxidized pyrite and lesser chalcopyrite. These sulphides are known to be reactive and oxidize readily upon exposure to air and water. Because samples PF-TP01-01 and PF-TP02-01 are composed of altered limestone, these samples have a high CaNP and NP. Further kinetic testwork and on-site monitoring would be required to determine the relative reaction difference between sulphide oxidation and carbonate dissolution rates and whether there is sufficient carbonate content to prevent acid generation from this portion of the Brown-McDade pit. Samples PF-TP03-01 and PF-TP04-01 are composed of foliated diorite, and schist and quartzite respectively. These samples were determined to contain some neutralization potential, predominantly as carbonate. However, for sample PF-TP03-01 there is a discrepancy between the CaNP (24.7 kg $CaCO_3$ / t) and NP (1.3 kg $CaCO_3$ / t) values. This is most likely due to the presence of slow reacting carbonate minerals such as siderite or ankerite. Mineralogical analysis

would be required to determine the cause of this discrepancy. Further, the presence and dissolution of siderite and ankerite can lead to accelerated sulphide oxidation by ferric (Fe^{3+}) iron. Based on observations of the pit walls and static test results, sample PF-TP03-01 could be considered a "worst case" scenario of the lower pit walls. In addition to having a limited neutralization potential this sample also had a very high sulphide content (18.72 weight %). The pit wall at the location from where this sample was taken was strongly weathered and oxidized on surface to reddish-orange with local pockets of bluish-green to pale yellow hydroxide precipitation as botryoidal-like masses on and adjacent to fractures.

Based on the static test results of these four samples from the lower sulphide zone of the north portion of the Brown-McDade pit would be considered to have a moderately high acid generating potential. This conclusion was not borne out by earlier pre-operational ARD prediction, as earlier prediction was focused on the oxide portion of the Brown-McDade deposit (Table 3.3-1). In the oxide zone of the Brown-McDade ore body, sulphide content of all ARD prediction samples was 0.6 weight % with a corresponding average MPA value of 16.1 kg $CaCO_3$ / t. The mean NP determination was 29.8 kg $CaCO_3$ / t. The resultant average NPR of oxide zone ARD samples was 13.1, supporting earlier prediction conclusions that the oxide zone of the Brown-McDade deposit had a very low potential to be acid generating.

Samples PF-TP05-01 and PF-TP06-01 were taken from the southern area of the Brown-McDade pit (Figure 3.3-6). ABA results are shown in Table 3.3-2, and Figures 3.3-1 to 3.3-3. Sample PF-TP05-01, composed of foliated diorite, contained negligible sulphide (pyrite) as reflected by a total sulphur content of 0.02 weight % and less than 1 % visible sulphides. The sample also contained negligible carbonate and neutralization potential. The NNP and NPR of this sample were 2.7 kg $CaCO_3$ / t and 5.3, respectively (Figure 3.3-5). Sample PF-TP06-01, composed of gneiss, was also found to contain negligible sulphides. Visual sulphides were not observed when the sample was collected and total sulphur analysis yielded 0.06 weight %. The carbonate content and neutralization potential were found to be slightly higher than sample PF-TP05-01. The CaNP and NP were determined to be 19.30 kg $CaCO_3$ / t and 25.4 kg $CaCO_3$ / t, respectively (Figure 3.3-5). The resultant NNP and NPR were also correspondingly higher. Based on these static test results, the south portion of the Brown-McDade pit would be characterized as having negligible acid generating potential. The results are consistent with the pit floor elevation being much higher than in the northern portion of the open pit. Open pit mining had exposed oxide ore and not sulphide ore as in the northern portion of the Brown-McDade pit.

The six pitwall samples collected during the September 27 to October 1, 1999 were tested to determine the readily soluble metals. A modified Special Waste Extraction Procedure[2] (SWEP) method was selected and used. This is the recommended method in British Columbia (Price, 1997) and is modified by using distilled water as the extractant at a 3:1 liquid:solid ratio and an extraction time of 24 hours. Pre-leaching solids characterization consisted of strong (4) acid digestion followed by total metals analysis by ICP-AES. The results are shown in Table 3.3-3. One or more pit wall samples yielded high concentrations of silver, arsenic, barium, cadmium, chromium, copper, iron, manganese, lead, antimony and zinc. These results are consistent with the sulphide mineralogy of the Brown-McDade deposit consisting of pyrite, arsenopyrite, sphalerite, galena, bornite, stibnite, chalcopyrite and sulphosalts.

The soluble metal extraction results show a general correlation between high solids concentrations and high metals solubility, particularly for sample PF-TP03-01. Soluble heavy metals, such as copper and lead, were significantly higher for this sample. Higher dissolved arsenic, cadmium, manganese and zinc were also associated with samples PF-TP01-01 and PF-TP02-01. These results are consistent with field observations and ABA test results, indicating the high sulphide content, and advanced extent of sulphide oxidation and metal leaching occurring in the pit wall at sample PF-TP03-01.

The results of metal extraction testing were compared to the available pit water chemistry and the water license effluent quality standards (EQS) (Table 3.3-4). This comparison shows moderately strong correlation between metal leaching results and pit water chemistry between 22 October 1998 and 27 June 1999. Dissolved copper, iron, manganese and zinc exceed the EQS. Dissolved cadmium concentrations approach the EQS. Other elements such as arsenic, lead and antimony are well below the EQS. Samples taken by Conor Pacific as part of their preliminary Site investigation yielded copper and iron concentrations well below those previously measured and below EQS. Manganese and zinc remained high and exceeded EQS.

3.4 TAILINGS IMPOUNDMENTS AND ARD/ML ASSESSMENT

Previous pre-operational and operational ARD/ML prediction results (Melis, 1989 and Process Research Associates, 1994) indicated a low potential for acid generation and metal leaching from tailings generated from Brown–McDade oxide ore.

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[2] Province of British Columbia (1992), *Waste Management Act: Special Waste Regulation Schedule 4, Parts 1 and 2*, Queens, Printer, Victoria, B.C. p.72-79.

The requirement for operational ARD/ML sampling and monitoring was incorporated into water license QZ94-004, however, the extent of fulfillment during operations is unknown. Specific requirements of the water license included ABA analysis of a monthly tailings composite sample. Conor Pacific was unable to obtain this database. Secondly, water license requirements also included a humidity cell test of a tailings composite sample taken after 60 days of mill operation and second "worst case" humidity cell to be run after one year of mill operation. It is unknown whether either of these humidity cells was ever initiated, as results have not been obtained.

Limited operational ABA results from tailings are shown in Table 3.3-4.

The results of ARD/ML assessment of samples collected during the September 28 to October 1, 1999 preliminary Site field assessment by Conor Pacific are discussed below. Particular emphasis is placed on characterization of sulphide-rich tailings which were not included as part of the mine development plan or the water license. A total of six samples were taken of beached tailings along a north-south transect across the western edge of the tailings impoundment (Figure 3.3-6). Conor Pacific identified this location during the initial minesite inspection on 1 September 1999, as the location of spigotting of sulphide-rich tailings during the final months of operations. It has been estimated that there are 10,000 m^3 of sulphide-rich tailings (Brodie Consulting Ltd., 1998).

Six samples were submitted to BC Research Inc. for modified Acid-Base-Accounting and metal leaching analysis. The results are summarized in Table 3.1-2. The raw laboratory data is also provided in Appendix D. The total and sulphide sulphur content of five of six samples range from 3.0 to 6.8 weight % (Table 3.1-2). The sixth sample contains negligible sulphide. These results substantiate the presence of significant quantities of sulphide-rich beached (exposed) tailings along the western edge of the tailings impoundment. Sample test pits showed little variation in colour or grain size. Tailings observed in test pits consisted of very fine silt to coarse sand. The colour was light yellowish to orangey brown. Sample pits T-TP02 and T-TP04 contained thin (mm-scale) dark grey to black sulphide lenses composed of up to 90 % sulphides. All six samples show a high carbonate content as indicated by an average inorganic carbon content of 2.0 weight %. Corresponding CaNP values ranged from 20.2 to 57.7 kg $CaCO_3$ / t. The NP values are slightly lower ranging from 16.6 to 38.7 kg $CaCO_3$ / t and averaging kg 31.1 $CaCO_3$ / t (Figure 3.3-4). The higher CaNP values are most likely due to the presence of excess carbon in the tailings generated from the water treatment plant (WTP) process and the addition of lime in the WTP process. The Neutralization Potential Ratios (NPRs) of the five samples with high sulphur content range from 0.1 to 0.4 (Figure 3.3-5).

The six samples collected during the September 27 to October 1, 1999 Site investigation were tested to determine the readily soluble metals. The results are shown in Table 3.4-1. One or more tailings samples contained high concentrations of silver, arsenic, barium, copper, iron, manganese, lead, antimony and zinc. Despite these high metal contents, only arsenic and antimony were readily leached (Table 3.3-3).

The results of metal extraction testing were compared to the available tailings pond chemistry and the water license effluent quality standards (EQS) (Table 3.4-2). This comparison shows only metal leaching results for arsenic and antimony is consistent with the pit water chemistry between 15 April 1997 and 27 June 1999. Metal leaching did not satisfactorily identify metals of concern in the tailings pond. Dissolved silver, cadmium, copper, manganese and zinc exceed the EQS. Dissolved iron, antimony and lead concentrations approach or periodically exceed the EQS. Other elements such as barium and chromium are generally well below the EQS. The tailings pond sample collected by Conor Pacific on 28 September 1999 was compliant with all EQS except copper and manganese (Table 3.3-4).

Based on the above results and given that these tailings are exposed to air and surface water infiltration, oxidation and subsequent metal leaching are presently occurring. The effect of these exposed sulphide-rich tailings on the tailings pond chemistry is undetermined. However, overall it is expected that they will continue to oxidize over an extended period of time and release silver, cadmium, copper, manganese and zinc into the tailings pond. In the absence of any attenuation mechanisms, dilution or collection and treatment, these metals may reach the receiving environment in Dome Creek downstream of the tailings impoundment via tailings impoundment seepage or spillway cresting. Continued treatment of the tailings pond water will lower the pond level in the tailings impoundment and potentially expose more sulphide-rich tailings. This could result in an increase in metal concentrations in the tailings pond. However, this is not a recommendation to cease the treatment and discharge of the tailings pond water.

It is recommended that additional studies be conducted to fully delineate the spatial distribution of exposed or shallow sulphide-rich tailings in the tailings impoundment. Mitigation and remediation options should consider disposal options that fully saturate these tailings to prevent further oxidation and metal leaching. Careful consideration should also be given to the preventing remobilization of stored oxidation products within the tailings and porewater both during remediation and post-remediation.

Several historical tailings impoundments were also inspected during the site field program. These two impoundments contain an estimated 25,000 tonnes of tailings (Brodie Consulting Ltd., 1998). The upper impoundment remains intact and was covered by water (Photo 14). The impoundment did not show any visual signs of physical instability and the tailings were not sampled. Therefore, the current condition of these tailings is unknown. The lower tailings impoundment straddles Dome Creek and was also flooded. A water diversion passage for Dome Creek was constructed from wood on the north side of the tailings dam. The dam appeared to have been breached at some time in the past. The date of this event and the extent of damage or tailings escapement is unknown. It is recommended that both of these historical tailings impoundments be resampled during winter when the ponds are frozen or summer when water levels decrease significantly to assess the current ARD/ML potential. Samples should consist of both tailings and pond water. If results indicate no potential acid generation or metal leaching then reclamation in place is recommended. Otherwise removal and disposal options should be considered.

3.5 ASSESSMENT OF EXPLORATION DISTURBANCE

Exploration trenches on the Mount Nansen property were excavated as early as the 1950's. Most of these trenches were cut to bedrock. The extent of trenching and surface disturbance on the Mount Nansen property is partially illustrated in Figure 3.5-1. This airphoto composite was constructed from the most recent airphotos available to Conor Pacific from the National Air Photo Library, Natural Resources Canada. They show the extent of site disturbance in 1994 and therefore cannot be considered an accurate representation of the current level of site disturbance. The full extent of the physical stability was not assessed during Conor Pacific's site field program. However, many trenches, regardless of age, were excavated perpendicular to, or at an obtuse angle to, the natural slope. This has locally led to accelerated soil erosion. An erosion gully along the south abutment of the tailings dam attests to the rapid erosion rates and extent of physical degradation possible (Photo 15). During the site field program by Conor Pacific it was also observed that some older trenches have naturally revegetated. Further fieldwork is required to fully assess the extent of reclamation required for exploration disturbance on the Mount Nansen property.

3.6 EFFLUENT CHARACTERISATION

Conor Pacific has also constructed a database of effluent and water quality data provided by Indian and Northern Affairs, Water Resources and other sources. This database has been used to evaluate trends in effluent and stream water quality for the development, operational and post-

operation phases at the Mount Nansen minesite. The database and its findings are discussed in this section and section 3.7 below.

A brief summary of the mining, milling and water treatment plant operations for the Mount Nansen minesite are described to provide context to the discussion of the effluent characterization below. Further details on the operational history of milling and water treatment plant operations, including changes and process upsets are discussed in Section 5.0.

Mining and milling operations at the Mount Nansen property were initiated in October 1996. The water license issued to BYG Natural Resources Inc. authorised the reclaiming of water from the tailings facility for use in the mill and the release of excess water, via a polishing pond, into Dome Creek. At that time, direct discharge from the tailings facility was not authorised. At the end of April 1997, the reclaiming of water to the mill from the tailings facility was initiated. Water discharge from the mill, via the polishing pond, into Dome Creek commenced in May 1997. The water treatment plant (WTP) was installed between July and September 1997, to allow for the discharge of excess water from the tailings pond. The WTP at the Mount Nansen minesite, uses the INCO/SO_2-air process to destroy cyanide and ferric sulphate for the stabilisation of arsenic and other heavy metals, by precipitation as their metal-hydroxides.

A trial run the WTP was conducted for six days between September 15 and 26, 1997. During this period, numerous bioassay tests used to determine the non-toxic requirements of the effluent quality standards (EQS) failed. The inability to meet this criteria resulted in the need for improvements to the WTP. As a consequence, the mill and WTP were shut down in November 1997 and restarted on February 26, 1998. Upgrades to the WTP included the addition of an ammonia adsorption tank and two carbon columns. A thickener was installed in the water treatment plant circuit in July 1998. The water treatment plant was on-line until September 17, 1998 at which time the discharge was suspended. Operation of the water treatment plant resumed on October 17, 1998 but was again suspended on December 7, 1998. Operations were suspended February 19, 1999.

The following discussion of effluent characterisation is based on review of the available operational and post-operational data at sampling station E7. Records of the effluent quality from the end-of-pipe discharge station (E7) were obtained for the operational period from May 1997 to December 1998. At the time this document was prepared, no additional effluent quality data were available for sampling station E7 in 1999. Therefore for purpose of these discussions, the effluent quality samples obtained by Conor Pacific and INAC in September 1999 are used as representative samples of the post-operational period. Samples taken by Conor Pacific and INAC were submitted independently to Norwest Labs for analysis. The laboratory data for Conor Pacific are provided in Appendix F.

A historical evaluation of the water treatment plant discharge was completed by comparing the trend in discharge for key parameters as indicated in the Water License QZ94-004 Effluent Quality Standards. The following discussion is on specific parameters that showed a tendency to exceed the effluent quality standards (EQS). These parameters include: WAD cyanide, total cyanide, dissolved arsenic, total cadmium, copper, iron, lead, manganese, and zinc. Parameters that were always within the EQS of the water license are not discussed and include: antimony, barium, chromium, mercury, nickel and silver. Total ammonia is also included in the discussions due to its importance in the cyanide destruction process and potential toxicity effects.

During the site visit in late September 1999 the discharge of treated effluent from the water treatment plant (WTP) was sporadic due to maintenance and fine-tuning of the system. The effluent sample collected on September 28th was resampled on September 29th (the WTP shut down during sample collection on September 28th.) The analytical results from the September 28th sample confirm that effluent was not being discharged at the time of sampling. This is evident from the low conductivity, hardness, sulphates and ammonium measurements compared to the sample collected on September 29th during which time treated effluent discharge was occurring. Based on the September 29th sample, the treated effluent has high concentrations of calcium, cobalt, copper, manganese, nickel, potassium, sodium, sulphur, and zinc. Other constituents such as ammonium, WAD cyanide, total cyanide, nitrate, nitrite and sulphates were also higher compared to the September 28th sample.

Total Cyanide

Figure 3.6-1a illustrates the trend in total cyanide during the water treatment plant (WTP) operational period from May 1997 to December 1998. September 1999 sample results obtained by CPET and INAC are also presented. Throughout the operational history of the mill, the concentrations of total cyanide in the effluent discharge were close to or exceeded the effluent quality standard (EQS) of 0.3 mg/l. The largest spike during the operational period was in May 1997, where total cyanide concentrations were greater than 1.2 mg/l, corresponding to the beginning of effluent discharge from the mill. During the installation period of the WTP (July to September 1997) total cyanide measurements were either not recorded or unavailable. It is believed that during this period some mill reclaim water was being discharged. On September 24, 1997 the total cyanide concentration in the discharge was approximately 0.4 mg/l and corresponds to the six-day test run of effluent discharge from the WTP. Several other time periods exceeded the EQS as indicated in Figure 3.6-1a. These periods typically correspond to changes in the WTP operations.

During the field sample collections completed by Conor Pacific and INAC in September 1999, effluent samples collected at E7 had total cyanide concentrations of 26.2 and 33.5 mg/l, respectively. These concentrations significantly exceed the water license EQS of 0.3 mg/l[3] and are significantly greater than total cyanide results from other samples collected during operation of the minesite. Other recent total cyanide data provided by Indian and Northern Affairs, Water Resources Division also indicate an increase in total cyanide. Information was not available to Conor Pacific to determine if this noted difference in cyanide chemistry is the result of different analytical methods used or significant decreases in water treatment plant efficiencies. Without identification of the analytical method used for each cyanide chemistry result, the data must be treated and interpreted with caution.

[3] The analytical method for determination of Total and WAD cyanide in the Mount Nansen database varies between laboratories and results in significant differences in values. Norwest Laboratories has identified that the routinely used EPA 335.3 or Environment Canada (Inland Waters) total cyanide method, results in higher values than the Environment Canada (Conservation and Protection) or the American Standard Method for Examination of Water and Wastewater methods used by other laboratories.

WAD Cyanide

Figure 3.6-1b depicts the trend for Weak Acid Dissociable (WAD) cyanide in discharge from May 1997 to December 1998. As illustrated, WAD cyanide concentrations are highly variable throughout the operational period. The range of concentrations is from 0.005 mg/l to greater than 1 mg/l in May 1997. Based on the data available for review, it is apparent that control over the discharge of WAD cyanide was limited to concentrations close to the effluent quality standards value of 0.1 mg/l. In late September 1997, water treatment plant (WTP) effluent discharged contained WAD cyanide greater than 0.3 mg/l. During the WTP operational periods of February to May 1998 WAD cyanide levels exceeded the EQS of 0.1 mg/l for extended periods of time. It was during this period that BYG Natural Resources Inc. submitted water license amendment applications #3 and #4 for the temporary relief of non-toxicity requirements. These applications support the observation that problems were present with control over the discharge of WAD cyanide from the site. The Yukon Territory Water Board denied amendment application #4. Additional peaks in October and November of 1998 correspond to the start-up of the WTP following a short-term suspension in operation.

During the September 1999 field investigations, WAD cyanide concentrations were 0.03 and 0.075 mg/l from samples collected by Conor Pacific and INAC, respectively. These concentrations are below the EQS value of 0.1 mg/L. Additional post-operational information was provided to Conor Pacific from Indian and Northern Affairs, Water Resources Division prior to this finalising this report. These WAD cyanide data were also below the EQS.

Total Ammonia

Total ammonia discharge appears to be directly related to the operation of the INCO/SO_2-air treatment plant as illustrated in Figure 3.6-2. The first spike in total ammonia was measured in September and October 1997 during the initial start-up of the water treatment plant (WTP). Additional total ammonia measurements are provided for the operational period from February 1998 to December 1998.

The highest total ammonia concentration was greater than 50 mg/l measured in August 1998. The historical review of the mill and WTP operations indicates a thickener was installed in the mill-WTP circuit during this period. During the installation, process upsets related to the operation of the INCO/SO_2-air oxidation process likely resulted in increased concentrations of free cyanide, WAD cyanide complexes and cyanate. A portion of the cyanate generated by this process may hydrolyze to ammonia and carbon dioxide. Single samples collected in September 1999 measured total ammonia concentrations between 7 and 14 mg/L at effluent sampling station E7. Total ammonia was not a licensed monitoring parameter for the effluent discharge, therefore no effluent quality standard is available for comparisons. A more detailed discussion of ammonia effects in the receiving water is provided in Section 3.7.1.

Arsenic

Figure 3.6-3a illustrates the trend in both total and dissolved arsenic concentrations within the treatment plant discharge (sampling station E7) from May 1997 until December 1998. Additional sample points provided for September 1999 are from the Conor Pacific and INAC September effluent sampling at station E7.

As indicated in Figure 3.6-3a, there were a couple of sample periods where total arsenic concentrations spiked. The first period was in early May 1997 following the initiation of the tailings pond reclaim. Arsenic concentrations peaked at 0.291 mg/l. Arsenic concentrations declined and then peaked again in June 1997, one month after reclaim was initiated. During installation of the water treatment plant (WTP) (summer 1997), arsenic concentrations in the discharge (station E7) were maintained at less than 0.1 mg/l. On November 6, 1998 an arsenic peak of 0.42 mg/l was measured. It was during this period that the WTP was undergoing alterations with several periods of shutdown and startup. In the September 1999, the total arsenic concentration was less than the 0.02 mg/l detection limit value in a sample collected by Conor Pacific at station E7.

The dissolved arsenic concentrations at station E7 from May 1997 to December 1998 followed a similar pattern as total arsenic; however, fluctuations between sample periods were greatly

reduced (Figure 3.6-3b). Dissolved arsenic concentrations were consistently well below the Water License EQS of 0.15 mg/l.

Cadmium

In 1997 and the early period of 1998, cadmium concentrations in the discharge effluent tended to exceed the Effluent Quality Standards of 0.02 mg/l (Figure 3.6-4a). This time period is related to the start-up of the water treatment plant (WTP) and various subsequent plant upgrades. The period following February 19, 1998 demonstrated consistently low cadmium concentrations with an average cadmium concentration of 0.001 mg/l. In September 1999, a sample of effluent taken from station E7 contained cadmium concentrations less than the 0.0005 mg/l detection limit. These lower cadmium concentrations indicate better control over the treatment process or change in ore feed stock with lower cadmium concentrations.

Copper

Figure 3.6-4b illustrates the copper concentrations over the operational periods in 1997 and 1998. Copper concentrations frequently exceeded the Effluent Quality Standards values of 0.02 mg/l. In the later part of 1997, copper reached concentrations as high as 1.3 mg/l. The increased copper concentrations in the effluent are attributed to pH control in Reactor No. 2 of the water treatment plant and low pH in the effluent, resulting in the dissolution of precipitated copper. In 1998, copper concentrations were sporadic ranging from 0.01 to 0.74 mg/l. The highest concentrations were reached in February, August and September. Post operational measurements by Conor Pacific and INAC in September 1999 indicate copper concentrations below the EQS 0.02 mg/l value.

Iron

Iron release prior to the start-up of the water treatment plant (WTP) peaked at over 30 mg/L in May 1997 well above the effluent quality standard (EQS) (Figure 3.6-5a). Iron concentrations were either not measured in the discharge during the construction of the water treatment plant or data were not available to Conor Pacific. However, iron concentrations were less than the 1.0

mg/l EQS during the initial start-up of the WTP in September 1997 and during release periods in January to March 1998. In mid-1998 additional spikes greater than 30 mg/l were measured. This is likely related to the addition of ferric sulphate treatment for arsenic in the WTP. Iron concentrations throughout 1998 were highly variable but appeared controlled in the latter parts of 1998. In September 1999, effluent iron concentrations were less than 0.5 mg/l, well below the EQS.

Lead

Over the operational period from May 1997 to December 1998, lead concentrations in the effluent discharge are generally below the 0.1mg/l effluent quality standard (Figure 3.6-5b). In early 1997, prior to treatment plant operation and late 1998, prior to the suspension of water treatment plant operation, lead concentrations peaked at levels ranging from 0.15 to 0.25 mg/l, well above the EQS of 0.005 mg/l. Samples collected during the September 1999 field investigation by Conor Pacific and INAC had lead concentrations below the 0.005 mg/l detection limit well below the 0.1 mg/l effluent quality standard.

Manganese

As illustrated in Figure 3.6-6a, the concentration of manganese in the effluent discharge has been highly variable throughout the operation of the water treatment plant (WTP). Manganese concentrations in the effluent often exceeded the effluent quality standard of 0.5 mg/l, reaching concentrations of approximately 2 mg/l. Effluent samples collected during the September 1999 field investigations measured manganese concentrations of 0.81 mg/L (Conor Pacific) and 0.247 mg/l (INAC). The differences in these two samples illustrate the high variability associated with the discharge of manganese from the WTP at the Mount Nansen site.

Zinc

In early 1997 before the water treatment plant was installed, zinc concentrations at effluent sampling station E7 approached concentrations of 7.0 mg/l (Figure 3.6-6b). These concentrations exceed the effluent quality standard (EQS) value of 0.3 mg/l considerably. Following the installation and initial operation of the water treatment plant in September 1997,

zinc concentrations were elevated to values greater than 9 mg/l. Concentrations remained elevated until March 1998 when zinc levels in effluent discharge was reduced and a high level of control in zinc discharge concentrations is apparent. Based on the samples collected by Conor Pacific and INAC in September 1999, concentrations of zinc in the effluent discharge remain below the EQS.

Effluent Toxicity

Rainbow trout 96-hour toxicity tests results were available for September 17, 1997 to September 15, 1998. The effluent discharge passed approximately 60% of the toxicity tests during this time period. The failed results corresponded to known water treatment plant events such as start-up, where there were five failed tests from September 26 to October 2, 1997. Additional failed results occurred from January 7, 1998 to March 12, 1998. During this period, five of seven toxicity tests failed. It was during this time period that BYG submitted Water License Amendment Applications #3 and #4 for the temporary relief of non-toxicity requirement. From April to mid-August 1998, available records indicate the effluent discharge passed the non-toxicity EQS requirement. On August 19, 1998 INAC submitted effluent samples that resulted in a failed toxicity test. It is during this time period that the highest total ammonia concentration was also recorded at a concentration of 58 mg/l. Since ammonia toxicity is related to the concentration of the un-ionized form of ammonia, pH and temperature are significant factors to consider when assessing the potential cause and effect relationship between the effluent discharge and the 96-hour rainbow trout toxicity tests. A more detailed discussion of ammonia toxicity is provided in the screening level ERA provided in Section 3.8.

3.7 STREAM WATER QUALITY

3.7.1 Primary Study Area

The objective of this component of the field program was to assess the spatial occurrence of chemical concentrations downstream of the effluent discharge point (station E7). For evaluation and discussion purposes, we have included sample collections from previous investigations at the Mount Nansen Site. The previous investigations were selected from three distinct time periods

which include the pre-operational period from October 1985 to October 1996; the operational period from October 1996 to February 1999; and the post-operational period from February 1999 to present. Data from representative field investigations conducted within each event period were selected from the data available at the time this document was written. The selection of specific data was based on the completeness of the data set to provide a spatial assessment on the water quality within Dome Creek, Victoria Creek and the Nisling River. The data chosen includes: pre-operational samples collected by Environment Canada (1988), operational data collected in 1998 by Environment Canada (1999), and post-operational data collected by Conor Pacific during their September 1999 field investigation.

Detailed investigations within Dome Creek, Victoria Creek and the Nisling River were completed in 1998 and 1999. These investigations included water sample collections from a series of similar locations and provide for a strong spatial comparison between the operational and post-operational periods. The following results and discussions pertain to the data collected during the three independent sampling events. Comparisons are for discussion of general trends only. No correction for seasonal differences and flow dependency has been included.

The figures corresponding to the following sections are arranged to maintain the spatial relationship of the sampling locations downstream of the treated effluent discharge at station E7 (Figure 2.1-1). Stations V1, V3, D1 and Ns1 are reference areas upstream of influences from the effluent discharge and therefore are separated as individual points within the figures. Stations E7, D3, D2, D4, V4, V5, V7 and Ns2 are exposure stations that form a spatial gradient from the point of discharge (E7) and tailings pond seep (D3). Figure 2.1-1 illustrates the spatial representation of the sampling locations.

The selection of parameters for discussion is based on a preliminary screening of the data in which comparisons to both the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (1999), and the Yukon Contaminated Sites Regulations - Generic Water Standard (YTWS) for protection of aquatic life were completed. Parameters with concentrations below the CCME Aquatic Life fresh water guidelines and the Yukon Contaminated Sites Regulations – Generic Water Standards were excluded from further discussion. The following parameters are

discussed in terms of concentrations present during the pre-operational, operational and post-operational along the previously defined spatial gradient within the downstream, receiving environment.

Conductivity and Sulphate

Figure 3.7-1a illustrates the spatial extent of effluent using conductivity as a surrogate for effluent levels. When compared with sulphate measurements (Figure 3.7-1b) the similarity in the patterns for both conductivity and sulphate within all three sampling events confirms the spatial trends of the effluent discharge.

The spatial representation of effluent downstream from the point of discharge is evident from the post-operational sampling event in 1999. The highest conductivity and sulphate measurements are at the E7 effluent discharge point and gradually decrease until they reach approximate background/reference levels at station V4 (approximately 2.5 km below the discharge and 6 km from the Nisling River) (Figure 2.1-1). The consistencies in the pattern between operational and post-operational periods suggest that significant effluent dilution occurs when Dome Creek enters Victoria Creek (Figure 2.1-1, stations D4 and V4).

The present status of sulphate concentrations within the receiving environment shows a slight elevation above the Yukon Generic Water Quality standard of 1,000 mg/l at station D2. Sulphate concentrations rapidly decline to within baseline conditions (300 mg/l) at D4.

Total Ammonia

Total ammonia concentrations during the pre-operational period were below the 0.05 mg/l detection limit at all sampling locations (Figure 3.7-2a). During the operational period in 1998 there was a high total ammonia concentration at both stations D2 and D4 with concentrations of 22.4 mg/l and 42.2 mg/l, respectively. In 1998, the concentrations declined to 2.3 mg/l at station V4 and were further reduced to less than 1.0 mg/l by station V5. During the post-operational sampling period in September 1999, total ammonia concentrations were greatest at stations E7

(11.3 mg/l), D3 (11.8 mg/l) and D2 (7.85 mg/l). At station D4 total ammonia concentrations were below 0.5 mg/l (Figure 3.7-3a).

Total ammonia concentrations at stations D2, D4 and V4 exceeded the CCME guideline for ammonia (ranged from 0.54 to 1.5 mg/l) during the operational period. However, during the post-operational period, there appears to be better control over the ammonia release, which shows much lower concentrations at D2 and D4 relative to the operational period. At the present period (September 1999), total ammonia concentrations are below CCME guideline values at station D4; however stations D2 and D3 exceed the CCME guideline (2.3 mg/l). This comparison to CCME guidelines is based on a pH of 7.75 and a water temperature of 0°C.

Arsenic

In September 1999 (post-operational phase), total arsenic concentration at station E7 (effluent discharge) is below the detection limit of 0.02 mg/l; however, at station D3 arsenic concentrations are 0.18 mg/l and decline to 0.08 mg/l at station D2. The results shown in Figure 3.7-2b indicate that the arsenic loading into Dome Creek is likely from the tailings pond seepage. These results are confirmed by the INAC samples collected during the same September 1999 sampling period. As was indicated by conductivity measurements, arsenic concentrations appear to reach background/reference concentrations by station V4. This similar decline at V4 was also present during the operational phase sampling program by Environment Canada in 1998 (Environment Canada, 1999). The pre-operational data indicates arsenic concentrations were below the 0.05 mg/l detection limit, with the exception of station V3 (0.07 mg/l).

At present, total arsenic concentrations at all locations are below the Yukon Generic Water Quality standard of 0.5 mg/l. However, CCME has recently revised the Canadian water quality guideline to 0.005 mg/l, which is lower than detection limit on the 1999 samples collected by Conor Pacific and INAC.

Copper

During the pre-operational period in 1988, copper concentrations in Dome Creek station D2 were below the 0.005 mg/l detection limit (Figure 3.7-3a). During the 1998 operational period sampling program, copper concentrations at D2 exceeded 0.15 mg/l, declining to 0.01 mg/l by station V4. These concentrations indicate that the Mount Nansen mining operations were influencing the water quality within this drainage. During the September 1999 field investigations copper concentrations at D2 were greater than 0.2 mg/l but declining to less than 0.01 mg/l at station D4. During this same period copper concentrations at E7 were 0.145 mg/l and 0.1 mg/l in the spillway/diversion channel. The highest copper concentrations were measured at D3 below the tailings pond downstream of the seepage pond but upstream of the effluent discharge area (Figure 2.1-1). It would appear that the seepage from the tailings pond provides a significant copper source into the Dome Creek drainage.

At present, copper concentrations at stations D2 and D3 exceed both the CCME guidelines (<0.004 mg/l) and Yukon Generic Water Quality standard (<0.1 mg/l). Stations from D4 downstream are all below the Yukon Generic Water Quality standard and near the CCME guidelines.

Iron

Iron is the fourth most abundant element in the earth's crust and is naturally released into the environment from the weathering of rocks. Natural concentrations can range from less than 0.001 mg/l to as high as 90 mg/l. As illustrated in Figure 3.7-3b, the pre-operational data indicates that iron concentrations in surface waters were highly variable, with concentrations ranging from less than 0.1 to greater than 25 mg/l within the Victoria Creek drainage.

During the operational period, iron concentrations were slightly above 3 mg/l at stations D2 and D4, but decreased to 0.2 mg/l at station V4. Further downstream in Victoria Creek there was increase in iron concentrations (0.7 mg/l) at station V7; however, this increase is likely the result of iron loading from Minnesota Creek which had iron concentrations greater than 0.9 mg/l (Environment Canada, 1999). Although iron concentrations exceed the CCME guideline (0.3

mg/l) at most locations, iron concentrations are below the Yukon Generic Water Quality standard of 3 mg/l, with the exception of stations D2 and D4.

Samples collected during the post-operational period in September 1999 exceed the CCME guideline at stations D3, D2 and D4; however, both stations D2 and D4 were well below the Yukon Generic Water Quality standard. Station D3 iron concentration was greater than 11 mg/l. Although this concentration is less than pre-operational concentrations measured within Victoria Creek, the elevated iron concentration at this station is not believed to be naturally occurring and is likely related to the seepage from the tailings facility.

Manganese

In 1988 during pre-operational period of the Mount Nansen mine, manganese concentrations were less than 0.05 mg/l at all locations (Figure 3.7-4a). In 1998, concentrations remained less than 0.05 mg/l from V4 downstream; however, concentrations at D2 and D4 were 1.74 mg/l and 4.89 mg/l, respectively. In 1999, manganese concentrations were again less than 0.05 mg/l from V4 downstream. Concentrations at D2 (1.25 mg/l) were similar to the 1998 measurements, but D4 was much lower in 1999 (1.85 mg/l) than in 1998. The highest concentration was measured at station D3 (7.99 mg/l) in 1999. This measurement is consistent with other metal concentrations where the highest concentrations were found downstream of the tailings pond.

At this time there are no CCME guidelines for manganese and aquatic life in which to compare. At present, manganese concentrations measured at stations D3, D2 and D4 exceed the Yukon Generic Water Quality standard of 1.0 mg/l.

Nickel

Figure 3.7-4b illustrates the trend in nickel concentrations for the three distinct time periods. During the pre-operational and operational periods nickel concentrations were below the detection limit of 0.02 mg/l at all sampled locations. For the post-operational period the detection limit was lowered to 0.002 mg/l. Concentrations at E7 were 0.017 mg/l and decreased downstream to 0.009 mg/l at D2. As with other metal concentrations measured at station D3,

nickel concentrations were elevated relative to all other stations. Conor Pacific and INAC measured nickel concentrations of 0.059 and 0.079 mg/l, respectively, during the September 1999 field investigation. Although D3 is elevated, concentrations remain below both the CCME guideline (0.150 mg/l) and the Yukon Generic Water Quality standard (1.50 mg/l) based on water hardness greater than 180 mg/l.

Silver

The interpretation of silver concentrations in the receiving environment is difficult since the majority of samples for the three time periods were below the analytical detection limits (Figure 3.7-5a). For the pre-operational and operational periods this limit was 0.01 mg/l. Only station D2 during the 1998 operational period demonstrated elevated silver concentrations (0.04 mg/l) which exceeds both the CCME guideline (0.0001 mg/l) and the Yukon Generic Water Quality standard (0.001 mg/l). The other stations can not be compared to the guidelines since the detection limits already exceed both guideline values. Post-operational silver concentration was only elevated at station D3 (0.02 mg/l), station D2 and all additional locations during this time period were below the analytical detection limit of 0.001 mg/l.

Zinc

Zinc concentrations are somewhat variable between the three independent time periods (Figure 3.7-5b). In 1988, the concentrations at stations V1, D1, D2 and V5 were similar. Stations V3 and V4 zinc concentrations were measured at 0.17 and 0.07 mg/l, respectively, greatly exceeding other sampling locations during this period. During the 1998 operational period the lowest concentration was measured at D2 (0.005 mg/l) and reached a maximum concentration at station V4 (0.027 mg/l). During post-operational period in 1999, the highest zinc concentrations were 0.11 mg/l and 0.088 mg/l at stations D1 and D3, respectively. Concentrations decreased with distance downstream of station E7, with levels decreasing to less than 0.01 mg/l by station V4.

At present, zinc concentrations at both D1 and D3 exceed the CCME guideline for protection of aquatic life (0.03 mg/l); however, at all stations the zinc concentrations are lower than the Yukon

Generic Water Quality standard (0.3 mg/L). The reason for elevated zinc concentrations at D1 are unknown at the present time; however, sampling station D1 is downstream of the upper Heustis adit which may serve as a source.

Cyanide

The numerical limit for cyanide recommended by the CCME for the protection of aquatic life is 5 µg/L (CCME, 1999). This value represents the measurement of free cyanide because it is the primary toxic form; however, due to analytical problems associated with measuring free cyanide, particularly in waters affected by mine wastes, the measurement of weak-acid-dissociable and total cyanide are commonly used. The Yukon Generic Water Quality standard for weak acid dissociable cyanide (WAD cyanide) is 0.050 mg/L.

The most representative cyanide compound is WAD cyanide since the weak-associated complexes dissociate readily generating high levels of free cyanide. The measurement of WAD cyanide and total cyanide was discontinuous over the three time periods used to represent pre-operational, operational and post operational events. WAD cyanide was only measured during the operational and post-operational periods. Figure 3.7-6a illustrates the spatial and temporal trend of the WAD cyanide measurements within the receiving environment locations. During the operational period, WAD cyanide was measured at V3, D2, D4 and V4. All measurements were at the detection limit of 0.03 mg/L with the exception of D4, which had a value (0.07 mg/L) greater than both the CCME criteria and Yukon Generic Water Quality standard. During the post-operational period, WAD cyanide measurements were greatest at station D2 (0.124 mg/L) significantly greater than the Yukon Generic Water Quality standard value of 0.05 mg/L. The WAD cyanide values are somewhat suspect since water samples collected by INAC at the same time and place for locations D2 and D3 had concentrations of 0.528 mg/L and 0.167 mg/L, respectively versus the Conor Pacific WAD cyanide measurements of 0.124 mg/L and 0.017 mg/L, respectively. The reason for this discrepancy is not clear, but may be related to a longer holding time for Conor Pacific samples prior to analysis or analytical interferences.

Total cyanide concentrations were only measured during the pre-operational and operational periods for the selected sampling programs. Samples collected by INAC on September 28, 1999 were used to represent the post-operational concentrations. As illustrated in Figure 3.7-6b, the total cyanide concentrations during the post-operational period greatly exceeded the values reported for other time periods. These higher total cyanide values may be attributable to difference in the analytical methods used, interferences, changes in effluent and/or tailings pond

cyanide chemistry or a combination of these factors. For the pre-operational and operational periods, only total cyanide from station D4 (0.07 mg/L) collected by Environment Canada in 1998 was above the analytical detection limit and the Yukon Generic Water Quality value for WAD cyanide (Figure 3.7-6b). Note that in 1998, the analytical detection limit was greater than the CCME criteria for free cyanide. Also of note is that the total cyanide and WAD cyanide concentrations for D4 are the same value indicating that all the cyanide is present as a weak acid dissociable complex, simple cyanide or free cyanide.

3.7.2 Secondary Study Area

The secondary study area consists of samples collected from Pony Creek and Back Creek. These locations are not directly influenced by the tailings pond or the treated effluent discharge but are within the zone of influence from the Brown-McDade open pit.

The review for this study area is restricted to the post-operational period since this system does not receive any direct point source discharge and is a lower concern in terms of operations at the Mount Nansen minesite. A review of the water chemistry data from stations Pony Creek (P1), Pony Creek (P2) and Back Creek (B1) does not indicate elevated concentrations with the exception of zinc at station P1. Zinc concentrations (0.121 mg/l) at this station are the highest for any site sampled at the Mount Nansen site, the reason for this elevation is unknown but may be related to the station proximity to the Pony Creek adit. The concentration at this station exceeds the CCME guideline for protection of aquatic life, but is lower than the Yukon Generic Water Quality standard.

3.8 STREAM SEDIMENT QUALITY

The collection of sediment at the Mount Nansen site was completed by scooping sediments out of depositional zones within the receiving streams. The sampling and analytical protocol used was consistent with those specified in the water license and used during operations. Samples have been collected from pre-operational (1986 and 1988), operational (1997), and post-operational (1999) periods. The following discussions evaluate the sediment data in terms of analyte concentrations at both a spatial and temporal scale. The focus of discussion will be on the post-operational period, which is the present state of the sediments at the Mount Nansen minesite. The parameters selected for discussion were pre-screened by visually assessing the changes within and between stations over time and space. Due to the nature of the sampling stations (transitional deposition areas) caution is emphasized in the interpretation of this sediment data. High variability is likely and evident for a large number of the locations (both reference and exposure stations).

Aluminum

Aluminum measurements were completed in 1988, 1997 and 1999 (Figure 3.8-1). The highest aluminum concentrations were measured at station P1 (Pony Creek) located just downstream of the Pony Creek adit, and at P2 (Pony Creek) located upstream of the road crossing and the Pony Creek adit. These results would indicate that the Pony Creek system is naturally high in aluminum and the differences between the two sites may be a result of natural variation. Overall, the concentrations of aluminum in 1999 exceeded those measured in both 1988 and 1997. These differences between years may be due to the extra caution taken in obtaining samples from good depositional areas in 1999. Little variation is seen in the spatial variation in aluminum concentrations from sample stations along Dome and Victoria creeks during the operational period. Comparison between available pre-operational and operational measurements indicates little temporal variability in aluminum sediment concentrations.

Arsenic

In general, arsenic concentrations are highest at station P1. This trend is consistent for the 1986, 1997 and 1999 sampling periods (Figure 3.8-2). The reasons for the conflicting data in 1988, which has a low P1 and high D2 arsenic concentration is not known; however, it is possible that a sample numbering or transcription error in the original data entry may have occurred. If this were true the trend in P1 arsenic concentrations would be consistent for all sediment sampling events.

A closer review of stations D1, D2 and D3 indicates an increased arsenic concentration in 1997 (200 mg/kg) and 1999 (1340 mg/kg for D1 and ~200 mg/kg for D2 and D3) relative to the 1986 baseline (~25 mg/kg). The highest concentrations were measured at station D1, which is near the mill, upstream of the Mount Nansen tailings impoundment and effluent discharge station E7 (Figure 2.1-1). The elevated arsenic concentration at D1 indicates that this increase is possibly natural variation within the system or influenced by the upper Heustis adit. Increased arsenic concentrations at D3 and D2 are possibly associated with arsenic attenuation related to tailings pond seepage recharge.

Cadmium

Cadmium concentrations in the sediment were recorded for all three periods including two pre-operational collection periods (Figure 3.8-3). The patterns for cadmium concentrations in the sediment illustrate a similar trend to that discussed for arsenic; however, concentrations for

cadmium are approximately 1/100th of those recorded for arsenic. For the majority of the time periods, sediment cadmium concentrations at P1 were the highest for all sites sampled. The exception to this trend is the 1988 sampling-period, where D2 was recorded at similar levels as the 1986 P1 sample. Sample P1 was recorded at similar levels as the 1986 D2 sample.

These results support the earlier statement that samples may have been incorrectly labelled or transcribed, resulting in 1988 P1 and D2 sample results being switched. The highest sediment cadmium concentration was recorded in 1999 and 1997 at station P1. Additional increases over time were reported for station D1, downstream of the Upper Heustis adit portal but upstream of the tailings impoundment and effluent discharge point (E7). In general, the sediment cadmium concentrations downstream of the tailings impoundment and effluent discharge point in 1999, are within the levels reported during the 1986/88 baseline collections.

Chromium

Samples were collected for sediment chromium measurements in 1988, 1997 and 1999 (Figure 3.8-4). The highest chromium concentrations were recorded in 1999 at station V5, located several kilometres downstream of the effluent discharge point (E7) and station D2 located 500 m downstream of this discharge point (Figure 2.1-1). Although chromium concentrations are elevated in 1999 relative to 1988 baseline values, elevated values are also recorded at reference locations and therefore are unlikely to be related to the effluent discharge.

Cobalt

In 1988, cobalt concentrations were all below the detection limit of 20 mg/kg (Figure 3.8-5). In 1997 and 1999 cobalt concentrations were measured at values ranging from 5 to 22 mg/kg at stations D3 and D1, respectively. Due to the high detection limit in 1988 it is unclear if cobalt concentrations have increased in the operational and post-operational periods.

Copper

Samples collected in 1986, 1997, and 1999 show station P1 with the highest copper concentrations (Figure 3.8-6). Concentrations measured in 1986, 1988 and 1997 show relatively similar levels at stations D1 and D2. Measurements at V1 and V5 are similar between the two baseline periods (1986 and 1988). The results form the 1999 collections would indicate that concentrations at all locations have increased considerably, even since 1997. The elevated copper concentrations were recorded at both reference and exposure stations in 1999, suggesting

that the increases are not related to point source discharges from the water treatment plant or tailings impoundment. It is suspected that the samples collected in 1999 were from longer-term depositional areas and not transitory depositional areas, resulting in higher concentrations.

Iron

Sediment iron concentrations range from 10,000 mg/kg to 112,000 mg/kg (Figure 3.8-7), with the highest concentration measured at station P1 in 1999. With the exception of station P1 and D1, iron concentrations have remained consistent between the years and sampling stations. The increase at station D1 is consistent to the trend seen for other parameters.

Lead

Lead concentrations in the sediment (Figure 3.8-8) illustrate a similar pattern to that seen for other analytes such as arsenic, cadmium and copper. The highest concentration was measured at station P1in 1999. As seen previously, lead concentrations for the other sampling periods were also greatest at station P1. The exception to this is 1988, the potential reason for this was discussed earlier. In general, the concentrations in 1997 and 1999 are higher than corresponding stations in 1986 and 1988; however, these increases are seen at both reference and exposure areas and therefore are more likely related to sampling differences than operational impacts.

Manganese

Sediment manganese concentrations in 1999 are considerably more erratic than identified during earlier sampling periods (Figure 3.8-9). The highest concentration was measured at station D1 in 1999, which is downstream of the Upper Heustis adit portal and upstream of the effluent discharge point (E7) and the tailings impoundment. The reason for this increase may be related to the upper Heustis mine, which is located slightly upstream of station D1. Other stations that demonstrate an increased manganese concentration relative to earlier periods include stations P1, V5, V4 and V6. It is unclear if these differences are due to natural variability at specific sampling locations or from the WTP effluent discharge and/or tailings impoundment seepage. The latter is more likely since the increases at stations D2 and D3 are minimal in comparison even though they are in fairly good depositional areas and in close proximity to the discharges.

Molybdenum

In contrast to all previously discussed metals, molybdenum shows a large reduction in concentrations in 1999 relative to 1997 and 1988 (Figure 3.8-10). The highest concentration of molybdenum was measured at station P1 in 1997 (20 mg/kg); this concentration was less than 5 mg/kg at station P1 in 1999.

Nickel

Nickel concentrations in the sediment were highest at stations V5, D2 and D3 in 1999 (Figure 3.8-11). The pattern illustrated by nickel concentrations follow a similar pattern to that seen with chromium. In general, nickel concentrations at stations sampled in 1999 are greater than those sampled in previous sampling periods. These increases are not necessarily related to operations at the Mount Nansen Site since increases were measured at both reference and exposure locations. The similarities between nickel and chromium concentrations suggest that these elements respond in a similar nature within the receiving environment.

Silver

The largest silver concentrations were measured at station P1 in 1997 and 1999 (Figure 3.8-12). In 1997, stations D1, D2 and D3 show a moderate increase in sediment silver concentrations relative to the 1986 and 1988 baseline collections. In 1999, samples collected from station D1 and D3 had higher concentrations than previously recorded. The cause of the increase at these two stations is unknown, but the spatial extent of this increase is restricted to these locations; station D2 has silver concentrations similar to baseline conditions.

Zinc

Zinc concentrations in the sediment (Figure 3.8-13) illustrate a similar pattern to that seen for other analytes such as arsenic, cadmium, copper and lead. The highest concentration was measured at station P1in 1999. As seen previously, zinc concentrations for the other sampling periods were also greatest at station P1. The exception to this is 1988, for which an explanation was discussed earlier. In general, the zinc concentrations between the four time periods are similar at each of the sampling locations. A slight increase may be apparent in 1997 and 1999; however, these increases are seen at both reference and exposure areas and therefore are not likely related to operational influences.

3.8.1 Screening Level Ecological Risk Assessment

The framework for Ecological Risk Assessment (CCME, 1996) defines a three-tiered approach consisting of sequentially more sophisticated and complex evaluations of contaminated sites. At the present time, the first tier Screening Assessment is being applied to the Mount Nansen site. The application of the Screening Assessment is to provide a simple descriptive species level assessment based on the September 1999 surface water quality collections and potential risk to aquatic resources.

3.8.1.1 Receptor Characterization

The Yukon Placer Authorization stream classification of Dome and Victoria creeks is Type IV defined as "streams and/or stream reaches considered to be inaccessible to fish because of physical barriers, velocity barriers, or unsuitable channel morphology or which have unproductive habitats". Although there has been no evidence of the presence of fish in Dome Creek, a large number of dead arctic grayling fry (20-30) were reported at the Dome Creek inflow to Victoria Creek and at the next pool downstream (~15m) (Environment Canada, 1999). Based on the observations of fish presence in Victoria Creek at the mouth of Dome Creek, Grayling are considered a receptor species for the purposes of the screening level ERA. Additional receptor species include invertebrates and aquatic plants, which serve an important ecological role as a food source and fish habitat.

Additional receptors for the Mount Nansen area include wildlife and birds. Moose are known to occur within the area at a low to moderate abundance and moose tracks have been identified around the tailings pond. Migratory birds (geese) and songbirds have been identified within the area. Other wildlife reported sighted at the Mount Nansen minesite includes bear, lynx, fox and woodland buffalo.

3.8.1.2 Exposure Assessment

The primary exposure pathway for the selected receptors to effluent discharge and tailings pond seepage is via the aquatic environment. Therefore the focus of this screening level assessment is on the aquatic environment within Dome Creek. No parameters exceed the CCME guidelines for protection of aquatic life at either Victoria Creek or the Nisling River sampling stations, therefore no screening assessment is necessary for this region. For Dome Creek, only the parameters that exceed available CCME guidelines are assessed for risk to potential aquatic resources.

An additional ERA assessment was completed for the exposure of birds and wildlife to contaminant concentrations present within the tailings pond and at station D3. The ERA is based strictly on the water samples collected during the Conor Pacific field investigations in September 1999.

From the parameters discussed in the surface water quality section, the following parameters were identified as exceeding the CCME guidelines and/or the Yukon Generic Water Quality standard at one or more stations within Dome Creek. The parameters and locations include:

Table 3.8-1 Stations and Parameters exceeding CCME Criteria or Yukon CSR Standards

Parameter	CCME (mg/l)	Yukon (mg/l)	Location
Ammonium	n/a	n/a	D2, D3, D4 (1998)
Arsenic	0.005	0.5	D2, D3
Copper	0.004	0.09	D2, D3
Manganese	n/a	1.0	D3, D2, D4
Zinc	0.03	0.3	D1, D3
WAD Cyanide	n/a	0.05	D2

3.8.1.3 Hazard Assessment

The primary emphasis of the hazard assessment is to obtain toxicity information from the literature for the contaminants of concern (CCME, 1996). The potential for a chemical or other agent to cause damage to the structure or function of an organism is considered to be a hazard. The response elicited from the organism is dependent on both the dose (concentration of chemical) and duration of exposure. This dose-response relationship is both organism and chemical specific. The concentration of a chemical that has a very low probability of causing an adverse health effect is termed the exposure limit or benchmark value.

Screening benchmark values for aquatic organisms were obtained from "Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota" (Suter and Tsao, 1996) prepared for the US Department of Energy and from the toxicological literature used in assessing the CCME guideline values. Conventional lowest chronic values were used as the screening level endpoints for metal parameters assessed in this screening level

ERA. The ammonium benchmark value is from the USEPA (1985) and has been adjusted for pH and water temperature and reported as un-ionized ammonia. The following table outlines the lowest chronic values for fish, invertebrates and plants where data is available.

Table 3.8-2 Screening ERA Benchmark Criteria

Parameter/Receptor	Lowest Chronic Value (µg/l)
Arsenic	
Fish	2,962
Invertebrates	914
Aquatic Plants	2,320
Copper	
Fish	3.8
Invertebrates	0.25
Aquatic Plants	1
Manganese	
Fish	1,780
Invertebrates	1,100
Zinc	
Fish	36.41
Invertebrates	46.75
Aquatic Plants	30
Un-ionized Ammonia	
Aquatic Organisms	83
Free Cyanide	
Fish	1 to 3
Migratory Birds	20 to 50 (mg/L)
Ungulates	276.6 (mg/L)

Benchmark criteria for wildlife and birds are based on the No Observable Adverse Effect Concentration (NOAEC) values provided in Sample et al., 1996. The NOAEC values for ingestion of water were used as the benchmark criteria as the exposure pathway to the contaminants of concern is via the aquatic pathway.

3.8.1.4 Risk Characterization

The quotient method was used to establish an understanding on the potential risk to the receptors at the Mount Nansen property. This method uses the expected environmental concentration (EEC) and literature based toxicological benchmark values (BC). The quotient is calculated by taking the ratio of the EEC and a BC. Higher quotients provide greater evidence of a hazard or risk. Quotients <1 imply that risk is slight. Quotients near 1 indicate uncertainty in the risk estimate. Quotients greater than 1 imply that risk is greater and that action should be taken to reduce the risk.

Un-ionized Ammonia

The toxicity of ammonium is highly dependent on pH and water temperature. As temperature and pH increases the concentration of un-ionized ammonia increases. Since un-ionized ammonia is known to be the toxic component, it is important to determine the concentration of un-ionized ammonia present at each location.

Determination of un-ionized ammonia can be calculated by utilizing the conversion table designed by the USEPA (Thurston *et al.* 1979). This table provides the percent of the total ammonia concentration that is present as un-ionized ammonia at the desired pH and temperature.

For this screening level risk assessment, all ammonia measurements were converted to un-ionized ammonia. For comparison purposes, data from the 1998 operational period has also been assessed because it is based on ammonia levels during the summer when temperatures are higher. The calculated un-ionized ammonia concentrations are provided in Table 3.8-3.

According to the USEPA (1985) acute toxicity of un-ionized ammonia for freshwater organisms ranges from 0.083 to 22.8 mg/l. As the lowest effect level benchmark value for un-ionized ammonia the concentration of 0.083 mg/l was used for the quotient determination. Calculated risk quotients are also provided in Table 3.8-3.

Based on the calculated un-ionized ammonia concentrations from water samples collected in 1999 (Table 3.8-3), toxicity to fish and invertebrates is likely only at station D2. Station D2 is the only station where the risk quotient value approaches one, indicating a potential risk to receptors in this area.

In 1998, un-ionized ammonia concentrations were much greater than identified in 1999. These increases are due to the higher release of total ammonia during the operational period, in addition to higher pH and temperature during this period. Table 3.8-3 provides the calculated un-ionized ammonia concentrations along the spatial gradient. Stations D2 and D4 both have un-ionized ammonia concentrations (0.41 mg/l and 2.34 mg/l, respectively) which are within the range of known toxicity to aquatic organisms. Both of these stations have a risk quotient greater than one, indicating a high level of toxicological risk at these locations. Documented observations by Environment Canada (1999) that dead larval arctic grayling were present in Victoria Creek at the outflow of Dome Creek (Station D4) supports the conclusion that lethal concentrations were reached during the summer operational discharge periods.

No ammonia guideline values for protection of wildlife are presently available. Nitrite is often of more concern to livestock and, for general comparison, the nitrite value in the tailings pond (0.121 mg/l) is well below the CCME guideline for protection of livestock (10 mg/l). Based on professional judgement, the ammonia concentrations at both D3 and the tailings pond would not amount to a significant risk to wildlife receptors.

Arsenic

The environmental concentrations of arsenic in the receiving environment are 80 µg/l at station D2 and 180 µg/l at station D3. Although these concentrations greatly exceed the CCME water quality guideline of 5 µg/l, these concentrations are much lower than the benchmark criteria provided in the hazard assessment section. These results suggest that there is limited risk to fish, invertebrates and aquatic plants at these locations based on present arsenic concentrations.

The concentrations of arsenic within the tailings pond were below the analytical detection limit of 0.02 mg/l. Therefore no risk as a result of arsenic exposure is expected for wildlife or birds in contact with the tailings pond. As stated earlier, station D3, which is downstream of the tailings pond and represents potential groundwater seepage from the tailings pond to the receiving environment, has a concentration of 0.180 mg/l. Based on the water based NOAEL of 0.29 mg/l for wildlife (white-tailed deer) and 22 mg/l for birds (swallow), the potential risk to these receptors from arsenic exposure at these two locations is negligible.

Copper

The environmental concentrations of copper in the receiving environment are 214 µg/l at station D2, and 4820 µg/l at station D3. These values greatly exceed the CCME guideline value of 6 µg/l for very hard waters (>300 mg/l). Based on the lowest chronic values, the risk quotient values for fish, invertebrates and plants are greater than 1, therefore indicating that these receptors are at risk from exposure to copper concentrations at these locations.

The concentrations of copper within the tailings pond and downstream at station D3 are 17.3 mg/l and 48.2 mg/l, respectively. Both of these concentrations are below the NOAEL for wildlife (65.2 mg/l) and birds (202 mg/l) exposed to contaminated waters. Therefore, risk from copper to these receptors is classified as negligible.

Manganese

Manganese concentrations at stations D2 (1250 µg/l), D3 (7990 µg/l), and D4 (1850 µg/l) exceed the Yukon Generic Water Quality standard (1,000 µg/l). Based on the lowest chronic value for fish (1780 µg/l), D2 has a risk quotient ratio of 1250/1780 (0.7) that is less than 1 and therefore not classified as a risk to this receptor. On the other hand, invertebrates have a benchmark value of 1100 µg/l resulting in a risk quotient 1250/1100 = 1.14, which is near 1 and considered insufficient data to assess the level of risk. Stations D3 and D4 have manganese concentrations that exceed the benchmark criteria for both fish and invertebrates and are considered a high risk to these receptors.

The concentrations of manganese within the Tailings Pond and station D3 are 1.36 mg/l and 7.99 mg/l, respectively. Both of these concentrations are well below the NOAEL for wildlife (377 mg/l) and birds (4284 mg/l) exposed to contaminated waters. Therefore, risk from manganese to these receptors is classified as negligible.

Zinc

The environmental concentrations of zinc in the receiving environment are 1100 µg/l at station D1 and 88 µg/l at station D3. As indicated earlier, these concentrations exceed the CCME water quality guideline of 30 µg/l. Further assessment comparing to the lowest chronic value benchmark indicate that zinc concentrations at both station D1 and D3 pose a substantial risk to fish, invertebrates and aquatic plants.

The concentrations of zinc within the Tailings Pond and station D3 are 0.032 mg/l and 0.088 mg/l, respectively. Both of these concentrations are well below the NOAEL for wildlife (685.4 mg/l) and birds (62.3 mg/l) exposed to contaminated waters. Therefore, risk from zinc to these receptors is classified as negligible.

Cyanide

Cyanide chemistry is highly complex and measurement methodologies greatly influence the resulting data. As stated earlier, WAD cyanide is the most representative of the potential free cyanide, the primary toxic form of cyanide. The toxicity of cyanide is dependant on it coming into contact and reacting with the appropriate binding sites within the organism. The free cyanide attaches to iron-containing enzymes leading to the formation of iron-cyanide complexes. Cyanide poisoning in fish is obvious from the bright red appearance of the gills. This bright red color is related to the formation of the iron-cyanide complexes. The lethal process of cyanide toxicity is related to the iron-cyanide complex inhibiting cytochrome oxidase. The ultimate response is the depletion of energy and subsequent death of the organism; reduced reproductive potential, growth or other histopathological damage. The lowest test concentration of free cyanide that elicited sub-lethal effect ranged from 0.001 to 0.003 mg/L causing impaired reproduction. Based on the present (September 1999) WAD cyanide concentrations, the sample at station D2 suggests possible impairment to the fisheries. However, since no fish are known to be present within the Dome Creek drainage the risk to the aquatic environment is negligible. WAD cyanide concentrations in Victoria Creek and the Nisling River are below levels expected to elicit a significant toxic response.

The WAD cyanide concentrations (most representative of free cyanide) in the tailings impoundment (E7) and receiving environment stations D2 and D3 are 5.63 mg/L, 0.124, and 0.017, respectively. These concentrations are much lower than the free cyanide NOAEL concentrations of 276.6 mg/L for ungulates and between 50 and 20 mg/L for migratory birds. Based on this information it is not expected that free cyanide concentrations in the tailings impoundment pose a risk to wildlife.

3.8.1.5 Conclusions

It appears that station D3 and D2 pose a considerable risk to aquatic receptors with respect to a number of the metal parameters measured. Although this risk has been identified, it is important to note that Dome Creek is not classified as a fish bearing waterbody and there has been no documented evidence of fish existing at these locations. With that said, the screening risk

assessment provided is an extreme case and in reality it is unlikely that the impacts to the Dome Creek ecosystem will have a significant ecological impact on the Mount Nansen area.

Ammonia appears to be of high concern in the Dome Creek drainage and may have posed a severe risk to the ecology of Victoria Creek in the past. Environment Canada (1999) documented this impact when summer ammonia levels in 1998 likely resulted in the presence of dead grayling fry within Victoria Creek near the Dome Creek outflow. Because the toxicity of ammonia is highly pH and temperature dependent, it is important to have strong control on ammonia release in the warmer summer months.

Based on the present discharge conditions from the Mount Nansen water treatment plant, there is no apparent risk to aquatic receptors beyond Dome Creek. Concentrations in the Nisling River are within both CCME guidelines and Yukon Generic Water Quality standards indicating negligible risk in these areas.

4.0 EXPLORATION AND DEVELOPMENT HISTORICAL REVIEW

4.1 EXPLORATION

Chevron Canada Resources Ltd. optioned (to earn a 62% interest the property) from BYG Natural Resources Inc. in 1985 and carried out exploration in the Mount Nansen area. However, in 1988, BYG held a sub-option agreement to earn 50% of Chevron's interest. With all options exercised, BYG would hold a 69% interest and Chevron a 31% interest. In 1989, Chevron and BYG held 30 mineral leases and 257 mineral claims covering 5299 hectares comprising the Mount Nansen property (Figure 1.2-1). Four surface leases were also held to cover the existing mill, tailings impoundment and water supply systems. During this period, extensive exploration consisting of trenching, drilling, geophysics and soil geochemistry was carried out. Metallurgical testing was also done to determine the amenability of oxide and sulphide ore to cyanidation. Development work in 1988 consisted rehabilitation of the Huestis 4300 level workings, examination and redesign of the mill facility for cyanidation and the study of potential tailings impoundment sites. By 1994, B.Y.G Natural Resources Inc. had acquired 100% interest in the Mount Nansen property. In April 1994, BYG Natural Resources Inc. signed an agreement with J. Malcolm Slack and Associates, a company of former Noranda executives, for financing to develop the Mount Nansen property. In the summer of 1994, development work consisted of a topographic survey, geotechnical drilling, rehabilitation of the Victoria Creek water well and a tailings impoundment study. Exploration and development work continued in 1995 with road construction, finalizing the tailings impoundment design, stripping of borrow areas within the tailings impoundment footprint, rehabilitation of the existing office and kitchen buildings, construction of a mine camp and initiation of mill upgrades.

4.2 WATER LICENSE APPLICATION AND PERMITS

In 1988, BYG Natural Resources Inc. initiated discussions and submitted environmental baseline study and development reports to Indian and Northern Affairs Canada, Water Resources Division and the Regional Environmental Review Committee (RERC) as part of the Environmental Assessment and Review Process (EARP). The project was temporarily shelved in 1989 because of low metal prices. At the time of application to EARP, BYG Natural Resources Inc. planned to mine 300,000 tonnes of gold oxide ore using open pit methods from the Brown-McDade deposit. The existing mill was to be retrofitted for cyanidation of the ore using carbon-in-pulp. The milling rate was estimated at 300 tonnes per day for an expected project life of 4 years, generating an estimated 620,000 tonnes waste rock. BYG Natural

Resources applied for various mining permits and licenses in 1995. A Class A water license was granted to B.Y.G Natural Resources Inc. for the Mount Nansen Mine on April 1, 1996.

4.3 ENVIRONMENTAL BASELINE STUDIES

The Mount Nansen minesite was subject to environmental baseline studies between 1985 and 1990. Norecol Environmental Consultants Ltd. was the lead consultant with their studies beginning October 11, 1985 (Norecol, 1985, 1987, 1989). Components addressed in the environmental baseline program included: hydrology/climate, hydrogeology, fisheries, surface water quality, acid-base accounting, terrestrial studies and land use, mine plan, waste management plan, water management plan, and reclamation plan and abandonment. Environmental baseline field studies were augmented by compilation and review of information for the Mount Nansen minesite area and discussions with Chevron Minerals Ltd., BYG Natural Resources Inc and Archer Cathro (1981) Ltd. Baseline studies completed included:

a) Water Quality: 1976 to 1994
b) Stream sediment: 1986 and 1988
c) Hydrology and Climate: 1988 – 4 times
d) Hydrogeological: piezometers installed 1989
e) Benthic Invertebrates: 1976, 1977, 1988
f) Fisheries: 1977 and 1989
g) Acid-base accounting: 1985, 1989, 1994
h) Wildlife aerial survey 1986
i) Fisheries survey: Victoria, Nansen and Nisling

This included additional environmental baseline studies carried out by Water Resources Division of Indian and Northern Affairs Canada and Environmental Protection of Environment Canada for the Mount Nansen minesite (Figure 4.3-1).

It was recognized by Norecol Environmental Consultants Ltd. from the development stage that the primary potential environmental effects from the Mount Nansen minesite were from the tailings impoundment on the downstream receiving environment (Dome and Victoria creeks). Potential environmental effects could be caused by effluent seepage through the tailings impoundment or an emergency decant (Norecol, 1989). Options identified to minimize potential impacts included: pumping seepage back to the tailings impoundment from downstream groundwater monitoring wells, installation of a low permeability geomembrane liner in the tailings impoundment or treatment of effluent prior to discharge into the tailings impoundment.

4.3.1 Archaeological Assessment

Archaeological information for the Mount Nansen area (esp. Victoria Creek crossing) was summarized in an assessment conducted by Yukon Tourism, Heritage Branch and is summarized in a letter dated 18 August 1995.

The assessment indicated traditional use on the east bank of Victoria Creek in the form of an old foot trail that follows the creek bank, and by a bush camp. No further heritage resource concerns were noted for the area near the Victoria Creek crossing.

The assessment also indicated that the archaeological potential in the vicinity of the tailings impoundment was judged to be very low. No further heritage resources assessment was recommended for the area.

4.3.2 Baseline Climatic Conditions

For the pre-operational period, the long term meteorological station located closest to the site was Carmacks which had 22 years of data available (summarised in the Yukon Territorial Water Board, water license issued to BYG Natural Resources Inc., March 1996). The station was located approximately 60 km east of the site at an elevation of 524 m, or about 600 m below the minesite elevation.

Precipitation at Mount Nansen occurs primarily as snow from November to the end of April. On average approximately 40% of the annual precipitation falls as snow which corresponds to the typical snowpack of 1 m observed at the site. Some rainfall occurs as early as April, but the majority of rainfall occurs from June to August. Total annual precipitation at the Carmacks station is approximately 270 mm. Total monthly precipitation ranges from 6.6 mm (April) to 53.8 mm (July).

The closest station for which lake evaporation data was available was Pelly Ranch, which is located about 80 km north of the minesite at an elevation of 454 m. From May to August, evaporation exceeds average precipitation indicating a soil moisture deficit. During the wettest month (July), lake evaporation is approximately twice the precipitation.

Long term climatic data for air temperature and wind were available from the Environment Canada meteorological station in Whitehorse[4], approximately 175 km to the southeast. Mean

[4] Environment Canada, http://www.cmc.ec.gc.ca/climate/

annual air temperature is -1°C. Mean monthly air temperature ranges from -18.7°C (January) to 14.0°C (July).

4.3.3 Stream Water Quality

The majority of pre-operational environmental baseline water quality data were collected by Norecol Environmental Consultants Ltd. Sampling program were conducted by Norecol on 11 October 1985; 4 March, 6 June, 4 September 1986; 4 July, 28 August 1987 and 27 May 1988. Additional water quality sampling was conducted by Indian and Northern Affairs, Water Resources Division and Environment Canada, Environmental Protection Services. The work of Environmental Protection Services also included limited stream flow measurements. On 14 September 1994, D. Melling also sampled a series of 7 reference sites. Details of this information, including interpretation, were presented in the Initial Environmental Evaluation (Higgs, 1995a, b, c). These and any other known pre-operational water samples events are shown in 4.3-1. Conor Pacific has compiled this available data into an environmental database. A discussion of this data is deferred to Section 6.7.

4.3.4 Stream Sediment Quality

Stream sediment samples were collected by Norecol at the water quality sites on 4 September 1986 and by Environmental Protection Services in 1988 (Figure 4.3-1). Details of this information, including interpretation, were presented in the Initial Environmental Evaluation (Higgs, 1995a, b, c). Conor Pacific has compiled these available data into an environmental database. A discussion of this data is deferred to Section 6.8.

4.3.5 Benthic Invertebrates

Pre-operational information on benthic invertebrates is provided in two reports by the Environmental Protection Service, Environment Canada, Pacific and Yukon Region. Benthic invertebrates were sampled during 1976-1977 (Environmental Protection Service, 1979) and during 1988 (Environment Protection Service, 1995). Findings of the 1988 study were also included in the Initial Environmental Evaluation by BYG Natural Resources Inc. (BYG Natural Resources, 1994a and b). The results of the 1988 study are presented below since that study included a larger number of stations located throughout the Victoria Creek watershed and findings were similar to the 1976-77 study.

Benthic invertebrates were collected at nine stations located throughout the Victoria Creek watershed. Samples were taken in triplicates by means of artificial substrate invertebrate

samplers that were left in the watercourse for a period of 41 days to allow for colonization. Results are summarized in Table 4.3-1 and a detailed taxonomic breakdown for each station is provided in Appendix C.

A total of 54 taxa were identified in the study area during 1988. The Back Creek sites (ST-5 and ST-7) reflected the lowest densities of benthic invertebrates found in the study area, which was assumed to be caused by placer mining operations upstream on Back Creek (Environmental Protection Service, 1995). The dominant order found overall was Plecoptera (stoneflies), with the genus *Podmosta* comprising over 85% of this order at each site. Ephemeroptera (mayflies) was the second most abundant order overall, but it was absent from Back Creek, Pony Creek and Dome Creek. Diversity and evenness indices were low for Dome Creek, as was also found in the 1976-77 study.

4.3.6 Fisheries

Pre-operational fisheries information for the Mount Nansen area is extremely limited. Arctic grayling (*Thymallus arcticus*) and sculpins (*Cottus* sp.) have been captured by electrofishing in Victoria Creek (Environmental Protection Service, 1979). Although no other fish species were captured, the Victoria Creek watershed was reported to have moderate fish habitat capability that could support other species.

The Nisling River was reported to have moderate fisheries capability (Norecol, 1989). Fisheries and Oceans Canada conducted radio tagging studies in the Nisling River (dates undetermined; reported in Norecol 1989). Chum salmon (*Oncorhynchus keta*) and chinook salmon (*Oncorhynchus tshawytscha*) were tracked approximately 30 km and 80 km, respectively, upstream of the confluence with the Donjek River. It was deemed possible for chinook salmon to migrate as far upstream as Nansen Creek or Victoria Creek provided there were no fish barriers. Salmon were not expected far upstream into the Mount Nansen property since the small streams draining the development area (Dome Creek, Pony Creek and Back Creek) were too small to have significant fisheries habitat and, in the case of Back Creek, may have been significantly impacted by placer mining activity.

Chemical analyses (copper, lead, zinc and mercury) of flesh samples from Arctic grayling taken in Victoria Creek in 1977 did not reveal any metal levels of concern (Environmental Protection Service, 1979).

It is important to note that Fisheries and Oceans Canada classified Victoria Creek as a Type IV stream under the authority of the Yukon Placer Authorization of the federal *Fisheries Act*. This means that for the purposes of the Yukon Placer Authorization and the *Fisheries Act*, the fish habitat values have not been assigned.

4.3.7 Wildlife

Pre-operational information on wildlife for the Mount Nansen area was summarized by Norecol (1985 and 1989). The terrain in the study area is uniform (i.e. rounded low lying mountains with shallow valleys and sparse vegetation) and was identified to have a generally low to moderate capacity to support wildlife. Moose (*Alces alces*) occurred in low numbers throughout the Mount Nansen area during summer and fall, favouring the valley bottoms and riparian edges of watercourses downstream of the property. During the winter period, a few moose utilized the lower elevations, in particular the floodplain and lower slopes along Victoria Creek. The low snow depth and availability of browse, primarily willow, offer limited winter range for low densities of moose.

Woodland caribou (*Rangifer tarandus*) occurred in the general area and occasionally moved through the property. Other large mammals that possibly occurred in low numbers included black bears (*Ursus americanus*) and timber wolf (*Canis lupus*). The area appeared to have generally low productivity for furbearers as little sign of furbearers were observed during field visits and helicopter flights (Norecol, 1989).

As part of the Canadian Wood Bison Recovery Program, a herd of Wood Bison (*Bison bison athabasca*) was established by the Yukon Game Branch in the Nisling River area, approximately 10 to 15 km downstream of the Mount Nansen property. The herd originally maintained in pens, was released in 1988. More animals were brought to the area and released afterwards. By the mid-1990s, the herd was becoming well established in the Nisling River valley and the Aishihik Lake area (reported in Higgs, 1994a).

4.3.8 Vegetation

The pre-operational vegetation of the Mount Nansen area was described in Norecol (1989). The Mount Nansen property lies in the Dawson Range Ecosystem (Oswald and Senyk, 1977). Open stands of black spruce (*Picea mariana*) and white spruce (*Picea glauca*) occurred in the valley along Victoria Creek and Nansen Creek; black spruce was predominant on wetter sites. Stunted black spruce and trembling aspen (*Populus tremuloides*) occurred on the lower slopes while the upper slopes and ridges were largely devoid of trees. Birch (*Betula* sp.) and willow shrubs

formed extensive cover from valley bottom to above treeline. Labrador tea (*Ledum groenlandicum*), mosses and lichens were dominant in the understory.

Vegetation disturbances in the area of the Mount Nansen property was generally limited to local disturbances related to pre-operational activities (primarily exploration). Since most of the Mount Nansen developments (i.e., pits, mill, tailings ponds, etc.) are located near or above the treeline, the vegetation susceptible to environmental impacts is comprised of shrubs and ground cover.

4.4 ARD/ML PREDICTION

Pre-operational ARD/ML prediction work was conducted primarily by Norecol Environmental Consultants Ltd. (Norecol, 1985, 1987, 1989).The first ARD assessment was initiated on October 11, 1985. Eight (8) rock samples were collected and submitted for Acid-Base-Accounting to determine their acid generating potential. Test results indicated that the Huestis zone ore and tailings have a high acid generation potential (Table 4.3-2). Ore samples from the Brown-McDade zone exhibited a low acid generation potential and waste wallrock has an acid neutralization potential. Waste rock was recommended for construction purposes. It was recognized that additional sampling of representative lithologies were needed from material to be mined.

Norecol Environmental Consultants Ltd. conducted a second ARD prediction program in 1989. Eleven representative waste rock and ore samples were collected from a drill core of the Brown-McDade deposit to assess the geological variability of each rock type (Table 4.3-2). Rock types sampled were altered granodiorite, feldspar porphyry dike and unaltered granodiorite. Based on Acid-Base-Accounting test results, Norecol (1989) predicted that it would be unlikely that the Brown-McDade zone would be acid generating. This prediction was based primarily on the ore to be mined being oxidized.

A comprehensive ARD prediction program was conducted in 1994 to provide additional information on the acid generating potential of rock types to be encountered during mining of the Brown–McDade open pit and confirm previous prediction results (Table 4.3-2). A total of 37 drill core samples were collected from the 1988 drillholes. Drillholes were selected to span the entire strike length of the Brown-McDade deposit. Samples were divided into three categories of waste rock and three rock types: (1) altered granodiorite, (2) altered feldspar porphyry and (3) unaltered granodiorite.

Estimated percentages of each rock type comprising waste rock from the Brown-McDade deposit were:

a) Upper altered granodiorite – 60%,
b) Lower altered granodiorite – 10%,
c) Upper feldspar porphyry – 15%,
d) Lower feldspar porphyry – 5% and
e) Unaltered granodiorite – 10%.

Based on interpretation of the ABA test results, it was concluded that the potential for acid generation from waste rock was negligible (Higgs, 1994b).

A concern for the potential for metal leaching of waste rock materials was identified. Therefore waste rock samples were assessed for their metal leaching potential by:

a) analysis of ABA samples for metals by ICP and whole rock oxide methods;
b) preparation of composite samples according to weight per cent by rock type; and
c) distilled water leaching tests.

Several ABA samples had high arsenic levels with highest levels in upper feldspar porphyry samples (up to 5899 ppm). Lead concentrations were also highest in upper feldspar porphyry samples. Most had high zinc levels greater than 1000 ppm. Leaching tests indicated a significant potential for arsenic, lead and zinc leaching from waste rock. Table 4.4-1 shows comparative solids and leaching chemistry for each rocktype.

In their Initial Environmental Evaluation (IEE), B.Y.G Natural Resources Inc. characterized tailings from the Brown-McDade oxide ore as containing 0.59% sulphur, a MPA of 18.4 kg $CaCO_3$ / tonne, a NP of 12.8 kg $CaCO_3$ / tonne, and a NNP of –5.61 kg $CaCO_3$ / tonne (Higgs, 1995). Despite the negative NNP, the tailings were not expected to generate acid. Reclamation and revegetation of beached (exposed) tailings areas were recommended.

In November 1995, Norecol, was requested to review information to assess the potential for significant leaching of arsenic from tailings. The review revealed the following major points:

a) The tailings contain elevated concentrations of metals and arsenic and required further evaluation of their ARD/ML potential to confirm they would be non-acid generating.

b) The high NP values are likely primarily due to high residual lime from the mill process, which will not provide long-term buffering as would the presence of carbonate minerals.
c) Residual sulphides in tailings are exposed and liberated from silicate and carbonate matrix by the milling process, thus exposing sulphides to oxidation.
d) The acid generation potential of the tailings was assessed using a composite sample representing the entire orebody and is therefore not representative of the vertical stratification of the orebody from oxidized ore downward to sulphide ore.
e) Leaching tests on the feed material, containing 0.6% arsenic, did not identify or consider the mineral forms of arsenic, which will have distinctly different geochemical behavior over time.

and concluded:

a) There is a significant potential for pH depression of tailings porewater, considering the likely higher sulphide content of the upper tailings.
b) There is a long-term potential for arsenic leaching in tailings by the oxidation of arsenopyrite under depressed pH conditions.
c) Well designed kinetic testing could address the engineering measure needed to address acid generation and metal leaching.

4.5 CONCEPTUAL WASTE MANAGEMENT PLAN

BYG Natural Resources Inc. outlined the need for a comprehensive waste management plan for managing waste materials. This included cyanide containment and control in effluent; sewage and refuse disposal, dust control and air emissions, surface runoff, reagent storage and handling, fuels and explosives storage and handling, and waste rock and tailings management (Norecol, 1987).

Operational waste management monitoring for ARD/ML was to include:

a) identification of individual rock types excavated during mining,
b) detailed records of waste rock distribution of all mined materials left on surface, and
c) regular review of waste management logs to ensure the risk of ARD/ML in on-surface waste materials is eliminated or minimized.

Proposed decision criteria for potentially ARD/ML waste and low-grade materials were:

a) a Neutralization Potential Ratio (NPR) greater than 3.0 for materials to be used for construction purposes;
b) segregation of theoretical acid generating waste rock defined as having a Net Neutralization Potential (NNP) less than 0; and
c) segregation of low grade ore defined as having a gold content between 1 and 2 grams per tonne.

4.6 CONCEPTUAL WATER MANAGEMENT PLAN

Norecol Environmental Consultants Ltd. (1987) recognized the need for a water management plan that included: peak runoff estimates from disturbed and undisturbed areas, layout of surface drainage system and design of settling ponds, drainage ditches and tailings impoundment. Details of a conceptual water management plan were provided in the water license application (Higgs, 1995). The key objectives were to:

a) ensure all contaminated water are retained and treated to appropriate water quality criteria prior to release to the environment,
b) collect and divert all clean uncontaminated water around disturbed areas; and
c) maintain acceptable flows in streams impacted by mining to minimize environmental impacts.

4.7 CONCEPTUAL RECLAMATION AND ABANDONMENT PLAN

Norecol Environmental Consultants Ltd. (1987) recognized the need for a conceptual reclamation plan for areas of development disturbance. The water license application provided details of a conceptual reclamation plan that included reclamation of all major minesite components, estimated costs and financial security details (Higgs, 1995).

5.0 OPERATIONAL HISTORICAL REVIEW

The general layout of the main mine components (i.e. open pit, waste rock dumps, tailings impoundment) and infrastructure is shown in Figure 5-1.

5.1 PERIOD OF OPERATION

A timeline of the major operational events occurring during operation of the Mount Nansen Mine is shown in Figure 5.1-1. Open pit mining of the Brown-McDade deposit and milling commenced on October 16, 1996 at the Mount Nansen Mine. Commissioning of the mill proceeded until 48 hour of continuous production was achieved on November 10, 1996. The official start date as defined by water license QZ94-004 was December 10, 1996. Mining and milling at the Mount Nansen mine was continuous from startup until November 30, 1997. At this time milling was temporarily shutdown due to excessive water volumes in the tailings impoundment and the inability to discharge in compliance with the effluent quality standards of the water license. BYG Natural Resources Inc. resolved this issue temporarily by emergency discharge from the tailings impoundment spillway. The mill resumed operation on February 26, 1997. Open pit mining ceased in January 1999 due to exhaustion of oxide ore from the Brown-McDade open pit. BYG Natural Resources Inc. suspended mill operations on February 19, 1999. As a result of several water license violations, Indian and Northern Affairs Canada, Water Resources Division issued a "Cease and/or undertake Certain Actions" letter to B.Y.G Natural Resources Inc. on March 3, 1998. D. Manning and Associates Inc. was appointed Receiver of BYG Natural Resources Inc. on February 10, 1999. By April 8, 1999 the Mount Nansen minesite had been put on "care and maintenance" status. D. Manning and Associates Inc. abandoned their responsibilities as Receiver on July 28, 1999.

5.2 WATER LICENSE AND AMENDMENTS

A Class A water license (QZ94-004) was granted to BYG Natural Resources Inc. by the Yukon Territory Water Board on April 1, 1996 for the Mount Nansen Au-Ag Mine. The license expiry date was December 31, 2001. The terms and conditions of the license included:

a) General Terms and Conditions;
b) Security;
c) Design, Construction and Modification;
d) Operating Conditions;
e) effluent quality standards;

f) Programs and Studies; and
g) Decommissioning and Reclamation.

During operations, BYG Natural Resources Inc. applied for a water license amendment on four separate occasions. Three amendments were approved. The first amendment of the water license was granted May 21, 1997. This amendment allowed BYG Natural Resources Inc. to:

a) Extract mill make-up water from a well near Dome Creek and the mill building (Part D);
b) Accommodate for higher arsenic concentration in groundwater from the Dome Creek mill well (Modification Part F – Tailings Arsenic Stability and Groundwater Arsenic Attenuation Program); and
c) Ensure all effluent from the milling operation is treated by a cyanide destruction system and the total cyanide concentration of the tailings pond does not exceed 25 mg/L (Part H – Cyanide Destruction Tailings Pond).

The second amendment was granted August 7, 1997. This amendment allowed temporary effluent discharge from the tailings impoundment, provided that discharge from the water treatment system via the polishing pond to Dome Creek, was capable of meeting the requirements of the effluent quality standard (Part E –including the non-toxicity requirement) for period not less that one month (Part I – Immediate Treatment and Discharge). The amendment also required the immediate construction of a toe berm on the tailings impoundment to minimize the potential for piping of dam materials (Part C, Section 17(d) amendment).

By early 1998, it became apparent to B.Y.G Natural Resources Inc., that there was a significant potential for the tailings impoundment water level to exceed the spillway invert if immediate measures were not taken to treat and discharge (Vista Engineering, 1998b). As a result, B.Y.G Natural Resources Inc. applied to the Yukon Territory Water Board for an emergency amendment to temporarily waive the non-toxicity requirement the EQS. The third amendment was granted February 20, 1998 to allow a temporary suspension of the non-toxicity requirement of Part E – effluent quality standards, for a maximum continuous period of sixty (60) days (Part J – Temporary Relief From Fish Toxicity Standard). In addition, a detailed Report was required on effluent quality to provide assurance of compliance with water quality standards and provide a detailed analysis of reasons for emergency license amendment application, actions taken and recommendations for remaining compliant for the remaining duration of the water license. The amendment was required to avoid uncontrolled, non-compliant discharge from the emergency spillway of the tailings impoundment, which had insufficient capacity for Spring runoff. It was anticipated that temporary relief of the non-toxicity requirement while complying with other

requirements of effluent quality standards, the necessary capacity would be create in the tailings impoundment to avoid unnecessary uncontrolled effluent discharge during the Spring runoff.

On April 3, 1998 B.Y.G Natural Resources Inc applied for a fourth amendment for continued temporary relief from the non toxicity requirement of water license QZ94-004. As with the previous application, this application was also considered an emergency. BYG Natural Resources Inc. stated the amount of effluent discharged under the previous amendment was less than anticipated (32,000 m^3 rather than the required 40,000 m^3) and cited reasons. The Water Board ruled that the application did not provide sufficient information to determine that an emergency existed, although "emergency" is not defined in the *Yukon Waters Act*. The release of 32,000 m^3 of effluent under the previous amendment was deemed sufficient to relieve any further emergency and substantially address capacity deficiencies in the tailings impoundment.

5.2.1 Security

The water license for the Mount Nansen mine included the provision for financial security. The total amount of this security was $974,5000, which included $455,000 for general reclamation and $519,000 for chemical security. The payment schedule for this security is shown in Table 4.4-1.

The security payments in the amount of $65,000 for General Reclamation and $80,000 for Chemical Stability were made on December 10, 1997, bringing the total security to $365,000 as required by the water license. Security deposits in the sum of $65,000 for General Reclamation and $160,000 for Chemical Stability were also made on December 10, 1998. This raised the General Reclamation Security to $160,000 and Chemical Stability Security to $225,000. Total Security of $445,000 had been paid as of December 10, 1998 (BYG Natural Resources Inc., 1999). This appears to have been $225,000 in arrears with the payment schedule.

5.3 MINING AND OPEN PIT

BYG Natural Resources Inc. was approved to mine oxide ore only from the Brown-McDade open pit. Over the life of the mine, the Brown-McDade deposit was open-pit mined to about 1230 metres elevation or about 10 metres below the initially proposed level in the Initial Environmental Evaluation (Brodie Consulting Ltd., 1998). B.Y.G Natural Resources Inc. mined below the water license permitted oxide zone and into the sulphide zone. This transition from oxide to sulphide ore is believed to occur at about 1240 metres elevation (Brodie Consulting Ltd., 1998).

5.3.1 Mining Method

Open pit mining was conducted by conventional truck and shovel. Mining was contracted to Ketza Construction of Whitehorse. Crews worked on an 8-day in / 6-day out schedule. The upper oxide zone was stripped with a dozer. Deeper, more competent rock was blasted using ANFO explosives before removal.

5.3.2 Pit Water Quality

Water inflow into the pit was expected from precipitation and groundwater recharge from blast holes. Because the pit lies on a ridge, the surface drainage area is only 3.8 ha.

5.3.3 Mining Inventory

At the time mining commenced, the Brown-McDade deposit was estimated to contain approximately 600,000 tonnes of drill-indicated reserves at 6.1 grams per tonne gold and 55.5 grams per tonne silver. Open pit oxide zone reserves were estimated to be 201,600 tonnes grading 7.1 grams per tonne gold and 69 grams per tonne silver. A total of 200,000 tonnes of material was removed from the Brown-McDade open pit between January and November 1997. Of this total, 120,000 tonnes were ore. Available records for the Mount Nansen Mine indicate that a total of 478,000 tonnes of material were mined of which 193,800 tonnes were ore and 129,000 tonnes were waste rock. However, these reported tonnages appear to be lower than the actual mined and waste rock tonnage.

5.3.3.1 Waste Management Program

B.Y.G Natural Resources Inc. implemented a waste management program for the Mount Nansen Mine to ensure proper characterization and ARD/ML prediction of waste materials and control waste rock transport and storage during mining operations.

5.3.3.2 Waste Rock ARD/ML Program

The waste rock ARD/ML prediction program was used to:

a) Ensure that waste rock used for construction purposes did not pose a risk of acid generation and metals leaching;
b) Verify per-operational ARD/ML prediction information;
c) Assist in reclamation and decommissioning planning; and
d) Identify and segregate waste rock with an ARD/ML risk.

Decision criteria used during the operation and post-closure phases of the Mount Nansen Mine consisted of comparison with the ARD/ML predictions in the Initial Environmental Evaluation (IEE) (Higgs, 1994a and b). If the ARD/ML potential was found to be substantially higher, then sub-aqueous disposal would be required.

By July 1997, an estimated 300,000 tonnes (one-half of the total estimate) of waste rock had been stripped from the Brown-McDade open pit. This material consisted almost entirely of hangingwall (west side) rock composed of clay-altered granodiorite and felsic porphyry dikes. The dikes are narrow and segregation was not possible. Therefore waste dump material is a mix of these two rock types.

5.3.4 Pit Wall and Floor ARD/ML Prediction

Waste rock characterization work, conducted as part of the overall ARD/ML prediction program at the Mount Nansen Mine, indicated portions of the lower pit walls and floor had an acid generating potential. While the water license restricted mining to upper portion of the Brown-McDade deposit defined as the oxide zone, it was recognized that exposure of lower sulphide zone material could result in oxidation and metal leaching. Therefore ongoing prediction work was required to characterize the ARD/ML potential of exposed rock throughout the mine life. This characterization was to consist of ongoing samples of pit wall rocks during open pit mining and monitoring of pitwall seepage. In addition, any Pony Creek adit drainage was to be monitored during operation. Decision criteria to assess the pit walls and floor for ARD/ML were to be based on the characteristics and quantities of each rock type identified after closure. If pit wall and floor rocks were found to contain high sulphur, then it would likely be required that the pit be flooded as soon as possible after closure.

Approximately 20 samples were to be collected to determine rock types and ARD/ML potential after exhaustion of oxide ore from the Brown-McDade pit. The Pony Creek adit was to be sealed, if necessary, to prevent post-closure drainage.

As part of the operational ARD/ML prediction studies, the Brown-McDade pit walls and waste rock were sampled and tested for Acid-Base-Accounting in June 1997. The specific objectives of this program were to:

a) Verify the results of previous ARD assessment in 1985, 1989 and 1994,
b) Aid in reclamation and decommissioning planning; and
c) Fulfil the requirements of water license QZ94-004, Parts 5 and 6.

The following discussion summarizes this ARD/ML prediction work conducted during operations to fulfil these water license requirements. A total of 14 samples were collected along the base of the West waste rock dump at 25-metre intervals. From the Brown-McDade open pit, 13 samples were collected from pit walls. Sample locations are shown on Figure 3.3-1. The samples were analyzed by modified Acid-Base-Accounting. The results of this analysis are summarized in Table 4.3-2.

The 1997 results were similar to previous studies and it was concluded that there was little potential for acid generation. Waste rock in the west dump contained sparse moderately to strongly oxidized pyrite, as noted by mud and rusty coating on fracture surfaces. Calcite was common in weakly oxidized waste rock. At the time of sampling, only 3 samples were collected from the hangingwall (west side) and the pit walls in the southern portion of the pit were not exposed. Additional waste rock and pit wall sampling and additional ARD analyses were recommended as mining proceeded.

5.4 MILLING, TAILINGS DISPOSAL AND EFFLUENT TREATMENT

Once the water license was issued, the projected production rate was modified to 500 tonnes per day (tpd) for a total estimated recovery of 1,555,174 grams (50,000 ounces) gold-equivalent an operating cost of $US 215 per ounce. However, the mill was upgraded to 700 tpd with the addition of a carbon-in-pulp cyanidation circuit on October 16, 1996. Forty-eight-hour continuous mill production was achieved on November 10, 1997. The first commercial gold bar was poured later that month. Further details of the operational history of the mill, WTP and tailings impoundment are discussed in the following sections and shown in Figure 5.1-1.

5.4.1 Mill Process and Reagents

The Mount Nansen mill consisted of a grinding circuit, classifier[5], thickener and a conventional 5-stage cyanidation/carbon-in-pulp (CIP) gold recovery circuit. After gold is leached with a dilute sodium cyanide solution, it is stripped from the solution onto activated carbon in CIP tanks. The gold is then recovered from the carbon using the Merrill Crowe zinc precipitation system. The resulting gold filter cake is then periodically removed and refined by smelting to dore metal. A brief description of the mill process is provided below.

[5] **classifier** - A mineral-processing machine which separates minerals according to size and density.

Ore preparation consisted of run-of-mine ore dumped through a "grizzly" [6] into a hopper and transferred to a coarse-ore storage bin. Coarse ore was fed through a jaw crusher, followed by a cone crusher. Fine ore was transferred to individual grinding circuits via a slot feeder into a single-stage ball mill and hydrocyclones. The ore then passes to a thickener. Lime was added to the grinding circuit for pH adjustment. The thickened slurry was passed on to a series of three cyanidation tanks for a retention time in excess of 24 hours. Additional lime was added to adjust the pH to between 10.5 and 11.0 to give a sodium cyanide concentration of 0.3 g NaCN/L. Air was also added to achieve the required oxygen content in the leach pulp. Following cyanide gold leaching, the cyanidation slurry flowed through a five-stage carbon-in-pulp (CIP) circuit with an estimated retention time of 5 hours. Gold loaded carbon was transferred to an acid wash tank followed by transfer to atmospheric carbon strip tanks. Gold and silver recovery required approximately 1.5 tonnes of carbon per day. The gold is removed from the carbon using a hot caustic/cyanide solution and then precipitated from the resultant gold "pregnant" solution using zinc dust. The gold-bearing zinc is then collected in a filter press. The filter press sludge is fluxed and smelted to produce dore bullion.

Operation of the mill required the use of numerous process reagents and chemicals. B.Y.G Natural Resources Inc. prioritized these chemicals with respect to the quantities used, their toxicity and the complexity of spill cleanup. The main chemicals and reagents identified are shown in Table 5.4-1.

5.4.1.1 Mill Throughput

During 1996, the total milled tonnage was 16,922 tonnes of ore. Mill throughput increased to a maximum of 534 tpd with a mean throughput of 217 tpd during October 1996. All of the ore was mined from the Brown-McDade open pit. No further mining occurred in 1997. During 1997, 102,000 tonnes of ore were processed in the mill at an average rate of 325 tpd over 314 days of operation. Milling was continuous up to November 1997 when the mill was temporarily shutdown for environmental reasons. Available records for 1998 indicate an additional 136,070 tonnes of ore were milled at an average rate of 442 tpd over 308 days of operation.

5.4.1.2 Upsets and Changes

In 1997, a groundwater well was installed next to the mill building for mill make-up water until there was sufficient volume in the tailings impoundment for reclaim. An estimated 11,500 m^3

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[6] **Grizzly (or mantle)** - A grating (usually constructed of steel rails) placed over the top of a chute or ore pass for the purpose of stopping large pieces of rock or ore that may hang up in the pass.

was produced at an average rate of 10 m^3 per hour. Reclaim of tailings impoundment water was initiated in April 1997. The average rate of reclaim was about 300 m^3 per day. In the summer of 1998 a thickening tank was added to the end of the mill circuit and prior to entering the cyanide destruction system. The purpose and benefits of adding this thickener were to:

a) Recycle and reduce the amount of sodium cyanide for treatment and therefore reduce the consumption of cyanide, sulphur dioxide, hydrogen peroxide and other reagents used in the cyanide destruction process; and
b) Lower concentrations of cyanide and ammonia in the tailings water and effluent discharge.

It was concluded that these improvements would result in the environmental benefit of less cyanate and ammonia in the effluent discharge. However, as previously discussed in Section 3 reduced cyanide and ammonia concentrations were not consistently achieved. The need for post-operational treatment of tailings pond water also demonstrates the inability to consistently achieve lower cyanide and ammonia concentrations. Thus little, if any, environmental benefit was realized.

5.4.2 Tailings Impoundment

In late 1996, the tailings impoundment was constructed on Dome Creek between 1130 and 1600 metres elevation, 110 metres below the mill elevation. The as-built capacity of the tailings impoundment was 294,000 cubic metres or 410,000 tonnes tailings-solids. The tailings impoundment dam was constructed using primarily silty, fine to medium grained sand from three borrow pits to the west of the tailings impoundment location and one borrow pit area to the south. An estimated 100,000 m^3 of fill material was used. The dam was built on a foundation of frozen ice-rich, silty-sandy valley fill, approximately 1 to 2 metres depth below ground surface.

Seepage analysis, using a two-dimensional finite element computer program, estimated a total seepage rate of less than 1 L/s. However, cracking of the dam was expected due to differential thaw-settlement of the foundation soils. Mitigation for the effects of cracking during operation was the installation of a geosynthetic clay liner and the placement of tailings along the upstream face of the dam to minimize seepage. The Dome Creek diversion was also constructed around the tailings impoundment. A small seepage collection pond was later constructed immediately downstream of the tailings impoundment to return seepage to the tailings impoundment.

B.Y.G Natural Resources Inc. recognized that a Water Balance Contingency Plan was important for the tailings impoundment, in the event the water balance was more positive than anticipated. This was proposed in their water license application (T.W. Higgs Associates Ltd., 1995). During the first year of operation additional data was collected to revise the water balance and predict when excess impoundment water would discharge. The additional data included:

a) mill tailings mass and liquids flowrates;
b) tailings pond elevations;
c) seepage pond flow estimates and measurements;
d) daily precipitation data;
e) snowpack and run-off data;
f) diversion ditch and site drainage flow estimates; and
g) pit water discharge rates.

The Mount Nansen water license included specific requirements to monitor the design performance of the tailings impoundment. These included:

a) a surveillance program to monitor the thermal performance of the dam and underlying foundations using thermistors, settling pins and piezometers; and
b) a tailings impoundment seepage monitoring program to determine whether seepage is occurring through the dam and underlying foundations, verify seepage under the dam will not occur and the geosynthetic liner and beached tailings reduce effluent seepage through the dam.

Tailings deposition started concurrently with the start of milling. Disposal started along the upstream face of the tailings dam to seal the base of the dam. As the impoundment was filled the discharge point was moved to facilitate deposition on as flat a slope as possible. The number of discharge points is unknown.

By spring 1997, only five months after mining and milling operations commenced, 200,000 m^3 of water had accumulated in the tailings impoundment. The source of this water was identified primarily as surface runoff and diversion ditch infiltration. The original design forecast allowed for a two to three year water volume capacity. However, the total impoundment volume was 290,000 m^3, exceeding its design capacity of 270,000 m^3. At this time, a decision was made by BYG Natural Resources Inc. to construct the water treatment plant (WTP). It was identified that the tailings impoundment water balance model did not account for seepage from the Dome Creek and Tailings Impoundment North and West diversion ditches, as the unlined ditches were in

permeable native silty/sandy soils. It was estimated that 35,000 to 120,000 m^3 of diversion ditch water could seep into the tailings impoundment during an average year freshet, based on stream flow measurements collected in 1997 (Vista Engineering, 1998). Over the summer months, precipitation could increase water volumes substantially, ranging from 230,000 to 384,000 m^3. A high-density polyethylene (HDPE) liner was recommended to reduce seepage from the diversion ditches, at an estimated cost of $65,000. In July 1997, excessive seepage from the toe of the tailings impoundment caused concern to regulatory authorities. An emergency toe berm was constructed to stabilize the tailings impoundment and prevent "piping" that could possibly lead to dam failure.

Information available to Conor Pacific on the quantity of tailings deposited over time is limited. Known volumes are shown in Table 5.4-2. To the end of 1998, a total of 258,174 m^3 of tailings were discharged. A bathymetric survey was completed on the tailings impoundment in August 1999. The results of this survey are shown in Figure 3.3-6.

5.4.3 Tailings ARD/ML Prediction

The tailings ARD/ML prediction program consisted of collecting monthly composite samples and conducting Acid-Base-Accounting (ABA). The objectives of this program were to:

a) determine the characteristics and assess the variability of the ARD/ML potential to verify that acid generation from the tailings will not occur post-closure and
b) assist in reclamation and decommissioning planning.

A kinetic humidity cell was to be conducted on a tailings composite sample collected after 60 days of operation. This was to be followed by second humidity cell test after the first year of operation. The second sample was to represent a "worst case" sample (i.e. greater than 75 percentile of ABA test results) and each humidity cell was to operate for 30 weeks.

As for the pit floor and wall ARD/ML prediction program, decision criteria for tailings were to be based on comparison of operational to pre-operational (IEE) data.

The sparse operational and post-operational tailings ABA data that were located are shown in Table 5.4-4.

5.4.4 Effluent Treatment Studies

The water license for the Mount Nansen required that BYG Natural Resources Inc. to:

a) conduct studies to determine effluent treatment options;
b) evaluate options; and
c) design a water treatment plant for reclaim effluent treatment.

Due to start-up problems in treated effluent being unable to meet the non-toxicity requirement of the water license effluent quality standards, additional studies were carried out between October 1997 and January 1998 by Vista Engineering and Conestoga-Rovers and Associates. The objectives of these studies were to:

a) determine the optimal operating conditions of the water treatment plant;
b) recommend upgrades to improve efficiency and reliability; and
c) determine operating conditions necessary to pass non-toxicity requirement of the water license.

Improvements were made to the water treatment plant including:

a) an overhaul of the sulphur dioxide system with new piping, fittings and metering equipment installed;
b) changes to the supply line to provide steady-state flow;
c) heating of the reclaim water;
d) installation of two carbon columns; and
e) installation of an insulated effluent discharge pipeline to Dome Creek.

(see Figure 5.1-1).

5.4.4.1 Tailings Arsenic Stabalization and Groundwater Attenuation Studies

A requirement of water license QZ94-004, was to conduct an arsenic stabilization and groundwater attenuation study program. The objectives of this program were to:

a) evaluate arsenic stability alternatives in the tailings;
b) assess the attenuation of arsenic in the groundwater if contaminated seepage occurs;
c) assess the capacity of native soils to attenuate arsenic in groundwater; and
d) provide information on closure options for the tailings impoundment.

The first phase of this program was implemented from December 1997 to January 1998, by Process Research Associates Ltd. and consisted of laboratory bench-scale testing on arsenic stabilization. The methodology used to assess arsenic stability was to subject tailings samples to equilibrium, bottle-roll tests for a 24-hour period. The materials analyzed included raw untreated tailings, treated tailings and treated tailings spiked with different ferric sulphate concentrations. The samples were filtered and analyzed for dissolved metals before and after bottle-roll tests. Data were presented for this initial laboratory test program but no interpretation was provided (Process Research Associates Ltd., 1998). BYG Natural Resources Inc. issued a Final Report with interpretation in April 1998 (BYG Natural Resources Inc., 1998). The study indicated that a Fe:As ratio of 5:1 was conservative (in excess) for full stabalization of soluble arsenic. The testing of mixed versus unmixed samples at the Fe:As ratio of 5:1 indicated that higher arsenic removal was achieved from mixing. In terms of on-site tailings treatment, treating the tailings slurry was more effective than treating the tailings supernatant. The study results also indicated that ferric arsenate became more stable over time and that the addition of ferric iron had no noticeable effect on the solubility of other species.

Conditions of the water license required that on-site testing be implemented by January 26, 1998 and completed by August 31, 1998. Based on the laboratory results, full-scale ferric sulphate treatment of the tailings slurry to remove arsenic was initiated by 20 April 1998[7]. Samples of the tailings slurry were collected after 1,3 and 7 days and then weekly for one month to verify that the arsenic is fully stabilized.

Additional arsenic laboratory studies using the same methodology as the previous study were conducted from August 1998 through to January 6, 1999. The results showed considerable variation in dissolved arsenic concentrations. Excluding August 14, 1998 results as an outlier, the average of 6 tests was 0.116 mg/L dissolved arsenic with a variance of 0.005 mg/L. This was below the 0.15 mg/L arsenic EQS of the water license. Pre-leached samples showed that raw tailings contained soluble arsenic concentration greater than 0.2 mg/L. These results confirmed earlier results that an optimal ferric sulphate dosage of 5:1 ferric iron to arsenic (Fe:As) would be required to treat the tailings to meet arsenic EQS of the water license. Recommendations were made for further on-site testwork to confirm these laboratory results. It was also recommended that tailings be encapsulated on closure to decrease water infiltration into the tailings and reduce arsenic mobilization.

[7] The precise date arsenic treatment commenced is unknown. It was indicated to have been full implemented in a Report by BYG Natural Resources Inc., 20 April 1998.

Conditions of the water license also required that a groundwater attenuation study be initiated once reclaim water had reached equilibrium with tailings. Assuming the bulk sample testing was able to stabilize arsenic, direct ferric sulphate addition to the treated mill tailings was to commence on a full-scale basis. Results were to be monitored for one month for verification. Monthly sampling and analysis of treated mill tailings was to be conducted to monitor arsenic stability.

A laboratory groundwater arsenic attenuation study was implemented in the summer of 1998. The results of this study indicated that 44 days were required to achieve breakthrough in the natural soils being tested. A total mass of 6335-milligrams arsenic was passed through the column over this period. Based on the volume of 0.05 m^3 of soil added to the column, a capacity of 127 kilograms arsenic per cubic metre was determined. Based on this capacity determination, it was calculated that 254,000 litres of seepage at an average concentration of 0.5 mg/L would be required to saturate 1.0 cubic metre of soil downstream of the tailings impoundment. The results of this laboratory study indicate that the attenuation capacity of the soils for soluble arsenic is high. However, the mechanism of arsenic attenuation was not determined by this study. Issues of remobilization were not addressed.

5.4.5 Mill Effluent and Water Treatment Plant

Tailings were transported to the tailings impoundment via a slurry pipeline located along the old access road (Figure 5-1). Tailings discharge to the impoundment was from a single discharge point, however the location was moved several times during milling operations.

Prior to release to the tailings impoundment, mill tailings were treated using the INCO/SO_2-air process for cyanide destruction followed by a ferric sulphate sludge treatment system for arsenic removal. Maximum cyanide concentrations in the tailings impoundment effluent were set at 25 mg/L total cyanide. A pump and reclaim waterline system was used to transport reclaimed effluent from the tailings impoundment back to the mill. The pump was operated from a floating barge. The reclaim system was initiated on the 30 April 1998. Once operation had commenced, B.Y.G Natural Resources Inc. was permitted to discharge treated mill effluent from the mill polishing pond or the tailings impoundment to Dome Creek according to water license, effluent quality standards.

By spring 1997, 200,000 m^3 of water had accumulated in the tailings impoundment, primarily from surface runoff and diversion ditch infiltration. At this time, a decision was made by BYG Natural Resources Inc. to construct the water treatment plant (WTP). Installation of the WTP

involved moving an INCO/SO_2-air cyanide destruction system from the Ketza minesite in the Yukon to the Mount Nansen minesite in May 1997.

Installation of this system and construction of the conventional coaggulation-flocculation circuit for the removal of heavy metals occurred between July and September 1997. The WTP had a design capacity of 70 m^3 per hour and was evaluated to be able to meet the non-toxicity requirement of the water license. A brief description of the WTP follows. The INCO/SO_2-air cyanide destruction system consisted of three 25 m^3 tanks in series followed by a lamella clarifier. In the first tank, SO_2 and air were added for cyanide destruction. Lime slurry was also added to adjust the influent pH between 8 and 9. Cupric sulphate was also typically required but was not used at Mount Nansen because dissolved copper concentrations in the influent to be treated were sufficient to catalyze cyanide destruction reactions. Additional mixing and aeration in a second tank provided increased reactor (residence) time. Ferric sulphate was added to the third tank to coagulate particulate matter and heavy metals. Additional lime slurry was added to this tank to maintain the influent pH. Polymer was added to the inlet of the lamella clarifier by flash mixing to create large flocs. The flocs settled by gravity in the lamella clarifier prior to discharge to a 1600 m^3 retention pond for final polishing.

5.4.5.1 Effluent Treated

The water treatment plant start-up occurred in September 1997, approximately two years early, in response to an urgent need to treat tailings pond water to reduce the overall volume to an acceptable level. Discharge occurred intermittently over 6 days during the initial start-up, however, the discharge was unable to meet the non-toxicity requirement of the water license, effluent quality standards (EQS). The WTP became fully operational in January 1998, after an extensive upgrade. The WTP operated with minor interruptions until mining operation suspension in February 1999. Additional difficulties were encountered meeting the non-toxicity requirement of the EQS during operations. The WTP operation was temporarily suspended several times. Limited records were available to Conor Pacific on the history of the WTP operations. Monthly records obtained indicate that between January and December 1998, 110,782 m^3 of treated effluent were discharged (Table 5.4-3). The discussion that follows is based on this limited information and discusses known process upsets and changes to the WTP.

5.4.5.2 Upsets and Changes

The cyanide and arsenic water treatment plant (WTP) was tested for six days between September 15 and September 26, 1997. One of two on effluent samples taken on September 26, 1997 failed the bioassay. INCO staff visited the Site and prepared a report that included recommendations

for upgrades to the WTP to achieve non-toxic effluent. The report indicated a dilution factor of 2:1 to 4:1 fresh dilution water to effluent was required to meet the EQS (Vista Engineering, 1998). Vista Engineering initiated an upgrade program after a Site visit and inspection. Conestoga-Rovers and Associates provided technical and analytical support. The upgrade program occurred between October 1997 and January 1998 and consisted of bench-scale testing to model the WTP process. The objective of the program was to determine and reduce the cause of toxicity. The results of this program were:

a) The WTP was capable of producing compliant effluent on a consistent basis;
b) The bioassay toxicity test passed when conditioned with 2:1 dilution water to effluent;
c) The likely cause of toxicity was identified as ammonia and/or cyanates, both of which are byproducts of the INCO/SO_2-air system;
d) These by-products are non-persistent compounds and readily volatilize when exposed to the atmosphere; and
e) The potential alternatives were superchlorination-dechlorination or dilution.

The use of superchlorination was eliminated on the basis of additional potential environmental impacts. Other recommendations included:

a) reducing effluent pH to between 6.0 and 6.3 would result in result in partial hydrolysis of cyanate compounds and reduce ammonia toxicity; and
b) granular activated carbon (GAC) was extremely effective at reducing heavy metal concentrations and reducing low concentration cyanide by up to 50%.

Discussions with Indian and Northern Affairs Canada, Water Resources Division staff resulted in BYG Natural Resources Inc. concluding that GAC installation and a hydrolysis reactor were viable improvements. Extensive improvements and upgrades were made to the WTP between October 1997 and January 1998. These included:

a) the installation of new supply lines;
b) complete upgrade of the SO_2 and pH control systems;
c) installation of an ammonia adsorption tank;
d) installation of two GAC columns;
e) aeration of the mill polishing pond; and
f) pre-heating of the reclaim water.

These changes were implemented by 16 April 1998 and resulted in few operating problems and WAD cyanide values decreasing to below the EQS limit on a consistent basis. The hydrolysis of cyanates was tested on Site by introducing SO_2 gas to the second reactor in the INCO/SO_2-air circuit. However, WAD cyanide was found to increase to above the EQS limit, therefore this was discontinued. It was found that a 2:1 dilution with Victoria Creek well water was sufficient to achieve a consistently non-toxic effluent for discharge (Vista Engineering, 1998).

5.5 DOMESTIC WASTE

5.5.1 Sewage

Domestic sewage at the Mount Nansen mine was treated using septic tank/tile field systems. The systems were designed to comply with Health and Welfare Canada standards and the *Yukon Public Health Act*. The septic systems were limited to domestic sewage and kitchen waste.

5.5.2 Solid Waste

All metal, glass, paper and wood waste products were to be separated and stored onsite. Combustible waste was to be incinerated on site using an approved fuel-oil incinerator. Non-combustible and incinerator residue was to be deposited in an approved landfill. Chemical waste from the mill and assay/metallurigical lab was to be contained, treated or neutralized and released to the tailings pond.

5.6 SPILL CONTINGENCY PLAN

The water license for Mount Nansen included a detailed and comprehensive spill contingency plan. The plan outlined response plans to minimize risk and impact to the environment and to worker health and safety from hazardous materials spills at or near the mine and on the access road. The plan was prepared in accordance with the Environment Canada, Environmental Protection document "Spill Response Contingency Planning Guidelines". The plan was also consistent with the *Yukon Environment Act and Special Waste Regulations* and also referred to the Federal *Transportation of Dangerous Goods Act*. B.Y.G Natural Resources Inc. included a corporate policy statement as part of the Spill Contingency Plan, outlining their commitment to maintaining high environmental standards and worker health and safety.

5.6.1 Known Spill Incidents

Records were located for three separate spill incidences at the Mount Nansen minesite. These occurred on:

a) September 21, 1996;
b) May 1997;
c) November 14, 1997; and
d) June 25, 1998.

A brief description of each incident follows. On September 21, 1996 at approximately 7:30 A.M. a broken fuel line from a diesel fuel tank resulted in approximately 10,000 litres of diesel fuel leaking onto the ground. At the time of discovery, the flow of diesel fuel had stopped. The incident was reported to Mr. D. Sherstone of Indian and Northern Affairs Canada. The Carmacks R.C.M.P. were notified at 8:30 A.M. Follow-up discussions took place with Mr. K. Rumsey, Water Management Officer, Water Resources Division. Remedial action consisted of absorbing fuel with matting, volatization of excess spilled fuel by blow-torching and redirecting Dome Creek flow to the tailings impoundment where the fuel pumped via the mill reclaim water and absorbed onto carbon in the leaching circuit. A review by Indian and Northern Affairs, Water Resources Division to the response by B.Y.G Natural Resources Inc. indicated several concerns.

No details could be located regarding a diesel spill that occurred in May 1997.

At about 6:10 P.M. on November 14th, 1996, a pipe feeding the cyanide destruction tank was found to have separated, resulting in some slurry spilling onto the mill yard. The slurry spread out over the frozen ground forming a thin sheet. An estimated 2046 litres (450 gallons) of slurry spilled. The frozen slurry was scraped up using a front-end loader and deposited in the tailings impoundment. The cause of pipe failure was determined to be excessive flexing of a pipe joint. The joint was repaired by stiffening with a steel brace.

On June 25th, 1998 about 15 litres of vehicle antifreeze was spilled on the ground in front of the powerhouse at the mill site, while a generator set was being flushed out. Placing sand onto the pooled antifreeze cleaned up the spill. Approximately 2 m^3 of sand and soil were removed and transferred to the SAG mill for processing through the mill circuit. The Environmental Coordinator reported the spill to the 24-hour Spill Reporting Hotline.

5.7 CONCEPTUAL DECOMMISSIONING AND RECLAMATION PLAN

Under condition of water license QZ94-004, BYG Natural Resources Inc. was required to submit a temporary closure plan by December 31, 1996. Temporary closure was defined as "when ore has not been processed in the mill for a six month consecutive period. Permanent closure was defined as temporary closure exceeding 3 years. A detailed decommissioning and reclamation plan was required to be submitted by December 31, 1997. This conceptual plan was submitted by BYG Natural Resources Inc. in January 1998. At the time this conceptual plan was written, reclamation at the Site had been initiated. These reclamation activities included:

a) Monitoring stream water quality, waste dump water quality, tailings dam water elevations and seepage
b) Establishing reclamation priorities and objectives for BYG Natural Resources Inc. property outside of the main mine and milling areas,
c) Investigating reclamation of the exploration trenches,
d) Contouring overburden slopes around the ultimate pit,
e) Resloping waste rock dumps during waste placement; and
f) Revegetating disturbed areas throughout the minesite.

Further Site reclamation identified to be conducted after closure included:

a) Disposal of all toxic materials and fuels;
b) Resloping and revegetation of waste rock dumps;
c) Scarifying plant site and roads for revegetation;
d) Removal of the Dome Creek Diversion around the tailings impoundment
e) Removal of all culverts in Site roads and reestablishing natural stream courses;
f) Construction of a closure spillway for the tailings impoundment; and
g) Removal of all Site infrastructure and buildings to ground level.

It was identified that assessment of the tailings chemical stability was incomplete but required to finalize decommissioning plans for the tailings impoundment. The available information on the physical stability of the tailings impoundment was also regarded as inadequate to accurately determine the long-term stability of the tailings dam. B.Y.G Natural Resources Inc. intended to leave the impoundment in partially flood state on closure. The Dome Creek diversions would be breached to allow Dome Creek to flow into the tailings impoundment. A closure spillway would be constructed on the north side. All beached tailings would be covered with overburden to assist in revegetation and limit infiltration into the tailings by precipitation. Assuming the water

quality of the seepage collection pond is acceptable for discharge at closure, the dam would be removed and the area recontoured and revegetated.

Plans for waste rock dumps were to reslope to 27 degrees during operation, then cover and/or revegetate. BYG Natural Resources Inc. had commenced testwork on seed mixtures, fertilization, planting techniques and vegetation. An arctic alpine seed mixture was recommended. Overburden slopes surrounding the pit were to be resloped and revegetated. The Pony Creek adit was to be sealed to prevent any drainage from the existing pit.

The handling of refuse and chemical waste are discussed in Section 6.1.

5.8 CLOSURE COST ESTIMATE

A closure cost estimate was conducted for Indian and Northern Affairs Canada, Water Resources Division. A Site inspection was carried out 29 October 1998. A cost estimate was prepared using the RECLAIM model based the Site inspection and a review of pertinent reports on file with the Water Resources Division. A total capital cost of $2,160,230 was estimated. The cost of post-closure water treatment was estimated to be $5,912,203 over 100 years, for a total cost of $8,038,434. The estimate was based on a two part treatment of tailings pond water; years 1 to 7 for cyanide, ammonia and metals treatment and years 8 to 100 for metals only. The estimate was conservative and had an associated high degree of confidence attached to meet all reclamation requirements (Brodie Consulting Ltd., 1998). This estimate was much higher than the 1995 cost estimate of $1,438,000 but is a more accurate reflection of the current environmental state of the Site.

5.9 RECEIVING ENVIRONMENT DATA

5.9.1 Climatic Conditions

A weather station was installed at the Mount Nansen minesite in August 1997 and operated throughout the operational period (although there were some interruptions in data logging). The weather station automatically recorded information on air temperature, precipitation (rainfall only), and wind speed and direction. The station did not record snowfall.

Mean monthly air temperature and rainfall for the operational period are summarised in Table 5.9-1. Based on these weather station data, it is difficult to determine whether the operational years had temperatures and/or precipitation that differed from baseline condition for

the area due to the lack of snowfall data and the interruptions in data collection. Nevertheless, monthly rainfall levels were relatively similar to baseline levels with the exception of June 1998 when rainfall was twice the baseline level.

Field measurements of snow pack were taken by BYG staff during the winter of 1996-97 and 1997-98 (reported in Vista Engineering, 1998). The water equivalent of the snow pack in the tailings drainage basin was 72 mm during 1996-97 and 53 mm during 1997-98.

5.9.2 Surface Water Quality

Updates of water quality of downstream sampling sites at the Mount Nansen minesite were provided in Monthly and Annual Reports by BYG Natural Resources Inc. No statistical analysis or interpretation was done for data provided in the Annual Reports. In 1998, water quality samples were collected on a weekly basis unless low flow or ice condition prevented sampling. All available water quality data for the operational period have been input into an environmental database for the Mount Nansen minesite. This data is discussed in detail in Section 6.7.

5.9.3 Stream Sediment Quality

A stream sediment sampling program was conducted at the Mount Nansen minesite in September 1998. This was the only known stream sediment sampling event conducted during the operational phase. Analyses were incomplete as of the 1998 Annual Report. These data have been input into a environmental database for the Mount Nansen property and have been included in the interpretation in Section 6.8.

5.9.4 Benthic Invertebrates

Based on the information reviewed, no benthic invertebrate sampling was completed at the Mount Nansen property during the operational period. Benthic invertebrate sampling was not included in the water license. Potential impact on the benthic fauna of the receiving watercourses is therefore unknown.

5.9.5 Fisheries

Operational fisheries information for the Mount Nansen area is limited to field observations made during July and August 1998 by Environmental Protection (Environment Protection, 1998). During July 1998, numerous schools of Arctic grayling fry (2-3 cm length) were observed in Victoria Creek, near its confluence with the Nisling River. Adult and sub-adult (6-16 cm length) grayling were abundant further upstream in the Victoria Creek valley. Virtually

every pool observed in Victoria Creek 2 km and further from the Nisling River had grayling present. Fry were present in the Victoria Creek valley, but not as abundant as near the Nisling River.

In the pool to which Dome Creek discharged into Victoria Creek, about 20 dead fry were observed lying in small groups on the creek bottom in low velocity zones. The next pool 15 m downstream of Dome Creek also had at least a dozen dead fry. No other dead fry were observed in any other portion of Victoria Creek surveyed. A pool about 30 m below Dome Creek had nine live adult grayling and a pool above Dome Creek also had adult grayling. The absence of obvious surface moulds on the dead fry tissues suggested that they had perished in the previous few days rather than the previous few months. There was a 0.7 m vertical drop where Dome Creek entered Victoria Creek and there was no evidence of fish in Dome Creek.

Observations recorded in August 1998 (12 days later) were similar to those made during July, but the dead fry were gone. One unidentified dead 15 cm fish was found within one of the small accumulations of detritus just below the Dome Creek confluence.

The cause of mortality for the observed dead fish was not determined. However, it was noted that the Dome Creek discharge at Victoria Creek had concentrations of several compounds (including ammonia, cyanate, nitrite, aluminum, silver and copper) at levels demonstrated to be acutely toxic to rainbow trout (*Oncorhynchus mykiss*) fingerlings in laboratory tests. No bioassay samples were taken of the Dome Creek discharge.

5.9.6 Wildlife

Based on the information reviewed, no wildlife information was compiled at the Mount Nansen property during the operational period. Potential impact of the mining operations on the wildlife is therefore unknown. However, numerous anecdotal evidences of site use by wildlife are summarized below.

5.9.7 Vegetation

Based on the information reviewed, no vegetation information was compiled at the Mount Nansen property during the operational period. Potential impact of the mining operations on the vegetation is therefore unknown. Vegetation disturbances at the Mount Nansen property during the operational period were likely limited to local disturbances related to operational activities (e.g., local stripping, brush cutting).

6.0 POST-ABANDONMENT HISTORICAL REVIEW

BYG Natural Resources Inc. decided to suspend all mining and milling operations at the Mount Nansen minesite on the 19 February 1999 (Figure 6-1). On 3 March 1999, D. Manning and Associates Inc. was appointed receiver. The water treatment plant (WTP) operation was intermittent during this period. Water Resources Division of Indian and Northern Affairs Canada issued a letter dated 24 July 1999 stating their intentions to take actions to protect the environment under Section 37(3) of the *Yukon Waters Act*. They also stated their intent to recover monies expended during its actions from B.Y.G Natural Resources Inc, D. Manning and Associates Inc or other responsible party under Section 37(4) of the *Yukon Waters Act*. These actions were taken to maintain operation of the WTP. D. Manning and Associates Inc. abandoned the Site later that day. On August 4, 1999 Indian and Northern Affairs Canada. Water Resources Division submitted an application for a "B" license to allow then to undertake emergency care and maintenance operation.

6.1 TAILINGS IMPOUNDMENT

As of December 1998, the seepage rates of the tailings impoundment were still near the upper limit of the designed range. In addition, the foundation was still thawing and appeared to be in the 3 to 5 m range below ground surface. The stability of the tailings impoundment is continuing to be closely monitored.

6.1.1 Tailings Pond Water Balance

At the time of Conor Pacific's Site fieldwork, the water level of the tailing impoundment was still in excess of desired levels to prevent overtopping during the spring freshet of 2000. Sulphide-rich tailings remain exposed along the west edge of the tailings impoundment.

6.2 WATER TREATMENT PLANT

Indian and Northern Affairs Canada, Water Resources Division has retained Ketza Construction to operate the water treatment plant (WTP) to reduce the tailings pond to levels sufficient to allow for predicted spring freshet volumes in 2000. The WTP has been operated intermittently since summer 1999 under the control of Indian and Northern Affairs Canada, Water Resources Division, with periodic shutdowns due to power failures, insufficient process chemicals and equipment failure. The SO_2 tank car used to supply the WTP had to be abandoned due to expiry of safety inspection coverage. Metabisulphite was chosen as a replacement for SO_2 gas and the WTP currently uses this as the SO_2 source. Metabisulfite was also used during operations.

6.3 RECEIVING ENVIRONMENT DATA

Water Resources Division of Indian and Northern Affairs Canada has continued frequent monitoring of effluent, discharge and receiving environment water quality at the Mount Nansen minesite (Figure 6-1).

6.3.1 Surface Water Quality

Post-abandonment surface water quality is discussed in Section 6.7

6.3.2 Stream Sediment Quality

Post-abanonment stream sediment quality data is discussed in Section 6.8.

6.3.3 Climatic Conditions

Minesite personnel are recording limited weather information daily. However, these post-operational climatic data were not collected or reviewed by Conor Pacific staff during the Site field investigation. Therefore, variations in the weather on the minesite since closure are unknown.

6.3.4 Benthic Invertebrates

Based on the information reviewed, no benthic invertebrate sampling has been completed at the Mount Nansen property since the mine closure. The status of the benthic fauna of the receiving watercourses is therefore unknown.

6.3.5 Fisheries

Based on the information reviewed, no fisheries information has been compiled at the Mount Nansen property since the mine closure. The status of the fisheries of the receiving watercourses is therefore unknown.

6.3.6 Wildlife

Based on the information reviewed, no wildlife information has been compiled at the Mount Nansen property since the mine closure. The status of wildlife resources at the site is therefore unknown. However, numerous anecdotal evidences of site use by wildlife are summarized below.

Staff from Conor Pacific recorded the following field observations during their site investigation (27 September to 1 October, 1999). Moose and caribou tracks were observed in and around the tailings impoundment. A resident red fox (*Vulpes vulpes*) was present at the mine camp area and was regularly fed by mine personnel. Black bear tracks were observed just north of Pony Creek. A dead songbird (species undetermined) was observed in Dome Creek, immediately downstream of the discharge point. Numerous migratory birds (mainly geese) were observed flying overhead.

The following observations were made by Jack Jackson (Ketza Construction) and communicated during Conor Pacific's field visit. Moose and caribou were observed migrating through the area, and moose were observed drinking from the tailings impoundment. Buffalo (wood bison) have been observed along Dome Creek and, in some instances, bison were observed eating hay used to insulate the discharge pipeline. A lynx (*lynx lynx*) was observed chasing a fox across the mine access road.

6.3.7 Vegetation

Based on the information reviewed, no vegetation information has been compiled at the Mount Nansen property since the mine closure. The status of vegetation at the site is therefore unknown.

Anecdotal evidence (Gerry Whitley, Water Resources Division, Indian and Northern Affairs Canada, pers. comm.) indicates the presence of unhealthy shrubs and understory vegetation along Dome Creek, downstream of the tailings impoundment. Possible causes for the observed unhealthy vegetation are numerous and may not be related to mining activities at the site.

7.0 SUMMARY AND CONCLUSIONS

Despite a rigorous regulatory environmental assessment and subsequent operating license and permits, the Mount Nansen mine was inadequately designed and operated from the development stage onward. Despite the best intentions of regulators, BYG Natural Resources Inc. failed to meet strict environmental compliance with their water license and the *Fisheries Act*. The company failed to apply sound engineering and environmental practice, frequently "reacting" to changing operational upsets and changes and environmental influences. In particular, the construction and monitoring of the tailings impoundment was poorly managed. This has resulted in environmental impacts to Dome Creek immediately downstream of the tailings impoundment. B.Y.G Natural Resources Inc. also mined sulphide ore from the Brown-McDade open pit, also prohibited under the conditions of the water license. In the event sulphide ore was encountered, immediate termination of mining was to occur. B.Y.G Natural Resources Inc. failed to comply, resulting in acid generation and metal leaching of the lower pit walls and floor. A secondary result was the deposition of sulphide-rich tailings in the tailings impoundment. These tailings were deposited subaerially and are also now generating acid and leaching metals.

The Site inventory and hazard assessment conducted by Conor Pacific in September 1999, has determined that:

1. The Mount Nansen minesite has been abandoned in a manner that did not meet the standards nor commitments made by BYG Natural Resources Inc in both their Initial Environmental Evaluation and water license application;
2. Chemicals and reagents used primarily at the mill, water treatment plant (WTP) and tailings impoundment collection pond have not been stored or disposed of safely. Most chemicals, reagents, grease and oil products, and solvents are stored adjacent to the mill and WTP. Many excess chemicals, reagents and petroleum products are stored outside, near the point of use. Long-term exposure to weather has deteriorated or damaged packaging of some chemicals and reagents at the mill area. In some cases, this has resulted in reagents spilling onto the ground. Chemicals and reagents stored in drums or barrels are full or partially full. Steel drums were noted to be corroded and rusty to varying degrees. Grease or oil waste are stored in open outside in steel drums exposed to weather and are at risk of spilling or overflowing. A sample of this waste exceeded metals criteria for CCME soil quality guidelines and Yukon CSR standards for metals, LEPH, HEPH and benzene. The contents of these drums are unlabelled. Some

chemicals and reagents were being used to operated the WTP at the time of Conor Pacific's inventory and assessment. Chemical spills were noted in the mill area;

3. Transformers, stored near the polishing pond at the mill, are on unstable ground. One transformer was lying on its side and had leaked transformer oils into the ground. However, sample results indicate that PCB levels of 0.12 mg/kg are below the Yukon CSR - Ingestion of contaminated soil standard. The sample did exceed the LEPH and HEPH Yukon CSR soil standard. A second transformer is open at the top and spilled oil is located around its base;
4. The SO_2 tank car appears to be in good condition and is no longer in use. The tank volume was not determined but site personnel indicated it is empty. The tank certification has expired and it cannot be reused until recertification is obtained. It is unknown if the tank was properly emptied and purged to prevent internal corrosion;
5. Equipment, materials, debris and machinery have been abandoned in unmaintained condition. Some material is located in active stream channels and presents a potential source for additional contamination into Dome Creek and downstream;
6. Buildings have been physically damaged and/or been left unsecured. As a result, buildings are in poor to fair condition. The eastern SAG mill loadout building is the most damaged, which appears to be the result of a collision by a large vehicle. The main electrical power control centre was open and accessible and presents a major human health and safety hazard;
7. The explosive storage area, located near the Ketza Construction shop contains two partial 2000-kilogram packages of ammonium nitrate. The packages are stored on pallets and securely wrapped in the original plastic burlap to prevent exposure to weather and access by humans or animals;
8. Solid waste disposal appeared to consist primarily of dumping into an unlined pit near the mill. Inspection indicated that some older waste had been burned. Recent waste consisted predominantly of chemical and reagents containers and packaging, and domestic garbage. Other laboratory solid waste was dumped into the tailings impoundment near the most recent spigot point in the northwest corner;
9. A set of four large propane tanks feeding the main office and dormitory building were leaking as evidenced by the smell of mercaptan in the air around the tanks.

The following conclusions have been drawn on the physical and chemical stability of the Brown-McDade open pit.

1. The Brown-McDade open pit was found to be physically unstable. This was evidenced by tension cracks and sink holes along the ultimate pit outline. The pit walls are also intensely fractured and weathered. Rock fall into the pit was frequent during the site assessment;
2. The exposure of sulphide ore in the lower portions of the Brown-McDade open pit is in direct violation of BYG Natural Resources' water license QZ94-004;
3. Pre-operational and operational ARD/ML prediction programs failed to fully and properly characterize the acid generation and metal leaching potential of this lower sulphide zone;
4. The lower pit walls of the northern portion of the Brown-McDade open pit were found to be chemically unstable. This is the result of exposure of sulphide minerals below the oxide zone to air and water. These sulphide minerals are rapidly oxidizing, releasing sulphate, acid (H^+ ions) and metals to surface and groundwater;
5. Soluble metal extraction test results indicate a high potential for copper, lead, arsenic, cadmium, manganese and zinc to be leached from exposed pit wall and floor rock.;
6. The pit water has periodically exceeded the EQS for copper, iron, manganese and zinc. Cadmium levels have approached the allowable EQS limit;
7. The upper oxide zone pit walls exhibit a low potential for acid generation, as previously predicted, but do show a low to moderate potential for metal leaching. This includes the southern segment of the Brown-McDade pit where open pit mining has only removed overburden and oxide ore.

An assessment of the physical and chemical stability of the waste rock dumps has determined that:

1. The west waste rock dumps are locally physically unstable and dump slopes are locally over-steepened. Tensions cracks and sink holes were noted at several locations. Waste rock dump slopes ranged from 20 to 45 degrees;
2. The dumps contain localized pockets of sulphide-rich waste rock that are oxidizing. However, it is unlikely that these pockets would have any significant effects on local surface or groundwater;
3. No large areas (greater than 4 m^2) of high-sulphide waste rock were found during the site assessment. However, their presence subsurface cannot be discounted without

further investigation or further review of available mining records of waste rock quantity inventories and location information;
4. The potential for acid generation and metal leaching from the waste rock is low.

Based on a review of available literature and the minesite assessment, the following conclusions have been made regarding the chemical stability of tailings:

1. BYG failed to conduct operational ARD/ML prediction work to assess the chemical stability of the tailings, as required in the water license QZ94-004. No records could be located on required monthly tailings composites or humidity cell tests;
2. The main impact associated with the above failure coupled with mining of sulphide-zone ore from the Brown-McDade open pit is the deposition of sulphide-rich tailings into the tailings impoundment. These sulphide-rich tailings are exposed (beached) in the northwest corner of the tailings impoundment;
3. Prediction results indicate that these tailings have a high potential to oxidize and leach metals into the tailings pond;
4. Soluble metal extraction test results indicate a high potential for arsenic and antimony to be leached from tailings despite samples containing high solids concentrations of silver, arsenic, barium, copper, iron, manganese, lead, antimony and zinc;
5. The previous metals extraction tests did not accurately predict the tailings pond chemistry. The tailings pond water has periodically exceeded the EQS for silver, cadmium, copper, manganese and zinc. Dissolved iron, antimony and lead concentrations approach or periodically exceed the EQS.
6. The effect of these exposed sulphide-rich tailings on the tailings pond chemistry is undetermined. However, in the absence of any attenuation mechanisms, dilution or collection and treatment, silver, cadmium, copper, manganese and zinc will continue to be leached. These metals may reach the receiving environment in Dome Creek downstream of the tailings impoundment via tailings impoundment seepage or spillway cresting.

Exploration and mining activities have created extensive surface disturbance of the Mount Nansen property. Limited natural revegetation has occurred. In addition, there is little evidence that BYG Natural Resources Inc. had undertaken reclamation activities during mining operations or prior to abandonment.

A historical evaluation of the key parameters of the water license QZ94-004 effluent quality standards (EQS) on the water treatment plant effluent discharge indicate:

1. WAD cyanide, total cyanide, dissolved arsenic, total cadmium, copper, iron, lead, manganese, and zinc showed a tendency to exceed the EQS;
2. The results of effluent toxicity testing for the period between September 1997 and 1998 indicate a average 60 % pass;
3. Exceedances of the EQS during operations appear to be associated with start-up, temporary suspension, and process changes in the water treatment plant and mill;
4. Parameters that were always within the EQS include antimony, barium, chromium, mercury, nickel and silver;
5. Total ammonia concentrations in effluent appear to be directly associated with operation of the water treatment plant (WTP);
6. Based on the single, post-operational sampling event by Conor Pacific in September 1999, concentrations of most parameters in effluent appears to have declined to low levels frequently below the EQS since the milling operations have ceased.

Assessment of the spatial occurrence of water quality downstream of the effluent discharge point (station E7) within Dome Creek, Victoria Creek and the Nisling River has determined that:

1. Ammonium, arsenic, copper, manganese and zinc have exceeded CCME Fresh Water guideline for the protection of aquatic life or Yukon Contaminated Site Regulations Generic Water Quality standards at two or more stream water quality sampling stations in Dome Creek;
2. The Heustis workings appear to be a source of contamination into upper Dome Creek;
3. The cause of elevated metal concentrations in the Pony Creek drainage remains unknown. Pre-operational data suggests metals were elevated prior to development of the Brown-McDade open pit.

The results of assessment of current and past stream sediment quality data are inconclusive. This is largely the result of both current background reference and exposure sample sites indicating significantly higher values than previous study results. Some metal concentrations such as arsenic, cobalt, iron and silver appear to have increased at stations D3 and D2 downstream of the tailings impoundment and are likely the result of attenuation of these metals from tailings pond seepage discharge and effluent discharge, respectively.

The conclusions reached from the screening-level ecological risk assessment are:

1. Monitoring stations D3 and D2 on Dome Creek pose a considerable risk to aquatic receptors, however, Dome Creek is classified as a Class IV waterbody by the Fisheries and Oceans Canada and there is no evidence of fish in Dome Creek to-date;
2. Based on the past and current concentrations of metals, cyanide, sulphate and ammonia in Dome Creek, it is unlikely that these localized impacts to Dome Creek will have a significant ecological effect on the Mount Nansen property and surrounding area;
3. Ammonia, a unregulated parameter at the Mount Nansen minesite, appears to currently be a contaminant of high concern in Dome Creek but shows no apparent risk to receptors downstream in Victoria Creek or the Nisling River;
4. During operations, ammonia also appeared to be a contaminant of high concern and may have posed a severe ecological risk to the ecology of Dome and Victoria creeks;
5. All parameters evaluated, including ammonia, are within both the CCME guidelines and Yukon CSR Generic Water Quality standards, indicating negligible ecological risk to this area.

8.0 RECOMMENDATIONS

It is recommended that the water treatment plant at the Mount Nansen minesite continue to operate for as long as practically possible to reduce the tailings pond volume as much as possible and therefore reduce the environmental impacts to Dome Creek.

A revised and more detailed decommissioning and reclamation cost estimate is recommended to reflect the current conditions and current costs. These costs should be incorporated directly into a revised decommissioning and reclamation plan.

The following is a list of specific decommissioning recommendations based on the inventory and hazard assessment for the Mount Nansen minesite. From highest to lowest priority these are:

1. The inactive transformers should be immediately secured and stored in a safe location. The open transformer should be sealed and the transformer that has been tipped on its side should be uprighted. Investigate all transformers on the minesite including those in active use to determine the presence of PCBs. This would entail identifying each transformer by its manufacture tag and/or sampling the mineral oil within the transformer. A management or disposal program should be completed for transformers determined to contain PCBs or mineral oil contaminated with PCBs;
2. Secure and remove the remaining ammonium nitrate from the site as soon as possible;
3. Identify all chemicals no longer in use and either store in a secure location or dispose in a proper manner. This may require analytical testing of any chemicals that are not clearly identified or if the contents of a container are suspect;
4. Initiate repairs as soon as possible on the leak in propane tank system supplying the camp facility;
5. Test all other pressurised gas cylinders and tanks and their contents. This would also include the SO_2 railcar tank at the mill. This may require analytical testing of individual container contents if they are not clearly identified or if the contents are suspect. If a tank will be kept and used, it should undergo pressure testing, repair (if needed), and certification. Pressurised gas tanks certified for use should be secured properly with any surplus or damaged gas cylinders or tanks disposed of properly;
6. Conduct a review of the previous solid waste management program to ascertain the location of all garbage and wastes. Initiate a clean-up program to collect and dispose of any garbage, scrap materials, surplus materials and/or empty drums. Surplus materials to be retained should be consolidated, stored, and maintained to prevent the migration of

contaminants into the environment. This may involve the permitting of a refuse dump or a temporary waste storage facility. A waste management program should be initiated for any solid waste and wastewater generated. This program should include the reduce, reuse, recycle principle to minimize the waste generated on the site, and address any permitting requirements;

7. Removal of any surplus chemicals in the buildings, and the safe storage and/or disposal of any equipment no longer in use. All buildings should be secured with doors and locks to prevent unauthorised access into the interiors.

It is recommended that the following additional field investigation or assessment be completed in spring or summer of 2000 to determine the full extent of the potential for soil and groundwater impacts on the Mount Nansen minesite. For potentially contaminated site soils:

1. Establish site-specific background metal concentrations to determine if CCME criteria and Yukon CSR soil standards are appropriate;
2. Conduct a detailed soil assessment to determine the full extent of contaminated soils, which may have been overlooked during this assessment due to the snow cover;
3. Conduct a detailed soil survey and sampling program to address potential impacts to soils from PCB's where transformers are stored:

For the tailings impoundment and Dome Creek it is recommended that:

1. Additional studies be conducted to fully delineate the spatial distribution of exposed or shallow sulphide-rich tailings in the tailings impoundment;
2. Mitigation and remediation options should considered that maintain tailings in a fully (water) saturated state to prevent further oxidation and metal leaching. Careful consideration should also be given to the preventing or minimizing remobilization of stored oxidation products within the tailings and porewater both during remediation and post-remediation.
3. Groundwater monitoring wells be installed and monitored to determine the extent and the effects of tailings pond seepage on Dome Creek;
4. A detailed stream sediment sampling program be conducted in the vicinity of Stations D3 and D2 to assess the extent of metals attentuation;

For historical tailings impoundments, it is recommended that:

1. These tailings be resampled to assess the current condition, despite previous studies indicating a low ARD/ML potential. Samples should consist of both tailings and pond water;
2. If results indicate no or low potential for acid generation and/or metal leaching then reclamation in place is recommended. Otherwise removal and disposal options should be determined.

For the Brown-McDade open pit and Pony Creek is recommended that:

1. A series of groundwater monitoring wells be installed to the north of the Brown-McDade open pit to determine the extent of groundwater contamination potentially impacting Pony Creek;
2. A preliminary site assessment be conduct covering exploration and development surface disturbance on the northern portion of the Mount Nansen property.

9.0 PROFESSIONAL STATEMENT

This Report has been prepared in accordance with the draft terms of reference provided by Indian and Northern Affairs Canada, Waste Management Program. The Report is consistent with the requirements of a Phase I historical information review and Phase II preliminary site investigation, which included a screening-level ecological risk assessment (Canadian Council of Ministers of the Environment, April 1997).

The person(s) signing the statement has demonstrable experience in minesite or contaminated site investigations and in the biophysical environment encountered at the site, and carried out or are familiar with the investigation carried out at the site.

CONOR PACIFIC ENVIRONMENTAL TECHNOLOGIES INC.

Per: Keith Mountjoy, M.A.Sc., P.Geo.
Geochemist

Per: Kevin Himbeault, M.Sc.
Senior Toxicologist

10.0 STATEMENT OF LIMITATIONS

This report ("Report") was prepared by Conor Pacific Environmental Technologies (Conor Pacific), for the sole benefit and exclusive use of Indian and Northern Affairs Canada, Yukon The material in it reflects Conor Pacific's best judgement in light of the information available to it at the time of preparing the Report. Any use that a third party makes of this Report, or any reliance on or decision made based on it, is the responsibility of such third parties. Conor Pacific accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken on this Report.

Conor Pacific has performed the work as described in the Scope of Work, and made the findings and conclusions set out in this Report in a manner consistent with the level of care and skill normally exercised by members of the environmental science profession practising under similar conditions at the time the work was performed.

This Report was prepared by Conor Pacific Indian and Northern Affairs Canada, Yukon and represents a reasonable review of the information available to Conor Pacific within the established Scope of Work, work schedule and budgetary constraints. It is therefore possible that currently unrecognised contamination or potentially hazardous materials may exist at the site(s) and that the levels of contamination or hazardous materials may vary across the site(s). No warranty, expressed or implied, is given concerning the presence or level of contamination on the site. The conclusions and recommendations contained in this Report are based upon applicable legislation existing at the time the Report was drafted and changes in the legislation may alter the conclusions and/or recommendations. Further, any discussion of regulatory implications is based on the applicable legislation existing at time of drafting the Report.

In preparing this Report, Conor Pacific has relied in good faith on information provided by others as noted in this Report and has assumed the information provided by those individuals is both factual and accurate. Conor Pacific accept no responsibility for any deficiency, misstatement or inaccuracy in this Report resulting from the information provided by those individuals.

The liability of Conor Pacific to Indian and Northern Affairs Canada, Yukon shall be limited to injury or loss caused by the negligent acts of Conor Pacific. The total aggregate liability of Conor Pacific related to this agreement shall not exceed the lesser of the actual damages incurred, or the total fee of Conor Pacific for services rendered on this project.

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Table 3.1-1 Summary of Major Chemical Stockpiles and Approximate Quantities

Chemical	Approximate Quantity (as of Oct. 1,1999)	Process Use
Copper Sulphate	~1000 kg	$INCO/SO_2$ process as a catalyst and a precipitant for ferrocyanide Cyanide destruction
Dense Soda Ash	324 bags	Increase pH of treated wastewater
Hydrated Lime	18 bags (25 kg)	$INCO/SO_2$ process for increasing pH
Hydrochloric Acid	11 drums	Decrease pH of treated wastewater
Hydrogen Peroxide	38 drums	Cyanide destruction
Sodium Metabisulphite	392 bags (22.67 kg)	Source of sulphur dioxide for the $INCO/SO_2$ process Cyanide destruction
Sodium Hydroxide	N/A	Increase pH of treated wastewater Clarification of treated water
Sulphur Dioxide	N/A	INCO/SO2 process as source of sulphur dioxide Cyanide destruction
Activated Carbon	N/A	Gold refining
Borax Dehydrate	100 bags (22.67 kg)	Gold refining
Lead nitrate	12 cans (25kg)	Chemical extraction of gold in the Merrill-Crowe process
Manganese Dioxide	36 25 L pails (32.67 kg)	Gold refining
Silica Flour/Sand	75 bags (22.7 kg)	Gold refining
Sodium Nitrate	20 bags (22.67 kg)	Gold refining
Sodium Cyanide	N/A	Gold refining
Ammonium Nitrate	~2 pallets (2000 kg)	Explosives component

Table 3.1-2 Specifications of Transformers Found Near the Polishing Pond

Quantity and Type	Manufacturer	Specifications	Serial Number (s)
3 Large Square	Bruce Peebles & Co Limited	2300/460-230-115 Volts 29 gallons oil each 1200 lbs.	31858 31859 34253
3 Large Barrel	General Electric	2500/230/460 Volts 45 gallons oil each 1100 lbs.	171798 169301 169303
3 Small Barrel	General Electric	2300/400DY-230/460 Volts 25, 23, 23 gallons oil respectively 660 lbs.	156471 217738 217727 (missing top)
2 Medium Square	N/A	N/A Less than ~ 29.7 gallons oil each 1.25 m x 0.3 m x 0.3m	N/A (resting on side) N/A
1 Small Square	English Electric Company	2500/115/230 Volts 7.6 gallons oil each 273 lbs.	117796

Table 3.1-3
Soil Chemistry Data

Soil chemistry data from the Mount Nansen project, 1999 and the associated regulation criteria

Analyte[1]	Units	GS1	GS2	GS3	GS4	GS5	CCME Regulations[2]	Yukon Regulations[2]
Metals								
Aluminum	$mg \cdot kg^{-1}$	8900	34800	32100	40800	30400	N/A	N/A
Antimony	$mg \cdot kg^{-1}$	**310**	**64**	**52**	**48**	2	20	40
Arsenic	$mg \cdot kg^{-1}$	**850**	**990**	**1240**	**920**	**118**	12	15
Barium	$mg \cdot kg^{-1}$	504	241	221	530	329	2,000	2,000
Beryllium	$mg \cdot kg^{-1}$	0.1	0.1	0.6	0.7	0.6	4	8
Boron	$mg \cdot kg^{-1}$	9	5	5	10	5	N/A	N/A
Cadmium	$mg \cdot kg^{-1}$	8	5.8	7.1	8.5	1.7	27	4000
Calcium	$mg \cdot kg^{-1}$	3220	71300	11500	12300	7110	N/A	N/A
Chromium	$mg \cdot kg^{-1}$	27.9	**72.9**	23.7	19.4	30.5	87	60
Cobalt	$mg \cdot kg^{-1}$	2.6	12.9	10.5	7.4	7.1	10	300
Copper	$mg \cdot kg^{-1}$	**255**	212	96.8	157	28.1	100	90-350,000
Iron	$mg \cdot kg^{-1}$	24000	92000	35000	42000	23000	N/A	N/A
Lead	$mg \cdot kg^{-1}$	**495**	485	436	760	**150**	400	100-40,000
Lithium	$mg \cdot kg^{-1}$	1700	10.9	9.6	13.6	14.7	N/A	N/A
Magnesium	$mg \cdot kg^{-1}$	873	4560	4970	3520	5730	N/A	N/A
Manganese	$mg \cdot kg^{-1}$	661	1160	879	1850	549	N/A	N/A
Molybdenum	$mg \cdot kg^{-1}$	**13700**	6	1	4	1	N/A	40
Nickel	$mg \cdot kg^{-1}$	49.2	36.3	13.2	10.6	11.9	20	500
Phosphorus	$mg \cdot kg^{-1}$	1370	460	833	912	406	N/A	N/A
Potassium	$mg \cdot kg^{-1}$	3640	7300	6500	9800	4600	N/A	N/A
Selenium	$mg \cdot kg^{-1}$	2	2	2	2	2	1	10
Silicon	$mg \cdot kg^{-1}$	999	417	594	3250	717	N/A	N/A
Silver	$mg \cdot kg^{-1}$	11.9	11.8	5.7	7	1	2	40
Sodium	$mg \cdot kg^{-1}$	291	1590	1280	1700	1890	N/A	N/A
Strontium	$mg \cdot kg^{-1}$	23	130	43	66	57	N/A	N/A
Sulfur	$mg \cdot kg^{-1}$	29000	63700	4330	6600	580	250	N/A
Thorium	$mg \cdot kg^{-1}$	4	1	1	1	1	1	N/A
Tin	$mg \cdot kg^{-1}$	3	3	2	3	2	5	300
Titanium	$mg \cdot kg^{-1}$	29.6	857	539	287	1330	N/A	N/A
Uranium	$mg \cdot kg^{-1}$	5	5	5	5	5	N/A	N/A
Vanadium	$mg \cdot kg^{-1}$	10	64	79	50	66	130	N/A
Zinc	$mg \cdot kg^{-1}$	**1790**	**748**	**667**	**1460**	**165**	380	150-15,000
Zirconium	$mg \cdot kg^{-1}$	33.7	5.8	4.3	7.1	13.4	N/A	N/A
Organics								
Benzene	$mg \cdot kg^{-1}$	**0.17**	-	-	**0.07**	**0.09**	5	0.04
EPH10_19	$mg \cdot kg^{-1}$	**28600**	218	**34000**	1720	**54100**	N/A	2,000
EPH19_32	$mg \cdot kg^{-1}$	**40500**	111	**23700**	**50700**	**8080**	N/A	5,000
Ethylbenzene	$mg \cdot kg^{-1}$	0.02	-	-	0.02	0.18	20	7
Mp-Xylene	$mg \cdot kg^{-1}$	0.05	-	-	0.05	0.42	N/A	N/A
O-Xylene	$mg \cdot kg^{-1}$	0.28	-	-	0.03	0.42	N/A	N/A
Total Xylene	$mg \cdot kg^{-1}$	0.33	-	-	0.08	0.84	20	20
PCB (total)	$mg \cdot kg^{-1}$	-	0.1	0.12	-	-	33	50
Toluene	$mg \cdot kg^{-1}$	0.02	-	-	0.02	0.02	0.8	2.5
VH6_10	$mg \cdot kg^{-1}$	1	-	-	6.3	63	N/A	200
VPH6_10	$mg \cdot kg^{-1}$	1	-	-	6.3	61	N/A	200
Physical Properties								
pH (lab)	pH units	5.2	6.74	6.82	6.88	5.48	N/A	N/A
% Moisture	%	7.4	22	9.8	3.7	19	N/A	N/A

1 [1] Metals are presented as total concentrations.

2 [2] Regulations are for an Industrial Site.

3 Yukon Contaminated Sites Regulation soil standards, Schedules 1 and 2
The most stringent value of "Intake of contaminated soil", "Groundwater used for drinking water", "Toxicity to soil invertebrates and plants", "Major microbial functional impairment", and "Groundwater flow to surface water used by aquatic life" was used.

4 "CCME Recommended Canadian Soil Quality Guidelines" dated 1997 and
"Interim Canadian Environmental Quality Criteria for Contaminated Sites" dated 1991 was used.

5 A range of values is given for those parameters which are dependent on soil pH.

6 "N/A" No applicable regulatory standard.

7 "-" Parameter not analyzed for.

8 Bold and underline indicates result exceedsYukon CSR criterion for IL

9 Shading indicates result exceeds CCME criterion

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Table 3.3-2 (Page 1 of 2)
Statistical Presentation of Post-Operational ABA Data

Sample ID	Rocktype	Field Paste pH	Temp °C	Cond. u S/cm	Rinse pH	Paste pH	CO_2 Inorg. wt.%	CaNP kg $CaCO_3$ / t	Total-S wt.%	Sulphate-S wt.%	Sulphide-S* wt.%	MPA** kg $CaCO_3$ / t	NP kg $CaCO_3$ / t	NNP kg $CaCO_3$ / t	NPR
Pit Wall Rock															
MN-PF-TP01-01	Altd LMST	4.57	8		4.0	6.0	2.58	58.57	2.76	1.62	1.14	35.6	30.2	-5.4	0.8
MN-PF-TP02-01	Altd LMST	7.10	10		7.2	7.4	3.75	85.13	1.51	0.33	1.18	36.9	54.3	17.4	1.5
MN-PF-TP03-01	Fol DORT	2.47	4		2.8	3.7	1.09	24.74	19.48	0.76	18.72	585.0	1.3	-583.7	0.0
MN-PF-TP04-01	SCST, QRZT	6.92	1		7.5	7.5	1.45	32.92	0.35	0.07	0.28	8.8	22.4	13.7	2.6
MN-PF-TP04-01 dupl										0.06			23.6		
MN-PF-TP05-01	Fol DORT	8.29	5		7.6	7.6	0.02	0.45	0.02	<0.01	0.02	0.6	3.3	2.7	5.3
MN-PF-TP06-01	GNSS	8.81	4		8.2	7.9	0.85	19.30	0.06	<0.01	0.06	1.9	25.4	23.5	13.5
Count					6	6	6	6	6	5	6	6	7	6	6
Maximum					8.2	7.9	3.8	85.1	19.5	1.6	18.7	585.0	54.3	23.5	13.5
Minimum					2.8	3.7	0.0	0.5	0.0	0.1	0.0	0.6	1.3	-583.7	0.0
Mean					6.2	6.7	1.6	36.8	4.0	0.6	3.6	111.5	22.9	-88.6	4.0
Standard Deviation					2.2	1.6	1.3	30.3	7.6	0.7	7.4	232.5	17.8	242.8	5.0
10 Percentile					3.4	4.9	0.4	9.9	0.0	0.1	0.0	1.3	2.5	-294.6	0.4
25 Percentile					4.8	6.4	0.9	20.7	0.1	0.1	0.1	3.6	12.9	-3.4	1.0
Median					7.4	7.5	1.3	28.8	0.9	0.3	0.7	22.2	23.6	8.2	2.0
75 Percentile					7.6	7.6	2.3	52.2	2.4	0.8	1.2	36.6	27.8	16.5	4.6
90 Pecentile					7.9	7.8	3.2	71.8	11.1	1.3	10.0	310.9	39.8	20.5	9.4
NBM-1 Std. (NP=42)													43.5		

*Based on difference between total sulphur and sulphate-sulphur

**Based on sulphide-sulphur

Table 3.3-2 (Page 2 of 2)
Statistical Presentation of Post-Operational ABA Data

Sample ID	Rocktype	Field Paste pH	Temp °C	Cond. uS/cm	Rinse pH	Paste pH	CO_2 Inorg. wt.%	CaNP kg $CaCO_3$ / t	Total-S wt.%	Sulphate-S wt.%	Sulphide-S* wt.%	MPA** kg $CaCO_3$ / t	NP kg $CaCO_3$ / t	NNP kg $CaCO_3$ / t	NPR
Tailings															
MN-T-TP01-01		10.33	4		8.4	8.5	1.82	41.31	3.88	0.81	3.07	95.9	27.6	-68.3	0.3
MN-T-TP02-01		10.37	1		8.3	8.4	2.22	50.39	4.00	0.81	3.19	99.7	36.9	-62.8	0.4
MN-T-TP03-01		9.75	1	1200	8.3	8.4	2.38	54.03	4.34	0.80	3.54	110.6	36.9	-73.7	0.3
MN-T-TP04-01		9.58	0	963	8.1	8.2	1.94	44.04	6.84	0.46	6.38	199.4	29.9	-169.5	0.1
MN-T-TP04-01 dupl							2.02		6.84	0.49					
MN-T-TP05-01		7.76	1	94.8	8.8	8.7	0.89	20.20	0.01	<0.01	0.01	0.3	16.6	16.3	53.1
MN-T-TP06-01		9.81	1	1017	8.4	8.5	2.54	57.66	3.65	0.63	3.02	94.4	38.7	-55.7	0.4
Count					6	6	7	6	7	6	6	6	6	6	6
Maximum					8.8	8.7	2.5	57.7	6.8	0.8	6.4	199.4	38.7	16.3	53.1
Minimum					8.1	8.2	0.9	20.2	0.0	0.5	0.0	0.3	16.6	-169.5	0.1
Mean					8.4	8.5	2.0	44.6	4.2	0.7	3.2	100.1	31.1	-69.0	9.1
Standard Deviation					0.2	0.2	0.5	13.4	2.3	0.2	2.0	63.2	8.4	59.3	21.6
10 Percentile					8.2	8.3	1.4	30.8	2.2	0.5	1.5	47.3	22.1	-121.6	0.2
25 Percentile					8.3	8.4	1.9	42.0	3.8	0.5	3.0	94.8	28.2	-72.4	0.3
Median					8.4	8.5	2.0	47.2	4.0	0.7	3.1	97.8	33.4	-65.6	0.4
75 Percentile					8.4	8.5	2.3	53.1	5.6	0.8	3.5	107.9	36.9	-57.5	0.4
90 Pecentile					8.6	8.6	2.4	55.8	6.8	0.8	5.0	155.0	37.8	-19.7	26.8
NBM-1 Std. (NP=42)													43.5		

*Based on difference between total sulphur and sulphate-sulphur

**Based on sulphide-sulphur

Table 3.3-3 (Page 1 of 2)
Post-Operational Metal Leaching Results

Solid-phase Total Metals Analysis by 4 Acid Digestion and ICP-AES

Element	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo	Na
Sample No.	ppm	%	ppm	ppb	ppm	ppm	ppm	%	ppm	ppb	ppm	ppm	ppm	%	%	ppm	%	ppm	ppm	%
PF-TP-01-01	17.3	6.27	2655	na	99	< 1	10	2.02	16.1	na	8	151	121	6.27	2.29	na	0.66	2542	5	0.05
PF-TP-02-01	8.8	7.82	388	na	658	< 1	< 5	1.93	18.8	na	12	89	218	4.37	2.48	na	0.7	3832	7	0.05
PF-TP-03-01	381.4	2.7	326	na	19	< 1	156	0.6	175.3	na	11	101	22846	17.55	1.04	na	0.34	1459	8	0.02
PF-TP-04-01	4.7	6.86	218	na	2070	< 1	< 5	0.82	12.8	na	5	36	242	2.12	2.46	na	0.4	1380	5	0.06
PF-TP-05-01	0.9	8.25	738	na	1083	1	< 5	0.27	9.4	na	9	46	28	3.48	3.05	na	0.32	1759	3	0.04
PF-TP-06-01	< .5	8.76	39	na	1443	< 1	< 5	1.52	< .4	na	18	75	36	5.87	1.6	na	1.15	833	2	0.07
T-TP-01-01	54.2	3.76	2169	na	92	< 1	28	1.77	31.9	na	3	12	449	5.38	1.26	na	0.36	2115	< 2	0.15
T-TP-02-01	59.8	4.55	2004	na	86	< 1	19	1.99	42	na	5	16	486	5.73	1.55	na	0.47	3032	< 2	0.11
T-TP-03-01	70.4	4.58	1959	na	89	< 1	21	2.03	40.3	na	5	14	509	5.89	1.56	na	0.48	3098	< 2	0.1
T-TP-04-01	72.8	4.02	1498	na	41	< 1	37	1.69	38.1	na	6	18	657	8.41	1.26	na	0.45	2106	< 2	0.37
T-TP-04-01	69.4	3.97	1561	na	43	< 1	31	1.69	35.3	na	5	14	610	8.01	1.21	na	0.43	2063	< 2	0.38
T-TP-05-01	< .5	6.95	< 5	na	1129	< 1	< 5	2.87	< .4	na	6	63	9	2.14	1.67	na	0.73	419	2	2.44
T-TP-06-01	36.2	5.8	2047	na	103	< 1	18	2.18	39.7	na	5	21	502	6.3	1.97	na	0.52	3093	< 2	0.15
NBM 99-07	0	0	0	na	0	0	0	0	0	na	0	0	0	0	0	na	0	0	0	0
STANDARD CT3/C	5.7	7.24	54	na	1053	4	22	1.61	24.9	na	13	259	63	4.14	1.91	na	0.95	943	25	1.81
STANDARD G-2	< .5	8.82	< 5	na	1076	1	< 5	3.06	< .4	na	5	73	4	2.6	3.03	na	0.76	774	2	2.77

Modified SWEP Extract Results by ICP-AES

Element	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo	Na
Sample No.	ppb	ppm	ppb	ppb	ppb	ppb	ppb	ppm	ppb	ppb	ppb	ppb	ppb	ppm	ppm	ppm	ppm	ppm	ppb	ppm
PF-TP-01-01	< 5	< .1	231	8	< 20	< 2	< 20	501.3	29	< 30	6	< 20	< 2	0.03	0.7	< .05	42.5	7.47	10	0.3
PF-TP-02-01	< 5	< .1	143	7	< 20	< 2	< 20	176.4	5	< 30	< 5	< 20	< 2	0.01	2.9	< .05	10.4	2.59	8	0.1
PF-TP-03-01	< 5	1.7	175	8	< 20	< 2	< 20	216.1	190	< 30	17	< 20	9834	18.24	1.2	< .05	27.4	16.46	11	0.1
PF-TP-04-01	< 5	< .1	31	< 5	32	< 2	< 20	21.3	< 2	< 30	< 5	< 20	< 2	< .01	1.8	< .05	8.7	0.12	< 5	0.2
PF-TP-05-01	< 5	0.2	222	17	< 20	< 2	< 20	1.9	< 2	< 30	< 5	< 20	2	0.29	1.1	< .05	0.3	0.01	< 5	0.2
PF-TP-06-01	< 5	< .1	< 30	< 5	< 20	< 2	< 20	9.5	< 2	< 30	< 5	< 20	< 2	0.02	0.8	< .05	1.2	0.01	< 5	0.4
PF-TP-06-01 dupl	< 5	< .1	< 30	< 5	< 20	< 2	< 20	9.6	< 2	< 30	< 5	< 20	< 2	0.02	0.7	< .05	1.2	0.01	< 5	0.4
T-TP-01-01	< 5	< .1	558	26	< 20	< 2	< 20	406.9	< 2	< 30	< 5	< 20	7	0.01	4.2	< .05	2.5	0.06	10	24.3
T-TP-02-01	< 5	0.1	400	79	< 20	< 2	< 20	408.7	< 2	< 30	< 5	< 20	< 2	0.01	4.4	< .05	4.1	0.13	10	21.6
T-TP-03-01	< 5	< .1	309	22	< 20	< 2	< 20	411.8	< 2	< 30	< 5	< 20	< 2	< .01	3.9	< .05	4	0.17	11	20.8
T-TP-04-01	< 5	< .1	236	10	< 20	< 2	< 20	226.5	< 2	< 30	< 5	< 20	< 2	< .01	3.5	< .05	2.8	0.16	9	13.3
T-TP-05-01	< 5	0.4	< 30	< 5	< 20	< 2	< 20	5.8	< 2	< 30	< 5	< 20	5	0.37	0.5	< .05	1.3	0.01	< 5	0.6
T-TP-06-01	< 5	< .1	579	24	< 20	< 2	< 20	466.2	< 2	< 30	< 5	< 20	2	0.01	6.2	< .05	3.4	0.05	13	24.3
T-TP-06-01 dupl	5	< .1	596	24	< 20	< 2	< 20	487.6	< 2	< 30	5	< 20	2	0.01	6.4	< .05	3.5	0.06	10	25.3
Control [1]	< 5	< .1	< 30	< 5	< 20	< 2	< 20	0.1	< 2	< 30	< 5	< 20	< 2	< .01	0.1	< .05	< .1	< .01	< 5	< .1
Standard [2]	71	0.4	234	968	971	185	< 20	< .1	52	< 30	166	422	608	0.37	0.1	< .05	< .1	0.82	335	0.1

[1] October 19/99 [2] Wastewater

Table 3.3-3 (Page 2 of 2)
Post-Operational Metal Leaching Results

Solid-phase Total Metals Analysis by 4 Acid Digestion and ICP-AES

Element	Ni	P	Pb	Sb	Se	Si	Sn	Te	Ti	U	Tl	V	W	Zn	TOT / S	CO_2	Zr	Au	La	Sr
Sample No.	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppb	%	ppm	ppb	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm
PF-TP-01-01	11	na	843	247	na	na	2	na	0.29	< 10	na	127	< 4	1059	2.76	2.58	40	< 4	31	434
PF-TP-02-01	5	na	359	55	na	na	< 2	na	0.25	< 10	na	89	< 4	1343	1.51	3.75	6	< 4	20	79
PF-TP-03-01	3	na	12524	1336	na	na	3	na	0.04	< 10	na	37	< 4	10380	19.48	1.09	13	< 4	3	31
PF-TP-04-01	3	na	336	48	na	na	< 2	na	0.07	< 10	na	28	< 4	1170	0.35	1.45	15	< 4	9	90
PF-TP-05-01	8	na	46	22	na	na	< 2	na	0.24	< 10	na	91	6	371	0.02	0.02	21	< 4	15	45
PF-TP-06-01	20	na	18	< 5	na	na	< 2	na	0.37	< 10	na	149	< 4	112	0.06	0.85	10	< 4	22	109
T-TP-01-01	4	na	1717	606	na	na	3	na	0.11	< 10	na	39	< 4	1811	3.88	1.82	23	< 4	13	142
T-TP-02-01	5	na	1932	729	na	na	4	na	0.11	< 10	na	43	< 4	2526	4	2.22	22	< 4	16	136
T-TP-03-01	5	na	1804	692	na	na	3	na	0.12	< 10	na	41	< 4	2389	4.34	2.38	25	< 4	15	130
T-TP-04-01	4	na	2248	729	na	na	< 2	na	0.13	< 10	na	42	< 4	2051	6.84	1.94	20	< 4	12	175
T-TP-04-01	5	na	1966	636	na	na	< 2	na	0.12	< 10	na	41	< 4	2009			20	5	12	177
T-TP-05-01	11	na	12	< 5	na	na	< 2	na	0.25	10	na	67	< 4	33	0.01	0.89	15	< 4	25	515
T-TP-06-01	7	na	2059	355	na	na	2	na	0.16	< 10	na	63	< 4	2480	3.65	2.54	25	< 4	16	127
NBM 99-07	0	na	0	0	na	na	0	na	0	0	na	0	0	0	1.08	0	0	0	0	0
STANDARD CT3/C	41	na	39	23	na	na	20	na	0.38	28	na	136	32	168	5.31	1.53	37	< 4	27	246
STANDARD G-2	10	na	25	< 5	na	na	2	na	0.25	11	na	60	< 4	49	< .01	< .01	7	< 4	29	**849**

Modified SWEP Extract Results by ICP-AES

Element	Ni	P	Pb	Sb	Se	Si	Sn	Te	Ti	U	Tl	V	W	Zn	Final
Sample No.	ppb	ppm	ppb	ppb	ppb	ppm	ppm	ppb	ppb	ppm	ppb	ppb	ppb	ppb	pH
PF-TP-01-01	< 20	< .02	< 10	48	204	0.82	na	11	< 10	na	< 10	< 10	13	1058	6.3
PF-TP-02-01	< 20	< .02	< 10	31	154	0.42	na	< 10	< 10	na	< 10	< 10	< 10	15	7.8
PF-TP-03-01	< 20	< .02	2917	123	171	0.42	na	< 10	< 10	na	< 10	< 10	48	12182	4.3
PF-TP-04-01	< 20	< .02	< 10	< 10	29	0.75	na	< 10	< 10	na	< 10	< 10	< 10	< 5	8.4
PF-TP-05-01	< 20	0.12	< 10	< 10	< 20	2.23	na	< 10	< 10	na	< 10	< 10	< 10	19	8.3
PF-TP-06-01	< 20	< .02	< 10	< 10	< 20	1.59	na	< 10	< 10	na	< 10	< 10	< 10	< 5	8.8
PF-TP-06-01 dupl	< 20	< .02	< 10	< 10	26	1.62	na	< 10	< 10	na	< 10	< 10	< 10	< 5	na
T-TP-01-01	< 20	< .02	< 10	255	200	1.05	na	< 10	< 10	na	< 10	< 10	< 10	5	8.7
T-TP-02-01	< 20	< .02	< 10	234	200	0.72	na	< 10	< 10	na	< 10	< 10	< 10	< 5	8.6
T-TP-03-01	< 20	< .02	< 10	248	208	0.72	na	< 10	< 10	na	< 10	< 10	< 10	7	8.5
T-TP-04-01	< 20	< .02	< 10	317	174	0.85	na	< 10	< 10	na	< 10	< 10	< 10	5	8.4
T-TP-05-01	< 20	0.06	< 10	< 10	< 20	1.69	na	< 10	13	na	< 10	11	< 10	9	9.5
T-TP-06-01	< 20	0.03	< 10	332	200	1.86	na	< 10	< 10	na	< 10	< 10	< 10	5	8.7
T-TP-06-01 dupl	< 20	0.03	< 10	348	201	1.9	na	< 10	< 10	na	< 10	< 10	< 10	5	na
Control [1]	< 20	< .02	< 10	< 10	< 20	< .01	na	< 10	< 10	na	< 10	< 10	< 10	< 5	6.3
Standard [2]	851	< .02	492	182	194	0.19	na	< 10	< 10	na	254	722	< 10	369	na

[1] October 19/99 [1] October [2] Wastewater

Table 3.3-4
Comparison of Metal Leaching Results to Pit Water Chemistry and Effluent Quality Standard

Modified SWEP Extract Results by ICP-AES

Element	Ag	As	Ba	Cd	Cr	Cu	Fe	Mn	Ni	Pb	Sb	Zn
Sample No.	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L
PF-TP-01-01	< 5	***231***	< 20	29	< 20	< 2	0.03	***7.47***	< 20	< 10	48	***1058***
PF-TP-02-01	< 5	***143***	< 20	5	< 20	< 2	0.01	***2.59***	< 20	< 10	31	15
PF-TP-03-01	< 5	***175***	< 20	***190***	< 20	***9834***	***18.24***	***16.46***	< 20	***2917***	***123***	***12182***
PF-TP-04-01	< 5	31	32	< 2	< 20	< 2	< .01	0.12	< 20	< 10	< 10	< 5
PF-TP-05-01	< 5	***222***	< 20	< 2	< 20	2	0.29	0.01	< 20	< 10	< 10	19
PF-TP-06-01	< 5	< 30	< 20	< 2	< 20	< 2	0.02	0.01	< 20	< 10	< 10	< 5
PF-TP-06-01 dup	< 5	< 30	< 20	< 2	< 20	< 2	0.02	0.01	< 20	< 10	< 10	< 5
Pit Water Quality												
Element	**Ag**	**As**	**Ba**	**Cd**	**Cr**	**Cu**	**Fe**	**Mn**	**Ni**	**Pb**	**Sb**	**Zn**
Station No.	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
E5 [1]	< 0.001	0.05	0.01	0.58	< 0.001	**2.51**	**14.85**	**56.72**	< 0.002	0.04	0.02	**40.14**
E5 [2]	< 0.001	<0.02	0.0059	0.107	< 0.001	0.076	0.037	**33**	0.017	0.007	<0.002	**15**
WL-EQS	0.1	0.15	0.15	1	0.04	0.2	1	0.5	0.3	0.1	0.15	0.3

[1] Pit water chemistry are mean concentrations of available data between 22 Oct. 1998 and 27 June 1999

[2] Pit water chemistry are from Conor Pacific data sampled 28 Sept. 1999

xxx High metal extraction concentrations

xx.xx Pit water chemistry in exceedance of the Water License Effluent Quality Standards

Table 3.4-1
Post-Operational Tailings Metal Leaching Data

Date	Sample ID	Paste pH	Total-S wt.%	Sulphate-S wt.%	Sulphide* wt.%	MPA** kg $CaCO_3$ / t	NP kg $CaCO_3$ / t	NNP kg $CaCO_3$ / t	NPR
16-Aug-94 [1]	Treated CN Effl.	8.5	1.70	1.11	0.59	18.40	12.80	-5.61	0.70
25-Nov-98 [2]	Tailings	7.8	1.18	0.53	0.65	20.31	19.9	-0.4	0.98
	Duplicate						20.2		
6-Jan-99	Tailings	8.26	3.38	1.15	2.23	69.69	29.9	-39.8	0.43
	Duplicate						29.9		
	NBM-1 Std.						49.8		
20-Feb-99	Tailings	8.38	3.56	0.87	2.69	84.06	48.1	-36	0.57
	Duplicate						48.2		
	NBM-1 Std.						49.6		

*Based on difference between total sulphur and sulphate-sulphur

**Based on sulphide-sulphur

[1] Process Research Associates Ltd., 1994

[2] B.Y.G. Natural Resources Inc. Monthly Reports 1998 and 1999

Table 3.4-2
Comparison of Metal Leaching Results to Tailings Pond Chemistry and Effluent Quality Standard

Modified SWEP Extract Results by ICP-AES

Element	Ag	As	Ba	Cd	Cr	Cu	Fe	Mn	Pb	Sb	Zn
Sample No.	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
T-TP-01-01	< 5	***558***	< 20	< 2	< 20	7	0.01	0.06	< 10	***255***	5
T-TP-02-01	< 5	***400***	< 20	< 2	< 20	< 2	0.01	0.13	< 10	***234***	< 5
T-TP-03-01	< 5	***309***	< 20	< 2	< 20	< 2	< .01	0.17	< 10	***248***	7
T-TP-04-01	< 5	***236***	< 20	< 2	< 20	< 2	< .01	0.16	< 10	***317***	5
T-TP-05-01	< 5	< 30	< 20	< 2	< 20	5	0.37	0.01	< 10	< 10	9
T-TP-06-01	< 5	***579***	< 20	< 2	< 20	2	0.01	0.05	< 10	***332***	5
T-TP-06-01 dupl	5	***596***	< 20	< 2	< 2	< 30	5	6.4	25.3	< 20	< 10
Element	**Ag**	**As**	**Ba**	**Cd**	**Cr**	**Cu**	**Fe**	**Mn**	**Pb**	**Sb**	**Zn**
Operation [1]	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Count	65	108	70	67	16	71	71	71	59	62	70
Min	0.008	0.000	0.009	0.002	0.001	0.036	0.070	0.019	0.001	0.001	0.023
Mean	**0.251**	**0.554**	0.032	**0.168**	0.004	**24.562**	**1.542**	**2.762**	0.045	0.136	**12.660**
Median	0.147	0.429	0.021	0.200	0.002	17.600	0.650	0.470	0.018	0.100	13.650
Max	1.800	1.830	0.269	0.444	0.021	105.000	**18.200**	27.500	**0.365**	**0.470**	32.000
Post-operational [2]											
E1	0.079	< 0.02	0.0213	< 0.0005	< 0.001	**17.3**	0.1	**1.36**	< 0.005	< 0.02	0.032
WL-EQS	0.1	0.15	1.0	0.02	0.04	0.2	1.0	0.5	0.1	0.15	0.30

[1] Tailings Pond water chemistry of available data from Station E1 between 15 Apr. 1997 and 27 June 1999

[2] Tailings Pond water chemistry of Conor Pacific data for Station E1 sampled 28 Sept. 1999

xxx High metal extraction concentrations

xx.xx Mean Tailings Pond water chemistry in exceedance of the Water License Effluent Quality Standards

Table 3.8-3
Calculated Un-ionized Ammonia Concentrations

Calculated un-ionized ammonia concentrations based on site specific total ammonia, pH and temperature measurements

	Autumn 1999						Summer 1998					
Station	Total ammonia	pH	Temp. °C	Conversion factor	Un-ionized ammonia	Risk Quotient	Total ammonia	pH	Temp. °C	Conversion factor	Un-ionized ammonia	Risk Quotient
E7	11.3	7.25	3.4	0.335	0.03786	0.46	n/a					
D3	11.8	7.53	1.1	0.284	0.03351	0.40	n/a					
D2	7.85	7.86	2.8	1.05	0.08243	0.99	22.4	8.15	10	1.83	0.40992	4.94
D4	0.41	7.25	1.5	0.284	0.00116	0.01	42.2	8.28	10	5.56	2.34632	28.27
V4	0.05	7.7	1.1	0.891	0.00045	0.01	2.34	7.68	10	1.83	0.04282	0.52
V5	0.05	7.71	2.5	1.05	0.00053	0.01	0.799	7.75	10	1.83	0.01462	0.18
V7	0.05	7.79	2.1	0.968	0.00048	0.01	0.032	7.83	10	1.83	0.00059	0.01
Ns1	0.05	7.18	2.6	0.106	0.00005	0.00	0.008	7.68	10	0.586	0.00005	0.00
Ns2	0.05	7.49	2.2	0.308	0.00015	0.00	0.017	7.67	10	0.586	0.00010	0.00

Table 4.3-1
Summary of Benthic Invertebrates Collected in the Mount Nansen Area During July-August 1998

Station	Number of animals	Diversity	Evenness
Dome Creek			
Station 2	531	0.21	0.19
Station 4	110	0.06	0.013
Back Creek			
Station 5	13	0.39	0.82
Station 7	16	0.82	0.91
Victoria Creek			
Station 8	797	0.54	0.41
Station 9	110	0.73	0.66
Station 10	263	0.70	0.60
Station 12	433	0.56	0.46
Minnesota Creek			
Station 11	186	0.73	0.62

Table 4.3-2 Statistical Presentation of Pre-operational ABA Data (Page 1 of 3)

Date	Sample ID	Section	DDH	Interval m	Elev. m	Rocktype	Paste pH	CO_2 Inorg. wt.%	CaNP kg $CaCO_3$ / t	Total-S wt.%	Sulphate-S wt.%	Sulphide* wt.%	MPA** kg $CaCO_3$ / t	NP kg $CaCO_3$ / t	NNP kg $CaCO_3$ / t	NPR
11-Oct-85	5					Marginal Ore				0.38			12	20.7	8.9	1.8
11-Oct-85	6					Wall Rock				0.09			3	19.8	17.2	7.6
11-Oct-85	7					Marginal Ore				0.46			14	6.2	-8.1	0.4
1989	T-2755		88-68	10.06		Altd GRDR	8.6	0.2	0.45	0.03	0.05 [1]	0.01 [1]	0.31	4.5	4.0	14.5
1989	T-2768		88-68	24.38		Altd GRDR	8.1	0.2	0.45	0.06	0.21 [1]	0.01 [1]	0.31	4.5	4.0	14.5
1989	T-0217		88-61	36.58		Altd GRDR	8.2	4.4	10.01	0.11	0.09 [1]	0.01 [1]	0.31	100.0	100.0	322.6
1989	T-0284		88-55	4.27		FPD	8.7	4.1	9.32	0.30	0.01 [1]	0.02 [1]	0.63	93.2	93.0	147.9
1989	T-0207		88-55	27.74		FPD	4.2	0.2	0.45	0.51	1.63 [1]	0.01 [1]	0.31	4.5	4.0	14.5
1989	S-01192		88-55	41.76		FPD	4.1	0.2	0.45	0.54	1.65 [1]	0.01 [1]	0.31	4.5	4.0	14.5
1989	S-01334		88-60	23.4		GRDR	7.9	1.4	3.18	1.35	1.57 [1]	0.42 [1]	13.13	31.8	19.0	2.4
1989	S-1826		88-66	30.48		GRDR	8.1	0.5	1.14	0.30	0.89 [1]	0.07 [1]	2.19	11.4	9.0	5.2
1989	S-01159		88-54A	6.1		VEIN	6.4	0.2	0.45	0.03	0.15 [1]	0.01 [1]	0.31	4.5	4.0	14.5
1989	S-01177		88-54A	21.34		VEIN	5.6	0.3	0.68	2.77	3.58 [1]	1.05 [1]	32.81	6.8	-26.0	0.2
1989	S-1188		88-55	37.19		VEIN	3.0	0.2	0.45	14.60	2.45 [1]	13.08 [1]	408.75	4.5	-404.0	0.0
1994		1+33 S	88-57	0-15		UAltd GRDR	7.9			0.37	0.12	0.25	7.8	33.2	25.4	4.3
1994		0+33 S	88-63	0-15		UAltd GRDR	8.0			0.34	0.01	0.33	10.3	56.4	46.1	5.5
1994		0+33 S	88-67	0-15		UAltd GRDR	8.2			0.14	0.03	0.11	3.4	31.6	28.2	9.2
1994		0+00	88-68	0-15		UAltd GRDR	8.1			0.06	0.03	0.03	0.9	13.1	12.2	14.0
1994		1+66 S	88-71	0-12		UAltd GRDR	7.4			0.25	0.15	0.10	3.1	8.6	5.4	2.7
1994		1+66 S	88-72	0-15		UAltd GRDR	8.0			0.24	0.07	0.17	5.3	45.5	40.1	8.5
1994		0+33 N	88-73	0-15		UAltd GRDR	8.2			0.27	0.01	0.26	8.1	30.4	41.6	14.3
1994		0+33 N	88-75	0-15		UAltd GRDR	8.1			0.14	0.04	0.10	3.1	44.7	41.6	14.3
1994		1+00 S	88-104	0-9		UAltd GRDR	8.1			0.33	0.01	0.32	10.0	30.8	20.8	3.1
1994		1+33 S	88-57	15-30		LAltd GRDR	7.9			0.39	0.08	0.31	9.7	52.1	42.4	5.4
1994		0+33 S	88-63	15-20		LAltd GRDR	6.6			0.20	0.02	0.18	5.8	4.3	-1.5	0.7
1994		0+33 S	88-67	15-22		LAltd GRDR	7.9			0.52	0.05	0.47	14.7	23.0	8.3	1.6
1994		1+66 S	88-72	15-32		LAltd GRDR	6.8			1.45	0.67	0.78	24.4	44.9	20.5	1.8
1994		0+33 N	88-75	15-30		LAltd GRDR	8.0			0.30	0.03	0.27	8.4	37.9	29.5	4.5
1994		0+67 N	88-82	15-20		LAltd GRDR	8.2			0.22	0.01	0.21	6.6	54.6	48.0	8.3
1994		1+00 S	88-55	0-15		UFPD	8.0			0.35	0.04	0.31	9.7	30.4	20.7	3.1
1994		1+33 S	88-56	0-7		UFPD	7.6			0.20	0.14	0.06	1.9	30.9	29.0	16.5
1994		0+67 S	88-60	0-5		UFPD	8.0			0.38	0.05	0.33	10.3	31.0	20.7	3.0
1994		3+33 S	88-97	0-14		UFPD	8.3			0.04	0.04	0.00	1.3	34.0	32.7	27.2
1994		2+67 N	88-83	0-15		UFPD	7.8			0.23	0.1	0.13	4.1	47.4	43.3	11.7
1994		3+30 S	88-92	0-5		UFPD	8.0			0.08	0.14	-0.06	2.5	57.3	54.8	22.9

Table 4.3-2 Statistical Presentation of Pre-operational ABA Data (Page 2 of 3)

Date	Sample ID	Section	DDH	Interval m	Elev. m	Rocktype	Paste pH	CO_2 Inorg. wt.%	CaNP kg $CaCO_3$ / t	Total-S wt.%	Sulphate-S wt.%	Sulphide* wt.%	MPA** kg $CaCO_3$ / t	NP kg $CaCO_3$ / t	NNP kg $CaCO_3$ / t	NPR
1994		0+67 N	88-82	0-15		UFPD	8.2			0.66	0.01	0.65	20.3	85.8	65.5	4.2
1994		1+00 S	88-55	15-24		LFPD	5.8			0.56	0.35	0.21	6.6	2.8	-3.7	0.4
1994		0+00	88-68	15-35		LFPD	7.4			0.33	0.12	0.21	6.6	27.2	20.7	4.1
1994		0+33 N	88-73	15-20		LFPD	8.4			0.83	0.01	0.82	25.6	90.8	65.2	3.5
1994		0+33 N	88-73	29-34		FWGRDR	7.1			0.42	0.15	0.27	8.4	10.7	2.3	1.3
1994		2+67 N	88-83	24-30			8.8			1.02	0.01	1.01	31.6	17.7	-13.9	0.6
1994		1+66 S	88-71	22-24			9.0			0.12	0.01	0.11	3.4	22.2	18.8	6.5
1994		0+00	88-68	54-55			8.6			0.60	0.07	0.53	16.6	26.7	10.2	1.6
1994		3+30 S	88-92	12-15			8.2			0.11	0.12	-0.01	3.4	27.2	23.8	7.9
1994		3+33 S	88-97	23-27			8.5			0.07	0.01	0.06	1.9	47.1	45.2	25.1
1994		0+67 N	88-77	48-52			8.5			0.50	0.01	0.49	15.3	36.0	20.6	2.3
1994		1+33 S	88-57	47.4-48.6			7.9			0.31	0.01	0.30	9.4	40.4	31.0	4.3
1994		1+66 S	88-72	40-42			7.8			0.50	0.04	0.46	40.6	14.4	26.2	2.8
1994		2+33 S	88-80	23-33			8.6			0.11	0.01	0.10	3.1	43.1	40.0	13.8
1994		0+67 N	88-82	29-33			8.5			1.16	0.01	1.15	35.9	53.4	17.4	1.5
1994		1+00 S	88-55	50-54			8.1			0.96	0.07	0.89	27.8	73.7	45.9	2.7
1994	Composite					UAltd GRDR										
1994	Composite					LAltd GRDR										
1994	Composite					UFPD										
1994	Composite					LFPD										
1994	Composite					FWGRDR										
Jun-96	6301	5+29			1261	FWAGRDR	7.1			1.82	0.82	1.00	31.3	46.7	15.4	1.5
Jun-96	6302	4+96			1261	FWAGRDR	6.3			0.32	0.03	0.29	9.1	8.0	-1.1	0.9
Jun-96	6303	4+63			1255	FWAGRDR	6.5			0.09	0.01	0.08	2.5	-1.9	-4.4	-0.8
Jun-96	6304	4+30			1255	FWAGRDR	6.7			0.37	0.04	0.33	10.3	16.0	5.7	1.6
Jun-96	6305	3+97			1261	FWAGRDR	6.1			0.21	0.01	0.20	6.4	-3.1	-9.5	-0.5
Jun-96	6306	3+64			1261	FWAGRDR	7.7			0.17	0.01	0.16	5.2	13.5	8.4	2.6
Jun-96	6307	3+31			1261	FWAGRDR	5.9			0.09	0.01	0.08	2.7	-1.9	-4.6	-0.7
Jun-96	6308	2+98			1265	FWAGRDR	7.1			0.12	0.01	0.11	3.6	3.1	-0.5	0.8
Jun-96	6309	2+65			1265	FWAGRDR	6.5			0.11	0.01	0.10	3.28	-4.36	-7.6	-1.3
Jun-96	6310	2+32			1265	FWAGRDR	7.7			0.63	0.01	0.62	19.53	23.09	3.6	1.2
Jun-96	6316	2+98			1262	HWAGRDR	7.6			0.32	0.01	0.31	9.84	50.54	40.7	5.1
Jun-96	6317	3+31			1262	HWFPD	7.9			0.81	0.01	0.80	25.16	76.51	51.4	3.0
Jun-96	6318	3+64			1262	HWGRDR, VEIN	7.0			0.14	0.01	0.13	3.75	5.52	1.8	1.5

Table 4.3-2 Statistical Presentation of Pre-operational ABA Data (Page 3 of 3)

Date	Sample ID	Section	DDH	Interval m	Elev. m	Rocktype	Paste pH	CO_2 Inorg. wt.%	CaNP kg $CaCO_3$ / t	Total-S wt.%	Sulphate-S wt.%	Sulphide* wt.%	MPA** kg $CaCO_3$ / t	NP kg $CaCO_3$ / t	NNP kg $CaCO_3$ / t	NPR
Count							61	11	11	64	50	50	64	64	64	64
Maximum							9.0	4.4	10.0	14.6	0.8	1.2	408.8	100.0	100.0	322.6
Minimum							3.0	0.2	0.5	0.0	0.0	-0.1	0.3	-4.4	-404.0	-1.3
Mean							7.5	1.1	2.5	0.6	0.1	0.3	16.1	29.8	14.9	13.1
Standard Deviation							1.2	1.6	3.7	1.8	0.2	0.3	50.8	25.3	58.4	43.6
10 Percentile							6.1	0.2	0.5	0.1	0.0	0.1	0.7	4.4	-4.5	0.4
25 Percentile							7.1	0.2	0.5	0.1	0.0	0.1	3.0	7.7	4.0	1.5
Median							7.9	0.2	0.5	0.3	0.0	0.3	6.6	27.2	18.9	3.3
75 Percentile							8.2	1.0	2.2	0.5	0.1	0.4	13.4	45.1	40.0	9.8
90 Pecentile							8.5	4.1	9.3	1.0	0.1	0.8	27.1	57.0	47.4	14.5

*Based on difference between total sulphur and sulphate-sulphur

**Based on sulphide-sulphur

[1] HNO_3 soluble

Table 4.4-1
Security Payment Schedule

Reclamation Security	Payment Schedule	Date	Payment Made	Chemical Security	Payment Schedule	Date	Payment Made	Total Security
$50,000	License issue date + 30 days		Yes					$50,000
$250,000	On or before start up date	10-Dec-96	Yes					$300,000
$65,000	On or before first anniversary	10-Dec-97	Yes	$80,000	On first anniversary	10-Dec-97	Yes	$445,000
$65,000	On or before second anniversary	10-Dec-98	Yes	$160,000	On second anniversary	10-Dec-98	Yes	$670,000
$25,000	On or before third anniversary	10-Dec-99	Unknown	$180,000	On third anniversary	10-Dec-99	Unknown	$875,000
				$99,500	On fourth anniversary	10-Dec-00	Unknown	$974,500
$455,000	Total			$519,500	Total			$974,500

Table 5.4-1
Classification of Main Chemical Reagents

Scale	Chemical/Reagent	Formula	Process Circuit	Purpose
large	sodium cyanide	NaCN	mill	gold recovery
	diesel fuel			
	lime (quicklime)	CaO		
	suphur dioxide	SO2	WTP	
small	copper sulphate	CuSO4		
	hydrochloric (muryatic) acid	HCl		
	sodium hydroxide (caustic soda	NaOH		
	propane			
	gasoline			
	antifreeze			
	greases, hydraulic fluids, lubricating oils			
	Percol E10			
	Essolube NOX PLUS 10W-30			
	waste oil			
	cleaning agents, solvents			
	Aerodri 104			
	ammonium nitrate solution			major explosives component
	sodium nitrate	NaNO3		
non-toxic	polyacrymide flocculants		mill	coagulating agent for removal of suspended solids in thickener
	silica flour		mill	gold refining flux
	anhydrous borax		mill	gold refining
	soda ash (sodium carbonate)	Na2CO3	mill	gold refining

Table 5.4-2 Operational Tailings Discharge Volumes (Page 1 of 2)

Year	Date	Tailings Ttl. m^3	S:L Ratio	Solid m^3	Liquid m^3	Cum. Ttl. m^3	% Reclaim	Comments	Seepage Rate L/min
Capacity		294,000		155,000	139,000	410,750		Density 2.65	
1996					25,403				
1997	Jan-97	–	0.41	13,976	19,949	30,700			
	Feb-97	7,492	0.39	2,884	10,376	38,192			
	Mar-97	–	–	–	–	–			
	Apr-97	10,396	0.35	6,301	4,095	48,588			
	May-97	10,085	0.40	8,068	2,017	58,763	100	T.P. sprinkler system working.	
	Jun-97	10,889	0.35	8,167	2,272	69,562	100	T.P. sprinkler system working, 100% reclaim achieved	
	Jul-97	11,559	0.40	4,624	6,935	81,121		deposited on upstream face of dam	
	Aug-97	–	–	–	–	–			
	Sep-97	8,169	0.40	3,267	4,901	89,290			
	Oct-97	12,856	0.40	5,034	7,822	102,146			
	Nov-97	7,950	0.40	3,180	4,770	110,096			
	Dec-97	–	–	–	–	–		Mill shutdown, T.P. water level too high, reclaim lines frozen	

Table 5.4-2 Operational Tailings Discharge Volumes (Page 2 of 2)

Year	Date	Tailings Ttl. m^3	S:L Ratio	Solid m^3	Liquid m^3	Cum. Ttl. m^3	% Reclaim	Comments	Seepage Rate L/min
1998	Jan-98	–	–	–	–	–		Mill shutdown	
	Feb-98	1,411	0.36	509	902	111,507	100	Mill restarted Feb 23, 1998; 100% reclaim	
	Mar-98	7,948	0.37	2,970	4,978	119,455	100	100% reclaim	6.5
	Apr-98	9,209	0.36	3,321	5,888	128,664	100	100% reclaim	8
									8
									8
									10
	May-98	11,028	0.42	4,659	6,369	139,692	100		11
									13
									16
									11
	Jun-98	17,027	0.42	7,096	9,931	156,719			8.5
									7.5
									8.5
									8.5
	Jul-98	14,407	0.42	6,026	8,381	171,126			
	Aug-98	–	–	–	–	–			
	Sep-98	15,456	–	–	–	186,582			
	Oct-98	–	–	–	–	–			
	Nov-98	–	–	–	–	–			
	Dec-98	–	–	–	–	–			
TOTAL						258,174	*		

Table 5.4-3
Water Treatment Plant Discharge

DAILY

Date	Duration	Rate	Discharge	Ttl Discharge
	hours	m3/hr	m3	m3
26-Jan-98	8.5	15	127	127
27-Jan-98	24	15	360	487
28-Jan-98	14	15	210	697
30-Jan-98	14	15	210	907
31-Jan-98	7	15	105	1012
AVERAGE	13.5	15	202.4	646
TOTAL	67.5	75	1012	3230

MONTHLY

Date	Duration	Duration	Av. Rate	Discharge	Ttl. Discharge
	hours	days	m3/hr	m3	m3
Jan-98	67.5	5	15	1012	1012
Feb-98	514.5	na	33.8	17384	18396
Mar-98	na	18			32118
Apr-98	430	20	24.4	10501	43720
May-98	565.5	29	19.3	10908	54628
Jun-98	na	6	na	16095	70723
Jul-98 [1]	na	31	na	19360	90083
Aug-98	na	22	na	10789	100872
Sep-98 [2]	na	na	na	na	na
Oct-98 [3]	na	na	na	na	na
Nov-98	na	19	na	9116	109988
Dec-98	na	2	na	794	110782
Jan-99 [4]	na	na	na	na	na
Feb-99 [5]	na	na	na	na	na
AVERAGE	394.4	17	23.1	10662	
TOTAL	1577.5	152	92.5	95959	110782

[1] Discharge from E7 to Dome Creek daily. 12 hrs July 7.

[2] Treatment Suspended 17 Sept. to 17 Oct. No Discharge

[3] Treatment Suspended 17 Sept. to 17 Oct. No Discharge

[4] Treatment Suspended 7 Dec.

[5] No Treatment - Milling and Mining Operations suspended 18 Feb.

WEEKLY

Date	Duration	Discharge	Ttl Discharge	Bioassay
	hours	m3	m3	Results
1-Feb-98	na	2100	na	failed
8-Feb-98	na	2800	4900	not required
15-Feb-98	na	4900	9800	passed
22-Feb-98	na	5000	14800	not required
1-Mar-98	na	4436	19236	failed
8-Mar-98	na	5790	25026	not required
15-Mar-98	na	6241	31267	failed
22-Mar-98	na	612	31879	not required
29-Mar-98	na	372	32251	no test
9-Apr-98	na	4305	36556	na
16-Apr-98	na	3075	39631	na
23-Apr-98	na	No Discharge	39631	na
30-Apr-98	21	2988	42619	na
7-May-98	20	1491	44110	na
14-May-98	21	2576	46686	last 5 passed
21-May-98	21	2204	48890	passed
30-May-98	21	2916	51806	na
4-Jun-98	na	3746	55552	passed
11-Jun-98	continuous	3790	59342	na
18-Jun-98	continuous	3203	62545	na
25-Jun-98	continuous	3846	66391	na
AVERAGE	20.8	3320		
TOTAL	104.0	66391	66391	

Table 5.4-4
Operational Tailings ABA Data

Date	Sample ID	Paste pH	Total-S wt.%	Sulphate-S wt.%	Sulphide* wt.%	MPA** kg $CaCO_3$ / t	NP kg $CaCO_3$ / t	NNP kg $CaCO_3$ / t	NPR
16-Aug-94 [1]	Treated CN Effl.	8.5	1.70	1.11	0.59	18.40	12.80	-5.61	0.70
25-Nov-98 c. M	Tailings	7.8	1.18	0.53	0.65	20.31	19.9	-0.4	0.98
	Duplicate						20.2		
6-Jan-99	Tailings	8.26	3.38	1.15	2.23	69.69	29.9	-39.8	0.43
	Duplicate						29.9		
	NBM-1 Std.						49.8		
20-Feb-99	Tailings	8.38	3.56	0.87	2.69	84.06	48.1	-36	0.57
	Duplicate						48.2		
	NBM-1 Std.						49.6		

*Based on difference between total sulphur and sulphate-sulphur

**Based on sulphide-sulphur

[1] Process Research Associates Ltd., 1994

[2] B.Y.G. Natural Resources Inc. Monthly Reports 1998 and 1999

Table 5.9-1. Summary of monthly air temperature and rainfall recorded at the Mount Nansen weather station during the operational period.

Month	Temperature (°C)		Precipitation (mm) [1]		
	1997	1998 [2]	Baseline [3]	1997	1998 [2]
January	–	-16.7	17.5	–	1.0
February	–	-6.2	12.0	–	1.5
March	–	-7.9	6.8	–	5.1
April	–	-1.1	6.6	–	3.6
May	–	14.0	19.6	–	13.5
June	–	11.0	33.7	–	67.3
July	–	10.1	53.8	–	18.3
August	–	8.4	38.5	–	33.8
September	5.5	3.7	30.0	32.5	37.1
October	N/A	-3.4	18.7	N/A	4.6
November	N/A	-11.0	17.9	N/A	0.0
December	N/A	-14.4	14.9	N/A	0.8
Year	–	-1.1	270	–	187

Notes:

1. Snowfall is not included in the weather station data for 1997 or 1998, and therefore the winter estimates do not reflect total precipitation.
2. There were interruptions in data collection during February (3 days), May (28 days) and July (28 days). These interruptions (especially for May and July) likely resulted in lower monthly rainfall measurements than actual.
3. The baseline weather data were obtained from the Carmacks station.
4. N/A indicates that no records were found for these months.

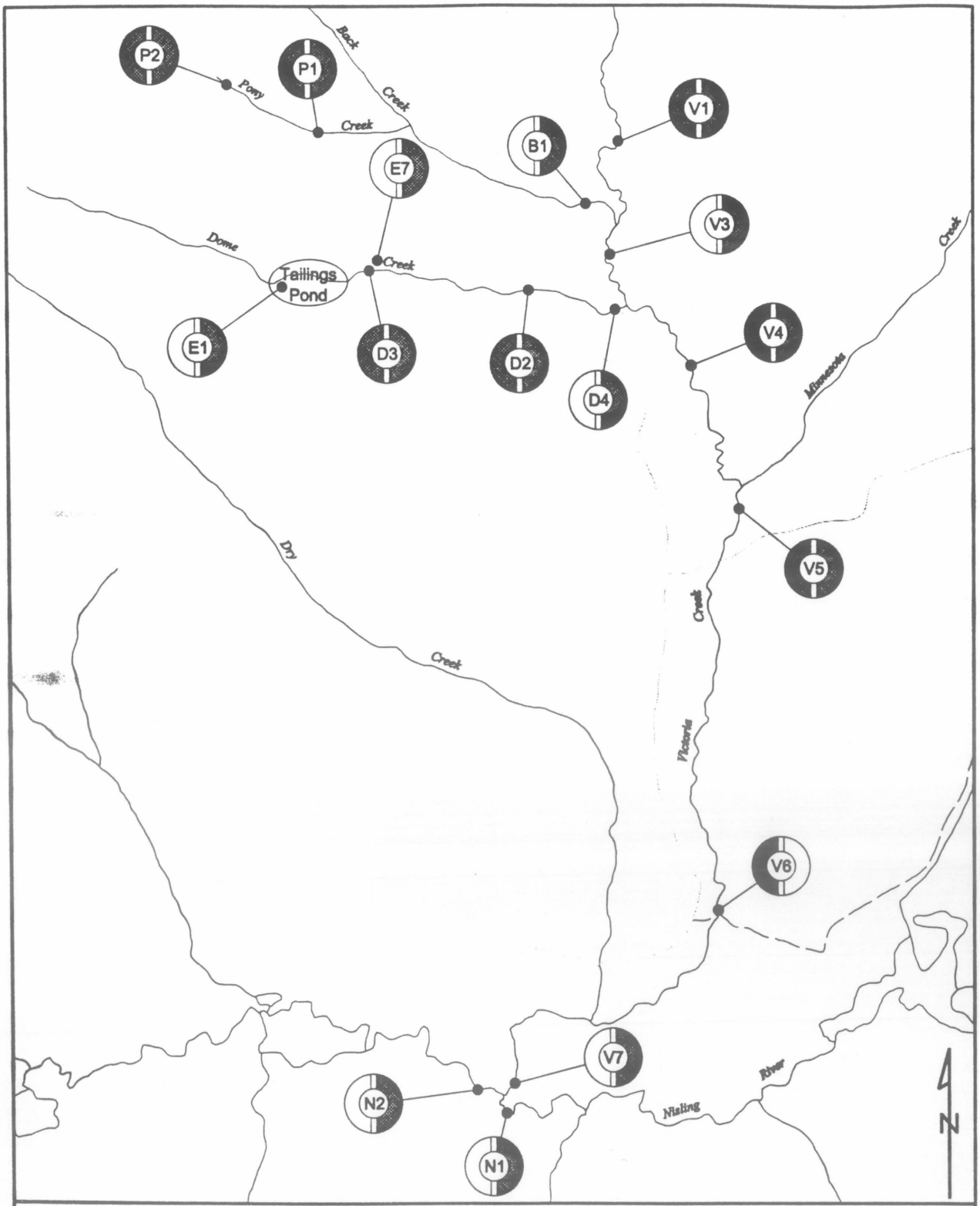
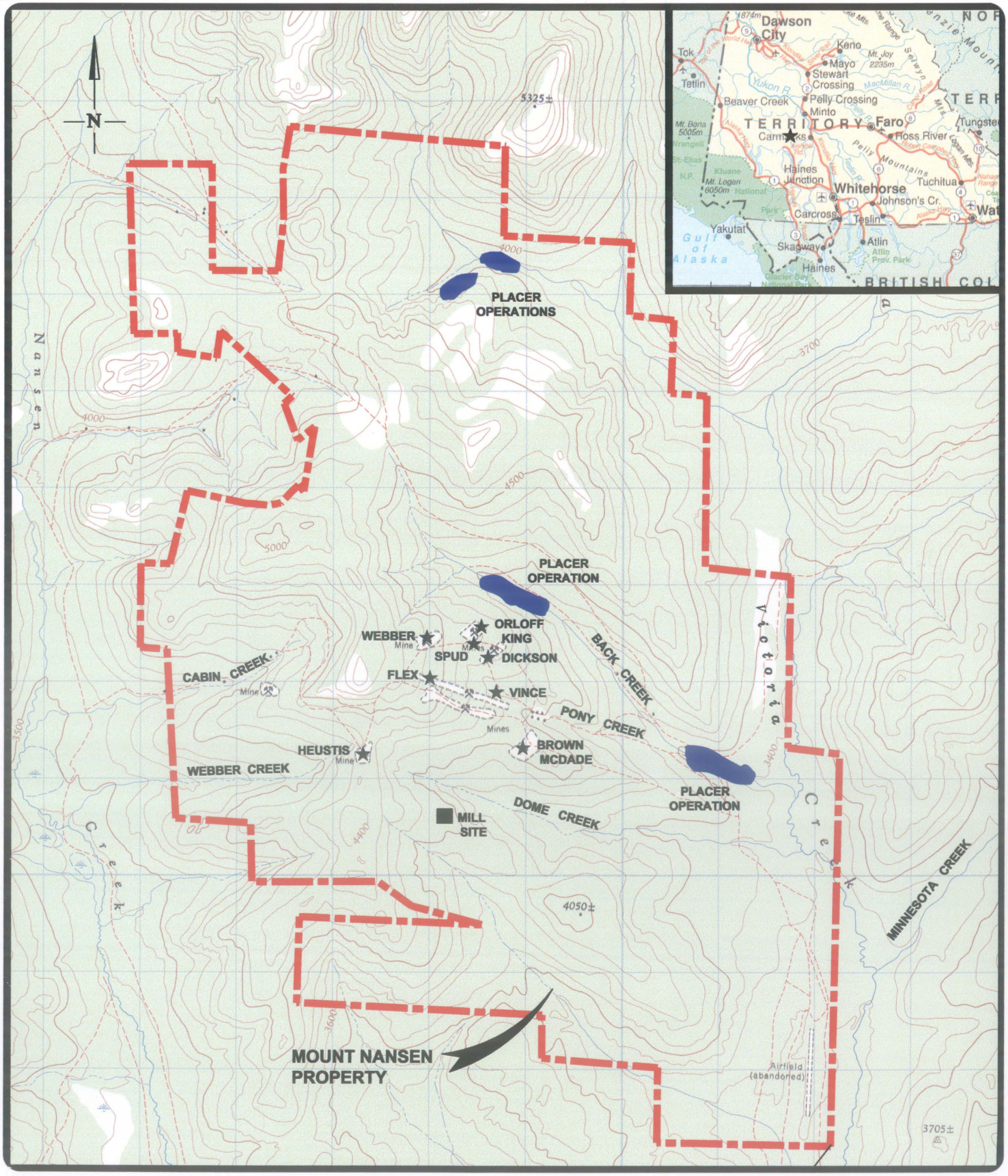


Figure 2.1-2
Receiving environment study area, September 1999.

Conor Pacific
Environmental Technologies Inc.



INDIAN AND NORTHERN AFFAIRS CANADA

SITE LOCATION MAP - MOUNT NANSEN PROPERTY

Conor Pacific
Environmental Technologies Inc.

Scale:	Date:
Grid is 1Km	02/03/00

FIGURE 2.1-1

96744T7000FIG1.DWG

ELECTRICAL PARTS
(POPE, SHELVING ETE.)

ELECTRICAL MOTORS

ELECTRICAL WIRES

METAL PARTS

METAL SCRAP

TIRES/RUBBER

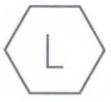
WOOD

WOOD SCRAP

REFUSE/DEBRIS

SAG MILL BALLS

BATTERIES



MECHANICAL COMPONENTS/ EQUIPMENT

LARGE PRESSURE/MIX TANKS

PIPE

EROSION CONTROL FABRIC

DRUMS - CHEMICAL

DRUMS - EMPTY

DRUMS - WASTE MATERIAL

PAILS - CHEMICAL

PAILS - EMPTY

GROUT/CEMENT/BENTONITE

COMPRESSED GAS CYLINDERS

OIL & SLUDGE

BAGGED CHEMICALS (MAGNESIUM DIOXIDE, SILICA SAND, SODIUM NITRATE, BORAX)

TRANSFORMERS

ABANDONED VEHICLE/EQUIPMENT

INDIAN AND NORTHERN AFFAIRS CANADA

INVENTORY SYMBOLS - MOUNT NANSEN PROPERTY

Conor Pacific
Environmental Technologies Inc.

Scale:	Date:
NTS	02/03/00

FIGURE 3.1-1

96744T7000FIG4.DWG

LEGEND:

⊕ SAG-GS1 GRAB SAMPLE

NOTES:

1. **Base Drawing provided by B.Y.G. Natural Resources Inc.**
2. **Dimensions and Site Features are approximate.**
3. **Drawings not to be used for Engineering Design or Construction Purposes.**
4. **For Inventory Symbol Legend see Figure 4.**

TITLE:

INVENTORY OF MILL SITE

PROJECT:

MOUNT NANSEN MINE SITE

CLIENT:

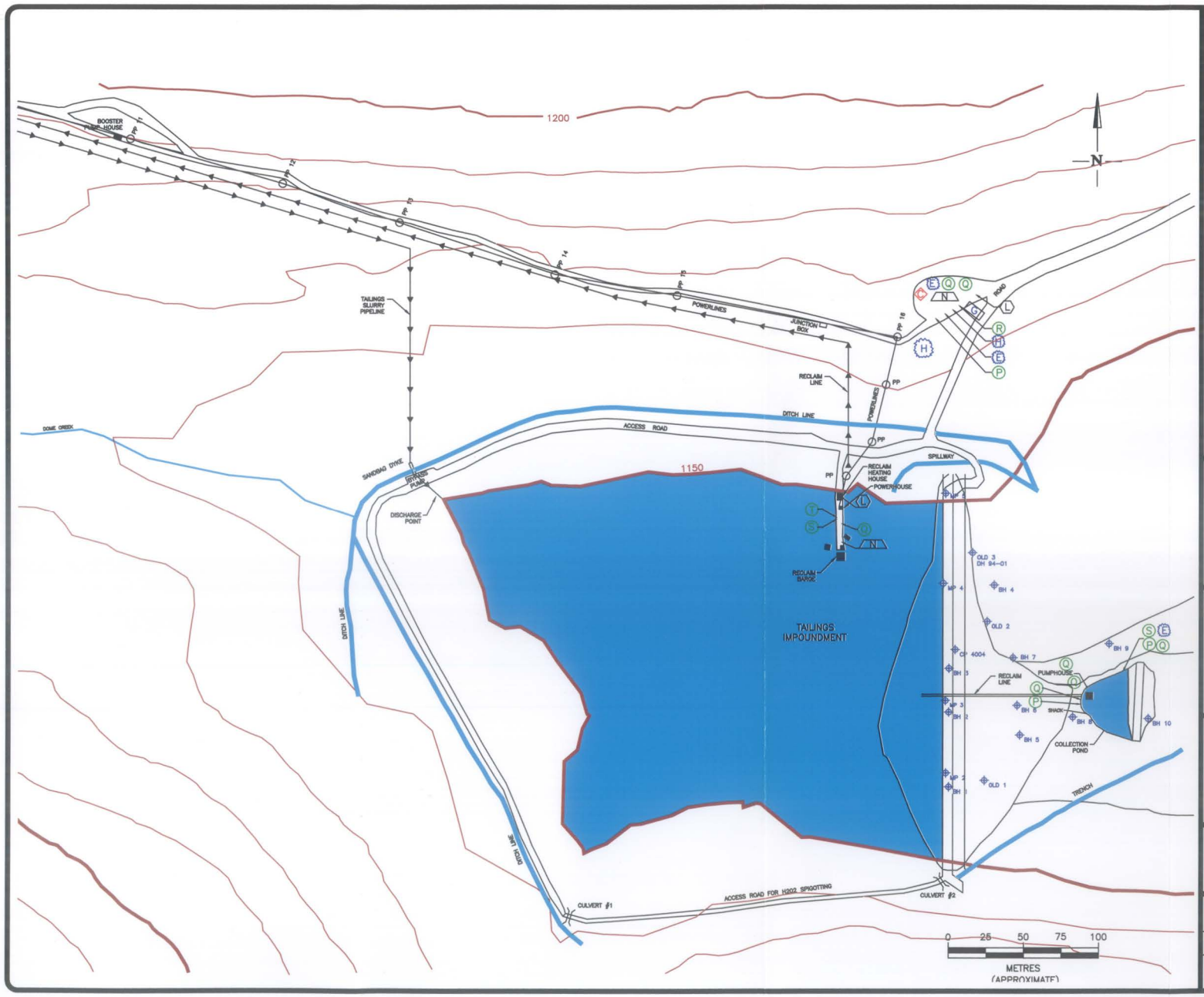
INDIAN & NORTHERN AFFAIRS CANADA

Conor Pacific
Environmental Technologies Inc.

Drawing date: 10/17/99	Revised date: 11/26/99
Drawn by: DK	Checked by: KM
Project #9216744 Task #7000	Date: 02/03/00

FIGURE 3.1-1a

96744T7000FIG4aDWG.



LEGEND:

- ROAD
- DIVERSION DITCH, STREAM OR RIVER
- CONTOUR LINE
- BUILDING
- RECLAIM LINE
- TAILINGS SLURRY LINE
- POWER LINE
- BH 2 BOREHOLE LOCATION

NOTES:

1. **Base Drawing provided by B.Y.G. Natural Resources Inc.**
2. **Dimensions and Site Features are approximate.**
3. **Drawings not to be used for Engineering Design or Construction Purposes.**
4. **For Inventory Symbol Legend see Figure 4.**

TITLE:

INVENTORY OF TAILINGS POND AREA

PROJECT:

MOUNT NANSEN MINE SITE

CLIENT:

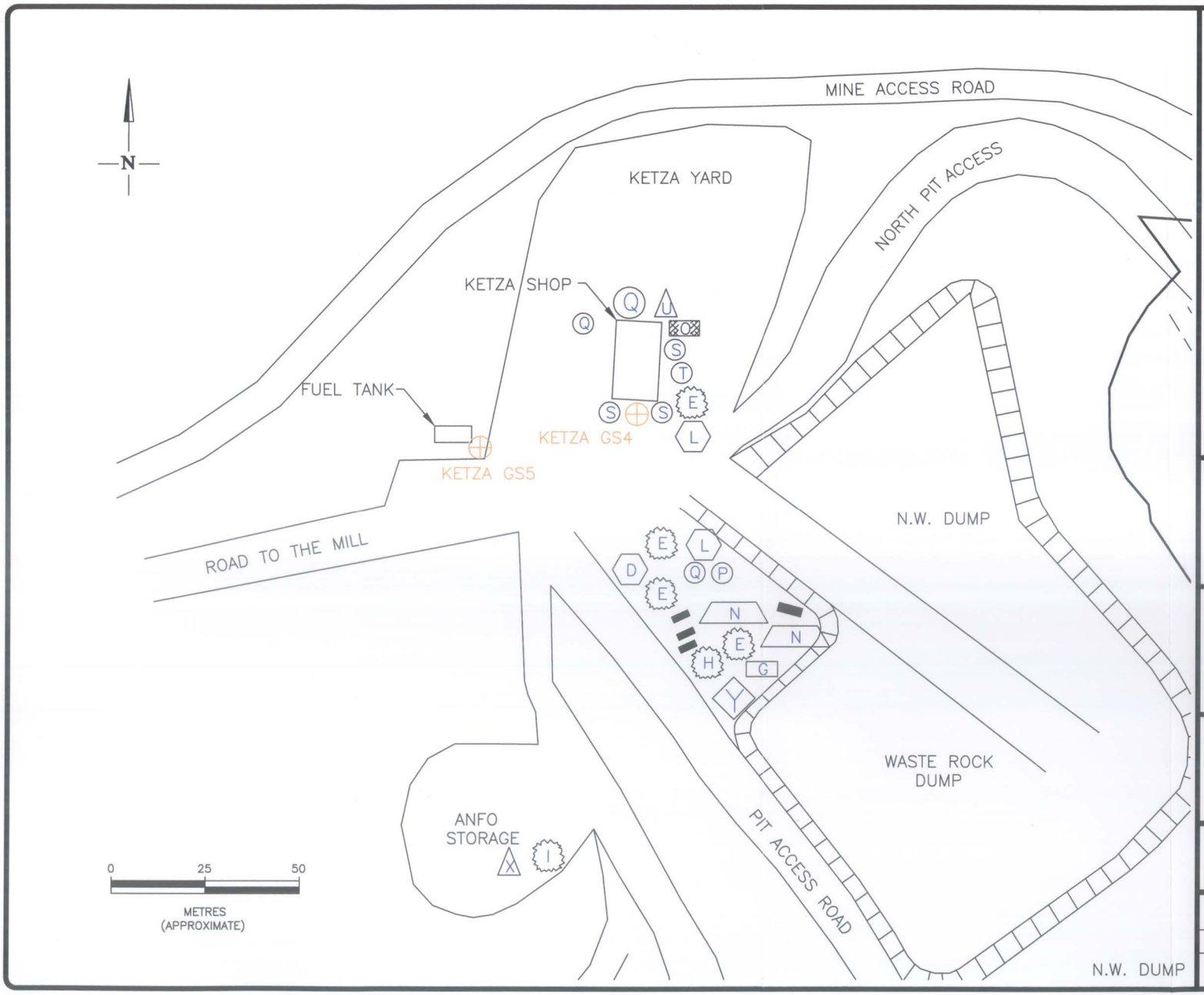
INDIAN & NORTHERN AFFAIRS CANADA

Conor Pacific
Environmental Technologies Inc.

Drawing date: 10/21/99	Revised date: 12/03/99
Drawn by: DK	Checked by: KM
Project #9216744 Task #7000	Date: 02/03/00

FIGURE 3.1-1b

96744T7000FIG4bDWG.



LEGEND:

⊕ GRAB SOIL SAMPLE
KETZA GS4

NOTES:
1. **Base Drawing provided by B.Y.G. Natural Resources Inc.**
2. **Dimensions and Site Features are approximate.**
3. **Drawings not to be used for Engineering Design or Construction Purposes.**

TITLE:

INVENTORY OF KETZA'S YARD

PROJECT:

MOUNT NANSEN MINE SITE

CLIENT:

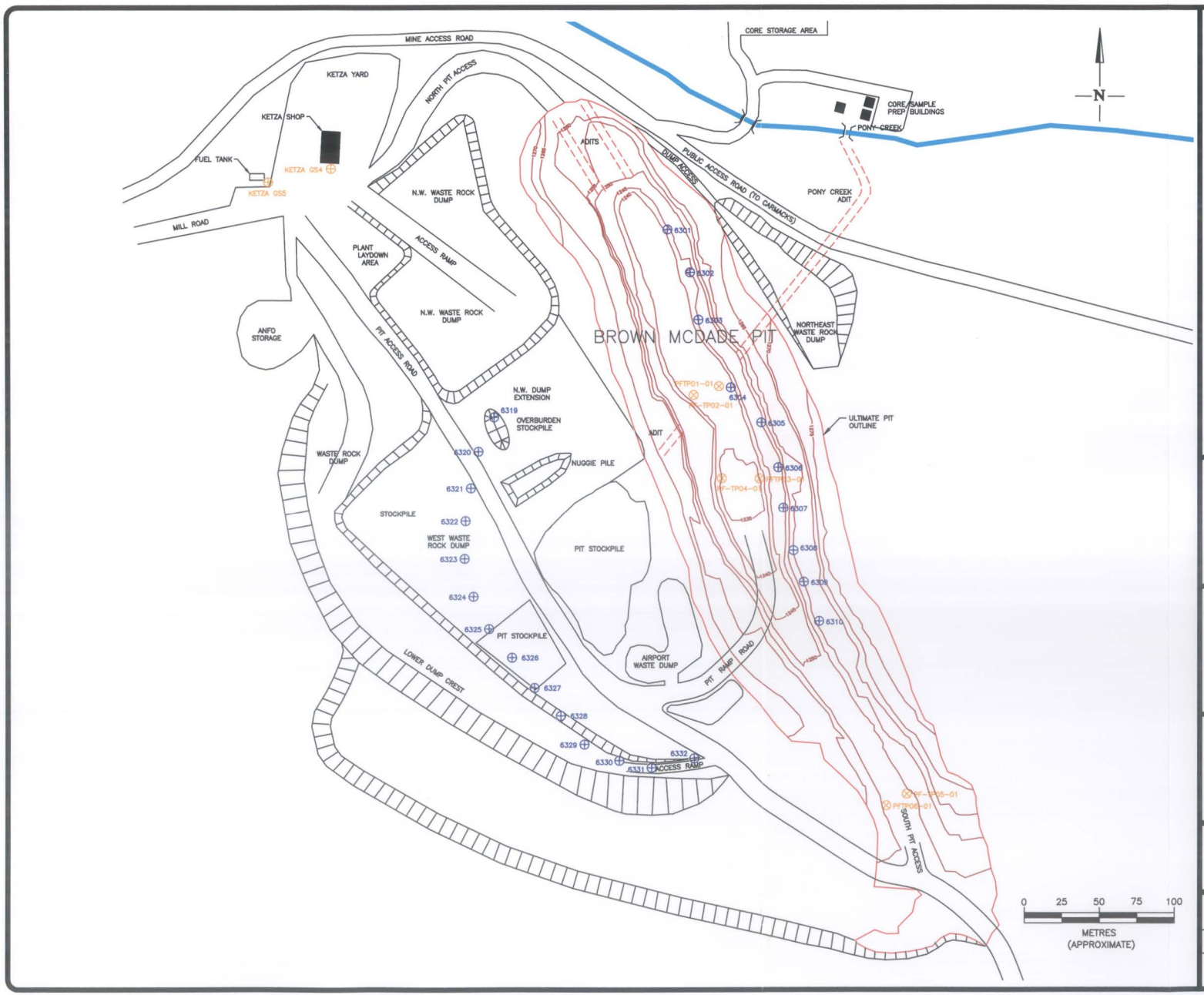
INDIAN & NORTHERN AFFAIRS CANADA

Conor Pacific
Environmental Technologies Inc.

Drawing date: 11/09/99	Revised date: 12/03/99
Drawn by: DK	Checked by: KM
Project #9216744 Task #7000	Date: 02/03/00

FIGURE 3.1-1c

96744T7000FIG4dDWG.



LEGEND:

- ROAD
- DIVERSION DITCH, STREAM OR RIVER
- CONTOUR LINE
- ADIT
- ULTMATE PIT OUTLINE
- BUILDING
- ⊕ 6325 — PREVIOUS ARD/ML SAMPLE LOCATIONS (APPROXIMATE)
- ⊕ KETZA GS4 — CPET SOIL SAMPLE LOCATIONS (APPROXIMATE)
- ⊗ PFTP06-01 — CPET ARD/ML SAMPLE LOCATIONS

NOTES:

1. **Base Drawing provided by B.Y.G. Natural Resources Inc.**
2. **Dimensions and Site Features are approximate.**
3. **Drawings not to be used for Engineering Design or Construction Purposes.**

TITLE:

BROWN - MCDADE PIT SITE PLAN WITH SAMPLE LOCATIONS & WASTE ROCK DUMP

PROJECT:

MOUNT NANSEN MINE SITE

CLIENT:

INDIAN & NORTHERN AFFAIRS CANADA

Conor Pacific
Environmental Technologies Inc.

Drawing date: 10/29/99	Revised date: 12/09/99
Drawn by: DK	Checked by: KM
Project #9216744 Task #7000	Date: 02/03/00

FIGURE 3.3-1

96744T7000FIG4cDWG.

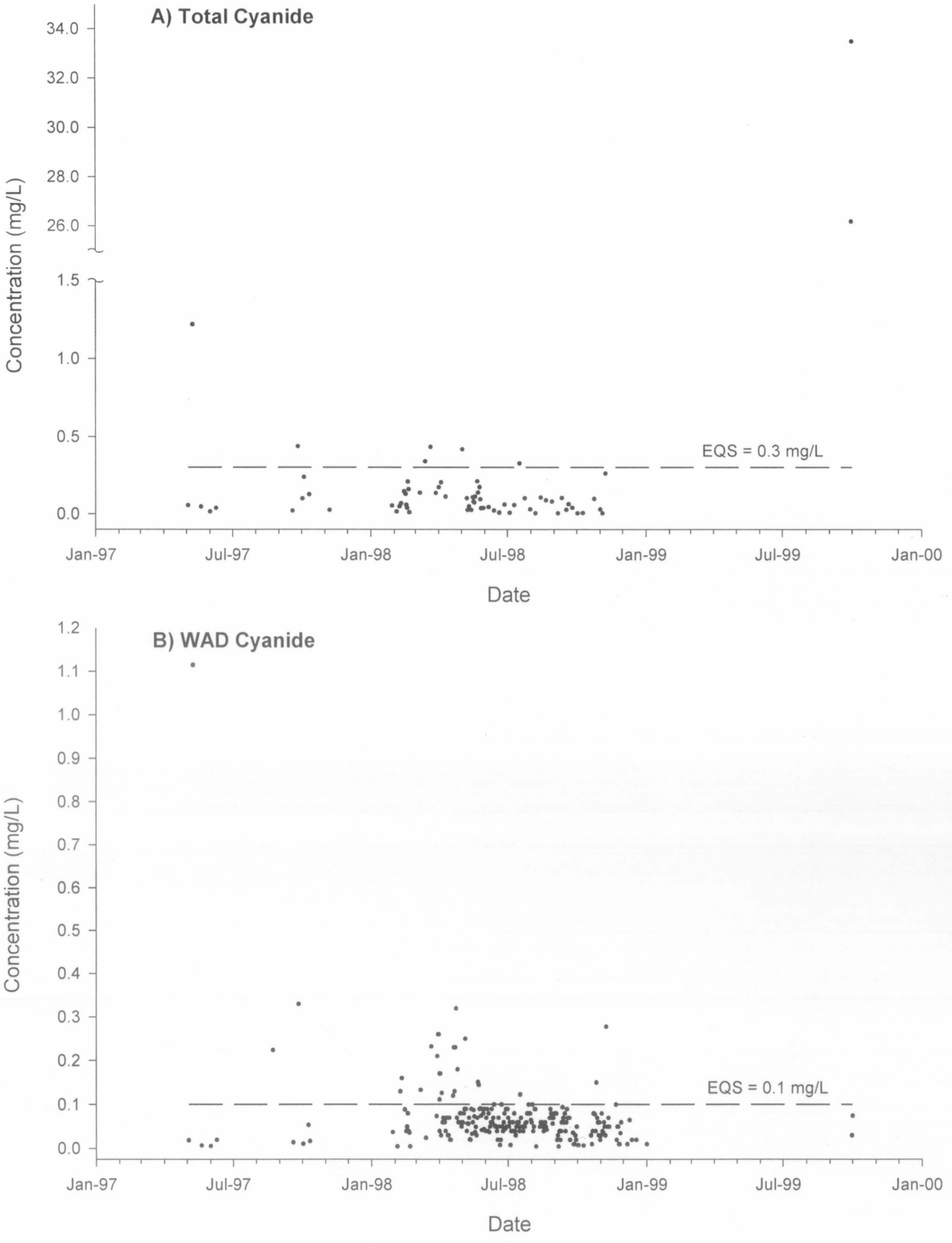


Figure 3.6-1
Effluent discharge trends for A) Total Cyanide and B) WAD Cyanide collected from station E7 during the operational period (1997-1999) and post-operational period (Sept. 1999).

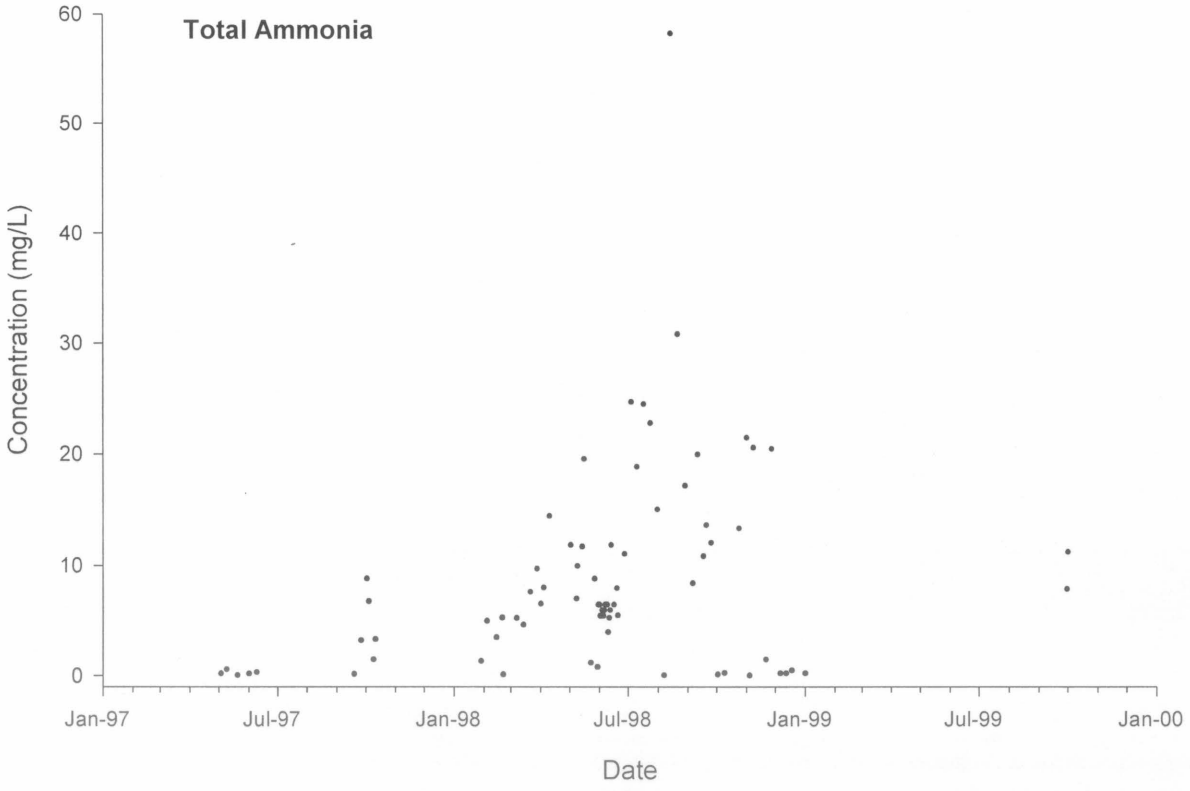


Figure 3.6-2
Effluent discharge trends for Total Ammonia collected from station E7 during the operational period (1997-1999) and post-operational period (Sept. 1999).

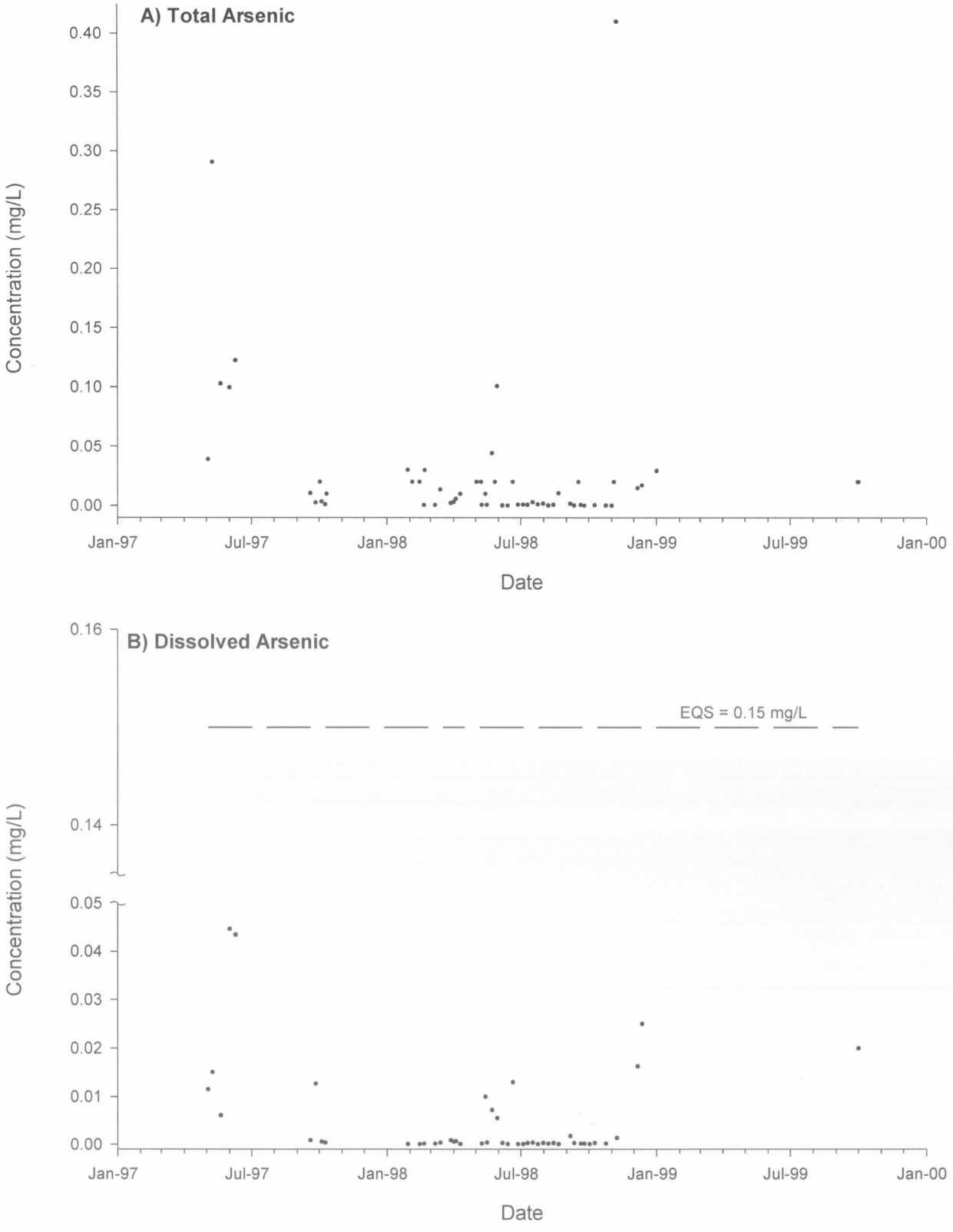


Figure 3.6-3
Effluent discharge trends for A) Total Arsenic and B) Dissolved Arsenic collected from station E7 during the operational period (1997-1999) and the post-operational period (Sept. 1999).

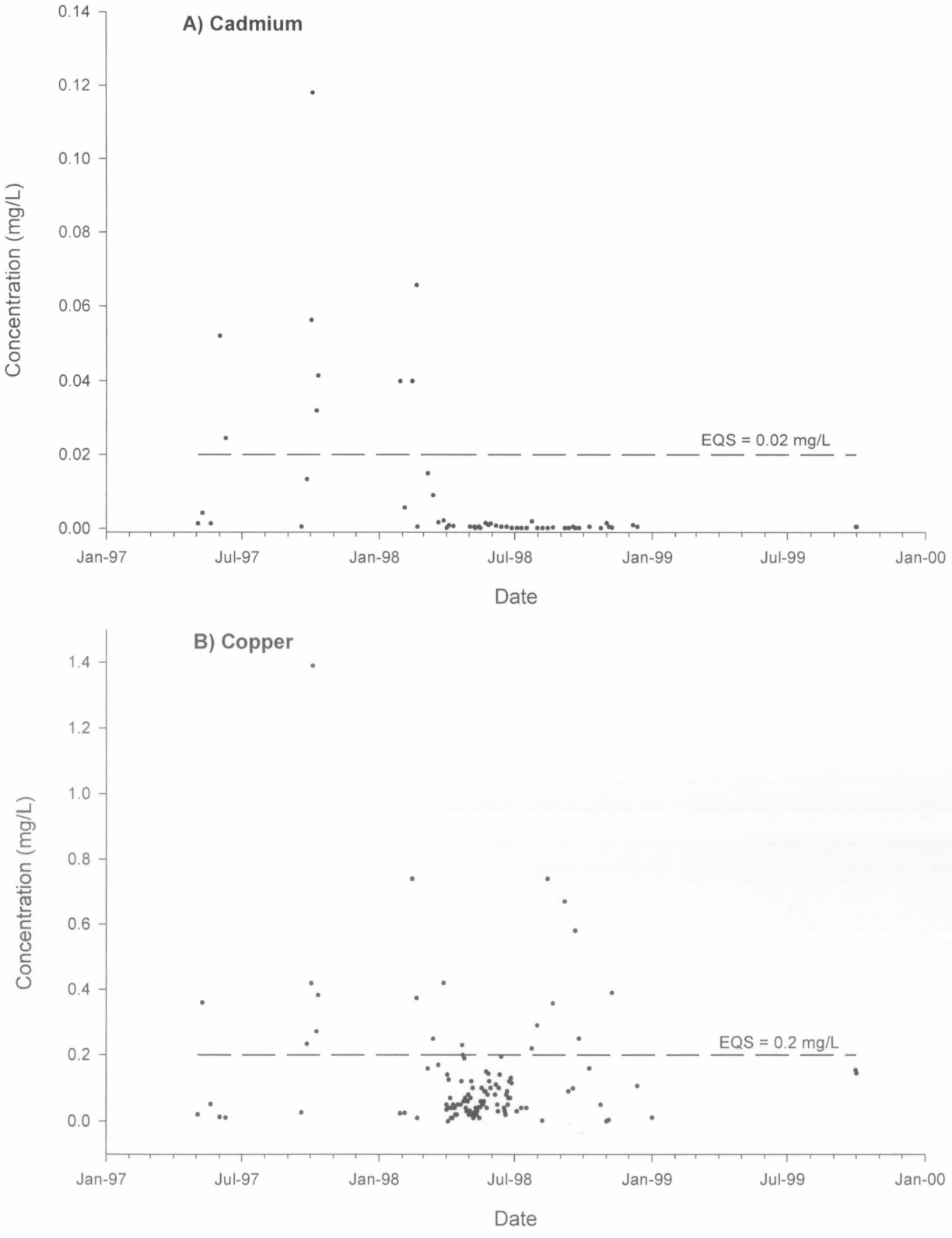


Figure 3.6-4
Effluent discharge trends for A) Cadmium and B) Copper collected from station E7 during the operational period (1997-1999) and post-operational period (Sept. 1999).

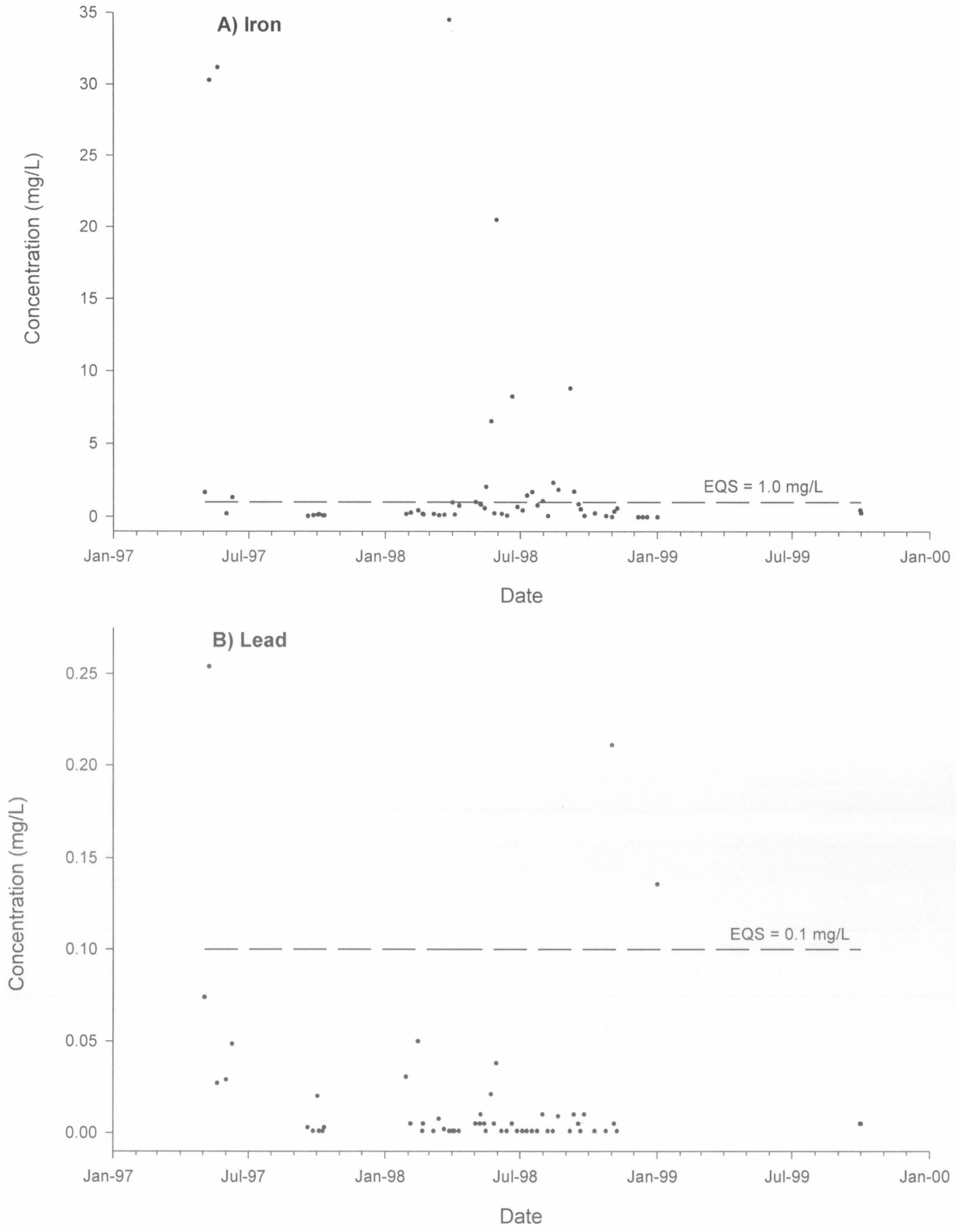


Figure 3.6-5
Effluent discharge trends for A) Iron and B) Lead collected from station E7 during the operational period (1997-1999) and post-operational period (Sept. 1999).

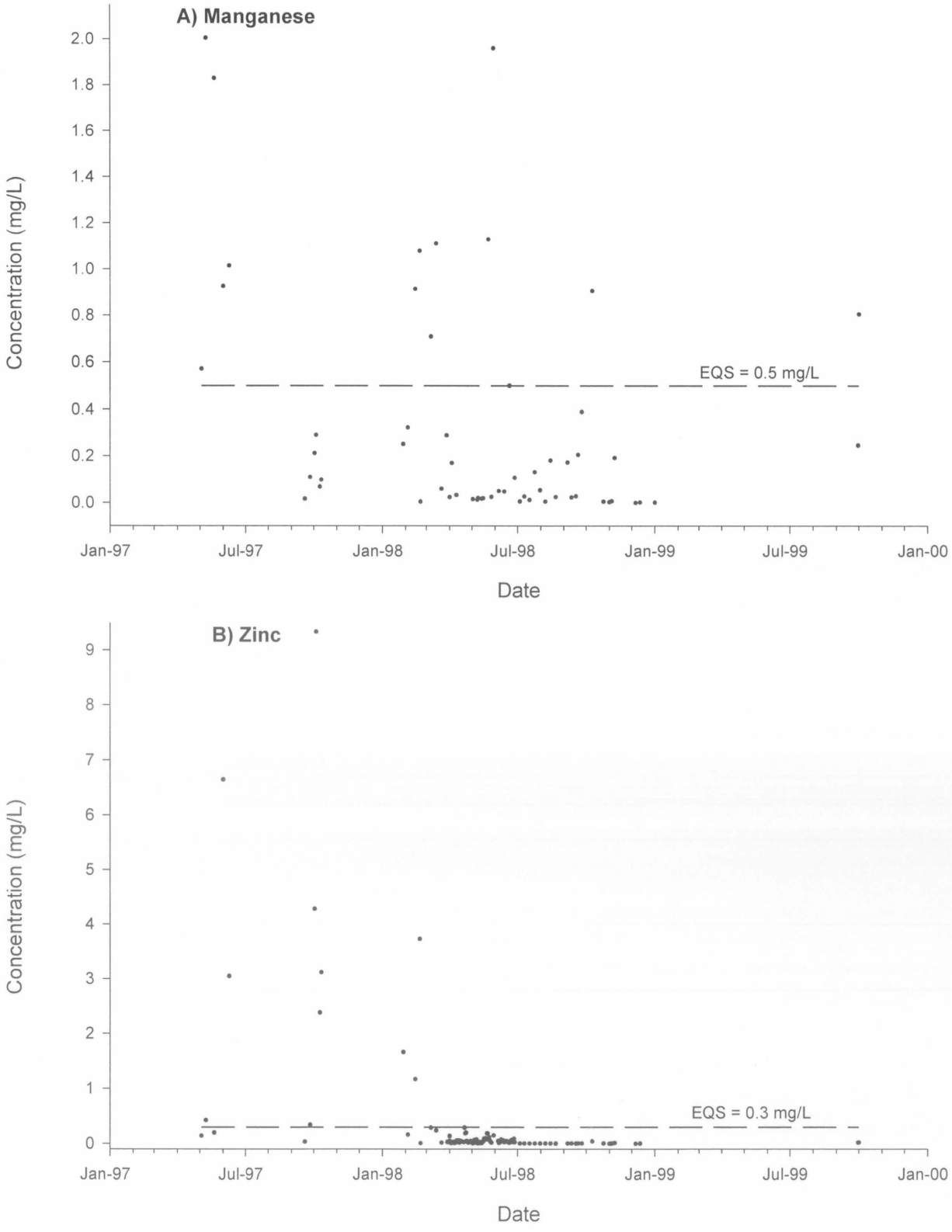
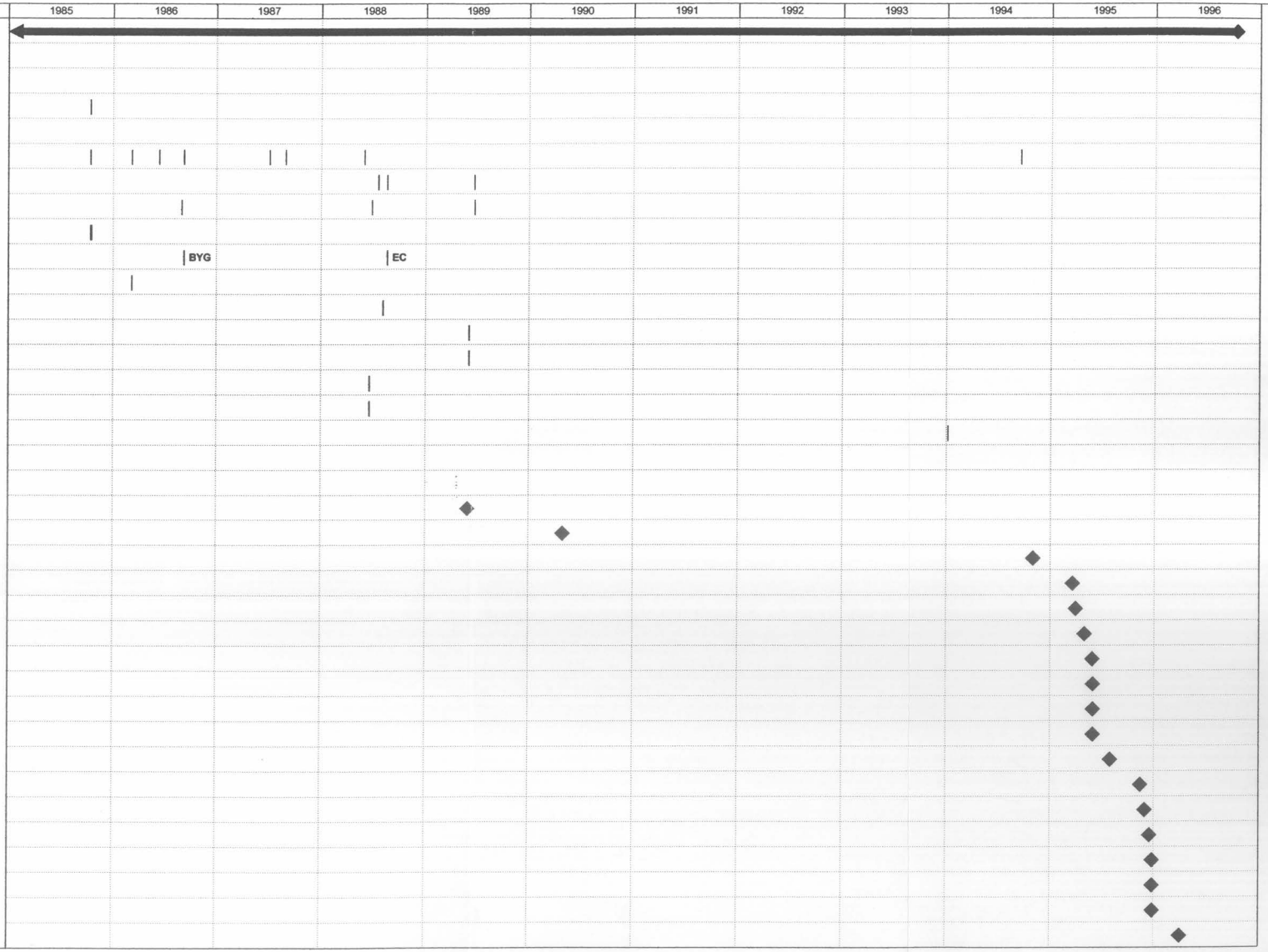
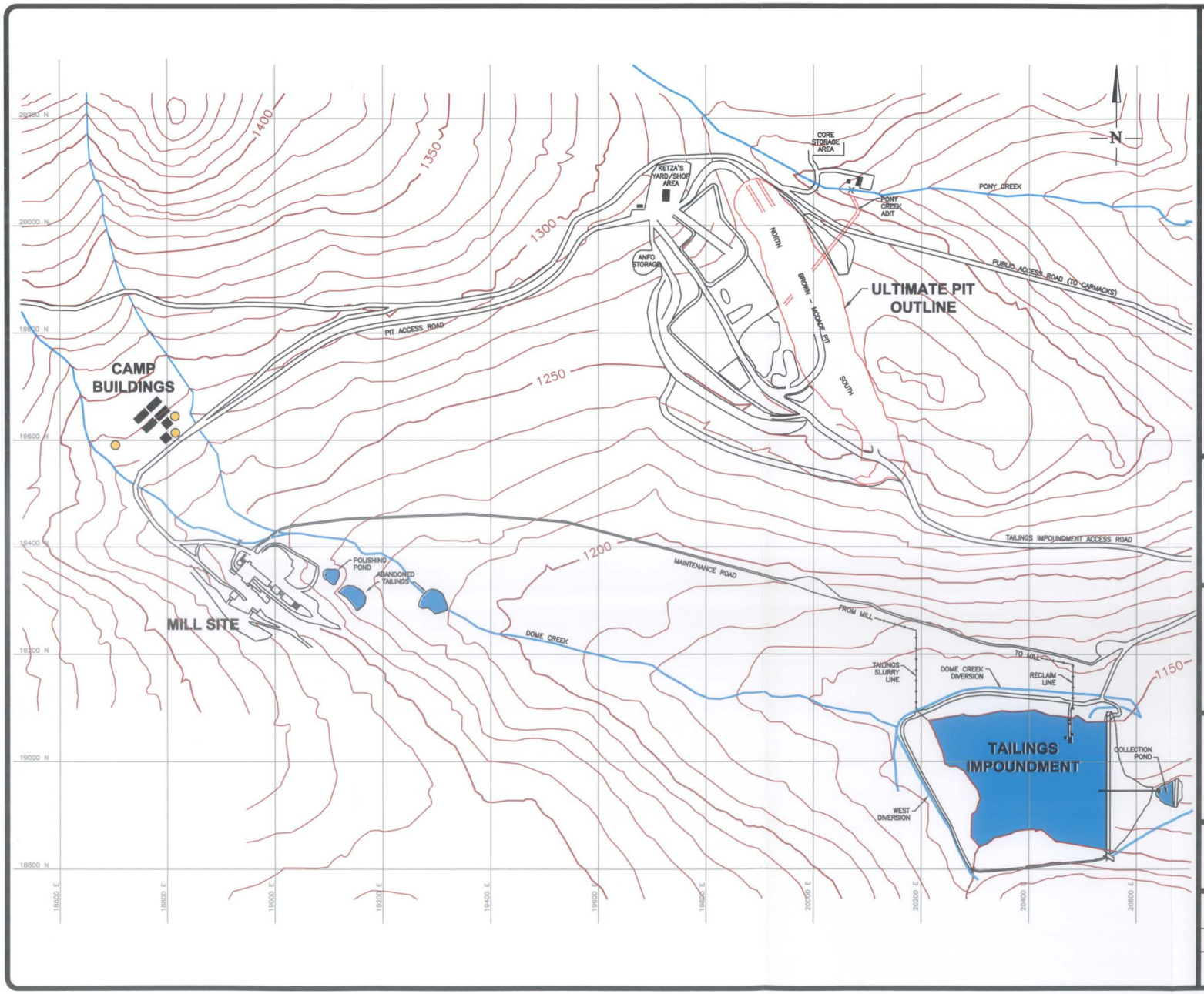


Figure 3.6-6
Effluent discharge trends for A) Manganese and B) Zinc collected from station E7 during the operational period (1997-1999) and post-operational period (Sept. 1999).

Figure 4.3-1 Pre-Operational Events Timeline





LEGEND:

- ROAD
- DIVERSION DITCH, STREAM OR RIVER
- CONTOUR LINE
- ADIT
- ULTMATE PIT OUTLINE
- BUILDING
- SEPTIC FIELD/TANK
- RECLAIM LINE
- TAILINGS SLURRY LINE

NOTES:

1. **Base Drawing provided by B.Y.G. Natural Resources Inc.**
2. **Dimensions and Site Features are approximate.**
3. **Drawings not to be used for Engineering Design or Construction Purposes.**

TITLE:

GENERAL SITE PLAN

PROJECT:

MOUNT NANSEN
MINE SITE

CLIENT:

INDIAN & NORTHERN
AFFAIRS CANADA

Conor Pacific
Environmental Technologies Inc.

Drawing date: 11/17/99	Revised date: 12/09/99
Drawn by: DK	Checked by: KM
Project #9216744 Task #7000	Date: 02/03/00

FIGURE 5-1

96744T7000FIG2DWG.

Figure 5.1-1 Operational Events Timeline

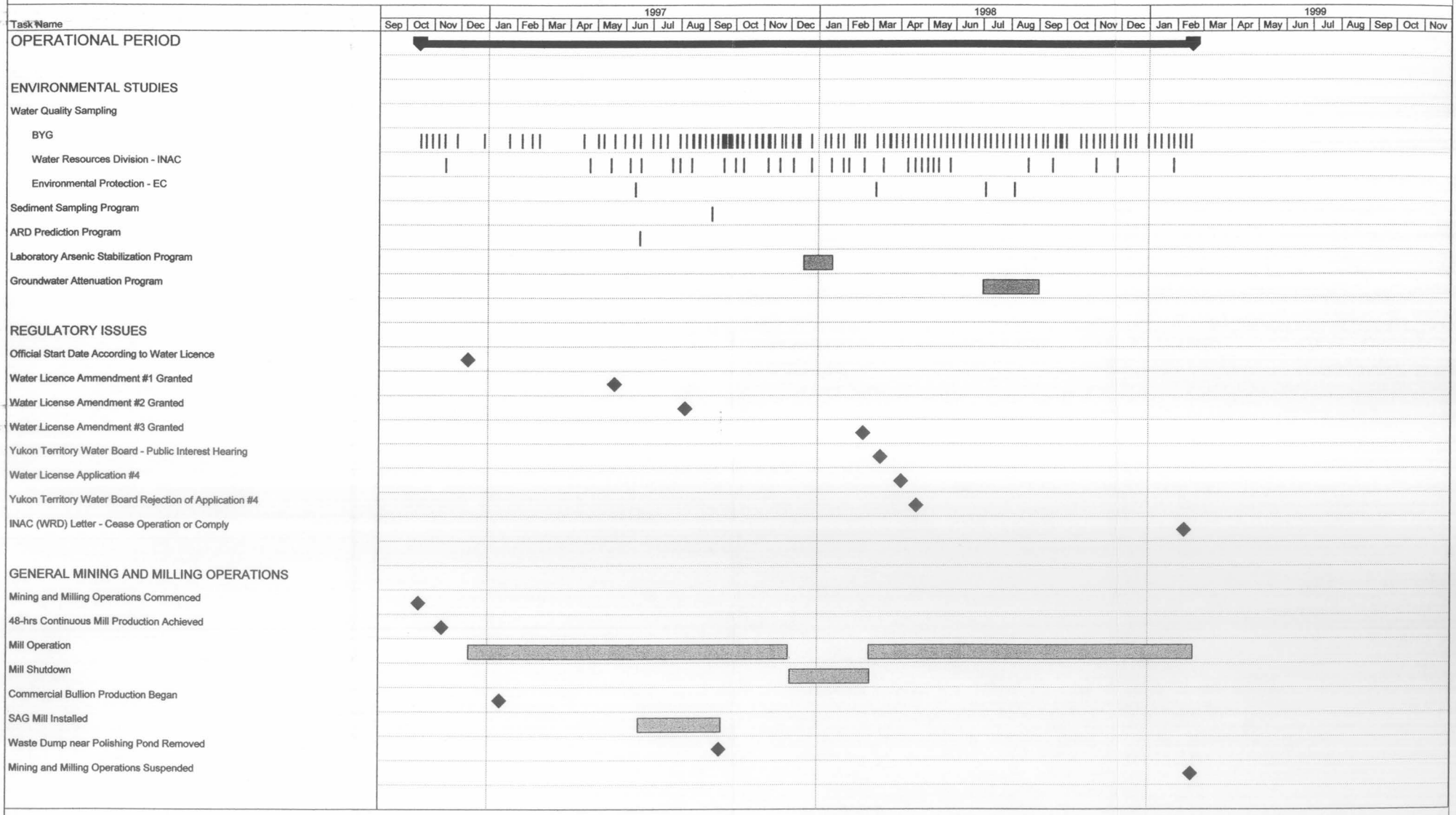


Figure 5.1-1 Operational Events Timeline

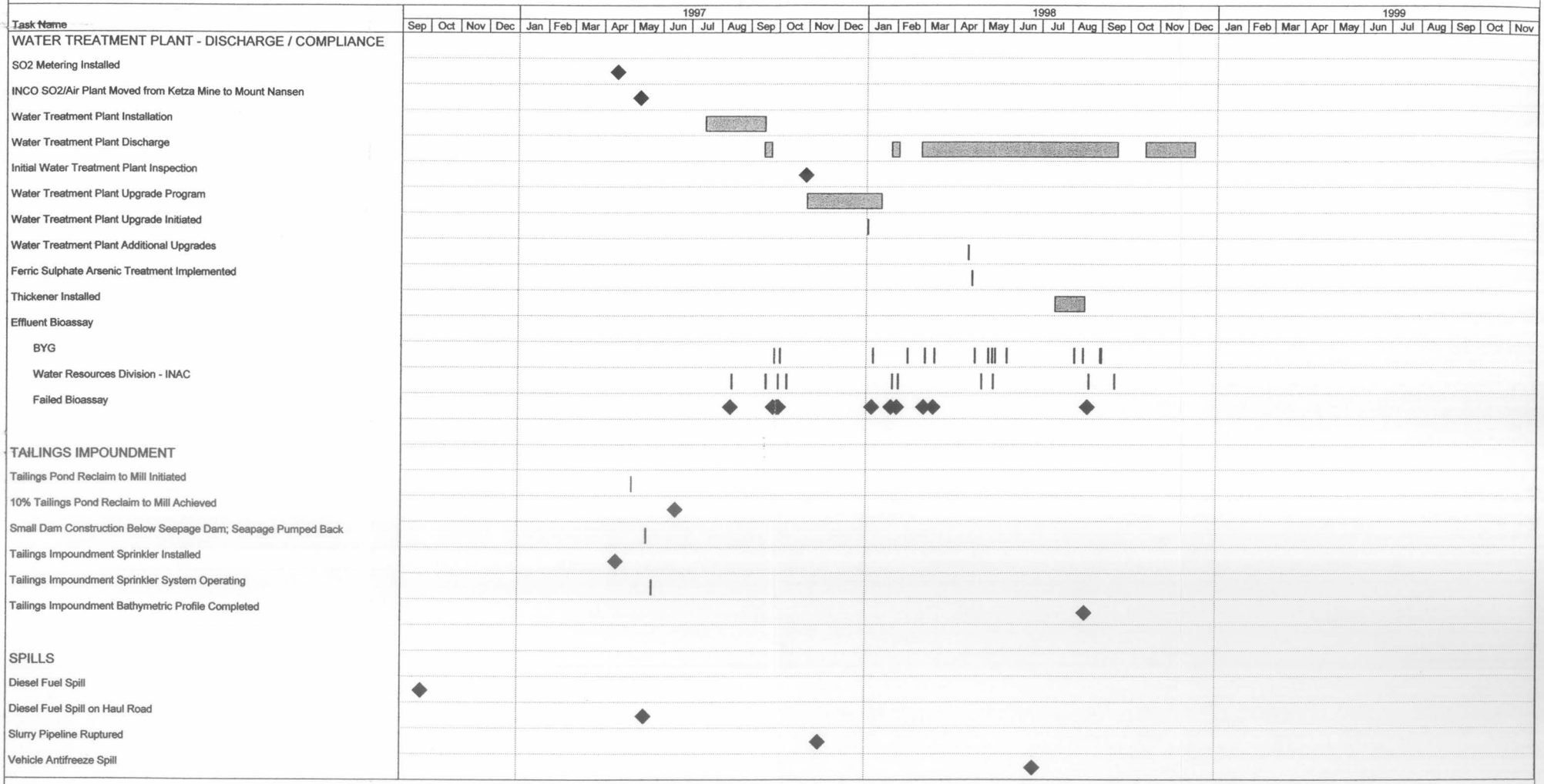
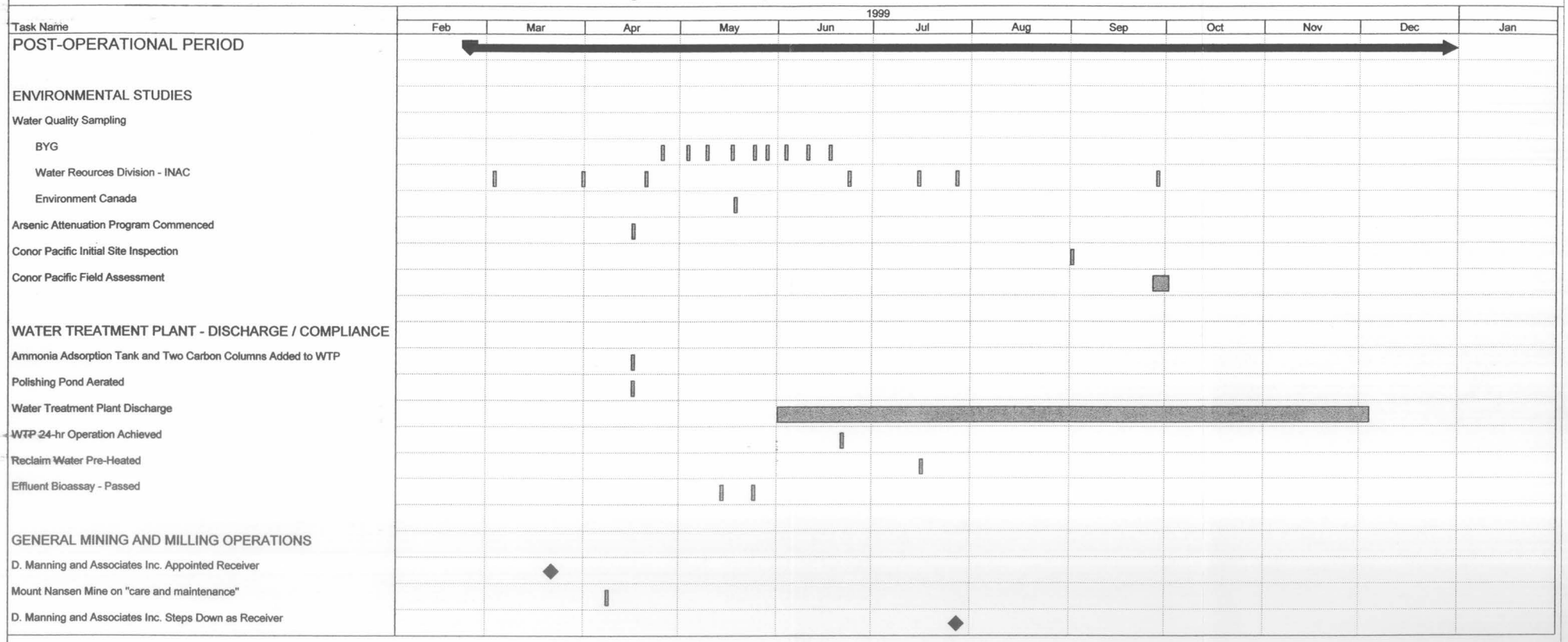


Figure 6-1 Post-Operational Events Timeline



Conor Pacific Environmental Technologies Inc.

PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project No.**
Indian and Northern Affairs Canada	Mount Nansen Minesite, Yukon	9216744

Photo No.	**Date:**
1	09–1999

Direction Photo Taken:

North from the north side of the SAG mill.

Description:

Drums containing soil and oil mixtures were located north of the SAG mill. Several drums were open with water collecting on the surface of the soil. Note the rust collecting on the sides and interior of the drums. SAG GS1 was collected from the soil and oil mixture.

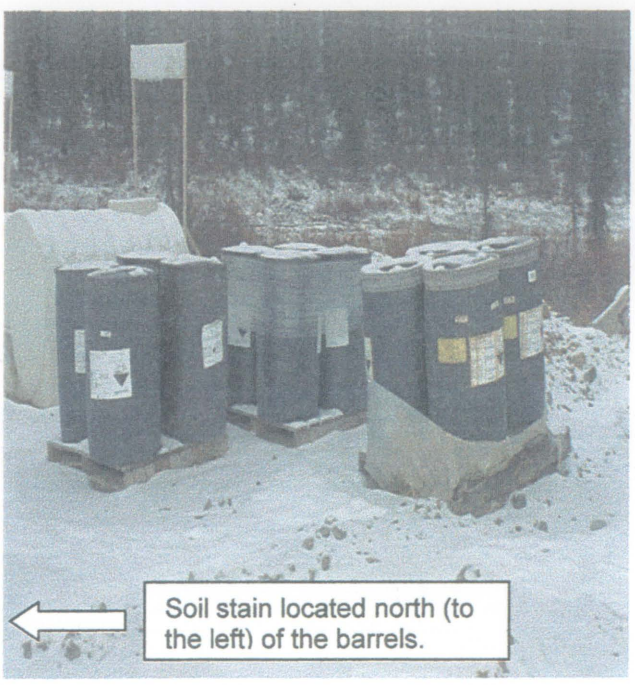
Photo No.	**Date:**
2	09-1999

Direction Photo Taken:

Photo: Northeast
Inset: Northeast

Description:

View of the hydrochloric acid storage area east of the mill building. The majority of the process chemicals were stored nearby. Sample MILL GS2 was collected from a 2 m by 2m soil stain near the chemical storage area shown.



Conor Pacific Environmental Technologies Inc.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Indian and Northern Affairs Canada	Mount Nansen Minesite, Yukon	9216744

Photo No.	Date:
3	09–1999

Direction Photo Taken:

East

Description:

Tailings slurry discharge pipe from the water treatment plant at the north end of the tailings impoundment. Note the red iron stained soils around the base of the pipe. Chemical bottles, laboratory glassware and garbage were visibly dumped with the tailings.

Photo No.	Date:
4	09-1999

Direction Photo Taken:

Southwest

Description:

Soil staining under the pump island at the Ketza construction yard AST. Sample KETZA GS5 was collected from below the tank and fuel lines.

Conor Pacific | Environmental Technologies Inc.

PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project No.**
Indian and Northern Affairs Canada	Mount Nansen Minesite, Yukon	9216744

Photo No.	**Date:**
5	**09–1999**

Direction Photo Taken:

South from the Ketza construction yard stockpiles.

Description:

A transformer of unknown age and origin was observed in the Ketza construction yard. Note the three certified PCB free transformers in the background and the miscellaneous equipment.

Photo No.	**Date:**
6	**09-1999**

Direction Photo Taken:

Northwest

Description:

Transformers east of the mill building were placed on top of an eroding soil pile. Note the leaning transformers and the erosion gullies along the sides of the bank. The mill building is visible in the background of the photograph.

Conor Pacific Environmental Technologies Inc.

PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project No.**
Indian and Northern Affairs Canada	Mount Nansen Minesite, Yukon	9216744

Photo No.	**Date:**
7	09–1999

Direction Photo Taken:

Close-up

Description:

Oil was observed leaking from a tipped transformer. Sample POLISH POND GS3 was collected from the stained soil below the leak.

Photo No.	**Date:**
8	09-1999

Direction Photo Taken:

Northeast

Description:

Soil staining in front of Ketza construction yard garage doors. A heavy oil and diesel smell was observed emanating from the soil at this location. Sample KETZA GS5 was collected from the stain in front of the doors.

Conor Pacific | Environmental Technologies Inc.

PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project No.**
Indian and Northern Affairs Canada	Mount Nansen Minesite, Yukon	9216744

Photo No.	**Date:**
9	**09–1999**

Direction Photo Taken:

North

Description:

Tension fractures along the western ultimate pit limit.

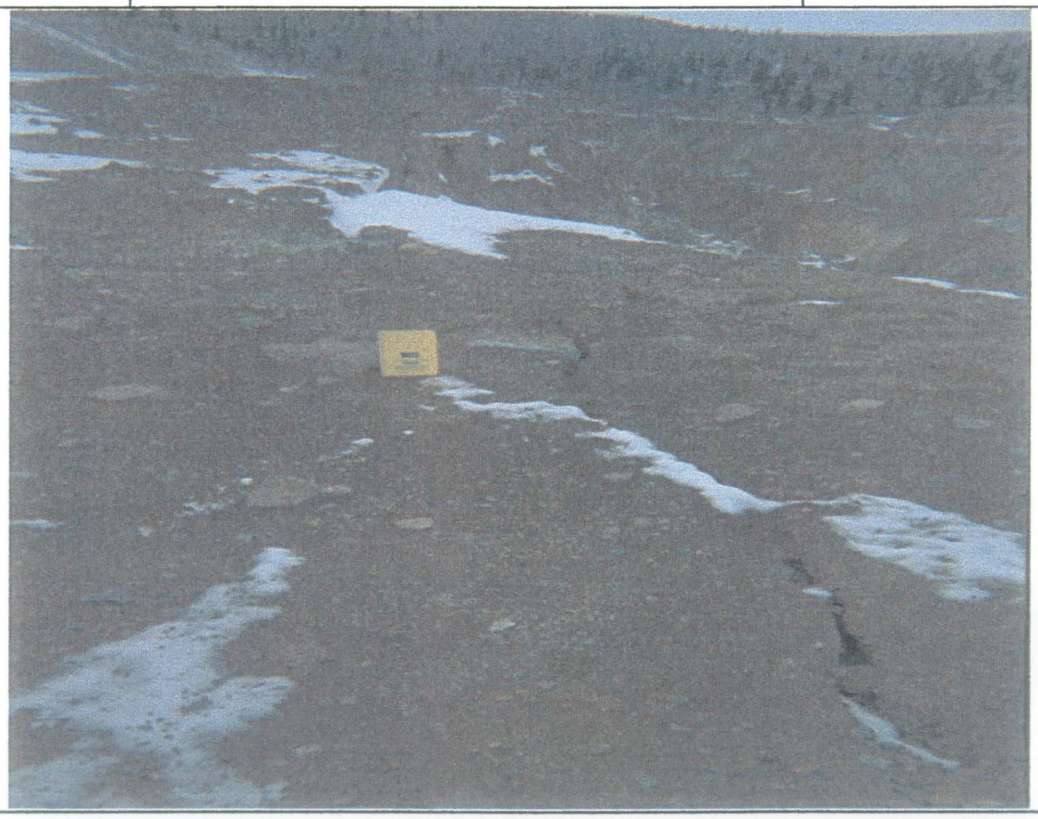


Photo No.	**Date:**
10	**09-1999**

Direction Photo Taken:

Close-up

Description:

Sink hole at access ramp into southern end of the Brown-McDade open pit.

Conor Pacific | Environmental Technologies Inc.

PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project No.**
Indian and Northern Affairs Canada	Mount Nansen Minesite, Yukon	9216744

Photo No.	**Date:**
11	09–1999

Direction Photo Taken:

Close-up

Description:

Sink hole and settling cracks in the lower West waste rock dump.

Photo No.	**Date:**
12	09-1999

Direction Photo Taken:

Close-up

Description:

Pocket of intensely oxidized sulphide-rich waste rock in the lower West waste rock dump. Note thermometer for scale.

Conor Pacific | Environmental Technologies Inc.

PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project No.**
Indian and Northern Affairs Canada	Mount Nansen Minesite, Yukon	9216744

Photo No.	**Date:**
13	09–1999

Direction Photo Taken:

North

Description:

Flooded portion at the north end of the Brown-McDade open pit. Note historical underground workings in north pit face. The sulphide zone is roughly below.

Photo No.	**Date:**
14	09-1999

Direction Photo Taken:

West

Description:

Historical Tailings Impoundment and pond.

Conor Pacific Environmental Technologies Inc.

PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project No.**
Indian and Northern Affairs Canada	Mount Nansen Minesite, Yukon	9216744

Photo No.	**Date:**
15	**09–1999**

Direction Photo Taken:

Close-up

Description:

Erosion gully adjacent to the southeast face of the tailings impoundment.

Photo No.	**Date:**
16	**09-1999**

Direction Photo Taken:

Description:

Mineral Claim Status Report February 17, 1998

Name	Grant No.	Expiry Date	Registered Owner	% Owned
TAWA 1 - 12	YA75263 – YA75274	2002/01/03	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
TAWA 15 – 24	YA75277 – YA75286	2002/01/03	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
TAWA 25 – 26	YA75051 – YA75052	2003/01/03	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
TAWA 27 – 34	YA75151 – YA75158	2003/01/03	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
TAWA 47 – 63	YA75163 – YA75179	2003/01/03	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
TAWA 64 – 71	YA75301 – YA75308	2003/01/03	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
TAWA 72 – 79	YA76963 – YA6970	2002/01/03	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
TAWA 83 – 90	YA76971 – YA6978	2002/01/03	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
GERALD 1 – 38	YB57855 – YB57892	1998/06/29	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
JULES 1 - 12	YB57893 – YB57904	1998/06/29	BYG Natural Resources Inc. Trumpeter Yukon Gold Inc.	50 50
ROSE	04241	1998/10/09	BYG Natural Resources Inc.	100
OLD TIMER	04242	2014/10/23	BYG Natural Resources Inc.	100
GOLDEN EAGLE	04278	1998/10/09	BYG Natural Resources Inc.	100
WAR EAGLE	04279	1998/10/09	BYG Natural Resources Inc.	100
GLOUSER	04324	2014/10/23	BYG Natural Resources Inc.	100
BIG THING	04329	2014/10/23	BYG Natural Resources Inc.	100
AMALEE	04351	2016/03/18	BYG Natural Resources Inc.	100
SHAMROCK	04354	1998/10/09	BYG Natural Resources Inc.	100
NANSEN	04359	1998/10/09	BYG Natural Resources Inc.	100
BUSTER	04360	2014/10/23	BYG Natural Resources Inc.	100
SPOT	04361	1998/10/09	BYG Natural Resources Inc.	100
CLARENCE	04363	1998/10/09	BYG Natural Resources Inc.	100
REX	04366	2014/10/23	BYG Natural Resources Inc.	100
SENORITA	04367	2016/03/18	BYG Natural Resources Inc.	100
ARLEP	04368	1998/10/09	BYG Natural Resources Inc.	100
PHYLLIS	04369	1998/10/09	BYG Natural Resources Inc.	100
LUCKY THING	04372	1998/10/09	BYG Natural Resources Inc.	100
BLUEBELL	39191	1998/10/09	BYG Natural Resources Inc.	100
QUEEN	55620	2016/03/18	BYG Natural Resources Inc.	100
LEROI	55621	2016/03/18	BYG Natural Resources Inc.	100
DUKE	55625	2016/03/18	BYG Natural Resources Inc.	100
RUB	55633	1998/10/09	BYG Natural Resources Inc.	100
TUB	55634	2014/10/23	BYG Natural Resources Inc.	100
PUB	55663	1998/10/09	BYG Natural Resources Inc.	100
SUN DOG	55665	1998/10/09	BYG Natural Resources Inc.	100
CUB	55666	1998/10/09	BYG Natural Resources Inc.	100
BUCK	55667	2014/10/23	BYG Natural Resources Inc.	100
HOPE	55795	2016/03/18	BYG Natural Resources Inc.	100
JAM	55890	1998/10/09	BYG Natural Resources Inc.	100
PAM	55892	1998/10/09	BYG Natural Resources Inc.	100
DOME 1 – 2	73537 – 73538	2006/02/06	BYG Natural Resources Inc.	100
DOME 3 – 5	73539 – 73541	2002/02/06	BYG Natural Resources Inc.	100
DOME 6	73542	2006/02/06	BYG Natural Resources Inc.	100
DOME 7	73453	2006/02/06	BYG Natural Resources Inc.	100
DOME 8 – 18	73694 - 73704	2003/02/06	BYG Natural Resources Inc.	100
DOME 19	73705	2002/02/06	BYG Natural Resources Inc.	100
DOME 20	73706	2007/02/06	BYG Natural Resources Inc.	100
DOME 21 – 22	73707 – 72708	2003/02/06	BYG Natural Resources Inc.	100
JOANNE	74283 – 74288	2007/02/06	BYG Natural Resources Inc.	100
DOME 25 - 28	77746 – 77749	2002/02/06	BYG Natural Resources Inc.	100
DOME 33 – 42	77754 – 77763	2006/02/06	BYG Natural Resources Inc.	100
DOME 43	77764	2002/02/06	BYG Natural Resources Inc.	100
DOME 47 – 48	77768 - 77769	2002/02/06	BYG Natural Resources Inc.	100
DOME 49 – 58	77770 – 77779	2006/02/06	BYG Natural Resources Inc.	100

DOME 59	77780	2002/02/06	BYG Natural Resources Inc.	100
DOME 60 – 61	77781 – 77782	2006/02/06	BYG Natural Resources Inc.	100
DOME 62	77783	2002/02/06	BYG Natural Resources Inc.	100
DOME 63 – 66	77784 – 77787	2006/02/06	BYG Natural Resources Inc.	100
JEFF 1 – 5	77798 – 77802	2002/02/06	BYG Natural Resources Inc.	100
JEFF 7	77804	2002/02/06	BYG Natural Resources Inc.	100
DOME 78 – 82	81842 – 81846	2005/02/06	BYG Natural Resources Inc.	100
DOME 83	81847	2001/02/06	BYG Natural Resources Inc.	100
DOME 84	81848	2005/02/06	BYG Natural Resources Inc.	100
DOME 86	81850	2001/02/06	BYG Natural Resources Inc.	100
LAURA 9	93454	1998/02/06	BYG Natural Resources Inc.	100
HIW 9	YA23835	2001/02/06	BYG Natural Resources Inc.	100
HIW 10 – 13	YA23836 – YA23839	2005/02/06	BYG Natural Resources Inc.	100
HIW 14 – 17	YA23840 – YA23843	2001/02/06	BYG Natural Resources Inc.	100
HIW 1 – 2	YA24813 – YA24814	2003/02/06	BYG Natural Resources Inc.	100
HIW 3 – 4	YA24815 – YA24816	1999/02/06	BYG Natural Resources Inc.	100
HIW 5	YA24817	2003/02/06	BYG Natural Resources Inc.	100
HIW 6 – 7	YA24818 – YA24819	2007/02/06	BYG Natural Resources Inc.	100
HIW 8	YA24820	2003/02/06	BYG Natural Resources Inc.	100
DD 1 – 10	YA59596 – YA59605	2002/02/06	BYG Natural Resources Inc.	100
DD 11	YA59606	2006/02/06	BYG Natural Resources Inc.	100
DD 12	YA59607	2002/02/06	BYG Natural Resources Inc.	100
DD 13	YA59608	2006/02/06	BYG Natural Resources Inc.	100
DD 14 – 37	YA59609 – YA59632	2002/02/06	BYG Natural Resources Inc.	100
DD 38 – 40	YA59633 – YA59635	2006/02/06	BYG Natural Resources Inc.	100
DD 41 – 48	YA59636 – YA59643	1998/02/06	BYG Natural Resources Inc.	100
TBR 1 – 8	YA86690 – YA86697	2007/02/06	BYG Natural Resources Inc.	100
ICT 1 – 4	YA86699 – YA86702	2003/02/06	BYG Natural Resources Inc.	100
ICT 5 – 18	YA86703 – YA86716	1999/02/06	BYG Natural Resources Inc.	100
ICT 19 – 30	YA86717 – YA86728	2003/02/06	BYG Natural Resources Inc.	100
ICT 31	YA86729	1999/02/06	BYG Natural Resources Inc.	100
ICT 32	YA86730	2003/02/06	BYG Natural Resources Inc.	100
ICT 33 – 36	YA86731 – YA86734	1999/02/06	BYG Natural Resources Inc.	100
ONT 1 – 33	YA87167 – YA87199	1999/02/06	BYG Natural Resources Inc.	100
ONT 34	YA87200	2003/02/06	BYG Natural Resources Inc.	100
ONT 35	YA87201	1999/02/06	BYG Natural Resources Inc.	100
ONT 36	YA87202	2003/02/06	BYG Natural Resources Inc.	100
ONT 37	YA87203	1999/02/06	BYG Natural Resources Inc.	100
ONT 38	YA87204	2003/02/06	BYG Natural Resources Inc.	100
ONT 39	YA87205	1999/02/06	BYG Natural Resources Inc.	100
ONT 40	YA87206	2003/02/06	BYG Natural Resources Inc.	100
ONT 41	YA87207	1999/02/06	BYG Natural Resources Inc.	100
ONT 42	YA87208	2003/02/06	BYG Natural Resources Inc.	100
ONT 43	YA87209	1999/02/06	BYG Natural Resources Inc.	100
EEK 1 – 18	YA87210 – YA87227	2003/02/06	BYG Natural Resources Inc.	100
ONT 44 – 51	YA92655 – YA92662	2003/02/06	BYG Natural Resources Inc.	100
ONE 1	YA92921	1999/02/06	BYG Natural Resources Inc.	100
JENNY 1 - 36	YB57727 – YB57762	1998/06/29	BYG Natural Resources Inc.	100
JOHNNY 1 – 21	YB57763 – YB57783	1998/06/29	BYG Natural Resources Inc.	100
JIMMY 1 – 8	YB57784 – YB57791	1998/06/29	BYG Natural Resources Inc.	100
NATALIE 1 – 33	YB57792 – YB57824	1998/06/29	BYG Natural Resources Inc.	100
APRIL 1 – 30	YB57825 – YB57854	1998/06/29	BYG Natural Resources Inc.	100
KR 1 – 116	YB58184 – YB58299	1998/09/08	BYG Natural Resources Inc.	100
KR 117 – 238	YB66000 – YB66121	1998/09/08	BYG Natural Resources Inc.	100
MIL 1 – 6	YB67166 – YB67171	2002/12/01	BYG Natural Resources Inc.	100
MIL 7	YB67172	2003/12/01	BYG Natural Resources Inc.	100
MIL 8	YB67173	2002/12/01	BYG Natural Resources Inc.	100
MIL 9 – 10	YB67174 – YB67175	2003/12/01	BYG Natural Resources Inc.	100
MIL 11 – 22	YB67176 – YB67187	2002/12/01	BYG Natural Resources Inc.	100
MIL 23	YB67188	2003/12/01	BYG Natural Resources Inc.	100
MIL 24 – 69	YB67189 – YB67234	2002/12/01	BYG Natural Resources Inc.	100
TRI 1 – 214	YB96316 – YB96529	1998/09/23	BYG Natural Resources Inc.	100
MN 1 – 58	YB96530 – YB96587	1998/09/23	BYG Natural Resources Inc.	100
MN 62 – 80	YB96588 – YB96606	1998/09/23	BYG Natural Resources Inc.	100

Twenty-one Year Leases Renewed December 15, 1997

Name	Grant No.	Expiry Date	Registered Owner	% Owned
JOANNE 1 – 6	74283 – 74288	2007/02/06	BYG Natural Resources Inc.	100
J. BILL # 1 – 2	YA78049 – YA78050	2009/02/28	BYG Natural Resources Inc.	100
J. BILL # 3 – 4	YA78051 – YA78052	2010/02/28	BYG Natural Resources Inc.	100
J. BILL # 5 – 6	YA78053 – YA78056	2009/02/28	BYG Natural Resources Inc.	100
J. BILL # 9 – 24	YA78057 – YA78072	2009/02/02	BYG Natural Resources Inc.	100
J. BILL # 25 – 32	YA78073 – YA78080	2009/02/28	BYG Natural Resources Inc.	100
BULL 1 – 8	YA81420 – YA81427	2014/12/01	BYG Natural Resources Inc.	100
RAT 9 – 24	YA81436 – YA81451	2010/02/28	BYG Natural Resources Inc.	100
WEDGE 1- -4	YA82167 – YA82170	2007/12/26	BYG Natural Resources Inc.	100
WEDGE 5 – 7	YA82171 – YA82173	2019/12/01	BYG Natural Resources Inc.	100
WEDGE 11 – 13	YA82177 – YA82179	2007/12/26	BYG Natural Resources Inc.	100
BULL 9 – 10	YA86288 – YA86289	2013/12/01	BYG Natural Resources Inc.	100
BULL 11 – 14	YA86290 – YA86293	2011/02/28	BYG Natural Resources Inc.	100
BULL 15 – 20	YA86294 – YA86299	2010/02/28	BYG Natural Resources Inc.	100
BULL 21 – 24	YA86300 – YA86303	2005/02/28	BYG Natural Resources Inc.	100
BULL 25 – 28	YA86304 – YA86307	2003/02/28	BYG Natural Resources Inc.	100
VIC 3 – 6	YA86310 – YA86313	2005/12/17	BYG Natural Resources Inc.	100
VIC 8	YA86314	2005/12/17	BYG Natural Resources Inc.	100
VIC 19 – 20	YA86324 – YA86325	2005/12/17	BYG Natural Resources Inc.	100
VIC 22	YA86327	2005/12/17	BYG Natural Resources Inc.	100
ETZEL 1 – 3	YA86336 – YA86338	2009/12/18	BYG Natural Resources Inc.	100
ETZEL 4	YA86339	2005/12/18	BYG Natural Resources Inc.	100
ETZEL 5	YA86340	2009/12/18	BYG Natural Resources Inc.	100
ETZEL 6	YA86341	2005/12/18	BYG Natural Resources Inc.	100
ETZEL 7	YA86342	2009/12/18	BYG Natural Resources Inc.	100
ETZEL 8	YA86343	2005/12/18	BYG Natural Resources Inc.	100
ETZEL 9	YA86344	2009/12/18	BYG Natural Resources Inc.	100
ETZEL 10	YA86345	2005/12/18	BYG Natural Resources Inc.	100
ETZEL 11 – 17	YA86346 – YA86352	2009/12/18	BYG Natural Resources Inc.	100
ETZEL 18 – 20	YA86353 – YA86355	2010/12/18	BYG Natural Resources Inc.	100
ETZEL 21 – 28	YA86356 – YA86363	2009/12/18	BYG Natural Resources Inc.	100
ETZEL 29 – 34	YA86364 – YA86369	2010/12/18	BYG Natural Resources Inc.	100
ETZEL 35-44	YA86370 – YA86379	2007/12/18	BYG Natural Resources Inc.	100
ETZEL 45 – 50	YA86380 – YA86385	2006/12/18	BYG Natural Resources Inc.	100
DIC 1 – 7	YA93470 – YA93476	2006/12/11	BYG Natural Resources Inc.	100
WEDGE 16 – 17	YA93843 – YA93844	2006/12/26	BYG Natural Resources Inc.	100
LGCS 1	YA95014	2005/12/01	BYG Natural Resources Inc.	100
LGCS 3	YA95016	2011/12/01	BYG Natural Resources Inc.	100
EAGLE 1 – 12	YB35415 – YB35426	2005/01/15	BYG Natural Resources Inc.	100
DIC 101 – 106	YB35470 – YB35475	2007/01/17	BYG Natural Resources Inc.	100
JON-WEDGE 1 – 6	YB35895 – YB35900	2006/12/01	BYG Natural Resources Inc.	100
JLZ 1	YB36258	2005/12/01	BYG Natural Resources Inc.	100
JBF 1	YB36259	2006/12/01	BYG Natural Resources Inc.	100
JBF 2 – 3	YB36954- - YB36955	2002/12/01	BYG Natural Resources Inc.	100
JBF 4 – 7	YB36954 – YB36955	2006/12/01	BYG Natural Resources Inc.	100
JBF 10	YB54543	2002/12/05	BYG Natural Resources Inc.	100
J.D. 1 – 2	YB54755 – YB54756	2002/12/05	BYG Natural Resources Inc.	100
D 1- 4	YB57373 – YB57376	2002/01/20	BYG Natural Resources Inc.	100

Twenty-one Year Leases applied for Renewal October 9, 1998

Name	Grant No.	Expiry Date	Registered Owner	% Owned
ROSE		1998/10/09	BYG Natural Resources Inc.	100
GOLDEN EAGLE		1998/10/09	BYG Natural Resources Inc.	100
WAR EAGLE		1998/10/09	BYG Natural Resources Inc.	100
SHAMROCK		1998/10/09	BYG Natural Resources Inc.	100
NANSEN		1998/10/09	BYG Natural Resources Inc.	100
SPOT		1998/10/09	BYG Natural Resources Inc.	100
CLARENCE		1998/10/09	BYG Natural Resources Inc.	100
ARLEP		1998/10/09	BYG Natural Resources Inc.	100
PHYLLIS		1998/10/09	BYG Natural Resources Inc.	100
LUCKY THING		1998/10/09	BYG Natural Resources Inc.	100
RUB		1998/10/09	BYG Natural Resources Inc.	100
BLUEBELL		1998/10/09	BYG Natural Resources Inc.	100

PUB		1998/10/09	BYG Natural Resources Inc.	100
SUN DOG		1998/10/09	BYG Natural Resources Inc.	100
CUB		1998/10/09	BYG Natural Resources Inc.	100
JAM		1998/10/09	BYG Natural Resources Inc.	100
PAM		1998/10/09	BYG Natural Resources Inc.	100

Appendix C - Detailed Breakdown of Benthic Invertebrate Taxonomy, July - August 1998

MEDIA	STATION	COLLEC	DATECODE	ANALYTE	VALUE	COMMENTS
BENTHOS	ST-2	EP	15-Aug-88	EPHEM_BAETIS		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	EPHEM_ALBERT		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	EPHEM_LONGIM		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	EPHEM_CINYGM		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	EPHEM_EPHEME		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	EPHEM_AMELET		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	EPHEM_T	0	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	PLECO_PODMOS	464	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	PLECO_UTAPER		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	PLECO_CAPNIA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	PLECO_ZAPADA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	PLECO_VISOKA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	PLECO_SWELTS		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	PLECO_SKWALA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	PLECO_T	464	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	TRICH_UN		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	TRICH_PUP_UN		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	TRICH_DICOSM		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	TRICH_BRACHY		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	TRICH_CHYRAN		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	TRICH_T	0	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	HOMOP_CICADE		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	HOMOP_APHIDI		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	HOMOP_TOTAL		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	HYMEN_SPHECO		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	COLEO_HALIPL		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_CHIRO_P		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_CHIRO_UN		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_EURYHA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_PSECTR		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_CRICOT		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_DIAMES		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_DIPLOC		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_EUKIEF		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_PARAKI		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_TANYTA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)

Appendix C - Detailed Breakdown of Benthic Invertebrate Taxonomy, July - August 1998

MEDIA	STATION	COLLEC	DATECODE	ANALYTE	VALUE	COMMENTS
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_CARDIO		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_HETERO		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_POTTHA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_THIENE		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_PSEDOD		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_ORTHOC		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_ANTOCH		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_TIPULA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_MUSCID		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_LIPSE		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_CHELIF		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_SIMULI_AD		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_SIMULI		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_SIMULI_P		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_CHIRON_T	0	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_TRIPUL_T	0	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_SIMULI_T	0	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIPTE_T	0	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	HYDRAC		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	GASTR_STAGNI		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	OLIGO_ENCHYT		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	OLIGO_KINCAI		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	OLIGO_LUMBRI		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	OLIGO_TUBIFI		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	OLIGO_T	0	Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	NEMAT		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	INVERT_T		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	INVERT_GENLVL		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	NO_GENERA		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	DIVERSITY_H		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)
BENTHOS	ST-2	EP	15-Aug-88	EVENNESS_J		Station identifled as "Dome Creek, 100 m upstream of confluence" (with old tailings pond outlet?) in Higgs (1994)

Appendix D - Inventory Summary of Chemicals and Materials
Grouped by Material
Inventory as of October 1, 1999

Location	Specific Location	Material Classification	Specific Material	Use	Count	Measurement	Notes
SAG Mill	Interior	Chemical	Acetylene	Gas	1	Cylinder	
CAMP	Yard Area	Chemical	Air Cylinder	Gas	1	Tanks	
MILL	South of Mill	Chemical	Antifreeze	Petroleum	12	Drum (55 Gallon)	
TAILINGS	Storage Area	Chemical	Antifreeze	Petroleum	0.5	Drum (55 Gallon)	
MILL	Warehouse Doors	Chemical	Batteries	Construction	12	Batteries	
KETZA	Construction Shop	Chemical	Bentonite	Construction	14	Bags	22.7 kg/bag
MILL	Mill Area to East	Chemical	Borax Dehydrate	WTP or Mill	100	Bags	22.7 kg/bag
KETZA	Yard Area	Chemical	Caustic Soda Beads	WTP or Mill	4	Drum (55 Gallon)	
MILL	Mill Area to East	Chemical	Caustic Soda Beads	WTP or Mill	4	Drum (55 Gallon)	
CAMP	Yard Area	Chemical	Cement	Construction	1	Pallets	
MILL	South of Mill	Chemical	Coolant	Petroleum	2	Drum (55 Gallon)	
MILL	Mill Area to East	Chemical	Copper Sulphate	WTP or Mill	1000	kg	
SAG Mill	Interior	Chemical	Cutting oil	Petroleum	0.5	5 L Jug	
MILL	Mill Area to East	Chemical	Dense Soda Ash	WTP or Mill	324	Bags	
MILL	Mill Area to East	Chemical	Dessicant	Construction	1	Bags	22.7 kg/bag
MILL	South of Mill	Chemical	Diesel Tanks	Petroleum	2	At least 30,000L	
MILL	Mill Area to East	Chemical	Dynagear	Petroleum	6	Drum (55 Gallon)	
CAMP	Yard Area	Chemical	Fuel Tank Above Ground	Petroleum	1	< 45,000L Unleaded	
KETZA	Yard Area	Chemical	Fuel Tank Above Ground	Petroleum	1	45,000L Unleaded	
TAILINGS	Tailings Pond Reclaim Station	Chemical	Fuel Tank Above Ground	Petroleum	1	Approx 500 - 1,000 L	
SAG Mill	Ore Feed	Chemical	Gas Cylinder	Gas	1	Cylinder	
SAG Mill	North of SAG Mill	Chemical	Grout	Construction	10	Bags (25 kg)	
MILL	Mill Area to East	Chemical	GW Prevent 855 Antiscalant	WTP or Mill	3	Drum (55 Gallon)	
TAILINGS	Tailings Pond Reclaim Station	Chemical	GW Prevent 855 Antiscalant	WTP or Mill	1	Drum (55 Gallon)	
Crusher	Ore Feed	Chemical	Heater oil	Petroleum	0.5	Pail (25L)	Esso
KETZA	Construction Shop	Chemical	Heater oil	Petroleum	2	Pail (25L)	Esso
SAG Mill	Interior	Chemical	Heater oil	Petroleum	6	Pail (25L)	Esso
MILL	Mill Area to East	Chemical	Hydrated Lime	WTP or Mill	18	Bags	25 kg/bag
MILL	Mill Area to East	Chemical	Hydrochloric Acid	WTP or Mill	10	Drum (55 Gallon)	
MILL	Polishing Pond Area	Chemical	Hydrochloric Acid	WTP or Mill	1	Drum (55 Gallon)	
MILL	South of Mill	Chemical	Hydrogen peroxide	WTP or Mill	3	Drum (55 Gallon)	
TAILINGS	Collection Pond	Chemical	Hydrogen peroxide	WTP or Mill	4	Drum (55 Gallon)	
TAILINGS	Collection Pond	Chemical	Hydrogen peroxide	WTP or Mill	12	Drum (55 Gallon)	
TAILINGS	Collection Pond	Chemical	Hydrogen peroxide	WTP or Mill	2.5	Drum (55 Gallon)	
TAILINGS	Collection Pond	Chemical	Hydrogen peroxide	WTP or Mill	1	Drum (55 Gallon)	
TAILINGS	Storage Area	Chemical	Hydrogen peroxide	WTP or Mill	15	Drum (55 Gallon)	
TAILINGS	Tailings Pond Reclaim Station	Chemical	Hydrogen peroxide	WTP or Mill	1	Drum (55 Gallon)	
MILL	Mill Area to East	Chemical	Lead nitrate	WTP or Mill	12	Cans	25 kg/can
MILL	South of Mill	Chemical	Lubricant	Petroleum	63	Drum (55 Gallon)	
TAILINGS	Tailings Pond Reclaim Station	Chemical	Lubricant	Petroleum	1	Pail (25L)	Mobil
MILL	Mill Area to East	Chemical	Manganese Dioxide	WTP or Mill	36	Pail (25L)	32.67 kg/pail
CAMP	Yard Area	Chemical	Motor and transmission fluid	Petroleum	4	Pail (25L)	
Crusher	Ore Feed	Chemical	Motor and transmission fluid	Petroleum	0.5	Pail (25L)	
SAG Mill	Interior	Chemical	Motor and transmission fluid	Petroleum	1	Pail (25L)	Used oil
SAG Mill	Interior	Chemical	Motor and transmission fluid	Petroleum	0.125	Pail (25L)	
SAG Mill	Ore Feed	Chemical	Motor and transmission fluid	Petroleum	7	Pail (25L)	
TAILINGS	Tailings Pond Reclaim Station	Chemical	NMS Crodalime CO2 Absorbent	WTP or Mill	11	Pail (25L)	40lb/jug
SAG Mill	Interior	Chemical	Oxygen	Gas	1	Cylinder	
MILL	Mill Area to East	Chemical	pH 4 Buffer Solution	Laboratory	1	Boxes	
CAMP	Yard Area	Chemical	Pressure Tanks	Gas	2	Tanks	
CAMP	Yard Area	Chemical	Propane Tanks	Gas	4	Tanks	
CAMP	Yard Area	Chemical	Propane Tanks	Gas	2	Tanks	
CAMP	Yard Area	Chemical	Propane Tanks	Gas	4	Tanks	
MILL	East of Warehouse	Chemical	Propane Tanks	Gas	1	~75 gall	
SAG Mill	Access to SAG Mill	Chemical	Propane Tanks	Gas	5	Tanks	5.5m L x 3.3m circ
MILL	Mill Area to East	Chemical	Propylene Glycol	Petroleum	2	Drum (55 Gallon)	
MILL	Mill Area to East	Chemical	Silica Sand	WTP or Mill	75	Bags	22.7 kg/bag
SAG Mill	North of SAG Mill	Chemical	Sludge, grease, oil	Petroleum	6	Drum (55 Gallon)	
MILL	Mill Area to East	Chemical	Sludge/Slag	Petroleum	3	Drum (55 Gallon)	
MILL	Mill Area to East	Chemical	Sodium Metabisulphite	WTP or Mill	392	Bags	22.7 kg/bag
MILL	Mill Area to East	Chemical	Sodium Nitrate	WTP or Mill	20	Bags	22.7 kg/bag
MILL	Mill Area to East	Chemical	Spartan EP 150	Petroleum	4	Drum (55 Gallon)	
SAG Mill	Interior	Chemical	Spartan EP 150	Petroleum	2	Drum (55 Gallon)	
SAG Mill	North of SAG Mill	Chemical	Spartan EP 150	Petroleum	0.5	Drum (55 Gallon)	
MILL	Mill Area to East	Chemical	Sulphuric acid	WTP or Mill	1	Bottle	4L
TNT	TNT Storage Area	Chemical	Titan Explosives Ammonium Nitrate	Construction	2	Pallets	2000 kg
KETZA	Construction Shop	Chemical	Ultra Plus 30	Petroleum	2	Pail (25L)	Chevron
MILL	South of Mill	Chemical	Unknown	N/A	2	Drum (55 Gallon)	
SAG Mill	Interior	Chemical	Unknown	N/A	1	Pail (25L)	
Crusher	Ore Feed	Chemical	Used gear oil	Petroleum	1	Pail (25L)	
MILL	South of Mill	Chemical	Varsol	Petroleum	7	Drum (55 Gallon)	
TAILINGS	Storage Area	Chemical	Varsol	Petroleum	0.5	Drum (55 Gallon)	
CAMP	Yard Area	Chemical	Vehicle Battery	Vehicle	1	Units	
CAMP	Yard Area	Chemical	Waste Grease and oil	Petroleum	2	Drum (55 Gallon)	
KETZA	Yard Area	Chemical	Waste Grease and oil	Petroleum	2	Drum (55 Gallon)	
CAMP	Yard Area	Drums	Empty	None	5	Drum (55 Gallon)	
CAMP	Yard Area	Drums	Empty	None	5	Drum (55 Gallon)	
CAMP	Yard Area	Drums	Empty	None	5	Drum (55 Gallon)	
CAMP	Yard Area	Drums	Empty	None	21	Pail (25L)	
CORE SHACK	Core Shack Area	Drums	Empty	None	1	Drum (55 Gallon)	Diesel
Crusher	Ore Feed	Drums	Empty	None	3	Drum (55 Gallon)	Esso Unitex EP 2
Crusher	Ore Feed	Drums	Empty	None	N/A	Drum (55 Gallon)	
KETZA	Construction Shop	Drums	Empty	None	5	Drum (55 Gallon)	
KETZA	Construction Shop	Drums	Empty	None	1	Drum (55 Gallon)	
MILL	East of Warehouse	Drums	Empty	None	5	Drum (55 Gallon)	
MILL	Mill Area to East	Drums	Empty	None	3	Pail (25L)	
MILL	Polishing Pond Area	Drums	Empty	None	1	Drum (55 Gallon)	
MILL	South of Mill	Drums	Empty	None	1	Drum (55 Gallon)	
MILL	South of Mill	Drums	Empty	None	2	Drum (55 Gallon)	

Appendix D - Inventory Summary of Chemicals and Materials
Grouped by Material
Inventory as of October 1, 1999

Location	Specific Location	Material Classification	Specific Material	Use	Count	Measurement	Notes
MILL	South of Mill	Drums	Empty	None	1	Pail (25L)	
MILL	South of Mill	Drums	Empty	None	9	Drum (55 Gallon)	
SAG Mill	Access to SAG Mill	Drums	Empty	None	6	Drum (55 Gallon)	
SAG Mill	Access to SAG Mill	Drums	Empty	None	2	Pail (25L)	
SAG Mill	Interior	Drums	Empty	None	2	Drum (55 Gallon)	Essolube XD-3 Extra
SAG Mill	Interior	Drums	Empty	None	2	Pail (25L)	
SAG Mill	North of SAG Mill	Drums	Empty	None	2	Drum (55 Gallon)	
SAG Mill	Ore Feed	Drums	Empty	None	2	Drum (55 Gallon)	
TAILINGS	Collection Pond	Drums	Empty	None	1	Drum (55 Gallon)	
TAILINGS	Collection Pond	Drums	Empty	None	8	Drum (55 Gallon)	
TAILINGS	Collection Pond	Drums	Empty	None	3	Drum (55 Gallon)	
TAILINGS	Storage Area	Drums	Empty	None	7	Drum (55 Gallon)	
TAILINGS	Storage Area	Drums	Empty	None	2	Drum (55 Gallon)	
TAILINGS	Storage Area	Drums	Empty	None	153	Drum (55 Gallon)	
TAILINGS	Tailings Pond Reclaim Station	Drums	Empty	None	4	Pail (25L)	40lb/jug
WEST ROAD	Waste Rock Dump	Drums	Empty	None	15	Drum (55 Gallon)	More than 15
SAG Mill	Access to SAG Mill	Electrical	Electric heater units	Electrical	2	Units	
MILL	Mill Area to East	Electrical	Electrical motor	Electrical	1	Boxes	
SAG Mill	Access to SAG Mill	Electrical	Electrical motors	Electrical	13	Motors	Various sizes
MILL	East of Warehouse	Electrical	Electrical switch boxes	Electrical	1	Units	
SAG Mill	Access to SAG Mill	Electrical	Electrical switch boxes	Electrical	8	Boxes	
SAG Mill	Access to SAG Mill	Electrical	Electrical switch/panel boxes	Electrical	4	Boxes	
SAG Mill	Access to SAG Mill	Electrical	Electrical wire	Electrical	20	Spools	
SAG Mill	Access to SAG Mill	Electrical	Electrical/plumbing hanger rods	Electrical	15	Rods	10 foot sections
MILL	Mill Area to East	Electrical	Heater units	Electrical	3	Units	
MILL	Polishing Pond Area	Electrical	Transformers	Electrical	11	Units	
KETZA	Yard Area	Electrical	Transformers	Electrical	3	Units	New
KETZA	Yard Area	Electrical	Transformers	Electrical	1	Units	Drained
MILL	Warehouse Doors	Electrical	Wires	Electrical	N/A	Spools	
SAG Mill	North of SAG Mill	Garbage	Garbage	None	1	Units	Metal Bucket
CORE SHACK	Core Shack Area	Garbage	Metal, wood, plastic	None	N/A	Piles	
MILL	Polishing Pond Area	Garbage	Metal, wood, plastic	None	N/A	Piles	
MILL	South of Mill	Garbage	Metal, wood, plastic	None	8	Piles	
MILL	South of Mill	Garbage	Metal, wood, plastic	None	N/A	Piles	
WEST ROAD	Waste Rock Dump	Garbage	Metal, wood, plastic	None	N/A	Piles	
MILL	South of Mill	Garbage	Wood	None	N/A	Piles	
MILL	South of Mill	Mechanical	Belt of conveyors	Machinery	4	Rolls	
SAG Mill	Access to SAG Mill	Mechanical	Conveyor rollers, fasteners	Machinery	N/A	Piles	
MILL	Mill Area to East	Mechanical	Diesel Generator fan	Machinery	1	Units	
MILL	East of Warehouse	Mechanical	Diesel motors/generators	Machinery	5	Units	
MILL	Warehouse Doors	Mechanical	Electrical motor	Electrical	12	Motors	
MILL	Northeast of Mill Area	Mechanical	Electrical motor	Electrical	N/A	Piles	
MILL	Northeast of Mill Area	Mechanical	Gear boxes, screeners	Machinery	N/A	Piles	
MILL	East of Warehouse	Mechanical	High pressure tanks	Machinery	3	Units	1 m D x 3 m H
MILL	Warehouse Doors	Mechanical	Hot Plates	Laboratory	2	Laboratory hot plates	
KETZA	Construction Shop	Mechanical	Machine parts	Machinery	N/A	Piles	
MILL	South of Mill	Mechanical	Pump	Machinery	1	Units	
MILL	South of Mill	Mechanical	Pump	Machinery	N/A	Units	
MILL	South of Mill	Mechanical	SAG Balls	Machinery	19	Drum (55 Gallon)	
SAG Mill	North of SAG Mill	Mechanical	SAG Balls	Machinery	2	Drum (55 Gallon)	
TAILINGS	Storage Area	Miscellaneous	Fire Hose	Miscellaneous	2	Hoses	
MILL	Warehouse Doors	Miscellaneous	Fire Hose and tarps	Miscellaneous	N/A	Units	
CAMP	Yard Area	Miscellaneous	Surveyor Stakes	Miscellaneous	0.25	Pallets	
CAMP	Yard Area	Scrap	Cement	Construction	N/A	Piles	
CAMP	Yard Area	Scrap	Core Boxes	Miscellaneous	N/A	Boxes	
CORE SHACK	Core Shack Area	Scrap	Core Boxes	Miscellaneous	N/A	Boxes	
MILL	Polishing Pond Area	Scrap	Electrical motor	Electrical	N/A	Piles	
KETZA	Construction Shop	Scrap	Electrical wire	Electrical	N/A	Piles	
KETZA	Yard Area	Scrap	Large metal scaffolding	Machinery	N/A	Piles	
KETZA	Yard Area	Scrap	Large metal tank	Machinery	N/A	Piles	
TAILINGS	Storage Area	Scrap	Lumber	Construction	N/A	Piles	
CAMP	Yard Area	Scrap	Lumber stacks	Construction	N/A	Pallets	
KETZA	Yard Area	Scrap	Machinery parts, metal	Machinery	N/A	Piles	
KETZA	Yard Area	Scrap	Metal	None	N/A	Piles	Pipe, cable, wire, steel, conveyor parts
MILL	East of Warehouse	Scrap	Metal	None	N/A	Piles	Pipe, cable, wire, steel, conveyor parts
MILL	Mill Area to East	Scrap	Metal	None	N/A	Piles	Pipe, cable, wire, steel, conveyor parts
MILL	Northeast of Mill Area	Scrap	Metal	None	N/A	Piles	Pipe, cable, wire, steel, conveyor parts
MILL	Polishing Pond Area	Scrap	Metal	None	N/A	Piles	Pipe, cable, wire, steel, conveyor parts
MILL	South of Mill	Scrap	Metal	None	1	Boxes	
SAG Mill	North of SAG Mill	Scrap	Metal	None	2	Drum (55 Gallon)	
TAILINGS	Storage Area	Scrap	Metal	None	N/A	Piles	Pipe, cable, wire, steel, conveyor parts
CAMP	Yard Area	Scrap	Metal, wood, plastic	None	N/A	Piles	
Crusher	Ore Feed	Scrap	Metal, wood, plastic	None	N/A	Piles	
KETZA	Yard Area	Scrap	Metal, wood, plastic	None	N/A	Piles	
MILL	East of Warehouse	Scrap	Metal, wood, plastic	None	N/A	Piles	
MILL	Mill Area to East	Scrap	Metal, wood, plastic	None	N/A	Piles	
MILL	Northeast of Mill Area	Scrap	Metal, wood, plastic	None	N/A	Piles	
MILL	Polishing Pond Area	Scrap	Metal, wood, plastic	None	N/A	Piles	
MILL	South of Mill	Scrap	Metal, wood, plastic	None	N/A	Piles	
MILL	South of Mill	Scrap	Metal, wood, plastic	None	N/A	Piles	
SAG Mill	Access to SAG Mill	Scrap	Metal, wood, plastic	None	N/A	Piles	
SAG Mill	Interior	Scrap	Metal, wood, plastic	None	N/A	Piles	
TAILINGS	Collection Pond	Scrap	Metal, wood, plastic	None	N/A	Piles	
TAILINGS	Storage Area	Scrap	Metal, wood, plastic	None	N/A	Piles	
WEST ROAD	Waste Rock Dump	Scrap	Metal, wood, plastic	None	N/A	Piles	
MILL	South of Mill	Scrap	Misc. metal parts	None	12	Pallets	
SAG Mill	Access to SAG Mill	Scrap	Misc. metal parts	None	4	Boxes	
SAG Mill	Access to SAG Mill	Scrap	Misc. metal parts	None	1	Drum (55 Gallon)	
CAMP	Yard Area	Scrap	Rebar and steel	None	N/A	Piles	

Appendix D - Inventory Summary of Chemicals and Materials
Grouped by Material
Inventory as of October 1, 1999

Location	Specific Location	Material Classification	Specific Material	Use	Count	Measurement	Notes
MILL	Mill Area to East	Scrap	Rubber	None	N/A	Piles	
CAMP	Yard Area	Scrap	Soil pile with metal and wood	None	N/A	Piles	
MILL	South of Mill	Scrap	Steel	None	5	Steel beams	
CAMP	Yard Area	Scrap	Steel insulated panels	None	N/A	Units	
CAMP	Yard Area	Scrap	Water Heaters	None	N/A	Units	
CAMP	Yard Area	Scrap	Wood	None	N/A	Piles	
MILL	South of Mill	Scrap	Wood	None	1	Piles	
CAMP	Yard Area	Structural	ATCO Trailers	Construction	3	Trailers	Modular
KETZA	Construction Shop	Structural	Erosion control mats/cloth	Construction	N/A	Rolls	
SAG Mill	Access to SAG Mill	Structural	Metal screens/pieces	Machinery	8	Pallets	
MILL	Mill Area to East	Structural	Mixing Tank	Machinery	1	500L plastic	
MILL	South of Mill	Structural	Mixing Tank	Machinery	1	500L plastic	
MILL	South of Mill	Structural	Plastic pipe	Construction	N/A	Piles	
MILL	Mill Area to East	Structural	Propylene Tarp	Construction	6	Pallets	
SAG Mill	Access to SAG Mill	Structural	Rubber bumpers	Machinery	1	Boxes	
SAG Mill	North of SAG Mill	Structural	Steel Culvert	Construction	1	Units	1.2 m dia X 4 m l
TAILINGS	Collection Pond	Structural	Steel Culvert	Construction	1	Units	
TAILINGS	Storage Area	Structural	Steel Culvert	Construction	4	Units	
SAG Mill	Access to SAG Mill	Structural	Steel Grates	Construction	1	Pallets	
SAG Mill	Access to SAG Mill	Structural	Steel shelving	Construction	2	Pallets	
CAMP	Yard Area	Vehicle	Canopy	Vehicle	1	Canopy	
MILL	South of Mill	Vehicle	Caterpillar 12 Series Grader	Vehicle	1	Caterpillar	
MILL	Mill Area to East	Vehicle	Caterpillar dozer bucket	Vehicle	1	Bucket	
TAILINGS	Storage Area	Vehicle	Caterpillar dozer bucket	Vehicle	1	Bucket	
MILL	South of Mill	Vehicle	Cherry Picker	Vehicle	1	Cherry Picker	
KETZA	Yard Area	Vehicle	D-9 Caterpillar Dozer	Vehicle	1	Caterpillar	
KETZA	Yard Area	Vehicle	Dump truck	Vehicle	1	Truck	
SAG Mill	Interior	Vehicle	Jerry can	Vehicle	1	Can	
MILL	South of Mill	Vehicle	Pick-up canopy	Vehicle	1	Canopy	
KETZA	Yard Area	Vehicle	Pick-up Truck	Vehicle	1	Pick-up Truck	
MILL	Mill Area to East	Vehicle	Pick-up Truck	Vehicle	2	Pick-up Truck	
MILL	Polishing Pond Area	Vehicle	Pick-up Truck	Vehicle	1	Pick-up Truck	
MILL	South of Mill	Vehicle	Pick-up Truck	Vehicle	2	Pick-up Truck	
KETZA	Yard Area	Vehicle	Tanker trailer	Vehicle	1	Trailer	
CAMP	Yard Area	Vehicle	Tires	Vehicle	10	Tires	
MILL	South of Mill	Vehicle	Tires	Vehicle	2	Tires	
CAMP	Yard Area	Vehicle	Trailers	Vehicle	2	Trailers	
KETZA	Yard Area	Vehicle	Treads	Vehicle	2	Treads	

BC RESEARCH Inc.

BC Research Inc., BC Research and Innovation Complex, 3650 Wesbrook Mall, Vancouver, BC, Canada V6S 2L2
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File No: 2-21-900
October 28, 1999

Mr. Keith Mountjoy
Conor Pacific
300 – 1727 West Broadway
Vancouver, BC V6J 4W6

Dear Keith:

Subject: Results and Invoice for Static ARD Testing

This report concerns testwork on 12 rock samples received October 6, 1999. The analyses conducted included Modified ABA, rinse pH, sulphate sulphur, carbonate content, total metals using 4 acid digestion, and modified SWEP with ICP-AES. Samples analysed for rinse pH were first screened through a 5.66 mm screen. One control test was run with the modified SWEP analysis.

Results for the ABA testing are shown in the Tables 1, 2, 3 and 4. Results of final pH on modified SWEP water extracts are shown in Table 5. Cost of analysis is detailed in Table 6. Results of total metals analysis and ICP-AES on water extracts are attached. Our invoice for $2,484.00, plus GST, is enclosed.

Thank you for using BC Research Inc. If you have any questions, please feel free to call.

Sincerely,

Tim O'Hearn, P.Eng.
AMD & Extractive Metallurgy
Environmental Sciences & Technology

Table 1: ABA Results (Mod. ABA Procedure) for Conor Pacific Samples

Sample ID	Rinse pH	Paste pH	CO2 Inorg. (Wt.%)	CaCO3 Equiv. (Kg CaCO3/Tonne)	Total Sulphur (Wt.%)	Sulphate Sulphur (Wt.%)	Sulphide Sulphur* (Wt.%)	Maximum Potential Acidity** (Kg CaCO3/Tonne)	Neutralization Potential (Kg CaCO3/Tonne)	Net Neutralization Potential (Kg CaCO3/Tonne)	Fizz Rating
MN-PF-TP01-01	4.0	6.0	2.58	58.57	2.76	1.62	1.14	35.6	30.2	-5.4	moderate
MN-PF-TP02-01	7.2	7.4	3.75	85.13	1.51	0.33	1.18	36.9	54.3	17.4	moderate
MN-PF-TP03-01	2.8	3.7	1.09	24.74	19.48	0.76	18.72	585.0	1.3	-583.7	none
MN-PF-TP04-01	7.5	7.5	1.45	32.92	0.35	0.07	0.28	8.8	22.4	13.7	moderate
MN-PF-TP05-01	7.6	7.6	0.02	0.45	0.02	<0.01	0.02	0.6	3.3	2.7	moderate
MN-PF-TP06-01	8.2	7.9	0.85	19.30	0.06	<0.01	0.06	1.9	25.4	23.5	moderate
MN-T-TP01-01	8.4	8.5	1.82	41.31	3.88	0.81	3.07	95.9	27.6	-68.3	moderate
MN-T-TP02-01	8.3	8.4	2.22	50.39	4.00	0.81	3.19	99.7	36.9	-62.8	moderate
MN-T-TP03-01	8.3	8.4	2.38	54.03	4.34	0.80	3.54	110.6	36.9	-73.7	moderate
MN-T-TP04-01	8.1	8.2	1.94	44.04	6.84	0.46	6.38	199.4	29.9	-169.5	moderate
MN-T-TP05-01	8.8	8.7	0.89	20.20	0.01	<0.01	0.01	0.3	16.6	16.3	moderate
MN-T-TP06-01	8.4	8.5	2.54	57.66	3.65	0.63	3.02	94.4	38.7	-55.7	moderate

*Based on difference between total sulphur and sulphate-sulphur

**Based on sulphide-sulphur

Table 2: QA/QC for Neutralisation Potential Determination

Sample No.	Neutralisation Potential (kgCaCO3/Tonne)	Neutralisation Potential (kgCaCO3/Tonne)
Duplicates		
MN-PF-TP04-01	22.4	23.6
NBM-1 Std. (NP=42)	43.5	-

Table 3: QA/QC for Sulphur/Sulphate Analysis

Sample No.	Sulphur (Wt.%)	Sulphur (Wt.%)
Duplicates (Total Sulphur)		
MN-T-TP04-01	6.84	6.64
Acme In-house Std. 5.2%S	5.31	-
Duplicates (Sulphate Sulphur)		
MN-PF-TP04-01	0.07	0.06
MN-T-TP04-01	0.46	0.49
BCRI 0.22% SO4-S Ref.	0.24	-

Table 4: QA/QC for CO2 Analysis

Sample No.	%CO2 (Wt.%)	%CO2 (Wt.%)
Duplicates		
MN-T-TP04-01	1.94	2.02
Acme Std. (1.50% CO2)	1.53	-

Table 5: Modified SWEP pH Data

Sample ID	Final pH
MN-PF-TP01-01	6.3
MN-PF-TP02-01	7.8
MN-PF-TP03-01	4.3
MN-PF-TP04-01	8.4
MN-PF-TP05-01	8.3
MN-PF-TP06-01	8.8
MN-T-TP01-01	8.7
MN-T-TP02-01	8.6
MN-T-TP03-01	8.5
MN-T-TP04-01	8.4
MN-T-TP05-01	9.5
MN-T-TP06-01	8.7
Control	6.3

Results of Totals Metals Analysis by 4 Acid Digestion

ACME ANALYTICAL LABORATORIES LTD. 852 E. HASTINGS ST. VANCOUVER BC V6A 1R6 PHONE(604)253-3158 FAX(604)253-1716
B.C. Research Inc. PROJECT 2-21-0900
Acme file # A9903931 Received: OCT 14 1999 * 15 samples in this disk file.

Samples	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm
PF-TP-01-01	5	121	843	1059	17.3	11	8	2542	6.27	2655	< 10	< 4	4	434	16.1	247	10	127	2.02	0.124	31	151
PF-TP-02-01	7	218	359	1343	8.8	5	12	3832	4.37	388	< 10	< 4	3	79	18.8	55	< 5	89	1.93	0.098	20	89
PF-TP-03-01	8	22846	12524	10380	381.4	3	11	1459	17.55	326	< 10	< 4	3	31	175.3	1336	156	37	0.6	0.02	3	101
PF-TP-04-01	5	242	336	1170	4.7	3	5	1380	2.12	218	< 10	< 4	3	90	12.8	48	< 5	28	0.82	0.03	9	36
PF-TP-05-01	3	28	46	371	0.9	8	9	1759	3.48	738	< 10	< 4	3	45	9.4	22	< 5	91	0.27	0.074	15	46
PF-TP-06-01	2	36	18	112	< .5	20	18	833	5.87	39	< 10	< 4	6	109	< .4	< 5	< 5	149	1.52	0.11	22	75
T-TP-01-01	< 2	449	1717	1811	54.2	4	3	2115	5.38	2169	< 10	< 4	3	142	31.9	606	28	39	1.77	0.043	13	12
T-TP-02-01	< 2	486	1932	2526	59.8	5	5	3032	5.73	2004	< 10	< 4	3	136	42	729	19	43	1.99	0.048	16	16
T-TP-03-01	< 2	509	1804	2389	70.4	5	5	3098	5.89	1959	< 10	< 4	3	130	40.3	692	21	41	2.03	0.051	15	14
T-TP-04-01	< 2	657	2248	2051	72.8	4	6	2106	8.41	1498	< 10	< 4	3	175	38.1	729	37	42	1.69	0.041	12	18
RE T-TP-04-01	< 2	610	1966	2009	69.4	5	5	2063	8.01	1561	< 10	5	3	177	35.3	636	31	41	1.69	0.049	12	14
T-TP-05-01	2	9	12	33	< .5	11	6	419	2.14	< 5	10	< 4	4	515	< .4	< 5	< 5	67	2.87	0.047	25	63
T-TP-06-01	< 2	502	2059	2480	36.2	7	5	3093	6.3	2047	< 10	< 4	4	127	39.7	355	18	63	2.18	0.064	16	21
NBM 99-07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Std. CT3/CSB	25	63	39	168	5.7	41	13	943	4.14	54	28	< 4	26	246	**24.9**	23	22	136	1.61	0.104	27	259
Std. G-2	2	4	25	49	< .5	10	5	774	2.6	< 5	11	< 4	8	**849**	< .4	< 5	< 5	60	3.06	0.102	29	73

Samples	Mg	Ba	Ti	Al	Na	K	W	Zr	Sn	Y	Nb	Be	Sc	TOT/S	CO2
	%	ppm	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%
PF-TP-01-01	0.66	99	0.29	6.27	0.05	2.29	< 4	40	2	8	< 2	< 1	15	2.76	2.58
PF-TP-02-01	0.7	658	0.25	7.82	0.05	2.48	< 4	6	< 2	13	< 2	< 1	8	1.51	3.75
PF-TP-03-01	0.34	19	0.04	2.7	0.02	1.04	< 4	13	3	3	< 2	< 1	2	19.48	1.09
PF-TP-04-01	0.4	2070	0.07	6.86	0.06	2.46	< 4	15	< 2	6	< 2	< 1	2	0.35	1.45
PF-TP-05-01	0.32	1083	0.24	8.25	0.04	3.05	6	21	< 2	11	< 2	1	9	0.02	0.02
PF-TP-06-01	1.15	1443	0.37	8.76	0.07	1.6	< 4	10	< 2	12	< 2	< 1	16	0.06	0.85
T-TP-01-01	0.36	92	0.11	3.76	0.15	1.26	< 4	23	3	5	< 2	< 1	4	3.88	1.82
T-TP-02-01	0.47	86	0.11	4.55	0.11	1.55	< 4	22	4	7	< 2	< 1	4	4	2.22
T-TP-03-01	0.48	89	0.12	4.58	0.1	1.56	< 4	25	3	7	< 2	< 1	4	4.34	2.38
T-TP-04-01	0.45	41	0.13	4.02	0.37	1.26	< 4	20	< 2	6	< 2	< 1	4	6.84	1.94
RE T-TP-04-01	0.43	43	0.12	3.97	0.38	1.21	< 4	20	< 2	6	< 2	< 1	4	6.64	2.02
T-TP-05-01	0.73	1129	0.25	6.95	2.44	1.67	< 4	15	< 2	12	2	< 1	8	0.01	0.89
T-TP-06-01	0.52	103	0.16	5.8	0.15	1.97	< 4	25	2	9	< 2	< 1	6	3.65	2.54
NBM 99-07	0	0	0	0	0	0	0	0	0	0	0	0	0	1.08	0
Std. CT3/CSB	0.95	1053	0.38	7.24	1.81	1.91	32	37	20	15	12	4	10	5.31	1.53
Std. G-2	0.76	1076	0.25	8.82	2.77	3.03	< 4	7	2	17	14	1	6	< .01	< .01

Results of ICP-AES Scan on Mod. SWEP Extracts

ACME ANALYTICAL LABORATORIES LTD. 852 E. HASTINGS ST. VANCOUVER BC V6A 1R6 PHONE(604)253-3158 FAX(604)253-1716
B.C. Research Inc. PROJECT 2-21-900
Acme file # A9904043 Received: OCT 20 1999 * 14 samples in this disk file.

Samples	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo	Na
	ppb	ppm	ppb	ppb	ppb	ppb	ppb	ppm	ppb	ppb	ppb	ppb	ppb	ppm	ppm	ppm	ppm	ppm	ppb	ppm
MN-PF-TP-01-01	< 5	< .1	231	8	< 20	< 2	< 20	501.3	29	< 30	6	< 20	< 2	0.03	0.7	< .05	42.5	7.47	10	0.3
MN-PF-TP-02-01	< 5	< .1	143	7	< 20	< 2	< 20	176.4	5	< 30	< 5	< 20	< 2	0.01	2.9	< .05	10.4	2.59	8	0.1
MN-PF-TP-03-01	< 5	1.7	175	8	< 20	< 2	< 20	216.1	190	< 30	17	< 20	9834	18.24	1.2	< .05	27.4	16.46	11	0.1
MN-PF-TP-04-01	< 5	< .1	31	< 5	32	< 2	< 20	21.3	< 2	< 30	< 5	< 20	< 2	< .01	1.8	< .05	8.7	0.12	< 5	0.2
MN-PF-TP-05-01	< 5	0.2	222	17	< 20	< 2	< 20	1.9	< 2	< 30	< 5	< 20	2	0.29	1.1	< .05	0.3	0.01	< 5	0.2
MN-PF-TP-06-01	< 5	< .1	< 30	< 5	< 20	< 2	< 20	9.5	< 2	< 30	< 5	< 20	< 2	0.02	0.8	< .05	1.2	0.01	< 5	0.4
MN-T-TP-01-01	< 5	< .1	558	26	< 20	< 2	< 20	406.9	< 2	< 30	< 5	< 20	7	0.01	4.2	< .05	2.5	0.06	10	24.3
MN-T-TP-02-01	< 5	0.1	400	79	< 20	< 2	< 20	408.7	< 2	< 30	< 5	< 20	< 2	0.01	4.4	< .05	4.1	0.13	10	21.6
MN-T-TP-03-01	< 5	< .1	309	22	< 20	< 2	< 20	411.8	< 2	< 30	< 5	< 20	< 2	< .01	3.9	< .05	4	0.17	11	20.8
MN-T-TP-04-01	< 5	< .1	236	10	< 20	< 2	< 20	226.5	< 2	< 30	< 5	< 20	< 2	< .01	3.5	< .05	2.8	0.16	9	13.3
MN-T-TP-05-01	< 5	0.4	< 30	< 5	< 20	< 2	< 20	5.8	< 2	< 30	< 5	< 20	5	0.37	0.5	< .05	1.3	0.01	< 5	0.6
MN-T-TP-06-01	< 5	< .1	579	24	< 20	< 2	< 20	466.2	< 2	< 30	< 5	< 20	2	0.01	6.2	< .05	3.4	0.05	13	24.3
RE MN-PF-TP-06-01	< 5	< .1	< 30	< 5	< 20	< 2	< 20	9.6	< 2	< 30	< 5	< 20	< 2	0.02	0.7	< .05	1.2	0.01	< 5	0.4
RE MN-T-TP-06-01	5	< .1	596	24	< 20	< 2	< 20	487.6	< 2	< 30	5	< 20	2	0.01	6.4	< .05	3.5	0.06	10	25.3
Control	< 5	< .1	< 30	< 5	< 20	< 2	< 20	0.1	< 2	< 30	< 5	< 20	< 2	< .01	0.1	< .05	< .1	< .01	< 5	< .1
Std. Wastwatr1	71	0.4	234	968	971	185	< 20	< .1	52	< 30	166	422	608	0.37	0.1	< .05	< .1	0.82	335	0.1

Samples	Ni	P	Pb	Sb	Se	Si	Te	Ti	Tl	V	W
	ppb	ppm	ppb	ppb	ppb	ppm	ppb	ppb	ppb	ppb	ppb
MN-PF-TP-01-01	< 20	< .02	< 10	48	204	0.82	11	< 10	< 10	< 10	13
MN-PF-TP-02-01	< 20	< .02	< 10	31	154	0.42	< 10	< 10	< 10	< 10	< 10
MN-PF-TP-03-01	< 20	< .02	2917	123	171	0.42	< 10	< 10	< 10	< 10	48
MN-PF-TP-04-01	< 20	< .02	< 10	< 10	29	0.75	< 10	< 10	< 10	< 10	< 10
MN-PF-TP-05-01	< 20	0.12	< 10	< 10	< 20	2.23	< 10	< 10	< 10	< 10	< 10
MN-PF-TP-06-01	< 20	< .02	< 10	< 10	< 20	1.59	< 10	< 10	< 10	< 10	< 10
MN-T-TP-01-01	< 20	< .02	< 10	255	200	1.05	< 10	< 10	< 10	< 10	< 10
MN-T-TP-02-01	< 20	< .02	< 10	234	200	0.72	< 10	< 10	< 10	< 10	< 10
MN-T-TP-03-01	< 20	< .02	< 10	248	208	0.72	< 10	< 10	< 10	< 10	< 10
MN-T-TP-04-01	< 20	< .02	< 10	317	174	0.85	< 10	< 10	< 10	< 10	< 10
MN-T-TP-05-01	< 20	0.06	< 10	< 10	< 20	1.69	< 10	13	< 10	11	< 10
MN-T-TP-06-01	< 20	0.03	< 10	332	200	1.86	< 10	< 10	< 10	< 10	< 10
RE MN-PF-TP-06-01	< 20	< .02	< 10	< 10	26	1.62	< 10	< 10	< 10	< 10	< 10
RE MN-T-TP-06-01	< 20	0.03	< 10	348	201	1.9	< 10	< 10	< 10	< 10	< 10
Control	< 20	< .02	< 10	< 10	< 20	< .01	< 10	< 10	< 10	< 10	< 10
Std. Wastwatr1	851	< .02	492	182	194	0.19	< 10	< 10	254	722	< 10

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Metal Analysis

	Detection Limit	Units	48146-1 Duplicate - 09/29	48146-2 NS1 - 09/28	48146-3 NS2 - 09/28	48146-4 V7 - 09/28
Arsenic - Dissolved in Water						
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
ICP Semi-Trace Scan - Total Metals in Water						
Aluminum	0.01	mg/L	<0.01	0.16	0.15	0.04
Antimony	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Barium	0.0005	mg/L	0.0217	0.0257	0.0334	0.0695
Beryllium	0.0002	mg/L	<0.0002	<0.0002	<0.0002	<0.0002
Bismuth	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Cadmium	0.0005	mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Calcium	0.01	mg/L	473	9.56	12.6	29.9
Chromium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.001	mg/L	0.117	<0.001	<0.001	<0.001
Copper	0.002	mg/L	16.3	0.013	0.011	0.029
Iron	0.003	mg/L	0.201	0.341	0.344	0.27
Lead	0.005	mg/L	0.012	<0.005	<0.005	<0.005
Lithium	0.002	mg/L	<0.002	<0.002	0.003	0.003
Magnesium	0.01	mg/L	15	2.41	3.59	10.1
Manganese	0.0005	mg/L	1.36	0.0369	0.042	0.0654
Mercury	0.0001	mg/L	0.0002	<0.0001	<0.0001	<0.0001
Molybdenum	0.005	mg/L	0.011	<0.005	<0.005	<0.005
Nickel	0.002	mg/L	0.077	<0.002	<0.002	<0.002
Phosphorus	0.06	mg/L	<0.06	<0.06	<0.06	<0.06
Potassium	0.2	mg/L	13	3.7	1.5	2
Selenium	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Silicon	0.05	mg/L	1.67	7.68	7.67	7.1
Silver	0.001	mg/L	0.078	<0.001	<0.001	<0.001
Sodium	0.05	mg/L	450	3.3	3.52	5.78
Strontium	0.005	mg/L	1.13	0.084	0.116	0.276
Sulfur	0.1	mg/L	695	1.9	3.4	13.7
Thorium	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Tin	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Titanium	0.001	mg/L	<0.001	0.004	0.004	<0.001
Uranium	0.06	mg/L	<0.06	<0.06	<0.06	<0.06
Vanadium	0.002	mg/L	<0.002	<0.002	<0.002	<0.002
Zinc	0.001	mg/L	0.034	0.003	0.004	0.004
Zirconium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Metal Analysis (con't.)

	Detection Limit	Units	48146-5 V5 - 09/28	48146-6 V4 - 09/29	48146-7 V3 - 09/29	48146-8 V1 - 09/29
Arsenic - Dissolved in Water						
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
ICP Semi-Trace Scan - Total Metals in Water						
Aluminum	0.01	mg/L	0.06	0.04	0.05	0.05
Antimony	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Barium	0.0005	mg/L	0.0666	0.0791	0.0603	0.0568
Beryllium	0.0002	mg/L	<0.0002	<0.0002	<0.0002	<0.0002
Bismuth	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Cadmium	0.0005	mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Calcium	0.01	mg/L	31.7	38.2	24.2	23.4
Chromium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Copper	0.002	mg/L	0.004	0.004	0.004	0.008
Iron	0.003	mg/L	0.163	0.11	0.091	0.098
Lead	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Lithium	0.002	mg/L	0.005	0.002	0.005	0.003
Magnesium	0.01	mg/L	9.4	11.9	7.92	7.65
Manganese	0.0005	mg/L	0.0782	0.158	0.0111	0.011
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Nickel	0.002	mg/L	<0.002	0.005	<0.002	<0.002
Phosphorus	0.06	mg/L	<0.06	<0.06	<0.06	<0.06
Potassium	0.2	mg/L	1.3	1	<0.2	1
Selenium	0.02	mg/L	<0.02	0.03	<0.02	<0.02
Silicon	0.05	mg/L	7.21	7.85	6.51	6.16
Silver	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Sodium	0.05	mg/L	6.49	6.71	2.54	2.38
Strontium	0.005	mg/L	0.25	0.327	0.245	0.232
Sulfur	0.1	mg/L	17	18.9	5.1	5.1
Thorium	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Tin	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Titanium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Uranium	0.06	mg/L	<0.06	<0.06	0.06	<0.06
Vanadium	0.002	mg/L	<0.002	<0.002	<0.002	<0.002
Zinc	0.001	mg/L	0.005	0.005	0.003	0.003
Zirconium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Metal Analysis (con't.)

	Detection Limit	Units	48146-9 D4 - 09/29	48146-10 D3 - 09/28	48146-11 D2 - 09/29	48146-12 End of Pipe - 09/28
Arsenic - Dissolved in Water						
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
ICP Semi-Trace Scan - Total Metals in Water						
Aluminum	0.01	mg/L	<0.01	2.45	0.6	<0.01
Antimony	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	mg/L	0.03	0.18	0.08	<0.02
Barium	0.0005	mg/L	0.0289	0.103	0.101	0.0564
Beryllium	0.0002	mg/L	<0.0002	<0.0002	<0.0002	<0.0002
Bismuth	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Cadmium	0.0005	mg/L	<0.0005	0.0015	<0.0005	<0.0005
Calcium	0.01	mg/L	126	194	232	37.6
Chromium	0.001	mg/L	<0.001	0.004	0.001	<0.001
Cobalt	0.001	mg/L	0.007	0.1	0.038	<0.001
Copper	0.002	mg/L	0.007	4.82	0.214	0.021
Iron	0.003	mg/L	0.594	11.3	1.19	0.126
Lead	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Lithium	0.002	mg/L	0.004	0.004	0.005	0.003
Magnesium	0.01	mg/L	34.5	32	24.9	16.4
Manganese	0.0005	mg/L	1.85	7.99	1.25	0.0233
Mercury	0.0001	mg/L	<0.0001	0.0001	<0.0001	<0.0001
Molybdenum	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Nickel	0.002	mg/L	0.003	0.059	0.009	<0.002
Phosphorus	0.06	mg/L	<0.06	0.09	0.12	<0.06
Potassium	0.2	mg/L	2.7	6.3	8.6	1.1
Selenium	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Silicon	0.05	mg/L	6.27	8.89	5.28	6.07
Silver	0.001	mg/L	<0.001	0.022	<0.001	<0.001
Sodium	0.05	mg/L	53.6	170	192	4.07
Strontium	0.005	mg/L	0.434	0.433	0.709	0.515
Sulfur	0.1	mg/L	146	285	351	8.1
Thorium	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Tin	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Titanium	0.001	mg/L	<0.001	0.142	0.023	<0.001
Uranium	0.06	mg/L	<0.06	<0.06	<0.06	<0.06
Vanadium	0.002	mg/L	<0.002	<0.002	0.014	<0.002
Zinc	0.001	mg/L	0.012	0.088	0.028	0.003
Zirconium	0.001	mg/L	0.001	0.002	0.001	<0.001

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Metal Analysis (con't.)

	Detection Limit	Units	48146-13 End of Pipe 2 - 09/29	48146-14 Spillway - 09/28	48146-15 E5 - 09/28	48146-16 B1 - 09/29
Arsenic - Dissolved in Water						
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
ICP Semi-Trace Scan - Total Metals in Water						
Aluminum	0.01	mg/L	<0.01	0.5	<0.01	0.13
Antimony	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Barium	0.0005	mg/L	0.0364	0.0725	0.0059	0.0629
Beryllium	0.0002	mg/L	<0.0002	<0.0002	0.0002	<0.0002
Bismuth	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Cadmium	0.0005	mg/L	<0.0005	0.0006	0.107	<0.0005
Calcium	0.01	mg/L	383	123	398	45.1
Chromium	0.001	mg/L	<0.001	0.002	<0.001	<0.001
Cobalt	0.001	mg/L	0.061	0.004	0.032	<0.001
Copper	0.002	mg/L	0.145	0.1	0.076	0.01
Iron	0.003	mg/L	0.279	1.09	0.037	0.631
Lead	0.005	mg/L	<0.005	<0.005	0.007	<0.005
Lithium	0.002	mg/L	0.003	0.014	0.029	<0.002
Magnesium	0.01	mg/L	17.9	44.7	407	11
Manganese	0.0005	mg/L	0.807	0.4	33	0.598
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Nickel	0.002	mg/L	0.017	0.003	0.025	<0.002
Phosphorus	0.06	mg/L	<0.06	<0.06	<0.06	<0.06
Potassium	0.2	mg/L	12.8	1.5	4.2	<0.2
Selenium	0.02	mg/L	<0.02	0.02	<0.02	<0.02
Silicon	0.05	mg/L	3.03	7.77	3.95	7.36
Silver	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Sodium	0.05	mg/L	315	20.3	12.9	4.32
Strontium	0.005	mg/L	1.06	0.316	1.05	0.247
Sulfur	0.1	mg/L	524	133	832	24.8
Thorium	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Tin	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Titanium	0.001	mg/L	<0.001	0.017	<0.001	0.001
Uranium	0.06	mg/L	<0.06	<0.06	<0.06	<0.06
Vanadium	0.002	mg/L	<0.002	<0.002	<0.002	<0.002
Zinc	0.001	mg/L	0.024	0.018	15	0.016
Zirconium	0.001	mg/L	<0.001	0.001	0.002	<0.001

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled: -
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Metal Analysis (con't.)

	Detection Limit	Units	48146-17 E8 - 09/29	48146-18 Seepage Pond - 09/29	48146-19 P1 - 09/30	48146-20 GW1 - 09/30
Arsenic - Dissolved in Water						
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
ICP Semi-Trace Scan - Total Metals in Water						
Aluminum	0.01	mg/L	<0.01	<0.01	0.04	<0.01
Antimony	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02	<0.02
Barium	0.0005	mg/L	0.0213	0.0615	0.036	0.0779
Beryllium	0.0002	mg/L	<0.0002	<0.0002	<0.0002	<0.0002
Bismuth	0.02	mg/L	<0.02	0.03	<0.02	<0.02
Cadmium	0.0005	mg/L	<0.0005	0.0043	0.0012	<0.0005
Calcium	0.01	mg/L	496	384	28.2	45
Chromium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.001	mg/L	0.114	0.17	<0.001	<0.001
Copper	0.002	mg/L	17.3	23.7	0.038	0.004
Iron	0.003	mg/L	0.1	4.28	0.138	0.015
Lead	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Lithium	0.002	mg/L	<0.002	0.003	<0.002	0.003
Magnesium	0.01	mg/L	15.4	40.9	6.32	20
Manganese	0.0005	mg/L	1.36	14.1	0.0407	0.0042
Mercury	0.0001	mg/L	0.0002	0.0002	<0.0001	<0.0001
Molybdenum	0.005	mg/L	0.006	<0.005	<0.005	<0.005
Nickel	0.002	mg/L	0.077	0.182	<0.002	<0.002
Phosphorus	0.06	mg/L	<0.06	<0.06	<0.06	<0.06
Potassium	0.2	mg/L	14	8	<0.2	0.8
Selenium	0.02	mg/L	<0.02	<0.02	<0.02	0.03
Silicon	0.05	mg/L	1.69	4.6	8.05	7.41
Silver	0.001	mg/L	0.079	0.059	<0.001	<0.001
Sodium	0.05	mg/L	472	312	4.24	4.9
Strontium	0.005	mg/L	1.12	0.938	0.138	0.63
Sulfur	0.1	mg/L	731	560	24.6	9.6
Thorium	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Tin	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Titanium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Uranium	0.06	mg/L	<0.06	<0.06	<0.06	<0.06
Vanadium	0.002	mg/L	<0.002	<0.002	<0.002	<0.002
Zinc	0.001	mg/L	0.032	0.058	0.121	0.003
Zirconium	0.001	mg/L	<0.001	0.002	<0.001	<0.001

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Metal Analysis (con't.)

	Detection Limit	Units	48146-21 P2 - 09/30	48146-22 D1 - 09/30	48146-23 E4 - 09/30
Arsenic - Dissolved in Water					
Arsenic	0.02	mg/L	<0.02	<0.02	<0.02
ICP Semi-Trace Scan - Total Metals in Water					
Aluminum	0.01	mg/L	0.13	0.01	0.08
Antimony	0.02	mg/L	<0.02	<0.02	<0.02
Arsenic	0.02	mg/L	0.02	<0.02	<0.02
Barium	0.0005	mg/L	0.0554	0.0643	0.0167
Beryllium	0.0002	mg/L	<0.0002	<0.0002	<0.0002
Bismuth	0.02	mg/L	<0.02	<0.02	<0.02
Cadmium	0.0005	mg/L	<0.0005	<0.0005	0.0006
Calcium	0.01	mg/L	26.7	79.1	137
Chromium	0.001	mg/L	<0.001	<0.001	<0.001
Cobalt	0.001	mg/L	<0.001	<0.001	<0.001
Copper	0.002	mg/L	0.01	0.01	0.007
Iron	0.003	mg/L	1.32	0.194	0.143
Lead	0.005	mg/L	<0.005	<0.005	<0.005
Lithium	0.002	mg/L	0.003	<0.002	0.007
Magnesium	0.01	mg/L	6.19	20.2	32.7
Manganese	0.0005	mg/L	0.165	0.208	0.095
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001
Molybdenum	0.005	mg/L	<0.005	<0.005	<0.005
Nickel	0.002	mg/L	<0.002	<0.002	<0.002
Phosphorus	0.06	mg/L	<0.06	<0.06	<0.06
Potassium	0.2	mg/L	<0.2	2.4	<0.2
Selenium	0.02	mg/L	<0.02	0.03	<0.02
Silicon	0.05	mg/L	10.7	5.81	8.23
Silver	0.001	mg/L	<0.001	<0.001	<0.001
Sodium	0.05	mg/L	4.12	6.2	11.4
Strontium	0.005	mg/L	0.131	0.203	0.232
Sulfur	0.1	mg/L	23.6	65.7	31.8
Thorium	0.005	mg/L	<0.005	<0.005	<0.005
Tin	0.005	mg/L	<0.005	<0.005	<0.005
Titanium	0.001	mg/L	<0.001	<0.001	<0.001
Uranium	0.06	mg/L	<0.06	<0.06	<0.06
Vanadium	0.002	mg/L	<0.002	<0.002	<0.002
Zinc	0.001	mg/L	0.018	0.11	0.069
Zirconium	0.001	mg/L	<0.001	<0.001	<0.001

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled: -
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Metal Analysis (con't.)

	Detection Limit	Units	48146-24 S1 - 09/30 (100 mL)
Arsenic - Dissolved in Water			
Arsenic	0.02	mg/L	na
ICP Semi-Trace Scan - Total Metals in Water			
Aluminum	0.1	mg/L	6.5
Antimony	0.2	mg/L	<0.2
Arsenic	0.2	mg/L	0.6
Barium	0.005	mg/L	0.105
Beryllium	0.002	mg/L	<0.02
Bismuth	0.2	mg/L	<0.2
Cadmium	0.005	mg/L	0.062
Calcium	0.1	mg/L	400
Chromium	0.01	mg/L	<0.01
Cobalt	0.01	mg/L	<0.01
Copper	0.02	mg/L	0.16
Iron	0.03	mg/L	11.9
Lead	0.05	mg/L	0.92
Lithium	0.02	mg/L	0.02
Magnesium	0.1	mg/L	174
Manganese	0.005	mg/L	2.84
Mercury	0.0001	mg/L	<0.0001
Molybdenum	0.0.5	mg/L	<0.05
Nickel	0.02	mg/L	<0.02
Phosphorus	0.6	mg/L	0.6
Potassium	2	mg/L	14
Selenium	0.2	mg/L	0.4
Silicon	0.5	mg/L	16.5
Silver	0.01	mg/L	<0.01
Sodium	0.5	mg/L	38.2
Strontium	0.05	mg/L	0.76
Sulfur	1	mg/L	449
Thorium	0.05	mg/L	<0.05
Tin	0.05	mg/L	<0.05
Titanium	0.01	mg/L	0.2
Uranium	0.5	mg/L	<0.5
Vanadium	0.02	mg/L	<0.02
Zinc	0.01	mg/L	7.08
Zirconium	0.01	mg/L	0.01

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled: -
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Metal Analysis (con't.)

	Detection Limit	Units	48146-25 Field Blank - 09/30	48146-26 Travel Blank - 09/30
Arsenic - Dissolved in Water				
Arsenic	0.02	mg/L	<0.02	<0.02
ICP Semi-Trace Scan - Total Metals in Water				
Aluminum	0.01	mg/L	0.03	<0.01
Antimony	0.02	mg/L	<0.02	<0.02
Arsenic	0.02	mg/L	<0.02	<0.02
Barium	0.0005	mg/L	<0.0005	<0.0005
Beryllium	0.0002	mg/L	<0.0002	<0.0002
Bismuth	0.02	mg/L	<0.02	<0.02
Cadmium	0.0005	mg/L	<0.0005	<0.0005
Calcium	0.01	mg/L	<0.01	<0.01
Chromium	0.001	mg/L	<0.001	<0.001
Cobalt	0.001	mg/L	<0.001	<0.001
Copper	0.002	mg/L	<0.002	0.007
Iron	0.003	mg/L	0.046	<0.003
Lead	0.005	mg/L	<0.005	0.006
Lithium	0.002	mg/L	<0.002	<0.002
Magnesium	0.01	mg/L	<0.01	<0.01
Manganese	0.0005	mg/L	<0.0005	<0.0005
Mercury	0.0001	mg/L	<0.0001	<0.0001
Molybdenum	0.005	mg/L	<0.005	<0.005
Nickel	0.002	mg/L	<0.002	<0.002
Phosphorus	0.06	mg/L	<0.06	<0.06
Potassium	0.2	mg/L	<0.2	<0.2
Selenium	0.02	mg/L	<0.02	0.03
Silicon	0.05	mg/L	<0.05	<0.05
Silver	0.001	mg/L	0.001	<0.001
Sodium	0.05	mg/L	<0.05	<0.05
Strontium	0.005	mg/L	<0.005	<0.005
Sulfur	0.1	mg/L	<0.1	<0.1
Thorium	0.005	mg/L	<0.005	<0.005
Tin	0.005	mg/L	<0.005	<0.005
Titanium	0.001	mg/L	<0.001	<0.001
Uranium	0.06	mg/L	<0.06	<0.06
Vanadium	0.002	mg/L	<0.002	<0.002
Zinc	0.001	mg/L	0.002	<0.001
Zirconium	0.001	mg/L	<0.001	<0.001

Approved By:

John Davidson, Dipl. T., C.P.H.I. (C)
Supervisor, Inorganics Lab

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Client Code: CONPAC

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Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Water Analysis

	Detection Limit	Units	48146-1 Duplicate - 09/29	48146-2 NS1 - 09/28	48146-3 NS2 - 09/28	48146-4 V7 - 09/28
Acidity						
Acidity	5	mg CaCO3/L	40	7	7	6
Alkalinity,total						
Total Alkalinity	5	mg CaCO3/L	39	114	39	79
Ammonium in Water						
Ammonium-N	0.05	mg/L	14.2	<0.05	<0.05	<0.05
Cyanate in Water						
Cyanate	0.01	mg/L	<0.01	0.15	0.21	0.15
Cyanide (weak acid dissociable)						
Cyanide	0.002	mg/L	6.2	<0.002	0.003	0.016
Dissolved Cyanide						
Cyanide	0.001	mg/L	40.5	0.001	0.003	0.021
Electrical Conductivity						
Electrical Conductivity	0.01	µS/cm	4000	75	100	235
Hardness						
Hardness (CaCO3 equiv)	0.5	mg/L	1160	33.5	44.2	110
Nitrate - Nitrogen in Water						
Nitrate-N	0.05	mg/L	1.58	<0.05	<0.05	na
Nitrite Nitrogen						
Nitrite-N	0.003	mg/L	0.121	<0.003	<0.003	na
pH in Water						
pH	0.01	pH	5.91	7.18	7.49	7.79
Sulphate in Water						
Sulphate	0.1	mg/L	1920	9	9.2	35.9
Thiocyanates						
Thiocyanates	0.1	mg/L	17.4	2.3	2.1	<0.1
Total Cyanide in Water						
Cyanide (Total)	0.001	mg/L	na	na	na	na
Total Suspended Solids						
Total Suspended Solids	5	mg/L	<5	<5	<5	<5

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
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VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
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Water Analysis (con't.)

	Detection Limit	Units	48146-5 V5 - 09/28	48146-6 V4 - 09/29	48146-7 V3 - 09/29	48146-8 V1 - 09/29
Acidity						
Acidity	5	mg CaCO3/L	5	6	5	7
Alkalinity,total						
Total Alkalinity	5	mg CaCO3/L	63	83	75	75
Ammonium in Water						
Ammonium-N	0.05	mg/L	<0.05	<0.05	<0.05	<0.05
Cyanate in Water						
Cyanate	0.01	mg/L	0.03	0.21	0.15	<0.01
Cyanide (weak acid dissociable)						
Cyanide	0.002	mg/L	0.004	0.003	0.002	<0.002
Dissolved Cyanide						
Cyanide	0.001	mg/L	0.053	0.028	0.005	<0.001
Electrical Conductivity						
Electrical Conductivity	0.01	µS/cm	235	240	175	175
Hardness						
Hardness (CaCO3 equiv)	0.5	mg/L	105	111	87.7	89.8
Nitrate - Nitrogen in Water						
Nitrate-N	0.05	mg/L	0.35	0.32	0.16	0.13
Nitrite Nitrogen						
Nitrite-N	0.003	mg/L	<0.003	<0.003	<0.003	<0.003
pH in Water						
pH	0.01	pH	7.71	7.7	7.72	7.77
Sulphate in Water						
Sulphate	0.1	mg/L	43.5	41.5	14.7	14.1
Thiocyanates						
Thiocyanates	0.1	mg/L	2.3	<0.1	<0.1	<0.1
Total Cyanide in Water						
Cyanide (Total)	0.001	mg/L	na	na	na	na
Total Suspended Solids						
Total Suspended Solids	5	mg/L	<5	<5	<5	<5

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VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
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Water Analysis (con't.)

	Detection Limit	Units	48146-9 D4 - 09/29	48146-10 D3 - 09/28	48146-11 D2 - 09/29	48146-12 End of Pipe - 09/28
Acidity						
Acidity	5	mg CaCO3/L	17	24	13	8
Alkalinity,total						
Total Alkalinity	5	mg CaCO3/L	110	158	154	158
Ammonium in Water						
Ammonium-N	0.05	mg/L	0.41	11.8	7.85	<0.05
Cyanate in Water						
Cyanate	0.01	mg/L	<0.01	<0.01	<0.01	0.21
Cyanide (weak acid dissociable)						
Cyanide	0.002	mg/L	0.006	0.017	0.124	<0.002
Dissolved Cyanide						
Cyanide	0.001	mg/L	0.006	15.1	10.3	na
Electrical Conductivity						
Electrical Conductivity	0.01	µS/cm	890	2050	2200	330
Hardness						
Hardness (CaCO3 equiv)	0.5	mg/L	360	605	678	153
Nitrate - Nitrogen in Water						
Nitrate-N	0.05	mg/L	0.79	2.35	0.92	0.32
Nitrite Nitrogen						
Nitrite-N	0.003	mg/L	0.006	0.05	0.098	<0.003
pH in Water						
pH	0.01	pH	7.25	7.53	7.86	7.88
Sulphate in Water						
Sulphate	0.1	mg/L	330	935	1040	23.5
Thiocyanates						
Thiocyanates	0.1	mg/L	2.2	86.4	71.6	<0.1
Total Cyanide in Water						
Cyanide (Total)	0.001	mg/L	na	na	na	0.026
Total Suspended Solids						
Total Suspended Solids	5	mg/L	11	151	132	<5

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VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
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Attn: Keith Mountjoy	Date Received: Oct 04, 1999
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Water Analysis (con't.)

	Detection Limit	Units	48146-13 End of Pipe 2 - 09/29	48146-14 Spillway - 09/28	48146-15 E5 - 09/28	48146-16 B1 - 09/29
Acidity						
Acidity	5	mg CaCO3/L	6	<5	30	<5
Alkalinity,total						
Total Alkalinity	5	mg CaCO3/L	102	102	118	99
Ammonium in Water						
Ammonium-N	0.05	mg/L	11.3	0.89	1.12	<0.05
Cyanate in Water						
Cyanate	0.01	mg/L	<0.01	<0.01	<0.01	na
Cyanide (weak acid dissociable)						
Cyanide	0.002	mg/L	0.075	0.044	<0.002	na
Dissolved Cyanide						
Cyanide	0.001	mg/L	na	na	na	na
Electrical Conductivity						
Electrical Conductivity	0.01	µS/cm	3300	970	3900	320
Hardness						
Hardness (CaCO3 equiv)	0.5	mg/L	1020	449	2490	141
Nitrate - Nitrogen in Water						
Nitrate-N	0.05	mg/L	1.19	0.9	14.5	0.13
Nitrite Nitrogen						
Nitrite-N	0.003	mg/L	0.15	0.064	0.199	0.003
pH in Water						
pH	0.01	pH	7.25	7.65	7.47	7.76
Sulphate in Water						
Sulphate	0.1	mg/L	1680	390	2590	64.8
Thiocyanates						
Thiocyanates	0.1	mg/L	97.2	4.1	<0.1	na
Total Cyanide in Water						
Cyanide (Total)	0.001	mg/L	33.5	1.05	0.012	na
Total Suspended Solids						
Total Suspended Solids	5	mg/L	<5	12	<5	<5

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Water Analysis (con't.)

	Detection Limit	Units	48146-17 E8 - 09/29	48146-18 Seepage Pond - 09/29	48146-19 P1 - 09/30	48146-20 GW1 - 09/30
Acidity						
Acidity	5	mg CaCO3/L	8	13	7	na
Alkalinity,total						
Total Alkalinity	5	mg CaCO3/L	59	225	32	na
Ammonium in Water						
Ammonium-N	0.05	mg/L	13	30.7	<0.05	<0.05
Cyanate in Water						
Cyanate	0.01	mg/L	<0.01	<0.01	na	na
Cyanide (weak acid dissociable)						
Cyanide	0.002	mg/L	5.63	0.184	na	na
Dissolved Cyanide						
Cyanide	0.001	mg/L	na	na	na	na
Electrical Conductivity						
Electrical Conductivity	0.01	µS/cm	4100	3600	220	na
Hardness						
Hardness (CaCO3 equiv)	0.5	mg/L	1140	1120	89.1	157
Nitrate - Nitrogen in Water						
Nitrate-N	0.05	mg/L	1.64	2.31	0.22	na
Nitrite Nitrogen						
Nitrite-N	0.003	mg/L	0.121	0.31	<0.003	na
pH in Water						
pH	0.01	pH	8.09	7.01	7.21	1.75
Sulphate in Water						
Sulphate	0.1	mg/L	1930	1780	83.6	23
Thiocyanates						
Thiocyanates	0.1	mg/L	180	82.1	na	na
Total Cyanide in Water						
Cyanide (Total)	0.001	mg/L	112	106	na	na
Total Suspended Solids						
Total Suspended Solids	5	mg/L	<5	31	<5	<5

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 18, 1999
Fax: (604) 738-1166	

Water Analysis (con't.)

	Detection Limit	Units	48146-21 P2 - 09/30	48146-22 D1 - 09/30	48146-23 E4 - 09/30	48146-24 S1 - 09/30 (100 mL)
Acidity						
Acidity	5	mg CaCO3/L	<5	<5	na	<5
Alkalinity,total						
Total Alkalinity	5	mg CaCO3/L	36	95	na	181
Ammonium in Water						
Ammonium-N	0.05	mg/L	0.89	0.53	<0.05	0.53
Cyanate in Water						
Cyanate	0.01	mg/L	na	0.03	na	na
Cyanide (weak acid dissociable)						
Cyanide	0.002	mg/L	na	<0.002	na	0.002
Dissolved Cyanide						
Cyanide	0.001	mg/L	na	<0.001	na	0.003
Electrical Conductivity						
Electrical Conductivity	0.01	µS/cm	170	530	22000	2450
Hardness						
Hardness (CaCO3 equiv)	0.5	mg/L	73.5	249	385	na
Nitrate - Nitrogen in Water						
Nitrate-N	0.05	mg/L	0.31	0.13	na	<0.05
Nitrite Nitrogen						
Nitrite-N	0.003	mg/L	0.007	<0.003	0.014	na
pH in Water						
pH	0.01	pH	6.99	7.62	1.73	8.3
Sulphate in Water						
Sulphate	0.1	mg/L	54.9	173	79	1160
Thiocyanates						
Thiocyanates	0.1	mg/L	na	<0.1	na	2.1
Total Cyanide in Water						
Cyanide (Total)	0.001	mg/L	na	na	na	na
Total Suspended Solids						
Total Suspended Solids	5	mg/L	<5	<5	<5	na

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48146**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Waters
VANCOUVER	Project: 9216744 - Mt. Nansen - Yukon
BC V6J 4W6	Date Sampled: -
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
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Water Analysis (con't.)

	Detection Limit	Units	48146-25 Field Blank - 09/30	48146-26 Travel Blank - 09/30
Acidity				
Acidity	5	mg CaCO3/L	5	8
Alkalinity,total				
Total Alkalinity	5	mg CaCO3/L	6	<5
Ammonium in Water				
Ammonium-N	0.05	mg/L	<0.05	<0.05
Cyanate in Water				
Cyanate	0.01	mg/L	0.03	<0.01
Cyanide (weak acid dissociable)				
Cyanide	0.002	mg/L	0.002	<0.002
Dissolved Cyanide				
Cyanide	0.001	mg/L	0.002	<0.001
Electrical Conductivity				
Electrical Conductivity	0.01	µS/cm	2	2
Hardness				
Hardness (CaCO3 equiv)	0.5	mg/L	<0.5	<0.5
Nitrate - Nitrogen in Water				
Nitrate-N	0.05	mg/L	<0.05	<0.05
Nitrite Nitrogen				
Nitrite-N	0.003	mg/L	<0.003	<0.003
pH in Water				
pH	0.01	pH	5.59	5.55
Sulphate in Water				
Sulphate	0.1	mg/L	<0.1	<0.1
Thiocyanates				
Thiocyanates	0.1	mg/L	0.2	<0.1
Total Cyanide in Water				
Cyanide (Total)	0.001	mg/L	na	na
Total Suspended Solids				
Total Suspended Solids	5	mg/L	<5	<5

Approved By:

John Davidson, Dipl. T., C.P.H.I. (C)
Supervisor, Inorganics Lab

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48149**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Soils
VANCOUVER	Project: 9216744 - Mt. Nansen
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 19, 1999
Fax: (604) 738-1166	

Petroleum Hydrocarbons

	Detection Limit	Units	48149-11 SAG - GS1 - 09/30	48149-12 Mill - GS2 - 09/30	48149-13 Polish Pond - GS3 - 09/30	48149-14 Ketza - GS4 - 10/01
BTEX in Soil						
Benzene	0.02	mg/kg	0.17	na	na	0.07
Toluene	0.02	mg/kg	<0.02	na	na	<0.02
Ethylbenzene	0.02	mg/kg	<0.02	na	na	<0.02
m,p-Xylene	0.05	mg/kg	<0.05	na	na	<0.05
o-Xylene	0.03	mg/kg	0.28	na	na	<0.03
EPH in Soil						
EPHs10-19	10	mg/kg	28600	218	34000	1720
EPHs19-32	10	mg/kg	40500	111	23700	50700
Moisture						
% Moisture		%	7.4	22	9.8	3.7
PCBs in Soil						
Total PCBs	0.1	mg/kg	na	<0.1	0.12	na
VPH in Soil						
VHs6-10	1	mg/kg	<1	na	na	6.3
VPHs6-10	1	mg/kg	<1	na	na	6.3

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48149**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Soils
VANCOUVER	Project: 9216744 - Mt. Nansen
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 19, 1999
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Petroleum Hydrocarbons (con't.)

	Detection Limit	Units	48149-15 Ketza - GS5 - 10/01
BTEX in Soil			
Benzene	0.02	mg/kg	0.09
Toluene	0.02	mg/kg	<0.02
Ethylbenzene	0.02	mg/kg	0.18
m,p-Xylene	0.05	mg/kg	0.42
o-Xylene	0.03	mg/kg	0.42
EPH in Soil			
EPHs10-19	10	mg/kg	54100
EPHs19-32	10	mg/kg	8080
Moisture			
% Moisture		%	19
PCBs in Soil			
Total PCBs	0.1	mg/kg	na
VPH in Soil			
VHs6-10	1	mg/kg	63
VPHs6-10	1	mg/kg	61

Approved By: _____

Ralph Hindle, B.Sc.
Supervisor, Organics Lab

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Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48149**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Soils
VANCOUVER	Project: 9216744 - Mt. Nansen
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 19, 1999
Fax: (604) 738-1166	

Soil Analysis

	Detection Limit	Units	48149-1 V1 - 09/29	48149-2 V4 - 09/29	48149-3 V5 - 09/29	48149-4 P1 - 09/30
pH in Soil (1:2 water)						
pH	0.01	pH	7.5	7.7	8.1	6.9

	Detection Limit	Units	48149-5 P2 - 09/30	48149-6 D1 - 09/30	48149-7 D2 - 09/30	48149-8 D3 - 09/30
pH in Soil (1:2 water)						
pH	0.01	pH	8.1	7	7.4	7.3

	Detection Limit	Units	48149-9 D3 (Duplicate) - 09/30	48149-10 V6 - 10/01	48149-11 SAG - GS1 - 09/30	48149-12 Mill - GS2 - 09/30
pH in Soil (1:2 water)						
pH	0.01	pH	7.2	7.7	5.2	6.74

	Detection Limit	Units	48149-13 Polish Pond - GS3 - 09/30	48149-14 Ketza - GS4 - 10/01	48149-15 Ketza - GS5 - 10/01
pH in Soil (1:2 water)					
pH	0.01	pH	6.82	6.88	5.48

Approved By: _____

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48149**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Soils
VANCOUVER	Project: 9216744 - Mt. Nansen
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 19, 1999
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Metal Analysis

	Detection Limit	Units	48149-1 V1 - 09/29	48149-2 V4 - 09/29	48149-3 V5 - 09/29	48149-4 P1 - 09/30
ICP Semi-Trace Scan - Metals in Solids						
Aluminum	5	µg/g	35000	31600	34600	57900
Antimony	2	µg/g	<2	<2	<2	310
Arsenic	2	µg/g	11	97	89	4480
Barium	0.05	µg/g	339	409	434	669
Beryllium	0.1	µg/g	0.7	0.8	0.9	0.6
Bismuth	5	µg/g	<5	<5	<5	54
Cadmium	0.1	µg/g	0.5	1.9	2.3	31.5
Calcium	1	µg/g	12800	9210	9530	3780
Chromium	0.5	µg/g	30.5	27.2	68.7	17.2
Cobalt	0.5	µg/g	11.5	14	14.1	9.6
Copper	0.5	µg/g	87.6	127	92.6	1150
Iron	1	µg/g	35000	36000	36000	106000
Lead	1	µg/g	35	76	76	4090
Lithium	1	µg/g	16.9	17.4	19.1	23.6
Magnesium	1	µg/g	9170	7510	7420	2710
Manganese	0.1	µg/g	440	3560	2650	3360
Molybdenum	1	µg/g	5	5	5	3
Nickel	1	µg/g	12.9	17.3	20.3	8.9
Phosphorus	5	µg/g	1020	1020	927	694
Potassium	20	µg/g	5900	6000	6900	17300
Selenium	2	µg/g	<2	<2	<2	<2
Silicon	5	µg/g	3760	3030	633	457
Silver	0.5	µg/g	<0.5	<0.5	0.6	98.9
Sodium	5	µg/g	1710	1850	1400	882
Strontium	1	µg/g	79	79	79	93
Sulfur	10	µg/g	460	460	510	23000
Thorium	1	µg/g	<1	2	3	<1
Tin	1	µg/g	2	4	4	1
Titanium	0.2	µg/g	1960	1020	1160	296
Uranium	5	µg/g	<5	<5	<5	<5
Vanadium	1	µg/g	76	70	77	56
Zinc	0.5	µg/g	119	210	228	2070
Zirconium	0.1	µg/g	19.3	14.9	15.3	8.4

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48149**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Soils
VANCOUVER	Project: 9216744 - Mt. Nansen
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 19, 1999
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Metal Analysis con't

	Detection Limit	Units	48149-5 P2 - 09/30	48149-6 D1 - 09/30	48149-7 D2 - 09/30	48149-8 D3 - 09/30
ICP Semi-Trace Scan - Metals in Solids						
Aluminum	5	µg/g	39400	31800	21800	22700
Antimony	2	µg/g	<2	45	5	<2
Arsenic	2	µg/g	125	1340	189	239
Barium	0.05	µg/g	406	399	264	204
Beryllium	0.1	µg/g	0.7	0.7	0.5	0.5
Bismuth	5	µg/g	<5	<5	<5	<5
Cadmium	0.1	µg/g	2.2	5.9	1.5	0.8
Calcium	1	µg/g	10600	9140	11400	16300
Chromium	0.5	µg/g	26.7	21.4	38	59.7
Cobalt	0.5	µg/g	11.3	21.7	7.9	9.5
Copper	0.5	µg/g	114	119	162	683
Iron	1	µg/g	35000	63000	24000	34000
Lead	1	µg/g	72	1160	90	24
Lithium	1	µg/g	17.2	12.9	9.6	11.5
Magnesium	1	µg/g	6420	7730	6590	8520
Manganese	0.1	µg/g	1980	6210	571	589
Molybdenum	1	µg/g	<1	1	1	1
Nickel	1	µg/g	16.2	13.9	20.3	19.2
Phosphorus	5	µg/g	944	1040	630	1070
Potassium	20	µg/g	4560	6200	4790	4130
Selenium	2	µg/g	<2	<2	<2	<2
Silicon	5	µg/g	2990	687	2670	374
Silver	0.5	µg/g	0.9	10.8	1.5	15.7
Sodium	5	µg/g	1360	856	2780	1790
Strontium	1	µg/g	68	41	77	74
Sulfur	10	µg/g	940	1640	870	880
Thorium	1	µg/g	<1	<1	2	1
Tin	1	µg/g	<1	<1	3	2
Titanium	0.2	µg/g	1140	711	1160	2310
Uranium	5	µg/g	<5	<5	<5	<5
Vanadium	1	µg/g	61	120	54	78
Zinc	0.5	µg/g	243	721	172	114
Zirconium	0.1	µg/g	13.2	7	9.5	15.8

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Client Code: CONPAC

Name: CONOR PACIFIC ENVIRO TECH INC	Workorder: **48149**
Address: 300-1727 West Broadway	WO (Other):
	PO Num: Soils
VANCOUVER	Project: 9216744 - Mt. Nansen
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 19, 1999
Fax: (604) 738-1166	

Metal Analysis con't

	Detection Limit	Units	48149-9 D3 (Duplicate) - 09/30	48149-10 V6 - 10/01	48149-11 SAG - GS1 - 09/30	48149-12 Mill - GS2 - 09/30
ICP Semi-Trace Scan - Metals in Solids						
Aluminum	5	µg/g	20000	33000	8900	34800
Antimony	2	µg/g	<2	<2	310	64
Arsenic	2	µg/g	251	52	850	990
Barium	0.05	µg/g	196	357	504	241
Beryllium	0.1	µg/g	0.5	0.7	<0.1	<0.1
Bismuth	5	µg/g	<5	<5	9	<5
Cadmium	0.1	µg/g	0.9	1.2	8	5.8
Calcium	1	µg/g	13700	10300	3220	71300
Chromium	0.5	µg/g	39	29.4	27.9	72.9
Cobalt	0.5	µg/g	9	11.2	2.6	12.9
Copper	0.5	µg/g	705	44	255	212
Iron	1	µg/g	31000	32000	24000	92000
Lead	1	µg/g	27	43	495	485
Lithium	1	µg/g	11.1	17.2	1700	10.9
Magnesium	1	µg/g	7870	7910	873	4560
Manganese	0.1	µg/g	525	1210	661	1160
Molybdenum	1	µg/g	<1	2	13700	6
Nickel	1	µg/g	19.1	13.1	49.2	36.3
Phosphorus	5	µg/g	1160	834	1370	460
Potassium	20	µg/g	3510	7200	3640	7300
Selenium	2	µg/g	<2	<2	<2	<2
Silicon	5	µg/g	1020	523	999	417
Silver	0.5	µg/g	17.1	<0.5	11.9	11.8
Sodium	5	µg/g	2240	1560	291	1590
Strontium	1	µg/g	62	78	23	130
Sulfur	10	µg/g	900	320	29000	63700
Thorium	1	µg/g	2	<1	4	<1
Tin	1	µg/g	2	2	3	3
Titanium	0.2	µg/g	1920	1300	29.6	857
Uranium	5	µg/g	<5	<5	<5	<5
Vanadium	1	µg/g	66	71	10	64
Zinc	0.5	µg/g	116	133	1790	748
Zirconium	0.1	µg/g	16.2	13.7	33.7	5.8

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	PO Num: Soils
VANCOUVER	Project: 9216744 - Mt. Nansen
BC V6J 4W6	Date Sampled:
Attn: Keith Mountjoy	Date Received: Oct 04, 1999
Phone: (604) 738-1100	Date Reported: Oct 19, 1999
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Metal Analysis con't

	Detection Limit	Units	48149-13 Polish Pond - GS3 - 09/30	48149-14 Ketza - GS4 - 10/01	48149-15 Ketza - GS5 - 10/01
ICP Semi-Trace Scan - Metals in Solids					
Aluminum	5	µg/g	32100	40800	30400
Antimony	2	µg/g	52	48	<2
Arsenic	2	µg/g	1240	920	118
Barium	0.05	µg/g	221	530	329
Beryllium	0.1	µg/g	0.6	0.7	0.6
Bismuth	5	µg/g	<5	10	<5
Cadmium	0.1	µg/g	7.1	8.5	1.7
Calcium	1	µg/g	11500	12300	7110
Chromium	0.5	µg/g	23.7	19.4	30.5
Cobalt	0.5	µg/g	10.5	7.4	7.1
Copper	0.5	µg/g	96.8	157	28.1
Iron	1	µg/g	35000	42000	23000
Lead	1	µg/g	436	760	150
Lithium	1	µg/g	9.6	13.6	14.7
Magnesium	1	µg/g	4970	3520	5730
Manganese	0.1	µg/g	879	1850	549
Molybdenum	1	µg/g	<1	4	<1
Nickel	1	µg/g	13.2	10.6	11.9
Phosphorus	5	µg/g	833	912	406
Potassium	20	µg/g	6500	9800	4600
Selenium	2	µg/g	<2	<2	<2
Silicon	5	µg/g	594	3250	717
Silver	0.5	µg/g	5.7	7	1
Sodium	5	µg/g	1280	1700	1890
Strontium	1	µg/g	43	66	57
Sulfur	10	µg/g	4330	6600	580
Thorium	1	µg/g	<1	<1	1
Tin	1	µg/g	2	3	2
Titanium	0.2	µg/g	539	287	1330
Uranium	5	µg/g	<5	<5	<5
Vanadium	1	µg/g	79	50	66
Zinc	0.5	µg/g	667	1460	165
Zirconium	0.1	µg/g	4.3	7.1	13.4

Approved By: _____

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Supervisor, Inorganics Lab

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na = not available

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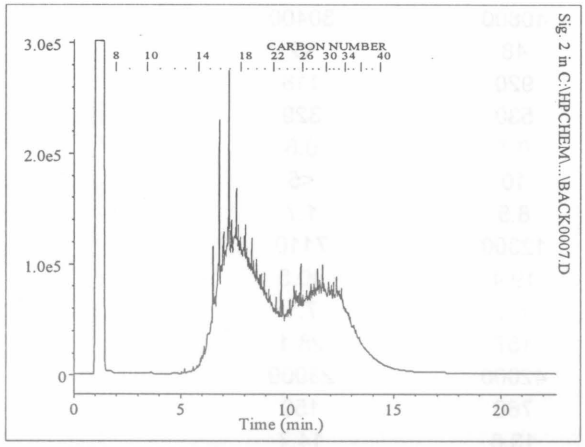
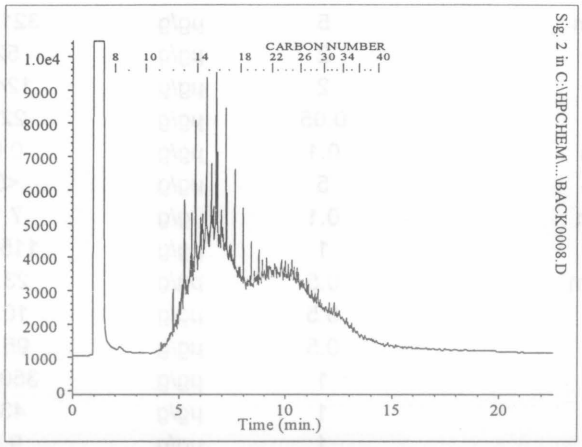
WO (Surrey) : **48149**
Quote No. :
WO (Other) :
PO Num : Soils
Project : 9216744 - Mt. Nansen
Date Sampled :
Date Received : Oct 04, 1999
Date Reported : Oct 19, 1999

Qualitative Fuel Assessment Report

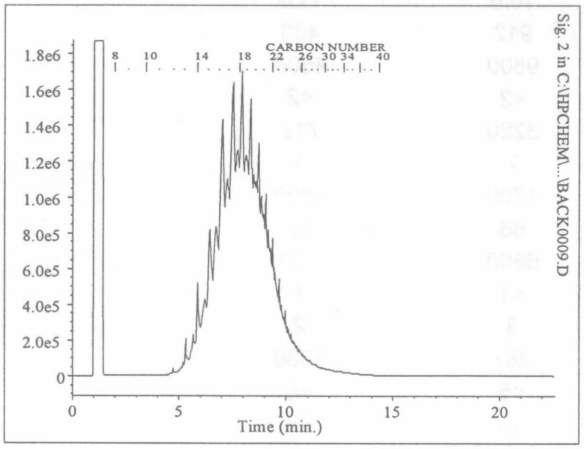
Method: EPH in Soil
Sample No. 48149-11
SAG - GS1 - 09/30



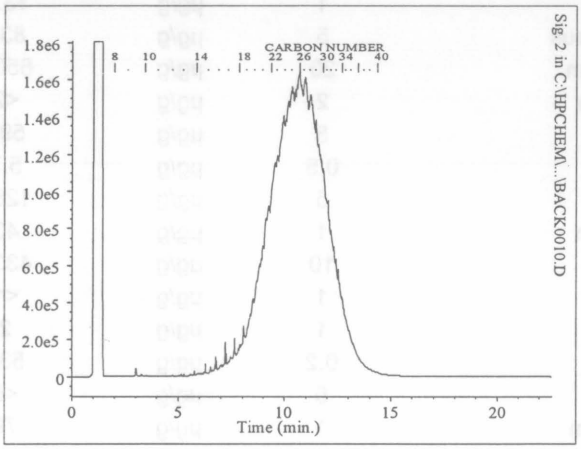
Method: EPH in Soil
Sample No. 48149-12
Mill - GS2 - 09/30



Method: EPH in Soil
Sample No. 48149-13
Polish Pond - GS3 - 09/30



Method: EPH in Soil
Sample No. 48149-14
Ketza - GS4 - 10/01



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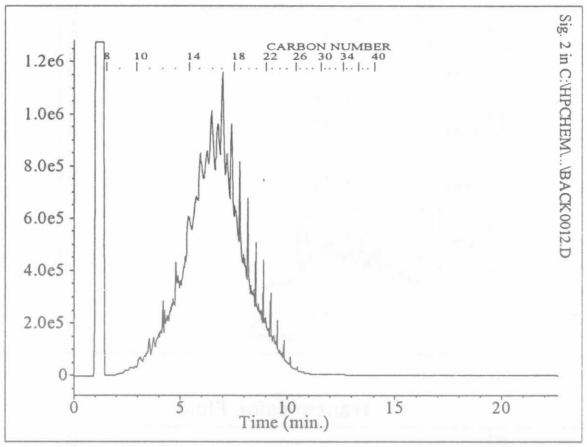
Date Received :	Oct 04, 1999
Date Reported :	Oct 19, 1999

Qualitative Fuel Assessment Report

Method: EPH in Soil
Sample No. 48149-15
Ketza - GS5 - 10/01



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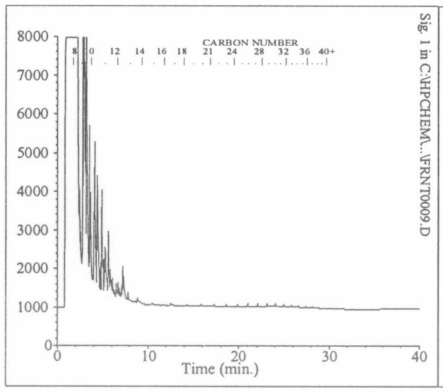
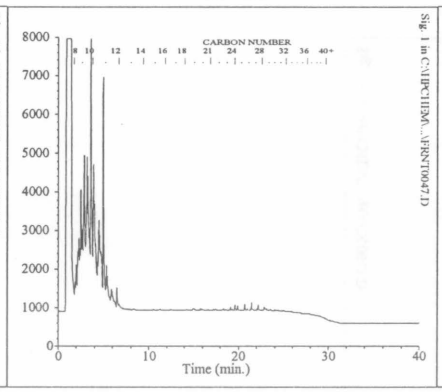
Qualitative Fuel Assessment Report

TYPICAL PRODUCT CHROMATOGRAMS

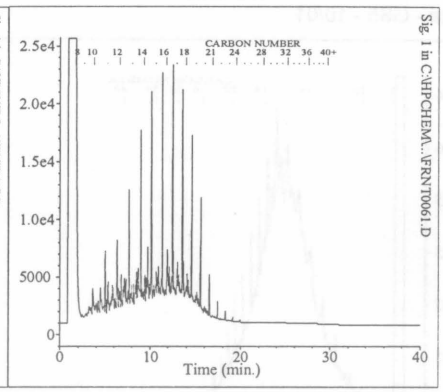
GASOLINE



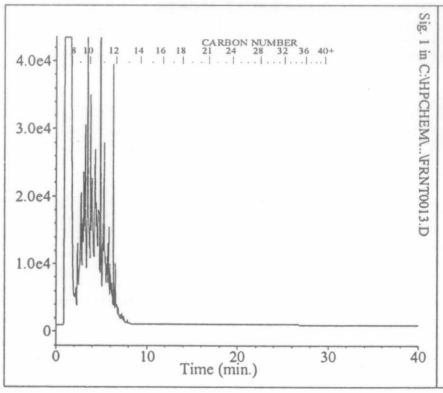
VARSOL



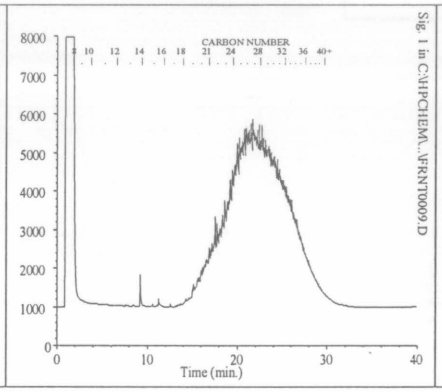
DIESEL



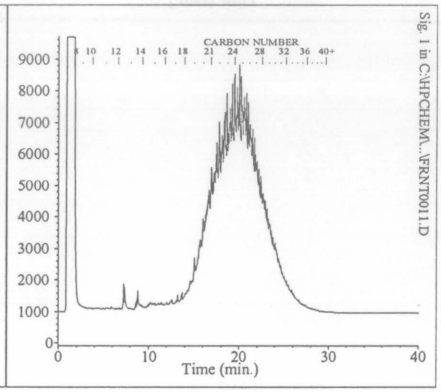
KEROSENE



10W30 MOTOR OIL



Transmission Fluid



Product Carbon Number Ranges

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Approved By:

Ralph Hindle, B.Sc.
Supervisor, Organics Lab

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Quality Assurance Report

BTEX in Soil

Sample Spikes	Units	Measured Amount	Target Amount	% Recovery
Replicate: 1		*Extraction Date: Oct 08, 1999*		*Analyst: Cathy Cardinall*
Benzene	%	75.5		
Toluene	%	97.1		
Ethylbenzene	%	83.9		
m,p-Xylene	%	92.7		
o-Xylene	%	104		
		Average:		

PCBs in Soil

Sample Spikes	Units	Measured Amount	Target Amount	% Recovery
Replicate: 1		*Extraction Date: Sep 29, 1999*		*Analyst: Minaz Lakha*
Total PCBs	%	79.2		
		Average:		

Approved By:

Ralph Hindle, B.Sc.
Supervisor, Organics Lab

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Method References

BTEX in Soil

US EPA Method 8020 which involves purge and trap extraction of the volatile components followed by analysis with capillary gas chromatography using a photo-ionization detector.

EPH in Soil

Summation of the C10-C19 and C19-C32 carbon range, using the BC Contaminated Sites, October 15, 1999, "Extractable Petroleum Hydrocarbons in Solids by GC/FID." No corrections for PAHs.

PCBs in Soil

Analysis by GC/ECD. EPA 3540 for preparation and EPA 8080/8150 for analysis. Equivalent to BC environmental laboratory manual, March 1997.

VPH in Soil

Summation of the C6-C10 carbon range, using the BC Contaminated Sites Method, October 15, 1999, "Volatile Hydrocarbons in Solids by GC/FID." VHs6-10 includes BTEX compounds, VPHs6-10 does not.

ICP Semi-Trace Scan - Metals in Solids

Modified EPA 3051 microwave digestion wih nitric acid. Analysis by ICP , EPA 200.15.

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