ULU PROJECT

Northwest Territories

ENVIRONMENTAL OVERVIEW

Prepared for:

BHP Minerals Ltd.
Vancouver, Canada

Prepared by:

Rescan Environmental Services Ltd.
Vancouver, Canada

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Rescan

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PROJECT FACT SHEET

CORPORATE DATA

Project Name:	Ulu Project
Company Name and Address:	BHP Minerals Ltd. Ste. 1600, 1050 West Pender Street Vancouver, B.C., V6E 3S7
Company Contact:	Mr. Neil leNobel, Manager Western Canadian Exploration Vancouver, B.C. Tel: (604) 683-6921

PROJECT DETAILS

Project Location:	510 km northeast of Yellowknife, NWT 66° 54' 30'' North Latitude 110° 58' West Longitude
Development Cost:	$35 million
Estimated Total Capital Cost:	$120 million
Commodity:	Gold
Mining Method:	Sub-level open stope and modified crater retreat
Production Rate:	1,000+ tpd
Process Plant/Mill:	To be constructed on site
Ore Beneficiation Process:	Conventional cyanide leach
Proposed Mine Life:	10 years

RESERVES

To be provided by BHP Minerals Ltd.

POWER SUPPLY:	On-site diesel generation
ACCESS/TRANSPORTATION	
Road Access:	Echo Bay Minerals Ltd. winter road from Yellowknife to the Lupin minesite on Contwoyto Lake, thence, via BHP Minerals Ltd. winter road from the Lupin mine to Ulu
Air Access:	Scheduled airline service to Yellowknife, thence, via charter from Yellowknife to Crown Camp on Penthouse Lake
WORKFORCE INFORMATION:	
Construction: (Annual Average)	200
Operation: (Annual Average)	240
Housing Options:	Atco-type portable modular camp
Workforce Rotation/Schedule:	2 weeks on/2 weeks off

EXECUTIVE SUMMARY

The Ulu property is located in the Northwest Territories, approximately 510 kilometres northeast of Yellowknife. Access to the Ulu property is gained by either air or road. Air access is via charter from Yellowknife to Crown Camp on Penthouse Lake. There is road access via Echo Bay Mines Ltd. winter road from Yellowknife to the Lupin minesite on Contwoyto Lake, thence, via air charter to Ulu.

BHP Minerals Ltd. has carried out mineral exploration at Ulu during the summers of 1989 to 1991 and intends to continue exploration during 1992. If justified by drilling results, an underground exploration program would be undertaken to verify the previously drill-indicated reserve, to confirm the surrounding geology and to obtain a bulk ore sample for metallurgical testing.

Located 45 kilometres north of the Arctic Circle, the Ulu property is situated in treeless arctic tundra where rock and glacial features dominate the landscape. Elevations range from 370 to 385 metres above sea level and the vegetation is comprised of small shrubs, lichens and mosses. Fauna inhabiting or nearby the Ulu site are characteristic of its arctic setting and include, among other species, caribou, muskox, ptarmigan, and smaller furbearers. Also characteristic of its arctic tundra location, the Ulu area experiences cool summers and extremely cold winters with very low annual precipitation.

The Ulu Project is intended to be developed as an underground mine (sub-level open stope and modified crater retreat), with conventional milling and ore beneficiation facilities to be developed on-site. Presently, mine life is anticipated to extend for ten years; potential for additional reserves has not been fully assessed. The project construction phase would employ some 200 workers; project operations will employ approximately 240 individuals with a two weeks on/two weeks off shift rotation.

Recognizing the importance of acquiring a sound baseline measurement of environmental conditions characterizing the project area, to allow the completion of a detailed environmental assessment prior to project development, BHP Minerals Ltd. initiated on-site baseline environmental studies during the summer of 1990. These efforts largely centered around establishing background water quality and surface hydrology conditions. In the spring of 1991, BHP Minerals Ltd. commissioned Rescan Environmental Services Ltd., a Vancouver-based firm of environmental scientists and engineers, to expand on these baseline efforts. More specifically, it was requested that all necessary environmental studies be initiated to allow the sound assessment of potential project-related impacts.

This Environmental Overview is submitted in partial fulfillment of these objectives. It discusses previous and planned exploration activities, it outlines preliminary project development concepts, it details the current understanding of project conditions at Ulu and, most importantly, it advances measures being undertaken to satisfy the data requirements of a Project Description Report (PDR) to be submitted to regulatory authorities as the first stage of the project review process. The Ulu Project PDR will better characterize baseline environmental and socioeconomic conditions as a foundation for predicting potential project-induced impacts, developing a sound environmental management plan for their mitigation and guiding overall project development.

1 - Introduction

1.0 INTRODUCTION

1.1 Preamble

BHP Minerals Ltd. intends to perform advanced underground exploration activities on its Ulu gold property by 1993 to establish the feasibility of developing an underground gold mine. This program will permit the verification of the reserve estimates and acquisition of a bulk ore sample for metallurgical process testing. Placement of necessary infrastructure will be accomplished during this period.

This Environmental Overview presents discussions on the Ulu geology, planned underground exploration and development, related infrastructural development, and an overview of environmental and socioeconomic conditions characterizing the project area. More specifically, it outlines the data gathering efforts already completed, and those proposed for the coming exploration period, to support the preparation of a detailed Project Description Report for submission to regulatory authorities. Submission of the Project Description Report is intended to accompany applications for a Land Use Permit and Water License.

1.2 Project Location and Setting

The Ulu property is located 45 kilometres north of the Arctic Circle, within the MacKenzie Mining District, Northwest Territories. The property is centered at 66° 55' North Latitude and 110° 58' West Longitude on NTS map sheet 76 L/14, 15. This position is 10 kilometres north of the Hood River and 90 kilometres south of Coronation Gulf, in the Arctic Ocean (Figure 1-1).

The Ulu property is located in the treeless arctic tundra where rock and glacial features dominate the landscape. Vegetation consists primarily of small shrubs, lichens and mosses. In the northern section of the claim group, steep cliffs and deeply incised linears dissect the volcanic plateau which is topographically elevated above the sediments and granitic rocks. Elevations on the property range from 370 metres to 485 metres above sea level (Figure 1-2).

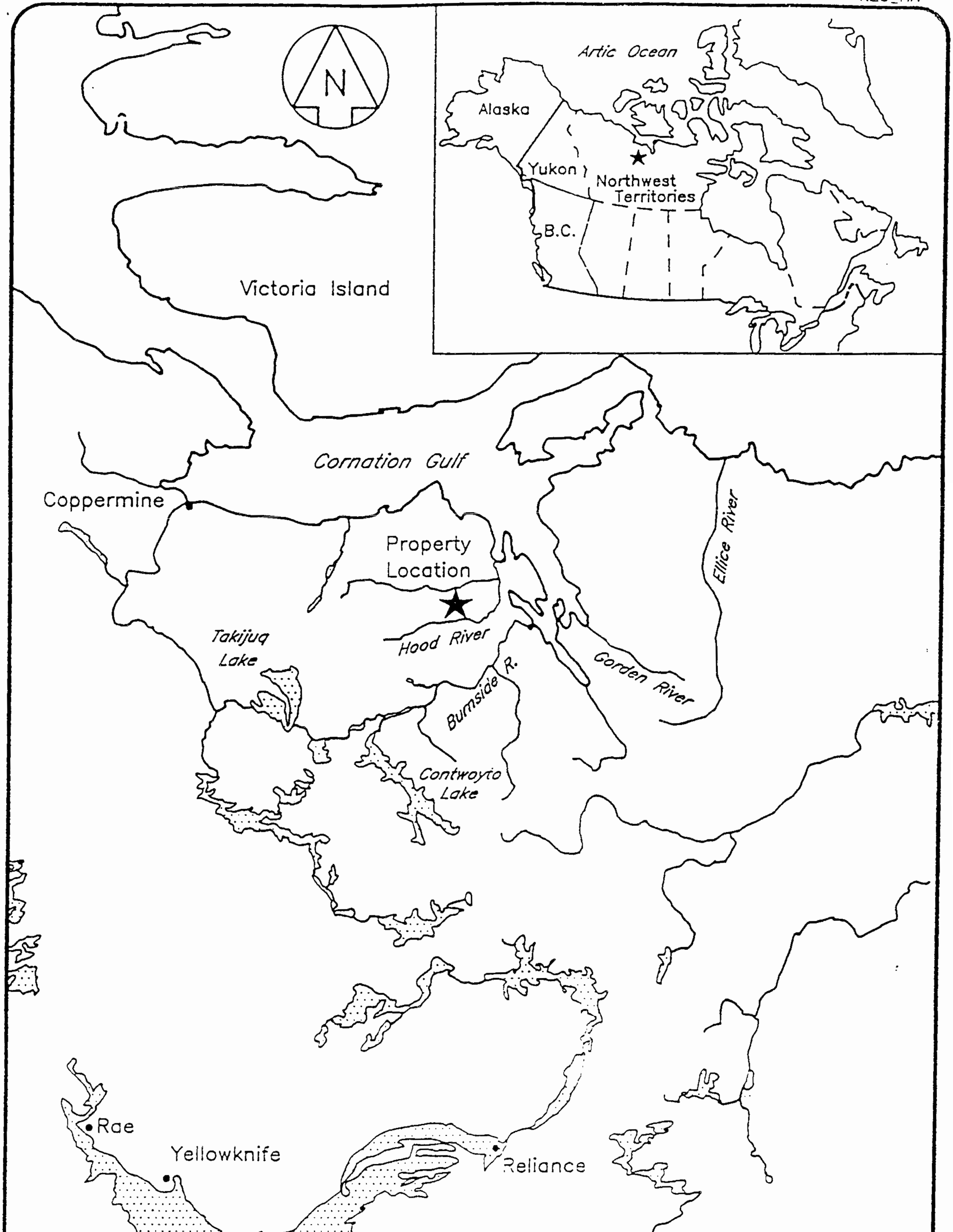

Figure 1-1
PROJECT LOCATION

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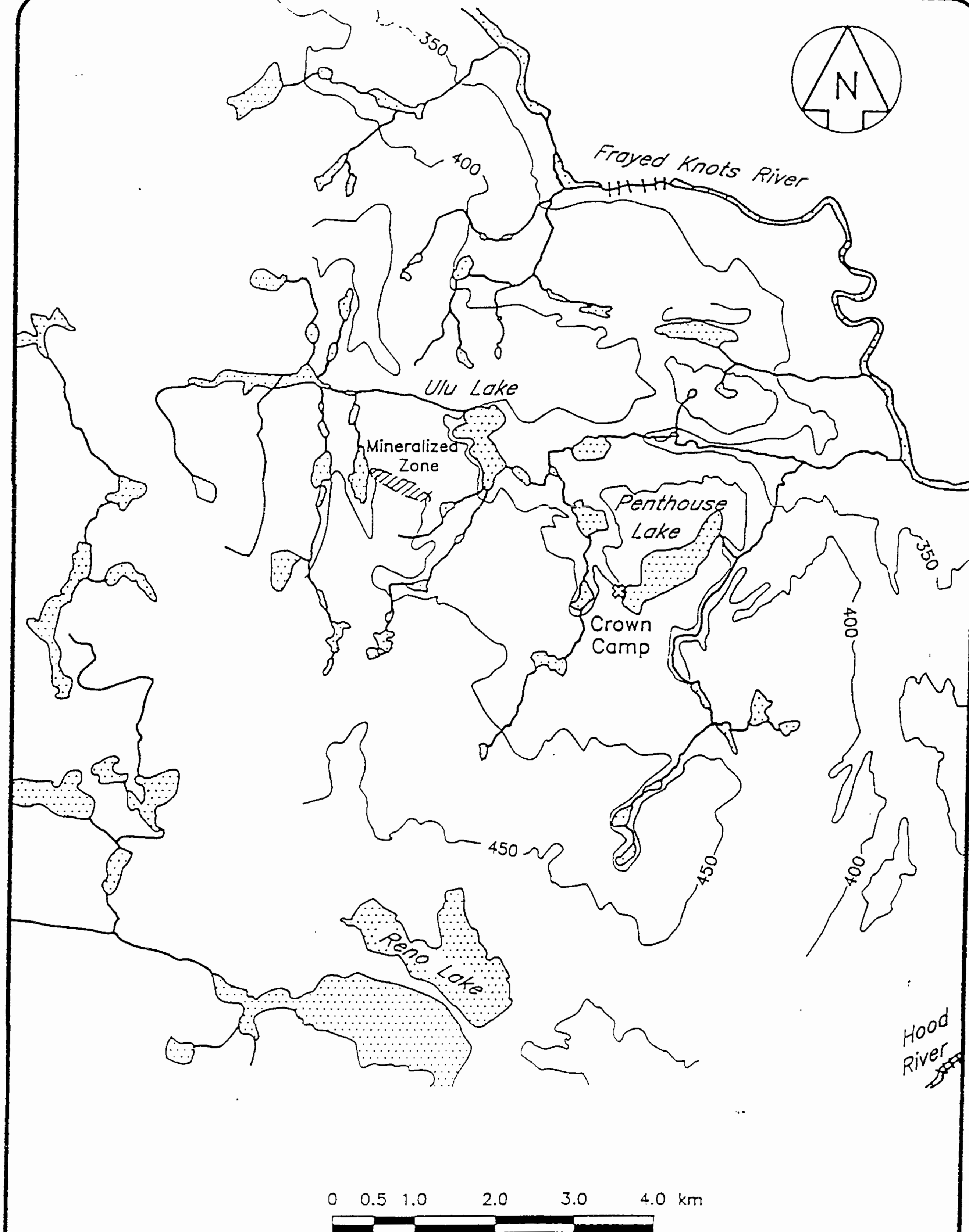

Figure 1-2 SITE LOCATION

Rescan

Outcrop density averages 50-60% with cover consisting of north trending lakes, grassy swamps and boulder-strewn glacial drift. Snow accumulation begins in September and lasts into June. Weather in the Ulu area is typical of the continental barrenlands which experience cool summers and extremely cold winters. This area is classified as semi-arid due to the low annual precipitation.

1.3 Environmental Program

Recognizing the need to have sound environmental planning accompany project development, BHP Minerals Ltd. initiated preliminary water quality and surface hydrology studies at Ulu during the summer of 1990. To enhance these efforts, and to ensure a comprehensive baseline environmental program is developed to support the preparation of a Project Description Report, BHP Minerals Ltd. commissioned Rescan to design and execute a comprehensive environmental and socioeconomic program at Ulu. The environmental program was initiated during the summer of 1991 and will continue as the project proceeds to advanced exploration.

It was initially intended that a Project Description Report would be filed with regulatory bodies in 1991 but it became apparent that the project is not sufficiently advanced to allow the accurate assessment of potential environmental and socioeconomic impacts. As a foundation for preparing the more comprehensive Ulu Project PDR, once project development plans are more clearly defined, we have prepared this Environmental Overview which outlines the current environmental database and the monitoring program that will continue in order that a detailed impact assessment can be completed.

2 - Program Description

2.0 PROJECT DESCRIPTION

2.1 Exploration History

Exploration activity in the High Lake volcanic belt initially focused on base metals, following Kennarctic's 1955 discovery of the High Lake deposit. Its drill-indicated reserves total 5.2 million tons of 3.5% Cu, 2.5% Zn and 0.023 oz/t Au with minor lead and silver. Companies including Pan American Ventures, Polar Star Mines, Texasgulf Inc., Borealis Exploration, Great Plains Development and Noranda Minerals Inc. conducted exploration programs in the late 1960's through to the mid-1970's at this deposit. Most of this work was concentrated in areas of felsic volcanic rocks considered to be favourable hosts for base metal deposits. Although showings emerged, no economically viable deposits were discovered.

Recent (post-1984) work in the area focused primarily on gold exploration. Gold mineralization has been reported in a wide variety of geologic settings.

BHP Minerals Ltd. has been active in the High Lake volcanic belt since 1986. In 1987 the company staked the CROWN claims and used this as a base during the 1988 field season to explore in the surrounding area. Reconnaissance traverses led to the staking of ULU and ULU 2 to 4 in the fall of 1988.

Eight new claims (ULU 5, 7-13) were added to the property following the discovery of the Flood Zone early in the 1989 season. Property work from 1989 to 1991 has included gridding, mapping, geophysical surveying; including magnetic, VLF-electromagnetic, induced polarization and ground electromagnetic surveys, drilling and geochemical soil sampling.

2.2 Geology, Mineralization and Ore Reserves

The Ulu property is located in the High Lake Supracrustal Belt which is part of a northerly trending complex of volcanic rocks, bounded on the west by extensive granitic plutons and flanked to the east by volcaniclastics, carbonate and turbidite sediments. The belt extends north-south for over 135 km across NTS map sheets 76L and 76M with a width varying from 7 to 15 km. The High Lake metavolcanic belt is noteworthy for its abundant pyritic siliceous gossans, major shear zones and occasional banded iron formations. The belt has been metamorphosed to greenschist grade, increasing to amphibolite facies in the vicinity of granitoid intrusives. Numerous prominent airphoto lineaments illustrate the presence of complex fault and fracture patterns. At least two distinct ages of faulting are recognized. North-south shears and faults post-date a northwest-southeast lineament as indicated by penetrative foliation and Proterozoic diabase dykes.

The southern part of the belt consists predominantly of intermediate volcanics with lesser amounts of mafic and felsic volcanic rocks which are overlain by minor amounts of metasediments. Massive and pillowed mafic and intermediate flows tend to be amygdaloidal and often porphyritic. Intermediate fragmentals are much more abundant than mafic equivalents.

Sedimentary rocks are exposed in two main areas; the Dock Lake (Reno Lake) and Frayed Knots River areas. Sediments are comprised mainly of graded greywacke-mudstone units which have been metamorphosed to low and medium grade shales and slates. Locally the metasediments are interbedded with felsic tuffs.

Further to the north mafic volcanics become less abundant. North of the James River, the mafic volcanics occur as narrow lenses within felsic to intermediate volcanics and metasediments.

The mafic volcanics primarily represent flows of andesitic composition. Intermediate tuffs and fragmentals, often calcareous, occur locally. Felsic volcanics are dominated by fragmentals, mainly tuffs. Breccias, agglomerates and quartz-eye rhyolites and cherty variants occur locally.

Slates and argillites are the most dominant metasediment. The slates are typically sulphide-bearing and locally contain banded sulphide iron formations. Rare thin chert bands and felsic volcanics are intercalated. Well-bedded limestones interbedded with felsic volcanics are widespread in the Mineral Lake and Snofield Lake areas.

Property Geology

The Ulu claim block is situated on the western margin of the High Lake volcanic belt where rocks of the Yellowknife Supergroup are in contact with an Archean granitic batholith (Figure 2-1). ULU and ULU 2 to 4 mineral claims cover a 2-3 km wide lobe of mafic metavolcanic and metasedimentary rocks bounded on three sides by the granitic terrain. The lithologic sequence comprises several biotite +/- cordierite and andalusite schist units interlayered with basaltic flows and intruded by gabbroic sills, quartz feldspar porphyry dykes and late stage diabase dykes. The basaltic flows are commonly pillowed. A minor component of fine mafic tuff and intermediate volcanic rocks are also present (see Figure 2-2).

On the ULU, ULU 3 and ULU 4 claims, the package is tightly folded into a north plunging asymmetrical anticline dissected by east-west trending faults. Pillow selvages indicate a northwest younging direction. Further north in ULU 2, the mafic volcanic package is tightly, synclinally folded with a southerly plunge. The package is intruded by granitic dykes and is disrupted by northeast trending faults.

The majority of metasedimentary and metavolcanic rocks on the property have been metamorphosed to upper greenschist - lower amphibiolite facies. The intrusion of the granitic batholith forming the western margin of the High Lake Belt is coincident with the deformation and metamorphism of the supracrustal rocks in the Ulu claims area. Cordierite and andalusite porphyroblasts, indicative of amphibolite grade metamorphism, are variably distributed in all of the pelitic layers. The sediments are thermally metamorphosed within the narrow contact auerole extending outwards from the granitic batholith. The mafic volcanic rocks display a mineral assemblage which includes actinolite/tremolite, biotite and hornblende.

Flood Zone Geology

Common stratigraphy of the Flood Zone consists of Archean age, lower amphibolite grade, basalt with subordinate sediment and gabbro, cross-cut by acidic and basic dykes (Figure 2-3). The sediments form interflow layers at two scales: 5-15m and 150-300m. One of the large scale sediments layers forms the core of the fold propagated in southern Ulu. Gabbroic bodies are locally developed as sills or flow cores. Four horizons of gabbro are noted in the succession forming the hanging wall. This succession lies on the west limb of the fold described above.

The west limb strikes north-south with a moderate westerly dip. A 15m thick quartz feldspar porphyry dyke, striking northeast, cross-cuts the succession and

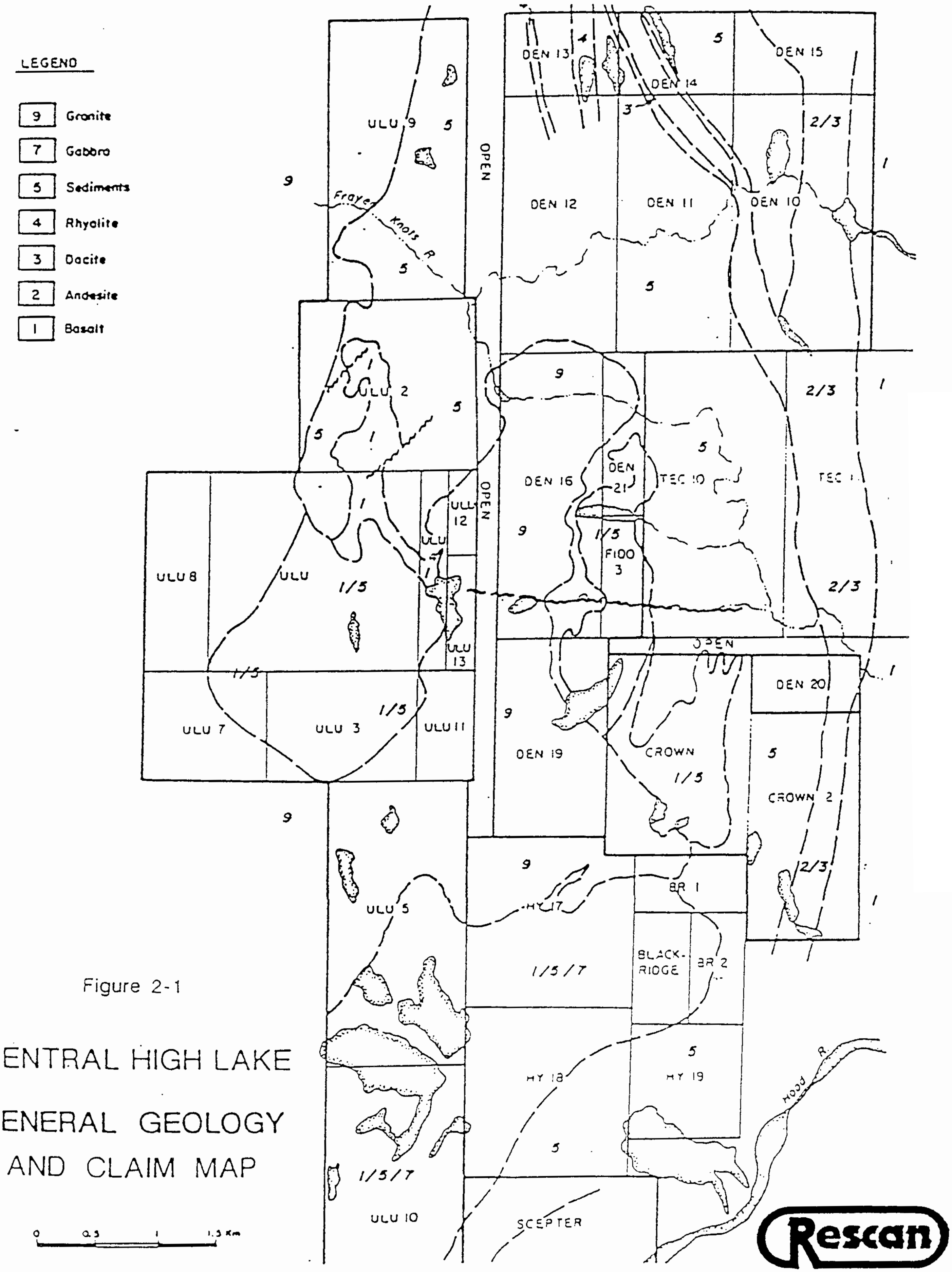

Figure 2-1

CENTRAL HIGH LAKE

GENERAL GEOLOGY AND CLAIM MAP

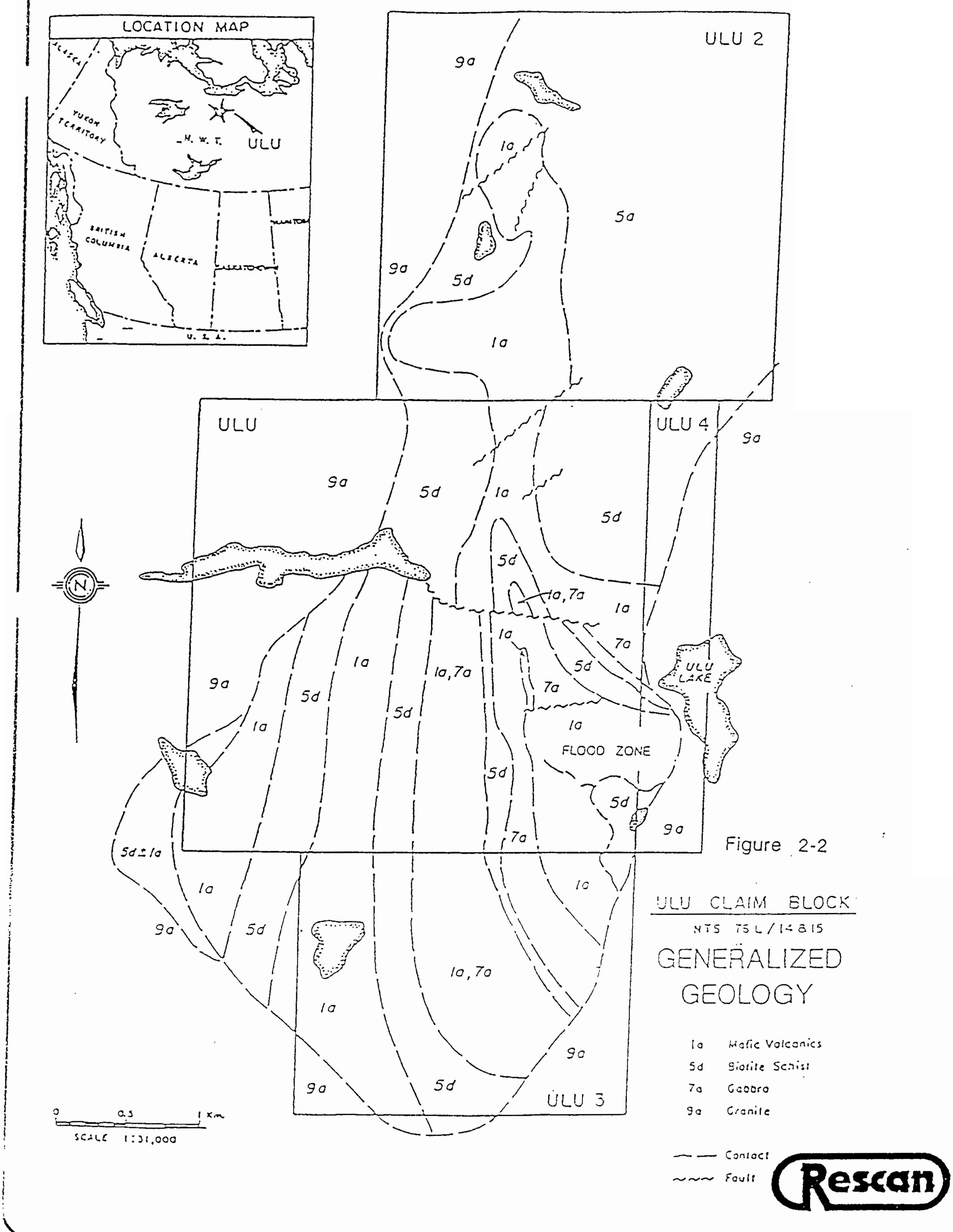

Figure 2-2

ULU CLAIM BLOCK

NTS 75L/14&15

GENERALIZED GEOLOGY

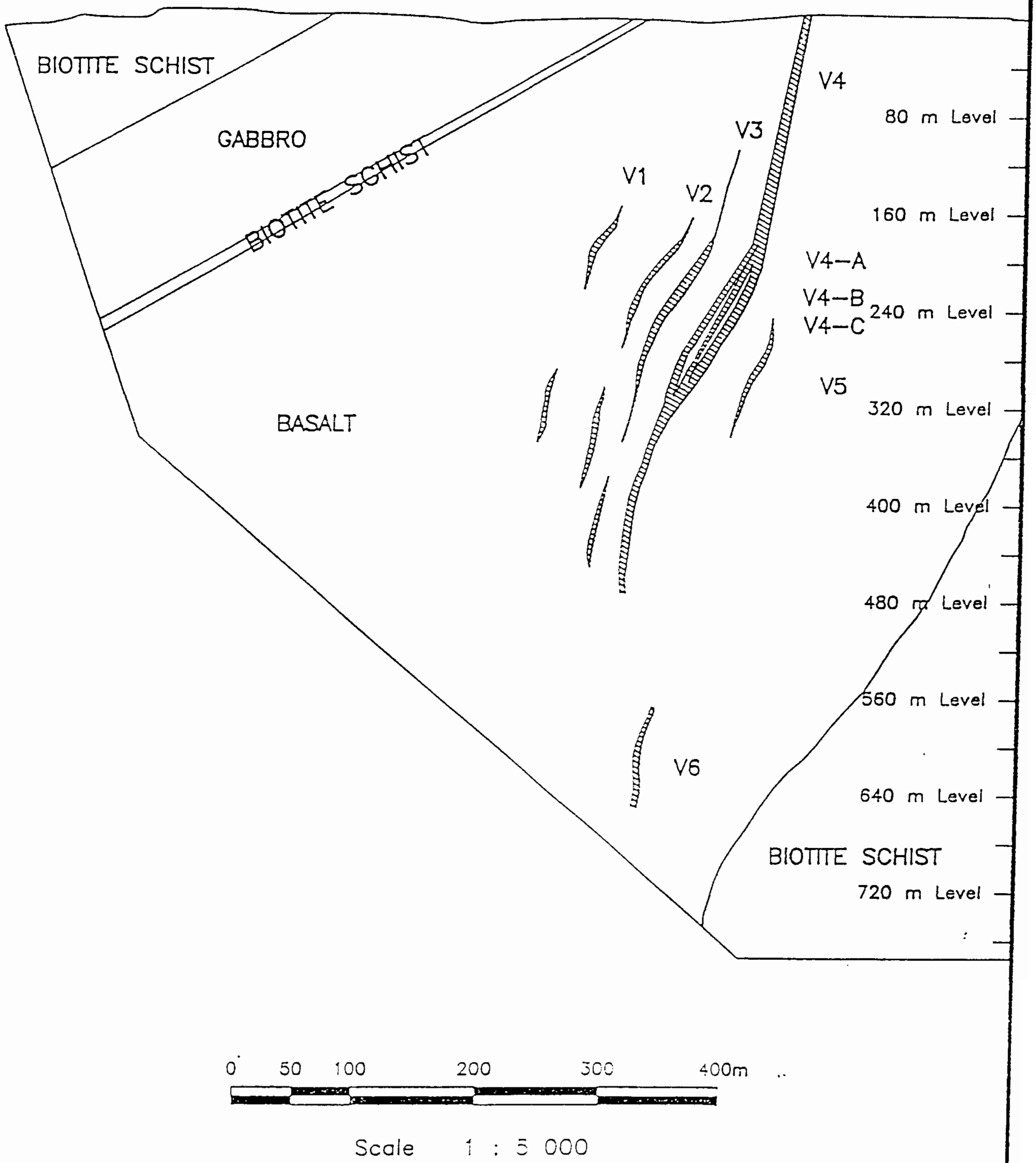

Figure 2-3

HYPOTHETICAL SECTION OF FLOOD ZONE GEOLOGY

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coincides with a flexure (likely a fault) in the flank of the west limb. A 10 m thick northwest trending diabase dyke cross-cuts all units.

The Flood Zone can be traced on surface for 400 m in a northwest direction near the core of the anticline. The 2-5 m thick mineralized zone dips steeply (70-80°) to the southwest and has been intersected at depths below 600 m. Areas of local thickening up to 10 m corresponds to flexure points along the roughly tabular body.

The Flood Zone mineralization is comprised of an intensely silicified zone with arsenopyrite contained in fractures and dilatancies within tholeiitic basalts. Arsenopyrite constitutes approximately 5% (locally to 10%) of the zone. Accessory sulphide minerals include pyrrhotite (~2%), pyrite (<1%) and minor chalcopyrite.

Alteration minerals present include biotite, hornblende, actinolite-tremolite, potassium feldspar (microcline) and calcite with minor epidote (clinozoisite), tourmaline and sphene. Stockwork quartz/actinolite veins and biotite form an alteration envelope which extends 2-5 m from the zone. Alteration is characterized by enrichment in potassium (biotite + microcline) and the depletion of sodium.

2.2.1 Geological Reserves

To be provided by BHP Minerals Ltd.

2.3 Advanced Exploration

If justified by exploration results, an advanced underground exploration program will be required to verify the previous drill-indicated reserve estimate, to confirm the surrounding geology and to obtain a bulk ore sample for metallurgical testing. The duration of this program is estimated to be one year including mobilization and set-up.

The exploration decline will be driven to the 180 and 240 levels at -18%. Level drifts approximately 500 m long will be established at these elevations to facilitate bulk ore sampling.

Only minor quantities of ore will be mined during the underground exploration program. The ore will be either processed on site, or trucked to the Lupin minesite (Echo Bay Mines Ltd.) for processing. The status of the latter option is pending further discussions with Echo Bay Mines Ltd. Tailings would either be disposed of on-site in accordance with an approved plan or at Lupin in their existing tailings pond. Waste materials will be stored northeast of the portal and used as construction material, if it is not acid generating, or on a properly prepared stockpiling pad if it is determined to be potentially acid generating. Water quality in the drainage basin will be routinely tested as discussed further herein.

The advanced exploration phase will require the construction of a winter road from the Lupin Mine and an airstrip for provision of fuel and supplies. The construction of a camp facility, complete with power plant, would be required for year round occupation.

3 - Development Schedule

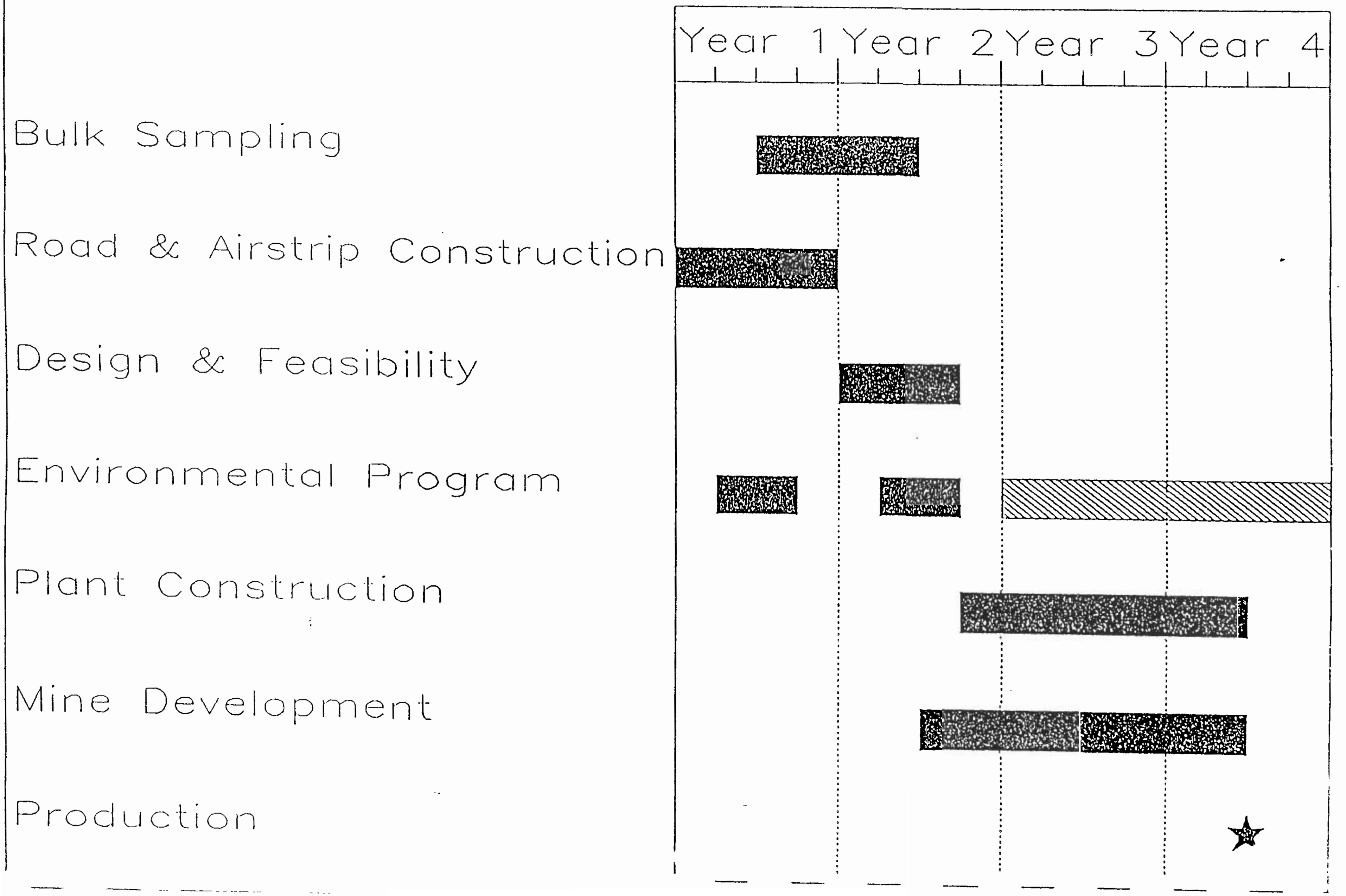
3.0 DEVELOPMENT SCHEDULE

3.1 Preliminary Development Schedule

A preliminary, four-year development schedule is presented in Figure 3-1. The first year will be devoted to the underground exploration program, construction of the road and airstrip, environmental and socioeconomic impact assessment and permit applications.

If a favorable production decision is arrived at during the first year, engineering, site preparation and mine development will begin with full production commencing by the fourth year. The necessary environmental approvals acquisition is provided for in this preliminary schedule.

ULU PROJECT
PRELIMINARY DEVELOPMENT SCHEDULE



4 - Proposed Mining and Milling Plan

4.0 PROPOSED MINING AND MILLING PLAN

4.1 Mining Method

Strong wall rock conditions and the steep inclination of the Ulu orebody lend themselves to low cost and efficient open stope mining methods. Of course, mine development will ultimately depend on the previously completed drilling program, the results of advanced underground exploration and bulk sampling testwork.

Ore greater than 5 metres wide will be mined with low cost bulk mining methods such as vertical crater retreat while the thinner ore, that which is less than 5 metres wide, will be mined by shrinkage stoping.

Mine access will be gained by a vertical shaft driven in the footwall of the orebody to a depth of 520 metres for efficient movement of ore, men and supplies. At the bottom a crushing station will be installed . The -18% decline will be continued from the surface to aid in stope development and allow diesel equipment mobility between individual stoping areas. Level development will be carried out in the footwall on 45 metre vertical intervals to facilitate orebody delineation and serve as ore haulage ways and ventilation openings. A mining rate of at least 1000 tonnes per day is anticipated with 40% of ore production originating from the bulk stopes and the remainder from shrinkage stopes. Vertical ore transport to the crushing station will be through a network of bored raises that will double as auxiliary ventilation openings. The main ventilation circuit will be through the shaft, decline and level drifts. Pre-production waste development will amount to approximately 160,000 tonnes over two years which will be stored on surface. Subsequent wastes produced during mining will be stored underground in empty stopes.

Development drilling will be completed using two electric hydraulic drill jumbos. Production drilling will be done with jacklegs in shrinkage stopes and ITH drills in bulk stopes. Diesel haulage equipment is the most versatile for this type of mine and allows mucking capacity to quickly move where it is needed. Diesel haulage equipment will be used to haul ore from draw points of all stopes. Electric scrapers will be used to move ore within shrinkage stopes to the draw point, until the final draw down phase. Four diesel service vehicles will be used to move men and materials within the ramp system. Annual fuel consumption is estimated at approximately 1.5 million gallons.

4.2 Metallurgy and Processing

A limited amount of metallurgical testwork to date has been carried out on composite ore samples collected from 16 holes drilled between 1989 and 1990. Milling and ore beneficiation processes will be finalized based on the results of the bulk sampling program, scheduled for completion in 1993.

At this point, it appears the recovery process will comprise gravity separation, with a cyanide leach beneficiation process with a planned ore throughput of 1000+ tonnes/day. A preliminary process design for treating Ulu ore is as follows (Figure 4-1):

- Ore is ground to 200 mesh, coarse gold is gravity separated in the grind circuit;
- Preaeration of the ground slurry in a mild alkaline system;
- Cyanide leaching of pre-aerated slurry;
- Scavenging flotation of the cyanide leach residue;
- Regrinding of the flotation concentrate; and
- Cyanide leaching of pre-oxidized concentrate.

Table 4-1 shows the anticipated gold recovery from the described process.

Table 4-1

Gold Recoveries

Cyanide Leach Extraction	88.8% Au (85.7-91.2%)
Flotation Concentrate Recovery	9.0% Au (7.1-12.7%)
Total Leach and Concentrate	97.8% Au (96.1-98.5%)

The extra pre-oxidation step of the ultrafine reground concentrate is necessary as the flotation concentrate is not cyanide amenable and recoveries were as low as 0.5%. Two pre-oxidation methods being considered are bioxidation or pressure oxidation.

Process water for the mine and mill be taken from one of the several small lakes in the

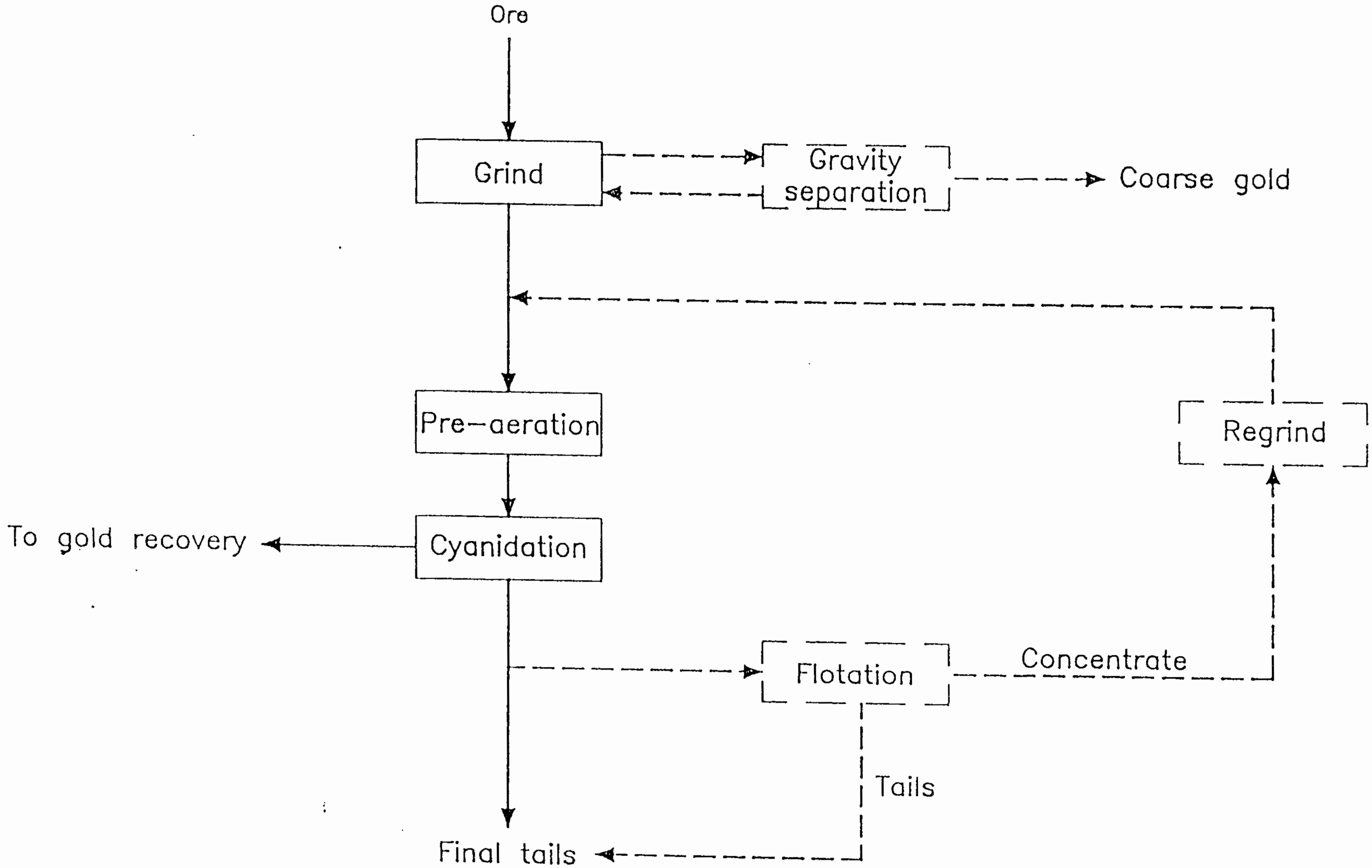


Figure 4-1 PROPOSED PROCESS FLOWSHEET

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immediate project area.

Tailings from the mill circuit will be treated for cyanide destruction prior to disposal. Lake disposal of the tailings appears to be a practical alternative to conventional land disposal. The proposed cyanide destruction process, combined with the absence of a fishery in Ulu Lake and immediately downstream, support this concept. Limnological and fisheries studies have been conducted for both Ulu and Penthouse Lakes and further investigations will be completed to assess their respective suitabilities as tailings disposal locations.

5 - Infrastucture

5.0 INFRASTRUCTURE

5.1 Transportation

The Ulu property is located approximately 510 kilometers northeast of Yellowknife, a major supply center, and 155 kilometers north of Echo Bay Mines Ltd./Lupin Mine.

Access to the Ulu property throughout most of the year (depending upon weather) is by air via charter from Yellowknife to Crown Camp located on Penthouse Lake. During spring melt, a glacial esker located 10 kilometers south of camp is used as a makeshift airstrip. Equipment and supplies are then shuttled to Crown Camp by helicopter. The property is currently accessible by road only during the winter via Echo Bay Mines Ltd. winter road from Yellowknife to the Lupin minesite on Contowoyto Lake, thence, via BHP Minerals Ltd. winter road to Ulu.

Prior to mine development, both the airstrip and road will be upgraded and maintained to service the construction and operational phases of the project. Alternative transportation routes are also being considered.

5.2 Surface Facilities

Surface facilities at Ulu will be consistent with those of northern operations of a similar size. Ore crushing will occur underground at Ulu and crushed materials will be hauled to surface for milling and processing.

In addition to the milling and process plant facilities, a mechanical shop, power plant, fuel storage (diesel drums) and explosives magazines will also be constructed. Offices will be maintained in Atco trailers as will camp accommodations for the proposed 240 operations workforce.

5.3 Water Supply

It is intended that the freshwater supply for the proposed mine camp will be derived from Penthouse Lake. No impacts such as those typically associated with dam construction or water storage are thus anticipated.

5.4 Domestic Waste

Garbage will be collected in covered, bear-proof metal containers located at strategic points around the operations. Refuse will be incinerated. Non-combustible waste and scrap metal will be collected, stockpiled, and shipped to appropriate disposal centers.

5.5 Sewage

The primary flow of waste water will be from the camp kitchen and dry facilities. It will comprise washroom discharge, gray water from showers and laundry facilities and kitchen wastes. The gray water will be routed through grease traps located immediately outside the building.

Combined sanitary sewage and waste water will be collected from all sources and channelled to a portable sewage treatment plant for treatment before final discharge. An optimum location for the plant has not yet been chosen.

6 - Enviromental and Socioeconomic Considerations

6.0 ENVIRONMENTAL AND SOCIOECONOMIC CONSIDERATIONS

6.1 Environmental Program

As discussed earlier, BHP Minerals Ltd. intends to perform advanced exploration activities on its Ulu property beyond 1991 for the purposes of establishing the feasibility of an underground gold mine. BHP Minerals Ltd. has commissioned an environmental study to collect baseline data in order to address potential impacts associated with mine development and operations.

An environmental program was initiated at Ulu during 1990 and expanded in June 1991. It encompasses the collection and interpretation of baseline data including climate, hydrology, water quality, fisheries and aquatic resources, wildlife and vegetation. Limited baseline information is also available from earlier environmental work completed by BHP Minerals Ltd. New data gathering efforts have elaborated this earlier work, with special attention afforded to waste rock and tailings disposal, effluent treatment, sediment and runoff control, and project closure and decommissioning.

The parameters considered in the Ulu environmental program are discussed individually below.

6.1.1 Climate

Situated within the southern arctic, the Ulu property lies in an area that experiences very cool summers and extremely cold winters, with January temperatures often below -30°C. Mean annual precipitation is less than 200 mm (Atmospheric Environment Service 1991). The Ulu property lies within the zone of continuous permafrost.

The collection of site-specific daily temperature, humidity, rainfall, wind speed and direction data began in the summer of 1990. In June 1991, a remote datalogger was installed to record and average data over one hour intervals throughout the year. The data collected from the station will be useful in verifying the estimated mine site climate as derived from records of the Atmospheric Environment Service from Coppermine and

Bathurst Inlet and from Echo Bay Mines Ltd. Lupin Mine (Table 6-1; Figure 6-1).

6.1.2 Hydrology

Hydrological studies will assist in the design of runoff and drainage control facilities, water supply and tailings management for the Ulu site. A detailed hydrological study of the site is required to characterize average flow distribution and estimate flood and low flow conditions. Flow data obtained will thus allow the refinement of regional estimates obtained from Inland Water Directorate stations at Burnside, Gordon and Ellice Rivers (Figure 6-2). On-site hydrological studies were initiated in June 1990 on the Rio Fido and on several smaller watercourses which drain the Ulu property.

A permanent hydrological station, located near the mouth of Rio Fido (Figure 6-3), was installed in June 1991 complete with a staff and crest gauge and an automated water stage recorder. Continuous staff measurements will allow the development of a stage-discharge relationship for the watercourse. This site has been gauged once during high flows in June and again in mid-August. Using a stage-discharge relationship, as shown in Figure 6-4, all water level data can be converted to flow discharges. These data are essential for calculating water balances and estimating potential project-related hydrological impacts.

6.1.3 Water Quality

Water quality monitoring will be required for all streams and rivers potentially affected by mine development. A water quality monitoring program comprising fourteen sample locations was initiated in June 1990. In 1991, the number of sites were decreased to twelve locations. A description of sampling sites and sampling frequency are provided in Table 6-2 and in Figure 6-5. Parameters measured include both field and laboratory pH, total dissolved solids, conductivity, turbidity, acidity, alkalinity, temperature, the major cations and anions, and total heavy metals.

Generally, the watercourses can be described as neutral in pH, clear, relatively soft and essentially devoid of any particulate matter. All waters were found to be low in dissolved constituents such as sulfates and total heavy metals were present at very low levels or below analytical detection limits (Tables 6-3 to 6-4).

Table 6-1
Atmospheric Environment Service Regional Climatological Stations

Station Name	Station Number	Latitude	Longitude	Elevation	Years of Operation	No. of Years	Observations A	B	C	D
Bathurst Inlet	2200550	6650	10801	44	1956-1962	7	X	X	X	X
Contwoyto Lake	2200850	6529	11022	1481	1956-1982	27	X	O	X	X
Coppermine	2200900	6750	11507	30	1930-1977	48	X	X	X	X
Coppermine A	2200902	6749	11509	73	1977-present	15	X	X	X	X
Lupin A	22026HN	6546	11114	1620	1982-present	10	O	O	X	X
Lupin (Aut)	2202685	6546	11114	1639	1981-present	11	X	X		

A = Synoptic (6 hours)
B = Hourly (x = 24 hours)
C = Temperature (Daily)
D = Precipitation (Daily)

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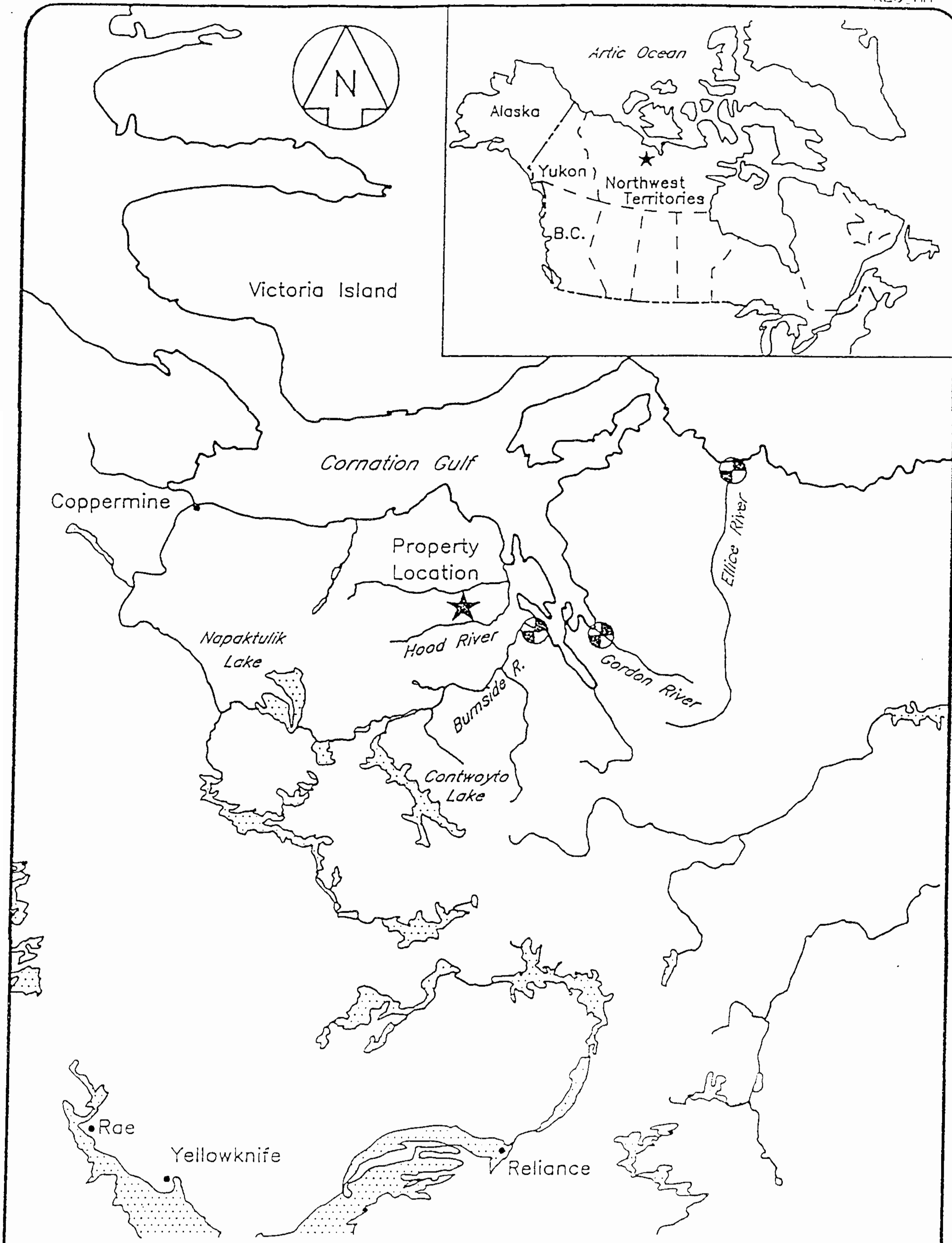

Figure 6-2
REGIONAL HYDROLOGICAL STATIONS

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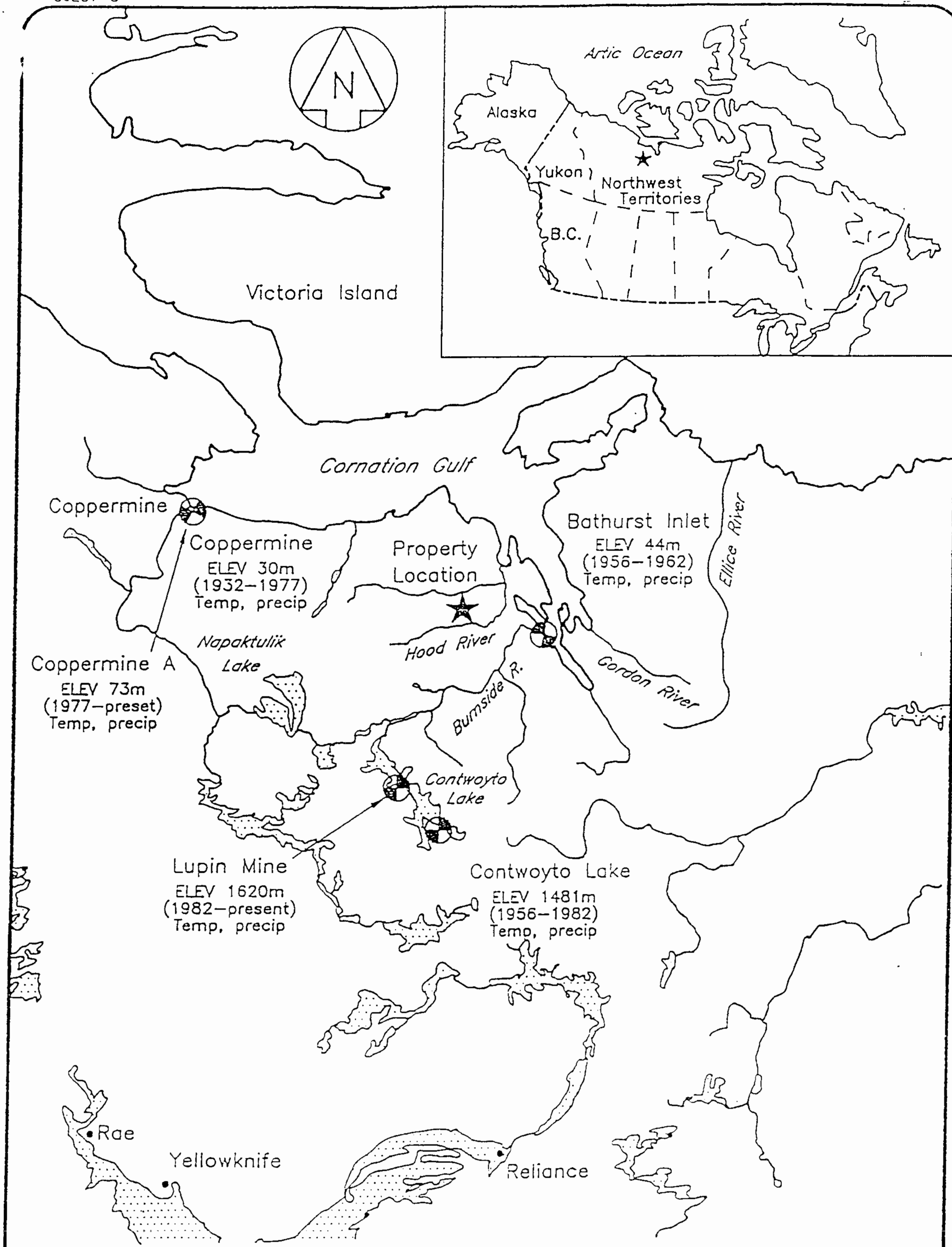

Figure 6-1
REGIONAL ATMOSPHERIC CLIMATOLOGICAL STATIONS

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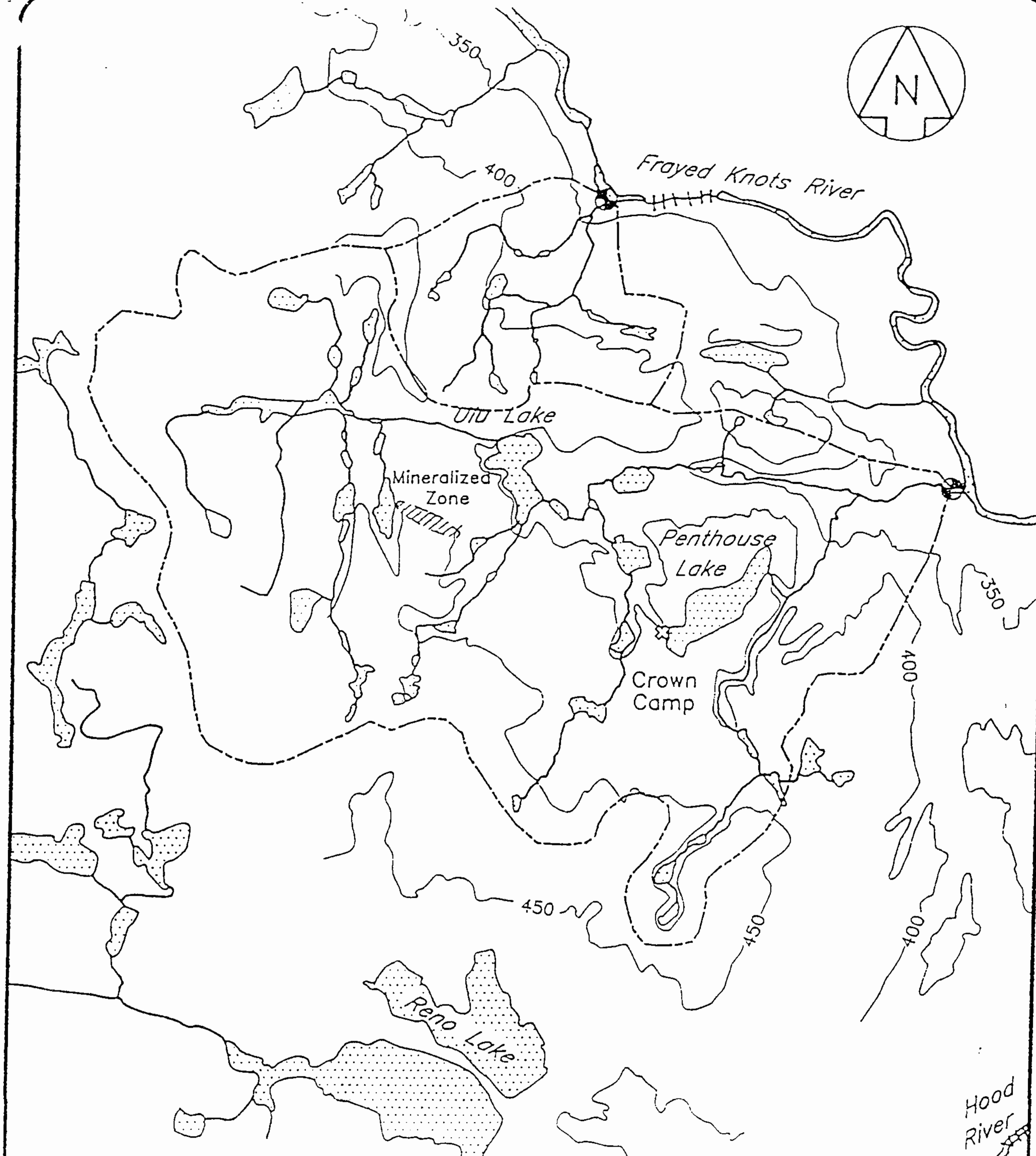


Water Storage Recorder

0 0.5 1.0 2.0 3.0 4.0 km

Scale 1 : 70 000

Figure 6-3
HYDROLOGICAL STATIONS
AND WATERSHED BOUNDARIES

Rescan

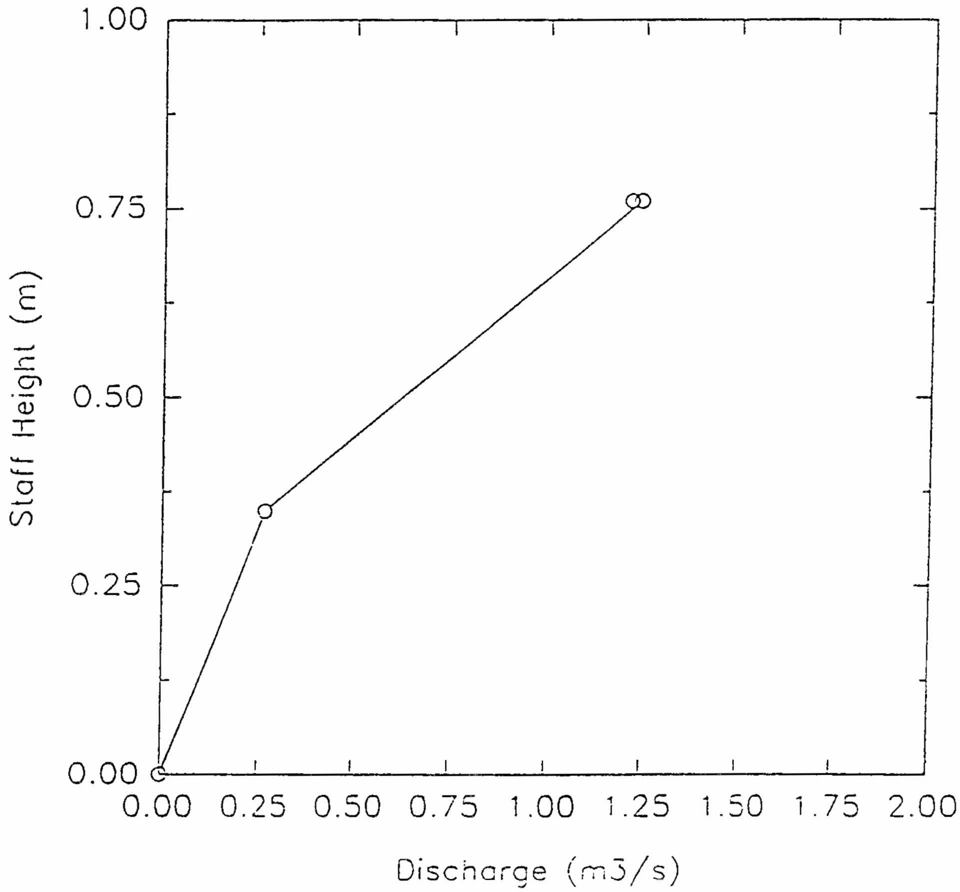


Figure 6-4: Staff Discharge Relationship
for Rio Fido Hydrological Station

Rescan

Table 6-2
Water Quality Site Locations
and Frequency of Sampling

Station #	Location	June 1990	August 1990	Sept. 1990	June 1991	August 1991
1	Frayed Knots Downstream of Rio Fido	√	√	√		√
2	Mouth of Rio Fido	√	√	√	√	√
3	Penthouse Lake Outlet	√	√	√	√	√
4	Mid Rio Fido	√	√	√	√	√
5	Camp Creek	√	√	√	√	√
6	Ulu Lake Outlet	√	√	√	√	√
7	Ulu Lake South Inlet	√			√	√
8	Ulu Lake North Inlet	√	√	√	√	
9	Mineralized Zone - Downstream	√	√	√	√	√
10	Upstream of #9 on Ulu Lake North Inlet	√	√	√		
11	Tributary to Frayed Knots	√	√	√		
12	North Tributary on Frayed Knots	√	√	√	√	√
13	Tributary to above Rio Fido	√	√	√	√	√
14	Penthouse Lake				√	√

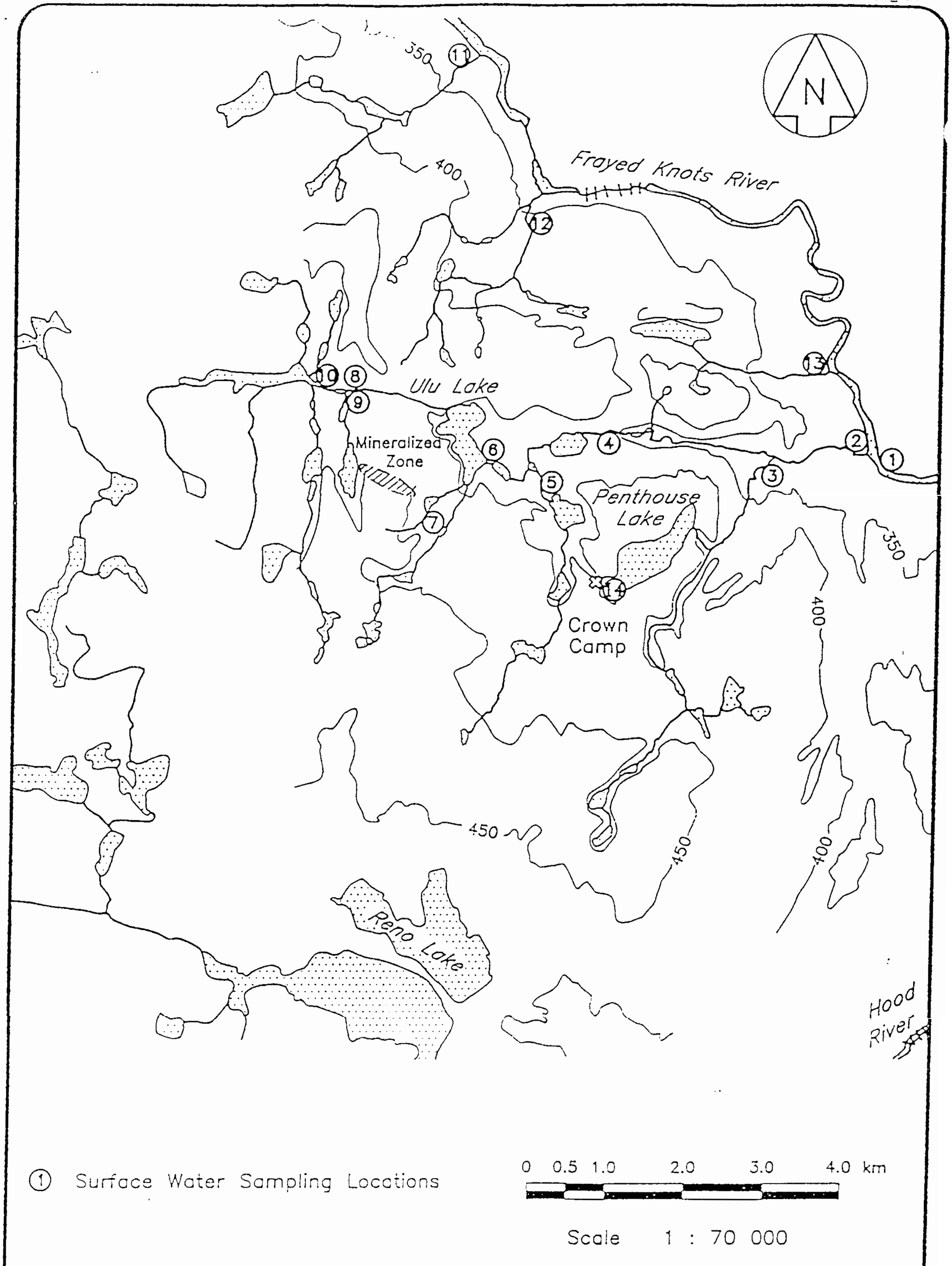


Figure 6–5
SURFACE WATER QUALITY STATIONS

Rescan

Table 6-4
Water Quality Results for Station #9

		Jun-90	Aug-90	Sep-90	Jun-91	Aug-91
PHYSICAL TESTS						
pH (field)		8.1			6.4	8.9
pH (Lab)		5.37	5.55	5.57	6.29	6.33
Conductivity	umho	10	15	45	95.3	208
Colour						
Turbidity	NTU	0.45	0.15	0.15	0.44	0.19
Suspended Solids	mg/L					
Dissolved Solids	mg/L		<10		25	166
Hardness CaCO3		8	12	16	36	52.4
Acidity CaCO3		5.37	4.7	8.2	2.9	4.1
ANIONS						
Alkalinity CaCO3		3	3	2.7	2.1	2.2
Sulphate	SO4	7.5	9.4	9.5	8.8	8.8
TOTAL METALS (mg/L)						
Aluminum	T Al	0.049	0.019	0.024	<0.2	<0.2
Antimony	T Sb				<0.2	<0.2
Arsenic	T As	<.0001	<0.0001		<0.0001	<0.0001
Barium	T Ba				0.012	0.024
Beryllium	T Be				<.005	<.005
Bismuth	T Bi				<0.1	<0.1
Boron	T B				<0.1	<0.1
Cadmium	T Cd	<0.0002	<0.0001	<0.0001	<.0002	<.0002
Calcium	T Ca				10.8	16.1
Chromium	T Cr				<0.015	<0.015
Cobalt	T Co				<0.015	<0.015
Copper	T Cu	0.004	0.002	0.0044	0.004	0.005
Iron	T Fe	0.03	0.012	0.014	<0.03	<0.03
Lead	T Pb	<0.002	<0.002	<0.002	<0.001	<0.001
Lithium	T Li				<0.015	<0.015
Magnesium	T Mg				2.13	2.89
Manganese	T Mn	0.03	0.014	0.023	0.017	<0.005
Molybdenum	T Mo	<0.002	<0.002	<0.002	<0.001	<0.001
Nickel	T Ni				<0.02	<0.02

Table 6-4
Water Quality Results for Station #9 (cont.)

		Jun-90	Aug-90	Sep-90	Jun-91	Aug-91
Phosphorus	T P				<0.3	<0.3
Potassium	T K				<2.0	<2.0
Selenium	T Se				<0.2	<0.2
Silicon	T Si				0.498	0.67
Silver	T Ag				<0.015	<0.015
Sodium	T Na				<2.0	16.6
Strontium	T Sr				0.107	0.164
Thallium	T Tl				<0.1	<0.1
Tin	T Sn				<0.3	<0.3
Titanium	T Ti				<0.01	<0.01
Tungsten	T W				<0.1	<0.1
Vanadium	T V				<0.03	<0.03
Zinc	T Zn	0.0064	0.0049	0.0047	0.01	0.011

Table 6-3
Water Quality Results for Station #2

		Jun-90	Aug-90	Sep-90	Jun-91	Aug-91
PHYSICAL TESTS						
pH (field)		8.6			6.7	7.9
pH (Lab)		5.38	5.27	5.38	6.82	6.71
Conductivity	umho		15	15	18.8	22.7
Turbidity	NTU	2.8	0.34	0.35	0.81	0.57
Suspended Solids	mg/L					
Dissolved Solids	mg/L	10	<10		10	18
Hardness CaCO3		6.9	6.3	6.9	5.52	9.07
Acidity CaCO3		11.03	9.86	17.9	2.9	3.1
ANIONS						
Alkalinity CaCO3		3	4.25	4	3	5.5
Sulphate	SO4	5	1.9	2.9	4	2.1
TOTAL METALS (mg/L)						
Aluminum	T Al	0.41	0.006	0.024	<0.2	<0.2
Antimony	T Sb				<0.2	<0.2
Arsenic	T As	0.0002	0.0001		<0.0001	<0.0001
Barium	T Ba				<0.01	<0.01
Beryllium	T Be				<.005	<.005
Bismuth	T Bi				<0.1	<0.1
Boron	T B				<0.1	<0.1
Cadmium	T Cd	<0.0002	<0.0001	<0.0001	<.0002	<.0002
Calcium	T Ca				1.24	1.34
Chromium	T Cr				<0.015	<0.015
Cobalt	T Co				<0.015	<0.015
Copper	T Cu	0.00025	0.0009	0.0011	0.001	<0.001
Iron	T Fe	0.28	0.065	0.046	<0.03	0.077
Lead	T Pb	<0.002	<0.002	<0.002	<0.001	0.007
Lithium	T Li				<0.015	<0.015
Magnesium	T Mg				0.575	0.671
Manganese	T Mn	0.012	0.0026	0.0023	<0.005	<0.005
Molybdenum	T Mo	<0.002	<0.002	<0.002	<0.001	<0.001
Nickel	T Ni				<0.02	<0.02
Phosphorus	T P				<0.3	<0.3
Potassium	T K				<2.0	<2.0

Table 6-3
Water Quality Results for Station #2 (cont.)

		Jun-90	Aug-90	Sep-90	Jun-91	Aug-91
Selenium	T Se				<0.2	<0.2
Silicon	T Si				0.382	0.314
Silver	T Ag				<0.015	<0.015
Sodium	T Na				<2.0	<2.0
Strontium	T Sr				0.006	<0.001
Thallium	T Tl				<0.1	<0.1
Tin	T Sn				<0.3	<0.3
Titanium	T Ti				<0.01	<0.01
Tungsten	T W				<0.1	<0.1
Vanadium	T V				<0.03	<0.03
Zinc	T Zn	0.013	0.0067	0.0092	<0.005	0.011

The monitoring program will continue during the advanced exploration phase in order to fully characterize surface water quality in the project area as a basis for future impact assessment.

6.1.4 Acid Generation Testwork

Initial acid generation potential studies have been completed for waste rock at Ulu. Acid/base accounting (ABA) is a static test and is usually the initial step in determining the potential for acid generation and net acidity. ABA attempts to determine the net neutralization potential (NNP) of a waste material by examining the balance between acid producing components, primarily pyrite, (FeS_2), and acid consuming components such as carbonates or minerals capable of neutralizing strong acids. A total of fifteen rock samples representing each lithology encountered on site were obtained from drill core and were subjected to ABA. Results from these tests indicate the rocks are not potentially acid producers; however, neither are they highly acid consuming (Table 6-5). Kinetic test work (i.e. humidity cells) may be warranted to confirm that the waste rock will not produce net acidity over time.

6.1.5 Fisheries and Aquatic Resources

Fisheries and benthic invertebrate sampling was completed on the project drainages (Figure 6-6) during the summer of 1991. Baseline data were obtained on fish species presence/absence, population estimates (per unit length of stream), fish tissue metal bioaccumulation and benthic invertebrate species composition. Characterization of fish habitat and habitat use also formed a component of the overall investigation. Limnological studies, most particularly bathymetric surveys, were completed for Penthouse and Ulu Lakes which are being considered as potential sites for underwater tailings deposition.

Population estimation and fish biophysical data collection (length, weight, age, sex, condition factor and stomach contents) in streams involved electrofishing enclosed sections of streams using the triple pass, removal-depletion method of Zippen (1969) and angling (catch per unit effort). Stop nets were used while electrofishing to prevent inward and outward migration from sampling areas. Two sites were electrofished on the Rio Fido and two sites were angled on the Frayed Knots River (one upstream and one

Table 6-5
Acid/Base Accounting Test Results

Sample No.	Rock Type	DDH Hole	Depth (m)	Vert. Depth	Length (m)	Description	Total S%	Acid Prod.	Acid Consum.	Net NP
ARD-1	Gabbro	89VD04	20.0-20.8	30	0.8	Adjacent to zone	0.24	7.35	21.53	14.18
ARD-2	Mafic Volc.	89VD05	60.6-61.6	30	1	low grade, 1%As, 0.5% Po	0.74	22.79	34.95	12.16
ARD-3	Diabase	89VD14	37.9-38.9	30	1	fresh, mod Mg	0.29	8.88	50.91	42.03
ARD-4	Banded Tuff	89VD22	171-172	120	1	below zone, tr. Po, calcite	0.04	13.29	23.02	9.73
ARD-5	Qtz. Fld. Phxx	90VD31	377.78-378.1	325	0.32	footwall, 1% Po	0.02	5.57	27.19	21.62
ARD-6	Basalt	89VD10	17.38-18.38	10	1	hanging wall, 1% qtz stringers	0.01	4.38	41.85	37.47
ARD-7	Basalt	89VD10	36.05-37.05	12	1	footwall, 1% qtz stringers, 0.5% Po	0.25	7.78	29.47	21.69
ARD-8	Greywacke	90VD44	409.54-410.54	360	1	footwall	0.17	5.27	20.04	14.77
ARD-9	Diabase	90VD43	319-320	240	1	hanging wall	0.02	7.35	52.32	44.97
ARD-10	Gabbro	90VD66	171-172.06		1.6	fresh	0.13	3.98	10.15	6.17
ARD-11	Basalt	90VD62	199-200	150	1	fresh, tr. qtz stringers	0.12	3.74	19.25	15.51
ARD-12	Flds Phxx	90VD62	253-254	180	1	fresh	0.01	0.36	38.45	38.09
ARD-13	Greywacke	90VD62	363-364	260	1	fresh	0.25	7.72	15.48	7.76
ARD-14	Basalt	90VD62	91.1-92.1	35	1	country rock, 7-8% qtz-carb strg	0.22	6.83	83.09	76.26
ARD-15	Basalt	90VD72	207.5-208.5		1	country rock, 4-5% qtz stringers	0.57	17.49	39.92	22.43

Phxx = porphry
Fld - feldspar

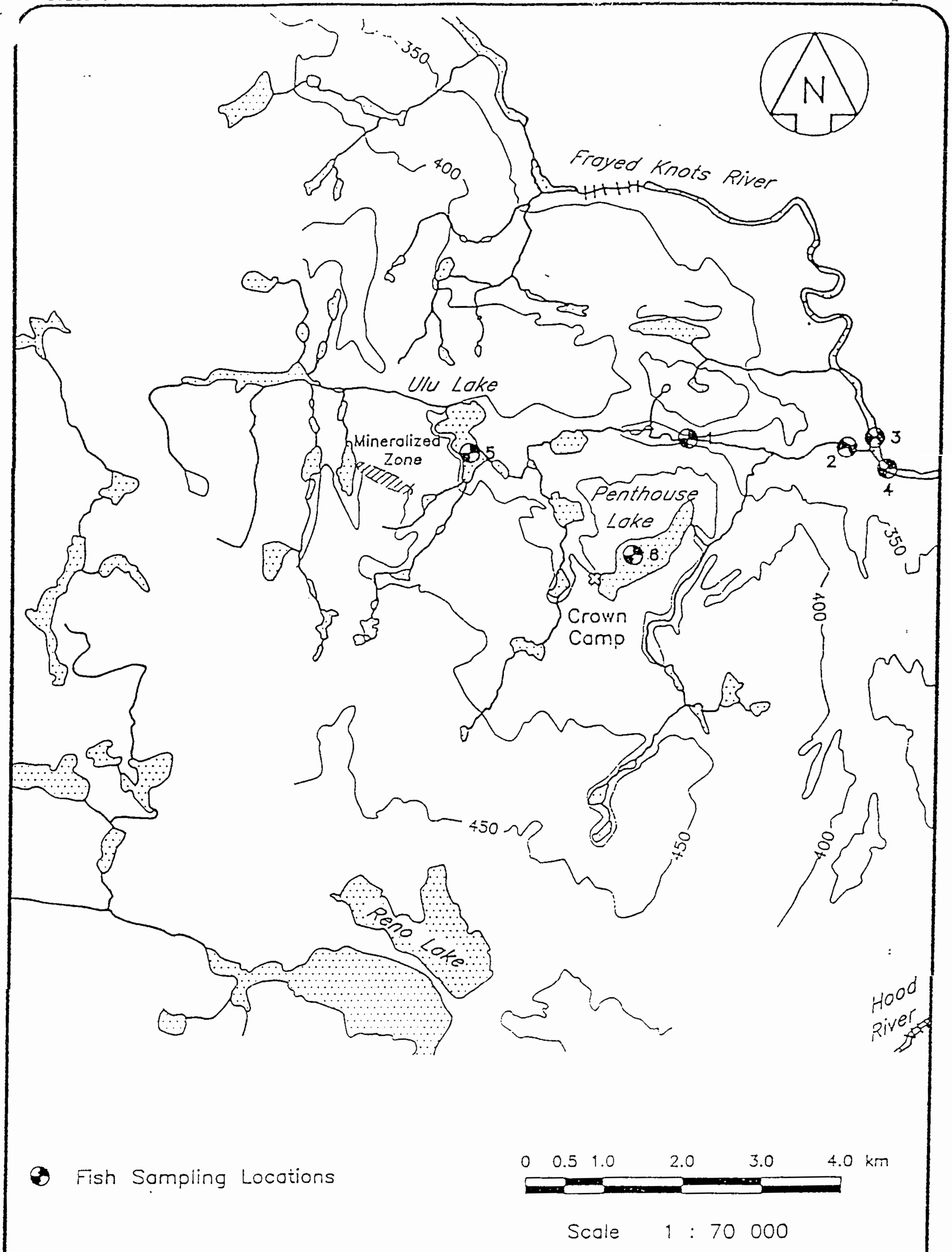


Figure 6-6
FISHERIES AND BENTHIC INVERTEBRATE SAMPLING LOCATIONS

Rescan

downstream of Rio Fido). Both Ulu and Penthouse Lakes were fished using floating and sinking gillnets. These lakes were also sampled for benthic invertebrates and sediments using a ponar grab sampler.

Sampling fish in lakes involved the setting of gillnets to obtain measures of catch per unit of effort, as indicators of relative abundance and to determine species presence and their spatial distribution throughout the water column. All fish captured were identified to species, enumerated, and measured for length, weight and age. Fish captured in gillnets were retained for biophysical measurement and analysis of tissues for metal bioaccumulations. Benthic invertebrates were identified to species and enumerated. Lake sediment samples were analyzed for Loss on Ignition (%), Total Sulphur (%) and Total Organic Carbon (%) along with metals (As, Ag, Au, Bi, Cd, Cu, Fe, Ag, Ni, Pb, Zn).

Ulu and Penthouse Lake bathymetry was measured by sounding transects throughout the lakes. Echo sounder transect charts were carefully analyzed and then digitized to produce bathymetric maps (Figures 6-7, 6-8).

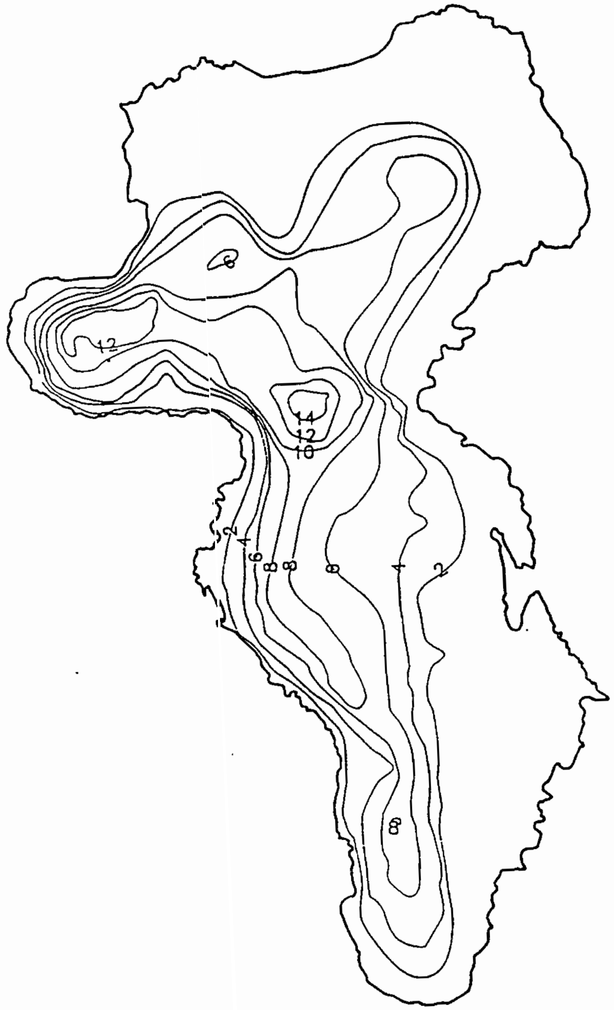
Results of Aquatic Sampling Program

The results of gillnetting in Ulu Lake yielded four (4) Lake Trout (*Salvelinus namaycush*) which ranged in age between 9-10 years and had fork lengths which ranged from 370 mm - 500 mm. Corresponding weights ranged between 570-1284 grams.

Penthouse lake gillnetting results yielded two (2) Lake Trout which ranged in age between 6-8 years. Lengths and weights correspondingly ranged from 275 mm, 212.5 g; and 380 mm, 647.5 g, respectively.

Electrofishing results from two sites surveyed on the Rio Fido yielded only one (1) coarse fish, a slimy sculpin (*Cottus cognatus*).

Fisheries habitat evaluation from two sites on the Rio Fido continues. Preliminary results of electrofishing indicate that the habitat is not utilized by species other than sculpins at the time of year that the stream was sampled. The stream is probably of little utility to other species for most of the year; however, during high water it may facilitate the movement of lake trout between the Frayed Knots River and Penthouse and Ulu Lakes.



DEPTH (m)	AREA (m^2)	PERIMETER (m)
0	291,323	3,679
2	160,115	2,455
4	124,534	2,381
6	82,958	2,246
6 (A)	345	80
8	37,737	1,425
8 (A)	85	36
10	19,142	808
12	3,100	212
12 (A)	3,012	274
14	970	118

VOLUME = 1,136,002.9 CU METRES

FIGURE 6–7 BATHYMETRIC MAP OF ULU LAKE

Rescan

Fig 6–7

RES_BF

DEPTH (m)	AREA (m^2)	PERIMETER (m)
0	471,026	4,217
2	436,323	3,832
4	393,192	3,669
6	360,544	3,610
8	302,537	2,948
8 (A)	255	62
8 (B)	146	47
10	267,269	2,893
12	231,786	2,807
12 (A)	447	83
14	181,378	2,212
14 (A)	252	62
16	113,352	1,719
18	91,037	1,611
20	64,486	1,116
20 (A)	6,792	325
22	54,889	1,050
22 (A)	3,450	234
24	41,531	994
24 (A)	1,141	161
26	33,184	928
26 (A)	6,824	363
28	8,522	561

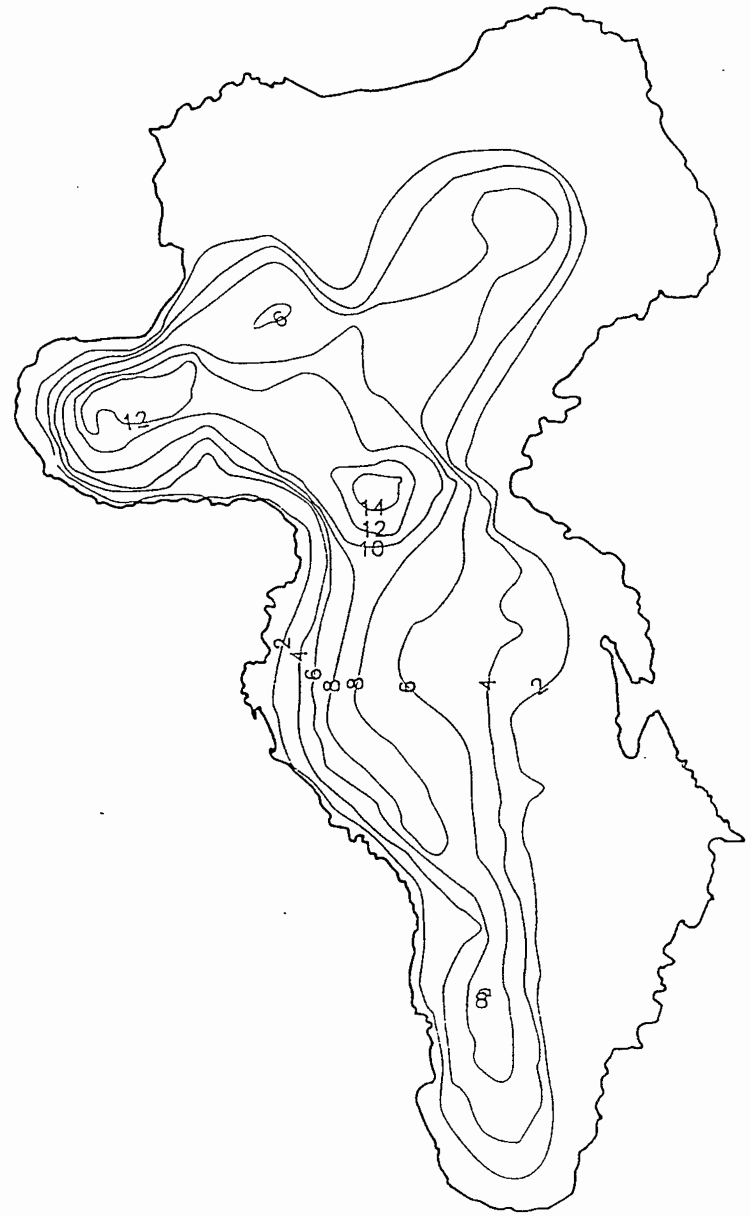
VOLUME = 5,713,578.1 CU METRES

FIGURE 6-8 BATHYMETRIC MAP OF PENTHOUSE (CROWN) LAKE

Rescan

Fig 6-8

C0157-1



DEPTH (m)	AREA (m^2)	PERIMETER (m)
0	291,323	3,679
2	160,115	2,455
4	124,534	2,381
6	82,958	2,246
6 (A)	345	80
8	37,737	1,425
8 (A)	85	36
10	19,142	808
12	3,100	212
12 (A)	3,012	274
14	970	118

VOLUME = 1,136,002.9 CU METRES

0 100 200 400 600 m

Scale 1 : 5 000

FI 'RE 6-7 BATHYMETRIC MAP OF U''J LAKE

Rescan

Fig 6-7

C0158-2

RES_BF

DEPTH (m)	AREA (m^2)	PERIMETER (m)
0	471,026	4,217
2	436,323	3,832
4	393,192	3,669
6	360,544	3,610
8	302,537	2,948
8 (A)	255	62
8 (B)	146	47
10	267,269	2,893
12	231,786	2,807
12 (A)	447	83
14	181,378	2,212
14 (A)	252	62
16	113,352	1,719
18	91,037	1,611
20	64,486	1,116
20 (A)	6,792	325
22	54,889	1,050
22 (A)	3,450	234
24	41,531	994
24 (A)	1,141	161
26	33,184	928
26 (A)	6,824	363
28	8,522	561

VOLUME = 5,713,578.1 CU METRES

0 100 200 400 600 m

Scale 1 : 5 000

FIGURE 6- BATHYMETRIC MAP OF PENTHOUS (CROWN) LAKE

Fig 6-8

Results of angling at locations upstream and downstream of the Rio Fido confluence with the Frayed Knots River, did not yield any catch. This, however, does not exclude the possible use of these waters by fish species such as lake trout or Arctic grayling (*Thymallus arcticus*). Future studies will permit a more detailed assessment of the use of the watercourse by fish.

Stomach content results indicate that cladocerans of the families Daphnidae, Holopedidae and Chydoridae are the most abundant in the stomachs of trout from both Ulu and Penthouse Lakes. Less abundant orders include Thichoptera, Diptera, Copepoda and the class Pelecypoda.

The results of analysis of benthic invertebrates from Penthouse and Ulu Lakes indicate that the predominant genera are Dipterans (true flies) of the family Chironomidae. Other genera include the order Pelecypoda (clams) and the class Oligochaeta (worms).

6.1.6 Soils and Vegetation

A program of examining soils and terrain features has been initiated for consideration of mine site reclaimation and location and engineering of mine site facilities. This includes a review of existing soils data plus data gathered in the field. Factors considered include soils distribution, slope gradients and stability, drainage features and particle size.

The flora of the development area, common to its tundra setting, is mainly comprised of dwarf shrub species, lichens and mosses. Vegetative abundance and diversity is necessary to assess food production potential for local wildlife species. A review of available literature on arctic vegetation, coupled with survey data, will contribute to this analysis during more detailed environmental impact assessment.

6.1.7 Wildlife and Habitat

As discussed above, vegetation at and surrounding the Ulu property is characteristic of arctic and montane tundra (see Appendix A). Dwarf shrub species (eg., willow - *Salix sp.*), mosses and lichens predominate and provide suitable habitat for caribou and smaller mammalian species.

A wildlife record was initiated at Ulu during the summer 1990. Thus far, species observed at or near Ulu include barren ground caribou (*Rangifer arcticus*), musk oxen

(*Ovibos moschatus*), wolves (*Canis lupus*), arctic fox (*Alopex lagopus*), arctic hare (*Lepus arcticus*), arctic ground squirrel (*Citellus parrui*), and ptarmigan (*Loggous lagopus*).

The barrenland caribou herd of interest to the Ulu Project is the Bathurst Herd, one of many in the Northwest Territory. This herd has not been studied as extensively as, for example, the Beverly and Kaminunak Herds, but it is known to pass nearby the Ulu property during its migration period and can number in the thousands.

It is environmentally important that the Ulu Project area is not situated on any major bird migratory route or nesting grounds. The Queen Maude Gulf Bird Sanctuary, to the northeast of Ulu, harbours the sensitive nesting grounds of numerous bird species.

The wildlife sighting log will be maintained over the forthcoming exploration phase. Regional trapping harvest statistics (wherever available) will be consulted to establish furbearer abundance in the area. Both animal observations and wildlife habitat evaluations will be mapped and presented at an appropriate scale to permit assessment of potential project-related impacts, and methods for their management, in the Ulu Project Description Report.

6.1.8 Land Use and Heritage Resources

Due to its extreme remoteness, competing land or resource uses are not encountered at Ulu. Mineral exploration is virtually the only economic activity in the area.

Potential native trapping activity will be analysed and fully discussed in the Ulu Project Description Report.

6.2 Conceptual Reclamation Plan

Whenever possible, the Ulu Project site will be reclaimed and left in a manner which ensures an acceptable productive land use consistent with pre-development levels. Disturbances created by the mine development and operations are expected to be localized and minimal. The main objectives of the conceptual reclamation plan are as follows:

- to protect surface and groundwater resources,
- erosion control, and

- to revegetate mine, camp and road disturbances wherever practical.

Since the area provides habitat for migratory caribou, the site will be revegetated, wherever possible, to a self-sustaining state using appropriate plant species. To achieve pre-development levels of productivity on the reclaimed site, it may be necessary to salvage surficial materials to provide a suitable growth medium to increase revegetation success. Borrowing suitable soil material from areas such as the airstrip and roads may be required to provide an adequate stockpile for final reclamation activities.

At mine closure, all machinery, equipment and buildings will be removed. All tanks will be removed and foundations buried and revegetated. Scrap materials will be disposed of in an acceptable manner.

Portal areas and waste rock dumps will be recontoured, dressed with available stockpiled topsoil and revegetated. The portal will be permanently sealed to prevent access.

If acid generation tests indicate the potential for acid rock drainage, special waste rock disposal and reclamation treatment will be completed.

Where possible, watercourses will be restored either to their original drainage or to a new drainage which will sustain itself without maintenance. Any culverts or obstructions will be removed and, when appropriate, watercourses will be designed to provide maximum use for wildlife. Slopes prone to erosion will be protected by rip-rapping or revegetation to provide erosion control and long term stability.

Roads which are not required after mining is complete will be reclaimed. This will involve surface scarification to reduce compaction and covering with a growth medium suitable to the prescribed land use for the area. Roads that are to be retained for permanent access, and the airstrip, shall be stabilized by revegetation of embankment slopes.

Tailings will be disposed of either on land (behind a man-made impoundment) or deposited in either Penthouse or Ulu Lakes. Should the tailings be determined to be potentially acid generating, it will be important that the surface of the tailings impoundment remain flooded to maintain an oxygen barrier over potentially acid generating sulphidic materials. This, of course, favors the deposition of tailings in one of either Penthouse or Ulu Lakes provided their limnology and aquatic ecology are suitable for this purpose.

Waste material which is directly or indirectly harmful to plant and animal life will be disposed of in a manner which prevents adverse effects. Vegetation shall be monitored for heavy metal uptake. Since revegetation will require surfacing with natural soil material and plants will not be grown directly on mine wastes, it is unlikely that elevated metal levels will occur.

6.3 Socioeconomics

As discussed above, owing to its remote location, the Ulu Project area is relatively devoid of economic activity save for mineral exploration and limited trapping activity. Historically, the area formed part of the Inuit's nomadic range. This virtually ended with the establishment of permanent communities by the Federal Government during the period 1920 to 1950. Three Inuit communities presently exist in the area: Coppermine (400 km northwest of Ulu), Bathurst Inlet (200 km east of Ulu) and Bay Chimo (250 km northeast of Ulu).

Since the introduction of a mining operation at Ulu will have non-trivial consequences for the regional population and economy, socioeconomic matters will be afforded considerable attention as project exploration and development proceeds.

Socioeconomic impact assessment involves identifying population and income effects on the region and any communities where mine employees or suppliers/contractors may settle. Company policies on workforce shift schedules, recruitment, workforce transportation and accommodation will be identified to help specify the potential impact areas. The overall impact on the region as a result of developing the Ulu Project is expected to be positive, largely because employment generated directly, through contractors, and through regional suppliers and services, will contribute significantly to the regional economy. Data on regional socioeconomic matters (e.g., housing, labour facilities, demographics, etc.) is available through government sources. Identification of jobs created, incomes, labour requirements and supply, indirect and induced employment and transportation, housing and infrastructure needs will be necessary components of the study. Increased revenues to regional and territorial treasuries arising from property, income and other taxes; along with levies and royalties payable by the company and employees, will be projected over the life of the project. Other economic spin-offs and benefits flowing to the region from employment and population increases will also be documented.

Also to be duly considered in the Ulu socioeconomic assessment are the potential negative impacts of project development, including social tensions, demographic considerations, racial interactions, etc. Overall, the objective of the development plan will be to maximize socioeconomic benefits to the region and to minimize any social disruption as best as possible.

6.3.1 Native Relations

BHP Minerals Ltd. recognizes the historical role and traditions of Native peoples in the Project area. Close consultation with the appropriate Native groups will be initiated, and maintained, as the project enters into advanced exploration and, if feasible, proceeds to development and operations.

Care will be taken to respond to Native concerns, particularly in the area of economic opportunities for interested Native peoples. The federal Department of Indian and Northern Affairs (DIAND) will be consulted for advice on appropriate Native groups to be contacted.

7 - Permit Requirements

7.0 PERMIT REQUIREMENTS

It is understood that a number of approvals will be necessary to allow the Ulu Project to proceed from advanced exploration to mineral production. Most important among these are the Land Use Permit and Water License as discussed individually below.

Quarry Permit(s) must be acquired for the excavation of concrete aggregate and common backfill and ballast material for the construction of roads, airstrip, campsite, tailings impoundment, mine and mill site. Mineral Land Claims will be converted to Mineral Leases and Land Tenure Agreements once the mine enters into production. Other approvals will be applied for as required by the legislation governing resource development in the Northwest Territories.

7.1 Land Use Permit

A Land Use Permit authorizes a company to carry out certain functions on a given site during a stated period of time and subject to certain conditions designed to ensure protection of the environment. For the Ulu Project, the Land Use Permit must encompass the tailings disposal area, camp and surface facilities, airstrip, site roads and the winter road to Echo Bay Mines Ltd. Lupin Mine.

A formal Land Use Permit application will be filed with the Land Use Engineer (DIAND) for official committee review at the appropriate time in the overall project review process.

7.2 Water License

Similar to land use requirements, a Water License must be acquired prior to the initiation of project development. Under authority of the *Northern Inland Waters Act and Regulations,* licenses are issued by the Northwest Territories Water Board upon approval by DIAND. An Interim Water License may be requested from the Controller of Water Rights (DIAND) depending upon overall development scheduling.

It is understood that a public hearing may be required, in conjunction with a technical review of the water license application by the Technical Advisory Committee of the

Water Board, and that this public hearing would be held in the nearest community to the project site. It is further understood that acquiring a water license customarily requires a much longer period of time (i.e. six to nine months) than obtaining a Land Use Permit and this will be scheduled for accordingly in the overall project development planning schedule.

References

REFERENCES

Zippin, C. The Removal Method of Population estimation. J. Wildl. Manage. 22(1):82-90; 1958.

Appendix A: Photographic Record

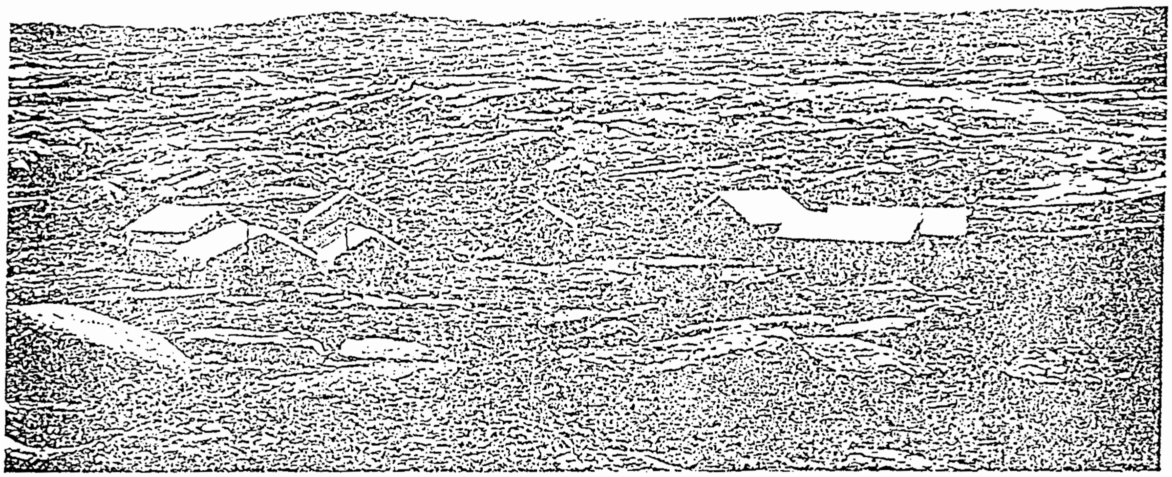


Plate 1. Ulu Drill Camp. Rock and glacial features dominate the landscape.

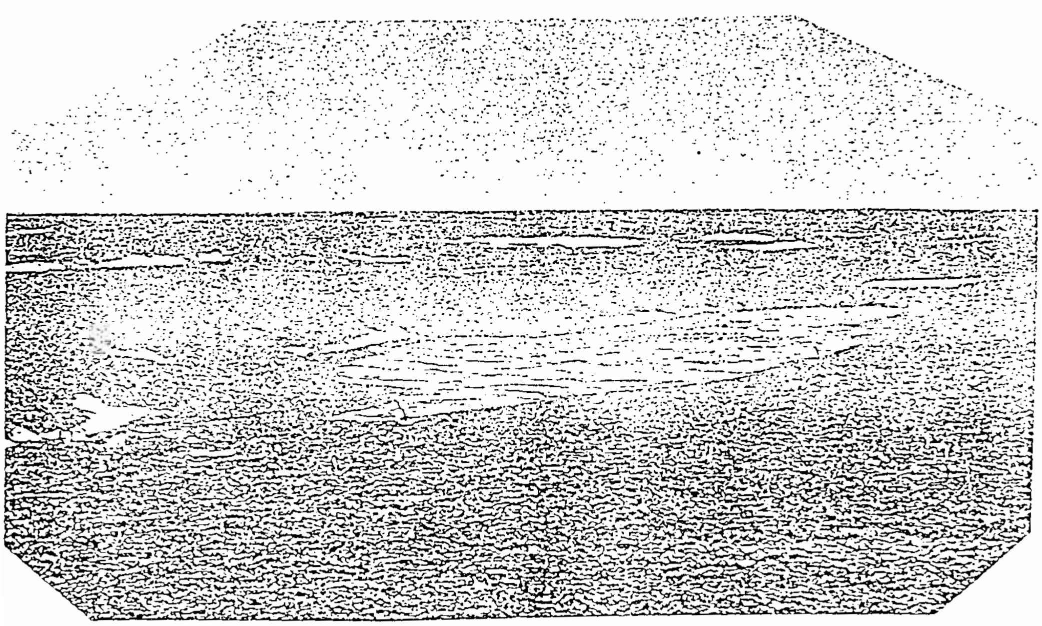


Plate 2. Ulu area of interest. Mineralized zone being drill tested

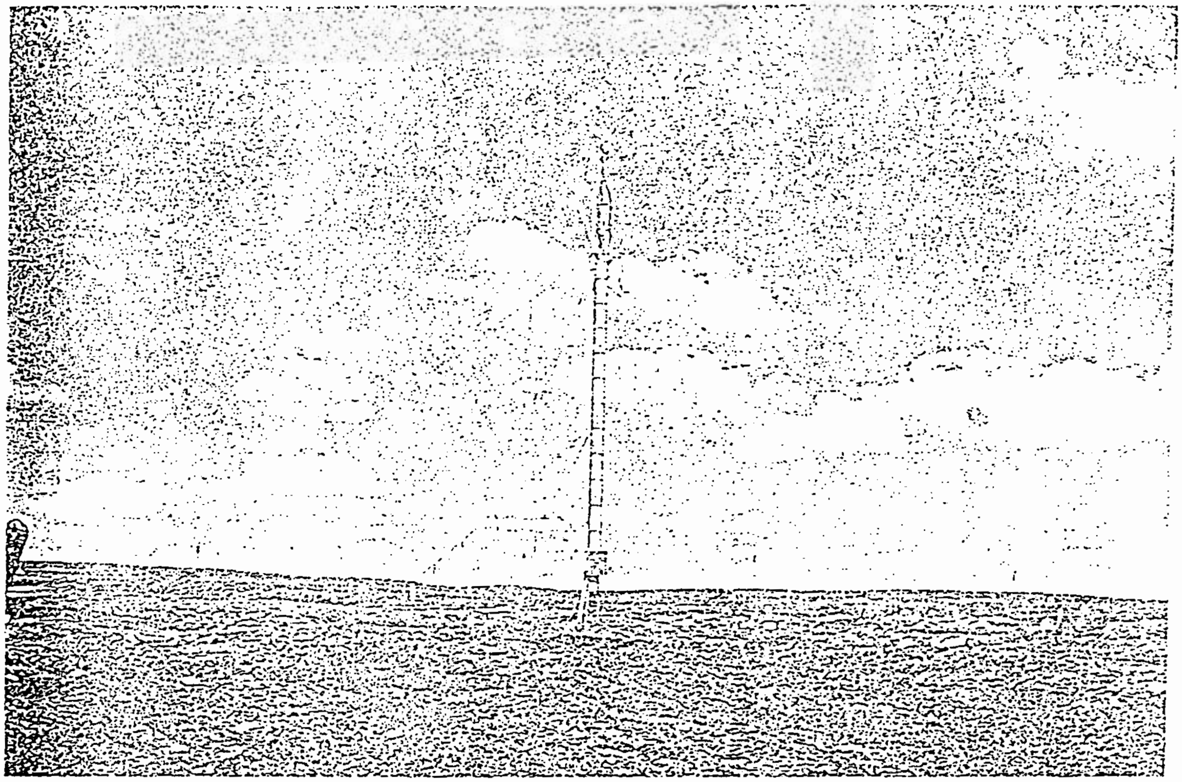


Plate 3. Automated weather station at Ulu. Temperature, humidity, rainfall, wind speed and direction being monitored and averaged hourly.

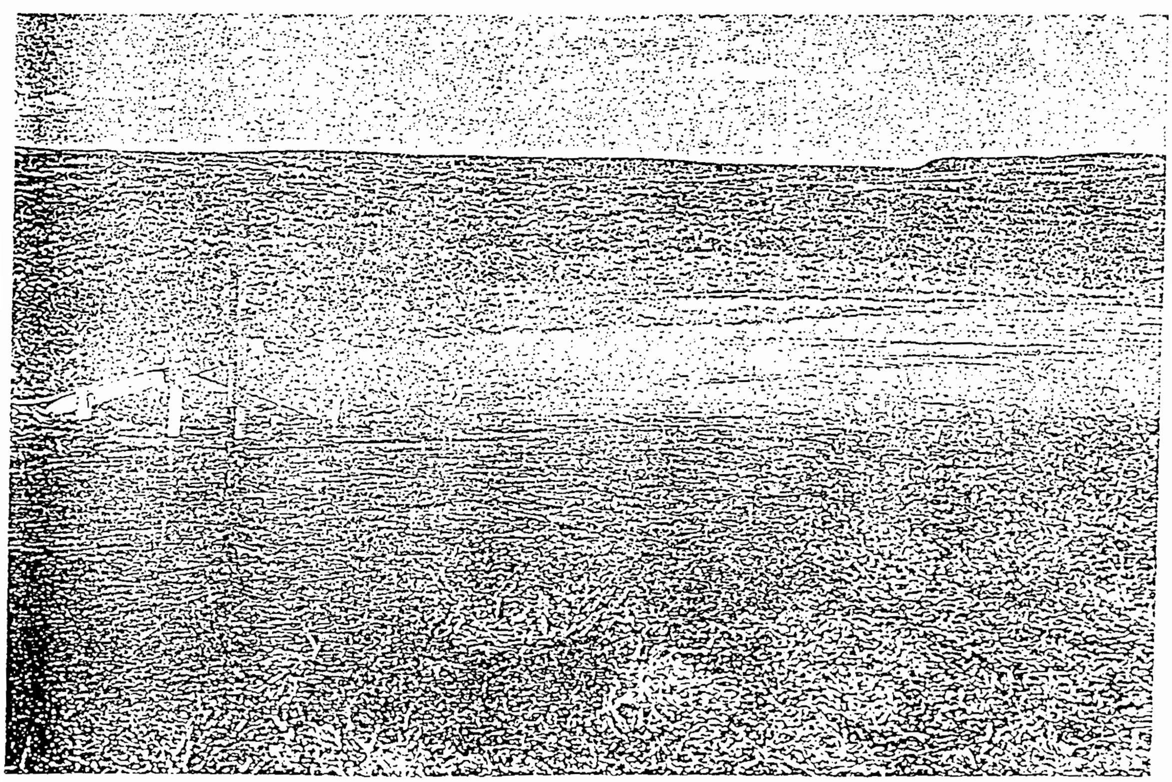


Plate 4. Automated water stage recorder, staff and crest gauges at Rio Fido station (installed in June, 1991).

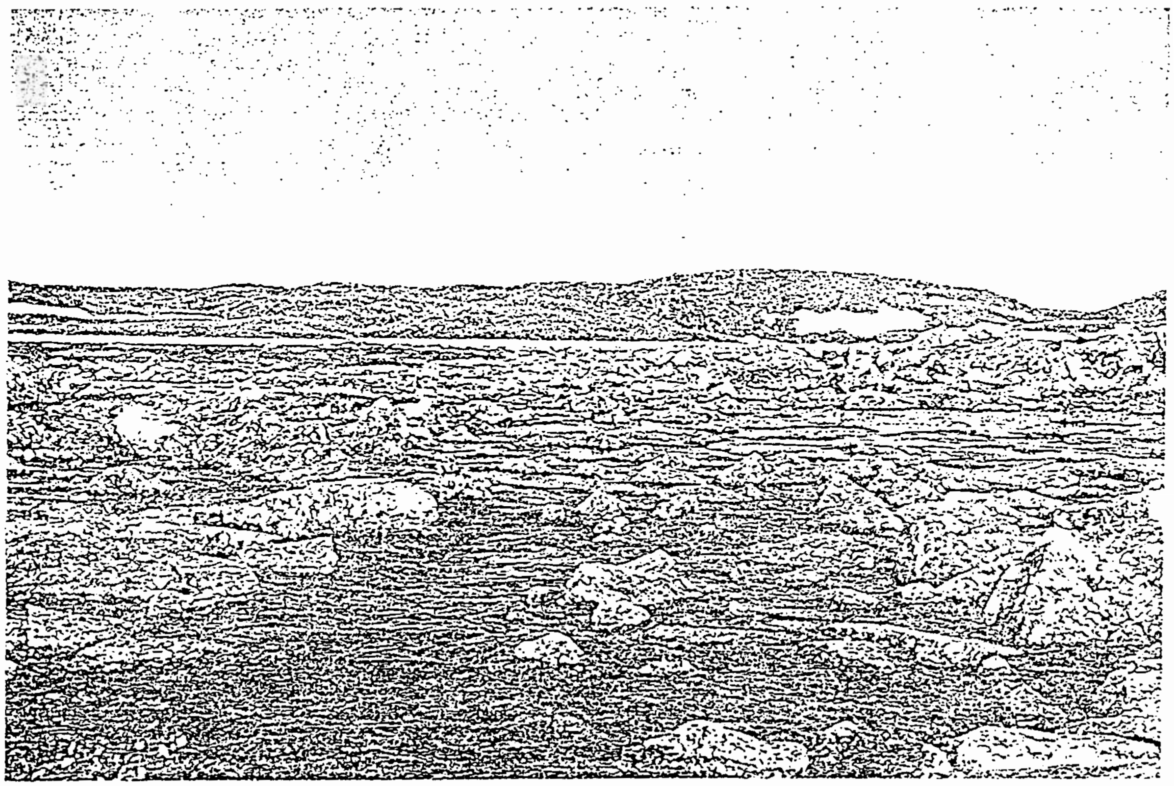


Plate 5. Water quality station #6 at outlet from Ulu Lake.

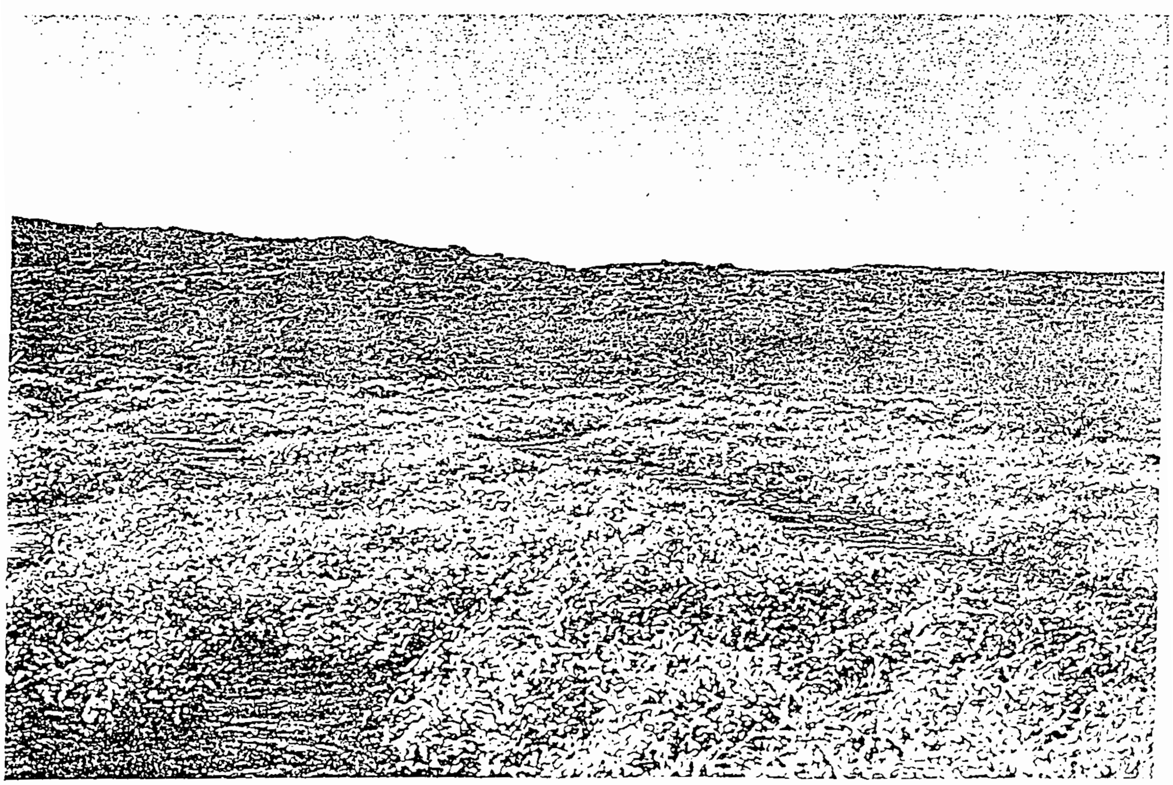


Plate 6. Water Quality Station #3 at outlet from Penthouse Lake.
(note abrupt vegetation and terrain changes).

Plate 7. View looking down on Ulu Lake towards Rio Fido
(note barren, rocky, glacial features).

Plate 8. Scrub willow and birch vegetation, typical of the Ulu Project area.