I.S.N. 134678

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		MINING DISTRICT:	WHITEHORSE
105 K 6		TYPE OF WORK:	ENVIRONMENTAL/HYDRO STUDY

REPORT FILED UNDER: Kerr/AEX Addison Joint Venture

DATE PERFORMED: DATE FILED: February 1975

LOCATION: LAT.: 62°16'N AREA: Faro

LONG.: 133°13'W VALUE $:

CLAIM NAME & NO.: GRUM Deposit

WORK DONE BY: J. Barter (Montreal Engineering Company Ltd)

WORK DONE FOR: Kerr/AEX Joint Venture

DATE TO GOOD STANDING		REMARKS: #30 GRUM

105 K 6 : GRUM #30

KERR/AEX JOINT VENTURE

GRUM DEPOSIT
PROGRAM OUTLINING THE ENVIRONMENTAL, HYDROLOGIC AND POWER SUPPLY STUDIES FOR 1975

FEBRUARY, 1975

Montreal Engineering Company, Limited,

593 King Street,

Fredericton, N.B.

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montreal engineering company, limited

593 KING STREET, FREDERICTON,
NEW BRUNSWICK

Tel: (506) 454-3309

28 February 1975

Mr. M.D. Rowswell
Executive Vice President
Kerr Addison Mines Limited
P.O. Box 91 - Commerce Court West
Toronto, Ontario

Dear Mr. Rowswell:

We are pleased to submit this report which describes the environmental, water supply and power studies we propose at the Grum deposit in 1975.

This program is designed to provide you with the inputs you require for the project feasibility study and to accumulate the bio-physical data necessary to minimize the environmental impact of the project. The estimated cost of the work proposed to meet these objectives is $103,500. In addition to this figure, an amount of approximately $30,000 may be required to provide engineering and other services associated specifically with the provision of environmental controls for the 1975 underground exploration program. The latter figure will only be required in total if the more complex treatment system, as described in our previous report to you is necessary.

We hope this proposed program meets your requirements and look forward to discussing it with you at your convenience.

Yours very truly,

Alan V. Bell, P. Eng.
Assistant Manager
Resources & Environmental Division

AVB/bs

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PART ONE

INTRODUCTION

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1.1 INTRODUCTION

The Kerr Addison/AEX Joint Venture is currently studying the prospects of developing a mine based on the lead-zinc ores of the Grum Deposit in the Vangorda Creek watershed of the Anvil Range near Faro, Yukon Territory. The site is situated approximately 8 miles southeast of the existing Anvil mine.

Indications of the ore body and mineralization have been established by the diamond drilling accomplished at the site to date. Exploration will continue in 1975 with approximately 40,000 ft. of additional diamond drilling from the surface and driving a 2,639 ft. decline with associated lateral drifts, cross-cuts and raises into the ore body. With the information provided by this work, a feasibility study of mine development will be carried out by the Joint Venture beginning in November 1975.

The preliminary data and program of investigations presented in this report are intended to serve several purposes:

1. To provide the required engineering, biological and cost imputs to the feasibility study by the Joint Venture partners,

2. To provide the biophysical information necessary to meet the requirements of the regulatory agencies,

3. To document pre-development environmental baseline conditions, and

4. To enable the impact of the prospective development on the environment to be minimized and to document the probable residual impact.

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Both engineering and biophysical investigations are required to develop the necessary data base. The engineering studies will address the problems of providing adequate water supply for mine operation, management of mine wastes and the preferred source of electric power. In general, these will identify needs and alternative solutions, and develop designs and costs to the feasibility level. The remaining studies will consider the biological and associated components of the environment such as geomorphology and soils, vegetation, wildlife, aquatic life and water quality,and archaeology. In addition, the socio-economic aspects of mine development will be reviewed.

Review of pertinent literature has already provided some basic information about the site, and this review will continue throughout the study period. Baseline field surveys will be initiated in April 1975 to develop a frame of reference which can be used to measure and monitor any environmental changes which may occur as a result of mine operation. The data collected and analyzed will be prepared as an engineering report and an environmental assessment for integration with the Kerr-Addison/AEX Joint Venture's own feasibility investigations. The approximate schedule of field and office activities described in this Report is shown on Figure 1-1.

At an early stage of the 1975 Program, a physical model of the development area will be constructed. The model will be portable and will cover an area bounded by the Anvil Mine, the Pelly River, most of the Blind Creek drainage shed and Mount Mye. This model will be of considerable benefit in planning site development and also in presenting proposed strategies to the public and to Government officials.

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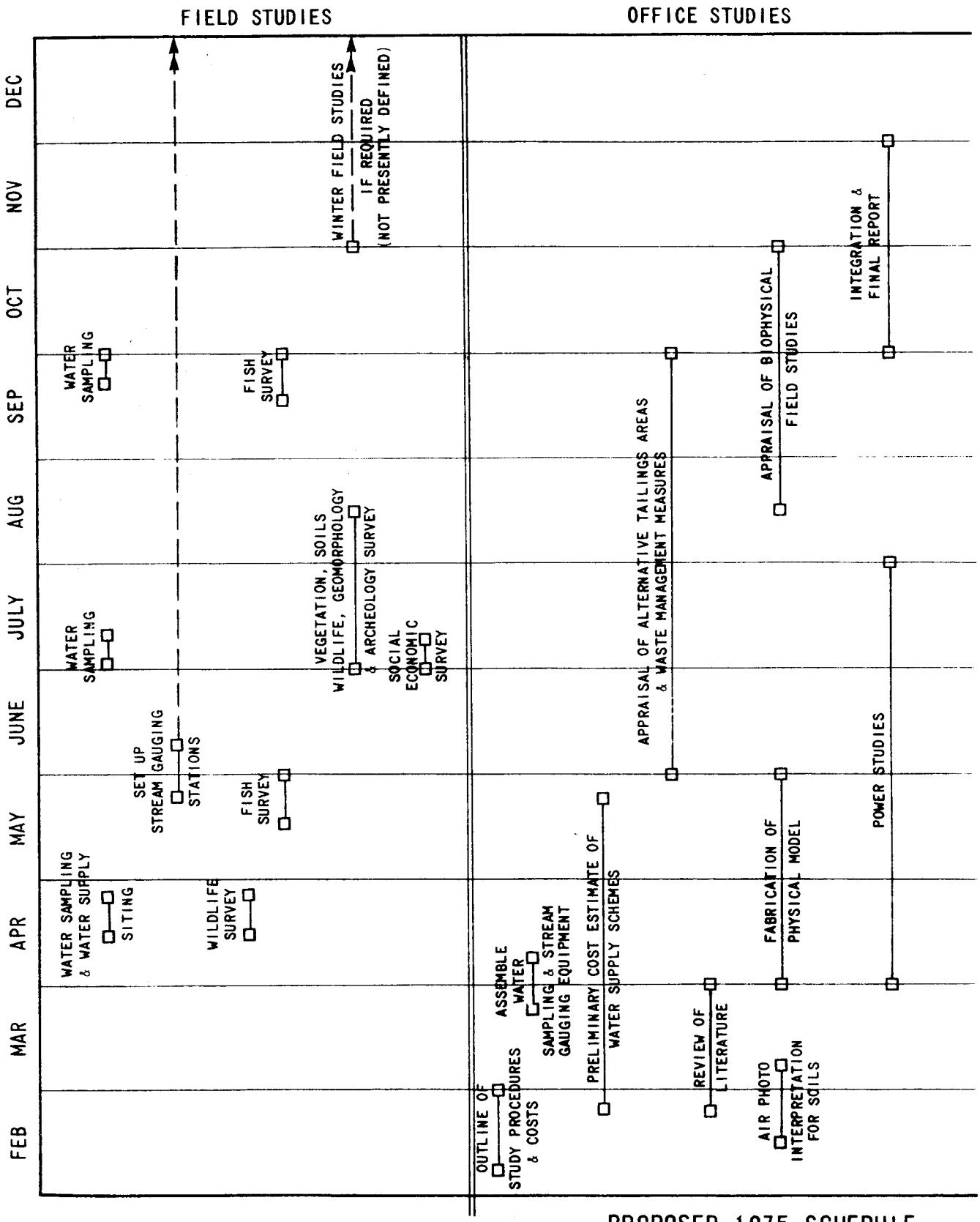

PROPOSED 1975 SCHEDULE

FIGURE 1-1

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PART TWO

BIOPHYSICAL STUDIES

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PART TWO - BIOPHYSICAL STUDIES

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2.1 GENERAL

The biophysical studies for the proposed Kerr Addison/AEX development will begin with a review of the literature on this region. This will give a general description of the major environmental factors and concerns in the area and also serve as preparation for the field studies.

The majority of the field studies will be carried out between the beginning of June and the end of August. A preliminary field trip will be taken at the end of April to make an initial assessment of the area and to collect baseline water samples. The possible need for winter field studies has not been overlooked. However, in view of the more difficult logistics involved, specific requirements (if any) will be defined as a result of the 1975 summer program for implementation in the 1975/76 winter season.

The main field program will consist of baseline and impact studies covering the major components of land, water, vegetation and wildlife. Baseline surveys will be undertaken to develop a frame of reference which future studies can use to measure and monitor any environmental changes which may occur as a result of the development. Impact studies will rate the various components as to their sensitivity to disturbance and the likely effects of any disturbance. These surveys will include:-

a) A description of the present state of the ecological components,

b) A statement of the impacts and disturbances of which they are presently exposed, or have been exposed in the past,

c) The likely effect of the development both during the construction and operation phase.

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The more detailed studies will be undertaken in those areas likely to receive the greatest impact from the development, such as the mine site, location of proposed tailings ponds, and the river valleys in the vicinity of proposed dam sites. In addition, a general environmental survey will be conducted covering a larger area. The basic working unit for these studies will be the Land Type, which is defined as an area of land on a particular parent material, having a fairly homogeneous combination of soil and a chronosequence of vegetation. They form the basic units on which field investigations will be undertaken and for which specific use capability ratings and impact statements will be made. These units have been delineated photogrametrically and outlined as shown on Figure 2-1.

Baseline studies have been designed to give a pre-impact description of the state of each of the components of the environment. This information will permit the future monitoring of any changes occuring in any of these components as a result of the development.

Impact studies will rate the Land Types as to their sensitivity to impacts of differing severity. Sites which appear to be least sensitive and most suitable for the various developments will be located. Methods of construction or operation (such as waste disposal) which would minimize any environmental deterioration will be suggested.

2.2 GEOMORPHOLOGY AND SURFICIAL MATERIAL

To a large extent, the geomorphology and surficial material give the land its major characteristics. The surficial deposits give the landscape its basic form, provide the parent material in which soil forms, to a

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large part determine the type and composition of the covering vegetation and are an important component in the overall sensitivity of an area. A study of the aerial photography shows that the entire study area was strongly glaciated and has a surface mantle of glacial drift. The drift is quite shallow, estimated at from 15 to 30 feet thick, and bedrock control is quite evident. The surface is marked by deep gouges indicating high pressure glaciation. This suggests that the material is likely to be quite compact. The texture is medium to heavy clays and loam. Small organic areas in the till occur in depressions and around lakes.

The alluvial deposits of the river valleys are quite coarse as the rivers are young and fast flowing. Extensive remnants of glacial terraces occur along most streams, many of these appear unstable. Organic soils are extensive in the alluvial flats, especially in the Pelly River valley.

A preliminary map of the landforms and surficial deposits at a scale of 1:50,000 has been prepared from aerial photos. (Figure 2-1). This map will serve as the base-map which forms the framework on which the field investigations of the other biophysical components will be based. It will also be useful in locating materials which may be used in various construction projects. For example, the location of gravel deposits for roads or clay for dam building, can be found more quickly with the aid of this map. Field checks will confirm the mapping and additional detail.

2.3 SOILS

The soil is the upper and physically and biochemically weathered portion of the earth's surface. A knowledge of the soils in the Vangorda

Creek area is important for the following reasons:-

- The type of soil largely determines the fertility of the site and this affects the suitability for wildlife and the potential for revegetation after a disturbance.

- The soil permeability will affect the amount of runoff and infiltration and consequently erosion potential. The soil permeability will be one of the considerations in locating the tailings pond. If the ideal of a zero effluent mine is to be achieved, this structure should be located where impermeable soils predominate, thereby minimizing seepage problems.

- The texture and erodibility of the soil to a large part determine the severity of the effects produced as a result of disturbance.

- If permafrost is present, any disturbance involving the removal of the vegetation cover is likely to have a considerable effect on the subsequent surface stability.

The soils in the area of concern are predominantly of glacial drift origin, with the largest part of the area covered with till and colluvial materials. In the river valleys, the materials tend to be of a coarse texture. Soil development is generally relatively weak due to the youthfullness of the material and the dry climate. The rooting of trees is affected in some areas by layers of volcanic ash, and in other places by permafrost at shallow depths. In depressional areas where ground water accumulated, extensive peat deposits have developed.

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A description of the soils will be made and a soils map prepared as part of an overall biophysical map. Soil test pits will be made in the various geomorphological units. Soil samples will be collected from profiles of the dominant soil types in the area. The System of Soil Classification for Canada (CDA, 1970 and modifications in 1973) will be used to classify the soils and collect the basic information according to the national standards.

The likely effects of disturbance in the different soil types will be examined by investigating past distrubances of varying severity. Sample sites will be located in disturbed areas such as seismic lines and oil drill sites, and comparisons made between the disturbed sites and the adjacent undisturbed area.

The final report will rate the various soil types as to their sensitivity to disturbance and the likely effects of disturbances. Methods will be suggested by which any adverse effects which could result from any of the various phases of the construction or mining can be minimized.

2.4 VEGETATION

241 VEGETATION SURVEY

The vegetation forms a protective mantle over the ground surface, and is the primary component of the wildlife habitat. This survey will describe the vegetation types in the areas affected by the development, and the likely effects of disturbances of the vegetation. The concern is not so much with the direct effects on the vegetation but with the resulting effects which may occur such as increased runoff causing erosion, raised watertables causing drainage problems or surface instability leading to possible landslides.

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The vegetation of the Vangorda Creek area forms part of the Eastern Yukon Section of the Boreal Forest Region. The species composition is very much dependent on the landform and the topographic positions. The alluvial flood plains of the Pelly River support stands of white spruce and balsam poplar. On the terraces, the latter gives way to white birch. On the lower slopes of Mount Mye, the forest is dominated by white spruce, lodgepole pine, trembling aspen, and birches. Small bogs in poorly drained sites and pockets of permafrost support black spruce, tamarack and Alaskan birch. Timberline on the slopes of Mount Mye is at an altitude of about 5,500 feet. At timberline, alpine fir is the dominant species while below this are large forests of a white spruce - birch - black spruce type.

Much of the forest in the Vangorda Creek area was destroyed by a fire in 1968. At present, only small stands remain mainly on some of the steeper slopes and other protected spots. Extensive forests, however, still occur near the timberline and on the river alluvium.

The field study will describe the present nature and state of the vegetation cover in the areas affected by the development. A map of the vegetation types will be produced. The impact which past disturbances have had on the vegetation and the rate of recovery and re-introduction of vegetation will be described. These studies will enable us to predict the likely effect of various disturbances such as removal of the tree cover, removal of the vegetation cover to mineral soil, or fire, in each vegetation type. They will allow us to identify any land types which may be especially sensitive to disturbance. Using this information, methods of ameliorating any adverse impact caused by a disturbance can be suggested. Guidelines can be

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developed for procedures which will minimize the adverse influences of development in each area.

242 DISTURBED SITE REVEGETATION STUDY

During the phasing-in of a mining operation, several disturbed sites will be created, which once the operation is underway, will no longer be used. Such sites include temporary construction campsites, gravel pits opened during road construction, the outer slopes of retaining dams, waste rock, berms and other structures. It would be desirable to have a vegetation cover on these areas as quickly as possible after use.

On severely disturbed areas, it is likely that field trials using various cover species and physical inputs will be required. Studies of the vegetation on both disturbed and non-disturbed sites will produce the data base required to initiate such a program. Studies of severely disturbed sites will be undertaken to determine which species tend to invade naturally and the length of time required to produce an adequate vegetation cover. In addition, a review of the literature will give suggestions as to which species may be successfully used to rehabilitate sites of this type.

2.5 WILDLIFE

Wildlife represents an important resource, especially in regions of the central Yukon where a significant segment of the population derives at least part of their income from this resource.

The development of the mine will have a considerable effect on the wildlife, even outside the immediate area of the development. The effect

will come, both as a result of the increased activity in the Vangorda Creek area and from an increase in hunting pressure by the expanded local population. This study will be undertaken to:-

a) determine the impact the mining operation will have on the wildlife, and

b) suggest methods and procedures which can be adopted to minimize this impact.

Species in the Mount Mye-Vangorda Creek area include white and fannin sheep, mountain caribou, moose, grizzly and black bear, mule deer and all fur-bearers. The Pelly River Valley forms a migration route for sandhill cranes and other waterfowl. Cyrfalcons and peregrine falcons, both quite rare species, are found along the Pelly River.

The project lies within the Ross River Group Trapping Area No. 1, and is used to some extent by the Ross River Band. In addition, the people of Faro hunt this area intensively. No specific wildlife studies have been carried out to date in the Vangorda Creek watershed. The Yukon Game Branch plans to do a survey for moose and caribou in late February and a sheep survey in the summer.

The wildlife and habitat within the zone of influence of the development will be surveyed. Each land type will be rated as to its suitability for wildlife habitat and as to the actual degree of utilization. Emphasis will be placed on deterimining if any of the affected land types are used by the game as overwintering areas, as these may be critical to the survival of some populations. Wildlife suitability class ratings in areas peripheral to the

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areas of direct impact will be used to determine the abundance of suitable alternate habitat to replace any habitat which may be destroyed by the development.

An initial survey of the wildlife populations will be made during a preliminary field trip in late April. Aerial transects combined with limited ground observations will be used to determine the presence and abundance of any game species in the area at that time.

During the summer field season, the wildlife studies will be undertaken as part of the overall biophysical survey. Observations on wildlife presence will be made at each site using indications such as signs of browsing, droppings and denning or nesting sites.

The presence of any unique, rare or endangered species or any habitat which is critical to a part of the life cycle of any species and the presence of mineral licks,or other areas of congregation,will be noted. At least one additional aerial reconnaissance will be undertaken at this time. The field surveys will be supplemented by information on wildlife abundance, locations, and conditions, gathered from local residents, game officers and a review of the pertinent literature.

The likely effect of the development on wildlife and wildlife habitat, including summer or winter grazing areas and denning or nesting sites will be determined. Proposals will be made on methods of operation and procedures which will result in the least wildlife and habitat disturbance.

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2.6 WATER QUALITY

A knowledge of water quality before and after development is probably one of the most important factors in any major development such as that proposed by Kerr-Addison/AEX.

Two water quality monitoring programs are proposed for 1975; one to monitor the discharge of wastes from the 1975 underground exploration program, and the other to give a baseline record of background water quality in the area affected by the mine development.

Background water samples will be taken three times a year at the thirteen stations shown on Figure 2-2. At each location, the stream will be tested for pH, dissolved oxygen and temperature. Samples will be taken at each location and analyzed, probably in Edmonton, for the following parameters:-

Total suspended solids	Copper	Nickel
Turbidity	Iron	Zinc
Total hardness	Lead	Cadmium
Conductance	Manganese	Arsenic
Total alkalinity	Mercury	

As an aid to interpretation of the background water quality, sediment samples will be taken where ponding or pooling is evident. Sediment sample analyses show any build-up over time of heavy metal concentrations which may or may not show up in the water sample analyses. The sediment samples will be analyzed for the heavy metals outlined above.

To monitor the discharge of treated wastes from the 1975 underground

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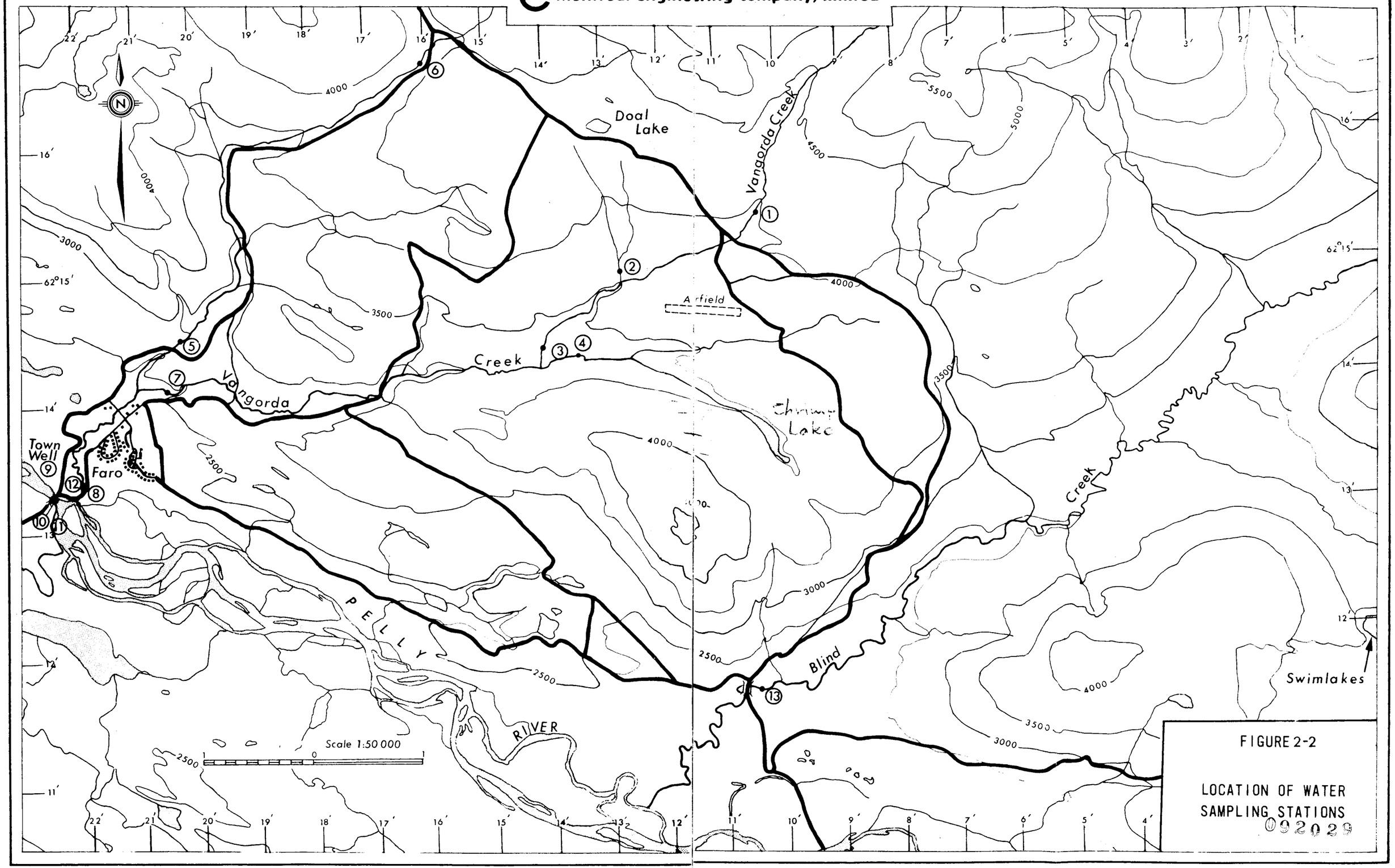

FIGURE 2-2

LOCATION OF WATER SAMPLING STATIONS

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exploration program, samples will be taken once a week of the effluent from the treatment plant and upstream and downstream of the outfall into Vangorda Creek. The untreated influent to the plant will also be monitored on a weekly basis. These samples will be analyzed for lead, zinc, iron, cadmium and total suspended solids.

From the monitoring results of the treatment plant, it will become apparent whether or not Scheme II (outlined in our January report) will have to be implemented.

2.7 FISH

Of the 67 species of freshwater and anadromous fish found in the waters of the Pacific drainage of Canada, 19 are known to occur in the upper reaches of the Yukon River basin, and at least 13 have been recorded in the Pelly River sub-drainage. Many of these, such as the chum, coho and chinook salmons, dolly varden, lake trout, lake and broad whitefish, inconnu, arctic grayling, and northern pike are of commercial and/or sport significance, and are the basis of subsistence fisheries.

Fisheries studies will provide an inventory of fish life in the area of the proposed development, will assess the potential effects of the development upon such fish life, will suggest means of minimizing these effects. A program of monitoring will also be proposed in order to document changes which may occur as development proceeds.

A literature review has been initiated and will dictate the scope of the field program survey to provide a complete inventory of fish stocks. This inventory will establish species present, the approximate magnitude of

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resident and migratory populations, the presence and magnitude of spawning and nursery areas, and food chain relationships. The contribution of the stocks so identified to the various types of fisheries in the area will be determined. Stream habitat conditions, both physical and chemical, which are critical to the survival of these stocks will be described. In addition, fish samples will be analyzed for their contents of various heavy metals (as in Section 2.6), in order to establish baseline data from which changes as a result of the development, if any, may be determined.

The effects of the development, in terms of both construction and operation, upon identifiable fish stocks, will be assessed, and detrimental situations identified. The greatest threats to fish are posed by the delay of migratory spawning runs, the destruction of spawning areas, increased stream sedimentation, reduction of stream levels or velocity, and effluent toxicity. The mine site at Vangorda Creek is likely to have a considerable impact on the creek, and Blind Creek or the Pelly River may be affected by dams or water withdrawals. Each waterway will be investigated at the level dictated by the proposed development, and methods of ameliorating any adverse effects in the fish stocks present will be developed.

A program of monitoring the affected waterways, both in terms of water quality and fish populations, will be proposed. This will provide ongoing surveillance with respect to the effect of plant operation on the aquatic fauna.

The field program is currently proposed in two segments; one in the spring, and one in the fall of 1975. However, due to the variety in life cycles of the species likely to be present, this may not provide a complete picture, and the possible need to extend the field program into the winter months will be assessed and specific recommendations made.

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2.8 ARCHAEOLOGY

The archaeological resources of an area constitute a part of its cultural history. This study will be designed to identify, preserve and protect these resources. There are no known pre-historic sites in our area and the only historic site of interest is the Vangorda Cabin located near the old airport.

A survey of the archeological resources will include an identification of both pre-historic and historic sites of note. The survey will be conducted as part of the general environmental studies and any sites located will be mapped and described, but not disturbed. Sites which appear to be of historic significance, or any sites which may be directly affected or destroyed by any phase of the development will be referred to a competent authority regarding their disposition.

2.9 SOCIAL AND ECONOMIC IMPACT

Development of a mine such as the one viewed as a possibility in the Grum Deposit area will have important effects on the social and economic structure of the region. Some of these may be of territorial significance. It is important to identify the socio-economic issues that a mine development might raise. Moreover, it will be advantageous, if not essential, to be able to discuss these issues and probable effects in quantitative terms with government agencies and interested citizen groups.

Historically, the most obvious socio-economic impact of the existing Anvil mine is the town of Faro. Less evident effects have undoubtedly occurred throughout the Territory, particularly at Whitehorse and other communities.

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Depending upon the ultimate size of the Kerr-Addison/AEX development, additional effects of a similar nature and of some proportional magnitude could be expected.

In preliminary discussions, government spokesmen have indicated generally favourable attitudes towards additional mining development. However, there is little doubt that the local Government will wish to be satisfied that new proposed projects are in the best interest of the Territory. Specific concerns which have been raised, and which will be the subject of socio-economic investigations carried out for the feasibility study include:-

a) magnitude and source of the required work force, what portion might be local, if any, and arrangements for housing;

b) how will the development affect facilities such as schools, transportation and other Government supplied social services;

c) what effect will the development have on personal incomes in the territory;

d) how will the development effect the business community;

e) what costs will be incurred by the Government, and what will be its revenues as a result of the project. Many of the local people derive at least a portion of their income from hunting, fishing or trapping, or from associated activities such as out-fitting and guiding. The effect of the proposed development on these industries will be considered in conjunction with relevant aspects of the biological investigations.

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The results of these studies will form the basis for recommendations towards minimizing any potential adverse effects of development and for deriving maximum benefit for the Yukon community consistent with the interests of the Joint Venture partners.

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PART THREE

WATER SUPPLY

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PART THREE - WATER SUPPLY

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3.1 INTRODUCTION

311 GENERAL

Following preliminary investigations into possible sources of water supply for the proposed mine development, three sources have been identified. These three sources are:-

a) storage and pumping from Vangorda Creek,

b) storage and pumping from Blind Creek,

c) intake structure and pumping from the Pelly River.

Depending on the size of mill envisaged and the amount of water recirculation designed into the mill, the water demand could be between 1,000 and 3,500 gallons per minute.*

312 VANGORDA CREEK

From an initial look at the hydrology of the sites and using an average runoff of 0.7 cfs per sq. mile, which is considered reasonable for this area, the Vangorda Creek site would be able to supply a maximum of approximately 3,000 gallons per minute in an average year if the total streamflow were utilized. This means that in order to take care of low flows, a substantial storage facility would have to be constructed. Considering the very low winter flows in this area, the capacity of the storage pond should be equal to about 6 - 9 months demand. Studies to be conducted in 1975 will confirm the flow in Vangorda Creek enabling the amount of storage required for different quantities of water supply to be determined.

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*All gallons in this report are Canadian

313 BLIND CREEK

The site on Blind Creek has a drainage area of 217 sq. miles and thus would be more than adequate to supply 3,500 gallons per minute in an average year. However, low flows could be as low as 2,700 gallons per minute thus indicating a requirement for some form of storage. The low flow has been determined by comparing the drainage area to similar drainage areas in the Yukon where stream gauging has been carried out, but this only gives an approximation of the flow in Blind Creek. In order to confirm the flows in Blind Creek, stream gauging will be required.

314 PELLY RIVER

The site on the Pelly River would consist of an intake structure into the river with a pumping station adjacent. No storage would be required on the Pelly River because it would be able to supply at least 3,500 gallons per minute all year round, the one in twenty-year minimum 7-day flow in the Pelly River being 142,000 gallons per minute.

315 GROUNDWATER

Groundwater has been considered and found to be not feasible for a water supply because the geology of the area exhibits mainly igneous rocks which are generally dense and not good suppliers of goundwater. Igneous rocks can be used for small water supplies when they contain many cracks and fissures but are rarely considered suitable for projects of this size.

However, groundwater is of interest in two other areas namely:-

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- drinking water supply,
- the potential reduction of flow in surface waters caused by a lowering of the groundwater table when dewatering the mine.

If the quality of the water supply developed for the mine process is below drinking water standards either the water from this source must be treated or a separate drinking water supply provided. Thus, groundwater will only be considered for a drinking water supply if surface waters do not produce the required standards.

During mining operations, the groundwater table will probably be lowered in the course of dewatering the mine. This may affect the surface waters by decreasing their flows; however, the mine water may be able to be used as part of the water supply depending on its quality. This possibility will be particularly significant with respect to the use of potentially marginal supplies such as Vangorda Creek and will be examined closely during the 1975 program.

3.2 PROCEDURE

It is necessary to obtain more accurate information on the flows in Vangorda Creek and Blind Creek both for water supply purposes and to assess the impact of discharging mine waste effluents.

A stream gauging station will be established on Vangorda Creek in late May following the spring break-up. The level of the water will be monitored continuously throughout the year by using a bubble gauge and

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recorder, the cross-section will be established in the spring and velocity measurements recorded two or three times during the year. Using this information and comparing it to other areas in the Yukon, a more accurate estimate of flow in Vangorda Creek will be established and its water supply potential assessed.

In order to establish whether or not stream gauging will be required for Blind Creek, possible sites have been chosen for an intake on the Pelly River (Figure 3-1), and a small dam on Blind Creek, and cost estimates will be prepared for the two systems. If the Pelly River scheme is the less expensive, stream gauging will not be required for Blind Creek. If the less expensive scheme is found to be the Blind Creek scheme, stream gauging will be carried out throughout the year, in a similar way to Vangorda Creek.

Following stream gauging in the summer and fall, the water supply potential at all sites will be assessed and preliminary cost estimates prepared for supplying the mine with either 1,000 gallons per minute or 3,500 gallons per minute.

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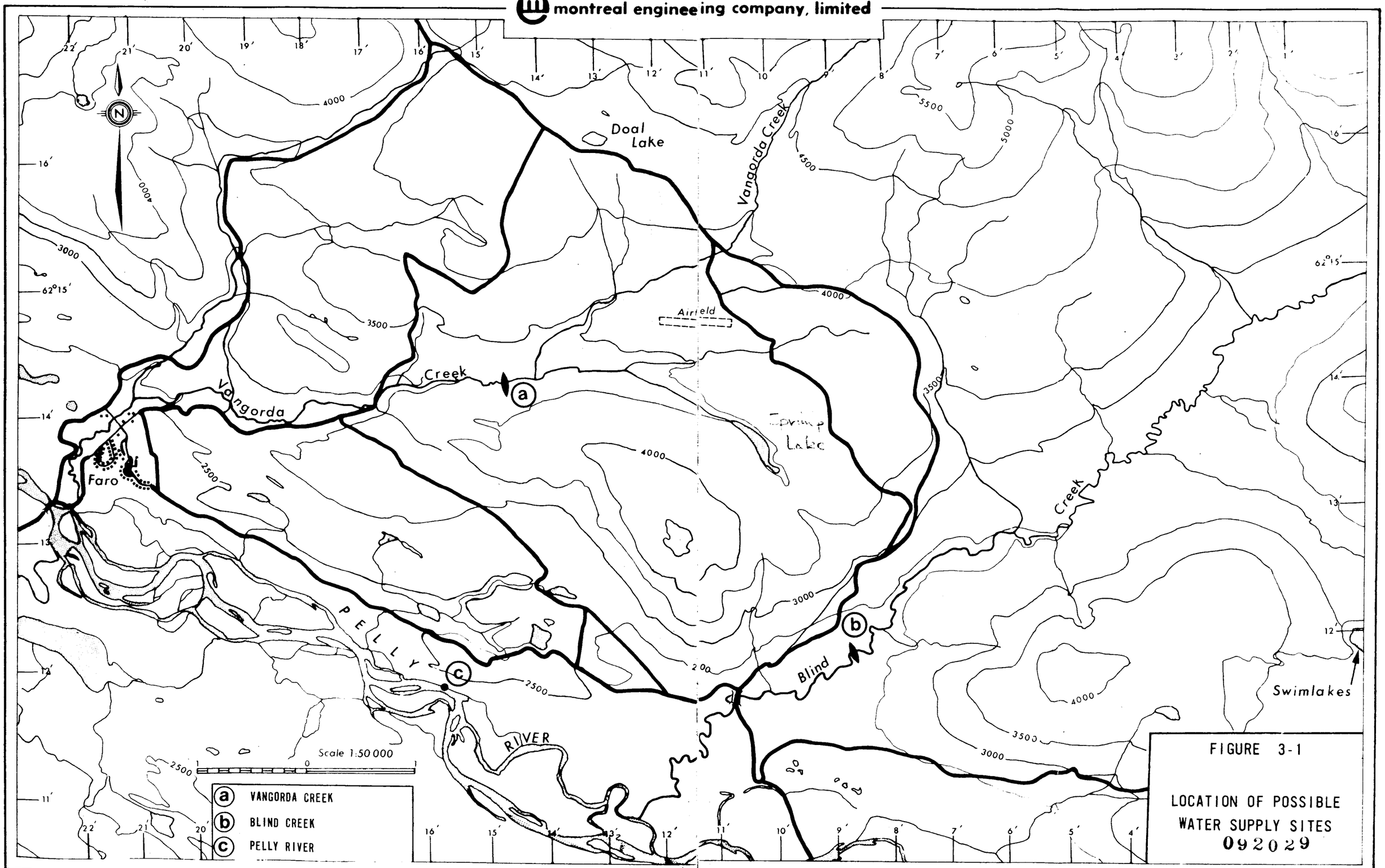

FIGURE 3-1

LOCATION OF POSSIBLE WATER SUPPLY SITES

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PART FOUR

MINE WASTE MANAGEMENT

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PART FOUR - MINE WASTE MANAGEMENT

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Two aspects of mine waste management will be considered during the 1975 exploration program and pre-feasibility studies:-

- definition and costing of various waste management alternatives as inputs to the feasibility study,

- the design, equipment specifications and start-up of treatment facilities possibly required during the 1975 underground exploration program.

4.1 FEASIBILITY STUDY INPUTS

Waste management measures which will require consideration as an integral part of the project feasibility study include the following:-

- location of potential tailings disposal areas,
- selection of tailings pond operational regime,
- selection of type of tailings dam structures, i.e. use of borrowed material, tailings, etc. Decant structure alternatives,
- project water balance including the integration of water supply requirements with recycle and waste discharge volumes,
- impact of alternative discharge volumes on receiving streams and inter-relationship with fresh water withdrawal,
- wastewater treatment requirements including use of tailings pond for treatment purposes,
- waste rock disposal alternatives,
- control of site and mine drainage,
- ultimate and interim rehabilitation of the development area,
- collection and treatment of sanitary wastes, including disposal of treatment sludge and camp garbage

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Final selection and design of waste management requirements obviously cannot be made until basic development data such as type of mining, mill capacity, water demand, etc. are known. These considerations, however, will not be finally decided until during, or even after, the overall project feasibility assessment scheduled for completion by May 1976. The approach which will be adopted in the 1975 program therefore, will be to assess the range of alternatives available for each of the above items based on several basic assumptions for mine type, layout, capacity, water demands, etc. Each alternative will be costed and its advantages and disadvantages identified. In this way, it will be possible to integrate the various waste management alternatives with mining development alternatives during the feasibility study, thus providing an optimum overall development strategy and total development costs.

4.2 1975 EXPLORATION PROGRAM REQUIREMENTS

The waste management measures required for the control of wastes during the 1975 underground exploration program have been described in a previously submitted report entitled, "Kerr/AEX Joint Venture, Grum Deposit, Environmental Aspects of Proposed Underground Exploration".

The estimated capital and operating costs of the measures proposed were included in the above report and are not repeated here. The report identified two possible treatment systems; one relatively simple, the other more complex depending on the characteristics of the mine drainage. If the mine drainage is basic or only weakly acid and the simple pond based system proposed is adequate, little cost will be incurred in the design of the system

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and specification of equipment. However, the treatment system proposed in the event of strongly acid mine water conditions will require more detailed specification, design and start-up assistance, probably involving approximately three manmonths of professional time. This estimate of time assumes that only basic equipment layout diagrams will be required rather than complete engineering drawings which would, in any case, be precluded due to the limited time available prior to the installation of the plant if it is in fact required.

Other costs which will be incurred as a result of the 1975 underground exploration program include the water quality monitoring program necessary to define the impact of the scheme on Vangorda Creek and defined in Section 2.6, plus the series of acid generation tests necessary to determine what treatment measures are required. Costs associated with the 1975 underground exploration program have been shown separately in Part 6.

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PART FIVE

POWER SUPPLY

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PART FIVE - POWER SUPPLY

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5.1 INTRODUCTION

Five sources of possible power supply have been considered in a preliminary investigation. These five sources are:

(a) Purchase power from Northern Canada Power Commission.

(b) Hydro power.

(c) Steam thermal power.

(d) Geothermal power

(e) Diesel power.

These sources have been considered on the assumption that first power would be required in 1977/8, increasing to about 12 MW of high load factor power in 1979 and to about 25 MW in 1984.

5.2 SOURCES OF POWER SUPPLY

521 PURCHASED POWER SUPPLY

The agency licensed to sell power in the Yukon is the Northern Canada Power Commission (NCPC). The Commission stated they could supply power to the mine before 1980 but to do so would require additional transmission construction. The construction of transmission lines from Whitehorse to Faro could require, 2½ to 3 years, allowing six months for engineering, 1 year for material delivery and 1 year for construction. The Power Commission has, at present, a bill before Parliament which will standardize their rate structure, and tend to equalize costs to all customers within each category. Thus, under such a rate, Kerr-Addison/AEX would expect to benefit to some extent from the hydro installation in the NCPC system and obtain power at less than the cost of diesel power especially

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if the system absorbs the cost of additional transmission line construction.

522 HYDRO POWER

Available information does not indicate any hydro sites of the required size within close proximity to Faro. To identify possible sites, investigate them by field surveys, prepare comparative cost estimates, choose the best site, obtain all licenses and design and construct the project to deliver first power before 1980 would not be possible and investigations into this source of power will be limited to that mentioned in Section 532.

523 STEAM THERMAL POWER

There are coal deposits within reasonable shipping distance to Faro but the quantity and quality are unknown. Known natural gas deposits are too remote for further consideration. Again, the time available to prove up a fuel supply and bring the plant into operation would appear to preclude this source of power from consideration at present.

524 GEOTHERMAL POWER

This type of power, in this area, is as yet only a potential resource, impossible to develop within the foreseeable future let alone within the present project schedule.

525 DIESEL POWER

Diesel power at the mine site would appear to be the one type of installation which would be feasible in the time available.

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526 COOPERATIVE POWER

Some reduction in the cost of independent diesel power might be achieved by sharing the reserve installations necessary to firm up the supply to the mine. Since the sole supplier of power in the area is at present NCPC, it would be necessary to reach some form of reserve sharing, or reserve supply agreement with them. This might still require the additional transmission line.

5.3 PROCEDURE

531 PRESENT PROJECT SCHEDULE

On the basis of the present schedule planned for this project, and the foregoing discussions, two possible alternative sources of power supply require further consideration:

a) Purchase of the total requirements from the Northern Canada Power Commission.

b) Supply of all, or part, of the requirement by the installation of diesel equipment at the mine site.

Under the possible forthcoming equalized rate structure that the NCPC is considering, it is likely that, because of the hydro installations and savings to a large purchaser in the cost of purchasing and transporting fuel, the purchase from NCPC would be more economic than an independent diesel supply. The economy of the purchased supply could however, depend upon the method of allocating the cost of the necessary transmission line construction. In addition, there may be other considerations such as tax savings or fast investment write-offs which could make the independent

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diesel installation attractive. In any case, the cost of this form of supply should be estimated as a limiting value for any other form of supply.

Thus, the continuing work will consist of estimating the probable requirements and obtaining the cost of supplying them by both of these two possible sources. Obtaining the cost of the supply from the NCPC might involve negotiating, within the limits of their rate structure, for the most reasonable price available. Supply from independent diesel installation may require investigation of a reserve sharing agreement as well as cost estimates for equipment, fuel, operating cost, etc.

A further possibility which will be looked into is some form of an interim power supply from the NCPC to supply requirements until a hydro or steam thermal plant could be commissioned. If it appears that such an arrangement is feasible, an office study to identify possible hydro sites of the required size in the vicinity of Faro, will be undertaken. Depending upon the results of this study additional work along the lines of that mentioned in Section 532 may be suggested.

532 DELAYED PROJECT SCHEDULE

If there is any possibility of a two year, or longer, delay in the project schedule then it might become desirable to give further consideration to the investigation of a hydro or coal fired thermal plant as a source of power supply in case either would be a more economic source than independent diesel or purchase from NCPC.

Such investigations would require considerable additional work

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to obtain field data and carry out office studies, project designs and cost estimates. Since the basic assumption as to project timing precludes these sources from consideration at this time, no allowance has been made for such investigations in the work schedule and cost estimates.

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