K- HOSMER-WHEELER (PARCEL 69) 75(9)A

KAISER COAL CANADA LTD.

HOSMER-WHEELER COAL PROJECT
PRELIMINARY ENVIRONMENTAL ASSESSMENT

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B.C. RESEARCH

GEOLOGICAL
ASSESSMENT

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PRELIMINARY ENVIRONMENTAL ASSESSMENT

January 1976

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SUMMARY

Kaiser Coal Canada Ltd. is planning to develop an underground hydraulic mine and coal processing facilities in an area midway between Fernie and Sparwood, B.C.

Exploration has been carried out on Hosmer Ridge intensively in 1970 and 1974. Additional exploration was initiated in 1975 to prove sufficient reserves to support a mine life of approximately 20 years. Results of this additional program are not yet available.

Kaiser has made a positive effort to minimize and reclaim disturbance due to exploration activities.

The proposed mine will extract 1.5 to 2.0 million long tons/year and will require a labor force of 600 to 800 at full production.

Mining methods involve underground hydraulic removal of coal with the use of high pressure water and fluming of the coal slurry to the process plant at the valley bottom.

In the preparation plant the coal will be separated from water and waste materials by a series of screens, cyclones and centrifuges. Coal processing will utilize a "closed" circuit whereby most of the process water is clarified and re-used. Waste water from surface drainage at the plant and treated sewage will be deposited in the tailings pond.

Clean coal will be transported to Roberts Bank on existing railway routes by extended services of Canadian Pacific Railway. Storage of coal at Roberts Bank will require expansion of the present terminal facilities.

Reclamation plans for the mine development have not been finalized; however, hydraulic mining creates relatively few surface disturbances and should present no major difficulties for reclamation.

Climate in the Elk River Valley is characterized by hot summers with sporadic rain shower activity and mild to severe winters with heavy snowfall at higher elevations.

In the Hosmer-Wheeler area, the major surface drainages flow into "No-name" Creek and subsequently into the Elk River. In the valley bottom the soil is permeable and there is evidence of substantial subsurface flow in the region of the proposed plant site and tailings ponds.

Water quality of surface drainages is characteristic of unpolluted natural drainages in the area and is generally alkaline and hard.

Habitat for resident fish exists in "No-name" Creek at the location of the proposed tailings ponds and downstream to the highway crossing. Eastern brook trout was the only species observed.

The major soils in the development area have formed on alluvial terraces and alluvial fans in the valley bottoms and glacial till above.

Vegetation in the valley bottom consists of a mixture of coniferous and deciduous growth.

Above 3500', Englemann spruce and lodgepole pine are dominant although sub-alpine fir and whitebark pine occur frequently.

Ungulates occurring in the development area include elk, moose, and mule deer. A portion of important winter range for these species extends into the proposed development area near the plant site and associated facilities.

Important furbearers observed in the proposed development area were black bears and coyotes. Other species are likely to occur.

Game birds in the development area are ruffed grouse, blue grouse, and spruce grouse. No substantial habitat exists for waterfowl. The status of other birds in the area is not known.

At present, the valley bottom area consists of immature productive woodland with pockets of pasture and rangeland. Surrounding hillsides primarily contain immature productive woodlands.

The development area is not used extensively for recreation. A provincial park exists adjacent to the area which is used extensively during the summer months as a picnic site.

Trapping in the area is controlled privately by Crows Nest Industries and no records exist for trapping returns.

The development area has moderate capability for forest production (C.L.I. Class 3 and 4), with some pockets of higher (Class 2) capability.

Agricultural capability in the area is highest in the valley bottom which has been designated as an Agricultural Land Reserve.

Recreational capability in the development area ranges from moderately low to low according to the C.L.I. (Canada Land Inventory) ratings.

There are no specific historic or archaeological sites known to exist in the development area, but a potential exists for discovery of unknown heritage resources.

No background air quality data exist for areas near the proposed Hosmer-Wheeler development.

The existing social environment surrounding the proposed development area has been collated and described in the appendices to this report.

Environmental impacts of the proposed development have been summarized in a "preliminary matrix of environmental impacts" (Table 10).

The major impact on water quality will occur as a result of mine construction and operation. With adequate controls the overall effect of these activities on water quality is expected to be low.

Disturbance to soils and vegetation will occur predominantly in the valley bottom. The impact on soil productivity in this area can be minimized by stockpiling topsoil for subsequent reuse in reclamation.

The magnitude of impact of the proposed development on mammals is not known, but a portion of the proposed valley bottom development will remove some elk and deer winter range. Although some areas of disturbance can be revegetated, other disturbances may prevent its utilization by wildlife during operation of the mine.

Some habitat for upland game birds will be removed in the valley bottom. Developments on slopes and ridges are not expected to significantly affect upland game species.

The proposed development should not create any major conflict with present human uses in the area.

Developments in the valley bottom will arfect areas of high (Class 1-2) forestry and agricultural capability and it may not be possible to restore these areas to their original values following mining activities.

Areas sensitive to noise disturbance are the provincial park near the valley bottom developments and the town of Hosmer.

The proposed development will have several potential sources of air quality contaminants including the coal drier, land surface and coarse waste contouring, and traffic and load out facilities. The Company must comply with existing air quality standards in accordance with B.C. Pollution Control Branch objectives.

Aesthetic impact of the proposed development is expected to be moderate.
- Screening of lower sp. by trees

The major socio-economic impacts of the mine development will occur during the operation of the mine as a result of an increased resident labour force and consequent demands on housing and community services.

Identification and discussion of specific impacts are discussed with reference to a socio-economic locational impact matrix (Table 12).

An additional 250 jobs covering a broad range of community and commercial services would also be indirectly generated by the project.

Including the family dependents of employees, the population increase resulting from the project will amount to about 3300. Allowing for possible relocation of existing residents, the major impact of this population influx is expected to affect Sparwood.

An increase in the supply of housing with attendant increases in social infrastructure would be necessary. Because of high wage levels and Company subsidies for housing, little difficulty is expected with regard to employee's ability to finance accommodation.

Training and recruitment will warrant close attention in view of the overall North American shortage of skilled labour and management. Overseas recruitment may be necessary but on the basis of past experience few social problems are expected.

INTRODUCTION

OBJECTIVES

The objectives of the study are:

- to summarize the development program with respect to preliminary mining and coal processing plans.
- to compile existing environmental information relating to the Kaiser Coal Canada Ltd. Hosmer-Wheeler coal project.
- to make a preliminary environmental impact assessment.
- to identify deficiencies in existing data and to make recommendations for further environmental studies.

BACKGROUND

Kaiser Coal Canada Ltd. is planning to develop an underground hydraulic mine midway between Fernie and Sparwood, B.C. (Figure 1). The Company has not completed final economic feasibility studies for this project, but if development proceeds, the project will involve construction of roads, adits, a coal processing plant and transportion facilities. Operation of the mine will involve underground hydraulic mining, on-site coal processing and loading.

The proposed locations of these facilities are shown in Figure 2. The coal seams exist above 5,000 ft on Hosmer Ridge (Figure 3). The portal for the hydraulic mine will be located near the valley bottom at approximately 3,500 ft elevation. Make-up water to be used for the hydraulic mining method will be obtained from the Elk River. The preparation plant, tailings pond and transport facilities will be

located in the valley bottom at approximately 3,500-ft elevation (Fig.4). Waste rock from the tunnel will form the access pad at the tunnel entrance. The preparation plant will separate the coal into coarse waste, tailings, coarse coal and fine coal. Wet coal will be dried thermally. Coarse waste and tailings will be deposited separately as shown in Figure 2. A railway loop will be necessary to connect the present rail line with the load out facilities near the plant.

This report is a preliminary environmental assessment of the Hosmer-Wheeler coal project and is aimed at fulfilling the Stage I criteria outlined in a draft of "Guidelines for Coal Development" (1). The study area includes the area of specific development (Figure 1) as well as the Elk Valley near Sparwood, Hosmer, and Fernie.

METHODS

DEVELOPMENT PROGRAM

The mine development program was summarized using information gathered in preliminary engineering and economic feasibility studies supplied by the client. Although many aspects of the development are subject to change, the information supplied represented the most current plans. Alternative mining plans based on subsequent studies may affect the rate and scale of the development.

ENVIRONMENTAL DATA

Environmental data was compiled on the basis of existing information, supplemented with data gathered during field surveys on October 28 and 29, 1975 for vegetation and aquatic components and on October 31 to November 2 for wildlife reconnaissance. During these surveys, snowfall limited access in the study area.

Aquatic Components

Physical characteristics of surface and subsurface drainage including rates of flow were determined by observation during the field trip. Water samples were collected from designated sites using the field procedure outlined in Appendix A and returned to B.C. Research laboratories for analysis. The samples were analyzed for turbidity, specific conductance, total dissolved and suspended solids, pH, hardness, alkalinity, sulfates, total organic carbon and heavy metals. Organic carbon was measured using a Beckman model 915 TOC analyzer. Heavy metals were analyzed with an atomic absorption spectrophotometer following solvent extraction. Procedures outlined in standard methods for the analysis of water and waste water (2) were used for the other analyses Additional water quality data for the Hosmer area was obtained from Kaiser Resource's environmental services laboratories.

Fish habitat potential of streams was assessed visually. At every site visited along each watercourse, observations for the presence of fish were made and a stream survey form was completed which listed important fish habitat criteria. A sample of the form is included in Appendix B. On the basis of this information, stream characteristics could be recorded and interpreted for fish habitat potential.

Terrestrial Components

Vegetation was assessed visually during field reconnaissance and from information obtained from Canada Land Inventory (C.L.I.) sources. Soils data in the valley bottom areas was taken from a published soil survey by the B.C. Department of Agriculture.

Observations of wildlife use (direct observation, evidence of browsing, pellet groups, tracks) were made during the field reconnaissance. Additional information was derived from discussions with Kaiser personnel and the B.C. Fish and Wildlife Branch. Canada Land Inventory maps provided general information on wildlife capabilities of the area.

Human Use

Information on present use and land use capability was obtained from the Canada Land Inventory and from familiarity with the region. Archaelogical and historical sites information was obtained by consultation with the Archaeological and Historical Sites Advisory Board of the Provincial Museum, Victoria, B.C.

Air Quality

Existing air quality data were obtained from Kaiser Resources Limited, Environmental Services Division.

Socio-economic Factors

Socio-economic analyses were derived from preliminary engineering and economic feasibility studies as well as interviews with agencies and individuals associated with the local communities and the Regional District of East Kootenay and with representatives of the transportation companies which would service the project.

IMPACT ASSESSMENT

The environmental impact was assessed in two ways. First, the direct effect of facilities on mapable components of the environment were found by overlaying the mine facilities on the data base. Secondly, the effects of past mining activity in the East Kootenays on water quality were studied in order to predict the effects of the proposed development.

The effects of the proposed mining activities upon the environmental components were summarized in a matrix of potential environmental impact and restoration feasibility (Table 10). This matrix records the impact as positive, negative, none or unknown. The degree of impact was summarized both horizontally and vertically by recording whether the cumulative impact was high, moderate, low or unknown. In several cases where an impact was unknown, an estimate was made of the probable degree of impact. The matrix summary section indicates the most important environmental factors and which of the proposed mining activities will result in the highest or lowest impacts.

A major consideration in assessing the magnitude of an impact concerns the feasibility of restoring the disturbance to its original condition. On the matrix, restoration feasibility was recorded as good, poor, none required or unknown. The restoration feasibility was also summarized both horizontally and vertically in the table.

PERSONNEL

This study was undertaken by the Terrestrial Ecology Group of the Division of Applied Biology, B.C. Research. Mr. I.V.F. Allen, Group Leader, was project supervisor. The engineering aspects were summarized and assessed by Mr. A. Bruynesteyn and Mr. A.W. Greenius. The environmental data components were assembled by Dr. J.C. Errington, Mr. M. Zallen and Mr. C. Schmidt. Technical assistance was provided by Mr. G. Longworth and Mr. M. Blazecka.

Water quality analyses were conducted by Mr. H. Long, Mr. G. Marsh, Mr. H. Hori and Miss M. Lewis under the direction of Dr. J. Leach. The air quality assessment was by Mr. R. Serenius of the Division of Applied Chemistry. The socio-economic studies were carried out by Mr. D. Wright of the Management Services Division.

Maps and illustrations were prepared by Mr. F. Phillips and Miss C. Kocsis typed the report.

DEVELOPMENT PROGRAM

EXPLORATION

This discussion of exploration is based upon a review and synthesis of the report "Exploration Study -Joint Hosmer-Wheeler Project Part I, dated January 31, 1975", prepared for Kaiser Coal Canada Ltd. by Kaiser Resources and Mitsui Mining Co. Ltd. That exploration study assessed the reserve potential within the upper four seams of the coal-bearing measures above the Kootenay Formation in the map areas A and B (Figure 2).

Limited reconnaissance and geological mapping of Hosmer and Wheeler Ridges had been conducted before 1960 by the Geological Survey of Canada, British Columbia Department of Mines and Crows Nest Pass Coal Company. In 1968, Kaiser Resources completed an access road south of Sparwood to Wheeler Ridge (Figure 5). The 1970 surface exploration program included: Tracing two and one-half miles of coal outcrop primarily along No. 3 Seam, driving eight prospect adits, completing preliminary geological mapping of trenches and surface exposures along the seam outcrop traces, and obtaining bulk samples for washability tests from the seams exposed on Wheeler Ridge.

An intensive exploration program was undertaken in the period June to November 1974 by Mitsui and Kaiser geologists to explore and assess the reserve potential within the 1,500-ft cover line of the upper four seams, Nos. 1, 2, 3, and 4, above the Kootenay Formation.

All work included liaison with reclamation personnel to ensure conformance with British Columbia Government Guidelines.

Coal Measures

The exploration programs have determined the coal measures in the Hosmer-Wheeler Ridge area. No. 1 and No. 2 Seams were not considered minable because of thickness variation and numerous carbonaceous splits. Only No. 3 and No. 4 Seams were considered suitable for hydraulic mining. Results of the 1975 exploration program may indicate that No. 2 Seam may also be considered minable.

Faults

The exploration study has revealed several faults which generally strike north. These affect the structure and result in displacements of up to 200 ft. The study interpreted positions and magnitudes of the faults largely from bore hole data, strata mapped on the surface, projections of surface dips and seam thicknesses, and elevations obtained from the bore holes. The interpretation of the faults is of considerable significance in the computation of the coal reserves and in providing basic data necessary for the commencement of mine feasibility studies.

Coal Quality

A variety of standard analyses and tests were performed on raw, clean, and diluted samples to determine the quality of the coal. The coals from No. 3 and No. 4 Seams are considered to be metallurgical coking coals. No. 3 Seam is considered to be of high-volatile bituminous rank, whereas No. 4 Seam is considered to be borderline medium-to-high volatile according to American Society for Testing Materials standards (4).

The Proximate Analysis (dry basis) of raw adit samples from No. 3 Seam is: ash, 8-11.5%; volatile matter, 28.8 - 32.6%; fixed carbon,

55.9 - 63.2%. The calorific content (dry basis) is 14,100 - 14,400 Btu/lb.

Coal Reserves

The Mitsui geologists adopted the following guidelines in calculating the coal reserves:

- exclude seams less than 10 ft in coal thickness (unless potentially minable by other than hydraulic methods).
- exclude rock partings greater than 3 ft thick.
- exclude outcrop pillar, approximately 200 ft in width.
- include area defined by maximum 1,500 ft cover line.
- confine No. 4 Seam estimate essentially to Area B.

The reserves in Project Areas A and B of clean coal, minable by hydraulic methods, have been calculated to be 27,728,000 metric tons (27,290,000 long tons) up to 1,500 ft cover. The minable clean coal was calculated by applying geological safety factors ranging from 65 to 85%, a mining recovery factor of 56% and a wash plant efficiency of 95%. Additional coal reserves between the 1,500 and 2,000 ft cover lines were also estimated but are not included as part of the reserves.

It was concluded the minable clean coal reserves found within the Project Reserve Area were insufficient to support a mine complex capable of producing 1.5 to 2.0 million long tons of clean metallurgical coal for a period of 20 to 25 years. The exploration and assessment program was therefore extended to include No. 4 Seam in the Project Reserve Area. The proven reserves from this source were deemed insufficient. The study therefore recommended obtaining additional reserves from No. 4 Seam and overlying seams in adjacent Parcel 69 which, it was anticipated, would satisfy the requirements necessary for the Project to be viable and economic. It was proposed that this work be undertaken in 1975. Results will not be available until May 1976.

Reclamation of Exploration Areas

Observations of reclamation areas during field reconnaissance indicated that Kaiser Resources Ltd., has made a positive effort to minimize and reclaim disturbance during exploration of Hosmer Ridge. Mitigation procedures for roads included: planning and minimizing the number of required exploration roads, logging and timber salvage on exploration roads before construction (Figure 6), and resloping and seeding cutbanks. Procedures at adits included removing and storing adit coal material (Figure 6). Reclamation treatments of adit sites included the construction of a berm above and below each adit portal, recontouring, terracing and seeding of waste slopes.

MINE DEVELOPMENT

Kaiser Coal Canada Ltd. submitted to B.C. Research its Mine Planning Study - Joint Venture Hosmer-Wheeler Project, dated May 30, 1975, to assist in the preparation of the environmental impact statement. The Mine Planning Study which is part of the overall program to determine the feasibility of mining the coal deposits in the Hosmer-Wheeler area is presented below in an abridged form.

Mining Plans and Mine Layout

Three alternative mining plans were developed and are presented in Table 1 along with estimated manpower, and capital requirements. Although the client reports that the final mining plan has not been selected, the following mining procedures are not likely to change significantly.

It is proposed to bore the tunnel on a contract basis at about 1000 ft per month using a full-face boring machine. The entire tunnel will be completed in about 12 months and produce about 180,000 long tons of rock to be used as fill around the portal site.

Continuous miners will be used to develop main entries from the outcrop at 5250 ft elevation to the adit at gradients of five to fourteen degrees. The main entries which will provide access for pipelines, flumes, men and materials as well as providing ventilation airways, will continue from the adit to the working areas. They will be supported by three-piece "TH" yieldable steel arches at 5 ft centres and will be completely lagged.

Double rock cross-measure drifts will be provided at three locations for access to No. 3 Seam from No. 4 Seam. Conventional drill and blast techniques will be used.

Two parallel headings will be driven to outline individual panels. Continuous miners, steel arches, and flumes to transport the coal will be used. Ten mining panels will be developed in No. 3 Seam. To extract the coal, the sub-level method will be used for 2 panels, the sub-rise method for 7 panels and one will use both methods. Four mining panels will be developed in No. 4 Seam. One will use the sub-level method and three will use the sub-rise method.

The sub-levels and sub-rises will be developed with continuous miners. The sub-levels will be driven on apparent dip and sub-rises on or near full dip with gradient limitations for both systems being 7 degrees minimum and 14 degrees maximum.

Cross-cuts between entries and between sub-levels or sub-rises will be provided to complete ventilation circuits and a second means of egress. The cross-cut will be driven with a small cross-cut miner. The interval between cross-cuts will be 800 ft, the longest distance interval allowed by the British Columbia Dept. of Mines Inspectorate for the Balmer South Hydraulic Mine. Square sets on 5-ft centres with complete lagging will be used. Flumes will be used to transport the coal from the face to the adit portal.

Triple ventilation roadways for No. 3 Seam and double roadways for No. 4 Seam will be driven in coal commencing at 5,250 ft elevation to connect with the adit at 4,400 ft elevation.

Mining Operations

It is proposed to extract the coal by a hydraulic mining method in which high pressure water dislodges the coal. The water requirement for the hydraulic extraction and fluming processes has been estimated at about 18,200 gpm. A 10-million gallon clearwater reservoir at 3,550 ft elevation near the plant site will supply the mine and plant water requirements. All water pumped into the mine will flume coal out of the mine and will be decanted in the raw coal storage system, clarified in the clarifier, and returned to the clear water reservoir for recirculation.

Ventilation of the workings in No. 3 Seam and No. 4 Seam will require two 400 HP and one 150 HP forcing fans. An acceptable air temperature will be maintained within the mine by natural gas-fired heaters.

Three diesel - hydraulic prime mover, roof-suspended, monorail units will carry personnel and materials for No. 3 and No. 4 Seam operations.

The rail system will be single track with by-passes at strategic points. Train movements will be co-ordinated by a dispatcher in the mine control centre through a two-way radio system.

Two auxiliary wheel-type transporters, Eimco 975 and Eimco 913-C will be used in the mine operations.

Electrical power will be supplied from the B.C. Hydro 69 KV system. A temporary substation of up to 4500 KVA capacity will be used for mine development and plant construction. Power will be tapped from the existing transmission line adjacent to the plant site (Figure 2).

The main underground communication system will be:

- private line, single coaxial cable, telephone system with electric or full paging throughout the mine.
- inherent monitoring capability for methane levels, air velocity, temperature, carbon monoxide, water levels, and simple control functions to start and stop fans and pumps.
- pocket-sized one-way pagers for key personnel.
- train-to-train and train-to-control radio in the monorail system.

Subsidence

The Study made no reference to subsidence although discussions with company personnel indicate that subsidence, especially near outcrops, will occur. Serious alterations of the topography are not expected.

PROCESS DESCRIPTION

Combined Surface Facilities

The coal-water slurry produced by the hydraulic monitors will be flumed at a maximum design rate of 1480 tph of coal and 20,000 gpm of water to a crusher station at the mine portal where the wood and tramp metal will be removed and the coal crushed (Figure 7). The crushed coal slurry will be stored in a 4-compartment raw coal storage area where access water, which continually drains from the coal, is collected and

pumped to the clarifier. With the addition of ionic and non-ionic flocculation agents to the clarifier, practically all the coal and clay particles will be removed from this water and returned to the raw coal storage. From the raw coal storage, an average flow of 13.42 tpm of coal will be pumped to the preparation plant where 8.32 tpm of clean coal are produced for final drying as well as 2.73 tpm of coarse refuse, which will be disposed of on the coarse refuse pile and 2.37 tpm of tailings, disposed of in the tailings pond.

Of the 8400 gpm slurry water entering the preparation plant with the coal, 1490 gpm will end up in the tailings pond with the tailings, 244 gpm will be vented to the atmosphere in the drying process, and 142 gpm will remain with the clean coal as does 162 gpm which remains with the coarse refuse. The remainder of the water will be recycled to the raw coal storage area for slurrying the coal. Any overflow will be directed to the clarifier. It is anticipated that some water will be recovered from the tailings pond and recycled back to the preparation plant.

The key to the closed water system is the use of a large capacity clarifier where, besides the drainage from the raw coal storage area, the excess water from the preparation plant will be treated for removal of suspended particles. The treated water from the clarifier will then be stored in the large clean water storage pond from which it will be recycled to the mining operation and preparation plant.

The surface areas of the preparation plant complex will be contoured for maximum collection of all surface waters which are channeled into two surface water retention ponds. The water will then be pumped to the tailings pond. This collection system is necessary since the surface waters could contain significant quantities of fine coal particles which must be recovered.

All domestic water and sewage will be collected and processed through a sewage treatment plant before being deposited in the tailings pond. Since the laboratory will perform ash analyses only, no chemicals will be discharged from the laboratory to interfere with the sewage treatment plant or to contaminate potential seepage waters from the tailings pond.

Preparation Plant

In the preparation plant the coal will be separated from the water and waste materials by a series of screens, cyclones and centrifuges. In the first treatment step the coal will be separated into a coarse and a fines fraction (Figure 8). About 60% of the coal ends up in the coarse fraction which will be then separated from the waste materials by means of heavy media cyclones. For this purpose, the coarse fraction will be mixed with a magnetite suspension in order to increase the overall density of the medium sufficiently to enable separation of the +28 mesh coal from the refuse. The waste products from this operation are screened into a coarse fraction for disposal on the coarse refuse pile and a fine fraction which, after removal and recovery of the magnetite, is thickened in the refuse thickener and is then deposited in the tailings pond.

The clean coal-containing fraction, produced in the heavy media cyclones will be first screened to remove and recover the magnetite following which the bulk of the coal particles are removed by centrifugal treatment and transported to the clean coal storage area. The fines fraction from the centrifugal operation has its remaining magnetite removed by magnetic processes following which its liquid phase will be separated from the solids which are then further dewatered in a series of filters. The product will be dried and transported to the clean coal area.

The liquid fractions from the dewatering operation will subsequently be used in water-only cyclone circuits which treat the fines fraction from the initial screening operation of the raw coal. The waste product from these cyclones will pass through the refuse sump into the tailings pond while the coal fraction is concentrated by means of froth flotation and filtered to produce a clean coal filter cake for drying and transport to the clean coal storage area.

TRANSPORTATION

Coal Transportation to Roberts Bank

It is expected that coal from the Hosmer-Wheeler project will be transported to Roberts Bank by the Canadian Pacific Railway. The transportation mode and route would therefore be the same as presently utilized for the output of the Kaiser Resources Elkview mine and Michel mine, and the output from the Fording Mining Company, a total of approximately 8 million long tons per year.

In terms of the number of trains handled per day through the mountains, C.P. Rail has long operated at capacity. Kaiser Resources Ltd. has therefore queried the ability of C.P. Rail's main line between Golden and Mission City to handle an additional 2 million long tons per year. In the past, tonnage increases have been achieved by utilizing higher capacity cars, more powerful diesel units, and by a number of other improvements. Currently, major improvements involving grade reductions and double tracking are scheduled to be completed in 1979 at three locations - Beavermouth, Notch Hill and Clan Williams. This, together with the lengthening of two important rail sidings should make the resultant increase in the tonnage capacity of the line adequate for the Hosmer-Wheeler output.

This viewpoint is reportedly shared by C.P. Rail who have offered to contract for an additional 3.0 million tons for 1979. Others point out that an overall shortage of line capacity is highly probable in view of the additional requirements of other Kootenay coal producers and the expected growth in shipments of bulk commodities such as wheat, sulphur and potash. The situation is apt to be exacerbated if approval of the double tracking program is withheld or delayed significantly. The forecasting of traffic demand and the complementary planning and development of additional rail facilities will continue to warrant close scrutiny.

Marine Terminal Facilities

Hosmer-Wheeler coal would be handled at the Roberts Bank marine facilities of Westshore Terminals Ltd., a subsidiary firm of Kaiser Resources Ltd. An appreciation of current planning for the terminal is therefore pertinent to this study.

At present the terminal handles 9.0 million long tons of coal per year. Additional facilities would be required to handle the Hosmer-Wheeler production of 2.0 million long tons per year.

In general, the capacity of a terminal is limited to that of the least productive component within the system. By upgrading or adding to the less productive components a staged development program can be designed to correspond with increases in expected demand. In anticipation of such increases, a five stage $50 million program has already been devised. It is contingent on a 50 acre expansion of the basic landfill area provided by the National Harbours Board. Although each stage would require about 3 years to complete, much of the work could be carried out concurrently such that large increases in terminal handling capacity could readily be made available. In total the allowable throughput for the 50 acre expansion will be approximately 24 million long tons per year. This estimate could be affected by the type and ownership of coal handled. Since each product must be handled and kept separately in its own storage pile, the actual sizing and management of stock-piling and retrieval systems must ultimately be designed to suit specific customer requirements.

To avoid the impression that all is in hand with regard to the development of terminal facilities, it should be re-emphasized that the 50 acre NHB expansion at Roberts Bank is a prerequisite to large scale increases in throughput. In view of the environmental sensitivity of this particular area, it may be difficult to obtain a timely approval to proceed.

MINE EMPLOYMENT

Determining the best strategy for developing a mine frequently involves an economic evaluation of alternative methods of development. The initial feasibility study for the Hosmer-Wheeler mine was based on three alternative proposals which featured different objectives regarding extraction rates, methods, capitalization, employment and mine life (Table 1). Although none of the proposals were found to be totally acceptable, additional studies are now in progress and it is expected that an acceptable (optimum) strategy can be formulated within the coming months. It is also expected that the mine labour force will be within the two extremes suggested in the initial feasibility study. For interim phase I planning, the range of estimates suggested below should be reasonably accurate.

ESTIMATES OF MINE LABOUR FORCE

	Base Plan		Extended Plan	
	Timing-Yrs	No. Employed	Timing-Yrs	No. Employed
Construction	0 - 4	?	0 - 4½	?
Startup	2½	360	2½	470
Full Employment	6 - 20	590	6 - 20	780

In the foregoing table, the construction force is unknown, but will depend on the contractor's on-site hourly labour and staff. The above figures include supervisory staff.

Tables 2 and 3 are presented as typical operating and management manpower breakdowns over the life of the project. They are provided in order to suggest the occupational composition envisaged but they could be significantly revised following further feasibility analysis. Office staff requirements have not been included.

MINE RECLAMATION

Although a continuous program involving reclamation of exploration roads and adits has been implemented, the long range reclamation plan has not yet been formulated for the Hosmer-Wheeler project. This will be done in Stage 2 studies.

An underground hydraulic coal mine results in very little surface disturbance, compared to conventional open pit operations. There will be, nevertheless, many areas which will require some form of revegetation.

At Hosmer-Wheeler, areas which will require reclamation are primarily on the valley bottom below 3,500 ft and will include the mine portal, plant site area, waste rock from the mine tunnel construction and tailings areas.

EXISTING ENVIRONMENTAL DATA

PHYSICAL OVERVIEW

Description of Climate

The climate in the Elk River valley region is classified as microthermal coniferous forest (microthermal snow forest climates; coldest month averages below $0^{\circ}C$, warmest month above $10^{\circ}C$; constantly moist, rainfall every month of year; warmest month below $22^{\circ}C$) according to the Koppen classification system (5). Generally, summers are hot with sporadic rain shower activity and winters range from mild to severe with heavy snowfalls at higher elevations.

Air mass movement is controlled locally throughout the region by topography. Variations in slope and elevation modify overall air movement by differential heating and cooling and the subsequent influence on winds and cloud cover. Three distinct air masses influence the climate in the Elk River valley region. A maritime tropical air mass, which develops in the sub-tropical Pacific, is found frequently at higher altitudes due to a tendency to ride over the cooler Continental and Maritime polar air. Arctic air is another infrequent modifier of weather patterns in the area as the Rocky Mountains act as a barrier to its westward flow. Occasionally during the winter, this cold air mass will flow south through the Elk River valley producing very low temperatures.

Maritime polar air which originates in the north Pacific is a frequent occurrence in the study area and is often associated with heavy shower activity.

Existing Meteorological Information

Temperature

The mean daily temperature at Fernie is 4.5°C (40.1°F) with a mean maximum and minimum temperature of 10.4°C (50.7°F) and -1.4°C (29.5°F), respectively (Table 4).

The highest temperature recorded at Fernie is 36.1°C (97°F) while the lowest is -41.6°C (-43°F). The Kaiser Resources station on Natal-Harmer Ridge is located at 6,000 ft and has recorded a maximum and minimum of 30°C (86°F) and -34°C (-29°F), respectively, over a three year period.

The Canada Land Inventory map for climate capability for agriculture indicates a range from Class 2 (75-90 frost-free days; 1900-2150 degree days) in the valley bottom to Class 5 (<50 frost-free days, 1650 degree days) at higher elevations.

Precipitation

Total annual precipitation is 108.15 cm (42.58 in) and is fairly evenly distributed throughout the year (Table 4).

Precipitation reaches a maximum of 15.21 cm (5.99 in) during December, 39% falling as rain. Minimum monthly precipitation occurs in the summer months of July, 3.68 cm (1.45 in) and August, 4.80 cm (1.89 in) all occurring as rain.

Approximately one-third of the total yearly precipitation falls as snow. Winter snowpack ranges from 2 to 3 ft in the valley bottoms to 6 to 8 ft at the higher elevations.

Wind

There is no wind measurement data available for the Hosmer-Wheeler area. Generally, winds tend to be from the south but are modified locally by topographic features.

AQUATIC RESOURCES

Physical Components

Description of watercourses

In the area of the proposed development, surface drainage on the west slope of Hosmer Ridge collects into one creek referred to locally as "No-name" Creek (Figure 9). The creek is approximately 7½ miles long receiving water from creeks K2, K4, and Hosmer Creek before entering the Elk River at the town of Hosmer. "No-name" Creek is characterized by steep gradients on the slopes of the ridge and forms a low gradient stream in the valley bottom near the proposed tailings pond (Figures 10 and 11). In this lower section, the stream bottom material is washed cobble and boulders.

Further along the valley bottom the creek moves slowly, meanders, and forms many smaller channels. The stream bank and bottom material becomes sandy textured and permeable.

During periods of low flow, surface run-off in sections of "No-name" Creek ceases. During the field trip in October flow in the creek consisted entirely of subsurface seepage in the lower reach east of the highway (Figure 9). In the area where the rail line crosses the creek, seepage from the creek collects west of the rail line and forms a drainage alongside the highway (Figure 12). The valley bottom appears to contain numerous areas where seepage collects in ponds and subsequently disappears which indicates significant subsurface flow.

Surface flows in "No-name" Creek and the surface drainages K2, K4 and TL were approximately 0.5 cfs in October, indicative of low discharge typical during the fall. Discharge data from the Elk River and Line Creek are shown in Figure 13. Both of these drainages are substantially larger than "No-name" Creek and the timing of peak and low flows may occur sooner in "No-name" Creek than in the larger streams. The discharge data indicates that one large spring peak occurs in June with no secondary peak occurring during the fall. Peak flows are extremely variable in both drainages.

Water quality

Chemical characteristics of water from the Hosmer-Wheeler area are shown in Tables 5 and 6. Samples were collected by B.C. Research in October and January at sites shown in Figure 9. Results of the analyses of water samples obtained by Kaiser Resources personnel from November through January are shown in Tables 7, 8 and 9.

Results of analyses by both laboratories were similar. High iron levels were recorded by Kaiser from November and December samples, but the method of detection (filter photometer) was probably unreliable. Lower iron levels measured by Kaiser in January were more similar to those obtained by B.C. Research and measured more reliably (spectrophotometer). In January, sulfate and alkalinity measurements were the only parameters showing significantly different values.

Seasonal variations in water quality of surface drainages have yet to be documented for the Hosmer area. Data from Alexander Creek, draining Wheeler Ridge to the east, indicates the magnitude of changes that are likely in undisturbed creeks (Figure 14). Most results of water analyses from "No-name" Creek from October through January are similar to those occurring in Alexander Creek in the same months. Sulphate levels and alkalinity appear to show greater monthly variation than the other parameters. In general, water in "No-name" Creek appears to be typical of local unpolluted water which is characteristically alkaline and hard.

Biological Components

Fisheries evaluation

The Elk River at Hosmer provides habitat for Dolly Varden char (Salvelinus malma), mountain whitefish (Prosoparium williamsoni), cutthroat trout (Salmo clarki) and eastern brook trout (Salvelinus fontinalis) (6), and these species are likely to occur in the "No-name" Creek drainage as well. No fish were observed in "No-name" Creek during the October field trip, but Kaiser personnel had reported the presence of eastern brook trout in "No-name" Creek near Site KB (Figure 11). In January, eastern brook trout (10-15 cm) were again observed in the drainage near site KD by B.C. Research staff (Figure 12).

Visual inspection of "No-name" Creek and its tributaries suggested that fish habitats occur in the portion of "No-name" Creek which flows from site KC through the valley bottom to its confluence with the Elk River (Figure 9 and 10). Gradients in the creeks appear to be too steep above the valley bottom to support fish populations. The portion of "No-name" Creek east of the highway which was dry in October (Figure 9) may provide fish habitat at other times of the year when flowing. Just upstream of the highway crossing of "No-name" Creek, old beaver ponds extend beyond the rail line creating pools apparently several feet deep. These pools offer overwintering habitat for fish. Kaiser personnel reported the occurrence of eastern brook trout in these ponds in November, 1975.

"No-name" Creek east of the highway does not appear to offer substantial habitat for Elk River fish stocks, and probably contains resident fish only. Intermittent flows and man made obstructions such as the railroad bed may prevent upstream fish movement from the Elk River by spawning adults and may block downstream movement of fry or young. The portion of the creek below the highway crossing appears to be more important as a spawning and rearing area for the Elk River fish populations.

Aquatic invertebrates

The flowing portion of "No-name" Creek below site KC was clear and the stream bottom was composed of cobbles and boulders up to 30 cm in diameter. Inspection of the rocks indicated aquatic macroinvertebrates were numerous and consisted mainly of mayflies (Ephemeroptera), stoneflies (Plecoptera) and caddisflies (Trichoptera). All of these insect groups are important fish food organisms.

TERRESTRIAL RESOURCES

Soil

Soils information in the study area is limited to the valley bottoms (3). The four map units, Crowsnest sandy loam, Michel sandy loam, Sparwood sandy loam and Wigwam Complex, are shown in Figure 15. The first three have developed on old river terraces and are gravels capped by a thin veneer of fine material. The last has developed on alluvial fans. The entire valley bottom is composed of gravelly textured surficial materials. Consequently the soils are well-drained. The well-drained surface soil is responsible for summer moisture deficiencies and a reduction in capability for forestry and agriculture, (see below, Land Use Capability). This porous material would have considerable groundwater movement and accounts for the intermittent nature of "No-name" Creek. There are areas, especially near the Elk River, where the water table is near the surface.

Crowsnest Sandy Loam

This soil has developed along the bank of the Elk River and varies in height from a few feet to 10 feet or more above the average river level. The topography is undulating caused by meander scars left from previous river channels. The soil profile consists of a thin organic horizon overlying a slightly weathered calcium layer (pH 7.6) beneath. This fine textured calcium layer overlies gravel and has a thickness which ranges from a few inches to over six feet. This soil is differentiated into second bottoms (Cn_3) which are undulating river deposits above the average freshet level, but subject to exceptionally high water, and first bottoms (Cn_2) which are covered by water annually.

Michel sandy loam

The Michel series has developed on low terraces of the Elk River in a similar fashion to the Crowsnest sandy loam but is older and consequently greater profile development has occurred. Fine textured surface soil averaging 24 inches overlies gravel. The soil is classified as a Eutric Brunisol (Brown wooded).

Sparwood sandy loam

This series has developed on the higher and older terraces in the Elk River valley and also consists of a thin surface covering of fine texture overlying sands and gravels derived from calcareous till material. The fine textured surface soil is from 12 to 16 inches thick and is well-to-excessively drained.

Wigwam soil complex

This soil complex has developed on alluvial fans of side streams entering the Elk River valley. These fans radiate from the stream mouths and are usually gently sloping. The texture of fan material is variable but often contains excessively stony material on the upper third, sandy loam to loam in the middle. The lower portion of the fan may be stone-free and is composed of either loam, silt loam, clay loam or clay materials.

The variation in texture and age of this complex has given rise to several stages of soil profile development.

Unmapped areas

The unmapped upland soils were not studied but appear to be derived from glacial till parent material. Considerable variation in soil depth, texture and horizon development is expected.

Vegetation

The vegetation of the study area occurs in two biogeoclimatic zones (7). The valley bottom lies in the wetter subzone of the Interior Douglas fir zone and the ridge top occurs in the Engelmann spruce subalpine fir zone. These two zones merge together at approximately the 4,300 ft level.

Plant communities in the valley bottom have been influenced by past and present activity. Logging activity has occurred and second growth covers much of this area. Recent logging has taken place near the proposed plant site (Figure 4). Grazing by domestic livestock may also have had an influence on these communities and several areas remain in pasture.

Forested valley bottom plant communities are dominated by lodgepole pine (Pinus contorta), although white spruce (Picea glauca) and trembling aspen (Populus tremuloides) occur frequently and cottonwood (Populus balsamifera) align many of the stream banks. Red-osier dogwood (Cornus stolonifera) is an important winter wildlife browse species and occurs frequently in the understory of several limited areas.

Above 3,500 ft, Engelmann spruce* (Picea engelmannii) forms a dominant component of the overstory vegetation. Lodgepole pine communities, indicating past fire activity, are also evident. In addition, there are several steep south westerly facing slopes which are covered by a shrub and grass vegetation component. At the higher elevations of Hosmer Ridge, plant communities are dominated by Engelmann spruce and

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* White spruce (Picea glauca) which occurs at lower elevations and Engelmann spruce (Picea engelmannii) which occurs at higher elevations frequently hydridize in this area. C.L.I. has chosen to call all spruce in this area, Engelmann spruce. For the purpose of this report the 3,500 ft contour will arbitrarily divide Engelmann spruce from White spruce.

subalpine fir (Abies lasiocarpa) with an understory of white rhododendron (Rhododendron albiflorum), false azalea (Menzeisii ferruginea) and grouseberry (Vaccinium scoparium).

Wildlife

Mammals

Ungulates

Ungulates found in the Hosmer area are elk (Cervus elephus nelsoni), moose (Alces alces andersoni), mule deer (Odocoileus hemionus hemionus) and white-tailed deer (Odocoileus virginianus ochrourus). Hosmer Ridge does not represent habitat for mountain goat (Oreamnos americanus). The status of bighorn sheep (Ovis canadensis canadensis) in the area is not clear.

Ungulate ranges in the Elk River valley have been rated by the Canada Land Inventory and by the B. C. Fish and Wildlife Branch (8) (Figure 16). Major winter ranges for moose, elk and deer are found in the upper Elk River Valley, Michele Creek Valley, Natal Ridge and on slopes above the Elk River Valley.

The only winter range which partially coincides with the development area is found on the west facing slopes on the east side of the Elk River Valley, just north of Hosmer (Figure 16). This range is rated by the C.L.I. as Class 3W: important winter range for elk with limitations due to snow depth and inadequate soil depth. This corresponds to the fire formed elk and mule deer winter range as defined by Demarchi (8) which is in map unit 4B (Appendix C).

This winter range lies on the lower, often open slopes and benches which support a good understory of deciduous shrubs and grasses, under a canopy of aspen or mixed forest. Willow shrubs (Salix sp.) and red-osier dogwood (Cornus stolonifera) were heavily browsed along the open slopes near "No-name" Creek. Elk and deer tracks were frequently found during a visit to the site in late October. A group of approximately 12 elk were reported using the open hillside shown in Figure 4 by Kaiser personnel in January, 1976. Sightings of elk were frequent during this period.

Summer range for ungulates extends throughout the study area. The valley bottom of the Elk River in the Hosmer area is rated by the C.L.I. as Class 3: lands with slight limitations to the production of deer and elk with limitations due to snow depth. Riparian edge along the Elk River and creeks and deciduous and mixed forests of the valley bottom provide summer range for deer and elk, and some potential for moose. Willow and red-osier dogwood provide good browse for moose along small drainages such as No-name Creek. Tracks of a cow moose and calf were seen on the flatlands during field reconnaissance.

Competition with domestic livestock in the flatlands of the development area may have resulted in a reduction of the capability of this area as ungulate range. Numbers of elk, moose and deer have been killed along the railway tracks in previous winters (9).

The lower elevation slopes are classified by Demarchi (8) as map units 2, 3 and 4 (Appendix C), representing less productive summer ranges, except where forest fires have led to improvements in range conditions, such as the area north of Hosmer (Figure 16).

The higher elevations of Fernie, Hosmer and Sparwood ridges and the west facing slopes on the east side of the Elk River valley are rated by the C.L.I. as a complex Class $4^{7}/3^{3}$: 70% moderate limitations and 30% slight limitations to the production of elk, moose and deer with limitations due to snow depth and severe climate. The Class 3 lands in this complex would be found on the high alpine slopes and on south facing aspects along the hillsides. The latter are open forested slopes with a good shrub layer and cover of grasses. The Class 4 lands consist of lodgepole pine and Engelmann spruce forests on hillsides with a less favourable aspect and a less well developed shrub understory. The high elevation ridge tops are classified by Demarchi (8) as map units 1B, 1C and 1D (Appendix C). The most productive of these is map unit 1B which occurs on high scree slopes on ridge tops in the area, including Hosmer ridge (Figure 16). Map unit 1B is rated as being excellent summer range and represents potential bighorn sheep habitat although the area is not rated for sheep by the C.L.I.

Carnivorous and furbearing mammals

A large number of carnivorous and furbearing mammals are possible in the study area, although the status of most species is not known. Black bears (Ursus americanus cinnamomum) appear to frequent the area. Several recent sets of tracks were seen on the open hillside above the proposed plant site (Figure 4). The flatlands and hillsides offer good habitat for black bears.

Grizzly bears (Ursus arctos) inhabit primarily high elevation alpine meadows which are limited in the Hosmer ridge area. The status of Grizzly bears in the Hosmer-Wheeler area is not known.

Coyote (Canis latrans lestis) tracks were frequently seen on the flatlands during the field reconnaissance.

Beaver (Castor canadensis leucodontus) activity is evident along back-water areas of the Elk River, but not within the mine development area.

Other carnivorous furbearing mammals* which may occur in the Hosmer area include:

red squirrel	Tamiasciurus hudsonicus richardsoni
muskrat	Ondatra zibethica osoyoosensis
wolf	Canis lupus columbianus
marten	Martes americana abietinoides
ermine	Mustela erminea invicta
long-tailed weasel	Mustela frenata oribasus
mink	Mustela vision energumenos
wolverine	Gulo gulo luscus
river otter	Lutra canadensis evexa
cougar	Felis concolor missoulensis
bobcat	Lynx rufus pallescens
lynx	Lynx lynx canadensis

*From range maps found in Cowan and Guiguet (10).

The area also represents habitat for a variety of small mammals, including shrews and voles, bats, rabbits, hares, and rodents. These animals are important food sources for predatory species.

Birds

The entire development area, including the Elk River valley is classified for waterfowl production by the C.L.I. as Class 7: lands with such severe limitations that almost no waterfowl are produced. Limitations are due to adverse topography, and above 6000 ft, to adverse climate. The Elk River and its back water areas represent some limited potential for ducks.

The valley bottom with its mixed forest stands and riparian edge along creek bottoms represents good habitat for ruffed grouse. Several individual birds and one group of three birds were seen during the field reconnaissance. Habitat for blue grouse and spruce grouse is found in the lodgepole pine and Engelmann spurce forests along the slopes. The higher elevation alpine areas of Hosmer ridge are also good habitat for the blue grouse in the summer.

A large number of other bird species is possible for the Hosmer area, either as breeding birds or as migrants. These include hawks and owls, woodpeckers, and songbirds. The status of these species in the area is not known.

HUMAN USE

Present Land Use

Canada Land Inventory present land use maps

Present land use mapping by the C.L.I. (Figure 17) indicates that the valley bottom of the Elk River in the development area is primarily immature productive woodland (T2). There are also several pockets of the cropland-pasture complex (P_1: 75.0 - 94.9% improved pasture and forage crops) and unimproved pasture and rangeland (K) in the flatlands of the development area. The hillsides and slopes up to high elevations are primarily immature productive woodland (T2) with pockets of non-productive woodland on a productive site (U_1) and small areas of non-productive woodland on a non-productive site (U_2) such as the open hillside in Figure 4.

The summit of Hosmer Ridge is classified as a mixture of mature (T_1) and immature productive (T_2) woodland and non-productive woodland on a non-productive site (U_2). A large expanse of mature productive woodland (T_1) is found on the higher elevations north of Hosmer Ridge.

Recreation

Provincial park

The Elk Valley Park is a Class "A" provincial park on the flatlands to the west of the development area. This park receives considerable use during the tourist season as a picnic site. The Regional District of East Kootenay has proposed to take over this park as a regional park. Future development of this park would then be controlled by the Regional District.

Hunting and guiding

The alpine areas, ridge tops and forested hillsides of the Hosmer-Wheeler area provide excellent opportunities for hunting of elk. Deer and moose are also hunted. Upland game species especially ruffed grouse which frequent the valley bottom and creek drainages, are also hunted. The lands in the area are owned by Crows Nest Industries which has an open access policy on its lands. This allows hunters to use the area of the proposed development. The extent of recreational hunting activity at present is restricted by exploration activities, and perhaps by domestic livestock use of the valley bottom. The general area has not been assigned to a licensed guide by the B. C. Fish and Wildlife Branch.

Angling

The only stream in the development area with any potential for angling is "No-name" Creek. As discussed previously, the lower reaches of this stream contain eastern brook trout and possibly other salmonids. The creek is not heavily fished by local residents, except near the highway crossing. In general, angling intensity in the development area is low.

Trapping

The development area has not been assigned as part of a Registered Trapline (RTL) by the B. C. Fish and Wildlife Branch. Crows Nest Industries allows trapping to a designated individual by permit. Trapping activity is concentrated in the valley bottom. Species taken include coyote, lynx and marten. Individuals with permits to trap on private lands are not obliged to file fur returns with Fish and Wildlife Branch officials.

Land Use Capability

Forestry capability

The valley bottom areas have forestry capability of Class 3 (71 - 90 cu ft/ac/yr) and Class 4 (51 - 70 cu ft/ac/yr) with lodgepole pine as the indicator species (Figure 18). Low soil moisture limits lodgepole pine from greater yields. Portions of the valley bottom west of the highway and alongside the Elk River have Class 2 capability for Engelmann spruce. Here, low soil moisture and excessive lime levels are the limiting factor.

Between the valley bottom (3,500 ft) and the 5,000 ft level, 70% of the land is Class 2 (91 - 110 cu ft/ac/yr) for Engelmann spruce and is limited by a combination of soil factors. The remaining 30% is either Class 3 (71 - 90 cu ft/ac/yr) or Class 5 (31 - 50 cu ft/ac/yr) for lodgepole pine with soil moisture deficiencies and restricted rooting depth limiting growth.

Above 5,000 ft, indicator species are Engelmann spruce, subalpine fir and lodgepole pine and forestry capability is generally reduced (Class 5 to 7) due to short growing season, adverse climate, restricted rooting depth and soil moisture deficiency. Small pockets of Class 2 forestry capability for Engelmann spruce exist near the 5,000 ft level.

Agricultural capability

The highest agricultural capability occurs on the valley bottom in lands below 3,700 ft elevation (Figure 19). Above this elevation, the capability for agriculture is reduced, and consists of lands of no productivity or suitable for natural grazing (Class 6 and 7).

The entire valley bottom lies in an Agricultural Land Reserve (ALR) and includes lands ranging from Class 3 to Class 6 in an unimproved condition, and Class 2 to Class 5 with irrigation. These capability classes represent suitability for a reduced range of crops which are limited largely by mositure deficiency, although excess water and stoniness limit capability in some areas. Increased slopes become important limiting factors at the valley edges.

Recreation capability

The valley bottom of the Elk River valley has been rated by the C.L.I. as having a moderate capability for outdoor recreation in an upland unit, with features described for viewing, angling and upland wildlife. The hillsides and slopes are rated as having a low capability for recreation in an upland unit, with features described for topographic patterns, significant vegetation, and upland wildlife. The ridge tops of Hosmer ridge are rated as having a moderately low capability for recreation in an upland unit, with features described for significatn vegetation, viewing, and upland wildlife.

Historic and Archaeological Sites

There are no specific historic or archaeological sites known to exist in the proposed plant site area. There are, however, a total of 89 known sites in the Elk River drainage. The distribution of these sites would suggest that a potential for discovery of unknown heritage resources does exist.

AIR QUALITY

No air quality information exists for areas near the Hosmer-Wheeler development site. Air quality data does exist near active mines for the Michel-Natal-sparwood-Elkview area (Appendix D). These data cannot be used to evaluate background air quality for the Hosmer-Wheeler area because there was no monitoring of undisturbed air quality prior to mining activities and because the existing monitoring network, with the possible exception of the Sparwood Station, does not include sites in the area of the proposed development.

EXISTING SOCIAL ENVIRONMENT

A number of studies known collectively as the Canada-British Columbia Interim Planning Agreement (IPA) Studies have been undertaken so as to consider alternative federal-provincial social economic strategies in the Kootenay region of British Columbia. The report of the IPA studies has not yet been completed, but considerable background information on the existing social environment has been made available for the purposes of this present study. In general, the information is comprehensive and it has therefore been included in its entirety as Appendix E. It covers: demographic characteristics of the resident population, a detailed analysis of the labour force and its income; a summary of School District enrollment statistics and current plans to meet local educational requirements; health service information regarding hospital capacity and utilization, physicians, dentists and mental health admissions; a field count of selected retail and service outlets and a discussion of trends in the commercial sector, a review of local recreation facilities and programs; and engineering assessment of community water and sewage systems including a projection of costs and financing for various population bases.

For the most part, the data pertains to Fernie and Sparwood, and to the regional centre of commerce - Cranbrook. The results of a housing study by a consultant to the IPA group will also be made available for subsequent studies. That particular study reportedly covers a number of important aspects of the present housing market as well as construction and land costs.

Supplementary housing information from three other sources has also been appended (Appendix F). An updated inventory of the housing stock in the Fernie area has been provided by the City. A statement regarding the need for rental accommodation in Sparwood has been extracted from an overview of current housing needs prepared by the District of Sparwood. Extracts

from an unpublished draft report prepared by McCarter, Nairne and Partners Ltd. on behalf of Kaiser Resources Ltd. are also included (Appendix F). They cover detailed inventories of housing and commercial/institutional facilities in Sparwood.

Appendix G consists of labour force statistics which tend to amplify and update those developed for the IPA studies. They detail recent trends in regional employment and they forecast population and labour force requirements for both Fernie and Sparwood up to 1980. It is interesting to note that the effective rate of growth forecast is in close agreement with that used in the forecast of school enrollments (ie., 47% compounded annually).

IMPACT ASSESSMENT

MINING AND PROCESSING ALTERNATIVES

This impact assessment is based upon current mine design which may be altered as feasibility studies continue. However, the constraints imposed upon the mine and mine facilities by the location of the present rail line and the coal reserves suggest that if any alternatives should occur, they will be of a moderate nature. Thus, the plant site and its related facilities will be restricted to the valley bottom somewhere near its present proposed alignment (Figure 2).

On the basis of current mine plans, the effects of the proposed development have been summarized in a matrix of potential environmental impact and restoration feasibility (Table 10) and a socio-economic locational impact matrix (Table 12). Detailed discussion of impact follows.

ENVIRONMENTAL IMPACTS

Aquatic Impacts

Water quality

The major impacts on water quality in the Hosmer-Wheeler area will occur as a result of mine construction and operation, but the overall effect of these activities on water quality is expected to be low. Exploration activities are concentrated at high elevations near the headwaters of some of the drainages and appear to have had negligible effects on overall water quality.

During the construction phase of the mine, some contamination of surface waters may occur. Sedimentation in "No-name" Creek may occur primarily as a result of road building and heavy equipment use, but these problems can be avoided by proper road building techniques and by avoiding the creation of erodable and unstable surfaces.

During operation of the mine, water quality problems may be associated with the tailings pond and transportation facilities. In the coal treatment process a flotation circuit is included which uses methylisobutylcarbonol and kerosene as flotation reagents. These chemicals have a very high affinity for coal particles and it should not be possible to detect any significant amount of either chemical in the process water. Some of the reagent will end up in the tailings pond adsorbed on fine coal and waste particles, while the bulk of the reagents will remain with the clean coal product.

To assist the precipitation of the small particles in the refuse thickener, Nalco depressants and flocculants will be used to settle the non-ionic particles (coal) and the ionic species such as clay. These reagents will remain with the precipitated materials and also end up in the tailings pond.

In the preparation plant, all process effluents end up in the refuse thickener and in the refuse sump. In the thickener, the bulk of the water is separated for reuse in the plant while approximately 1500 gpm will flow with the tailings into the tailings pond.

Although it is anticipated that some water will be decanted from the tailings pond for reuse in the plant, some contamination of subsurface water may result from seepage losses that eventually may end up in "No-name" Creek and in the Elk River.

At present the quality of subsurface water samples obtained from under the tailings pond of the Elkview plant at Sparwood (Table 11) are better than that required by the most stringent of government regulations, indicating that subsurface contamination should not be a major problem.

The June samples shown in Table 11 coincided with the period of maximum runoff and it could be expected that due to high volume of runoff water, dilution effects would significantly lower the dissolved metal values in the subsurface waters. Such is not the case, which suggests that significant quantities of dissolved metals occur naturally in the subsurface waters and that any contribution from the coal mining operation is relatively insignificant when compared with naturally occurring variations.

In addition, the very low sulfur content of the coal plus waste (0.3-0.4%) and the high pH values of the water make it extremely unlikely that any biological acid production will take place in the tailings pond. The pH of the subsurface waters under the existing tailings pond at the Elkview plant varied from 7.2 to 8.0 during 1974 and the pH of the tailings pond supernatant between 7.8 and 8.3.

Contamination of surface waters is not likely to occur as a result of coal processing. The only source of possible contaminants will be from surface runoff in the plant area where fuel or other chemical spillage may occur. Surface drainages at the plant site are being designed to collect surface run-off and divert it to the tailings pond (see "Process Description"). Accidental contamination of creeks by deposition of materials at creek crossings is possible during transport of coal and other materials.

Fisheries

Road crossings of "No-name" Creek and the water intake on the Elk River represent the only potential disturbance to fish habitat, if construction is limited to the areas outlined in this study. The water intake system will have to be designed to prevent damage to fish resources and with reference to present government regulations (Appendix H). Both the tailings pond and coarse waste pile lie adjacent to a region of

"No-name" Creek containing a potential spawning ground, and care will be required to preserve the quality of this section of the creek.

Terrestrial Impacts

Soils

The extent of soil disturbance will govern the overall magnitude of impact on many of the terrestrial and land use components. Disturbance to soils derived from alluvial terrace material (Crowsnest sandy loam, Michel sandy loam and Sparwood sandy loam) is especially critical. These soils have a surface capping of fine textured material overlying old river gravels and the value of these soils for both forestry and agriculture depends upon the maintenance of this surface material. Therefore, to retain the productivity of these soils it will be important to keep disturbance to a minimum. Should disturbance be unavoidable, surface soil material should be saved, stockpiled and replaced during reclamation.

The Wigwam soil complex has developed on alluvial fan material and does not exhibit the vertical stratification typical of the alluvial terrace material. Texture differences may vary considerably. Wigwam soil is valuable for forestry and agriculture, and the surface soil should be retained whenever possible for its nutritive properties alone.

The unmapped soils all occur on upland areas and are predominantly derived from glacial till. Disturbance to the soil mantle, although not as important as the alluvial terrace soils, will nevertheless reduce productivity in these areas. The proposed valley bottom developments (tailings areas, railway loop, fresh water line and a portion of the plant site) occur in roughly

equal proportions on both alluvial terrace and alluvial fan soils (Figure 15). The majority of the plant site, portal area and upland developments (roads, pumps, substation, water tanks and ventilation shaft) all occur on unmapped soil areas.

Vegetation

The status of unique species or plant communities in the Hosmer area is unknown; however, there is little likelihood that unique vegetation exists.

Mammals

The proposed valley bottom developments will be constructed on and near areas classified as elk and deer winter range (Figure 16). The developments will directly affect range through habitat removal and indirectly affect elk and deer through habitat alienation. The effect on winter ungulate range will be determined by the degree to which the present range is utilized. Most of the disturbance could be revegetated relatively easily providing a replacement of winter food. Nevertheless, continual mining activity may prevent its utilization.

A program of range improvement in the area surrounding the development may offset some of these potentially adverse effects. Methods to improve quality of the range could include patch logging, burning, slashing, and perhaps fertilization or planting. Programs could be designed with the co-operation of the B.C. Fish and Wildlife Branch and supervised by that agency.

Summer range for elk, moose and deer will be affected near the valley bottom and along Hosmer Ridge. The developments affecting summer range do not cover a large surface area. They include the road network, fan sites, and pump station, and portions of the plant site development in the valley bottom. Summer range is usually not of critical concern and the potential impact on elk, moose and deer through summer range disturbance is expected to be low.

Carnivores and furbearers may be affected in the valley bottom but the overall magnitude of this effect is presumed to be low.

Birds

Although the entire area is rated as unproductive waterfowl habitat, there is a small pond upstream of the highway crossing of

the railway loop affect this area, the loss of habitat would be minor.

Upland game bird habitat will be affected primarily by the extensive development in the valley bottom where good habitat for ruffed grouse exists. The less extensive development in the slopes and ridge areas are not expected to affect upland game species.

The status of rare or endangered birds is unknown for the Hosmer area.

Impact on Present Land Use

Canada land inventory classification

The C.L.I. classification parameters have been marked in order of decreasing value in the impact matrix (Table 10). Values in the Hosmer-Wheeler area range from cropland-pasture complex to swamp. None of these uses represent high values in terms of agriculture or forestry.

The valley bottom development will be the most extensive and will effect land used for cattle grazing in the cropland-pasture complex and open grassland categories, and immature productive woodland (Figure 17). This present land use is below its capability for either forestry or agriculture and the restoration of disturbance to these present land uses following mine closure will be a realistic objective.

The upland developments will be less extensive, will affect woodland categories and are expected to have little impact.

Recreation

Although not directly affected, there is a Class A provincial park close to the development area. This area receives considerable use during the tourist season as a picnic site and development near here may lessen its park qualities.

The exploration road provides access to Hosmer Ridge and consequently may increase hunting activity. Although Crows Nest Industries has an open access policy on its lands, hunting is prohibited in the areas of active exploration. Once the mine development occurs, hunting activity will likely be curtailed for reasons of safety.

The only effect on angling activity would be through disruption of the lower reaches of No-name Creek. Should this occur, the overall impact on angling would be low.

Guiding

As this area has not been assigned to a licensed guide, there will be no impact on current guiding activity.

Trapping

The development will affect the trapping activity of one individual but to what extent is presently unknown, since no trapping records exist.

Impact on Land Use Capability

Forestry capability

Areas of high forestry capability (Class 1-2) will be affected by exploration roads, the mine portal and waste rock, pump station and water tanks, plant site, water line, tailings pond and coarse tailings dump (Figure 18). The high forest values on the valley floor are there by virtue of the thin capping of fine textured soils overlying the coarse alluvial deposits. The restoration feasibility of these areas depends upon this fine textured material being retained.

The largest proportion of disturbance will take place on lands classified as having Medium (Class 3-4) forest capability (Figure 18).

Agricultural capability

Many of the valley bottom developments will occur in areas designated as occurring within the Agriculture Land Reserve (Figure 19). As in forestry capability ratings, the reasons for the high agricultural land values are the relatively flat topography and the thin mantle of fine textured material overlying the coarse textured alluvial gravels. Any major disruption of this thin mantle or alteration of the flat topography will make difficult the restoration of this land to the original agricultural values.

Areas above the valley bottom are of little agricultural value.

Recreation capability

The valley bottom development will affect areas that have a moderate capability for outdoor recreation with features described for viewing, angling and upland wildlife. The overall magnitude of this effect is expected to be low.

Historic and Archaeological Sites

Although no known sites exist in the proposed development area, a potential for discovering archaeological sites exists.

Noise

The background noise levels are discontinuous and are restricted to railway and highway traffic. At present, the expected noise levels caused by mine construction and operation are unknown. It is possible that elevated noise levels could be a source of irritation to the village of Hosmer or possibly the picnic site area.

Maximum sound attenuation can be obtained by retaining as much of the forest as possible between the plant site and the park or Hosmer village.

It is not expected that noise factors at the plant site will alienate elk and deer winter range area nearby.

Air Quality

Existing information is insufficient to determine the magnitude of impact of the proposed hydraulic operation on air quality. The impact will depend on the number of air emission sources, local weather patterns and proximity to population centers. Compared to the present mining and processing facilities near Sparwood, the Hosmer-Wheeler development will have fewer emission sources. Hydraulic mining methods and nearby plant facilities proposed for Hosmer-Wheeler eliminate open pit excavation and coal transportation to the plant as sources of contaminants. The remaining sources will be the coal dryer, land surface and coarse waste contouring, traffic and load out procedures.

The areas most snesitive to air quality deterioration as a result of the Hosmer-Wheeler project are residences close to the development (Hosmer and north of the plant site) and the provincial park just across from the proposed plant site.

The Company must comply with existing air quality standards in accordance with Pollution Control Branch objectives.

Aesthetic Impact

Although no detailed study of aesthetic impact was conducted for the Hosmer development, it is likely that the proposed development will have a moderate effect. Highway 3 which runs along the Elk River valley, provides a major transportation artery across British Columbia. Travellers along this route are afforded extensive panoramas of the Rocky Mountains along with the rural setting along the valley bottom.

Visible development at Hosmer will include the preparation plant, tailings dams and rail and road access. The uppermost sections of the facilities will probably be apparent at intervals along a five mile portion of the highway.

Had there been no previous industrial activity in the Elk Valley the aesthetic impact of a new development would be high. However, because of both past and present coal mining exists near the Hosmer area, the relative aesthetic impact should be moderate.

With a judiceous placement of facilities, immediate cosmetic reclamation, and retention of maximum forest barriers between the highway and the development, the aesthetic impact can be minimized.

Socio-economic Impacts

Locational Impact Matrix

A Socio-economic Locational Impact Matrix has been prepared to indicate the presence and importance of impacts during the four basic phases of the project (Table 12). Exploration activities are well underway and the absence of impact indicators in the matrix means that no new or substantial impacts are expected beyond those which would overlap (and be indicated in) the

development phase. Proposal details regarding the size, composition and accommodation of the contractor's workforce have not yet been made and the relative importance of development impacts as indicated by the matrix is therefore subject to further analysis. In general, the operational phase is the most important. Many aspects of this phase have been considered in detail and are discussed in the following section. In many respects, the post operational impacts are the mirror image of the operational impacts. Ideally, the assembled manpower and social infrastructure would be re-deployed for some other purpose (ie., a different economic source base). Major impacts would then become major assets. If viable alternatives were not developed, however, the same imputs would be considered major liabilities. The more obvious solutions are: increase mine life to the maximum feasible extent, delay other developments in the area so that they can be phased in as this mine is phased out, or begin the search for viable alternatives early.

Operation Phase Impacts

Employment

Direct Employment - As previously indicated, full employment should involve about 600 - 800 employees. A representative income for employees at 1976 rates of pay would be $15,000 per year which excludes fringe benefits. A clerical staff increase in Sparwood in addition to those employed at the minesite location is included in the estimate of full employment.

Indirect Employment - Employment multipliers pertaining to the mining industry tend to be large relative to other industries. Mines which produce minerals to be further processed within the province usually involve very large multipliers in the order of 2.0. The multiplier associated with the mining of coal for export would therefore be somewhat less. Regional multipliers also vary with the existing regional economic base. The impact on a well-established diverse economy will tend to be larger (but less visible) than would occur in the case of a smaller, developing economy. Moreover, little is known about the tendency for inappropriate double counting of normal growth and induced growth. With this in mind, a rather conservative estimate is called for. A multiplier of 1.3 - 1.4 would result in about 250 additional jobs. Most would occur in the Fernie-Sparwood area and would probably be distributed in the various support and service industries in the same proportions as now exist. The following distribution would therefore apply.

Education	27
Health and welfare	27
Government	21
Retail	50
Accommodations and food	31
Other commercial services	35
Wholesale and secondary industries	34
Total	225

Although different income levels would apply to each sector, a nominal cross-the-board figure of $9,000/annum is suggested. The balance of jobs - 25 (ie., 10%) would probably accrue to Cranbrook's commercial services sector and would be absorbed in its overall pattern for normal growth.

Population

Under conditions of full employment, the existing and projected population estimates are as follows:

	Sparwood	Fernie	Influx From Project
Existing (1975) population	3,500	5,000	
Alberta transfers	500	-	
Direct employment base			2,500
Indirect employment base			750
Total	4,000	5,000	3,250

Over the next few years, a number of Michel-Harmer employees who presently reside in Fernie are expected to relocate to Sparwood in order to eliminate their 20 mile daily commuting trip. In addition, about half (150) of the Kaiser employees now resident in Alberta are expected to move their families to Sparwood to take advantage of housing subsidies. Some of the new employees assigned to the Hosmer-Wheeler mine would consider Fernie and Sparwood equally convenient. The net result is that while Fernie might experience only negligible or moderate growth, Sparwood would probably bear the major thrust of the population influx. Cranbrook would also experience a minor influx. Other considerations may eventually alter this view but for preliminary planning, the net population addition is associated entirely with Sparwood. At full Hosmer-Wheeler employment the population of Sparwood could potentially reach about twice the present population. Composition of the forecast population is expected to be as follows:

Male	53%	3,840
Female	47%	3,410
0 - 14 years	35%	2,540
15 - 34 years	36%	2,610
35 - 64 years	25%	1,810
65+ years	4%	290

Average size of household	3.0 - 3.3
Non-working women	1,270
Pre-school children	1,380
Elementary school children (5 - 12 years)	1,270
Junior secondary (13-15 years)	425
Senior secondary (16-18 years)	120

Housing development

The mix of housing proposed for new mine employees and their dependents is as follows. The possibility of using a similar mix for other population additions should also be considered:

Rental Accommodation	% of Total Units Required	Est. Price (1975 Dollars)
Single men's camp	(phased out)	-
Single men's permanent quarters	11.80	$195/month
Apartments - studio	2.75	$235 /month
1 bedroom	5.77	$250 /month
2 bedroom	8.13	$270 /month
Mobile home lots	11.40	$ 80 /month
Townhouses - 2 bedroom	6.68	$30,200
3 bedroom	2.23	$31,300
Duplex - 2 bedroom	5.50	$32,900
3 bedroom	6.55	$34,400
Detached houses - 3 bedroom	22.41	$39,500
4 bedroom	14.02	$41,000
Others boarding, etc.	2.75	-
Total	100%	

Income levels for mine employees are relatively high as indicated by the 1975 range of earnings covering hourly rated employees. That is, a representative labourer's annual income was $13,400 and a representative underground journeyman's annual income was $18,400. With a Company housing subsidy in effect, mine employees should have little difficulty arranging their finances. Other would-be homeowners without comparable subsidies may experience financial difficulty.

Services

Education - On the basis of the foregoing projections of school age children, about 20 equivalent teaching units would have to be provided. A new elementary school would probably be required.

Recreation - In view of the substantial requirements for additional housing, a new subdivision(s) would be necessary, and appropriate allowances for neighbourhood parks should be incorporated in subdivision planning. With the increased tax base, the community may also find it can afford to improve/expand its existing recreational facilities. An indoor swimming pool for example would be a most welcome asset to the community.

Commercial Services - Estimating the commercial needs for a community of about 7,500 people can be and has been approached in several different ways (McCarter, Nairne & Partners for Kaiser Resources Ltd.). Different methods tend to result in diverse solutions, however to produce reliable estimates, standard approaches need to be modified by local marketing factors. The proximity of sales-tax free shopping in Alberta and the variety of selection offered by other retail outlets in Fernie and Cranbrook will probably continue to divert some of the local shopping potential from Sparwood retailers. The increase in jobs in the Cranbrook commercial services has previously been noted. As indicated in the following table, however, the potential for growth in Sparwood is considerable, particularly in automotive goods and general merchandise (ie., junior department store, variety store, yard goods, etc.).

	Present Facilities		Facilities for 7,500 Population	
	Retail Floor Area-sq ft	No. of Outlets	Retail Floor Area-sq ft	No of Outlets
Food	23,410	8	33,917	10
General merchandise	-	0	45,478	3
Automotive	3,000	3	42,045	12
Apparel & accessories	8,652	4	12,847	6
Hardware & furnishings	7,929	5	22,547	7
Others	14,390	8	33,636	10
Total	57,381	28	190,470	48

Medical Services - Currently, the capacity of the new Sparwood hospital is planned to be a 27 bed unit. The East Kootenay Regional Hospital District feels that a 35 bed hospital may be necessary. Because the size, the type (the B.C. Hospital Insurance Service has designated five types ranging from Type I - Personal Care to Type 5 - Acute Care), and the timing of hospital construction are matters which need to be co-ordinated on a regional basis, the impact of the Hosmer-Wheeler development alone is but one of several essential data imput. This report's principal contribution to the planning process must therefore be limited to the preceding outline of resultant demographics.

Other Services - To come as part of 2nd stage studies.

Community land

As indicated in Sparwood's "Municipal Housing Study Guide" - September, 1975, residential expansion should be directed toward the 200 acre areas immediately east of Highway 3. The property is owned by Crows Nest Industries but is under contractual usage by Kaiser Resources Ltd. Subsequent development could also take place in expansion areas to the

north and north-west of the present townsite.

Community infrastructure

The water supply and sewerage systems are basically designed to accommodate a resident population of about 6,000. Only relatively minor modifications would be required to increase the present capacities to that level. To serve a community of 7,500, however, some fairly extensive modifications might be required. For example, a second sewage treatment plant may be necessary.

Regional infrastructure

To come as part of Stage 2 studies.

Social adjustment considerations

In view of the anticipated growth of the coal mining industry in North America and other major projects such as the Syncrude development, a widespread shortage of qualified manpower for the mining industry is expected within the next few years. Shortages are expected in the managerial and salaried contingent as well as the hourly paid labour force. The number of available certified underground facemen will be particularly acute. To meet the demand, the Company will be required to extend current training programs and to possibly recruit qualified personnel from other countries.

A new 56 week program has been established whereby men with a minimum of grade 8 educational background can undertake survival course instruction and tests, obtain their

provisional certificate (after 6 months), work at the coal face for an additional 6 months, and finally obtain their certification from the Provincial Superintendent of Mines. About 50 men per year can be trained on an on-going basis. The two-year high school (grade 11 and grade 12) mining work study program should also be providing about 25 trained staff per year.

Overseas recruitment of coal miners may account for about 1/3 of the total. The ratio of Canadians trained to skilled foreigners recruited, (ie. 2:1) would conform to the guidelines established by Canada Manpower and Immigration. About 1/5 of the maintenance tradesmen would probably also be supplied from overseas. General labour, plant operators and supervision would not involve overseas recruitment.

Labour turnover is traditionally very high during the initial period of a mine start-up. This is primarily due to the isolation and lack of permanent accommodation and community facilities. The Hosmer-Wheeler mine should present more stable circumstances, however, and the estimated turnover rate is in the order of 60% - 70%. The 1975 overall turnover rate at existing Kaiser operations was 27%.

Initially, employment may involve a relatively high proportion of single men. Above average turnover, differing social values, and problems related to social instability can therefore be expected. As the "married" proportion of employees increases, these problems will tend to diminish.

Recent experiences related to the immigration of British miners and their families is very encouraging. Evidently, integration within the community has proceeded without incident.

Economic assessment

The information in Table 13 is presented to assist the Province in its benefit-cost analysis of the proposal. The estimates are preliminary and serve only as indicators of the general scale of the development proposed. In many cases a cost factor from one point of view but may be considered a benefit from another point of view.

On-site capital investment by the company is a typical case. Normally an investor would consider a capital investment to be a cost factor. To a government trying to encourage capital formation, the same investment would be considered a benefit. One may also wish to distinguish between that portion of the investment which was spent on provincially produced supplies and services as opposed to that which "leaks" from the economy on the "first round" of spending. If a portion of the investment involves items such as land acquisition, that portion is only a transfer payment rather than a more meaningful "value added" component. Hidden costs such as lost opportunities for alternative land uses or timing of resource extraction might also be considered. With this in mind, the factors presented may well have to be reallocated and/or modified to suit the accounting process.

RECOMMENDATIONS FOR FURTHER STUDY

This report was designed to meet the Stage I requirements as outlined in the draft of "Guidelines for Coal Development", Environment and Land Use Committee. In order to comply with Stage II requirements an additional program of studies is proposed. Many of these studies are ongoing and were initiated during the Stage I program.

Kaiser Resources Ltd. has operated underground hydraulic, conventional underground and open pit mines in the East Kootenays since 1969 and has developed considerable environmental expertise especially in their land reclamation and environmental monitoring programs. Reclamation studies which would normally be undertaken by B.C. Research would be duplicate previous Kaiser experience and are unwarranted. Because of Kaiser's experience in establishing air and water quality monitoring stations for its current operations in the Sparwood area, it is proposed that B.C. Research will provide limited input towards the monitoring at the proposed development area. The B.C. Research input will consist of a liaison with Kaiser Coal Canada Ltd. on monitoring site selection and air and water analysis and in preparation of a detailed impact assessment.

Meteorological Data

The collection of additional meteorological data at a station to be erected near the proposed development area is necessary.

Wind velocity and direction data from this station would, in conjunction with data from the existing station at Sparwood, provide a sufficient background for interpreting air quality data.

Aquatic Resources

Continuous monitoring by Kaiser Coal Canada Ltd. of water quality in surface drainages including the Elk River should be continued on a monthly basis with periodic cross-analyses by B.C. Research.

In addition, wells should be constructed to collect seepage from the proposed tailings pond area. Subsurface water quality in these wells should be monitored on a regular basis prior to construction of the tailings ponds.

Further studies will be required to design, locate and construct the water intake system on the Elk River in order to minimize the impact on existing fisheries.

Terrestrial Resources

Soils

Sufficient soils data exists in the valley bottom, however, soils data in the upland areas are lacking. Soils in the plant site area, as well as in the upland developments should be described and mapped.

Vegetation

Existing plant communities in the study area should be described, quantified, and mapped. Particular attention should be given to the existence of unique species and plant communities.

Wildlife

The distribution and abundance of wildlife including ungulates, carnivorous and furbearing mammals, and birds should be documented. Quantitative information on habitat use by ungulates should be made from pellet plot studies, browse surveys and direct observation. Winter range in the area should receive particular attention. The use and capabilities of this range should be documented through a winter field program including aerial and ground surveys. Monitoring of ungulate use of this winter range should be initiated as soon as possible.

Human Use

Present land use

With the exception of some aspects of recreation and trapping, the existing information adequately describes the present land use in this area. Additional information is required on the Provincial Park in terms of its use, any planned expansion or any alternate picnic sites should the park be affected by development. Additional information should be obtained on trapping in the area. The Company should investigate the possibility of providing guided tours of the proposed operation.

Land use capability

Existing data adequately describes the land use capability in the proposed development area.

Historic and archaeological sites

As it appears that there is a potential for unknown archaeological sites in the proposed development area, the Archaeological Sites Advisory Board should be contacted regarding further study requirements.

Noise

A detailed evaluation should be undertaken to assess all aspects of the expected noise levels. The degree of sound attenuation at various locations should be evaluated with respect to aesthetics.

Air Quality

To provide adequate background data for later assessment of the Hosmer-Wheeler operations impact on air quality it is considered that the following 1-year program would be adequate:

Dustfall sampling at four locations between Hosmer and a point approximately 5 miles north-northeast of Hosmer. Monthly average samples.

High volume air sampling for suspended particulate at three locations in the same area as under (A) above. Ten days of sampling during spring, summer, fall and winter for a total of 40 days.

Sulfation plate exposure at the same locations as under (B) above. (Monthly averages.)

Analysis of data from the proposed field sampling and from existing monitoring networks.

Socio-economic and Community Assessment

The identification of impacts has not been detailed uniformly, and further study is recommended as follows:

Fill apparent data gaps related to the existing environment. This should be done mainly in the light of the recent IPA studies. Where possible, future changes due to other proposed mining developments should be included.

Provide information and identify socio-economic impacts related to the construction phase of this project.

Update the employment estimates covering the operational phase and if necessary revise projected data concerning population, housing services, infrastructure, etc.

Examine alternative community development proposals which may arise in response to this report.

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TABLE 1

ALTERNATE PLANS WITH CAPITAL AND OPERATING COSTS

	Average clean coal production Million long tons per year	Life of mine based on proven reserves	Possible working schedule	Manpower	Mine capital costs Million $	Plant capital costs Million $	Total capital costs Million $ **
A	1.7	10	3 shifts/ day, 5 days/week	397	65.6	85.0	150.6
B	2.1	8	4 shifts/ day, 5 days/week	461	65.6	90.0	155.6
C	1.96	10	4 shifts/ day, 7 days/week	585	59.7	85.0	143.7

* Further exploration during 1975 was undertaken to improve the reserve status to the 20-25 year level.

** Does not include preproduction interest costs.

TABLE 2

MANPOWER REQUIREMENT
HOURLY

Description	Year																
	1	2	3	4	4 6 Mos.	5	6	7	8	9	10	11	12	13	14	15	16
	DEVELOPMENT				OPERATING												
Monitor Operators	-	-	-	-	16	16	20	20	20	20	20	24	24	24	16	16	16
Pull Back Men	-	-	-	-	32	32	36	36	36	36	36	40	40	40	32	32	32
C. M. Operators	-	16	16	24	40	40	40	40	40	40	40	40	40	24	16	16	-
Facemen	-	32	32	48	80	80	80	80	80	80	80	80	80	48	32	32	-
C. M. Mechanics	-	8	8	12	20	20	20	20	20	20	20	20	20	12	8	8	-
Dintheader Operators	-	-	8	8	8	8	8	8	8	8	8	8	8	8	8	8	-
Facemen	-	-	16	16	16	16	16	16	16	16	16	16	16	16	16	16	-
Timbermen	-	-	4	4	21	21	21	21	21	21	21	21	21	21	21	16	-
Bratticemen	-	3	6	6	10	10	10	10	10	10	10	10	10	10	10	8	6
Mechanics	-	3	3	3	9	9	9	9	9	9	9	9	9	9	9	6	4
Electricians	-	4	4	4	10	10	10	10	10	10	10	10	10	10	10	8	4
Supplymen	-	4	16	16	32	32	32	32	32	32	32	32	32	32	32	20	10
Miners	-	4	16	16	24	24	24	24	24	24	24	24	24	24	24	16	13
Monitor Pump Operators	-	-	-	-	4	4	4	4	4	4	4	4	4	4	4	4	4
Crushing & Scalping Screen	-	-	-	-	4	4	4	4	4	4	4	4	4	4	4	4	4
TOTAL	-	74	128	157	326	326	334	334	334	334	334	342	342	286	242	210	93

Figures indicate persons required at work on a daily basis. Absenteeism AWOL not included.
Number of men required for employment should be based on 7 days.

TABLE 3

MANPOWER REQUIREMENT
SUPERVISION

Description	Year 1	2	3	4 6 Mos.	4 6 Mos.	5	6	7	8	9	10	11	12	13	14	15	16 8 Mos.
	DEVELOPMENT				OPERATING												
MANAGEMENT PERSONNEL																	
Mine Manager	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mine Superintendent	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1
General Foreman	-	4	4	4	4	4	8	8	8	8	8	4	4	4	4	4	4
Maintenance General Foreman	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1
UNIT FOREMEN																	
Monitor Face	-	-	-	-	8	8	8	8	8	8	8	8	8	8	8	8	8
Development Face	-	8	8	12	20	20	20	20	20	20	20	20	20	20	8	8	-
Maintenance	-	1	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4
Electrical Foremen	-	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mechanical Foremen	-	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Sub-Total 5 Days	-	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3
Sub-Total 7 Days	-	15	21	25	44	44	48	48	48	48	48	44	44	44	32	32	24
SERVICE PERSONNEL																	
Chief Engineer	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1
Industrial Engineer	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	-
Mining Engineer	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mechanical Engineer	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Electrical Engineer	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chief Surveyor	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Surveyors	-	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Assistant Surveyors	-	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Safety & Rescue Co-Ordinator.	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ventilation Engineer	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	-
Sub-Total	-	7	7	9	11	11	12	12	12	12	12	12	12	12	12	12	8
TOTAL	-	23	29	35	58	58	63	63	63	63	63	59	59	59	47	47	35

Figures indicate persons required at work on a daily basis.
Absenteeism AWOL not included.
Number of men required for employment should be based on 7 days.

TABLE 4

CLIMATE DATA FROM FERNIE*

Temperature (°F)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Mean Daily	17.1	23.7	28.7	40.4	49.4	55.7	61.6	59.9	51.4	42.0	30.2	21.6	40.1
Mean Maximum	24.2	33.3	38.4	50.7	61.8	67.5	76.5	74.6	64.3	51.7	36.8	28.1	50.7
Mean Minimum	9.4	13.7	19.1	30.0	37.6	43.9	46.7	45.2	38.3	31.9	23.5	15.1	29.5
Extreme Maximum	51	54	63	80	91	97	96	95	89	78	60	54	97
Extreme Minimum	-39	-40	-25	-4	18	28	32	30	-1	-12	-26	-43	-43
Precipitation (in)													
Rain	1.74	1.93	1.61	1.97	2.54	3.41	1.45	1.89	2.59	3.86	2.69	2.32	28.00
Snow	39.2	23.1	15.5	7.5	0.6	0.0	0.0	0.0	0.1	3.4	19.1	36.7	145.2
Total	5.66	4.25	3.16	2.73	2.61	3.41	1.45	1.89	2.60	4.20	4.63	5.99	42.58

*From: Climate of British Columbia "Tables of temperature and precipitation, climatic normals 1941-1970", British Columbia Department of Agriculture.

TABLE 5

WATER ANALYSES HOSMER-WHEELER, OCTOBER 28 AND 29, 1975, (B.C. RESEARCH.)

Site	Temp (^{o}C)	Field pH	Lab pH	Total Solids mg/l	Suspended Solids (mg/l)	Specific Conductance micromhos/cm	Turbidity (NTU)	Alkalinity (mg/l $CaCO_3$)	Sulfate (mg/l)	T.O.C.	Hardness (mg/l)	Dissolved Cu (mg/l)	Dissolved Pb (mg/l)	Dissolved Zn (mg/l)	Dissolved Fe (mg/l)
KA (HW3)	0.0	9.1	7.8	116	<1.0	132	0.6	72.5	7.0	3	77.3	<0.001	<0.005	0.003	<0.005
KB (HW8)	2.0	8.7	7.9	177	<1.0	233	0.8	127.5	11.0	2	136.2	<0.001	<0.005	<0.001	<0.005
KC (HW12)	3.0	8.4	7.8	166	1.0	207	1.3	115.5	9.0	3	121.7	<0.001	<0.005	0.003	<0.005
KD (HW9)	3.0	8.3	7.8	230	<1.0	325	0.4	180.0	14.0	1	187.8	<0.001	<0.005	0.003	0.007
KE	3.0	8.6	7.9	252	<1.0	335	0.5	196.5	7.8	2	203.6	<0.001	<0.005	0.002	<0.005
K3A (HW2)	1.0	8.8	8.0	204	<1.0	276	0.5	157.5	12.8	4	163.1	<0.001	<0.005	0.001	<0.005
K2A (HW6)	1.0	8.5	7.8	176	1.0	212	1.0	120.5	7.8	5	120.8	<0.001	<0.005	0.002	0.005
K4A	4.0	8.3	7.6	234	1.4	330	0.6	189.5	7.0	2	193.0	<0.001	<0.005	0.001	0.024
TLA	1.0	8.3	8.1	205	<1.0	278	0.5	160.5	11.0	3	167.7	<0.001	<0.005	0.002	<0.005

TABLE 6

WATER ANALYSES, HOSMER-WHEELER, JANUARY 8, 1976, (B.C. RESEARCH.)

Site	Temp (^{o}C)	Field pH	Lab pH	Total Solids mg/l	Suspended Solids (mg/l)	Specific Conductance micromhos/cm	Turbidity (NTU)	Alkalinity (mg/l $CaCO_3$)	Sulfate (mg/l)	T.O.C.	Hardness (mg/l)	Dissolved Cu (mg/l)	Dissolved Pb (mg/l)	Dissolved Zn (mg/l)	Dissolved Fe (mg/l)
KA (HW3)	0.0	8.0	8.05	118	<1	165	0.45	90.5	7.0	3	95.2	<0.001	<0.005	0.0079	0.002
KB (HW8)	0.0	7.8	8.22	149	<1	218	1.4	120	10.4	3	125	<0.001	<0.005	0.0013	0.003
KC (HW12)	0.0	8.0	8.15	154	<1	216	1.4	120	10.4	3	124	<0.0016	<0.005	0.0031	0.005
KD (HW9)	0.0	7.9	8.10	203	<1	305	0.85	169	12.0	2	176	<0.001	<0.005	0.0014	0.005
KE	0.0	7.8	8.06	206	1.2	315	1.5	177	10.7	3	183	<0.001	<0.005	0.0013	0.006
K2A (HW6)	0.0	7.9	8.11	142	2.4	185	4.8	102	8.0	5	104	0.0021	<0.005	0.0020	0.036
K3A (HW2)	0.0	8.2	8.27	184	3.2	265	1.1	155	11.0	10	159	<0.001	<0.005	0.0013	<0.001
K4	0.0	7.7	7.98	192	<1	280	1.6	163	7.0	4	166	<0.001	<0.005	0.0019	0.027
K7A	0.0	8.1	8.16	159	<1	222	1.3	122	13.4	5	127	<0.001	<0.005	0.0010	0.002
HW10	0.0	8.2	8.27	226	<1	320	0.9	160	30	1	187	<0.001	<0.005	0.0019	<0.001
HW11*	0.0	8.1	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	<0.001	<0.005	0.0011	<0.001
TLA	0.0	8.3	8.29	199	<1	276	0.8	164	10.0	5	169	<0.001	<0.005	0.0011	0.003

N.R. = Not Run

* Samples acidified in the field.

TABLE

WATER QUALITY DATA, NOVEMBER 19 AND 20, 1975, (KAISER RESOURCES.)

Site	Temp (°C)	Dissolved Oxygen	B.O.D.	Alkalinity P	Alkalinity M	Acidity	pH	Sulphates	Solids Susp.	Solids Total	Turbidity	Color	Iron	Phenolics	Ammonia
HW1			1.6		142	N.D.	8.01	16.5	4.00	298.0	4		0.11		0.02
HW2			1.3		168	3.8	7.80	14.5	3.79	278.1	3		0.12		
HW3			1.0		202	N.D.	7.91	18.0	6.01	269.6	2		0.20		
HW4			0.9		196	5.0	7.80	21.5	5.03	281.0	2		0.32		
HW5			1.1		214	5.0	7.90	20.0	3.80	258.5	10		0.31		
HW6			1.3		200		8.01	14.5	3.14	261.0	6		0.39		
HW7			1.2		156		8.00	12.0	4.33	289.7	16		0.09		
HW8		N.R.	1.0		138		7.98	12.0	3.78	248.0	2	N.D.	0.10	N.D.	N.D.
HW9			1.0		148	N.D.	7.98	14.0	6.05	279.5	2		0.01		
HW10			0.9		140		8.10	16.0	2.14	238.1	1		N.D.		
HW11			1.2		146		8.09	16.0	1.89	246.5	1		N.D.		

N.D. = Not Detectable N.R. = Not Run

TABLE 8

WATER QUALITY DATA, DECEMBER 2, 1975, (KAISER RESOURCES)

Site	Temp (°C)	Dissolved Oxygen	B.O.D.	Alkalinity P	Alkalinity M	Acidity	pH	Sulphates	Solids Susp.	Solids Total	Turbidity	Color	Iron	Phenolics	Ammonia
HW1		10.0			104		7.96	28.5	2.29	285.7	2		.01		
HW2		10.6			152		8.01	31.0	2.27	300.0	2		.11		
HW3		10.3			96		8.09	30.5	1.73	270.6	3		.08		N.D.
HW4															
HW5		10.8			146		7.96	35.5	1.49	298.7	2		.02		.01
HW6		10.6	N.R.	N.D.	114	N.D.	7.94	38.0	2.90	307.6	3	N.D.	.20	N.D.	
HW7		10.4			150		8.03	38.5	4.02	311.7	2		.15		
HW8		10.2			110		7.96	37.5	4.68	314.0	3		.02		N.D.
HW9		10.2			174		7.98	41.0	5.53	287.0	2		N.D.		
HW10		10.6			136		7.99	34.0	6.17	291.0	1				
HW11		10.8			172		8.01	36.5	3.71	300.7	1				

N.D. = Not Detectable N.R. = Not Run

TABLE 9

WATER QUALITY DATA, JANUARY 8, 1976, (KAISER RESOURCES.)

Site	Temp (°C)	Dissolved Oxygen	B.O.D.	Alkalinity P	Alkalinity M	Acidity	pH	Sulphates	Solids Susp.	Solids Total	Turbidity	Color	Iron	Phenolics	Ammonia
HW1		N.R.	N.R.	N.D.								N.D.			
HW2					198	0.1	8.00	30.0	5.79	228.0	2		<0.01	<0.1	<0.1
HW3					138	0.1	8.03	32.0	0.9	201.0	1		<0.01	<0.1	<0.1
HW4															
HW5															
HW6					156	0.1	8.01	29.5	3.21	221.7	2		<0.01	<0.1	<0.1
HW7															
HW8					174	0.1	8.06	2.72	2.72	231.2	2		<0.01	<0.1	<0.1
HW9					220	0.1	8.09	2.31	2.31	227.5	2		<0.01	<0.1	<0.1
HW10					210	0.4	7.91	1.47	1.47	259.0	1		<0.01	<0.1	<0.1
HW11					192	<0.1	8.06	2.37	2.37	258.8	1		<0.01	<0.1	<0.1
HW12					198	0.3	8.09	2.50	2.50	231.8	1		<0.01	<0.1	<0.1

N.D. = Not Detectable N.R. = Not Run

TABLE 10

PRELIMINARY MATRIX OF POTENTIAL ENVIRONMENTAL IMPACT AND RESTORATION FEASIBILITY

LEGEND

Potential Impact		Restoration Feasibility	
Positive	+	Good	
Negative	−	Poor	
None		None required	
Unknown	?	Unknown	

PROPOSED MINE ACTIVITIES

- Exploration Phase: Roads; Adits
- Construction Phase — Mine: Portal; Waste Rock (Tunnel & Portal); Ventilation Shaft portal area; Pump station & Water Tanks; Road network
- Construction Phase — Processing: Plant Site; Tailings Dam; Water Supply; Water Line; Railway Loop
- Operation Phase: Mine; Plant Site; Water Supply; Tailings Pond; Coarse Tailings Dump; Coal Transport

SUMMARY

- Potential Impact: High; Moderate; Low; Unknown
- Restoration Feasibility: Low; Moderate; High; Unknown

ENVIRONMENTAL FACTORS

AQUATIC

- Surface: Stream Alignment; Stream discharge; Water quality; Invertebrates; Fish habitat
- Sub-Surface: Groundwater table; Groundwater quality

TERRESTRIAL

- Soil: Crowsnest Sandy Loam; Michel Sandy Loam; Sparwood Sandy Loam; Wigwam complex; Unmapped; Unique vegetation
- Mammals — Ungulates: Elk & Deer winter range; Elk summer range; Moose summer range; Deer summer range
- Mammals: Carnivores and furbearers
- Birds: Waterfowl; Upland game; Rare and endangered species

HUMAN USE

- PRESENT LAND USE — Canada Land Inventory Present Land Use: Cropland-pasture complex (P_1); Open grassland (k); Mature productive woodland (T_1); Immature productive woodland (T_2); Non-productive woodland on a productive site (U_1); Non-productive woodland on a non-productive site (U_2); Swamp (M)
- PRESENT LAND USE — Recreation: Class A Provincial Park; Hunting; Angling; Guiding; Trapping
- LAND USE CAPABILITY — Forestry: High (class 1 - 2); Medium (class 3 - 4); Low (class 5 - 7)
- LAND USE CAPABILITY — Agriculture: High (Agricultural Land Reserve); Low (natural grazing and no productivity)
- LAND USE CAPABILITY — Recreation: Moderate; Low
- Past Land Use: Historic and Archaeological sites

Air Quality

Noise

Aesthetic Values

SUMMARY

- Potential Impact: High −; Moderate −; Low −; Unknown −
- Restoration Feasibility: Low −; Moderate −; High −; Unknown −

TABLE 11

WATER QUALITY DATA FROM WELL EP17

NEAR THE ELKVIEW TAILINGS POND

Time	Dissolved Copper mg/l	Dissolved Lead mg/l	Dissolved Iron mg/l	TOC mg/l	pH
Sept. 1974	0.007	0.012	0.080	89	7.4
Dec. 1974	0.004	0.036	0.090	55	7.8
March 1975	0.010	0.022	0.150	275	-
June 1975	0.026	0.032	0.278	32	-
Govt. Standards					
A	0.05	0.05	0.30		
B	0.30	0.10	1.00		
C	1.00	0.50	5.00		

TABLE 12: SOCIO-ECONOMIC LOCATIONAL IMPACT MATRIX

FACTORS	1. EXPLORATION		2. DEVELOPMENT			3. OPERATION			4. POST OPERATION		
	Nearest Town(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)
1.0 Employment											
1.1 Direct employment			****	***		***	*			****	
1.2 Indirect employment in support industry				*	*		***	*		****	*
1.3 Indirect employment in services				*	**		***	**		****	*
2.0 Population											
2.1 Age/sex			**	**			**	*		*	
2.2 Household size				*			**			*	
2.3 Non-working women							****	*		*	
2.4 School age children (by age)				**			***	*		*	
3.0 Housing											
3.1 type mix			***	****			****			****	
3.2 tenure mix			***	****			****			****	
3.3 cost mix			***	**			****			****	
4.0 Services											
4.1 Education (classrooms/ grades)				**			****			****	
4.2 Recreation (community facilities)			**	**	*		***	*		****	*
4.3 Commercial				**	*		****	**		****	*
4.4 Health							***	*		****	*
4.5 Social				***			**	*		****	*

Note: No distinction is made between positive and negative impacts. Indicators merely reflect a subjective assessment of those factors which are considered to be fairly minor (a blank or a single *) and those which are considered to be very important (*** and ****).

TABLE 12: (Cont'd)

	1. EXPLORATION		2. DEVELOPMENT			3. OPERATION			4. POST OPERATION		
	Nearest Town(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)
4.0 Services (continued)											
4.6 Cultural/Entertainment				**	*		**	**		*	*
4.7 Communication							**			*	
4.8 Police and Fire				**			**			*	
4.9 Legal and Court							*			*	
4.10 Industrial (by type)							***			*	
5.0 Community Land											
5.1 Housing							****			*	
5.2 Education/Health/ Institutional				***			**			*	
5.3 Recreation (Outdoor areas and facilities)				**			***			*	
							**			*	
5.4 Commercial and Services											
5.5 Industrial				**			**			*	
6.0 Community Infrastructure											
6.1 Sewage Collection and Disposal			**				****			****	
6.2 Water Supply and Distribution			**				***			****	
7.0 Regional Infrastructure											
7.1 Regional Roads							***	**		*	*
7.2 Railroads				*				**		*	*
7.3 Airport(s)							**	***		*	*
7.4 Energy						*	*			*	
8.0 Social Adjustment Consider-											

TABLE 12: (Cont'd)

	1. EXPLORATION		2. DEVELOPMENT			3. OPERATION			4. POST OPERATION		
	Nearest Town(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)	Minesite	Primary Employee Location (existing or new community(s)	Regional Centre(s)
8.1 Employment											
8.11 Source			**			****				****	
8.12 Training required and other hiring conditions			*			****				****	
8.13 Seasonality			**	*		**				*	
8.14 Duration			**	*		***				*	
8.2 Population (Social adjustment problems program needs and proposals for incoming and existing population including relocation and way of life adjustments, social pathology, cultural/ethnic concerns) (Historical/archaeological sites activities)				**	*		***	*		****	
8.3 Local Government (Economic, socio-political)							****			****	

TABLE 13

BENEFIT-COST FACTORS

FACTOR	BENEFITS	COSTS
Capital		
Portion of Company's capital invested in the province	Estimate 150 million less 50 million out-of-province expenditures	
Commercial services	-?-	-?-
Housing		$35,000/house less residual value at mine life
Institutional facilities -schools -hospitals		-?-
Municipal services (roads, sewers, water etc.)		$8,000/lot to be largely offset by future property taxes
Provincial services (highways, etc.)		-?-
Operating		
Balance of payments	2.0 million tons @ $25/ton = $50 million	
Mineral Royalties	$2.0 million tons @ $0.75/ton = $1.5 million	
Employment - Direct	700 jobs representing a payroll of $14 million	
- Indirect	20 jobs representing a payroll of $0.4 million	
Municipal business taxes	-?-	
Property taxes	-?-	
Provincial sales taxes	5% of $5.0 million = $0.25 million	
Provincial income taxes	4% of $14 million = $0.65 million	
Company purchases from provincially based services and suppliers	$5.0 million (excluding utilities)	
Reduced welfare payments	-?-	
Employment and expenses of additional government services required -hospitals -schools -municipal services -provincial services		10 jobs @ $15,000 x 250% = $0.37 million
Intangibles		
Existing residents	-a broader tax base -improved/additional services -real estate appreciation -job opportunities -job continuity -better commercial services	-more crowded highways, stores, recreational facilities, etc.

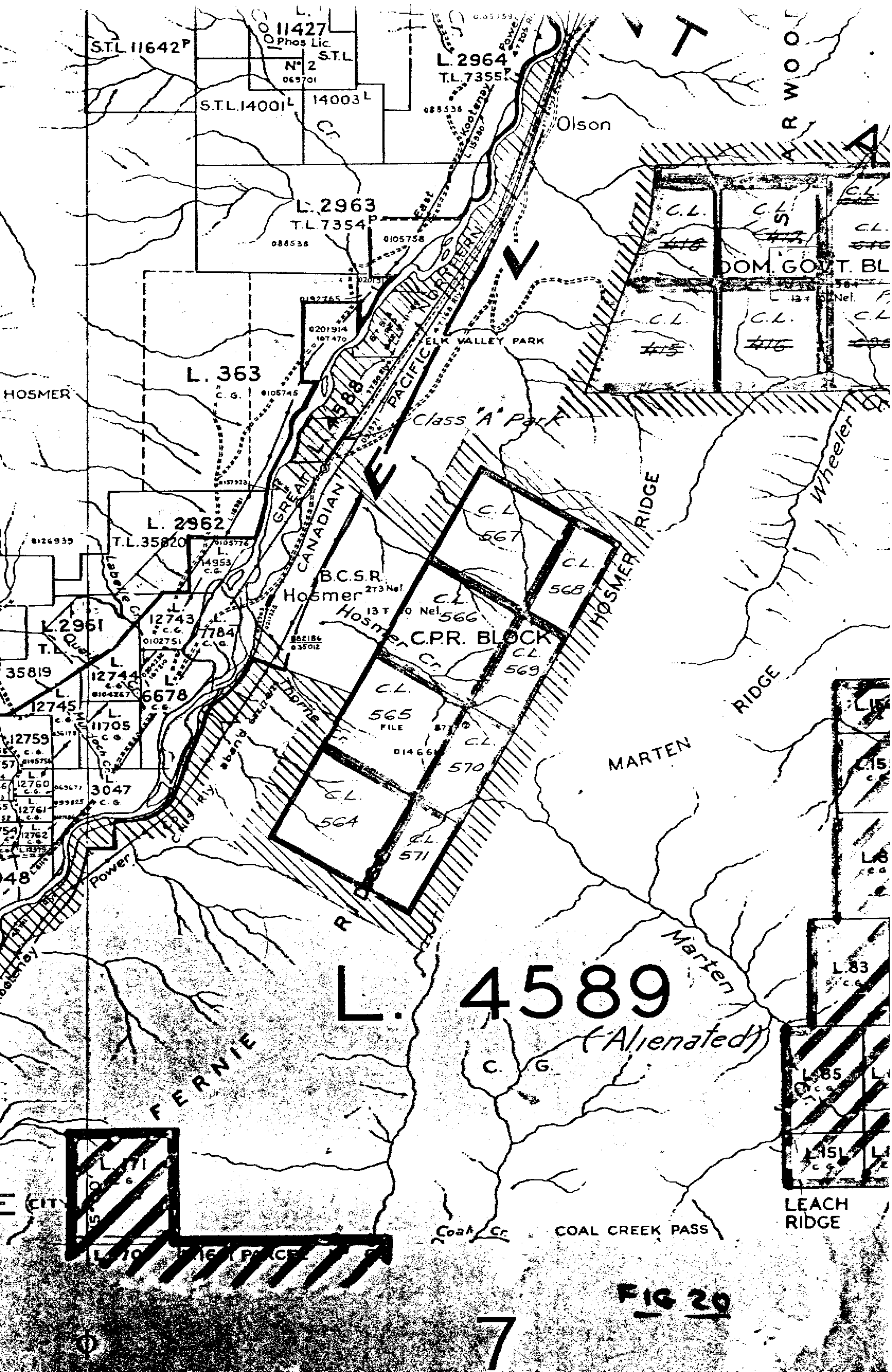
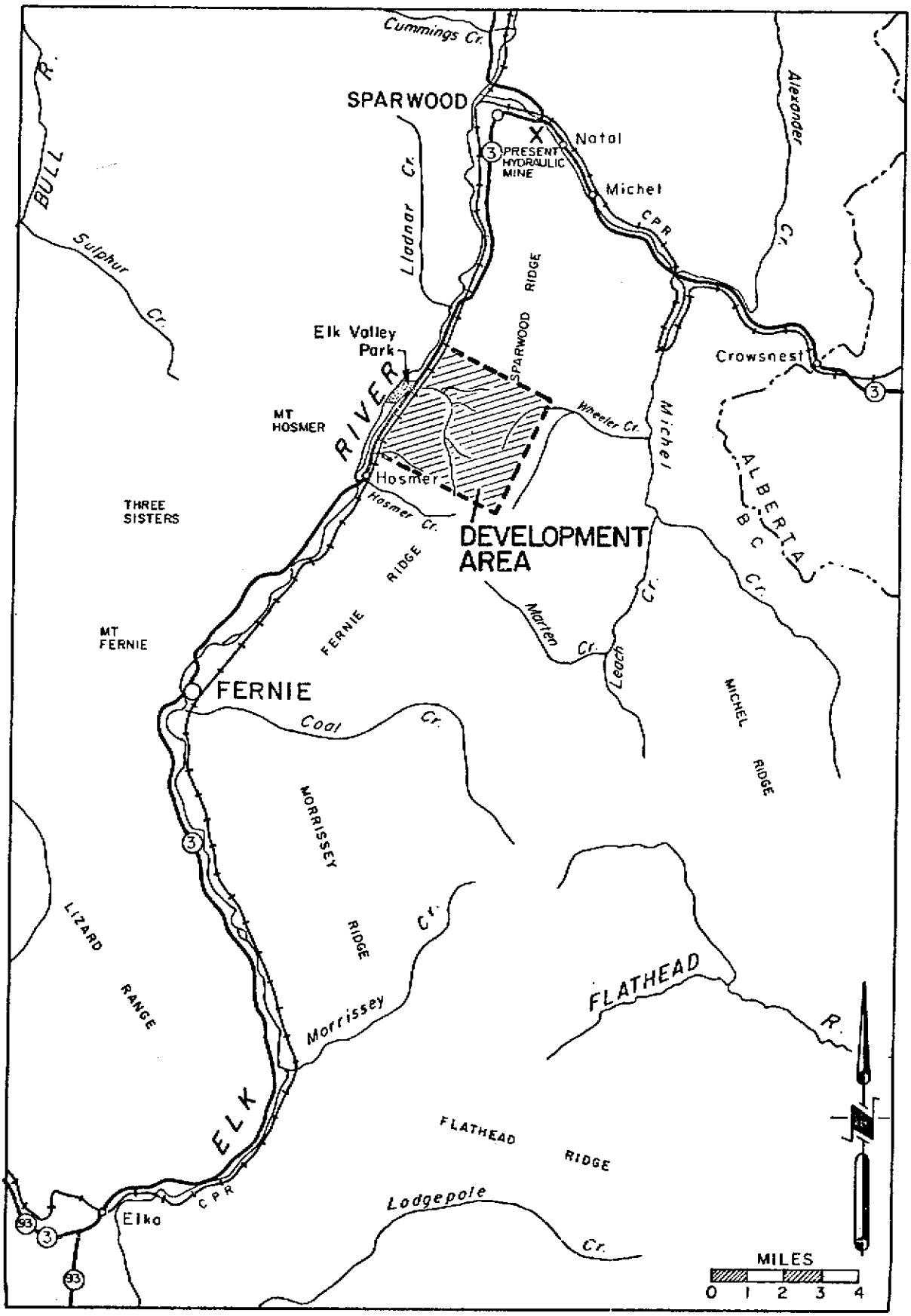


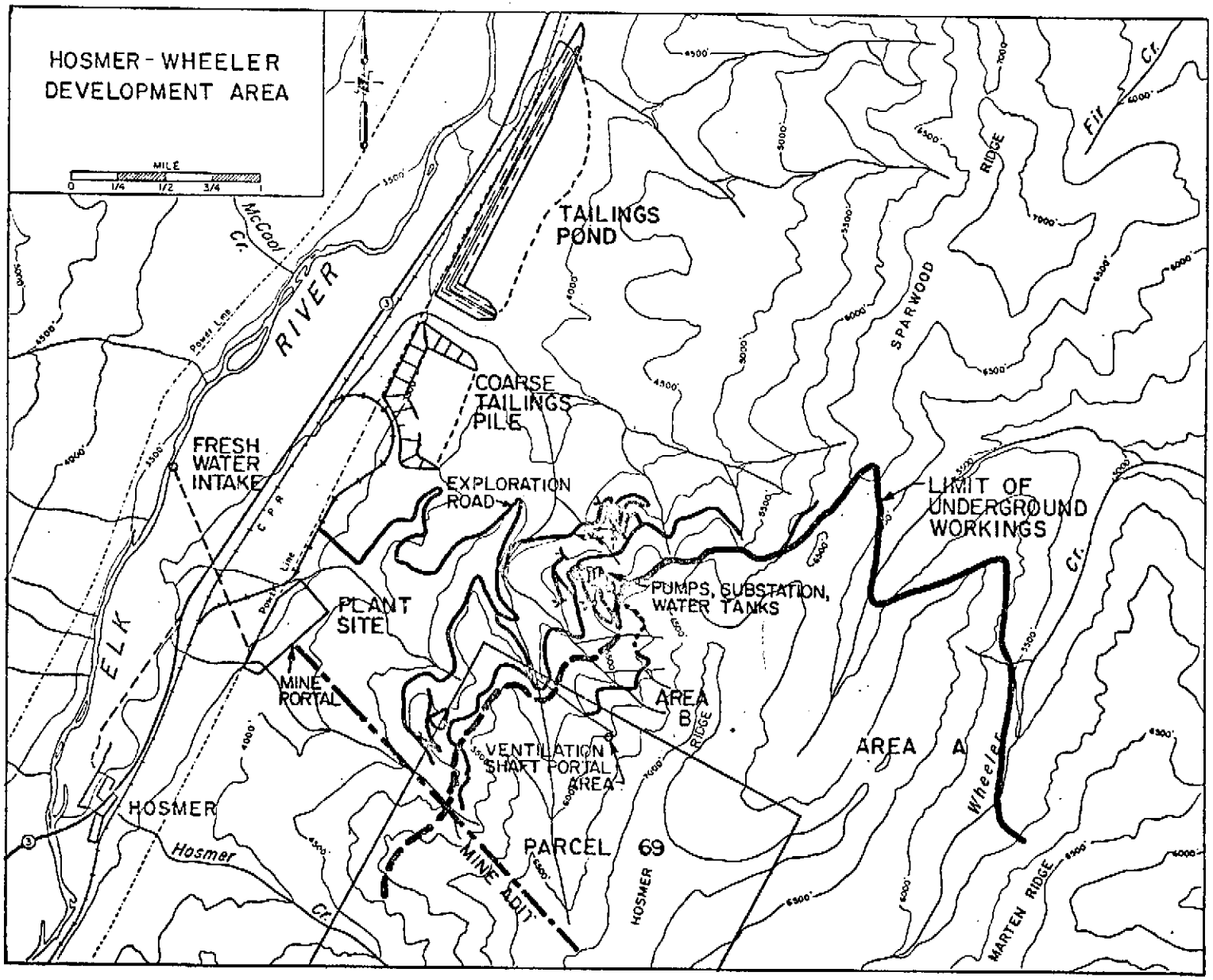
FIG 20

COAL MAP #138 (82G/10W)

Figure 1

LOCATION OF THE PROPOSED HOSMER-WHEELER MINE DEVELOPMENT





Overlay of proposed developments in back pocket

Figure 2
LOCATION OF PROPOSED DEVELOPMENTS, JANUARY 1976

FIGURE 3

HOSMER RIDGE FROM HIGHWAY NO. 3, RAILROAD IS IN THE FOREGROUND. (22570-21A)

FIGURE 4

LOCATION OF PROPOSED PLANT SITE. (22588-13)

FIGURE 5

EXPLORATION ROAD ON HOSMER RIDGE. (22570-22A)

FIGURE 6

EXPLORATION ROAD ON HOSMER RIDGE,

SHOWING PRE-LOGGING AND STOCKPILING OF ADIT COAL. (22570-23A)

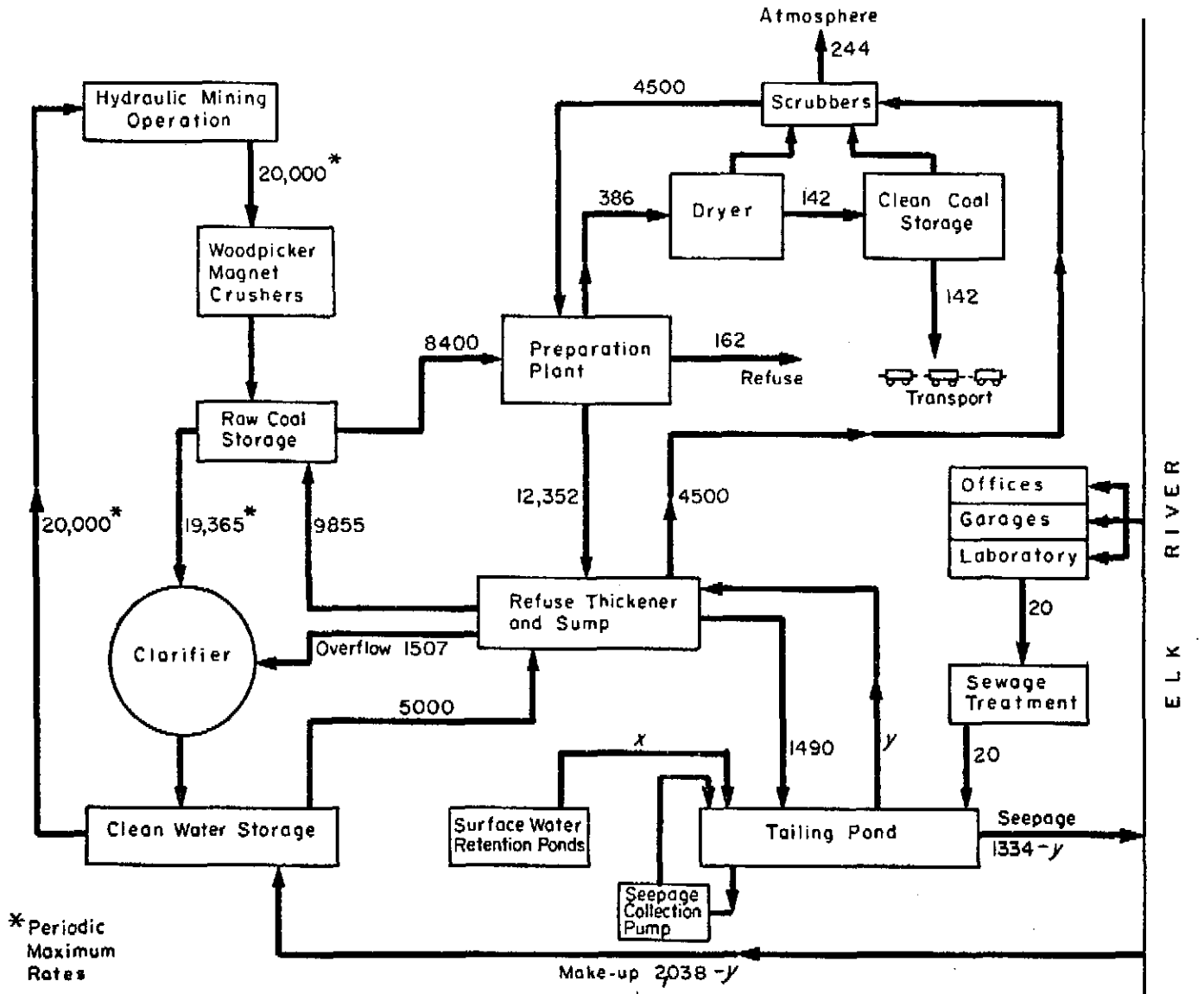


Figure 7

PROCESS WATER FLOW SHEET

(Average flows in USg / min)

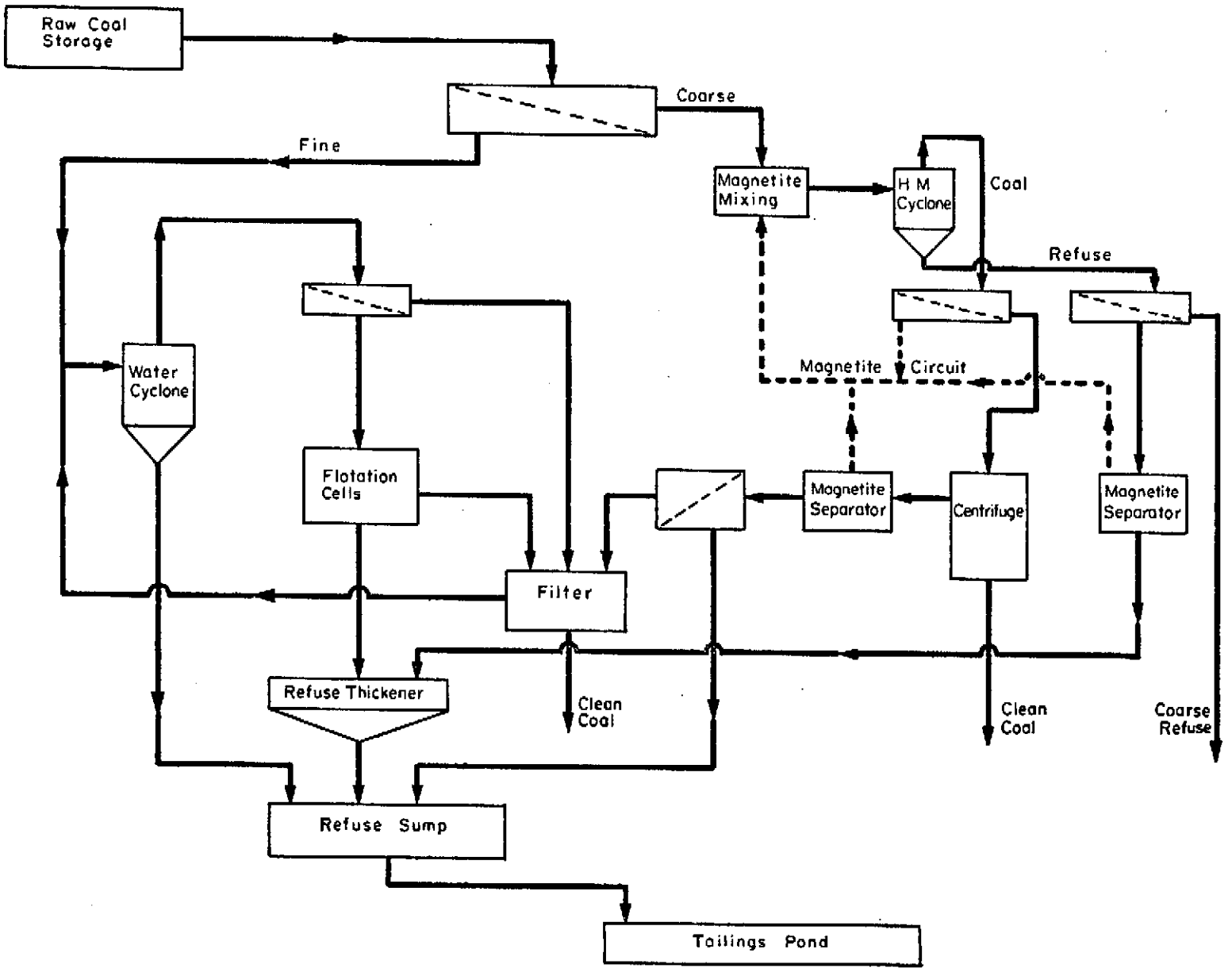


Figure 8

SURFACE PREPARATION PLANT FLOW SHEET

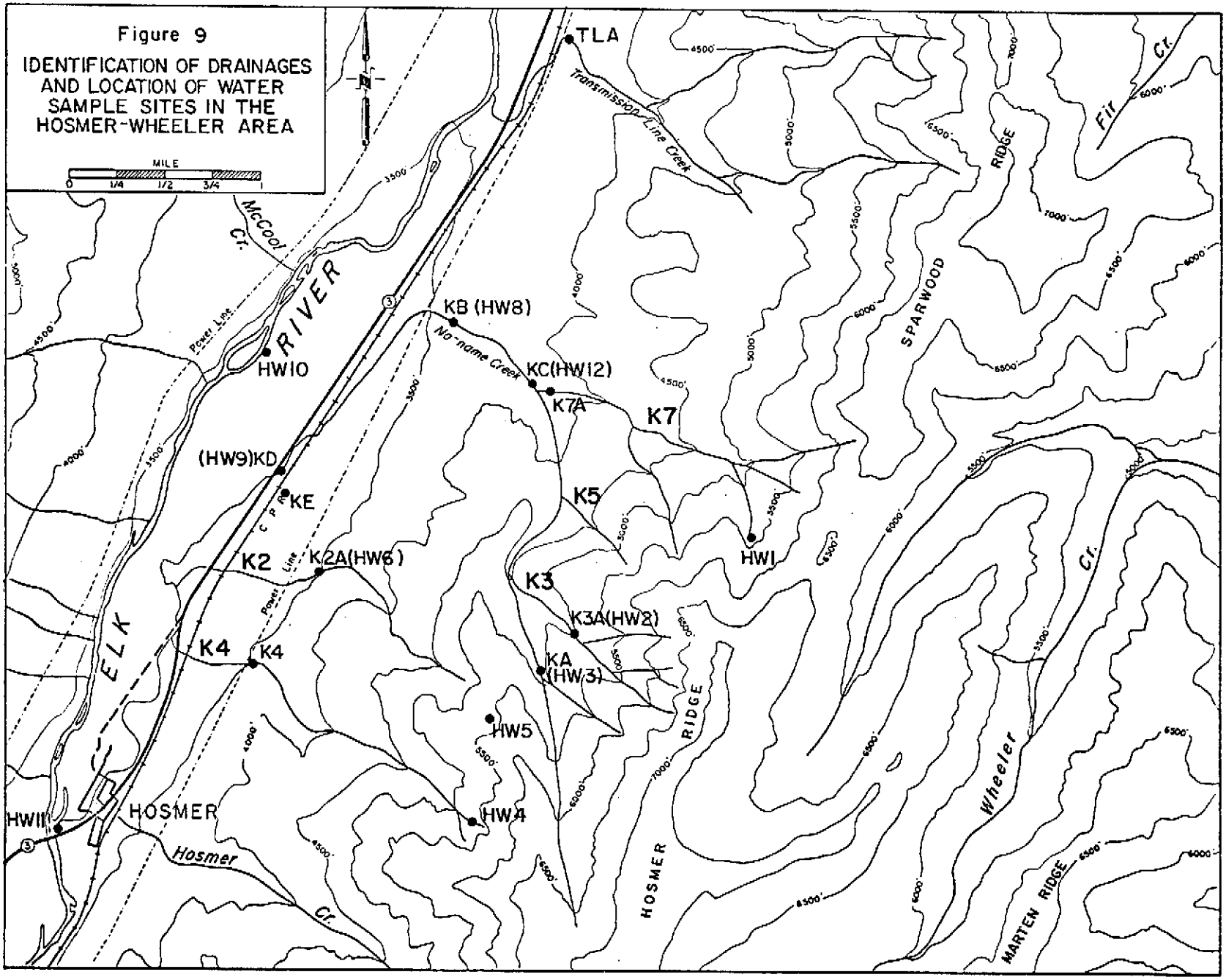


Figure 9
IDENTIFICATION OF DRAINAGES AND LOCATION OF WATER SAMPLE SITES IN THE HOSMER-WHEELER AREA
MILE
0 1/4 1/2 3/4 1
TLA
Transmission Line Creek
Fir Cr.
RIDGE
SPARWOOD
McCool Cr.
ELK RIVER
Power Line
KB (HW8)
No-name Creek
KC(HW12)
K7A
K7
HW10
(HW9)KD
KE
K5
HW1
K2
K2A(HW6)
K3
K3A(HW2)
K4
K4
KA (HW3)
HW5
HW4
HW11
HOSMER
Hosmer Cr.
HOSMER RIDGE
Wheeler Cr.
MARTEN RIDGE

Figure 10

PROFILE OF NO-NAME CREEK

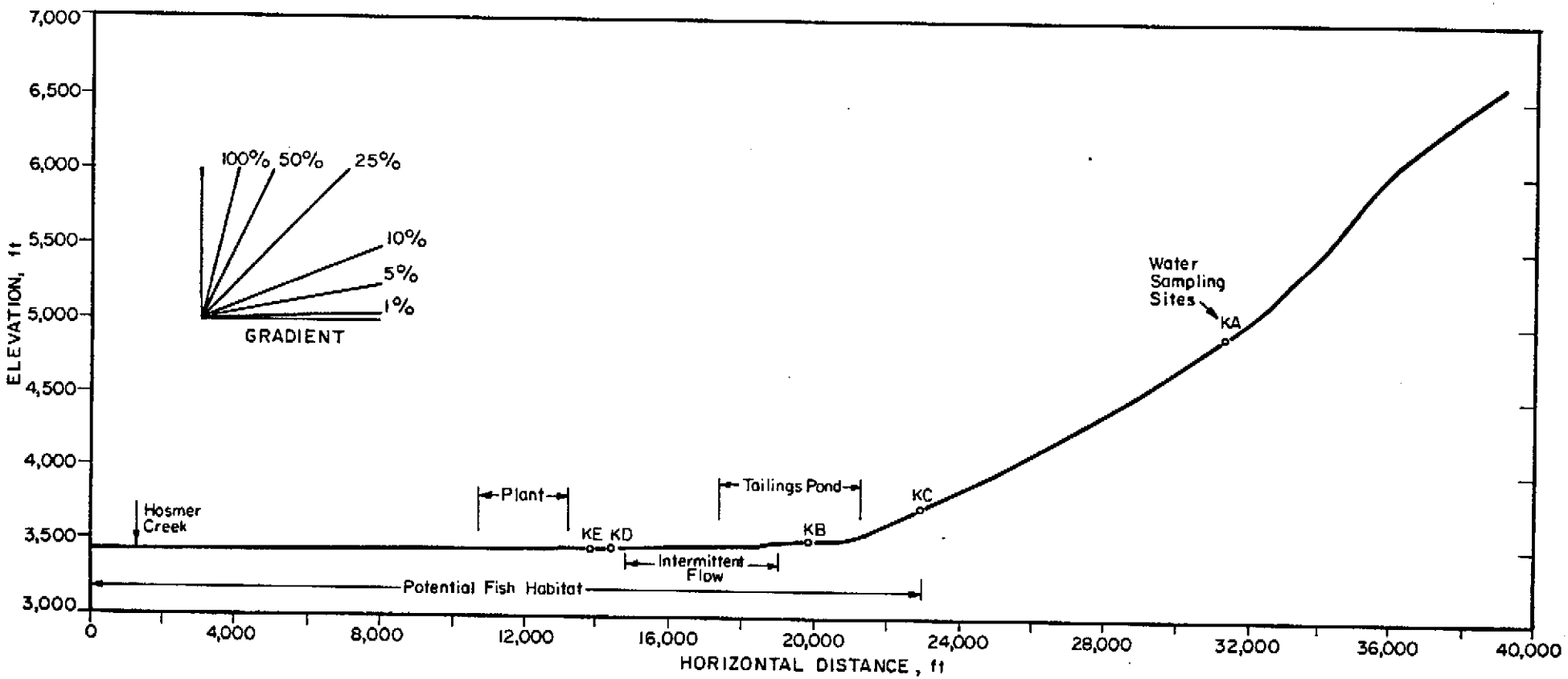


FIGURE 11

"NO-NAME" CREEK AT WATER SAMPLE SITE KB. (22582-32)

FIGURE 12

"NO-NAME" CREEK AT WATER SAMPLE SITE KD NEAR HIGHWAY NO. 3. (22582-36A)

Figure 13

MEAN MONTHLY DISCHARGE IN CUBIC FEET PER SECOND FOR THE ELK RIVER NEAR NATAL 1965-1974 AND LINE CREEK 1971-1974. VERTICAL BARS SHOW RANGE

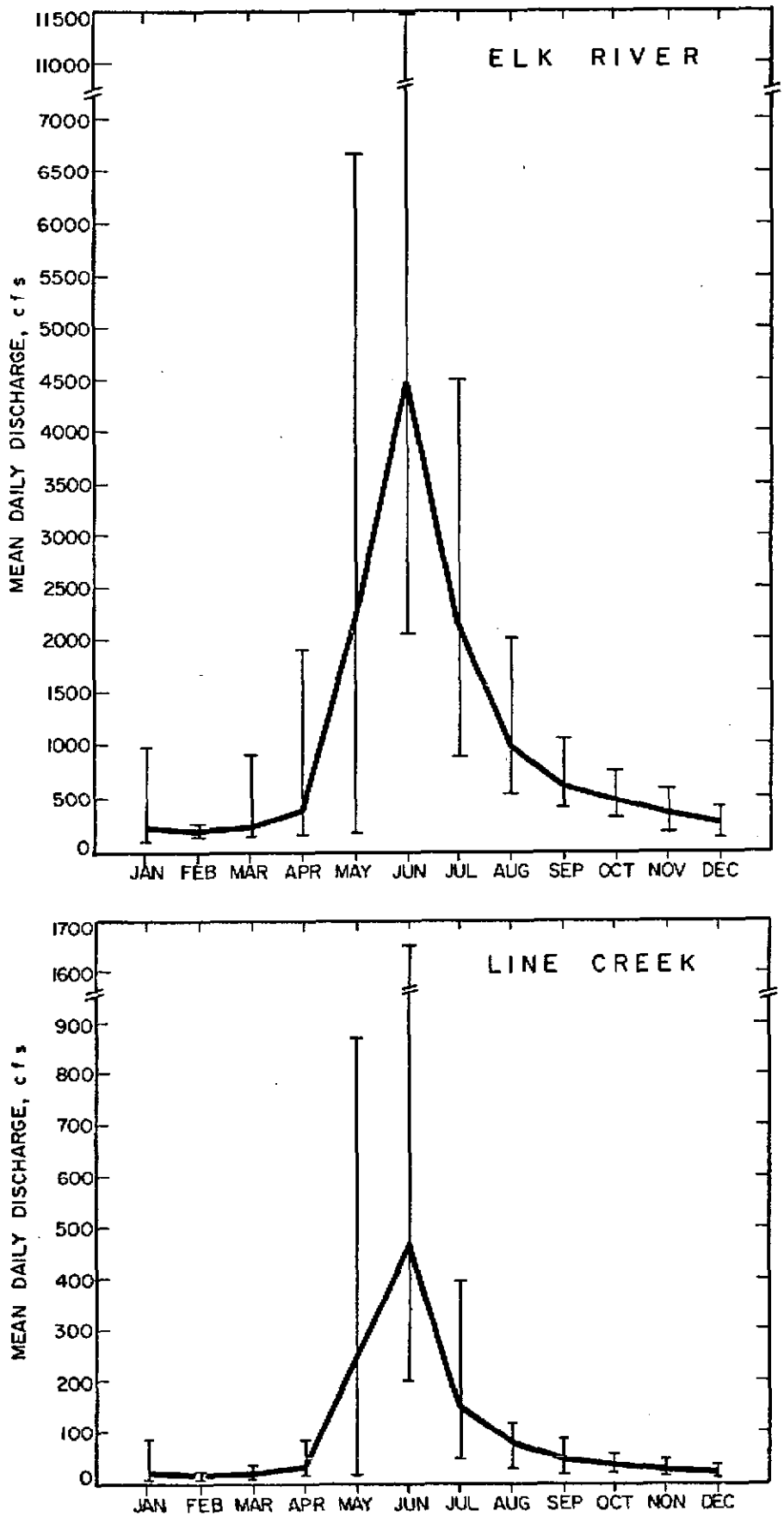
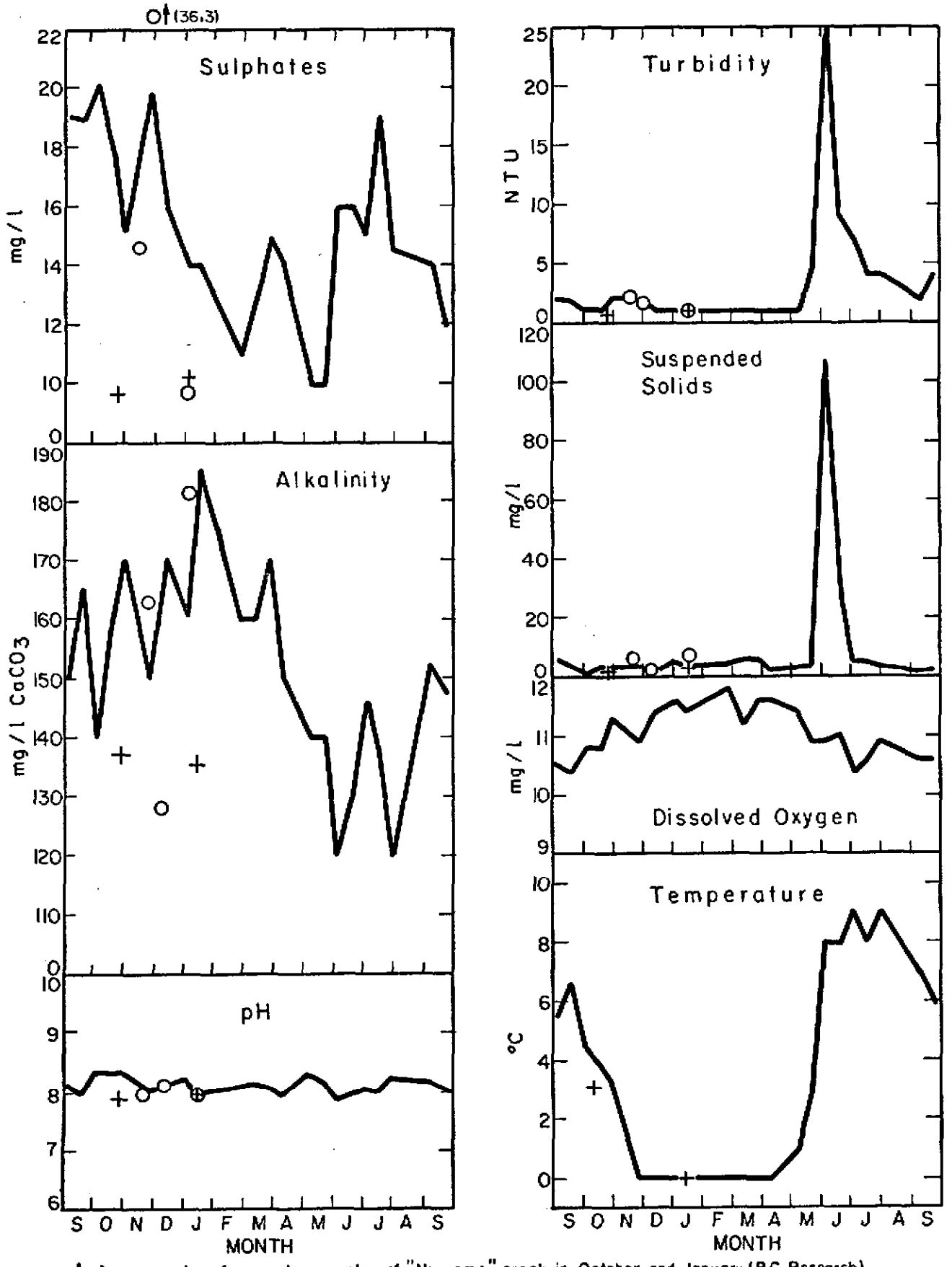


Figure 14

WATER QUALITY CHARACTERISTICS FROM ALEXANDER CREEK, 1974 - 1975

(Data from Kaiser Resources)



+ Average values from water samples of "No-name" creek in October and January (B.C. Research)

○ " " " " " " " " November – January (Kaiser Resources)

BRITISH COLUMBIA DEPARTMENT OF AGRICULTURE SOILS MAP LEGEND

Map Symbol	
	Soils Derived from Alluvial Terraces
Mi	Michel Sandy Loam
	Podzolized Grey Wooded Soils
Sp	Sparwood Sandy Loam
	Groundwater Soils
Cn_2	Crowsnest Sandy Loam (First Bottoms)
Cn_3	Crowsnest Sandy Loam (Second Bottoms)
	Soil Derived from Alluvial Fans
	Undifferentiated Grey Wooded, Brown Wooded and Dark Brown Soils
Wi	Wigwam Complex
Wi:x	Excessively Stoney Phase
	Miscellaneous
Sw	Swamps

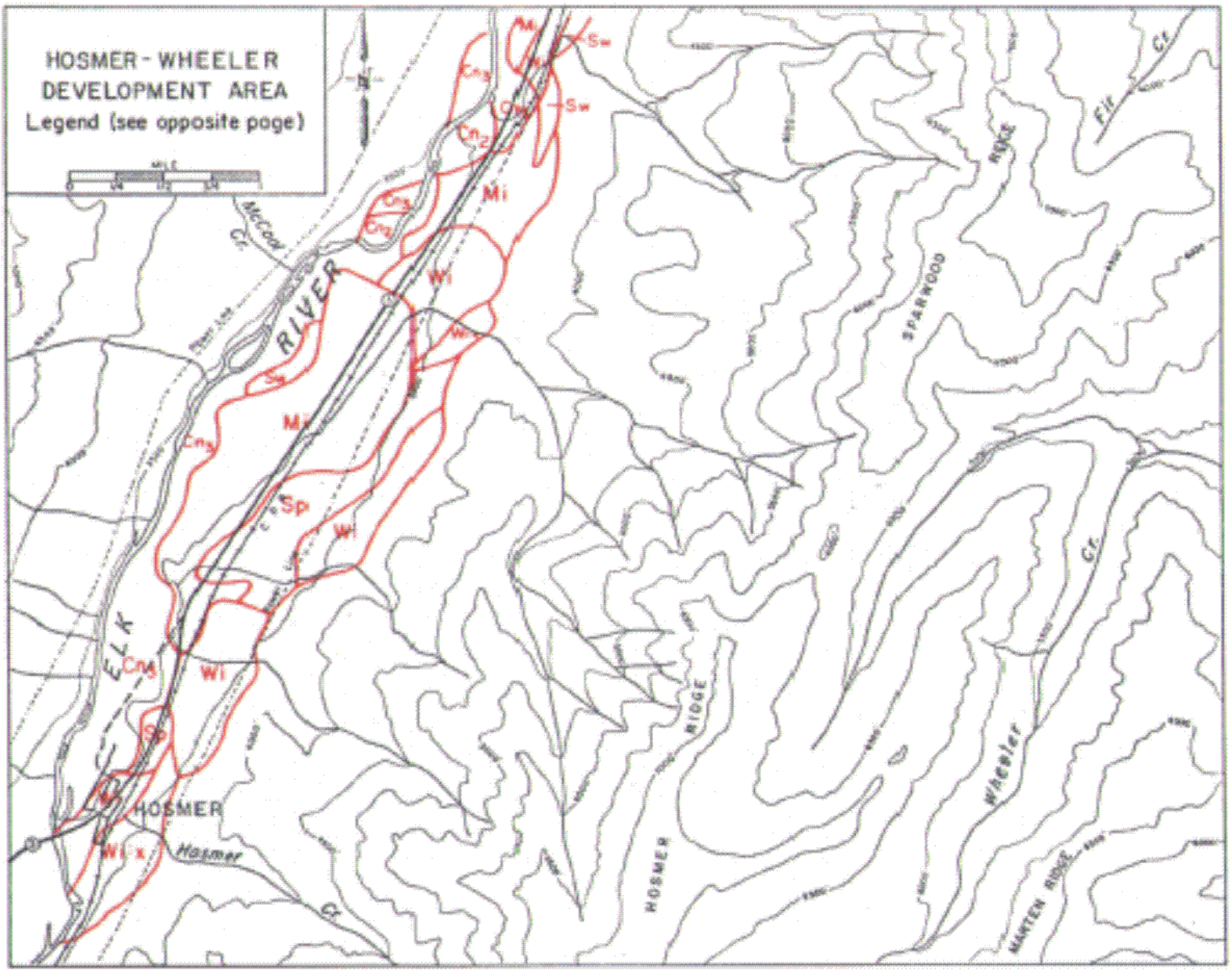


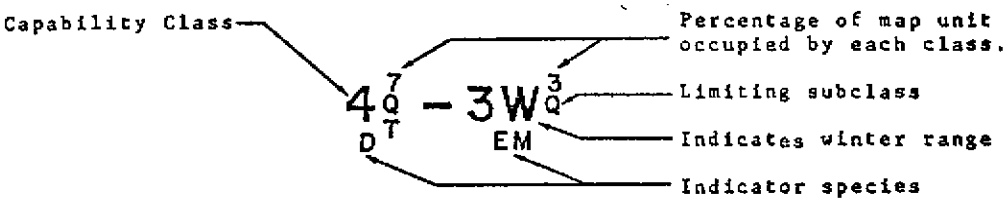
Figure 15
SOILS

Overlay of proposed developments in back pocket

KEY FOR INTERPRETATION OF UNGULATE CAPABILITY MANUSCRIPT MAPS (B.C.)

There are 7 capability classes based on the ability of the land to support or produce wild ungulates. The capability class level is determined by the degree of limitation which affects the quality and/or quantity of habitat for the animals.

Example Classification



a) Capability Classes

Class 1 - No limitations to the production of ungulates.
Class 1W - Extremely important winter range for ungulates.
Class 2 - Very slight limitations to the production of ungulates.
Class 2W - Very important winter range for ungulates.
Class 3 - Slight limitations to the production of ungulates.
Class 3W - Important winter range for ungulates.
Class 4 - Moderate limitations to the production of ungulates.
Class 5 - Moderately severe limitations to the production of ungulates.
Class 6 - Severe limitations to the production of ungulates.
Class 7 - Such severe limitations that almost no ungulates are produced.

b) Limiting Subclasses

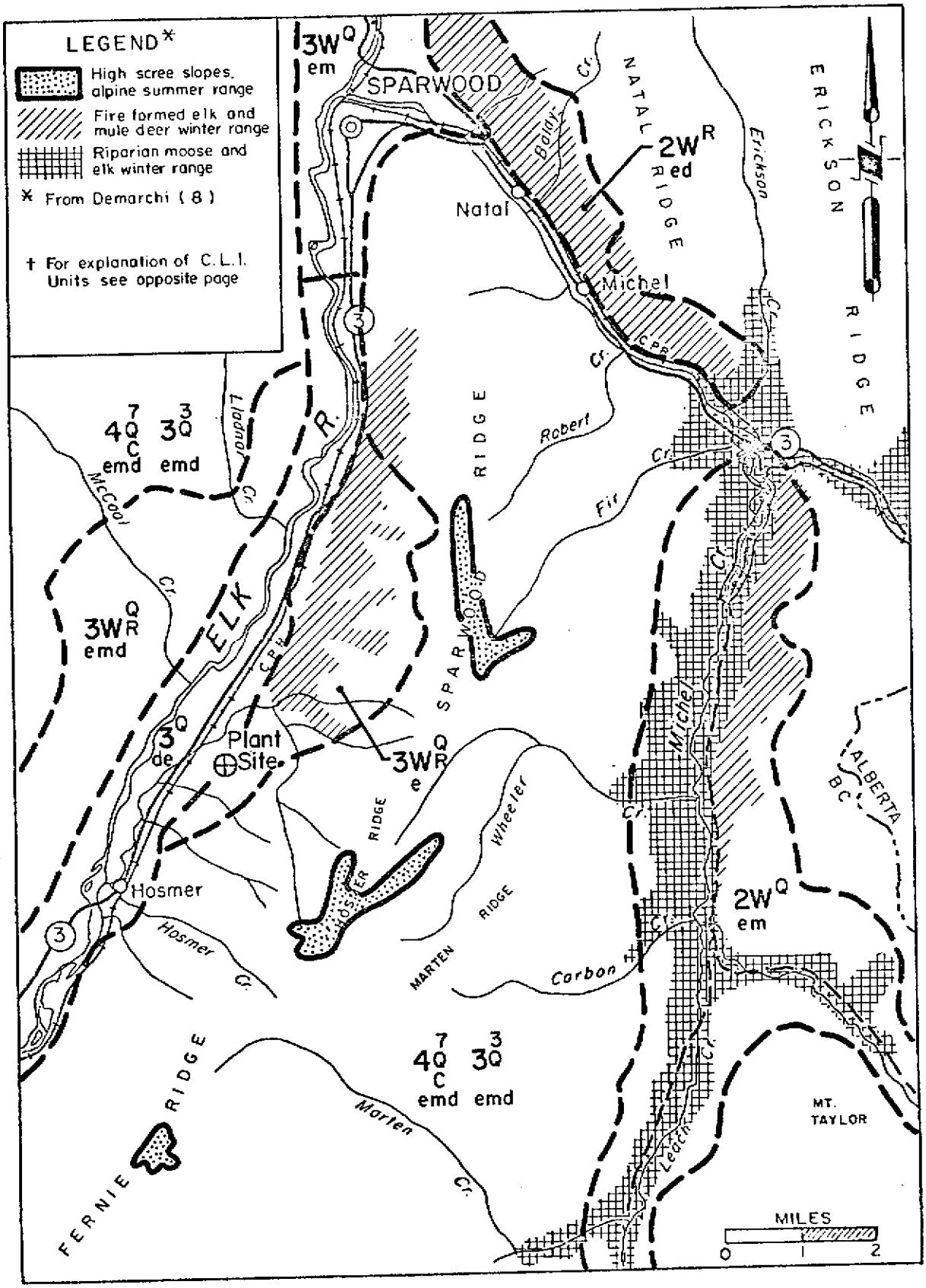
A - Aridity (climate restricts growth of suitable food).
C - Climate (combination of Climate factors such as excessive cold or moisture, short growing season, high rainfall, etc., restricting growth of suitable food and cover plants).
F - Fertility (lack of nutrients in soil for optimum growth of cover plants).
G - Landform (poor distribution or interspersion of landforms necessary for optimum ungulate habitat).
I - Inundation (excessive water fluctuation that adversely affects the habitat or survival of ungulates).
M - Soil Moisture (poor soil mositre limitations affecting development and growth of vegetation or limiting the mobility of ungulates).
N - Adverse Soil Characteristics (excessive salinity or alkalinity, abundance of toxic elements in the soil).
Q - Snow Depth (prolonged periods of snow conditions reducing mobility of ungulates and/or availability of food plants).
R - Soil Depth (restriction of rooting zones by bedrock).
T - Adverse Topography (excessive steepness or flatness of the land).
U - Exposure or Aspect (special climatic factors such as exposure to prevailing winter winds or hot dry summer winds).

c) Species

A - Antelope
C - Caribou
D - Deer
E - Elk
G - Goat
M - Moose
S - Mountain Sheep

Figure 16

C.L.I. CAPABILITY CLASSES FOR UNGULATES† AND IMPORTANT UNGULATE RANGES FROM DEMARCHI (8)



BRITISH COLUMBIA PRESENT LAND USE CLASSIFICATION

Mapping Symbol	
O	1. Outdoor Recreation. Land used for private or public outdoor recreational purposes. Summer cottages and associated beach areas, parks and golf courses are included.
A	2. Cropland. Land used primarily for cash crops, ususally in rotation but including both cash and feed grains. Oilseeds, sugar beets, potatoes, field vegetables, associated fallow and land in the process of being cleared for cultivation are included.
P	3. Improved Pasture and Forage Crops. Land used primarily for the production of improved pasture, hay and other forage crops. Cultivation and planting have occurred in a recent year.
	2,3. Cropland-Pasture Complex. Where large blocks of Categories 2 and 3 cannot be distinguished, the folloiwng complexes are shown on the land-use maps:
A	95.0 - 100% Cropland
A_1	75.0 - 94.9% Cropland
A_2	50.0 - 74.9% Cropland
P_2	50.1 - 74.9% Improved Pasture & Forage Crops
P_1	75.0 - 94.9% Improved Pasture & Forage Crops
P	95.0 - 100% Improved Pasture & Forage Crops
	The subscript is determined by use of a "Cropland/Improved Pasture and Hay" ratio derived from the 1961 or 1966 Census of Agriculture and applied on a census subdivision basis. Census subdivisions are subdivided into two or more parts with different symbols only where it is known from other sources or from the photos that significant differences do exist within the subdivision.
	4. Unimproved Pasture and Range Land
K	a. Open Grassland. Based on cover rather than use as not necessarily used for grazing (eg., remote meadows). Open grassland includes grasses, sedges, herbaceous plants and scattered shrubs to four feet in height. Abandonned farms and intermittently wet hay land (sloughs) are included.
	5. Woodland. Land covered with tree or scrub growth.
T_1	a. Mature Productive Woodland. Land bearing a productive forest type with at least one tree per acre greater than 11.1" d.b.h.
T_2	b. Immature Productive Woodland. Productive forest land with immature cover.
U_1	c. Non-productive Woodland on a Productive Site. Forest land which has been logged, burnt or diseased and has either not been satisfactorily restocked or has been restocked by a non-commercial type.
U_2	d. Non-productive Woodland on a Non-productive Site. Land bearing a non-productive type on a non-productive site.
M	6. Swamp, Marsh and Bog. Open wetlands except for those with evidence or knowledge or haying or grazing in the drier years.
	7. Unproductive Land. Land that is biologically unproductive in its present state.
S	a. Sandflats, Dunes and Beaches. Depositional features with exposed sand surfaces predominating.
L	b. Rock and Other Unvegetated Surfaces. Badlands, eroded river banks, rock barrens, etc.

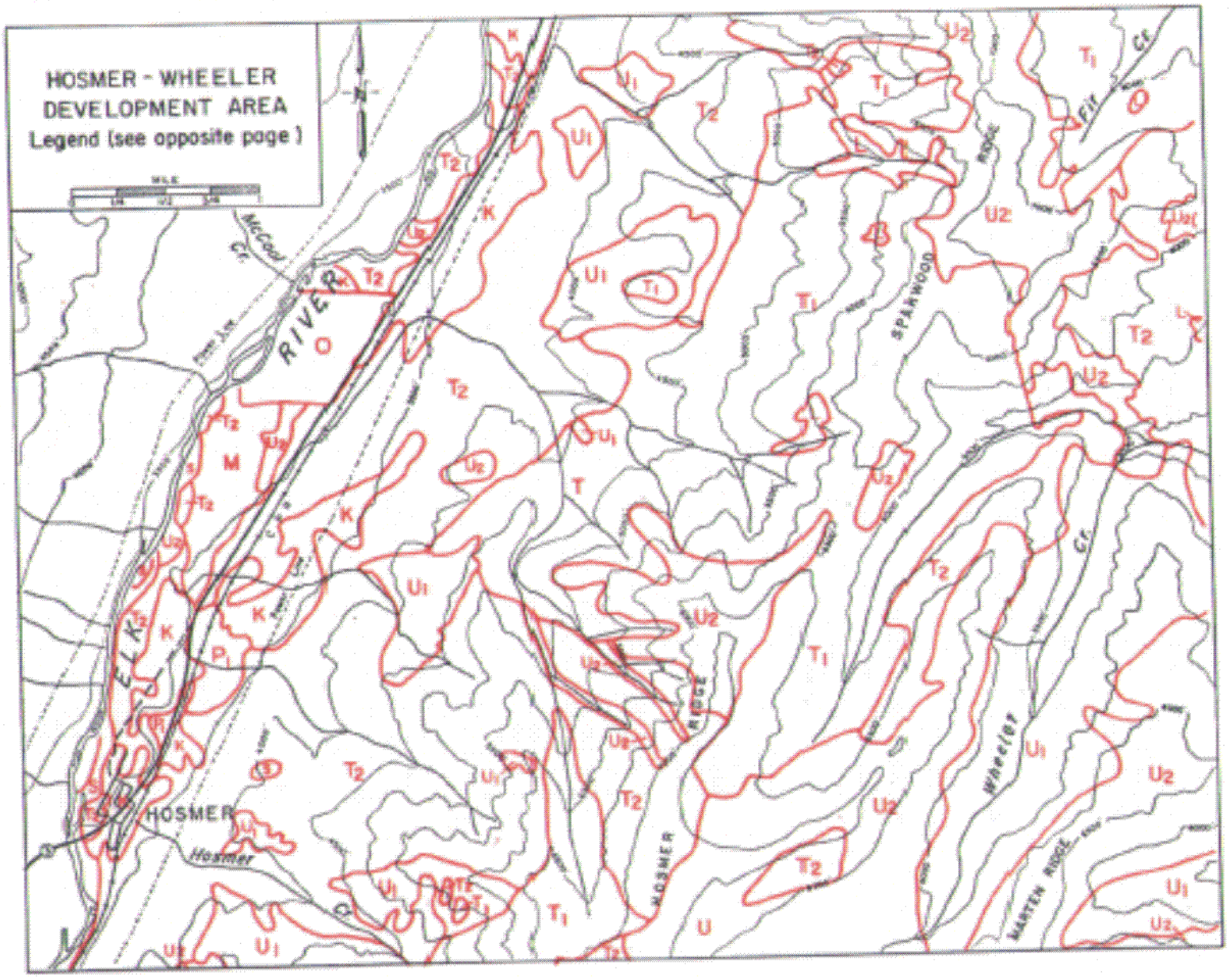


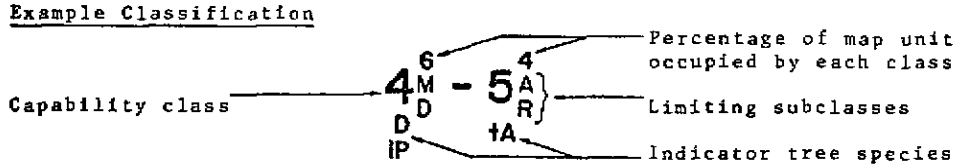
Figure 17
PRESENT LAND USE

Overlay of proposed developments in back pocket

KEY FOR INTERPRETATION OF FORESTRY CAPABILITY MANUSCRIPT MAPS (B.C.)

There are seven capability classes based on their inherent ability to grow commercial timber. The classes are based on a productivity range representing total tree volumes (no merchantability factors have been included).

Example Classification



a) Capability Classes

Class 1 - 111-130 cubic feet per acre per year growth,
- as required can be further subdivided as class 1a (131-150), class 1b (151-170), class 1c (171-190), etc., increasing by 20 cubic feet for classes thereafter.

Class 2 - 91 - 110 cubic feet per acre per year
Class 3 - 71 - 90 cubic feet per acre per year
Class 4 - 51 - 70 cubic feet per acre per year
Class 5 - 31 - 50 cubic feet per acre per year
Class 6 - 11 - 30 cubic feet per acre per year
Class 7 - 0 - 10 cubic feet per acre per year

b) Limiting Subclasses

A - drought or aridity
C - adverse climate - usually high alpine areas
D - rooting depth restricted by a dense or compacted soil layer
E - actively eroding soils
F - low fertility
H - low air and soil temperatures, short growing season
I - inundation (flooding)
L - excessive lime levels
M - soil moisture deficiency
N - excessive levels of toxic elements
P - stoniness
R - rooting depth restricted by bedrock
S - combination of soil factors
U - exposure
W - soil moisture excess

c) Species

rAl - red alder
Ar - arbutus
wB - white birch
D - Douglas-fir
aF - amabilis fir
alF - alpine fir
gF - grand fir
mH - mountain hemlock
wH - western hemlock
aL - alpine larch
tL - tamarack
wL - western larch
bM - broadleaf maple
gO - Garry oak

lP - lodgepole pine
liP - limber pine
pP - ponderosa pine
sP - shore pine
wP - western white pine
whP - whitebark pine
tA - trembling aspen
bCo - black cottonwood
bPo - balsam poplar
bS - black spruce
eS - Engelmann spruce
sS - Sitka spruce
wS - white spruce

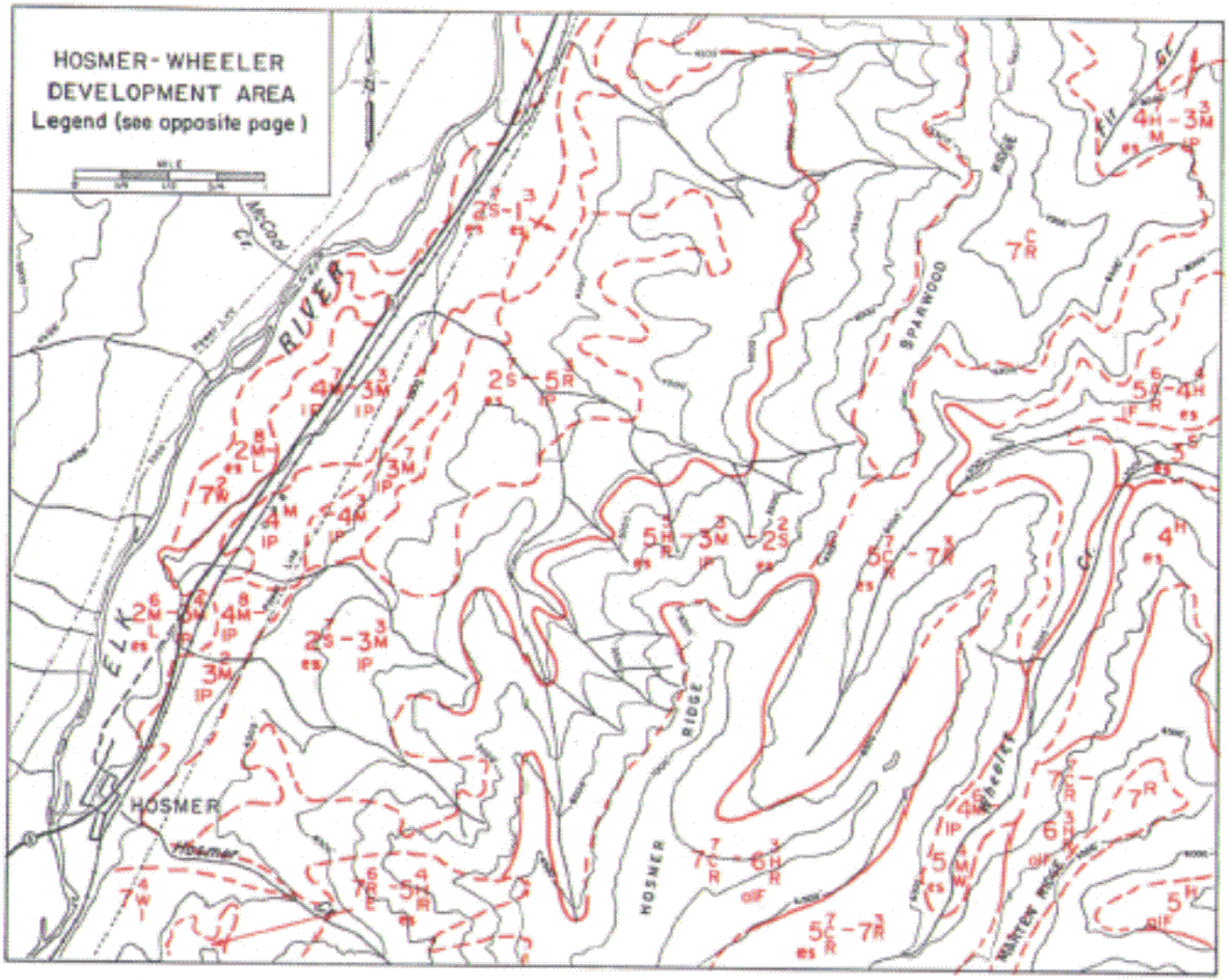


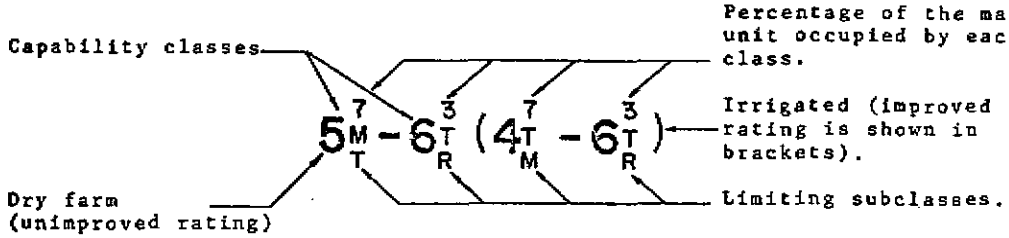
Figure 18
FOREST CAPABILITY

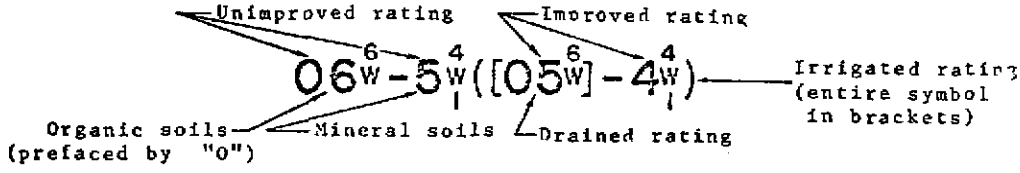
Over lay of proposed developments in back pocket

KEY FOR INTERPRETATION OF AGRICULTURE CAPABILITY MANUSCRIPT MAPS (B.C.)

There are 7 capability classes for agriculture with 1 representing the highest class and 7 representing the lowest. In some areas of the province, two ratings are shown: one for dry farming and a second for irrigated or drained (improved) conditions. The irrigated ratings are shown enclosed in round brackets while the drained ratings appear in square brackets. In all cases improved ratings have precedence over dry farm ratings.

Example Classifications





The agriculture capability classes are determined on the relative range of crops the land can produce.

a) Capability Classes

Class 1 - widest range of crops
Class 2, Class 3, Class 4 - reduced range of crops caused by a number of limiting factors (subclasses)
Class 5 - only permanent pasture or forage
Class 6 - natural grazing
Class 7 - no productivity

b) Limiting Subclasses

C - adverse climate
D - undesirable soil structure
E - erosion
F - low fertility
I - inundation (flooding)
M - moisture deficiency (droughtiness)
N - salts
P - stoniness
R - bedrock near the surface
T - topography (slope)
W - excess water
X - combination of soil factors

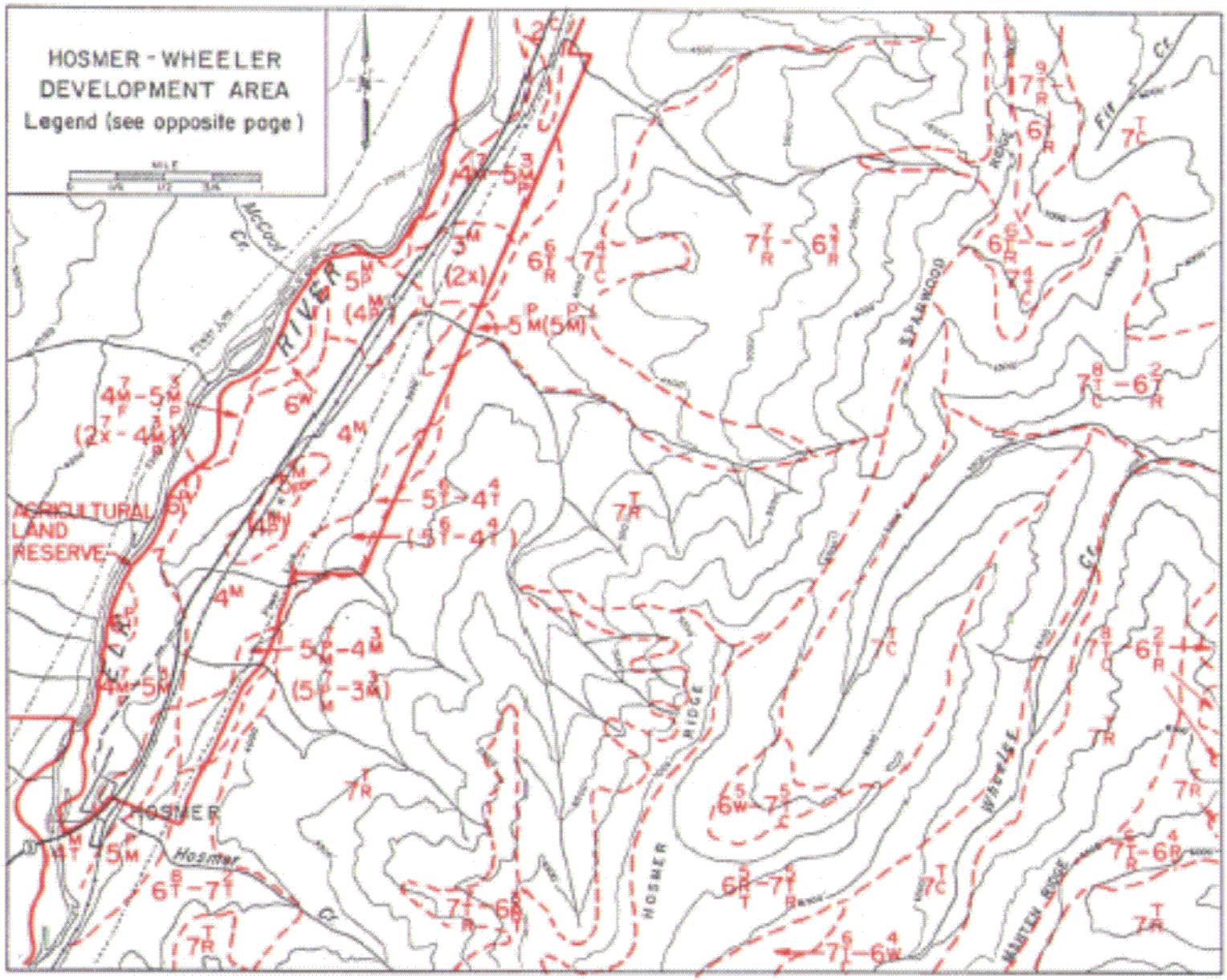


Figure 19

AGRICULTURAL CAPABILITY

Overlay of proposed developments in back pocket

APPENDIX A

WATER SAMPLE COLLECTION PROCEDURE

PROCEDURE: Two water samples should be collected at each site, one in the polyethylene bottle marked "DI and another in the bottle marked "AC".

"DI" SAMPLE: Completely submerge the bottle in the flowing portion of the creek until approximately half full, and discard to remove any contaminants. Then completely fill the bottle.

"AC" SAMPLE: The samples collected in the bottles marked "AC" (acid-washed) must be filtered. The procedure is to use one bottle marked "AC" to collect water at each site in the manner described above (for DI samples). The same bottle may be used to initially collect all "AC" samples. The contents are then poured from this bottle through a filtering apparatus into a fresh acidified "AC" bottle. The filtering procedure is as follows:

Pours a small portion (≈50 ml) of the sample into the top of the glass funnel. Using the handpump, draw the portion through the filter into the suction chamber and discard. Place a clean acidified "AC" bottle into the suction chamber such that the funnel may be placed into the bottle. Repear the filtering procedure, this time filtering the remainder of the sample into the fresh "AC" bottle. Clearly label both the "DI" and "AC" bottles with the appropriate sample site number and date. All samples should be refrigerated until shipping.

*IMPORTANT - 1) A new acid washed filter paper must be used for each "AC" sample.

2) Submerge to upper portion of glass filter in the same flowing portion of the creek that the sample was taken from. This will remove traces of water left from the previous filtering.

3) Add 0.6 ml hydrochloric acid to each "AC" sample at the end of the sampling day.

APPENDIX B

STREAM SURVEY FORM

Stream No. _____ Station _____ Date _____

Photo No. _____ Air temp. _____ Time _____

Water Sample No. ____

Location and surrounding vegetation: _____

Temp.	pH	Dissolved Oxygen	Bedload		Total Width	Riffle	Pool	WIDTH										Vegetation Bank Cover			Bank Stability	
								Pool Quality					Bottom									
			Yes	No				#1	#2	#3	#4	#5	B	C	G	S-S	O	F	B	O	S	U

Remarks

SURBER SAMPLES			
No.	Distance from bank	Bottom	Remarks

DISCHARGE				
Distance from bank	Depth	Velocity		Discharge
		cks/min	ft/sec	
TOTAL				

APPENDIX C

DESCRIPTION OF DEMARCHI'S (1967)*

MAP UNITS

Map Unit No.	Physiography	Soils	Vegetation	Wildlife Capability Rating
1B	High scree slopes with some rock outcrops.	Moderately stable; some broad ridges of stable soils; Dark colored regosolic "Chernozemic" soils common, with subalpine Brown soils and gleyed subalpine Brown "Mountain Meadow" soils.	Mainly grasses on stable areas, some forbs, shrubs and stunted conifers.	Summer range: Excellent Winter range: Good on windswept areas.
1C	High uplands of gentle relief interspersed with rock outcrops.	Stable; subalpine Brown soils and subalpine Podzols common with considerable development of gleyed and peaty associates.	Many areas of low stunted coniferous forests; peat meadows; bunchgrass areas on drier rocky outcrops.	Summer range: Moderate Winter range: Nil
1D	Mainly steep upper and middle slopes dissected by numerous avalanche tracks.	Mainly unstable; Regosols and Regosolic soils; some Brown wooded soils.	Vertical strips of coniferous forest alternating with narrow strips of grasses, forbs and occasionally shrubs.	Summer range: Good Winter range: Low
2	Mainly steep slopes dissected by numerous small creeks.	Moderately stable; Regosolic Acid Brown Wooded and Acid Brown Wooded soils.	Coniferous forest with sparse forb and grass cover.	Summer range: Very low Winter range: Low Logging activity, fires, etc., do not greatly enhance capability.
3	Mainly steep slopes with areas of rock outcrops dissected with numerous small creeks.	Moderately stable; Acid Brown Wooded and Brown Wooded soils.	Largely coniferous forest with local areas of pinegrass understory and occasional bunchgrass areas on south slopes.	Summer range: Low Winter range: Low Logging activity, fires, etc., moderately enhance summer potential on most areas and winter potential on lower, south facing slopes.

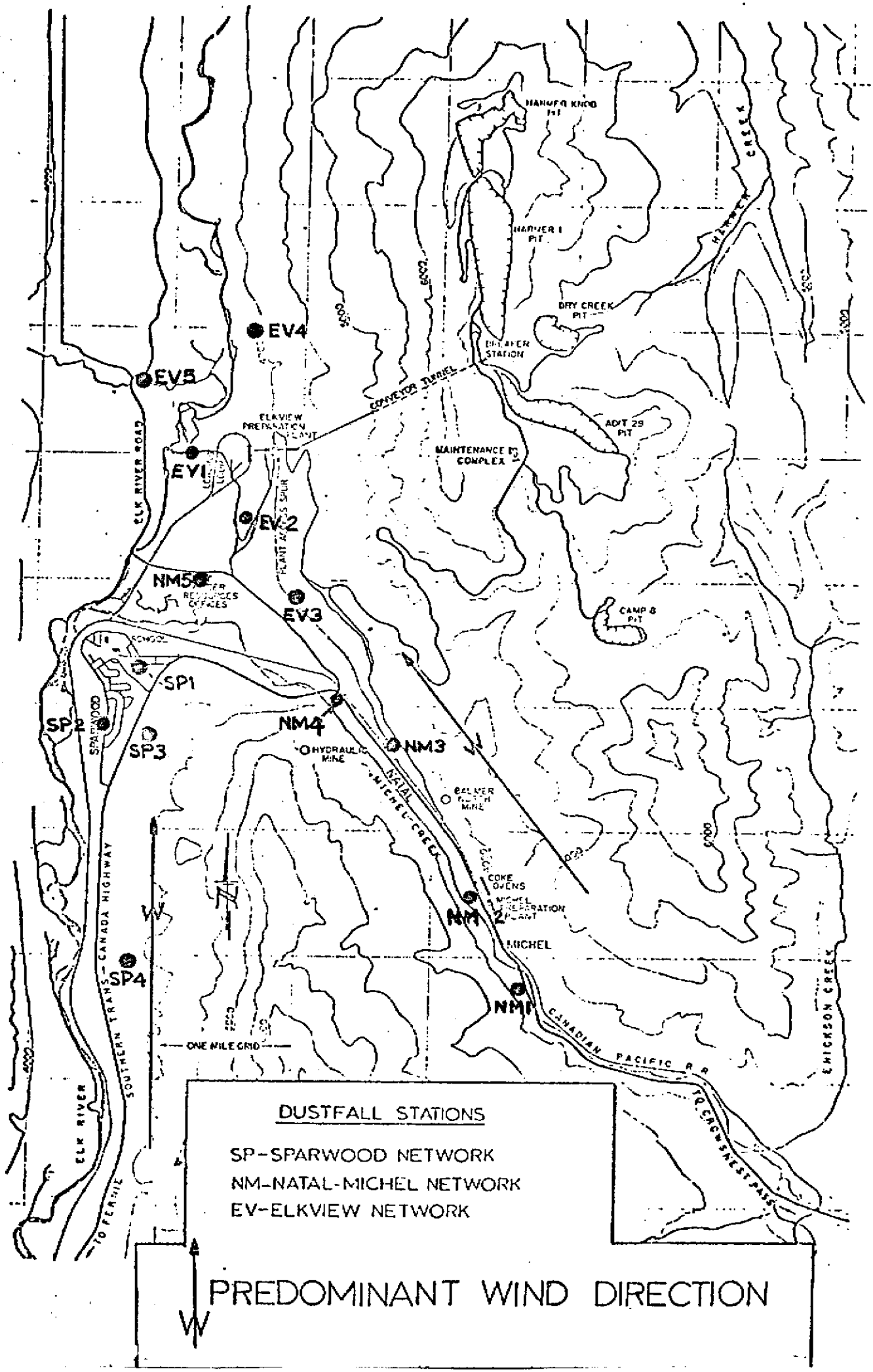
Cont'd . .

Map Unit No.	Physiography	Soils	Vegetation	Wildlife Capability Rating
4	Steep, hilly and strongly rolling dissected land forms generally between 2700 and 4800 feet.	Moderately stable to stable; Brown Wooded, Acid Brown Wooded Gray Wooded, and Brunisitic Gray Wooded depending upon soil parent material and soil moisture regime.	Coniferous forest with dense pine grass understory.	Summer range: Moderate Winter range: Low to moderate. Logging activity, fires, etc., result initially in a strong invasion of bunchgrasses and forbs followed by deciduous shrubs significantly increasing summer range potential on most areas and winter range potential in open valley bottoms and south and westerly exposures.
4B	Steep, hilly and rolling land forms.	Stable; Brown Wooded with intergrades to Acid Brown Wooded.	Open coniferous forest with an understory of bunchgrasses and sod grasses.	Summer range: Moderate Winter range: Moderate Logging activity, fires, etc., result in an invasion of forbs and shrubs, enhancing the capability as winter range.

*Source: Demarchi, R.A. 1967. A general wildlife capability inventory of Crow's Nest Industries Limited lands in the East Kootenay Region of British Columbia. B.C. Fish and Wildlife Branch, Dept. Recreation and Conservation. Victoria. 11 p. plus map.

APPENDIX D

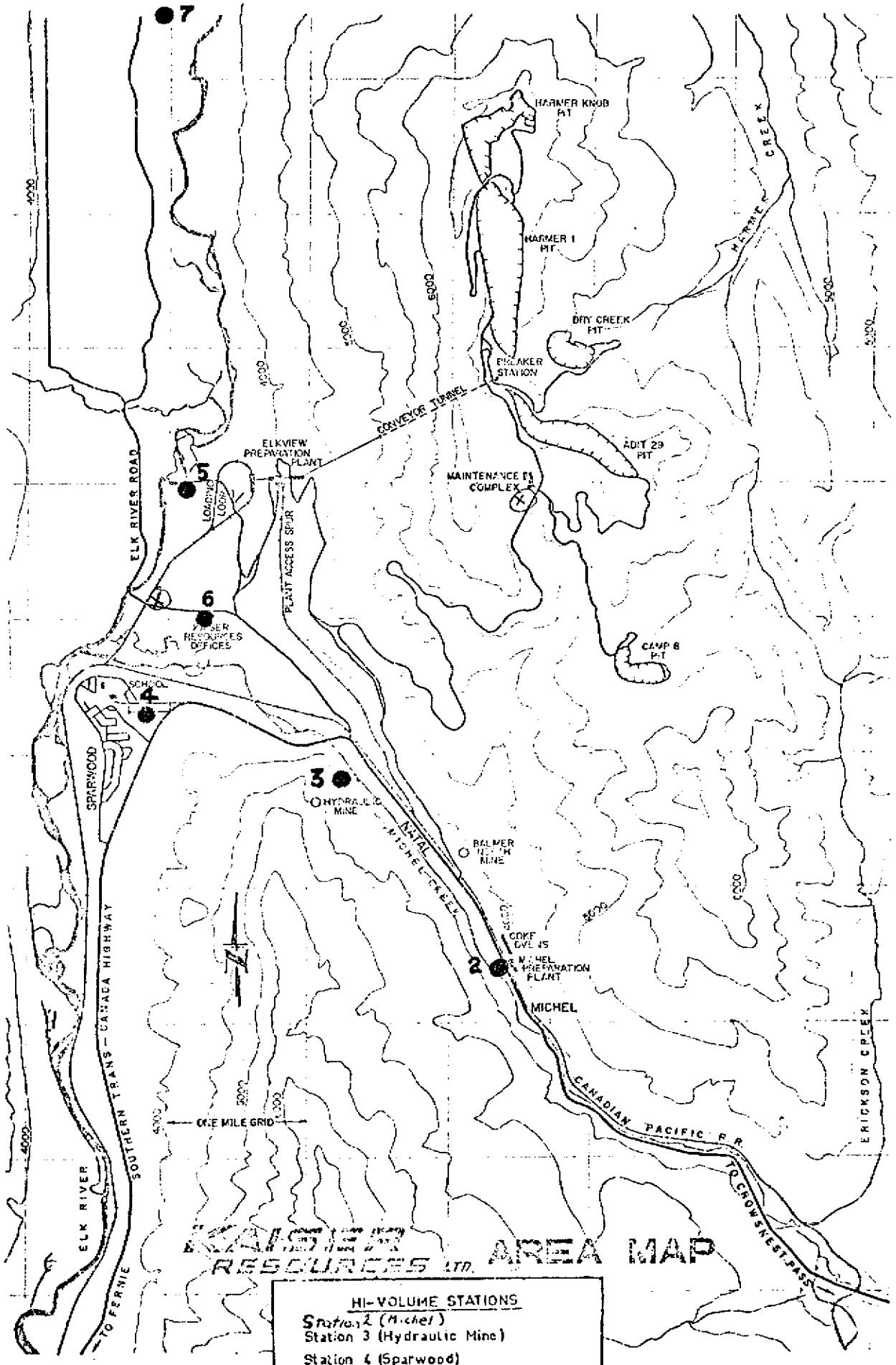
AIR QUALITY INFORMATION FROM KAISER RESOURCES LTD.


EV4
EV5
EV1
EV2
EV3
NM5
SP1
SP2
SP3
SP4
NM4
NM3
NM2
NM1
ELK RIVER ROAD
ELKVIEW PREPARATION PLANT
CONVEYOR TUNNEL
MAINTENANCE COMPLEX
ADIT 29 PIT
DRY CREEK PIT
HARMER KNOB PIT
HARMER I PIT
HOSMER CREEK
CAMP 8 PIT
SCHOOL
SPARWOOD
HYDRAULIC MINE
NATAL
MICHEL CREEK
COKE OVENS
MICHEL PREPARATION PLANT
MICHEL
CANADA HIGHWAY
SOUTHERN TRANS-
ELK RIVER
TO FERNIE
ONE MILE GRID
CANADIAN PACIFIC R R
TO CROWSNEST PASS
ERICKSON CREEK
DUSTFALL STATIONS
SP-SPARWOOD NETWORK
NM-NATAL-MICHEL NETWORK
EV-ELKVIEW NETWORK
PREDOMINANT WIND DIRECTION
W

DUSTFALL (TOTAL SOLIDS) Tons/mi^2/Mo

Sampler Network	ELKVIEW Network					NATAL - MICHEL Network					SPARWOOD Network				Avg.	Average Including Estimated Data
Sampler Site	1	2	3	4	5	1	2	3	4	5	1	2	3	4		
Sept. 75	20	47	27	43	7	17	185	41	34	24	20*	53*	51*	30*	44.5	42.8
Aug. 75	32	33	22	19	19	41	261	94	60	28	55	56	16*	20	56.9	54.0
July 75	72	21	19	16	15	29	212	40	30	11	14	27	18	7	32.6	
June 75	65	37	69	23	33	42	287	44	28	14	19	13	37	14	51.8	
May 75	59	47	15	16	16	24	200	43	23	19	17	13	6*	17	36.2	36.8
April 75	34	87	18	11	17	13	348	56	37	11	25	25	33*	23	46.8	52.7
March 75	6	21	13	13	8	9	178	30	30	6	12	8	6	5	24.6	
Feb. 75	11	22	15	20	11	18	211	25	69	8	12	16	8	6	32.3	
Jan. 75	11	16	12	15	20	21	210	25	24	11	9	7	10	11	28.7	
Dec. 74	18	27	18	29	18	17	279	48	34	17	23	29	30	21	43.4	
Nov. 74	57	63	61	53	32*	45*	451*	85	66*	28*	46	33*	36*	25*	61.6	77.2
Oct. 74	118	59	25	40	48	54	261	61	68	20	13	41	28	20	61.1	
Sept. 74	109	54	33	41	43	38	352	72	44	19	20	53	51	30	68.5	
Aug. 74	9	68	5	17	7	25	265	44	46	32	22	15	16	10	41.5	
July 74	35	30	32	25	15	33	404	79	24	23	26	28	65	17	59.7	
June 74	39	89	27	26	34	33	422	105	65	18	22	6	16	17	65.6	
May 74	17	43	31	23	9	20	373	346	23	18	25	18	6	12	68.8	
April 74	22	50	41	11*	12	34	146	89	57	22	28	13	9*	6	43.3	38.6
March 74	13	22	14	16	14	18	255	20	19	7	12	2	2	10	29.6	
Feb. 74	21	20	12	42	27	39	235	60	31	9	14	16	23	35	41.7	
Jan. 74	15	11	7	12	4	23	194	29	25	4	4	4	3	3	24.1	
Average	33.3	41.3	24.6	25	18.8	26.1	263.9	68.4	38.5	16.1	20.9	19.5	21.3	14.9	45.9	46.5
Average including estimated figures	34.4			24.3	19.5	28.2	272.8		39.9	16.6	20.9	22.7	22.4	16.1	45.2	46.6

* Estimated Data



FRASER RESOURCES LTD. AREA MAP

HI-VOLUME STATIONS

Station 2 (Michel)
Station 3 (Hydraulic Mine)
Station 4 (Sparwood)
Station 5 (Elkview)
Station 6 (Main Office)
Station 7 (Elk Valley)

High Volume Monthly Report for September 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Temp. °F max.	Temp. °F min.
Sept. 1	--	--	--	--	--	--	--	--	--	--	--
2	134	69	65	NP	30	23	0.06	30	4.6	59	31
3	314	89	77	NP	27	23	0.06	20	1.6	59	36
4	231	83	57	29	40	18	--	20	2.9	58	31
5-7	--	--	--	--	--	--	--	22	3.4	70	35
8	412	121	83	47	78	31	--	20	2.9	78	38
9	601	127	61	42	49	48	--	20	6.0	74	38
10	942	143	99	1021*	84	20	--	30	3.8	72	36
11	525	163	110	41	68	33	--	15	0.1	65	34
12-14	--	--	--	--	--	--	--	20	3.3	71	31
15	2525	269	103	231	65	62	--	--	--	75	32
16	404	35	37	41	37	16	0.07	25	4.8	63	51
17	149	33	57	12	35	10	0.39	10	0.41	52	37
18	256	61	80	16	35	--	--	20	2.3	46	32
19-21	--	--	--	--	--	--	--	16	2.2	59	28
22	383	60	96	32	51	12	--	20	3.1	70	33
23	412	78	86	58	102	38	--	20	3.5	70	30
24	775	70	32	49	23	27	--	20	3.8	71	33
25	771	94	54	23	34	20	--	20	4.2	68	34
26-28	--	--	--	--	--	--	0.01	20	3.4	68	29
29	359	145	81	475*	47	31	--	10S	2.7	67	30
30	324	54	63	16	55	22	--	15W	3.8	60	27
Geo. Mean	426	86	69	27	46	24					
Average	560	100	73	49	51	27	0.03	20	3.1	65	34

*Figures not included in determining the average

Residential: 1) 55.9 % of the results are less than 65 Ug/m^3
2) 91.2 % of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) 42.6 % of the results are less than 80 Ug/m^3
2) 48.9 % of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 66.7 % of the results are less than 80 Ug/m^3
2) 76.7 % of the results are less than 120 Ug/m^3

High Volume Monthly Report for August 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Temp. max °F	Temp. min °F
Aug.											
1-4	--	--	--	--	--	--	--	--	--	--	--
5	2806	315	100	120	104	52	--	20E	3.5	78	36
6	2084	296	107	177	161	44	--	20E	6.0	76	44
7	1338	329	74	341	84	49	--	25S	4.6	74	42
-10	--	--	--	--	--	--	0.02	20S	3.8	71	37
11	884	131	96	96	128	--	--	20S	2.7	73	39
12	964	222	124	57	143	--	--	--	--	72	41
13	649	130	107	72	143	--	--	--	--	71	40
14	607	154	113	40	93	--	--	--	--	69	42
5-17	--	--	--	--	--	--	0.16	20S	1.3	68	40
18	252	58	NP	6	31	--	--	20	0.4	58	50
19	160	80	NP	9	49	--	0.10	20	3.5	63	50
20	692	124	74	NP	68	--	--	25	6.0	70	41
21	1747	151	66	NP	152	--	--	20	5.0	72	41
2-24	--	--	--	--	--	--	0.26	22	6.8	68	45
25	151	NP	43	9	39	--	0.19	20	1.3	60	40
26	276	NP	72	18	29	--	0.02	10	1.3	58	41
27	364	NP	73	22	42	--	--	15	1.3	59	40
28	526	NP	24	17	15	--	0.17	20	6.9	77	38
9-31	--	--	--	--	--	--	0.04	25	6.2	53	38
Geo. Mean	631.9	103.7	76.4	38.2	69.0	48.2	0.05	20	3.8	68	41
Average	900.0	180.9	82.5	75.7	85.4	48.3					

Residential: 1) 28.6 % of the results are less than 65 Ug/m^3
2) 60.7 % of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) 25.6 % of the results are less than 80 Ug/m^3
2) 30.8 % of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 41.7 % of the results are less than 80 Ug/m^3
2) 50.0 % of the results are less than 120 Ug/m^3

High Volume Monthly Report for July 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Max. Temp. °F
July 1	512	NP	74	71	101	66	--	--	--	71 41
" 2	705	122	129	139	149	104	--	20N	1.5	75 46
" 3	615	185	120	61	147	57	--	20W	1.5	79 52
" 4-6	--	--	--	--	--	--	--	20W	1.5	91 51
" 7	170	58	74	34	23	29	0.75	15N	0.2	63 58
" 8	332	91	71	196	NP	--	--	20S	2.9	63 53
" 9	850	139	108	434	NP	80	--	20W	5.2	83 58
" 10	495	165	97	56	110	73	--	10S	0.4	76 54
" 11-13	--	--	--	--	--	--	0.22	20W	5.4	74 56
" 14	1194	123	42	59	76	6	--	20E	4.2	78 51
" 15	725	54	23	21	29	--	0.11	20E	3.5	72 55
" 16	319	32	34	43	20	--	0.03	--	--	62 52
" 17	504	59	35	51	16	--	--	--	--	64 53
" 18-20	--	--	--	--	--	--	0.02	--	--	67 43
" 21	1430	259	53	38	96	--	--	20	3.3	73 43
" 22	934	186	58	39	74	--	--	--	--	74 46
" 23	792	150	115	240	181	--	--	--	--	76 47
" 24	--	--	--	--	--	--	--	--	--	78 45
" 25-27	--	--	--	--	--	--	--	--	--	84 47
" 28	3634	411	98	728	131	32	--	30S	6.5	78 51
" 29	308	46	41	29	25	20	0.23	15E	2.3	70 50
" 30	182	62	51	22	31	18	0.26	0	0	50 50
" 31	208	59	41	28	50	27	0.02	10S	1.3	54 44
Geo. Mean	564	103	54	69	60	36				
Average	773	129	70	127	79	47	0.07	17	2.8	72 50

Residential: 1) 47.1 % of the results are less than 65 Ug/m^3
2) 70.6 % of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) 37.7% of the results are less than 80 Ug/m^3
2) 39.6% of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 57.1% of the results are less than 80 Ug/m^3
2) 60.0% of the results are less than 120 Ug/m^3

High Volume Monthly Report for June 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Max. Temp.	Min °F
June											
1	--	--	--	--	--	--	--	--	--		--
2	--	--	--	--	--	--	--	25 S	10	71	39
3	--	--	--	--	--	--	--	30 E	15	65	49
4	--	--	--	--	--	--	0.05	30 S	11	66	48
5	--	--	--	--	--	--	0.14	30 E	11	64	39
-8	--	--	--	--	--	--	0.04	25 E	4	63	37
9	--	--	--	--	--	--	0.02	15 W	1	60	33
10	--	--	--	--	--	--	--	20 S	3	72	31
11	--	--	--	--	--	--	--	20 E	4	74	39
12	919	140	103	128	121	--	--	--	--	71	39
-15	--	--	--	--	--	--	--	--	--	69	60
16	224	32	33	7	17	0.41	--	--	--	58	42
17	222	56	49	24	54	--	0.16	--	--	58	48
18	261	55	43	23	58	--	--	--	--	58	46
19	159	59	38	15	36	--	0.17	0 S	0	55	47
-22	--	--	--	--	--	--	.04	17 S	2	57	45
23	289	79	84	51	83	41	0.05	15 N	0.4	68	41
24	268	72	88	47	78	29	0.03	20 N	2	69	44
25	325	47	65	380	37	29	0.29	30 S	9	72	51
26	969	61	47	--	31	26	--	30 S	11	53	43
-30	--	--	--	--	--	--	0.14	30 S	14	54	44
Geo. Mean	330	62	57	40	49	35					
Average	404	67	61	84	57	36	0.08	22	6	64	43

Residential: 1) 61.1% of the results are less than 65 Ug/m^3
2) 88.9% of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) 53.8% of the results are less than 80 Ug/m^3
2) 53.8% of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 82.4% of the results are less than 80 Ug/m^3
2) 82.4% of the results are less than 120 Ug/m^3

High Volume Monthly Report for MAY 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Max. Temp. °F max	Max. Temp. °F min
May											
1-4	--	--	--	--	--	--	0.14	17E	2.9	56	33
5	168	63	85	17	42	14	0.11	10N	0.4	49	35
6	597	62	50	37	141	12	--	10W	0.4	54	38
7	--	83	72	--	--	7	0.17	20W	1.9	52	39
8	--	88	87	--	--	9	--	15N	1.7	58	30
-11	--	--	--	--	--	--	--	11N	0.5	59	37
12	--	119	98	--	--	--	--	25E	10.4	60	32
13	--	126	123	--	--	44	--	20E	2.7	66	38
14	--	194	150	--	--	56	--	15W	1.5	72	39
15	--	152	152	--	--	38	0.01	20E	3.4	72	39
-19	--	--	--	--	--	--	0.15	24E	6.4	56	40
20	--	74	51	--	--	--	0.15	20E	4.3	54	33
21	--	110	111	--	--	--	--	20E	3.4	61	28
22	--	89	64	--	--	--	--	25	7.5	60	30
-25	--	--	--	--	--	--	0.11	30S	10.0	54	33
26	--	--	--	--	--	--	--	20E	5.4	58	38
27	--	--	--	--	--	--	--	20N	6.3	64	29
28	--	--	--	--	--	--	0.10	15W	0.8	65	35
29	--	--	--	--	--	--	--	20W	3.8	70	35
June 1	--	--	--	--	--	--	--	15N	1.6	73	38
Geo. Mean	316.7	99.2	88.6	25.1	77	19.7					
Average	382.5	105.5	94.8	27	91.5	27.1	0.05	19	3.8	61	35

Residential: 1) 30.8 % of the results are less than 65 Ug/m^3
2) 61.5 % of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) ... % of the results are less than 80 Ug/m^3
2) % of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 38.5 % of the results are less than 80 Ug/m^3
2) 76.9 % of the results are less than 120 Ug/m^3

High Volume Monthly Report for April 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Max. Temp. max	Max. Temp. mi
April 1	1264	165	118	88	78	17	--	15	3.1	29	-3
2	908	46	41	28	17	16	--	20	3.9	33	23
3	NP	58	84	324	49	64	--	20	2.5	35	21
4-6	--	--	--	--	--	--	--	13	1.0	40	16
7	832	122	97	49	87	43	--	20	0.6	40	15
8	236	53	45	91	47	27	0.1	10N	0.0	36	26
9	362	101	119	43	97	24	1.5	10N	0.08	39	25
10	969	164	178	60	92	NP	--	10N	0.6	42	27
11-12	--	--	--	--	--	--	--	15S	2.2	54	23
14	1145	93	144	73	152	34	--	15N	1.8	54	31
15	1291	211	202	301	116	--	--	10N	0.4	44	31
16	1203	49	85	35	47	7	0.23	15S	1.6	51	22
17	505	91	185	9	63	21	0.10	0	0	45	30
18-20	--	--	--	--	--	--	--	24N	5.5	50	32
21	1737	143	238	26	131	--	--	15E	4.3	48	30
22	1387	124	172	596	126	41	--	25E	3.1	55	28
23	1095	50	62	251	36	29	0.01	25E	5.8	53	34
24	750	79	131	63	57	68	--	15E	3.0	52	35
25-27	--	--	--	--	--	--	0.05	16E	3.3	63	32
28	145	40	49	19	24	17	0.20	15	2.3	46	28
29	258	94	76	39	94	24	0.21	10	0.2	46	30
30	1267	178	172	49	143	39	--	10	0.08	50	28
Geo. Mean	744.7	91.3	107.5	66.0	69.3	27.1					
Average	903.2	103.4	122.1	119.1	76.6	31.4	0.11	14	2.06	46	26

Residential: 1) 33.3 % of the results are less than 65 Ug/m^3
2) 58.3 % of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) 35.8 % of the results are less than 80 Ug/m^3
2) 47.2 % of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 52.8 % of the results are less than 80 Ug/m^3
2) 69.4 % of the results are less than 120 Ug/m^3

High Volume Monthly Report for March 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Max. Temp. °F Max	Max. Temp. °F Mi
Mar 3						12	0.17	30 S	5.4	40	33
4	333	57	59	18	35	13	--	10 S	1.5	37	19
5						22	0.24	0 S	0.0	29	18
6	379	75	69	47	69	39	--	0 S	0.0	30	-3
7-9	501	NP	65	104	59	--	--	20 S	4.4	25	8
10	777	99	45	37	58	19	--	24 S	3.6	35	14
11	389	90	59	14	36	18	--	10 S	0.8	35	15
12	537	5	38	14	3	13	--	20 S	1.8	34	2
13	157	19	82	53	3	18	0.02	20 S	1.6	37	22
14-16	427	4	NP	NP	8	--	0.14	25 S	4.9	39	25
17	239	28	2	3	2	2	0.03	20 S	2.7	33	26
18	122	25	--	--	3	6	0.24	12 S	2.6	38	27
19	81	41	55	11	29	9	0.15	20 S	4.6	38	29
20-23	169	33	55	12	27	--	0.19	20 S	1.6	37	14
24	364	90	170	13	58	14	0.03	20 S	0.3	37	22
25	454	73	46	13	76	35	--	PEN NOT		27	12
26	802	199	250	31	120	12	0.04	WORKING		29	0
27-30	613	123	151	122	59	--	--	25 S	3.9	42	-6
31	1180	193	50	162	71	--	--	25 S	1.8	42	10
Geo Mean	358.2	46.2	56.6	25.7	23.6	13.5					
Average	442.6	72.1	79.7	43.6	42.1	16.6	0.07	18	2.4	35	15

Residential: 1) 68.8 % of the results are less than 65 Ug/m^3
2) 87.5 % of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) 45.8 % of the results are less than 80 Ug/m^3
2) 56.3 % of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 71.0 % of the results are less than 80 Ug/m^3
2) 83.9 % of the results are less than 120 Ug/m^3

High Volume Monthly Report for February, 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Max. Temp. °F Max	Max. Temp. °F Min
Feb. 3	1420	104	33	25	37	23	0.25	20NNE	3.9	16	-5
4	1576	194	25	25	23	19	--	14N	0.4	8	-6
5		138	38	13	39	11	--	14NNE	1.7	12	-22
6	1510	58	26	15	32	17	--	0	0	12	-21
7-9	304	70	26	24	35	--	0.10	14SE	0.7	28	-26
10							0.90	36S	5.0	30	-8
11	444	73	39	56	54	--	1.1	CHART NOT TURNING		0	-4
12						9	--			-	--
13	135		26	28	38	17	1.1			37	-9
14-16	131	45	18	17	26	--	0.5	12S	1	27	-1
17	1113	43	9	19	13	4	--	--	--	29	-4
18	519	37	9	12	9	7	--	22S	7.8	30	15
19	482	18	4	7	5	2	--	22S	4.5	33	13
20	333	39	10	15	12	5	0.2	28S	6.5	32	-24
21-23	347	47	11	11	9	--	0.1	28NE	4.4	41	-8
24	958	74	23	11	48	9	tr	28N	4.4	38	-3
25	509	109	NP	13	52	11	--	16S	1.1	32	1
26	709	91	31	16	NP	13	--	20S	1.7	28	-9
27	432	44	22	21	NP	12	--	20SSW	2.1	38	6
28-Mar.2	142	29	12	10	17	--	tr	20S	1.3	42	21
Geo. Mean	490.5	60.3	18.2	16.7	22.8	9.6					
Average	650.8	71.4	19.2	18.8	28.1	11.3	0.2	20	2.6	27	-5

Residential: 1) 100.0% of the results are less than 65 Ug/m^3
2) 100.0 % of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) 57.7 % of the results are less than 80 Ug/m^3
2) 63.5 % of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 85.7 % of the results are less than 80 Ug/m^3
2) 94.3 % of the results are less than 120 Ug/m^3

High Volume Monthly Report for January 1975

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Max. Temp. °F
Jan. 1	-	-	-	-	-	-	-	-	-	-
2	456	51	14	20	12	3	0.02	36	5.5	27
3-5	250	23	5	6	8	-	0.5	36	5.2	28
6	260	43	4	6	NP	8	-	24	6.7	30
7	221	35	14	7	23	3	0.67	20	2.8	28
8	355	122	17	34	66	17	-	30	3.8	28
9	357	131	46	33	70	23	-	20	2.8	-
10-12	179	73	31	26	34	-	0.22	26	3.0	15
13	777	32	11	8	14	6	0.1	14	0.3	21
14	436	48	17	6	14	-	-	20	5.3S	32
15	248	73	22	7	20	3	-	0	0	28
16	1132	49	15	13	21	-	-	16	0.5S	14
17-19	372	20	4	4	4	-	0.38	36	7.0S	40
20	440	77	34	9	80	6	-	30	5.3S	40
21	1445	121	24	NP	38	20	-	20	2.0S	34
22	1031	65	6	NP	7	23	-	30	10.0S	32
23	375	40	3	6	17	6	-	28	8.4S	35
24-26	196	61	22	10	24	-	-	7	1.3	34
27	644	75	22	9	32	10	-	0	0	15
28	438	63	37	24	57	15	-	10	1.3	13
29	524	84	63	8	43	9	-	12	0.6	17
30	781	131	59	14	62	9	-	0	0	16
1-Feb. 2	569	112	43	36	53	-	-	26	6.8	18
Geo. Mean	443.0	62.0	16.9	11.3	25.1	8.6				
Average	522.1	71.8	23.3	14.3	33.3	10.7	0.09	20	3.6	26

Residential: 1) 93.0 % of the results are less than 65 Ug/m^3
2) 100.0 % of the results are less than 100 Ug/m^3

Industrial including Station 2: 1) 56.3 % of the results are less than 80 Ug/m^3
2) 59.4 % of the results are less than 120 Ug/m^3

Industrial excluding Station 2: 1) 85.7 % of the results are less than 80 Ug/m^3
2) 90.5 % of the results are less than 120 Ug/m^3

High Volume Annual Geometric Means

DATE	STATION 2	3	4	5	6	7
1971	--	77.7	84.3	--	--	--
1972	--	61.4	66.1	29.3	46.5	--
1973	--	83.1	72.2	26.8	38.2	20.9
1974	602.8	75.1	49.2	38.4	49.3	14.8
1975						

HIGH VOLUME MONTHLY REPORT FOR DECEMBER 1974

Date	2	3	4	5	6	7	Precip.	Velocity Max.	Velocity Av.	Max. Temp. (F)
Dec1	-	-	-	-	-	-	--	0	0	26
2	2011	123	121	45	114	37	--	20	1.6S	35
3	599	122	68	20	133	12	--	0	0	36
4	939	56	19	18	26	11	0.06	26	3.3S	36
5	751	26	14	7	7	8	0.02	16	8.0S	40
6-8	788	80	84	62	61	--	--	34	3.0S	36
9	2320	56	15	51	19	22	--	34	10.5S	36
10	685	29	13	12	16	3	--	36	4.5S	39
11	413	57	5	5	8	5	0.32	20	4.3S	36
12	552	86	31	NP	65	3	--	20	2.3S	36
13-15	598	43	20	NP	31	--	0.02	20	1.9S	32
16	1354	26	4	3	3	3	0.03	22	9.2	35
17	1206	76	50	58	15	8	0.10	30	8.5	38
18	260	45	15	40	21	13	0.10	24	3.8	30
19	566	28	7	17	11	--	--	19	1.2	33
20-22	257	NP	NP	10	17	--	0.12	47	5.8	40
23	277	NP	NP	6	NP	6	--	0	0	25
24-26	NP	36	12	18	23	--	1.10	Chart not turning		30
27-29	NP	33	7	23	19	18	0.94			34
30	113	87	50	7	33	--	0.26			30
31-Jan 1	249	60	12	10	14	--	--			25
Ave-rate	774	59	30	23	33	11	0.15	22	4.0	34
Geo. Mean.	587.6	52.5	19.1	15.9	21.9	8.5				

sidential: 1) 83.8 % of the results are less than 65 Ug/m^3
2) 91.9 % of the results are less than 100 Ug/m^3

dustrial including Station 2: 1) 57.4 % of the results are less than 80 Ug/m^3
2) 64.8 % of the results are less than 120 Ug/m^3

dustrial excluding Station 2: 1) 86.1 % of the results are less than 80 Ug/m^3
2) 94.4 % of the results are less than 120 Ug/m^3

HIGH VOLUME MONTHLY REPORT

NOVEMBER 1974

Date	2	3	4	5	6	7	Prec.	Velocity Max.	Velocity Av.	Max Temp °F
Nov. 1-3	166	121	86	95	96	-	-	24	2.0 S	46
4	1016	132	86	45	99	47	-	-	-	46
5	3479	119	47	104	114	45	-	-	-	50
6	411	38	15	45	35	19	0.22	24	10 S	41
7	270	46	14	10	16	11	0.48	30	4.9S	39
8-11	320	27	37	154	20	-	0.13	34	7.4S	40
12	367	35	29	33	31	13	0.25	26	6.6S	38
13	206	44	63	NP	45	14	-	16	2.7S	36
14	459	26	99	27	89	15	-	0	0	30
15-17	915	77	63	40	39	-	-	40	5.9S	42
18	327	25	6	14	7	7	0.08	46	11.5S	33
19	492	27	6	19	10	8	-	30	10.4S	35
20	126	35	2	4	7	NP	0.5	30	11.1S	35
21	62	36	20	33	33	NP	0.76	38	10.2S	35
22-24	236	36	9	16	15	-	1.34	32	6.1S	40
25	755	47	10	11	12	NP	0.52	46	9.0S	40
26	566	119	51	9	93	NP	-	0	0	35
27	1264	96	290	30	212	NP	-	0	0	27
28	1290	207	199	NP	142	16	-	0	0	27
29-Dec. 1	946	59	120	39	153	-	-	20	0.6	36
Average	684	68	63	41	63	20	0.24	24	5.5	38
Geo.Mean	452.5	48.1	32.2	27.3	39.2	16.0				

Residential: 1) 65.0% of the results are less than 65 $\mu g/m^3$

2) 82.5% of the results are less than 100 $\mu g/m^3$

Industrial including Station 2: 1) 51.7% of the results are less than 80 $\mu g/m^3$

2) 60.3% of the results are less than 120 $\mu g/m^3$

Industrial excluding Station 2: 1) 76.3% of the results are less than 80 $\mu g/m^3$

2) 89.5% of the results are less than 120 $\mu g/m^3$

High Volume Monthly Report for October 1974

Date	2	3	4	5	6	7	Prec.	Velocity Max.	Velocity Av.	Max Temp (c
Oct. 1	2906	110	57	*1787	92	6	-	32	5.9	64
2	2298	82	41	73	40	36	0.06	44	13.8	61
3	1132	78	38	185	79	18	-	34	11.1	56
4-6	205	45	30	NP	40	-	0.03	40	3.2	46
7	462	101	56	62	146	21	-	24	1.7	56
8	761	126	75	357	129	26	-	22	3.0	63
9	642	114	72	112	110	53	-	26	2.9	76
10	1449	123	83	*1042	124	25	-	26	6.0	60
11-14	936	73	42	*2712	73	38	-	36	5.6	66
15	2855	169	45	*6795	103	73	-	48	14.1	64
16	1457	203	44	NP	119	53	-	30	14.0	69
17	2663	225	90	NP	172	40	-	30	5.1	68
18-20	805	NP	95	NP	144	-	-	30	3.4	69
21	1004	NP	121	NP	117	57	-	18	1.3	54
22	541	212	119	125	159	42	-	21	2.1	51
23	1069	124	106	77	NP	60	-	20	1.7	57
24	733	NP	141	86	171	-	-	14	2.6	59
25-27	621	NP	75	180	148	-	-	20	2.2	62
28	633	128	154	63	169	60	-	0	0	58
29	567	123	138	67	240	57	-	17	2.2	61
30	546	135	146	95	157	92	-	16	3.3	56
31	803	130	98	128	123	63	-	12	3.1	53
Average	1140	128	81	820	126	43	0.004	25	5.5	60
Geo. Mean.	924.1	119.1	75.9	78.3	116.4	39.2				

Residential: 1. 23.3% of the results are less than 65 Ug/m^3.
2. 46.5% of the results are less than 100 Ug/m^3.

Industrial including Station 2: 1. 14.0% of the results are less than 80 Ug/m^3.
2. 26.4% of the results are less than 120 Ug/m^3.

Industrial excluding Station 2: 1. 22.9% of the results are less than 80 Ug/m^3.
2. 42.9% of the results are less than 120 Ug/m^3.

* Average without these values = 123

High Volume Monthly Report for September, 1974

Date	Station 2	3	4	5	6	7	Velocity Prec.	Max.	Av.	Max. Temp (°F)
Sept. 1	-	-	-	-	-	-	0.36	-	-	64
2	-	-	-	-	-	-	-	-	-	78
3	622	88	89	97	133	34	-	22	5.8	73
4	531	118	98	62	159	9	-	24	6.7	72
5	1028	138	67	*7696	146	-	-	22	4.1	72
6 - 8	632	82	49	-	128	7	-	30	7.9	72
9	554	59	26	286	29	-	0.21	34	7.3	69
10	141	29	21	56	30	4	0.26	30	2.5	55
11	246	76	58	33	62	36	0.22	10	0.4	60
12	348	69	70	36	64	47	-	12	1.6	56
13-15	263	67	NP	502	88	10	-	28	4.3	70
16	524	111	79	141	147	40	-	22	4.7	72
17	790	131	96	125	162	91	-	26	4.0	76
18	1220	102	116	*2760	157	45	-	38	4.8	74
19	954	113	109	150	151	-	-	10	2.7	70
20-22	462	NP	84	116	111	3	-	22	3.6	70
23	745	166	105	50	160	-	-	14	2.8	75
24	1026	203	75	130	177	45	-	24	6.4	73
25	2039	291	121	774	291	65	-	34	8.7	77
26	202	44	46	95	87	23	0.3	32	6.5	58
27-29	574	56	41	70	37	31	-	28	6.3	64
30	694	166	98	*1284	133	-	-	20	3.3	50
Average	680	111	76	761	123	33	0.06	24.6	4.7	68
Geo. Mean	563.8	96.2	69.1	87.4	105	22.1				

Residential: 1. 28.2% of the results are less than 65 Ug/m^3.
2. 56.4% of the results are less than 100 Ug/m^3.

Industrial including Station 2: 1. 22.4% of the results are less than 80 Ug/m^3.
2. 37.9% of the results are less than 120 Ug/m^3.

Industrial excluding Station 2: 1. 33.3% of the results are less than 80 Ug/m^3.
2. 56.4% of the results are less than 120 Ug/m^3.

* Average without these values = 170

Hig olume Monthly Report for Augus 1974

Date	Station 2	3	4	5	6	7	Prec.	Velocity Max.	Av.	Max. Temp. F.
Aug 1	645	96	113	84	140	32	--	16	3.9	85
2-5	753	97	76	135	114		--	26	3.4	88
6	1560	189	87	*1107	NP		--	32	8.0	89
7	837	177	73	67	183		0.12	24	3.5	88
8	871	174	104	107	123		--	20	6.3	74
9-11	391	59	10	31	54		1.05	26	4.5	71
12	73	30	5	1	13		1.21	14	3.3	65
13	257	73	57	24	63		0.14	14	1.9	60
14	240	98	68	46	NP		0.01	24	2.5	56
15	587	61	57	30	NP		0.38	24	4.0	65
16-18	525	55	57	314	NP		--			72
19	661	71	59	21	66		--			66
20	279	56	31	16	55	53	0.77			68
21	NP	118	70	68	61	17	0.03			68
22	NP	117	69	92	131	20	--			74
23-25	852	78	47	383	40	20	0.03			71
26	NP	149	72	119	116	12	--			76
27	829	93	77	*1864	153	34	--	28	7.1	77
28	NP	152	86	106	151	49	--	18	1.5	72
29	NP	122	NP	*2394	142	52	--	26	7.9	78
30-3	209	60	48	51	47	2	1.49	30	2.1	78
Average	598	101	63	336	97	29	0.25	23	4.3	73
Geo. Mean.	467.5	91.4	53.3	42.5	81.8	21.8				

Residential: 1) 43.2% of the results are less than 65 Ug/m^3
2) 70.2% of the results are less than 100 Ug/m^3

Industrial including Michel: 1) 34.4% of the results are less than 80 Ug/m^3
2) 53.4% of the results are less than 120 Ug/m^3

Industrial excluding Michel; 1) 45.2% of the results are less than 80 Ug/m^3
2) 71.4% of the results are less than 120 Ug/m^3

* Average without these values = 77

High Volume Monthly Report for July, 1974

Date	Station 2	3	4	5	6	7	Prec.	Velocity Max.	Av.	Max. Temp °F.
July 1	-	-	-	-	-	-	-	-	-	-
2	1559	177	60	59	83	5	0.05	22	4	71
3	2514	137	22	66	37	2	-	28	6	71
4	477	55	17	16	25	2	0.70	30	7	65
5-7	185	63	40	18	49	4	1.16	-	-	67
8	344	51	46	19	37	17	0.16	-	-	64
9	1455	117	38	26	49	20	0.68	-	15	65
10	875	95	36	19	76	20	0.05	28	7	70
11	935	33	12	7	9	8	0.91	36	22	67
12-14	593	NP	61	17	67	-	0.26	-	-	85
15	3258	265	110	61	NP	67	0.2	28	10	86
16	2236	121	84	83	NP	37	-	25	6	80
17	1357	115	70	48	110	18	-	28	5	70
18	1699	123	58	32	62	11	-	30	4	80
19-21	549	68	60	363	64	10	0.55	-	-	79
22	1317	110	70	71	104	24	-	28	5	80
23	946	128	89	59	126	28	0.02	26	5	75
24	1425	104	58	60	125	38	-	30	7	78
25	1323	180	78	48	95	29	-	26	8	78
26-28	593	338	77	71	103	9	-	28	4	88
29	1548	228	108	NP	200	-	-	22	4	88
30	949	157	91	59	154	20	-	28	5	85
31	1430	85	65	70	144	53	-	24	5	87
Average	1253	131	61	44.6	86	22	0.15	27	7	76
Geo. Mean	1037.9	113	54.0	36.8	70.7	14.4				

Residential: 47.6% of the results are less than 65 Ug/m^3.
76.1% of the results are less than 100 Ug/m^3.

Industrial including Michel: 35.9% of the results are less than 80 Ug/m^3.
46.8% of the results are less than 120 Ug/m^3.

Industrial excluding Michel: 54.7% of the results are less than 80 Ug/m^3.
71.4% of the results are less than 120 Ug/m^3.

HIGH VOLUME MONTHLY REPORT FOR JUNE 1974

Date	2	3	4	5	6	7	Weather Start	Weather End	Wind Max.	Wind Ave.	Prec.	Max. Temp.
June 3	1004	152	31	38	30	7	OV.W	OVW	-	-	--	68
4	191	100	32	7	27	3	OVW	OVW	-	-	1.16	55
5	1212	71	42	20	38	-	OV	OV	-	-	0.05	61
6	175	65	23	10	19	34	OV	OV	-	-	0.11	58
7-9	104	70	76	NP	66	4	OV	OV	-	-	0.77	68
10	531	201	96	NP	184	59	CL	CL	-	4	0.09	70
11	1446	205	146	77	264	-	CL	CL	-	9	--	77
12	1241	208	141	72	161	54	CL	CL	-	5.5	--	80
13	1009	144	117	59	209	35	CL	CL	-	7.8	--	81
14-16	258	288	119	75	127	-	CL	CL	-	-	0.23	90
17	1111	194	224	127	193	65	CL	CL	-	6.5	--	85
18	658	257	183	89	164	54	CL	CL	-	7.3	--	85
19	739	208	148	130	192	79	CL	CL	-	6	--	84
20	475	98	56	35	65	14	OV	CL	23	9	0.33	82
21-23	NP	129	66	35	77	-	CL	OV	30	5	--	82
24	1855	225	104	56	145	58	CL	CL	-	-	--	82
25	1185	192	94	61	112	NP	CL	CLW	-	-	--	83
26	1341	113	51	98	39	NP	CLW	CLW	34	13	0.38	75
27	2433	155	36	263	21	NP	OVW	CLW	30	9	0.09	62
28-2	686	123	NP	447	NP	-	CLW	CL	30	10	0.13	78
Average	938	164	94	94	112	39			29	8	0.17	75
Geo.Mean	714.6	149.1	77.6	59.7	83.5	25.4						

RESIDENTIAL: 36.8 % of the results are less than 65 Ug/m^3
52.6 % of the results are less than 100 Ug/m^3

INDUSTRIAL: 1) 26.3 % of the results are less than 80 Ug/m^3
40.4 % of the results are less than 120 Ug/m^3
Includes Michel

2) 39.5 % of the results are less than 80 Ug/m^3
55.3 % of the results are less than 120 Ug/m^3
Excludes Michel

NOTE The Michel high volume sampler was moved from the dry to the top of the Michel offices on June 17, 1974.

High Volume Monthly Report For May 1974

Date	Station #2	#3	#4	#5	#6	#7	Weather Start	End	Precip. (in.)
May 1	-	-	-	-	-	-	-	-	0.54
2	-	62	57	13	26	8	CL.	CL.	0.18
3-5	-	58	81	71	51	8	CL.	OV.	--
6	340	89	109	28	73	-	OV.	OV.R.	--
7	203	62	39	46	27	11	OV.	OV.R.	0.05
8	423	91	72	44	89	-	OV.	CL.	1.88
9	353	41	47	23	44	20	CL.	CL.R.	--
10-12	187	34	43	24	15	4	CL.W.	OV.W.R.	0.64
13	620	29	39	17	14	-	OV.W.	OV.W.	0.39
14	408	*627	53	*410	NP.	21	OV.W.	OV.W.SN.	0.03
15	455	26	37	41	22	20	OV.W.SN.	OV.SN.	--
16	168	*315	*517	90	-	3	OV.W.SN.	OV.	0.66
17-20	222	54	172	34	37	-	OV.SN.	CL.	1.43
21	276	123	103	67	169	29	CL.	CL.	--
22	559	157	114	38	119	34	CL.	CL.	--
23	330	51	36	26	33	15	CL.	OV.	0.01
24-26	195	104	101	NP.	19	9	OV.	CL.	0.82
27	554	88	50	23	168	-	CL.	OV.	0.01
28	227	108	127	43	243	24	OV.	OV.	--
29	205	108	59	58	132	16	OV.	OV.R.	--
30	66	33	18	9	35	7	OV.R.	OV.	0.70
31-June 2	711	46	61	40	36	-	OV.	OV.W.R.	0.28
Average	342	110	92	58	71	15			
Geo.Mean	297.6	63.2	61.8	33.3	49.4	12.4			

Residential: (#4 & #6)
1) 60.0% of the results are less than 65 Ug/m^3
2) 70.0% of the results are less than 100 Ug/m^3

Industrial: (#2,#3 & #5)
1) 50.0% of the results are less than 80 Ug/m^3
2) 61.7% of the results are less than 120 Ug/m^3

* Averages without these values are 71.8, 70.9 and 38.7, respectively.

HI-VOL MONTHLY REPORT FOR APRIL 1974

Date	Station #3	#4	#5	#6	#7	Weather Start	Finish
April 1	59	174	14	51	14	OV. SN.	CL.
2	57	97	17	45	11	CL.	Par. CL. SN.
3	14	77	19	10	10	OV.	OV. W. SN.
4	24	197	15	17	--	OV. W.	OV. W.
5-7	25	77	12	10	--	OV. W.	CL.
8	131	258	18	205	18	CL.	Par. OV.
9	179	248	69	297	57	Par. OV.	OV.
10	106	170	22	200	--	Par. CL.	OV. W.
11-14	60	NP	NP	28	--	OV. W.	CL.
15	78	255	33	152	6	CL.W.	OV. R.
16	56	51	13	38	7	OV.	OV.
17	95	204	22	105	--	OV.	CL.
18	85	159	34	93	3	CL.	Par. CL.
19-21	44	88	112	62	7	Par. CL.	CL.
22	69	81	41	98	26	CL.	CL.
23	82	60	33	197	14	CL.	CL.
24	150	125	81	190	56	CL.	CL.
25	146	167	188	178	101	CL.	OV. R.
26-28	33	30	10	23	--	OV.	PAR. OV.
29	NP	130	20	105	--	Par. OV.	Par. CL.
30-1	57	51	12	19	--	Par. CL.	CL.
Average	77.5	138.9	39.3	101.1	25.3		
Geo. Mean	64.4	116.8	26.9	65.5	15.5		

Residential

34.1 % of the results are less than 65 Ug/m^3
51.2 % of the results are less than 100 Ug/m^3

Industrial

72.5 % of the results are less than 80 Ug/m^3
87.5 % of the results are less than 120 Ug/m^3

HIGH VOLUME MONTHLY REPORT

March 1974

Date	Station					Weather	
	3	4	5	6	7	Start	End
Mar. 1-3	40	11	76	N.P.	-	OV. SN.	OV. W.
4	31	10	24	11	9	OV. W.	OV. SN. W.
5	39	16	39	18	5	OV. SN.	Par. OV. W.
6	N.P.	67	43	91	26	Par. OV. W.	Par. OV. SN.
7	124	58	11	63	12	OV. SN.	Par. CL.
8-10	82	38	36	N.P.	4	Par. OV.	Par. CL.
11	105	27	22	N.P.	10	OV.	OV.
12	44	11	12	N.P.	8	OV.	OV.
13	23	23	9	11	9	OV.W.	CL. W.
14	81	63	*006	45	33	CL. W.	CL. W.
15-17	48	47	26	30	2	CL.	CL.
18	32	57	25	21	8	CL.	Par. CL.
19	165	141	26	135	9	Par. OV.	CL.
20	88	211	31	72	16	CL.	OV. W.
21	94	80	39	37	25	OV. W.	SN. W.
22-24	67	82	N.P.	42	-	CL.	Par. OV.
25	101	98	160	72	27	Par. OV.	OV.
26	58	60	26	46	18	OV.	OV.
27	67	53	13	30	9	OV.	OV. W.R.
28	23	7	7	5	6	OV. W. R.	OV. W.
29-31	23	56	8	17	-	OV. W.	OV. SN.
Average	66.8	57.9	75.9	43.9	13.1		
Geo. Mean	46.1	40.9	24.1	32.3	10.4		

* Average without thi s value is 31.3.

KAISER RESOURCES LTD

Department of Environmental control — Feb., 1974.

H.I.Vol. Monthly Report.

Date	STATIONS # 3	# 4	# 5	# 6	# 7	WEATHER. Start	End
1-3	4	2	2	2	1	OV.W.	OV.
4	68	42	30	41	14	OV.	OV.
5	73	20	15	19	14	OV.	OV.
6	172	68	12	59	13	OV.	OV.
7	164	59	28.	84	19	OV.	OV.
8-10	73	31	25	28	-	OV.	Par.CL
11	117	6	257	15	29	Par.CL	Par.OV
12	67	36	30	16	20	Par.OV.	OV.W.SN
13	115	28	183	14	28	OV.W.SN	Par.OVW.
14	64	17	163	11	28	Par.ov.w.	Par.OV.W.
15-17	28	N.P	12	11	6	Par.OV.W.	OV.W.SN
18	24	9	9	2	8	OV.W.SN	OV.SN
19	34	17	8	20	6	OV.SN	OV
20	161	79	34	113	8	OV.	Par.CL
21	10	23	63	19	12	OV.	OV.W.
22-24	73	34	25	12	9	OV.W.	OV.W.SN
25	37	7	11	12	5	OV. W. SN.	OV. SN.
26	30	13	8	11	-	OV. SN.	OV.
27	88	27	N.P.	64	-	OV. W.	OV. SN.
28	35	9	9	10	-	OV. SN.	OV. SN.
Average	72	28	49	28	14		
Geo. Mean	50.5	19.8	22.8	17.5	10.6		

MAR 14 1974

Jan.,74

Date	Station #3			Station #4			Station #5			Station #6 and #7			Weather	
	Dust	% Ash	Coal Dust	Dust	% Ash	Coal Dust	Dust	% Ash	Coal Dust	Dust	% Ash	xGook Dust	Start	End
1	-	--	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	28	-	-	63	-	-	31	-	-	60	-	7	OV.SN.C	CL.C
5		-	-		-	-		-	-		-			
6														
7	22	-	-	57	-	-	31	-	-	18	-	15	CL.C	CL.C
8	39	-	-	73	-	-	39	-	-	34	-	8	CL.C	CL.C
9	33	-	-	90	-	-	-	-	-	25	-	22	CL.C	CL.C
10	30	-	-	89	-	-	51	-	-	16	-	7	CL.C	CL.C
11	36	-	-	24	-	-	108	-	-	59	-	1	CL.C	OV.W.SN.
12														
13														
14	-	-	-		-	-	-	-	-	-	-	-	-	-
15	3	-	-	43	-	-	5	-	-	6	-	-	OV.W.SN	OV.W.R.
16	23	-	-	47	-	-	6	-	-	14	-	1	OV.W.R.	OV.W.
17	37	-	-	62	-	-	7	-	-	37	-	11	OV.W.	OV.
18	19	-	-	39	-	-	18	-	-	NP	-	1	OV.	CL.
19														
20														
21	231	-	-	44	-	-	NP	-	-	NP	-	20	CL.	CL.W.
22	151	-	-	14	-	-	208	-	-	88	-	-	CL.W.	CL.W.
23	58	-	-	8	-	-	48	-	-	27	-	16	CL.W.	OV.W.
24	19	-	-	3	-	-	8	-	-	15	-	10	OV.W.	OV.
25	22	-	-	28	-	-	85	-	-	12	-	-	OV	OV.W.
26														
27	28			63			31							
28	68	-	-	47	-	-	51	-	-	11	-	13	OV.W.	OV.W.SN
29	145	-	-	54	-	-	40	-	-	55	-	32	OV.W.SN	Par.OV.
30	262	-	-	71	-	-	70	-	-	65	-	44	Par.OV.	OV.SN
31	142	-	-	52	-	-	53	-	-	49	-	11	OV.SN	OV.W.
Geo. Mean	43.4			37.8			32.1			27.0		8.6		
Average	72	-	-	48	-	-	49	-	-	35	-	14		

Note: Ov = Overcast
W = Windy
R = Rain
Par. = Partial
Sn. = Snow
Cl. = Clear
C = Cold

APPENDIX E

INTERIM PLANNING AGREEMENT STUDIES

Demographic Characteristics

Employment

Education

Health Services

Commercial Services

Recreation Facilities

Infrastructure

DEMOGRAPHIC CHARACTERISTICS

The following statistics on the demographic characteristics of the communities in the vicinity of the proposed coal developments can provide a useful indication of general trends. However, due to the rapid rate of population growth associated with mining activity in the area in recent years, these figures are no longer completely accurate. .Elkford, for example, was not incorporated at the time of the 1971 census. People living in that area were included in totals for subdivision C.

A. Population Totals

	1971	1975
Cranbrook	12,000	15,500
Kimberley	7,643	-
Fernie	4,422	5,000
Sparwood	2,990	3,500
Elkford	-	2,500
East Kootenay Regional District	39,430	47,500

Source: *Statistics Canada, 1971 Census, Catalogue 92-702, Vol 1, Part 1*
P.S. Ross and Partners, Consultants to the GDA/IPA Study,. 1975

B. Sex Composition of the Population

	Fernie	Sparwood	Sub C	East Kootenay Regional District	B.C.
Male	2310(52%)	1630(54%)	1755(53%)	68295(52%)	51%
Female	2120(47%)	1360(45%)	1515(41%)	63500(48%)	49%

C. Age Composition

	Fernie	Sparwood	Sub C	East Kootenay Regional District	B.C.
0 -14	1355(30%)	1045(34%)	1125(34%)	39410(30%)	(28%)
15-34	1430(32%)	1065(35%)	1130(34%)	40460(31%)	(31%)
35-64	1335(30%)	760(25%)	860(26%)	41555(32%)	(31%)
65+	310(7%)	120(4%)	155(4%)	70370(8%)	(9%)

D. Number of Families and Average Family Size

	Fernie	Sparwood	Sub C	B.C.
# Of Families	1080	690	815	-
Average Family Size	3.630	3.804	3.676	3.496

Source: Statistics Canada 1971

E. Number of Families and Household Size

	Fernie	Sparwood	Sub C	B.C.
# Of Households	1310	875	940	-
Household Size	2.988	2.995	3.169	2.783

Souce: Statistics Canada 1971

DISCUSSION

Section 'A' provides some indication of the rapid growth rate in this area of the Kootenays. The total population of Fernie increased by 15% between 1971 and 1975, where the population of Sparwood grew by 20%.

In 1971, the population of the area was younger than that of B.C. as a whole, and had a higher proportion of males than the average for the Province. In view of the increasing importance of the mining industry in this area, it would be expected that this trend is continuing in 1975.

Both families and households are slightly larger than the norm for the Province.

The status Indian population of the area would appear to be small relative to the total population. The IPA study group reported that Status Indians comprised only about 2.0% of the total population of the Kootenays. About 69% of the Status Indian population lives on designated "reserves". The IPA study team has not collected any information on non-Status Indians.

EMPLOYMENT

Much of the data which has been collected on the present labour force in the Crowsnest area is based on 1971 census statistics. These statistics are no longer very accurate due to the rapid growth in the area since 1971. However, they can provide indications of general trends.

A. LABOUR FORCE BY SEX

	Fernie	Sparwood	Sub C.	East Kootenay Reg. District	Kootenay Reg. Districts	B. C.
Male	1,285 (70%)	945 (79%)	1,000 (79%)	11,765 (71%)	37,588 (71%)	612,570 (66%)
Female	550 (30%)	245 (21%)	285 (22%)	4,750 (29%)	15,532 (29%)	317,460 (34%)
TOTAL	1,835	1,190	1,285	16,515	53,120	930,030

Source: Statistics Canada, 1971

B. LABOUR FORCE BY AGE

	Cranbrook	Kimberley	Fernie	Sparwood	Sub C.	Kootenay Reg. Districts	B. C.
15-24	2,350 (28%)	1,440 (28%)	810 (26%)	535 (28%)	570 (26%)	23,935 (26%)	385,780(24%)
25-44	3,280 (39%)	1,735 (34%)	1,190 (37%)	895 (47%)	855 (40%)	31,675 (34%)	549,575(34%)
45-64	1,975 (24%)	1,510 (29%)	830 (26%)	365 (19%)	565 (26%)	26,265 (28%)	434,535(27%)
65+	815 (10%)	480 (9%)	350 (11%)	120 (6%)	170 (8%)	10,505 (11%)	205,160(13%)

Source: Statistics Canada, 1971

C. LABOUR FORCE PARTICIPATION RATES BY SEX

	Cranbrook	Kimberley	Fernie	Sparwood	Sub C.	East Kootenay Reg. District	Kootenay Reg. Districts	B. C.
Male	.82	.80	.80	.85	.85	.82	.79	.78
Female	.40	.35	.37	.28	.28	.37	.35	.40
TOTAL	.62	.58	.59	.61	.59	.61	.58	.59

Source: Statistics Canada, 1971

D. PERCENTAGE DISTRIBUTION OF LABOUR FORCE BY INDUSTRY

	Cranbrook	Kimberley	Fernie	Sparwood	Sub C.
Agriculture	1	--	--	--	7
Forestry	2	1	4	--	10
Fishing	--	--	--	--	--
Mining	13	30	21	43	14
Manufacturing	13	17	10	11	17
Construction	9	5	6	8	14
Transport	17	4	10	4	8
Trade	19	13	13	6	9
Finance	4	3	4	2	--
Community Business	23	20	22	17	12
Public Administration	4	4	6	2	--
Not Stated	5	4	5	7	7

Note - A breakdown by industry, sub-groups, sex & year(1971, 197 974 & 1975) is also available for East Kootenay Regional Distric

A labour force distribution by occupation is now also available.

Source: Statistics Canada, 1971

E. EDUCATIONAL BACKGROUND OF LABOUR FORCE

	Fernie	Sparwood	Sub C.	East Kootenay Reg. District	B. C.
OTAL	1,835	1,190	1,285	16,515	930,030
ess than Grade 9	370 (20%)	250 (21%)	355 (28%)	3,490 (21%)	174,050 (19%)
Grades 9-11	715 (39%)	485 (41%)	505 (39%)	6,575 (40%)	314,120 (34%)
rades 12+13	470 (26%)	310 (26%)	315 (25%)	4,440 (27%)	286,915 (31%)
Some University	205 (11%)	100 (8%)	65 (5%)	1,330 (8%)	92,375 (10%)
niversity Degree	75 (4%)	45 (4%)	45 (4%)	685 (4%)	62,575 (67%)

Source: Statistics Canada, 1971

F. HOUSEHOLD INCOME

	Fernie	Sparwood	Sub C.	East Kootenay Reg. District	Kootenay Reg. Districts	B. C.
Households	1,305	875	935	11,335	38,640	668,270
Annual Household Income	$9,759	$9,652	$8,477	$9,349	$8,674	$9,349
% of Households Under $5,000	22.6	22.9	21.4	26.5	26.5	26.5

Source: Statistics Canada, 1971

G. INDIVIDUAL INCOME LEVELS - 1973

	Total #	Average Income	Under 2,000	2,000 3,000	3,000 4,000	4,000 5,000	5,000 7,000	7,000 10,000	10,000 15,000	15,000 20,000	20,00 + ove
l	662	$9,103	74	26	38	20	56	124	266	51	7
wood	1,651	$8,393	216	128	109	82	156	259	570	109	22
	2,636	$7,565	406	223	210	195	317	476	621	119	69
otenay	20,305	$7,469	3,158	1,733	1,576	1,467	2,507	3,699	4,789	984	392
	1,191,401	$7,675									

Source: Income Tax Records, 1973

H. MANPOWER STATISTICS

Cranbrook CMC (1974)	1st Quarter	2nd Quarter
Population of working age	36,738	37,141
Labour Force	20,726	21,054
Unemployment	1,651	1,520
Participation Rate	56.42	56.69
Unemployment Rate	7.96	7.22
Labour Force as % of Provincial Total	2.0467	1.9933
Labour Force as % of Regional Total	26.87	26.87
Unemployment as % of Provincial Total	2.5139	2.5767
Unemployment as % of Regional Total	27.32	30.02

Kootenay Region (1974)	1st Quarter	2nd Quarter
Population of Working Age	142,326	143,885
Labour Force	77,136	78,356
Unemployment	6.043	5.064
Participation Rate	54.20	54.46
Unemployment Rate	7.83	6.46
Labour Force as a % of Provincial total	7.61	7.42
Unemployment Rate as a % of Provincial total	9.16	8.58
Paticipation Rate in B. C.	57.60	59.40
Unemploymnet Rate in B. C.	6.50	5.60

Source: Quarterly Estimates, Economic Analysis and Forecasts Branch, Canada Manpower, cited in Social Demographic and Labour Force Statistics, IPA Studies, 1975

INDIVIDUALS UNEMPLOYED AND SEARCHING FOR WORK BY SEX - SEPTEMBER, 1974

	Cranbrook	Kootenay Region
Male	1,050	3,918
Female	953	2,809
Total	2,003	6,727
Employment Vacancies	230	678

Source: Social Demographic and Labour Force Statistics, IPA Studies, 1975

Discussion:

The above statistics indicate that the labour force of the Fernie, Sparwood and Elkford (Subdivision C) area is somewhat younger than that of the rest of the Kootenays or British Columbia as a whole. Men comprise the majority of the labour force in all municipalities examined. Furthermore, the male participation rate in each locality is at least double that for women. This is particularly noticeable in Sparwood and Elkford (Subdivision C). The male dominance of the labour force reflects the importance of primary industries, manufacturing and construction activities in the area. In 1971, this was most noticeable in Sparwood, where 43 percent of the labour force was employed in the mining industry. The educational level of the labour force in the East Kootenays is

somewhat lower than that of the entire Province. In general, the income level in the East Kootenay Regional District is not as high as the average for British Columbia. However, the income of the labour force in the Crowsnest area is much higher than that of the Province. The average income in Elkford and Sparwood, for example, is approximately $1,000 higher than in the B. C. average. The disparity between the income levels of the Crowsnest area and the remainder of the East Kootenay Region reflects the importance of the mining industry in that area. Miners earn between $12,000 and $18,000 per year.

However, the level of unemployment in the East Kootenays is high relative to that in the Kootenays in general and in the rest of the Province. The Canada Manpower office for this regional district is located at Cranbrook. As can be seen, the unemployment rate for that office was 7.22 percent in the second quarter of 1974, as compared to a rate of 5.60 percent in British Columbia.

EDUCATION

Fernie, Elkford, Sparwood and the "South Country" region west of Elko are included within School District No. 1 (Fernie). The predicted 1975 enrollment and the total teaching staff of each school within the School District is shown in the table below.

Predicted 1975 Enrollment and Teaching Staff of School District 1

	Students	Teachers
Fernie Secondary	554	31
Elko Elementary	46	2
Sparwood Secondary	501	29
Grosmere Elementary	33	2
Isobella Dicken Elementary	455	19½
Sparwood Elementary	533	21
Joffrey Elementary/Secondary	348	17½
Ridgemont Elementary	526	20½
Elkford Elementary	376	17
Baynes Lake Elementary	24	1
Mt. View Elementary	264	11
	3,710	170½

Source: E. T. Chambers, Secretary-Treasurer, School District No. 1, 1975

The recent coal development in the Crowsnest area has led to a great increase in enrollment in this school district. In 1965-66, the total enrollment of the school district was 1,701 students. Thus, in ten years enrollment has more than doubled. In the two years between 1973 and 1975 alone, enrollment increased by 200 students, or 5 percent.

The recent rate of growth in the number of students represents an additional seven to eight classrooms a year. The local school board has found it difficult to provide facilities fast enough to meet the rapidly increasing demand. For example, additions are already being made to Mt. View Elementary School, which was constructed in Sparwood in late 1974. The plans for additions to the local school system are two classrooms for Isobella Dicken Elementary School, four classrooms for Elkford Elementary School and six classrooms for Mt. View Elementary School. Renovations and additions are now being made to Fernie Secondary School.

The School Board has problems retaining existing staff, let alone attracting any additional teachers which are required. Fifty teaching positions had to be filled for the start of the 1975 school term. Forty of these were replacements for teachers who had left in the Spring. This represents a staff turnover of approximately 25 percent. The high turnover rate of teachers is due to the isolation of these communities, the lack of social life and entertainment, and the housing shortage. Although the School Board helps teachers to find accommodation, it is still difficult to find suitable housing. Furthermore, as with other people employed in service occupations, teachers find it difficult to compete in the housing market with mining company employees who benefit from special financial assistance.

The Fernie School District can expect to continue to face large increases in enrollment in the future. The B. C. Research Council predicts that enrollment in this school district will increase by approximately 44 percent between 1975 and 1983. This increase is especially significant when contrasted with the enrollment predictions for the rest of the East Kootenay Regional District, or of the more general Kootenay area of the Province. Since major population growth could significantly affect the quality of education in School District No. 1, it is important that both the local School Board and the Department of Education be informed as quickly as possible of the time and location of any planned population increases.

Projected School Enrollment

School District	Projected Growth in Enrollment (%) 1975-1983
East Kootenay Regional District	19.4
Fernie	44.4
Cranbrook	19.3
Kimberley	- 5.5
Windermere	-12.3
Kootenay Region	- 3.8
B. C.	2.4

Source: B. C. Research, March, 1973.

School District No. 1 does not suffer from a large school drop-out problem at present. As can be seen from the table on public and secondary school drop-outs, the drop-out rate in the Fernie School District is lower than that of most of the other school districts in the East Kootenays and of the Province. The majority of the male drop-outs in the Fernie School

District leave school in the hope of finding high-paying employment with one of the mining companies operating in the area. While this does not appear to be a serious problem at present, future development of the coal resources of the area could induce more students to drop out of school in search of employment. The IPA study group suggests that improved counseling services, vocational training programs and work-study programs may be required to deal with this problem in the future. Such programs would have the additional benefit of improving the quality of the future labour force of the Kootenay region.

The School Board also has responsibility for bussing students to school when required. High school students living in Elkford, for example, must be taken to Sparwood Secondary School. Large mobile home parks which have been developed outside the existing communities in this area, have resulted in a heavy demand for bussing to and from schools. The School Board finds it difficult to organize the bussing system on a long term basis. Because mobile homes can be set up quickly, the location of future needs cannot be predicted. Source: W. F. Marshall, Superintendent of Schools; E. T. Chambers, Secretary-Treasurer, School District No. 1, August, 1975.

The School Board of School District No. 1 also coordinates an Adult Education Program. This program is intended both to assist school drop-outs to reach the Grade 12 level, and to provide vocational training. It is not presently oriented towards craft courses. The total enrollment during the past year was 800 students. The Adult Education Program in this area operates on an annual budget of between 10 and 12 thousand dollars. The administration has found the program quite inexpensive to operate and has accumulated a reserve of $12,000.

In the past, the Adult Education Program was operated in conjunction with Selkirk College and Notre Dame University. In the future, however, the Program will be associated with the newly opened East Kootenay Community College. The administrative centre for this College is to be located at Cranbrook, but classes will be held in any School District where there is a demand for a course. The College will provide the equivalent of the first two years of university as well as vocational training. It will be operating on a budget of $70,000 during its first year.

The Provincial Department of Education, the local Adult Education Director, the local Mines Inspector, the United Mineworkers Union and Kaiser Resources are working together to establish a night school up-grading program for miners. The framework for courses will be based on the qualification for the various levels of miner's licences required by the Department of Mines. The first of these courses will commence this September. Manpower is paying the instructors for these courses. In addition, a mine study program at the high school level is being established. Under this program, students would enroll in courses in Grade 11 oriented to the mining industry

and would spend 100 percent of their time working in various sections of a mine operation during Grade 12. Grade 12 students would receive a full salary for their work. The program is intended to enable students who are dropping out anyway to receive their Grade 12 diploma, while obtaining employment. At present, however, there is some disagreement between the mining companies, which want the students to spend all of their time underground, and the Adult Education Director, who would like the students to obtain a broad range of experience and skills. (Contacts regarding this program are Ray Hughes, the Director of the local Adult Education Program and Fred Savage, Coordinator of the Mobile Learning Section of the Provincial Department of Education.)

The Adult Education Director is also involved in an attempt by local community groups to establish a cultural and educational centre. The Fernie Municipal Government has offered to sell an abandoned hospital to the Provincial Public Works Department for one dollar provided it is used for this purpose. The East Kootenay College would administer the centre. Facilities would be provided for such groups as the Handicapped Society, the Historical Society, the Arts Council and the local Day Care group, as well as classrooms for Adult Education courses. Source: Ray Hughes, Director of Adult Education, School District No. 1, 1975.

Health Services

Hospitals in the East Kootenay Regional District are administered by the East Kootenay Regional Hospital District. The hospitals which are now operating in the region and their rated capacity are shown below.

List of Hospitals by Regional District and School District - January 1, 1975

	Name	Location	Rated Beds	Capacity Bassinets
East Kootenay				
1. Fernie	Fernie Memorial	Fernie	66	7
	Michel-Natal District	Sparwood	17	2
2. Cranbrook	Cranbrook & District	Cranbrook	80	18
3. Kimberley	Kimberley & District	Kimberley	55	12
4. Windermere	Windermere District	Invermere	31	6
			249	45

Source: B.C. Hospital Insurance Service, 1975.

The hospital at Cranbrook also serves as a rehabilitation hospital for the Regional District and can provide this type of service to 50 patients during a given period of time.

Construction of a new hospital is planned for Sparwood within two years. This hospital, which will replace the Michel-Natal hospital, will have a capacity of 27 beds. It should also be noted that a diagnostic and treatment centre was recently established in Elkford. The centre provides emergency and out-patient facilities and can keep people overnight in cases of emergencies.

The occupancy rates of the existing hospitals in the East Kootenay Regional District are shown below.

Occupancy by Hospital Based on Rated Bed Capacity

	1970	1971	1972	1973
Fernie Memorial	88.2%	82.8%	82.5%	79.4%
Michel-Natal District, Sparwood	57.8%	94.9%	98.0%	98.0%
Cranbrook and District	80.9%	83.7%	82.5%	88.0%
Kimberley and District General	78.1%	74.8%	70.0%	61.8%
Windermere District, Invermere				
Total B.C.				

As can be seen, the occupancy rate of the Michel-Natal hospital is high relative to that of the total of hospitals in British Columbia.

It is the opinion of the Hospital Insurance Service that, unless a very major population increase occurs, the addition of the new Sparwood Hospital will mean that there will be more than sufficient hospitals in the area. The Hospital Insurance Service and the East Kootenay Regional Hospital District had assumed that the coal industry in the area would have expanded at a faster rate than has actually been the case. As a result, there is a slight over-supply of hospital beds.

The Hospital Insurance Service indicates that it would probably not favour the construction of a new hospital should a new town be developed in the East Kootenays. It encourages Regional Hospital Districts to provide facilities on a regional basis. In the East Kootenays, therefore, local hospitals handle routine problems and provide diagnostic services, while more serious health problems are dealt with by the Cranbrook hospital, which has more specialists and more sophisticated facilities. The Hospital Insurance Service believes that better health care can be provided under this system than if little hospitals are scattered throughout the region. For this reason and because of the present Province-wide policy of reducing acute-care facilities and increasing out-patient services, the Hospital Insurance Service would probably recommend the establishment of a diagnostic centre should a new town be constructed. These centres can be established within one year of approval, whereas it takes approximately 5 years to provide a hospital.

Source: B.C. Hospital Insurance Services

In September, 1974, there were 54 physicians practicing in the East Kootenay Regional District. At that time, it was estimated that there were 12.44 active physicians for every 10,000 people in the Regional District. This is slightly higher than the average ratio for non-metropolitan Regional Districts in B.C. (12.08 physicians per 10,000 people), but much lower than the ratio for the Province as a whole (18.33 physicians per 10,000 people).

The following table shows the number of doctors actively practicing in municipalities which are of particular concern.

Municipality	No. of Physicians
Cranbrook	21
Kimberley	9 (Medical Clinic)
Fernie	8 (Medical Centre)
Sparwood	3
Elkford	2

Source: B.C. Hospital Insurance Service.

Seventeen dentists were practicing in the East Kootenay Region in 1974. The ratio of dentists to population in the Regional District is 3.92 per 10,000 people. As is the case for physicians, this is slightly higher than the ratio for the non-metropolitan Regional Districts in B.C. in general

(3.53 per 10,000 people) and much lower than that for the Province as a whole (5.08 per 10,000 people). At present, there are 6 dentists in Cranbrook, 3 in Kimberley, 1 in Fernie and 1 in Sparwood.

The only Mental Health Unit in the East Kootenay Regional District is located in Cranbrook. However, a Mental Health officer does make weekly visits to Fernie and Sparwood. The admissions to the Cranbrook Mental Health Unit during 1971 and 1972 by age and sex are shown below.

Admission of Patients by Age and Sex to Cranbrook Mental Health Centre and Admissions to All B.C. Mental Health Centres

Age Groups		Cranbrook		B.C.
		1971	1972	1972
All Admissions	Male	118	82	3335
	Female	114	133	3312
	Total	232	215	6647
0 - 14	Male	44	16	1325
	Female	28	10	524
	Total	72	25	1849
15 - 24	Male	30	14	702
	Female	36	35	869
	Total	66	49	1571
25 - 44	Male	32	36	860
	Female	40	66	1268
	Total	72	102	2128
45 - 69	Male	12	13	411
	Female	10	22	598
	Total	22	35	1009
Over 69	Male	-	3	37
	Female	-	-	53
	Total	-	3	90

Source: B.C. Department of Health, Mental Health Branch, 1971 Statistical Report and 1972 Statistical Report.

As can be seen from this table, more than 50 percent of all admissions to the Cranbrook Mental Health Unit fall in the combined 15 - 24 and 25 - 44 age groups. The majority of the admissions of working age were women. There are many possible explanations for this. It may be that women have more difficulty in coping with life in resource communities such as those in the East Kootenays. Women have a much lower participation rate in the labour force than men in this region. Without any employment, women may face more

boredom and frustration than the male residents of the East Kootenays. However, the higher incidence of mental problems among women may simply indicate that they have more time than men to visit mental health centres.

Source: Social and Community Characteristics in the Kootenay Region, IPA Study, 1975.

The rates of admission of patients per 100,000 population for school districts in the East Kootenays is shown below.

Rates of Admissions of Patients Per 100,000 Population - 1972

Mental Health Planning District (School District)	Admission Ratio
Cranbrook	1,332.2
Kimberley	797.6
Fernie	321.1
Windermere	235.1
East Kootenay Regional District	796.6
B.C.	498.3

Source: B.C. Department of Health, Mental Health Branch, "1972 Statistical Report", December, 1972.

This table indicates that the rate of admission to mental health facilities is much higher in the East Kootenays Regional District than the admission rate in the Province as a whole. The discrepancy between the admission rates in Cranbrook and Kimberley and those in Fernie and Windermere may be explainable in terms of the distance to mental health facilities.

It should be noted that Public Health facilities have also been established in the East Kootenay Regional District. There are Public Health offices at Cranbrook, Kimberley and Fernie. In addition, Sparwood and Elkford receive the services of a public health nurse.

COMMERCIAL SERVICES

The attached table indicates approximate totals of selected retail and service outlets in Cranbrook, Kimberley, Fernie, Sparwood and Elkford. Data was obtained for the first four of these communities from a telephone directory survey conducted by Hedlin, Menzies and Associates, Ltd. for the IPA studies. In addition, a field count of commercial outlets in Sparwood and Elkford was made by an E.L.U.C. Secretariat staff member. The communities have been arranged in order of their importance as commercial centres in the region. As can be observed, Cranbrook has the greatest number of commercial outlets, and is the main shopping centre of the region.

A discussion of the trade and service activity in each community follows the table. (Attached)

Cranbrook

As has been stated, Cranbrook is the major commercial centre in the East Kootenays. The municipal government hopes that the city will become the chief centre for the Kootenays as a whole. However, the high level of retail expenditures made outside the region in centres such as Spokane, Lethbridge and Calgary, has hindered Cranbrook's commercial development.

Originally, Cranbrook developed a central shopping area. However, before this area was able to establish itself as the main retail centre, a commercial "strip" developed on Highway 95 at the northern entrance to the city. With the exception of a small downtown shopping mall, most recent commercial expansion in the city has taken place on the "strip."

Cranbrook has been attempting to persuade a major department store to open an outlet in the city, in the hope that this would ensure its success as the regional centre of the Kootenays. However, the large department stores claim that the city does not offer a large enough market to support a shopping centre of this type.

The following table shows the proportion of Cranbrook's labour force employed in specific types of retail or service occupations. As can be observed, approximately 47 percent of the labour force of the city is employed in trade and service industries.

NUMBER OF SELECTED RETAIL AND SERVICE OUTLETS

	Grocery	Restaurants	Service Stations	Pharmacies	Clothing	Hardware	Automobile Dealers	Banks	Lawyers
Cranbrook	10	30	23	3	17	2	7	7	13
Kimberley	8	8	10	2	8	7	3	2	3
Fernie	5	11	5	2	2	3	5	5	8
Sparwood	5	3	2	2	2	2	0	3	1
Elkford	1	2	1	1	1	1	0	1	0

LABOUR FORCE IN TRADE AND
SERVICE INDUSTRIES IN CRANBROOK
1971

	Number		Percentage	
Trade	975		19.66%	
Wholesale		300		6.05%
Retail		675		13.61%
Services	1,350		27.22%	
Finance, Insurance & Real Estate		175		3.53%
Education & Related Services		230		4.64%
Health & Welfare		275		5.54%
Personal Services		80		1.61%
Accommodation & Food		365		7.36%
Other Services		225		4.54%
Unspecified Industries	220		4.44%	
Other Primary, Secondary & Government	2,415		48.68%	
TOTAL LABOUR FORCE	4,960		100.00%	

Source: Hans J. Kerkonuis, City Planner,
City of Cranbrook
Hedlin, Menzies and Associates Ltd., 1975
Statistics Canada, 1971

Kimberley

Although Kimberley's commercial sector is large for its population size, residents tend to shop in Cranbrook. During the past five years, the commercial district of Kimberley has been redeveloped as a "Bavarian City." Although this development has been a tourist attraction it has not changed local buying patterns.

As can be seen from the following table, only 35.5 percent of the labour force in Kimberley is employed in the trade and service sector.

LABOUR FORCE IN TRADE AND
SERVICE INDUSTRIES IN KIMBERLEY
1971

	Number	Percentage
Trade	405	12.84%
Wholesale	30	0.95%
Retail	375	11.89%
Services	715	22.66%
Finance, Insurance & Real Estate	110	3.49%
Education & Related Services	175	5.55%
Health & Welfare	155	4.91%
Personal Services	60	1.90%
Accommodation & Food	140	4.44%
Other Services	75	2.38%
Unspecified Industries	155	4.91%
Other Primary, Secondary & Government	1,880	59.59%
TOTAL LABOUR FORCE	3,155	100.00%

Source: Hedlin, Menzies and Associates Ltd., 1975
Statistics Canada, 1971

Fernie

Fernie is the major service centre in B. C.'s Crowsnest Pass area. In recent years the commercial sector of the city has been revitalized as a result of the increased coal mining activity in the area. However, commercial expansion in the downtown core is restricted by a lack of available land. Most suitable property is owned by Crow's Nest Industries, who have shown little interest in selling the land. A shift in commercial activity to the area adjacent to the highway may be expected, therefore. This trend has already begun with the recent development of a supermarket and several motels and restaurants along the highway.

The following table indicates that about 39 percent of the labour force of the municipality is occupied in the trade and service sector. Most of those employed in the trade sector work in retail trade rather than wholesaling. This is to be expected, as most wholesaling activity in the region is concentrated in Cranbrook.

LABOUR FORCE IN TRADE AND
SERVICE INDUSTRIES IN FERNIE
1971

	Number	Percentage
Trade	235	13.02%
Wholesale	30	1.66%
Retail	205	11.36%
Services	475	26.31%
Finance, Insurance & Real Estate	55	3.04%
Education & Related Services	105	5.81%
Health & Welfare	105	5.81%
Personal Services	30	1.66%
Accommodation & Food	130	7.20%
Other Services	50	2.77%
Unspecified Industries	90	4.99%
Other Primary, Secondary & Government	1,005	55.68%
TOTAL LABOUR FORCE	1,805	100.00%

Source: Hedlin, Menzies & Associates Ltd.
IPA Studies, 1975
Statistics Canada, 1971

Sparwood and Elkford

Both of these municipalities have developed central commercial areas. Although there is a greater selection of stores in Sparwood than Elkford, residents of both areas complain that the variety of goods is small and the prices are high. With the exception of convenience shopping, such as liquor and some groceries, residents shop outside these municipalities. Shopping trips to Lethbridge and Calgary, which are within easy driving distance, are frequent.

RECREATION FACILITIES

In general, recreation services and facilities in Fernie, Sparwood, and Elkford appear to be adequate to meet the needs of present population. However, additional facilities or improvements to the existing facilities may be required if the population is greatly increased.

Fernie

The municipal recreation facilities in Fernie include an ice arena, a curling rink, a swimming pool, a ball field, a tennis court, a community centre and a golf course. Crow's Nest Industries has helped to finance some of these facilities. Unfortunately some facilities, particularly the swimming pool and the arena require renovation.

The municipality employs a recreation director who organizes arts and craft programs as well as sports activities.

Source: Fernie Municipal Clerk

Sparwood

Construction of a recreation complex was commenced three years ago in Sparwood. The complex was built quickly so that it could be open for use as soon as possible. Additional construction activity is still going on. The complex includes an arena, a curling rink and a recreation activity room. The building is maintained by the Provincial Public Works Department. In addition, the municipality employs a recreation director. A number of arts and craft courses, sports and social activities are organized through the centre. At present, 50% of the people using the centre are children and teenagers. However, the recreation director is having difficulty in interesting young people in using the centre. Many courses and activities are cancelled as a result of a lack of participation.

Community parks are the biggest inadequacy in recreation facilities in Sparwood. The recreation director feels that the municipality needs three playground areas, two activity parks (e.g., tennis court, softball field or track) and a leisure park. In addition, the municipal government would like to have an indoor pool developed. However, it is questionable whether Sparwood's tax base would support the cost of a pool.

Source: Brian Standback, Sparwood Recreation Director

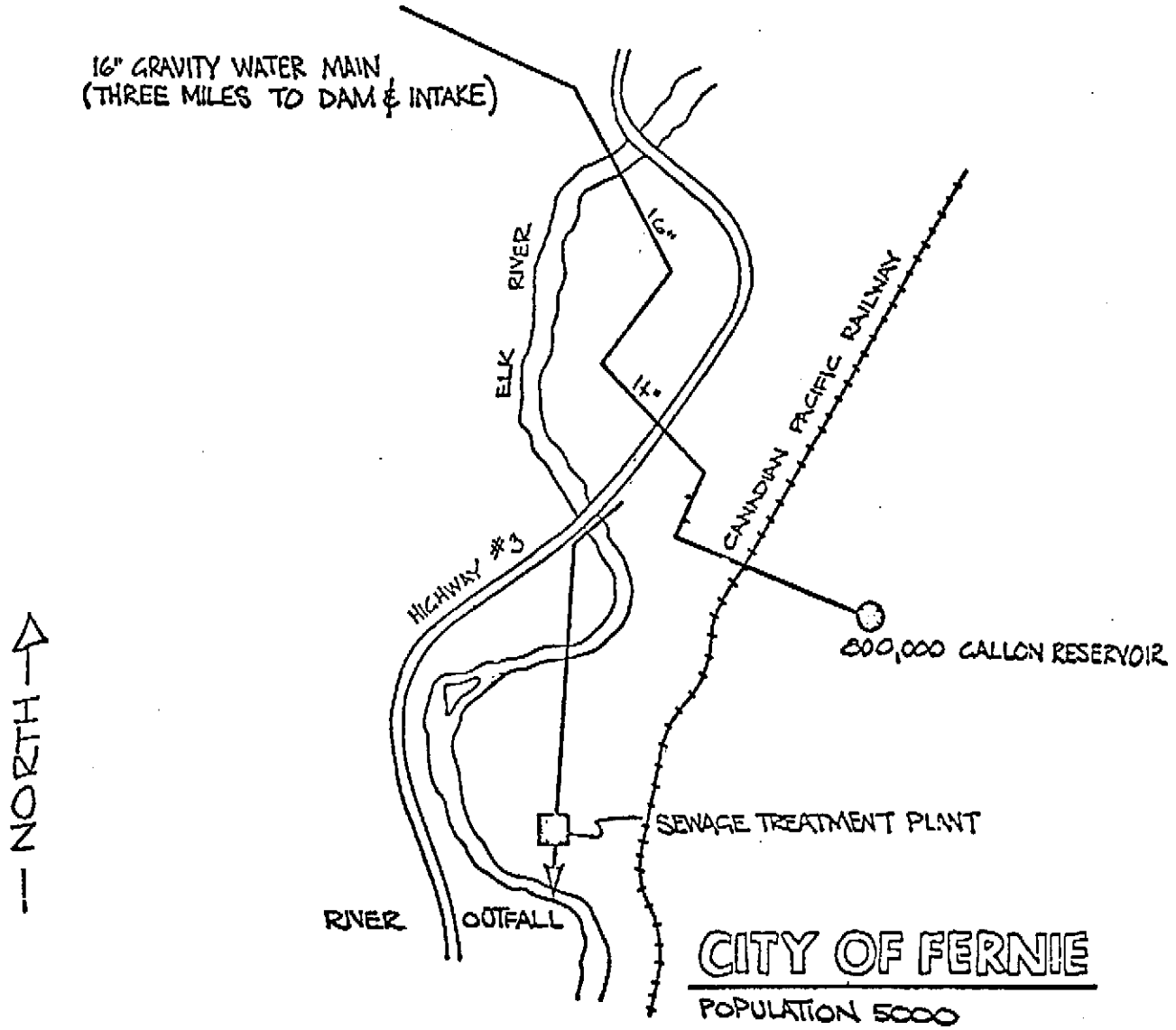
Elkford

A recreation complex is now being completed in Elkford and is now open. The complex includes tennis facilities, a curling rink, an ice arena and an activity area. The municipality employs a recreation director who organizes sports and craft activities, as well as excursions to Lethbridge, Cranbrook and other centres.

Infrastructure

A. Water and Sewage Systems of Fernie, Sparwood and Elkford.

Source: Strong, Lamb and Nelson Report on Infrastructure, IPA Studies, 1975.


16" GRAVITY WATER MAIN
(THREE MILES TO DAM & INTAKE)
16"
14"
ELK RIVER
CANADIAN PACIFIC RAILWAY
HIGHWAY #3
800,000 GALLON RESERVOIR
SEWAGE TREATMENT PLANT
RIVER OUTFALL
NORTH
CITY OF FERNIE
POPULATION 5000

COMMUNITY - Fernie

EXISTING INFRASTRUCTURE - HARD SERVICES

WATER SYSTEM

1. Components

a. Source - Dam on Fairy Creek.
b. 16 in. gravity feeder main.
c. Pressure reducers for lower areas.
d. 800,000 gal. reservoir.
e. Capacity in main for 10,000 pop.

2. Deficiencies and Problems

a. Variety of types and ages of system components - results in maintenance problems.

3. General Requirements

a. Possible upgrading of obsolete water system components.

SEWER SYSTEM

1. Components

a. Aerated lagoons.
b. Outfall to Elk River.
c. 2 river crossings (syphons)
d. Capacity for 10,000 people.

2. Deficiencies and Problems

a. Infiltration, problems in lagoon.
b. Some combined sanitary and storm sewer.
c. Outlet in river backs up during high water.

3. General Requirements

a. Relocate river outfall.
b. Determine infiltration problem and repair.
c. Study and repair of sanitary and storm systems that are tied together.

AVAILABILITY OF LAND TO ACCOMMODATE FUTURE GROWTH

1. Residential Development

a. Approx. 200 acres on east side of C.P.R.
Population equivalent of 3,000.

UNITY - Fernie

INFRASTRUCTURE TO SERVICE POPULATION LEVELS

MATE LATION L	RECOMMENDED PHASING[1] WATER POPULATION	WATER COMPONENT	WATER CAPITAL COST[2]	SEWER POPULATION	SEWER COMPONENT	SEWER CAPITAL COST[2]	TOTAL CAPITAL COST[4] WATER	TOTAL CAPITAL COST[4] SEWER	ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS WATER	ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS SEWER
TING - 000	5,000	Backlogs[3] Water Main looping	68,000	5,000	Backlogs Sewer outfall relocation W.Fernie to be serviced	44,500 1,101,000	68,000	1,145,500	23,900	39,000
000	5,000 ↓ 6,000	Backlogs Reservoir supply mains	68,000 342,000	5,000 6,000	Backlogs	1,145,500	410,000	1,145,500	25,100	39,000
000	5,000 ↓ 6,000 ↓ 8,000	same as above Reservoir Pumps looping	410,000 600,000	5,000 6,000 8,000	same as above Trunk Mains Enlarge S.T.Pond influent line	1,145,500 654,000	1,010,000	1,800,000	31,600	45,400
000	5,000 ↓ 8,000 ↓ 10,000	same as above Reservoir exp. pumps	1,010,000 310,000	5,000 8,000 10,000	same as above Enlarge S.T.P. and trunk mains	1,800,000 325,000	1,420,000	2,125,00	38,900	49,500

1. A separate phasing program is outlined for each ultimate population level.
2. Capital costs expressed in 1975 dollars.
3. Capital expenditures required to upgrade existing services to an adequate standard.
4. All capital costs include allowances for engineering and contingencies.

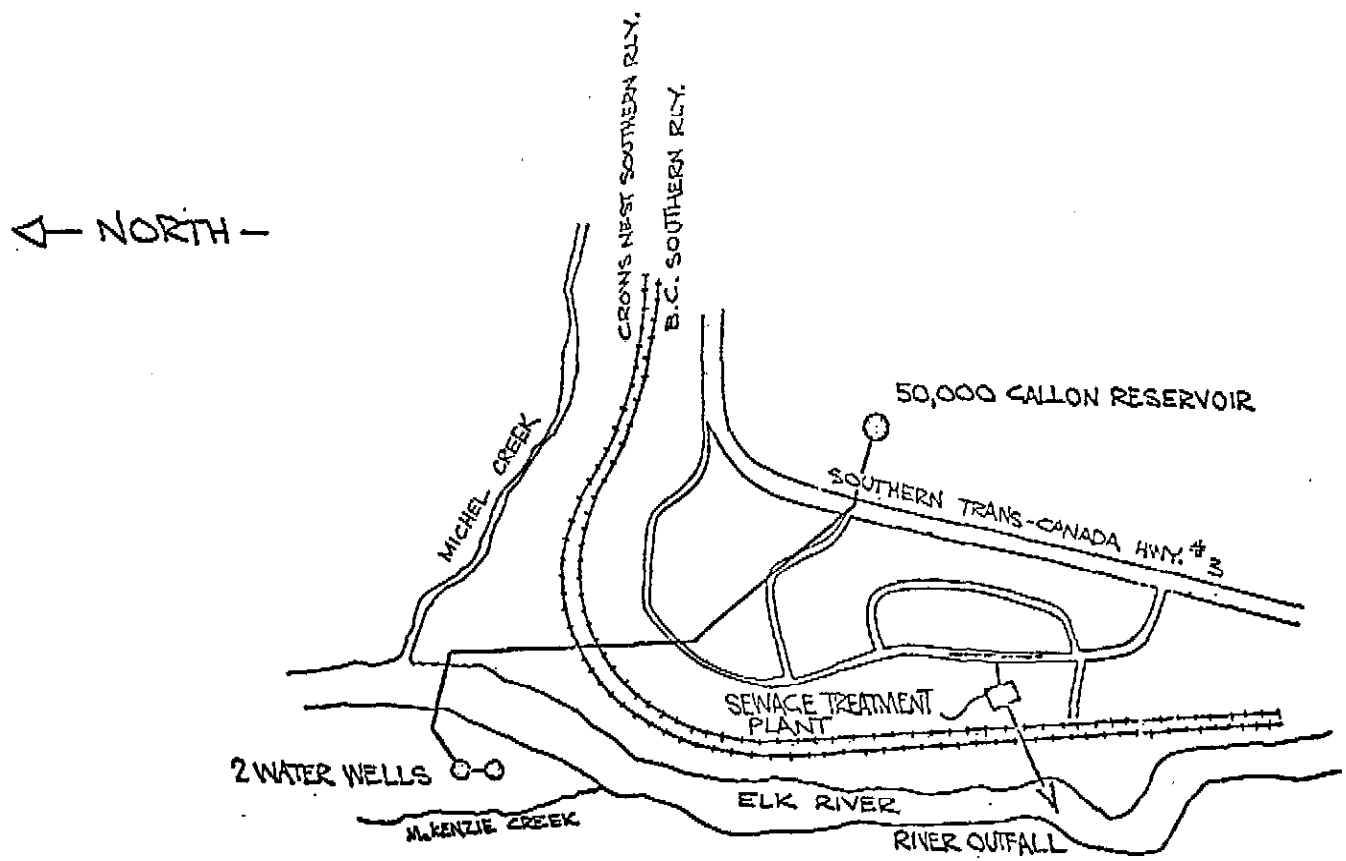
COMMUNITY - Fernie

FINANCIAL ANALYSIS

Population Level	Projected Assessment	Capital Grant By Federal Government		Annual Amortization (New Work)		Annual Amortization (Existing Debt)		Total Amortization New Work Plus Existing Debt		Maximum Annual Assistance for Debt Retirement from Provincial Government	
		Water	Sewer	Water	Sewer	Water	Sewer	Water	Sewer	Water	Sewer
Existing Level 5,000	7,480,000	NIL	191,000	7,300	102,500	NIL	NIL	7,300	102,500	NIL	60,000
6,000	9,000,000	NIL	191,000	44,000	102,500	NIL	NIL	44,000	102,500	NIL	56,600
8,000	12,000,000	NIL	300,000	108,400	161,000	NIL	NIL	108,400	161,000	NIL	93,800
10,000	15,000,000	NIL	354,200	152,400	190,000	NIL	NIL	152,400	190,000	NIL	108,800

Population Level	Total Annual Costs Debt Retirement Plus Operating & Maintenance			Equivalent Per Household Levy Req'd to Finance Systems[1]			Estimated Maximum Annual Contribution Per Household		Residual Per Household		
	Water	Sewer		Water	Sewer		Water	Sewer	Water	Sewer	
		No.Gov't Ass't.	With Gov't Ass't.		No.Gov't Ass't.	With Gov't Ass't.				No. Gov't Ass't.	With Gov't Ass't.
5,000	31,200	133,500	73,500	23	97	54	120	120	NIL	NIL	NIL
6,000	69,100	141,500	84,900	42	86	52	120	120	NIL	NIL	NIL
8,000	140,000	206,400	112,600	64	94	51	120	120	NIL	NIL	NIL
10,000	191,300	239,500	130,700	70	87	48	120	120	NIL	NIL	NIL

1. Average household size is assumed to be 3.65 persons per household.



DISTRICT OF SPARWOOD

POPULATION 3500

COMMUNITY - Sparwood

EXISTING INFRASTRUCTURE - HARD SERVICES

WATER SYSTEM

1. Components

   a. Source - 2 wells on Mackenzie Creek.
   b. 500,000 gal. reservoir.
   c. Capacity for 4,000 pop.
   d. Adequate fire protection.

2. Deficiencies and Problems

   a. Approaching capacity of existing supply.

3. General Requirements

   a. New wells and supply main as required.

SEWER SYSTEM

1. Components

   a. Oxidation ditch for treatment.
   b. Outfall to Elk River.
   c. Capacity for 3,700 pop.
   d. Mainly vitrified clay pipe.

2. Deficiencies and Problems

   a. Treatment plant approaching capacity.
   b. Possible problems due to inadequate bedding of mains - may have resulted in crushed pipe. This will likely lead to high maintenance costs.
   c. S.T.P. influent and effluent lines are underdesigned.

3. General Requirements

   a. Addition to treatment plant.
   b. Upgrading of influent line.

AVAILABILITY OF LAND TO ACCOMMODATE FUTURE GROWTH

1. Residential Development

   a. Virtually unlimited area for development on east side of Southern Trans Canada Highway #3.

   No major servicing problems are anticipated.

NITY - Sparwood

INFRASTRUCTURE TO SERVICE POPULATION LEVELS

ATE ATION	RECOMMENDED PHASING[1] WATER POPULATION	WATER COMPONENT	WATER CAPITAL COST[2]	SEWER POPULATION	SEWER COMPONENT	SEWER CAPITAL COST[2]	TOTAL CAPITAL COST[4] WATER	TOTAL CAPITAL COST[4] SEWER	ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS WATER	ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS SEWER
ING		Backlogs[3]			Backlogs					
00	3,500	Increase well capacity	65,500	3,500	Influent & effluent lines for S.T.P.	28,800	65,500	28,800	12,000	11,800
00	3,500 ↓ 6,000	Backlogs Water well Supply main Reservoir inc.	65,500 423,250	3,500 6,000	Backlogs S.T.P. expansion Increase trunk mains	28,800 720,300	423,250	749,100	22,700	26,500
00	3,500 ↓ 6,000 ↓ 8,000	Backlogs Well, supply main, reservoir Well, reservoir supply main	65,500 423,250 475,000	3,500 6,000 8,000	Backlogs S.T.P. expansion Trunk mains S.T.P. exp. Trunk mains	28,800 720,300 225,000	898,250	974,100	31,700	30,200
,000	3,500 ↓ 8,000 ↓ 10,000	same as above Add well and storage capacity	898,250 375,000	3,500 8,000 10,000	same as above S.T.P. expans.	974,100 325,000	1,273,250	1,299,100	39,800	34,050

1. A separate phasing program is outlined for each ultimate population level.
2. Capital costs expressed in 1975 dollars.
3. Capital expenditures required to upgrade existing services to an adequate standard.
4. All capital costs include allowances for engineering and contingencies.

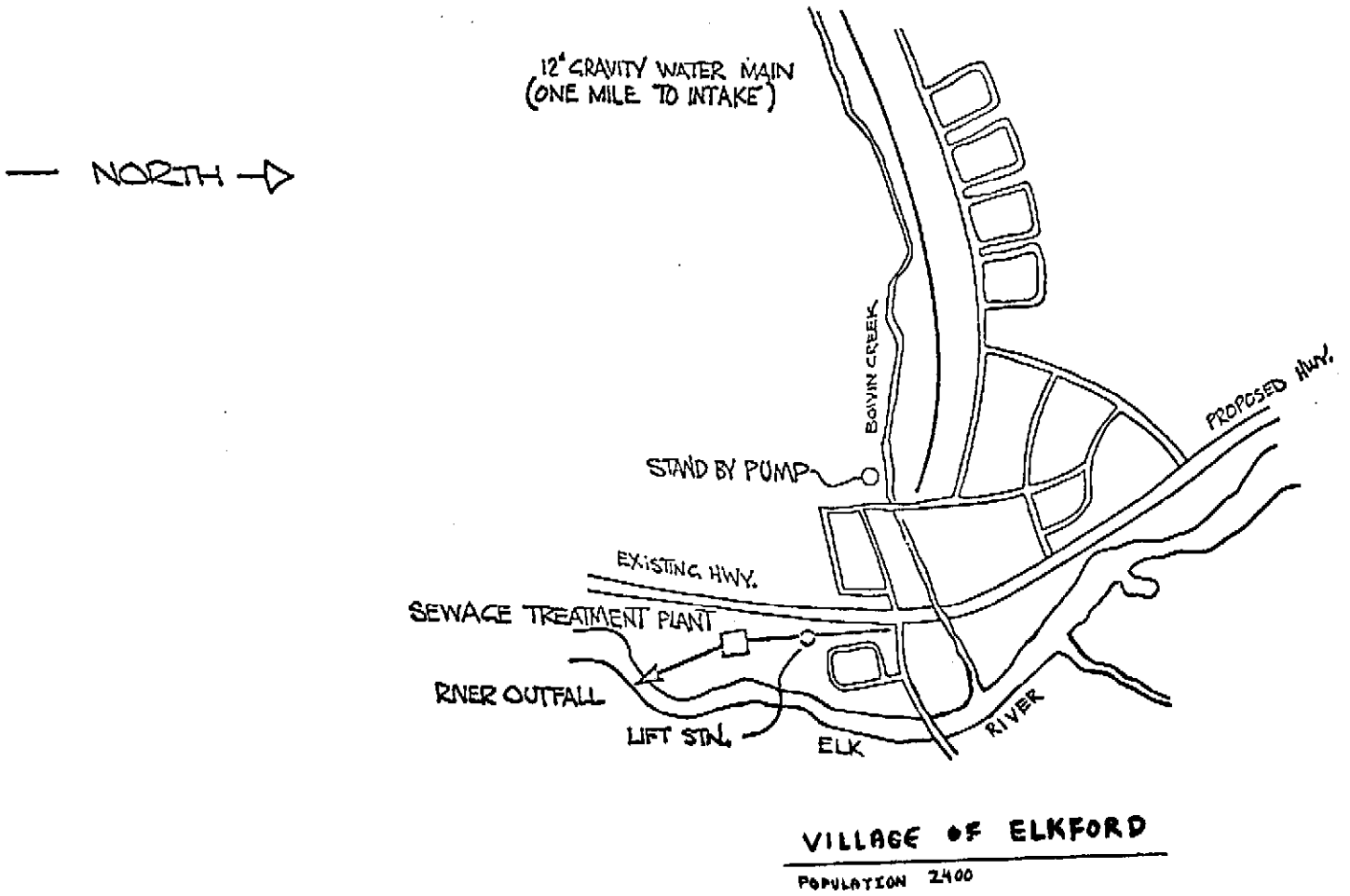
COMMUNITY - Sparwood

FINANCIAL ANALYSIS

Population Level	Projected Assessment	Capital Grant By Federal Government		Annual Amortization (New Work)		Annual Amortization (Existing Debt)		Total Amortization New Work Plus Existing Debt		Maximum Annual Assistance for Debt Retirement from Provincial Government	
		Water	Sewer	Water	Sewer	Water	Sewer	Water	Sewer	Water	Sewer
Existing Level 3,500	8,500,000	NIL	4,800	7,035	2,600	2,990	37,600	10,000	40,200	NIL	11,000
6,000	14,580,000	NIL	125,000	45,500	67,000	2,990	37,600	48,500	104,600	NIL	45,600
8,000	19,440,000	NIL	162,000	96,500	87,200	2,990	37,600	99,500	124,800	NIL	69,900
10,000	24,300,000	NIL	216,500	136,700	116,300	2,990	37,600	139,700	154,000	NIL	80,800

Population Level	Total Annual Costs Debt Retirement Plus Operating & Maintenance			Equivalent Per Household Levy Req'd to Finance Systems[1]			Estimated Maximum Annual Contribution Per Household		Residual Per Household		
	Water	Sewer		Water	Sewer		Water	Sewer	Water	Sewer	
		No.Gov't Ass't.	With Gov't Ass't.		No.Gov't Ass't.	With Gov't Ass't.				No. Gov't Ass't.	With Gov't Ass't.
3,500	22,000	$2,000	41,000	23	54	42	120	120	NIL	NIL	NIL
6,000	71,200	131,100	85,500	43	80	51	120	120	NIL	NIL	NIL
8,000	131,200	155,000	105,100	60	70	48	120	120	NIL	NIL	NIL
10,000	179,500	193,800	133,000	65	71	48	120	120	NIL	NIL	NIL

1. Average household size is assumed to be 3.65 persons per household.



VILLAGE OF ELKFORD

POPULATION 2400

COMMUNITY - Elkford

EXISTING INFRASTRUCTURE - HARD SERVICES

WATER SYSTEM

1. Components

   a. Source - Intake in Boivin Creek.
   b. Gravity feeder mains.
   c. Pressure reduced at Town.
   d. No reservoirs - not a deficiency.
   e. Fire-fighting capacity for 4,000.
   f. Stand-by intake.

2. Deficiencies and Problems

   a. Some freezing water mains due to inadequate cover.
   b. High water table poses installation & maintenance problems.

3. General Requirements

   a. NIL

SEWER SYSTEM

1. Components

   a. Aerated lagoons.
   b. Discharge into Elk River.
   c. Lagoon capacity - 6,000 pop.
   d. Trunk main & lift station capacity - 4,600 pop.

2. Deficiencies and Problems

   a. Level of southern lagoon raises when river level rises.
   b. High water table is a problem for any deep excavations.

3. General Requirements

   a. Raise southern lagoon and line with impervious material.

AVAILABILITY OF LAND TO ACCOMMODATE FUTURE GROWTH

1. Residential Development

   a. Upper plateaus on south side of Boivin Creek.
   One square mile - population equivalent of 10,000 people.

COMMUNITY - Elkford

INFRASTRUCTURE TO SERVICE POPULATION LEVELS

ULTIMATE POPULATION LEVEL	RECOMMENDED PHASING[1] WATER POPULATION	WATER COMPONENT	WATER CAPITAL COST[2]	SEWER POPULATION	SEWER COMPONENT	SEWER CAPITAL COST[2]	TOTAL CAPITAL COST[4] WATER	TOTAL CAPITAL COST[4] SEWER	ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS WATER	ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS SEWER
EXISTING LEVEL		Backlogs[3]			Backlogs					
2,400	2,400	NIL	NIL	2,400	NIL	NIL	NIL	NIL	20,100	17,580
,000	2,400 ↓ 6,000	Water supply mains Reservoir Pumping	835,500	2,400	Sewer main	259,000	835,500	259,000	35,800	24,100
,000	2,400 ↓ 6,000 ↓ 8,000	same as above Upgrading of system	835,500 250,000	2,400 6,000 8,000	same as above Exfiltration ponds	259,000 798,800	1,085,400	1,057,800	42,600	28,100
),000	2,400 ↓ 8,000 ↓ 10,000	same as above Upgrading of system	1,085,400 300,000	2,400 8,000 10,000	same as above Upgrading of system	1,057,800 275,000	1,385,400	1,332,800	48,500	32,100

1. A separate phasing program is outlined for each ultimate population level.
2. Capital costs expressed in 1975 dollars.
3. Capital expenditures required to upgrade existing services to an adequate standard.
4. All capital costs include allowances for engineering and contingencies.

COMMUNITY - Elkford

FINANCIAL ANALYSIS

Population Level	Projected Assessment	Capital Grant By Federal Government		Annual Amortization (New Work)		Annual Amortization (Existing Debt)		Total Amortization New Work Plus Existing Debt		Maximum Annual Assistance for Debt Retirement from Provincial Government	
		Water	Sewer	Water	Sewer	Water	Sewer	Water	Sewer	Water	Sewer
Existing Level 2,400	3,016,000	NIL	NIL	NIL	NIL	2990	37,600	2990	37,600	NIL	21,400
6,000	7,560,000	NIL	43,000	89,700	23,200	2990	37,600	92,700	60,800	NIL	28,600
8,000	10,080,000	NIL	176,000	116,500	94,700	2990	37,600	119,500	132,300	NIL	76,500
10,000	12,600,000	NIL	222,000	148,800	119,300	2990	37,600	151,800	156,900	NIL	89,300

Population Level	Total Annual Costs Debt Retirement Plus Operating & Maintenance			Equivalent Per Household Levy Req'd to Finance Systems[1]			Estimated Maximum Annual Contribution Per Household		Residual Per Household		
	Water	Sewer		Water	Sewer		Water	Sewer	Water	Sewer	
		No.Gov't Ass't.	With Gov't Ass't.		No.Gov't Ass't.	With Gov't Ass't.				No. Gov't Ass't.	With Gov't Ass't.
2,400	23,100	55,200	33,800	34	84	50	120	120	NIL	NIL	NIL
6,000	128,500	84,900	56,300	77	52	34	120	120	NIL	NIL	NIL
8,000	162,100	160,400	83,900	73	73	38	120	120	NIL	NIL	NIL
10,000	200,300	189,000	99,700	72	69	36	120	120	NIL	NIL	NIL

1. Average household size is assumed to be 3.65 persons per household.

APPENDIX F

SUPPLEMENTARY HOUSING INFORMATION

Year End Housing Statistics

Extract from Municipal Housing Study Guide - Sparwood

Housing Inventory

Commercial Inventory

Educational Facilitiy Inventory

Inventory of Other Facilities

YEAR END HOUSING STATISTICS
(Housing Units)

	Fernie-Elko Area	Sparwood-Elkford Area	Fernie C.M.C. Branch Area
1969 Housing Stock	1,610	700	2,310
1970 Housing Stock	1,700	850	2,550
1971 Housing Stock	1,880	1,000*	2,880
1972 Additions	24		
1973 Additions	19		
1974 Additions	39		
1975 Additions (Est.)	56		

* Excludes mobile home units - approximately 180 in Sparwood District and 70 at Elkford.

Sources: Housing stock - Vocational School Brief - Fernie & District Board of Trade.

1972 - 1975 Additions - City of Fernie.

EXTRACT FROM MUNICIPAL HOUSING

STUDY GUIDE - SPARWOOD - SEPTEMBER, 1975

Rental Accommodation

Vacancy rate in 1974 and 1975 - nil.

Rent levels - there are no independent homes to establish level.

- row housing - $175. per month
- mobile home parks - $50.00 p.m. (single)
  $60.00 p.m. (double wide)
- apt. (range) - 1 bedroom $155.00 - $165.00
  2 bedroom $185.00 - $195.00
  (includes heat)
- hostels (batchelor & kitchen units) ($100.00 - $120.00)

Demand for rentals - (taken from Kaiser records)

- houses (unknown as there are none available)
- rowhousing - average of 25 on waiting list
- hostel or batchelor pat. - average of 5 on waiting list
- apts. (1 & 2 bedrooms) average of 27 on waiting list.

Other forms of rentals - 27 mobile homes rented to employees
- 3 bedroom @ $225.00 per month fully furnished.

In addition to the above statistics there is evidence of demand for rental as currently many prospective tenants are living in Fernie and commuting to work. These include school teachers, tradesmen, and non-Kaiser laborers.

Transient workers are usually on waiting list for hostels or apartments. These accommodations are also used as a stop-gap pending availability of building lots or mobile home spaces.

Housing Inventory

As of September 1974

Location	Mobile Homes & Trailers	Apartment Units	Townhouse Units	Duplex Units	Detached Houses	Totals
1. Lodgepole Park (Elk Prairie)	15					15
2. Cummings Creek Elk Valley Trailer Court	78				2	2 78
3. Elk River Bridge (Lower Bench)					6	6
4. L.6251 (Upper Bench)	3				5	8
5. Lower Elk Valley Road (North)	53				20	73
6. Elk Valley Road (incl. Industrial Strip)	5				3	8
7. K.R.L. Mine Road					2	2
8. Elk Valley Road (South)					42	42
9. Spardel Trailer Court	90				10	100
10. Upper Townsite	6	188*		10	136	340
11. Lower Townsite	27		76	78	267	448
12. Natal/Michel					5	5
13. Industrial Strip	8					8
TOTALS	285	188	76	88	498	1,135

* 101 Hostel units included

NOTE: new mobile home park - under construction 1974-1975 110

new municipal subdivision - 1975 64

TOTAL 1,309

Source: McCarter, Nairne & Partners

Commercial Inventory (Retail and Service Commercial)

As of September 1974.

Outlet	Floor Area	Employees Male	Employees Female	Total
a. Mall Retail				
1. Furnishings-Gallery Home	1,152	1	1	2
2. Liquor Vendor	2,304	4	2	6
3. Superior TV & Stereo	1,152	2		2
4. TV Sporting Goods	1,152	1	2	3
5. Vic's Mens Store	1,152	2		2
6. Murphy's Camera & Stereo	1,152	1	1	2
7. S.S Drug Store Ltd.	2,580	1	2	3
8. Food Store	11,500	4	6	10
9. Dairy Bar	160		1	1
10. Vacant Store	380			
11. Vacant Store	1,152			
	23,836			31
b. Mall Service & Professional				
1. C.I.B.C.	2,580	3	5	8
2. Olympia Restaurant	1,920	2	3	5
3. Royal Bank of Canada	2,580	4	6	10
4. Linda's Coiffures	470		1	1
5. Ray's Hairstyling/Barber Shop	380	1		1
6. Hislop and Company -Barristers & Solicitors	936	(1)		(1)
	8,866			26
Totals - 17 outlets	32,702	27	30	57

Source: McCarter, Nairne & Partners

Commercial Inventory (Retail and Service Commercial) (continued)

Outlet	Floor Area	Employees Male	Employees Female	Total
c. Centennial Square Retail				
1. Drapery Shop	1,875		1	1
2. Minton-Cook Pharmacy	3,750	2	2	4
3. Birite Confectionery	1,875	1	1	2
4. Fontana's Meats	1,375	1		1
5. European Delicatessen	1,875	1	1	2
6. Blue Jay Bakery	1,875	1	2	3
7. TV Appliances	1,875	2		2
8. Dress Shop	1,875		1	1
9. Shoe Store	1,875	1	1	2
10. Clothing & Hardware	3,750	2	2	4
11. G & M Stores Ltd. Groceries	3,750	1	1	2
	25,750			24
d. Centennial Square Service and Professional				
1. Elk Valley Building Supplies	1,875	2	1	3
2. Paradise Beauty Salon	1,875		2	2
3. Realty Office	1,875	1		1
4. Accountant, Lawyer, Insurance	1,875	1	3	4
5. Sparwood Billiards	1,875	1		1
6. Golden Arch Cabaret Ltd.	3,750	2	3	5
7. Dr. Lungren's office	1,875	1	3	4
8. Newspaper office	1,775	1	1	2
9. Kingston Insurance Agencies	1,775	1	2	3
10. Dental Office				
11. Sparwood Dry Cleaners	1,875	1		1
	20,425			26
Totals - 23 outlets	46,175	23	27	50

Source: McCarter, Nairne & Partners

Commercial Inventory (Retail and Service Commercial) (continued)

Outlet	Floor Area	Employees Male	Employees Female	Total
e. Elk Valley Road Service & Industrial				
1. Natal Tires		2	1	3
2. East Kootenay Steel Ltd.		43	2	45
3. Fraiser Distributors		1		1
4. Donke & Sons Ltd.		3		3
5. Kiki Transfer		3	1	4
6. Miller & Brown Truching		5	1	6
7. Liquid Carbonic				
8. KRL Offices				
9. B.C. Hydro Substation				
10. Daniels Tire Service Ltd.		4	2	6
11. Fontana, Lou - Trucking		2		2
12. Siep, Charles -Excavating		1		1
13. Wagner, F.D. - Construction				
13 outlets				71
f. Elk Valley -Spardell Court Service - Industrial				
1. Finning Tractor		13	2	15
2. KRL Unit Rig & Equipment Co.				
3. Acklands		2	1	3
4. J.T. Industries		1		1
5. Corner Store & Gasoline		1	1	2
5 outlets				21
g. Natal-Industrial				
1. C.P. Transport Trucking				
2. Fred Sawchuck Trucking		26	4	30
2 outlets				
		107	15	122

Source: McCarter, Nairne & Partners

Commercial Inventory (Retail and Service Commercial) (continued)

Outlet	Floor Area	Employees Male	Female.	Total
h. Highway No. 3 Service Commercial				
1. Sparwood Motel		2	3	5
2. Sparwood Restaurant		2	2	4
3. Tip Inn Motel			1	1
4. Trailer Sale - Airflo		2	1	3
4 outlets				13
i. Highway No. 3 Service - Industrial				
1. Welders Supplies Ltd.		2	1	3
2. Double K Builders Supply		1	1	2
3. Dac Production Ltd.		1		1
4. Pacific 66 Bulk Plant		2	1	3
5. R.B. Steel Fabricators Ltd.		2		2
6. Lowen's Plumbing & Heating		2	1	3
7. Sparwood Collision Repair		2		2
8. McGauley Ready-Mix		7	1	8
8 outlets				24
j. Aspen Road - Service Commercial				
1. Sparwood Esso Station		3		3
2. Sparwood Texaco Station		3		3
3. Greyhound Bus Station				
3 outlets				6
k. Village - Service Commercial				
1. Elk Valley & District Credit Union		1	2	2
1 outlet				3
		32	14	46

Source: McCarter, Nairne & Partners

Educational Facility Inventory

Based on School District No. 1 (Fernie) enrollment summary for December 1974

Facility	Enrollment	Staff	Site Area (acres)	Site Capability Max. Enrollment Allowance	% Developed (approx.)
1. Sparwood Secondary (less Elkford students)	484 -130 354	27	20 (shared site)	1,100	44%
2. Sparwood Elementary Kindergarten	446 +84 530	20		530	100%
3. Mountain View Elementary	240	11	11 (called 8)*	570	42%
Totals	1,124	58	31	2,200	51%

* Because the lower portion of the Mountain View Elementary School site is in the high ground water area and is vulnerable to flooding and because of the long shape of the site, this 11 acre site has been discounted to the level of an 8 acre elementary school site equated with an enrollment potential of 570 pupils.

Source: McCarter, Nairne & Partners

F. Inventory of Other Facilities

	Employees		
	Male	Female	Total
a. Municipal Services			
1. Village Hall		3	3
2. Library-1,152 s.f. in Shopping Mall		2	2
3. Recreation Centre	1	2	3
4. Works Yard	4	4	8
5. R.C.M.P.	7	1	8
	12	12	24
b. Private Services and Utilities			
1. Churches	3		3
2. B.C. Telephone Company		1	1
3. Salus Funeral Chapel	(1)		(1)
	4	1	5
c. Government Services			
1. Kootenay Health Unit - Centennial Square		1	1
2. Department of Highways Yard	1	2	3
3. C.P. Railway Co.	1	1	2
	2	4	6

Source: McCarter, Nairne & Partners

APPENDIX G

CURRENT LABOUR FORCE STATISTICS

Labour Force and Unemployment Statistics

Labour Force by Age Groups and Sex

Labour Force and Unemployed Clients

Population and Labour Force Forecasts

LABOUR FORCE AND UNEMPLOYMENT STATISTICS
EAST KOOTENAY REGIONAL DISTRICT
June 1, 1971 - 1975

LABOUR FORCE	MALE	FEMALE	TOTAL
1971 (Census)	11760	4750	16510
1972 (Estimate)	12700	5250	17950
1973 (Estimate)	13750	5750	19500
1974 (Estimate)	14450	6150	20600
1975 (Estimate)	15200	6550	21750

Unemployment:

1971 (Census)	860	525	1385
Per Cent of Labour Force	7.9%	12.4%	8.4%

1972 -1975

No data available; however unemployed client registrations registered at month - end at the Cranbrook Manpower Centre shown on separate schedule together with labour force estimate for the Manpower Centre; the Manpower Centre embraces all the East Kootenay Regional District plus the Creston area of the Central Kootenay Regional District.

D.M. Roussel
E.A.F.B., Kamloops
26 JUNE 1975

LABOUR FORCE BY AGE GROUPS AND SEX
EAST KOOTENAY REGIONAL DISTRICT, 1971, 1975

AGE GROUP	June 1, 1971 *(Census)			June 1, 1975 (Estimate)			Growth 1971 - 1975		
	Male	Female	Total	Total	Male	Female	Total	Male	Female
14-19 (1)	1325	775	2100	3340	1970	1370	1240	645	595
20-24	1705	810	2515	3480	2220	1260	965	515	450
Sub-Total 14-24	3030	1585	4615	6820	4190	2630	2205	1160	1045
25-44 (1)	5255	1915	7170	8940	6565	2375	1770	1310	460
45-64 (1)	3275	1185	4460	5615	4145	1470	1155	870	285
65 & Over	260	80	340	375	300	75	35	40	(5)
Total	11820	4765	16585	21750	15200	6550	5165	3380	1785
*14-19, Estimated									
(1) Sub-Groups									
15-19	1270	760	2030	--	--	--	--	--	--
25-34	2835	990	3825	4775	3545	1230	950	710	240
35-44	2420	925	3345	4165	3020	1145	820	600	220
45-54	1985	785	2770	3475	2500	975	705	515	190
55-64	1290	400	1690	2140	1645	495	450	355	95

D.M. Roussel
E.A.F.B., Kamloops
10 JULY 1975

LABOUR FORCE AND UNEMPLOYED CLIENTS
CRANBROOK MANPOWER CENTRE 1972-1975

ABOUR FORCE, JUNE 1	MALE	FEMALE	TOTAL
1971 (Census)	13750	5665	19415
1972 (Estimate)	14800	6250	21050
1973 (Estimate)	16000	6825	22825
1974 (Estimate)	16825	7275	24100
1975 (Estimate)	17525	7725	25250

Unemployed Client Registrations, Month - End (1)	MALE				FEMALE			
	1972	1973	1974	1975	1972	1973	1974	1975
January	1081	1451	1068	1917	527	716	599	1442
February	1315	1047	1000	2116	558	637	573	1409
March	1038	810	1188	2274	512	488	892	1538
April	973	1073	1527	2246	565	653	1326	1508
May	831	968	1623	2045	562	591	1498	1498
June	918	720	1178		485	593	1081	
July	673	864	1271		353	704	1292	
August	629	647	1518		328	504	1359	
September	669	468	1062		407	434	962	
October	781	527	1368		493	541	1168	
November	958	666	1464		620	437	1141	
December	961	655	1616		716	380	1212	
Monthly Average	902	825	1324	2120	511	556	1092	1479

(1) Normally the number of unemployed client registrations in B.C. is substantially greater than the official unemployment estimate of the monthly labour force survey.

D.M. Roussel
E.A.F.B., Kamloops
26 JUNE 1975

POPULATION AND LABOUR FORCE FORECASTS

AS AT JUNE 1, 1971, 1975 - 1980

	1971	1975	1976	1977	1978	1979	1980
Fernie-Galloway							
Male Population	3520	3775	3900	4050	4275	4500	4750
Female Population	3150	3375	3475	3650	3825	4050	4250
TOTAL	6670	7150	7375	7700	8100	8550	9000
Sparwood-Elkford							
Male Population	1926	3800	4150	4400	4650	4950	5250
Female Population	1588	3150	3450	3650	3850	4100	4350
TOTAL	3514	6950	7600	8050	8500	9050	9600
Fernie-Galloway							
Male Labour Force	1900	2125	2200	2300	2450	2575	2725
Female Labour Force	770	925	975	1025	1100	1200	1275
TOTAL	2670	3050	3175	3325	3550	3775	4000
Sparwood-Elkford							
Male Labour Force	1000	1875	2075	2225	2400	2575	2725
Female Labour Force	380	775	875	950	1000	1100	1200
TOTAL	1380	2650	2950	3175	3400	3675	3925

Source: Canada Manpower Economic and Analysis Branch, Kamloops.

APPENDIX H

Department of the Environment
Fisheries and Marine Service

WATER INTAKE FISH PROTECTION FACILITIES

PROVISIONS OF THE FISHERIES ACT - SECTION 28

In the Provinces of British Columbia, Manitoba, Saskatchewan and Alberta, the Northwest Territories and the Yukon Territory, every ditch, channel or canal constructed or adapted for conducting water from any lake, river or stream, for irrigating, manufacturing, domestic or other purposes, shall if the Minister deems it necessary in the public interest, be provided at its entrance or intake with a fish guard or a metal or wire grating, covering or netting, so fixed as to prevent the passage of fish from any lake, river or stream into such ditch, channel or canal.

Such fish guards shall have meshes or holes of such dimensions as the Minister may prescribe, and shall be built and maintained by the owner or occupier of such ditch, channel or canal, subject to the approval of the Minister or of such officer as he may appoint to examine it.

The owner or occupier of such ditch, channel or canal shall maintain such fish guard in a good and efficient state of repair, and shall not permit its removal except for renewal or repair and during the time such renewal or repair is being effected the sluice or gate at the intake or entrance shall be closed, and the passage of fish into the ditch, channel or canal prevented.

SPECIFICATIONS FOR INTAKE STRUCTURES WITH STATIONARY SCREENS

1. Screen Material: The screen material shall be either aluminum, stainless steel, brass or bronze.

2. Screen Mesh Size: Clear openings of the screen (the space between strands) shall not exceed 0.10 inch*. The open screen area shall not be less than 50% of total screen area. The recommended screen is 8 strands per lineal inch, square-mesh wire cloth with .028 or .025 inch diameter wire.

3. Screen Area: A minimum unobstructed screen area of 10 square feet shall be provided for each cubic foot per second** entering the intake. The required screen area shall be installed below minimum water level. (Screen area lost by framing shall not be included as part of the unobstructed screen area.)

4. Screen Support: The screen shall be adequately supported with stiffeners or "back-up" material to prevent excessive sagging.

* 0.10 inch = 3/32" (approximately)
** One cubic foot per second = 450 U.S. gallons per minute
= 375 Imperial gallons per minute

5. Screen Protection: The intake structure shall, where necessary, be equipped with a trash rack or similar device to prevent damage to the screen from floating debris, ice, etc.

6. Screen Accessibility: The screen shall be readily accessible for cleaning and inspection. (Screen panels or screen assemblies which cannot be removed for cleaning, inspection and repairs should be avoided.)

7. Allowable Openings: The portion of the intake structure which is submerged at maximum water level shall be designed and assembled such that no openings exceed 0.10 inch in width.

8. Design and Location: The design and location of the intake structure shall be such that a uniform flow distribution is maintained through the total screen area.

PROCEDURES FOR INSPECTION AND APPROVAL OF INTAKE STRUCTURES

Diversions less than one cubic foot per second: The intake structure shall be constructed in accordance with the foregoing specifications. Upon completion of construction and prior to operation, the owner shall contact a local representative of the Fisheries & Marine Service, Department of the Environment, to arrange for on site inspection and approval of the installation. (Permanently submerged screens must be inspected prior to installation.)

Diversions greater than one cubic foot per second: The owner shall submit to the Regional Director of Fisheries, Department of the Environment, 1090 West Pender Street, Vancouver, B.C., V6E 2P1 detailed plans of the proposed installation for review and approval prior to fabrication. The plans shall contain the following information: intake structure location and dimensions, maximum capacity of diversion (expressed either in cubic feet per second, U.S. or Imperial gallons per minute), screen dimensions, screen material, mesh size, fabrication details and minimum water level at the intake site.

The intake structure shall then be constructed in accordance with the approved plans. Upon completion of construction and prior to operation, the owner shall contact the local representative of Fisheries & Marine Service to arrange for on site inspection and approval of the installation. (Permanently submerged screens must be inspected prior to installation.)

ALTERNATE FISH PROTECTION FACILITIES

Self-cleaning type screens or infiltration-type intakes are sometimes used when diversions present major maintenance and cleaning problems. Enquiries concerning the Department's requirements for these types of structures should be directed to the Fisheries & Marine Service, 1090 West Pender Street, Vancouver, B.C., V6E 2P1.

Revised February 23, 1972

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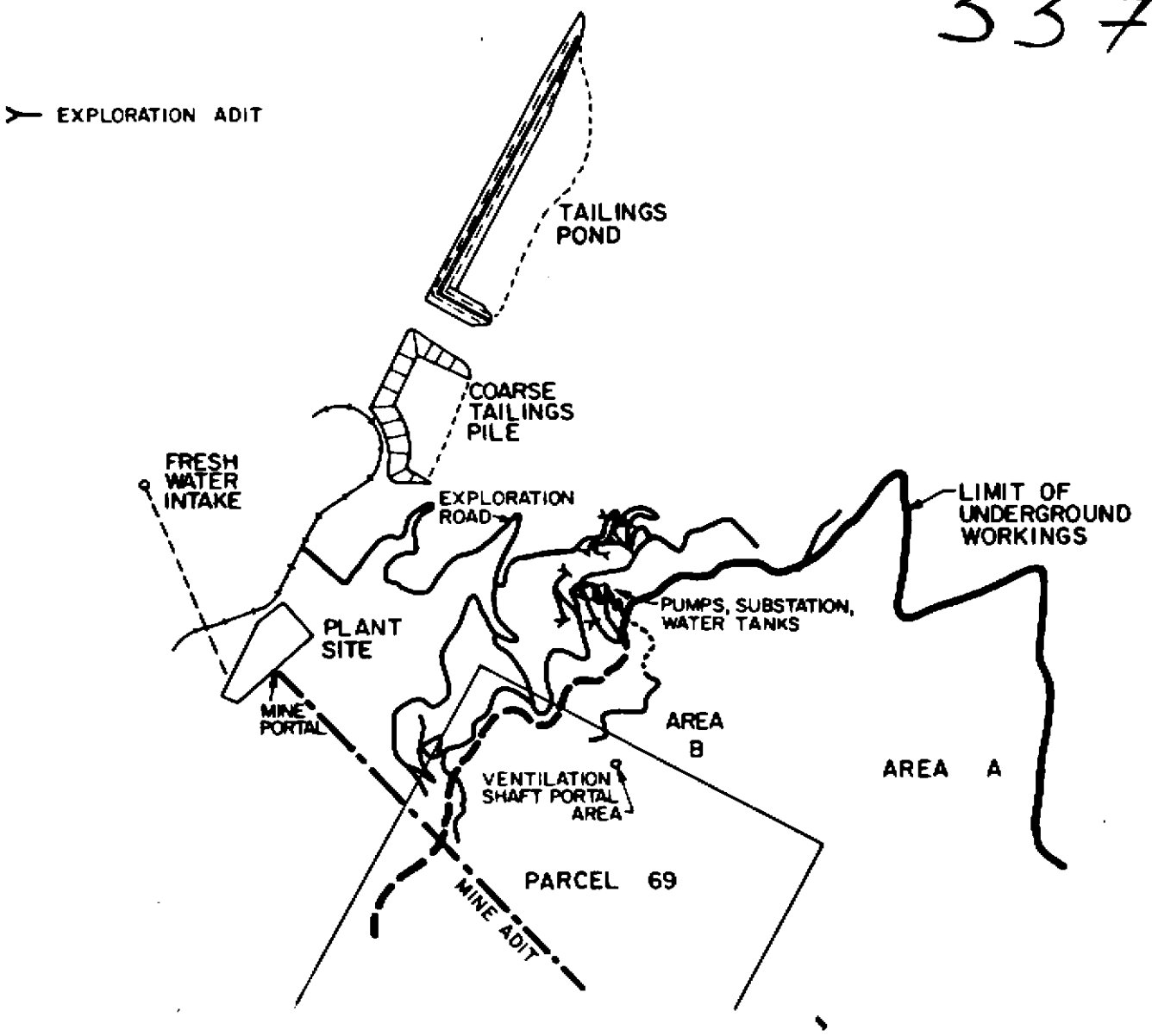

LOCATION OF PROPOSED DEVELOPMENTS, JANUARY 1976