

A Brief Submitted to the Royal Commission of Inquiry

Health and Environmental Protection
Uranium Mining

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Mining

BY THE INSPECTION AND
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MINERAL RESOURCES BRANCH

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**SUBMISSION OF MINISTRY OF ENERGY
MINES AND PETROLEUM RESOURCES TO
ROYAL COMMISSION ON HEALTH AND ENVIRONMENTAL
PROTECTION – URANIUM MINING**

PHASE III – MINING

**October 1979
Inspection and Engineering Division
Mineral Resources Branch**

TABLE OF CONTENTS

	Page
SUMMARY	5
I. INTRODUCTION	6
1.1 General Introduction to Phase III	6
1.2 Moritorium	6
II. FROM EXPLORATION TO PRODUCING MINE	7
2.1 Introductory Note	7
2.2 Guidelines for Coal Development	7
2.3 Metal Mine Development	10
2.4 Uranium Mining Steering Committee	11
2.5 Technical Coordinating Group (TCG) on Uranium Mining and Milling	14
III. LEGISLATIVE FRAMEWORK – AS IT APPLIES TO PRODUCING MINES	18
3.1 Mineral Act	18
3.2 Mines Regulation Act	18
3.3 Other Provincial Legislation	22
3.4 Federal Legislation and Regulation	22
3.5 Other Regulations or Standards	22
IV. REGULATORY PROCESS – MINING	23
4.1 Structure of Inspection and Engineering Division	23
4.2 Qualifications and Training of Inspectors	23
4.3 Functions of Inspectors	25
4.4 Engineering Approach Used	27
4.5 Inspection of Mines (Metal)	28
APPENDICES	
1.2.1 News Release, September 27, 1978	30
2.2.1 Environment and Land Use Act	31
2.2.2 Guidelines for Coal Development	33
2.2.3 Status of Coal Properties	68
2.3.1 Procedures for Obtaining Approval of Metal Mine Development	71
2.4.1 News Release, January 20, 1977	117
2.4.2 Schedule of Licensing and Compliance Surveillance Activities for British Columbia	119

TABLE OF CONTENTS — *Continued*

	Page
APPENDICES — <i>Continued</i>	
2.4.3 Distribution List	124
2.4.4 Uranium Mining Steering Committee, Public Meeting: Clearwater, B.C.	128
2.4.5 Environmental Pre-operational Baseline Survey, Blizzard Uranium Property, prepared by Envirocan Ltd.	134
2.4.6 Notes re Tyee Uranium Deposit	140
2.5.1 Memo, J. D. McDonald to J. T. Fyles, September 22, 1978	166
2.5.2 Memo, J. T. Fyles to B. E. Marr, October 13, 1978	168
2.5.3 Memo, B. E. Marr to J. T. Fyles, November 7, 1978	170
3.2.1 Memo, W. C. Robinson to All District Inspectors, February 9, 1978	171

SUMMARY

- From the time a mine development is proposed, the Division takes an active role in monitoring compliance with provincial regulations by applying the *Guidelines for Coal Development* and *Procedures for Obtaining Approval of Metal Mine Development*. The guidelines and procedures call for compliance with the safety, health, and environmental requirements of the Ministry of Energy, Mines and Petroleum Resources and of other Ministries, such as Environment and Health. In addition, the guidelines and procedures call for consideration at the outset of the social impact of a mine development.
- The Ministry has established the Uranium Mining Steering Committee and the Technical Coordinating Group on Uranium Mining and Milling as a means of monitoring compliance with provincial and federal regulations in any proposed uranium mine development.
- The *Mines Regulation Act*, which is the main tool of the Ministry in matters related to the safety of workers in mining, is administered by District Inspectors and those who assist them. The Ministry as a matter of policy employs professional engineers as District Inspectors and asks them to take an engineering approach to ensuring the mines are as safe as the law requires and practical considerations will permit.
- In applying the *Mines Regulation Act* and especially the Rules contained in it, District Inspectors apply, where appropriate, recognized standards of the Canadian Standards Association, the Ministry of Health, the Workers' Compensation Board, and other recognized standards-setting bodies.
- Amendments to the General Rules in the *Mines Regulation Act*, and variations from those Rules permitted pursuant to section 23, are made in consultation with workers and management.
- In its submission in Phase VII, the Ministry will present further details about inspection procedures and will discuss the safety record of the mining industry in British Columbia.

I. INTRODUCTION

1.1 General Introduction to Phase III

The Ministry's submission in Phase III will describe the following:

- (a) the processes which the Ministry has developed in conjunction with other Ministries, to monitor proposed coal and metal mine developments to ensure compliance with all provincial requirements;
- (b) the processes the Ministry has developed, again in conjunction with other Ministries and federal agencies, to monitor proposed uranium mine development to ensure compliance with all provincial and federal requirements;
- (c) the legislative framework already referred to in the Ministry's submission to Phase II – Exploration, but with special reference to the application of this legislation to safety of mine workers;
- (d) the structure of the Inspection and Engineering Division which administers the *Mines Regulation Act* and other safety provisions.

1.2 Moratorium

At this time there is no uranium mining in British Columbia. It should be noted that on September 27, 1978, by way of an announcement marked as Appendix 1.2.1, the government of British Columbia declared a moratorium on uranium mining to be government policy.

II. FROM EXPLORATION SITE TO PRODUCING MINE

2.1 Introductory Note

Major mine development in both coal and metal mining and associated processing will change the environmental, social, and economic conditions in the region of development. Mineral development occurs where the mineral deposit is found and, in most cases, is in an isolated area where access, environmental impact, and social and economic considerations vary from low to high. The guidelines, described later in parts 2.2 to 2.4, identify the diversity of provincial government interests and public concerns associated with mineral development and establish a procedure for the developer, government, and the public to assess and manage all major impacts.

Guidelines for Coal Development was issued in March 1976 under the authority of the *Environment and Land Use Act* and the Environment and Land Use Committee, a Cabinet Committee.

Procedures for Obtaining Approval of Metal Mine Development was issued in April 1979 as metal mine development increased considerably in early 1979 and further development is being considered. There were four metal mines which went through a process similar to the coal guidelines prior to the issuance of the new metal mine guidelines, these being the Afton mine, Equity silver mine, the Kitsault project, and the Highmont project. The Inspection and Engineering Division acted as the steering committee for these metal mines.

The coal and metal guidelines are described in parts 2.2 and 2.3 to provide case studies of how the Ministry has responded to the regulatory problems raised by mine development.

In an attempt to meet problems any proposed uranium mine developments would pose, the Uranium Mining Steering Committee was formed in January 1977. It acts as a "one window" approach to coordinate provincial and federal requirements, the developer, government agencies, and the public. In addition, the Technical Coordinating Group on Uranium Mining and Milling was formed to coordinate the technical aspects of uranium mining and milling within the provincial agencies concerned.

2.2 Guidelines for Coal Development

Large-scale coal mine developments have considerable impact on the natural, social, and economic conditions in the region of development. In recognition of this fact, a comprehensive set of guidelines was prepared to assist coal companies in the preparation of environmental impact assessments of their proposed developments.

It should be noted from the outset that the guidelines for environmental impact studies are broad in scope, covering the major economic, social, and natural environmental implications of coal

development. Coal developments should conform to the principles of integrated resource planning, principles which seek a balance between economic, social, and environmental goals. Thus, net economic benefits of coal development must be carefully weighed against the environmental and social costs before final decisions are made.

It should also be noted that the guidelines cover all related components of the coal development program, not just the coal mine, waste dump areas, and processing plants, but also off-site activities such as new transportation networks, shipping terminals, community development, power and power supply corridors, and any ancillary industrial activity generated in the region as a result of the coal development impetus.

Thus, the environmental impact assessment should not be received as a set of narrowly based studies on the impacts of coal development on the natural environment, prepared late in the engineering feasibility study process. Rather, it should be thought of as a planning tool that shapes the whole development program from its inception to be responsive to the economic, social, and environmental goals of the region of development.

Legislative Framework

The environmental guidelines for coal development are produced under the authority of the Environment and Land Use Committee, a Cabinet Committee of the Government of British Columbia. The Environment and Land Use Committee comprises seven ministers representing nine departments, is responsible for the resource use and economic development, as well as matters dealing with major public facilities such as highways, settlement, and public health services. Under the *Environment and Land Use Act*, the Committee is responsible for integrated land and resource use planning in the Province and ensuring that the environmental impacts of all major resource developments are fully assessed. That Act is marked as Appendix 2.2.1.

Although the *Environment and Land Use Act* supersedes all other provincial legislation, various departments are responsible for statutes relating to specific aspects of coal development. Coal companies are required to apply for permits and licences for both exploration (under the *Coal Act*) and for development and reclamation (under the *Coal Mines Regulation Act*).

These regulations are quite specific regarding the engineering safety of the mine, the provision of environmental safeguards at the minesite, and the programs of minesite reclamation required during and following development. In addition, coal companies must obtain permits from the Pollution Control Branch for discharge of liquid, solid, and gaseous wastes and a licence from the Water Rights Branch for water use and must comply with numerous additional statutory procedures (see Appendix 2.2.2, page 33, for details). There are also procedures and regulations governing such matters as use of Crown lands for transportation routes, settlements, and

other facilities, resource uses other than mining, the establishment of communities, and the provision of housing and services.

The regional and municipal levels of government have well-defined interests in major coal developments, and these projects should conform to regional plans and municipal zoning policies. Furthermore, citizen groups formed to represent recreation and conservation or socio-cultural interests should also have a forum to discuss and debate the development proposals.

The environmental guidelines and review process discussed later recognize all these legislative and social interests and try to ensure a process in which all these concerns are systematically reviewed during the coal development feasibility studies. The objective of the guidelines is not to add another layer of government bureaucracy to the legislative framework, but to provide the most efficient manner in which to satisfy these diverse requirements.

The Four Stages of the Process

The environmental assessment process contains four separate stages. The process systematically moves from a general overview of the project to more site-specific impact assessments and management proposals.

Following presentation of a general prospectus outlining the development program, Stage I studies include a description of the existing biophysical environment and community services, a conceptual description of the mine, plant, waste storage, drainage control, and reclamation, and includes as well identification of major data gaps, initial review of some of the major environmental impacts, and some alternatives for their management or mitigation.

The main emphasis in the Stage II report lies with the detailed evaluation of alternative programs to avoid or manage biophysical and community impacts. This task requires, first, an explicit documentation of the major changes created by the coal development and second, the evaluation of these changes in biophysical terms where possible. The coal companies are asked to examine a number of alternatives and state their preferred program with its rationale.

The main purpose of Stage III is to finalize detailed plans to meet statutory requirements for the various permits and licences mentioned earlier. Much of the groundwork for these detailed plans will be laid during the earlier studies. Final approval of all applications must await completion of Stage II.

It should be noted however that it is possible, in appropriate cases, for applications for permits and licences to be made before Stage II, thereby shortening the approval process.

Stage IV involves the actual implementation of the environmental and community impact management measures accepted in previous stages. It is important that these measures are in fact carried out, and post-project monitoring programs will also be required to ensure the development conforms to statutory requirements.

A steering committee comprising representatives from the Ministry of Energy, Mines and Petroleum Resources, the Ministry of Economic Development, and the Environment and Land Use Committee Secretariat has been formed to coordinate this review process for coal development proposals. This committee serves as a point of contact for the coal companies and their consultants and coordinates comments of various government agencies at each stage of the review.

Final recommendations of this Coal Guidelines Committee are forwarded to the Environment and Land Use Technical Committee, members of which are public servants, and from that committee are passed to the Environment and Land Use Committee which is, as has been noted, a Cabinet Committee.

Marked as Appendix 2.2.2 is the pamphlet, *Guidelines for Coal Development*; on page 5, the coal development assessment procedure outlined previously is shown in schematic form.

Marked as Appendix 2.2.3 is a summary of the status of coal properties as of August 1, 1979.

2.3 Metal Mine Development

A process similar to that described in part 2.2 has been developed for metal mines, though procedures have been modified to meet the requirements of the metal mine industry. In particular, the size of the operation can vary from a few employees up to 800 or 900 employees, and the procedures are designed to take this into account. Appendix 2.3.1 sets out the procedures in detail. Particular attention is drawn to these pages:

- pages 5 and 6 — Schematic outline of the process.
- page 7 — Responsibilities of proponent.
- page 7 — Role of Ministry in chairing the Steering Committee.
- pages 18 to 22 — Interface with other Ministries.

The *Procedures for Obtaining Approval of Metal Mine Development* was issued some 3 years after *Guidelines for Coal Development* was issued. In preparing those metal mine procedures, the regulatory experience gained with respect to coal mines was drawn on.

As is the case with proposals for coal mines, a "one window" approach is adopted, which gives the governmental bodies and the metal mine developers one recognized channel of communi-

cation. As is the case with coal mines, personnel from several Ministries are involved in vetting proposals for metal mines development.

The staged approach is also taken from the coal experience, though the number of stages for metal mines is reduced to two.

Another parallel with the coal process is found in the flexibility built into the metal mines process. Provision is made for metal mines proposals, when appropriate, to go directly to the regulatory process, or, indeed, for proposals to be made subject to more elaborate processes, when the scale or complexity of the proposed metal mine calls for more information and study.

2.4 Uranium Mining Steering Committee

General

In the fall of 1976, Consolidated Rexspar Minerals & Chemicals Limited indicated to the Ministry it was considering putting the Birch Island property into production. Uranium mining comes under federal jurisdiction through the *Atomic Energy Control Act*; provincial statutes also have an impact on uranium mining. The interplay of federal and provincial powers relating to uranium mining will be discussed further in the Ministry's submission in Phase X – Jurisdiction. The Ministry, in consultation with the AECB, decided that it would be advantageous to form a committee to coordinate the federal and provincial approvals for uranium mining and avoid duplication of reports and requirements.

A joint statement (Appendix 2.4.1) was made on January 20, 1977, by the Honourable James R. Chabot, Minister of Mines and Petroleum Resources, and the Honourable J. A. Nielsen, Minister of Environment, establishing a Uranium Mining Steering Committee. A committee of three was appointed as follows:

J. D. McDonald, P. Eng.,
Ministry of Mines and Petroleum Resources,
Senior Reclamation Inspector,
Co-chairman, Coal Guidelines Steering Committee,
Chairman, Uranium Mining Steering Committee.

J. O'Riordan,
Ministry of Environment,
Assistant Director, Special Projects,
Environment and Land Use Committee Secretariat,
Chairman, Coal Guidelines Steering Committee.

A. B. Dory, P. Eng.,
Atomic Energy Control Board,
Manager of Mining.

At a later date, Dr. A. McIntyre was appointed to the committee to represent Environment Canada.

In consultation with J. T. Fyles, J. O'Riordan, and J. D. McDonald, Mr. A. B. Dory drew up a tentative *Schedule of Licensing and Compliance Surveillance Activities for British Columbia* (Appendix 2.4.2). The Steering Committee agreed to using the stage approval process as outlined in the *Guidelines for Coal Development* in British Columbia (see Appendix 2.2.2). The stage approval process is to be coordinated with the licensing process as required by the AECB under Licensing Guide 31.

Consolidated Rexspar Minerals & Chemicals Limited – Birch Island Project

Prior to the formal establishment of the Steering Committee on January 20, 1977, the company was informed that the stage approval process would be required in conjunction with the AECB licensing process. The decision to require a stage approval was made in consultation with J. T. Fyles, Deputy Minister, Ministry of Mines and Petroleum Resources, J. O'Riordan, Ministry of Environment, and A. B. Dory, Atomic Energy Control Board.

In November 1976, the Prospectus for Consolidated Rexspar Minerals & Chemicals Limited – Birch Island Project was received. Copies were forwarded to government agencies for their information. The main purpose of the Prospectus is to provide an information summary of a possible development at an early stage. A distribution list is shown in Appendix 2.4.3.

A meeting was held on January 13, 1977, with the Ministry of Environment, Ministry of Mines and Petroleum Resources, and AECB, to consider specific requirements regarding Consolidated Rexspar Minerals & Chemicals Limited, Birch Island property. Later the same day, a meeting was held with the company to discuss the agreed upon requirements. Basically the company was informed that the stage approval process was to be followed and that it would be tailored to fit the AECB licensing process. The company was informed that a public meeting at Clearwater was to be held after the Stage I report had been received and distributed to all government agencies and regional district officials. The meeting was to be arranged and conducted by the company.

The *Preliminary Environmental Study of the Proposed Birch Island Project*, dated March 1977, was received by the Deputy Minister of Mines and Petroleum Resources on June 6, 1977. Copies were forwarded to the appropriate government agencies on June 9, 1977 (see distribution list, Appendix 2.4.3).

A public meeting was held in Clearwater in December 1977. The company and its consultants outlined the project. Mr. McDonald and Mr. Dory of the Steering Committee attended the meeting. At the opening of the meeting, a statement from the Uranium Mining Steering Committee was read (Appendix 2.4.4). Subsequent to the meeting and at a later date, the company indicated to the Steering Committee that it would review the decision to proceed with the project. No further work has been done on the property to date and no notification has been received of plans to proceed. The Steering Committee decided that if the project was being held in abeyance, the committee could take no further action. Should a decision to be made to proceed, the committee would direct the company to provide detailed plans, taking into account government and the public concerns. The major concern would be the tailings pond which would have to be located in an isolated area. Also, a major monitoring program and a complete environmental assessment study would be required.

Norcen Energy Resources Ltd. – Blizzard Uranium Property

Diamond drilling in 1977 on the Blizzard uranium property indicated that there was a possible commercial uranium orebody. An expanded drilling program was completed in 1978, and a preliminary feasibility report was finalized and final engineering plans were commenced.

The company has kept the Steering Committee, Ministry of Energy, Mines and Petroleum Resources, Ministry of Environment, and AECB fully informed of the developments on the Blizzard property.

Discussions were held in February 1978 on environmental concerns for the Blizzard property. The company was informed that a preliminary baseline study should be commenced as soon as possible. The study must meet the requirements as set out in the AECB Licensing Guide 31, as well as the other standard parameters for all preliminary environmental baseline studies. The outline of the *Environmental Pre-operational Baseline Study Survey* is shown in Appendix 2.4.5. An *Environmental and Socio-Economic Feasibility Report*, prepared by Envirocan Ltd., was submitted.

The appointment of the Royal Commission of Inquiry into Uranium Mining and associated moratorium on uranium mine development have precluded the company from making official submissions to the provincial government and the AECB.

Placer Development Limited – Hydraulic Lake Project

A meeting was held on June 1, 1978, with Placer Development Limited to discuss *in situ* leaching tests on the Hydraulic Lake project. Mr. G. G. Hunkin, consultant on *in situ* leaching for uranium, outlined the *in situ* leaching process, and described some of *in situ* leaching for uranium operations in the southwest United States.

The proposed test program consisted of drilling four holes using a push-pull method. The initial program would consist of groundwater testing to determine groundwater flows. The second stage would be the installation of a small portable leaching plant. This program is outlined in Appendix 2.4.6. The Pollution Control Branch stated that a pollution control permit would be required.

Placer Development Limited did not proceed with testing because of some technical problems. No further representations were made by Placer Development Limited, and it is understood the company has dropped its option on the Tyee Lake uranium deposit.

2.5 Technical Coordinating Group (TCG) on Uranium Mining and Milling

Purpose of the Committee

The necessity of having a provincial technical committee to coordinate various aspects of radiation hazards in uranium mining and milling was discussed in September 1978. The following correspondence is in the Appendices.

- (a) Appendix 2.5.1 – letter to J. T. Fyles from J. D. McDonald, recommending establishment of TCG Committee.
- (b) Appendix 2.5.2 – memorandum to B. E. Marr from J. T. Fyles on formation of TCG Committee.
- (c) Appendix 2.5.3 – memorandum to J. T. Fyles from B. E. Marr, agreeing to formation of committee and confirmation of two appointments.

Terms of Reference

The terms of reference (Appendix 2.5.2) are as follows:

- (a) To coordinate analytical services, eliminating duplication and engendering cooperation within provincial Ministries for purposes of identifying and monitoring radiation associated with uranium exploration and possible future uranium mine development;
- (b) To provide technical information to the respective Ministries of the radiation hazards of uranium exploration and mine development;
- (c) To provide technical information and advice to the Uranium Mining Steering Committee.

Members of Technical Coordinating Group

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It should be noted that Mr. Brodie left the public service effective September 10, 1979. It is anticipated his place on the Technical Coordinating Group will be filled by:

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The Technical Coordinating Group has met four times in 1979. Topics of discussion have been, among other things, allocation of responsibilities within the group, coordination of sampling procedures, and coordination of assay procedures. Consideration has also been given to purchase of laboratory equipment.

On September 16, 17, and 18, Messrs. Green, Richardson, McDonald, Elias, and Johnson of the Technical Coordinating Group in company with Mr. Negraeff and others visited the Midnite and Sherwood uranium mines in the State of Washington, and met with Terry C. Frazee, Radiation Control Specialist of the Health Services Division of the Department of Social and Health Services of the State of Washington, to discuss regulatory procedures in that state.

III. LEGISLATIVE FRAMEWORK – AS IT APPLIES TO PRODUCING MINES

3.1 Mineral Act

Title for a mining property is obtained through the *Mineral Act* (see Ministry's submission to Phase II – Exploration, parts 2.2 and 3.1).

It is no longer a requirement that a mine operator planning production obtain a production lease under the *Mineral Act*. However, a mine operator may obtain a production lease if desired. Apparently, some operators find that such a document facilitates the acquisition of funds. Before obtaining a production lease, it is a requirement that the mineral claim(s) be legally surveyed. A legal survey is also required, under the *Mineral Act*, where production of over 1 000 tonnes per year is expected.

3.2 Mines Regulation Act

It is the responsibility of mine operators to adhere to the requirements of the *Mines Regulation Act*. The primary function of this Act is the safeguarding of the mine worker and the public. Sections 1 to 22 of this Act pertain to definitions, appointment of Inspectors, powers of Inspectors, reporting of accidents, investigations, inspections, notice of opening a mine, approval of the work system, reclamation of surface, mine closure, mine plans, registration of employees, age of employment, medical examinations, certificates of fitness, hours of employment, safety committees, shiftboss certification, plus the requirement to appoint a mine manager, and his, and where applicable, a contractor's responsibility.

The General Rules, three hundred and sixteen in number, are found in section 23 of the Act. These Rules outline required safe working practices, working conditions, plus various other requirements that relate to the safety and health of mine workers.

Sections 24 to 31 pertain to offences, penalties, and regulations and forms prescribed by the Lieutenant-Governor in Council.

Generally, the protection sought with regard to the safety and health of a worker or the safety of the public is apparent in a given section or Rule.

Other protection, however, is not so readily apparent. An Inspector is required to order remedial action or provision if, after investigation, he is of the opinion that a mine or part thereof is dangerous to the safety or health of any person in or about the mine or the safety of the public [section 7(1)]. The remedial action or provision would be dependent on the Inspector's judgment or advice provided by a specialist or consultant.

No work other than surface exploratory work shall commence without the written approval of the Chief Inspector [section 10(1)]. Approval is contingent upon assurance being given that the mineral resource is not wasted, as indicated in this section. In addition, however, the method of mining is studied from a safety viewpoint and approval is not granted until assurance can be given that it will be done in accordance with good engineering practice. The safety of the public is considered in this approval as is the safety of the worker. The plans for placement of a proposed tailings impoundment, along with other considerations, are studied and assurance of stability provided prior to the granting of this approval.

When a mine has been closed down, it is a requirement that the mine openings be fenced or otherwise protected against inadvertent access (section 12). Underground workings could be dangerous due to a dangerous gas, air deficient in oxygen, or the condition of the ground. Steep faces that could remain at an open-pit site should be protected in some manner, although there is provision for an Inspector to grant an exemption where the workings present no greater hazard than the natural topographic features of the district.

It is a requirement that a plan of a mine be filed in the office of the Inspector when the mine closed (section 13). It is also a requirement that a plan of the mine workings be kept at the mine while operating (section 14). The reason for these requirements is to prevent a possible nearby operating mine or other work from breaking into old workings, particularly in the case of an abandoned underground mine that may have become filled with water. A survey of an operating mine is also necessary to prevent encroachment on natural features that could present a hazard, such as lakes and rivers.

Section 18 of the *Mines Regulation Act* defines a "dust-exposure occupation" and prescribes the medical surveillance necessary for those workers employed in a dust-exposure occupation. It is a requirement that a worker in such an occupation be examined prior to commencing work, again within the next 12 months, and again every 12 months thereafter. Employment of a worker in a dust-exposure occupation is contingent upon the physician finding the person free from disease of the respiratory organs and otherwise fit for employment in such an occupation. A special medical examination is required yearly of a hoistman to determine that he is not subject to any infirmity, mental or bodily, and that his sight and hearing are not defective to such a degree as to interfere with the efficient discharge of his duties.

Section 20 pertains to inspections of mines on behalf of workers, which are undertaken at least once a month. Generally, items noted on a safety committee report are attended to at the local level. However, any outstanding items are reviewed by the Inspector and the appropriate corrective action taken where necessary.

Every person employed underground or in open-pit workings shall be under the daily supervision of a certified shiftboss (section 21). The purpose of this requirement is to ensure that mine

workers are supervised by qualified personnel, having the necessary training, experience, and knowledge of the *Mines Regulation Act*, and of safe working practices.

General Rule 11(a) requires that "a sufficient quantity of drinking-water complying with drinking-water standards established by the Ministry of Health shall be provided, with sanitary appliances for drinking, at both the surface and underground."

General Rule 14(a) requires that first-aid supplies and services shall be provided at mines as required by the Workers' Compensation Board.

In addition, where any regulation of the Workers' Compensation Board is applicable to a mine and is not specifically covered by the *Mines Regulation Act* or a directive, the Inspectors have been advised that action can be taken to have a particular rule or regulation declared a minimum requirement or standard. This also applies to rules and regulations of other agencies where an Inspector is of the opinion that a particular rule or regulation is appropriate and pertains to a situation or condition not covered by the *Mines Regulation Act*. This advice was given by the Chief Inspector by way of a memo marked Appendix 3.2.1.

General Rule 24 pertains to the approval of explosive magazines at mines. These approvals are contingent on the proposed magazines meeting the standards set by the federal *Explosives Act*. Also, where possible, the site for a magazine must be in accordance with the British Table of Distances.

General Rule 85(a) provides the Chief Inspector with the authority to issue standards for permissible mine air, the most recent standards having been revised during January 1979. The maximum permissible doses and exposures outlined in these standards are used when monitoring is done at uranium properties. See the Ministry's submission in Phase II - Exploration, Appendix 4.5.1, for a copy of those standards.

No furnace nor device for heating mine air shall be installed without the written permission of the Chief Inspector (General Rule 86). Prior to granting this approval, the Gas Inspection Branch of the Ministry of Labour is consulted and their approval of a proposal obtained.

General Rule 116 pertains to mine-rescue facilities at mines. Mine-rescue stations, equipped and maintained by the Ministry of Energy, Mines and Petroleum Resources, have been established at Nanaimo, Kamloops, Nelson, Fernie, Smithers, and Prince George. Training of underground and surface mine-rescue crews is provided at these stations and at mines. In addition to the training of underground and surface rescue crews, all persons working underground must receive training in survival rescue procedures. The survival rescue course has been established to provide the mini-

mum training necessary to enable an underground worker to evacuate a mine in the safest manner possible in the event of an emergency. The mine-rescue courses have been established to provide training to crews for rescue and fire-fighting purposes.

General Rule 251(g) provides that where a worker is able to demonstrate, on reasonable grounds, that a condition of unusual hazard exists at his work location, he shall not be subject to discipline by reason of refusing to work at that place.

General Rule 315 requires that all buildings at a mine shall be constructed in accordance with the National Building Code of Canada except where the Inspector does not consider these standards suitable.

Where appropriate, it is possible to suspend or vary the operation of a Rule. The *Mines Regulation Act*, section 23, provides:

The following General Rules apply to and shall be observed and posted up at every mine in the Province, but, where the Chief Inspector receives a written application from the owner or manager of a mine, or from a safety committee or president of the local union requesting the suspension or variation of the operation of a Rule, the Chief Inspector, upon being satisfied that it is advisable to do so, may suspend or vary the operation of the Rule accordingly, and he shall notify each person or committee of his decision.

Prior to any amendments to the *Mines Regulation Act*, participation by workers and management is sought. For at least the past 20 years, representatives of the various unions and mine management have been consulted, usually at a meeting with the various groups present, and all views put forth considered prior to putting forth proposed amendments to the Government.

A recent example of this consultative process is the series of meetings held in the summer and fall of 1977 for the purpose of hearing from employees and employers their recommendations as to amendment of the Rules now in section 23 of the *Mines Regulation Act*. In the summer months, several days of plenary meetings were held to which representatives of unions and operators involved in metal mining were invited. Plenary meetings were held later in the summer of 1977 with coal mines unions and operators to review Rules set out in the *Coal Mines Regulation Act*. In the fall of 1977, consultative meetings with individual unions and operators were held; many of those meetings were held in the offices of the unions or operators concerned.

The recommendations of the Inspection and Engineering Division, prepared after those plenary and individual meetings were complete, are now before the Cabinet.

3.3 Other Provincial Legislation

Reference has been made in part 3.2 to first-aid supplies required by the Workers' Compensation Board. In part 3.2 reference is also made to the policy of consulting the Gas Inspection Branch of the Ministry of Labour prior to approving mine air heaters. Drinking-water standards at mines are governed by the Ministry of Health.

3.4 Federal Legislation and Regulation

In part 3.2 reference is made to the requirement that explosive magazines meet the standards set by the *Explosives Act* and Explosives Regulations. The National Building Code of Canada governs construction of all buildings at mines except where the Inspector does not consider those standards suitable.

In the Ministry's submission in Phase II – Exploration, it has been recognized that the Atomic Energy Control Board has a role to play in exploration. It is also recognized that the AECB would be concerned with uranium mining in British Columbia if it were to occur.

3.5 Other Regulations or Standards

All electrical equipment shall be installed, maintained, and operated in accordance with the standards prescribed by the Canadian Electrical Code, Part V, except where those standards do not conform with the provisions of the *Mines Regulation Act*, or where the Electrical Inspector does not consider these provisions suitable (General Rule 310).

The Canadian Electrical Code, Part V, establishes the basic essential requirements and minimum standards for the installation and maintenance of electrical equipment in mines, and is prepared for the adoption by the provincial Ministries of Mines into their mining regulations. In its preparation, consideration is given to the prevention of fire hazard, injury to persons and property, and also proper maintenance and operation.

The Canadian Electrical Code is prepared by the Canadian Standards Association. Except where the Inspector does not consider such standards suitable, boilers and pressure vessels, elevators and moving stairways, aerial tramways, and all artificial illumination shall be installed and maintained in accordance with the standards prescribed by the code of the Canadian Standards Association (CSA) while the manufacture of steel-wire rope shall also be in accordance with the above standards (General Rules 297, 298, 299, 300, and 118).

Canadian Standards Association standards, by reason of Association procedures, reflect a national consensus of manufacturers, consumers, and scientific, technical, and professional organizations, and governmental agencies.

IV. REGULATORY PROCESS -- MINING

4.1 Structure of Inspection and Engineering Division

The organization of the Inspection and Engineering Division was sketched out in parts 1.1 to 1.3 of the Ministry's submission to Phase II -- Exploration. The role of the District Inspectors (and those who back them up), insofar as they regulate the activity of mining, will now be described.

A prime function of this Division is the enforcement of the *Mines Regulation Act* and the *Coal Mines Regulation Act*. The Division is managed by a Chief Inspector of Mines and two Deputy Chief Inspectors of Mines. One Deputy Chief is responsible for the metal mining section and mine rescue. The mine-rescue organization comprises a Senior Mine-Rescue Coordinator in Victoria and Mine-Rescue Coordinators stationed in Nanaimo, Smithers, Prince George, Kamloops, Nelson, and Fernie. The other Deputy Chief Inspector is responsible for the coal mining section plus the various specialist groups.

4.2 Qualifications and Training of Inspectors

All District Inspectors of Mines are Professional Engineers, having specialized in mining and having obtained considerable practical experience in underground and open-pit mining, plus other related experience prior to being engaged with the Inspection and Engineering Division (*see* submission to Phase II -- Exploration, part 1.3).

Continuing education for Inspectors is provided by periodic attendance, either by a group or by individuals, to various seminars, symposiums, or courses. An example of the type of courses attended by a group are the three courses, from 2 to 3 days in duration, put on at the University of British Columbia and presenting the "state of the art" in pit slope stability and soil mechanics in relation to mine waste dumps and tailings impoundments. The last course of this type attended by the District Inspectors and several representatives from headquarters, was a course, 3 days in duration, put on at the University of British Columbia, during April 1978. Courses or conferences, attended by individuals since January 1, 1978, are as follows:

Deutz Diesel Engine Seminar, Portland, Oregon, January 23 to 27, 1978

K. Hughes

Development and Reclamation Review, Committee Seminar, Calgary, Alberta,
February 13 to 15, 1978

J. D. McDonald

Seminar — Mining Exploration and Development of Coal Deposits, University of Alberta, March 13 and 14, 1978

V. E. Dawson and D.I.R. Henderson

Technical Evaluation Group, Steering System — Mining Trucks, San Diego, California, 2 days, April 1978

R. Heistad

Uranium Mine Inspector Training Course, Elliot Lake, Ontario, May 8 to 19, 1978

S. Miller

Symposium — Canadian Land Reclamation Association, Sudbury, Ontario, May 29 to 31, June 1, 1978

A. O'Bryan

Modern Hoisting Technology Conference, Golden, Colorado, June 6 to 8, 1978

V. E. Dawson

International Congress for Energy and the Ecosystem, University of North Dakota, June 12 to 16, 1978

J. D. McDonald, D. M. Galbraith, and J. C. Errington

Annual Western Industrial Ventilation and Air Cleaning Conference, Seattle, Washington, September 11 to 15, 1978

D. Murray

Longwall Mining and Subsidence Seminar, Edmonton, Alberta, September 25 and 26, 1978

D.I.R. Henderson

International Annual Meeting of the Institute of Electrical and Electronic Engineers (IEEE), Mining Industry Conference, Toronto, Ontario, October 2 and 3, 1978

Paper presented by J. Cartwright

Seminar on Modern Longwall Mining Equipment, Calgary, Alberta, October 31 and November 1, 1978

V. E. Dawson and D.I.R. Henderson

Uranium Mine Inspector Training Course, Elliot Lake, Ontario, November 20 to 24, 1978

A. J. Richardson and S. J. Hunter

Symposium on Uranium Mill Tailings Disposal, Colorado State University, Fort Collins, Colorado, November 20 and 21, 1978

J. D. McDonald

Fourth Annual Underground Operators Conference, Timmins, Ontario, February 19 to 21, 1979

J.B.C. Lang

Uranium Mine Inspector Training Course, Elliot Lake, Ontario, April 30 to May 4, 1979

V. E. Dawson and E. Sadar

Joint Visit to U.S. Coal Mines re Education and Training of Miners, Illinois and Kentucky, May 22 to 25, 1979

D.I.R. Henderson

Annual Meeting and Technical Sessions, Mines Accident Prevention Association of Ontario, Toronto, Ontario, May 23 to 25, 1979

D. J. Murray

4th Annual Meeting Canadian Land Reclamation Association, University of Regina, August 13 to 15, 1979

D. M. Galbraith and E. J. Hall

Uranium Mining Seminar, Casper, Wyoming, September 9 to 12, 1979

D. Smith

The object of encouraging and arranging the attendance at the aforementioned presentations is to provide the Inspection and Engineering Division with the latest information available on a particular subject that is considered to be a concern to this Division. It has been a policy that a summary be submitted and circulated when a course or other presentation is attended by individuals.

4.3 Functions of Inspectors

Inspectors of Mines have been appointed for 11 districts in the Province of British Columbia (for map, *see* submission to Phase II, Appendix 1.2.2). As the title implies, the primary function of an Inspector of Mines is to inspect mines within his jurisdiction to ascertain whether the provisions of the two aforementioned Acts are complied with. The Inspector is concerned with the safety and health of any person at a mine and the safety of the public.

In addition to the aforementioned District Inspectors of Mines, Inspector-Technicians are based in Prince Rupert, Smithers, Prince George, Kamloops, Vancouver, and Nanaimo to assist in routine and follow-up mine inspections. Inspector-Technicians are drawn from persons having a number of years' experience in the practical working of a mine.

Environmental Control Inspectors

The Environmental Control section performs the specialized function of ensuring an acceptable working environment at mines. This section comprises three Environmental Control Inspectors, who are Mining Engineers, an Audiologist, and a Noise Technician. As well as concern for the working environment at a mine, Inspectors in this section are concerned with medical surveillance of the work force at mines.

This section conducts dust and ventilation surveys at mines to ensure that workers are not exposed to air containing dust, fumes, or smoke in injurious quantities. A program to survey all existing underground mining properties for ionizing radiation is presently being carried out by Environmental Inspectors and the results to date have indicated unacceptable levels of radiation in two relatively small metalliferous mines. This necessitated temporary closure of the operations until better ventilation had been established [see submission to Phase II, part 4.5 (b)].

Reclamation Inspectors

The Reclamation section has the responsibility of ensuring that operators of mines carry out their duty required by section 11 of the *Mines Regulation Act* and section 8 of the *Coal Mines Regulation Act*. It is the duty of every owner, agent, or manager of a mine to institute and carry out a program for the protection and reclamation of the surface of the land and watercourses. This section comprises a Senior Reclamation Inspector (a Mining Engineer), a Reclamation Inspector (a Civil Engineer), an Agronomist, and three Reclamation Inspector-Technicians, based at Charlie Lake, Prince George, and Nelson.

Geo-Technical Inspector

The position of a Geo-Technical Inspector remains to be filled. The function of this Inspector will involve the civil engineering specialties of soil mechanics and rock mechanics. Tailings impoundments now under construction are relatively large man-made structures and must be properly engineered.

The functions which the Geo-Technical Inspector will carry out once appointed are now being carried out by Alex Richardson, P.Eng., J. D. McDonald, P.Eng., and the District Inspector and Resident Engineer, with the assistance of consultants. Particular attention is being paid to the stability and general suitability of tailings impoundments systems.

Mechanical Inspector

The Senior Mechanical/Electrical Inspector (a Mechanical Engineer) is responsible for the Mechanical/Electrical section. The Mechanical Inspector provides advice of a specialized nature on all types of mechanical equipment with regard to the safety aspect. This advice includes recommendations concerning the acceptance or non-acceptance of equipment used at mines. Two Inspector-Technicians assist in this work.

Electrical Inspector

The Electrical Inspector (an Electrical Engineer) provides specialized advice on all matters pertaining to the safe use of electricity at mines. Advice given by this Inspector also concerns the possible acceptance of electrical installations.

Senior Coal Inspector of Mines

The Senior Coal Inspector of Mines is a specialist responsible for examining coal mining proposals to ensure satisfactory operation from the safety point of view and to ensure maximum feasible recovery of the resource. This Inspector also advises the District Coal Inspectors, of which there are two, on various coal mining problems, plus various other duties related to coal mining.

Senior Inspector of Roads

The Senior Inspector of Roads (a Mining Engineer) is responsible for the mine and petroleum access road program carried out by the Ministry of Energy, Mines and Petroleum Resources.

4.4 Engineering Approach Used

The policy of the Ministry is to maintain an adequate staff of highly qualified professionals in the Inspection and Engineering Division. District Inspectors and senior management are registered Professional Engineers with significant experience in mining. These qualifications and experience are considered essential in the administration of engineering and safety requirements of the *Mines Regulation Act*, and in maintaining the policies of the Ministry respecting the mining practices of the industry. Complexities of the minesite, which contribute to the need for care in establishing safe working conditions, must be under the surveillance of highly trained and experienced Inspectors through the planning, operating, and rehabilitating phases of the life of a mine.

The role of the specialist within the Division is to provide advice and assistance to the District Inspector of Mines in matters that are, generally, beyond the expertise of the District Inspector. While inspections at mines are undertaken by the Environmental Control Inspectors, Reclama-

tion Inspectors, Mechanical Inspector, and Electrical Inspector, their role is predominantly advisory. The District Inspector of Mines and Resident Engineer is the prime representative of the Inspection and Engineering Division within a given district.

Specialized engineering problems may arise that are beyond the expertise of any member of the Inspection and Engineering Division. These problems can, usually, be solved by seeking the required specialized engineering expertise. Under section 7(3) of the *Mines Regulation Act*, an Inspector may require, at the expense of the mine operator, a suitable engineering report assessing the conditions at a mine with regard to the safety of the public or persons employed in or about a mine. In addition, specialized expertise may be obtained directly by implementing studies or programs to provide the information sought.

Requirements outlined in the *Mines Regulation Act*, including such requirements as standards for permissible mine air declared by the Chief Inspector, are quite specific and must be adhered to unless an exemption has been granted. A few of the General Rules provide for such an exemption to be granted by the Inspector [for example, General Rule 5(d)]. In addition, as has been described, section 23 of the *Mines Regulation Act* outlines the conditions under which the Chief Inspector may grant an exemption or variation of any particular Rule for specific operation. Apart from the specific requirements of the *Mines Regulation Act*, an Inspector may order that certain remedies be applied or such provisions be made at a particular mine to ensure the safeguarding of those employed in or about the mine or of the public [section 7(1)]. Such an order will require a judgment of the Inspector which will be dependent on his engineering background and experience. An example of an engineering judgment could be the ordering of a certain number of rockbolts of a minimum length for a particular section of ground while an example of a judgment based on experience could be the ordering of additional scaling of a rock face. Generally, the mine operator and the workers will have taken the appropriate steps over and above those requirements specified in the *Mines Regulation Act* to ensure that a specific working place is safe. During a routine inspection of a mine, an Inspector must make an assessment of the working conditions based on his judgment, to ascertain whether or not all the necessary appropriate steps have been taken to ensure the safety of the worker and the public. Specific regulations are required for the mining industry but there is provision for an Inspector to order additional requirements for a specific situation.

4.5 Inspection of Mines (Metal)

It is a requirement that an Inspector shall visit every mine within his jurisdiction once a month or as often as his duties permit or existing circumstances require [section 6(1), *Mines Regulation Act*]. Routine inspections are carried out at all known producing mines as frequently as feasible, with priority being determined by the Inspector and dependent on conditions and type of operation at a particular mine. The purpose of an inspection is to ascertain whether the provisions of the *Mines Regulation Act* are being complied with. More detail on inspection of mines will be given in the Ministry's submission in Phase VII – Public and Worker Health Protection.

APPENDICES



Province of
British Columbia

NEWS RELEASE

20/78
VICTORIA, BRITISH COLUMBIA

FOR IMMEDIATE RELEASE:
September 27, 1978

Provincial mining regulations, standards and pollution control objectives for uranium mining in British Columbia will be the subject of a Public Inquiry to be held early in 1979.

In making the announcement, James Chabot, Mines and Petroleum Resources Minister, and Environment Minister, Jim Nielsen, noted that "We have had a chance to study a number of reports on public uranium inquiries including the comprehensive final report of the Cluff Lake Board of Inquiry by Mr. Justice Bayda for the Province of Saskatchewan, and have concluded that the special conditions for mining which exist in British Columbia require special attention and an analysis of all technical data and viewpoints."

The inquiry will set standards appropriate for specific conditions found in British Columbia. Existing federal and provincial requirements for health and safety in uranium mining and for the protection of the environment and of the public will be critically reviewed. The inquiry will make recommendations to the Cabinet which will be used in setting standards and regulations for mine development, worker safety, and objectives for tailings ponds, and for the control of radioactive discharges for uranium mines.

No uranium mine development will be allowed to proceed until the results of the inquiry have been reviewed by Cabinet and the new standards are in place.

Participation by all interested individuals and organizations is invited. Details respecting the time and place for hearings and the submission of briefs will be advertised in newspapers and other publications throughout the province.

Environment and Land Use Act

[Consolidated for convenience only, January 20, 1978.]

- Interpretation.** 1. In this Act, unless the context otherwise requires,
- (a) "committee" means the Environment and Land Use Committee established under this Act;
 - (b) "environment" means all the external conditions or influences under which man, animals, and plants live or are developed.
- 1971, c. 17, s. 1.
- Committee established.** 2. (1) There is established a committee to be known as the "Environment and Land Use Committee" (herein called the "committee"), consisting of a chairman and such other members of the Executive Council as the Lieutenant-Governor in Council may appoint.
- (2) The chairman and the other members of the committee shall be appointed by the Lieutenant-Governor in Council for such term as he may determine.
- (3) The committee may determine its own procedure and may elect an acting chairman to act in the absence of the chairman.
- (4) If the membership of the committee exceeds three members, the quorum is three members.
- 1971, c. 17, s. 2.
- Duties of the committee.** 3. Upon establishment of the committee, it is the duty of the committee, and it is empowered, to
- (a) establish and recommend programmes designed to foster increased public concern and awareness of the environment;
 - (b) ensure that all the aspects of preservation and maintenance of the natural environment are fully considered in the administration of land use and resource development commensurate with a maximum beneficial land use, and minimize and prevent waste of such resources, and despoliation of the environment occasioned thereby;
 - (c) if considered advisable, make recommendation to the Lieutenant-Governor in Council respecting any matter relating to the environment and the development and use of land and other natural resources;
 - (d) inquire into and study any matter pertaining to the environment, or land use; and
 - (e) prepare reports, and, if advisable, make recommendations for submission to the Lieutenant-Governor in Council.
- 1971, c. 17, s. 3.
- Right to hold public inquiries, etc.** 4. The committee may
- (a) hold a public inquiry whenever it appears to the committee that the proper determination of any matter within its jurisdiction necessitates an inquiry, and, for that purpose, the chairman of the committee or a member of the committee authorized by

the committee to hold a hearing has all the powers and jurisdiction of a Justice of the Peace under the *Summary Convictions Act*;

- (b) appoint technical committees; and
- (c) subject to the approval of the Lieutenant-Governor in Council, provide for the remuneration of experts, specialists, and researchers and, pursuant to the *Civil Service Act*, of such clerks and other employees as may be required.

1971, c. 17, s. 4.

Provision
for expenses
of committee
members.

5. No member of the committee is entitled to remuneration as a member of the committee, but he may be paid and receive such travelling and out-of-pocket expenses as the Comptroller-General may approve.

1971, c. 17, s. 5.

Orders of
Lieutenant-
Governor in
Council.

6. The Lieutenant-Governor in Council, on the recommendation of the committee, may make such orders respecting the environment, or land use, as he may consider necessary or advisable, and he may make such orders under this Act, notwithstanding any other Act or regulation, and no Minister, ministry of Government, or agent of the Crown specified in the order shall exercise any power granted under any other Act or regulation except in accordance with the order.

1971, c. 17, s. 6; 1977, c. 75, s. 1 (proc. eff. Oct. 21, 1977).

Regulations.

7. For the purpose of carrying out the provisions of this Act according to their intent, the Lieutenant-Governor in Council may make such regulations or orders as are ancillary thereto and not inconsistent therewith and as are considered necessary or advisable; and every regulation or order made under this section shall be deemed part of this Act and has the force of law.

1971, c. 17, s. 7.

Printed by K. M. MACDONALD, Printer to the Queen's Most Excellent Majesty
in right of the Province of British Columbia.

1978

GUIDELINES FOR COAL DEVELOPMENT



ENVIRONMENT AND LAND USE COMMITTEE
BRITISH COLUMBIA

March 1976

Parliament Buildings
Victoria, B.C.

GUIDELINES FOR COAL DEVELOPMENT

ENVIRONMENT AND LAND USE COMMITTEE

CONTENTS

PART	PAGE
Introduction.....	3
I. The Project Assessment Process.....	4
II. Information Requirements for Project Assessment.....	11
Biophysical Impact Assessment.....	11
Socio-economic and Community Impact Assessment.....	16
APPENDICES	
1. Summary of Statutory Requirements	21
2. Elements of Mining Development Program	25
3. List of Provincial Government Agency Contacts	27
4. Biophysical Impact Assessment Matrix	29
5. Socio-economic and Community Development Impact Assessment Matrix....	32

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INTRODUCTION

Major resource developments such as coal mining and processing will change environmental, social, and economic conditions in the region of development. Careful planning of large-scale coal developments is therefore necessary to ensure that a rational approach to managing land use, environmental and community impacts is undertaken prior to final decisions on coal and related developments being made.

The coal development guidelines set out in this document describe the planning process designed to achieve this rational approach. The guidelines identify the diversity of Provincial Government interests and public concerns associated with coal and related developments and establish a procedure for the developer, Government, and the public to assess and manage all major impacts.

The guidelines are prepared under the authority of the Environment and Land Use Committee, a Cabinet Committee of the Government of British Columbia. This committee is composed of nine ministries responsible for resource use and conservation as well as for major public facilities such as highways, settlement, and health services. In addition to providing procedural direction for impact assessment and management, the guidelines specify types of information required by the Provincial Government for the review of permit and licence applications required under various Provincial Statutes and regulations before coal mines can be developed.

This document is organized into two parts. Part I describes briefly the Provincial Government's four-stage project assessment process. Part II describes in more detail information required by various Government agencies in their review of coal and related developments.

There are also five Appendices. Appendix 1 summarizes key Provincial Government Statutes and regulations controlling coal development decisions. Appendix 2 describes in detail the main elements of the onsite mining development that will be considered by the Department of Mines and Petroleum Resources. The third Appendix lists the main Provincial Government contacts both in Victoria and in the major coal-bearing regions. The final two Appendices contain two matrices to assist in the assessment process—one for biophysical impacts and the other for socio-economic and community impacts.

PART I: THE PROJECT ASSESSMENT PROCESS

This section describes the Provincial Government's impact assessment and management process for new coal and related developments in the Province. To co-ordinate this review process, a Coal Steering Committee comprised of representatives from the Department of Mines and Petroleum Resources, the Department of Economic Development, and the Environment and Land Use Committee Secretariat has been formed. It will serve as a contact with the coal companies and their consultants, and will co-ordinate comments of the various agencies of Government responsible for aspects of coal development for the guidance of developers and their consultants.

The four-stage assessment process is outlined on Figure 1. The process systematically moves from a general overview of the project to more specific impact assessments and management proposals, with Government-developer review following each stage.

Throughout the assessment process, information related to both minesite and offsite aspects of each coal development proposal will be requested and should include:

Minesite: Pit areas, waste dump areas, drainage and road systems, processing and loading facilities, power and maintenance facilities, water supplies, etc.

Offsite: Community development, highway and railway linkages, shipping terminals, power supply corridors, etc.

Developers are encouraged to seek out public response to their projects before presentation to Government. The purpose of public involvement is to provide adequate exchange of information between the developer and the public; to enable public assessment of potential impacts and related public concerns; and to provide an evaluation of the public's perspectives on the social significance of the losses and gains associated with a proposed development. To ensure that they will have an adequate opportunity to review the development proposal, the developer should make contact with the public at the earliest possible date and inform them of the opportunities that will be available for public consultation during the assessment process.

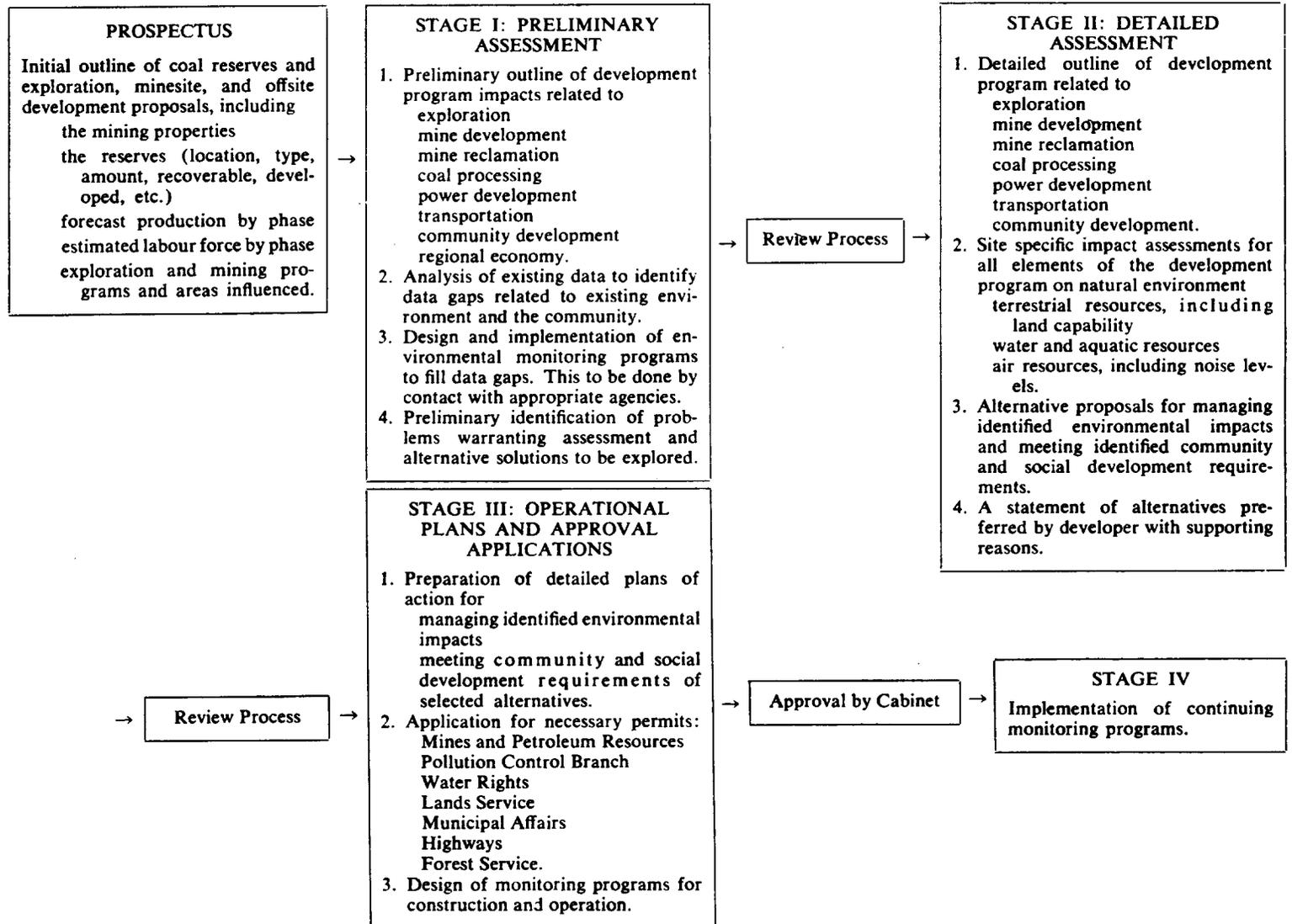
DETAILS OF THE IMPACT ASSESSMENT AND PLANNING PROCESS

PROSPECTUS

The assessment process begins with a prospectus which contains a general outline of the proposed exploration and mining programs. Its purpose is to introduce the concept and basic facts to various Government departments. The developer should submit this prospectus to the Deputy Minister of Mines and Petroleum Resources, who will forward it to the Coal Steering Committee for review.

The prospectus should describe the minesite operation; road and rail systems; operating, storage, and processing locations; maintenance areas and large buildings. Appropriate map scales should be used to locate the works within the area of development. Descriptions of the area and depth of excavation, total of overburden and wasterock, annual production of raw and clean coal, proposal for overburden and wasterock disposal, processing water requirements, and wastewater discharge are

Figure 1—Coal Development Assessment Procedure



to be included. Proposed offsite works and activities, such as shipping terminals, major transportation routes, size of labour force, townsite options, and power rights-of-way, should be included. (The elements of a mining development program listed as Appendix 2 may be of assistance in formulating the prospectus.)

A flow chart of the proposed operations indicating input of materials, the release of effluents from processing plants and tailing areas, and the disposition of finished and waste products would assist understanding. A broad schedule of planning indicating approximate time-span of exploration, construction, operation, and termination, is essential as is a description of the method of mining, coal-processing, and the minesite power supply.

The prospectus should be prepared as early as possible in the developer's planning process to give the Government agencies maximum lead time for compiling existing data sources and for preparing an information base to assist the proponent in Stage I studies.

STAGE I: PRELIMINARY ASSESSMENT

Stage I should identify the major economic, environmental, and social impact of the proposed development on the region in general. Then, Government and the developer can jointly prepare more detailed studies for the Stage II level of assessment to examine alternatives for resolving these problems more efficiently. The main components of Stage I are described below.

1.1 OUTLINE OF PROPOSED DEVELOPMENT PROGRAM

This section would include a full description of all the onsite and offsite developments outlined in the prospectus. Up-to-date information on schedules for additional exploration, planning, construction, operation, and termination phases of the project is required.

1.2 DESCRIPTION OF EXISTING ENVIRONMENT

Existing natural, social, and economic conditions within the zone of influence of the development should be described. As a result of the prospectus, Government agencies will be able to assist developers in assessing the existing information base quickly to identify major information gaps. (See Appendix 3 for principal Government contacts in Victoria and at regional offices.)

1.3 FILLING OF INFORMATION GAPS

The developer is expected to initiate studies and (or) monitoring programs to fill gaps identified during Stage I. These should be undertaken only after discussion with appropriate Government agencies to ensure consistency of approaches, standards, and definitions used to develop the present data base. Copies of all data shall be supplied to the Provincial Government as the study progresses. Monitoring programs need not necessarily be completed by the end of Stage I. Indeed, in certain instances, such as water quantity and quality studies, monitoring should be continued as required by the appropriate Provincial agencies.

Factors to be considered in this environmental and socio-economic baseline assessment are described in detail in Part 2 and are listed on the left-hand column of both the environmental and social matrices (Appendices 4 and 5).

1.4 PROBLEM IDENTIFICATION

It is important that the Stage I assessment include a systematic documentation of the major interactions between the development and the environment. This may be most efficiently achieved by completing a number of "checklist" matrices (such

as suggested in Appendices 4 and 5). Separate matrices should be completed for minesite and offsite impacts on the biophysical environment as well as the social-community environment. The matrices included in this report serve only as guides and may well have to be modified to suit specific developments. (Value judgments will be expected both in the selection of activity and environmental factors and in the nature of impact. In some cases, the impacts may vary depending on the assumptions lying behind the activity factor, e.g., whether some design work which would reduce the impact is included.) The use of these matrices is described in Appendices 4 and 5.

1.5 ECONOMIC EVALUATION

As coal mines and related facilities involve major investments and employ significant numbers of people, they have important economic implications for the Province and in the region of development. The Government, in seeking a balance between economic, social, and environmental aspects of such development, will assess the broad economic benefits of the project during Stage I. In order to conduct such an assessment, the developer is requested to provide preliminary estimates of gross anticipated economic benefits and minesite and offsite development costs.

Government will weigh economic benefits against the environmental and social costs resulting from the project: To ensure the over-all development contributes positively to the net well-being of the Province and the region; to permit initial assessment of the cost-sharing responsibilities regarding various facets of the project such as development of community and transportation facilities, other infrastructure requirements and environmental protection measures. Only preliminary benefit-cost analyses are expected in Stage I; more detailed studies should be included in Stage II.

1.6 IDENTIFICATION OF CONSTRUCTIVE ALTERNATIVES

Stage I should examine alternatives for mitigating or avoiding adverse environmental and social impacts. Opportunities for enhancing environmental and social conditions should also be identified.

Following this step, the developer is responsible for proposing alternative plans for managing these impacts to the satisfaction of Government agencies. At this stage, dialogue between the developer's environmental consultants and engineering design team is essential in defining alternative solutions.

1.7 PRESENTATION OF STAGE I REPORT

The developer should send eight draft copies of the Stage I report to the Coal Steering Committee through the Deputy Minister of Mines and Petroleum Resources. This draft will be quickly reviewed by the Steering Committee to check that it generally conforms with these guidelines. If it does, the Coal Steering Committee will request 50 additional copies and send these to various Government agencies for review. (See Figure 2 for outline of Government agency review process.)

Depending on the type and scope of Government commentary, the Steering Committee may call a meeting between the developer and the Government agencies, or simply send a co-ordinated reply to the developer. If the initial draft report does not conform to these guidelines, the Steering Committee will so advise the developer and request a second draft. Government review of the developer's Stage I report should take between one and two months.

Acceptance of the Stage I report does not mean a decision-in-principle has been granted the developer. It simply means that the assessment is proceeding

according to approved guidelines and that the developer is in a position to embark on Stage II studies. Government response will indicate the apparent degree of success that identified alternatives are likely to have in meeting the environmental protection standards and other Government interests.

1.8 PUBLIC CONSULTATION

At the end of Stage I, a preliminary assessment of environmental, social, and economic impacts is beginning to emerge, and some alternatives for managing these impacts will have been formulated. Developers should be prepared at this point to initiate their public consultation process with local government authorities that will be directly affected by the project (municipalities, regional districts, hospital authorities, school boards, etc.) as well as local interest groups (Chambers of Commerce, fish and wildlife associations, union locals, etc.) To ensure both organized and individual interests are involved it may be desirable to create continuing workshops or study groups representing a broad range of citizen interests to provide an in-depth consideration of particularly difficult aspects of the project proposal.

STAGE II: DETAILED ASSESSMENT

The Stage II report generally parallels the Stage I report in scope but requires more in-depth analysis. Its components are

- detailing of the development program outlined in Stage I;
- site specific analyses of impacts on the natural environment related to both minesite and offsite aspects of the proposed development program;
- analysis of alternative proposals for mitigating identified impacts on the biophysical environment using benefit-cost analysis;
- the cost-effectiveness of alternative proposals for mitigating or compensating for identified impacts on the biophysical environment;
- identification of alternative means of meeting identified community and social requirements;
- statement of the preferred approach for each aspect of the development.

Part II of this report outlines information required for environmental and social impact assessments expected in the Stage II report.

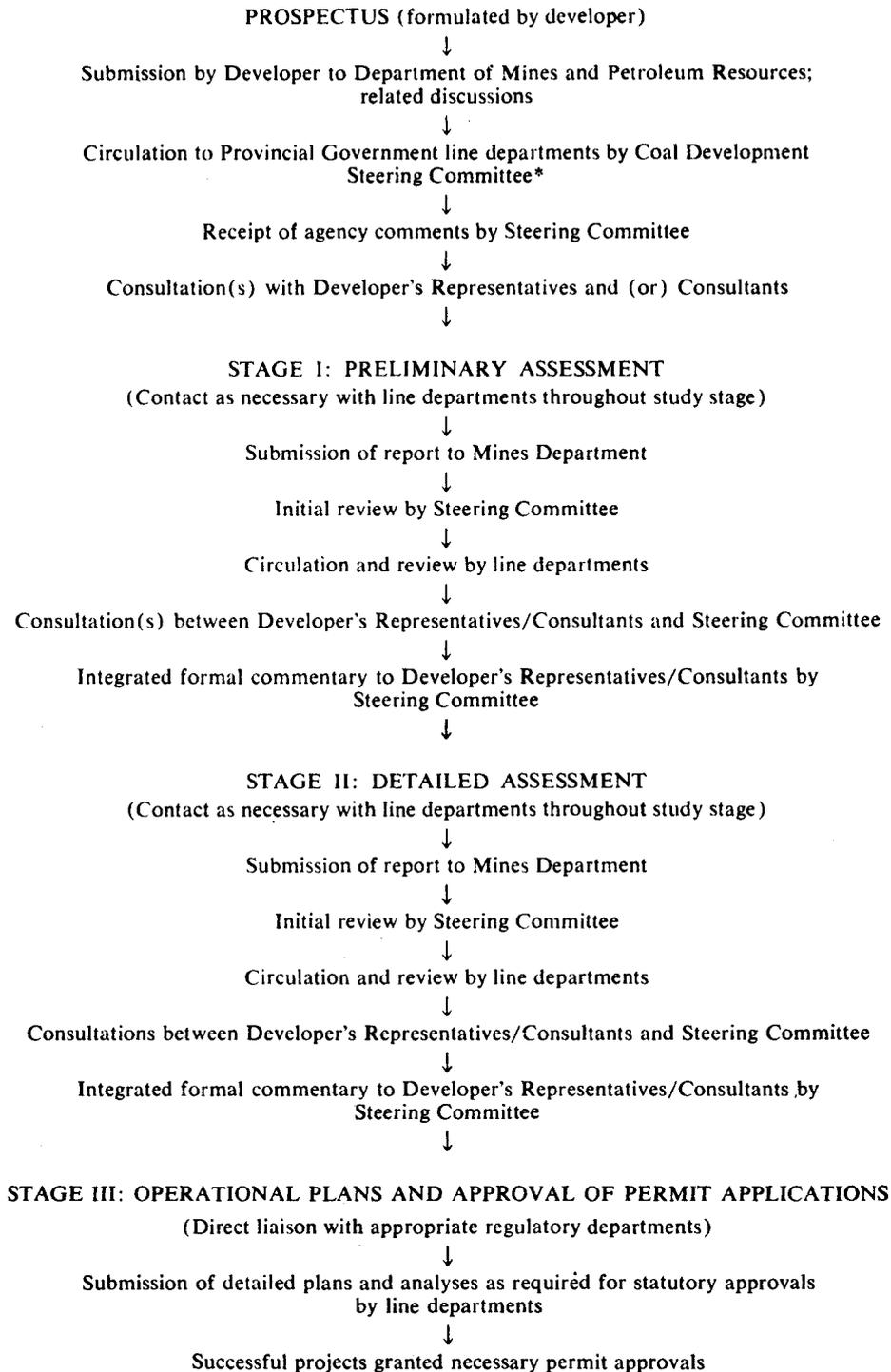
Where possible, benefit-cost analyses should be used to compare alternatives designed to mitigate impacts or plan developments in a rational way. (Example: Wasterock disposal or community settlement options.)

As a general rule, the Province is seeking a proposal from developers wherein economic, social, and environmental concerns are assessed, planned for, and "traded-off," to produce a balance that maximizes net social well-being in the region of development and to the Province. Thus, environmental impacts at a particular site might not necessarily be minimized if costs of such actions far outweigh the value of foregone resources. However, in cases where environment resource values are very high, special efforts for environmental protection are expected. Developers are expected to provide cost estimates of alternative proposals for reducing environmental impacts so that a satisfactory level of mitigation can be selected. Similarly, estimated costs of providing community services and infrastructure should be documented so that responsibilities for their provision can be assessed.

Public meetings to discuss this report should be anticipated, in which case the developer and its consultants would be expected to conduct such meetings, present its findings and answer questions from the public.

Review of the Stage II report will follow the same procedure outlined for Stage I. As this review requires careful assessment of preferred alternatives and leads to final operational planning, the review will take a minimum of eight weeks.

Figure 2—Procedure for Processing Impact Assessments of Proposed Coal Developments



* Consists of representatives of Departments of Mines and Petroleum Resources and Economic Development and the ELUC Secretariat.

STAGE III: OPERATIONAL PLANS AND APPROVAL APPLICATIONS

Acceptance of the Stage II report represents approval in principle for the environmental and community development aspects of the coal mine development. However, before the project can proceed, the developer must obtain various licences and permits, as required by various Statutes. Stage III represents the application and granting of such licences and permits. Detailed reclamation proposals must be formally submitted to the Department of Mines and Petroleum Resources for review by the Reclamation Committee in accordance with section 8 of the *Coal Mines Regulation Act* (Appendix 1). In addition, before the project can proceed the developer must obtain pollution control permits, water licences, land use permits, forestry approval, approval of the operating plan, and a production lease as required by various Statutes (Appendix 2).

It should be recognized that Stage III is not a duplication of Stages I and II, but rather these earlier assessments ensure that appropriate assessments and studies required for project evaluation, awarding of various permits, licences, and approvals are systematically undertaken. In cases where the review of a licence or permit application takes more than several months, formal application may be initiated during the Stage II assessment. Approval of certain permits such as the pollution control permit and water licence may involve public hearings, in which case, the developer will be required to participate. Pursuant to section 26 (3) of the *Coal Act*, approval of the production lease is given by the Lieutenant-Governor in Council upon the recommendation of the Minister of Mines and Petroleum Resources.

STAGE IV: PROJECT IMPLEMENTATION

Various Provincial Government agencies have specific and continuing responsibilities during development of the project into a producing mine and will continue to monitor specific aspects of the project. The developer is responsible for conforming with Government regulations in such key areas as air and water quality and surface reclamation. The same applies to offsite facilities. Most intensive monitoring can be anticipated through the development phase, during which accepted guidelines to mitigate construction impacts are enforced. Once operational, normal regulatory functions related to adequacy, safety, etc., are implemented.

PART II: INFORMATION REQUIREMENTS FOR PROJECT ASSESSMENT

The purpose of this section is to describe in more detail the types of information and analyses to be included in the various staged studies. This section is divided into two parts. The first part describes the array of biophysical information required, the second part relates to socio-economic and community impact requirements.

Environmental disruption or socio-economic and community impacts may be associated with any or all of the following activities:

- Exploration (roads, adits, blasting):
- Excavation (surface or underground):
- Overburden and waste disposal:
- Processing of coal:
- Reclamation:
- Transportation (roads, rail, marine access):
- Community and ancillary developments:
- Power requirements (generation, transmission).

1. BIOPHYSICAL IMPACT ASSESSMENT

In the Stage I report, the main emphasis lies in the full description of the existing biophysical environment in accordance with the categories outlined in this subsection, an initial identification of the major impacts of coal developments on this resource base, and some alternative impact management plans. Not all environmental factors need to be described in equal detail. Developers should use their judgment concentrating on the significant impacts.

The main emphasis in the Stage II report involves the detailed evaluation of alternative programs to avoid or manage impacts. This task requires first an explicit documentation of the major biophysical changes created by the developments and, second, the evaluation of these impacts in socio-economic terms where possible. Benefit-cost analysis should be used to compare mitigatory alternatives, so that the costs of such alternatives (longer route alignments; more distant waste dumps, etc.) are weighed against the benefits (protection of fish, wildlife habitat, greater recreational opportunities).

Such assessments will require the developers to attempt some form of benefit-cost analysis of both "intangible" resources such as angling effort, hunter days, recreation opportunity, and "tangible" resources such as forestry, agriculture, and grazing. The Special Projects Unit of the ELUC Secretariat is currently preparing a manual of techniques for undertaking such benefit-cost analyses. This manual is expected to be completed in the spring 1976, but developers are invited to consult the Secretariat for guidance in the interim.

The intent of benefit-cost analysis is to ensure a more rational and orderly approach to evaluating alternatives. There are many problems in mensuration, especially of "intangibles," and developers should be careful that the costs of data acquisition are commensurate with the improved data analysis. Again this is a judgmental decision, and the Coal Steering Committee would be willing to advise developers during the preparation of the Stage II report.

The main purpose of Stage III is to prepare plans in sufficient detail for required approval of permits and licences. The developers should contact the appropriate line agencies during Stage II studies to determine the precise data requirements for licence application, as the approval process may take several months.

Components or factors of the biophysical environment which may be influenced by the mine exploration and development activities are as follows:

Land use and land capabilities:	Aquatic resources:
Noise levels:	Atmospheric conditions.
Water:	

A matrix presented as Appendix 4 assists developers to array the biophysical impacts of the possible development activities on the five components of the biophysical environment. This matrix may serve as a graphic checklist or it may be used as a more sophisticated analytical tool, depending on the nature of the impacts.

1.1 LAND USE AND LAND CAPABILITIES

This information should assist in the analysis of land suitability for the location of various developments and to assess land capability to support alternative resource uses.

Physical Setting

- Soils and landforms.
- Depth to bedrock.
- Surficial materials.
- Existing and climax vegetation.
- Climate (ppt, temps, wind, humidity, growing season).
- Natural drainage.

Main source: Resource Analysis Unit, ELUC Secretariat, Victoria.

Land Capability and Present Use

Present and projected land use patterns in both the absence and presence of the coal mine and ancillary facilities should be carefully assessed. This requires evaluation of resource capability maps based on the biophysical data noted above, knowledge of existing and potential demands for various resources in the region, and an understanding of compatibility and incompatibility between the various resource uses. Land use and capabilities to be assessed include:

Minerals and petroleum.	Forestry.
Agriculture.	Wildlife.
Recreation.	Urban development.
Grazing.	

Minerals and Petroleum

- Coal reserves and major seams.
- Geological conditions.
- Nature and composition of overburden.
- Petroleum resources and minerals other than coal.

Agriculture

- Location of agricultural land reserves.
- Present range of crops and productivities.
- Agricultural land capabilities.
- Relationship with other resource uses.

Main sources:

- Resource Analysis Unit, ELUC Secretariat, Victoria.
- Department of Agriculture, Victoria, Regions.

Recreation

Present recreation use:

- Public facilities (camp-sites, parks, picnic sites, etc.).
- Private facilities (camp-sites, trailer courts, etc.).
- Access (roads, trails).
- Undeveloped (wild or pastoral) areas for hiking, camping, etc.

Present and projected demands (visitor days, camper nights) by local residents and visitors (prior to and after mine development).

Probable impacts on existing facilities and features:

Increased use through improved access, population increase.

Loss of potential sites due to minesite development.

Recreational land use capabilities (features, physical carrying capacity).

Mitigatory measures:

Outdoor recreation (new trails, camp-sites).

Community recreation (*see* section on community impacts).

Main sources:

Parks Branch, Department of Recreation and Travel Industry, Victoria, Region.

Department of Travel Industry, Victoria.

Resource Analysis Unit, ELUC Secretariat, Victoria.

B.C. Forest Service, Victoria, Regions.

Grazing

Present carrying capacities (animal-unit months).

Potential carrying capacities (animal-unit months).

Relationships with forest and wildlife resource uses.

Main sources:

Grazing Division, Forest Service, Victoria, Regions.

Resource Analysis Unit, ELUC Secretariat, Victoria.

Forestry

Forest inventory and capability.

Present AAC and commitments.

Existing forest road patterns and projected developments.

Relationships with wildlife, fisheries, and grazing.

Impacts of development on forest resource:

New access, compatibility of logging and mining roads.

Loss of resource.

Increase in protection forests requirements (greenbelts).

Main sources:

B.C. Forest Service, Victoria, Regions.

Resource Analysis Unit, ELUC Secretariat, Victoria.

Wildlife (categories of assessment should include big game, small game, fur-bearers, upland birds, waterfowl, rare and endangered species)

Present population levels, seasonal habitat identification, migratory routes, and mineral licks.

Recreational use (consumptive, nonconsumptive).

Capability of habitat.

Direct and indirect impacts of development on habitat.

Present and projected hunting pressures with increased population and access, sustainability of wildlife populations.

Identification of mitigatory measures:

Short-term—during mining development.

Long-term—following reclamation.

Main sources:

B.C. Fish and Wildlife Branch, Department of Recreation and Travel Industry, Victoria, Regions.

Resource Analysis Unit, ELUC Secretariat, Victoria.

Urban Suitability

Use of biophysical maps to assess land stability, flood plain areas, suitability for sewage-waste disposal, transportation developments. (*See also* 1.6.)

Main sources:

Water Resources Service, Victoria (floodplain maps).
Resource Analysis Unit, ELUC Secretariat, Victoria.
Department of Highways, Victoria.

Land Status

A map should be provided showing the present status of land:

Crown land—reserves and alienations (leases and licences).
Private land—ownership and leases.

Main sources:

Lands Service, Land Registry Office, Forest Service.

1.2 NOISE LEVELS

Decibel levels at various distances away from main sources:

Minesite.
Processing plant.
Transportation routes.

Main Sources:

Workers' Compensation Board and *Mines Regulations Act* and (or) municipal and regional district by-laws:

Frequency of noise.
Impacts on local population, wildlife.
Abatement measures.

1.3 WATER RESOURCES

Water Quantity

Surface:

Hydrologic regime (note maximum and minimum flows)
Present water licences and water use.
Delineation of floodplain.

Groundwater:

Shallow and deep aquifers.
Natural filter depth.
Relationships to surface water flows.
Present use (well records).

Identification of source(s) of water supply for mine and community:

Assess impacts of other consumptive and nonconsumptive users.
Evaluate mitigatory measures.

Main sources:

Water Survey of Canada, Department of Environment, Vancouver.
B.C. Water Resources Service, Victoria.

Water Quality

Existing water quality in all streams that might be affected by the project should be sampled prior to any development. Developers should consult with B.C. Pollution Control Branch, Victoria, and Water Quality Section, Inland Waters, Department of Environment (Canada), Vancouver, for existing data, as well as advice on the following information for new monitoring studies:

Location, frequency, and analytical techniques.

Water quality parameters (the following are suggested):

pH.	Turbidity.
Total solids.	Specific conductance.
Dissolved solids.	Temperature.
Phenols.	Sulphate.
Total alkalinity.	Total iron.
Organic carbon.	Hardness.
Suspended sediments.	Acidity.

The above parameters form the core of a water quality monitoring program, and it may be necessary to add parameters to this list on a site-specific basis.

Identification of potential pollutants from:

Overburden disposal.	Transportation and access road construction.
Tailings ponds.	Sewage from community developments.
Coal processing.	

Presentation of detailed plans for pollution abatement measures:

All point source discharges require a permit from the B.C. Pollution Control Branch.

Location of roads and overburden must be detailed for mine reclamation permit.

Main sources:

B.C. Pollution Control Branch, Victoria.

Department of Mines and Petroleum Resources, Victoria.

1.4 AQUATIC RESOURCES

Benthic Fauna

Species distribution.

Pollution tolerance.

Utilization by fisheries.

Impact of suspended solids and other pollutants and species composition and productivity.

Impact of changes in benthic fauna on higher organisms.

Fisheries

Species composition, distribution, and population.

Resident, anadromous species.

Habitat assessment—rearing, spawning, migration.

Minimum flow requirements.

Present and projected angler use and success rates.

Probable impacts of development on habitat.

Assessment of management alternatives to replace lost habitat or mitigate habitat loss.

International implications, if any.

Main sources:

B.C. Fish and Wildlife Branch, Department of Recreation and Travel Industry, Victoria, Regions.

Fisheries Service, Department of Environment (Canada), Vancouver.

Resource Analysis Unit, ELUC Secretariat, Victoria.

Water Resources Service, Victoria.

1.5 ATMOSPHERIC CONDITIONS

Existing air quality should be monitored before development begins. Air quality data are available from the B.C. Pollution Control Branch and the Atmospheric Environment Service, Department of Environment (Canada), Vancouver. Specifications for undertaking special monitoring programs to fill data gaps should be discussed with each of the above agencies prior to sampling.

The assimilative capacity of the airshed at site should be determined as best as possible. This will require the following information:

Temperatures.

Inversions—frequency, season, extent.

Precipitation (snow, rain).

Wind—speed, direction, diffusion capacity.

Potential sources of air pollutants should be identified:

Minesite.

Processing plant.

Ancillary activities.

Plans for pollution abatement measures must be approved by B.C. Pollution Control Branch as part of the pollution control permit.

Main sources:

B.C. Pollution Control Branch, Victoria.

Atmospheric Environment Service, D.O.E. (Canada), Vancouver.

Resource Analysis Unit, ELUC Secretariat, Victoria.

1.6 ENVIRONMENTAL HAZARDS

Potential for landslides, snowslides, floods, fires.

2. SOCIO-ECONOMIC AND COMMUNITY IMPACT ASSESSMENT

The three-stage assessment procedure should apply as follows:

Stage I: Identification of socio-economic/community development impacts.

Stage II: Outline of proposed (or alternative) plans and programs for impact management.

Stage III: Detailed plans and programs for impact management (community development, provision of physical and social services, etc.).

Reference should be made to all the following components or factors at each of the three stages in the assessment process:

Employment.

Population.

Housing.

Services.

Community land.

Community infrastructure.

Regional infrastructure.

Social adjustment.

Government revenues.

Those impacts related to population and employment factors should be identified as precisely as possible to ensure that predictions of impacts related to other social factors are reliable. The commencement and duration of predicted impacts should be indicated to facilitate their management.

The risk or uncertainty of positive and negative impacts occurring should be specified.

It is recognized that much of the information on impacts in this subsection must be based on experience in coal-mining communities in the area and elsewhere as well as other similar resource-based communities. Where such experiences are being used for projection, this should be noted.

In all cases information on impact should be compared to existing socio-economic conditions in the direct impact area of proposed minesite, i.e., the community or communities employees will live in, as well as those which will be used for higher levels of commercial, social, educational, and health services. This is necessary in order to determine the additive effects of coal development(s). Current deficiencies and opportunities for overcoming these can thus also be identified. A general matrix is presented in Appendix 5 to assist in arraying the information.

2.1 EMPLOYMENT

New Employment

Number of new direct positions created by project during its phases of construction, operation, and post-operation.

Union, trade, and professional conditions related to hiring.

Education, training, and experience requirements.

Seasonality of employment.

Existing local union arrangements.

Timing of manpower and training requirements.

Cyclical pattern and general economic conditions related to coal markets which could cause future employment instability.

Employment in Social, Cultural, Education, Health Facilities

Number of employees by category (*see* section 2.4 following for detailed list).

Employment in Auxiliary (Support) Industrial Economic Activity

What goods and services does the developer expect to purchase in the area and what employment can be projected for these activities?

Expected required occupations.

Source of Labour Force and Training Requirements

Recruitment programs.

Most likely origin of new supply.

Effect on unemployed labour pool of local communities, region and Province (special attention should be paid to groups such as women, high school dropouts, etc., who have particular problems finding work). Identify scope within occupational structure for employment of this labour pool.

Effect on regional out-migration and school dropout rates.

What existing training programs can be employed locally, regionally and Provincially to meet employment needs? What new training programs will be required?

Distinction between industry (on the job) versus institutional training.

Income Levels

Estimate of total personal income generated by project over anticipated lifetime. Relate this to job categories:

Construction phase.

Operation phase (estimates of mine-related and service labour).

Effect and distribution of income on community and region.

Disparities, if any, between traditional wage levels in the region and wages associated with employment in the mine; and the anticipated effect of these disparities.

2.2 POPULATION

Population impact: Predicted population totals of existing and projected communities (distinguish between population generated from direct (mine) and indirect (service) employment).

Age-sex characteristics of total population.
Household types anticipated (family size).
Dependent population (estimates):
 Number of women/men brought into the area as a result of spouse's employment.
 Number of children (approximate age, for example, pre-school, elementary school, secondary school).
Socio-cultural characteristics of incoming population, for example, ethnicity, educational level. (Refer to 2.8 and comment on implicating.)

2.3 HOUSING DEVELOPMENT

Aggregate housing requirements for
 mine-related employees and dependent population;
 service employees and dependent population.

Type, tenure, and cost to householder of direct and indirect employee requirements: Breakdown according to rental versus owner-occupied, and single-family, multi-family, and "mobile" units.

The capacity of the existing housing market to meet housing requirements. The ability of the local construction sector to meet increases in housing demand, and identify source and amount of shortfall housing.

The availability of mortgage funding and applicant requirements. Analysis of the ability of labour force in both mine and mine operation-related jobs and as well as service sectors to afford proposed housing.

Proposed program for meeting housing requirements. Who will develop this housing? What forms of subsidy, if any, will be necessary? Anticipated investment in construction industry and region of investment.

Subdivision standards (*see* 2.6).

2.4 SERVICES

Education

Number of school-age children expected.
Expansion in existing school facilities required.
Availability and demand for adult education.

Community and Regional Recreation Facilities and Services

Existing supply of facilities and patterns of use (pressures).
Change in type and amount of recreation activity required by new populations.

Commercial Services

Type and amount of expected commercial expenditures of population as indicated by experiences in other mining-based communities, personal income and availability of goods and services in community and region.

Which commercial services will likely be added to the commercial mix due to enlarged local payroll.

The impact on commercial services should consider regional implications, e.g., impact on facilities provided in Cranbrook in the case of the Southeast Kootenays, and in Dawson Creek, in the case of the northeast coal areas.

Medical and Health Facilities and Services

Based on population projections and past experience in coal-mining communities, specify by type of service, e.g., general practitioners, paediatricians, dentists, public health, mental health, etc., and the type and amount of required facility development—hospitals, etc.

Cultural Facilities and Social Services

The expected demand for entertainment and cultural facilities such as restaurants, theatres, arts and crafts, churches, child care centres (relate to age structure of population and projected number of women in the workforce with children requiring child care).

Social and counselling services (social workers, marital counsellors, foster homes and transition houses, women's centres, alcoholism and drug treatment centres, and voluntary community services).

Communication Facilities and Services

Existing media and communication facilities and impact of new populations on demand.

Court and Judicial Services

The amount and type of demand for these services.

Fire and Police Protection

Incremental demand for these services.

Support Industrial Activities

Equipment sales and services to mining industry and resident population.

2.5 COMMUNITY LAND

Requirements for land for residential, commercial, industrial, institutional, and other uses.

Availability of land at the alternative locations and any problems with respect to physical supply and price.

2.6 COMMUNITY INFRASTRUCTURE

Sewage Disposal

Predicted demand on existing sewage-disposal systems and for new collection and treatment systems.

Environmental and cost considerations.

Development responsibilities, i.e., coal mine developer, municipality, other.

Water System

Predicted demand on existing water systems and need for new water systems resulting from project and increased population; resource and cost considerations.

Development responsibilities, i.e., coal-mine developer, municipality, other.

Subdivision Standards

What standards of subdivision are planned? Will these be curbs, gutters, sidewalks, underground wiring? How much will this affect the cost of houses to final purchasers?

2.7 REGIONAL INFRASTRUCTURE

Transportation

Predicted increased use of existing local and regional transportation systems (public and private) (discussion of safety, pollution, and noise factors to be included).

Expansion of existing transportation network which will be required (safety, pollution, aesthetic, and noise factors to be included as well as responsibility for development indicated).

New types of transportation services which may be required or desirable (e.g., transit between residential areas and commercial or recreational facilities).

Transportation from community to minesite operations.

Development responsibilities, for above, i.e., coal-mine developer, railway company, Federal and (or) Provincial Governments.

Energy

Power requirements and potential sources.

Power line rights-of-way locations.

2.8 SOCIAL AND ECONOMIC ADJUSTMENT CONSIDERATIONS

(NOTE—Some of these considerations have already been listed under employment.)

Cultural Impact

Discuss social problems which may arise based on comparable situations (e.g., mental health problems among women, crime drug abuse, alcoholism, and marital breakdown); indicate the factors contributing to these problems and outline proposed approaches the developer feels should be taken to overcome these problems and who would be responsible for these.

Community Integration

Predicted areas of conflict between newcomers and existing population (based on experiences with similar developments) and proposals for resolving these.

Relocation

Will families be required to relocate to make way for mining operations (number of families and possible receiving communities)? What disturbance of traditional land use and way of life will occur?

Local Government Impact

What increased revenue through taxes will be available to the local governments as a result of the development. The detailed impact on fiscal position of local governments should be considered as part of the examination of alternatives in Stage II.

Impact on political structure of local government.

Archæological and Historic Sites

Sites which will be lost to society in general or to a community which places special value on them should be identified.

2.9 COMMUNITY DESIGN AND AESTHETIC CONSIDERATIONS

Townsite site selection factors: Sunlight, orientation, micro-climate.

Urban design factors: Environmental, social relationships, circulation, landscaping and maintenance of existing vegetation cover, housing design and finishes.

APPENDIX 1—SUMMARY OF STATUTORY REQUIREMENTS

SUMMARY OF STATUTORY REQUIREMENTS APPLICABLE TO COAL MINE DEVELOPMENT IN BRITISH COLUMBIA

This Appendix outlines some of the Acts of the Provincial Legislature and highlights sections which apply directly to coal mine development. It is not and should not be considered as a complete list of applicable Statutes or a full presentation of their applicable contents.

COAL ACT

In all cases developers must refer to the Statutes and consult with individual departments regarding legislation, regulations, and departmental policy.

This Act defines the general conditions under which a person may receive and hold title to coal land. For the purposes of this Act, coal land is defined as "land in respect of which coal, or the right to explore for, develop, and produce coal, are vested in, or reserved to, the Crown."

To obtain such rights a person must hold a valid free miner's certificate as defined by the *Mineral Act*. Coal licences, issued at the discretion of the Minister of Mines and Petroleum Resources, are for exploration and the licensee is required to pay a rental, a land tax under the *Taxation Act*, and to perform work of a specified minimum value. No coal production is permitted from licences except in amounts less than 100 tons per day, for which a limited production permit, issued by the Minister, has been obtained. Leases issued by the Lieutenant-Governor in Council, on approval of the Minister, are required for coal production (CA sec. 26). Application for a coal licence or application for extension of a licence must be accompanied by a plan of exploration and development, which must be approved. Application for a lease must also be accompanied by a plan of operations, and the Minister, in considering the application, must be satisfied regarding efficient operation, optimum coal recovery, and minimum environmental effect.

Section 29 of the Act describes the coal royalties payable: "Every lessee and holder of a permit shall pay to the Crown, in respect of coal produced from the location of his lease or permit, such royalty as the Lieutenant-Governor in Council may at any time prescribe." As of November 1975, the royalty payment was \$0.75 per ton of thermal coal produced, and \$1.50 per ton of metallurgical coal produced. Coal royalties are administered by the Director, Mineral Revenue Division, Department of Mines and Petroleum Resources.

A coal lease allows exploration, development, and production (CA sec. 24 (1)) for up to 21 years (CA sec. 27 (1)). It also allows use of surface area for producing coal and entitles issuance of a licence to cut timber under the *Forest Act* (CA sec. 24 (3)).

Application for a coal lease must be accompanied by a plan of intended operations (CA sec. 26 (2d)), which must conform with sections 7 and 8 of the CMRA.

COAL MINES REGULATION ACT (CMRA)

This Act controls the operations of coal mines in both the exploratory and the production phases in every place regardless of the nature of the coal tenure. The Act is largely concerned with mine safety, but section 7 deals in part with conservation and section 8 regulates reclamation of the surface. Before any work can begin an operator must submit and have approved a report on proposed work showing what protection and reclamation of the land surface will be carried out (CMRA sec. 8 (1), (2), (3)).

These plans and reports must be reviewed by all departments affected by or interested in the proposal (CMRA sec. 8 (5)), and must be approved by the Ministers of *Environment, Recreation and Travel Industry, and Agriculture* (CMRA sec. 8 (6)). Guidelines under CMRA sec. 8 are in effect which are periodically upgraded to require developers to carry out modern reclamation practices.

CONTROLLED ACCESS HIGHWAY ACT

This Act governs access to a designated controlled access highway. Where access is required, application must be made to the Department of Highways and Public Works.

For other provisions regarding roads and the subdivision of land, reference should be made to the *Municipal Act* and the *Land Registry Act*.

CORPORATION CAPITAL TAX ACT (consolidated December 15, 1973)

ENVIRONMENT AND LAND USE ACT (Consolidated July 1, 1971)

This Act establishes the Environment and Land Use Committee, consisting of the Ministers of Environment (chairman), Mines and Petroleum Resources, Forests, Recreation and Travel

Industry, Highways, Health, Municipal Affairs, Economic Development, and Agriculture.

The Committee is empowered to "ensure that all aspects of preservation and maintenance of the natural environment are fully considered in the administration of land use and resource development commensurate with a maximum beneficial land use, and minimize and prevent waste of such resources, and despoliation of the environment occasioned thereby" (sec. 3 (b)). In that Act, "environment" is defined as "all external conditions or influences under which man, animals, and plants live or are developed" (sec. 1 (b)).

The Committee may hold public inquiries and hearings.

Orders in Council under this Act cannot be contravened by any Minister, department of Government, or agent of the Crown, and such orders or regulations are legally binding (secs. 6 and 7).

FOREST ACT (consolidated Dec. 13, 1974)

The *Forest Act* deals with Crown timber, defined as "any trees, timber, and products of the forest in respect whereof Her Majesty in right of the Province is entitled to demand and receive any royalty or revenue or money whatsoever."

The Act is administered by the Forest Service. Sections of the Act which have specific application to mine exploration and development include 24, 25A, 47, 33, 116, and 118.

Permits to cut Crown timber must be obtained from the Forest Service, and this timber is subject to the payment of stumpage, including royalty, and such terms and conditions as the Minister may prescribe (sec. 24). Free-use permits which exempt the payment of stumpage or royalties can also be applied for where timber is actually used in mine exploration, development, or operation (sec. 25A). For further details, refer to B.C. Reg. 8/59, which deals with the granting of free-use permits of timber on tree-farm licences.

In addition to Crown timber, the Forest Service has administrative responsibility for lands designated as forest reserves—lands delimited for the perpetual growing of timber, for grazing or recreational uses, or for other forest uses (sec. 33 (1)). Proclaimed forest reserves are withdrawn from sale, settlement, and occupancy under the provisions of the *Land Act* or *Taxation Act*, and, in respect of the *Mineral Act*, *Placer Mining Act*, *Coal Act*, and *Petroleum and Natural Gas Act*, their use is subject to such conditions as the Lieutenant-Governor in Council imposes (sec. 33 (2)).

Further to the provisions of the *Forest Act* regarding forest reserves, special regulations have been prepared for minerals, coal, petroleum, and natural gas exploration and development in these areas. These are found in Division 6 of the Forest Reserve Regulations (B.C. Regs. 7/59, 208/71). These regulations state that no buildings can be erected in a Provincial forest, and no surface rights will be granted for under any licence or lease under the *Coal Act* (or other mine-related Acts) while such lands are included within a Provincial forest.

Sections 116 and 118 deal primarily with management and protection of forest lands.

With reference to sections of the *Coal Act* dealing with licences to cut timber, it should be noted that the Forest Service prefers, whenever it is practical, both on a time basis and a geographic basis, that removal of the forest values be done through normal timber sale procedures.

**INCOME TAX ACT (consolidated Dec. 15, 1973), INCOME TAX AMENDMENT ACT
(assented to June 20, 1974)**

Coal-mining ventures are subject to taxation under the normal provisions contained in these Acts.

LAND ACT (consolidated July 19, 1974)

It is not necessary for a company to obtain a lease under the *Land Act* to authorize the use of vacant Crown land for the purpose of developing a coal deposit. This is covered under the *Coal Act*. However, for uses of vacant Crown land related to the coal development such as a cleaning plant, crushing plant, or rights-of-way, leases must be obtained under section 9 of the *Land Act*.

Procedures for applications are set down in section 28. Applicants are required to submit detailed plans of the development proposed for Crown land, including a time schedule and cost estimate. Authority for this is section 31 of the *Land Act*. Detailed procedures and requirements under this section are set out in *Summary of General Guidelines for Environmental Impact Control of Development of British Columbia Crown Lands*. This can be obtained from the Environmental Service Unit of the Land Service. Developers are advised to consult with this unit to determine how these guidelines will be applied relative to the development guidelines in the preceding text.

Final approval for a lease would include a requirement for the posting of a performance and (or) clean-up deposit under authority of section 32 of the *Land Act*. Land Management Circular Letter 78 explains the policy and procedure applied to these deposits. The minimum deposit for an industrial lease including a plant or smelter or like development would be \$50,000.

LAND REGISTRY ACT

MINERAL LAND TAX ACT (consolidated Dec. 15, 1973)

Mineral land is defined under this Act as

“ . . . land, other than Crown land and land comprising a right-of-way, station ground, yard, or terminal of a railway, in respect of which

(i) any mineral is or may be situated; or

(ii) any person has the right to work, win, or carry away any material;”

The Lieutenant-Governor in Council may also “designate” other lands (including the above exemptions) as mineral land for the purposes of this Act. Mineral land may fall into the definition of “production area” or “production tract” (*see* secs. 1, 2, 3) and as a result be subject to different levels of taxation. Tax rates for mineral land are described in section 4, tax rates for mineral land in a production area are described under section 5. In the latter case, the per acre tax rate is higher than applied to a nonproduction area and is subject to an additional tax based on the assessed value of the designated land. The procedure for assessing the value of mineral land for the purposes of taxation is described in section 6. Liability for tax payment falls on the “owner” of mineral land, defined as “a person who has the right to work, win, or carry away minerals from any mineral land.” This Act is administered by the Assessor of Mineral Land Tax. Further information is available from the Mineral Revenue Division, Department of Mines and Petroleum Resources. This Act applies to feehold on Crown-granted land carrying coal rights.

MINING TAX ACT (consolidated June 1, 1970)

Under the *Mining Tax Act*, every owner of a mine is assessed and taxed on his net income derived from mining operations. In this context, a “mine” includes any work or undertaking in which mineral ore is extracted or produced. The tax rate is set out in section 3 (2) and net income is defined in sections 4 and 5.

The Act is administered in the Department of Finance by the Commissioner of Income Tax.

MUNICIPAL ACT (consolidated Dec. 15, 1973)

Reference should be made to sections of the *Municipal Act* dealing with
Incorporation.

Assessment and Taxation.

Community Planning.

Special Areas Division (2) Regional Districts.

Section 10A of the *Municipal Act* provides for the incorporation of resource communities.

The *Municipal Act* also specifies the application of property taxation in incorporated areas and regional districts. It provides for community and regional district subdivision and zoning by-laws that must be recognized by mining companies whose development involves private lands. It is noted that regional districts also have referral provisions under other jurisdictions, although these are not specified in the *Municipal Act*.

PARK ACT (consolidated July 1, 1973)

This Act applies to Provincial parks and recreation areas, and should be consulted if resource uses other than those specified in the Act are being considered for these areas.

POLLUTION CONTROL ACT, 1967

The Pollution Control Branch enforces the requirements and regulations of the *Pollution Control Act, 1967* and regulations, as amended. The Act requires a permit or approval from the Director for each discharge of effluent, or refuse, or emission of air contaminants. Division (2) of the regulations describes the acquisition of permits, section 6 of the Act describes the amendment of permits, and section 7A of the Act describes the suspension and cancellation of permits.

The technical considerations and measures to meet the requirements of the *Pollution Control Act, 1967* as amended, have been formulated as minimum objectives for the various industries of British Columbia. The pertinent objectives for coal-mining and related developments are *Pollution Control Objectives for Mining, Mine-milling, and Smelting Industries of British Columbia*. The sections of particular interest for coal-mining are:

- 2.3 (f)—Control objectives applicable to coal-preparation plant, coke plant, and related bulk-loading facilities.
- 3.4—Coal washplant refuse.
- 4.2.5—Effluent objectives applicable to coal-preparation plants.
- 4.2.6—Effluent objectives applicable to coke plants.

TAXATION ACT

All leases and licences are subject to real property assessment and taxation under section 26 (3) of the *Taxation Act*—this is a land tax and subject to annual assessment. Buildings, machinery, and equipment at the minesite are assessable and taxable under the *Taxation Act* and the *Public Schools Act*. Buildings are assessed for both general and school purposes. Machinery is taxed for both school and other Government purposes.

It should also be noted development expenditures are subject to the social services tax at the rate of 5 per cent.

WATER ACT AND REGULATIONS (consolidated July 19, 1974)

The property in and the right to the use and flow of water is vested in the Crown in the right of the Province except where private rights have been established under licences issued under the *Water Act* or some former Act.

Sections 3, 5, 8, 9, 10, 11, 23, and 29 are the most applicable sections for consideration by coal mine development companies. Division (2), page 2, outlines permit acquisition procedures to use water and Division (3), page 3, outlines permit acquisition procedures to flood Crown land.

Applications for water licences can be made to the Comptroller of Water Rights for entitlement to the use and storage of water, related works, stream improvement or channelization, and measures for the conservation of fish and wildlife.

WILDLIFE ACT (consolidated July 19, 1973)

This Act provides for the conservation of game animals, birds, and fish which are specified in the Act. There are also provisions under the Act for action against those who, without authority, destroy or damage wildlife habitat in an area set aside for the purpose of wildlife management.

APPENDIX 2—ELEMENTS OF MINING DEVELOPMENT PROGRAM

DESCRIPTION OF COAL RESERVES

- * A résumé of coal licences held by the developer and indicating total reserves of coal; mineable reserves of coal; summary of geology of area; possible extension of coal reserves and mineability, open pit and underground.

DESCRIPTION OF PROPOSED COAL-MINING OPERATION

A. EXPLORATION PHASE

- * Proposed exploration program: Areas involved and phases; proposed access routes, camp location, and ancillary problems.
- * Proposed methods of exploration: Indicate road construction to drill sites, adits, and trenches, with erosion controls to be practised.
- * Proposed adits—trenches: Indicate methods of erosion control and restoration of disturbed areas as required.
- * Public access: Indicate mine access routes with relation to the possibility of increasing hunting and fishing pressure on critical wildlife areas and fisheries. Alternately, the relief of pressure on presently overtaxed areas. Possibility of hunting restrictions to be considered during exploration, construction, and production of coal mine resources.

B. CONSTRUCTION PHASE OF MINESITE DEVELOPMENT

- * Proposed construction plans by phases: Timing of each phase with estimated employment and category for each phase.
- * Camp location and sizes: Indicate sewage and garbage disposal.
- * Proposed access by roads: Indicate standards required for moving in equipment and machinery; indicate drainage control and settling ponds for all aspects of the construction phase in respect to roads.
 - Drainage control: Possible relocation of watercourses in major building areas; to avoid runoff of continually disturbed raw earthroads, excavations, dam construction; to design for potential groundwater problems.
 - Proposed overburden, stripping of pit area and plant site: Indicate scheduling, amounts, and capability for stockpiling for reclamation.

C. MINE OPERATION

- * Proposed mining development plans by phase: Timing of each phase with relation to stripping, waste disposal, and tonnage mined; estimate employment by occupational category for each phase (i.e., increased tonnage; phasing in underground with open pit); indicate annual production of raw and clean coal for each phase.
- * Proposed methods of extraction: Indicate mining method and related machinery and manpower.
- * Mine site area: Indicate total area of surface disturbance, indicating open pit excavation, waste dumps, coal reject lagoons, stockpiles, plant site, roads, and settling ponds.
 - Open pit mining: Indicate area of open pit, excavation and depth; indicate total waste material to be moved and total coal removed.
 - Waste or spoil dumps: Indicate preferred location from straight economic viewpoint and plan of operations; indicate geotechnical and watershed drainage studies of proposed location(s); indicate method of dumping and final configuration of dumps and their relation to reclamation (maximum angle of the slopes of spoil mines to be 26 degrees or less).
 - Surface drainage control, as in the construction phase but phasing into mining: Indicate location of interceptor ditches, culverts, bridges with relation to sediment control to be practised for roads, plant site, waste dumps, etc.
 - Pit draining control: Indicate method of interception, collection and disposal of ground and runoff water in the pit; indicate operational monitoring required.
- * Transportation requirements by phase relating to method, route, and destination of the coal: Indicate transport facilities required and if presently operational or construction required; indicate environmental controls necessary for dust control, siltation, monitoring.

* These are key features of prospectus; other factors are dealt with in subsequent stages.

D. MINING RECLAMATION

Present programs (if any).

Overburden disposal proposals: Indicate economic capability of stockpiling for a long period of time and method of revegetation of overburden dumps until required; indicate possibility of not requiring overburden for revegetation; indicate nutrients content and pH of overburden and waste rock.

Waste rock (spoil piles) disposal proposals: Indicate the most economic method of disposal with reference to operational and final reclamation (spoil piles are not considered physically or biologically stable at the angle of repose).

Revegetation proposals: Indicate type of vegetation, proposed method of seeding or planting; indicate proposed method and length of management of the vegetation on the waste dumps, overburden, reject lagoons, roads, plant site, and portions of open pit.

Reclamation program during mining operation: Indicate proposed department requirements for staff, program, nurseries, research, and test work responsibilities.

Proposed land use and capability of reclaimed land: Indicate the potential land use in relation to the resources and sensitivities of the area (e.g., wildlife habitat, fisheries, forestry, grazing, etc.).

Siltation and sedimentation controls (as detailed previously).

E. COAL PROCESSING

* Proposed method(s) of processing raw coal: Indicate yield and summarize pollution control requirements.

Annual and total estimated waste and tailings disposal.

Processing water requirements: Indicate daily amount required, source, make up water requirements, closed circuit or not.

Proposed waste discharges: Indicate amount and location of effluents, discharges, air emissions as per permit application for Pollution Control Board requirements.

* These are key features of prospectus; other factors are dealt with in subsequent stages.

APPENDIX 3—PROVINCIAL GOVERNMENT AGENCY CONTACTS

The following lists the prime contacts in key Provincial Government resource and infrastructure agencies at the headquarters level in Victoria as well as the regional and local levels in the resource management regions of the Province where coal developments are under consideration. The developers should request a list of appropriate social service agency contacts from the Coal Steering Committee.

ENVIRONMENT AND LAND USE COMMITTEE SECRETARIAT

Victoria:

Director.
Assistant Director, Special Projects Unit.
Assistant Director, Resource Planning Unit.
Assistant Director, Resource Analysis Unit.
Resource Analysis Co-ordinator, Resource Analysis Unit.

DEPARTMENT OF HIGHWAYS AND PUBLIC WORKS (HIGHWAYS)

Victoria:

Chief Highway Engineer.
Chief Planning Engineer.
Senior Approving Officer.
Omineca/Peace: Regional Highway Engineer, Prince George.
Thompson/Okanagan: Regional Highway Engineer, Kamloops.
Kootenay: Regional Highway Engineer, Nelson.

DEPARTMENT OF MINES AND PETROLEUM RESOURCES

Victoria:

Associate Deputy Minister, Mineral Resources Branch.
Senior Reclamation Inspector, Inspection and Engineering Division.
Omineca/Peace: Inspector of Mines, Prince George.
Kootenay:
Reclamation Engineer, Nelson.
Inspector of Mines, Fernie.

LANDS SERVICE, DEPARTMENT OF ENVIRONMENT

Victoria:

Assistant Deputy Minister, Lands Service.
Assistant Director of Land Management, Southern Interior Regions.
Land Management Branch.
Co-ordinator of Environmental Services, Land Management Branch.
Omineca/Peace:
Regional Land Inspector, Prince George.
Land Inspector, Dawson Creek.
Thompson/Okanagan:
Regional Land Inspector, Kamloops.
Land Inspector, Kamloops.
Kootenay:
Regional Land Inspector, Nelson.
Land Inspector, Nelson.

DEPARTMENT OF AGRICULTURE

Victoria: Deputy Minister.

Omineca/Peace: District Agriculturist, Dawson Creek.
Thompson/Okanagan: District Agriculturist, Kamloops.
Kootenay: District Agriculturist, Nelson.

FISH AND WILDLIFE BRANCH

Victoria:

Associate Deputy Minister (Fish and Wildlife, Marine Resources).
Assistant Director, Environment and Enforcement.
Fisheries Co-ordinator.
Habitat Protection Co-ordinator.
Habitat Protection Biologist.

Omineca/Peace:
Regional Director, Prince George.
Conservation Officer, Dawson Creek.

Thompson/Okanagan:
Regional Director, Kamloops.
Conservation Officer, Clinton.

Kootenay:
Regional Director, Nelson.
Conservation Officer, Fernie.

PARKS BRANCH

Victoria:
Head, Northern District Section, Planning Division.
Head, Central District Section, Planning Division.

Omineca/Peace: Regional Manager, Prince George.
Thompson/Okanagan: Regional Manager, Kamloops.
Kootenay: Regional Manager, Nelson.

FOREST SERVICE

Victoria:
Chief Forester.
Director, Range Management Division.

Omineca/Peace: District Forester, Prince George.
Thompson/Okanagan: District Forester, Kamloops.
Kootenay: Assistant District Forester, Nelson.

WATER RESOURCES SERVICE

Victoria:
Director, Pollution Control Branch.
Director, Water Investigations Branch.
Comptroller of Water Rights, Water Rights Branch.
Chief, Environmental Studies Division, Water Investigations Branch.

Omineca/Peace:
Regional Engineer, Water Rights Branch, Prince George.
Regional Manager, Pollution Control Branch, Prince George.

Thompson/Okanagan:
Regional Engineer, Water Rights Branch, Kamloops.
Regional Manager, Pollution Control Branch, Kamloops.

Kootenay:
Regional Engineer, Nelson.
Regional Manager, Pollution Control Branch, Nelson.

REGIONAL RESOURCE MANAGEMENT COMMITTEE CHAIRMEN

Omineca/Peace: Regional Land Inspector, Prince George.
Thompson/Okanagan: District Forester, Kamloops.
Kootenay: Assistant District Forester, Nelson.

APPENDIX 4—ENVIRONMENTAL IMPACT MATRIX

As mentioned in the main text, the environmental impact matrix is suggested as a means for documenting the major interactions between the development and the natural environment. It should only be used as a "checklist" and is not intended to replace benefit-cost analysis as a decision tool. Developers are expected to evaluate the major impacts of the development wherever possible in economic terms and fit these values into the social benefit-cost accounting framework.

Separate matrices should be completed for minesite and offsite developments on the biophysical environment. Preparation of each matrix should meet a number of general criteria:

- (a) Factors on the activity (vertical) axis should be separated in sufficient detail to isolate locational, construction, and operational processes. This selection will require some initial judgmental decisions by the developer, though Governmental review of Stage I and Stage II studies will help define the appropriate level of analysis.
- (b) Factors on the activity (vertical) axis should be broken down into subgroupings required to define all significant impacts.
Example: If a water supply reservoir provides habitat for a lake fishery, but also eliminates some stream spawning habitat, both impacts should be clearly identified.
- (c) Impacts can be qualitatively assessed during Stage I using the following colour coding:
 - Red to indicate negative impacts.
 - Blue to indicate positive impacts.
 - Yellow to indicate uncertain or ambivalent impacts.
 - Blank to indicate no impact.
- (d) Impacts should be quantitatively assessed during Stage III so they can be included in over-all project evaluation using benefit-cost analysis. Consequently, impact data should be assembled in a manner amenable to quantification and eventual evaluation in economic terms where practical.

**ENVIRONMENTAL
IMPACT MATRIX**

Project:

Developer:

- Negative impact
 - major ▽ Red
 - minor ▽ Red
- Beneficial impact
 - major ▽ Blue
 - minor ▽ Blue
- Ambivalent □ Yellow
- No impact □

Proposed Offsite Activities

	Proposed Offsite Activities										Post Operations
	Construction					Operation					
	Townsite	Railroad Spur No. 1	Highway Route 1	Transport to Port	Port Expansion	Townsite	Railroad Spur No. 1	Highway Route 1	Transport to Port	Port	
	Townsite Preparation Townsite Water Supply Sewage Disposal	Camps Crew-site Activity Tote Roads Public Access Temporary Crossings Culverts Cut/fill Surfaces	Camps Crew-site Activity Tote Roads Public Access Temporary Crossings Culverts Cut/fill Surfaces	Expansion of Railway Cut/fill Surfaces Temporary Crossings	Fill Areas Source of Fill Back-up Lands Dredging	Site Occupancy Storm Sewer Sanitary Sewer Water Withdrawal	Traffic Flows Bank Stability	Traffic Flows Emissions Bank Stability	Traffic Flows Bank Stability	Traffic Movement Spills, Etc.	Slope Structure Erosion Control Drainage Control Soil Replacement Revegetation Water Quality
Stream discharge											
Streamwater quality											
Groundwater table											
Groundwater quality											
Stream bottom fauna											
Fish											
Air quality											
Noise level											
Landform											
Soils											
Vegetation											
Ungulates											
Furbearers											
Waterfowl											
Other wildlife											
Rare and endangered											
Recreational feature (terrain)											
Heritage											
Agriculture											
Forestry											
Hunting											
Fishing											
Guiding											
Sightseeing, hiking, camping											
Micro-climate											

Environmental Factors

APPENDIX 5—SOCIO-ECONOMIC AND COMMUNITY DEVELOPMENT IMPACT ASSESSMENT MATRIX

The matrix outline is designed as a checklist to help identify all relevant possible social impacts of a project. It can also provide an index to those wishing to examine the information collected on any particular type of impact. Obviously, all information on the social impacts of developments cannot be contained within the impact matrix itself, nor will cross-impacts necessarily occur between each activity and each social factor.

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. Employment (nos. and income levels)—											
Direct employment.....											
Indirect employment in support industry.....											
Indirect employment in services.....											
2. Population (nos. by appropriate breakdown)—											
Age/Sex.....											
Households and size.....											
Dependents.....											
School-age children (by age).....											
3. Housing (nos. and cross-tabulations)—											
Type mix.....											
Tenure mix.....											
Cost mix.....											
Standards.....											
4. Services (appropriate units and breakdowns)—											
Education (classrooms/grades).....											
Recreation (community facilities).....											
Commercial.....											
Health.....											
Social.....											
Cultural/Entertainment.....											
Communication.....											
Police and fire.....											
Legal and court.....											
Industrial (by type).....											
5. Community Land (area requirements)—											
Housing.....											
Education/Health/Institutional.....											
Recreation (outdoor areas and facilities).....											
Commercial and services.....											
Industrial.....											
6. Community Infrastructure (locational mapping, environmental impact, and costing)—											
Sewage collection and disposal.....											
Water supply and distribution.....											
7. Regional Infrastructure (locational mapping, environmental impact, and responsibility for cost)—											
Regional roads (public and private).....											
Railroads.....											
Airport(s).....											
Energy.....											
8. Social Adjustment Considerations subjective or verbal statement with support statistics where applicable/possible.—											
9. Community design and aesthetic considerations.											

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STATUS OF COAL PROPERTIES

PROJECT	EXPLORATION	PROSPECTUS	STAGE I	STAGE II	STAGE III	PRODUCTION
NORTHEAST BRITISH COLUMBIA						
Belcourt (Denison Mines)	Active					
Bow River Resources (Utah Mines)	Active					
B.P. Sukunka (B.P. Canada)		August	Nov. 1977 (rejected) May 1978 (revised)	Expected 1979		
Bulmoose (Teck Corp)		Waived	Expected			
Burnt River (Teck Corp) Thermal & MET	Active					
Carbon Creek (Utah Mines)		March 1976	Dec. 1976	Expected		
Gulf Oil (Gulf Oil Canada)	Active					
Hasler Creek (Norcen Resources)	Active					
Monkman (Petrocan)		Waived	May 1979	Expected 1980		
Quintette (Denison Mines)		May 1976	Dec. 1976	Expected Fall 1979		
Saxon (Denison Mines)	Completed					

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. Employment (nos. and income levels)— Direct employment..... Indirect employment in support industry..... Indirect employment in services.....											
2. Population (nos. by appropriate breakdown)— Age/Sex..... Households and size..... Dependents..... School-age children (by age).....											
3. Housing (nos. and cross-tabulations)— Type mix..... Tenure mix..... Cost mix..... Standards.....											
4. Services (appropriate units and breakdowns)— Education (classrooms/grades)..... Recreation (community facilities)..... Commercial..... Health..... Social..... Cultural/Entertainment..... Communication..... Police and fire..... Legal and court.....											
5. Community Land (area requirements)— Housing..... Education/Health/Institutional..... Recreation (outdoor areas and facilities)..... Commercial and services..... Industrial.....											
6. Community Infrastructure (locational mapping, environmental impact, and costing)— Sewage collection and disposal..... Water supply and distribution.....											
7. Regional Infrastructure (locational mapping, environmental impact, and responsibility for cost)— Regional roads (public and private)..... Railroads..... Airport(s)..... Energy.....											
8. Social Adjustment Considerations subjective or verbal statement with support statistics where applicable/possible—											
9. Community design and aesthetic considerations.											

33

STATUS OF COAL PROPERTIES

PROJECT	EXPLORATION	PROSPECTUS	STAGE I	STAGE II	STAGE III	PRODUCTION
SOUTHEAST BRITISH COLUMBIA						
Byron Creek Colliery Thermal						X
Coleman Collieries						X
Crows Nest Industries						
Line Creek	Active	July 1976	July 1976	Aug. 1977	In Process	
Ewin Pass	Active					
Flathead Area	Active					
Coal Mountain Thermal		March 1978	Expected 1979			
Dominion Coal Block ½	Inactive					
Elco Mining Ltd.		Dec. 1976	Feb. 1977	Oct. 1978	In Process	
Kaiser Resources Ltd.						
Hosmer-Wheeler		Waived	March 1976	Nov. 1976	Inactive	
Greenhills Burnt Ridge	Active	July 1979	Expected 1980			
Sage Creek (Rio Algom.)		July 1975	July 1975	Expected 1979		

STATUS OF COAL PROPERTIES

PROJECT	EXPLORATION	PROSPECTUS	STAGE I	STAGE II	STAGE III	PRODUCTION
OTHER AREAS						
Bowron River	Active					
Hat Creek (B.C. Hydro) Thermal		Waived	Sept. 1975	Expected 1979		
Merritt (Shell Resources)	Active					
Northern Coalmines						
Quinsam (Luscar Coal Weldwood)		Dec. 1977	Jan. 1979	Expected 1979		
Telkwa (Bulkley Valley Colliery) Thermal						Very Limited Production
Telkwa (Shell Resources)	Active					
Tulameen (Cyprus Anvil) Thermal		June 1979	Expected 1979			

**APPENDIX 2.3.1. PROCEDURES FOR OBTAINING APPROVAL
OF METAL MINE DEVELOPMENT**



Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

**PROCEDURES
FOR
OBTAINING APPROVAL
OF
METAL MINE DEVELOPMENT**

April, 1979

PROCEDURES
FOR
OBTAINING APPROVAL
OF
METAL MINE DEVELOPMENT

Prepared by
Ministry of Energy, Mines and
Petroleum Resources

April 1979

FOREWORD

This manual of *Procedures for Obtaining Approval for Metal Mine Development* sets out a process through which the development of new mines can be expedited. It has been prepared by the Inspection and Engineering Division of the Mineral Resources Branch in response to a request from the Environment and Land Use Committee for guidelines to assist industries with the development of major projects. The accelerated pace of new mine development has required us to more frequently provide guidance to industry representatives as they face government requirements for permits and approvals. These guidelines attempt to strike a balance between stated government policy to "de-regulate" and the public pressures for more sophisticated planning of major projects and the requirements of existing regulations.

It is hoped that the manual will prove useful. The process and the manual will be reviewed early in 1980 and the comments of those making use of it before that time directed to the Chief Inspector will be of value in that review.

James T. Fyles
May 30, 1979

TABLE OF CONTENTS

	Page
INTRODUCTION	1
OBJECTIVES	2
OUTLINE OF REVIEW PROCESS	3
General Procedure (A)	3
Small Project (Procedure B)	3
Procedure C	4
Procedure D	4
Responsibilities of Proponent	7
Committees	7
Steering Committee	7
Minesite Advisory Committee	8
Mine Housing Advisory Committee	8
Environmental Impact Assessment Committee	8
Economic Evaluation Committee	9
Approvals	9
Timing	10
Stage I Report	10
Stage II Report	11
Applications for regulatory approvals	12
Ministry of Energy, Mines and Petroleum Resources	12
Ministry of the Environment	18
Pollution Control Branch	18
Water Rights Branch	20
Ministry of Forests	21
Ministry of Lands, Parks and Housing	22
APPENDICES	23
Appendix A - Outline of the Stage I Report	24
Appendix B - Addresses for Regulatory Agencies	26
Appendix C - Guidelines for Mine Abandonment	29
Appendix D - Guidelines for the design, construction,	33
operation, and abandonment of tailings	
impoundments	
Appendix E - The Pollution Control Objectives for the	38
mining, smelting and related industries in	
British Columbia.	

INTRODUCTION

The review procedures which are described in the following pages stress two things: the responsibility of a mine proponent to make a definitive proposal to government; and the responsibility of government to advise whether or not these proposals meet either legislative requirements or the policy objectives of the Province of British Columbia.

During recent years, the legislation which regulates the mining industry has evolved both directly through the Mines Regulation Act, and indirectly through environmental and land use legislation and regulations. The procedures which follow are intended to assist the mining companies in the meeting of these necessary requirements and to co-ordinate government response.

Many review procedures are now in place from existing legislation. The minesite, for example, is governed by the Mines Regulation Act which covers the approval of the work system and approval of the program for environmental protection and reclamation. The Pollution Control Act covers emissions and discharges. Both acts allow for interagency comment, both require publication of the filing of plans and both allow for public involvement.

OBJECTIVES

The objectives of this review procedure are:

- (1) to provide a vehicle for overall project approval by identifying the nature and magnitude of environmental, social and economic impacts associated with the proposed development.
- (2) to provide a procedure for solving problems not falling under existing regulatory responsibilities.

OUTLINE OF REVIEW PROCESS

The following review process will apply to new mining operations. The procedure is designed to be flexible and can be modified by the Steering Committee when necessary. A Stage I report is required for all projects.

GENERAL PROCEDURE (A)

It is anticipated that most new mining operations will follow the two stage process outlined in Figure 1. The Stage I process requires the submission of a Stage I report, a general distribution and review. At the end of Stage I the Environment and Land Use Technical Committee (ELUTC) will determine if the full Stage II process is required. A Stage II report is required if development information is not finalized or if mitigations are not resolved.

The Stage II procedure requires a Stage II report and an application for regulatory approvals. The Stage II report should provide detail on the final project design. This report will receive general distribution and review and is culminated by an approval of the project from the Environment and Land Use Committee (ELUC).

SMALL PROJECT (PROCEDURE B)

Small projects with low environmental or social impact will be able to by-pass the review process following submission of a Stage I report and will be able to apply directly for regulatory approvals.

Applications for regulatory approval involve the normal inter-agency referral process.

PROCEDURE C

If, at the end of the Stage I review process, the project design is finalized and it is apparent that the proposal will have low environmental and social impact and there will be no economic cost to the Province, then the ELUTC may decide that a full Stage II report is unwarranted. It will recommend that the proponent apply directly for regulatory approvals.

PROCEDURE D

If the project design is finalized by the end of the Stage I review process and, although all possible mitigations have been undertaken, there is still a moderate to high environmental or social impact or an economic cost to the Province then there would be little value to continuing the review procedure with a Stage II report.

In this case the ELUTC may request that the ELUC provide an overall approval of the project at this time subject to receipt of all necessary regulatory approvals.

The major catalysts for the review process are the committees. The main committee, the Steering Committee, makes use of several working committees that report directly to it. The Minesite Advisory Committee and Mine Housing Committee are responsible for ensuring that the project is designed to best accommodate all environmental and social interests.

The Environmental Impact Assessment Committee evaluates the environmental and social impacts of the proposed development, and presents this assessment to the Steering Committee. The Economic Evaluation Committee determines if there will be a net benefit to the Province and may decide to evaluate the estimated costs and benefits. Reports from both of these committees will be used in the overall decision regarding the proposed mine development.

FIGURE 1
 GENERAL PROCEDURE FOR OBTAINING APPROVAL FOR
 METAL MINE DEVELOPMENT

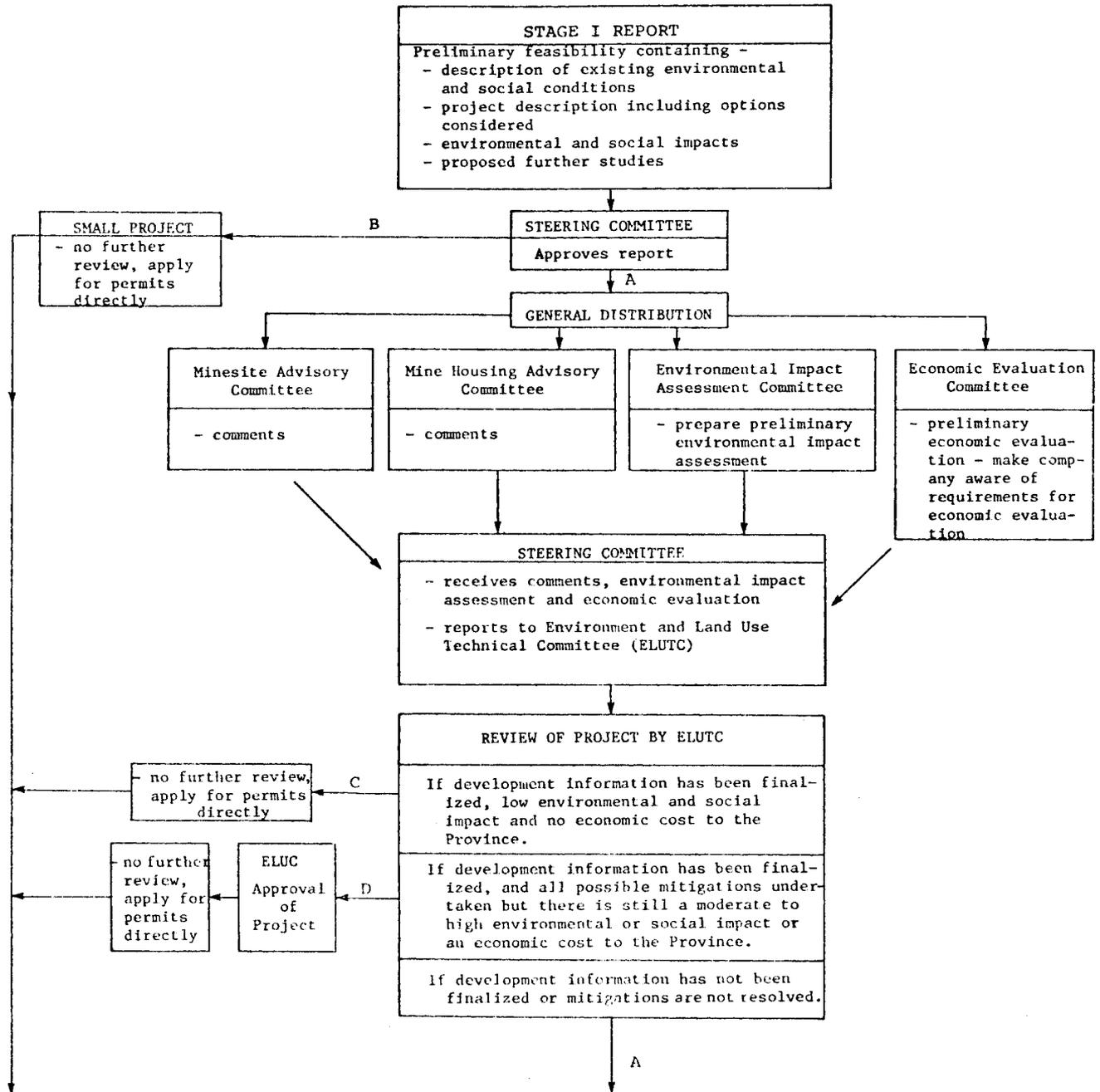
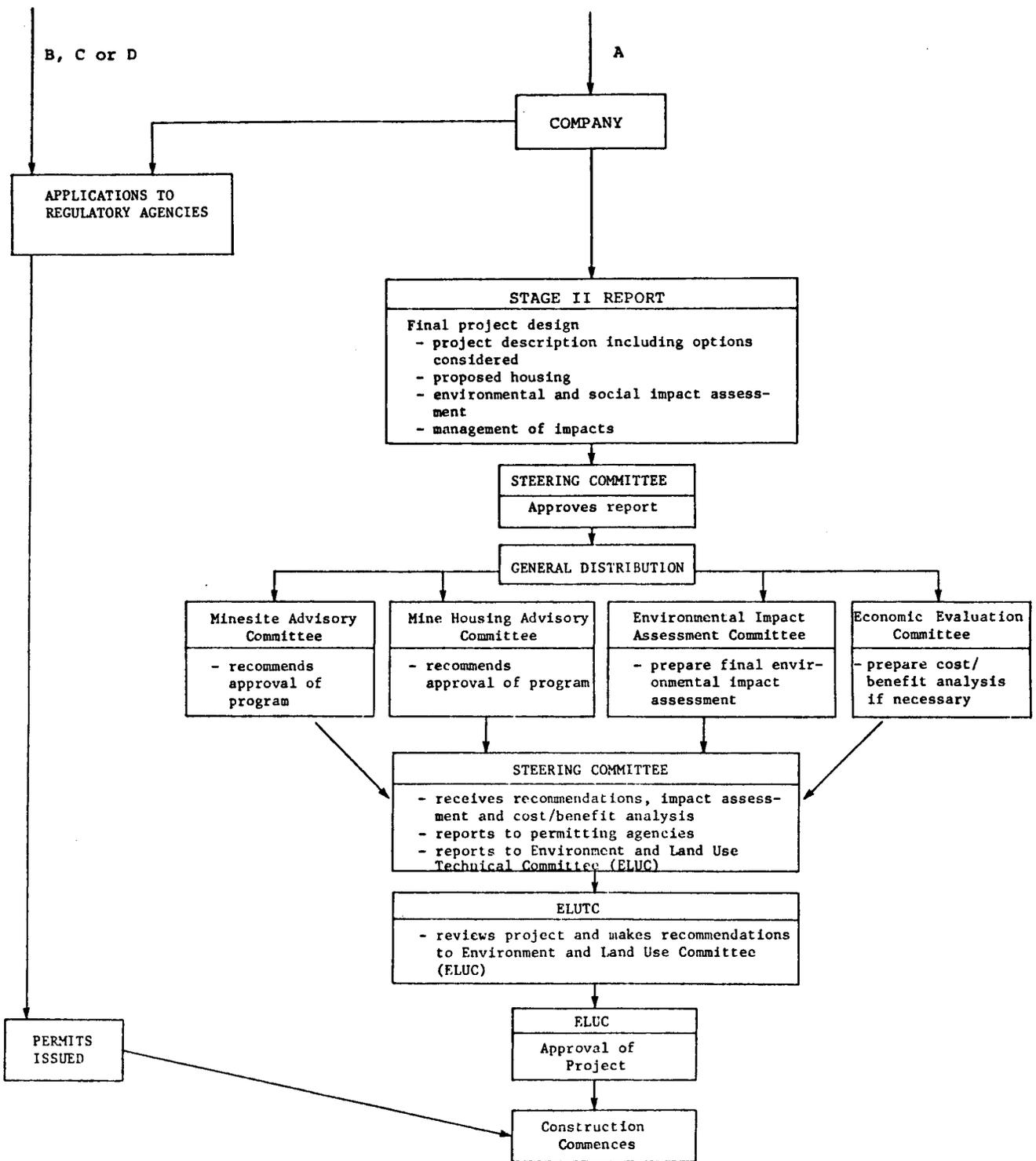


FIGURE 1 (Continued)



RESPONSIBILITIES OF PROPONENT

The proponent makes a definitive development proposal through preparation of Stage I and Stage II reports and meets with committees to present proposals and solve problems that may arise.

The proponent is asked to prepare or commission an environmental impact assessment. This may be conducted "in-house" or commissioned to an outside consultant. In either case the proponent should endeavor to be as objective as possible. The Environmental Impact Assessment Committee will evaluate this assessment and may prepare an additional report for review by the Steering Committee.

The Steering Committee will direct the proponent to the permitting agencies but the proponent is responsible for obtaining all permits required under existing legislation.

COMMITTEES

Steering Committee

The Steering Committee is responsible for co-ordinating the review process. It functions as the main government contact for the mine and the primary vehicle for feedback from regulatory and non-regulatory government agencies and the public. It can appoint subcommittees as they are needed.

The Steering Committee is chaired by the Ministry of Energy, Mines and Petroleum Resources and is composed of:

- one additional member from the Ministry of Energy, Mines and Petroleum Resources
- one member from the ELUC Secretariat
- one member from the Ministry of Economic Development
- one member from the Ministry of Municipal Affairs
- one member from the Ministry of the Environment

Minesite Advisory Committee

This committee is essentially the "Advisory Committee on Reclamation" which now operates under Section 11 of the Mines Regulation Act on all applications for a surface work permit and, therefore, will review every mine proposal whether or not the mine is large enough to warrant the full review process.

This committee reviews the environmental protection and reclamation of the proposed mine and access plans. It will be composed from representatives of the ministries of Agriculture; Environment; Forests; Lands, Parks and Housing; and will be chaired by a member from the Ministry of Energy, Mines and Petroleum Resources.

Mine Housing Advisory Committee

This committee reviews all associated developments concerned with providing living accommodations for mine employees. It reports to the Steering Committee, is chaired by a member of the Ministry of Municipal Affairs, and is composed of members from the ministries of Energy, Mines and Petroleum Resources; Environment; Lands, Parks, and Housing; Transport, Communications, and Highways; and others as required.

Environmental Impact Assessment Committee

This committee reviews the proponents' environmental impact assessment and, if necessary, prepares or commissions an environmental impact (including socio-economic impacts) statement based upon the submissions from the proponent and their consultant, and comments received from government and the public. This committee should be chaired by a member from ELUC Secretariat and be composed of members from the ministries of Energy, Mines and Petroleum Resources; Environment; Forestry; Lands, Parks and Housing as required.

The impact statement is submitted to the Steering Committee who, in turn, submits their recommendations to the Environment and Land Use Technical Committee as part of the overall project approval by ELUC.

Economic Evaluation Committee

This committee is responsible for making an economic evaluation of the project to decide if a cost/benefit analysis should be done. During Stage I, this committee makes the proponent aware of the data requirements for an economic evaluation. When required, this committee will provide or commission an economic cost/benefit analysis during Stage II.

The cost/benefit analysis will be submitted to the Steering Committee who, in turn, will submit their recommendations to the Environment and Land Use Technical Committee as part of the overall project approval by ELUC.

Confidentiality of cost data is a major concern of many mining companies. As the Ministry of Energy, Mines and Petroleum Resources has the expertise to provide this analysis, this committee should be chaired by Ministry of Energy, Mines and Petroleum Resources staff in the Economics and Planning group. A representative from the Ministry of Economic Development should be on this committee, with additional members from other ministries added as they are required.

APPROVALS

Both the Stage I and Stage II reports must be approved by the Steering Committee before general distribution to ensure that their contents provide a level of information that is suitable for analysis and assessment by government. The proponent may be asked to prepare additional information at this time.

For major projects requiring Stage I and Stage II reports, overall project approval is the responsibility of ELUC. Smaller projects or larger projects with minimal impacts and low public costs can proceed following review of the Stage I report and approval by the ELUTC. Issues unresolved by the ELUTC will be referred to ELUC who may give approval subject to special conditions or may require a Stage II report and subsequent approval.

The responsibility for issuing permits and granting approvals for specific aspects of the project lies with line agencies under existing regulatory approval systems. These agencies and the approvals required are discussed in the section entitled "Applications for Regulatory Approval".

TIMING

The minimum length of the review procedure during Stage I from the time of submission of the Stage I report to an approval in principle, is estimated to be three months (Figure 1). Similarly, for Stage II, a three month period is anticipated from the time of submission of the Stage II report to overall approval of the project.

Approval from regulatory agencies during the Stage II period will generally fall easily within the three month time-frame with the possible exception of applications for water rights. It is the proponent's best interest to contact the regional water rights engineer as early as possible to expedite this application.

STAGE I REPORT

The Stage I report should provide sufficient detail to inform regulatory and non-regulatory agencies about the current status of the project. An

outline of a suggested format is included in Appendix A. The report should contain:

- a description of the existing environmental and social conditions that could be affected by the proposed development.
- a detailed project description including options that have been considered.
- a preliminary environmental and social impact assessment.
- an outline of proposed further studies.

It is suggested that the report not exceed 100 pages although the size of the report will depend very much on the scale and complexity of the project and its affect on the existing environmental and social conditions.

If considered necessary, the Stage I report could be presented by the Steering Committee to the members of the Regional Resource Management Committee and Regional District.

Six copies of the Stage I report are submitted to the Senior Assistant Deputy Minister, Ministry of Energy, Mines and Petroleum Resources, Parliament Buildings, Victoria, B.C. who will forward them to the Steering Committee. If the Steering Committee approves the report, an additional 24 copies are required.

STAGE II REPORT

The format of the Stage II report remains flexible to accommodate the specific requirements of each proposed development. The content and format is left to the discretion of the proponent and consultant. It may be in the proponent's best interest to consider two reports, one covering the minesite and another, housing.

Whatever the format, the Stage II report must contain a description of the final project design including:

- project description including options considered
- proposed housing for employees
- environmental and social impact assessment
- management of impacts

Six copies of the Stage II report are submitted to the Senior Assistant Deputy Minister, Ministry of Energy, Mines and Petroleum Resources, Parliament Buildings, Victoria, B.C. who will forward them to the Steering Committee. If the Steering Committee approves the report, an additional 24 copies are required.

APPLICATIONS FOR REGULATORY APPROVAL

Ministry of Energy, Mines and Petroleum Resources

The Ministry of Energy, Mines and Petroleum Resources has regulatory responsibilities under the Mines Regulation Act and Mineral Act. The proponent must be a holder of the mineral rights, obtain an approval of the work system and obtain a surface work permit.

Approval of the Mine Plan - Section 10, Mines Regulation Act

Approval of the mine plan is the responsibility of the Chief Inspector, Ministry of Energy, Mines and Petroleum Resources.

To obtain approval the proponent must forward the mine plan to the Chief Inspector. The development proposal contained in the Stage II Report should be sufficient as supporting documentation, although additional information may be requested at any time.

The Chief Inspector may call a meeting to discuss the proposal and could require modifications to the mining system before approval is given.

Surface Work Permit - Section 11, Mines Regulation Act

Section 11 of the Mines Regulation Act sets out the requirements of legislation for reclamation in British Columbia and is administered by the Ministry of Energy, Mines and Petroleum Resources, Inspection and Engineering Division, Reclamation Section. Legislation covers mineral exploration, placer mining, quarries, gravel pits and metal mines. The contact is the Senior Reclamation Inspector.

As a basic statement of policy, this Act begins:

"It is the duty of every owner, agent, or manager of a mine to institute and carry out a programme for the protection and reclamation of the surface of the land and watercourses affected thereby, and, on the discontinuance or abandonment of a mine, to undertake and complete the programme to leave the land and watercourses in a condition satisfactory to the Minister"

To obtain approval the proponent must initiate the following procedure:

File Report - a report is submitted to the Minister of Energy, Mines and Petroleum Resources prior to the commencement of operations containing:

- (a) A map showing the location and extent of the mine, and the location of lakes, streams and inhabited places in the vicinity.
- (b) Particulars on the nature of the mining operation including the anticipated area to be occupied during the lifetime of the mine.
- (c) Particulars on the nature and present uses of the land to be used.
- (d) A programme for land reclamation and conservation with particular reference to:
 - i the location of the land
 - ii the effect of the programme on livestock, wildlife, watercourses, farms and inhabited places in the vicinity of the mine, and the appearance of the mine site.
 - iii the potential use of the land, having regard to its best and fullest use, and its importance for existing and future timber, grazing, water, recreation, wildlife and mining.

Advertising - the company must advertise that it has filed an application for a surface work permit. This notice of filing must be advertised in the B.C. Gazette and a local newspaper.

Confirmation of publication - copies of the advertisement are sent to the Ministry of Energy, Mines and Petroleum Resources.

Review - the report is reviewed by the Advisory Committee on Reclamation, consisting of the Ministry of Energy, Mines and Petroleum Resources and other resource agencies.

Bonding - a bond not exceeding \$2,500.00 per hectare of disturbance is set. These funds are placed in trust and a Receipt and Agreement form is issued by the bank.

Permit Issued - issuance of a surface work permit with such special terms and conditions as the Minister sees fit to prescribe.

Mineral Act - sections 29, 41 and 42

The mineral act is primarily concerned with mineral rights. Production on a mineral claim, other than limited production (maximum of 1,000 tonnes/yr), cannot be commenced unless the mineral claim has been surveyed.

A company may apply for a Mining Lease - section 29:

- "(1) The minister shall issue a mining lease to a holder of a mineral claim who applies in the prescribed form, pays a fee of \$50 and satisfied the gold commissioner that he has
- (a) had the mineral claim surveyed by a British Columbia Land surveyor,
 - (b) posted, after the Surveyor-General confirms the surveyor's plan, at the office of the gold commissioner a notice in the prescribed form stating that he intends to apply for a mining lease within 90 days after the date he posted the notice, and,
 - (c) published, not less than once in the Gazette and once each week for 4 consecutive weeks in a newspaper circulating in the area in which the mineral claim is situated, a copy of the notice referred to in paragraph (b).
- (2) Not more than 40 adjoining 2 post claims, units, or a combination of claims and units shall be included in one mining lease"

The mining lease results in a doubling of assessment work requirements and if production has commenced the company can apply for a Certified Mining Lease - section 42:

- "(1) On application to the chief gold commissioner by the holder of a mining lease, payment of an annual rent in advance and notification by the Chief Inspector of Mines that he is satisfied that the holder is in production on the mining lease, the chief gold commissioner shall certify, on an anniversary date of the mining lease, that the holder is in production.
- (2) The annual rent, payable in advance, is \$10/ha or fractional hectare contained in a certified mining lease, and section 33 does not apply to a certified mining lease.

- (3) Where the holder of a certified mining lease does not pay the annual rent when due, the minister may serve a notice on the holder requiring him to forthwith pay the rent, and, if the rent is not paid within 30 days after service of the notice, the minister may order that the mining lease be forfeited to, and vested in, the Crown in right of the Province.
- (4) On application by the lessee, and confirmation by the Chief Inspector of Mines that a mine situated on a mining lease has ceased production, the chief gold commissioner shall decertify the mining lease and section 33 again applies to the mining lease."

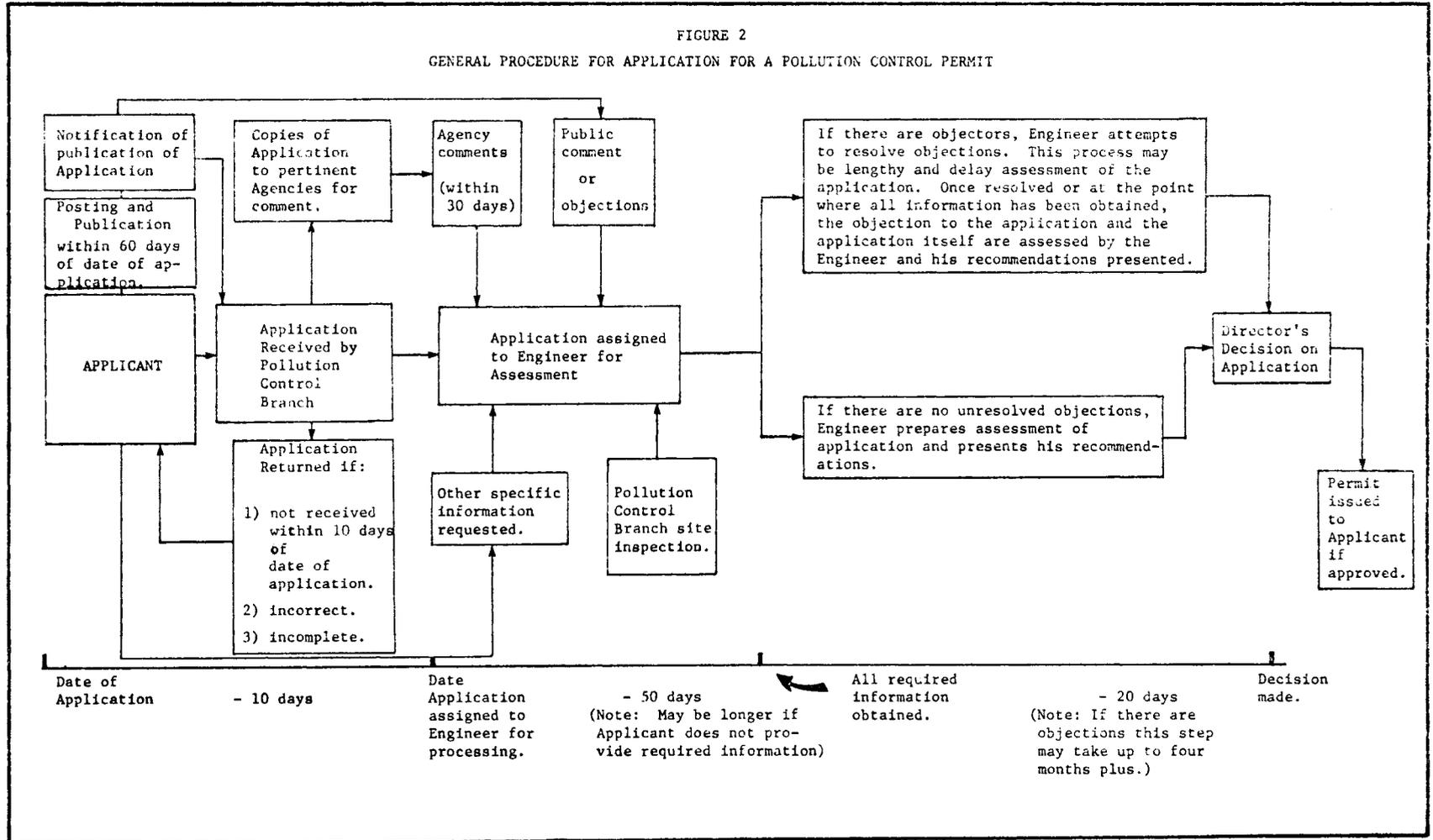
Ministry of the Environment - Pollution Control Branch

Control of all effluents, emissions, sewage, refuse and garbage are under the jurisdiction of the Pollution Control Branch who administer the Pollution Control Act.

The number of permits required for each project will depend upon the complexity of the project. Therefore, before making application for permits it is best to contact either the Regional Manager of the Pollution Control Branch or the Head, Mining Section Industrial Division, Victoria, (Appendix B).

A general outline of the permit process is shown in Figure 2.

FIGURE 2
GENERAL PROCEDURE FOR APPLICATION FOR A POLLUTION CONTROL PERMIT



Ministry of the Environment - Water Rights Branch

The Water Rights Branch is responsible for licencing the use of all surface water. The use of groundwater is not licenced at this time. The initial point of contact should be the Regional Engineer (Appendix B) who will advise the proponent on the application. The proponent is encouraged to apply for the required water licences as early as possible as there is, at present, an average of two years required from the time of the initial water rights application until the granting of a licence.

Every applicant must do the following:

- (1) Post the application on the ground; that is, in conspicuous places at or near the proposed point of diversion, site of the dam (if any) and place of use.
- (2) File two copies with the Water Recorder in whose district the point of diversion will be, within twenty days of the posting on the ground.
- (3) Within ninety days of the posting of the application on the ground, serve signed copies on all owners of land or mining property that will be affected physically by the proposed works or by the operation or utilization thereof, and on all licences or prior applicants whose points of diversion are at or below the applicant's proposed point of diversion.

It is advisable to file the application with the Water Recorder as soon as possible after posting it on the ground because the date of filing will, in most cases, determine the priority of the licence that may be issued.

Ministry of Forests

The major concern of the Forest Service is the disposal of timber. There are two permits used to do this: a free use permit and a licence to cut. Basically, the free use permit is used for small disturbances, while major exploration or mining activities require a licence to cut. The normal procedure is for the company to forward copies of form 10 and 11 under the Mines Regulation Act to the local forest service ranger. It is his duty to determine the form of permit required. Usually he will require the company to cut and deck the merchantable timber which will be sold by the Forest Service. Upon sale of the timber, logging and decking costs will be repaid to the miner. In remote areas where it is not feasible to remove the timber the company will be billed for stumpage. (Stumpage in the case of the timber sale is paid by the buyer.) The permits will contain the usual forest protection clauses required in all timber licences. It takes about six weeks to process these permits.

The other aspect where Forest Service permits may be required is for roads. In the case where a Forest Service road exists the company may obtain a permit to use that road for industrial hauls. Modifications to the road and road standards will be determined by the Forest Service.

In cases where a mine road is to be built over a forest reserve the company will require a Special Use Permit. This document will specify conditions for the removal of timber along the right-of-way and for the layout of the road. On roads built on other Crown land, the company will still require a licence to cut for timber along the right-of-way. All of these permits can be processed by applying through the local ranger. The Forest Service can be contacted through the Regional Manager's office (Appendix B).

Ministry of Lands, Parks and Housing

The Ministry of Lands, Parks and Housing has jurisdiction over land tenure on unreserved crown land and it is wise to contact the Regional Land Manager (Appendix B) to determine where the jurisdiction of this Ministry falls. On unreserved crown land the two main forms of tenure are obtained through a Right-of-Way application and an application for a land lease.

APPENDICES

APPENDIX A

OUTLINE OF THE STAGE I REPORT

The following outline is suggested. The exact format need not be followed but should serve rather as a check-list. The entire Stage I Report, for most projects, should not exceed 100 pages.

TABLE OF CONTENTS

SUMMARY

ACKNOWLEDGEMENTS (authors and contributors to this report)

INTRODUCTION

5 pages

History

Location

Brief project description and schedule of development

DESCRIPTION OF EXISTING ENVIRONMENTAL AND SOCIAL CONDITIONS

30 pages

Physiography

Land tenure

Climate

Air Quality

Surface Water

Drainages

Water quality

Hydrology

Fisheries

Groundwater

Quantity

Quality

Soils and surficial geology

Vegetation

Wildlife

Land Capability and Use

Agriculture, Forestry, Recreation, Trapping, Guiding

Historic and Archaeological Sites

Existing Social Environment

Population

Employment

Housing

Education

Commercial services

continued:

PROJECT DESCRIPTION

30 pages

Exploration
Description of Deposit
Options considered
Mine Development (pit, underground, waste disposal,
reclamation, drainage control)
Mill (Process description, loading, storage, waste
disposal, water supply, drainage control,
reclamation)
Transportation
Sewage and Garbage disposal
Utilities
Employment
Housing
Detailed Development Schedule
Reclamation objectives, facilities and staff
Drainage control and monitoring
Effluent control and monitoring

ENVIRONMENTAL AND SOCIAL IMPACTS

10 pages

- should address itself to significant impacts or an
identification of environmental concerns which will
be assessed in submissions for permit applications.

PROPOSED FURTHER STUDIES

5 pages

APPENDIX B
ADDRESSES FOR REGULATORY AGENCIES

MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

Chief Inspector of Mines	525 Superior Street, Victoria	387-3781
Senior Reclamation Inspector	525 Superior Street, Victoria	387-3781
Chief Gold Commissioner	Parliament Buildings, Victoria	387-6245

District Inspectors

Fernie	Box 1290	423-6222
Kamloops	101, 2985 Airport Drive	376-7201
Nanaimo	2226 Brotherstone Road	758-2342
Nelson	310 Ward Street	352-2211 (342)
Prince George	1652 Quinn Street	562-8131 (322)
Prince Rupert	Court House, Box 758	758-2342
Smithers	Box 877	847-4411 (237)
Vancouver	2747 East Hastings St.	254-7171

MINISTRY OF THE ENVIRONMENT - POLLUTION CONTROL BRANCH

Head, Mining Section Industrial Divison	1106 Cook Street, Victoria	387-5321
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Regional Managers

Cranbrook	1617 Baker Street	489-2311 (228)
Kamloops	1050 West Columbia Street	374-5981
New Westminster	313 Sixth Street	521-9641 (279)
Prince George	3691 - 15th Avenue	562-8131 (238,9)
Vernon	1, 3001 - 43rd Avenue	542-2351
Williams Lake	202, 172 - 2nd Avenue N.	392-6261 (312)

MINISTRY OF THE ENVIRONMENT - WATER RIGHTS BRANCH

Regional Engineers

Kamloops	523 Columbia Street	374-4112
Kelowna	1905 Kent Road	860-6280
Nelson	310 Ward Street	352-2211 (275)
New Westminster	313 Sixth Street	521-9641 (281)
Prince George	606, 1488 Fourth Avenue	562-8131 (236)
Victoria	765 Broughton Street	387-6477

MINISTRY OF FORESTS

Regional Managers

Kamloops	515 Columbia Street	374-7741
Nelson	518 Lake Street	354-4181
Prince George	1600, 3rd Avenue	562-8131
Prince Rupert	Market Place	624-2121
Vancouver	631, 355 Burrard Street	668-2470
Williams Lake (Cariboo)	540 Borland Street	392-6261

MINISTRY OF LANDS, PARKS AND HOUSING

Regional Land Managers

Cariboo Region	Rm. 201, 172 North 2nd Avenue, Williams Lake, B.C. V2G 1Z6	392-6261 (306,7)
Kootenay Region	622 Front Street, Nelson, B.C.	352-2211 (330)
Lower Mainland Region	McLaren Centre, 4240 Manor St., Burnaby, B.C. V5G 1B2	438-5344 (247)
Omineca-Peace Region	505 Oxford Building, 280 Victoria St. Prince George, B.C. V2L 2J5	562-8131 (324)
Skeena Region	Box 3460, 2nd Floor, Government Bldg. 3794 Alfred Avenue, Smithers V0J 2N0	847-4411 (268)
Thompson-Okanagan Region	348 Tranquille Road, Kamloops, B.C. V2B 3G4	554-3144
Vancouver Island Region	2nd Floor, 190 Wallace Street Nanaimo, B.C. V9R 5B1	753-7717

APPENDIX C

RECLAMATION GUIDELINES

BRITISH COLUMBIA MINISTRY OF
ENERGY, MINES AND PETROLEUM RESOURCES

MINE ABANDONMENT

(A) When a mine is shutdown and the entire plant is left on the property it shall be considered a temporary shutdown. Reclamation of the disturbed areas shall be done on the basis determined by the Reclamation Section of the Ministry of Energy, Mines and Petroleum Resources.

(B) Where a mine is shutdown and the mine plant removed the following shall be done:

General

- (1) The mining company shall submit to the Senior Reclamation Inspector a plan of total reclamation prior to shutdown.
- (2) All buildings, machinery, mobile equipment shall be removed. All scrap material shall be disposed of in a manner mutually acceptable to the Ministry of Energy, Mines and Petroleum Resources and the mine operator.
- (3) Concrete foundations and slabs may be left intact and covered by overburden and revegetated where practical.
- (4) All provisions of either the Mines Regulation Act or Coal Mines Regulation Act shall be complied with to the satisfaction of the District Inspector or Resident Engineer

Tailings ponds

- (1) A plan shall be submitted showing the proposed drainage controls for the tailings pond and surrounding drainage area.
- (2) Where necessary a permanent spillway is required on or adjacent to the tailings dam to provide for excessive run-off water. Details and design shall be submitted to the Chief Inspector of the Ministry of Energy, Mines and Petroleum Resources and the District Inspector for approval.
- (3) Where practical the tailings pond shall be revegetated to a condition

approved by the Reclamation Section of the Ministry of Energy, Mines and Petroleum Resources. If vegetation is to be established, it shall be done to a point where no maintenance of the vegetation is required. A minimum of three years experience is necessary to determine the quality of vegetation.

- (4) Land use of the disturbed areas following mine abandonment shall be mutually agreed upon by the Ministry and the mine operator and shall take into consideration the use of the land prior to mining and the capability of the disturbed soil and/or mine waste to sustain the pre-mining land use.

Waste Dumps - Metal

- (1) Where possible waste dumps should be sloped to an angle where vegetation can be maintained. If overburden is available, flat areas of the dumps shall be covered to a depth of three to six inches of overburden or top soil.
- (2) All flat areas on the dumps shall be revegetated and vegetation shall be established to a point where no maintenance is required. A minimum of three years experience is necessary to determine the quality of vegetation.
- (3) A plan of the drainage area surrounding the dumps shall be submitted to the Senior Reclamation Inspector. Where possible all drainage should be directed away from the dumps.
- (4) Ultimate land use of the disturbed dump area shall be specified.

Waste Dumps - Coal

- (1) Final slope of coal waste dumps shall be 26 degrees or at an angle where the dump is physically stable and vegetation can be

maintained on the slope of the dumps.

- (2) All coal waste dumps shall be revegetated to a point where vegetation is free of maintenance.
- (3) A plan of the drainage area surrounding the dump area shall be submitted to the Senior Reclamation Inspector. Where possible all drainage should be directed away from the dumps.
- (4) Ultimate land use of the reclaimed dumps shall be specified.
- (5) A minimum of three years is necessary to determine the quality and the permanence of the established vegetation.

Pit Area

- (1) Pits shall be backfilled whenever possible.
- (2) A plan shall be submitted to the Senior Reclamation Inspector showing how the pit area shall be left after completion of mining.
- (3) Where the pit area is going to be designated as a lake, a report shall be submitted to the Senior Reclamation Inspector outlining source of water, drainage area, maximum level of water, water quality, access to lake, plans for stocking of the lake.
- (4) Where the pit floor will be free from water, where possible overburden shall be used to provide sufficient cover to establish vegetation.
- (5) Pit walls shall be left in a safe manner to the satisfaction of the District Inspector of Mines.



**Province of British Columbia
Ministry of Mines and Petroleum Resources**

**GUIDELINES
FOR THE DESIGN, CONSTRUCTION, OPERATION, AND ABANDONMENT
OF TAILINGS IMPOUNDMENTS**

Tailings impoundments involve two important aspects of public concern and the additional concern of the safety of the workers. Structural stability of dams and impoundments is essential because, if failure occurs, large volumes of water and/or semi-fluid tailings would be released causing a serious threat to life and property and accompanying pollution problem. The other aspect of concern is the possibility of pollution during the operational and post-operational periods due to controlled discharges (by overflowing or decanting) and seepage downstream of the tailings dam.

In the Province of British Columbia there are two Ministries whose approvals are required before proceeding with construction of any tailings dam or tailings impoundment.

A. MINISTRY OF MINES AND PETROLEUM RESOURCES

Under the authority of section 7 (3) of the *Mines Regulation Act* or section 6 (3) of the *Coal Mines Regulation Act*, the Chief Inspector of Mines shall require an engineering report, signed by a professional engineer registered in the Province of British Columbia specializing in geotechnical engineering. The Chief Inspector of Mines may waive certain requirements for small mining operations.

B. MINISTRY OF THE ENVIRONMENT – POLLUTION CONTROL BRANCH

A permit is required by the Pollution Control Branch for the discharge of effluents to the tailings impoundment and any discharge of effluents from the impoundment. Other agencies which are

consulted in assessment of a permit application are Ministry of Recreation and Conservation, Ministry of Agriculture, Ministry of Health, Water Rights Branch, and Environment Canada.

PROCEDURE

1 SITE INVESTIGATIONS

Preliminary investigations can be done by the company where in-house engineering is available.

- 1.1 Topography of area
- 1.2 Geological and subsurface covering
 - (a) Superficial geology and subsoil investigations
 - (b) General geology – rock types, fracturing, faulting, permeability
 - (c) Evidence of previous mudslides, rockslides
 - (d) Assessment of the downstream area which might be affected by any dam failure
- 1.3 Availability of materials for dam construction – soil – gravels – waste rock – cycloned tailings
- 1.4 Climate data
- 1.5 Hydrology – evaluation of catchment area, total precipitation, rate of runoff, stream flows, evaporation, evidence of springs and artesian conditions
- 1.6 Seismicity

2 DESIGN ANALYSIS

An analysis of the integrity of the proposed design. The information should include:

- 2.1 Results of geological studies and site investigations including logs of drill holes, field permeability tests, and groundwater levels
- 2.2 Results of soil tests on foundation and abutment materials including shear strength and consolidation test data
- 2.3 Description of the engineering properties of the materials to be used for the construction of the dams
- 2.4 Type of construction
 - Upstream Construction – using tailings
 - Centreline Construction – using tailings
 - Downstream Construction – using tailings or borrow material
 - Conventional Dam Construction – using open-pit waste or borrow material

Tailings dams are usually constructed in two phases with Phase I being the Starter Dam which is normally carried out in the same manner as conventional dams and is usually done by a contractor. Phase II is the continual raising of the dam which is normally carried out by the mining operator. Design must take into account the proposed ultimate height of the dam.

- 2.5 Hydrology – design must take into consideration the hydrology of foundation area and the upstream and downstream areas. This should include surface and subsurface water conditions, diversion of water courses, drainage and runoff from the upstream basin, erosion control. Design should allow for a maximum of a 200-year flood runoff from the upstream basin – water balance to include operational water, recycle water, runoff water, mine water (if applicable), evaporation, seepage, and water entrained in solids. Decant systems using decant towers and pipes through the dam should not be used in major structures.
- 2.6 Seismicity – design should take into account the seismic activity in the area and the safety factor should be indicated.
- 2.7 Drainage Features – the design must indicate adequate drainage features to control the location of the phreatic line within the structure and uplift pressures in the foundation soils downstream of the dam.
- 2.8 Instrumentation -- sufficient instrumentation must be used to determine settlement, pore pressure, seepage, phreatic line. Downstream monitoring of surface and subsurface waters is required to determine changes from the base line data.
- 2.9 Seepage Control – The impoundment design should ensure that seepage through and under the dam is minimized to prevent receiving water contamination downstream, unless the impoundment is deliberately constructed as an infiltration basis (the Pollution Control Branch should be consulted in this case).

3 CONSTRUCTION CONTROL

- 3.1 Construction Specifications – rate of Construction-Scheduling is to be drawn up and copies issued to the Chief Inspector of Mines, and the District Inspector and Resident Engineer.
- 3.2 Design Control -- the design consultant is required to be on site during construction and shall be responsible to ensure that the design requirements are followed by the contractor. Copy of reports submitted to the mining company shall be forwarded to the District Mine Inspector.
- 3.3 Construction Phase II – when the mining company is continually raising the dam after Phase I Starter Dam is completed, the company is required to submit monthly reports to the District Mine Inspector concerning the results of monitoring of seepage, phreatic line, and other requirements to meet the design parameters. The District Inspector of Mines may require reports on a less frequent basis.
- 3.4 Construction During Freeze-Up – construction during freeze-up and winter months is not permitted. This period may vary with location and type of winter.

4 OPERATING CONTROL

- 4.1 Instrumentation — the basic instrumentation required to maintain surveillance on the performance of the tailings dam should include: piezometers to measure water levels and outline the phreatic water line in the dam and its foundations; settlement and alignment gauges to measure vertical and horizontal movements; gauges to measure seepage flows through the dam; determination and monitoring of seepage flows to be made on a regular basis as required by the Pollution Control Permit.
- 4.2 Annual Report — an annual report on the stability of the tailings dams and related works will be required to be submitted to the Chief Inspector of Mines, the District Inspector, and the Pollution Control Branch. The Pollution Control Branch normally requires submission of annual reports on seepage control, water balance, and other aspects related to pollution control. To simplify reporting requirements, it is preferable to submit one report to both agencies, with the report incorporating both Mines and P.C.B. requirements. The report shall be submitted by a qualified geotechnical engineer and can be in-house engineering with the permission of the Chief Inspector of Mines. The report shall contain the following:
- Review of the stability — including vertical and horizontal movements
 - Seepage — including controlled and any other evident seepages which might indicate new leakage
 - Summary of the analysis of the water seepage as required by the Pollution Control Permit
 - Water balance is required for the year's operation
 - Summary of the phreatic levels in the dam cross-section and downstream foundation
 - Construction details including dam height and amount and type of material
 - Measured freeboard and projected freeboard available during the year with reference to the 200-year flood

5 POST OPERATIONAL

- 5.1 A report shall be submitted to the Chief Inspector of Mines outlining the proposed post-operational state of the dam, related seepage control works, mine water department, and post-operational monitoring.
- 5.2 Spillway — a permanent spillway shall be designed and installed prior to final abandonment of the tailings dam. The design shall take into consideration the runoff in the catchment area for the 200-year flood. (The minimum amount of impoundment water shall be considered in the design.)
- 5.3 Reclamation — a report on the proposed total reclamation of the tailings area shall be submitted to the Chief Inspector of Mines pursuant to section 11 of the *Mines Regulation Act* and section 8 of the *Coal Mines Regulation Act*.

6 GENERAL

6.1 Ministry of Mines and Petroleum Resources and Ministry of the Environment (Pollution Control Branch)

The following reports shall be submitted to the Chief Inspector of Mines, the District Inspector of Mines, and the Pollution Control Branch.

- Initial report on proposed new impoundments and any additional lifts proposed by the company.
- Report of the design by consultants is required. When the report is received, the Chief Inspector of Mines shall arrange an on-site meeting with the company, their consultants, District Inspector, a Ministry of Mines' Engineer from Victoria, and in certain cases, the Pollution Control Branch.
- The design must be approved by the Chief Inspector of Mines. Approval with any terms and conditions will be submitted to the company and a copy will be forwarded to the Pollution Control Branch prior to the issuing of a Pollution Control Permit.

6.2 Pollution Control Branch

Copies of all reports submitted to the Chief Inspector of Mines shall be submitted to the Pollution Control Branch.

6.3 Seepages Other Than Controlled

Any seepages which are observed other than the controlled seepage shall be reported to the District Inspector of Mines and the Regional Manager of the Pollution Control Branch. Mines shall make recommendations and issue instructions as the seepage affects stability and the Pollution Control Branch shall do the same as seepage affects pollution. Any malfunction in the seepage return works shall be reported to the District Inspector of Mines and the Regional Manager of the Pollution Control Branch.

6.4 All reports submitted shall be signed by a professional engineer registered in the Province of British Columbia.

**W. C. Robinson, P. Eng.,
Chief Inspector of Mines.**

Inspection and Engineering Division
Victoria, B.C.
March 15, 1978.

APPENDIX E

THE POLLUTION CONTROL OBJECTIVES
FOR THE MINING, SMELTING AND RELATED INDUSTRIES
IN BRITISH COLUMBIA

In Press

contact the
Pollution Control Branch
for details.

**DEPARTMENT OF
MINES AND
PETROLEUM RESOURCES****NEWS RELEASE**

1 - 1977
British Columbia

January 20th 1977

The following joint statement is made by the Hon. James R. Chabot, Minister of Mines and Petroleum Resources and the Hon. J.A. Nielsen, Minister of the Environment.

Because of the energy crisis, interest in exploration for uranium deposits and the development of uranium mines in British Columbia has recently accelerated. To ensure a high level of safety both for mine workers and the public, as this valuable mineral resource is developed, your Government is working closely with the Atomic Energy Control Board of Canada.

Recently, Denison Mines Limited, producers of uranium in eastern Canada, have submitted a preliminary report on a proposed development of the Rexspar property at Birch Island, 65 miles north of Kamloops, and on January 13th 1977 company officials attended meetings in Victoria to discuss the project with technical officers of our two Ministries and the AECB.

The Rexspar deposit is one that has been known for many years and contains a variety of valuable minerals in addition to the uranium. The proposed development is a small open pit mine producing at a rate of 1,000 tons per day and employing approximately 80 people. A reserve of 1.22 million tons, grading 1.539 pounds U_3O_8 /ton is indicated and there is significant potential to extend these reserves.

To co-ordinate Government approvals for new uranium mines, a Steering Committee has been established from officials of these three agencies. A staged approval process of environmental assessment is required, similar to that now in place for other mines but placing particular emphasis on the potential hazards from the handling of radioactive materials.

The staged process requires developers to submit a prospectus; a first stage report which identifies the problems; a second stage report which proposes solutions, and a third stage report in preparation for the application for various permits under Provincial statutes. Each stage requires the approval of all interested Government agencies.

At this time, no application from Denison Mines has been made for a Pollution Control Permit.

However, industry has been warned that such an application must meet stringent requirements, including:

- A copy of any application under the Pollution Control Act, with supporting documents, to be made available to AECB as well as agencies named in the Act and to the general public;
- Any public hearing under section 13 of the Act to include representation from AECB on the technical panel;
- All requirements of the AECB will be contained in any permit issued in addition to Provincial requirements under the Pollution Control Act.

The AECB has jurisdiction over all uranium production in Canada. Before any work on uranium properties can be undertaken, an AECB permit is required. Denison Mines now holds an exploration permit for the Rexspar property and will require another permit before production can begin. The process of issuing the AECB permit necessitates the holding of public information meetings.

**APPENDIX 2.4.2. SCHEDULE OF LICENSING AND COMPLIANCE SURVEILLANCE
ACTIVITIES FOR BRITISH COLUMBIA**

A. B. Dory
6 January, 1977

SCHEDULE OF LICENSING AND COMPLIANCE SURVEILLANCE ACTIVITIES FOR BRITISH COLUMBIA

(continuous compliance activity indicated by *)

The following is the proposed schedule for licensing and compliance surveillance action for uranium mine-mill facilities in the Province of British Columbia. The time anticipated for study and review action prior to approval indicated at each stage is approximate. Some of the activities, indicated by an asterix (*), will continue during all phases of the facility as compliance surveillance.

ACTIVE PARTICIPATION

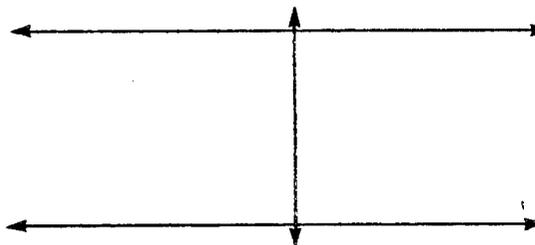
STAGE (duration of study
and review)

KEPT INFORMED WITH OCCASIONAL INPUT
IF REQUIRED

UNDERGROUND EXPLORATION
PERMIT

Atomic Energy Control Board

- (a) Application for UEP
 - (i) work practices;
 - (ii) ventilation and radiation control;*
 - (iii) protection of public;*



Energy, Mines and Resources Canada

Information on ore reserves for URAG

Ministry of Mines and Petroleum Resources (B.C.)

- (a) Safety*
- (b) Exploration methods and design*
- (c) Reclamation*
- (d) Radiation monitoring
- (e) Approval of mining method Section (10)
Mines Regulation Act

Health and Welfare Canada

Radiation exposure records*

.../2

SITE APPROVAL

(24 months)

Ministry of the Environment (B.C.)

- (a) Pollution Control Act (1967);
- (b) Pollution Control Objectives for mining, milling, etc.
- (c) Environmental Impact Study;
- (d) Environmental Impact Assessment;
- (3) Public information and participation.

Atomic Energy Control Board

- (a) Feasibility study;
- (b) Baseline data; (related to impact assessment);
- (c) Preliminary design;
- (d) Public information and participation;
- (e) Public and worker impact assessment.

Environment Canada

- (a) Participation with Department of the Environment (B.C.);
- (b) Marine Dumping Act;
- (c) Fisheries Act;
- (d) Environmental Contaminants Act.

Environment and Land Use Committee Secretariat (B.C.)

- (a) Environment and Land Use Act;
- (b) Coordination of the environmental impact assessment.

Ministry of Mines and Petroleum Resources (B.C.)

- (a) Environmental Impact Study;
- (b) Reclamation;
- (c) Approval of plant drainage, tailings pond;
- (d) Approval of mining methods Section 10 M. R. A.
- (e) Approval of monitoring.

Ministry of Health (B.C.)

Advice on health criteria.

Health and Welfare Canada

Advice on health criteria.

Ministry of Economic Development (B.C.)

Coordination.

DEVELOPMENT AND CONSTRUCTION

(8 months)

Atomic Energy Control Board

- (a) Design (mine, mill, waste management);
- (b) Mining plans;
- (c) Health and safety;*

Health and Welfare Canada

- (a) Radiation exposure records;*
- (b) Radiation surveys if requested;*
- (c) Standards development (coordination with Health, B.C.).*

Ministry of Mines and Petroleum Resources (B.C.)

- (a) Detailed mine design;*
- (b) Health and safety in the mine and mill;* (active inspection)
- (c) Reclamation;
- (d) Construction safety;
- (e) Dump and dam stability.

Ministry of Health (B.C.)

- (a) Standards development* - (coordination with Health and Welfare Canada);
- (b) Advisor to Ministry of Energy, Mines and Petroleum Resources (B.C.).

Ministry of the Environment (B.C.)

- (a) Environmental impact monitoring;*
- (b) Design.

Environmental and Land Use Committee Secretariat (B.C.)

Environment and Land Use Act*

Environment Canada

- (a) Environmental impact monitoring* (cooperation with provincial Environment)
- (b) Design.

Energy, Mines and Resources Canada

Information for URAG.

Labour Canada

- (a) Labour Code;
- (b) Cooperation with provincial Labour.

Ministry of Transport Canada

(Airports, docking facilities).

Ministry of Highways (B.C.)

If roads required.

Ministry of Economic Development (B.C.)

Coordination.

.../4

OPERATION - MFOL

(8 months)

Atomic Energy Control Board

- (a) Operating policies
- (b) Production information;*
- (c) Final design (as built);
- (d) Ventilation design;*
- (e) Mining methods;
- (f) Health and safety;*
- (g) Waste management.*

Ministry of Mines and Petroleum Resources (B.C.)

- (a) Mining methods and approvals;*
- (b) Health and safety (inspections);*
- (c) Radiation monitoring;*
- (d) Reclamation.*

Ministry of Labour (B.C.)

Labour relations.*

Labour Canada

Labour Code.

Ministry of the Environment (B.C.)

- (a) Waste management;
- (b) Environmental monitoring.*

Environment Canada

- (a) Waste management; (cooperation with provincial Environment);
- (b) Environmental monitoring;*
- (c) Metal Mining Liquid Effluent Regulations.*

Environment and Land Use Committee Secretariat (B.C.)

Environment and Land Use Act.*

Health and Welfare Canada

- (a) Radiation exposure records;*
- (b) Radiation surveys if requested;*
- (c) Advice on standards.

Ministry of Health (B.C.)

Advice to Ministry of Mines and Petroleum Resources (B.C.)
Monitoring - drinking water.

Ministry of Transport Canada

If services required.

Ministry of Highways (B.C.)

If services required.

Ministry of Economic Development (B.C.)

Coordination.

Atomic Energy Control Board

- (a) Design and measures for decommissioning;
- (b) Waste Management;*
- (c) Protection of the public;*
- (d) Remedial action.*

Ministry of the Environment (B.C.)

- (a) Design and measures to protect the environment;
- (b) Environmental monitoring.*

Environment Canada

Environmental monitoring* (cooperation with provincial environment*)

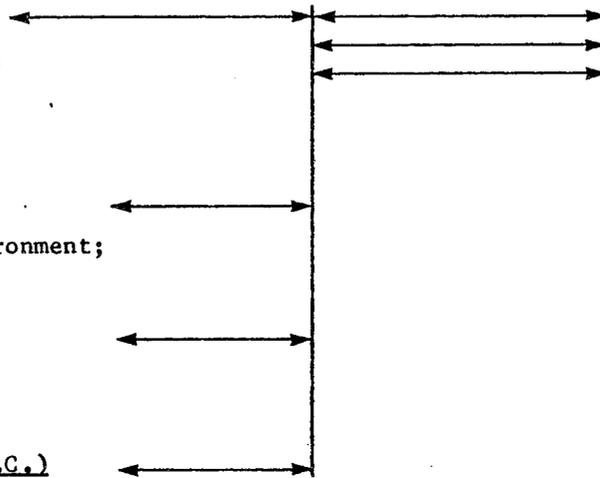
Ministry of Mines and Petroleum Resources (B.C.)

- (a) Decommissioning of the mine and mill;
- (b) Reclamation.

Ministry of Economic Development (B.C.)

Transport Canada

Ministry of Highways (B.C.)



NOTE: ————— Direction of the flow of input.

MINERAL RESOURCES BRANCHMEMORANDUM

TO: Distribution - See attached list.

RE: Preliminary Environmental Study of the Proposed Birch Island Project
Prepared by: Kilborn Engineering (B.C.) Ltd., and B.C. Research,
dated March, 1977.

DATE: June 9, 1977.

Enclosed is a copy of the above mentioned report, which has been forwarded to provincial government agencies listed in the attached distribution list. Six copies of the report have been forwarded to the Atomic Energy Control Board in Ottawa.

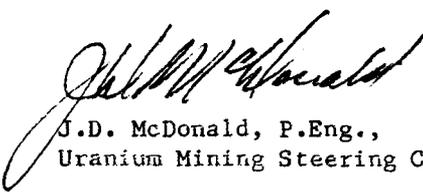
It is requested that each office review the report and forward their comments to this office by July 15th, 1977 for review by the Uranium Mining Steering Committee.

The proposed uranium mine must meet all the provincial requirements as well as the regulations issued by the A.E.C.B. Prior to issuing a permit to start construction, public meetings must be held to discuss the project as laid down by the A.E.C.B.

To co-ordinate the provincial and federal agencies, a "Uranium Mining Steering Committee" was appointed, consisting of the following members:

Ministry of Mines and Petroleum Resources	-	J.D. McDonald, P.Eng.
Ministry of Environment	-	Dr. J. O'Riordan
Atomic Energy Control Board (Ottawa)	-	A.B. Dory, P.Eng.

A copy of the report is on file in the Kamloops office of the Ministry of Mines and Petroleum Resources and can be viewed by citizens or groups at that location. The office is located at 2985 Airport Drive, Kamloops, B.C., telephone number 376-7201.



J.D. McDonald, P.Eng.,
Uranium Mining Steering Committee

JDM:jau
Encls.

copy: Dr. J.T. Fyles, B. Marr, A.B. Dory, J. O'Riordan, R. Getty.



MINERAL RESOURCES BRANCH

DISTRIBUTION LIST

Preliminary Environmental Study

of the

Proposed Birch Island Project

Prepared by:

KILBORN ENGINEERING (B.C.) LTD.

AND

B.C. RESEARCH

DATED MARCH 1977

MINES & PETROLEUM RESOURCES	-	Dr. J.T. Fyles (Deputy Minister)
	-	Dr. A. Sutherland-Brown (Chief Mineralogical Division)
	-	B.M. Dudas
ENVIRONMENT	-	Dr. J. O'Riordan (Asst. Director, ELUC Secretariat)
	-	A.N. Boydell (R.A.U.)
	-	F. Hodgson (P.C.B.)
	-	T. Leach (Water Resources)
FORESTRY	-	H. Bancroft
HIGHWAYS	-	D. Readshaw, Director
RECREATION AND CONSERVATION	-	B. Simonsen, Archaeological
	-	J. Anderson, Fish and Wildlife
	-	B. Rice, Parks Branch
HEALTH	-	Dr. H. Richards - Public Health
LAND COMMISSION	-	G. Runka - Director
HUMAN RESOURCES	-	R. Willems - Community Program Branch
LABOUR	-	J. Schuyff - Research & Planning
MUNICIPAL AFFAIRS	-	G. Harkness - Planning Services
PUBLIC WORKS	-	D. Youngson - Programming Branch
CHAIRMAN - Regional Resource Management Committee	-	Mr. G. Springer
CHAIRMAN - Regional District	-	Mr. W. Winters (Thomson-Nicola)
CLEARWATER IMPROVEMENT DISTRICT	-	Robert A. Cochlan (Chairman)
	-	<i>S. ELIAS</i>

Nov 26/76

DISTRIBUTION LIST

BIRCH ISLAND PROJECT

CONSOLIDATED REXSPAR MINERALS AND CHEMICALS LIMITED

PROSPECTUS

Honourable J. Chabot	-	Minister, Ministry of Mines and Petroleum Resources
Honourable D. Phillips	-	Minister, Ministry of Economic Development
J.W. Peck	-	Chief Inspector of Mines, Department of Mines
P.E. Olson	-	Senior Inspector-Roads, Mineral Development Committee
A. Sutherland Brown	-	Chief Geologist, Department of Mines
R. Rutherford	-	Deputy Chief Gold Commissioner, Department of Mines
J. Poyen	-	Director, Mineral Development Div., Department of Mines
S. Elias	-	Senior Environmental Inspector, Department of Mines
B. Smith	-	Inspector of Mines and Resident Engineer (Kamloops), Department of Mines
W. Dudas	-	Inspector of Mines and Resident Engineer (Kamloops), Department of Mines
J. O'Riordan	-	Assistant Director, ELUC Secretariat
J. Brodie	-	Pollution Control Board
J. Rae	-	Associate Deputy Minister, Ministry of Economic Development
G. Harkness	-	Ministry of Municipal Affairs
A. Schori	-	Head, Soils Branch, Ministry of Agriculture
T.A.J. Leach	-	Water Resources Service, Ministry of Environment
D. Zirul	-	Special Projects Section, Lands Service Ministry of Environment
B. Pendergast	-	Fish and Wildlife Branch, Ministry of Recreation and Travel Industry

E. Smith	-	Grazing Division, Ministry of Forests
G. Runka	-	B.C. Land Commission
E.E. Readshaw	-	Ministry of Highways
L. Bell	-	Ministry of Housing
G. Merner	-	Ministry of Human Resources
J. Schuyff	-	Ministry of Labour
J. Ryder	-	Chairman, Thompson-Okanagan Resource Management Committee (Ministry of Agriculture - Kamloops)
R.M. Duncan	-	Chief- Mine, Chemical & Waste Licensing Division (A.E.C.B., Ottawa)
H. Viridi	-	Director of Planning Thompson-Nicola Regional District 2079 Falcon Road Kamloops, B. C. V2C 4A2

APPENDIX 2.4.4.

URANIUM MINING STEERING COMMITTEE

PUBLIC MEETING: CLEARWATER, B.C.

BIRCH ISLAND PROJECT: CONSOLIDATED REXSPAR MINERALS AND CHEMICALS LTD.

The Steering Committee would like to make the following statement at the beginning of this Public Meeting. After a review of the Stage I Report and the review by government agencies, the Committee decided that it was necessary for the project to be outlined to the citizens in Clearwater and surrounding area, and their concerns on the technical aspects of the project would be taken into account. The Committee requested the Company to hold a public meeting in Clearwater to explain their project and answer questions relating to the project. The concerns of the residents in the area would be taken into account by the Committee and would request the company to cover this aspect in the Stage II Report.

Role & Planning Process

The Committee's main function is to co-ordinate government agency reviews of environmental impact assessments and to ensure that all standards and specifications set out in various Federal and Provincial statutes are met before a decision to develop the mine is taken.

The Committee is composed of representatives from Federal and Provincial Governments agencies with a direct involvement in the environmental, regulating and technical aspects of

the development.

A. B. Dory, P.Eng., Atomic Energy Control Board.

J. D. McDonald, P. Eng., Ministry of Mines and Petroleum Resources, Senior Engineer and Inspector, Reclamation, Stability pits dams, Environmental impact assessments, co-chairman Coal Guideline Steering Committee.

Dr. J. O'Riordan, Environment Land Use Committee, Secretariat, Assistant Director, Special Projects, chairman, Coal Guidelines Steering Committee.

The Secretariat reports to the ELUC, a 9-member Cabinet Committee which administers the Environment and Land Use Act. This Act requires that all aspects of environment and land use are considered before any decision on major resource development is undertaken. The Secretariat is therefore responsible for ensuring that impacts on land use, fisheries, wildlife, recreation, forests, communities and heritage resources are identified and evaluated.

Process

The Steering Committee has requested the Company, Consolidated Rexspar Minerals and Cehmicals Ltd., to follow a four-stage planning process, similar to the established process of *Guidelines for Coal Development*. This process is applied to all major coal developments in the province. Uranium mining being new to the province, that established process used for coal would be followed for uranium mining.

1. Prospectus. A short document describing the location and design of the mine and related facilities. This was

prepared in 1976 and most of the information is contained in the Information Brochure prepared by the Company in November 1976.

2. Stage I Report: Preliminary Environmental Analysis

This report was completed in April, 1977 and outlines in more detail the minesite, development proposal and the preparation plant together with information on control of liquid and solid wastes. The main intent of the Stage I Report is to identify impacts on the natural and social environment and to discuss alternative approaches to reducing and managing these impacts, e.g., locations of waste materials, general design of tailings pond. In addition, the developer is expected to establish a monitoring program to determine the base-line quality of the waters and atmosphere surrounding the mine. It is not the purpose of the Stage I report to detail the pollution control facilities and other measures required to reduce environmental impacts as the final engineering and feasibility is not complete at this stage. This is the primary function of the Stage II report.

This report has been reviewed by the various government regulatory agencies with an interest in the project, the technical concerns expressed at today's meeting will be part of the review process. The comments and advice of all the agencies and public concerns will be reviewed by the Steering Committee, and as a result, a set of specific directives will be issued to the developer to ensure that the Stage II report

adequately covers those concerns. The Steering Committee has already met with the Company to discuss the comments received from the government agencies and these will be incorporated in the Stage II Report. The meeting with company was held on August 16th, 1977. A summary of comments reviewed at the meeting can be obtained by representatives of interested groups, from the Steering Committee.

Stage III

If the project is given "approval-in-principle" then the developer must prepare final detailed plans for the approval of specific license and permits.

Provincial Government

- (1) Pollution Control Act: Permits for discharge of air emissions and effluents.
- (2) Water Act and Regulations: Licenses for use of water.
- (3) Mines Regulation Act:

Section 10: Approval of the mining plan by the chief inspector of mines. This includes tailings dam stability, dumps and pit.

Section 11: Reclamation Permit Authorizing Surface ^{Work} ~~Work~~:
The Act governs the health and safety of the workman, in safety regulations, dust and gas exposures, radiation exposures.

- (4) B.C. Land Commissioners Act: Authority to remove land from the Agriculture Land Reserve.

- (5) Forestry Act: Timber Removal.
- (6) Land Act: Issuance of land leases on crown land and issues for right-of-way development.

Federal Government Permits & Approvals

The Atomic Energy Control Board has jurisdiction over all operations where there is radioactivity. In Uranium mining, the AECB has a review process for issuing permits. The Steering Committee will co-ordinate the Federal and Provincial review process to avoid duplication.

1. AECB -- permits

- Exploration
- Construction and Development
- Operational
- Post operational

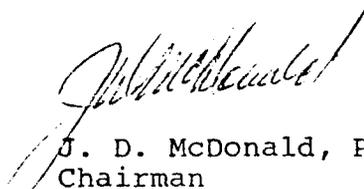
2. Environment Canada

- Approval of project by fisheries.

Stage IV: Project Implementation

Various Provincial Government agencies have specific and continuing responsibilities during development of the project into a producing mine and will continue to monitor specific aspects of the project. The developer is responsible for conforming with government regulations in such key areas as air and water quality and surface reclamation. The same applies to offsite facilities. Most intensive monitoring can be anticipated through the development phase, during which accepted guidelines to mitigate construction impacts are

enforced. Once operational, normal regulatory functions related to adequacy, safety, etc., are implemented.



J. D. McDonald, P.Eng.
Chairman
Uranium Mining Steering Committee

**APPENDIX 2.4.5. ENVIRONMENTAL PRE-OPERATIONAL BASELINE SURVEY,
BLIZZARD URANIUM PROPERTY, PREPARED BY ENVIROCAN LTD.**

NORCEN ENERGY RESOURCES LIMITED
BLIZZARD URANIUM PROPERTY

ENVIRONMENTAL PRE-OPERATIONAL BASELINE
SURVEY

Prepared by:

ENVIROCON LTD.
#1400 - 777 Hornby St.
Vancouver, B.C.
V6Z 1S4

Tel: 687-7588

August 29, 1978

BLIZZARD URANIUM PROPERTY
 ENVIRONMENTAL PREOPERATIONAL BASELINE
 SURVEY

Aug. 29, 1978

<u>Parameter</u>	<u>Location</u>	<u>Frequency</u>	<u>Analysis/Measurement</u>
Water Quality			
Surface Water	Site/Regional	Monthly (1)	AECB Guide #31 - attached (4)
Ground Water	Test Wells	Monthly (9)	
Hydrology			
Surface Water	Site/Regional	Monthly (11)	Flow Regime (11)
Ground Water	Site	July/Aug/Sept. (11)	Hydrology (11)
Radiological			
Vegetation	5-10 km off site	Spring/Fall (2)	Th-230, Ra-226, Pb-210 (9)
Soils	1-3 km off site	Yearly (9)	U-238, Th-230 (1) (9) Ra-226 pB-210
Sediments	Lassie and Joan Lake/ Trapping Creek	Yearly (11)	U-238, Th-230 (8) (5) Ra-226, Pb-210
Aquatic Biota	Lassie & Joan Lake Sandrift Lakes I & II, Clark Lake	Spring/Fall (2)	U-238, Th-230 Ra-226, Pb-210 (2) Po-210
Tissue (Bird/Mammals)	Vicinity of Site	Spring/Fall (2)	U-238, Th-230 Ra-226, Pb-210 (2)
Bone (Bird/Mammals)	Vicinity of Site	Spring/Fall (2)	U-238, Th-230 (2) (12) Ra-226, Pb-210
Milk	Range Cattle	Yearly (11)	U-238, Th-230 (11) Ra-226, Pb-210
Precipitation	Dustfall Sites	Quarterly (11)	U-238, Th-230 (11) Ra-226, Po-210 Pb-210

<u>Parameter</u>	<u>Location</u>	<u>Frequency</u>	<u>Analysis/Measurement</u>
In addition, the above radiological parameters should be analyzed for:			
a)	gamma spectrum - ref. 11		
b)	gross gamma		
c)	gross beta - ref. 2		
d)	gross alpha - ref. 2		
e)	K-40 - ref. 2		
Radon Gas	Vicinity of Workers/ Environs	Quarterly (5)	Ra-222, Gross Alpha (7)
Gamma Radiation	Site/Workers	Quarterly (11)	Gross gamma (11) - TLD's
Particulates	5-10 km surrounding site	Quarterly/ Composite (11)	U-238/gamma spect. (11)
	Site/Hi-Vol.	Quarterly/24 hrs (11)	U-238/gamma spect. (11)
	Dustfall Sites	Quarterly/ Composite (5)	U-238, Th-230 (5) Ra-226, Pb-210 plus radiological measurements.
Meteorology Minisonde	Site	Seasonal	Temp., Wind speed, Wind direction with height above ground.
Weather Station	Site	Continuous - hourly averaged	WS/direction/humidity/temp./ solar rad.
Evaporation	Site	Daily: Apr.-Oct.	

<u>Parameter</u>	<u>Location</u>	<u>Frequency</u>	<u>Analysis/Measurement</u>
Biological Study Fishery/Limnological	Regional	Seasonal (11)	Species/Habitat Utilization (11)
Wildlife	Regional	Seasonal (11)	Species/Habitat Utilization (11)
Vegetation/Soils	Site/Regional	Aug/Sept. (11)	Species/Soil Profiles (11) Chemical Analysis

Guide to the licencing of Uranium and Thorium Mine-Mill Facilities:

A.E.C.B. - Licencing guide No. 31
P.19 A.4.4. Hydrology

January 6, 1976

- (3) The local ground and surface water quality should be analyzed for the following constituents:

pH	acidity as CaCO ₃
total solids	alkalinity as CaCO ₃
suspended solids	phosphorous as P
dissolved solids	chlorides as Cl
sulphates as SO ₄	gross alpha
uranium as U	gross beta
thorium-227,228,230,232	iron as Fe
radium-226	manganese as Mn
total kjeldahl nitrogen (expressed as N)	sodium as Na
nitrates (expressed as N)	potassium as K
nitrites " "	calcium as Ca
ammonia " "	magnesium as Mg

REFERENCES

1. Pre-Operational Radiological Monitoring Program
Tallahasse Creek Mill
2. Sherwood Uranium Project
Final Environmental Statement
United States Department of the Interior
3. Guide to the Licensing of Uranium and Thorium
Mine-Mill Facilities
Atomic Energy Control Board Draft Licencing guide
Licencing Guide No. 31.
4. Operational Radiological Environmental Monitoring
Program for Uranium Mills.
United States Nuclear Regulatory Commission
5. Procedure for Pre-Operational Environmental
Monitoring
R.A. Facey, C.H.P.S. 8 March, 1978

6. Summary of Environmental Assessment and Safety Report for Amok Ltd. Uranium Project.
Cluff Lake, Saskatchewan. October, 1976
Environmental Sciences Division, Stearns Roger Incorporated.
7. Preparation of Environmental Reports for Uranium Mills (April, 1973)
USAEC Regulatory Guide 3.8
8. Final Environmental Statement related to Operation of the Highland Uranium Mill March, 1973.
Exxon Company, U.S.A.
9. Guidelines for the Preparation of a Detailed Environmental Impact Assessment for a Uranium Mine-Mill Project
 - governing uranium mine and mill development in Saskatchewan
10. Blizzard Uranium Property Environmental Pre-Operational Baseline Survey
 - Envirocon
11. The Effects of Uranium Mill Wastes on Stream Biota
 - Utah Agricultural Experiment Station
 - Utah State University

APPENDIX 2.4.6. NOTES RE TYEE URANIUM DEPOSIT

DRAFT - Notes by Geoffrey G. Hunkin, P. Eng.

April 25th, 1978

Project Description

During the 1978 field season, carry out a program of hydrologic testing at the TYEE uranium deposit, followed by a metallurgical leach response test in situ.

Objectives to Determine

- a) Physical characteristic of the orebody and its host formation.
 1. Permeability and response to leaching solutions
 2. Directional permeability
 3. Local hydraulic gradient and drift velocity
 4. Storage co-efficient
 5. Local permeability (transmissivity) variation
 6. Hydraulic isolation of the mineralized formation
- b) Baseline water quality characteristics
- c) Chemical response of the ore, surrounding formation, to leach fluids and the effectiveness as a mining method. Leaching rate and overall recovery will be estimated.
- d) Restoration characteristics of the formation, determining the rate of return to near baseline chemistry.
- e) Access cost and technical feasibility of in situ leaching uranium recovery.

Procedures

A test well, and three observation wells will be constructed so as to be sealed off from all except the mineralized zone. An existing exploration bore hole will be used as a fourth hydrology test observation site. Two or more test wells, without accompanying observation wells, will be constructed at the selected locations which intercept the orebody.

All wells will be cored across the mineralized interval, cased and cemented and fitted with wedge bar well screen, or slotted casing in the monitor wells.

Time Schedule (Assumes Licensing concurrent with file work)

	<u>Weeks</u>	<u>Elapsed Time</u>	
Drilling wells & site preparation (first 4 holes, balance concurrent)	2	2	2
Baseline water quality, assay time	2		
Hydrologic Testing	1	1	3
Report preparation	3	3	6
Core analysis and mineralogy	3	-	6
Order push-pull equipment	-	-	6
Stage 1 report	1	1	7
Government approval of push-pull		?	
Equipment Assembly	2	2	9
Push Pull 1	1	1	10
2	1½	1½	
3	1½	1½	13
Analytical Work	3	3	16
Yellow Cake _____ and ppt.	2	-	16
TOTAL FIELD SEASON	-	-	16 weeks
Final Report	4	4	20

PRELIMINARY 1978 PROGRAM ANALYSIS

FOR

PLACER DEVELOPMENT LTD.

TYEE - KELOWNA URANIUM DEPOSIT

Project Description

During the 1978 field season, carry out a program of hydrologic testing at the Tyee uranium deposit, followed by a metallurgical leach response test in situ.

Objectives are to determine:

- a. Physical characteristics of the orebody and its host formation.
 1. Permeability and response to leaching solutions.
 2. Directional permeability.
 3. Local hydraulic gradient, and groundwater drift velocity.
 4. Storage coefficient.
 5. Vertical and horizontal permeability.
 6. Hydraulic isolation of the mineralized formations.
 7. Local permeability variations - faults, barriers, channels.
- b. Baseline water quality characteristics.
- c. Chemical response of the ore, and the surrounding formation to leach fluids and the effectiveness of in situ leaching as a mining method. Leaching rate and overall

recovery will be estimated. Specimen response graphs are appended.

- d. Restoration characteristics of the formation, determining the rate of return of groundwater to near-baseline chemistry.
- e. Assess cost and technical feasibility of in situ leach uranium recovery.
- f. Test product for commercial saleability. (Example appended.)

Procedures

A test well and three observation wells will be constructed so as to be sealed off from all except the mineralized zone. An existing exploration bore hole will be used as a fourth hydrology test observation site. Two or more test wells, without accompanying observation wells, will be constructed at other selected locations so as to intercept the orebody. All wells will be cored across the mineralized interval, cased and cemented and fitted with wedge bar well screen, or slotted casing in the monitor wells.

Time Schedule

(Assumes licensing concurrent with field work.)

	<u>Weeks</u>	<u>Elapsed Time</u>	<u>Total</u>
Drilling wells and site preparation (first 4 holes, balance concurrent) Order submersible pump	2	2	2
Baseline water quality, assay return time	2	-	-
Hydrologic testing	1	1	3
Hydrologic Report preparation	3	3	6
Core analysis and mineralogy	3	-	6
Order balance of push-pull test equipment and supplies	-	-	6
Stage 1 report	1	1	7
Government approval of push-pull	?	?	
Equipment assembly	2	2	9
Push-pull 1	1	1	10
2	1½	1½	11½
3	1½	1½	13
Analytical work	3	3	16
TOTAL FIELD SEASON	-	-	16 weeks
Yellowcake elution and ppt	2	-	16
Final report	4	4	20

Cost Estimates

	<u>PER WELL</u>	<u>TOTAL</u>
1. Well Construction - six wells		
Drill, run casing, cement	6,000	36,000
materials: casing & cement 400		
fittings 100		
screen 500		
mud 50	1,050	6,300
Well development, rig time	350	2,100
Submersible pump, cable		
starter (3 wells)(may rent)	500	1,500
Delivery pipe (3 wells)}		200
Misc. fittings(3 wells)}	100	100
		<hr/> 46,200
2. Hydrology tests complete 1 major, 2 minor sites including all equip- ment and instrumentation, full report	6,000	18,000
3. Surface equipment (one set for all tests)		
tank and erection 500		
site moves 300		
Filters 60		
Aux. pump (rent) 50		
instrumentation 125		
Generator, 5 KW N.C.		
Misc. pipe fittings 75		
Chemical pump N.C.		
		<hr/> 1,100
4. Consumable supplies		
Ammonium Bicarbonate 75		
Hydrogen peroxide N.C.		
Ammonium Hydroxide 30		
Gasoline 25		
Misc. tools, etc. 60		
Sample containers 50		
Filter media 50	260	780
5. I.X. equipment and uranium precipita- tion (internal Placer Lab)		
I.X. tank and fittings 300		
I.X. Resin (transport) 200		
Elution and ppt (Placer Labs) 6000		<hr/> 6,500

	<u>PER WELL</u>	<u>TOTAL</u>
6. Misc. site operations		
Site preparation		2,000
Trailer rental		750
Sample shipments		500
Vehicle rentals		2,500
Site labor, 4 mos. 1 man 1 shift		12,000
Well probing truck		1,500
Equipment rentals (unidentified)		3,500
		<u>22,750</u>
7. Analytical (mainly internal Placer Labs)		
Site analysis equip-		
ment purchase	1000	
Water quality	5000 (Ra226 outside)	
Process	3000	
Core, mineralogy	2000 (Air perm. outside)	
		<u>11,000</u>
8. Restoration program		
Periodic well pumping		
10 sampling visits x well		
pumping		
Assume 10 x \$250.		
		<u>2,500</u>
9. License acquisition		
(Technical staff time)		?
10. Hunkin Engineers, Inc. fees **		
Site operations direction		
Test specifications		
Report and preliminary feasibility		
Cash flow estimate		
		<u>10,000</u>
	TOTAL	<u>118,830</u>
	<u>Say (3 tests)</u>	<u>120,000</u>
	Minimum (1 test)	<u>90,000</u>

** As standard tariff. Depends on quantity of site supervision.
This figure probably the minimum.

File D-6.6A

DRILLING, CASING, CEMENTING AND CORING
SPECIFICATIONS
FOR SHALLOW DEPTH (200-400 ft:60-105m)
IN SITU URANIUM TEST WORK

1. General Philosophy

Testing for permeability and chemical leaching response comprise the first stage in development of a solution mining venture. Thus, three primary objectives are identified:

- a. Data must be accurate and reliable. An incorrect decision at this stage will lead to either unwarranted expense or possible abandonment of a viable property.
- b. Data developed should be sufficiently comprehensive to enable economic analyses and ore reserves to be developed.
- c. Cost should be minimised, provided (a) and (b) are not compromised.

Achievement of these objectives require precision and careful attention to detail. Well drilling quality is vital to the operation.

2. Field work and drilling requirements for both permeability and leach testing are the same.

A sufficient number of sites are to be selected which will provide a reliable sampling of the mineralized zone, throughout the lease area, both as to permeability and leach response. At each site, we require:

- a. Central drill hole, cased and cemented, cored across mineral interval and set with suitable gauge wedge-bar well screen across the zone of potential economic production.

This hole must be fitted with oxidation resistant casing, of suitable collapse strength to withstand cementing pressures and hydrostatic head at maximum predicted pump drawdown. Casing ID must allow insertion of a submergible pump capable of 15 to 40 gallons per minute (55 to 180 liters per minute), selected according to permeability predictions.

- b. Three monitor wells deployed 120° and 75 to 150 feet (23 to 45 meters) from the central well. Distance is selected by calculation using estimated permeability: the higher values may be adviseable when drift control is poor.

These wells must be open to the zone of mineralization but sealed from all other formations. At the shallower depths, monitor well expense can be reduced by using 2 inch (50mm) PVC casing and substituting slotted pipe for the well screen at the mineral interval.

In practice, it is generally recommended that monitor well construction be the same as for the test well.

- c. Drift control of wells is important, and all holes must be drift surveyed on completion.

3. Drilling Equipment

Excess drilling depth capacity should be avoided, for reasons of general economy. Rig must have capacity to handle two drill collars at the maximum depth called for in the drilling program.

Straight holes are achieved in the typical shale-sandstone sequence of uranium orebodies by providing solid footings for the rig, precise verticality of mast, ensuring that Kelly and drill pipe are straight and true, and pins and boxes in good shape. Rig is to be operated at high mud circulation rates, with, generally, two heavy collars, permitting the collars to provide all the required bit weight, with no rig pull-down.

Holes may be drilled to full gauge in one pass, or piloted at 4 5/8 inch and reamed to the diameter required by the casing. Each method is equally satisfactory.

Core drilling requires an independent, smaller size mud pump. Rig pumps can seldom be run at sufficiently low flow rates for good core recovery in unconsolidated sand formations. Drill contractor must supply the following additional equipment over and above the normal exploration or seismic drilling equipment:

1. Steel mud pit of 200-250 gallon capacity.
2. Drill collars 4 inch x 15 feet or similar.
3. Mud mixing gun - preferrably Johnson U.O.P. Revert type.
4. Revert type mud, muriatic acid, Baroid mud funnel.
5. Christensen type 10 ft. core barrels, triple tube with split inner tube or with independent chromed inner core barrel. Replacement bearings, adjusting shims, tools, subs, grease gun.
6. Face discharge diamond bit, set 8 to 12 p/c stones.
7. Hose and fittings for hydraulic core removal.
8. Extra inner tube assembly complete.
9. Elevators and slips for 6 inch PVC integral coupling pipe and 6 inch yellowmine pipe.
10. Independent mud pump for coring operations, with pressure gauges and flow central valves, hoses for connections to Kelly, assorted subs and pipe fittings.
11. Mud pressure gauges sensitive to 20 psi.
12. Tools and subs for lowering well screen.
13. Water jet well cleanup tool, two or four nozzle, extension pipe and subs for operating.

WELL COMPLETION REQUIREMENTS

Reliable test data is generated when test conditions are correct. At the well drilling and completion stage, objectives are:

1. Efficiently cemented casing, landed within five feet of the top of the ore.
2. High-recovery core drilling across the ore interval extending not more than five feet into the ore footwall.
3. Use of high viscosity zero-solids mud (polymer type) during coring stage in order to:
 - a. eliminate contamination of core by filtrate.
 - b. avoid gel cake buildup on walls of hole.
4. Obtain near-100% well efficiency by the use of wedge-bar screen completion followed by high velocity water jet and airlift cleanup. A more detailed completion procedure will be provided at the site.

SETTING CASING AND CEMENTING

The casing will be set with suitable light-duty centralizers and fitted with a cementing shoe. Cement will be minimum-weight with bentonite additive. A single drillable wiper plug will be used, with shut-in valves at collar.

It is probable that the rig mud pump will be used for cement mixing and placement, as it is difficult to bring in contract well cementers for this small job. This is a matter for discussion.

SELECTION OF CASING AND HOLE DIAMETER

In this instance, casing I.D. and subsequently hole I.D. is predicated by core bit O.D., which must pass safely inside the casing.

Three inch core (presumably PQ size) has a set bit O.D. of 4.835 inches thus 6 inch PVC casing is adviseable. This calls for 7 7/8 inch hole diameter and light duty centralizers.

METHOD OF CEMENTING

This program calls for standard oil field plug cementing practice with cement returns to surface. No other method is acceptable.

The alternative method of single stage drilling and cementing using a plaster of paris plug and cement baskets is completely unsatisfactory for the following reasons:

- a. Completions are unreliable due to frequent cement leakage past the basket and consequent screen blinding.
- b. High cement pumping pressures called for result in frequent casing failures, and formation fracturing by the escaping cement.
- c. Inability to restrict fluid access to the mineralized zone, as cement baskets must be landed above the sandstone formation, often leaving many feet of open completion above the ore zone.
- d. Caving of sandstone formation in the upper part of the screened interval and shale blinding in the lower section caused during well development operations due to the long section of unsupported formation below the cement basket.
- e. Severe blinding of the screen by shale and mud in the course of running the screen through the open hole. Treatment by mud acid to clean up is chemically undesirable.

This plug and cement basket method is sometimes selected because of lower predicted drill costs, but the failure rate is such that the whole test program may be compromised. If, for instance, the best obtainable well efficiency is limited by 50% screen blinding, or if fluid access to the mineralized zone is partially blocked by caving outside the screen, these influences may be undetectable but test results may seriously underestimate production potential.

SHORT SPECIFICATION LIST FOR DRILLERS

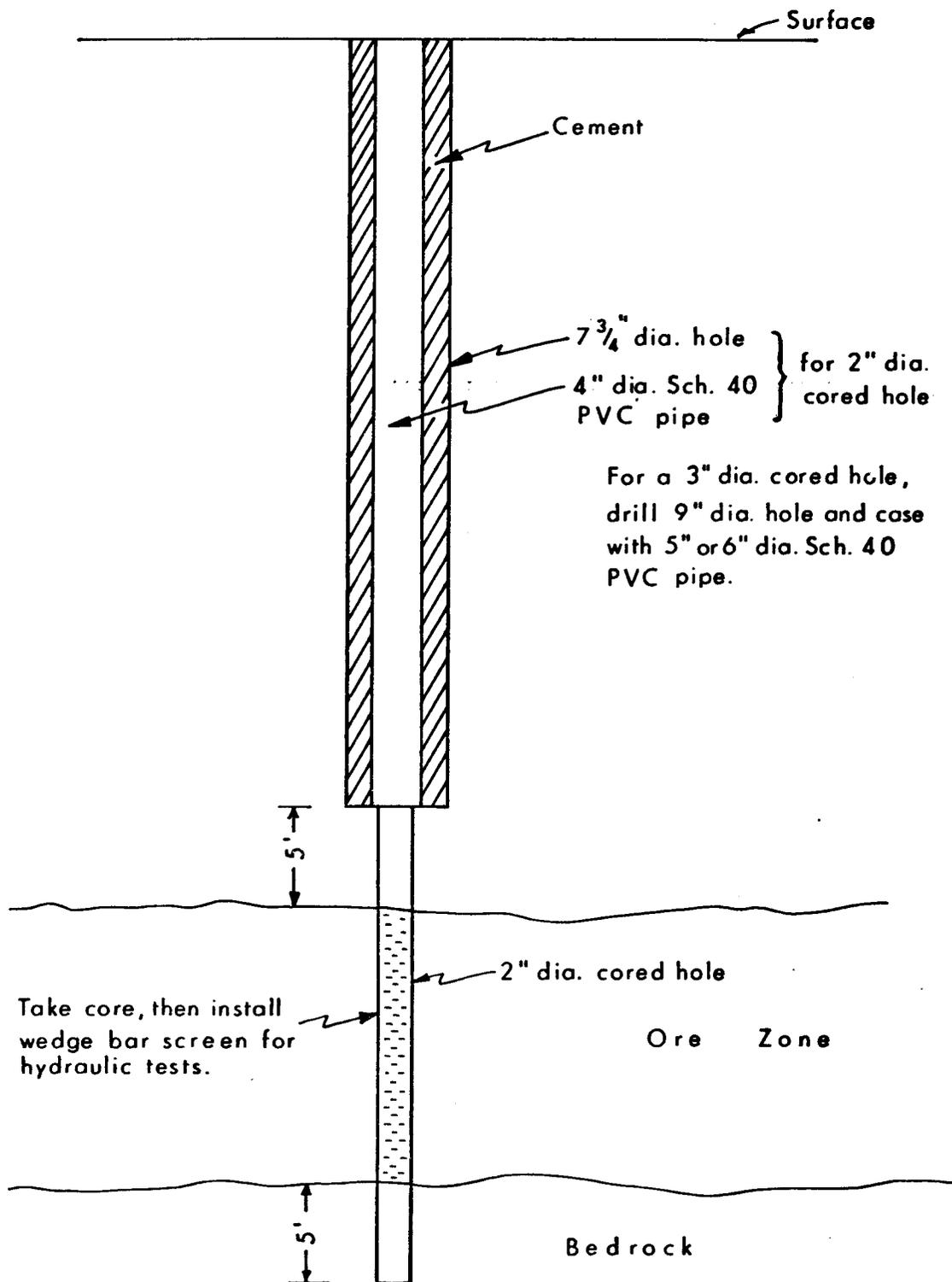
Achievement of the objectives of the well program will be the primary objective of the drillers.

Drilling depth	200 feet
Maximum drift	8 feet
Hole diameter, completed, upper section	7 7/8 inches
Hole diameter, cored section	4.835 inches
Mud pit capacity (steel pit)	approx. 250 gallons
Mud pump capacity, plug drilling	5 x 10 size
Mud pump capacity, auxilliary for core drilling	20/60 gpm
Rotary table to handle 6 inch PVC casing. Retractable table is an advantage.	

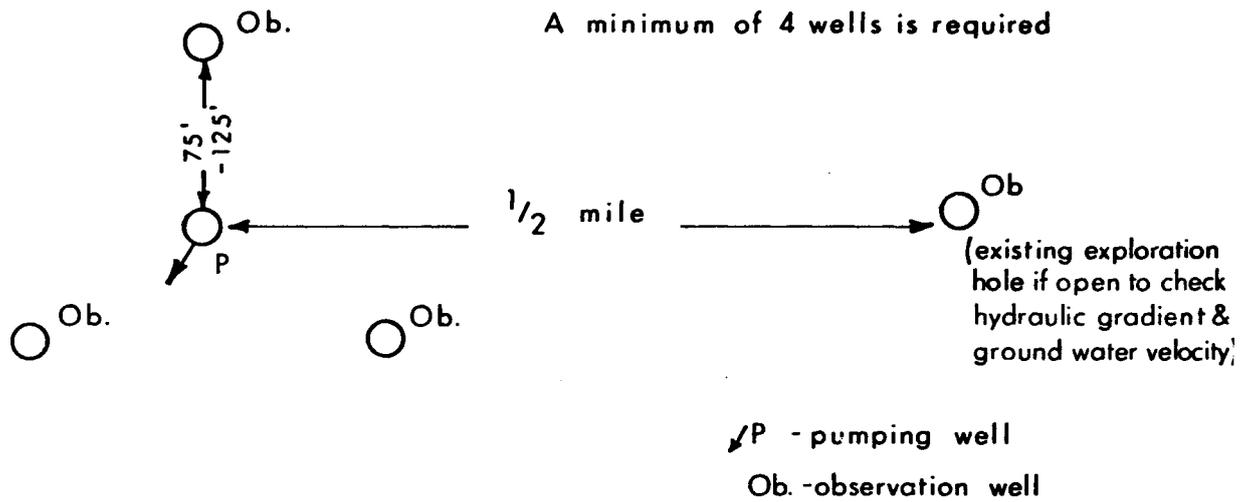
Driller is expected to perform cementing of casing and well completion work.

Starting date	_____
Number of wells - test	_____
- monitor	_____
Drilling water source,	
distance	_____ miles
Logging services	<u>by owner</u>
Extra equipment	<u>see list in text</u>

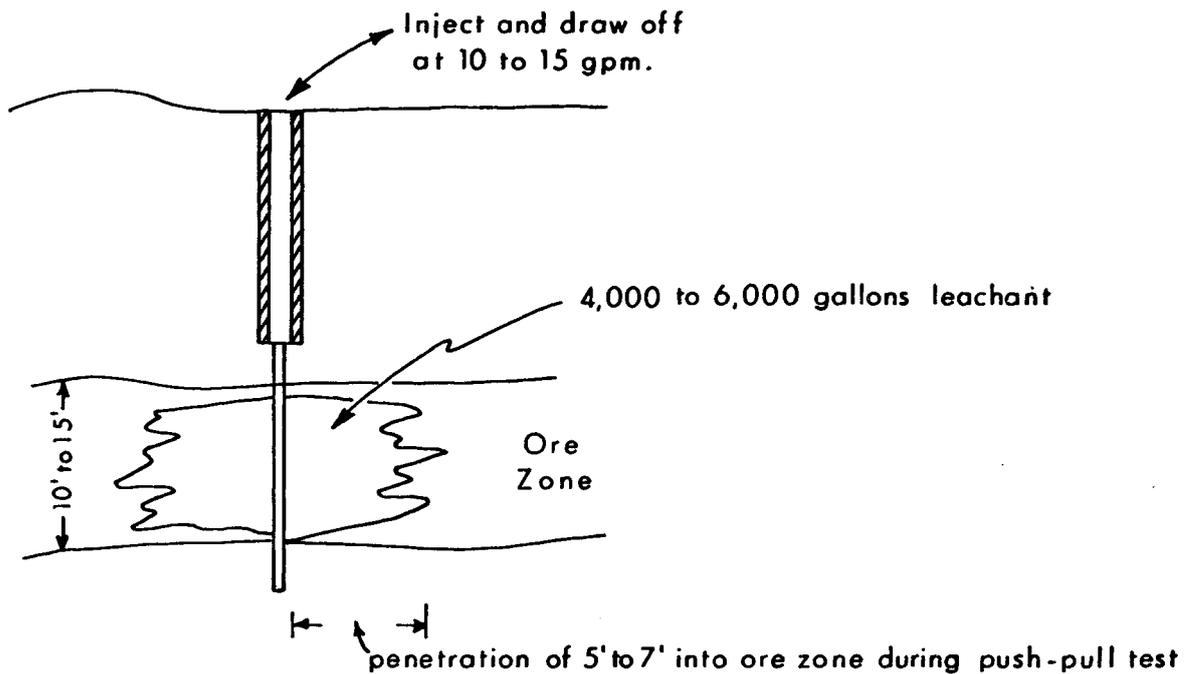
Test Hole Specifications for In-Situ Leaching of Uranium



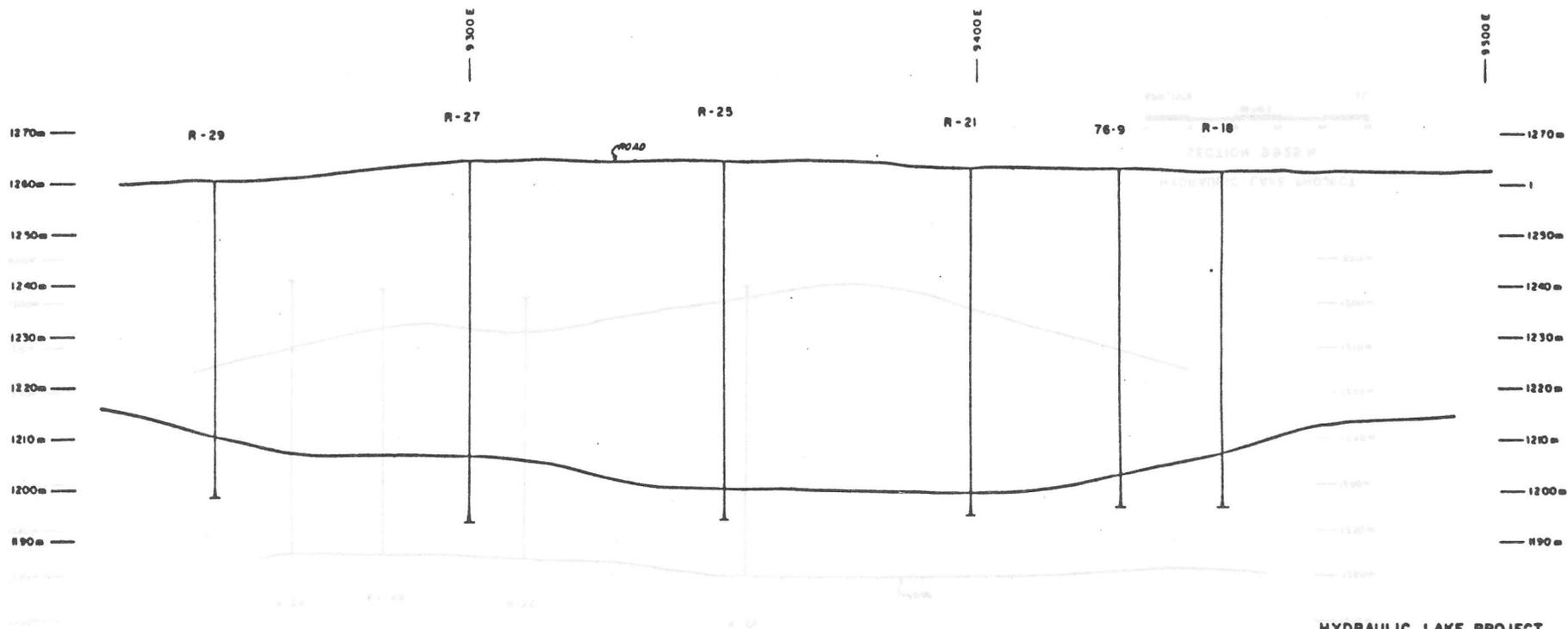
Well array for hydraulic tests



Leaching Test

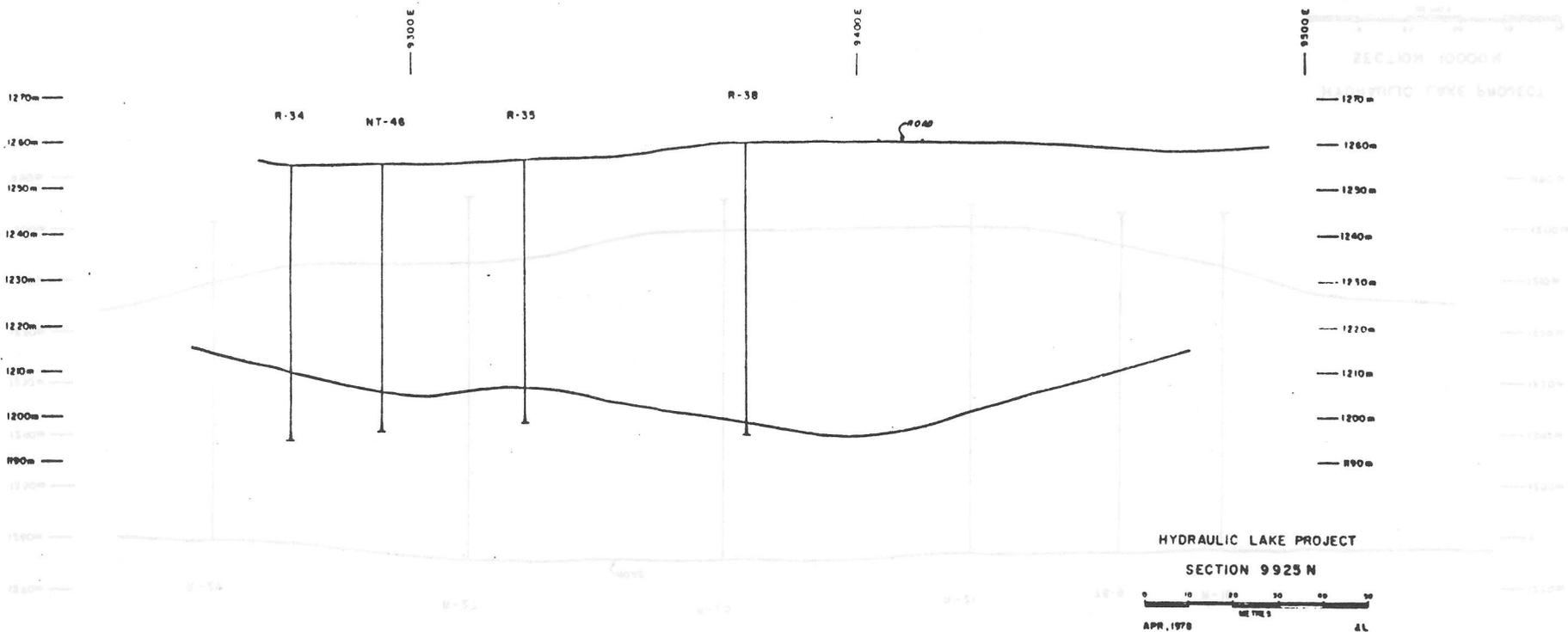


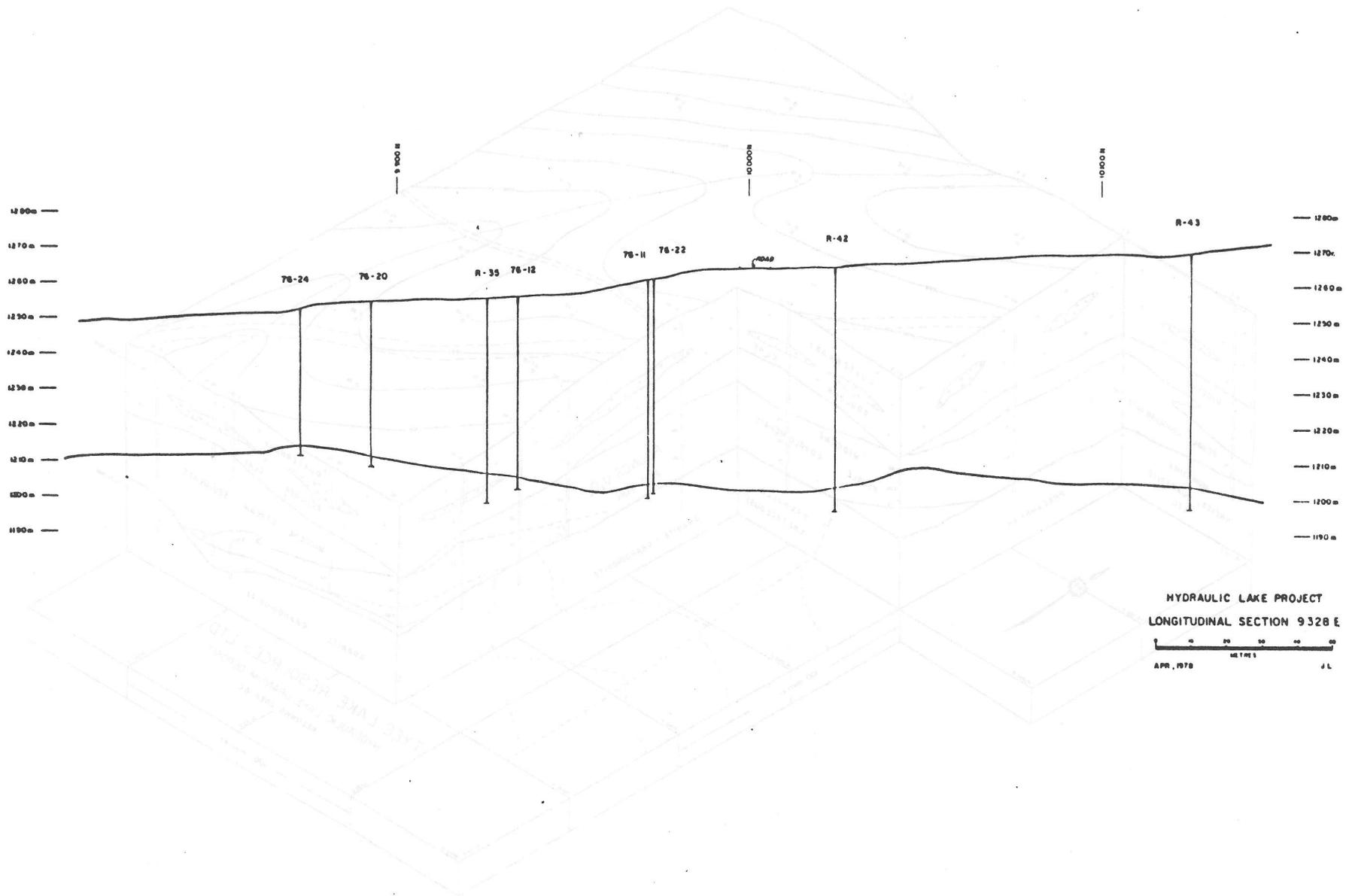
Using these approximate dimensions, this method should sample leach 75 to 125 tons of material. A minimum of 3 wells should be leach tested.



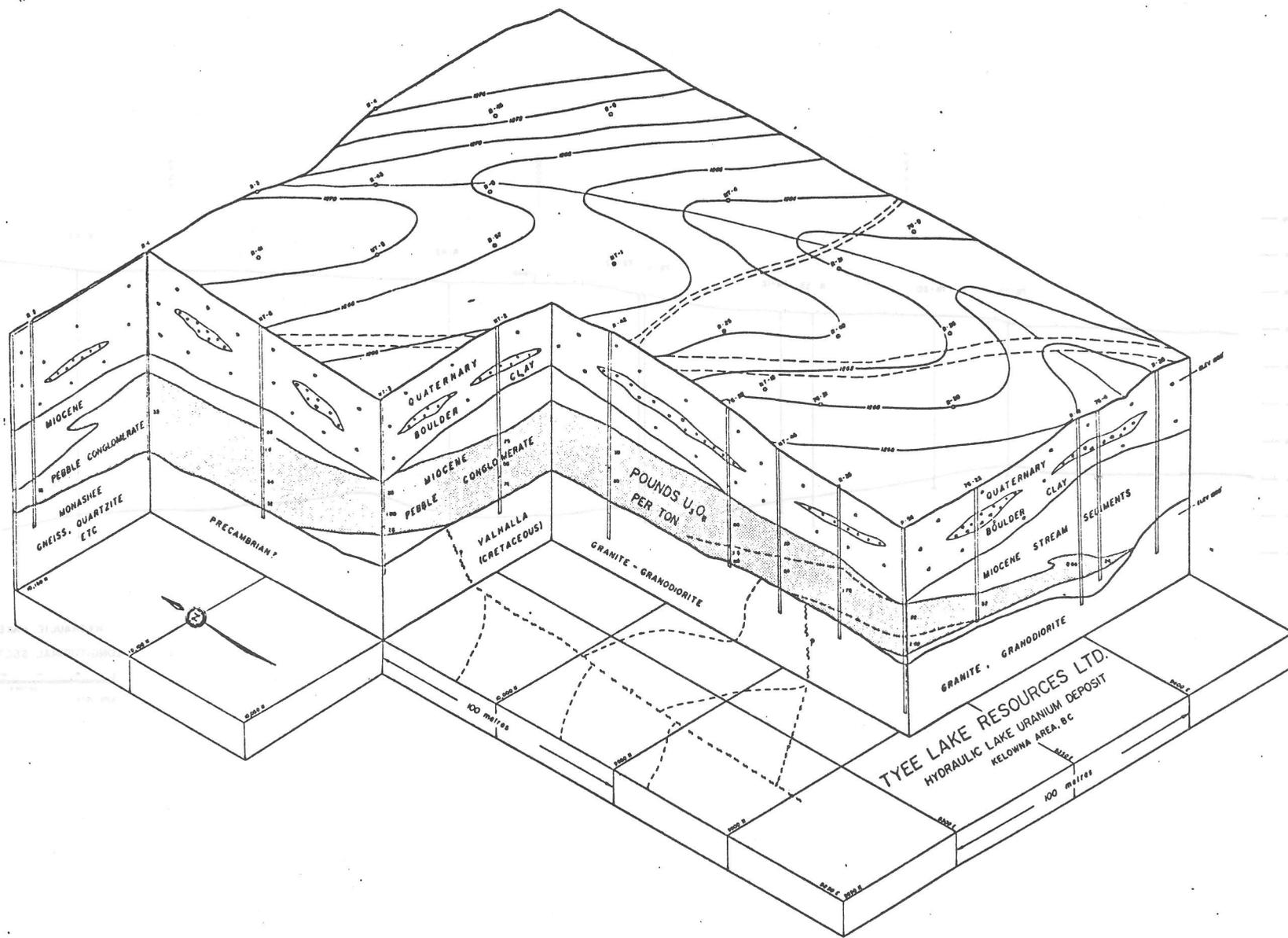
HYDRAULIC LAKE PROJECT
SECTION 10000

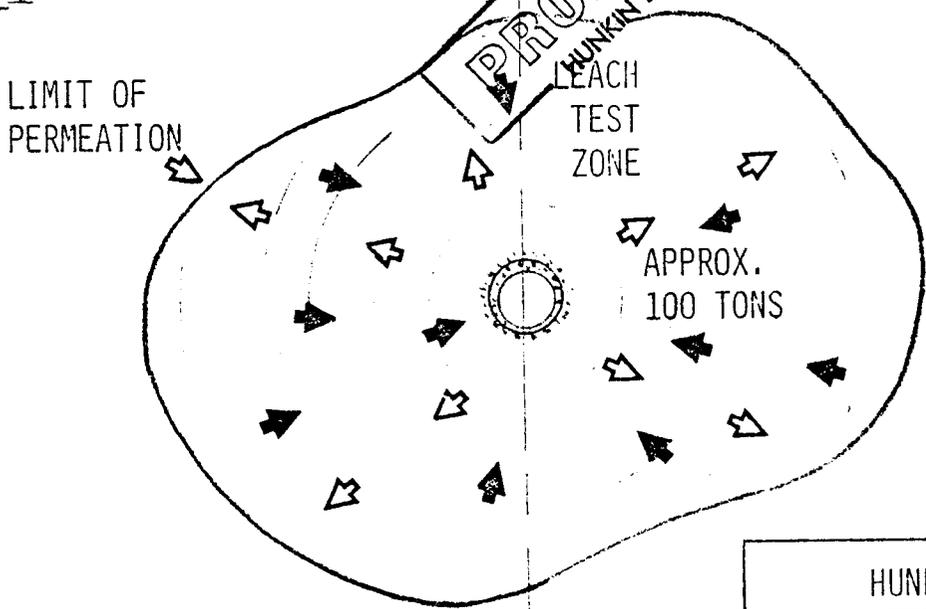
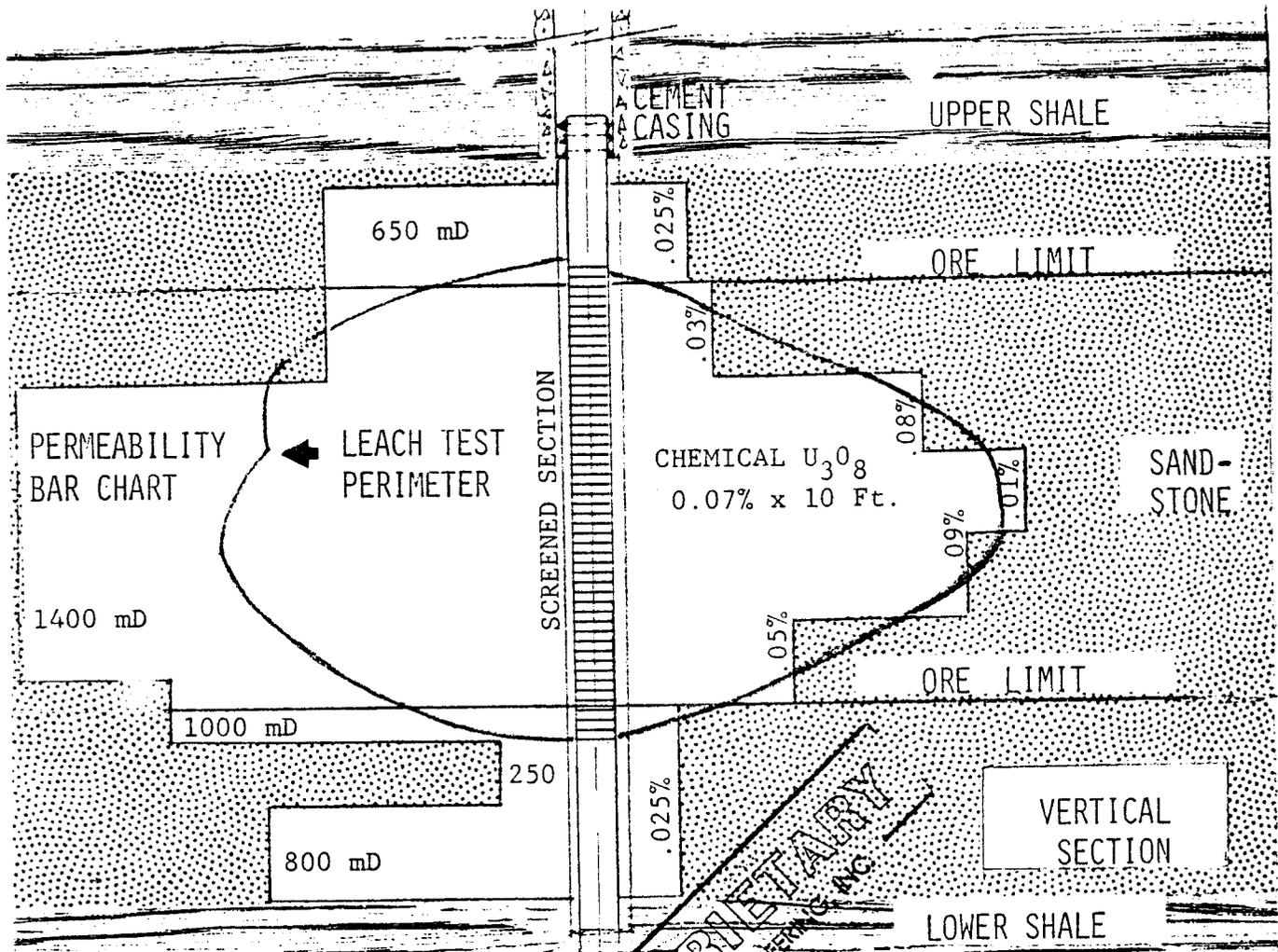
0 10 20 30 40 50
METRES
APR, 1978 J.L.





HYDRAULIC LAKE PROJECT
 LONGITUDINAL SECTION 9328 E
 0 20 40 60 80 100
 METERS
 APR, 1978 J.L.





PLAN VIEW

HUNKIN ENGINEERS, INC.		
URANIUM IN-SITU LEACH PRODUCTION TEST		
1/4" = 1 Ft.	1976	REVISED 1978 FT.

EQUIPMENT

INJECTION MODE

5000 gal (aprox.) Plastic Lined Storage Tank	Sample Point	Pump 15 GPM	Flow Meter	Filter Range (5 Micron)	Flow Control Valve	Chemical Metering Pump	Air Release Cock	Sample Point
--	-----------------	----------------	---------------	-------------------------------	-----------------------	------------------------------	------------------------	-----------------

REAGENTS

5000 gal
Formation Water
2.5 gm/liter
 $NH_4(CO_3)_2$

.75 gm/liter
 H_2O_2

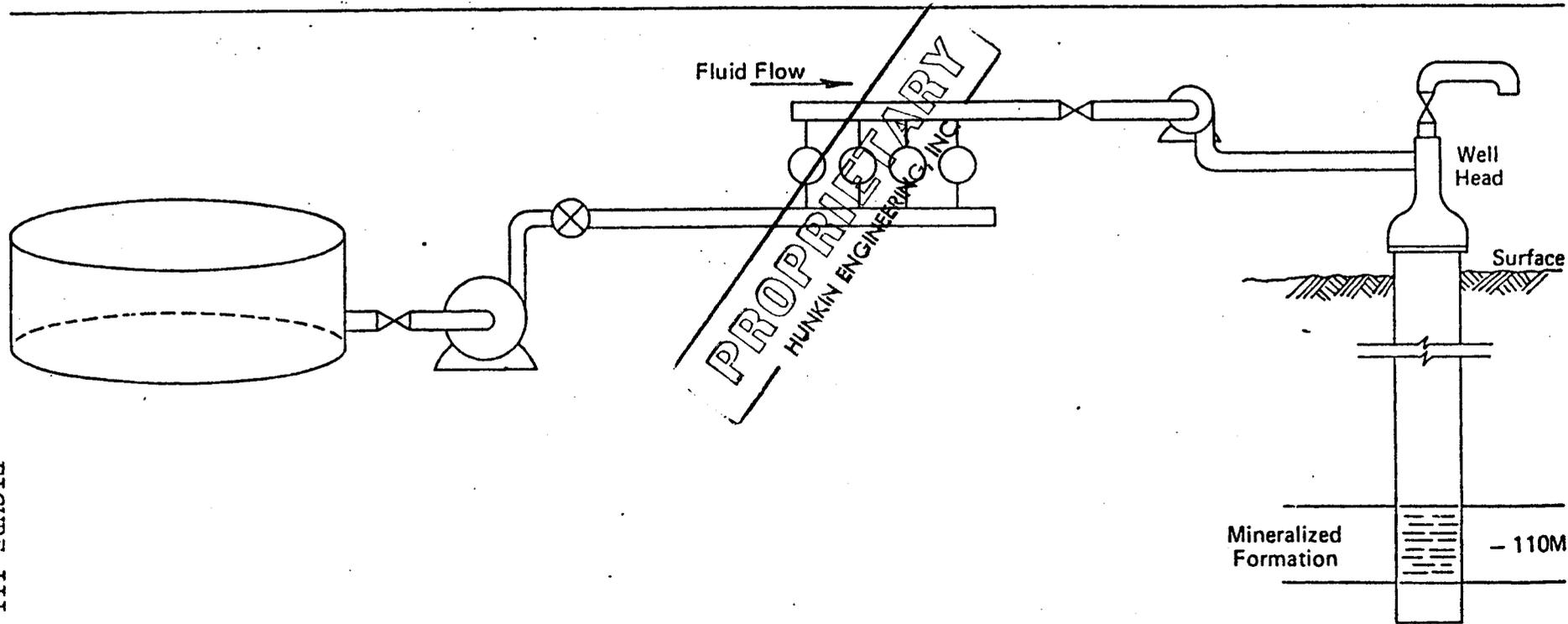


FIGURE III-1

PUSH - PULL FIELD TEST
SYSTEM - I

HUNKIN ENGINEERS INC.
LITTLETON, COLORADO
USA 1977

EQUIPMENT

PRODUCTION MODE

162

5000 gal (aprox.)
Plastic Lined
Storage Tank

Sample
Point

I.X.
Tank

Pump
15 gpm

Flow
Meter

Flow Control
Valve

Submergible
Pump

Sample
Point

REAGENTS

3 to 5 Cubic
Feet Ion
Exchange
Resin

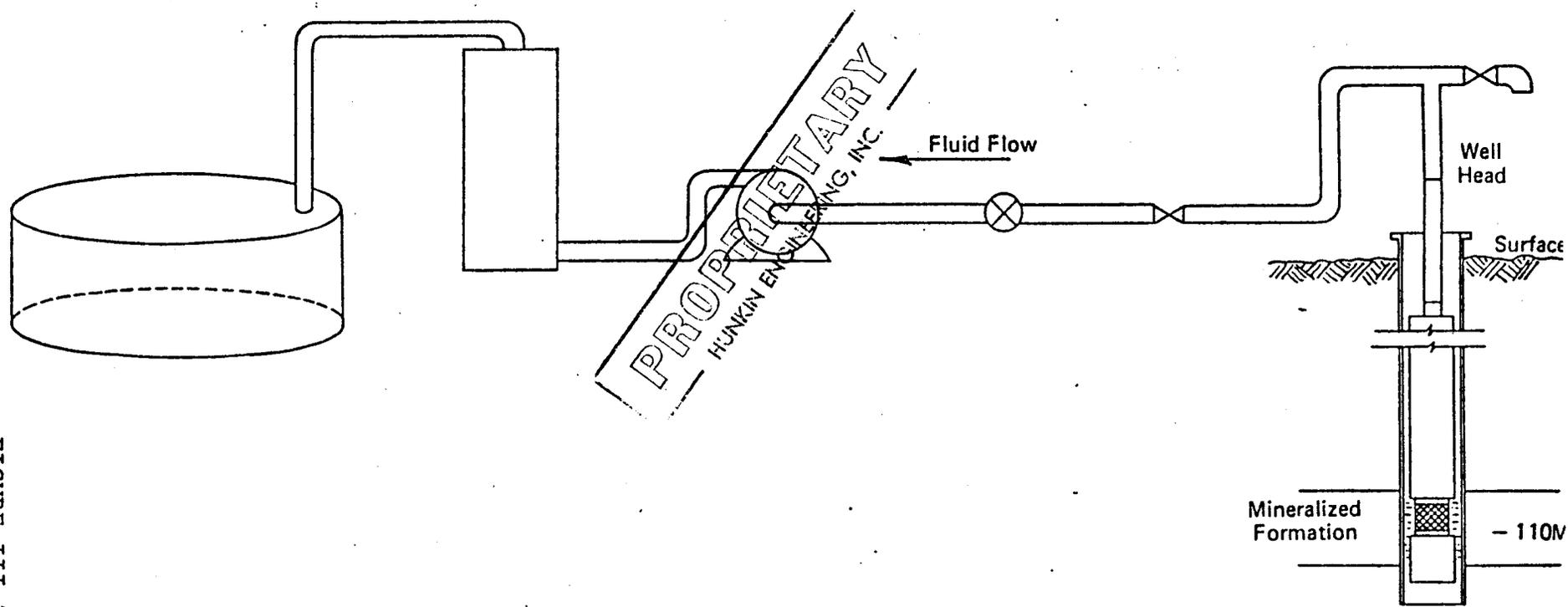
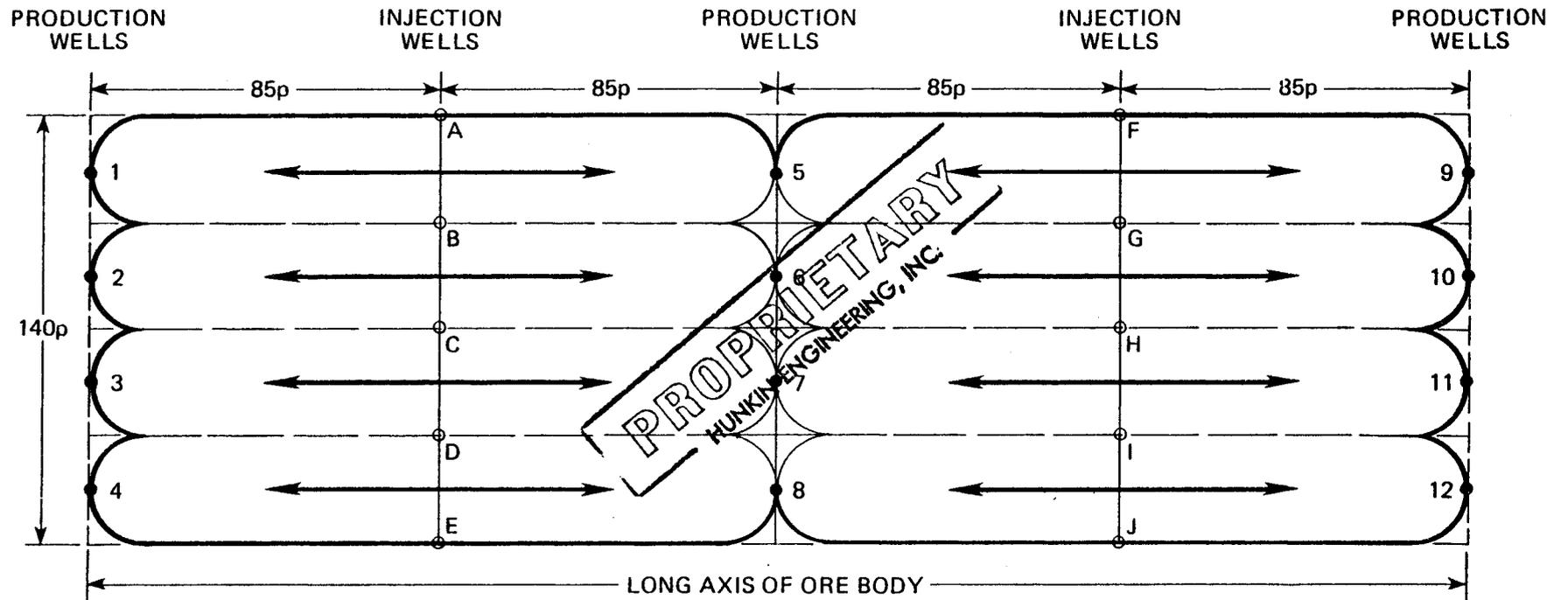


FIGURE III-2

PUSH - PULL FIELD TEST
SYSTEM - II

HUNKIN ENGINEERS INC.
LITTLETON, COLORADO
USA 1977



IDEALIZED STAGGERED LINE DRIVE

GROSS AREA 49,000 sq. ft.

SWEPT AREA 43,120 sq. ft. at 88% SWEEP EFFICIENCY

ARROWS INDICATE FLOW DIRECTIONS

CHEMICAL DATA

DRILL HOLE # _____

DEPTH
LITHOLOGY
REDOX

U₃O₈, wt%

V, ppm

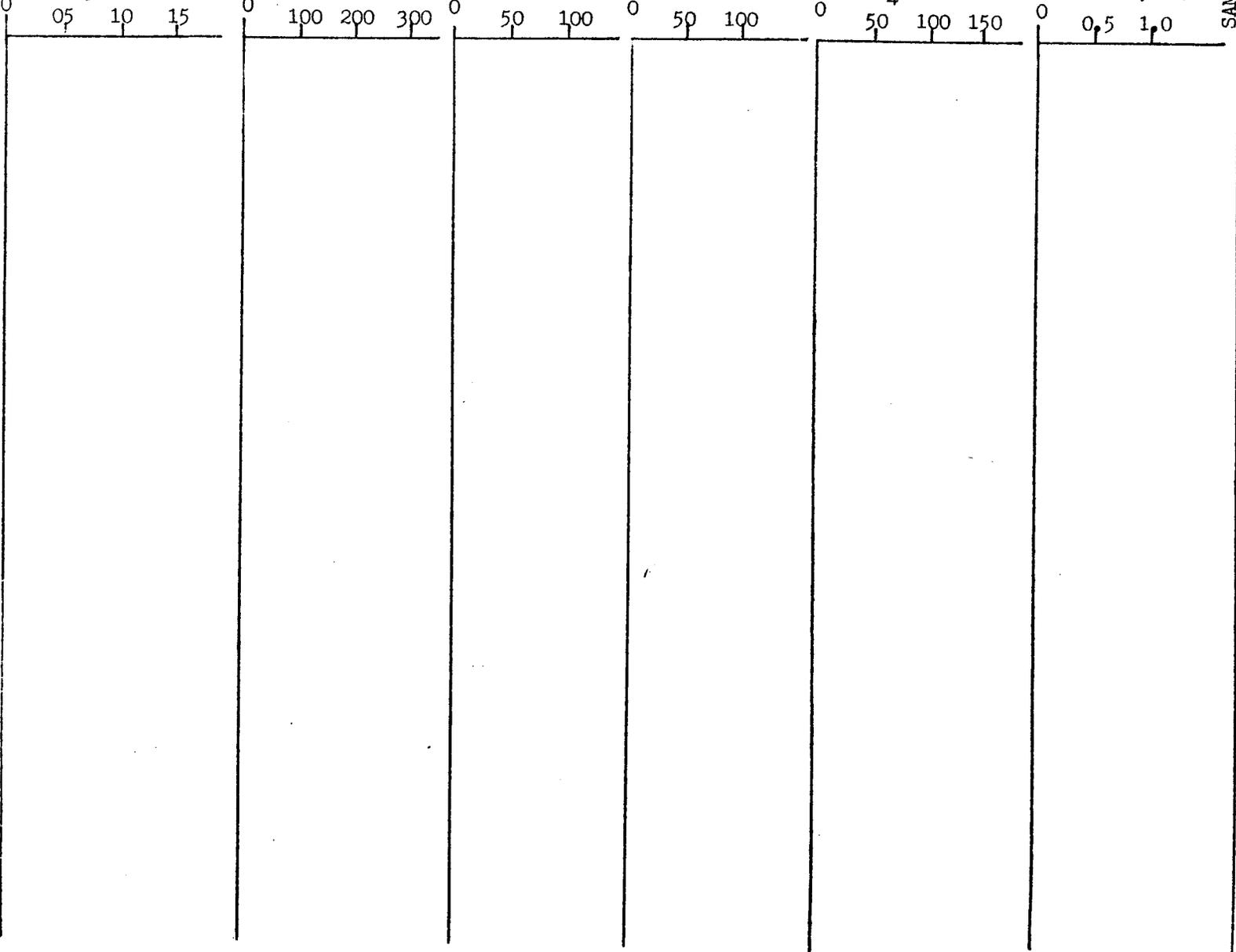
Mo, ppm

Se, ppm

NH₄⁺, ppm

PYRITE, wt%

SAMPLE #



Dr. J. T. Fyles
Deputy Minister
Ministry of Mines and Petroleum Resources

September 22, 1978

Re: Proposed Technical Committee on Radiation Hazards
in Uranium Mining and Milling

In previous discussions, the necessity of having a technical committee on radiation hazards in uranium mining and milling was considered important. The following terms of reference and composition of the committee is submitted for your consideration.

TERMS OF REFERENCE

URANIUM

1. COMMITTEE - Technical Committee on Radiation Hazards.
2. OBJECTIVES - (a) To recommend standards for radiation protection for public health and safety and occupational health and safety. This would require a review of standards set in Canada and elsewhere in the world and update on new material as it becomes available.

(b) To co-ordinate analytical services for radiation hazards within the Provincial Ministries.

(c) To provide technical information to the respective Ministries.

(d) In matters of radiation in uranium exploration and mining, to provide technical information to the Uranium Mining Steering Committee.
3. GENERAL - The committee should be set up as strictly a Provincial Committee. The reporting and recommendations should be designed to eliminate duplication. The Chairman of the committee should set out the lines of communication. The Uranium Mining Steering Committee should be kept advised and will circulate the appropriate information to other Provincial, Federal Agencies and Industry.

COMPOSITION OF COMMITTEE

The committee should be composed of technical people. I would recommend that it would be appropriate to have as chairman, Dr. Wayne Greene, Head, Radiation Service, Ministry of Health. The following should be represented on the committee and I have taken the liberty of suggesting names.

Ministry of Environment

Pollution Control Board - J. Brodie
Water Investigation Branch - P. M. Brady
Environmental Protection - A. J. Lynch

Dr. J. T. Fyles

September 22, 1978

Ministry of Mines and Petroleum Resources

Chief Analyst Analytical Laboratory - W. M. Johnson
Environmental Control S. Elias
Deputy Chief Inspector - Metal Mines - A. Richardson
Reclamation - J. D. McDonald

Ministry of Health

Head, Radiation Protection Service - W. Greene

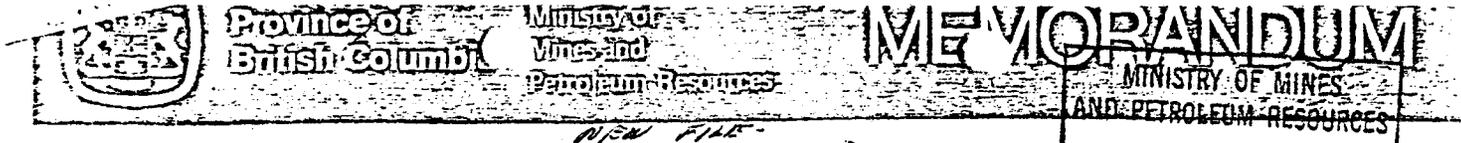
Uranium Mining Steering Committee - Chairman

Additional people can be added where deemed necessary. Names recommended may desire to have alternates.

J. D. McDonald, Chairman
Uranium Mining Steering Committee

JDM:kw

c.c. W. C. Robinson



MEMORANDUM

MINISTRY OF MINES AND PETROLEUM RESOURCES

Rec'd OCT 17 1978
Date: October 13, 1978

VED		
WJ		

To: B.E. Marr,
Deputy Minister,
Ministry of the Environment.

Re: Proposed Technical Coordinating Group (TCG)
in Uranium Mining and Milling

As discussed recently the necessity of having a technical committee on radiation hazards in uranium mining and milling is considered important. The following terms of reference and composition of the TCG is submitted for your consideration.

TERMS OF REFERENCE

- (a) To co-ordinate analytical services eliminating duplication and engendering cooperation within Provincial Ministries for purposes of identifying and monitoring radiation associated with uranium exploration and possible future uranium mine development.
- (b) To provide technical information to the respective Ministries on the radiation hazards of uranium exploration and mine development.
- (c) To provide technical information and advice to the Uranium Mining Steering Committee.

The TCG is a Provincial Government Committee reporting through its chairman to Uranium Mining Steering Committee. That Committee will circulate the appropriate information to other Provincial, Federal agencies and the industry.

COMPOSITION OF TCG

The TCG should be composed entirely of technical people. I would recommend that it would be appropriate to have as chairman, Dr. Wayne Greene, Head, Radiation Service, Ministry of Health. The following should be represented on the Committee and I have taken the liberty of suggesting names.

B.E. Marr,
Deputy Minister,
Ministry of the Environment.

2.

Ministry of the Environment

Pollution Control Board - J. Brodie
Water Investigations Branch - P.M. Brady
Environmental Protection - A.J. Lynch

Ministry of Mines and Petroleum Resources

Chief Analyst Analytical Laboratory - W.M. Johnson
Environmental Control - S. Elias
Deputy Chief Inspector/Metal Mines - A. Richardson

Ministry of Labour - Workers Compensation Board
representative

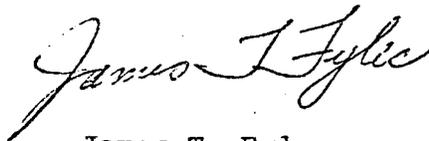
Ministry of Health

Head, Radiation Protection Service - W. Greene

Uranium Mining Steering Committee, Chairman

- J.D. McDonald

May I have your approval in principle regarding the setting up of the TCG and your recommendations for appointees and/or alternates to the group. I am sending a copy of this memo to Jim Mainguy to indicate my desire for Dr. Greene to act as the chairman. If you concur I will make a formal request to him at which time we could also designate members and final terms of reference.



James T. Fyles
Deputy Minister

JTF:sgn

cc: J.W. Mainguy, Deputy Minister, Ministry of Health
J.G. Matkin, Deputy Minister, Ministry of Labour



Province of
British Columbia

Ministry of
the Environment
OFFICE OF THE
DEPUTY MINISTER

MEMORANDUM

To: Dr. James T. Fyles,
Deputy Minister of Mines
and Petroleum Resources,
Buildings.

Date: November 7, 1978

5.1621

Re: Proposed Technical Coordinating Group
on Uranium Mining and Milling

Thank you for your memorandum on the above subject.

I agree with the formation of the Committee and appoint Mr. J. Brodie of our Pollution Control Branch and Mr. A. J. Lynch, Director of our Environmental Lab as members.

We may appoint a third member at a later date, as suggested in your memorandum.

I would suggest that the Committee give us immediate advice on lab facilities required in fiscal 1979-80. I understand that there is agreement that additional equipment is required in our Environmental Laboratory and this may also be the case for other laboratories.

If the Committee could outline the total requirements for fiscal 1979-80 for all provincial laboratories then we could submit a "C" budget to obtain the necessary funds rather than proceeding independently.

DEPUTY MINISTER M. & P. R.		
REC'D NOV 8 '78		
REFERRED TO	DATE	INITIAL
A.D.M.	8/11	AM
A.D.P.		
A.S.		
M.R.		
FILE		

B. E. Marr,
Deputy Minister of the Environment.

2501

cc: utR/VED
JDm/D
ERM

APPENDIX 3.2.1. MEMO, W. C. ROBINSON TO ALL DISTRICT INSPECTORS,
FEBRUARY 9, 1978

W. C. Robinson

ALL DISTRICT INSPECTORS

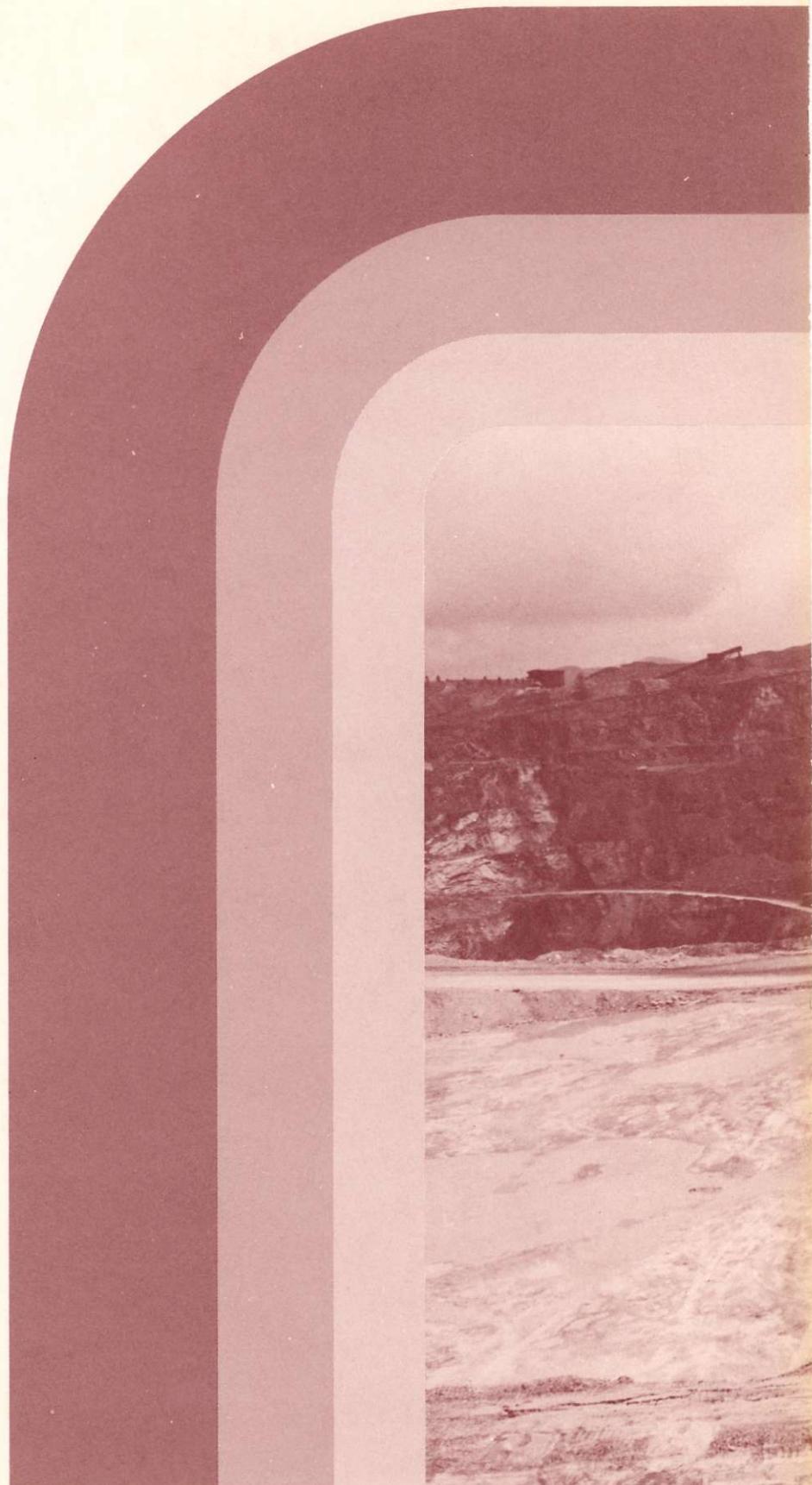
February 9, 1978

Occasionally circumstances arise where certain potentially hazardous conditions or situations that, although not specifically covered in the Mines Regulation or Coal Mines Regulation Acts, or by previous directives, are covered under rules or regulations of other agencies. An example of this would be Workers' Compensation Board Regulations governing the use of "explosive tools".

Where such a situation is encountered, and it is apparent that an existing rule or regulation covered by the Workers' Compensation Board, Canadian Standards Association standards, etc., is applicable, action could be taken, under Section 7 of the Mines Regulation Act or Section 6 of the Coal Mines Regulation Act, to have that particular rule or regulation declared a minimum requirement or standard.

W. C. Robinson, P. Eng.,
Chief Inspector of Mines.

WCR/tr



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Victoria, 1980



**Province of
British Columbia**

Ministry of
Energy, Mines and
Petroleum Resources