

# A Brief Submitted to the Royal Commission of Inquiry

Health and Environmental Protection  
Uranium Mining

September, 1979



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Exploration

BY THE INSPECTION AND  
ENGINEERING DIVISION  
MINERAL RESOURCES BRANCH



Province of  
British Columbia

Ministry of  
Energy, Mines and  
Petroleum Resources



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

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**PHASE II – EXPLORATION**

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

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## **SUMMARY**

- The Inspection and Engineering Division is staffed by Professional Engineers, other university graduates, and technicians, many of them working in the 11 Mining Inspection Districts of the Province.

- There is no statutory obligation to require those exploring for uranium to inform the Ministry that uranium is being sought.

- The Ministry has requested those exploring for uranium to say they are doing so.

- Provisions applied to exploration for minerals other than uranium are applied to uranium exploration as well. The requirements in brief are these:

- (a) to give notice of work of all kinds, including surface exploratory work;

- (b) to apply for and receive a permit for underground work;

- (c) to apply for and receive a reclamation permit in the event of significant disturbance of the surface of the land, and, if required, to post a bond.

- The Chief Inspector has given special directives to govern uranium exploration sites to ensure drinking-water is protected.

- District Inspectors and Inspectors with special responsibilities (for example, Reclamation Inspectors) inspect exploration sites, including uranium exploration sites, to ensure compliance with conditions set out in permits.

- It has been directed by the Chief Inspector that those who discover uranium or thorium in concentrations of 0.05 per cent or more report their discovery to the Ministry's District Inspector; they are required as well to obtain licences from the Atomic Energy Control Board when the removal of more than 10 kilograms of uranium or thorium from a deposit is involved in any one calendar year.

- The Ministry on its own or in conjunction with others is monitoring all underground mines, has monitored uranium exploration sites and is monitoring waters for radiation, as well as monitoring various sites (including private homes) for the presence of radon and radon daughters.

- Ministry personnel through seminars and visits to uranium operations are familiarizing themselves with what is required to regulate uranium mining and exploration.

# **I. ORGANIZATIONAL OUTLINE OF THE MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES AND OF THE INSPECTION AND ENGINEERING DIVISION**

## **1.1 The Ministry**

The Ministry of Energy, Mines and Petroleum Resources is made up of three branches, that is, Energy Resources Branch, Mineral Resources Branch, and Petroleum Resources Branch. The Mineral Resources Branch is subdivided into the following divisions:

Geological Division  
Inspection and Engineering Division  
Economics and Planning Division  
Titles Division

## **1.2 The Inspection and Engineering Division**

The Inspection and Engineering Division is responsible for the establishment and enforcement of provincial legislation for the safety and health of workers in the mining industry, for reclamation and conservation of land, and also for ensuring that mining operations do not endanger the safety of the public. An organizational chart of the Division is marked as Appendix 1.2.1.

The Division is under the supervision of the Chief Inspector, whose office is in Victoria.

In the field, there are 11 District Inspectors and Resident Engineers, one for each Inspection District (see Map, Appendix 1.2.2). The Division supports these District Inspectors and Resident Engineers with administrative services and the assistance of Inspectors with special responsibility for the environment within mines, for mechanical, electrical, and reclamation aspects of mining and for roads and trails.

The functions of the various positions in the Division will be described in more detail later in this submission and, where appropriate, will be described in the submission relating to Phase III—Mining, and subsequent phases.

## **1.3 Personnel**

The Inspection and Engineering Division has 25 professional people in its ranks; all are Professional Engineers save for our audiologist who has a Master's degree and our agronomist who has a doctorate. The aggregate experience of this group shows an average of 3.3 years per person of work in the Division. It also shows an average of 17.9 years of mine-related work experience outside the Division.

Apart from the considerable expertise of the District Inspectors and Resident Engineers, all of whom have a Professional Engineer qualification, the Division has specialists to deal with requirements such as mechanical, electrical, noise, dust, radiation, light standards, vegetation, and other related reclamation problems.

Many of these specialists are Professional Engineers; others are Technicians with a number of years' experience in the practical workings of a mine.

In addition there are six Inspector-Technicians working directly in the field with District Inspectors and Resident Engineers.

Individual work resumes of most of our professional staff are marked as Appendices (see Appendices 1.3.1 to 1.3.22), as is a summary of the years of work experience of the Division's professional staff (see Appendix 1.3.23).

#### 1.4 Expenditures and Budget of the Division

The Inspection and Engineering Division's expenditures for 1978/79 and current budget for 1979/80 are as follows:

	Actual Expenditures 1978/79	Budget Estimates 1979/80
	\$	\$
Salaries — Estimated . . . . .	1 242 692	1 394 754
Salaries — Temporary . . . . .	31 418	18 383
Travel Expense . . . . .	281 757	272 647
Professional and Special Services . . . . .	22 994	27 599
Office Expense . . . . .	17 212	31 360
Office Furniture and Equipment . . . . .	11 423	11 100
Advertising and Publications . . . . .	87	—
Materials and Supplies . . . . .	30 058	28 515
Rentals — Outside Suppliers . . . . .	27 824	32 231
Acquisitions — Machinery and Equipment . . . . .	3 099	47 564
<b>TOTALS . . . . .</b>	<b>1 668 564</b>	<b>1 864 163</b>

Included in these expenditures and budget items are the cost of purchasing equipment needed to carry out the surveys of all existing underground mining properties for ionizing radiation and of exploration sites, which surveys are described in more detail in section 4.4 of this submission.

## II. LEGISLATIVE FRAMEWORK – GENERAL DESCRIPTION

### 2.1 Introductory Note

In the Ministry's submission in Phase I – Overview, the Commission was given a three-page report which included reference to statutes administered by the Mineral Resources Branch of the Ministry. Copies of those statutes were provided as well.

In the Ministry's submission for the remaining phases of this Commission, certain of these statutes will be referred to with some frequency.

In addition, reference will be made to the *Atomic Energy Control Act* and Atomic Energy Control Regulations.

It will perhaps be useful to review these statutes and regulations in a general way at this point, leaving more particular reference to individual provisions of these statutes and regulations to the more detailed discussions later in the Ministry's submissions.

### 2.2 Mineral Act

The *Mineral Act*, a British Columbia statute, sets out who may prospect for, locate, mine, and produce minerals; defines right to explore on and in other ways use lands; defines rights to minerals; establishes a system for recording those rights; and establishes a system for leasing mineral lands.

The most significant provisions of the *Mineral Act* are these:

#### *definition of "mineral"*

For the purposes of the *Mineral Act*, "mineral" is given a special definition which, along with coal, petroleum, and other categories of mineral, specifically excludes minerals as defined in the *Placer Mining Act*.

#### *section 2*

Only free miners may explore for, locate, mine or produce minerals, or acquire title to a mineral claim or leasehold. Free miners must be Canadian residents or Canadian corporations.

#### *section 6*

By becoming a free miner, a person becomes entitled to enter on Crown land and land in which minerals are reserved to the Crown in order to explore,

locate, mine and produce minerals. Occupied land, parks, and certain areas specified by the Lieutenant-Governor, are off-limits to free miners.

*section 9*

Free miners, if required by owners of land, must post security for damage to land and must compensate the owner for any damage caused.

*sections 10 to 13*

Rights to use of the surface of mineral lands are defined.

*sections 14 to 19*

Conditions under which free miners may locate mineral claims are defined.

*sections 20 to 28*

Mechanisms for recording mineral claims are set up. To keep the claims in good standing, holders of mineral claims must perform work or pay money.

The mechanics by which the Minister issues mineral leases are set up. Leases may not be issued for more than 21 years (*see* section 30). Leases convey minerals to leaseholders (*see* section 32). The leaseholder must keep his lease in good standing by doing work or making payments in lieu (*see* section 33); once production is underway, he pays rent and is not required to record work (*see* section 42).

Other provisions of the *Mineral Act* provide for surveys of mineral claims, transfers of interests in mineral claims or leases, resolutions of disputes among rival claimants, and for administration of the *Mineral Act*.

### **2.3 Placer Mining Act**

This Act in many respects parallels the *Mineral Act*. It defines who may explore for minerals as defined in the *Placer Mining Act*, and who may acquire locations for purposes of placer mining and placer leases.

In general terms, minerals governed by the *Placer Mining Act* are those which are loose or fragmentary or are by decomposition or erosion of rock found in wash, loose earth, gravel, or sand. These minerals are excluded from the definition of "mineral" under the *Mineral Act*.

## 2.4 Mines Regulation Act

### General Note

This statute and the Rules set out in it are the primary tool the Ministry has for regulating the health and safety of workers associated with metal mining in British Columbia, and for protecting the environment and the public from hazards associated with metal mining.

The Act is divided into three parts, being

- Part I      — Administration (sections 4 to 22)
- Part II     — General Rules (section 23)
- Part III    — Offences, Penalties, and Regulations (sections 24 to 32)

### Activities Governed by the Act

Section 2 defines a mine in these terms:

“mine” means any underground, open-pit, or quarry working, or other working of the ground, for the purpose of prospecting, mining, opening up, developing, or proving any mineral or mineral-bearing substance, and includes any orebody, mineral deposit, rock, limestone, earth, clay, sand, gravel, or place classified by the Chief Inspector as a mine, and includes all crushing plants, concentrating-works, machinery, plant, building, and premises below or above ground belonging to or used in connection with a mine as defined herein;

The definition is a generous one. The Ministry considers that uranium falls in the definition.

Section 3 cuts back on the application of the Act by excluding mines covered by the *Coal Mines Regulation Act* and the *Petroleum and Natural Gas Act*.

### Inspectors — Their Powers and Duties

#### *section 4*

Inspectors are provided for.

#### *section 5*

The Chief Inspector has available to him the wide powers under the *Public Inquiries Act*.

*sections 6 and 7*

Inspectors have available to them very wide powers:

They may examine and inquire as required [section 6(2)(a)].

They may enter mines at any time [section 6(2)(b)].

To ensure health and safety of mine workers, they may "exercise such powers as may be necessary" [section 6(2)(c)].

Inspectors may order that remedies or safeguards be put into effect, to address a matter the Inspector is of the opinion constitutes a danger to safety or health [section 7(1)].

Inspectors may order mines or parts of them to close down [section 7(2)].

Inspectors may also order that engineering reports be made [section 7(3)].

Inspectors are to visit mines once monthly or as often as duties permit or circumstances require [section 6(1)].

Inspectors are to post inspection reports, and provide copies to management and workers [section 6(3)].

**Duties of Owners**

Owners are to report instances of loss of life, serious injury, or dangerous occurrences in accordance with sections 8 and 9.

**Section 10 – Notices and Approvals**

Section 10 gives the Chief Inspector wide powers with which to control how mining is carried out. By section 10(5), in exercising that control, he is required to consider (1) maximizing recovery of the mineral resource, (2) good engineering practice, and (3) safety of operation.

The Chief Inspector exercises these power through his power to approve or disapprove plans for working mines and which plans mine owners must file (or cause to be filed) with the Chief Inspector. Without the Chief Inspector's approval, no work, save for surface exploratory work, is to be commenced [see section 10(2)].

Notice of commencing or ceasing mining must be given to the District Inspector [see section 10(1)].

## **Reclamation**

The *Mines Regulation Act* places on the owner, agent, or manager of a mine the duty of instituting and carrying out a program of reclamation [see section 11(1)].

The program of reclamation must be approved by the Minister of Energy, Mines and Petroleum Resources, who is obliged to obtain the approval of the Lieutenant-Governor in Council, the Minister of Lands, Forests and Water Resources, the Minister of Recreation and Conservation, and the Minister of Agriculture [see section 11(1) to (6)].

Security to ensure that the program is carried out may be demanded [see section 11(7)] and may be used to carry out reclamation should the owner fail in his duty [see section 11(12)].

Penalties are provided for [section 11(14)] and exceptions may be made [section 11(17)].

## **Some Safety and Health Provisions of the Act**

Closed down mines are to be protected from inadvertent access. This is to be done by the owner or at his expense (see section 12).

The owner is to keep a register of those employed in mines (see section 17). Workers under 18 and trainees under 17 are not to be employed underground or at the work face (see section 17).

Where more than 20 persons are employed at a mine, they shall appoint one or more of their number as a safety committee which shall at least once a month inspect as many active locations in the mine and plant as they see fit. The owner and all persons in the mine shall afford the person so appointed every facility for the inspection. The persons appointed shall as a result of the inspection make and sign a report of the conditions found during the inspection and a copy of this report shall be filed with the owner, with the Chief Inspector, with the District Inspector, and with the local union (see section 20).

There are special provisions for dust exposure occupations (see section 18).

Provisions are made for qualifying shiftbosses and for requiring their presence on the job (see section 21).

## **The General Rules**

Part II of the Act sets out 316 General Rules to be observed and posted in every mine. These General Rules govern safety in mines.

It should be noted that the Chief Inspector has power to vary or suspend General Rules for particular minesites, providing he has received an application from a mine owner or from a safety committee or local union present, requesting a variation or suspension (see section 23).

## **Offences, Penalties, and Regulations**

Sections 24 to 31 define offences, provide for penalties, and empower the Lieutenant-Governor in Council to make regulations.

### **2.5 Atomic Energy Control Act**

This Federal Act sets up the Atomic Energy Control Board, gives that Board certain powers in sections 8 and 9, and gives the Minister, under the Act, certain other powers under section 10.

The section 8 powers given to the Board are powers to govern itself, to employ persons, to disseminate information, and to provide scholarships and research grants.

The section 9 powers given the board are powers to make regulations, with the approval of the Governor in Council, respecting, among other things, mining and prospecting for prescribed substances [see section 9(c)] and regulation of production, refining, possession, ownership, and sale of prescribed substances [see section 9(d)]. Prescribed substances include uranium (see section 2).

Under section 10, the Minister has power, among other things, to incorporate companies.

### **2.6 Atomic Energy Control Regulations (as amended)**

These regulations have been made pursuant to the *Atomic Energy Control Act*, section 9.

These regulations provide for licensing those who will be handling prescribed substances (see Part II, sections 3 to 7).

They provide as well for health, safety, and security of persons connected with nuclear facilities such as nuclear reactors (see Part III, sections 8 to 10).

The regulations impose record-keeping obligations on licencees (see section 11) and, in addition, provide for appointment of Inspectors (see section 12).

Part V, sections 13 and 14, provides for security.

Part VI, sections 15 to 23, provides for health and safety in dealing with prescribed substances; Schedule II, referred to in section 19, "Permissible Doses," sets out maximum doses and exposures to radiation and to radon daughters.

The regulations do not deal with health and safety in operating a mine and consequently do not duplicate the provisions of the *Mines Regulation Act*.

### III. LEGISLATIVE FRAMEWORK — EXPLORATION

#### 3.1 Mineral Act

The Act generally covers the establishment of title to mineral properties and the rights of leaseholders and claim holders. 'Mineral' for the purpose of this Act is defined as ore of metal and every natural substance that can be mined and that

- (i) occurs in fragments or particles lying on or above or adjacent to the bedrock source from which it is derived, and commonly described as talus, or
- (ii) is in the place or position in which it was originally formed or deposited, as distinguished from loose, fragmentary, or broken rock or float which, by decomposition or erosion of rock, is found in wash, loose earth, gravel, or sand,

but does not include coal, petroleum, natural gas, building and construction stone, limestone, dolomite, marble, shale, clay, sand, gravel, volcanic ash, earth, soil, diatomaceous earth, marl, or peat.

No person is allowed to prospect or explore for, locate, mine, or produce minerals or acquire title to a mineral claim or leasehold unless he is a free miner. The procedure necessary to obtain a free miner's certificate and the required qualifications are listed in the Act together with other information pertaining to renewal of a certificate.

Rules pertaining to the staking and surveying of land and the application and issuing of placer leases are included in the Act. The Lieutenant-Governor in Council may make regulations for the purpose of carrying out the provisions of this Act.

#### 3.2 Mines Regulation Act

The *Mines Regulation Act* is the basic legislation governing the mining industry of British Columbia (other than coal mining) insofar as the safety and health of mine workers and the public is concerned. The Act also ensures that mining operations are carried out in accordance with good engineering practice so as to achieve a maximum recovery of available mineral resources with a minimum adverse effect on the environment.

In this Act, the word 'mine' is defined as follows:

'Mine' means any underground, open-pit, or quarry working, or other working of the ground, for the purpose of prospecting, mining, opening up, developing,

or proving any mineral or mineral-bearing substance, and includes any orebody, mineral deposit, rock, limestone, earth, clay, sand, gravel, or place classified by the Chief Inspector as a mine and includes all crushing plants, concentrating-works, machinery, plant, building, and premises below or above ground belonging to or used in connection with a mine.

Exploration activities must conform to the Act in matters of health and safety. In particular, the following sections are important:

***Section 10 – Notice of Work on a Mineral Property***

At least one week before commencing work at a mine or at any time that a person is employed at a mine either underground or on the surface, the owner shall give notice to the inspector and when work ceases the owner shall at least one week prior to cessation also give notice to the Inspector. In addition the Chief Inspector has to approve a plan of the system under which it is proposed to work the mine and no work other than surface exploratory work shall be commenced without the written approval of the Chief Inspector.

***Section 11 – Reclamation of Surface***

Subsection (18) gives authority to the Chief Inspector of Mines to issue a reclamation permit where the use of mechanical equipment would cause significant disturbance of the land. This is covered in more detail in section 4.3, Reclamation of Exploration Sites.

**3.3 Other Provincial Legislation**

(a) *Forest Act*

On Crown land administered by the Forest Service a free miner is required to obtain the following when necessary:

*Free Use Permit* – to cut and use timber for mining purposes on mineral claims.

*Licence to Cut* – to cut timber for camp sites, roads, drill sites, adit sites.

*Right of Way* – for roads through forest reserve land, but does not include roads on mineral claims.

(b) *Land Act*

Lands Department has jurisdiction over Crown land other than that land administered by the Forest Service.

*Right of Way* – for access roads to a mineral property but does not include roads on a mineral property.

(c) *Water Act – Ministry of Environment*

*Water Licence – Creek Diversions* – water use from creeks, rivers, or lakes.

(d) *Fish and Wildlife – Ministry of Environment*

There is no act governing the protection of wildlife habitats other than the Federal *Fisheries Act*. The Regional Fish and Wildlife Branch receives copies of the Forms 10–11 from the District Inspector of Mines. Any concerns are taken into consideration and any conflicts are usually resolved at the regional level. The company doing the exploration work may be instructed to avoid or minimize impacts on habitats or fisheries.

(e) *Sewage and Garbage Disposal*

Depending on the size of the exploration camp, sewage and garbage disposed are covered under the *Public Health Act* or *Pollution Control Act*.

### 3.4 Federal Legislation and Regulation

*Atomic Energy Control Act*, section 9(b) authorizes the Atomic Energy Control Board to make regulations respecting mining and prospecting for prescribed substances, the definition of which includes uranium.

Section 3 of the Atomic Energy Control Regulations SOR/74/334 prohibits, among other activities, the activity of prospecting for uranium without a licence from the Atomic Energy Control Board, though section 6(1)(b) makes an exception from this general rule for persons

6(1)(b) prospecting for prescribed substances if such prospecting does not involve the removal of more than 10 kilograms of uranium or thorium from a deposit thereof in any one calendar year.

In section 6(2) further exceptions from the section 3 licence requirement are made in these terms:

6(2) Subject to subsection (3), no licence is required in respect of

- (a) a substance containing uranium or thorium in percentages less than 0.05 per cent by weight;
- (b) any use, sale or possession of a substance containing uranium or thorium if such use, sale or possession does not involve more than 10 kilograms of uranium or thorium in any calendar year;

In the event exploration activities involve uranium in percentage of 0.05 per cent by weight or more, or involve the removal of more than 10 kilograms of uranium in any one calendar year, and hence trigger the requirement for a licence, the Board (that is, the AECB) can, in the interests of health and security and safety, include in the licence conditions set out in section 7(3) of the regulations.

The Federal *Fisheries Act* and regulations under it also have an impact on exploration activities; placing of debris in fish streams is, for example, prohibited.

## IV. REGULATORY PROCESS – EXPLORATION

### 4.1 Establishment of a Mine

It may be of interest briefly to review the various steps necessary to put a mine into production starting from the initial prospecting. The odds of an initial mineral discovery making a mine are very slight.

Prospecting and agency title to mineral claims are covered by the provisions of the *Mineral Act*. An individual or company is required to obtain a **free miner's certificate** prior to staking claims. When prospecting has indicated mineralization in an area, claims are staked and recorded in accordance with the *Mineral Act*. There is no requirement to specify the type of mineralization.

#### Notice Must be Given

Notice has to be given to the District Inspector of Mines pursuant to section 10 of the *Mines Regulation Act* prior to commencing work on mineral property including exploration work of any kind. Notification must also be given upon cessation of any operations. There is no requirement under provincial statute to identify the mineralization sought.

#### Approval Needed in Most Cases

All underground work, whether for the purposes of exploration, bulk sampling, or for removal of ore for sale requires the written approval of the Chief Inspector [*see* section 10(2)].

Surface exploratory work, which includes diamond drilling, trenching, geophysical, and geochemical surveys, can be carried on without written approval of the Chief Inspector [*see* section 10(2)] ; but when the surface work ceases to be for exploration purposes, the written approval of the Chief Inspector is required [*again see* section 10(2)].

#### Reclamation Permits Needed in Some Cases

Surface exploratory work is not, however, entirely free from scrutiny or control by the Division.

In the exploration stage all work is to conform to the *Guidelines for Coal and Mineral Exploration* (Appendix 4.1.1) as updated by the document *Review Procedures – Mineral Operations* (Appendix 4.1.2). Pursuant to section 11(18) of the *Mines Regulation Act*, a reclamation permit may be required where there is significant disturbance of the surface of the land by mechani-

cal equipment (see Appendix 4.1.4 for an example permit). Other British Columbia Provincial Government agencies are notified of any proposed environmental disturbance, in particular, Ministries of Environment, Forests, and Lands, Parks and Housing.

The section 11 permit is the primary tool the Division has for controlling environmental disturbance. As was the case for the exploration programs of Norcen Energy Resources Ltd., PNC Exploration (Canada) Co. Ltd., Consolidated Rexspar Minerals & Chemicals Limited, and China Creek Consortium Inc., conformity to the ministerial guidelines was one of the conditions imposed on exploration programs (see, as examples, documents marked Appendices 4.4.21, 4.4.32, 4.4.38 to 4.4.40).

#### **Other Requirements**

As has been said, any underground work in the exploration stage requires approval of the Chief Inspector of Mines. Equipment, methods of mining, ventilation, and environmental requirements must be approved prior to commencement of any work.

Once production exceeds 1 000 tonnes, the claims must have a legal survey by a qualified British Columbia Land Surveyor, pursuant to section 29, *Mineral Act*.

Except for placer mines, sand and gravel pits, quarries and exploration projects where a limited amount of environmental disturbance would result from the mining operations, the stage approval process and the reclamation process as explained later in later briefs have to be followed prior to the establishment of a producing mine and all permits, licences, and approvals necessary, such as Pollution Control Board permits, have to be obtained.

The Atomic Energy Control Board issued a document in 1976 entitled *Guide to the Licensing of Uranium and Thorium Mine-Mill Facilities* known as Licensing Guide No. 31 (Appendix 4.1.5). In this guide, the Atomic Energy Control Board describes in detail the licensing procedures and the requirements for obtaining a licence to operate a uranium or thorium mine-mill facility. The control of nuclear facilities and materials as governed by the *Atomic Energy Control Act* is achieved through licensing. In accordance with the Atomic Energy Control Regulations, the operations of a facility within which mining and milling of uranium or thorium takes place requires a mine-mill facility operating permit (MFOL) and is subject to the requirements set down in the regulations.

The MFOL may specify any terms and conditions the Board considers necessary in the interest of health, safety, and security. It should be noted that mining covers the activities involved in the excavation, removal, and storage of ores and milling covers the activities involved in physical concentration of the ore and in the production of concentrates by chemical means.

## 4.2 Inspection of Exploration Projects

Pursuant to section 10 of the *Mines Regulation Act* the District Inspector of Mines is to be notified of work on a mineral property. Work may consist of anything from basic prospecting to detailed drilling or underground exploration. Section 10 does not specify by what method the notification must be. *Notice of Work* forms have been used for over 20 years and have been revised from time to time with the last revision being 5 years ago, when exploration reclamation was incorporated into the present Form 10-11 (the number 10 indicates section 10 and the number 11, section 11 of the *Mines Regulation Act*).

To indicate the activity of exploration in 1978, there was a total of 606 Forms 10-11 received by the District Inspectors and the total for 1979 to September is over 1 000. It would be impossible to visit each exploration project so the Inspector must make a decision on priorities based on knowledge of the area, individuals and companies involved, past performances, and gathering further information. Large exploration programs when more than a minimal amount of surface disturbance is indicated, any work underground, and any work that in the opinion of the Inspector could lead to a conflict in one form or another, would fall into the category that would require early inspection.

Inspections are made to determine if the provisions of the *Mines Regulation Act* are being conformed to. Where hazards are observed, the Inspector can issue a directive on site to eliminate the hazard or protect the worker from the hazard [see subsections (6) and (7)].

In the case of exploration projects for which reclamation permits have been issued, environmental concerns are observed such as protection of watercourses, erosion, wildlife, and fisheries.

District Inspectors or Inspector-Technicians in the course of their inspections of exploration sites, and Reclamation Inspectors and Reclamation Inspector-Technicians (some of whom are in the field and some of whom work from Victoria) watch for variation from the conditions set out in the section 11 permits. As has been described earlier, conditions of the reclamation permits are that those doing the exploration follow guidelines, principally the *Guidelines for Coal and Mineral Exploration*. In some cases verbal directives are issued and where required, written directives are issued. For an example of a written directive see Appendices 4.4.29 and 4.4.30. Depending on the size of the exploration project, an Inspection Report is issued to the company. One copy is posted in a place where it can be read by all employees. An example Inspection Report is found in Appendix 4.4.6 and following.

The Ministry has divided the Province into 11 Inspection Districts (see Appendix 1.2.2) based on mining and exploration activities. There are 11 District Inspectors and Resident Engineers in the

field, 6 Inspector-Technicians, and 3 Reclamation-Technicians. In addition, Environmental Control Inspectors, based in Vancouver, inspect major exploration projects for dust control, noise attenuation, and, in the past year, radiation monitoring.

#### 4.3 Reclamation of Exploration Sites

Pursuant to section 11, subsection (18) the Chief Inspector of Mines may require a reclamation permit to be issued where the use of mechanical equipment is involved which could cause significant disturbance of the land. A security deposit is required to be posted prior to issuance of the permit. Bonding is set by the Chief Inspector of Mines who may determine, having regard to the nature of the land involved, a sum not exceeding \$1 000.00 for each acre of land disturbed [see section 11(7)]. This maximum it is expected will be changed to reflect the new metric realities sometime in 1980.

Notification that a reclamation program and bonding are required is made by way of form letters, examples of which are attached as Appendices 4.3.1 to 4.3.4.

The factors which enter into consideration in determining the amount of bonding are:

- (a) The amount of land disturbed.
- (b) The degree of difficulty in reclamation.
- (c) The type of land disturbed.
- (d) Environmental considerations.
- (e) Past performance of the company.

Where a section 11 reclamation permit is required, the *Programme for Protection and Reclamation* is completed on the Form 10-11 and a copy is forwarded to the Chief Inspector of Mines. As has been outlined, permits are not required where the following work of a nature not likely to cause significant surface disturbance is proposed: linecutting, geological mapping, hand trenching, small test pitting, geophysical and geochemical surveying, percussion drilling and limited diamond drilling.

A general *Reclamation Exploration Permit* can be issued upon application by letter to the Chief of Mines to these companies which maintain a number of exploration projects in British Columbia. This permit is issued for a 3-year period and covers all of the company's projects, thereby greatly simplifying bonding procedures. The company is still required to submit the Form 10-11 for each exploration project. A list of companies with general permits is marked Appendix 4.3.5.

Companies and individuals are required to conform to *Guidelines for Coal and Mineral Exploration* (Appendix 4.1.1) on all exploration projects with or without permits. The guidelines not only take into account reclamation but also environmental protection and protection of other resources.

These guidelines must be interpreted in the light of site-specific conditions. In general they recommend that the following points must be considered in the construction of roads, drill sites, adits, and trenches:

Minimization of the extent of land disturbances through geological mapping, pre-planning and engineering of layout, and close supervision of work.

Utilization of the least disturbing means available when working in areas with sensitive resource conflicts, such as wildlife and fisheries.

Drainage control by provision of ditches, culverts, and water bars where necessary.

Minimization of disturbance in alpine areas.

The necessity for site preparation prior to seeding and fertilizing.

Companies or individuals who are engaged in either coal or mineral exploration and have a reclamation permit are required to submit a *Reclamation Report* which describes the reclamation work which has been completed for the calendar year. In the case of mineral exploration, the report is submitted to the District Inspector of Mines with a copy to the Senior Reclamation Inspector.

When an exploration project is completed and the property is dropped, a final inspection is made. If the terms and conditions of the permit have been satisfied, the bonding is returned.

There have been 188 mineral exploration and 110 placer mining reclamation permits issued January to September 1979.

#### **4.4 Special Provisions for Regulating Uranium Exploration Sites**

It is a requirement that the Inspector be notified prior to commencement of work on a mining property [section 10(1)]. To ensure that uranium exploration is conducted in a manner satisfactory to the Inspector, it is essential that an Inspector be aware of the fact that a particular exploration program is one involving uranium or thorium. To this end, companies or others

conducting exploration work have been requested to advise the District Inspector if uranium or thorium is being sought. (The Division has no present statutory authority to demand to be told that uranium is being sought.) In addition to requesting that the District Inspectors be advised if uranium or thorium is being sought, it is a requirement that a company or individual report to the District Inspector occurrences of more than 0.05 per cent uranium or thorium where encountered in drilling or trenching (see directive dated May 17, 1979, Appendix 4.4.1). It has been the practice that exploration programs encountering such occurrences be inspected at an early date. Reclamation at mining properties has been described (Part 4.3) and it has been indicated that where surface disturbance is minimal, a reclamation permit would not be required. For exploration of uranium or thorium, however, it has become the Division's practice to insist on the issuance of a *Permit Authorizing Surface Work*, pursuant to section 11 prior to drilling or trenching regardless of whether or not surface disturbance is minimal.

Special provisions at uranium exploration sites have been imposed, and some policies have been confirmed in directives dated June 25, 1979 and August 17, 1979 (see Appendices 4.4.2 and 4.4.4). Drill holes which encounter uranium mineralization in excess of 0.05 per cent uranium shall, after completion, be cemented in. Where exploration drilling is being carried out for uranium, and where a drinking-water supply could possibly be affected, the drill water must be recirculated and the cuttings suitably contained to ensure that a drinking-water supply cannot be contaminated. Other requirements that have been noted on Inspection Reports include the following, which are reproduced here as examples:

Core shed and sampling area to be isolated and signs posted **No Admittance Except to Authorized Personnel.**

Dosimeters to be worn as discussed. Records maintained of workmen carrying such badges.

A reference to the list of those companies known to the Division to have explored in British Columbia for uranium in recent years is marked as Appendix 4.4.5; the reference is to Appendix 4-1 in Phase I - Overview of the Ministry's submission.

Examples of the Forms 10-11 submitted by some of these companies in respect to their exploration sites, and example permits granted them pursuant to sections 10 and 11 as well as Inspection Reports in respect to those properties are marked as Appendices 4.4.6 to 4.4.40. Included as well are reports, directives, and other documents relating to these uranium exploration sites.

Pursuant to Atomic Energy Control Regulations, five British Columbia Inspectors of Mines have been appointed as AECB mine-mill inspectors and have been issued with certificates of appointment.

#### 4.5 Preliminary Measures Regarding Regulation of Uranium Exploration

In addition to the regulatory processes, several other preliminary measures have been and are being taken to prepare the Division to control exploration activity for uranium or thorium. They include these steps.

(a) *Technical Coordinating Group on Uranium Mining and Milling*

A committee known as the "Technical Coordinating Group on Uranium Mining and Milling" has been formed comprising senior staff members from the Ministry of Energy, Mines and Petroleum Resources, the Ministry of Health, and the Ministry of Environment. The following are the main terms of reference to this group:

- (a) to coordinate analytical services, eliminating duplication and engendering cooperation within Provincial ministries for the purpose 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.

The functions of this committee will be described in more detail in the Ministry's submission in Phase III – Mining.

(b) *Monitoring Existing Underground Sites*

The Inspection and Engineering Division of the Ministry of Energy, Mines and Petroleum Resources has undertaken on-site monitoring for exposure to ionizing radiation by workers. The *Mines Regulation Act*, section 85, empowers the Chief Inspector to prescribe minimum standards of permissible air – he has done so (see Appendix 4.5.1). The standards are **Permissible Mine Air Standards** which have been accepted by International Commission on Radiological Protection. A program to survey all existing underground mining properties for ionizing radiation is presently being carried out by the Environmental Control Inspectors of the Inspection and Engineering Division and the results to date have indicated unacceptable levels of radiation in two relatively small metalliferous mines, the Hewitt mine near Silverton and the Silvana mine near Sandon. This necessitated temporary closure of the operations in which unacceptable levels were found until better ventilation had been established (see Appendices 4.5.2 to 4.5.6).

(c) *Monitoring Present Exploration Sites*

Surveys for radon daughters and gamma radiation have been carried out by Inspectors of the Division at the three working locations where exploration for uranium was being carried out and the drill core or sample storage areas of exploration sites have also been checked. It has been a requirement that drill core and samples must be stored in a locked building and marked by a sign indicating that a radiation hazard exists. Employees that may come within the classification of radiation workers have been required to wear film-monitoring badges and be registered with the Radiation Protection Bureau of Health and Welfare, Canada. In addition the Ministry of Health has carried out a baseline study of gamma radiation in the vicinity of uranium exploration sites by the use of thermoluminescent detectors set up 1 metre above the ground at selected locations around drilling-sites. Where uranium mineralization has been encountered or likely to be encountered, all water, mud, and sludge at drill sites has been collected and water recirculated and, in addition, all drill holes encountering mineralization have been cemented or capped upon completion.

As mentioned before, monitoring has been carried out by the Environmental Control Inspectors of the Inspection and Engineering Division at several uranium exploration sites. Ionizing radiation measurements have been taken at Norcen Energy Resources Ltd., PNC Exploration (Canada) Co. Ltd., and Consolidated Rexspar Minerals & Chemicals Limited (*see* Appendices 4.5.7 to 4.5.9). The scope of the radiation surveys included measurements at old diamond-drill holes, active diamond-drilling operations, old underground workings, core storage areas, and the general ambient environment. The only measurement that exceeded the **maximum permissible exposure** contained in the schedule to the Atomic Energy Control Regulations was in the old underground workings of Consolidated Rexspar Minerals & Chemicals Limited at Birch Island. The entrances to these workings have been bulldozed closed to prevent inadvertent entry to the public.

(d) *Monitoring Natural Levels of Radiation*

A joint program by the Ministry of Health and the Ministry of Energy, Mines and Petroleum Resources has been underway for several months monitoring natural levels of uranium, gross alpha, and gross beta in waters used for domestic purposes at selected sites throughout the Province. This program, it is expected, will be described for the Commission by Dr. Wayne Greene and possibly others.

(e) *Monitoring Radon and Radon Daughters in Homes and Other Sites*

The Ministry of Health has also carried out baseline studies on radon and radon daughters in homes and other sites in the areas where uranium deposits are known to exist. This program, it is expected, will be described for the Commission in evidence in Phase I — Overview to be given by Dr. Wayne Greene and others.

(f) *Regional Geochemical Survey*

A regional geochemical survey has been carried out over approximately 20 per cent of British Columbia including the known potential uranium regions. Samples of silts have been analysed for 14 metals including uranium and samples of waters have been analysed for fluorine, uranium, and acidity. This program is described in the Ministry's submission in Phase I.

(g) *Specialized Training of Inspectors*

At this time there is no specialist in uranium mining within our Inspection and Engineering Division. If it becomes apparent that a uranium property is due to enter the production phase, it will be necessary to obtain additional advice, or guidance, concerning uranium mining to ensure the safety of workers and the public and to safeguard the environment. However, some special training concerning problems of uranium mining has been provided to a number of Inspectors. Twelve Inspectors have taken a one-week (Part I) Uranium Mine Inspector Training Course at Elliot Lake, sponsored by the Atomic Energy Control Board, in conjunction with provincial governments and federal agencies. The course is specifically concerned with dust and radiation in the mining environment in order to identify the characteristics, sources, and methods of control of these potential hazards in inspection duties in uranium mines. In addition, a second one-week course (Part II) has been taken at Elliot Lake by three Environmental Control Inspectors. The course outline is as follows:

**Part I**

*Respirable Dust*

Characteristics of dust clouds and standard techniques for dust control.

Hazards of respirable dust to man.

Measuring instruments.

### *Radiation*

Characteristics of radioactive materials.  
Radioactive characteristics of uranium.  
Radioactivity concentration and radiation exposure units.  
Estimation of radiation exposure and measurement techniques.  
Practical observation in a uranium mine.

## **Part II**

### *Laboratory Training*

Description, operation, and maintenance of instruments.

### *Mine Training*

Practical use of gravimetric samplers and konimeters.  
Kusnetz method of personal dosimetry and working level meters.

### **(h) *Seminars***

In addition to the Elliot Lake course, several Inspectors have attended various seminars and conferences on uranium mining and nuclear issues, and visits have been made to other uranium mining areas in the United States and other Canadian provinces. The *Uranium Mill Tailings Management Symposium* was attended by Mr. J. D. McDonald in Fort Collins, Colorado on November 20 and 21, 1978. While in Colorado, Mr. McDonald also visited the Technical Support Center (MESA) in Denver, and obtained from them information on methods of measurement of radon and radioactivity. Four members of the Inspection Division attended the *National Conference on Nuclear Issues in the Canadian Energy Context* in Vancouver on March 7, 8, and 9, 1979. The *Seminar on Uranium Mining and the Environment* was attended by four Inspectors in Vancouver on April 11, 1979. At this seminar, Mr. J. D. McDonald presented a paper on the *Role of the Uranium Steering Committee* (see Commission Document Accession Number 285A). The Third Annual Uranium Seminar was attended in Casper, Wyoming, on September 9, 10, and 11, 1979 by Mr. David Smith. One of the interesting subjects at this seminar pertained to *in situ* mining of uranium.

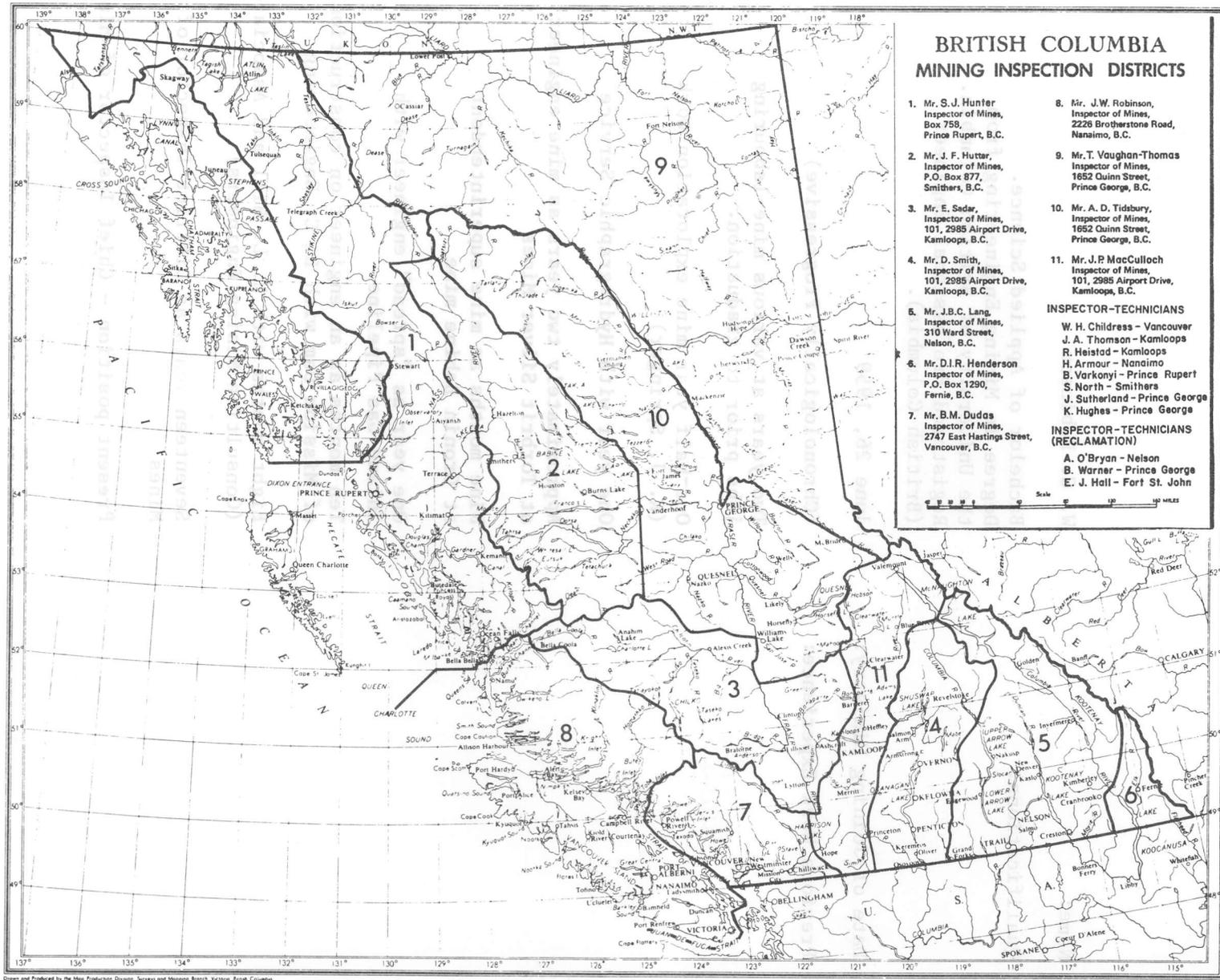
(i) *Mine Visits*

A visit was made to the Eldorado underground uranium mine, near Radium City, Saskatchewan, by Messrs. W. C. Robinson, J. D. McDonald, and S. Elias on June 4 and 5, 1979. On June 6 and 7, 1979, a visit was made by the same group to the surface uranium mining operation of Gulf Minerals at Rabbit Lake, Saskatchewan. Both these visits were made in company with Dr. Gordon Atherley, Director of Occupational Health and Safety for Saskatchewan, and Mr. John Alderman, Chief Inspector of Mines for Saskatchewan. A visit was made by Mr. Robinson to the Whiteshell Nuclear Research Establishment at Pinawa, Manitoba, on September 12, 1979. Talks during this visit included a discussion on disposal of nuclear waste. On September 17 and 18, 1979, a visit to two uranium mines in Washington State, the Sherwood and Midnite mines, is planned by Messrs. Robinson, Richardson, McDonald, and Elias.



## APPENDICES





APPENDIX 1.2. BRITISH COLUMBIA MINING INSPECTION DISTRICTS

APPENDIX 1.3.1

Name: W. C. Robinson

Qualifications: Bachelor of Applied Science.  
Degree in Mining Engineering from  
the University of British Columbia.  
Registered Professional Engineer  
(British Columbia).

Date of Joining Ministry: June 26, 1959

Previous Work Experience: (Chronologically Progressive)

Two years at various mine-labouring  
jobs prior to graduation.

One-half year mine exploration work  
(K. J. Springer)

One year with Hydrographic Service

Approximately two years as mine engineer  
at Torbrit Silver Mines

Nine months as mine superintendent  
at Cronin Babine mine

One year as "spread" engineer with  
Inland Gas Pipeline

Ten months as an engineer on construction  
of Mission Dam with B. C. Engineering

Eight months with H. L. Hill and Associates  
(Consulting Mining Engineers)

Seventeen years as District Inspector of  
Mines

Present position - Chief Inspector of Mines

APPENDIX 1.3.3



WHEN REPLYING PLEASE REFER TO

FILE NO. ....

MINERAL RESOURCES BRANCH  
DEPARTMENT OF MINES AND PETROLEUM RESOURCES

P.O. Box 758,  
Prince Rupert, B.C.  
V8J 3S1.

July 12, 1979.

Mr. W. C. Robinson, P. Eng.,  
Chief Inspector of Mines,  
Ministry of Energy, Mines  
and Petroleum Resources,  
525 Superior Street,  
Victoria, B.C.  
V8V 1T7.

Reference: Your Letter of July 5, 1979 - Work Summaries.

Dear Sir:

SUMMARY Name: Bert Varkonyi  
Industry: Uranium  
Company: Eldorado Nuclear (Sask.)  
Time: 2 Years  
Jobs: Miner  
Surveyor  
Engineer  
Date: Ministry of Mines, July, 1975.

SUMMARY Name: S. J. Hunter  
Industry: Uranium  
Company: Rio Algom, Elliot Lake, Ontario  
Time: 7 Years  
Jobs: Miner  
Lay-out  
Planning  
Chief Engineer  
Superintendent  
Manager  
Company: Rip Van Mines Ltd.  
Time: 3 Years  
Jobs: Uranium Exploration  
Date: Ministry of Mines, June, 1978.

Yours truly,

*S. J. Hunter*  
For: S. J. Hunter, P. Eng.,  
Inspector of Mines and  
Resident Engineer.

SJH/DC



Province of  
British Columbia

Ministry of  
Energy, Mines and  
Petroleum Resources

# MEMORANDUM

To: Mr. W. C. Robinson  
Chief Inspector of Mines

Date: July 10, 1979

Our File:

Work Experience Prior to Joining the Ministry

- 1946 - 1949 - Cominco exploration engineer - Yellowknife, N.W.T.
- 1949 - 1952 - Senior Mine Engineer - H. B. Mine, Salmo.
- 1952 - 1955 - Mine Planning Engineer, also connected with Research and Development, and blasthole drilling.
- 1955 - 1964 - Senior Mine Engineer and Mine Superintendent - H. B. Mine, Salmo.
- 1964 - 1967 - Mine Superintendent - Bluebell Mine, Riondel, B. C.
- 1967 - 1968 - Operating Superintendent - Sullivan Mine, Kimberley.
- 1968 - 1973 - Manager, Con Mine Operations - Yellowknife, N.W.T.
- 1973 - 1975 - Manager, Black Angel Operations - Greenland.
- 1975 - 1978 - Senior Mining Project Engineer - Cominco Ltd., Trail, B. C.
- May 1, 1978 - Joined Ministry of Mines and Petroleum Resources.

A. J. Richardson,  
Deputy Chief Inspector of Mines

S. J. Hunter

1938 - 1948	Miner, Surveyor, Prospector	British Columbia, Yukon
1948 - 1949	Engineer, Miner	Emerald-Jersey mine, Placer Development, B.C. Tungsten-lead-zinc
1949-1951	Miner, Engineer	Pioneer Gold Mines, B.C. Gold
1952	Miner, Engineer	Reeves MacDonald Mine, B. C. Lead-zinc
1953	Engineer	McIntyre Porcupine, Ontario - Quebec Gold
1953 - 1955	Engineer	Geco Mine, Ontario Copper, Zinc, Silver
1955 - 1961	Miner - Engineer - Superintendent - Manager	Rio Algom Mine, Elliot Lake, Ontario Uranium
1961 - 1963	Manager	Canada Tungsten Northwest Territories Tungsten-copper
1963	Superintendent	Diamond Crystal Salt, New Iberia, La. Salt
1963 - 1964	Manager	Peso Silver Mine, Mayo, Yukon Silver, Lead, Zinc
1964 - 1965	Superintendent	Granduc Mine, B. C. Copper
1965 - 1969	Consulting Engineer	Vancouver. Active in Canada, U.S.A., and South America
1970	Mine Manager	Steel Rock Iron Mines, Ontario Iron
1971	Superintendent	Granduc Mine, B.C. Copper
1972 - 1978	Director, B. C. Mining School	Rossland, B. C. Training Miners and Operators
1978 - 1979	Ministry of Energy, Mines and Petroleum Resources Inspector	Prince Rupert, B. C.

APPENDIX 1.3.4



Province of  
British Columbia

Ministry of Energy,  
Mines and  
Petroleum Resources

P.O. Box 877  
Smithers, B.C.  
VOJ 2N0

12 July 1979

File: 13-3

*WJK*

Mr. W. C. Robinson, P. Eng.,  
Chief Inspector of Mines,  
Ministry of Energy, Mines and  
Petroleum Resources,  
525 Superior Street,  
Victoria, B.C. V8V 1T7

Dear Sir:

Subject: RESUME OF WORK EXPERIENCE PRIOR TO JOINING THE MINISTRY  
OF MINES.

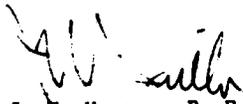
Graduation	-	University of Alberta 1946 - Mining Engineering B.Sc.
2 Years	-	Geological field work in area north of Yellowknife, N.W.T.
3 Years	-	Chief Engineer and acting Manager at Polaris-Taku Mine, Tulsequah, B.C.
2 Years	-	Project Engineer - shaft sinking and ventilation raising at Pioneer Gold Mines.
2 Years	-	Chief Engineer at Reeves MacDonald Mines, Remac, B.C.
3 Years	-	Chief Engineer at East Sullivan Mines, Val D'or, Quebec.
3 Years	-	Chief Engineer and Assistant Manager at Bicroft Mines, Bancroft, Ontario.
4 Years	-	K & H Equipment Limited (Senior partner). Plant installations in Uranium City, Goderich Salt Mine, Mary Kathleen - Australia, Hammersly Iron - Australia, Consolidated Gold Fields - S. Africa.
6 Years	-	Rio-Tinto Zinc Corporation (London). Manager of Engineering at the Peterboro Branch of Ore Sorters Limited, the successor Company to K & H Equipment.

Mr. W. C. Robinson, P. Eng.,  
12 July 1979  
Page 2

2 Years - Chief Engineer, Mine Manager at Bradina Joint  
Venture, Houston, B.C.

August 1973 to Date - B.C. Ministry of Mines.

Yours very truly,

  
- J. F. Hutter, P. Eng.,  
Inspector of Mines and  
Resident Engineer.

JFH/hh

NOTE: On September 10, 1979, James Hutter died. He will be missed by those in the Division who knew him and worked with him.



Province of  
British Columbia

Ministry of  
Mines and  
Petroleum Resources

# MEMORANDUM

To: Mr. W.C. Robinson, P.Eng.,  
From: A.D. Tidsbury

Date: July 26, 1979

RESUME, MINING EXPERIENCE

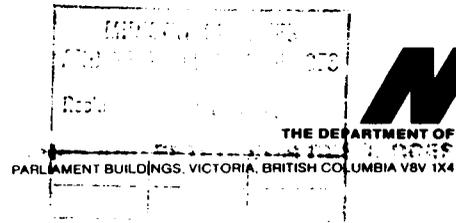
<u>YEAR</u>	<u>COMPANY</u>	<u>REMARKS</u>
1938 - 1941	Cominco	Con Mine, Yellowknife. (Miner and Prospector)
1941 - 1945	R.C.A.F. and R.A.F.	U.K. and Middle East (Radar Technician)
1946 - 1950	U of A, Alberta	B.Sc. in Mining Eng.
1950 - 1952	Cominco	Sullivan Mine, Kimberley (Mining Engineer)
1952 - 1953	Lane Wells Cdn. Co.	Sales Eng. Well logging Services, Radioactive.
1953 - 1957	Self employed	Consulting-Contracting in Alberta, B.C., N.W.T., Yukon, U.S.A., Mexico
1958 - 1961	British American Oil Co.	Edmonton and Calgary (Design & Field Supervision)
1962 - 1969	Self employed	Consulting-Contracting U.S.A., Mexico, Peru, B.C. Yukon
1969 - Present	Gov't. of B.C.	Prince George Office

.....  
A.D. Tidsbury, P. Eng.,  
Inspector of Mines and  
Resident Engineer.  
Prince George, B.C.

ADT:jt

APPENDIX 1.3.6

FROM E. Sadar  
TO W. C. Robinson



DATE Aug. 31, 1979

Resume of Work Experience

Aug.69 - Present	B. C. Ministry of Energy, Mines and Petroleum Resources Inspector & Resident Engineer
1968-69	Alwin Mining Co. Ltd. Chief Mine Engineer
1967-68	International Minerals & Chemicals (Canada) Ltd. Mine Engineer Planning Engineer
1964-67	Cominco Limited Explosives Research Engineer Mine Planning Engineer
1962-64	San Lius Mining Co., Mexico Assistant Mine Superintendent
1960-62	U. S. Gypsum Co.--U.S.A. Mine Engineer Mine Superintendent
1959-60	Howe Sound Co. Special Projects Engineer Shiftboss
1956-59	Cerro de Pasco Corporation--Peru South America Assistant Mine Foreman Mine Foreman Mine Engineer--Copper Precipitation

*E. Sadar*

Ed Sadar

lc

APPENDIX 1.3.7

July 1979

RESUME - David Smith

Coal Miner - McGillivray Creek Coal & Coke, Coleman  
1937 - 1941

War Service - 1941 - 1946

Coal Miner - 1946 4 months  
1947 6 months  
1948 6 months

Hard Rock Miner - Sullivan Mine, Kimberley 1949 6 months

Engineer - Sullivan Mine 1950 - 1951

Engineer - Con Mine, Yellowknife 1952 1 year  
Appointed Mine Superintendent, Pine Point  
and immediately tendered resignation.

Instructor - University of Alberta 1 semester  
Assisted for 8 months in a government  
sponsored study, Concentration of Uranium  
by Cycloning. Ore was brought in from  
Gunnar Gold. E. A. Lilge - Co-author

Engineer and  
Superintendent - Bryan Mountain Coal, Robb, Alberta  
1953 - 1954

Property  
Manager - Heath Steel Mines 1954, 1955, 1956

Engineer and  
Superintendent - Reeves McDonald 1956 - 1957

Mine Inspector - Northern British Columbia 1957 - 1959

Mine Inspector - Southern British Columbia 1959 - 1979

Holder - Coal Mine Surveyers Certificate #21 Alberta  
- First Class (Mine Manager Certificate)  
B. C. #213  
- Uranium Inspector Certificate issued by A.E.C.B.  
- Graduate U. of A. in Metal Mining  
- Certificate in Public Administration - U. of  
Victoria  
- All other certificates pertinent to B. C.  
Mining

*David Smith*  
David Smith, P.Eng.  
Inspector of Mines  
and Resident Engineer



Province of  
British Columbia

Ministry of  
Energy, Mines and  
Petroleum Resources

# MEMORANDUM

To: W. C. Robinson  
Chief Inspector

Date: July 16, 1979

Re: J. P. MacCulloch -  
Work Experience prior to Ministry Employment

- 1952 - 1958 - Chief Engineer for Granby Mining Co.
- 1958 - 1959 - Project Engineer for Hill, Stark & Assoc.
- 1959 - 1962 - Various supervisory for Britannia Mining and Smelting at Britannia Beach
- 1962 - 1964 - Project Supt. - Underground placer operation in Caribou
- 1964 - 1975 - Assistant Manager - Texada Mines Limited
- 1975 - 1977 - Mine Manager and Project Manager for Patrick Harrison & Co. Ltd.
- 1977 - 1978 - Walker on Tunnel job for Canadian Mine Services Ltd.
- July 1978 -  
present - Ministry of Energy, Mines and Petroleum Resources

J. P. MacCulloch, P.Eng.  
Inspector of Mines  
and Resident Engineer

JPM/jw

APPENDIX 1.3.9

GOVERNMENT OF BRITISH COLUMBIA

**MEMORANDUM**

TO W.C. Robinson, P. Eng.  
Chief Inspector of Mines  
Victoria, B.C.

FROM J.B.C. Lang, P. Eng.,  
District Inspector of Mines  
Nelson, B.C. July 24, 1979

SUBJECT .....

OUR FILE .....

YOUR FILE .....

Re: Your Request of July 5, 1979 — Brief Resume

Lang J.B.C.

1942-45 R.C.A.F. Pilot

1945-49 University of Toronto — Mining Engineering Intersemester work — Miner at Falconbridge Ont. and Sigma Mines P.Q.

1949-51 Central Patricia Gold Mines Ltd. - Ont. Shift Boss — Mine Engineer.

1951-65 United Keno Hill Mines ltd., Yukon:  
Mine Captain - 2yrs  
Chief Engineer 1yr  
Mine Supt. 4yrs 10 properties operating.  
Prod. Manager 7yrs

1965-1968 Pickle Crow Gold Mines Ltd. (Teck Corpn) Mine Manager.

1968-71 Western Mines Ltd. (Buttle Lake) Mine Manager.

1971-74 Private Consulting Practice Vancouver, B.C. and U.S.A.

Dec. 1974 Joined M.E.M.P.R. - Inspection Branch at Nelson, B.C.

Respectfully Submitted

  
J.B.C. Lang, P. Eng.,  
District Inspector of Mines  
and Resident Engineer.

JBCL/jb



Province of  
British Columbia

Ministry of  
Mines and  
Petroleum Resources

# MEMORANDUM

To: Mr. W. C. Robinson, P.Eng.

AND PETROLEUM RESOURCES

Rec'd AUG 14 1979 Date: August 10th, 1979

*D.I.R.*

Subject: Resume of work experience - Your letter of July 5th, 1979

Enclosed, as requested, is a resume of my work experience prior to commencing employment with the Ministry in August 1971.

A handwritten signature in cursive script, appearing to read "D. I. R. Henderson".

D. I. R. Henderson, P. Eng.  
Inspector of Mines and Resident Engineer  
Fernie, B. C.

DIRH:hm

enc.

RESUME - D. I. R. HENDERSON

1955 - 1961	National Coal Board N & C Division	Basic and face training. Employed in various positions as underground haulage worker and faceman.
1961 - 1965	National Coal Board N & C and East Midlands Divisions	Colliery Ventilation Officer.
1965 - 1968	National Coal Board South Notts. Area	Assistant Area Ventilation Engineer.
1968 - 1971	International Nickel Co. of Canada Limited, Sudbury, Ontario	Area Ventilation and Fire Control Engineer.

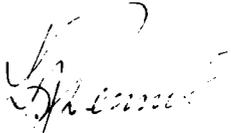
Qualifications

Professional Engineer - Ontario and B. C.  
Chartered Engineer (U. K.)  
Fellow of the Institution of Mining Engineers (U. K.)  
First Class Certificate of Competency (U. K. and B. C.)  
Member C. I. M.  
Surface and Underground Mine Rescue Certificates  
St. Johns Ambulance Standard First Aid Certificate

APPENDIX 1.3.11

- 1942 - 53 6 years - Workman and part time student at Coal Mines in Staffordshire, England, followed by 3 years study at Durham University, England to obtain a Degree of Bachelor of Science in Applied Science (Mining).  
1 year - Junior official (Deputy) at Stafford Colliery, Staffordshire, England - Up to 45 persons under my direct control.
- 1953 - 54 1½ years - Assistant Undermanager at Hem Heath Colliery, Staffordshire, England - Up to 100 persons under my direct control.
- 1954 - 56 1½ years - Undermanager at Fenton Colliery, Staffordshire, England. Up to 450 persons under my direct control.
- 1956 - 60 4½ years - Manager of Mossfield Colliery, Staffordshire, England - Up to 950 persons under my direct control.
- 1960 - 64 3 ¾ years - H. M. Inspector of Mines and Quarries, South Nottinghamshire and South Lincolnshire District, England.
- 1964 - 71 6½ years - H. M. District Inspector of Mines and Quarries (Special Duties), South Western Division, Great Britain.
- 1971 - 78 7 years - H. M. District Inspector of Mines and Quarries, West Midlands and North Western District, Great Britain.

Joined the Ministry of Energy, Mines and Petroleum Resources as Senior Coal Mines Inspector in August, 1978.

  
H. J. Dennis  
July 11, 1979

APPENDIX 1.3.12



Province of  
British Columbia

Ministry of  
Mines and  
Petroleum Resources

MEMORANDUM

To: Mr. W.C. Robinson, P. Eng.,  
Chief Inspector of Mines  
Ministry of Energy, Mines & Petroleum Resources  
525 Superior Street  
Victoria, B.C.

Date: July 16, 1979

WORK EXPERIENCE

The following is the information which was asked for in your memo received on the 10th July, 1979.

QUALIFICATIONS:

M.Sc. (B.Sc. (Hons.) F.I. Min.E  
C. Eng. Dip. Met Min.  
First Class Certificate of Competency

EXPERIENCE:

Lower Management position in British Coal Mines	1 Year
Post Graduate Study - U.S.A.	2 Years
Undermanager	1 Year
Strata Control Engineer	1 Year
Senior Work Study Engineer (Industrial Engineering)	1 3/4 years
Manager, then Mining-Engineer in charge of large Coal Mines development and reconstruction	5 Years
Area Reconstruction & Planning Engineer responsible for planning and progress control of reconstruction of 14 collieries in S. Wales:	2 Years
H.M. Inspector of Mines & Quarries	11 1/4 Years
Senior Consultant Mining Engineer i/c Phosphate Exploration and Phosphate Mine Development - Pakistan	1 1/2 Years
Senior Coal Mine Engineer responsible for reorganising present mining system, and planning deep mine development of largest coal mine in South Korea	1 Year
August 29, 1979 - Commenced in Ministry of Energy, Mines and Petroleum Resources, British Columbia	

*T. Vaughan-Thomas*  
.....  
T. Vaughan-Thomas  
Inspector of Mines & Resident  
Engineer.

TVT:jt

APPENDIX 1.3.13

GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

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

FROM Verna Pyplacz, M. Sc. *NP*  
Inspector of Mines  
..... Audiologist.....  
..... Environmental Control  
..... July 24..... 19..... 79

SUBJECT..... BRIEF RESUME.....

OUR FILE.....

YOUR FILE.....

As per your request in memorandum dated July 5, 1979 for a brief resume of my work experience prior to joining our Ministry.

Previous Employment:

-2 1/2 years as an Audiologist with the Workers' Compensation Board of British Columbia.

-joined this Ministry January 1979.

*Verna Pyplacz*

APPENDIX 1.3.14



Province of  
British Columbia

Ministry of  
Energy, Mines and  
Petroleum Resources

Suite 103  
Second Floor  
2747 East Hastings Street  
Vancouver  
British Columbia  
V5K 1Z8

WHEN REPLYING PLEASE REFER TO

FILE No. ....

July 23, 1979

Mr. W. C. Robinson, P. Eng.  
Chief Inspector of Mines  
Ministry of Energy, Mines  
and Petroleum Resources  
525 Superior Street  
Victoria, B.C. V8V 1T7

*WR*

Dear Mr. Robinson:

RE: BRIEF WORK SUMMARY AS REQUESTED

Graduated with a BaApSc in Mineral Engineering from U.B.C. in 1973, obtained my P. Eng. in 1976.

After graduation I spent 6 months with Mascot Mines and Petroleum Ltd. as mine engineer on their evaluation of Greyhound Mine Ltd.

I then spent 4 years at Dankoe Mines Ltd.; 2 years as mine engineer and 2 years as mine superintendent.

I started with the Inspection Branch in April 1978.

Yours truly,

*S. J. L. Miller*  
S.J.L. Miller, P. Eng.  
Inspector  
Environmental Control

SJLM:bl

APPENDIX 1.3.15

D. J. MURRAY  
RESUME OF WORK EXPERIENCE

AND PETROLEUM RESOURCES		
Recd AUG 13 1979		

- B.A.Sc., Mining Engineering, University of Toronto, 1963.  
Member Association Professional Engineers of British Columbia.  
Started with B. C. Ministry of Mines July 11, 1977.
- 5½ years - Texasgulf Canada Limited, P. O. Box 2002, Timmins, Ontario, P4N 7K1.  
Project Engineer - Long-hole drill layouts, backfill project, ventilation calculations and measurements, supervision of surface construction, industrial engineering, grade control in Open Pit. Environmental section, underground ventilation, waste water treatment on surface, water supply for mines.
- 2 years - International Nickel Company of Canada, Copper Cliff, Ontario. Assistant Layout Engineer. Long-hole drill layouts and planning. Scheduling long-hole drilling. Rockhouse sample calculations. Cost analysis.
- 3 years - Self employed. Consulting geology. Supervising diamond drill programs. Logging drill core. Prospecting, geological mapping, geophysics including magnetometer, electro-magnetometer and self potential surveys, soil sampling, trenching and pitting. Staking claims and supervising staking crews. Writing reports on mining properties. Work was in Ontario, Quebec, New Brunswick, British Columbia and the Northwest Territories.
- 9 months - International Nickel Company of Canada, Copper Cliff, Ontario. Assistant Layout Engineer. Flood control underground, long-hole drill layouts, scheduling and supervising long-hole drilling underground.
- 1½ years - Roan Selection Trust, Luanshya, Zambia. Learner Mine Official (13 months), Assistant Mining Engineer (5 months). Timbering, raise mining and stoping. Monthly reports, safety reports and cost analysis for each section of the mine.
- 4 months - Canadian Nickel Company, Copper Cliff, Ontario. Party leader in the Contwoyto Lake area of the Northwest Territories, geological mapping, sampling and check magnetometer work over the airborne mag. anomalies.
- 4 months - Sherritt Gordon Mines, Lynn Lake, Manitoba. Underground mining.
- 5 months - Falconbridge Nickel Mines, Falconbridge, Ontario. Underground mining.

## APPENDIX 1.3.16

### SAMUEL ELIAS, P. Eng.

Education: British Columbia Professional Engineer 1974  
Elliot Lake Centre - Uranium Mine Inspectors Training Course  
McGill University - Environmental Control Course  
Michigan State University - Industrial Ventilation Course  
Witwatersrand College - Mine Ventilation Correspondence Course  
Provincial Institute of Mining - Mining Technologist Course

### Experience:

Feb. 1, 1968 to date - Senior Inspector Environmental Control  
B. C. Ministry of Energy, Mines and  
Petroleum Resources

Apr. 1963 - Feb. 1968 - Inspector Environmental Control  
B. C. Ministry of Energy, Mines and  
Petroleum Resources

Sept. 1952 - Apr. 1963 - Inspector Silicosis Control Dept.  
Workers' Compensation Board

June 1949 - Sept. 1952 - Sullivan Mine Cominco Ltd. as:-  
Planning Engineer - development and mine  
layouts  
Section Engineer - directing underground  
engineering work  
Blast Hole Layout - drilling and blasting  
large tonnages  
Ventilation and Testing - underground venti-  
lation and gas control  
Surveyor - surveying bench mark stations  
Surveyor's Helper

May 1946 - Sept. 1947 - Con Mine Cominco Ltd.  
Geological Mapping  
Mill Operator

Sept. 1945 - May 1946 - Trail Smelter Cominco Ltd.  
Smoke Tester

May 1943 - Sept. 1945 - Royal Canadian Air Force A.E.M.

Jan. 1943 - May 1943 - Trail Smelter Cominco Ltd.  
Smoke Tester

Dec. 1940 - Jan. 1943 - Con Mine Cominco Ltd.  
Assayer

Sept. 1939 - Dec. 1940 - North Star Coal Mine, Saskatchewan  
Miner and Mucker

## APPENDIX 1.3.17

Name: T. G. Carter

Qualifications: Honours Degree (Mechanical Engineering),  
Registered Professional Engineer (British  
Columbia and Ontario)  
Chartered Engineer (United Kingdom)  
Member, Institute of Mechanical Engineers  
(United Kingdom)

Date of Joining Ministry: September 1978

Previous Work Experience: (Chronologically Progressive)

Nine years with National Coal Board (U.K.) in a variety of positions from underground miner to supervisory positions in both maintenance and design engineering at coal mines and plants.

Three years with the Research Dept. of the General Post Office (U.K.) as an executive engineer; involved mainly with the design and development of hardware used in telecommunication systems.

Five and a half years with Inco (Ontario) in supervisory maintenance positions at hardrock mines and plants; the final three years as superintendent.

Three and a half years in Consulting Engineering (Ontario) supervising mining projects or projects involving heavy materials handling systems.

## APPENDIX 1.3.18

TO: W. C. Robinson

FROM: J. Cartwright

DATE: July 6, 1979

5 years	Electrical Engineering Apprentice, General Electric Co., England
3 years	Electrical Engineering Trainee, National Coal Board, England
1 year	High Voltage Development Engineer, General Electric Co., England
3 years	Senior Engineer, Electrical Contracts, English Electric Co. Ltd. Nuclear Power Consortium, England
1 year	Engineer Electrical Systems, H.A. Simons International Ltd., Vancouver
1 year	Electrical Project Engineer, M.A. Thomas & Associates, Electrical Consultants, Vancouver
1 year	Senior Electrical Project Engineer, T. Ingledow & Associates, Vancouver
3 years	Senior Electrical Project Engineer (Kaiser Resources Ltd.) Phillip Barratt Hillier & Jones, Vancouver
8 years (1971)	Electrical Inspector of Mines, Inspection & Engineering Division Ministry of Energy, Mines & Petroleum Resources

## APPENDIX 1.3.19

RESUME - John D. McDonald, P.Eng., Senior Inspector of Mines Reclamation  
Inspection and Engineering Division

- 1941 - 1945 Royal Canadian Navy
- 1946 - 1951 University of Alberta  
B.Sc. Mining Engineering
- 1951 - 1952 Cominco - Pine Point Mines  
Con Mine - Exploration
- 1952 - 1959 Cominco - Bluebell Mine  
Surveying - Shift Boss - Design Contract - Ventilation -  
Grouting - Planning  
Engineer  
Cominco - Sullivan Mine
- 1959 - 1963 Department of Mines and Petroleum Resources - Nelson, B. C.  
Inspector and Resident Engineer
- 1963 - 1968 Mining Association of B. C.  
Director of Safety Division
- 1968 - 1973 President and Partner - Canadian Guncrete & Grouting Ltd.  
President and Partner - Canadian Gun Mining Ltd.  
- Companies contracted work in shotcreting, guniting, grouting,  
slope stability rock bolting, underwater repairs and instal-  
lation. Fields included mining, construction, highways.  
Consulting Mining Engineer on a minor basis
- 1973 - 1979 Ministry of Energy, Mines and Petroleum Resources.  
Senior Inspector of Mines - Reclamation

J. D. McDonald, P.Eng.,

## APPENDIX 1.3.20

D.M. Galbraith, P.Eng.

### DEGREES:

B.Sc. in Civil Engineering, University of Saskatchewan, 1956.

### EXPERIENCE AS SALARIED EMPLOYEE (1957-1970):

1957 to 1960: Junior engineer with a Vancouver consulting firm designing and supervising construction of road works.

1961 to 1970: Provincial engineer for Fish and Wildlife Branch, Government of B. C.

### EXPERIENCE AS CONSULTANT (1971-1975):

Undertook studies and took part in project reviews for thirty projects in Western Canada, to determine environmental impact in resource development. (List attached).

### EXPERIENCE WITH MINISTRY OF E. M. P. R. (1975-1979):

Reclamation Inspector, Inspection Branch, Victoria, B. C. Review of projects and environmental protection in Sand & Gravel, Placer, Quarry, Mineral & Coal; both exploration and production.

### PUBLISHED ARTICLES:

Third Man Theme: A discussion of the role played by the environmental (specifically fisheries) engineer in problem-solving, with reference to other disciplines. B. C. Professional Engineer's Magazine, April 1973. Winner of Editorial Award 1973.

### MEMBERSHIPS:

Association of Professional Engineers of British Columbia.  
Chairman, Victoria Branch, 1977.

Canadian Land Reclamation Association.

Canadian Institute of Mining & Metallurgy.

Canadian Society of Civil Engineers.

### OTHER:

Convenor 1977 B. C. Mine Reclamation Symposium.

Chairman 1978 Technical and Research Committee on Reclamation.

Banff School of Environment - October 1977.

## APPENDIX 1.3.21

### RESUME OF EDUCATION AND EXPERIENCE

#### PERSONAL

FULL NAME: John Charles Errington  
HOME ADDRESS: 975 Ambassador Avenue  
Victoria, B.C. V8X 3N3  
PHONE: 479-0276  
BUSINESS ADDRESS: Ministry of Energy, Mines  
and Petroleum Resources  
1837 Fort Street  
Victoria, B.C. V8R 1J6  
PHONE: 387-3630 (3179)  
MARITAL STATUS: Married  
AGE: 33  
HEIGHT: 5' 8"  
WEIGHT: 165 lb.  
HEALTH: Good

#### EDUCATION

Ph.D. Faculty of Forestry, University of British Columbia. 1975.

Thesis Title: Natural Revegetation of Disturbed Sites in British  
Columbia.

Abstract: See attached sheet.

Courses: Forest Land Classification  
Multiple Regression Methods  
Photo Interpretation of Forest Lands  
General Forestry Seminar  
Seminar in Management of Forest Resources  
Soil Classification  
Methods of Soil Analysis  
Advance Plant Autecology  
Advance Plant Synecology

M. Phil. Biology Department, University of York, England. 1970.

Thesis Title: A Study of Factors Determining the  
Pattern of Woodland Bryophytes.

B.Sc. Botany/Biology, University of Victoria, B.C. 1967.

#### EMPLOYMENT

April 1977 to present. Inspector, Mine Reclamation, Ministry of  
Energy, Mines and Petroleum Resources.

At present I am employed with the Ministry of Energy, Mines and Petroleum Resources. My duties are concerned with inspection of areas disturbed by mining and exploration. My duties have included:

- Summer field programs involving inspection and inventory of species growing on selected portions of minesites. design and implementation of reclamation trials in the alpine and subalpine regions in the Peace River Coal field.
- organization of the Annual Mine Reclamation Symposium during 1978 and 1979.
- edited the "Handbook of Environmental Protection and Reclamation in Coal Exploration".

During 1978 I was also involved in a government funded program to revegetate pre-legislation mine wastes materials. Projects undertaken were:

- Princeton tailings - irrigation program with sewage effluent on the old Granby tailings ponds.
- Phoenix tailings - seeding and fertilizing and drainage control.
- Salmo tailings - seeding and fertilizing.
- Hedley tailings - seeding and fertilizing.

April 1974 to April 1977. Research Officer at B.C. Research

At B.C. Research I was a member of a team of biologists conducting environmental impact studies. I was responsible for the terrestrial components, including soil and vegetation mapping and descriptions and reclamation

feasibility studies. During the three years at B.C. Research I was directly involved with the following projects:

- Terrestrial studies in the Eastern Arctic at two mine sites.
- Terrestrial studies of three coal mine projects in the East Kootenays.
- Terrestrial studies of four coal mine projects in Northern B.C.
- Preliminary reclamation feasibility of open pit coal mining at Hat Creek.
- Reclamation study of a B.C. Hydro transmission line right-of-way.
- Mapping of sensitivity zones in a coal exploration area in the East Kootenays.

September 1973 to January 1974. Plant Ecologist at F.F. Slaney & Co. Ltd.

My experience included conducting vegetation, soil and reclamation studies for a preliminary environmental assessment at Manalta Coal in Alberta. I also assessed the impact of potential sulphur dioxide emissions on vegetation in the Mackenzie Delta. In January, 1974 I attended the University of British Columbia in order to complete my Ph.D. studies.

## APPENDIX 1.3.22

### P. E. Olson - Approximate Work Record

1944-49 Misc. jobs as miner, shiftboss, minor engineering jobs, etc.  
in many mines in B.C. - Copper Mtn., Bralorne, CGQ, Highland Bell

1949-50 Mine Engineer - South America

1950-54 Copper Mountain - Exploration Engineer, shiftboss, stope engineer, etc.

1954-59 Yale lead and Zinc - Mine Manager

1959-62 Ireland - Mine Supt. - Copper Mine

1963 Ministry of Energy, Mines & Petroleum Resources

APPENDIX 1.3.23. SUMMARY OF WORK EXPERIENCE – DIVISIONAL STAFF

	<u>Ministry Experience</u>	<u>Work-related Experience</u>
W. C. Robinson	20	9
A. J. Richardson	1	31
D. Smith	22	8
A. D. Tidsbury	10	19
J.B.C. Lang	5	25
J. P. MacCulloch	1	26
J. F. Hutter	6	27
S. J. Hunter	1	31
E. Sadar	10	13
B. M. Dudas	10	18
J. W. Robinson	10	22
 <u>Coal</u>		
H. J. Dennis	1	25
T. Vaughan-Thomas	1	27
D.I.R. Henderson	8	10
V. E. Dawson	13	22
 <u>Special Services</u>		
T. G. Carter	1	21
J. Cartwright	8	18
P. E. Olson	16	19
V. Pyplacz	1	3
S.J.L. Miller	2	5
D. J. Murray	2	14
S. Elias	17	13

Reclamation

J. D. Errington	2		4	
D. M. Galbraith	4		19	
J. D. McDonald	10		18	
	<hr/>		<hr/>	
Total: 25	82	3.3 years	447	17.9 years

APPENDIX 4.1.1

# **GUIDELINES FOR COAL AND MINERAL EXPLORATION**



# **GUIDELINES FOR COAL AND MINERAL EXPLORATION**

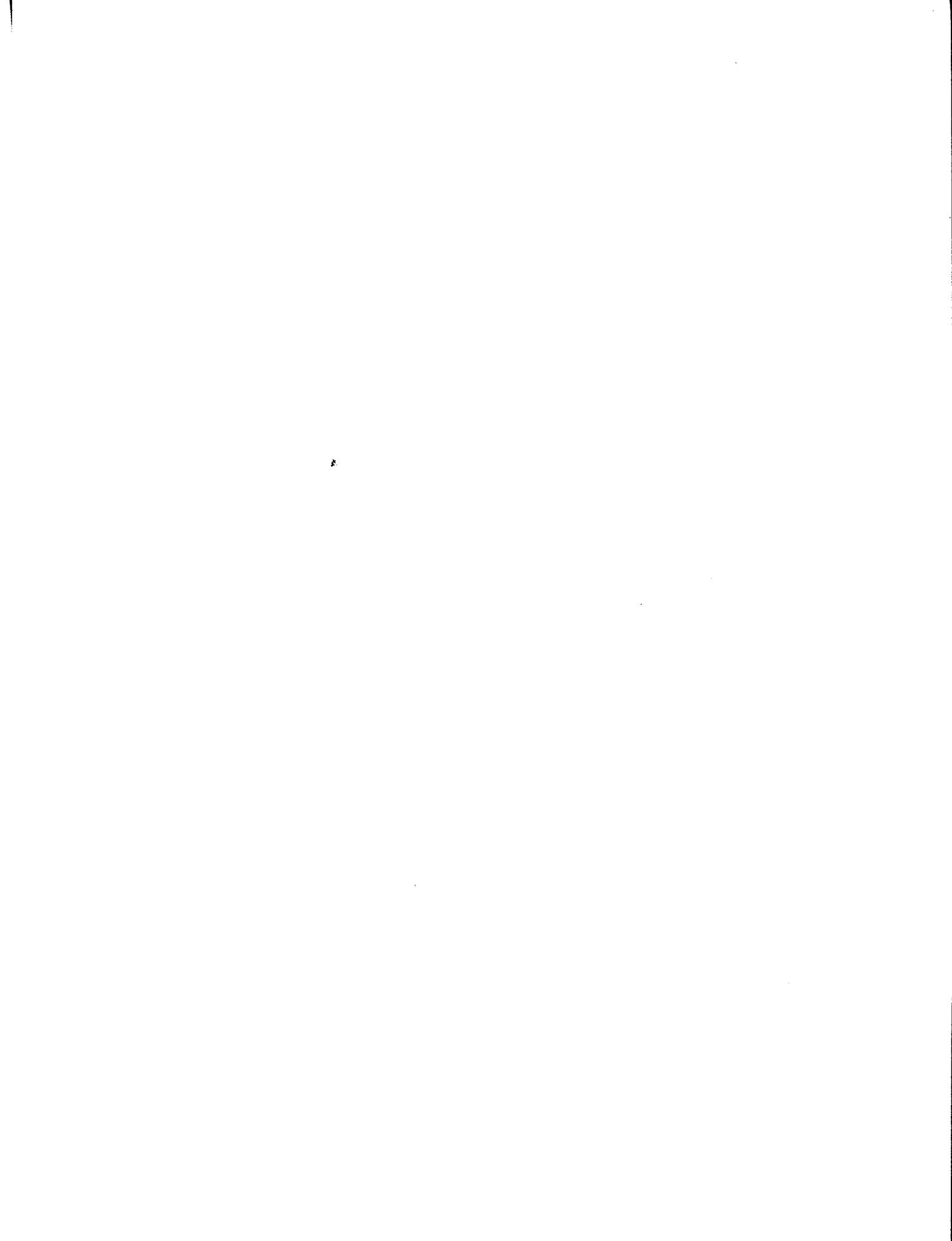
INSPECTION AND ENGINEERING DIVISION  
VICTORIA, BRITISH COLUMBIA  
CANADA

February 1977

First Printing, February 1977 .....	2000 copies
Second Printing, April 1977 .....	2000 copies
Third Printing, June 1978 .....	1000 copies

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The Guidelines for Coal and Mineral Exploration were written with the object of assisting individuals and companies who are engaged in coal and mineral exploration in British Columbia to carry out their work with due regard for the Province's other resources. Emphasis is placed on the need to provide planning time and budget sufficient to safeguard the landscape, biological resources, and other uses in project development.

The first set of Reclamation Guidelines were written in 1973 to cover coal and mineral exploration done under the Surface Work Permit system. Reclamation approval within the system itself has only been in operation since 1972 (for coal) and 1973 (for minerals). The 1977 edition is designed to provide better co-ordination in the statement of government agency requirements to industry, and to provide practical advice on methods of achieving environmental protection.

It is not possible or desirable to write detailed regulations within which industry must totally work considering the complexities of the exploration field and the many natural resources of the Province. It is essential however to the minimizing of disturbance that industry maintain a significant level of effort to achieve environmental control, and the most important aspect here is the assignment of reclamation management to capable staff. On larger projects this of course is a full-time job. Some general guidelines can be written to convey concepts of good practice and to help explain legislation and the administrative procedure.

Some specific activities which could occur during exploration are prohibited by legislation, such as the placing of debris in fish streams (*Fisheries Act*); some are not allowed except with special permission of the Inspection Staff (the establishment of gridlines by bulldozer, the hydraulic removal of overburden, and in the case of coal exploration the use of bulldozers for trenching); and others are advised against, such as the locating of roads on southwest grassy slopes.



## SECTION II

# LEGISLATION AND THE PERMIT SYSTEM

Authority for regulation of the industry is vested in the Ministry of Mines and Petroleum Resources by the *Mines Regulation Act* and the *Coal Mines Regulation Act*. Sections 10 and 11 of the former and 7 and 8 of the latter pertain to environmental control and reclamation (see Appendices I and II).

Section 10 of the *Mines Regulation Act* requires that the (Chief) Inspector of the Ministry of Mines and Petroleum Resources be notified prior to the commencement of work on or about a mine and again prior to completion of the work. Section 11 requires that a program for the protection and reclamation of the surface of the land and watercourses affected thereby be submitted, and must receive the approval of the Minister of Mines and Petroleum Resources. Approval for the program is required also from the Ministers of Forests, Environment, Recreation and Travel Industry, and Agriculture, insofar as their responsibilities are affected. The Chief Inspector of the Ministry of Mines and Petroleum Resources may approve mineral exploration programs and issue permits on behalf of the Minister, as stated in subsection 18 of the *Mines Regulation Act*.

Pursuant to sections 10 and 11 of the *Mines Regulation Act* a 'Notice of Work on a Mineral Property' form and a 'Programme for Protection and Reclamation'\* have been drawn up to reduce paper work, establish better communications with other Government departments, and expedite approvals. A sample of these forms are included in Appendix III.

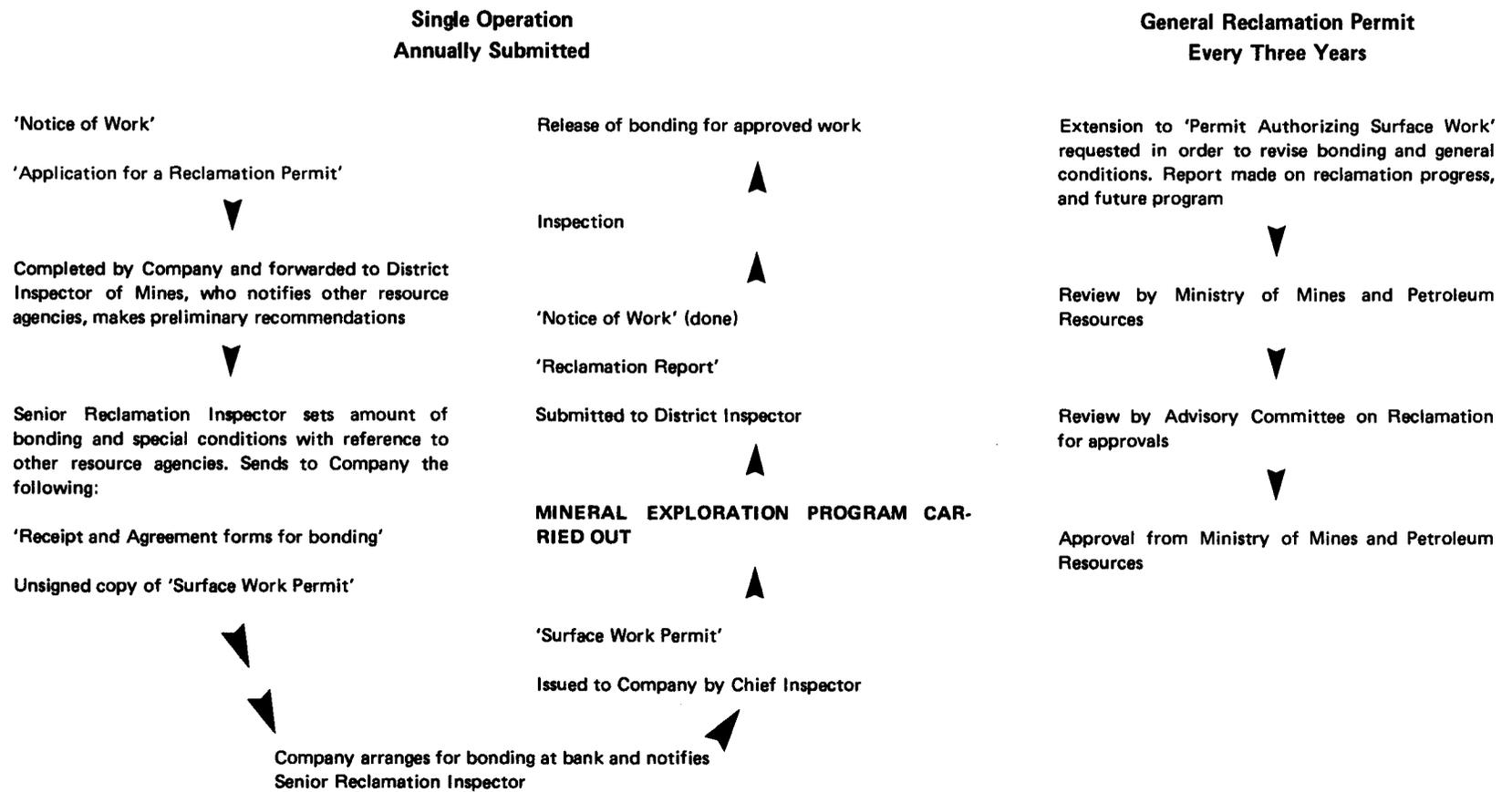
The 'Notice of Work' is completed by all companies or individuals carrying out exploration work. It describes the nature and extent of the work and earth disturbance. The Chief Inspector may therefore determine if reclamation bonding is required and also the size of the disturbed area upon which it is to be based. Where the use of mechanical equipment is involved which will cause significant disturbance the form entitled 'Programme for Protection and Reclamation' is completed. This need not be done when only the following work is proposed: linecutting, geological mapping, limited hand test pitting, geochemical surveying, and geophysical surveying.

The operator is required to contact the Forest Service for the proper completion of Notice of Work as noted in the sample form in Appendix III. The District Inspector of Mines will contact the resource agencies noted above on behalf of the Chief Inspector, where the form is required.

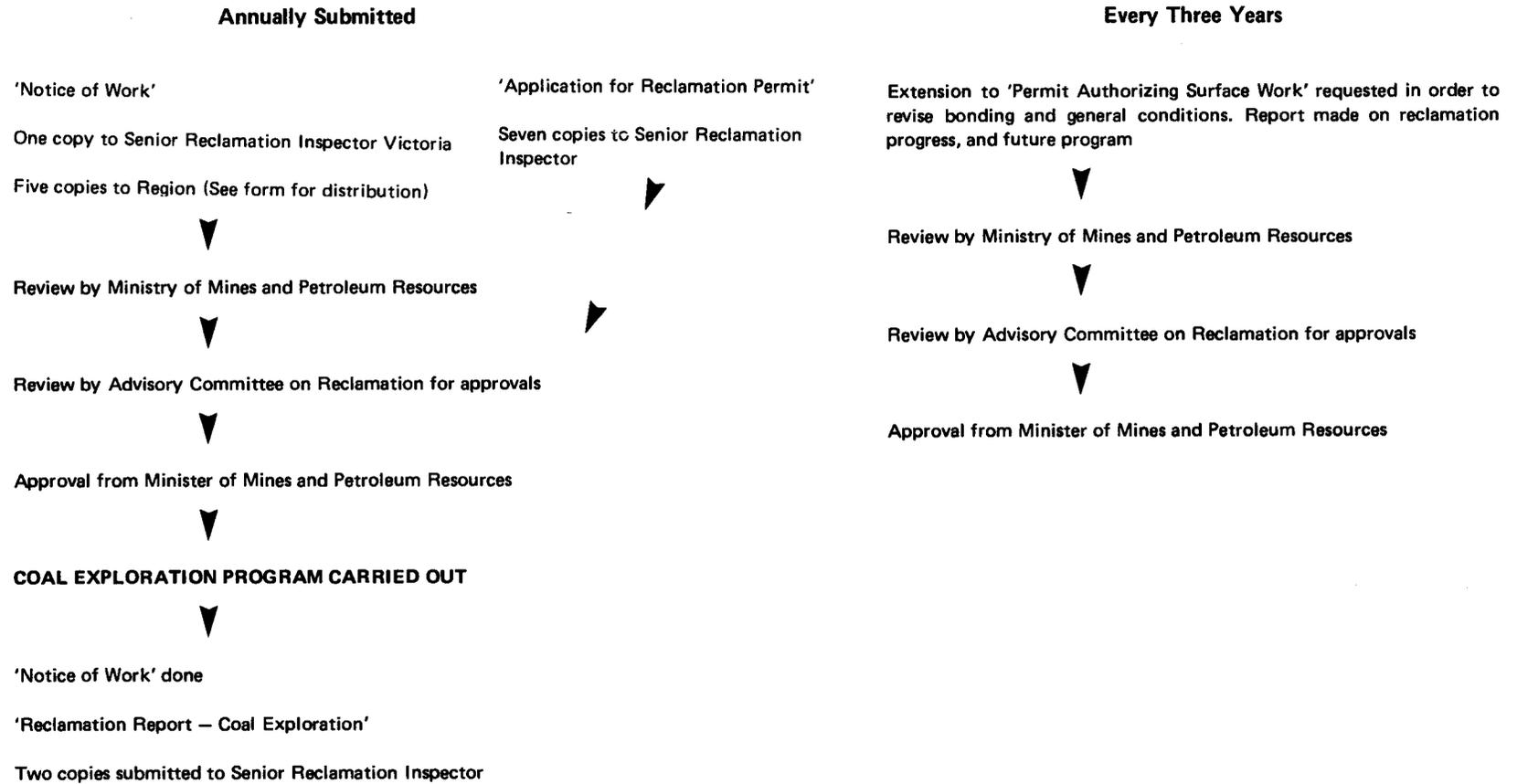
'General Exploration Reclamation Permits' can be issued, upon application by letter to the Chief Inspector of Mines, to those companies which maintain a number of projects in the Province of British Columbia. This permit is issued for a 3-year period and covers all of the company's projects, thereby greatly simplifying the bonding procedure. The company is still required to submit Form 10-11 for each exploration project.

\*To be available in 1978. Presently called 'Application for a Reclamation Permit.'

**FIGURE 1. FLOW CHART – MINERAL EXPLORATION APPROVAL**



**FIGURE 2. FLOW CHART – COAL EXPLORATION**



Permit procedure in coal exploration is similar to that for mineral exploration except that there is no specific provision in the legislation for the Chief Inspector to approve programs on behalf of the Minister. A 'Notice of Work on a Coal Licence' must be submitted prior to the actual starting of field work and preferably at least one month in advance, in any calendar year, and again within one month of completion of work. As noted in section 8(2)(a), of the Act '...where the employment of mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching...' a 'Programme for Protection and Reclamation'\* must also be submitted. Distribution of these forms is noted thereon (see Appendix V).

Companies which are engaged in either coal or mineral exploration submit a 'Reclamation Report' which describes reclamation work which has been completed for the calendar year. In the case of coal exploration this is submitted to the Senior Reclamation Inspector in Victoria, and in the case of mineral exploration it is submitted to the District Inspector of Mines. Sample 'Reclamation Report' forms are included in Appendix VI.

A flow chart illustrating the approval process is included in Figures 1 and 2.

With respect to performance bonding for reclamation work, securities are requested to be deposited with the Minister of Finance in an amount not exceeding \$1,000.00 for each acre of land used, and these are returned upon satisfactory completion of the reclamation program. Three factors enter into consideration in determining the total size of the reclamation bond: the amount of land disturbed; ease of reclamation; and the companies past performance. The advantages to a company maintaining a progressive program are obvious.

The bureaucratic procedure involved in the developer obtaining legal right for exploration which includes prospecting, staking of claim, registration of same with the District Mining Recorder, payment of the necessary fees initially and annually, and the undertaking of work each and every year on the claim(s) to maintain title in good standing, is not detailed in these guidelines. This has been omitted in order to concentrate the included work on the reclamation and environmental aspects.

## SECTION III

# PRINCIPLES IN PLANNING PROTECTIVE MEASURES AND RECLAMATION

It was noted previously that the variability which is present in both individual exploration operations, and land and water resources make it impossible to write guidelines which can be followed universally. Three principles, however, do apply in all cases, and these are: that sensitive areas should be identified and avoided to the maximum extent possible; that protective measures must be engineered; and that surface work should be reclaimed as rapidly as possible.

Putting these principles into practice requires more time, larger budgets, and closer supervision of construction equipment than would otherwise be the case, and on larger projects the extra work load requires the services of an environmental-reclamation manager.

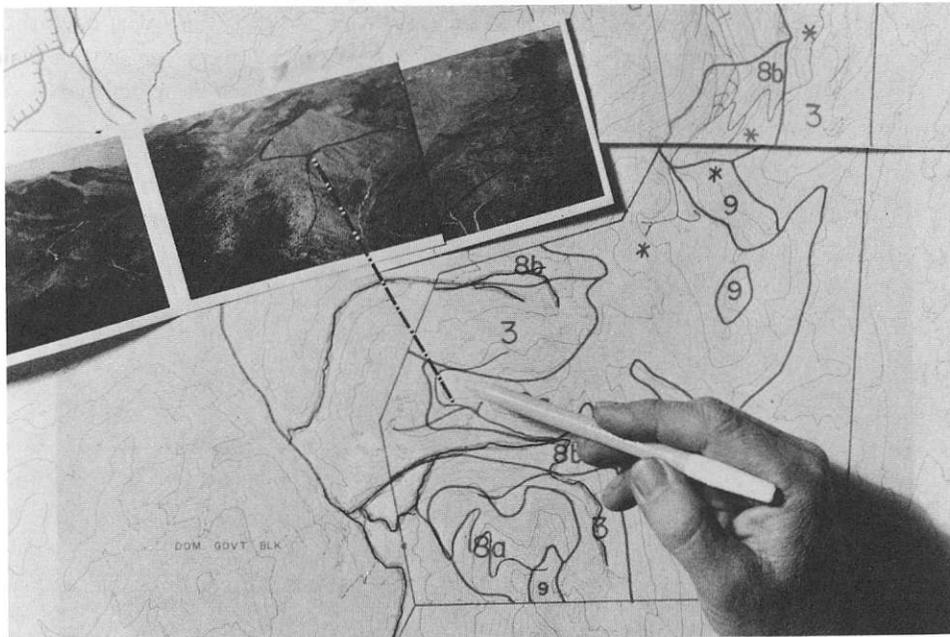


FIGURE 3

Advance planning of exploration activities enables sensitive areas to be avoided and, where this is not possible, minimizes the disturbance which does occur. Cost effectiveness of reclamation work is improved and possibly also the cost effectiveness of exploration. On large projects retention of environmental and reclamation staff permanently or by contract is desirable, as is also an advance discussion with appropriate resource and environmental agencies.



A section of stream which is highly productive of fish and aquatic life. Those portions of permanent watercourses, which are of clear quality when not in freshet and which produce bars of pea to baseball size gravel, provide spawning habitat for trout and other fish. These areas are often unique, are generally about 1 per cent gradient, and may be used by fish which migrate from streams and lakes many miles distant. It is therefore important that access by fish to these sections not be limited by culverting, and that erosion from areas of disturbed earth be excluded from reaching watercourses.



A southwest grassy slope which provides browse for sheep, elk, deer, and other wildlife. These slopes are free of snow early in the spring and constitute valuable wildlife habitat. Access to or through these areas should be minimized, as should earth disturbance. Their steep gradient and lack of tree cover make re-vegetation difficult and erosion can be generated which degrades downstream water quality.

FIGURE 4

## **AVOID SENSITIVE AREAS**

Sensitive areas to be avoided if at all possible include: southwest-facing grassy slopes which are utilized for winter range by goats, sheep, elk, and other ungulates; steep slopes on fine-grained soils particularly if these are saturated and overlie stream courses; and scenic slopes open to view for long distances (Figs. 3 and 4). As a general example the northern sides of mountains are less sensitive than are southern aspects, making them more attractive for access. They are more heavily treed than are the southern, making them generally less valuable to wildlife, and more capable of holding roadways without erosion. Timing of work is also important. Undertaking earth work prior to break-up, during winter, or in the rainy season magnifies sloughing of slopes, degradation of water quality, and coverage of wildlife browse. The use of helicopters and tracked vehicles can also be considered to reduce the total scope of disturbance.

## **ENGINEERING PROTECTIVE MEASURES**

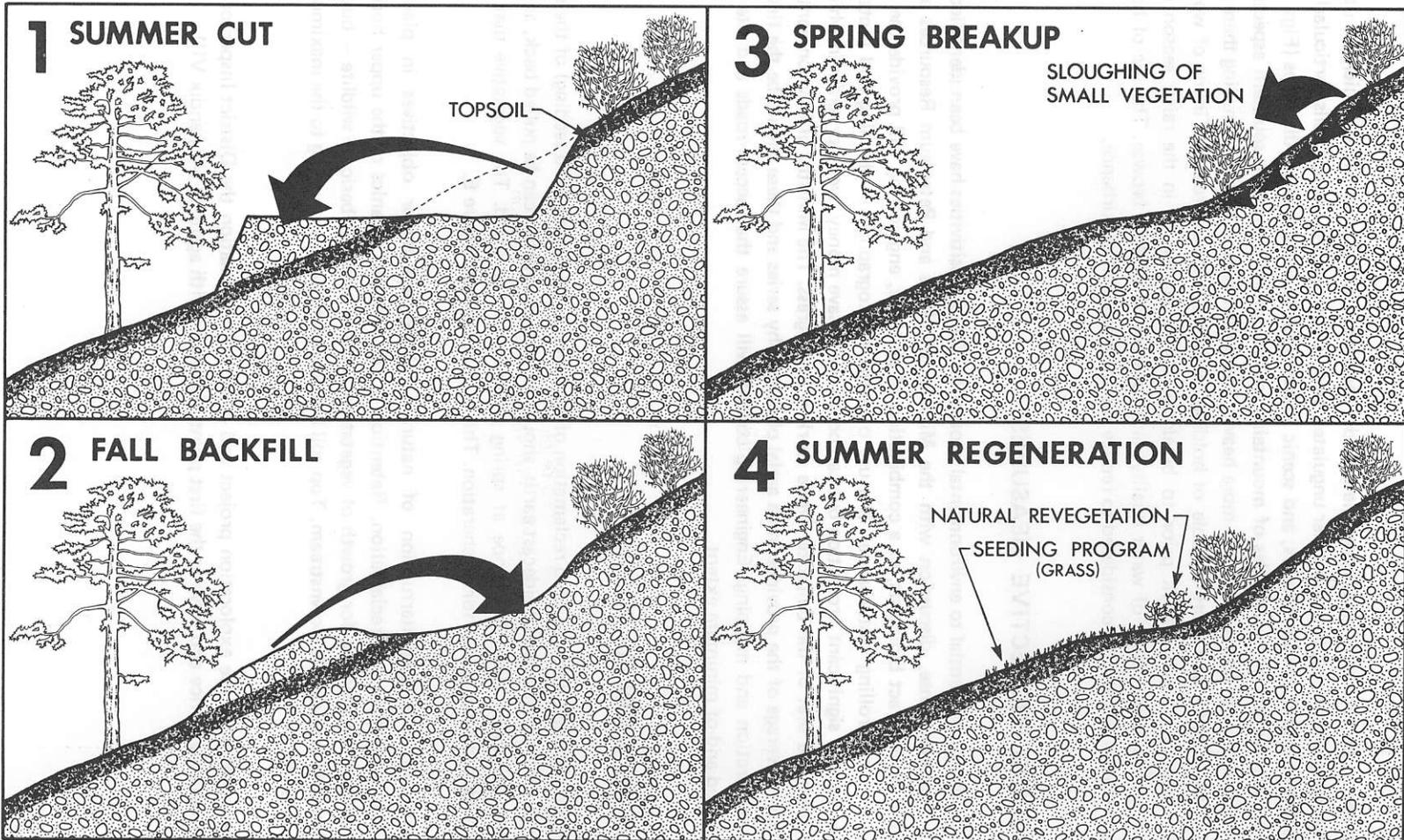
Engineering Control is essential to environmental protection. Once sensitivities have been identified through the use of common sense, discussion with the Ministry of Mines and Petroleum Resources and other agencies, staff or contract biologists, or a combination of all three, engineering will provide the means of minimizing and controlling disturbance. The use of aerial photographs for planning and plotting work cannot only achieve significant protection but can occasionally save money over a program in which layout is planned from the seat of the bulldozer while work is in progress. The Ministry of Environment provides comprehensive coverage of the province in its aerial photography series and these should be the first tools in geological exploration and mapping. Engineering control will assure that access roads and site work are properly located and of minimum extent.

## **RECLAIM AS SOON AS POSSIBLE**

Advantages are obtained through rapid reclamation of earth work. Re-sloping (and seeding) of the summer's work prior to snowfall means that sidecast earth, shoulders, and spoil banks can be pulled back, and the soil which would otherwise slide downslope at spring break-up can be saved. The vegetative mat which is retained provides an ideal source for regeneration. This is illustrated on Figure 5.

Soil conservation and non-interruption of natural drainage are major objectives in planning for environmental protection and reclamation. Retention of the silts and organics of the upper horizons not only ensures that the medium for growth of vegetation exists – which is basic to wildlife – but protects water quality and aquatic life downstream. Top soil has been defined as extending to the maximum extent of root penetration.

In the planning of both the exploration project and attendant reclamation the District Inspector of Mines can provide valuable advice and serve as the first point of contact with agencies (Appendix VII).



**FIGURE 5**

This series of sketches shows an ideal work sequence. Reclamation is done at the end of the year in which work took place. Natural re-vegetation has been given a head start, and erosion has been considerably reduced.

## SECTION IV WORK GUIDELINES

Of all industrial operations, poorly planned secondary roads are the major source of water turbidity. Even when no longer in use, such roads continue to be a source of stream sediments, unless measures are taken to re-establish drainage patterns and to stabilize bare-earth surfaces. On the other hand, a well-planned road may save considerable money in construction and maintenance; will have only minor adverse effects on water quality; and may be an asset to the area after exploration operations cease. An exception can, however, be the access of people and hunters to remote areas with resultant hazard to vulnerable wildlife.

On large projects, companies which support an environmental-reclamation section have little difficulty in providing an acceptable standard of access. Some engineering firms specialize in this type of work, and can provide road layouts which avoid physical problem areas such as steep slopes, fine grained soils, poor foundation types, and saturated roadbeds. This layout can consider other sensitivities such as unique fish spawning areas, wildlife habitat, mineral licks and attractive scenery. Ordinary colour photographs taken from helicopter or light aircraft are of assistance on large or small projects, particularly if used in conjunction with topographic mapping.

Construction of roads to acceptable standards requires the use of more versatile equipment than does the bulldozing of four-wheel access. A track-mounted front-end loader/backhoe and dump truck combination is useful for hauling rip-rap and culverts. The backhoe will minimize disturbance in trenching. They are also useful for the disposal of adit waste.

The use of track-mounted vehicles in general for transport of drills and personnel will reduce the amount of access road required.

### GUIDELINES FOR ROAD LOCATION AND DESIGN

- (1) Use existing roads wherever possible. Build the narrowest road possible consistent with safety and traffic needs. Plan for minimum permanent road length through use of main access roads and secondary tote roads. These can be more successfully reclaimed.
- (2) When locating a road, utilize natural benches, ridge tops, and flatter slopes to enhance road stability and avoid heavy cuts and fills. Look for and avoid areas of seepage and natural erosion as they are often evidence of unstable soil types. In road location work use all existing topographic soil and surficial geology maps and the most recent aerial photographs available. Avoid areas of erodible soils.

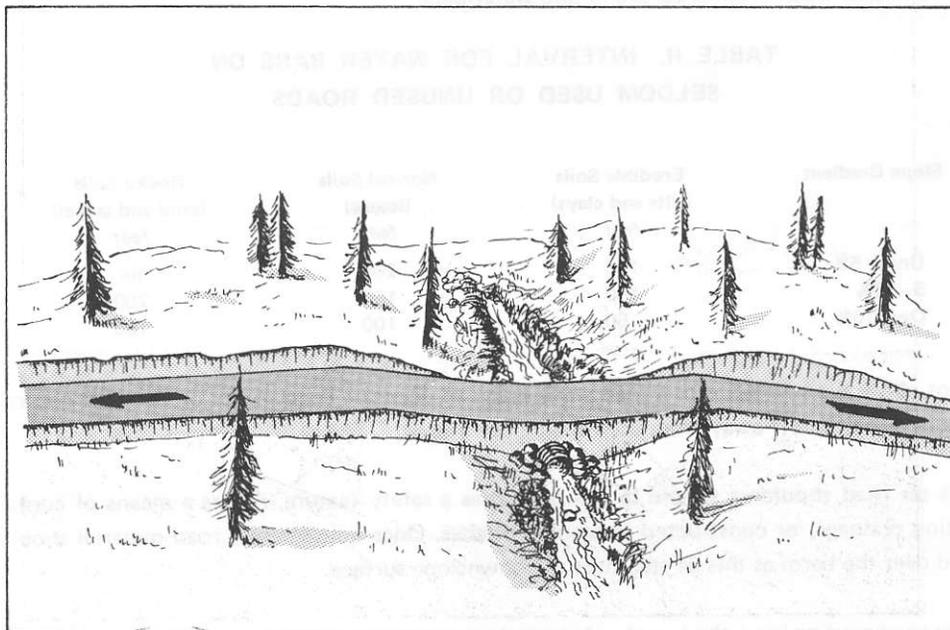


This may require short steep sections of grade on rocky terrain, instead of maintaining a predetermined maximum (see Table I for gradients).

**TABLE I. SOME APPROXIMATIONS REGARDING SLOPE, STABILITY, AND EROSION**

REMARKS	GRADIENT		
	per cent	degrees	hor:vert
Maximum for main haulages .....	8	5	12:1
Short pitches at .....	10	6	10:1
Approximate two-wheel drive maximum .....	15	9	7:1
Maximum soil slope for revegetation .....	50	26	2:1
Angle of repose earth fill .....	67	34	1½:1
Angle of repose loose angular rock .....	80	39	1¼:1

- (3) Other factors being equal, roads on south and west aspects require more intensive measures for the prevention of erosion than do roads on north and east aspects. Drought conditions are more severe on the former favouring the occurrence of grasslands. Grasslands have less capacity for absorbing over-land sediment flow than forested or shrub-covered areas and lack the stabilizing influence of the tree root systems. These open areas and the treed edge are also most productive of wildlife range and should be avoided if possible.
- (4) Where 'sidecast' excavation would reach stream edges, end-haul should be planned. Rip-rap or retaining walls may be used in some instances to eliminate 'sidecast.' Avoid also marshes, meadows, and ponds. Where cuts are necessary at the approach to a stream, cut material should be end-hauled to a safe bench location.



**FIGURE 7**

Road grade 'rolled' at a stream crossing. Ditch drainage is thereby prevented from entering the watercourse.

- (5) Where streams must be traversed the number of crossings should be minimized. The approach should be at right angles unless this results in excessive bank excavation. An exception to the rule of minimizing the number of crossings is presented when a stream meanders completely across a flat valley floor. The use of bridging here may allow the road to be located on low gradient terrain and eliminate disturbing sidehill cuts. A design for a simple bridge structure is shown on Figure 6. When a tote road is to be used for one season only permission should be requested from either the Provincial or Federal fisheries agencies to use dry creek flood channels, if this is desired. It may be possible to obtain permission to ford equipment temporarily across a stream if this will result in less disturbance than construction of a crossing. In no circumstances should the crossing be bladed, or changes made to the channel below maximum flood level. Road grade should be 'rolled' at the approach to the stream, that is, a gentle dip on each side of the crossing (Fig. 7). Culverts and bridges should of course be large enough to accommodate peak stream flow for the life of the road.

## GUIDELINES FOR CONSTRUCTION AND MAINTENANCE

- (1) Construct culverts and ditches as part of the road building program, and complete them before the rainy season begins. Ditches should serve two purposes: the drainage of run-off from the road surface and the collection of seepage from terrain through which the road passes. Ditches should not re-route existing drainage courses, either temporary or permanent. Road surface run-off and seepage should be conducted away from the road as soon as possible. The former tends to run downhill in ruts, and in seldom used roads this can be prevented by bulldozing water bars or small dips at intervals. A table of water bar spacing for various gradients as recommended by the British Columbia Forest Service is given in Table II. In more heavily used roads open-topped culverts can be installed as water bars. Small diameter culverting can be used for cross drains to convey seepage water through the roadway and avoid the collection and concentration of drainage in the uphill ditch. Take advantage of low fill areas to release water from cross drains and water bars.

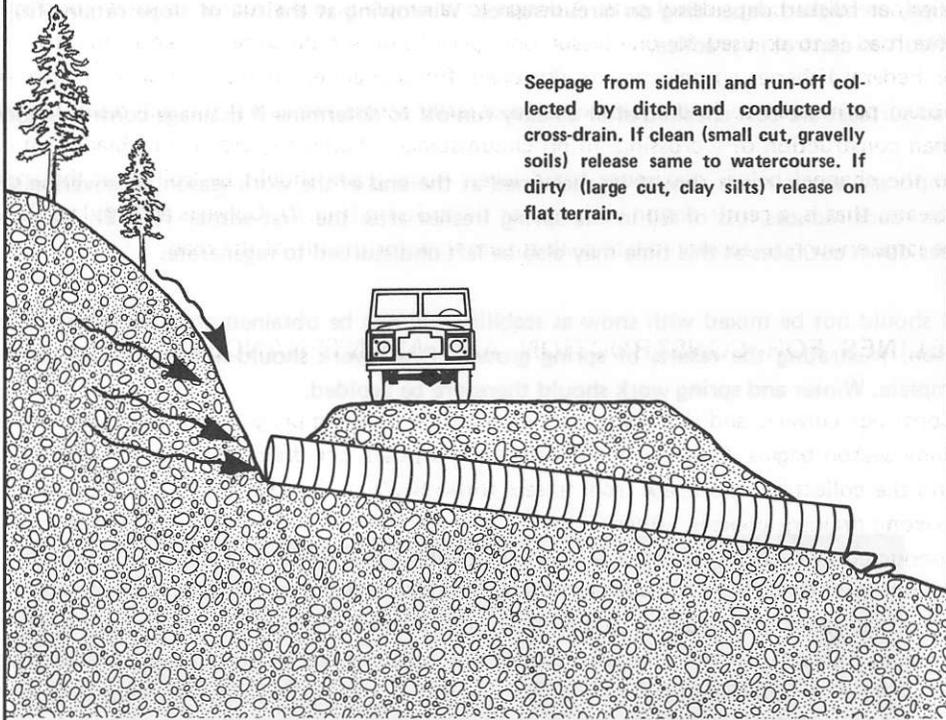
TABLE II. INTERVAL FOR WATER BARS ON SELDOM USED OR UNUSED ROADS

Slope Gradient	Erodible Soils (silts and clays) <i>feet</i>	Normal Soils (loams) <i>feet</i>	Rocky Soils (sand and gravel) <i>feet</i>
Under 5%	150	200	nil
5-10%	100	150	200
Over 10%	50	100	150

- (2) Do not allow the low point of a road grade break to occur on deep fills or on unstable natural slopes. Conduct ditch run-off away from the fill area (see Fig 8).
- (3) Berms on road shoulders should be considered as a safety feature, not as a means of containing or diverting drainage, or constructed instead of ditches. Once constructed, road material should not be bladed over the berm as this de-stabilizes the downslope surface.
- (4) During road grading leave the toe of cut slopes intact.

## CULVERTED CROSS-DRAIN

Seepage from sidehill and run-off collected by ditch and conducted to cross-drain. If clean (small cut, gravelly soils) release same to watercourse. If dirty (large cut, clay silts) release on flat terrain.



## WATER BAR ACROSS SELDOM USED OR UNUSED ROAD GRADE

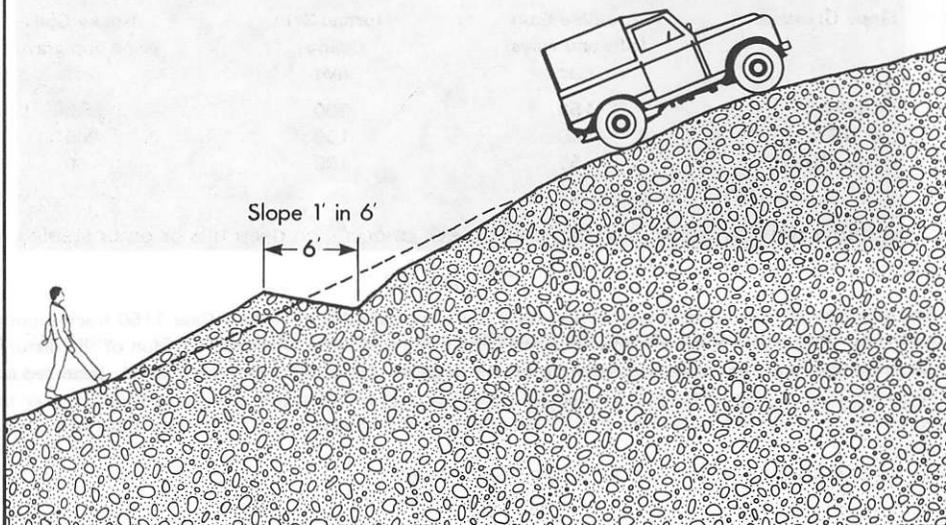


FIGURE 8

- (5) The Inspector of the Ministry of Mines and Petroleum Resources and/or the District Forest Ranger may require that roadways on licences be cleared prior to construction. Slash disposal will be in accordance with Forest Service standards (see Appendix VIII for Prince George Forest District Policy). Unmerchantable logs and coarser slash from road right-of-way may be required to be burned, buried, or bucked depending on circumstance. Winrowing at the toe of slope retains fill, however is difficult to control in practice.
- (6) Road surfaces are best checked after a heavy run-off to determine if drainage control is adequate.
- (7) Temporary access roads should be reclaimed at the end of the work season. Recovering shoulders on these roads reduces loss of fill in the spring freshet after the first winter (Fig. 9). Vegetation which slides down cut faces at this time may also be left undisturbed to regenerate.
- (8) Fill should not be mixed with snow as stability will not be obtained until the onset of the summer season, frustrating the results of spring growth. Road work should not commence until breakup is complete. Winter and spring work should therefore be avoided.



**FIGURE 9**

The shoulder of this unused exploration road has been pulled back with a Case 1150 track-mounted bulldozer. The area has been seeded and fertilized using a mixture of grasses. Erosion of the disturbed earth on the downhill side and ravelling of the slope on the uphill side have thereby been reduced. Ground slope is approximately 25 degrees. Stability and re-vegetation will be achieved sooner than would have otherwise happened, and a scar which would otherwise be visible for miles will soon be healed.

## **GUIDELINES FOR CLEARING, STRIPPING, AND TRENCHING**

- (1) Clearing, stripping, and trenching operations should be pre-planned to disturb the smallest possible surface area. A Licence to Cut is required from the Forest Service and for the timber to be used in mine development a Free Use Permit must be obtained.
- (2) Overburden material from stripping and test pits should be conserved for backfilling. Under no condition should it be shoved downhill. Excavated material should be segregated into two piles: topsoil, which extends to the limit of maximum rooting, and overburden. When backfilling, overburden should be replaced first (preceded by oxidized coal in coal exploration) then topsoil.
- (3) Stripping or trenching should not be done adjacent to a watercourse.
- (4) Trenches shall be backfilled when geological examination has been completed, prior to the onset of winter.
- (5) No trenching shall be done on slopes exceeding 26 degrees (2:1) without approval from the Ministry of Mines and Petroleum Resources.
- (6) Trenching should ideally be done by backhoe. Where this is not possible (or practicable as is often the case in mineral exploration) and a bulldozer is used, work should be carefully controlled. In coal exploration bulldozer trenching is not permitted, except with the specific permission of the Ministry of Mines and Petroleum Resources. To minimize disturbance trenching should be done only at right angles to the strike. 'Seam tracing' or the continuous or semi-continuous stripping of surface soils from an outcrop can also be damaging and is to be avoided. The proper location of access roads becomes impossible if seam tracing occurs and excess amounts of ore (or coal) are made available for erosion.

## **GUIDELINES FOR DRILLSITES AND ADITS**

- (1) When drilling close to a creek, river, or lake, a small sump or tank or settling area shall be used for containment of mud. Gas or oil shall be discharged into a waterless pit.
- (2) Every effort should be made to locate adits and rock tunnels on slopes less than 26 degrees. Coal waste shall be conveyed to a slope of less than 26 degrees, dressed and covered to a depth of not less than 6 inches with topsoil, and revegetated.
- (3) Adit refuse shall not exceed a slope of 26 degrees and shall be revegetated at the cessation of tunnelling. The Ministry of Mines and Petroleum Resources may relax this requirement in exceptional cases.
- (4) Adit platforms on sidehills shall be insloped and provisions made to carry run-off waters past disturbed earth and onto stable areas adjacent to the adit. Particular care should be taken to prevent access road drainage from reaching adit waste.
- (5) Surface soils stripped from adit excavation shall be stockpiled, and subsequent to completion of adit work spread uniformly over spoil.

## **GUIDELINES ON THE CONDITION OF THE OPERATION AT THE END OF THE WORK SEASON**

- (1) Campsites which are to be abandoned shall be completely dismantled at the end of operations and all refuse burned and buried. The site shall be ripped, if necessary, to break surface compaction and be revegetated as noted in the following section.
- (2) Some portions of the exploration road system may be required by the Forest Service for permanent fire access. It is in the operator's interest to contact the Forest Service in this regard. Such roads need not be reclaimed provided that permanent drainage has been established, and cut and fill slopes stabilized.
- (3) All unused roads should be ditched at their junction with permanent roads to prevent access. The road or trench surface and the cut and fill slopes should be revegetated (*see* revegetation sections).
- (4) Disturbed earth on drillsites, adit platforms, test pits, stripping, and trenches shall be contoured and revegetated (*see* following section). Overland drainage shall be conducted around or protected by rip-rapping or other non-erosive measures through areas of disturbed earth.
- (5) All water drainage structures shall be completed when exploration crews withdraw in the autumn.

## **GUIDELINES FOR REVEGETATION**

- (1) Topsoils shall be salvaged to the maximum depth of vegetative rooting, and disturbed areas shall be surface dressed with this soil, on completion of operations.
- (2) Revegetation shall be either seeding to appropriate mixtures of grass and legumes species or reforestation. Mines ecological personnel will advise as to the preferred method and will advise on the proper grass/legume seed mixtures. Seed and equipment should be on hand at the start of exploration.
- (3) Additional information on fertilizer requirements may be obtained by sending soil samples to the Ministry of Agriculture, Soils Testing Laboratory, Kelowna. Soil sampling instructions and sample containers are available from them on request. Cost of each sample tested is approximately \$3.00 (1976).
- (4) In the event that the operator is unable to obtain specific advice for his operating site, the following rough guide may be used:
  - (a) Seeding shall be done at a rate of approximately 25 pounds per acre. This should be doubled for alpine areas.
  - (b) All legumes should be double inoculated.
  - (c) Rhizomatous or creeping varieties of alfalfa should be used in the Interior.
  - (d) Birdsfoot Trefoil may be substituted for alfalfa in the wetter areas.

- (e) Slow release type fertilizers should be applied at a rate of 200 pounds per acre. A 20-24-15 fertilizer blend is recommended.
- (f) Seeding and fertilizing should be done as early as possible (before hard frosts) preferably early spring. This entails return to the site the following year for reclamation. Fall seeding may be approved in certain cases. Small or inaccessible sites are best seeded with hand-operated 'Cyclone' seeders. Road systems may be treated with either hand seeders or power take-off 'Cyclone' seeders mounted on a four-wheel-drive vehicle.
- (g) See Table III for seed mixture guides. Note: These guide mixtures are intended for use on adit, trench, and test pit waste materials where a surface dressing of salvaged topsoil exists.

## **GUIDELINES FOR CULVERT INSTALLATION**

Culverts on streams often cause problems through blockage of fish runs, and these are not easily identified unless they are severe. Where culverting of permanent streams is proposed the Fisheries Service of Canada or the Provincial Fish and Wildlife Branch should be contacted well in advance of installation so that streams may be identified as supporting fish or not. Arrangements are presently being made with the Provincial agency to have proposed crossing sites identified as major, minor, or non-fish streams so that standard guidelines can be written to guarantee fish passage and erosion protection. Both the Federal and Provincial Fisheries Acts place the onus on the installer to provide suitable fish pass facilities.

The basic cause of fish passage problems at culverts is the increase in water velocity which is created by the smooth walls and straight lineage. Fish, particularly small ones, cannot migrate upstream against high velocities unless there are resting pockets, and smooth-walled culverts eliminate these. Increased water velocities create a second problem — erosion of the stream bed downstream — which in turn creates a high velocity spillover. Culverts should therefore only be placed in fish streams where bridging is particularly expensive and difficult. They should be large enough and at a grade flat enough not to create problems of velocity. Present guidelines for culvert installations in fish streams are being re-written. When completed they will be made available as an addendum to these guidelines. In the meantime several simple rules may be observed which will avoid problems:

- (1) Contact the local Fish and Wildlife Branch office regarding the location of proposed crossings.
- (2) Install culverting at minimum gradient, preferably less than 1 per cent.
- (3) Rip-rap the stream bed downstream of culverting to prevent formation of a 'blow-hole' and scouring.

## **MISCELLANEOUS GUIDELINES**

Garbage shall be disposed of in the following manner: food scraps and food containers shall be segregated and buried daily; non-food items, paper and wood, etc., shall be burned and/or buried. Where larger amounts of kitchen left-overs are involved, a slit trench can be made (preferably by backhoe), the garbage dumped in, and a 6-inch blanket of soil shovelled over daily. At completion of the season, 3 feet of soil shall be backfilled over the garbage trench.

TABLE III. SUGGESTED SEED MIXTURES FOR RECLAMATION OF EXPLORATION OPERATIONS

Area	Altitude (feet)	Rainfall (inches)	Type Vegetation	Seed Mixture
I. Coastal	0-3,000	25- 35	Douglas fir/shore pine/arbutus	Canada bluegrass, 20%; creeping red fescue, 15%; orchardgrass, 15%; timothy, 15%; perennial ryegrass, 10%; redtop, 10%; alfalfa, 5%; white clover, 10%
		35+	Hemlock/cedar	Reed canary grass, 20%; orchardgrass, 15%; creeping red fescue, 15%; timothy, 15%; redtop, 10%; Canada bluegrass, 15%; alsike, 5%; ladino clover, 5%
II. Southern Interior	900-2,500	15 or less	Ponderosa pine/bunch- grass/sagebrush	Nordan crested wheatgrass, 30%; stream bank wheatgrass, 20%; pubescent wheatgrass, 20%; redtop, 10%; Canada bluegrass, 10%; alfalfa, 10%
	1,500-4,500	15- 25	Douglas fir/pinegrass/ ponderosa pine	Intermediate wheatgrass, 25%; pubescent wheatgrass, 25%; smooth brome, 20%; hard fescue, 10%; alfalfa, 15%; sweet clover, 5%
	1,200-5,000	25- 35	Douglas fir/western larch, lodgepole pine/ cedar	Intermediate wheatgrass, 20%; smooth brome, 20%; Canada bluegrass, 15%; creeping red fescue, 15%; climax timothy, 10%; alfalfa, 10% white dutch clover, 5%; sweet clover, 5%
	1,200-5,000	35- 65	Hemlock/cedar/white pine/western larch	Intermediate wheatgrass, 20%; smooth brome, 15%; orchardgrass, 15%; timothy, 15%; creeping red fescue, 15%; redtop, 10%; alsike, 5%; alfalfa, 5%
III. North-Central	1,700-3,000	20- 50	Douglas fir and aspen parklands/white spruce/ black spruce/birch	Timothy, 30%; smooth brome, 20%; boreal creeping red fescue, 20%; intermediate wheatgrass, 15%; alsike, 5%; alfalfa, 10%
IV. Apline and sub-alpine areas province-wide; the Far North	3,000-7,000	25-100	Engelmann spruce/sub- alpine fir, alpine meadows and tundra	Pubescent wheatgrass, 20%; meadow foxtail, 20%; crested wheatgrass, 15%; smooth brome, 15%; hard fescue, 10%; tall wheatgrass, 10%; boreal creeping red fescue, 10%

**APPENDIX I**

**SECTIONS 10 AND 11**

***MINES REGULATION ACT***

Notice to  
Inspector on  
opening or  
closure of  
mine.

**10.** (1) At least one week prior to the commencement of work on, in, or about a mine or at any time that a person is employed on, in, or about a mine either underground or on the surface, the owner, agent, or manager shall give notice thereof to the Inspector; and, when work ceases, the owner, agent, or manager shall at least one week prior to the cessation give notice thereof to the Inspector.

Approval of  
work system.

(2) Before opening or beginning to open or develop a mine, the owner, agent, or manager shall file with the Chief Inspector a plan of the system under which it is proposed to work the mine, and no work other than surface exploratory work shall be commenced without the written approval of the Chief Inspector.

(3) The requirement of filing a plan under subsection (2) is additional to the requirements for filing a plan under the *Mineral Act* and the *Placer Mining Act*.

(4) The owner, agent, or manager shall carry out the plan of the system filed, and shall not depart from it in any substantial manner unless he submits a new plan to, and receives the approval of, the Chief Inspector.

(5) The plan of the system shall provide for the maximum possible recovery of the mineral resource in the location to be mined, having due regard for good engineering practice and the safety of the operation.

(6) The Chief Inspector shall not approve of a plan of a system that does not comply with subsection (5). [R.S.B.C. 1960, c. 242, s. 10 (*am.*); 1967, c. 25, s. 10; 1973 (2nd Sess.), c. 131, s. 12 (proc. eff. Jan. 1, 1974); 1975, c. 41, s. 2.

Reclamation  
of surface.

**11.** (1) 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; and such a programme shall be submitted to and approved by the Minister as hereinafter provided.

(2) Before commencing preparatory work for production from a mine, the owner, agent, or manager of the mine shall file with the Minister a report in such form and containing such information as the Minister may prescribe.

(3) The report shall include the following:—

- (a) A map showing the location and extent of the mine, and the location of any lakes, streams, and inhabited places in the vicinity:
- (b) Particulars of the nature of the mine and the extent of the area to be occupied during the probable duration of the mining operation:
- (c) Particulars of the nature and present uses of the land to be used:
- (d) A programme for reclamation and conservation of the land during, and on the discontinuance or abandonment of, the

mining operation, with particular reference to

- (i) the location of the land;
- (ii) the effect of the programme on live stock or wildlife, watercourses, farms, inhabited places in the vicinity of the mine, and the appearance of the site of the mine; and
- (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, or mineral use.

(4) Notice of the filing of the report with the Minister, in a form prescribed by him, shall be published in the Gazette and in such newspapers having local circulation as the Minister may prescribe.

(5) After considering representations and advice from other departments of the Government of the Province affected by or interested in the report and the programme for reclamation and conservation of the land, and after hearing representations within thirty days after the date of publication of the notice required by subsection (4) from any other persons in any way affected by the report and the programme, and within sixty days of the filing of the report, the Minister may

- (a) approve the report; or
- (b) reject the report; or,
- (c) after revising or amending the programme set out therein, approve the report in its revised or amended form;

and if he approves the report and the programme, he shall submit the report to the Lieutenant-Governor in Council for approval; and if he receives the approval of the Lieutenant-Governor in Council, he shall issue a permit authorizing the commencement or continuance of the work, subject to compliance with the approved programme and to such terms and conditions as he or the Lieutenant-Governor in Council may prescribe.

(6) The Minister shall, before exercising the powers in this section, obtain approval of the programme for reclamation and conservation from the Minister of Lands, Forests, and Water Resources, the Minister of Recreation and Conservation, and the Minister of Agriculture in so far as the programme affects in any way the ministerial responsibilities of those Ministers.

(7) The Minister shall require, and it shall be a condition of the issue of a permit under subsection (5), that the owner, agent, or manager of a mine deposit with the Minister of Finance and maintain in the same amount at all times security in such form and for such amount as the Lieutenant-Governor in Council may determine, having regard to the nature of the land involved, but not exceeding the sum of \$1,000 for each acre of land used year to year or to be used for the mine and the waste disposal of the mine as set out in the approved programme.

(8) The security so determined shall be held by the Minister of Finance as security for the proper performance by the owner, agent, or manager of the approved programme and all the terms and conditions of the permit in a manner satisfactory to the Minister of Mines and Petroleum Resources, or the security may be used, on requisition of the

Minister of Mines and Petroleum Resources, for the purposes of subsection (12).

(9) During the entire period of production from a mine, the owner, agent, or manager

(a) shall continually and progressively reclaim the surface of the land affected by the mining operation; or

(b) deposit as security in a manner satisfactory to the Minister, in each year, a sum of money that, together with the deposit made in compliance with subsection (7) and calculated over the estimated life of the mine, will provide the funds necessary to properly perform and carry out

(i) all the requirements of the approved programme at the proper time; and

(ii) all the orders and directions of the Chief Inspector or an Inspector respecting the execution of the approved programme.

(10) When a dispute arises respecting any order or decision of the Chief Inspector or an Inspector under subsection (9) or (17), the owner, agent, or manager may appeal in writing to the Minister; and if the Minister is unable to reconcile the matter of dispute to the satisfaction of the contending parties, an appeal shall lie to the Lieutenant-Governor in Council, who may

(a) hear the appeal; or

(b) appoint a committee of Cabinet to hear the appeal; or

(c) appoint a person or persons to hear the appeal,

and the decision of that body shall be final and conclusive of the dispute.

(11) The owner, agent, or manager or the Inspector may apply to the Minister at any time for revision of the terms and conditions of the permit issued under this section, and, subject to the approval of the Lieutenant-Governor in Council, the Minister may alter or amend such terms and conditions as he deems advisable.

(12) Where the owner, agent, or manager of a mine fails to perform and complete the programme for reclamation and the terms and conditions of the permit in a manner satisfactory to the Minister, the Minister may apply all or any part of the security in and toward payment of the cost of the work required to be performed and completed.

(13) Upon the completion, discontinuance, or abandonment of a mining operation, and upon the Minister being satisfied that the provisions of this section have been complied with, and that the programme for reclamation of the surface of the land has been properly completed, the person who deposited the security under subsection (7) is entitled to the return of his security, less any amount paid out under subsection (12).

(14) A person who fails to comply with or contravenes the provisions of this section, or who carries on production from a mine or exploration, without holding a valid and subsisting permit under this section, or who fails to comply with or contravenes the terms and conditions of the permit, is guilty of an offence.

(15) In addition to the penalties provided in this Act for an offence under subsection (14),

- (a) where the failure to comply with, or a contravention of, this section, or of a term or condition of a permit, or an order or direction made by the Minister, continues or is repeated after notice from the Minister, the Minister may cancel a permit that has been issued under this section, and, whether or not he cancels the permit, he may order the owner, agent, or manager and all employees and other persons to cease and desist from carrying on the mining operation, and, on receipt of the order of the Minister, the owner, agent, or manager shall cease the mining operation and close down the mine, in accordance with the provisions of this Act and the orders of the Chief Inspector or an Inspector; and
- (b) where the failure to comply with, or a contravention of, this section, or of a term or condition of a permit issued under this section by the Chief Inspector, or an order or direction made by the Chief Inspector or an Inspector under this section, continues or is repeated after notice from the Chief Inspector, the Chief Inspector may cancel a permit that has been issued by him under this section, and, whether or not he cancels the permit, and whether or not he issued the permit, he may order the owner, agent, or manager and all employees and other persons to cease and desist from carrying on the mining operation, and, on receipt of the order of the Chief Inspector, the owner, agent, or manager shall cease the mining operation and close down the mine, in accordance with the provisions of this Act and the orders of the Chief Inspector or an Inspector.

(16) The Lieutenant-Governor in Council may, by Order, provide that the provisions of this section shall apply to any mining operation; but no Order shall be made under this subsection until the Minister has caused an investigation to be made by an officer of his department and, based on the investigation so made, has recommended to the Lieutenant-Governor in Council that the Order be so made.

(17) Notwithstanding the provisions of this section, where a substance is not a mineral as defined in the *Mineral Act*, the Chief Inspector has and may exercise power and authority under this section, and may

- (a) approve programmes for reclamation and conservation of land comprising a mine and issue permits required under this section, subject to such terms and conditions as he may prescribe; or
- (b) if he is satisfied that the protection and reclamation of the land is adequately secured and controlled under any Act, regulation, or municipal by-law, by order, exempt that mine from the provisions of this section.

(18) Notwithstanding the provisions of this section in respect of all placer mining operations other than hydraulic monitoring, and in respect of all mines in the exploration stage, the Chief Inspector has the same power and authority that is granted to any person, except the Lieutenant-Governor in Council, under this section, where the employment of mechanical equipment is likely to disturb the surface of the land in clearing,

stripping, trenching, or such other operations as the Chief Inspector may consider likely to cause significant disturbance of the surface of the land, and he may approve programmes for reclamation and conservation of the land surface and issue permits required under this section, subject to such terms and conditions as he may prescribe. [R.S.B.C. 1960, c. 242, s. 11 (*part*)]; 1967, c. 25, s. 11; 1969, c. 18, s. 2; 1971, c. 34, s. 2; 1973 (2nd Sess.), c. 131, s. 13 (proc. eff. Jan. 1, 1974); 1975, c. 41, s. 3.

**APPENDIX II**

**SECTIONS 7 AND 8**

***COAL MINES REGULATION ACT***

**Approval of  
work system.**

**7.** (1) Before opening or beginning to develop a mine, the owner, agent, or manager shall file with the chief inspector a plan of the system under which it is proposed to work the mine, and no work shall be commenced without the written approval of the chief inspector.

(2) The requirement of filing a plan under subsection (1) is additional to the requirements for filing a plan under the *Coal Act*.

(3) The owner, agent, or manager shall carry out the plan of the system filed, and shall not depart from it in any substantial manner unless he submits a new plan to, and receives the approval of, the chief inspector.

(4) The plan of the system shall provide for the maximum possible recovery of the coal resource in the location to be mined, having due regard for good engineering practice and the safety of the operation.

(5) The chief inspector shall not approve of a plan of a system that does not comply with subsection (4). 1975, c. 10, s. 3.

**Notice where  
new work.**

**7A.** The owner, agent, or manager shall give written notice to the inspector before beginning to drive a new shaft, raise, slope, or adit in a mine, or before abandoning a shaft, raise, slope, or adit in a mine. 1975, c. 10, s. 3.

**Approval of  
support  
system.**

**7B.** (1) The owner, agent, or manager shall, within 6 weeks after commencing the development of a new underground mine or a new section of an underground mine, file with the inspector a plan for the systematic support of the roof and, where necessary, the sides of the workings.

(2) On receipt of the written approval of the inspector, the owner, agent, or manager shall cause the method and system of support specified in the support plan to be adopted and carried out, and shall not depart from it in any substantial manner without the approval of the inspector.

(3) The owner, agent, or manager shall

(a) file a copy of the support plan, as approved by the inspector, with the local union or safety committee; and

(b) cause the employees concerned to be instructed in the execution of the support plan. 1975, c. 10, s. 3.

**Reclamation  
of surface.**

**8.** (1) 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; and such a programme shall be submitted to and approved by the minister as hereinafter provided.

(2) The owner, agent, or manager shall file with the minister a report in such form and containing such information as the minister may prescribe before commencing

(a) exploratory work at a mine where the employment of mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching, and such other operations as the

minister may consider likely to cause significant disturbance of the surface of the land; or

(b) preparatory work for production from a mine.

(3) The report shall include the following:—

(a) A map showing the location and extent of the mine, and the location of any lakes, streams, and inhabited places in the vicinity:

(b) Particulars of the nature of the mine and the extent of the area to be occupied during the probable duration of the mining operation:

(c) Particulars of the nature and present uses of the land to be used:

(d) A programme for reclamation and conservation of the land during, and on the discontinuance or abandonment of, the mining operation, with particular reference to

(i) the location of the land;

(ii) the effect of the programme on live stock or wildlife, watercourses, farms, inhabited places in the vicinity of the mine, and the appearance of the site of the mine; and

(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, or mineral use.

(4) Notice of the filing of the report with the minister, in a form prescribed by him, shall be published in the Gazette and in such newspapers having local circulation as the minister may prescribe.

(5) After considering representations and advice from other departments of the Government of the Province affected by or interested in the report and the programme for reclamation and conservation of the land, and after hearing representations within thirty days after the day of publication of the notice required by subsection (4) from any other persons in any way affected by the report and the programme, and within sixty days of the filing of the report, the minister may

(a) approve the report; or

(b) reject the report; or,

(c) after revising or amending the programme set out therein, approve the report in its revised or amended form;

and if he approves the report and the programme, he shall submit the report to the Lieutenant-Governor in Council for approval; and if he receives the approval of the Lieutenant-Governor in Council, he shall issue a permit authorizing the commencement or continuance of the work, subject to compliance with the approved programme and to such terms and conditions as he or the Lieutenant-Governor in Council may prescribe.

(6) The minister shall, before exercising the powers in this section, obtain approval of the programme for reclamation and conservation from the Minister of Lands, Forests, and Water Resources, the Minister of Recreation and Conservation, and the Minister of Agriculture in so

far as the programme affects in any way the ministerial responsibilities of those ministers.

(7) The minister shall require, and it shall be a condition of the issue of a permit under subsection (5), that the owner, agent, or manager of a mine deposit with the Minister of Finance and maintain in the same amount at all times security in such form and for such amount as the Lieutenant-Governor in Council may determine, having regard to the nature of the land involved, but not exceeding the sum of \$1,000 for each acre of land used year to year or to be used for the mine and the waste disposal of the mine as set out in the approved programme.

(8) The security so determined shall be held by the Minister of Finance as security for the proper performance by the owner, agent, or manager of the approved programme and all the terms and conditions of the permit in a manner satisfactory to the Minister of Mines and Petroleum Resources, or the security may be used, on requisition of the Minister of Mines and Petroleum Resources, for the purposes of subsection (12).

(9) During the entire period of production from a mine, the owner, agent, or manager

(a) shall continually and progressively reclaim the surface of the land affected by the mining operation; or

(b) deposit as security in a manner satisfactory to the minister, in each year, a sum of money that, together with the deposit made in compliance with subsection (7) and calculated over the estimated life of the mine, will provide the funds necessary to properly perform and carry out

(i) all the requirements of the approved programme at the proper time; and

(ii) all the orders and directions of the chief inspector or an inspector respecting the execution of the approved programme.

(10) When a dispute arises respecting any order or decision of the chief inspector or an inspector under subsection (9), the owner, agent, or manager may appeal in writing to the minister; and if the minister is unable to reconcile the matter of dispute to the satisfaction of the contending parties, an appeal shall lie to the Lieutenant-Governor in Council, who may

(a) hear the appeal; or

(b) appoint a committee of Cabinet to hear the appeal; or

(c) appoint a person or persons to hear the appeal,

and the decision of that body shall be final and conclusive of the dispute.

(11) The owner, agent, or manager or the inspector may apply to the minister at any time for revision of the terms and conditions of the permit issued under this section, and, subject to the approval of the Lieutenant-Governor in Council, the minister may alter or amend such terms and conditions as he deems advisable.

(12) Where the owner, agent, or manager of a mine fails to perform and complete the programme for reclamation and the terms and con-

ditions of the permit in a manner satisfactory to the minister, the minister may apply all or any part of the security in and toward payment of the cost of the work required to be performed and completed.

(13) Upon the completion, discontinuance, or abandonment of a mining operation, and upon the minister being satisfied that the provisions of this section have been complied with, and that the programme for reclamation of the surface of the land has been properly completed, the person who deposited the security under subsection (7) is entitled to the return of his security, less any amount paid out under subsection (12).

(14) A person who fails to comply with or contravenes the provisions of this section, or who carries on production from a mine, without holding a valid and subsisting permit under this section, or who fails to comply with or contravenes the terms and conditions of the permit, is guilty of an offence.

(15) In addition to the penalties provided in this Act for an offence under subsection (14), if the failure to comply with, or a contravention of, this section continues or is repeated after notice from the minister, the minister may cancel the permit, and may order the owner, agent, or manager and all employees and other persons to cease and desist from carrying on the mining operation, and, upon receipt of the order of the minister, the owner, agent, or manager shall cease the mining operations and close down the mine, in accordance with the provisions of this Act and the orders of the chief inspector or an inspector.

(16) The Lieutenant-Governor in Council may, by Order, provide that the provisions of this section shall apply to any mining operation; but no Order shall be made under this subsection until the minister has caused an investigation to be made by an officer of his department and, based on the investigation so made, has recommended to the Lieutenant-Governor in Council that the Order be so made. 1969, c. 3, s. 8; 1973 (2nd Sess.), c. 100, s. 7; 1975, c. 10, s. 4.



**APPENDIX III**

**NOTICE OF WORK ON A MINERAL PROPERTY**

**APPLICATION FOR A RECLAMATION PERMIT**

**(To be replaced in 1978 by  
'Programme for Protection and Reclamation')**



DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

## NOTICE OF WORK ON A MINERAL PROPERTY

(Pursuant to section 10, *Mines Regulation Act*)

This form is to be completed by all companies or individuals carrying out exploration work one month prior to commencement of work and one week prior to cessation of work. Keep one copy and forward one copy to the District Inspector of Mines.

1. NAME OF PROPERTY: \_\_\_\_\_  
Number of claims \_\_\_\_\_ Principal Claim Group \_\_\_\_\_

2. LOCATION: Mining Division \_\_\_\_\_ NTS Map Sheet (e.g., 82E/9E) \_\_\_\_\_  
Lat. \_\_\_\_\_ ° \_\_\_\_\_ ' Long. \_\_\_\_\_ ° \_\_\_\_\_ ' Locality and Access \_\_\_\_\_

3. OWNER: Name \_\_\_\_\_ Free Miner's Cert. No. \_\_\_\_\_  
Address \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_

4. OPERATOR: Name \_\_\_\_\_ Free Miner's Cert. No. \_\_\_\_\_  
Address \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_  
Postal Code \_\_\_\_\_ Telephone No. \_\_\_\_\_

5. DURATION OF EXPLORATION WORK: From \_\_\_\_\_ to \_\_\_\_\_

6. DATE WORK COMPLETED (report of closing only): \_\_\_\_\_ 19 \_\_\_\_\_

7. APPROXIMATE NUMBER OF MEN EMPLOYED: \_\_\_\_\_

8. EXPLORATION WORK: Indicate PROPOSED or COMPLETED — use metric measure (1 metre = 3.3 feet)

Geophysical \_\_\_\_\_ Geochemical \_\_\_\_\_

Linecutting (distance, width, method) \_\_\_\_\_

Drilling — No. of Sites \_\_\_\_\_ Total area \_\_\_\_\_ metres

Road Construction — Length \_\_\_\_\_ metres Width \_\_\_\_\_ metres

Underground Exploration \_\_\_\_\_ (type)

Total Area:  
Trenching \_\_\_\_\_ square metres Stripping \_\_\_\_\_ square metres  
Test Pitting \_\_\_\_\_ square metres Other \_\_\_\_\_ square metres

Work by self or contractor (Name) \_\_\_\_\_

NOTE: Owner is responsible for ensuring the Contractor complies with pertinent regulations (see section 11, *Mines Regulation Act*).

9. DATE FOREST SERVICE ADVISED BY OPERATOR: \_\_\_\_\_  
Name and Title of Forest Official \_\_\_\_\_  
Address \_\_\_\_\_

### NOTICE

- A. Pursuant to section 11, sub-section (18) of the *Mines Regulation Act* — 'Where mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching or such other operations as the Chief Inspector may consider likely to cause significant disturbance of the surface of the land, the Chief Inspector may require a Reclamation Permit.' If there is a surface disturbance, complete back of this form, 'Application for Reclamation Permit.'
- B. Where timber is to be cut, a 'Free Use Permit' or 'Licence to Cut' is required from the Forest Service.

SIGNATURE OF APPLICANT \_\_\_\_\_ TITLE \_\_\_\_\_

Print Name \_\_\_\_\_ DATE \_\_\_\_\_





DEPARTMENT OF MINES AND PETROLEUM RESOURCES

MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

SITE PLAN



**INDICATE:**  
 Claim boundaries, permanent watercourses, access road and distance to nearest town, proposed roads, test pits, trenches, ground slope at trenches, drill sites, and camp sites.

<p><b>LOCATION MAP</b>          Show nearest town and access road.</p>	<p>Name of property _____</p> <p>Claim No. _____</p> <p>Owner _____</p> <p>Date _____</p> <hr/> <p>File No. _____</p>
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**APPENDIX IV**

**GENERAL EXPLORATION RECLAMATION PERMITS**

**MINERAL EXPLORATION**

**COAL EXPLORATION**



DEPARTMENT OF MINES AND PETROLEUM RESOURCES

MINES REGULATION ACT

**PERMIT**

AUTHORIZING SURFACE WORK

(Issued pursuant to section 11 of the *Mines Regulation Act*.)

Permit No. ....

Issued to .....

.....

.....

for surface work at the .....

.....

..... mine(s).

Located at .....

.....

.....

and subject to the appended terms and conditions, all of which are applicable to this permit.

Issued at Victoria, British Columbia, this ..... day of ..... in the year .....

.....  
*Minister of Mines and Petroleum Resources.*

TERMS AND CONDITIONS

1. This permit is issued subject to all the terms and conditions of section 11 of the *Mines Regulation Act*.
2. The permit is for a period of ..... years. It is renewable on application, and upon evidence of satisfactory performance.
3. Pursuant to subsections (6) and (7) of section 11 of the Act, security as specified by Order in Council No. ...., approved on the ..... day of ....., 19....., has been deposited with the Minister of Finance in the amount of ..... dollars (\$.....).
4. The report, dated ....., as filed with the Minister pursuant to subsection (2) of section 11 of the *Mines Regulation Act*, together with all revisions and amendments thereto, and as approved by the Minister, is an integral part of this permit.

OTHER

NOTE.—This permit applies only to the requirements under section 11 of the *Mines Regulation Act*. Other legislation may be applicable to the mining operations, and this permit in no way abrogates the responsibility and obligation of the permittee under such other legislation.



DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
COAL MINES REGULATION ACT

**PERMIT**

AUTHORIZING SURFACE WORK

(Issued pursuant to section 8 of the *Coal Mines Regulation Act*)

Permit No. ....

Issued to .....

.....  
.....

for surface work at the .....

.....  
..... mine(s).

Located at .....

.....  
.....

and subject to the appended terms and conditions, all of which are applicable to this permit.

Issued at Victoria, British Columbia, this ..... day of ..... in the year .....

.....  
*Minister of Mines and Petroleum Resources*

TERMS AND CONDITIONS

1. This permit is issued subject to all the terms and conditions of section 8 of the *Coal Mines Regulation Act*.
2. The permit is for a period of.....years. It is renewable on application, and upon evidence of satisfactory performance.
3. Pursuant to subsections (6) and (7) of section 8 of the Act, security as specified by Order in Council No....., approved on the.....day of....., 19....., has been deposited with the Minister of Finance in the amount of.....  
.....dollars (\$.....).
4. The report, dated....., as filed with the Minister pursuant to subsection (2) of section 8 of the *Coal Mines Regulation Act*, together with all revisions and amendments thereto, and as approved by the Minister, is an integral part of this permit.

OTHER

NOTE—This permit applies only to the requirements under section 8 of the *Coal Mines Regulation Act*. Other legislation may be applicable to the mining operations, and this permit in no way abrogates the responsibility and obligation of the permittee under such other legislation.



**APPENDIX V**

**NOTICE OF WORK ON A COAL LICENCE**

**APPLICATION FOR A RECLAMATION PERMIT**

**(To be replaced in 1978 by  
'Programme for Protection and Reclamation')**



DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
 MINERAL RESOURCES BRANCH  
 INSPECTION AND ENGINEERING DIVISION

NOTICE OF WORK ON A COAL LICENCE

Pursuant to section 7 of the *Coal Mines Regulation Act* this notice is to be completed by all companies or individuals carrying out exploration work prior to commencement of work, and within one month of cessation of work and one copy is to be sent to each of the following:

Senior Reclamation Inspector, Victoria  
 District Inspector of Mines  
 Regional Water Rights Engineer

District Forester or Forest Ranger  
 Regional Fish and Wildlife Office

PERMIT NO. \_\_\_\_\_

1. NAME OF PROPERTY: \_\_\_\_\_  
 Coal Licence Numbers: \_\_\_\_\_
  
2. LOCATION: Mining Division \_\_\_\_\_ NTS Map Sheet (e.g., 82E/9E) \_\_\_\_\_  
 Lat. \_\_\_\_\_ ° \_\_\_\_\_ ' Long. \_\_\_\_\_ ° \_\_\_\_\_ ' Locality and Access \_\_\_\_\_
  
3. OWNER: Name \_\_\_\_\_ Free Miner's Cert. No. \_\_\_\_\_  
 Address \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_
  
4. OPERATOR: Name \_\_\_\_\_ Free Miner's Cert. No. \_\_\_\_\_  
 Company \_\_\_\_\_ Telephone No. \_\_\_\_\_  
 Address \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_
  
5. ESTIMATED DURATION OF WORK: From \_\_\_\_\_ to \_\_\_\_\_
  
6. ACTUAL DATE WORK COMPLETED: Day \_\_\_\_\_ Month \_\_\_\_\_ 19 \_\_\_\_\_
  
7. APPROXIMATE NUMBER OF MEN EMPLOYED: \_\_\_\_\_
  
8. EXPLORATION WORK: Proposed  Completed  (Use metric measure - 1 metre = 3.3 feet.)  
 Linecutting (distance, width, method) \_\_\_\_\_  
 (Requires approval of Forest Service. 'Licence to Cut' or 'Free Use Permit' may be withheld until Reclamation Permit approval.)  
 Drilling - No. of Sites \_\_\_\_\_ Total Area \_\_\_\_\_ square metres  
 Road Construction - Total Length \_\_\_\_\_ metres Approximate Width \_\_\_\_\_ metres  
 Underground Exploration \_\_\_\_\_ (type)  
 Tranching - Number \_\_\_\_\_ Total Length \_\_\_\_\_ metres Width \_\_\_\_\_ metres  
 Test Pitting - Number \_\_\_\_\_ Total Disturbed Area \_\_\_\_\_ square metres  
 Work by Self  OR Name of Contractor \_\_\_\_\_  
 (Owner is responsible for ensuring the Contractor complies with pertinent regulations, see section 8, *Coal Mines Regulation Act*.)
  
9. DATE FOREST SERVICE ADVISED BY OPERATOR: \_\_\_\_\_  
 Name and Title of Forest Official \_\_\_\_\_  
 Address \_\_\_\_\_

NOTE: Pursuant to section 8, subsection 2(a) of the *Coal Mines Regulation Act*, "...where the employment of mechanical equipment is likely to disturb the surface of the land in clearing, stripping, tranching..." the Application for a Reclamation Permit on the reverse side is also to be submitted.

SIGNATURE OF APPLICANT \_\_\_\_\_ TITLE \_\_\_\_\_  
 PRINT NAME \_\_\_\_\_ DATE \_\_\_\_\_



DEPARTMENT OF MINES AND PETROLEUM RESOURCES
MINERAL RESOURCES BRANCH
INSPECTION AND ENGINEERING DIVISION

APPLICATION FOR A RECLAMATION PERMIT ON A COAL LICENCE

Pursuant to section 8 of the Coal Mines Regulation Act, this form is to be completed when applying for a Reclamation Permit, when renewing same, or when reporting exploration work to be done.

PERMIT NO. \_\_\_\_\_

1. THIS IS: An Initial Application [ ] Renewal [ ] Report of Proposed Exploration Work [ ]

2. PRESENT STATE OF LAND ON WHICH EXPLORATION WILL BE DONE IS:
Canada Land Inventory (where possible) \_\_\_\_\_
Present Land Use (ranching, timber, etc.) \_\_\_\_\_
Type of Vegetation \_\_\_\_\_
Access Roads (present use, condition) \_\_\_\_\_
Campsites, Old Workings (location, condition) \_\_\_\_\_

NOTE: Items shown above should be indicated on the NTS maps which are required for the following section.

3. PROPOSED SURFACE WORK: (Attach 7 copies of 1:50,000 NTS map with full extent of exploration work noted - Coal Titles Reference Maps.) (Use metric measure - 1 metre = 3.3 feet.)

Roads: Total length \_\_\_\_\_ metres Total disturbed area \_\_\_\_\_ square metres
Test Pits: Total No. \_\_\_\_\_ Total disturbed area \_\_\_\_\_ square metres
Trenches: Total No. \_\_\_\_\_ Total disturbed area \_\_\_\_\_ square metres
Adits: Total No. \_\_\_\_\_ Total disturbed area \_\_\_\_\_ square metres
Drill Sites: Total No. \_\_\_\_\_ Total disturbed area \_\_\_\_\_ square metres
Other: \_\_\_\_\_ Total disturbed area \_\_\_\_\_ square metres
Total Disturbed Area (square metres): \_\_\_\_\_ square metres
Total Disturbed Area (hectares): \_\_\_\_\_ hectares

4. EQUIPMENT TO BE USED (list size, capacity, and number):
(a) \_\_\_\_\_ (d) \_\_\_\_\_
(b) \_\_\_\_\_ (e) \_\_\_\_\_
(c) \_\_\_\_\_ (f) \_\_\_\_\_

5. GOVERNMENT CLEARANCES INITIATED AT REGIONAL/DISTRICT LEVEL:
Forestry Fish and Wildlife Water Rights
Name of Official \_\_\_\_\_
Title \_\_\_\_\_
Location \_\_\_\_\_
Date Notified \_\_\_\_\_

6. SIGNATURE OF APPLICANT \_\_\_\_\_ DATE \_\_\_\_\_
Title \_\_\_\_\_ Company \_\_\_\_\_

FOR DEPARTMENT OF MINES USE ONLY

Terms and Conditions other than Guidelines \_\_\_\_\_

Bonding Required (Permit is issued on receipt of bonding.) \_\_\_\_\_

Approved by Advisory Committee \_\_\_\_\_ Date \_\_\_\_\_

Approved by Sr. Reclamation Inspector \_\_\_\_\_ Date \_\_\_\_\_

Date of Minister's Approval \_\_\_\_\_ Order-in-Council \_\_\_\_\_

Date Permit Issued \_\_\_\_\_

NOTE: When geotechnical and reclamation work have been completed for the calendar year, a Reclamation Report should be submitted to the Senior Reclamation Inspector in Victoria.



**APPENDIX VI**

**RECLAMATION REPORT – MINERAL EXPLORATION**

**RECLAMATION REPORT – COAL EXPLORATION**



**DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION**

**RECLAMATION REPORT – MINERAL EXPLORATION**

To be submitted in duplicate to District Inspector of Mines. See note at bottom of page.

1. FOR CALENDAR YEAR 19\_\_\_\_\_ PERMIT NO. MX \_\_\_\_\_
2. COMPANY \_\_\_\_\_ NAME OF OFFICIAL \_\_\_\_\_  
 ADDRESS \_\_\_\_\_ SIGNATURE \_\_\_\_\_  
 \_\_\_\_\_ DATE SUBMITTED \_\_\_\_\_

3. DETAILS OF WORK DONE AND DESCRIPTION OF RECLAMATION  
 Use metric measure (1 metre = 3.3 feet). Show method of reclamation, for example, backfill of excavated earth and replacement of topsoil, seed type, fertilizer used and application, etc. Use back of sheet if required. Reference work on map and site plan.

	Area Disturbed	Area Reclaimed
<b>ROADS:</b> Indicate lengths of individual roadways built and approximate width both cut and fill.		
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>TRENCHES:</b> Indicate lengths, widths, and ground slope.		
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>DRILL SITES:</b>		
Total No. _____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>OTHER:</b>		
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>Total Disturbed and Reclaimed Area (square metres)</b>	_____ m <sup>2</sup>	_____ m <sup>2</sup>
---	----------------------	----------------------

<b>Total Disturbed and Reclaimed Area (hectares)</b> (1 hectare = 10 000 square metres)	_____ ha	_____ ha
--	----------	----------

4. GENERAL COMMENTS:
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**NOTE:** Refer to original 'Application Permit' and note work done on two copies of the 1:50,000 NTS map. Specify where work done has varied from that which was proposed. Attach to this report. Refer to booklet entitled, *Guidelines for Coal and Mineral Exploration*, available at the office of the District Inspector of Mines, for reclamation advice. Attach photographs or other support data to supplement this format.

o



**DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION**

**RECLAMATION REPORT – COAL EXPLORATION**

To be submitted in duplicate to Senior Reclamation Inspector, Victoria. See note at bottom of page.

1. FOR CALENDAR YEAR 19 \_\_\_\_\_ PERMIT NO. \_\_\_\_\_

2. COMPANY \_\_\_\_\_ NAME OF OFFICIAL \_\_\_\_\_

ADDRESS \_\_\_\_\_ SIGNATURE \_\_\_\_\_

DATE SUBMITTED \_\_\_\_\_

3. DETAILS OF WORK DONE AND DESCRIPTION OF RECLAMATION

Use metric measure (1 metre = 3.3 feet). Show method of reclamation, for example, backfill of excavated earth and replacement of topsoil, seed type, fertilizer used and application, etc. Use back of sheet if required. Reference locations on 1:50,000 map (Coal Titles Reference Maps).

	Area Disturbed	Area Reclaimed
<b>ROADS:</b> Indicate lengths of individual roadways built and approximate width both cut and fill.		
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>TEST PITS:</b>		
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>TRENCHES:</b> Indicate lengths, widths, and ground slope.		
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>ADITS:</b>		
Total No. _____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>DRILL SITES:</b>		
Total No. _____	_____ m <sup>2</sup>	_____ m <sup>2</sup>

<b>OTHER:</b>		
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
_____	_____ m <sup>2</sup>	_____ m <sup>2</sup>
<b>Total Disturbed and Reclaimed Area (square metres)</b>	_____ m <sup>2</sup>	_____ m <sup>2</sup>
<b>Total Disturbed and Reclaimed Area (hectares)</b> (1 hectare = 10 000 square metres)	_____ ha	_____ ha

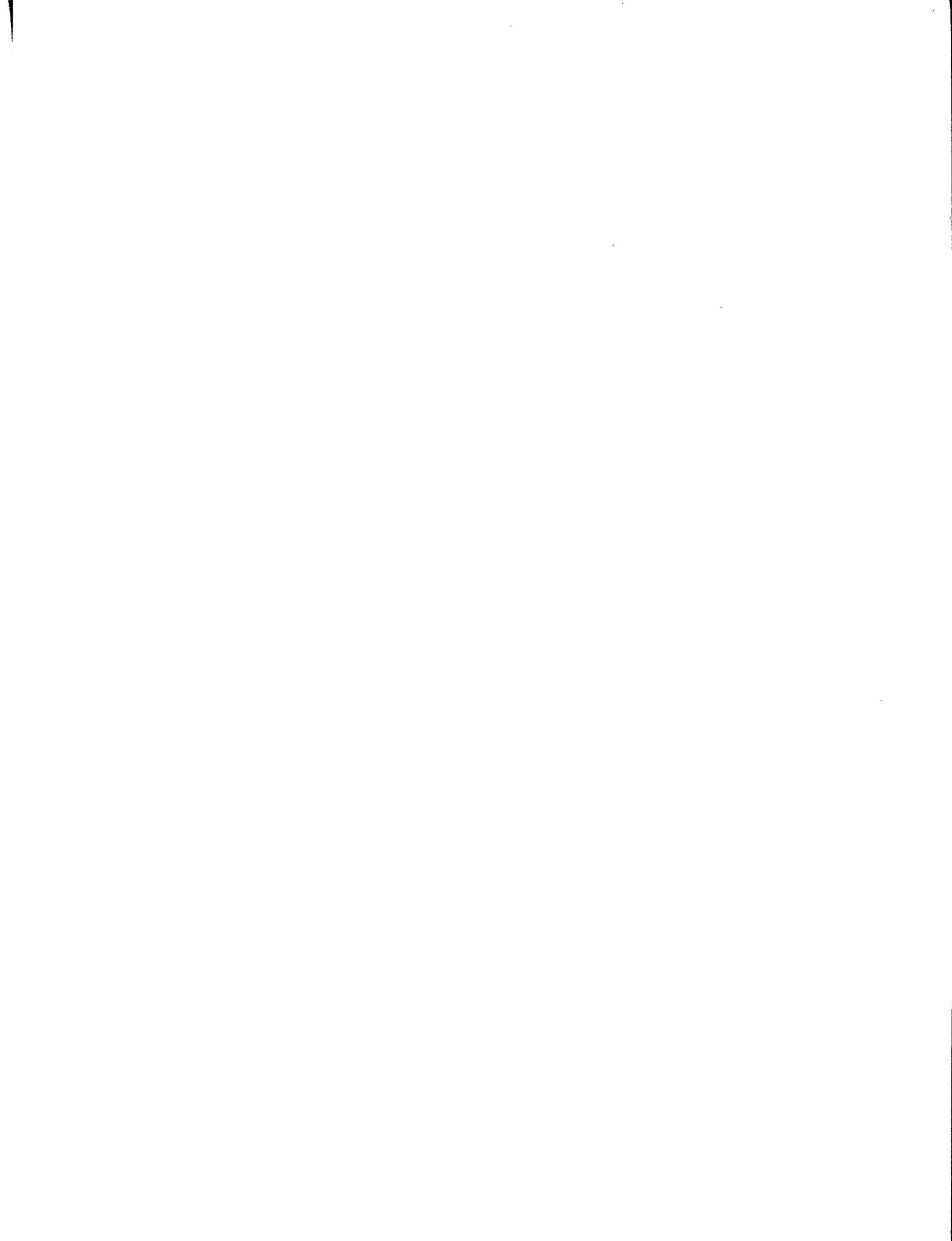
4. GENERAL COMMENTS:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**NOTE:** Refer to original 'Application for a Reclamation Permit' and note work done on two copies of the 1:50,000 map. Specify where work done has varied from that which was proposed. Attach to this report. Refer to booklet entitled, *Guidelines for Coal and Mineral Exploration*, available at the office of the District Inspector of Mines, for reclamation advice. Attach photographs or other support data if desired to supplement this format.



**APPENDIX VII**

**ADDRESSES OF DISTRICT OFFICES  
OF RESOURCE MANAGEMENT AGENCIES**

## ADDRESSES OF DISTRICT OFFICES OF RESOURCE MANAGEMENT AGENCIES

### DEPARTMENT OF MINES AND PETROLEUM RESOURCES

Chief Inspector of Mines	1837 Fort Street, Victoria	387-3781, 2
Senior Reclamation Inspector	1835 Fort Street, Victoria	387-3630
Chief Gold Commissioner	Parliament Buildings, Victoria	387-6245

### DISTRICT MINE INSPECTORS

Prince George	1652 Quinn Street	562-8131 (322, 323)
Kamloops	101, 2985 Airport Drive	376-7201
Prince Rupert	Court House, Box 758	624-3245
Nanaimo	2226 Brotherstone Road	758-2342
Vancouver	2747 East Hastings Street	254-7171
Smithers	Box 877	847-4411 (237)
Nelson	310 Ward Street	352-2211 (213)
Fernie	Box 1290	423-6222

### WATER RESOURCES SERVICE - REGIONAL OFFICES

Prince George	606, 1488 Fourth Avenue	562-8131 (236)
Kamloops	523 Columbia Street	374-4112 (191, 2, 3)
Kelowna	Court House	762-2404
Nelson	310 Ward Street	352-2211 (275)
Victoria	Parliament Buildings	387-3416
New Westminster	303 Sixth Street	521-9641 (281)

### POLLUTION CONTROL BRANCH - DISTRICT OFFICES

Williams Lake	235 Oliver Street	392-6261 (312)
Kamloops	106, 1050 West Columbia Street	374-4112 (219)
Prince George	3691 - 15th Avenue	562-8131 (238, 9)
Victoria	1088 Fort Street	387-5321
Cranbrook	1617 Baker Street	426-7203
Vernon	Court House	542-2351
New Westminster	313 Sixth Street	521-9641 (279)

### FISH AND WILDLIFE BRANCH - REGIONAL DIRECTORS

Prince George	1777 Third Avenue	562-8131 (231)
Kamloops	523 Columbia Street	374-5102, 7
Nanaimo	Court House	754-2111 (234)
Burnaby	4529 Canada Way	435-4137
Nelson	310 Ward Street	352-2211 (240)
Smithers	Court House	847-3702
Penticton	152 Main Street	493-0008
Williams Lake	Government Buildings	392-6261 (371)

### FORESTRY DISTRICTS

Prince George	562-8131	Vancouver	684-2321
Kamloops	374-4112	Nelson	352-2211
Prince Rupert	624-2121	Cariboo (Williams Lake)	392-6261

### LAND SERVICE

Prince George	1600 - 3rd Avenue	562-8131 (324)
Kamloops	774 Victoria Street	374-7391
Nanaimo	190 Wallace Street	754-2111 (73)
Vancouver	4240 Manor Street, Burnaby	438-5344 (249)
Smithers	3793 Alfred Avenue	847-4411 (268)
Nelson	310 Ward Street	352-2211 (330)
Williams Lake	Government Buildings	392-6261 (307)

**APPENDIX VIII**

**SLASH DISPOSAL POLICY FOR ROAD RIGHTS-OF-WAY  
IN THE PRINCE GEORGE FOREST DISTRICT**

## **SLASH DISPOSAL POLICY FOR ROAD RIGHTS-OF-WAY IN THE PRINCE GEORGE FOREST DISTRICT**

1. Full disposal by burning and/or burying shall be required on all roads considered usable at any time during the closed season May 1 to October 31 and on any other type of road which is cut to a width greater than 33 feet. When a road is constructed through an area formally approved for logging within the next two logging seasons, then this requirement may be waived.

**(a) Disposal by Burning**

All trees, snags, and brush on the right-of-way shall be felled or pushed away from the marginal timber. Where economically possible, all material of 6 inches top diameter (unless associated cutting contract specifies a lower figure) and over, and 8 feet in length and over, shall be commercially utilized. Where utilization is not possible, then it may be disposed of along with slash and debris in the following manner:

- (i) Material under 8 inches in diameter shall be piled not less than 10 feet from the marginal timber and burned concurrently as weather conditions will permit.
- (ii) Material 8 inches in diameter and over shall, where possible, be disposed of with the smaller material as outlined above. Where this cannot be done, the boles of the trees over 8 inches in diameter must be bucked so that they are in close contact with the ground throughout their entire length, and are placed not less than 10 feet from the marginal timber. Stumps when pushed free of the ground and not burned may, unless otherwise directed, be scattered singly along the right-of-way. Partially burned or charred material shall be spread out along the right-of-way and in no case left bunched or in piles.

**(b) Disposal by Burying**

Disposal by burying is acceptable in most cases but requires more supervision to ensure a satisfactory job. The following conditions must be adhered to for satisfactory disposal by this method:

- (i) Pushouts on the area on which material is to be buried must be cleared and properly prepared with a pit dug to receive the slash and debris.
- (ii) Material to be buried shall be bucked into lengths not exceeding 12 feet.
- (iii) Prior to covering with earth, all material must be compacted within the pit. In no case shall the top of the compacted piles protrude above normal ground level.
- (iv) The compacted pile must be covered with a minimum of 2 feet of soil.
- (v) Close supervision must be maintained on this type of disposal.

Where considered desirable, the Forest Service may require more complete disposal than that specified above.

2. On winter roads, temporary access roads, tote roads, etc., provided their width is not greater than 33 feet, slash may be disposed of by lopping and scattering. Where this method is used, all trees felled shall have their branches lopped and the slash scattered. The boles of the trees felled shall be severed from the stump at the root collar and bucked so as to lie in close contact with the ground.

Where this type of road crosses any river, permanent road or other right-of-way on which full disposal is required, then full disposal shall be required within 20 chains of the crossing.

Notwithstanding the above, the Forest Service may for good reason require total disposal on any road or portion thereof.

3. **General**

Leaners or damaged marginal trees shall be felled and disposed of along with the material from the right-of-way proper.

During the period May 1 to October 31 all burning must be done under a permit which is obtained from the Forest Ranger concerned. Periods of high hazard may result in cancellation of burning permits until more favourable conditions prevail. All regulations for forest fire prevention, as required by Part XI of the *Forest Act* must be fully complied with during the course of right-of-way clearing and construction.



## GLOSSARY

- ADIT** – Horizontal entry to orebody (or coal).
- CUT** – Earth or rock section to be removed.
- CLEARING** – Removal of trees only.
- CROSS DRAIN** – Passage of water through road by culvert.
- DRILL SITE** – Area bulldozed flat for equipment.
- FILL** – Earth or rock placed to build up a grade.
- FLOAT** – Plank or bar with teeth or chain, dragged to cover seed.
- GRUBBING** – Removal of roots and woody debris.
- MERCHANTABLE TIMBER** – Sawlogs.
- OVERBURDEN MATERIAL (O.M.)** – To a highway engineer the soil materials which overlie rock; to a mining engineer all materials which overlie ore (or coal).
- RECLAMATION** – Returning disturbed lands as close as possible to previous.
- REHABILITATION** – Return of disturbed lands to productive use.
- RESTORATION** – Exact replacement of disturbed values.
- REVEGETATION** – Coverage with permanent plant cover.
- SEAM TRACING** – Following ore (or coal) strike through continuous or semi-continuous stripping.
- SCARIFY** – To loosen compacted earth with ripper teeth.
- SLASH ABATEMENT** – Disposal of wasted forest cover so as not to present a fire or insect hazard, and for appearance.
- SITE PREPARATION** – Work prior to seeding (filling, contouring, sloping, scarification, etc.).
- SOIL A HORIZON** – Layer of rotted organics.
- SOIL B HORIZON** – Includes weathered mineral material and leachates from A Horizon.
- SPOIL** – Cut material not required for fill.
- STRIPPING** – Removal of topsoil.
- TAILINGS** – Reject material from cleaning or concentrating plant.
- TEST PIT** – Hand excavation to expose orebody (or coal).
- TOP SOIL** – Material extending to maximum root penetration.
- WASTE ROCK** – Rock covering orebody in a surface mine.
- WATER BAR** – Trench to drain run-off from roadway.



## APPENDIX 4.1.2

### REVIEW PROCEDURE - MINERAL OPERATIONS

Section 10 of the Mines Regulation Act requires Notice of Work about a mine to be given to the Inspector; Section 11 makes it an offence to conduct mineral exploration without holding a permit (reclamation/environment) from the Chief Inspector of Mines.

Some mineral exploration work, such as geochemical surveys and line-cutting, does not constitute disturbance of the land under the definition of Section 11 of the Mines Regulation Act. A programme of protection and reclamation is therefore not required to be submitted. Procedure for a company to follow then, is to annually submit to the District Inspector 'NOTICE OF WORK' prior to field programmes being started. This form is completed again after fieldwork is finished for the calendar year. Both are maintained in District Files. A summary list of these operations titled "Mineral Exploration - Minimal Disturbance" should be maintained in the District Files and forwarded monthly to Victoria.

#### BONDED MINERAL EXPLORATION

Where clearing, stripping and/or trenching is likely to cause significant disturbance to the surface of the land, a permit is required from the Chief Inspector of Mines pursuant to the Mines Regulation Act. This requires a security deposit (bonding) to be made, and, possibly the writing of special conditions into the permit. The procedure is:

1. The Company submits to the District Office "NOTICE OF WORK ON A MINERAL PROPERTY" and "RECLAMATION PROGRAM" (See new abbreviated Form 10-11 attached), prior to the start of the field season.

2. The District Inspector reviews the proposal with Reclamation staff and when required will request a more detailed mining plan and/or program of environmental protection (see attached sample letter). This will be circulated to the resource agencies noted in Section 11 when the program affects their responsibilities.
3. When the "NOTICE" and "PROGRAM" are satisfactorily completed the company is notified of acceptance of the mining plan and preliminary acceptability of the reclamation programme. The Chief Inspector is advised of proposed underground work in appropriate detail before approval can be given.
4. A permit number is assigned to the application as in the following example: MX-1-13 where:

MX denotes Mineral Exploration  
1 denotes the District Office  
13 denotes the sequence of issuance.

(The new numbering system will be initiated as soon as a supply of the new Form 10-11's are received in the District Office. As old permits come due for renewal, they will also be recorded in the new system.)

5. Bonding amount is to be recommended and the need for any special conditions on the blue form (see attached sample) which is to be attached to the Form 10-11 (with a copy of the letter to the company) and forwarded from the District Office to Victoria.
6. All permit applications received in Victoria will be processed in the following manner:
  - Note will be made on an Incoming Status Sheet of date received, permit number, operator, location. Permit will then be routinely processed and typed. Once bonding is requested the permit number will be entered in the Mineral Exploration Operation Status Book.

- If no notation is made on routing instructions the permit application will be routinely typed and processed.
  - If notation is made on routing instructions the person designated will first receive the application prior to processing.
7. The Senior Reclamation Inspector will confirm amount of bonding and forward to the Company bonding instructions, Receipt and Agreement Forms and an unsigned draft permit (see letter attached).
  8. Upon receipt of signed Receipt and Agreement Form indicating that securities have been deposited in the bank, the Chief Inspector will sign the permit and forward it to the company (see attached letter). A copy of this letter of notification is sent immediately to the District Inspector of Mines.

Bonding will be adjusted on the basis of reports received from the company and on site inspections.

Prior to the completion of surface work, a final report of work and reclamation will be made to the District Inspector's Office. Bonding will be returned on the basis of this report and the field inspection report.

Companies which carry our mineral exploration in several Districts will receive a General Exploration Permit. The procedure is the same as that at present. A list of General Permits has been circulated (see attached) and when Form 10-11's are received from these companies the Permit Number should be clearly marked in one corner and a copy forwarded to Victoria for the files. Amount of disturbance and status of bonding will be checked periodically.

APPENDIX 4.1.3



PERMIT NO. MX .....

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

MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

**NOTICE OF WORK ON A MINERAL PROPERTY**

(Pursuant to section 10 of the *Mines Regulation Act*)

This form is to be completed by all companies or individuals carrying out exploration work one week prior to commencement of work and one week prior to cessation of work. Keep one copy and forward one copy to the District Inspector of Mines (see Notes on reverse side, at bottom of page).

1. NAME OF PROPERTY .....  
 Number of claims ..... Principal Claim Group .....
2. LOCATION: Mining Division ..... NTS Map Sheet (e.g., 82E/9E) .....  
 Lat. .... ° ..... Long. .... ° ..... Locality and Access .....
3. OWNER: Name ..... FMC No. ....  
 Address ..... City .....  
 Province ..... Postal Code ..... Telephone No. ....
4. OPERATOR: Name ..... FMC No. ....  
 Address ..... City .....  
 Province ..... Postal Code ..... Telephone No. ....
5. DURATION OF EXPLORATION WORK: From ..... to .....
6. EXPLORATION WORK: Indicate PROPOSED  or COMPLETED  – indicate area in square metres  
 Geophysical ..... Geochemical .....  
 Linecutting (distance, width, method) .....  
 Drilling – Number of Sites ..... Total Area .....  
 Road Construction – Length ..... Width ..... Area .....  
 Underground Exploration ..... (type)  
 Trenching (number, method) ..... Area .....  
 Test Pits (number, method) ..... Area .....  
 Stripping Area ..... Other ..... Area .....  
 Camp Contractor ..... Number of men employed .....
7. DATE FOREST SERVICE ADVISED BY OPERATOR .....  
 Name and Title of Forest Official .....  
 Address .....

SIGNATURE OF APPLICANT ..... TITLE .....  
Print Name ..... DATE .....

APPENDIX 4.1.4



PERMIT NO. MX .....

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

MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

RECLAMATION PROGRAM

(Pursuant to section 11 of the *Mines Regulation Act*)

The following is to be completed where the use of mechanical equipment will disturb the surface of the land. It is also to be completed after exploration work is finished. For recommendations on reclamation and environmental control procedures, see booklet entitled *Guidelines for Coal and Mineral Exploration*, available at the office of the District Inspector of Mines.

- 1. PRESENT LAND USE (ranching, timber, etc.) .....
  - Type of vegetation .....
  - Access roads (present use and condition) .....
  - Campsites, old workings (location, condition) .....
  - .....
- 2. EQUIPMENT TO BE USED IN EXPLORATION PROGRAM (List size, capacity, number.)
  - (a) ..... (d) .....
  - (b) ..... (e) .....
  - (c) ..... (f) .....
  - Total disturbed area (1 hectare = 10 000 square metres) ..... hectares
- 3. RECLAMATION EQUIPMENT .....
- .....

SIGNATURE OF APPLICANT ..... TITLE .....

Print Name ..... DATE .....

COMMENTS FROM OTHER GOVERNMENT AGENCIES (by District Inspector) .....

.....

.....

NOTE: A. Pursuant to section 11, subsection (7) of the *Mines Regulation Act*, this side is to be completed where mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching, or such other operations.  
 B. Where timber is to be cut, a 'Free Use Permit' or 'Licence to Cut' is required from the Forest Service.  
 C. Owner is responsible for ensuring the Contractor complies with pertinent regulations (see section 11, *Mines Regulation Act*).



**PLAN**

Indicate claim boundaries, permanent watercourses, access road and distance to nearest town, proposed roads, test pits, trenches, adits, drill sites, and camp sites.

**LOCATION MAP**

Show nearest town and access road



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

MINES REGULATION ACT  
PERMIT  
APPROVING RECLAMATION PROGRAM – MINERAL EXPLORATION

(Issued pursuant to the *Mines Regulation Act* – see inside.)

Permit No. MX .....

Issued to .....

Address .....

for exploration work at the following properties .....

Located at .....

The permit is subject to appended terms and conditions, as noted hereinafter.

Issued this ..... day of ..... in the year .....

.....  
Chief Inspector of Mines

TERMS AND CONDITIONS

1. This permit is issued subject to all the terms and conditions of sections 10 and 11 of the *Mines Regulation Act*.

2. Pursuant to subsection (7) of section 11 of the Act, security as specified and approved by the Chief Inspector of Mines has been deposited in the amount of ..... dollars (\$ .....).

This security is returnable as provided for in subsection (13).

3. The Report dated ....., as filed with the Chief Inspector of Mines, together with all revisions and amendments thereto, and as approved by the Chief Inspector of Mines, is an integral part of this permit.

4. Security deposit will be adjusted on the basis of reports received from the permit holder describing work done and reclamation, and on the basis of field inspections.

*SPECIAL CONDITIONS*

*RECORDING OF REVISIONS TO SECURITY DEPOSIT*

NOTE: This permit applies only to the requirements under sections 10 and 11 of the *Mines Regulation Act*. Other legislation may be applicable to the mining operations, and this permit in no way abrogates the responsibility and obligation of the permittee under such other legislation.

APPENDIX 4.1.5

ATOMIC ENERGY CONTROL BOARD

FINAL DRAFT LICENSING GUIDE

LICENSING GUIDE NO. 31

27 August, 1976

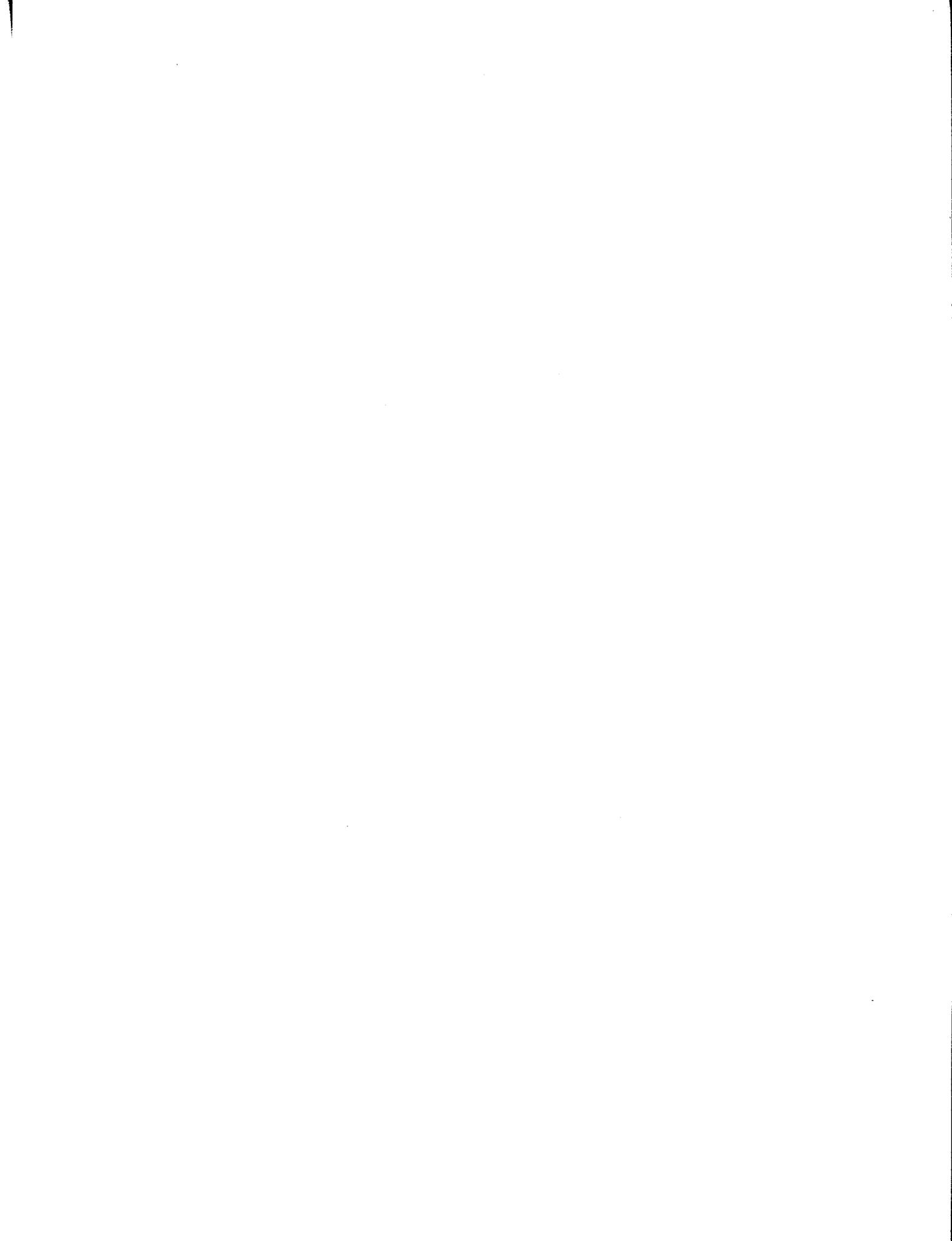
GUIDE TO THE LICENSING OF

URANIUM AND THORIUM MINE-MILL FACILITIES

S U M M A R Y

The licensing procedure is described and the requirements for obtaining a licence to operate a uranium or thorium mine-mill facility are outlined.

\*\*\*\*\*



GENERAL NOTES ON LICENSING GUIDES

- (1) Licensing Guides are provided to publicize approaches and methods which are acceptable to the Atomic Energy Control Board for satisfying the requirements of the Atomic Energy Control Regulations. Licensing Guides supplement the Regulations and are in no way intended to replace the requirements thereof.
- (2) Compliance with Licensing Guides, in whole or in part, is not mandatory. Where an applicant chooses to diverge from a Licensing Guide or its provisions, he must accept the responsibility of demonstrating, to the satisfaction of the Board staff and/or advisers, that the alternative approach or method adequately fulfills the intent and requirements of the Atomic Energy Control Regulations.
- (3) Comments and suggestions for new Licensing Guides and for improvement of existing Guides are encouraged and should be directed to the Secretary, Atomic Energy Control Board. New Guides will be issued and existing Guides revised periodically to incorporate accepted comments and suggestions and to reflect developing technology and practice.
- (4) Copies of Licensing Guides and related index lists are available in both English and French on request from the Technical Information Division. Requests for technical information on and interpretation of the Guides should be requested from the appropriate Licensing Officer.
- (5) The Atomic Energy Control Board may be contacted as follows:

Postal Address:

Atomic Energy Control Board  
P.O. Box 1046  
Ottawa, Ontario K1P 5S9  
CANADA

Telephone Number:  
(general enquiries)

(613) 995-6941

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GUIDE TO THE LICENSING OF URANIUM  
AND THORIUM MINE-MILL FACILITIES

1. INTRODUCTION

The purpose of this guide is to:

- (1) explain the basis for requiring authorization to construct and operate uranium and thorium mine-mill and associated radioactive waste management facilities;
- (2) describe the various stages of authorization, including the documentation normally required and the review procedure normally followed, prior to and following the issuance of an operating licence;
- (3) indicate the conditions that are likely to be imposed in the authorization for construction and operation of the facilities;
- (4) summarize the basic principles and criteria of radiological health and safety to be satisfied in the development and operation of mine-mill and associated radioactive waste management facilities;
- (5) outline the information which should be submitted in support of an application for a Mine-Mill Facility Operating Licence;
- (6) outline the information which should be submitted on an annual basis after the facility has received an operating licence.

The licensing of a mine-mill facility can be divided into two separate components, one involving the mine-mill facility excluding the associated radioactive waste management facilities, and the other involving solely the waste management facilities. The former component will involve review and assessment by the Mine Safety Advisory Committee, whereas the latter will involve review and assessment by both the Mine Safety Advisory Committee and the Radioactive Waste Safety Advisory Committee; in each case, the health and safety principles, guidelines and criteria appropriate to each Committee's area of concern will be applied.

Although the jurisdiction of the Atomic Energy Control Board extends over environmental effects only insofar as these effects relate to the health and safety of workers and of the public, the licensing of mine-mill facilities, particularly during site selection and evaluation, will be co-ordinated with the appropriate review process of federal or provincial agencies concerned with the broad issues of environmental quality.

Other activities, such as surface exploration for, and transfers of, uranium and thorium, are not part of the facility licensing discussed in this guide.

Transfers of uranium and thorium may only be made to consignees authorized by the Board to receive the material. Although transfers of concentrate from the mill site must be reported to the Board, it is the responsibility of the shipper to ensure that the consignee is a duly authorized recipient.

Domestic sales contracts must be submitted to the Board for information purposes, and export sales contracts must be submitted for review and approval. An export permit is required for exporting uranium and thorium.

Export sales contracts will be examined against such criteria as international safeguards, the relationship between the contracting parties, price and volume of sales to the export market, and reserves and rate of exploitation. The review will also consider the adequacy of the contracting company's uncommitted uranium reserves to meet its share of the Canadian domestic reserve margin.

Further information on the topics of the four previous paragraphs can be obtained by contacting the AECB offices.

## 2. BASIS FOR LICENSING

The Atomic Energy Control Act authorizes the Atomic Energy Control Board to make regulations governing the development, application and use of atomic energy in Canada. Regulations, designated the Atomic Energy Control Regulations, therefore, have been framed to, among other things, control nuclear facilities and materials in the interest of national and international security, and to ensure that the health and safety of workers and members of the public are adequately protected. Both radiological and non-radiological aspects of health and safety are included.

Control of nuclear facilities and materials is achieved through licensing. In accordance with the Regulations, therefore, the operation of a facility within which the mining and milling of uranium or thorium takes place requires a Mine-Mill Facility Operating Licence (MFOL) and is subject to the requirements set down in the Regulations.

The MFOL may specify any terms and conditions the Board considers necessary in the interest of health, safety and security. It may be noted that "mining" covers the activities involved in the excavation, removal and storage of ores, and "milling" covers the activities involved in physical concentration of the ore and in the production of concentrates by chemical means.

Being a federal agency, the Board will, upon ministerial directive, use its jurisdictional power and specify in the requirements for facility licensing whatever other terms and conditions may be declared to be in the national interest.

### 3. LICENSING SCHEDULE AND PROCEDURE

#### 3.1 Stages of Mining Activity

For the purposes of licensing, the following distinct stages of activity are recognized and stages 2(b), 3, 4 and 5 are covered in this licensing process:

- (1) Prospecting - defined as the search for mineral occurrences and includes mapping, airborne and ground geophysical work, geochemical work, trenching, test pitting and shallow diamond drilling;
- (2) Exploration - defined as the determination of the extent and content of a mineral occurrence by:
  - (a) - surface exploration which includes detailed geological mapping, geophysical and geochemical surveying, trenching, test pitting, diamond drilling from the surface;
  - (b) - underground exploration which includes stripping of the overburden, driving exploration drifts, raises and inclines, sinking shafts, and diamond drilling from below the surface;
- (3) Development - defined as the preparation of an economic mineral occurrence for production, and includes bulk sampling for mill test purposes and the opening of underground or open pit works to reach the orebody;
- (4) Operation - defined as the actual mining and milling activity which results in production of marketable product;
- (5) Abandonment - defined as measures taken to eliminate or minimize the impact, the mining and milling activities could have on the environment, subsequent to the cessation of operation.

3.2 Summary of Licensing and Other Requirements

The Board's current requirements may be summarized as follows:

- (1) Prospecting and surface exploration for uranium or thorium in general is governed by different regulatory procedures and is not part of this Guide;
- (2) Underground exploration requires prior approval from the Board, in the form of an Underground Exploration Permit. (see item 3.3.2, item 3.3.3);
- (3) Before the start of the development stage, Site Approval is required. There is a little flexibility in the siting of the mine itself, and hence a judgement on the acceptability of the development of the mine at the given location has to be made as a "yes-no" decision based on major factors.

The siting of the mill is more flexible, with the economics of transportation of ore and product being the major factor with considerations given to the possibility of returning a portion of tailings into the mine, and to the use of the mine water in the mill being an important factor also.

The siting of the tailings management area is critical, because of its potential for extensive environmental impact.

Site Approval, therefore, is an essential stage of licensing, the timing being related to the period prior to development approval, necessary to perform an appropriate Environmental Assessment and Review.

The granting of such approval depends on the suitability of the site for the proposed facilities, taking into account credible events which could affect the health and safety of workers and of the public. The applicant shall inform the public of his intention to proceed with the project and provide the public with pertinent information, allowing sufficient time for public response (see 3.3.4);

- (4) Development approval from the Board is required prior to the start of development and construction of the facilities (see 3.3.2 and 3.3.5);
- (5) Operation of a uranium or thorium mine-mill facility and associated radioactive waste management facilities requires a Mine-Mill Facility Operating Licence which would normally not be issued unless previous approvals mentioned above have been obtained and unless the conditions, if any, of such approvals have been complied with (see 3.3.2, 3.3.5 and 3.3.6);

- (6) Abandonment of the Mine, Mill & Waste Management Facility requires authorization from the Board. Finalization of the provisions for abandonment must be made well prior to the date of decommissioning of the facility (see 3.3.2, 3.3.4, 3.3.5 and 3.3.6);
- (7) All transfers of concentrate from the mill site must be reported to the Board by a "Nuclear Material Transfer Report Form 59" in accordance with AECB-1049, "Record and Reporting Requirements for Nuclear Materials";
- (8) Exports of uranium and thorium for any purpose must be authorized by the Board. Application for a permit to export can be obtained from the Department of Industry, Trade and Commerce. An export permit is normally valid for one year.

### 3.3 Documentation Required

#### 3.3.1 Letter-of-Intent

The Board must be notified in writing of any intent to develop a uranium or thorium mine-mill facility as soon as such plans become definite. This letter is to be sent as early as possible prior to the commencement of underground exploration.

This represents the first formal indication of intent to seek, eventually, an operating licence. However, informal discussions between the prospective applicant and Board staff frequently take place well before submission of the letter-of-intent.

The letter shall be addressed to the President of the Atomic Energy Control Board and indicate in general terms, the proposed method of mining and milling, state the location of the proposed mine-mill facility and outline the project schedule.

#### 3.3.2 Letter-of-Application

An application shall be made in writing for each approval phase, including underground exploration, siting, development, operation and abandonment of the mine-mill facility and its associated waste management facilities.

The letter shall be addressed to the President of the Atomic Energy Control Board, stating the approval being sought, and referring to all documentation submitted in support of the application, including any documents previously submitted which are considered relevant to the approval currently being sought.

### 3.3.3 Application for Underground Exploration Permit

A report shall be submitted in support of an application for this permit, outlining the extent of underground exploration to be carried out, describing the radiation protection program to be implemented for the workers and the program for the protection of the environment relative to this stage.

### 3.3.4 Site Evaluation Report

A Site Evaluation Report shall be submitted in support of the application referring to approval of the proposed site for the facilities. The report shall include a general description of the mine-mill facility, a description of the mine-mill site emphasizing the geological and hydrological features of the proposed location for the waste facilities, an outline of the nature, form and quantity of the radioactive waste involved, and a description of the engineered structures for storing the waste.

Consideration shall be given to the effects of site-related factors, including the effects of the ion-exchange properties and capacity of the soil, on the movement of radioactive or chemically toxic material from the waste management facilities into the environment.

The principles behind the measures which will be instituted for assuring the continued protection of the health and safety of the general public after abandonment of the facility shall be discussed. Additional information and documentation, related to the overall environmental assessment and review, shall be submitted on demand to the agencies and the public, as designated by the Board.

### 3.3.5 Safety Reports

A preliminary Safety Report shall be submitted in support of an application for approval to develop a mine-mill facility and to construct the facilities for managing the radioactive waste. Appendix A is a guide for information requirements.

It is recognized that the information in a preliminary Safety Report might be incomplete and be subject to change. The report, nevertheless, shall contain sufficient detailed information, specifications and supporting data to enable the Board to assess whether the mine-mill and associated radioactive waste facilities are being designed such that their construction and operation will conform with the health and safety guidelines and criteria for workers and the public pursuant to the requirements laid down in the Atomic Energy Control Regulations and in any other applicable legislation.

Where design information required in the preliminary Safety Report is not available at the time of writing, the report shall describe the criteria and bases being used to develop the required information, or the alternatives being considered. The schedule for submission of missing information shall be given.

During the interval between the granting of construction or development approval and the granting of an operating licence for the mine-mill and associated radioactive waste management facilities, the preliminary Safety Report shall be revised at yearly intervals to reflect the progress of design, development and analytical work. Each such revision shall identify any significant changes in design or intent.

The final Safety Report supporting an application for an operating licence shall cover the as-built facilities and include all the information specified in Appendix A.

### 3.3.6 Statement of Operating Policies and Principles

A document shall be submitted, in support of the application for an operating licence, defining the operating policies and principles which will be instituted by the applicant to ensure a continuing high level of confidence that the facility will be operated in accordance with the appropriate health and safety requirements.

The policies and principles which will be instituted for assuring the continued protection of the health and safety of the general public after abandonment of the facility shall also be defined.

### 3.4 Participants in Review Procedure

#### 3.4.1 AECB Staff Review

Board staff will study the application and supporting documentation, request additional information when required, meet with the applicant when necessary and make recommendations to the Board.

#### 3.4.2 Safety Advisory Committee Review

At the request of the Board's Mine Safety Advisory Committee and/or the Radioactive Waste Safety Advisory Committee, they may study the application, including any supporting documentation and any additional information which Board staff have presented as being relevant to the application under consideration. The Committees may hold meetings, either with the applicant or in private session to discuss the application. The Committee's recommendations and comments are then submitted to the Board.

The Mine Safety Advisory Committee and the Radioactive Waste Safety Advisory Committee are appointed by the Board for advice on all matters relating to the licensing of mine-mill facilities and of radioactive waste management facilities, respectively. The membership includes independent experts in various disciplines associated with mining, waste management, public health, and environmental protection, some of whom are drawn from federal, provincial and local regulatory agencies. Thus, the Committees provide a wide range of expertise and experience in the review of applications for licences and approvals, assist in inter-governmental communication and co-operation during the licensing procedure.

#### 3.4.3 AECB Review

The Board considers the application, supporting documentation and the comments and recommendations of its staff and of the Safety Advisory Committees in deciding whether to approve or deny the issuance of the requested approval or licence.

#### 3.5 Scheduling of Licensing Activities

The timing of various licensing actions will depend upon the applicant's construction and start-up schedule for the facility, the time required to review the applicant's submissions, and on any need to seek additional information. It is recommended that discussions be held between the applicant and Board staff as early as possible to discuss scheduling of the project and the information required by the Board. One of the purposes of such discussion meetings is to ensure that all activities will be integrated into an overall schedule and to minimize the effect on a project schedule of meeting regulatory requirements. A total schedule for licensing actions is shown in Figure 1, indicating the time period required for the reviews mentioned in this document.

#### 3.6 Compliance Surveillance

Routine reports, by the applicant or licensee, on the progress of construction of the facility and on the operation of the facility are generally required under the conditions of the construction approval or operating licence. These reports are reviewed by Board staff and may also be reviewed by the Safety Advisory Committees. Appendix B outlines the information required in Annual Reports which are to be submitted by the licensee under a condition of the operating licence.

In addition, members of Board staff or other authorized representatives of the Board may make visits to the mine-mill facility or to the premises of equipment suppliers in order to satisfy themselves that the policies, principles and procedures described in the licensing documents are being implemented, that the conditions set down in any licence or approval are being followed, and that the requirements of the Atomic Energy Control Regulations are being fulfilled.

The results of this continuing review and inspection program will be considered when the operating licence is presented for renewal. The review procedure for licence renewal is similar to that for approval of an operating licence. At least in the early years of plant operation, mine-mill facility licences are valid for one year only.

4. LICENCE CONDITIONS

Following are some of the conditions which will be imposed in the MFOL related to the operation of most mine-mill facilities:

- (1) That the facility be operated in accordance with certain operating policies and principles specified by the applicant and approved by the Board;
- (2) That no modifications or deviations from the existing design, operating conditions, or procedures specified by the applicant which may affect the safety of the facility be made without prior approval of the Board;
- (3) That an Annual Report be submitted to the Board summarizing the operating experience, significant events, changes in procedures and modifications of equipment which occurred or were made in the preceding calendar year (See Appendix B);
- (4) That the facilities not be used for purposes other than those authorized by the Board;
- (5) That all applicable provincial and federal health, safety, pollution control and other regulations which are not inconsistent with the Atomic Energy Control Act and Regulations be complied with;
- (6) That federal and provincial government agencies responsible for environmental concerns be permitted to monitor the facility and its surroundings;
- (7) That the facility and all plans, drawings, documents and records pertaining to the design, construction, testing and operation of the facility be made available at all reasonable times for inspection by Board representatives;
- (8) That any tests, inspections, analyses, modifications or procedural changes which the Board may require be carried out;
- (9) That information or events which reveal significant degradation or weakening of components and systems whose failure would significantly increase the probability of a hazard to the health and safety of workers and the public be promptly reported to the Board;

- (10) That reports be made promptly to the Board and to the provincial health authorities of any occurrence which resulted in or is likely to result in any person receiving a dose of radiation exceeding the limits specified in Section 19 of the Atomic Energy Control Regulations, or exceeding the derived secondary limit for exposure to radon daughters as specified in Section 5.2.2 of this Guide;
- (11) The physical security measures approved by the Board be taken to protect the integrity of the facility, and to prevent theft, loss or any unauthorized use of the uranium or thorium concentrates;
- (12) That transfers of uranium or thorium concentrates be made only to authorized consignees, and that such transfers be reported to the Board in accordance with AECB-1049, "Record and Reporting Requirements for Nuclear Materials". "Authorized Consignee" shall mean:
  - (a) in Canada, any person authorized by virtue of the Atomic Energy Control Regulations to receive uranium and thorium;
  - (b) any foreign consignee so authorized in an export permit issued by the Department of Industry, Trade and Commerce and approved by the Atomic Energy Control Board.
- (13) That all domestic sales contracts be submitted to the Board;
- (14) That all foreign sales contracts be submitted to and approved by the Board;
- (15) That exports of uranium and thorium receive prior authorization from the Board;
- (16) That the mine-mill tailings or residue confined in the waste management facilities not be removed without prior approval of the Board and by other appropriate agencies;
- (17) That the transport of uranium or thorium concentrates from the premises of the mine-mill facility comply with the packaging and shipping requirements of the appropriate transport regulations;
- (18) That when it has been decided by the licensee that the mine-mill facility is to be taken out of production, and well before the suspension or termination of mining and milling activities, that the operations planned for such decommissioning and the plans for the continued safe operation of the associated radioactive waste management facilities be approved by the Board and by other appropriate agencies;

- (19) That all employees exposed to radiation be informed regularly and on demand, of their accumulated exposure;
- (20) That a certificate, issued by the Board, denoting the particular approval or licence currently in force, be posted in a prominent place in the facility.
- (21) That submissions on ore reserves be made to the Uranium Reserve Assessment Group of the Department of Energy, Mines and Resources. These submissions are to be made in the form and at the times requested by the Uranium Reserve Assessment Group.

## 5. HEALTH AND SAFETY PRINCIPLES AND CRITERIA

### 5.1 Radiological Health and Safety

It is evident from the Atomic Energy Control Regulations that, with respect to the operation of nuclear facilities, both radiological and non-radiological aspects of the health and safety of the workers and of the public must be considered by the Board. The provinces, however, have traditionally exercised jurisdiction over mineral resources and mining, and have established regulations governing the operation of mines and mills. Where appropriate provincial regulations do not exist, the corresponding federal regulations are applied. Thus the Board can be assured that the general principles of non-radiological health and safety are complied with.

#### 5.1.1 Objectives

The objectives for limiting the radiation exposure of individuals are those recommended by the International Commission on Radiological Protection. These objectives may be summarized by stating that mine-mill and associated radioactive waste management facilities shall be designed and operated in such a manner as to:

- (1) prevent the exposure of any person to ionizing radiation in excess of the maximum permissible doses specified in Section 19 of the Atomic Energy Control Regulations;
- (2) prevent the unnecessary exposure of any person to ionizing radiation;
- (3) keep all doses as low as is reasonably achievable, economic and social considerations being taken into account.

It should be noted that the total dose to any organ or tissue shall comprise the doses contributed by external sources during working hours and by the intake of radioactive materials into the body during working hours.

#### 5.1.2 Worker Exposure Limits

Inhalation of radon daughters normally constitutes the greatest potential radiation hazard to uranium mine workers, the lung dose being of primary concern. If, in the proposed operation, the likelihood exists of employees in the course of their occupation receiving radiation doses in excess of limits for the general public set by ICRP, these employees must be declared "Atomic Radiation Workers". For atomic radiation workers, Section 19 of the Regulations limits the lung dose to 15 rems per year. A secondary exposure limit can be derived such that compliance with the derived limit implies compliance with the statutory limit. As an interim guideline for this secondary exposure limit, the Board has specified that the maximum permissible exposure of uranium miners to radon daughters shall be 4 working level months (WLM) in any consecutive twelve month period. The actual exposure, however, should be as far below 4 WLM as is reasonably achievable.

When exposure to external or internal sources other than radon daughters contributes measurably to the total dose, the exposure to radon daughters must be reduced accordingly, such that the total dose received does not exceed the regulatory limit.

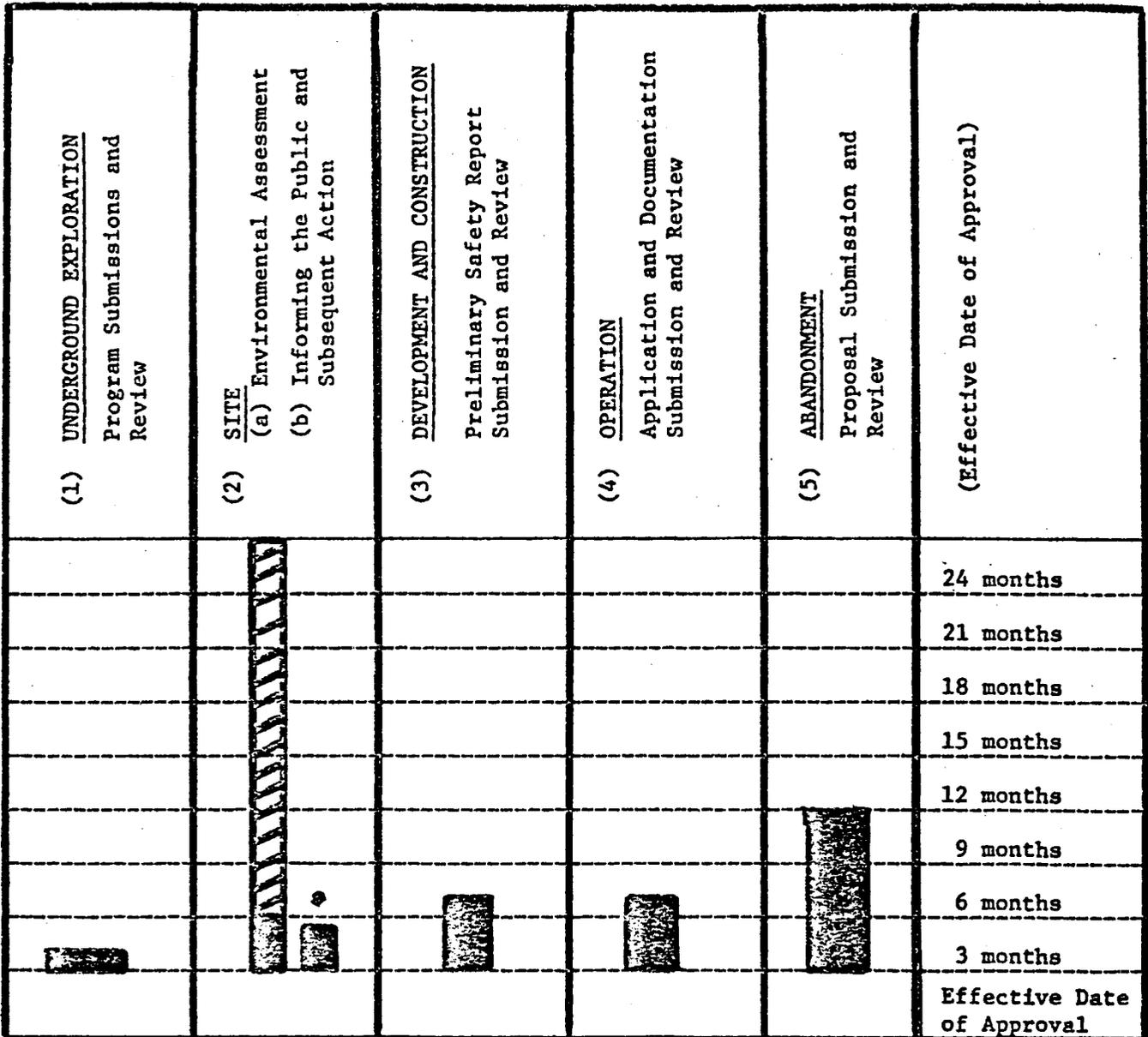
It may be noted that the requirement to maintain the radiation exposure of individual workers below statutory limits necessitates not only control of the working environment and operational procedures through proper design and operation of the facilities, but also control of the exposure of individual workers by effective administrative procedures in conjunction with the maintenance of individual exposure records.

The Board supports the view that miners who are approaching or who may have already exceeded a cumulative exposure of 120 WLM should be made aware, on a case-by-case basis, of the risks and benefits associated with continuing or changing their present type of employment, and, in view of the uncertainties regarding the effect of smoking in combination with exposure to radon daughters, the Board believes that uranium miners should be made aware of these uncertainties and be advised against smoking both at work and at other times.

5.1.3 Effluent Release Limits

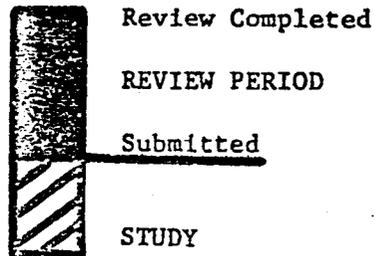
The release of radioactive material, both controlled and uncontrolled, from mine-mill and associated radioactive waste management facilities must be such that the dose of ionizing radiation received by any member of the public through any viable pathway is as far below the regulatory limit as is reasonably achievable. Appropriate design and operating targets for such releases, therefore, will be established for each individual facility in accordance with the "as low as reasonably achievable" concept. It should be noted that control and engineering measures should be developed to assure the above even after decommissioning and abandonment of the facilities.

FIGURE 1 - TYPICAL SCHEDULE FOR LICENSING ACTIONS



SIZE  
PUBLIC  
HEARINGS?  
COMPANY?  
SURVEY?

LEGEND:



IN CASE OF SHUT DOWN.  
RE-APPLICATION REQUIRED

A P P E N D I X A

INFORMATION TO BE INCLUDED IN SAFETY REPORTS

A.1 INTRODUCTION

As explained in Section 3.3.5, the preliminary Safety Report is the principal document supporting an application for approval to develop a uranium or thorium mine-mill facility and to construct the associated radioactive waste management facilities, and the final Safety Report is the principal document supporting an application for a licence to operate these facilities.

The main purpose of Safety Reports is to provide information on which an assessment of the potential health and safety hazards associated with the construction and operation of the facilities can be based.

For convenience, the information specified here has been put under topical headings, but Safety Reports need not necessarily follow a similar format. It may be noted that the information specified here is the basic information expected from all applicants, but that other information necessary for evaluating the application may also be requested at any time.

The use of SI metric units is encouraged, with customary units referred to parenthetically.

A.2 GENERAL

A.2.1 Organizational Information

- (1) The applicant's full name and address should be given. If the applicant is a corporation, the manner of its incorporation should be stated and the names and home addresses of all its directors and officers should be listed.

It may be noted that a mining company is required to be incorporated in accordance with the Canada Corporations Act or a provincial Companies Act.

- (2) The names and addresses of other persons or organizations associated with the applicant in the proposed mining and milling operations should be given, and the nature and extent of their interest should be described.
- (3) The names, addresses, and telephone numbers of the mine and mill managers should be given, as should the name, title, address and telephone number of the mine officer designated to receive and act on communications and orders from the Board.

- (4) The organizational arrangements and assignment of responsibilities and authority should be described with the aid of an organization chart.

#### A.2.2 Project Description

- (1) The mine-mill facility and the proposed mining and milling operation, including the radioactive waste management facilities and operation, should be described briefly. A discussion of the principal design criteria, operating characteristics and safety-related subject matters should be included. Unusual site characteristics, solutions to particularly difficult engineering problems and significant extrapolations in technology represented by the design should be highlighted.
- (2) The location of the mine-mill facility should be described with the aid of maps of successively larger scale. If the facility is situated in unsurveyed lands, a location plan should be attached, showing the surveyed latitude and longitude of the mine shaft or mill, together with its position relative to the identifiable physical features in the vicinity.
- (3) The map of the site should clearly show property lines, the boundary of the exclusion zone, the location and orientation of principal structures within the site, utility routes such as gas, electricity and water routes, and roads, railways and waterways that traverse or are adjacent to the site. If unusual transportation difficulties are anticipated, these should be discussed.
- (4) The total area of the property held by the applicant should be stated, and the serial numbers of the individual claims should be listed.

#### A.2.3 Security

The measures to be taken to prevent theft, loss or unauthorized use of the uranium or thorium ore and concentrate, and to prevent intrusion by unauthorized persons upon the waste management area should be described. Measures for deterring the misuse of tailings after abandonment of the facility should be discussed.

#### A.3 RESOURCES

##### A.3.1 Ore Reserves and Resources

Current estimates of ore reserves based on the latest submission to the Uranium Reserves Appraisal Group should be submitted. A tabular format is suggested for summarizing these estimates. This information is necessary to enable the Board staff to properly assess the extent of proposed mining operations, and the adequacy of proposed mill tailings disposal facilities.

A.3.2 Geology

The geological structure of the orebody should be described, including its dimensions and approximate shape, and the country rock near the orebody should be described briefly.

A.3.3. Mineralogy

The assay weights of economically important minerals in the orebody and the assay weights of gangue minerals should be listed. The list should also include the pyrite (marcasite), pyrrhotite and total arsenic contents, and the arsenic minerals should be identified.

A.4 THE SITE

A.4.1 Demography and Land-Use

The current and predicted population in the area surrounding the facility should be given as a function of direction and distance from the site. Nearby centres of permanent or transient population should be identified. The present uses of land in the surrounding area and any predictable future development should be described.

A.4.2 Flora, Fauna and Aquatic Biota

The local vegetative cover, wildlife and aquatic biota should be described briefly.

A.4.3 Meteorology

The effects which meteorological considerations will have in establishing design bases and operating requirements for the facility should be explained. Sufficient meteorological data, obtained from nearby weather stations and from the site itself, should be included to justify the design requirements. The data should include frequency of winds of a given velocity and direction, monthly temperatures, monthly and yearly precipitation and monthly atmospheric water vapour.

A.4.4 Hydrology

- (1) Information should be submitted about the hydrology of the site and its surroundings within a radius of about 10 km. The location, size, shape and other hydrological characteristics of streams, lakes and shore regions and the regional and local groundwater aquifers, formations, sources and sinks should be described. Existing and proposed water control structures, both upstream and downstream, that may influence conditions at the site, should be described. Copies of the most recent and largest scale topographic maps of the

site for the mine-mill and associated radioactive waste management facilities should be included, showing any proposed changes to natural drainage features. Groundwater or piezometric contour maps of aquifers beneath and in the vicinity of the site to indicate flow directions and gradients should be provided.

- (2) The present use and projected future use of both ground and surface water sources in the region surrounding the proposed mine-mill facility should be described.
- (3) The local ground and surface water quality should be analyzed for the following constituents:

pH	chlorides as Cl
total solids	✓ <del>gross alpha</del>
suspended solids	✓ <del>gross beta</del>
dissolved solids	iron as Fe
sulphates as SO <sub>4</sub>	manganese as Mn
uranium as U	sodium as Na
✓ thorium -227, 228, 230, 232	potassium as K <i>nickel</i>
✓ radium -226 ( <i>total dissolved</i> ) 210	calcium as Ca
total kjeldahl nitrogen	magnesium as Mg
(expressed as N)	copper as Cu
nitrates (expressed as N)	lead as Pb
nitrites (expressed as N)	zinc as Zn
ammonia (expressed as N)	nickel as Ni
acidity as CaCO <sub>3</sub>	barium as Ba
alkalinity as CaCO <sub>3</sub>	<i>chromium as Cr</i>
phosphorus as P	✓ <i>total 210</i>
	✓ <i>total 210</i>

- (4) Intake locations for water required by the facility and the release points for and subsequent route of effluents from the mine-mill facility, including the waste management facilities should be identified.
- (5) The route and destination of runoff from the mine-mill site should be described, with special reference to periods of acute thaws or heavy precipitation. The susceptibility of the area to flooding should be discussed.
- (6) The ability of the ground and surface water environment to disperse, dilute or concentrate accidental releases of liquid radioactive or chemically toxic effluents with respect to existing or potential future water users should be described.
- (7) The program for monitoring effluents and receiving water quality during operation of the facility should be discussed.
- (8) The anticipated effect of pumping mine water on the local water table should be considered.

A.4.5 Geology and Seismology

- (1) Copies of the most recent and largest scale soils maps and geologic maps covering the site for the mine-mill and associated radioactive waste management facilities should be submitted. The effect of site geology on civil design should be discussed.
- (2) Information on earthquakes and ground motion at the site should be presented.

A.5 THE MINE

A.5.1 Existing Property Development

- (1) A brief description should be given of any existing development, such as shafts, adits, mills, and tailings areas which had been constructed before control of the property was assumed by the applicant. The name or number, and the present and proposed depths or lengths of shafts or adits presently on the property should be given and those presently in use should be identified.
- (2) If old workings are to be dewatered, the chemical and radiological characteristics of the water before and after any required treatment, the total volume and the destination of the water should be specified.

A.5.2 Design and Activities of the Mine

- (1) All planned mining activities should be described. If open pit operations are proposed, and conventional underground operations are to follow, an estimate should be given of when underground operations would begin. The extent of sorting or preconcentration before the initial stages of fragmentation in the mill should be described.
- (2) For underground operations, the description should show the mine layout, and should include a discussion of strata control, the use of backfill, the hoisting and haulage systems, the mining machinery and the ventilation system.
- (3) For open pit operations, the description should show the pit layout, and should include a discussion of the loading machinery and the haulage system. The maximum length, width and depth of the pit should be specified. The extent of the planned restoration of the mined-out area should be described.
- (4) The nominal total daily and yearly production of ore and the expected life of the mine or pit should be specified.

- (5) The electrical power distribution system should be discussed, with emphasis on those features which assure continuity of power sufficient for safety needs, including an evaluation of the reliability of sources, distribution systems and equipment.
- (6) The type and quantity of material, including waste rock, that will be rejected daily during mining operations, and the management and storage of such material should be specified.
- (7) If solution mining is planned, the daily volume of solution to be pumped, the chemical nature of the solution, including pH and the uranium, iron and sulphate contents should be given.
- (8) The principal uses of water in the mine, the source of the water and the volume used daily should be specified.
- (9) The total volume of water to be discharged daily from the mine during normal operation and whether any water will be directed to the mill for process use should be specified. The discharge points for the mine water and the flow rate of the water discharged as effluent should be specified. The expected chemical and radiological characteristics of the mine water, including pH, sulphates, iron, uranium, thorium and radium should be given.
- (10) The proposed operating schedule for the mine, including hours per day, days per week, weeks per year, shift periods and number of employees should be given.

#### A.6 THE MILL

- (1) All activities and processes in the proposed milling operation should be described. Crushing, grinding and extraction processes, and product and effluent handling should be discussed. A description of and operating specifications for all major items of process equipment should be given. A copy of the mill flow sheet should be attached, showing at which points various reagents or chemicals will be added. The source of the mill water and the volume required daily should be specified.
- (2) The type and quantity of all reagents or chemicals to be used in the mill, and the reactions involved should be specified.
- (3) If the proposed grinding circuit is to employ rod or ball mills, the expected total rod or ball metal losses should be given. The expected grind in the grinding circuit should be given.

- (4) The nominal daily and yearly ore processing capacity of the mill should be stated and the expected overall efficiency for the recovery of uranium or thorium should be given. The concentrates being produced and the quantities produced daily should be listed. The expected mill heads analysis, including  $U_3O_8$ ,  $ThO_2$ , Fe and total S should be specified.
- (5) If the mill is to handle ore from other properties, the details of the proposed arrangements should be specified.
- (6) The expected chemical and radiological characteristics and the total volume of the water or solution to be discharged daily from the mill should be given. If all water or solution leaving the mill is not destined for the waste management area, this should be explained.
- (7) The average dry weight of tailings to be discharged daily from the mill, and the liquid to solid ratio of the tailings should be specified.
- (8) The electrical power distribution system should be discussed, as in Section A.5.2 for the mine.
- (9) The proposed operating schedule for the mill, including hours per day, days per week, weeks per year, shift periods and number of employees should be given.

A.7 WASTE MANAGEMENT

- (1) The design, construction and operation of the waste management system should be described, and a detailed scale plan of the waste management area should be submitted. Guidelines for effluent release developed by other federal and provincial agencies may be used as a basis for defining design objectives.

The plan should show:

- (a) all structures for settling, decanting, retaining and treating, and for controlling the movement of wastes or wastewaters from the mine-mill facility, and all structures for flood control and for otherwise diverting or controlling the movement of water in existing water systems;
- (b) the flow network for wastes, wastewaters, and decant, including water directed back to the mill for re-use from the waste management facilities, such as settling ponds, and the expected flow rates within the network;

- (c) the watercourses or waterbodies receiving the effluent from the waste management system and the effluent flow rate;
  - (d) any existing water system, flowing either permanently or intermittently, which will be engulfed, disturbed, or diverted by any part of the waste management system, and the flow rate and flow direction of such water;
  - (e) any existing water system which will or might flow into any part of the waste management system, and the flow rate of such water;
  - (f) the direction of flow and the flow rate of groundwater on the site occupied by the waste management system.
- (2) The design, construction and operation of all structures referred to in Subsection (1) (a) above should be described, and detailed large scale drawings of such structures should be included. Typical cross sections of all proposed embankments and anticipated future extensions should be shown. Embankment design should include information on height, top width, side slope freeboard, seepage control, protection of embankment surfaces and foundation design.
  - (3) A design analysis of the integrity of the proposed waste management system should be provided and should include, where applicable, the results of soil tests, geologic exploration, nature of foundation materials, stability investigations and characteristics of fill material.
  - (4) Conditions that might lead to accidental release of the waste, the recovery action to be taken in the event of a release, the probable effects of such releases on public health and on environmental quality, and the proposed programs of inspection and maintenance to prevent such accidental release should be evaluated and discussed.
  - (5) The size and the total dry weight capacity of all proposed tailings impoundment facilities should be specified. If any impoundment facility is to occupy a former lake basin, the approximate size of the basin should be given.
  - (6) The expected maximum and average depths of tailings in the tailings impoundment facilities after all operations on the property have ceased should be stated.
  - (7) If the proposed tailings impoundment facilities are not intended to contain the entire production from the mine-mill facility for the life of the facility, the plans for future tailings management should be discussed.

- (8) If solid tailings from the mill or elsewhere are to be used as backfill or for other purposes, the quantities used daily for each purpose should be specified.
- (9) The chemical and radiological characteristics of all present water systems which will be disturbed or diverted by the waste management system of which might flow into any part of the waste management system, and the expected chemical and radiological characteristics of the effluent discharged from the waste management system during full operation should be given.
- (10) The chemical and physical treatment for controlling the chemical and radiological quality of the effluent eventually discharged from the waste management system should be described. The settling time and the chemical addition rates should be specified, the equipment should be described, and relevant engineering drawings should be supplied.
- (11) Measures for controlling the movement of material from solid waste piles due to the effect of heavy rainfall, flooding and wind erosion should be discussed. The leachability of radium in the waste rock should be considered.
- (12) The on-site management of radioactive waste other than tailings and waste rock should be described. Arrangements for the off-site storage and management of radioactive waste material or used contaminated equipment or parts should also be described.
- (13) If some or all of the waste management area is not on property controlled by the applicant, the owners of the property claims should be identified and the claim boundaries should be shown on the plan in Subsection (1). Copies of all pertinent agreements signed with the owners of the claims not held by the applicant should be attached.
- (14) Provisions for revegetation and for the chemical or physical treatment of the contained tailings after abandonment should be described.

A.8 HEALTH AND SAFETY

A.8.1 Policy

The applicant's policy with respect to occupational health and safety, and accident prevention should be stated.

A.8.2 Radiation Protection

- (1) The administrative organization of the radiation safety or health physics program including the authority and responsibility of each position, and the experience and qualifications of the personnel responsible for the health physics program should be described.
- (2) The health physics facilities, laboratory facilities for radioactivity analyses, and the facilities for washing, eating, changing and laundering should be described. The source and quality of water used for drinking, cooking and bathing should be specified.
- (3) All measures for ensuring that the exposure of mine-mill workers to all internal and external radiation will be as low as reasonably achievable should be discussed. Consideration should be given to:
  - (i) radon or thoron, and to radon or thoron daughters in the atmosphere;
  - (ii) long-lived alpha emitters, such as uranium, thorium and Ra-226 in the atmosphere;
  - (iii) other radioactive material, such as Th-230, Pb-210 and Po-210 in the atmosphere;
  - (iv) external gamma radiation;
  - (v) external beta radiation.

Some of the measures which should be discussed are:

- (a) the design of the mine and mill to minimize the radiation exposure of workers;
- (b) isolation or diversion of radon or thoron from main air streams, including control of radon-bearing underground water;
- (c) ventilation - the design and layout of the main and auxiliary ventilation systems in the mine, in ore storage areas, in the mill, and in any other area should be described, and the relevant design calculations for the main fans should be shown; the discussion should be supplemented with appropriate drawings to show the flow distributions and flow capacities; and the control system for operating the ventilation system should be described;

- (d) air cleaning - the design of the air filtration systems in the mine and in the mill, the equipment used, the radionuclide removal efficiency, the maintenance required, including regeneration and replacement of filter elements, and the plans for managing the collected wastes from the filtration system should be discussed;
- (e) dust control - the facilities and measures for preventing and suppressing the emission of both radioactive and non-radioactive dust during mining and milling operations and for controlling the airborne concentration of dust should be discussed; the discussion should include the role of the general and auxiliary ventilation systems, and the design of the enclosures, exhaust systems and collectors;
- (f) monitoring - instruments, plans and procedures for periodically and continually surveying or monitoring the working environment in the mine and mill for both internal and external radiation should be described, including specifications such as sensitivity and range, the calibration, maintenance and numbers of such instruments, the frequency and location of the measurements, and the sources and expected magnitude of errors or uncertainties in the measurements; and the program for personnel dosimetry and the bioassay program should be described;
- (g) respiratory protection - the types and specifications of the respirators to be used, the requirements for inspection and maintenance, the testing frequency and the frequency of use should be described;
- (h) job rotation - the extent and justification for job rotation should be discussed with reference to the expected external radiation levels and to the design levels of airborne radionuclides in work areas;
- (i) administrative and operational procedures - a description should be given of the practices and procedures which will be implemented and the precautions which will be taken in the conduct of various mining and milling operations to ensure that external radiation levels, airborne radionuclide concentration levels, and occupational radiation exposure will be as low as reasonably achievable; operational limits and rules with respect to radiation protection should be specified, the action levels for radiation alarm systems, the criteria for establishing the levels and the procedures to be followed when the levels are exceeded should be described; a detailed description of the control measures for preventing inhalation and ingestion of uranium or thorium concentrate, and the rules for personal hygiene and use of personal protective equipment both in the mine and in the mill should be given.

- (4) The system for measuring, compiling, recording, and reporting the cumulative radiation exposure of individual workers should be described.
- (5) The release rates of radionuclides to the atmosphere from the ventilation and exhaust systems under normal operating conditions should be specified and should be related to the resulting exposure both of workers on-site and of the public off-site at the boundary of the exclusion zone. Any provisions for monitoring and controlling gaseous releases of radionuclides should be described.

#### A.8.3 Medical Surveillance

The program for monitoring and supervising the health of employees should be discussed and should include a brief description of the medical examinations conducted during employment and the frequency and timing of such examinations.

#### A.8.4 Conventional Health and Safety

The administrative organization of the health and safety program, other than the radiation safety or health physics program, the authority and responsibility of each position, and the experience and qualifications of the personnel responsible for the health and safety program should be described.

#### A.8.5 Induction Program

The induction program for new employees should be described, emphasizing the health and safety topics which will be covered.

#### A.8.6 Training

The training programs for supervisors and for new and experienced employees should be described, indicating the degree of emphasis placed on health and safety topics, including radiation protection.

#### A.8.7 Accident Prevention

The proposed accident prevention program should be described. The types and frequency of safety meetings, particularly those involving workers, should be discussed. The major types of injuries to be guarded against, and the causes of and circumstances surrounding typical accidents should be described. The extent to which causes of accidents will be investigated, and the frequency of safety inspections of equipment and work areas should be specified.

A.8.8 Fire Prevention

The possible fire hazards in the mine, mill and elsewhere on the site, and the precautions which will be taken to prevent fires should be discussed. Special mention should be made of the fire hazards which may be associated with the solvent extraction process. The training of personnel for fire fighting and the fire fighting facilities and equipment should be described.

A.8.9 Mine Rescue

The facilities and training of personnel for mine rescue work should be described, and the number of supervisors and personnel trained for rescue work should be given.

A.8.10 First Aid

First aid facilities, including emergency showers for acid or alkaline splashes, should be described. The qualifications of attendants and the fraction of all personnel which will be given first aid training should be specified.

A.8.11 Noxious Gases and Fumes

The measures, facilities and equipment should be described for controlling noxious gases and fumes, such as diesel exhaust, sulphur dioxide, arsine and hydrogen cyanide, which may be produced or encountered during mining and milling operations.

A.8.12 Dangerous Substances

The facilities, equipment and program for protecting employees from all potentially hazardous substances used or encountered during mining and milling operations should be described.

A.8.13 Hearing Conservation

A list of anticipated noise sources, estimated noise levels and a description of measures and equipment for noise attenuation should be given.

A.8.14 Non-Radiological Monitoring

Instruments, procedures and facilities should be described for sampling, monitoring, and analyzing the levels of all chemically toxic substances, such as dusts, fumes, gases and chemicals, in the mine-mill working environment. Instruments and procedures for measuring noise exposure should be included.

A.8.15 Communications

The communications and warning systems in the mine and in the mill, and the associated instrumentation and equipment should be described.

A.9 STANDARDS AND REGULATIONS

A.9.1 Standards

The standards that have been adopted with respect to limiting the exposure of workers or members of the public should be summarized for the following:

- (a) Radon and radon daughters in air, or thoron and thoron daughters in air;
- (b) Long-lived alpha emitters in air, such as natural uranium, natural thorium and Ra-226;
- (c) Other significant radionuclides in air, such as Th-230, Pb-210 and Po-210;
- (d) External radiation from ore or concentrate;
- (e) Natural uranium, natural thorium, Ra-226, and other significant radionuclides in the mine-mill effluent and in the mine-mill drinking water;
- (f) Quartz in respirable dust;
- (g) Respirable dust;
- (h) Diesel exhaust;
- (i) Other toxic gases or fumes;
- (j) Toxic chemicals;
- (k) Noise.

A.9.2 Regulations

The mine safety and pollution control regulations that are applicable to the proposed mining and milling operations should be specified.

A P P E N D I X B

INFORMATION TO BE INCLUDED IN ANNUAL REPORTS

B.1 INTRODUCTION

The submission of an Annual Report is a requirement under the conditions of the operating licence. The purpose of the Annual Report is to summarize the performance and operation of the mine-mill facility and associated waste management facilities, to describe any changes in procedures or equipment, and to report the occurrences of events which could have had, or did have a significant influence on public or personnel safety.

For convenience, the information specified here has been put under topical headings, but Annual Reports need not necessarily follow a similar format. Although the information specified here is the basic information expected from all licensees, other information necessary for evaluating the operation of the mine-mill facility may also be requested at any time.

The use of SI metric units is encouraged, with customary units referred to parenthetically.

B.2 GENERAL

B.2.1 Organizational Information

- (1) The full name and address of the licensee, and the Mine-Mill Facility Operating Licence number should be given.
- (2) Any changes should be reported in the following:
  - (a) Directors or officers;
  - (b) Home addresses of directors or officers;
  - (c) Key management personnel and mine-mill organization;
  - (d) Persons or organizations associated with the licensee in his operations;
  - (e) Names and addresses of persons or organizations associated with the licensee;
  - (f) Nature and extent of the interests in the property and in the mining operations of persons or organizations associated with the licensee;
  - (g) Property lines, site boundaries, total area of the property and serial numbers of claims.

B.2.2 Security

Details of any changes in security arrangements from those previously described should be given.

B.2.3 Transfer of Concentrate

The amount of concentrate transferred from the mill during the preceding year should be reported and the recipients identified.

B.3 RESOURCES

B.3.1 Ore Reserves and Resources

Current estimates of ore reserves, as defined in Section A.3.1, should be given.

B.3.2 Geology

Additional information should be provided on the geological structure of the orebody obtained from production and exploration work in the preceding year, illustrated by maps, sections and core logs.

B.4 OPERATION

B.4.1 The Mine

- (1) The total and daily average quantities of ore mined, the quantity of waste rock moved to waste piles, and the quantity of waste rock used to backfill the mine should be given.
- (2) The extent of exploration with drifts, raises, shafts and inclines should be described.
- (3) Significant changes in the method of mining should be reported. Different mining methods which may have been employed during the previous year should be evaluated.
- (4) The ventilation development in drifts, raises, shafts and inclines should be described. Updated maps (plans and sections) of the ventilation system should be supplied showing the direction and flow rates for fresh and exhausted air.
- (5) Updated maps (plans and sections) should be supplied showing the stoping and the extent of the development during the preceding year.

- (6) The expected life of the mine based on current long range production plans should be given.
- (7) The volume of water being discharged daily from the mine during normal operation, and the chemical and radiological characteristics of the water should be given (see Section B.5.2).
- (8) Any treatment of the water discharged from the mine and whether any of it is recycled should be described.

#### B.4.2 The Mill

- (1) The total and daily average mill feed rate, the grade of mill feed, the analysis of present mill heads, the amount, nature and grade of concentrates produced, the average recovery of  $U_3O_8$  or  $ThO_2$  per metric ton milled, the overall uranium extraction obtained, and the number of days of mill operation should be reported.
- (2) The average solid losses and the average solution losses of tailings expressed as  $U_3O_8$  or  $ThO_2$  per metric ton milled should be given.
- (3) The quantity of tailings directed to the waste management system and the quantity used as backfill in the mine should be reported.
- (4) Significant changes in the method of milling should be reported, and the effect of such changes evaluated.
- (5) A copy of the current mill flow sheet should be supplied, indicating materials balance and reagent addition points.
- (6) The types and quantities of reagents being used, and the consumption of grinding media should be given.
- (7) The volume and the chemical and radiological characteristics of the water and solution being discharged daily from the mill should be reported.
- (8) Any treatment being applied to the tailings stream prior to discharge from the mill, and the amount of recycling should be described.
- (9) The dry weight quantity of tailings discharged daily, the character of the tailings material, such as screen analysis and any treatment of tailings to produce backfill material should be reported.
- (10) Provisions being made to produce additional values, such as thorium, from the tailings should be described.

B.4.3 Waste Management

- (1) Updated plans and sections should be provided showing the extent and depth of stored tailings. Plans and drawings should be supplied of any retaining structures, decant mechanisms and solution treatment systems which have been changed. The extent of preventive maintenance carried out on the components of the waste management system, such as embankments, should be described.
- (2) Any changes in the settling times of solids from the effluent and in the chemical addition rates should be described.
- (3) The treatment of the tailings dam decant should be described and the quantities of reagent used should be reported. The retention time for the effluent in settling ponds, and the decant flow rates should be given.
- (4) The flow rate and the chemical and radiological characteristics of the effluent discharged from the waste management system should be reported (see Section B.5.2).
- (5) Work done on revegetation or other means of stabilization and control of tailings for permanent storage should be described.

B.4.4 Operating Problems

Safety-related problems that occurred as a result of process malfunctions or of other failures should be described. The corrective actions that were initiated and the effect of such action with respect to improving the operation should be discussed.

B.5 HEALTH AND SAFETY

B.5.1 Radiation Protection

- (1) A summary of the results of the radiation surveys for radon or thoron daughters in working places should be given.
- (2) A concise report on the results of the bioassay program should be given, results and trends noted and data tabulated.
- (3) A concise report on the results of the personal dosimetry program should be given, with results and comments and tabulation of data.
- (4) A list of the atomic radiation workers who were employed by the licensee during the previous year, and their accumulated exposures during the year should be provided.

- (5) The number of employees whose exposures to radon daughters exceeded 1.0, 1.5 and 2.0 WLM in any three month period during the year, and the number of employees whose exposures exceeded 2.0, 3.0 and 4.0 WLM during the preceding twelve month period should be given. If any worker had been exposed to more than 2.0 WLM during a quarter, or to more than 4.0 WLM during the year, a detailed explanation of the reason for such occurrence should be given and measures for preventing future similar occurrences should be described.
- (6) The number of employees whose whole body exposures to external radiation exceeded 0.5, 1.0 and 3.0 rem in any three month period during the year, and the number of employees whose exposure exceeded 3.0, 4.0 and 5.0 rem during the preceding twelve month period should be given. If any worker had been exposed to more than 3.0 rem during a quarter, or to more than 5.0 rem during the year, a detailed explanation of the reason for such occurrence should be given and measures for preventing future similar occurrences should be described.
- (7) Any changes in the radiation monitoring program and in the methods or equipment being used should be reported.
- (8) Any radiation safety training given during the year should be noted and changes in training procedures described.

**B.5.2 Effluent Monitoring**

- (1) Data obtained by the various systems for monitoring gaseous and liquid effluents and receiving water quality should be presented in tabulated form showing both the chemical and radiological characteristics. Any changes in the monitoring program and in the methods or equipment being used should be reported.
- (2) The average concentrations of Ra-226 in the following should be reported:
  - (a) untreated mine water;
  - (b) untreated mill water;
  - (c) treated effluent discharged from the waste management system;
  - (d) drinking water on-site;
  - (e) drinking water in the surrounding area off-site.

B.5.3 Air Contaminants

- (1) A general description should be presented of the extent of the hazards to employees of various airborne contaminants, other than radon or thoron daughters, during the previous year. Average airborne concentrations of quartz in respirable dust, toxic gases or fumes and uranium or thorium concentration should be given.
- (2) Over-exposures to contaminants specified in (1) above should be described and explained.

B.5.4 Miscellaneous Programs and Practices

Any changes in safety practices, in the medical surveillance program and in the induction, training, accident prevention, mine rescue, first aid and the fire fighting programs should be described. Drills carried out to rehearse emergency situations should be noted and assessed.

B.5.5 Noise

The current noise sources and noise levels should be listed, and the methods being used to ensure protection from noise should be described.

B.5.6 Significant Events

Events of the type and magnitude which were not anticipated and which could have had, or did have a significant influence on public or personnel safety should be described.

B.6 COMPLIANCE WITH OTHER FEDERAL AND PROVINCIAL REGULATIONS

General comments should be documented on aspects of the operation of the facility regulated by other federal or provincial agencies, such as industrial safety and environmental protection, in order to give the Board a broader understanding of how well the facility is being operated with respect to the requirements of these agencies.

B.7 OUTLOOK

A general projection should be given as to the future operation of the facility, and any significant changes in internal or external conditions that are proposed or foreseen should be mentioned. This should note, in particular, any action that is being considered or that is to be taken to correct any recognized deficiencies relating to safety.

APPENDIX 4.3.1



Province of  
British Columbia

Ministry of Energy,  
Mines and  
Petroleum Resources

GUIDE FOR REPLY TO  
COMPANY AFTER SUB-  
MISSION OF FORM 10-11  
WHERE PERMIT + BONDING  
ARE REQUIRED

Our File: MX-

(Address of District)

DATE

TO:

Dear Sir:

Re: Proposed Mineral Exploration Permit MX-  
Located at \_\_\_\_\_  
Operator/Company \_\_\_\_\_

Your proposed mineral exploration, as described in "NOTICE OF WORK ON A MINERAL PROPERTY" dated \_\_\_\_\_, has been reviewed pursuant to Section 10 of the Mines Regulation Act and

- found to be satisfactory
- or - you are required to comply with the following conditions: etc.

The "RECLAMATION PROGRAM" as described pursuant to Section 11 and dated \_\_\_\_\_

- has been recommended for approval to the Chief Inspector
- or - will require inclusion of the following conditions before a recommendation for approval can be forwarded to the Chief Inspector: etc.

You will subsequently be notified by the Senior Reclamation Inspector with respect to amount of security deposit (bonding) and issuance of a permit pursuant to the Mines Regulation Act, Section 11.

For your information the following is included with this letter:

- Requirements of other government agencies (as they may be applicable)
- Copy of Sections 10 and 11 of the Mines Regulation Act
- A Form 10-11 to be completed at the end of the work season.

Yours very truly,

Inspector of Mines &  
Resident Engineer

73

cc: Victoria Office

Note: Re. Section 10 Approval - Where underground work is proposed plan must be submitted to the Chief Inspector with details of size and length of heading, method of ventilation, and transport

APPENDIX 4.3.2

Attached please find "NOTICE OF WORK ON A PLACER LEASE" submitted to this office pursuant to Section 10 of the Mines Regulation Act, and found satisfactory.

I have reviewed plans of operation and RECLAMATION PROGRAM with reclamation staff. A permit is recommended with bonding at \$ \_\_\_\_\_.

Special conditions pursuant to Section 11  
- are not required.

or - are recommended as follows:

- 1.
- 2.
- etc.

ROUTING INSTRUCTIONS			
Beth Stoner			
<input type="checkbox"/>	DMG	<input type="checkbox"/>	AJR
<input type="checkbox"/>	JDM	<input type="checkbox"/>	WCR
<input type="checkbox"/>	VED		

District Inspector of Mines  
& Resident Engineer

Attached please find "NOTICE OF WORK ON A PLACER LEASE" submitted to this office pursuant to Section 10 of the Mines Regulation Act, and found satisfactory.

I have reviewed plans of operation and RECLAMATION PROGRAM with reclamation staff. A permit is recommended with bonding at \$ \_\_\_\_\_.

Special conditions pursuant to Section 11  
- are not required.

or - are recommended as follows:

- 1.
- 2.
- etc.

ROUTING INSTRUCTIONS			
Beth Stoner			
<input type="checkbox"/>	DMG	<input type="checkbox"/>	AJR
<input type="checkbox"/>	JDM	<input type="checkbox"/>	WCR
<input type="checkbox"/>	VED		

District Inspector of Mines  
& Resident Engineer

APPENDIX 4.3.3



Province of  
British Columbia

Ministry of Energy,  
Mines and  
Petroleum Resources

BONDING

Our File: MX-

525 Superior Street  
Victoria, B.C.  
V8V 1T7

DATE

TO:

Dear Sir:

Re: Permit Approving Reclamation Program MX-  
Pursuant to Section 11, Mines Regulation Act  
Name of Property \_\_\_\_\_  
Located at \_\_\_\_\_

This letter will acknowledge receipt of your report dated \_\_\_\_\_ . It has been reviewed and issuance of a permit has been approved by the Chief Inspector of Mines, Mr. W.C. Robinson, P.Eng.

A security deposit of \$ \_\_\_\_\_ is required to be posted for the proposed disturbance of \_\_\_\_\_ hectares of land. This can be done through your bank with the enclosed Receipt and Agreement Forms. Please advise the bank to complete the forms, retain one copy and return the original to this office. When the completed form has been received from the bank the signed permit will be issued to you.

Enclosed is a photocopy of the permit which is proposed to be issued to you. Please ensure that the acreage shown is sufficient for your needs. If this is not the case, please advise this office and the permit will be revised.

Yours very truly,

J.D. McDonald, P.Eng.,  
Senior Reclamation Inspector

JDM/

cc: District Inspector  
District Reclamation Inspector/Technician.

APPENDIX 4.3.4



Province of  
British Columbia

Ministry of Energy,  
Mines and  
Petroleum Resources

LETTER SENDING  
OUT PERMIT.

Our File: MX-

525 Superior Street  
Victoria, B.C.  
V8V 1T7

DATE

TO:

Dear Sir:

Re: Permit Approving Reclamation Program MX-  
Pursuant to Section 11, Mines Regulation Act  
Name of Property \_\_\_\_\_  
Located at \_\_\_\_\_

Receipt is acknowledged of the completed Receipt and Agreement  
Form in the amount of \$ \_\_\_\_\_, dated \_\_\_\_\_.

Please find enclosed herewith, Mineral Exploration Permit MX-  
duly signed by the Chief Inspector of Mines, Mr. W.C. Robinson,  
P.Eng. In particular, your attention is drawn to the Terms and  
Conditions, which are an integral part of this permit.

Security deposit will be adjusted on the basis of field inspections  
by this Ministry, and on reclamation reports which may in the  
future be requested.

When work on the site is complete, please document reclamation and  
forward a request for return of bonding to the Inspector of Mines,  
Mr. \_\_\_\_\_ at \_\_\_\_\_.

Yours very truly,

J.D. McDonald, P.Eng.,  
Senior Reclamation Inspector

JDM/

Encl.

cc: District Inspector of Mines  
District Reclamation Inspector/Technician  
Bank



Province of  
British Columbia

Ministry of  
Energy, Mines and  
Petroleum Resources

MEMORANDUM

To: ALL DISTRICT INSPECTORS

Date: July 23, 1979

Our File:

Attached is a list of all companies holding general permits issued for exploration in British Columbia.

If your district receives a Form 10-11 submission from one of these companies, the new procedure will be to mark the MX number plainly visible on the 10-11 form and send us a copy for our files.

General files will be reviewed periodically for the amount of activity and bonding status. The proposed changes to the existing permit procedure do not affect the numbering of General Permits.

We will maintain an up-to-date list of General Permits which will be circulated periodically.

J.D. McDonald, P.Eng.,  
Senior Reclamation Inspector

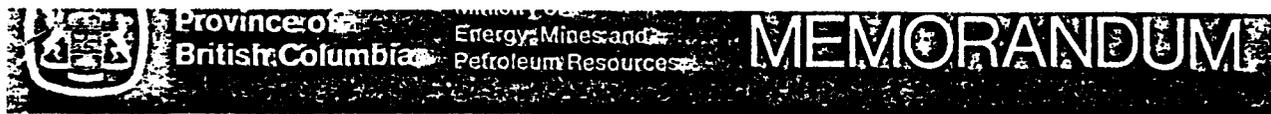
/eas

cc: W.C. Robinson  
V.E. Dawson  
A.J. Richardson

GENERAL PERMITS ISSUED

<u>Company Name</u>	<u>Permit No.</u>
Amax Potash Ltd.	MX-179
Bethlehem Copper	MX-2
BP Minerals Ltd.	MX-103
Brenda Mines Ltd.	MX-164
Canadian Superior Exploration Ltd.	MX-67
Cominco Ltd.	MX-88
Consolidated Rexpar Minerals & Chemicals Ltd.	MX-118
Dupont of Canada Exploration	MX-111
Gibraltar Mines Ltd. (N. P. L.)	MX-65
Gold Fields Exploration Canada Ltd.	MX-167
Hudson's Bay Oil and Gas Co. Ltd.	MX-70
Imperial Oil Ltd.	MX-101
Kaiser Resources Ltd.	MX-165
Kalvin Energy Ltd.	MX-147
Lacana Mining Corporation	MX-133
Mountain Minerals Co. Ltd.	MX-148
Newconex Canadian Exploration Ltd.	MX-74 Cancelled 20/7/78
Noranda Exploration Co. Ltd.	MX-79
Norcen Energy Resources	MX-139
Pacific Petroleum Ltd.	MX-142
Placer Development Ltd.	MX-80
Quintana Minerals Corp.	MX-76
Rio Tinto Canadian Explorations Ltd.	MX-66
Shell Canada Resources Ltd.	MX-131
Union Carbide Canada Ltd.	MX-121
Union Oil Company of Canada Ltd.	MX-123
Utah Mines	MX-14
Western Mines Ltd.	MX-68
*Sun Oil Company Ltd.	MX-182

\* Permit not yet issued because bonding not received.



To: District Inspectors

Date: May 17, 1979

Our File:

Re: Uranium Exploration

It is essential that the Ministry be aware of those properties on which exploration for uranium or thorium is being conducted.

When a Form 10-11 is received and you consider that the prime exploration target is uranium or thorium, the following procedure is to be followed:

1. A letter to the company asking if uranium or thorium is being prospected for and the methods of exploration, i.e. geo-chemical, geophysical, drilling or trenching.
2. If drilling or trenching or both is being done, a permit authorizing surface work pursuant to Section 11 of the Mines Regulation Act will be required, following the procedure already being used. No drilling or trenching is to commence without a permit being issued.
3. A company or individual is required to report to the District Inspector, occurrences of more than 0.05% uranium or thorium when encountered in drilling or trenching.
4. The Chief Inspector of Mines should be kept advised on uranium exploration where drilling and/or trenching is being done.

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

JDM:kw

c.c. E. R. Macgregor  
A. J. Richardson  
V. E. Dawson  
J. D. McDonald



To: District Inspectors

Date: June 25, 1979

Our File:

Re: Uranium Exploration - Cementing in Drill Holes

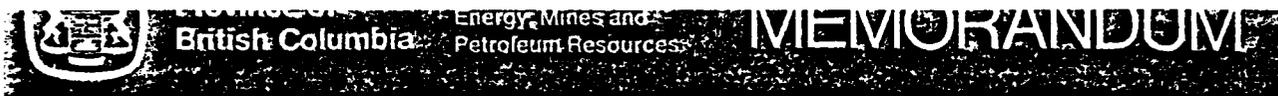
Drill holes which encounter uranium mineralization in excess of 0.05% uranium shall be cemented in. Because of variable geological conditions the cementing of holes shall be done on instructions of the District Inspector.

A handwritten signature in cursive script that reads "W. C. Robinson".

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

:lr

c.c. E. R. Macgregor  
A. J. Richardson  
V. E. Dawson  
J. D. McDonald



To: ALL DISTRICT INSPECTORS

Date: August 15, 1979

Our File:

Re: Uranium Exploration - Monitoring Drill Holes

Where exploration drilling is being carried out for uranium, and where a drinking-water supply could possibly be affected, the following steps should be taken:

1. Where drill holes have encountered uranium mineralization, or where uranium mineralization could be encountered due to a nearby known occurrence, the cuttings from the hole should be monitored for radiation at regular intervals (at least twice per shift) and the results recorded.
2. If such monitoring indicates that an occurrence in excess of 5.0 per cent uranium has been encountered, drilling shall be stopped, and the District Inspector notified.
3. Drilling must not re-commence until assurance can be given that it can be done safely.

A handwritten signature in cursive script that reads "W. C. Robinson".

W. C. Robinson,  
Chief Inspector of Mines

WCR/tr

- c.c. E. R. Macgregor  
V. E. Dawson  
A. J. Richardson  
J. D. McDonald  
S. Elias



To: ALL DISTRICT INSPECTORS

Date: August 17, 1979

Our File:

Re: Uranium Exploration - Drilling

The following directive supercedes that issued on August 15, 1979.

Where exploration drilling is being carried out for uranium, or where uranium has been encountered on a property, and where a drinking-water supply could possibly be affected, steps should be taken to ensure that drill water is re-circulated, and cuttings suitably contained to ensure that a drinking-water supply cannot be contaminated.

A handwritten signature in cursive script that reads "W. C. Robinson".

W. C. Robinson,  
Chief Inspector of Mines

WCR/tr

c.c. E. R. Macgregor  
V. E. Dawson  
A. J. Richardson  
J. D. McDonald  
S. Elias

**APPENDIX 4.4.5. LIST OF COMPANIES KNOWN TO THE DIVISION  
TO HAVE EXPLORED IN BRITISH COLUMBIA FOR URANIUM IN RECENT YEARS**

*See Appendix 4-1 to Ministry's submission to Phase I – Overview.*

*clp*



Chief Inspector of Mines  
 AUG 14 1953  
 Referred to \_\_\_\_\_  
 Ans'd \_\_\_\_\_

DEPARTMENT OF MINES

"METALLIFEROUS MINES REGULATION ACT"  
 (R.S.B.C. 1936, Chap. 189)

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Rexspar District Princeton  
 Locality Birch Island Mining Division Kamloops  
 Owner or operator Rexspar Uranium & Metals Limited,  
 Manager Superintendent: S. Leeming, Address Birch Island, B.C.  
 No. of Men employed.—As Shiftbosses \_\_\_\_\_ Miners \_\_\_\_\_ Muckers and Helpers \_\_\_\_\_  
 Timberman Prospectors: 2 Diamond Drillers: 9 On Transportation \_\_\_\_\_  
 In Rock-house \_\_\_\_\_ At Mill \_\_\_\_\_ On Technical and Clerical Staffs 8  
 In other Capacities 3 Total: Underground -- On Surface 22.

Plans of Workings: On what Scale? -- Date of last Survey Survey is being made.  
 Ventilation Surface work only.  
 Timbering ---  
 Method of Mining ---  
 Hoisting and Haulage Equipment ---  
 Shafts and Ladderways ---  
 Protection of Dangerous Openings ---  
 Machinery: In Mine --- On Surface Diamond drilling equipment.  
 At Mill ---

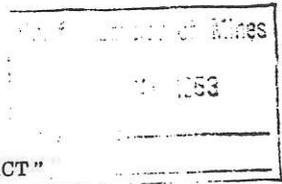
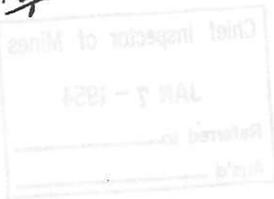
Daily Inspection of Workings and Machinery ---  
 Exits ---  
 Explosives Small amounts purchased as required. When larger amounts are to be used proper storage facilities must be provided.  
 Fire Protection: Underground --- On Surface Chemical.  
 Living Conditions Fair for temporary camp. A new camp is contemplated.

Remarks: The work being done at this property at the present time is chiefly of an exploratory nature and consists of diamond drilling, surveying, prospecting, and geological work. No underground work is being done at this time. Conditions were found to be generally satisfactory.

S. Leeming Princeton, B.C.  
 Inspector of Mines. Address.

84  
 Date of inspection August 6th, 1953, 19\_\_

*Chy*



DEPARTMENT OF MINES

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Roxspar Uranium & Metals Mining Co. Ltd. District Princeton  
 Locality Birch Island Mining Division Kamloops  
 Owner or operator Roxspar Uranium & Metals Mining Co. Ltd.  
 Manager W.F. Atkins Address Birch Island

No. of Men employed.—As Shiftbosses Diamond Drillers 9 Muckers and Helpers  
 Timbermen \_\_\_\_\_ Machinists and Blacksmiths \_\_\_\_\_ On Transportation \_\_\_\_\_  
 In Rock-house \_\_\_\_\_ At Mill \_\_\_\_\_ On Technical and Clerical Staffs 6  
 In other Capacities 10 Total: Underground \_\_\_\_\_ On Surface 25

Plans of Workings: On what Scale? \_\_\_\_\_ Date of last Survey \_\_\_\_\_

Ventilation Surface work only.

Timbering \_\_\_\_\_

Method of Mining Diamond drilling only at present.

Hoisting and Haulage Equipment \_\_\_\_\_

Shafts and Ladderways \_\_\_\_\_

Protection of Dangerous Openings \_\_\_\_\_

Machinery: In Mine \_\_\_\_\_ On Surface Diamond drills only.  
 At Mill \_\_\_\_\_

Daily Inspection of Workings and Machinery \_\_\_\_\_

Exits \_\_\_\_\_

Explosives \_\_\_\_\_

Fire Protection: Underground \_\_\_\_\_ On Surface Water & chemical.

Living Conditions Satisfactory for temporary camp. A new camp is being built.

Remarks: The only work presently being done consists of surface diamond drilling, construction, and geological work.

Conditions were found to be generally satisfactory.

*W.F. Atkins*  
 Inspector of Mines.

Princeton, B.C.  
 Address.

Date of inspection October 12th, 1953, 19 \_\_\_\_\_

*copy*



DEPARTMENT OF MINES

"METALLIFEROUS MINES REGULATION ACT"

Chief Inspector of Mines  
 JAN 7 - 1954  
 Referred to \_\_\_\_\_  
 Ans'd \_\_\_\_\_

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Rexspar Uranium & Metals Mining Co. Ltd. District Princeton  
 Locality Birch Island Mining Division Kamloops  
 Owner or operator Rexspar Uranium & Metals Mining Co. Ltd.  
 Manager W. F. Atkins Address Birch Island, B. C.

No. of Men employed—A: Shiftbosses 1 Miners 4 Muckers and Helpers 1  
 Timbermen — Machinists and Blacksmiths 1 On Transportation 5  
 In Rock-house 6 At Mill — On Technical and Clerical Staffs 13  
 In other Capacities — Total: Underground — On Surface —

Plans of Workings: On what Scale? 1" = 20', 100' Date of last Survey December 16th, 1953.  
 Ventilation Satisfactory at present.

Timbering Satisfactory where required.  
 Method of Mining Drifting only at present.

Hoisting and Haulage Equipment No hoisting. Hand tramping only at present.  
 Shafts and Ladderways None.

Protection of Dangerous Openings Satisfactory.  
 Machinery: In Mine Satisfactory. On Surface Satisfactory.

At Mill —

Daily Inspection of Workings and Machinery One only at present. Adit level in 164 feet.

Exits Satisfactory, except that lock is required on magazine.  
 Explosives Water Water & chemical.

Fire Protection: Underground Satisfactory. On Surface —

Living Conditions —  
 Remarks: An adit level has been started on the Black Diamond No. 2 M. C.  
The portal is at an elevation of 3,725 feet.  
At the time of inspection the face of the level had been  
advanced 164 feet from the portal.  
Conditions were found to be generally satisfactory.

[Signature] Princeton, B. C.  
 Inspector of Mines. Address.



Chief Inspector of Mines  
1954

DEPARTMENT OF MINES

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Rexspar Uranium & Metals Mining Co. Ltd. District Princeton  
 Locality Birch Island, B.C. Mining Division Kamloops  
 Owner or operator Rexspar Uranium & Metals Mining Co. Ltd.  
 Manager J.W. Scott Address Birch Island, B.C.

No. of Men employed.—As Shiftbosses \_\_\_\_\_ Miners 2 Muckers and Helpers \_\_\_\_\_  
 Timbermen \_\_\_\_\_ Machinists and Blacksmiths \_\_\_\_\_ On Transportation \_\_\_\_\_  
 In Rock-house \_\_\_\_\_ At Mill \_\_\_\_\_ On Technical and Clerical Staffs 4  
 In other Capacities 3 Total: Underground 2 On Surface 7

Plans of Workings: On what Scale? 1" = 20', 30' Date of last Survey April 13th, 1954  
 Ventilation Satisfactory (natural)  
 Timbering Satisfactory where required.  
 Method of Mining Diamond drilling only at present.  
 Hoisting and Haulage Equipment None.  
 Shafts and Ladderways None.  
 Protection of Dangerous Openings None.  
 Machinery: In Mine Diamond drill only. On Surface Compressor only.

At Mill \_\_\_\_\_  
 Daily Inspection of Workings and Machinery \_\_\_\_\_  
 Exits One only. No more required at present.  
 Explosives None in stock.  
 Fire Protection: Underground Water On Surface Water & chemical.  
 Living Conditions Good.

Remarks: Present operations are confined to underground diamond drilling.  
Conditions found to be generally satisfactory.

J.W. Scott Inspector of Mines Princeton, B.C. Address.

Date of inspection April 21st, 1954, 19



Chief Inspector of Mines

FEB 23 1955

Referred to \_\_\_\_\_

Ans'd \_\_\_\_\_

REPORT OF DUST AND VENTILATION CONDITIONS AT  
REXSPAR URANIUM AND METALS MINING COMPANY LIMITED  
BIRCH ISLAND, B. C.

REPORT OF DUST AND VENTILATION CONDITIONS AT  
REXSPAR URANIUM AND METALS MINING COMPANY LIMITED  
BIRCH ISLAND, B. C.

A survey of the dust and ventilation conditions was made in the underground working of the Rexspar Uranium and Metals Mining Company Limited on February 5, 1955. The results obtained were as follows.

<u>Underground February 5, 1955</u>	<u>No. of particles per c.c. of air</u>	
3850 level "A" zone adit, drilling with jackleg approximately 340 feet from portal	536	522
	562	586
	600	618
	526	474
	510	498
	554	520
3850 level 100 feet from face of tunnel	266	254
	288	204
	184	196
3850 level 200 feet from face of tunnel	66	114
	126	116
	108	92

Temperatures

Outside air temperature	31°F
Temperature at face of tunnel	40°F

Remarks

This company is doing exploration work at present. The tunnel on 3850 level ("A" zone adit) has advanced approximately 340 feet from surface. The company plans to drive a raise to the surface from this tunnel from a point approximately 400 feet from the portal. The men work on a two shift a day basis and compressed air is used to blow out the smoke and dust after blasting.

The average dust count while drilling with a jackleg was 542 particles per c.c. of air. The average dust count at two other locations in the tunnel was 168 particles per c.c. of air.

*S. Elias*  
S. Elias,  
Inspector, Silicosis Branch.

SE.b

WORKMEN'S COMPENSATION BOARD.

*Chief*



DEPARTMENT OF MINES

Chief Inspector of Mines  
APR 5- 1955  
Referred to \_\_\_\_\_  
Ans'd \_\_\_\_\_

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Rexspar Uranium & Metals Mining Co. Ltd. District Princeton  
Locality Birch Island, B.C. Mining Division Kamloops  
Owner or operator Rexspar Uranium & Metals Mining Co. Ltd.  
Manager J.W. Scott, Address Birch Island, B.C.

No. of Men employed.—As Shiftbosses — Miners 3 Diamond Drillers: 2  
Timbermen — Machinists and Blacksmiths — On Transportation —  
In Rock-house — At Mill — On Technical and Clerical Staffs 4  
In other Capacities 5 Total: Underground 5 On Surface 9

Plans of Workings: On what Scale? 1" = 30' Date of last Survey Continuous

Ventilation Satisfactory at present (natural).

Timbering Satisfactory where required.

Method of Mining Spring and diamond drilling only at present.

Hoisting and Haulage Equipment None.

Shafts and Ladderways None.

Protection of Dangerous Openings None.

Machinery: In Mine Satisfactory. On Surface Satisfactory

At Mill \_\_\_\_\_

Daily Inspection of Workings and Machinery \_\_\_\_\_

Exits One only. No more required at present.

Explosives See Remarks.

Fire Protection: Underground Water On Surface Chemical

Living Conditions Satisfactory.

Remarks: The following conditions are herewith brought to the attention of the management:-

Explosives: Explosives may be stored only in the approved magazine on the surface, and in a storage-box underground in an amount not exceeding a supply sufficient for twenty-four hours for each working-place.  
First Aid: At least two good blankets are required to be kept near the basket-stretcher at the mine for emergency purposes.  
Track Frogs: Track frogs are required to be blocked so that persons may not inadvertently get their feet caught.  
Exit Covers: A structure covering an exit is required to be of such material and so constructed as to reduce the fire hazard to a minimum.

B.R. Hughes Princeton, B.C.  
Inspector of Mines. Address.

March 22nd, 1955.

Date of inspection \_\_\_\_\_, 19\_\_\_\_



THE GOVERNMENT OF  
THE PROVINCE OF BRITISH COLUMBIA

DEPARTMENT OF MINES

Chief Inspector of Mines

JUN 2 - 1955

Referred to \_\_\_\_\_

Ans'd \_\_\_\_\_

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine REXSPAR URANIUM & METALS MINING CO. LTD. District Princeton  
 Locality Birch Island, B.C. Mining Division Kamloops  
 Owner or operator REXSPAR URANIUM & METALS MINING CO. LTD.  
 Manager J.W. Scott Address Birch Island, B.C.

No. of Men employed.—As Shiftbosses \_\_\_\_\_ Miners 4 Muckers and Helpers 1  
 Timbermen \_\_\_\_\_ Machinists and Blacksmiths 1 On Transportation \_\_\_\_\_  
 In Rock-house \_\_\_\_\_ At Mill \_\_\_\_\_ On Technical and Clerical Staffs 3  
 In other Capacities 4 Total: Underground 5 On Surface 8

Plans of Workings: On what Scale? 1" = 30' Date of last Survey Continuous

Ventilation Satisfactory (natural)

Timbering Satisfactory where required.

Method of Mining Raising and diamond drilling.

Hoisting and Haulage Equipment none

Shafts and Ladderways No shafts - for ladderways see Remarks.

Protection of Dangerous Openings Satisfactory.

Machinery: In Mine Satisfactory On Surface Satisfactory

At Mill \_\_\_\_\_

Daily Inspection of Workings and Machinery \_\_\_\_\_

Exits New exit will soon be completed in 'A' Zone workings.

Explosives Satisfactory.

Fire Protection: Underground Water On Surface Water & chemical

Living Conditions Satisfactory

Remarks: The following conditions were herewith brought to the attention of the management:

Sealing: More attention is required to be given to sealing down loose rock.

Mammy Guard-rail: A guard-rail is required to be installed between the slide and the ladderway in the 3800 mammy raise - 'A' Zone workings.

G. R. ...  
Inspector of Mines.

Princeton, B.C.  
Address.

Date of inspection May 3rd, 1955., 19\_\_



DEPARTMENT OF MINES

Chief Inspector of Mines

JUL 20 1955

Referred to \_\_\_\_\_

Ans'd \_\_\_\_\_

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Rexspar Uranium & Metals Mining Co. Ltd. District Princeton  
 Locality Birch Island, B.C. Mining Division Komloops  
 Owner or operator Rexspar Uranium & Metals Mining Co. Ltd.  
 Manager J.W. Scott, Address Birch Island, B.C.

No. of Men employed: As Shiftbosses - Miners - Muckers and Helpers -  
Diamond Drill crew: 5 Land Survey Crew: 3  
 Timbermen - Machinists and Blacksmiths - On Transportation -  
 In Rock-house - At Mill - On Technical and Clerical Staffs 6  
 In other Capacities 5 Total: Underground - On Surface 19

Plans of Workings: On what Scale? 1" = 30' Date of last Survey to date  
 Ventilation Satisfactory (natural)  
 Timbering Satisfactory where required.  
 Method of Mining Surface diamond drilling, geological work, surveying, and prospecting only at present.  
 Hoisting and Haulage Equipment none  
 Shafts and Ladderways Satisfactory.  
 Protection of Dangerous Openings See Remarks.  
 Machinery: In Mine none On Surface satisfactory  
 At Mill -

Daily Inspection of Workings and Machinery -  
 Exits Satisfactory.  
 Explosives See Remarks.  
 Fire Protection: Underground Water On Surface Water & chemical  
 Living Conditions Satisfactory

Remarks: The current underground project was completed on June 1st and and no further underground work is presently in progress.  
Surface diamond drilling, geological work, surface surveying for crown-granting, and prospecting is the only work now in progress.  
The attention of the management is herewith directed to the following:-  
Protection of Dangerous Openings: The grizzly at the bottom of the #3880 raise to the surface requires to be properly covered.  
Explosives Magazine: The surface explosives magazine must be kept securely locked.

E. R. [Signature]  
 Inspector of Mines.

Princeton, B.C.  
 Address.

Date of inspection July 13th, 1955., 19\_\_



DEPARTMENT OF MINES

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Roxspar Uranium & Metals Mining Co. Ltd. District Princeton  
 Locality Birch Island, B.C. Mining Division Kasloops  
 Owner or operator Roxspar Uranium & Metals Mining Co. Ltd.  
 Manager J. W. Scott, Address Birch Island, B.C.

No. of Men employed.—As Shiftbosses - Miners - Muckers and Helpers -  
 Timbermen - Machinists and Blacksmiths - On Transportation -  
 In Rock-house - At Mill - On Technical and Clerical Staffs 3  
 In other Capacities 7 Total: Underground - On Surface 10

Plans of Workings: On what Scale? 1" = 30' Date of last Survey to date at time of last work.  
 Ventilation -  
 Timbering -  
 Method of Mining No mining at present.  
 Hoisting and Haulage Equipment -  
 Shafts and Ladderways -  
 Protection of Dangerous Openings -  
 Machinery: In Mine - On Surface Guard required on exposed shaft at lighting plant.  
 At Mill -  
 Daily Inspection of Workings and Machinery -  
 Exits -  
 Explosives -  
 Fire Protection: Underground Satisfactory. On Surface Chemical.  
 Living Conditions -  
 Remarks: Work at present time consists of clearing mill-site, geology, and camp maintenance. This inspection covered campsite only which is satisfactory except as stated above re lighting plant.

J. W. Scott Inspector of Mines. Princeton, B.C. Address.

Date of inspection April 5, 1956., 19



DEPARTMENT OF MINES

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Raxspar District Princeton  
 Locality Birch Island, B.C. Mining Division Kamloops  
 Owner or operator Rfx Raxspar Uranium & Metals Mining Co.Ltd.  
 Manager J. W. Scott, Address Birch Island, B.C.

No. of Men employed.—As Shiftbosses — Miners — Muckers and Helpers —  
 Timbermen — Machinists and Blacksmiths — On Transportation —  
 In Rock-house — At Mill — On Technical and Clerical Staffs 2  
 In other Capacities 5 Total: Underground — On Surface 7

Plans of Workings: On what Scale? 1" = 30' Date of last Survey to date.  
 Ventilation —  
 Timbering —  
 Method of Mining —  
 Hoisting and Haulage Equipment —  
 Shafts and Ladderways —  
 Protection of Dangerous Openings —  
 Machinery: In Mine — On Surface —  
 At Mill —  
 Daily Inspection of Workings and Machinery —  
 Exits —  
 Explosives See Remarks.  
 Fire Protection: Underground — On Surface water & chemical.  
 Living Conditions Satisfactory.  
 Remarks: The only work being done at the time of inspection was in preparing to close down the camp. The camp only was visited on this occasion as no work was being done at the mine. The management is hereby notified as follows:—  
In closing down a mine the following matters require to receive attention  
1. Notice of closing is required to be given to the Inspector.  
2. All adits, shafts, or other openings to the mine must be securely fenced to guard against inadvertent entrance.  
3. When a mine is closed down, all explosives and fuse must be disposed of; and no explosive may be stored at a shut-down mine.  
4. An accurate plan of the mine must be filed in the office of the Chief Inspector of Mines.

J. W. Scott, Inspector of Mines. Princeton, B.C. Address.



1867

DEPARTMENT OF MINES

DEPT. OF MINES	
REC'D. JAN 29 1957	
LAT. & LONG.	
TOP. MAP REF.	
FILE DESIGNATION	
X-REF.	

"METALLIFEROUS MINES REGULATION ACT"  
(R.S.B.C. 1936, Chap. 189)

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Rexspar District Princeton  
 Locality 3 miles south of Birch Island Mining Division Kamloops  
 Owner or operator Rexspar Uranium & Metals Mining Co. Ltd.  
 Manager John W. Scott Address Birch Island, B.C.

No. of Men employed.—As Shiftbosses 1 Miners \_\_\_\_\_ Muckers and Helpers \_\_\_\_\_  
 Timbermen \_\_\_\_\_ Machinists and Blacksmiths \_\_\_\_\_ On Transportation \_\_\_\_\_  
 In Rock-house \_\_\_\_\_ At Mill \_\_\_\_\_ On Technical and Clerical Staffs 3  
 In other Capacities 5 Total: Underground \_\_\_\_\_ On Surface 9

Plans of Workings: On what Scale? \_\_\_\_\_ Date of last Survey \_\_\_\_\_

	REFERRED TO	DATE	INITIALS
Ventilation _____	D. M.		
Timbering _____	C. C.		
Method of Mining _____	D. C. C.		
Hoisting and Haulage Equipment _____	C. C.		
Shafts and Ladderways _____			
Protection of Dangerous Openings _____			
Machinery: In Mine _____ On Surface _____			
At Mill _____			
Daily Inspection of Workings and Machinery _____		<u>2/1</u>	<u>H.C.H.</u>
Exits _____			
Explosives _____			
Fire Protection: Underground _____ On Surface _____			
Living Conditions _____			
Remarks: _____			

There is no underground work being done at present. Men are doing general surface work.

Inspector of Mines  
JAN 25 1957

[Signature] Inspector of Mines. Lillooet, B.C. Address.

Date of inspection January 18, 1957.



DEPARTMENT OF MINES

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Rexspar. District S. Central Interior  
 Locality Birah Island, B.C. Mining Division Kamloops.  
 Owner or operator Rexspar Uranium & Metals Mining Company Ltd.  
 Manager J. W. Scott. Address Birah Island, B.C.

No. of Men employed.—As Shiftbosses — 2 Drillers 6 Muckers and Helpers 4  
 Timbermen — — — — — Machinists and Blacksmiths — — — — — On Transportation — — — — —  
 In Rock-house — — — — — At Mill — — — — — On Technical and Clerical Staffs 4  
 In other Capacities 2 Total: Underground — — — — — On Surface 18

Plans of Workings: On what Scale? 1" = 30' Date of last Survey To date.  
 Ventilation — — — — —  
 Timbering — — — — —  
 Method of Mining Surface exploration and diamond drilling only.  
 Hoisting and Haulage Equipment — — — — —  
 Shafts and Ladderways — — — — —  
 Protection of Dangerous Openings — — — — —  
 Machinery: In Mine — — — — — On Surface Satisfactory.  
 At Mill — — — — —  
 Daily Inspection of Workings and Machinery — — — — —  
 Exits — — — — —  
 Explosives Storage satisfactory.  
 Fire Protection: Underground — — — — — On Surface Satisfactory.  
 Living Conditions Satisfactory.  
 Remarks: Surface diamond drilling only is being carried out at this property at present. General working conditions were found to be satisfactory.

A.R. James 104-732 West Hastings St., Vancouver, B.C.  
 Inspector of Mines. Address.

Date of inspection May 14th., 19 57.

DEPT. OF MINES  
 Rec'd SEP 4 1958



DEPARTMENT OF MINES

"METALLIFEROUS MINES REGULATION ACT"

REPORT OF INSPECTOR OF METALLIFEROUS MINES

Name of mine Rexspar District S. Central Interior  
 Locality Birch Island, B.C. Mining Division Kamloops  
 Owner or operator Rexspar Uranium & Metals Mining Company Ltd.  
 Manager J.W. Scott Address Birch Island, B.C.

No. of Men employed.—As Shiftbosses — Miners — Muckers and Helpers —  
 Timbermen — Machinists and Blacksmiths. — On Transportation —  
 In Rock-house — At Mill — On Technical and Clerical Staffs 5  
 In other Capacities 5 Total: Underground — On Surface 10

Plans of Workings: On what Scale? 1" = 30' Date of last Survey To date  
 Ventilation —  
 Timbering Satisfactory  
 Method of Mining Preparation only at present.  
 Hoisting and Haulage Equipment —  
 Shafts and Ladderways —  
 Protection of Dangerous Openings —  
 Machinery: In Mine — On Surface —  
 At Mill —  
 Daily Inspection of Workings and Machinery —  
 Exits —  
 Explosives Storage satisfactory  
 Fire Protection: Underground — On Surface —  
 Living Conditions Satisfactory.

Remarks: At the time of my inspection the only work in progress on this property was the driving of a short tunnel with a view to tapping a source of water supply for the camp. This tunnel had just been collared and the portal timbers had been set. General working conditions were found to be satisfactory.

A.H. Jones 104, 739 West Hastings St., Vancouver, B.C.  
 Inspector of Mines. Address.

Date of inspection August 28th, 19 58

APPENDIX 4.4.19



MINERAL EXPLORATION FORM 10-11  
 DEPT. OF MINES  
 AND PETROLEUM RESOURCES  
 Rec'd JUN 21 1976

DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
 MINERAL RESOURCES BRANCH  
 INSPECTION AND ENGINEERING DIVISION

NOTICE OF WORK ON A MINERAL PROPERTY

(Pursuant to section 10, *Mines Regulation Act*)

This form is to be completed by all companies or individuals carrying out exploration work one month prior to commencement of work and one week prior to cessation of work. Keep one copy and forward one copy to the District Inspector of Mines.

1. NAME OF PROPERTY: Consolidated Rexspar Minerals & Chemicals Ltd. - Birch Island  
 Number of claims 202 Principal Claim Group REX

2. LOCATION: Mining Division KAMLOOPS NTS Map Sheet (e.g., 82E/9E) 82/M/12  
 Lat. 119° 45' Long. 51° 30' Locality and Access Birch Island - Road

3. OWNER: Name Con. Rexspar Minerals & Chemicals Ltd. Free Miner's Cert. No. 151367  
 Address 4 King St. W. City Toronto Prov. Ont.

4. OPERATOR: Name Con. Rexspar M & C Ltd. Free Miner's Cert. No. \_\_\_\_\_  
 Address \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_  
 Postal Code M5H 1C2 Telephone No. 416 / 363-4995

5. DURATION OF EXPLORATION WORK: From July 1/76 to August 15/76

6. DATE WORK COMPLETED (report of closing only): \_\_\_\_\_ 19\_\_\_\_

7. APPROXIMATE NUMBER OF MEN EMPLOYED: 5

8. EXPLORATION WORK: Indicate  PROPOSED or  COMPLETED - use metric measure (1 metre = 3.3 feet)

Geophysical \_\_\_\_\_ Geochemical \_\_\_\_\_

Linecutting (distances, width, method) \_\_\_\_\_

Drilling - No. of Sites 3 Total area 625 metres

Road Construction - Length 300 metres Width 3 metres

Underground Exploration \_\_\_\_\_ (type)

Total Area:  
 Trenching \_\_\_\_\_ square metres Stripping \_\_\_\_\_ square metres  
 Test Pitting \_\_\_\_\_ square metres Other \_\_\_\_\_ square metres

Work by self or contractor (Name) Not established yet.

NOTE: Owner is responsible for ensuring the Contractor complies with pertinent regulations (see section 11, *Mines Regulation Act*).

9. DATE FOREST SERVICE ADVISED BY OPERATOR: June 15/76  
 Name and Title of Forest Official Mr. Monteith (674-9155)  
 Address Birch Island, B.C.

NOTICE

- A. Pursuant to section 11, sub-section (18) of the *Mines Regulation Act* - "Where mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching or such other operations as the Chief Inspector may consider likely to cause significant disturbance of the surface of the land, the Chief Inspector may require a Reclamation Permit." If there is a surface disturbance, complete back of this form, 'Application for Reclamation Permit.'
- B. Where timber is to be cut, a 'Free Use Permit' or 'Licence to Cut' is required from the Forest Service.

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SIGNATURE OF APPLICANT [Signature] TITLE [Signature]  
 Print Name Kenneth H. Bates DATE 17 June 1976



DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

APPLICATION FOR A RECLAMATION PERMIT  
(Pursuant to section 11, Mines Regulation Act)

The following is to be completed when applying for a Reclamation Permit or when reporting work to be done under General Reclamation Permits. When reporting on work done, see instructions at bottom of page. For recommendations on reclamation and environmental control procedures see booklet entitled Guidelines for Coal and Mineral Exploration, available at the office of the District Mining Inspector.

PERMIT NO. MX \_\_\_\_\_

- INDICATE APPROPRIATE DESIGNATION  
Application for Reclamation Permit  Work to be done under General Reclamation Permit
- PRESENT STATE OF LAND ON WHICH EXPLORATION WILL BE DONE (Note on 1:50,000 map.)  
Present land use (ranching, timber, etc.) Not used.  
Type of vegetation Spruce, pine & alder  
Access roads (present use and condition) Jeep - useable  
Campsites, old workings (location, condition) Not useable
- DETAILS OF PROPOSED SURFACE WORK (Note on attached sketch plan with boundaries of claim.)  
Roads: Total length 300 metres Total disturbed area 900 square metres  
Test Pits: Total No. \_\_\_\_\_ Total disturbed area \_\_\_\_\_ square metres  
Trenches: Total No. \_\_\_\_\_ Total disturbed area \_\_\_\_\_ square metres  
Drill Sites: Total No. 3 Total disturbed area 625 square metres  
Camp Sites: Total No. \_\_\_\_\_ Total disturbed area \_\_\_\_\_ square metres  
Other Disturbed Areas: \_\_\_\_\_ square metres  
Total Disturbed Areas: 1525 square metres  
(1 metre = 3.3 feet 1 hectare = 10 000 square metres) \_\_\_\_\_ hectares
- EQUIPMENT TO BE USED (List size, capacity, number.)  
(a) Bulldozer (d) \_\_\_\_\_  
(b) Diamond drill (e) \_\_\_\_\_  
(c) \_\_\_\_\_ (f) \_\_\_\_\_
- SIGNATURE OF APPLICANT: [Signature] Date June 18, 1976

FOR DISTRICT OFFICE USE ONLY

Date of Notification of Government Agencies:  
Forestry \_\_\_\_\_ N.A.  Fish and Wildlife \_\_\_\_\_ N.A.   
Water Resources \_\_\_\_\_ N.A.  Lands \_\_\_\_\_ N.A.   
COMMENTS: \_\_\_\_\_

RECLAMATION PERMIT: Required  Not Required   
Bonding Recommended, Terms and Conditions: \_\_\_\_\_

FOR VICTORIA RECLAMATION OFFICE (Copy to District)

Bonding required: \_\_\_\_\_  
Bonding received: \_\_\_\_\_  
Date approved: \_\_\_\_\_ Date permit issued: \_\_\_\_\_

NOTE: At year-end all surface and reclamation work which has been done should be reported to the District Inspector. Submit a one-page report which describes field work in detail under the following headings: roads, truckbeds, drill sites, camp sites, seeds and fertilizers used, slash abatement, other. Note on a copy of the 1:50,000 N.T.S. map and on a copy of the Site Plan where work done has varied from that which was proposed in the "Notice of Work" or on this "Application." See the 1976 Reclamation Guidelines for a sample of a one-page work report.

1835 Fort Street,  
Victoria, B.C. V8R 1J6.

April 4, 1977.

Mr. R.G. Getty, P.Eng.,  
General Manager,  
Kilborn Engineering (B.C.) Ltd.,  
1199 West Pender Street,  
VANCOUVER, B.C. V6E 2R1.

Dear Mr. Getty:

Re: Consolidated Rexspar Minerals & Chemicals  
Ltd. - Birch Island Project - Stage I Report.

In general the Stage I Report is acceptable to the Steering Committee. If possible, an addendum would be useful to indicate the monitoring and environmental programs proposed for this year.

There are several items which must be considered immediately but should not be included in the Stage I Report:

- General:**
1. A climate station should be established on site. The longer local climatic monitoring is in place the greater the reliability on extrapolation with neighbouring stations.
  2. A program of monitoring, if not already underway, should commence immediately - the flows of surface, groundwater, mine water from adits and the flows on Foghorn and Clay Creeks. Two days of monitoring is sparse even for a Stage I and some attempt should be made to capture this year's freshet such as it is.
  3. It is recognized that the tailings pond is the major impact in this project and the design meet all the requirements laid down by the A.E.C.B., Pollution Control Board and the Ministry of Mines and Petroleum Resources.
  4. Stage I Report should be distributed by the Company to Thompson-Nicola Regional District and Clearwater Improvement District.

**Socio-Economic**

1. The date of data collection is December 1975, which could make some of the data on zoning and Regional District plans out of date.

...2

2.

Updated data on zoning should be sought immediately.

2. More attention should have been paid to assessing impacts of new housing and services on the community services (water, sewer) in Clearwater. Even though this impact may be relatively small, it should be identified in view of the short time frame to complete Stage II studies.
3. Development on the 200 year flood plain is disallowed at present unless there is flood proofing. A careful land use plan of proposed construction camp and operations work force should be prepared with the flood hazard in mind.
4. With a 4 year life span; we are looking at a very short-term development. Relatively more responsibility should therefore lie with the developer to finance service improvements that have nollong-term benefit to the community.

The number of copies required will be thirty to the Steering Committee for distribution to Provincial Government agencies and six to A.E.C.B. care of Mr. A.B. Dory in Ottawa.

Comments on the Stage I Report are required to be submitted to the Steering Committee within thirty days from distribution. A summation of the comments will be forwarded within the following two weeks.

Yours very truly,

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

JDM:jau

copy: Dr. J.T. Fyles  
Mr. B. Marr  
Mr. M.J. Bastiani  
Dr. J. O'Riordan  
Mr. A.B. Dory



DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINES REGULATION ACT

**PERMIT**

AUTHORIZING MINERAL EXPLORATION

(Issued pursuant to section 11 of the *Mines Regulation Act*)

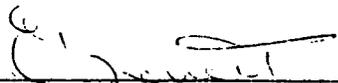
Permit No. MX-118

Issued to CONSOLIDATED REXSPAR MINERALS & CHEMICALS LTD.

for exploration work at General Mineral Exploration Permit. The security bond  
posted on this permit is sufficient to cover all the exploration programmes of  
CONSOLIDATED REXSPAR MINERALS & CHEMICALS LTD., conducted in the Province of  
British Columbia.  
Located at Report of Exploration Work will designate the location of each  
programme.

and subject to the appended terms and conditions, all of which are applicable to this permit.

Issued at Victoria, B.C., this 18th day of June in the year 1976

  
Deputy Chief Inspector of Mines

## TERMS AND CONDITIONS

1. This permit is issued subject to all the terms and conditions of section 11 of the *Mines Regulation Act*.
2. The permit is for a period of three years. It is renewable on application, and upon evidence of satisfactory performance.
3. Pursuant to subsection (18) of section 11 of the Act, security as specified and approved by the Chief Inspector of Mines has been deposited with the Chief Inspector of Mines in the amount of \_\_\_\_\_  
FIVE THOUSAND dollars (\$5,000.00).  
The security is returnable as provided for in subsection (13).
4. The report, dated June 17th, 1976, as filed with the Chief Inspector of Mines pursuant to subsection (2) of section 11 of the *Mines Regulation Act*, together with all revisions and amendments thereto, and as approved by the Chief Inspector of Mines, is an integral part of this permit.

### OTHER

5. Conform to "Reclamation Guidelines for Exploration".

**NOTE**—This permit applies only to the requirements under section 11 of the *Mines Regulation Act*. Other legislation may be applicable to the mining operations, and this permit in no way abrogates the responsibility and obligation of the permittee under such other legislation.

114-276-5226

APPENDIX 4.4.22

1835 Fort Street,  
Victoria, B.C. V8R 1J6.

July 7th, 1976.

Consolidated Rexspar Minerals  
& Chemicals Limited,  
20th Floor, 4 King Street West,  
TORONTO, Ontario.

Attention: Mrs. M. Kustka, Claims Supervisor,  
Exploration Division.

Dear Sir:

Re: General Exploration Reclamation Permit MX-118.

Enclosed herewith General Exploration Reclamation Permit  
MX-118, duly authorized by the Deputy Chief Inspector of Mines, for  
exploration work conducted in the province of British Columbia.

In particular, please note Condition No. 5 which requires  
that in all exploration work you conform to the "Reclamation Guide-  
lines for Exploration".

Yours very truly,

J.D. McDonald, P.Eng.,  
Senior Reclamation Inspector.

JDM:jau

Encl.

*cc permit 410-11 - D. Smith*

  
 THE DEPARTMENT OF  
**MINES AND PETROLEUM RESOURCES**  
 101, 2985 Airport Drive, Kamloops, B. C.

WHEN REPLYING PLEASE REFER TO

FILE NO. ....

August 22, 1977

Kilborn Engineering (B.C.) Limited  
 1199 W. Pender Street  
 Vancouver, B. C.  
 V8E 2R1

Attention: Mr. R. C. Getty, P.Eng.

Dear Mr. Getty:

Re: Consolidated Rexspar Minerals and  
 Chemicals Limited--Birch Island

On July 21 I inspected the BD, B and the A zone areas of the above mineral property.

The 1976 drilling area was left reasonably clean; however there are some erosion problems, which were created by the "cuts" particularly in the A zone and BD zone areas. Perhaps some tidying up and seeding may solve the problem. I have also noted that the portals at the A zone, BD zone and below the old camp were open and in damaged condition, primarily due to weathering. - Section 12 of the Mines Regulation Act requires that the entrances to a mine and cave areas are securely fenced or otherwise protected against inadvertent entry. In addition, I would like to recommend that signs "Danger-Keep Out" be placed at each portal.

Please let me know how soon you can comply with the above requests.

Yours very truly,



Mr. B. M. Dudas, P.Eng.  
 Inspector of Mines  
 and Resident Engineer

*BMD*: 1c

cc: W. C. Robinson  
 M. de Bastiani  
 J. D. McDonald



WHEN REPLYING PLEASE REFER TO

FILE NO .....

101, 2985 Airport Drive  
Kamloops, B. C.  
V2B 7W8  
June 5, 1978

REGISTERED

Consolidated Rexspar Minerals  
and Chemicals Limited  
P.O. Box 40  
Royal Bank Plaza  
Toronto, Ontario  
M5J 2K2

Attention: Mr. W. N. O'Brien

Dear Mr. O'Brien:

Re: Open Portals on your Mineral  
Claims near Birch Island, B. C.

Recently one of our inspectors was on your mineral claims and reported that the portals on your mineral claims were open and some of them in dangerous conditions.

On your advice, about a year ago I brought it to the attention of your consultant, Kilborn Engineering and your Mr. Mario de Bastiani that the open portals were to be securely closed as required by Section 12 of the Mines Regulation Act. For your information I am enclosing copies of these letters.

Please take immediate steps to ensure that all mine openings are securely fenced or sealed to prevent unauthorized entry into the underground workings and let me know within seven days what action you have taken.

Yours very truly,

B. M. Dudas, P.Eng.  
Inspector of Mines  
and Resident Engineer

BMD:lc

cc: Mario J. de Bastiani, Vice President  
cc: W. C. Robinson, Chief Inspector of Mines  
cc: J. D. McDonald, Chairman, Uranium Steering

cc: KILBORN ENGINEERING, U Committee

APPENDIX 4.4.25



Province of  
British Columbia

Ministry of  
Energy, Mines and  
Petroleum Resources

Second Floor  
2747 East Hastings Street  
Vancouver  
British Columbia  
V5K 1Z8

July 23, 1979

WHEN REPLYING PLEASE REFER TO

FILE No. ....

Mr. W. C. Robinson, P. Eng.  
Chief Inspector of Mines  
Ministry of Energy,  
Mines & Petroleum Resources  
525 Superior Street  
Victoria, B. C. V8V 1T7

MINISTRY OF MINES AND PETROLEUM RESOURCES	
RECEIVED JUL 23 1979	
VED	<i>[Signature]</i>

Dear Sir:

Re: Early Work on the BD Zone at Birch Island,  
(Consolidated Rexspar Minerals & Chemicals Ltd.)

Old reports indicate that the adit on the BD zone (Black Diamond as it used to be called) was completed during 1954 and it could be that at that time while clearing the adit site and building the access road over to the F zone the overburden and waste rock was disposed of down slope which eventually may have been carried by slides into Foghorn Creek.

My first contact with this prospect was during the Fall of 1976 when a 3 months drilling programme was reported to be completed by Canadian Mine Services on behalf of Consolidated Rexspar. I have inspected the drill site during 1977 and found it to be reasonably clean other than a few drums. I found that the wooden door on the BD portal was damaged but no other recent activity was evident either at the portal or down slope from the portal. The drilling was above the portal thus, no direct effect was noted at Foghorn Creek.

On the other side of Foghorn Creek (almost opposite from the BD adit) there are some slides which appeared to be of earlier origin than the clearing at the BD zone and perhaps originated when the F zone was explored during or before 1954.

Below the BD portal I noted an old trestle which served as track support and used for disposing of the broken rock from the underground workings during 1954 and before. This waste dump was mostly overgrown and no recent activity was evident.

During 1977 I have examined the other two portals (Camp portal and the A zone portal) and found that the doors have fallen off or been vandalized thus, I have requested the owners to close the adits. This was attended to during June 1978 by hiring a local contractor from Clearwater who filled in both the "A" zone and the BD zone

Mr. W. C. Robinson, P. Eng.

July 23, 1979

portals with waste rock from the adjacent banks, the evidence of which would be very noticeable thus, perhaps this may have caused some persons to think that the waste rock below the portal may be the result of recent mining activity.

During 1978, while I was introducing Mr. MacCulloch, my successor, to my former inspection district I have checked in the BD portal. I found it closed and no other recent mining activity was noted.

Yours very truly,

*for*  


B. M. Dudas, P. Eng.  
Inspector of Mines and  
Resident Engineer

BMD:jg

c.c. A. J. Richardson, P. Eng.  
J. P. MacCulloch, P. Eng.

P.S. I finished this letter over the weekend and since I will be away for a couple of weeks I have asked Mr. Childress to sign it for me.

SECOND FLOOR, 2747 EAST HASTINGS STREET  
VANCOUVER, BRITISH COLUMBIA  
V5K 1Z8



WHEN REPLYING PLEASE REFER TO

FILE NO. ....

April 5, 1978

Mr. R. W. D. Clarke, P. Eng.  
Uranium Mine Division  
Atomic Energy Control Board  
Operations Directorate  
P. O. Box 1046  
Ottawa, Canada K1P 5S9

Dear Mr. Clarke:

I am enclosing the results of tests made at E. Amendologine's residence. The content is self-explanatory. We have had no directive from the A.E.C.B. as to the method of reporting inspections made in Uranium Mines. As you will note in this case we did not have jurisdiction but we do have an agreement with the Ministry of Health in this and related fields to cooperate.

Yours truly,

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

SE:jg

c.c. W. C. Robinson, P. Eng., Chief Inspector of Mines  
J. B. C. Lang, P. Eng., Inspector of Mines

Encl.

RADON GAS SAMPLING AT  
MANNY CONSULTANTS LTD.  
4550 HARRIET STREET  
VANCOUVER, BRITISH COLUMBIA V5V 4K5

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

March 29, 1978

RADON GAS SAMPLING AT

MANNY CONSULTANTS LTD.

4550 HARRIET STREET

VANCOUVER, BRITISH COLUMBIA V5V 4K5

The principal of Manny Consultants Limited Mr. E. Amendologine, P. Eng., has a residence at 4550 Harriet Street, Vancouver, B. C. Samples for assay and residue pulp samples from assays from the China Creek Uranium project near Castlegar were being stored in the garage and in the basement of the house. There was also a box of high grade uranium ore from the Northwest Territory being stored under the garage. The storage of samples from the China Creek, B. C. area was reported by Mr. J. B. C. Lang, P. Eng., Inspector, Nelson District.

The jurisdiction of the Ministry of Mines as defined in the Mines Regulation Act does not include private residences therefore Mr. M. Wayne Green, Head, Radiation Protection Services, Ministry of Health was contacted and arrangements made for an early inspection of the above residence. Mr. Dennis Fitzsimmons from the Radiation Protection Services and myself made a joint inspection of the above residence on March 29, 1978. The results of the radon gas tests about the residence were as follows:

- No. 1 sample taken over the box that contained the high grade uranium samples from N.W.T. This sample was taken in the fresh air outside of the garage.  
Results = 0.0136 WL or 1775.5 MeV/l
- No. 2 sample taken at the mouth of a sample bag containing uranium ore from the China Creek area stored in the garage.  
Results = 0.00116 WL or 151.3 MeV/l
- No. 3 sample taken over boxes of pulp residue samples that had been returned after assaying; these were stored in the basement.  
Results = 0.0000388 WL or 5.04 MeV/l

It was suggested to Mr. Amendologine that he return all of the samples to the place of origin forthwith as no permit had been issued by the A.E.C.B. for storage of samples at his residence.



S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

April 5, 1978



MINISTRY OF MINES AND PETROLEUM RESOURCES  
 MINERAL RESOURCES BRANCH  
 INSPECTION AND ENGINEERING DIVISION

NOTICE OF WORK ON A MINERAL PROPERTY

(Pursuant to section 10, Mines Regulation Act)

This form is to be completed by all companies or individuals carrying out exploration work one month prior to commencement of work and one week prior to cessation of work. Keep one copy and forward one copy to the District Inspector of Mines.

1. NAME OF PROPERTY: CHINA CREEK URANIUM CONSORTIUM  
 Number of claims 7 Principal Claim Group U<sub>3</sub> + U<sub>3</sub>O<sub>8</sub>

2. LOCATION: Mining Division TRAIL CREEK NTS Map Sheet (e.g., B2E/9E) M 82 F 4E  
 Lat. 49° 14' Long. 117° 43' Locality and Access N + S OF CHINA CREEK

3. OWNER: Name ROY CARLSON Free Miner's Cert. No. 159234  
 Address 1765 KILKENNY City N. VAN. Prov. B.C.

4. OPERATOR: Name E. AMENDOLAGINE Free Miner's Cert. No. 198854  
 Address 4550 HARRIET ST City VAN Prov. B.C.  
 Postal Code VAN B.C. V5V 4K5 Telephone No. 872 2901

5. DURATION OF EXPLORATION WORK: From ON GOING to \_\_\_\_\_

6. DATE WORK COMPLETED (report of closing only): ON GOING 1978

7. APPROXIMATE NUMBER OF MEN EMPLOYED: 6-8

8. EXPLORATION WORK: Indicate PROPOSED or COMPLETED - use metric measure (1 metre = 3.3 feet)  
 Geophysical SCINTILLIMETER, RADON GAS DETECTION AND GEOCHEMICAL SURVEY  
 Linecutting (distance, width, method) LINE FLAGGING ONLY - 75 line km. of EACH  
 Drilling - No. of Sites 2 MAIN SITES ON CLAIM U<sub>3</sub> AND U<sub>3</sub>O<sub>8</sub> Total area \_\_\_\_\_ metres  
 Road Construction - Length REPAIR EXISTING ROADS metres Width \_\_\_\_\_ metres  
 Underground Exploration NONE (type)  
 Total Area: \_\_\_\_\_ square metres  
 Trenching \_\_\_\_\_ square metres Stripping \_\_\_\_\_ square metres  
 Test Pitting \_\_\_\_\_ square metres Other \_\_\_\_\_ square metres  
 Work by self or contractor (Name) MANNY CONSULTANTS LTD

NOTE: Owner is responsible for ensuring the Contractor complies with pertinent regulations (see section 11, Mines Regulation Act).

9. DATE FOREST SERVICE ADVISED BY OPERATOR: MR. N. FIPKE ASS. RANGER  
 Name and Title of Forest Official CASTELGAGNE June 15-78  
 Address \_\_\_\_\_

NOTICE

- A. Pursuant to section 11, sub-section (18) of the Mines Regulation Act - "Where mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching or such other operations as the Chief Inspector may consider likely to cause significant disturbance of the surface of the land, the Chief Inspector may require a Reclamation Permit." If there is a surface disturbance, complete back of this form, "Application for Reclamation Permit."
- B. Where timber is to be cut, a "Free Use Permit" or "Licence to Cut" is required from the Forest Service.

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SIGNATURE OF APPLICANT E. Amendolagine TITLE CONSULTANT GEOL  
 Print Name E. AMENDOLAGINE DATE APRIL 28 1978



MINISTRY OF MINES AND PETROLEUM RESOURCES  
 MINERAL RESOURCES BRANCH  
 INSPECTION AND ENGINEERING DIVISION

APPLICATION FOR A RECLAMATION PERMIT  
 (Pursuant to section 11, Mines Regulation Act)

The following is to be completed when applying for a Reclamation Permit or when reporting work to be done under General Reclamation Permits. When reporting on work done, see instructions at bottom of page. For recommendations on reclamation and environmental control procedures see booklet entitled *Guidelines for Coal and Mineral Exploration*, available at the office of the District Mining Inspector.

PERMIT NO. MX \_\_\_\_\_

1. INDICATE APPROPRIATE DESIGNATION

Application for Reclamation Permit  Work to be done under General Reclamation Permit

2. PRESENT STATE OF LAND ON WHICH EXPLORATION WILL BE DONE (Note on 1:50,000 map.)

Present land use (ranching, timber, etc.) NO APPARENT USE  
 Type of vegetation NONE TO SCUM PINE AND PINE  
 Access roads (present use and condition) NEEDS REPAIR  
 Campsites, old workings (location, condition) NONE

3. DETAILS OF PROPOSED SURFACE WORK (Note on attached sketch plan with boundaries of clear.)

Roads: Total length	<u>REPAIR</u> metres	Total disturbed area	<u>NONE</u> square metres
Test Pits: Total No.	<u>NONE</u>	Total disturbed area	<u>NONE</u> square metres
Trenches: Total No.	<u>NONE</u>	Total disturbed area	<u>NONE</u> square metres
Drill Sites: Total No.	<u>15-20</u>	Total disturbed area	<u>3 miles</u> square metres
Camp Sites: Total No.	<u>NONE</u>	Total disturbed area	<u>NONE</u> square metres
Other Disturbed Areas:	<u>NONE</u>		square metres
Total Disturbed Areas:			square metres

(1 metre = 3.3 feet 1 hectare = 10 000 square metres) \_\_\_\_\_ hectares

4. EQUIPMENT TO BE USED (List size, capacity, number)

(a) DRILL BBS1 (d) \_\_\_\_\_  
 (b) CAT (e) \_\_\_\_\_  
 (c) PICKUP TRUCKS (f) \_\_\_\_\_

5. SIGNATURE OF APPLICANT \_\_\_\_\_ Date APRIL 28, 1978

FOR DISTRICT OFFICE USE ONLY

Date of Notification of Government Agencies:

Forestry \_\_\_\_\_ N.A.  Fish and Wildlife \_\_\_\_\_ N.A.   
 Water Resources \_\_\_\_\_ N.A.  Lands \_\_\_\_\_ N.A.

COMMENTS: \_\_\_\_\_

RECLAMATION PERMIT: Required  Not Required

Bonding Recommended, Terms and Conditions: SOME BONDING IS RECOMMENDED IN CASE OF CREEK POLLUTION BY OIL

FOR VICTORIA RECLAMATION OFFICE (Copy to District)

Bonding required: \_\_\_\_\_  
 Bonding received: \_\_\_\_\_  
 Date approved: \_\_\_\_\_ Date permit issued: \_\_\_\_\_

NOTE: At year-end all surface and reclamation work which has been done should be reported to the District Inspector. Submit a one-page report which describes field work in detail under the following headings: roads, trenches, drill sites, camp sites, seeds and fertilizers used, slash abatement, other. Note on a copy of the 1:50,000 NTS map and on a copy of the Site Plan where work done has varied from that which was proposed in the 'Notice of Work' or on this 'Application.' See the 1976 Reclamation Guidelines for a sample of a one-page work report.

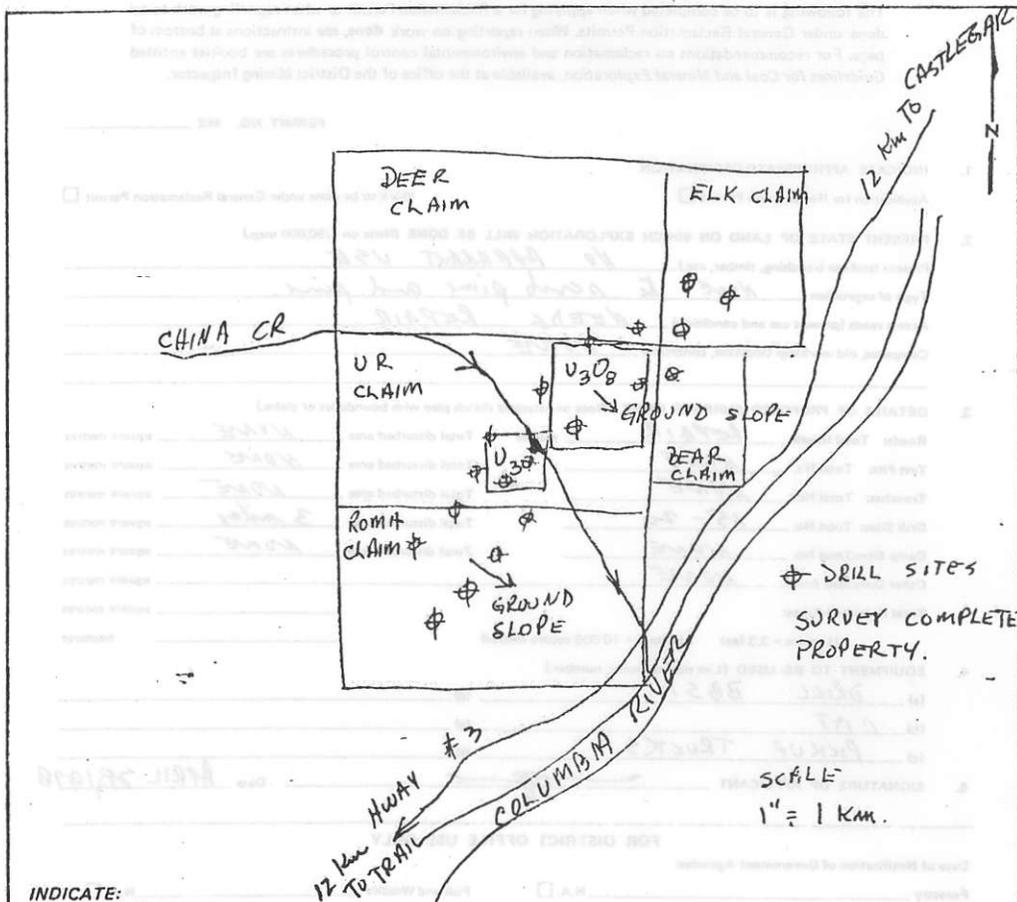


MINISTRY OF MINES AND PETROLEUM RESOURCES

MINERAL RESOURCES BRANCH

INSPECTION AND ENGINEERING DIVISION

SITE PLAN



INDICATE:

Claim boundaries, permanent watercourses, access road and distance to nearest town, proposed roads, test pits, trenches, ground slope at trenches, drill sites, and camp sites.

LOCATION MAP

Show nearest town and access road.

CHINA CREEK  
URANIUM  
Name of property CONSORTIUM  
Claim No. 7 CLAIMS  
Owner R. CARLSON  
Date \_\_\_\_\_  
File No. \_\_\_\_\_



FILE NO. \_\_\_\_\_

MINERAL RESOURCES BRANCH  
DEPARTMENT OF MINES AND PETROLEUM RESOURCES

310 Ward Street,  
Nelson. B.C. V1L 5S4.

May 1st, 1978.

Mr Roy Carlson, President,  
Nomad Mines Ltd.,  
510 W. Hastings Street,  
Vancouver, B.C.  
V6B 1L8

MINISTRY OF MINES AND PETROLEUM RESOURCES		
Rec'd MAY 3 1978		
NR	WD	

Dear Sir,

This office is in receipt of a letter from the Water Rights Branch in Nelson, in which a serious complaint has been filed concerning access roads in the China Creek drainage area.

On investigation of this complaint, it was found to be truly justifiable. The roads used last summer were not left in proper condition with effective water bars in place when they were abandoned in the fall.

The results of this negligence has caused havoc during runoff period this spring. The road became a new watercourse and washed tons of sand into the back yards of several private properties.

The situation has to be rectified as quickly as possible. We suggest that you, or your operator, Manny Consultants, start on this work immediately.

The road giving trouble is the one on the south-west side of China Creek leading through the U<sub>3</sub> Claim as described in the 10-11 form sent to us on April 5th, 1977 by Mr E. Amendolagine.

Should you not contact this office within one week of today's date, steps will be taken to have the work done under Section 12, Subsection (2) of the Mines Regulation Act.

I trust we will hear from you very shortly.

Yours truly,

*J.B.C. Lang*  
J.B.C.Lang, P. Eng.,  
District Inspector of Mines  
and Resident Engineer.

c.c. W.C. Robinson, P. Eng., Victoria ✓  
J.D. McDonald, P. Eng., " ✓  
T.H. Oxland, Water Rights, Nelson.



WHEN REPLYING PLEASE REFER TO  
FILE NO. ....

MINERAL RESOURCES BRANCH  
DEPARTMENT OF MINES AND PETROLEUM RESOURCES

MINISTRY OF MINES AND PETROLEUM RESOURCES
1000-1001

DEPT. 6310 Ward Street,  
Nelson, B.C. V7L 5S4.

June 16th, 1978.

*[Signature]*

MX137

Mr Amendolagine, Consultant,  
4550 Harriet Street,  
Vancouver, B.C.  
V5V 4K5

Dear Sir,

Your 10-11 form covering the U<sub>3</sub> and U<sub>3</sub> O<sub>8</sub> in the Trail Creek Mining District is being processed by the various agencies.

As you are aware, the work is to be done in a very sensitive area and will be under the scrutiny of a great many of the local people.

These people are mainly concerned with their water supply, and should it become polluted or changed in any way from its present condition the implications will be fierce.

You are cautioned then to stay within the planned work proposal. Take extra care to keep away from the creeks, letting no silt enter them. All refuse must be cleaned up and removed from the area. When drilling, log the holes individually watching particularly for any aquifer which may affect the quality of ground water.

Regarding the trespass fine, levied on your operations last year, I have taken the matter up very thoroughly with the Forest Service, but there is no way out, the fine must be paid. We have all learned something from this.

Finally, bonding may be required this year.

Yours very truly,

*[Signature]*  
J.B.C.Lang, P. Eng.,  
District Inspector of Mines  
and Resident Engineer.

116 c.c. J.D. McDonald, P. Eng., Victoria ✓

JBCL/elg

*China Creek*

MINISTRY OF MINES AND PETROLEUM RESOURCES		
Rec'd JUL 20 1978		
	VKD	

310 Ward Street,  
Nelson, B.C. V1L 5S4

July 18th, 1978.

Yanny Consultants Ltd.,  
4550 Harriat Street,  
Vancouver, B.C.  
V5V 4K5

Dear Mr Amendolagine,

Mr R.W.D. Clarke, P. Eng., of the Operations Directorate of the A.E.C.B. contacted me today regarding the monitoring of certain aspects of your China Creek operations.

Firstly, it is requested that measurements of Radon Daughter concentration in drill holes and pits be reported on a monthly basis. These holes and pits should also be properly plugged as discussed with you and the drill cuttings collected.

Secondly, drill water should be sampled before and after use and tested for Ra 226 and U both dissolved and total. This work should also be done on a monthly basis. As much of your water used is being re-cycled a third set of tests will be necessary.

Please understand that this monitoring is your responsibility and copies of the results should be sent to Mr Clarke in Ottawa, Mr Elias in Vancouver, Mr Robinson in Victoria and to this office. Periodically this Ministry will audit your results.

Yours very truly,

*J.B.C. Lang*  
J.B.C. Lang, P. Eng.  
District Inspector of Mines  
and Resident Engineer.

JBCI/alg

c.c. R.W.D. Clarke, P.Eng., Ottawa.  
W.C. Robinson, P.Eng, Victoria.  
S. Elias, P. Eng., Vancouver.  
J.D. McDonald, P. Eng., Victoria.



DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINES REGULATION ACT

**PERMIT**

AUTHORIZING MINERAL EXPLORATION

(Issued pursuant to section 11 of the *Mines Regulation Act*)

Permit No. MX-137

Issued to China Creek Uranium Consortium Inc. c/o E. Amendolagine, Consultant

4550 Harriet Street

Vancouver, B. C. V5V 4K5

for exploration work at Trail Creek

Lat. 49 14' Long. 117 43'

Located at North and South of China Creek

and subject to the appended terms and conditions, all of which are applicable to this permit.

Issued at Victoria, B.C., this 3<sup>rd</sup> day of August in the year 1978

V. J. Dawson  
Deputy Chief Inspector of Mines

## TERMS AND CONDITIONS

1. This permit is issued subject to all the terms and conditions of section 11 of the *Mines Regulation Act*.
2. The permit is for a period of THREE years. It is renewable on application, and upon evidence of satisfactory performance.
3. Pursuant to subsection (18) of section 11 of the Act, security as specified and approved by the Chief Inspector of Mines has been deposited with the Chief Inspector of Mines in the amount of ONE THOUSAND dollars (\$ 1,000.00 ).  
The security is returnable as provided for in subsection (13).
4. The report, dated April 28, 1978, as filed with the Chief Inspector of Mines pursuant to subsection (2) of section 11 of the *Mines Regulation Act*, together with all revisions and amendments thereto, and as approved by the Chief Inspector of Mines, is an integral part of this permit.

### OTHER

5. All work, where applicable, shall conform to the work guidelines contained in Section IV of the publication "Guidelines for Coal and Mineral Exploration" published by the Ministry of Mines and Petroleum Resources.
6. The conditions contained in the Surface Exploration Permit MX29/78 issued May 23, 1978 by the Operations Directorate of the Atomic Energy Control Board shall be fully observed and complied with.
7. No silt or other mineral deposits or deleterious substances shall be allowed to enter creeks.
8. All refuse shall be cleaned up and removed from the area.
9. All drill holes shall be logged and particular attention shall be given to the existence of aquifers.
10. No work other than that shown on the Mineral Exploration Form 10-11, dated April 28, 1978 shall be performed without prior approval from the Chief Inspector of Mines.

NOTE—This permit applies only to the requirements under section 11 of the *Mines Regulation Act*. Other legislation may be applicable to the mining operations, and this permit in no way abrogates the responsibility and obligation of the permittee under such other legislation.

APPENDIX 4.4.33



DEPARTMENT OF MINES  
AND PETROLEUM RESOURCES

MINISTRY OF MINES AND PETROLEUM RESOURCES	
Rec'd SEP 7 1978	
<i>[Signature]</i>	

**REPORT OF INSPECTOR OF MINES**

(Issued pursuant to sections 6 and 7 of the Mines Regulation Act.)

PROSPECTS UNDER EXPLORATION AND DEVELOPMENT

Name of prospect U<sub>3</sub> & U<sub>3</sub>O<sub>8</sub> Co-ordinates 49° 14' N, 117° 43' W  
 Owner or operator China Creek Consortium Locality \_\_\_\_\_  
 Manager E. Amendolagine Address 4550 Harriet Street, Vancouver, V5V 4K5

Number employed, including all contractors:

Surface - Underground \_\_\_\_\_ Contractors \_\_\_\_\_ Total \_\_\_\_\_

Mineral(s) sought: Uranium

First aid: \_\_\_\_\_

Condition of access roads and clearings: Will have to be bared before winter  
Residents have dug trench across road at bottom -  
impassable except on foot.

Explosives: N.A.

General surface: Satisfactory - Drill holes to be plugged and small pits to be  
properly covered or better filled.

Active or dormant: Dormant at time of Inspection

Reclamation: Some clean up needed.

Work done since last report: Drilling completed - for now? - Moved equipment out.

Work remaining this season: ?

Remarks: Citizens pressure group have forced operator out.

J.B.C. Lang, P. Eng.  
Inspector of Mines

310 Ward Street, Nelson, B.C.  
(Address)

Date of inspection August 30th, 19 78



310 Ward Street,  
Nelson. B.C. V7L 5S4

September 6th, 1978.

Mr E. Amendolagine, Consultant,  
4550 Harriet Street,  
Vancouver, B.C.  
V5V 4K5

Dear Sir,

Re: China Creek Property

The property was visited on August 30th by myself and the R.C.M.P. - at their request. A complaint was laid that you had left dangerous holes in the ground.

I would advise, that if you are through with the pits you have dug, that they be filled in. Also, plug the 6" drill holes.

Before snow falls, the water bars must be put back on the roads and a general clean up of the area at the drill sites completed.

Please let me know when you intend to go back on to the property.

Yours very truly,

*J. B. C. Lang*  
J.B.C. Lang, P. Eng.,  
District Inspector of Mines  
and Resident Engineer.

c.c. A.J. Richardson, P. Eng.,  
J.D. McDonald, P. Eng.

Mr J.D. McIlwain, P. Eng.



MINERAL RESOURCES BRANCH  
DEPARTMENT OF MINES AND PETROLEUM RESOURCES

WHEN REPLYING PLEASE REFER TO

FILE NO.	
DEPT. OF MINES AND PETROLEUM RESOURCES	
Rec'd NOV 28 1978	
<i>J.M.</i>	<i>W.V.</i>

310 Ward Street,  
Nelson. B.C. V7L 5S4.

November 28th, 1978.

Mr Manny Amendelogine,  
4550 Harriet Street,  
Vancouver B.C.  
V5B 4K5.

Dear Sir,

Re Reclamation Permit No. MX 137 pursuant  
to section 11 Mines Regulation Act  
Trail Creek.

On November 23rd, 1978 I along with Mr Bruce Lang, District Mine Inspector made an inspection of your China Creek property. The purpose of this inspection was to make sure that you had carried out the reclamation as per the Reclamation Guide-lines.

During the month of November I had a verbal discussion with you regarding the property and you assured me that the work had been done. Let me assure you that the reclamation work has not been done, the only work completed was establishment of erosion control on the access road, west of China Creek. There has been no attempt to revegetate the disturbed area as per our Guidelines for Mineral Exploration.

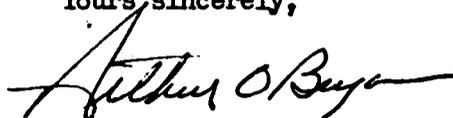
The east side of China Creek has had no work done, in fact several 5 gallon oil or grease cans were found beside the still to be covered or plugged holes.

One would think that after all the difficult times and barriers placed in your way by the Genelle concerned citizens group, you would like to leave the property knowing that you have done no wrong. I would suggest you do the following:

1. Seed and fertilise the disturbed area including the road on the west side of China Creek.
2. Establish water bars and seed and fertilise the east side disturbance.
3. Remove the oil or grease cans and samples.
- 122 4. Plug or fill in the test holes on the east side of the creek.

If you have any further questions, please do not hesitate to get in touch with the Nelson office.

Yours sincerely,

A handwritten signature in cursive script, appearing to read "A.L. O'Bryan".

A.L. O'Bryan,  
Reclamation Inspector.

c.c. J.B.C.Lang, P. Eng.,  
J.D. McDonald, P. Eng. ✓

APPENDIX 4.4.36



Province of  
British Columbia

Ministry of  
Energy, Mines and  
Petroleum Resources

OFFICE ADDRESS:  
403 Vernon Street  
Nelson, B.C. V1L 4E6

MAILING ADDRESS:  
310 Ward Street  
Nelson, B.C. V1L 5S47 OF MINES

May 11th, 1979.

Mr T.G. Mackenzie, Chairman,  
Board of Trustees,  
Genelle Improvement District,  
P.O. Box 82,  
Genelle, B.C.  
VOG 1G0

Dear Mr Mackenzie,

I acknowledge receiving your letter of May 7th, concerning your complaints stemming from debris and unprotected test pits in the China Creek watershed.

Last fall, I did inspect the area. There were no sample bags of material at the site, the test pits were fenced and the drill holes were capped. Subsequent to my inspection, the area was again inspected by Mr O'Bryan of this office, who went with Mr Amendologine. My observations were confirmed.

Today, I again visited the area and I must concur with your findings, particularly on the site to the North of China Creek.

Steps will be taken to get rid of the samples, fill in the test pit and cap the drill holes on the north side of the creek just as soon as I can arrange for a contractor to do the work.

Yours very truly,

*J.B.C. Lang*  
J.B.C. Lang, P. Eng.,  
District Inspector of Mines  
and Resident Engineer.

JBCL/elg  
x.c. A.J. Richardson, P. Eng.,  
Deputy Chief Inspector

**MEMORANDUM**

MINISTRY OF MINES  
AND PETROLEUM RESOURCES

Rec'd JUL 16 1979

TO A.J. Richardson, P. Eng.,  
Deputy Chief Inspector of Mines,  
Victoria.

FROM J.B.C.Lang, P. Eng.,  
District Inspector of Mines, Nelson.

July 9th 1979.

SUBJECT Re: China Creek Conditions during Commission  
Investigation.

OUR FILE .....

YOUR FILE .....

I will discuss the problem in two sections, that on the south side of China Creek, the area on which the drill was located during your visit, and that on the north side of the creek.

The south side is the location causing the concern. The access road just above the highway has a large cut across it to prevent access by any four wheeled vehicle. This cut was put in the road by the people at Genelle.

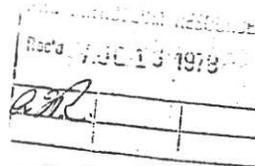
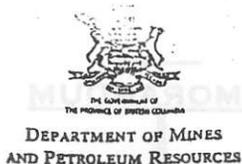
The contractor, Mr M.S. Pistak of Rossland, who was to do the rehabilitation claimed he had trouble getting up to the site with necessary tools and equipment as he had to use trail bikes. He claims that he filled in the large drill holes (6" diameter) and many of the smaller ones. He also claims to have filled in half of the 5' x 5' pit and picked up any trash that he could find in the area. He also built a birch fence around the pit and put flagging on it. Dr. Bates pointed out that just about everywhere on the hill radiation readings were 10 to 15 microrems per hour compared to 2 to 4 microrems per hour elsewhere in B.C.

The north side of China Creek was well rehabilitated. All holes were cemented in and the 5' x 5' pit was filled in. There was no debris around the site at all. My personal opinion is that a first class job was done on the north side.



J.B.C.Lang, P. Eng.,  
District Inspector of Mines  
and Resident Engineer.

JBCL/elg  
Encl.



## REPORT OF INSPECTOR OF MINES

(Issued pursuant to sections 6 and 7 of the Mines Regulation Act.)

### PROSPECTS UNDER EXPLORATION AND DEVELOPMENT

Name of prospect Blizzard Co-ordinates 49°37'; 118°54'  
 Owner or operator Norcen Energy Resources Locality Kelowna  
 Manager T. Turner Address 715 Fifth Avenue S. W.  
Glen McWilliams Calgary, Alberta

Number employed, including all contractors:

Surface 12 Underground N/A Contractors 11 Total 23

Mineral(s) sought: Uranium (autunite).

First aid: Enclosed regulations indicating necessary first aid coverage required immediately.

Condition of access roads and clearings: Satisfactory.

Explosives: N/A.

General surface: Area affected is a recent burn using forestry access roads.

Active or dormant: Active.

Reclamation: Work permit, holes to be capped as discussed.

Work done since last report: Drilling.

Work remaining this season: Drilling.

Remarks: D. W. Coates, foreman Jean Guy Leclere  
2 drills operating  
7 men

Stewart Drilling, foreman Stewart  
1 drill  
4 men

David Smith  
 Inspector of Mines

101 - 2985 Airport Drive, Kamloops  
 (Address)

Date of inspection August 3, 1978

APPENDIX 4.4.39



DEPARTMENT OF MINES AND PETROLEUM RESOURCES

MINES REGULATION ACT

PERMIT

AUTHORIZING MINERAL EXPLORATION

(Issued pursuant to section 11 of the *Mines Regulation Act*)

Permit No. MX-139

Issued to Norcen Energy Resources Ltd.

715-5th Avenue S. W.

Calgary, Alberta T2P 2X7

for exploration work at General Mineral Exploration Permit. The security bond posted on this permit is sufficient to cover all the exploration programmes of NORCEN ENERGY RESOURCES LTD. conducted in the Province of British Columbia.

Located at Report of Exploration work will designate the location of each programme.

and subject to the appended terms and conditions, all of which are applicable to this permit.

Issued at Victoria, B.C., this 31 day of August in the year 1978

V. E. Danson  
*Deputy* Chief Inspector of Mines

TERMS AND CONDITIONS

- 1. This permit is issued subject to all the terms and conditions of section 11 of the *Mines Regulation Act*.
- 2. The permit is for a period of THREE years. It is renewable on application, and upon evidence of satisfactory performance.
- 3. Pursuant to subsection (18) of section 11 of the Act, security as specified and approved by the Chief Inspector of Mines has been deposited with the Chief Inspector of Mines in the amount of \_\_\_\_\_  
~~FIVE THOUSAND~~ dollars (\$ ~~5,000.00~~ ).  
 The security is returnable as provided for in subsection (13).

4. The report, dated January 5, 1978, as filed with the Chief Inspector of Mines pursuant to subsection (2) of section 11 of the *Mines Regulation Act*, together with all revisions and amendments thereto, and as approved by the Chief Inspector of Mines, is an integral part of this permit.

OTHER

- 5. Conform to "Guidelines for Mineral and Coal Exploration".
- 6. Conform to the Atomic Energy Control Board Regulations and Licencing Guide #31 for work on Uranium Properties.

NOTE---This permit applies only to the requirements under section 11 of the *Mines Regulation Act*. Other legislation may be applicable to the mining operations, and this permit in no way abrogates the responsibility and obligation of the permittee under such other legislation.

APPENDIX 4.4.40

MINERAL EXPLORATION FORM 10-11



MINISTRY OF MINES  
AND PETROLEUM RESOURCES  
KAMLOOPS, B.C.  
Rec'd. OCT 30 1978

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DEPT. OF MINES  
AND PETROLEUM RESOURCES  
Rec'd. OCT 1 1978

4X139  
Kw

DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

NOTICE OF WORK ON A MINERAL PROPERTY

(Pursuant to section 10, Mines Regulation Act)

This form is to be completed by all companies or individuals carrying out exploration work one month prior to commencement of work and one week prior to cessation of work. Keep one copy and forward one copy to the District Inspector of Mines.

1. NAME OF PROPERTY: Blizzard

Number of claims Four (63 units) Principal Claim Group Blizzard

2. LOCATION: Mining Division Greenwood NTS Map Sheet (e.g., 82E/9E) 82E/10W  
 Lat. 49° 37' Long. 118° 54' Locality and Access 32 air miles southeast of Kelowna access by Trapping Creek.

3. OWNER: Name Norcen Energy Resources Limited Free Miner's Cert. No. 159095  
 Address 715 - 5th Avenue S.W. City Calgary Prov. Alberta

4. OPERATOR: Name \_\_\_\_\_ Free Miner's Cert. No. \_\_\_\_\_  
 Address \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_  
 Postal Code \_\_\_\_\_ Telephone No. \_\_\_\_\_

5. DURATION OF EXPLORATION WORK: From February, 1978 to December, 1978

6. DATE WORK COMPLETED (report of closing only): \_\_\_\_\_ 19\_\_\_\_

7. APPROXIMATE NUMBER OF MEN EMPLOYED: 15

8. EXPLORATION WORK: Indicate PROPOSED or COMPLETED - use metric measure (1 metre = 3.3 feet)

Geophysical \_\_\_\_\_ Geochemical \_\_\_\_\_

Linecutting (distance, width, method) \_\_\_\_\_

Drilling - No. of Sites 300 ± 50 Total area 100 square metres per site

Road Construction - Length 5,000 metres Width 10 metres

Underground Exploration \_\_\_\_\_ (type) \_\_\_\_\_

Total Area:  
 Trenching \_\_\_\_\_ square metres Stripping \_\_\_\_\_ square metres  
 Test Pitting \_\_\_\_\_ square metres Other \_\_\_\_\_ square metres

Work by self or contractor (Name) \_\_\_\_\_

NOTE: Owner is responsible for ensuring the Contractor complies with pertinent regulations (see section 11, Mines Regulation Act).

9. DATE FOREST SERVICE ADVISED BY OPERATOR: October 12, 1978 (letter)  
 Name and Title of Forest Official Mr. Bob Keep, Forest Ranger  
 Address P. O. Box 100, Beaverdell, British Columbia

NOTICE

- A. Pursuant to section 11, sub-section (18) of the *Mines Regulation Act* - Where mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching or such other operations as the Chief Inspector may consider likely to cause significant disturbance of the surface of the land, the Chief Inspector may require a Reclamation Permit. If there is a surface disturbance, complete back of this form, 'Application for Reclamation Permit.'
- B. Where timber is to be cut, a 'Free Use Permit' or 'Licence to Cut' is required from the Forest Service.

SIGNATURE OF APPLICANT [Signature] TITLE Exploration Supervisor  
 Print Name Arthur Terry DATE 1978-10-12



DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

MINISTRY OF MINES  
AND PETROLEUM RESOURCES  
VANCOUVER, B.C.  
Rec'd. JAN 9 1973

DEPT. OF MINES  
AND PETROLEUM RESOURCES

Rec'd. JAN 19 1978

NOTICE OF WORK ON A MINERAL PROPERTY

(Pursuant to section 10, *Mines Regulation Act*)

This form is to be completed by all companies or individuals carrying out exploration work one month prior to commencement of work and one week prior to cessation of work. Keep one copy and forward one copy to the District Inspector of Mines.

1. NAME OF PROPERTY: BLIZZARD  
Number of claims Four (63 units) Principal Claim Group BLIZZARD

2. LOCATION: Mining Division Greenwood NTS Map Sheet (e.g., 82E/9E) 82E/10W  
Lat. 49° 37' Long. 118° 54' Locality and Access 32 air miles southeast of Kelowna  
Access by Trapping Creek Logging Road

3. OWNER: Name NORCEN ENERGY RESOURCES LIMITED Free Miner's Cert. No. 159095  
Address 715 - 5th Avenue S.W. City Calgary Prov. Alberta

4. OPERATOR: Name As Above Free Miner's Cert. No. \_\_\_\_\_  
Address \_\_\_\_\_ City \_\_\_\_\_ Prov. \_\_\_\_\_  
Postal Code \_\_\_\_\_ Telephone No. \_\_\_\_\_

5. DURATION OF EXPLORATION WORK: From February, 1978 to December, 1978

6. DATE WORK COMPLETED (report of closing only): \_\_\_\_\_ 19\_\_\_\_

7. APPROXIMATE NUMBER OF MEN EMPLOYED: 8

8. EXPLORATION WORK: Indicate PROPOSED or COMPLETED - use metric measure (1 metre = 3.3 feet)  
Geophysical \_\_\_\_\_ Geochemical \_\_\_\_\_  
Linecutting (distance, width, method) \_\_\_\_\_  
Drilling No. of Sites 125 + 25 Total area 100 square meters per site  
Road Construction - Length \_\_\_\_\_ metres Width \_\_\_\_\_ metres  
Underground Exploration \_\_\_\_\_ (type) \_\_\_\_\_  
Total Area:  
Trenching \_\_\_\_\_ square metres Stripping \_\_\_\_\_ square metres  
Test Pitting \_\_\_\_\_ square metres Other \_\_\_\_\_ square metres  
Work by self or contractor (Name) \_\_\_\_\_

NOTE: Owner is responsible for ensuring the Contractor complies with pertinent regulations (see section 11, *Mines Regulation Act*).

9. DATE FOREST SERVICE ADVISED BY OPERATOR: January 3, 1978 (letter)  
Name and Title of Forest Official Mr. Bob Keed, Forest Ranger  
Address P. O. Box 100, Beaverdell, British Columbia

NOTICE

- A. Pursuant to section 11, sub-section (18) of the *Mines Regulation Act* - Where mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching or such other operations as the Chief Inspector may consider likely to cause significant disturbance of the surface of the land, the Chief Inspector may require a Reclamation Permit. If there is a surface disturbance, complete back of this form, 'Application for Reclamation Permit.'
- B. Where timber is to be cut, a 'Free Use Permit' or 'Licence to Cut' is required from the Forest Service.

SIGNATURE OF APPLICANT [Signature] TITLE Chief Inspector  
Print Name Allen Tracy Turner DATE Jan 5/78



DEPARTMENT OF MINES AND PETROLEUM RESOURCES
MINERAL RESOURCES BRANCH
INSPECTION AND ENGINEERING DIVISION

APPLICATION FOR A RECLAMATION PERMIT
(Pursuant to section 11, Mines Regulation Act)

The following is to be completed when applying for a Reclamation Permit or when reporting work to be done under General Reclamation Permits. When reporting on work done, see instructions at bottom of page. For recommendations on reclamation and environmental control procedures see booklet entitled Guidelines for Coal and Mineral Exploration, available at the office of the District Mining Inspector.

PERMIT NO. MX \_\_\_\_\_

1. INDICATE APPROPRIATE DESIGNATION

Application for Reclamation Permit [X] Work to be done under General Reclamation Permit [ ]

2. PRESENT STATE OF LAND ON WHICH EXPLORATION WILL BE DONE (Note on 1:50,000 map.)

Present land use (ranching, timber, etc.) Timber has been removed

Type of vegetation Grass Land

Access roads (present use and condition) Forestry and Logging Roads, Good Condition

Campsites, old workings (location, condition) None

3. DETAILS OF PROPOSED SURFACE WORK (Note on attached sketch plan with boundaries of claim.)

Table with 2 columns: Item and Total disturbed area. Rows include Roads (20,000 metres, 100,000 square metres), Test Pits, Trenches, Drill Sites (125 + 25), Camp Sites, and Total Disturbed Areas (100,000 square metres, 10 hectares).

4. EQUIPMENT TO BE USED (List size, capacity, number.)

(a) One Bulldozer (D-6) (d) (b) (e) (c) (f)

5. SIGNATURE OF APPLICANT

Date

FOR DISTRICT OFFICE USE ONLY

Date of Notification of Government Agencies:
Forestry N.A. [ ] Fish and Wildlife N.A. [ ]
Water Resources N.A. [ ] Lands N.A. [ ]

COMMENTS:

RECLAMATION PERMIT: Required [ ] Not Required [ ]

Bonding Recommended, Terms and Conditions:

FOR VICTORIA RECLAMATION OFFICE (Copy to District)

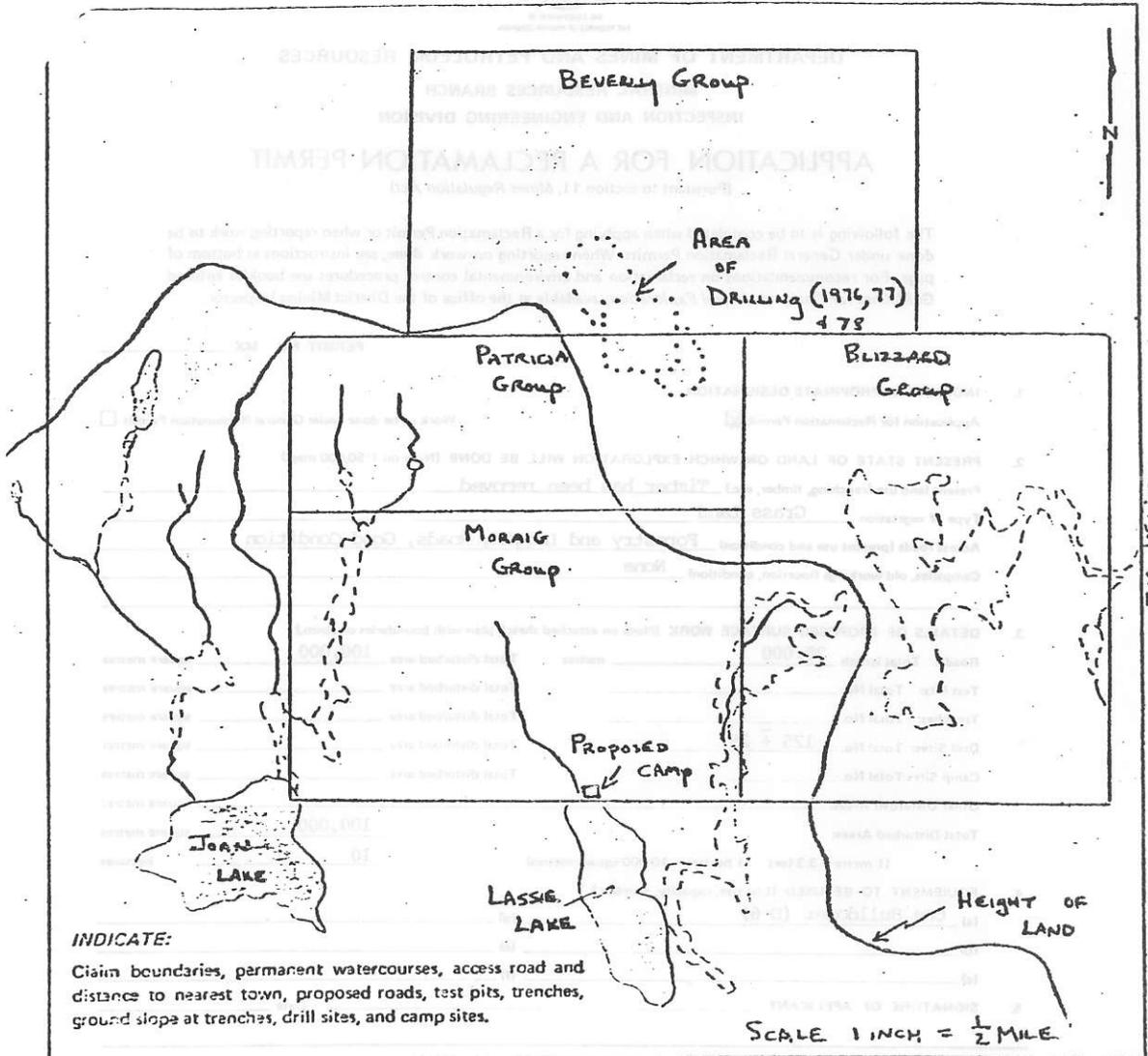
Bonding required:

Bonding received:

Date approved: Date permit issued:

NOTE: At year-end all surface and reclamation work which has been done should be reported to the District Inspector. Submit a one-page report which describes field work in detail under the following headings: roads, trenches, drill sites, camp sites, seeds and fertilizers used, slash abatement, other. Note on a copy of the 1:50,000 NTS map and on a copy of the Site Plan where work done has varied from that which was proposed in the 'Notice of Work' or on this 'Application' see the 1976 Reclamation Guidelines for a sample of a one-page work report.

SITE PLAN



INDICATE:

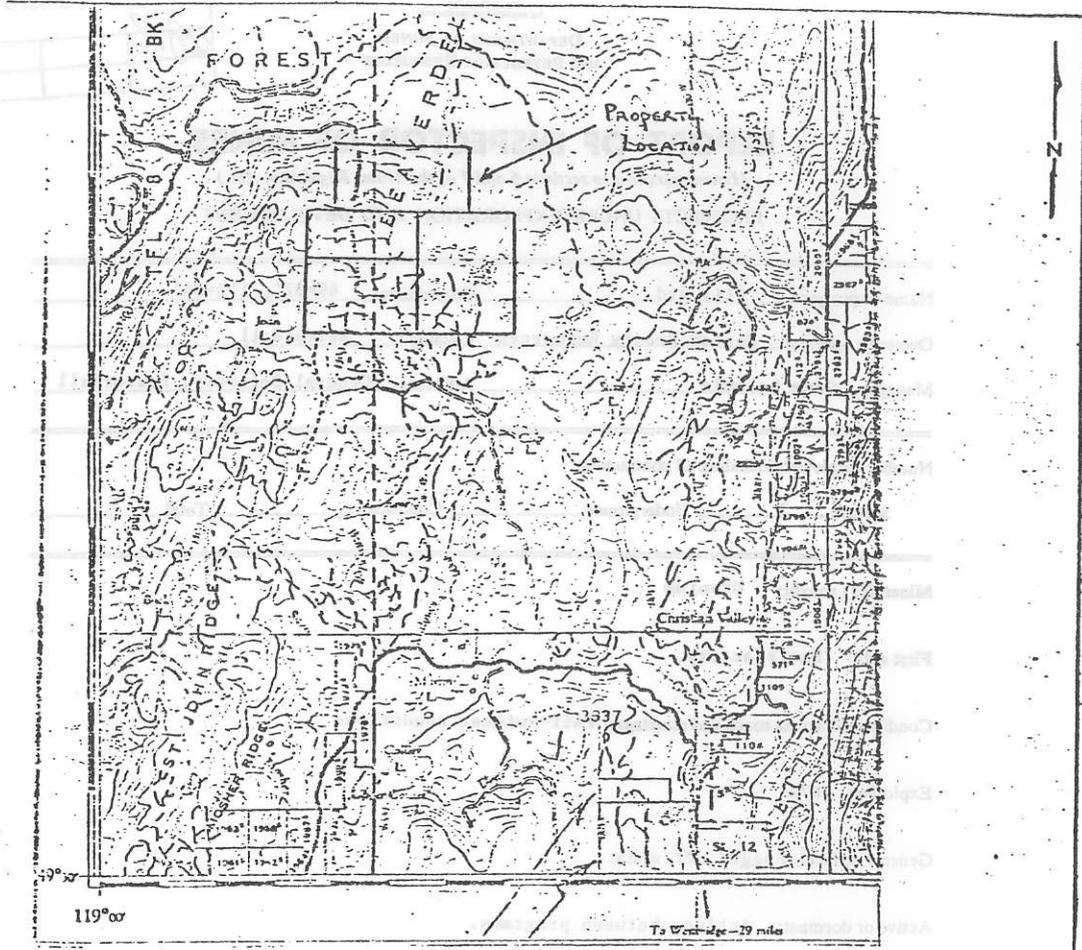
Claim boundaries, permanent watercourses, access road and distance to nearest town, proposed roads, test pits, trenches, ground slope at trenches, drill sites, and camp sites.

LOCATION MAP

Show nearest town and access road.

Name of property BLIZZARD  
 Claim No. \_\_\_\_\_  
 Owner LACANA MOUNTING CORP.  
 Date January 2, 1977  
 File No. \_\_\_\_\_

SITE PLAN



INDICATE:

Claim boundaries, permanent watercourses, access road and distance to nearest town, proposed roads, test pits, trenches, ground slope at trenches, drill sites, and camp sites.

SCALE 1" = 2 MILES

LOCATION MAP

Show nearest town and access road.

Name of property BLIZZARD  
 Claim No. \_\_\_\_\_  
 Owner LACANA MINING CORP  
 Date FEB 22, 1977  
Jan 7 / 77.  
 File No. \_\_\_\_\_

APPENDIX 4.4.41



DEPARTMENT OF MINES  
AND PETROLEUM RESOURCES

DEPARTMENT OF MINES  
AND PETROLEUM RESOURCES  
Rec'd MAY 1 1979  
*DR*

**REPORT OF INSPECTOR OF MINES**

*(Issued pursuant to sections 6 and 7 of the Mines Regulation Act.)*

PROSPECTS UNDER EXPLORATION AND DEVELOPMENT

Name of prospect Blizzard Co-ordinates 49°37', 118°54'

Owner or operator Norcen Energy Resources Locality Beaverdell

Manager Gene Laramie Address General Delivery, Beaverdell

Number employed, including all contractors:

Surface 3 Underground \_\_\_\_\_ Contractors \_\_\_\_\_ Total 3

Mineral(s) sought: Uranium

First aid: Satisfactory.

Condition of access roads and clearings: Fair--winter conditions

Explosives: N/A

General surface: Logged off area.

Active or dormant: Active--between programs.

Reclamation: Drill holes to be plugged or capped as discussed.

Work done since last report: Drilling--sampling.

Work remaining this season: Drilling.

Remarks:

Dosimeters are worn as per recommendation.

Core shed isolated and signs posted.

*Jack A. Thomson*

Jack A. Thomson Inspector of Mines  
Technician

101, 2985 Airport Drive, Kamloops, B. C.  
(Address)

Date of inspection April 18, 19 79



**Norcen**  
Energy Resources Limited

NORCEN TOWER,  
715 - 5th Avenue S.W.  
CALGARY, ALBERTA T2P 2X7  
Phone (403) 231-0111

30 April 1979

Ministry of Mines and Petroleum Resources  
Second Floor  
2747 East Hastings Street  
Vancouver, British Columbia  
V5K 1Z8

Attention: Mr. S. Elias  
Inspector, Environmental Control Inspection  
and Engineering Division

Dear Mr. Elias,

Subject: Blizzard Uranium Property  
TLD Radiation Monitoring

This letter is to confirm our telephone conversation of April 25, 1979 concerning your request for information pertaining to personal dosimeter radiation monitoring conducted on the Blizzard Property in the vicinity of Beaverdell, British Columbia.

Norcen approached the Health Protection Branch, Radiation Protection Bureau of Health and Welfare Canada on 23 August 1978 applying for enrollment in the Thermoluminescent Dosimeter (TLD) Monitoring Service in connection with worker surveillance during exploration on the Blizzard Property.

. . . . 2

DEPT. OF MINES  
AND PETROLEUM RESOURCES  
MAY 3 1979  
TLD  
HL  
112 3 174 107

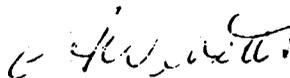
I enclose a copy of the September 11, 1978 letter from David Grogan, Chief, Occupational Radiation Hazards Division indicating that Norcen would be receiving a shipment of dosimeters and that the Norcen group were to be enrolled in the "three-monthly service".

In view of the transient nature of the workers that were on the site (geologists, field technicians, etc. are usually on site for a few days only) the use of the dosimeters has not been significant, but I have enclosed the results for the one person who has been on site during the entire time the dosimeter monitoring has been conducted. This person is acting as a watchman for the property and core shack and is also checking on the environmental monitoring instrumentation located on the Property.

I trust that this material is satisfactory for your purposes.

Yours very truly,

NORCEN ENERGY  
RESOURCES LIMITED



G. A. WEBSTER, P. Eng.  
Environmental Engineer  
/ Minerals

GAW/jc

Encl.

Health and Welfare  
Canada

Santé : Bien-être social  
Canada

Health Protection  
Branch

Direction générale de la  
protection de la santé

Radiation Protection Bureau  
Brookfield Road  
Ottawa, Ontario K1A 1C1

September 11, 1978

Norcen Energy Resources  
Limited  
Norcen Tower  
Attn: Mr. T.J. Neville  
Manager, Eng. & Environment  
Blizzard  
715-5th Avenue S.W  
Calgary, Alberta  
T2P 2X7

Your file    Votre référence

1140-2-2

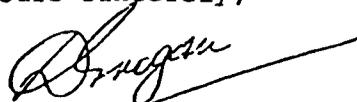
Our file    Notre référence

Dear Mr. Neville:

Your request for enrollment in our TLD service is being actioned as soon as possible, and you will shortly receive your first shipment of TLD monitors under separate cover.

You should note that your group has been enrolled on the three-monthly service since the semi-monthly service is restricted to the few organizations that are regarded as being relatively high risk users.

Yours sincerely,



David Grogan  
Chief  
Occupational Radiation Hazards  
Division

DG/mw

Telephone: (613) 998-4751

00089

SEE REVERSE FOR EXPLANATION    REGARDER LE VERSO POUR L'EXPLICATION

(19)  
(10)  
235

RADIATION EXPOSURE REPORT – RAPPORT D'EXPOSITION AUX RADIATIONS

GROUP CODE  
 CODE DU GROUPE  
 (D) 11987

DATE OF REPORT  
 DATE DU RAPPORT  
 03/29/79

PAGE 1

NORDEX ENERGY RESOURCES LTD  
 MINERALS DEPARTMENT  
 ATTN: JIM NEVILLE  
 715 - 5TH AVENUE SOUTH WEST  
 CALGARY ALBERTA  
 T2P 2X7

TLD SERVICE SERVICE DTL  
 QUARTERLY TRIMESTRIEL

RADIATION: X-GAMMA-BETA

Monitor number Numéro du moniteur		Name – Nom	DOSE ESTIMATE (mREM) DOSE ESTIMÉE				Signals Signaux				Arcomatics			
Period Période	Serial Série		First line – Body Second line – Skin		Première ligne – Corps Deuxième ligne – Peau		This year Cette année		To date à ce jour					
				Current Période	Quarter Trimestre					1/4	3/4	1/2	3/4	
2378	032115	LARABIE E												
2378	006496	NOT USED												
2378	007579	NOT USED												
2378	011339	NOT USED												
2378	015078	NOT USED												
2378	015530	NOT USED												
2378	018311	NOT USED												
2378	018458	NOT USED												
2378	020208	NOT USED												
2378	021048	NOT USED												
2378	022792	NOT USED												
2378	023292	NOT USED												
2378	026743	NOT USED												
2378	034527	NOT USED												

NUMÉRO DE COLONNE

EXPLICATION (par le numéro des colonnes)

- (1) An identification number of ten digits; the first two digits refer to the period number, the second two to the year and the last six to the monitor serial number.
- (2) Full name and initials (surname abbreviated by an asterisk if more than eleven characters).
- (3) Asterisk indicates person currently active at more than one group. Cumulative totals are all inclusive.
- (4) Unless indicated in this column, the first record line indicates the body dose estimate while the second gives the skin dose estimate. Other dose estimates are titled by HD/TT (head dose), EXT 2 (right hand and arm), EXT 3 (left hand and arm), EXT 4 (right foot and leg), or EXT 5 (left foot and leg) in this column.
- (5) Current period estimated dose (mrem).
- (6) Cumulative dose for current quarter (mrem).
- (7) Cumulative dose for current year (mrem).
- (8) Cumulative dose to date from RPB records. An asterisk indicates other records included and/or available.
- (9)
 

<b>WARNING SIGNALS</b>	<b>BODY</b>	<b>SKIN</b>
Quarter	3,000 mrem	15,000 mrem
Year	5,000 mrem	30,000 mrem
	<b>HEAD</b>	<b>EXTREMITIES</b>
Quarter	8,000 mrem	38,000 mrem
Year	15,000 mrem	75,000 mrem
- (10) Unusual occurrence indicated.
 

<ul style="list-style-type: none"> <li>1. Monitor Contaminated</li> <li>2. Control Monitor Exposed</li> <li>3. Faulty Holder</li> <li>4. Foil Image Absent</li> <li>5. Monitor Damaged</li> </ul>	<ul style="list-style-type: none"> <li>6. Late Monitor</li> <li>7. Non-Personal</li> <li>8. Thermal Neutron Exposure Included</li> <li>9. Non-Uniform</li> <li>A. Chip Missing</li> </ul>
---	---

NUMÉRO DE COLONNE

EXPLICATION (par le numéro des colonnes)

- (1) Un numéro d'identification de dix chiffres dont les deux premiers indiquent la période, les deux suivants, l'année et les six derniers, le numéro de série du moniteur.
- (2) Nom au complet et initiales (les surnoms sont abrégés par un astérisque s'il y a plus de onze lettres).
- (3) L'astérisque indique que la personne est présentement active dans plus qu'un groupe. Les totaux sont cumulatifs.
- (4) A moins d'indication contraire dans cette colonne, la première ligne des données indique la dose corporelle estimée et la seconde, la dose à la peau estimée. Les autres doses estimées seront indiquées dans cette colonne comme suit: HD/TT (dose à la tête), EXT 2 (main et bras droits), EXT 3 (main et bras gauches), EXT 4 (pied et jambe droits), ou EXT 5 (pied et jambe gauches).
- (5) Dose estimée à la période courante (mrem).
- (6) Dose cumulative du trimestre courant (mrem)
- (7) Dose cumulative de l'année courante (mrem).
- (8) Dose cumulative, à ce jour, obtenues des dossiers du B.R. Un astérisque indique les autres données incluses ou disponibles.
- (9)
 

<b>SIGNAUX D'ALERTE</b>	<b>CORPS</b>	<b>PEAU</b>
trimestre	3000 mrem	15 000 mrem
année	5000 mrem	30 000 mrem
	<b>TÊTE</b>	<b>EXTRÉMITÉS</b>
trimestre	8000 mrem	38 000 mrem
année	15000 mrem	75 000 mrem
- (10) Anomalies indiquées
 

<ul style="list-style-type: none"> <li>1. Moniteur contaminé</li> <li>2. Moniteur de contrôle exposé</li> <li>3. Porte-moniteur défectueux</li> <li>4. Image-filme absente</li> <li>5. Moniteur endommagé</li> </ul>	<ul style="list-style-type: none"> <li>6. Moniteur en retard</li> <li>7. Non personnel</li> <li>8. Exposition à des neutrons thermiques incluse</li> <li>9. Moniteur sans uniformité</li> <li>A. DTL égaré</li> </ul>
--	---

APPENDIX 4.4.43

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

Rec'd	AUG 22 1979
<i>[Signature]</i>	<i>[Signature]</i>
<i>[Signature]</i>	<i>[Signature]</i>

**REPORT OF INSPECTOR OF MINES**

(Issued pursuant to sections 6 and 7 of the Mines Regulation Act.)

PROSPECTS UNDER EXPLORATION AND DEVELOPMENT

---

Name of prospect Blizzard Co-ordinates 49° 118°

Owner or operator Norcen Locality Beaverdell

Manager Gene Larrabee Address 715-5th Ave. S.W., Calgary, Alberta  
T2P 2X7

---

Number employed, including all contractors:

Surface 4 Underground \_\_\_\_\_ Contractors \_\_\_\_\_ Total 4

---

Mineral(s) sought: Uranium

First aid: Satisfactory

Condition of access roads and clearings: As per forestry consensus

Explosives: N/A

General surface: Satisfactory

Active or dormant: Dormant except for environmental monitoring.

Reclamation: Grass (seeded and growing over disturbed areas).

Work done since last report: Monitoring

Work remaining this season: As per Section 10

Remarks: Camp housekeeping excellent.  
Core house locked and appropriate signs.

*David Smith*  
 David Smith, P.Eng. Inspector of Mines

101, 2985 Airport Drive, Kamloops, B. C.  
 (Address) V2B 7W8

APPENDIX 4.4.44

#120 - 1006 Government St.,  
Victoria, British Columbia,  
October 5, 1973.

Mr. S. Satoh,  
Nissho-Iwai Canada Ltd.,  
Suite 801, 1111 West Hastings Street,  
VANCOUVER 1, BRITISH COLUMBIA.

Dear Mr. Satoh:

Thank you for your letter of August 30th. My apologies for not answering your queries sooner.

With reference to your number questions:-

1. This is correct.  
Reclamation Reports and exploration permits are required only where exploration results in soil disturbance by machines.
2. In the case of a new exploration project the Reclamation Report must accompany the "Report of Exploration Work on a Mineral Claim" submitted annually prior to the start of exploration work. In the case of a continuing program where work was undertaken between April 1969 and May 1973, a "Report of Exploration Work on a Mineral Claim" should be submitted to cover this work and a Reclamation Report should accompany this. In both of the above cases a Reclamation Report need be submitted only once for any particular mineral property. Thereafter only the annual "Report of Exploration Work on a Mineral Claim" is required providing the area to be explored has been covered under sections 3(a), (b) and (c) of the Reclamation Report.

3. The format for the Reclamation Report is given in Section 11(3) of the Mines Regulation Act. It includes a topographic map of suitable scale showing the extent of exploration work in relation to lakes, watercourses and inhabited places in the vicinity. The body of the report should include the following:-

- (a) The nature, and the present and potential uses of the land included in the map area. Discuss the nature of the land with reference to soils, geology, vegetation, water, climate and topography. Describe past, present and potential land use with reference to mining, forestry, agriculture, grazing, fish and wildlife, recreation and water resources.

. . . 2

Mr. S. Satoh (continued)

October 5, 1973.

(b) Discuss the possible effects of exploration work on: livestock and grazing, fish and wildlife, watercourses, timber, farms and inhabited places, recreation and the general appearance of the area; and describe the way in which exploration operations will be carried out to minimize these effects.

(c) Describe the reclamation operations which will be undertaken to ensure that (i) the potential prime use of the land is attained in the earliest possible time, and (ii) the adverse effects of exploration described in 3(b) are minimized.

4. In writing parts (a) & (b) of the Reclamation Report you should consult the following Government officers:- the District Forest Ranger, the District Fish and Wildlife Conservation Officer, the District Agriculturist and the District Water Rights Engineer.

5. The Surface Work Permit for exploration is issued only after receipt of the Reclamation Report. This report is reviewed by a committee comprising members of the various resource departments of government. After the report is accepted or revised by this committee, the permit is issued subject to payment of the bond. For a company such as yours the permit would probably be issued for a period of 3 years.

6. The bond can be in the form of securities or a certified cheque made out in favour of the Minister of Finance, lodged with your bank. I am attaching a "Receipt and Agreement Form" for your information.

Yours truly,

John Dick,  
Inspector of Mines - Reclamation.

JD:sl

encl.

APPENDIX 4.4.45

TERMS AND CONDITIONS



DEPARTMENT OF MINES AND PETROLEUM RESOURCES

MINES REGULATION ACT

PERMIT

AUTHORIZING MINERAL EXPLORATION

(Issued pursuant to section 11 of the Mines Regulation Act, Order in Council 1532)

Permit No. MX-40

Issued to Nissho-Iwai Canada Ltd.

for exploration work at P.B. 1-80 claims, inclusive; P.B. 81-140 claims, inclusive; Donen 281-320 claims, inclusive.

Located at Greenwood Mining Division

and subject to the appended terms and conditions, all of which are applicable to this permit.

Issued at Victoria, B.C., this 22nd day of April in the year 1974

Handwritten signature of Chief Inspector of Mines

## TERMS AND CONDITIONS

1. This permit is issued subject to all the terms and conditions of section 11 of the *Mines Regulation Act*, Order in Council 1532.

2. The permit is for a period of three (3) years. It is renewable on application, and upon evidence of satisfactory performance.

3. Pursuant to subsections (6) and (7) of section 11 of the Act, security as specified and approved by the Chief Inspector of Mines has been deposited with the Chief Inspector of Mines in the amount of Two Thousand dollars (\$ 2,000.00). The security is returnable as provided for in subsection (13).

4. The report, dated December 11, 1973, as filed with the Chief Inspector of Mines pursuant to subsection (2) of section 11 of the *Mines Regulation Act*, together with all revisions and amendments thereto, and as approved by the Chief Inspector of Mines, is an integral part of this permit.

### OTHER

5. Topsoil and overburden soil stripped from the surface shall be conserved, as feasible, for possible useage in the reclamation of disturbed areas.

6. The location of roads is to be planned for minimum possible disturbance of the surface of the land and watercourses. Roads are to be properly ditched and culverted to adequately control erosion and silting of watercourses.

7. Erosion control of cleared and stripped areas and of trenches is to be provided as may be necessary to prevent silting of watercourses, and as required by the Inspector.

8. Trenches which did not expose mineralization are to be filled.

9. At the termination of exploration each year, the disturbed areas are to be left in a neat, clean and safe condition.

10. At the completion of the total exploration programme, a reasonable time will be allowed for the decision as to whether or not to proceed to production. If the decision is not to proceed to production, then the reclamation of all disturbed areas shall be carried out to the orders and satisfaction of the Chief Inspector of Mines.

11. On completion of the exploration programme, a report of exploration work done is to be filed with the office of the Chief Inspector of Mines. If no future work is planned on the property, please advise the Chief Inspector and the District Inspector so that the property can be examined to determine if the security bond can be released.

NOTE---This permit applies only to the requirements under section 11 of the *Mines Regulation Act*, Order in Council 1532. Other legislation may be applicable to the mining operations, and this permit in no way abrogates the responsibility and obligation of the permittee under such other legislation.

500-773-6296



DEPARTMENT OF MINES AND PETROLEUM RESOURCES

MINES REGULATION ACT

PERMIT

AUTHORIZING MINERAL EXPLORATION

(Issued pursuant to section 11 of the *Mines Regulation Act*, Order in Council 1532)

Permit No. MC-40

Revised May 9, 1979 to:

Issued to Nissho-Iwai Canada Ltd. PNC Exploration (Canada) Co. Ltd.

PERMIT RENEWED: April 22/77 to April 22/80 (Mar. 9/77)

for exploration work at P.B.-1-80 claims, inclusive; P.B.-31-140 claims, inclusive; Donen 281-320 claims, inclusive. (See over for May 9, 1979 revisions)

Located at Greenwood Mining Division, Osoyoos and Vernon Mining Division

and subject to the appended terms and conditions, all of which are applicable to this permit.

Issued at Victoria, B.C., this 22nd day of April in the year 1974

*J. E. Stewart*  
Chief Inspector of Mines

Revisions of May 9, 1979 approved

Chief Inspector of Mines

COVER PAGE:  
~~TABLE OF CONTENTS~~

the claims to be covered by the Plan

1) McCulloch Group (Osoycos and Vernon M.D)

Pb 180 - 188	30542 - 30550
Pb 189 - 198	17323 - 17329
Pb 208 - 209	17339 - 17340
Pb 212 - 214	17343 - 17345
Pb 250 - 259	31200 - 31209

2) Kallis Creek Group (Greenwood M.D)

Pb 81 - 140	36330 - 36389
PNC #2	914
D-1	953

3) Big White Group (Greenwood M.D)

Pb 260 - 289	37507 - 37536
--------------	---------------

4) Cup Lake Group (Greenwood M.D)

Donan 43 - 45	30063 - 30066
Donan 61 - 64	30081 - 30084
Donan 281 - 320	35281 - 35320

5) Fuki Group (Greenwood M.D)

Fuki 1 - 28	27843 - 27870
Fuki 29 - 40	28047 - 28058
PNC 1	892
PNC 3	915

6) Collier Lake Group (Greenwood M.D)

Donan 93	30113
Donan 95	30115
Donan 99 - 104	30119 - 30124
Donan 108	30128
Donan 110	30130
Donan 112	30132

7) Lassie Lake Group (Greenwood M.D)

Donan 361	114
-----------	-----

*Handwritten notes:*  
 camp  
 H. J. Lake  
 fields

TERMS AND CONDITIONS

1. This permit is issued subject to all the terms and conditions of section of the *Mines Regulation Act*, Order in Council 1532.

2. The permit is for a period of ~~three~~ (3) years. It is renewable on application, and upon evidence of satisfactory performance.

3. Pursuant to subsections (6) and (7) of section 11 of the Act, security as specified and approved by the Chief Inspector of Mines has been deposited with the Chief Inspector of Mines in the amount of ~~Two Thousand~~ FIVE THOUSAND (Approved May 9, 1979) dollars (~~\$ 2,000.00~~ 5,000.00). The security is returnable as provided for in subsection (13).

4. The reports dated ~~December 11, 1973~~ February 5, 1979, as filed with the Chief Inspector of Mines pursuant to subsection (2) of section 11 of the *Mines Regulation Act*, together with all revisions and amendments thereto, and as approved by the Chief Inspector of Mines, is an integral part of this permit.

OTHER

5. Topsoil and overburden soil stripped from the surface shall be conserved, as feasible, for possible useage in the reclamation of disturbed areas.

6. The location of roads is to be planned for minimum possible disturbance of the surface of the land and watercourses. Roads are to be properly ditched and culverted to adequately control erosion and silting of watercourses.

7. Erosion control of cleared and stripped areas and of trenches is to be provided as may be necessary to prevent silting of watercourses, and as required by the Inspector.

8. Trenches which did not expose mineralization are to be filled.

9. At the termination of exploration each year, the disturbed areas are to be left in a neat, clean and safe condition.

10. At the completion of the total exploration programme, a reasonable time will be allowed for the decision as to whether or not to proceed to production. If the decision is not to proceed to production, then the reclamation of all disturbed areas shall be carried out to the orders and satisfaction of the Chief Inspector of Mines.

11. On completion of the exploration programme, a report of exploration work done is to be filed with the office of the Chief Inspector of Mines. If no future work is planned on the property, please advise the Chief Inspector and the District Inspector so that the property can be examined to determine if the security bond can be released.

(See over for additional conditions of May 9, 1979)

NOTE—This permit applies only to the requirements under section 11 of the *Mines Regulation Act*, Order in Council 1532. Other legislation may be applicable to the mining operations, and this permit in no way abrogates the responsibility and obligation of the permittee under such other legislation.

ADDITIONAL CONDITIONS OF MAY 9, 1979

12. All work, where deemed applicable, shall conform to Section IV of the booklet "Guidelines for Coal and Mineral Exploration" published by the Ministry of Energy, Mines and Petroleum Resources.
13. The conditions contained in the Surface Exploration Permit MX6-79 issued January 29, 1979 by the Operations Directorate of the Atomic Energy Control Board shall be fully observed and complied with.
14. No silt or other mineral deposits or deleterious substances shall be allowed to enter creeks.
15. All refuse shall be cleaned up and removed from the area.  
All drill holes shall be logged and particular attention shall be given to the existence of aquifers.
- 17 ~~16~~. No work other than that shown on the Mineral Exploration Form 10-11, dated February 5, 1979, shall be performed without prior approval from the Chief Inspector of Mines.
16. Drill holes will be plugged ~~at~~ as required by the District Inspector of Mines, ~~Kamloops~~ office.

APPENDIX 4.4.47



DEPARTMENT OF MINES  
AND PETROLEUM RESOURCES

MINISTRY OF MINES AND PETROLEUM RESOURCES	
MAY 1 1979	

**REPORT OF INSPECTOR OF MINES**

(Issued pursuant to sections 6 and 7 of the Mines Regulation Act.)

PROSPECTS UNDER EXPLORATION AND DEVELOPMENT

Name of prospect Cup Lake (Donen Claim) Co-ordinates 49°35', 118°53'  
 Owner or operator R.N.C. Exploration Co. Limited Locality Beaverdell  
 Manager Wayne Bulmer Address General Delivery, Beaverdell, B. C.

Number employed, including all contractors:  
 Surface 3 Underground --- Contractors 6 Total 9

Mineral(s) sought: Uranium

First aid: First aid coverage must comply with "Rule 14" of the Mines Regulation Act.

Condition of access roads and clearings: Fair, winter conditions.

Explosives: N/A

General surface: Logged off area.

Active or dormant: Active

Reclamation: Drill holes to be plugged or capped as discussed.

Work done since last report: Drilling.

Work remaining this season: Drilling.

Remarks:

Drill Contractor--Cameron McCutcheon Limited  
Dosimeters to be worn as discussed.  
Records maintained of workmen carrying such badges.  
Core shed and sampling area to be isolated and signs posted  
No Admittance to unauthorized personnel.

Jack A. Thomson  
 Jack A. Thomson  
 Inspector of Mines  
 Technician

101, 2985 Airport Drive, Kamloops, B. C.  
 (Address)

Date of inspection April 18, 19 79

APPENDIX 4.4.48



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

MINISTRY OF MINES AND PETROLEUM RESOURCES	
Rec'd AUG 22 1979	
<i>[Signature]</i>	<i>[Signature]</i>
VO	

**REPORT OF INSPECTOR OF MINES**

(Issued pursuant to sections 6 and 7 of the Mines Regulation Act.)

PROSPECTS UNDER EXPLORATION AND DEVELOPMENT

Name of prospect Cup Lake, Fuki, Kallis Creek Co-ordinates 49° 118°  
Collier Lake  
 Owner or operator P. N. C. Exploration Locality Beaverdell  
 Manager M. Suginochara Address 3060 - 650 W. Georgia Street  
Vancouver

Number employed, including all contractors:

Surface 2 Underground 1 Contractors 0 Total 3

Mineral(s) sought: Uranium

First aid: #2 kit on site, recommended that for every 4 workers one person have an accepted First Aid Certificate.

Condition of access roads and clearings: Forestry

Explosives: N/A

General surface: Satisfactory; camp area housekeeping to be improved.

Active or dormant: Dormant at time of inspection.

Reclamation: Drill holes, cuttings to be treated as per Chief Inspector's directives.

Work done since last report: Percussion holes drilled; drill sites not visited as no one available to act as a guide.

Work remaining this season: As per Section 10 dated August 13, 1979 further drilling proposed.

Remarks: Drill was stored at campsite.

It is recommended that core not be left in the open, unattended. This area is subject to numerous visitors at this time of year.

*David Smith*  
 \_\_\_\_\_  
 David Smith, P.Eng. Inspector of Mines

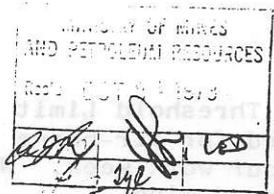
101, 2985 Airport Drive, Kamloops, B. C.  
 \_\_\_\_\_  
 (Address) V2B 7W8

Date of inspection August 15, 1979

APPENDIX 4.4.49



DEPARTMENT OF MINES  
AND PETROLEUM RESOURCES



**REPORT OF INSPECTOR OF MINES**

(Issued pursuant to sections 6 and 7 of the Mines Regulation Act.)

PROSPECTS UNDER EXPLORATION AND DEVELOPMENT

Name of prospect Buckhorn Lake Co-ordinates 51°49' 124°15'  
~~Owner~~ Operator Kelvin Energy Limited Locality Chilanko Forks  
 Manager E. Estabrooks Address Chilanko Forks

Number employed, including all contractors:  
 Surface \_\_\_\_\_ Underground \_\_\_\_\_ Contractors \_\_\_\_\_ Total 3

Mineral(s) sought: Radioactive minerals.

First aid: Satisfactory.

Condition of access roads and clearings: Satisfactory.

Explosives: N/A.

General surface: Satisfactory.

Active or dormant: Active.

Reclamation: Reclamation required to drill sites and access road.

Work done since last report: Geophysical surveys.

Work remaining this season: Completion of drilling program.

Remarks: Diamond drill and truck require fire extinguishers. Open wheels such as pump motor couplings require guarding.

Ed Sadar  
 Ed Sadar, P.Eng. Inspector of Mines

101 - 2985 Airport Drive, Kamloops  
 (Address)

Date of inspection October 5, 19 78.



Mineral Dusts\*

Asbestos, all forms (a) 5 fibers of longer than 5 micrometers per cubic centimeter of air. Ceiling concentration, 10 fibers longer than 5 micrometers per cubic centimeter of air.

(b) The total respirable dust in the return air or the make up air shall not exceed the lesser of:

a maximum of 0.20 milligrams per cubic meter of total respirable dust or,

$$C_R = \frac{1}{2} (TLV - C_o) \times \frac{Q_T}{Q_R} \times \frac{1}{K}$$

where

C<sub>R</sub> = maximum permitted concentration of fibers of longer than 5 micrometers per centimeter of air in exit air from the collection after cleaning

TLV = threshold limit value of contaminant

C<sub>o</sub> = concentration of contaminant in workers breathing zone with local exhaust discharged outside

Q<sub>T</sub> = total ventilation flow through affected space, cfm

Q<sub>R</sub> = recirculated air flow, cfm

K = an "effectiveness of mixing" factor of 3 \*\*\*

(c) Total dust in the atmosphere shall not exceed: the quotient obtained in dividing 30 milligrams per cubic meter by the percentage of quartz (total dust) plus 3 expressed in milligrams per cubic meter, i.e.:

$$\frac{30 \text{ mg/m}^3}{\% \text{ Quartz} + 3} =$$

Coal dust, all forms - less than 5% quartz, respirable dust fraction 3 mg/m<sup>3</sup> as sampled by an approved method of the Chief Inspector of Mines.\*\*\*\*

Mineral dusts - less than 1% quartz, total dust 10 mg/m<sup>3</sup> or respirable dust fraction 5 mg/m<sup>3</sup>.

Siliceous dusts - 30% and under silica SiO<sub>2</sub> 300 particles percc of a  
30 - 50% silica SiO<sub>2</sub> 200 particles percc of a  
50% and over silica SiO<sub>2</sub> 100 particles percc of a  
dust as sampled with a Konimeter and using standard British Columbia Mines Branch counting and processing method.

Heat Stress

Rules for working in hot environments will be determined by the Chief Inspector of Mines for each individual circumstance after consultation with the Division of Occupational Health of British Columbia.

\*Threshold Limit Values for Mixtures with Additive Effects -

When two or more hazardous substances are present their combined effect, rather than of either individually should be given primary consideration. In the absence of information to the contrary the effects of the different hazards should be considered as additive. That is, if the sum of the following fractions exceeds unity, then the threshold limit of the mixture is exceeded.

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \dots + \frac{C_n}{T_n} = 1$$

Example: Air contains 25 ppm carbon monoxide (TLV 50), 2 ppm nitrous fumes (TLV 5), 100 ppcc siliceous dust (TLV 300)

$$\frac{25}{50} + \frac{2}{5} + \frac{100}{300} = 1.2 \text{ Threshold Limit is exceeded.}$$

- \*\* Intended change - 2 fibers of longer than 5 micrometers per cubic centimeter of air January 1980.
- \*\*\* Effective the 1st of January 1979.
- \*\*\*\* Intended change - 2 mg/m<sup>3</sup> January 1979.

Ionizing Radiation Standard Schedule:

Maximum Permissible Doses and Exposures (1, 2)

Table 1

Maximum Permissible Doses (3)

Column I  Organ or Tissue	Column II  Atomic Radiation Workers		Column III  Female Atomic Radiation Workers of Reproductive Capacity		Column IV  Any Other Person
	Rems per quarter of a year	Rems per year	Rems per quarter of a year	Rems per year	Rems per year
Whole body, gonads, bone marrow	3	5	1.3(4)	5(4)	0.5
Bone, skin, thyroid	15	30	15	30	3(5)
Any tissue of hands, forearms, feet and ankles	38	75	38	75	7.5
Lungs (6) and other single organs or tissues	8	15	8	15	1.5

Table 2

Maximum Permissible Exposures To Radon Daughters (6)

Column I		Column II
Atomic Radiation Workers		Any Other Persons
WLM per quarter of a year	WLM per year	WLM per year (7)
2	4	0.4

Notes to Ionizing Radiation Standard Schedule:

- (1) The maximum permissible doses and exposures specified in this Table do not apply to ionizing radiation
  - (a) received by a patient in the course of medical diagnosis or treatment by a qualified medical practitioner; or
  - (b) received by a person carrying out emergency procedures undertaken to avert danger to human life.
- (2) The Chief Inspector may, under extraordinary circumstances, permit single or accumulated doses or exposures up to twice the annual maximum permissible doses or exposures for atomic radiation workers. Such variance will not be granted
  - (a) if appropriate alternatives are available;
  - (b) for irradiation of the whole body or abdomen of women of reproductive capacity; or
  - (c) for irradiation of the whole body, gonads or bone marrow if the average dose received from age 18 years up to and including the current year exceeds 5 rems per year.
- (3) In determining the dose, the contribution from sources of ionizing radiation both inside and outside the body shall be included.
- (4) The dose of the abdomen shall not exceed 0.2 rem per two weeks, and if the person is known to be pregnant, the dose to the abdomen shall not exceed 1 rem during the remaining period of pregnancy.
- (5) The dose to the thyroid of a person under the age of 16 years shall not exceed 1.5 rems per year.
- (6) For exposures to radon daughters, the maximum permissible exposures (in working level months) apply instead of the maximum permissible doses for the lungs (in rems).

Notes to Ionizing Radiation Standard Schedule: (Cont'd.)

- (7) The WLM unit is not appropriate for exposures in the home or in other non-occupational situations. In such situations, the maximum permissible annual average concentration of radon daughters attributable to the operation of a nuclear facility shall be 0.02 WL.

These are the standards that have been accepted by:

- (ICRP) International Commission on Radiological Protection  
(IAEA) International Atomic Energy Agency

Revised - January, 1978

Ionizing Radiation Schedule  
Revised - January, 1979

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

Under the Authority of General Rule 85 (a)  
of the Mines Regulation Act



Province of  
British Columbia

APPENDIX 4.5.2

Ministry of  
Mines and  
Petroleum Resources

Second Floor  
2747 East Hastings Street  
Vancouver  
British Columbia  
V5K 1Z8

WHEN REPLYING PLEASE REFER TO FILE No.

August 1, 1979

Mr. Frank Pho  
Hewitt Mine  
P. O. Box 86  
New Denver, B. C. VOG 1S0

MINISTRY OF MINES AND PETROLEUM RESOURCES		
Rec'd AUG 8 1979		
VED	WPH	
Qu		

Dear Mr. Pho:

Enclosed are two copies of a survey of radiation made about the underground workings of the Hewitt Mine during July 19, 1979. Would you please have one copy of the report posted as required by M.R.A. Section 6 (3).

As you will note the radon daughter radiation level was well above 0.10 W.L. figure. This was due to the ventilating air flowing through many old workings and then out the 10 level east portal. The ventilation should be arranged that the 10 level east portal is intake air as it is the closest to the fresh air source. A bulkhead should be placed at the shaft at 10 level to ensure that the air flows down the shaft and stopping should be placed on each level so that the air flows to the lower working level and then up the old stopes to the old workings and out. It will be necessary to install a bulkhead with doors and fan on the 10 level near the shaft to force the air down the shaft. The fan must be operated at all times to avoid a build up of radon daughters. It is not possible to accurately predict the volume of air required to lower the radon daughter level but I would like to suggest that a minimum of 10,000 CFM should be considered at this time. Approved respirators should be used during the period that the bulkheads and fans are being placed.

I will be back in the New Denver area in the very near future to make another survey of the conditions at the Hewitt to ensure that the adverse conditions have been corrected.

Thank you for your cooperation and courtesy extended to me during my inspection.

Yours truly,

  
S. Elias, P. Eng.  
Senior Inspector  
Environmental

SE:jg

c.c. V. E. Dawson, P. Eng., Deputy Chief Inspector of Mines  
J. B. C. Lang, P. Eng., District Inspector of Mines

Encl.

APPENDIX 4.5.3

RADIATION SURVEY OF A NON-URANIUM MINE

HEWITT MINE

SILVERTON, BRITISH COLUMBIA

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

July 19, 1979

RADIATION SURVEY OF A NON-URANIUM MINE

HEWITT MINE

SILVERTON, BRITISH COLUMBIA

A preliminary radiation survey was made to assess the radon daughter and gamma radiation level about the mine workings and exhaust airways of the Hewitt Mine operated by Frank Pho of New Denver, B. C. during July 19, 1979. The equipment used was as follows:

Air samples were taken with an H & H Custom Work diaphragm air pump with pulsation damper. The pump was calibrated at a flow rate of 8.8 litres per minute using a wet test meter. A Sartorius membrane filter, 25 mm in diameter with a 0.8 micron pore size was used to collect the sample. A 44.4 litre sample was collected at each location. A Tri-Met Instruments Ltd., Model TM372A alpha counter equipped with a foil type open zinc sulphide detector was used to evaluate the radiation level. A certified AM-241 alpha standard was used to calibrate the Tri-Met alpha counter before and after the sampling project.

A Ludlum Model 19 Micro R meter, with an internally mounted 1" x 1" Na(Tl) scintillator to give optimum performance in counting low level gamma radiation provided with five ranges 0-25 Micro R/hr as the most sensitive and 0-5000 Micro R/hr on the highest range, was used to assess gamma radiation levels.

Following are the results of the survey:

<u>Location</u>	<u>W.L. Radon Daughters</u>	<u>Micro R/hr Gamma Radiation</u>
10 level east, exhaust air from mine workings, air flow quantity too small to measure, water running out.	0.7551	36
11 level shaft station, dead end, used as pump station.	0.4959	24
10 level near portal, outside air.	0.0074	24

Remarks

A preliminary evaluation was made to assess for the presence of hazardous concentrations of radon daughters and gamma radiation. On a preliminary survey representative headings of different types of workings, poorly ventilated areas and return airways only are sampled. If the preliminary survey does not show measurable concentrations of radon daughters or under 0.10 W.L. it can be assumed that the health hazard does not exist. Should results indicate 0.10 W.L. (work level) more sampling is done to further assess the potential hazard. If the sampling indicates any workers are exposed to an average full shift exposure of more than 0.30 W.L. (work level) enough sampling must be done to indicate individual exposure over a (3) three month period. If exposure exceeds 1 W.L.M. (work level month) over a three month period permanent records must be kept for all workers working in radiation areas of the mine, or until it can be shown that the health hazard no longer exists (less than 0.10 W.L. average exposure). When sampling indicates an inherent radon daughter hazard exists in any mine all standards applied normally to uranium mines shall be considered to be in force.

The radiation levels are well above the permissible standards. The crew shall be immediately removed. Adequate positive mechanical ventilation is required before resuming any underground work.

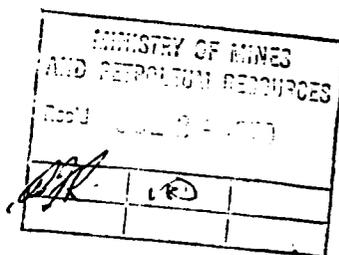
The ventilation should be so designed that the fresh air flows into the mine via the shortest route to the working areas and the volume shall be adequate to dilute the radon daughters to below 0.10 W.L. at all times and at all working locations.



S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

August 1, 1979

APPENDIX 4.5.4



July 19th, 1979.

Mr Wm. Hogg,  
Box 189,  
New Denver, B.C.

Dear Mr Hogg,

As a result of Mr S. Elias, P. Eng., ventilation survey the 4000 level workings are shut down till ventilation is upgraded.

It is suggested a fan at the Silversmith workings must produce 75,000 CFM. 55,000 CFM must go up to Op or Wp raise to the 4500 E decline, thence to exhaust. 20,000 must be exhausted out the 4000 adit.

A split off of 8000 CFM must be pumped into the 4000 level face.

Yours very truly,

*J.B.C. Lang*  
J.B.C. Lang, P. Eng.,  
District Inspector of Mines  
and Resident Engineer.

JBCL/elg  
c.c. A.J. Richardson, P. Eng.,  
Deputy Chief Inspector.



Province of  
British Columbia

Ministry of  
Mines and  
Petroleum Resources

CIRCULATION / FILE

Second Floor  
2747 East Hastings Street  
Vancouver  
British Columbia  
V5K 1Z8

WHEN REPLYING PLEASE REFER TO FILE No. \_\_\_\_\_

July 30, 1979

Mr. W. Hogg, Manager  
Silvana Mines Incorporated.  
P. O. Box 189  
New Denver, B.C. V0G 1S0

MINISTRY OF MINES  
AND PETROLEUM RESOURCES  
Rec'd AUG 2 1979

Dear Mr. Hogg:

Enclosed are two copies of a report on the survey for radon daughters and gamma radiation done at the Silvana Mines Incorporated on July 18, 1979. Would you please have one copy of the report posted as per M.R.A. Section 6 (3).

As you will note that the exhaust air from the 4000 level was above the 0.10 W.L. at which point action must be taken to correct any adverse condition. It is unfortunate that the mine development is such that considerable expenditures may be required to alleviate the adverse conditions. Where diesel powered equipment is used the ventilation must be on a one pass basis, that is it can not be used to ventilate other workings in series. Therefore if the 4000 level is partially used as a fresh air circuit to ventilate the decline area, diesel haulage would then not be acceptable on the section of the 4000 level that is supplying fresh air to other areas of the mine. It is suggested that the target figure of (75,000 CFM) 2125 m<sup>3</sup>/min. should be investigated.

Thank you for your cooperation and courtesy that was extended to me during my inspection.

Yours truly,

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

SE:jz

c.c. J. B. C. Lang, P. Eng.  
V. E. Dawson, P. Eng.

Encl.

APPENDIX 4.5.6

MINISTRY OF MINES AND PETROLEUM RESOURCES		
Rec'd 2007-11-18 1079		
<i>OK</i>		

RADIATION SURVEY OF NON-URANIUM MINES

SILVANA MINES INCORPORATED

NEW DENVER, BRITISH COLUMBIA

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

July 18, 1979

RADIATION SURVEY OF NON-URANIUM MINES

SILVANA MINES INCORPORATED

NEW DENVER, BRITISH COLUMBIA

In the company with Mr. W. Hogg, Mine Manager, Silvana Mines Incorporated a radiation survey was made to preliminary assess Gamma radiation and Radon Daughter levels in the general workings of the mine. The survey was made July 18, 1979. The equipment used was as follows:

Air samples were taken with an H & H Custom Work diaphragm air pump with pulsation damper. The pump was calibrated at a flow rate of 8.8 litres per minute using a wet test meter. A Sartorius membrane filter, 25 mm in diameter with a 0.8 micron pore size was used to collect the sample. A ten minute sample was collected at each location. A Tri-Met Instruments Ltd., Model TM372A alpha counter equipped with a foil type open zinc sulphide detector was used to evaluate the radiation level. A certified AM-241 alpha standard was used to calibrate the Tri-Met alpha counter before and after the sampling project.

A Ludlum Model 19 Micro R meter, with an internally mounted 1" x 1" Na(Tl) scintillator to give optimum performance in counting low level gamma radiation provided with five ranges 0-25 Micro R/hr as the most sensitive and 0-5000 Micro R/hr on the highest range, was used to assess gamma radiation levels.

Following are the results of the survey:

<u>Location</u>	<u>W.L. Radon Daughters</u>	<u>Micro R/hr. Gamma Radiation</u>
4000 level Ruth at portal outside ambient atmosphere.	0.0128	15
4000 level #2 west lateral, development dead end heading, ventilation via duct approx. 30 meters from face, quantity insufficient to measure, mucking with mucking machine, muck wet.	0.0119	23
4000 level #1 west lateral #2 drill station dead end, drill holes making water.	0.1055	32
4000 level portal exhaust air from 4000 level workings - day shift outcast air volume (8,400 CFM) 237.8 m <sup>3</sup> /min. ahead of Ruth - night shift after Ruth - night shift	0.2005 0.1834 0.3660	23 24

<u>Location (Cont'd.)</u>	<u>W.L.</u> <u>Radon Daughters</u>	<u>Micro R/hr.</u> <u>Gamma Radiation</u>
<u>Night Shift</u>		
4000 level exhaust air from #2 W. lateral and haulageway at Silversmith fan location.	0.0997	42
4000 level air from Silversmith working being blown to #2 W. lateral face via ducting.	0.0143	40
4000 level Ruth mine water sump area.	0.4588	36
4625 level station of decline, exhaust air from development and mining.	0.0364	24
4585 level stub, dead end, scooptram dumping waste rock, no ventilation in this area.	0.013	22

Remarks

A preliminary evaluation was made to assess for the presence of hazardous concentrations of radon daughters and gamma radiation. On a preliminary survey representative headings of different types of workings, poorly ventilated areas and return airways only are sampled. If the preliminary survey does not show measureable concentrations of radon daughters or under 0.10 W.L. it can be assumed that the health hazard does not exist. Should results indicate 0.10 W.L. (work level) more sampling is done to further assess the potential hazard. If the sampling indicates any workers are exposed to an average full shift exposure of more than 0.30 W.L. (work level) enough sampling must be done to indicate individual exposure over a (3) three month period. If exposure exceeds 1 W.L.M. (work level month) over a three month period permanent records must be kept for all workers working in radiation areas of the mine, or until it can be shown that the health hazard no longer exists (less than 0.10 W.L. average exposure). When sampling indicates an inherent radon daughter hazard exists in any mine all standards applied normally to uranium mines shall be considered to be in force.

It is evident from the results that conditions definitely require corrective action to insure that health hazards from radiation do not develop. The air volume to the 4000 level is not adequate and it is required that a complete evaluation be made of both the 4000 level and decline working area to insure that adequate ventilation is subsistent at all times to remove the radon daughters and supply adequate air for diesel operations.

Remarks (Cont'd.)

It is suggested that the connection to the Ruth mine should be bulkheaded off from the 4000 level mine workings and a method of pressurizing the Ruth workings instituted so that air would flow from the 4000 level to the Ruth mine. This would stop radon daughters emanating in the Ruth mine from entering the 4000 level ventilation circuit.



S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

July 27, 1979

July 30, 1979

Mr. W. Hogg, Manager  
 Silvana Mines Incorporated  
 P. O. Box 189  
 New Denver, B. C. VOG 1S0

Dear Mr. Hogg:

Enclosed are two copies of a report on the survey for radon daughters and gamma radiation done at the Silvana Mines Incorporated on July 18, 1979. Would you please have one copy of the report posted as per M.R.A. Section 6 (3).

As you will note that the exhaust air from the 4000 level was above the 0.10 W.L. at which point action must be taken to correct any adverse condition. It is unfortunate that the mine development is such that considerable expenditures may be required to alleviate the adverse conditions. Where diesel powered equipment is used the ventilation must be on a one pass basis, that is it can not be used to ventilate other workings in series. Therefore if the 4000 level is partially used as a fresh air circuit to ventilate the decline area, diesel haulage would then not be acceptable on the section of the 4000 level that is supplying fresh air to other areas of the mine. It is suggested that the target figure of (75,000 CFM) 2125 m<sup>3</sup>/min. should be investigated.

Thank you for your cooperation and courtesy that was extended to me during my inspection.

Yours truly,



S. Elias, F. Eng.  
 Senior Inspector  
 Environmental Control

SE:jg

c.c. J. B. C. Lang, F. Eng.  
 V. E. Dawson, P. Eng.

Encl.

APPENDIX 4.5.7

RADIATION SURVEY OF  
NORCEN ENERGY RESOURCES LIMITED  
BLIZZARD PROPERTY  
BEAVERDELL, BRITISH COLUMBIA

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

April 18 and 19, 1979

RADIATION SURVEY OF  
NORCEN ENERGY RESOURCES LIMITED  
BLIZZARD PROPERTY  
BEAVERDELL, BRITISH COLUMBIA

In the company with Jim Chapman, geologist and/or Eugene Larabie, manager at property for Norcen Energy Resources Limited a radiation survey was made about the Lassie Lake area drill holes and core storage area. The equipment used was as follows:

Air samples were taken with an H & H Custom Work diaphragm air pump with pulsation damper. The pump was calibrated at a flow rate of 8.8 liters per minute using a wet test meter. A Sartorius membrane filter, 25 mm in diameter with a 0.8 micron pore size was used to collect the sample. A ten minute sample was collected at each location. A Tri-Met Instruments Ltd., Model TM372A alpha counter equipped with a foil type open zinc sulphide detector was used to evaluate the radiation level. A certified AM-241 alpha standard was used to calibrate the Tri-Met alpha counter before and after the sampling project.

A Ludlum Model 19 Micro R meter, with an internally mounted 1" x 1" Na(Tl) scintillator to give optimum performance in counting low level gamma radiation provided with five ranges 0-25 Micro R/hr as the most sensitive and 0-5000 Micro R/hr on the highest range, was used to assess gamma radiation levels.

Following are the results of the survey:

<u>Location</u>	<u>W.L. Radon Daughters</u>	<u>Micro R/hr Gamma Radiation</u>
Gate Claim south center boundary of claim on roadway Percussion hole No. S.5 10 meters deep	0.0008	7
Gate Claim south center boundary of claim on roadway Percussion hole No. S.6 10 meters deep	0.0008	7
Gate Claim south center boundary of claim on roadway Percussion hole No. S.7 10 meters deep	0.001	7
Diamond drill core storage building at No. 23	0.011	15
Diamond drill core storage building at No. 24	0.013	100
Diamond drill core storage building at No. 26	0.010	15

<u>Location</u>	<u>W.L. Radon Daughters</u>	<u>Micro R/hr Gamma Radiation</u>
Background along roadway to property	0.0005	6

Gamma Radiation Survey about Diamond Drill Storage Building.

<u>Location (see figure I)</u>	<u>Micro R/hr</u>
No. 1	8
No. 2	22
No. 3	11
No. 4	7
No. 5	7
No. 6	9
No. 7	7
No. 8	7
No. 9	6
No. 10	5
No. 11	9
No. 12	6
No. 13	5
No. 14	5
No. 15	7
No. 16	5
No. 17	7
No. 18	7
No. 19	8
No. 20	50
No. 21	7
No. 22	11
No. 23	15
No. 24	100
No. 25	12
No. 26	15
No. 27	28
No. 28	90

Remarks

The company had stopped the drilling program until more favorable weather conditions will allow movement of drilling equipment.

All the diamond drill holes had been cemented. The drill holes that were tested were percussion holes drilled to a depth of 10 meters in overburden. The tests were taken at the collar of the hole in such a manner as to draw the sample from the drill hole proper without sealing the top. Water could be seen in all of the holes.

The diamond drill core storage building is of metal construction and is equipped with a man door, a large service door and roof ventilators. The diamond drill core boxes are stacked approximately 3 meters in height as illustrated in figure I. A work table was also located

Remarks (Cont'd.)

in the core storage area. A truck load of pulp samples and core samples being returned from the analysis laboratory was in the process of being moved into the storage building. A measurement taken in the truck was found to be 50 Micro R/hr gamma radiation.

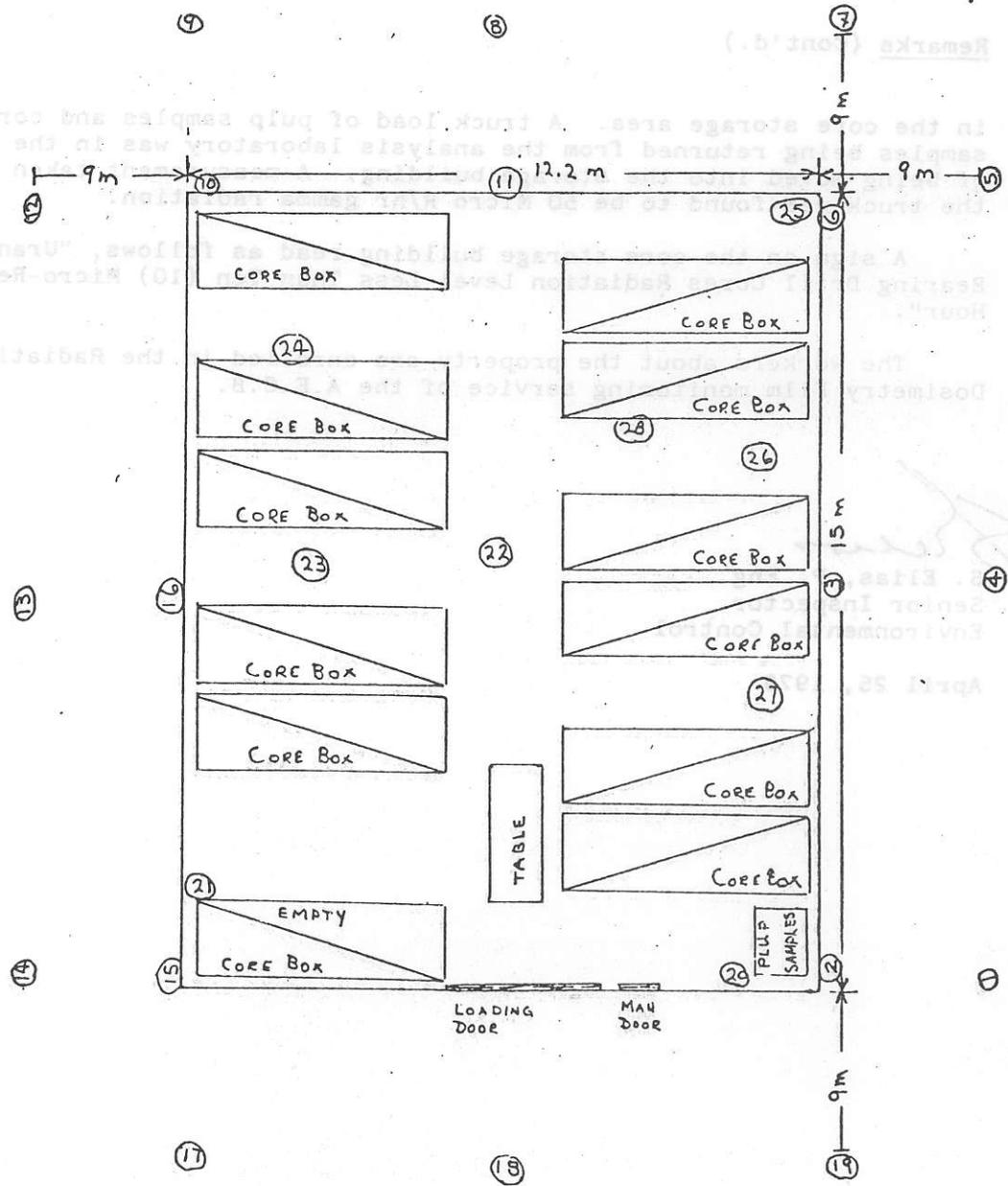
A sign on the core storage building read as follows, "Uranium Bearing Drill Cores Radiation Level Less Than Ten (10) Micro-Rem per Hour".

The workers about the property are enrolled in the Radiation Dosimetry Film monitoring service of the A.E.C.B.



S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

April 25, 1979



SCHEMATIC DIAGRAM SHOWING SAMPLE LOCATION  
OF  
GAMMA RADIATION AT NORCEN D.D. CORE STORAGE

FIGURE I

April 26, 1979

Mr. T. (Jim) Neville, Manager  
Environmental & Engineering  
Norcen Energy Resources Ltd.  
715 - 5th Ave. S.W.  
Calgary, Alberta T2P 2X7

Dear Sir:

Enclosed is a copy of the radiation survey results made at  
Norcen Energy Resources Limited Blizzard Property during  
our recent inspection.

Would you please have one copy of the report posted as  
required by the M.R.A. Section 5 (3) so that all workers  
may have access to the results.

Thank you for your courtesy and cooperation received during  
our survey.

Yours truly,

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control  
Ministry of Energy  
Mines & Petroleum Resources

SE:jg

c.c. V. E. Dawson, P. Eng., Deputy Chief Inspector  
David Smith, P. Eng., Inspector of Mines  
Eugene Larabis, Supervisor, Blizzard Property  
R. M. Duncan, Director, Fuel Cycle Branch  
Ottawa, Ontario K1P 5S9

Encl.

April 26, 1979

April 26, 1979

Mr. Eugene Larabie, Supervisor  
Norcen Energy Resources Limited  
Blizzard Property  
Beaverdell, B. C. V0N 1A0

Dear Sir:

Enclosed is a copy of the radiation survey results made at Norcen Energy Resources Limited Blizzard Property during our recent inspection.

Would you please have one copy of the report posted as required by the M.R.A. Section 6 (3) so that all workers may have access to the results.

Thank you for your courtesy and cooperation received during our survey.

Yours truly,

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control  
Ministry of Energy  
Mines & Petroleum Resources

SE:jg

c.c. V. E. Dawson, P. Eng., Deputy Chief Inspector  
David Smith, P. Eng., Inspector of Mines  
T. (Jim) Neville, Manager Environmental & Engineering  
Norcen Energy Resources Ltd.  
715 - 5th Ave. S.W.  
Calgary, Alberta T2P 2X7  
R. M. Duncan, Director, Fuel Cycle Branch  
Ottawa, Ontario K1P 5S9

Encl.

**APPENDIX 4.5.8**

RADIATION SURVEY OF  
P.N.C. EXPLORATIONS (CANADA) LIMITED  
BEAVERDELL, BRITISH COLUMBIA

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

April 18, 1979

RADIATION SURVEY OF  
P.N.C. EXPLORATIONS (CANADA) LIMITED  
BEAVERDELL, BRITISH COLUMBIA

In the company with Wayne Bulmer, geologist and Takeo Obara, Mining Engineer for P.N.C. Explorations (Canada) Limited a radiation survey was made about the Cup Lake Lat. 49°35' Long. 118°53' property drill holes and core storage area. The equipment used was as follows:

Air samples were taken with an H & H Custom Work diaphragm air pump with pulsation damper. The pump was calibrated at a flow rate of 8.8 liters per minute using a wet test meter. A Sartorius membrane filter, 25 mm in diameter with a 0.8 micron pore size was used to collect the sample. A ten minute sample was collected at each location. A Tri-Met Instruments Ltd., Model TM372A alpha counter equipped with a foil type open zinc sulphide detector was used to evaluate the radiation level. A certified AM-241 alpha standard was used to calibrate the Tri-Met alpha counter before and after the sampling project.

A Ludlum Model 19 Micro R meter, with an internally mounted 1" x 1" Na(Tl) scintillator to give optimum performance in counting low level gamma radiation provided with five ranges 0-25 Micro R/hr as the most sensitive and 0-5000 Micro R/hr on the highest range, was used to assess gamma radiation levels.

Following are the results of the survey:

<u>Location</u>	<u>W.L. Radon Daughters</u>	<u>Micro R/hr Gamma Radiation</u>
Open core box rack near storage shed	0.0005	10
Diamond drill hole No. 111, 47.6 m deep	0.0008	5
Diamond drill hole No. 110 in drill shack	0.0007	5
Diamond drill hole No. 107	0.0005	5
Background along roadway, at campsite	0.0005	6

Remarks

The company is engaged in an exploration diamond drilling program on the Cup Lake Lat. 49°35' Long. 118°53' property. The drilling contractor is Cameron McCutcheon Drilling Ltd., Vancouver, B. C. A Longyear Super 38 diamond drill was being used to drill. The drill was housed in drill shack approximately 4 meters square. The daily diamond drill was located in the drill shack. A Boyles 35A diamond drill was in the process of being set up in preparation to drill the

Remarks (Cont'd.)

next hole. The holes were being drilled in an unconsolidated conglomerate type of overburden.

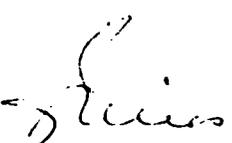
The diamond drill core storage area at the campsite was an open air rack stationed beside a storage building.

The present program for sealing diamond drill holes is as follows:

All radioactive holes will be sealed with cement. (ie over 1000 cpm)

- A. 1. If collared in basalt - plug the top with cement.  
2. If collared in overburden - then drilled into basalt below, plug with cement as far down as basalt.  
3. If drilled all the way in overburden fill with cement from bottom to top.
- B. If hole is non-radioactive they intend to:-  
1. If in basalt leave open.  
2. If in overburden then basalt, let it cave in.  
3. If in overburden all the way, let it cave in.
- C. If hole is producing water whether radioactive or not they will be treated as radioactive holes and plugged as in "A" above.

The company is requested to initiate a Radiation Dosimetry program using the Film Monitoring for measuring personal exposure to Gamma (Beta) radiation.

  
S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

April 26, 1979

April 26, 1979

The diamond drill core storage area at the campsite was an open air rack stationed beside a storage building.

The present program for sealing diamond drill core storage areas follows:  
1. All radioactive holes will be sealed with cement.  
2. If contained in basalt - plug the top with cement.  
3. If contained in overburden - then drilled into basalt below.  
4. Plug with cement as far down as basalt.

Dear Sir:

Enclosed is a copy of the radiation survey results made at your property during our recent inspection. Would you please have one copy of the report posted as required by the W.R.A. Section 6 (3) so that all workers may have access to the results.

Thank you for your courtesy and cooperation during our inspection.

Yours truly,

The company is requested to initiate a Radiation Dosemetry program using the Film Monitoring for measuring personal exposure to Gamma (beta) radiation.

S. Elias, P. Eng.  
Senior Inspector  
Environmental Control  
Ministry of Energy -  
Mines & Petroleum Resources

SE:jjz

c.c. V. E. Dawson, P. Eng., Deputy Chief Inspector  
David Smith, P. Eng., Inspector  
Mr. M. Seginchara, General Manager  
3060 - 650 W. Georgia St.  
Vancouver, B. C. V6B 4N6  
R. M. Duncan, Director, Fuel Cycle Branch  
Ottawa, Ontario K1P 5S9

Encl.

APPENDIX 4.5.9

RADIATION SURVEY OF PROPOSED BIRCH ISLAND PROJECT OF  
CONSOLIDATED REXSPAR MINERALS AND CHEMICALS LIMITED  
BIRCH ISLAND, BRITISH COLUMBIA

Radiation Survey of Proposed Birch Island Project of  
Consolidated Rexspar Minerals and Chemicals Limited  
Birch Island, British Columbia

In company with Mr. Ron Ripley and Bert Haywood, residents in the Birch Island area, a radiation survey was made about the proposed Birch Island Project of Consolidated Rexspar Minerals and Chemicals Limited on May 30, 1978. The equipment used was as follows:-

Air samples were taken with a H & H Custom Work diaphragm air pump with pulsation damper. The pump was calibrated at a flow rate of 8.8 liters per minute using a wet test meter. A Sartorius membrane filter, 25 mm in diameter with a 0.8 micron pore size was used to collect the sample. A Tri-Met Instruments Ltd., Model TM372A alpha counter equipped with a foil type open zinc sulphide detector was used to evaluate the radiation. A certified AM-241 alpha standard was used to calibrate the instrument before and after the sampling project. The Atomic Energy Control Regulations, Registration SOR/78-58, 16 January, 1978, Schedule 11, Maximum Permissible Doses and Exposures, Table Column II. Any Other Person, limit the radiation exposure in the home or in other non-occupational situations as follows: "the maximum permissible annual average concentration of radon daughters attributable to the operation of a nuclear facility shall be 0.02 W.L. (work level)." There were no concentrations found above this limit in the ambient air about the proposed site.

Following are the results of the survey:-

RADIATION SURVEY OF PROPOSED BIRCH ISLAND PROJECT

MAY 30, 1978

Sample No.	Time of Sample	Time of Reading ( $\Delta t$ )	Sampling Time (Min)	Counting Time (Min)	Number of Counts	Average Count	Location	W.L.
1	10:57	11:47 (50)	15	5	2	1,980	DDH alongside road. Hole caved 18" from collar. Pump sealed to hole.	0.05
2	12:48	1:38 (50)	5	0.1	5	424	10 ft. inside portal. <i>"B" Zone</i>	1.6
3	1:09	1:59 (50)	10	1 5	1 1	321 1,700	DDH in middle of road 200' above portal. <i>"A" Zone</i> , Pump sealed to hole.	0.06 0.07
4	2:03	2:53 (50)	15	1 5	3 2	104 631	Old log core shack $\frac{1}{4}$ mile from U/G samples.	0.01 0.02
5	2:21	3:11 (50)	10	1	5	83	10' inside portal of 100' adit 200 yds. from core shack. <i>Old Camp. (Silver Mine Adit)</i>	0.02
6	3:02	3:52 (50)	10	1	5	2,844	10' inside portal at top of mountain, access blocked by cave 100' from entrance. <i>"A" Zone</i>	0.56
7	3:27	4:17 (50)	10	1 5	3 1	24 139	DDH 400' above portal at top of mtn. Open hole, pump sealed to hole.	0.005 0.005
8	3:55	4:45 (50)	10	5	2	63	DDH 75-1 S.E. face of mtn. below road. Hole caved 1' down. Pump open to atm.	0.003

ample No.	Time of Sample	Time of Reading ( $\Delta t$ )	Sampling Time (Min)	Counting Time (Min)	Number of Counts	Average Count	Location	W.L.
9	4:09	4:59 (50)	10	5	1	43	DDH 76-B-2 100' from DDH 75-1. Hole open. Pump open to atm.	0.002
10	4:26	5:16 (50)	15	5	2	39	Within 3 ft. radius of DDH 76-B-2 collar. (3 locations/5 min. each)	0.001
11	4:44	5:34 (50)	15	5	1	32	Within 2 ft. radius of DDH - 75-1. (3 locations/5 min. each)	0.001
12	5:57	6:42 (45)	15	5	1	14	Isolated corner of core shack in proposed tailings pond area.	0.0003
13.	6:15	6:50 (35)	15	5	2	12	Background sample. Open air sample in proposed tailings site	0.0003
14	8:19	9:09 (50)	15	5	3	7	Background sample. Little Fort Hotel parking lot.	0.0002
15	9:55	10:45 (50)	15	5	3	10	Background sample. Sagebrush Motel parking lot - Kamloops.	0.0003
16	-	-	-	5	3	11	Background sample. Blank filter calibration.	

SUMMARY OF BIRCH ISLAND RADIATION SURVEY MAY 30/78

(All Results in Working Levels)

DDH Pump Sealed to Hole	DDH Pump Open to Hole	DDH Vicinity -within 3 ft. of Open DDH	Inside old Core Shacks	Open Air Samples	10 Ft. Inside Accessible Portals
.05	.003	.001	.02	.0003	1.6
.07	.002	.001	.0003	.0002	.02
.005				.0003	.56
<b>AVERAGES</b>					
.04	.0025	.001	.012	.0003	.73

## Underground

The adit entrance to the underground workings at the three adit locations had at one time been closed off to prevent inadvertent access by unauthorized persons. The fencing had been partially removed by persons unknown so that entry is possible by any person. This condition must be immediately corrected to prevent access to any of the underground workings by unauthorized persons.

The BD zone underground workings are all dead ends. This means that the only ventilation possible would be by convection due to temperature variance between the mine workings air and the ambient outside atmosphere. This means of air movement decreases in direct ratio with the length of the underground workings and temperature variance between the underground and ambient atmosphere temperature. There would only be minimal air movement from the underground workings proper to the outside atmosphere. The immediate portal area would be flushed by surface breezes. The high underground radon daughter concentrations can be attributed to the minimal air circulation and the long period of underground working dormancy. The radon gas and daughters that reach the outside atmosphere are very quickly diluted by natural air currents to levels well below the established permissible limits.

Following are the results obtained in the BD zone underground workings together with a sketch showing the location of the samples:-

UNDERGROUND SAMPLES  
Black Diamond Zone  
RADIATION SURVEY OF PROPOSED BIRCH ISLAND PROJECT

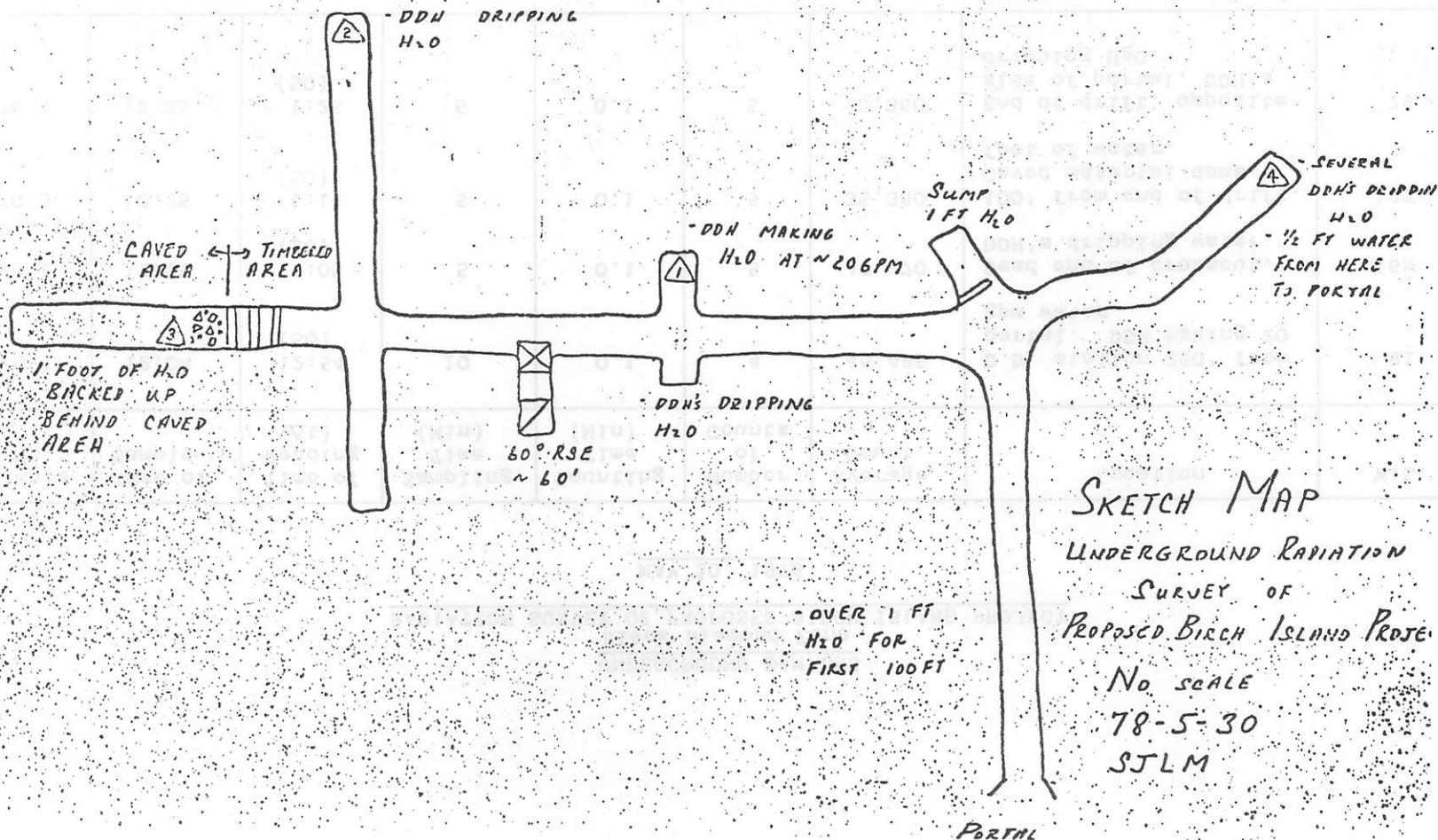
MAY 30, 1978

Sample No.	Time of Sample	Time of Reading ( $\Delta t$ )	Sampling Time (Min)	Counting Time (Min)	Number of Counts	Average Count	Location	W.L.
/G 1	12:04	12:54 (50)	10	0.1	4	46,485	D.D. station 250' from portal. DDH making 20 gpm water.	91
/G 2	12:15	1:05 (50)	5	0.1	5	43,370	Dead end of crosscut. DDH's dripping water.	168
/G 3	12:25	1:15 (50)	5	0.1	5	35,380	100' from end of drift. Caved material dams 1 foot of water.	137
/G 4	12:35	1:25 (50)	5	0.1	5	20,360	End of drift, opposite side of portal, DDH's dripping H <sub>2</sub> O.	79

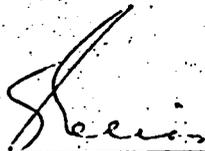
Average U/G Count      119

Consolidated Rexspar Minerals and Chemicals Limited has been ordered by the District Mines Inspector to effectively close all entrances to the underground workings to protect against inadvertent access by unauthorized personnel as per Section 12 (1) of the Mines Regulation Act.

△ - DENOTATION OF SPECIFIC  
SAMPLE LOCATIONS  
UNDERGROUND

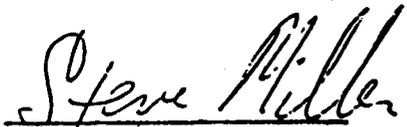


This report must be used in its complete form at all times.  
No extracts, excerpts or quotes are to be used separately.



S. Elias  
S. Elias, P. Eng.  
Senior Inspector  
Environmental Control

June 6, 1978



S. Miller  
S. Miller, P. Eng.  
Inspector  
Environmental Control



Queen's Printer for British Columbia ©  
Victoria, 1980



**Province of  
British Columbia**

Ministry of  
Energy, Mines and  
Petroleum Resources