

K. NATAL RIDGE 78 (1)A

"APPLICATION TO  
EXTEND MINING PERMIT  
NO. 2 FOR SURFACE MINING  
OF C & D SEAMS."

- 1974 -

GEOLOGICAL BRANCH  
ASSESSMENT REPORT

00 355

Part 1/3

**KAISER  
RESOURCES**

Application to extend  
Mining Permit No. 2  
for surface mining of  
C&D SEAMS-NATAL RIDGE

Presented to The Ministry of Mines and  
Petroleum Resources, Victoria, British Columbia

**GEOLOGICAL BRANCH**  
**ASSESSMENT REPORT** September 6, 1978

00 355

N O T E

This copy contains Appendix "C" which was not contained in the presentation made to the Department on September 6, 1978. Appendix "C" contains further environmental information.

DEPT. OF MINES AND PETROLEUM RESOURCES		
Rec'd DEC 97 1978		

**KAISER**  
RESOURCES

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78-12-19

Mr. J.D. McDonald,  
Senior Reclamation Inspector,  
Department of Mines &  
Petroleum Resources of British Columbia  
1837 Fort Street,  
Victoria, B.C. V8R 1J6

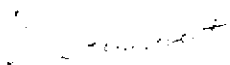
Dear Sir:

Re: Application to extend Mining Permit No. 2  
For surface mining of C & D Seams-Natal Ridge

Please find enclosed seven (7) copies of the captioned application for your use as requested.

Please note that the enclosed copies have an additional Appendix; "Appendix C" which was not in the original as presented to the Department in September 6, 1978. The additional Appendix is provided at your request and provides detailed environmental information of the subject mining areas.

Yours very truly,  
KAISER RESOURCES LTD.

  
N. Stonestreet  
General Superintendent  
Mine Engineering and Planning

NS/cl  
Enclosure (7)  
cc: A. Milligan

**KAISER**  
RESOURCES

KAISER RESOURCES LTD  
P O BOX 2000  
SPARWOOD, BRITISH COLUMBIA  
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September 6, 1978

Mr. W. Robinson  
Chief Inspector of Mines  
Department of Mines and Petroleum  
Resources of British Columbia  
1837 Fort Street  
Victoria, B. C.

Dear Sir:

Re: Application for Approval To Develop  
a Mine: Sections 7 and 8; Coal  
Mines Regulation Act of British  
Columbia by Kaiser Resources Ltd.  
Open-Pit Mining of "C" and "D"  
Seam, Natal Ridge near Sparwood,  
British Columbia

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The purpose of this letter is to seek your approval of Kaiser Resources Ltd.'s "Application For Approval to Develop a Mine" which is attached.

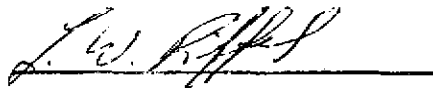
This application concerns mining reserves of metallurgical coal in "C" and "D" seams on Natal Ridge near Sparwood by open-pit mining methods. It is estimated that 1,500,000 clean long tons (1,520,000 clean tonnes) of low-ash, high-volatile metallurgical coal will be recovered over a ten year period. In the course of mining, 27,000,000 bank cubic yards (20,600,000 bank cubic metres) of overburden rock will be moved and 400 acres (162 hectares) of land disturbed. Reclamation of disturbed land will commence within one year of start-up and then continue concurrently with mining operations. It is expected that virtually all of the disturbed land will be reclaimed to very high standards since our experience in this general area has been very encouraging.

Mr. W. Robinson  
Chief Inspector Of Mines  
Page 2  
September 6, 1978

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We trust that you will find this application  
in order and that you will find it acceptable.

Yours very truly,  
KAISER RESOURCES LTD.



L. W. Riffel,  
General Superintendent  
Surface Mine Operations

cc: Mr. D. I. R. Henderson,  
Department of Mines and Petroleum  
Resources of British Columbia

LWR:dgs

Attach;

Application to Extend  
Mining Permit No. 2  
for Surface Mining of  
C AND D SEAMS - NATAL RIDGE

Presented to The Ministry of Mines  
and Petroleum Resources,  
Victoria, British Columbia

September 6, 1978

Prepared by:

Surface Mine Engineering  
and Planning

KAISER RESOURCES LTD.

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APPENDIX A

		<u>Map No.</u>
Exhibit 1	Location Map	137-9-1A
Exhibit 2	Pit Subdivisions	9070-03-02
Exhibit 3	Proposed Haulage Routes	9070-03-06

APPENDIX B

Exhibit 4	C & D Seam Phase I	9070-03-03
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Exhibit 6	C & D Seam Phase III	9070-03-05
Exhibit 7	C & D Seam Composite Plan	9070-01-01
Exhibit 8	Mining Sequence	9070-03-07



Abstract

It is proposed to develop low-ash, high-volatile metallurgical C and D seam coal reserves on Natal Ridge. A small pit is designed to produce 150,000 Clean Long Tons (152,000 Clean Metric Tonnes) per year for a designed life of 10 years.

APPLICATION FOR APPROVAL TO DEVELOP A MINE

1.0 Application

1.1 Application is hereby made by Kaiser Resources Ltd. to the Chief Inspector of Mines, Department of Mines and Petroleum Resources of the Province of British Columbia requesting written approval to undertake certain surface open-pit mining work to recover metallurgical coal from areas known as the North and South blocks of "C" and "D" seams.

Further application is made to secure an extension of Kaiser Resources Ltd.'s Reclamation Permit No. 2 to include areas which will be disturbed by the above mentioned coal mining (see Exhibit No. 137-9-1A). The above applications are made as required by Sections 7 and 8 of the Coal Mines Regulations Act of British Columbia.

1.2 The date of these applications is  
September 6, 1978.

## 2.0 Legal Description of Mine Area

2.1 This area is within Lot 1 of Lot 4588 held by Kaiser Resources Ltd. under Title Certificate No. 213762<sup>I</sup> defined by Plan No. 9330 in the Nelson Land Registry Office.

## 3.0 General Description of Area and Access

3.1 The Natal Ridge area is located approximately 3 miles (5 kilometres) south-east of the town of Sparwood. The ridge extends from about 3,800 feet elevation (1,158 metres) at Michel to 6,500 feet (1,980 metres) at its highest point.

3.2 The area is accessible by a medium-duty gravelled road 8.1 miles (13.0 kilometres) long from the Harmer Pit area. Another road from the Harmer Gate area (main entrance from Highway No. 3 to Harmer Ridge) proceeds directly up Natal Ridge and links up with the Harmer Route.

#### 4.0 Other Mining Activities on Natal Ridge

4.1 The area has been previously mined by underground methods in both C and D seams and surface methods in C seam.

4.2 The current open-pit operations on Harmer Ridge are situated about 15,000 feet (4,600 metres) north of the proposed C and D seam area and at about the same elevation. The Balmer North underground mine is situated in Natal Ridge approximately 8,000 feet (2,400 metres) northwest of C and D seams with the portal about 1,500 feet (460 metres) below.

4.3 The seams considered suitable for mining in the proposed area are C and D seams. The two seams outcrop between 5,000 feet (1,500 metres) and 6,500 feet (2,000 metres). They represent approximately 10 years of mining at the designed rate of 150,000 Clean Long Tons (152,000 Metric Tonnes) per year.

4.4

Table 1

C &amp; D Seam

## SCHEDULE OF PRODUCTION

BLOCKS	ROCK		METALLURGICAL RAW COAL RECOVERABLE		LIFE OF BLOCK
	1,000 Bank Cubic Yards	1,000 Bank Cubic Metres	1,000 Long Tons	1,000 Tonnes	Months
Block A S	1,257	961	150	152	9.0
Block B S	411	314	38	39	2.3
Block C S	507	388	65	66	3.9
Block A N	3,262	2,494	337	342	20.2
Block B N	1,414	1,081	87	88	5.2
Block D S	3,602	2,754	283	288	17.0
Block E S	1,341	1,025	118	120	7.0
Block F S	547	418	44	44	2.6
Block C N					
D-Seam	3,577	2,735	194	147	11.6
C-Seam	11,241	8,594	748	760	45.0
TOTAL	27,159	20764	2,064	2,096	123.8

9/.....

5.0 Evaluation of C and D Seam Reserves and Quality

5.1 The geology of the area consists of interbedded medium to coarse-grained sandstones, siltstones, mudstones, coal and minor chert-conglomerates. The general attitude is flat-lying striking east-west and dipping  $10^{\circ}$ - $15^{\circ}$  to the south and southwest.

5.2 D seam is variable from 2-14 feet in thickness (0.6-4.3 metres) and overlies C seam by approximately 115 feet (35 metres). C seam occurs as a sequence of three coal zones with an aggregate coal thickness of 6-15 feet (1.8-4.6 metres). The reserves as shown in Table 2 indicate 10 years reserves at 150,000 clean long tons (152,000 Metric Tonnes) per year. The average annual stripping is slightly over 2.7 million bank cubic yards (2.1 million bank cubic metres).

5.3

Table 2

## RECOVERABLE RESERVES

AREA	ROCK		RAW COAL RECOVERABLE			
			METALLURGICAL		OXIDIZED	
	1,000 Bank Cubic Yard	1,000 Bank Cubic Metre	1,000 Long Tons	1,000 Tonnes	1,000 Long Tons	1,000 Tonnes
NORTH BLOCK						
C-Seam	15,916	12,169	1,171	1,190	96	98
D-Seam	3,577	2,735	194	197	35	35
SOUTH BLOCK						
C-Seam	7,665	5,860	698	709	113	114
TOTAL	27,158	20,764	2,063	2,096	244	247

L/...

## C &amp; D SEAM QUALITY

Area	Raw			Clean @ 1.50 Specific Gravity						
	Ash	V.M.	F.S.I.	Ash	V.M.	V.M. daf	F.C.	F.S.I.	D.D.M.	Yield
D-Seam N	14.0	30.6	5.1	5.5	34.1	36.7	59.5	5.0	4,178	84.5
C-Seam										
CU N	16.6	30.2	7.0	4.1	33.8	35.6	61.1	7.0	260	79.0
CM N	21.6	27.0	6.3	4.2	32.0	35.0	61.9	7.25	682	74.6
CL N	21.5	26.5	5.4	5.5	31.8	34.4	61.9	6.6	1,067	75.0
CU S	16.5	24.9	7.0	5.4	31.9	35.4	61.1	7.5	3,423	73.0
CM S	15.4	29.8	5.4	6.0	31.2	-	59.0	5.6	4,370	81.9
CL S	20.1	26.8	6.0	6.5	30.7	-	59.7	7.5	2,520	74.0
C-AVG.	18.6	27.5	6.2	5.3	31.9	35.1	60.8	6.9	2,054	76.25

The quality of the two seams listed on the above Table indicates attractive reserves of low-ash, high-volatile metallurgical coal.



## 6.0 Mine Planning

6.1 The pit is designed in two stages with several blocks per stage.

### 6.2 Stage I:

The first stage represents stripping to a low ratio wall with bulldozers. Since the seams dip gently to the south and west, a 200 foot (50 metre) strip of overburden will be dozed down-dip, followed by recovery of the coal in the stripped section. The next sequence will push overburden into the mined out block and partially over the initial dump. This second strip of coal is then recovered. Resloping of the inactive dump will take place simultaneous with the stripping of the next block. The sequence calls for completion of the three blocks in C-South followed by two blocks in C & D-North (see Dwg. No. 9070-03-02).

### 6.3 Stage II:

The second stage extends the dozer walls back to the economic limit for a combined shovel-truck/dozer operation. This material will be dumped onto the flat spoil areas created by the dozer pits. Haul roads and bench heights will be designed in compliance with the Coal Mines Regulations Act and will be determined by the size of equipment used. Three blocks in C-South and one in C & D-North are designed for this method. Again the reclamation sequence will closely follow the mining. The walls at the pit limits for this phase average 175 feet (53 metres) high in the south block and 250 feet (76 metres) in the north. The wall angles vary between  $45^{\circ}$  and  $60^{\circ}$  depending on the relationships between the walls and the geological conditions at the wall locations. Where the seams dip into the walls, the  $60^{\circ}$  slope angle will be used; where they dip out of the wall, the  $45^{\circ}$

angle is designed. The angles are determined according to safety limits as set out by a report prepared for wall design on Harmer Ridge. The coal removal will be accomplished by loaders into trucks of 25-40 ton (23-36 tonnes) capacity. The coal will be either shipped to the Harmer Ridge Breaker Station by utilizing the present Harmer Ridge haul roads or will be shipped directly to the intrusive conveyor via the Harmer Gate haul road. Typical plans and sections showing the progress of the mine phases as well as proposed haulage routes are shown in the attached appendices.

- 6.4 The present Route C is 8.1 miles (13 kilometres) long and an upgraded and partially modified version (Route C-C') is designed. This route is 7.4 miles (12 kilometres) long and eliminates two switchbacks by the addition of section C'. The road is designed at a minimum width of 35 feet (11 metres) suitable for 40 ton (36 tonne) trucks.

Runaway lanes will be designed in areas of long grades and the road will be widened wherever possible for added safety. All trucks will be under radio-control, therefore, extra safety will be realized by this arrangement. In addition, the direct route to the intrusive conveyor will be upgraded in a similar manner. It is expected that this route will be used as a service and access road as well as a haul road. The C & D seam raw coal will be cleaned in the Elkview Preparation Plant. The accompanying Map No. 9070-03-06 shows the existing and proposed C-C' routes. Other routes shown indicate possible alternatives should market conditions warrant increased production.

6.5 The dumps created by the mine in the area will be very stable due to several factors:

- (1) The original dump will be on an area that has very little unconsolidated material overlying bedrock.

- (2) The slopes beyond the outcrop are flat-lying.
- (3) The dump material has very little till-like material in it.
- (4) The dump heights are quite small.

## 7.0 Environmental Description of C and D Seam Mining Area

7.1 The area of C and D seams in which the proposed mining disturbances will occur is within the Englemann spruce - Alpine fir zone between elevations of 5,000 feet (1,524 metres) and 6,500 feet (1,981 metres) and this mining activity will be confined to 400 acres (162 hectares).

Previous logging activities and fires have left a variety of successional stages. Areas with a more northerly aspect have a coniferous overstory which blends on the southern aspects into typical grass-shrub communities. The trees and shrubs native to this area are common to those found in this

zone elsewhere on the mine property. Also within the proposed mining area are 39 acres (15.8 hectares) of land disturbed by earlier mining that had been successfully reclaimed four years ago. Prior to mining, the only direct land uses of this site was wild-life habitat, forestry and recreation.

#### 8.0 Reclamation Proposals for Mining Disturbances on C and D Seams

8.1 The final reclamation of the mining disturbances has been an integral part of the proposed mining design. In Stage I, the overburden will be stripped to a low cutwall by the bulldozers. Following the removal of the exposed coal, the overburden from the next sequence will be pushed into the mined out block and partially over the initial dump. Resloping of the inactive dump will take place simultaneously with the stripping of the next block. The sequence calls for the completion of the three blocks

8.1

Table 4

## DISTURBED AND RECLAIMED AREAS

	TOTAL DISTURBED AREA	TOTAL RECLAIMED AREA	DISTURBED AREA (ACRES)				TOTAL ON SLOPE
			IN PIT		OUTSIDE PIT		
			ON FLAT	ON SLOPE	ON FLAT	ON SLOPE	
C-SEAM SOUTH BLOCK	186.17 ( 75.37)	170.30 ( 68.95)	60.61 (24.54)	31.67 (12.82)		93.89 (38.01)	125.56 ( 50.83)
C & D SEAM NORTH	237.07 ( 95.98)	200.27 ( 81.00)	95.53 (38.68)	58.70 (23.77)	7.14 (2.89)	75.70 (30.65)	134.40 ( 54.42)

All Acreages are adjusted for slope and converted to true areas.

Metric equivalents in Hectares given in brackets.

in C-South followed by two blocks in C and D-North.

The second stage extends the dozer walls back to the economic limit for a combined shovel-truck/dozer operation. This spoil will be dumped onto the flat areas created by the dozer pits. Three blocks in C-South and one in C and D-North are designed for this method. The reclamation will follow closely behind the active mining at all times. It is important to note that in Block A 40 acres (16 hectares) will be reclaimed within one year of commencement of the initial stripping operation.

In reclamation, the most important factor is site preparation. The basic rehandling of spoil to a more shallow slope angle allow vegetation to establish more readily. Also an important part of site preparation is control of surface run off to prevent erosion. On C and D seams, the resloping of dormant dumps will be a continuing function.



Slope angles will be held to 26° or less where feasible. Spoil will be contoured to blend with the existing terrain. Experiments will be made to compare replacement of topsoil with other methods of accomplishing revegetation.

At the optimum time after resloping has been completed, the dumps will be seeded and harrowed using agronomic species that have proved successful on similar sites on the property.

Fertilizer will be applied in conjunction with the application of seed. This will become an annual application until such time as it has been determined that the vegetation has a sufficient pool of nutrients to be self-sustaining.

In general, it can be stated that the area is similar in spoil type, aspect and elevation to other reclaimed sites on the property that are sustaining successful stands of vegetation. The wild-life studies on this area which have continued since 1974 indicate that

these relatively minor disturbances will not unduly affect the animals. During normal winters, the major feeding areas are much closer to the valley floor. And once the reclamation of the dumps has begun, it is expected that ungulates will use the vegetation on a seasonal basis. This is based on observations around the larger mine sites on the property where animals graze during certain seasons in reclaimed areas adjacent to the active pits.

For further details, refer to the Annual Reclamation Progress Report submitted by the Kaiser Resources Reclamation Department under Surface Work Permit Number 2.

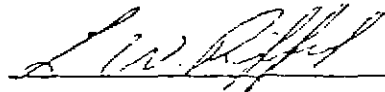
## 9.0 Summary

9.1 This mining proposal will yield 1,500,000 clean long tons (1,520,000 clean tonnes) of low-ash, high-volatile metallurgical

coal over a ten year period. It is quite possible that markets for this coal will develop in 1979 which is the reason for making this application now.

In the course of recovering the coal, 27,000,000 bank cubic yards (20,600,000 bank cubic metres) of overburden rock will be moved and about 400 acres (162 hectares) of land disturbed. Reclamation of disturbed land will commence within one year of the mining start-up and then becomes part of the continuing operation.

Submitted on behalf of KAISER RESOURCES LTD.



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L. W. Riffel,  
General Superintendent,  
Surface Mine Operations

K - NATAL RIDGE 78 (9) A

ENVIRONMENTAL  
INFORMATION

APPENDIX C. . . . . - 1978

**GEOLOGICAL BRANCH  
ASSESSMENT REPORT**

**00 355**

Part  $\frac{2}{3}$

## APPENDIX C

Application to Extend Mining Permit No. 2  
For Surface Mining of C & D Seams - Natal Ridge  
by  
KAISER RESOURCES LTD.

### Description of the Lands

The area of C and D seams in which the proposed disturbance of 162 ha. (400 ac.) will occur is within the Englemann spruce-alpine fir zone between elevations of 1524 m. (5000 ft.) and 1981 m. (6500 ft.) a.s.l. Three plant communities occur on the area: the south and southwest aspect grass-shrub community, the lodgepole pine community, and the larch-Douglas fir community. The flora of each of these communities is as follows:

### Flora of Plant Communities on Proposed C & D Seam Mining Development

#### A) South and Southwest Aspect Grass-shrub Community

Populus tremuloides (trembling aspen)  
Amelanchier alnifolia (saskatoon)  
Shepherdia canadensis (buffaloberry)  
Salix sp. (willows)  
Ceanothus velutinus (snowbrush)  
Acer glabrum var. douglasii (Douglas maple)  
Juniperus communis (common juniper)  
Mahonia repens (creeping mahonia)  
Spirea lucida (mountain spirea)  
Lupinus sp. (lupines)  
Verbascum thapsus (great mullein)  
Epilobium angustifolium (fireweed)  
Achillea millefolium (yarrow)  
Geranium sp. (geraniums)  
Tragopogon dubius (oysterplant)  
Allium sp. (wild onion)  
Smilacina amplexicaulis (false solomon's seal)

B) High Elevation Lodgepole Pine Community

Pinus contorta (lodgepole pine)  
Vaccinium scoparium (grouseberry)  
Alnus sinuata (alder)  
Symphoricarpos albus (waxberry)  
Rubus parviflorus (thimbleberry)  
Ribes viscosissium (sticky currant)  
Arnica cordifolia (arnica)  
Calochortus apiculatus (mariposa lily)

C) Larch-Douglas fir Community

Larix occidentalis (western larch)  
Pseudotsuga menziesii (Douglas fir)  
Pinus contorta (lodgepole pine)  
Populus tremuloides (trembling aspen)  
Shepherdia canadensis (buffaloberry)  
Rosa nutkana (wild rose)  
Rubus parviflorus (thimbleberry)  
Symphoricarpos albus (waxberry)  
Mahonia repens (mahonia)  
Salix sp. (willows)  
Aster conspicuus (large purple aster)  
Thalictrum accidentale (meadow rue)  
Fragaria glauca (blueleaf strawberry)  
Pyrola sp. (wintergreen)  
Lathyrus sp. (sweet pea)  
Vicia sp. (vetch)  
Cornus canadensis (bunchberry)

The tree, shrubs, and forbs native to these communities are common to those found elsewhere on the property.

The variety of successional stages may partly be attributed to fire and logging. However, hydroseric and the southern aspect's xeric sites are occupied by true mountain parks. More northerly aspects have a coniferous overstory.

In addition, within the proposed mining area there are 15.8 ha. (39 ac.) of land disturbed by previous mining activity that was reclaimed four years ago and which has sustained a successful vegetative cover.

## Current Land Use

### Forestry

The Canada Land Inventory (CLI) has classified much of the area either as limited yield forest <sup>\*1</sup> with pockets of high yield forest <sup>\*2</sup> forestry use. In the past, a considerable portion of the area has been logged or burned.

Initially the reclamation programme was based on the land use designations as of the CLI, Land Capability Analysis. However, as the reclamation programme developed, it was realized that this was not the most practical approach. As most of the areas which have and will be disturbed are valuable wildlife habitat, the most practical approach to reclamation is to establish vegetation at a primary level of succession and allow natural vegetative succession to develop from this point. The value of this approach is that once site preparation has been completed then grasses and legumes can be established to aid in erosion control and begin the buildup of organic matter as part of the natural soil forming process. Also this approach has the added advantage of providing areas of forage for wildlife to replace those feeding areas alienated by the ongoing mining programme.

### Footnotes

\*1 Limited Yield Forest  
Productivity ranges from 31 to 50 cubic feet per acre per year for main commercial species. Large units of this class would be required to sustain a viable industry.

\*2 High Yield Forest  
Productivity ranges from 71 to 130 cubic feet per acre per year for main commercial species.



## Wildlife

The area classified by the CLI as native range <sup>\*3</sup> or highland <sup>\*4</sup>.

Existing reclaimed sites in the area are used extensively by elk. Upper C, Lower C, and D seam reclaimed areas are heavily utilized in the fall and spring. The Erickson area is heavily used in winter.

On the reclaimed areas fall and winter grazing largely takes place on Medicago sativa (alfalfa), Melilotus sp. (sweet clover), Trifolium sp. (low-lying clovers), Dactylis glomerata (orchardgrass), Poa compressa (Canada bluegrass), and Poa pratensis (Kentucky bluegrass). Other reclamation species such as Festuca rubra (red fescue), Bromus inermis (smooth brome), Phleum pratense (timothy), and Agrostis alba (red top) are used to a lesser degree.

On undisturbed plant communities in the proposed mine area, winter browse occurs largely on Salix sp. (willows), Populus tremuloides (trembling aspen), Prunus melanocarpa (chokecherry), Amelanchier alnifolia (saskatoon), and Acer glabrum var. douglasii (Douglas maple). Grazing takes place in the spring on succulent shoots.

## Footnotes

\*3 Native Range  
Rangeland supporting native perennial forage with capabilities for use by both domestic and wild ungulates. The areas include Moderate Big Game Range and Limited Capability land for Agriculture.

\*4 Highland  
This is high elevation land with capabilities for both Big Game and Recreation. For Big Game it contains excellent summering areas for many species as well as escape terrain and wintering ranges for mountain goat and sheep. Capabilities for Recreation are of the Extensive Recreation type such as hiking and riding, mountain climbing, wildlife viewing and hunting.

### Recreation

A portion of the area has a capability of extensive recreation including such activities as hiking, riding, and fauna and flora viewing.

## Reclamation Considerations

The mining sequence outlined previously has included the basic reclamation requirements with regard to the disposition of spoil (to meet the primary requirements of dump and slope stability) and to control erosion and sedimentation.

The ultimate land use of this land is wildlife habitat. The reclamation programme has this aim in view during all phases of the operation.

Reclamation of disturbed areas will be kept as close behind ongoing mining as possible. Two direct benefits will result from this. First, as the mining programme will be relatively slow, the unreclaimed disturbed area at any given time will be comparatively small and erosion and sedimentation will be minimized. Second, since there will be reclaimed vegetative cover adjacent to the mine, forage for wildlife will be readily available and the impact of the mining operation on winter and spring elk ranges will be reduced.

In a sense, the reclamation process will begin prior to mining. Where it is feasible, topsoil and till will be selectively stripped and stockpiled for eventual use in topdressing on otherwise ready-to-reclaim spoil dumps.

The seed mixes to be used in revegetation are:

### 1. Seed mix for elevations over 5900 ft:

- Creeping red fescue
- Meadow foxtail
- Orchardgrass (Chinook)
- Kentucky bluegrass (Sydsport)
- Redtop
- Timothy (Climax)
- Smooth brome (Manchar)
- Perennial ryegrass
- Alsike clover
- White clover

2. Low, mid-elevation grass mixture for use below 5900 ft:

Smooth brome  
Intermediate wheatgrass  
Crested wheatgrass  
Canada bluegrass  
Timothy (Climax)  
Creeping red fescue  
Redtop  
Perennial ryegrass  
Alfalfa  
Sainfoin  
Cicer milkvetch (Oxley)  
Alsike clover

In the past the success of these mixes has been very good. On several previously reclaimed sites in and near the proposed mine site the following levels of vegetative production have been obtained:

<u>Area Sampled</u>	<u>Total Dry Weight (Kg/ha)</u>			<u>Production (Kg)</u>		
	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
C Seam (4.9 ha.)	1,497	2,363	1,590	7,271	11,578	7,791
D Seam (4.0 ha.)	1,401	4,201	2,311	5,669	16,804	9,244
Erickson (13.4 ha.)	1,177	1,438	752	15,714	19,269	10,077
Lower C (6.9 ha.)	2,659	2,410	1,152	18,287	16,629	7,947

It is also planned to establish trees and shrubs on the reclaimed areas. Stock of species such as willows, trembling aspen, chokecherry, saskatoon, Douglas maple, alder, and buffaloberry will be planted in appropriate areas in pockets. This will create an "island" effect in which the interface between cover, browse, and grazing will be maximized.

Until such a time as a self-sustaining vegetative community can be established maintenance fertilization will be carried out in conjunction with the existing programme.