

003648

Property file

82J SW 009

Canal Flats

STAGE ONE REPORT

LUSSIER GYPSUM QUARRY

— LOCATED IN BRITISH COLUMBIA  
NEAR THE JUNCTION  
OF COYOTE CREEK AND THE LUSSIER RIVER  
N.T.S. # 82J /4E  
( LAT. 50° 2.5' ; LONG. 115° 31.3' )

PREPARED FOR:  
DOMTAR INC.  
P.O. BOX 6138  
2001 UNIVERSITY STREET  
MONTREAL, QUEBEC H3C 3K4

BY:

KOOTENAY GEO-SERVICES  
(G.M. RODGERS)  
BOX 63  
SKOOKUMCHUCK, B.C.  
VOB 2E0

AND

JOHN KOVACS, P. ENG.  
(PLANT MANAGER)  
DOMTAR CONSTRUCTION  
MATERIALS  
1805 - 30TH AVE. S.E.  
CALGARY, ALBERTA  
T2G 4X8

APRIL 5, 1984

SUPPORTING DOCUMENTS

Table 1.....Claim Status (Follows Sec. 2.02)

Photograph.....Proposed Quarry Site

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## SUMMARY

Domtar Inc. is one of the largest Canadian corporations with 15,000 employees across Canada. It is made up of many divisions one of them is Domtar Construction Materials. Within this division is the gypsum wallboard manufacturing subdivision consisting of five major plants from coast to coast producing wallboard under the trade name of Gyproc.

The success of the corporation can be contributed to one of its major policies that is to control the main basic raw materials for its manufacturing plants. The only gypsum wallboard plant that doesn't meet with this criteria is located in Calgary, Alberta. So, it was decided to open up a quarry at the closest possible location.

The proposed quarry site is located 2½ kilometres south of the Coyote Creek - Lussier River junction near Canal Flats, B.C. It has been adequately explored, and has been found to contain sufficient reserves and it meets the quality and mining criteria established by Domtar as a long term quarry. The quarry area is completely covered by mineral claims owned by Domtar Inc..

It is proposed to quarry gypsum at a rate of approximately 100,000 tonnes per annum. The rock would be drilled, blasted, excavated and loaded into trucks. From the quarry it would be hauled to Canal Flats. There the ore would be crushed and loaded into railway cars for shipment to Calgary. The project is expected to employ 10-12 people on a year round basis.

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1. W. R. Anderson  
B. C. Ministry of Finance  
102 - 11th Ave. S.,  
Cranbrook, B.C., V1C 2P3  
Ph.: 489-3527
2. R. W. Grimm  
B. C. Ministry of Environment  
(Waste Management Branch)  
1617 Baker St.,  
Cranbrook, B.C., V1C 1B4
3. J. B. C. Lang , P. Eng.  
B. C. Ministry of Energy, Mines and Petroleum Resources  
(Mineral Resources Branch)  
310 Ward St.,  
Nelson, B.C., V1L 5S4  
Ph.: 352-2211
4. J. R. B. MacKinnon, R.P.F.  
B.C. Ministry of Forests  
(Forest Service)  
Box 189,  
Invermere, B.C., VOA 1K0  
Ph.: 342-9257
5. D. Martin  
B.C. Ministry of Fish and Wildlife  
44 - 6th Ave. S.,  
Cranbrook, B.C.  
Ph.: 489-3521
6. A. L. O'Bryan  
B.C. Ministry of Energy, Mines and Petroleum Resources  
310 Ward St.,  
Nelson, B.C., V1L 5S4  
ph.: 352- 2211
7. W. R. Cowan, Ph.D., P. Eng., President  
Palliser Environmental & Terrain Services Inc.  
9859 Palistone Rd. S.W.  
Calgary, Alta., T2V 3W1  
Ph.: 251-2829

## 1.0 INTRODUCTION

### 1.01 History of the Lussier River Area

Gypsum deposits in the Lussier River area have been known for decades. A natural cliff of gypsum up to 40 metres high occurs on the east bank of the Lussier River just south of the Roam Creek-Lussier River junction (see Figure 1). This cliff attracted attention early on and mineral claims covering it have changed hands many times over the years. Another gypsum cliff 10 metres in height, approximately 1.5 kilometres north of the Roam Creek - Lussier River junction, was optioned to Domtar (then called The Dominion Tar and Chemical Company) and in 1962 a diamond drilling program was initiated by Domtar. Fifteen holes were drilled using a small drill which was brought in by horseback. This original drilling was confined to the area presently covered by the Bluebird and Nuthatch mineral claims (Figure 2).

In the middle 1960's, a forestry road was built to Whiteswan Lake and then south along the Lussier River to gain access to timber in the area.

In the early 1970's, the area presently covered by most of the Bluebird, Nuthatch, Duke, Wren, and Lucy claims was completely logged. This logging left a network of logging roads and skid trails. The property described herein changed hands, but was later reacquired by Domtar in 1982.

During 1983, an exploration program was initiated by Domtar which included prospecting, claim staking, geological mapping and diamond drilling. Sufficient reserves were outlined to warrant establishing a long term quarry in this area.

Permission was obtained, Reclamation Permit No.: MX 547, from the B.C. Ministry of Energy, Mines and Petroleum Resources to make a test run of the proposed quarry in order to confirm it's economic viability. An area (85 metres by 150 metres) was stripped clean of treestumps and debris and the north half of this area has been cleaned down to bedrock using caterpillars and a track mounted backhoe. Overburden here was found to be 1 to 3 metres deep. Approximately 35,000 tonnes of gypsum was blasted, excavated and crushed and approximately 20,000 tonnes was trucked to Canal Flats. From there it was loaded into railway cars and shipped to the Domtar plant in Calgary.

### 1.02 Location and Access (See Figure 1)

The proposed Lussier Quarry area is located on the east bank of the Lussier River approximately 2.5 kilometres south of it's confluence with Coyote Creek (See Fig. 1). It is located within National Topographic Service mapsheet number 82J/4E at approximately Latitude  $50^{\circ} 2.5'$  and Longitude  $115^{\circ} 31.3'$ .

Access is via excellent gravel road which leaves Highway 93/95 six kilometres south of Canal Flats and heads east to Whiteswan Lake. At kilometre 21½, this road branches and the main Lussier River logging road heads south parallel to the Lussier River, past the proposed quarry area and on ultimately to Top of the World Park. At kilometre 30½, a spur road branches east and then south, cutting through the main claim block and interconnecting with many recent logging roads and skid trails.

The loading site will be located in Canal Flats on a land presently owned by Crestbrook Forest Industries (CFI) of Cranbrook, B.C.

#### 1.03 Project Description and Development Schedule

Figure 3 shows the initial development work that has already been done as well as the ultimate quarry boundary. Drilling, blasting and excavation will be done at the quarry site and the rock (minus 60cm) will be trucked to Canal Flats via existing privately maintained forestry roads. The loaded ore trucks will not travel on or across any presently paved public road.

The gypsum rock will be stockpiled at Canal Flats on privately owned CFI land. A crew of permanent Domtar employees here will then crush the gypsum to minus 15cm and load it into covered railway cars.

It is estimated that the whole operation will employ about 12 people.

Domtar plans to have the quarry in full production by early summer of 1984.

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## 2.0 ENVIRONMENTAL & SOCIAL CONDITIONS

### 2.01 Physiography

The proposed quarry area is situated between the Hughes Range to the west and the VanNostrand Range to the east of the Western Cordillera (Rocky Mountains). Sharks Tooth Mountain is located 3 kilometres northwest of the proposed quarry area and is 2511 metres in elevation. The proposed quarry site is situated at approximately 1300 metres in elevation.

The mineral claims containing the proposed quarry area are situated near the Lussier River valley floor and are on a 25° to 30° west facing slope. The Lussier River flows north to Mutton Creek, then curves 180° and flows south to Sheep Creek Village, then southwest to Skookumchuk village where it empties into the Kootenay River.

Sinkholes (conical depressions formed by collapse due to dissolution of underlying gypsum) are commonly found throughout the Lussier River valley. Sinkholes vary in depth from 1 metre to 12 metres.

The quarry area has been subjected to at least two periods of glaciation. In the Lussier River valley floor morainal material underlies the river's floodplain and many old river channels have cut through this material. The proposed quarry area is above and east of the Lussier River and is covered by locally thick fluvioglacial deposits occurring in late glacial outwash plains, fans, terraces and large meltwater channels. Above the quarry area bedrock terrain is more extensive along with avalanche deposits, slopewash deposits and colluvial mantles.

### 2.02 Land Tenure

All mineral claims held by Domtar Inc. in the Lussier River area are located within the Fort Steele Mining Division which has its district office in Cranbrook. Table no. 1 shows the claim status of the quarry area in more detail (See also Figure 2). Application for a longer term mineral lease is pending.

The nearest land that is classified as being within the Agricultural Land Reserve is located at the village of Sheep Creek, 8 kilometres due west of the proposed quarry area. Ecological reserves are found at the Ram Creek Hot Springs, 7 kilometres due west of the quarry area and also at Whiteswan Lake and Top of the World Park. All land in the vicinity of the proposed quarry area is vacant crown land and is within the East Kootenay Regional District.

A trapline lease for the Lussier River area above Coyote Creek has been granted to Mr. P. Lum of Sheep Creek and he holds an occupancy permit for his cabin located 10 kilometres south of the proposed quarry area. Guiding territory leases for the upper Lussier River belong to Mr. B. Jamieson of Kimberley and a similar lease for Coyote

TABLE #1

CLAIM STATUS - DOMTAR CONSTRUCTION MATERIALS

LUSSIER RIVER AREA

<u>CLAIM NAME</u>	<u>RECORD NUMBER</u>	<u>EXPIRY DATE</u>
WREN 1	1956	OCT. 5, 1989
WREN 2	1957	OCT. 5, 1989
WREN 3	1958	OCT. 5, 1989
LUCY 2	1750	FEB. 17, 1994
DUKE	152	FEB. 23, 1984
BLUEBIRD	1764	MAR. 24, 1994
NUTHATCH	1763	MAR. 24, 1994
TOM	1662	SEPT. 8, 1993
TOM 2	1663	SEPT. 8, 1993
PETER	1664	SEPT. 8, 1993
ERIC	1661	AUG. 30, 1993
JAMES	1762	MAR. 24, 1994
GLEN 1	1860	JULY 7, 1991
GLEN 2	1861	JULY 7, 1990

Creek is held by M. E. Cretney of Tata Creek.

Timber rights in the area of the proposed quarry are held by Crestbrook Forest Industries Ltd. of Canal Flats.

### 2.03 Climate

Climatic conditions are continental and semi-arid with extreme temperature ranges and low precipitation in the main Lussier River valley. Because of the extreme topographic relief in the quarry area air temperature, precipitation, wind direction and atmospheric stability varies greatly.

No meteorological data is available for the Lussier River other than some sparse data from Top of the World Park (10.1cm average rainfall from June to middle September). The Cranbrook Airport has recorded an average annual rainfall of 420mm. A weatherstation located at Wasa has recorded an approximate annual rainfall of 420mm. No weather information for the Canal Flats area was available to the authors.

Prevailing winds at the quarry area are from the west or southwest and frequently weather is funnelled through the Ram Creek - Roam Creek pass. Winter winds frequently come from the north due to the north-south orientation of the mountain ranges. Windspeeds in the timbered Lussier valley area are believed to be low (less than 5 kph.). Windspeeds at Canal Flats are erratic however and frequently high due to the proximity of Columbia Lake.

The average number of frost free days recorded at the Cranbrook Airport is known to be 96. Since the quarry site is 300 metres higher in elevation than this point and the number of hours of solar radiation are reduced due to the high relief of the Lussier River valley mountain ranges, the number of frost free days would be less (say 75 to 80).

The average snowpack for the quarry area is known to be 100cm.

### 2.04 Air Quality

Air quality in the Lussier River valley area is difficult to assess due to the lack of meteorological or air study data. Since the only other industrial activity is logging, it is assumed that there would be very low background levels of atmospheric pollutants. The primary sources of air contaminants in the area are distant forest fires, slash burning, as well as dust and emissions from motor vehicles.

At the proposed quarry site there will be no air borne contaminants other than that from the diesel powered equipment. An approved dust collector will be attached to the drill.

At the loading site located near Canal Flats (see Figure 4), crushed gypsum will be loaded into closed railway cars. A flexible chute will be used when dropping gypsum from the loading conveyor into the railway cars and all conveyors will be covered to minimize dust emission.

## 2.05 Surface Water

### 2.05.1 Drainage

The proposed quarry site is located approximately 150 metres east of the Lussier River. Although there are many westward sloping gullies and draws in the quarry area, they are dry for all of the year.

Exploration drilling during the summer of 1983 commonly reached depths of up to 48 metres and no ground water was ever encountered. During drilling, water circulation was lost only at the bedrock-overburden interface. There is no surface water other than the Lussier River, due to the extremely good internal drainage of the glacial overburden. Precipitation percolates through the glacial materials and then follows the bedrock surface down to the Lussier River.

### 2.05.2 Water Quality

There are no present operations on the Lussier River other than logging activity that would contaminate the water. Except for naturally high silt levels in the spring, the Lussier River water is assumed to be very clean. A geochemical study done in 1969 and 1971 of the Lussier and Coyote Creek has shown unusually high, naturally occurring, sulphate values in some of the water samples analyzed. For samples taken from the Lussier River and from Coyote Creek the average temperature was 7.1°C (summer) and the average P.H. was 8.1. The average concentration in millimoles per litre of calcium, magnesium, alkalinity (carbonate) and sulphate are respectively 1.11; 0.6; 2.33 and 0.5. Also the samples showed the sulphate values from emerging gypsiferous springs are commonly 9 to 12 millimoles per litre.

A settling pond, if found necessary, shall be built between the quarry and the Lussier River of the catchwater from the quarry floor should contain any suspended sediment.

One location, at least 100m from any watercourse, shall be designated for diesel fuel storage and for heavy machinery oil changes.

There is no surface water close enough to the loading site at Canal Flats to be of concern and groundwater at this site will not be affected.

### 2.05.3 Hydrology

The average annual precipitation for the Lussier River area is estimated to be approximately 500mm. Snowpack at the bottom of the Lussier River valley has been known to reach 1.7 metres but it is commonly 1.0 metres deep.

There is no Water Survey of Canada data available for the Lussier River, however it is not probable that a 1:50 year flood level would reach the quarry site. Bridges on the Lussier River have been designed for a maximum rise in water level of 2 metres.

### 2.05.4 Fisheries

The fisheries resources of the Lussier River area have been noted as being moderate to good for sport-fishing by the B.C. Fish and Wildlife branch in Cranbrook.

Of the resident species found in this area, Cutthroat Trout and Mountain Whitefish are the most abundant while Char and Dolly Varden are present in lower population densities.

Rainbow Trout is the only non-resident species found in the quarry area and it has probably migrated to this area from either Alces Lake or Fish Lake, both of which are stocked annually. Alces Lake is open to fly-fishing only whereas Whiteswan Lake, Lussier River and Fish Lake (Top of the World Park) are open to all anglers.

Ice fishing at Whiteswan Lake and Fish Lake is of recreational importance for many local residents. Normal fishing regulations apply throughout the Lussier River area year round.

### 2.06 Groundwater

There are no groundwater problems anticipated at either the proposed quarry site or at the Canal Flats loading site.

### 2.07 Soils and Geology

#### 2.07.1 Soils and Surficial Materials

From the Canada Land Inventory Soils map for the area, the quarry site is on the border of two soil units (see Figure 5). To the east of the quarry, land is classified as "Gagnebin" and has a fluvio-glacial origin with terraces, fans and slopes of 30 - 60%. To the west of the quarry area soils are classified as both "Couldron" and "Four Points" which have fluvial or colluvial origins and are stoney, soils with gentle to extremely steep slopes.

A poorly developed 'A' horizon (approximately 5cm. thick) can occasionally be observed. Underlying this is a well developed light brown, tan-grey 'B' horizon (commonly 20-50cm. thick). In the actual quarry area, the overburden thickness is relatively thin (2-3 metres) and much of this material is due to residual weathering of the gypsum outcrop.

Stripping already done has revealed that the bedrock overburden interface is irregular and is frequently crevassed. The crevasses are 1 to 4 metres deep and are filled with mud. Hence the purity of the gypsum product is less when taken from the upper 4 metres below the paleosurface.

The area is covered by a "glacial" till known as the Cedrus Till which normally contains 15% clasts (usually limestone), 15% sand, 40% silt and 30% clay. In the area of Domtar's claims there are several thick terraces containing 1 to 3 metre thick beds of lacustrine clay. This sediment was probably trapped here when glacial ice filled the Lussier River valley and dammed off small tributaries. A later glacial event, known as the Fraser Glaciation, left an upper till of sand, gravel and boulders. Overburden thickness generally increases with proximity to the valley bottom.

## 2.07.2 Geology

The claims owned by Domtar are within the foreland thrust zone of the Western Cordillera (Hughes Range). They lie on the western edge of a north plunging syncline. The syncline is bounded by the Lussier River to the west and by Coyote Creek to the east.

A major longitudinal, steeply dipping thrust fault runs parallel and just to the west of the Lussier River. Two major right-hand transverse faults run east-west and are the loci for hot springs in the Whiteswan Lake Park and Ram Creek pass areas.

The Beaverfoot-Brisce formation stratigraphically underlies the Burnais formation and is found on the west side of the Lussier River. It consists of up to 600 metres of carbonate rock with chiefly limestone at the top and dolomite at the bottom. It is thought to be Ordovician to middle Silurian in age.

The Burnais formation hosts the gypsum deposits. It is composed principally of well-bedded and finely laminated gypsum. The gypsum weathers light to dark grey. The general attitude of the bedding strikes north-east and dips south east. Black, fetid, well brecciated limestone has been observed to comprise a small percentage of this unit. It is thought to be middle Silurian to middle Devonian age.

Total outcrop area within the Burnais formation is slight as most of the area is covered by glacial drift. Sinkholes and "gypsite" are reliable indicators of covered gypsum. The Burnais formation has been traced for over 140 kilometres from Windermere to Wardner. Gypsum is the only known economic mineral in the Lussier River valley.

## 2.08 Vegetation

The quarry area is within the sub-alpine forest zone and according to the B.C. Ministry of Forests biophysical classification, it lies between the Montagne Spruce (MSa) and the Engelmann Spruce-Subalpine Fir (ESSFa) zones.

The climatic climax forest for the quarry area includes Engelmann spruce, white spruce, alpine fir, lodgepole pine and Douglas fir.

Common shrubs include: blue clematis, red-berryelder, labrador tea, shrubby cinquefoil, red teaberry, white rhododendron, crowberry soap-lallie, blue berry, huckleberry, red ossier dogwood; and locally false azalea and kinnikinnick.

Common flowers include fireweed, bunchberry, cow parsnip, gentian, beard tongue, giant ragwort, large purple aster, lady's tresses, longstem greencaps, yellow dryas and mountain valerian.

The quarry area east of the Lussier River was clearcut logged in the early 1970's except for a shelter belt along the Lussier River and for a 'Y' shaped seed block. This seed block was logged out during August, 1983. The area was never replanted but left to natural regeneration. Total regeneration back to climax forest will take at least 80 more years in the quarry area. Pinebark beetle infestation of the hillside on the west side of the Lussier River valley across from the quarry area means that this hillside will soon be logged also.

## 2.9 Wildlife

From the map entitled "Biophysical Classification for Wildlife Capability" (see Figure 6) the quarry site is shown to be situated between zones: E4X4M5W5 and E3M4X4. This means that snowfall is moderate to

LfEfSh                      EfEwSm

high, soil is typical of the Upland Forest class and the slopes above the quarry are well drained whereas the river bottom below the quarry is subject to occasional flooding.

There is a low to moderate ability of land in the proposed quarry area to support elk. There is a low to very low capacity for supporting mule deer. The area has a low capability for supporting moose, although moose might be seen in the vicinity during the winter months. Marten, red Squirrels, Chipmunks and field mice are common in the proposed quarry area. Mountain sheep are not expected to be found near the quarry area. A sheep lick which is 4 kilometres south of the quarry area is on the route of sheep migrations in the Lussier River valley, and from here they travel due east towards Coyote Creek.

Avifauna observed include ruffed grouse, spruce grouse, belted kingfisher, common sparrow and the occasional golden eagle. Grouse are

the most common upland game bird in the area and display great fluctuations in abundance. From the Canada Land Inventory "Land Capability for Wildlife - Waterfowl" map, the entire Lussier River area is classed as being 7TC. This means that lands in the this class have severe limitations that almost no waterfowl are produced. Adverse climate and topography also inhibit the production and survival of waterfowl.

As bears are present in the area, any garbage produced shall be trucked out to a proper landfill site so as not to attract bears to the quarry site.

## 2.10 Land Capability and Use

### 2.10.1 Agriculture

The estimated number of frost free days in the Lussier River area is estimated to be 75-80 (see sec. 2.3). Slopes in the proposed quarry area are west-facing and generally slope at 25 to 30 degrees. Total precipitation is estimated to be approximately 500mm per annum.

From the Canada Land Inventory "Agricultural Capability" map (see Figure 8) the quarry area is classed as 6 5TR - 7 5TC. This means that the area is classified as 50% within the "natural grazing" and 50% within the "no productivity" capability classes. Agriculture is limited by steep topography, surface bedrock and adverse climate.

### 2.10.2 Forestry

The Lussier River valley will continue to be a steady future source of timber for logging companies (see sec. 2.8).

The proposed quarry area will alienate approximately 9,000 square metres of land from timber production. Tree planting will be done on reclaimed areas and it is probable that regeneration of the quarry area will take hold faster than that of the surrounding clearcut areas due to application of fertilizers.

From the Canada Land Inventory map entitled "Forest Capability" (see Figure 7), the quarry area is classed as 4 8AM - 4 2D (LP). This implies that the area is capable of producing 51-70 cubic feet of timber per acre. It has a soil moisture deficiency in 80% of the area and 20% of the area's rooting depth is restricted by a dense or compacted soil layer. Lodgepole pine is listed as the only tree species although Douglas fir, alpine larch and white spruce also grow in this area (personal observation).

### 2.10.3 Recreation

Within the Regional District of the East Kootenay tourism and subsequently, recreation, is particularly important to economy of the region where the majority of communities depend heavily on tourism for their livelihood. Recreational pursuits common in the Lussier River area include hunting, fishing, camping, hiking, cross-country skiing, boating



and picnicking. Camping facilities for trailers and tents exist at Whiteswan Lake and Top of the World Park offers tenting and a cabin for hikers. Both these parks are maintained by the B.C. Ministry of Land, Parks and Housing.

Visual resources of the Lussier River valley offer the tourist a surface pattern of inconspicuous forest cover, vertical slide chutes and rocky sharp snow-capped peaks. Viewing opportunities of the proposed quarry area from roads are very restricted. To preserve this, planning for the logging of pine below the Lussier logging road (also Top of the World access road) between kilometre marks 31 and 34, might include that a 50 metre wide belt of undisturbed timber be left below this road. However, there is low visual vulnerability to linear developments in the quarry area due to the pre-existing logged cutblocks.

#### 2.10.4 Trapping

The registered trapline for the Lussier River in the vicinity of the proposed quarry site belongs to Mr. Pete Lum of Sheep Creek. It is felt that the 100 - 200 metre shelter belt west of the Lussier River would negate any impact of the quarry on fur bearing animals. Animals trapped include marten and occasionally lynx.

#### 2.10.5 Guiding

The registered guiding territory for the Lussier River area belongs to Mr. Bob Jamieson of Kimberley. Animals hunted include sheep, elk, deer and occasionally bear. The area of the proposed quarry site being unaesthetic, is not favoured as a hunting spot by either local or guided hunters.

#### 2.11 Historical Sites

No historical or archaeological sites of any importance are known of in the proposed quarry area.

#### 2.12 Existing Social Environment

##### 2.12.1 Population

Population Center	Population	Distance From Quarry (km)
Canal Flats	1,530	42
Skookumchuck	35	62
Sheep Creek	75	74
Cranbrook	18,000	136

## 2.12.2 Employment, Commercial Services, Housing & Education

The main employer in the area is Crestbrook Forest Industries Ltd., which employs approximately 300 people at it's mill site in Canal Flats and 60 people at it's pulp mill at Skookumchuk. Many spin off jobs are also due to Crestbrook Forest Industries mostly by way of contract work (logging, trucking, building construction, etc).

Canal Flats provides a post office, grocery store, restaurant and Skookumchuck provides a motel, restaurant and a garage. Both towns provide a spur line and loading area for railroad service.

Canal Flats school children attend elementary school in Canal Flats, but then are bussed to Invermere for junior and senior high school. Sheep Creek and Skookumchuck children attend elementary school at Wasa, and then are bussed to Kimberley for junior and senior high school.

The proposed quarry, loading site and trucking shall employ up to 12 men, and it is expected that they will be housed in Canal Flats.

### 3.0 PROJECT DESCRIPTION

#### 3.01 Exploration

An exploration program conducted in 1962 drilled 15 holes using EX size equipment on what is presently the Bluebird and Nuthatch mineral claims.

During 1982, exploration was concentrated on the Eric claim as this has the most obvious accessible gypsum. Trenching was carried out above the 40 metre gypsum cliff in order to test the overburden thickness. A 60 ton bulk sample was excavated using a backhoe and trucked to the Domtar plant in Calgary, to test it's suitability.

During 1983, exploration centered on the Duke, Tom, Bluebird and Nuthatch claims. Prospecting and claim staking were carried out peripheral to this area. Geological mapping was carried out at 1:5000 scale and later at 1:600 scale. A drilling program was proposed and 20 holes were drilled (totalling 460 metres) using BX size equipment. Water was provided by a truck mounted water tank and all roads used were previously existing logging skid roads that had in some cases been improved.

Two outcrops were stripped using a track mounted backhoe. A 180 tonne bulk sample was taken from each stripped outcrop and trucked to the Domtar Calgary plant.

Permission was obtained from the B.C. Ministry of Energy, Mines and Petroleum Resources to quarry 25,000 tonnes of gypsum. This was to evaluate the economic feasibility of establishing a viable quarry in this area. An area 85 metres by 150 metres was cleaned off and the north half stripped of overburden using caterpillars and track mounted backhoe to clean mud out of crevasses.

The enclosed photograph shows the quarry site as it was left after the completion of the exploration program.

#### 3.02 Description of Deposit

The gypsum occurs as white to grey to dark-grey to black semi-opaque bands and laminae. Banding ranges from 0.1mm to 4cm thick and because of rip-up clasts observed in the drill core, probably represents the original bedding attitude (ie: tops to the east). Associated with the gypsum are interbands of fine grained argillaceous gypsum which is somewhat harder ( $H=2\frac{1}{2}$ ). Black laminations, black gouge on fracture surfaces, and as overall (locally) black color is due to an impurity (either carbon or bitumen). The black and white sequences of interbanding are reminiscent of varve-like deposits or it could be that the darker bands are due to turbidite infusion into the basin.

Joints and fractures are filled with secondary gypsum. Selenite crystals are common throughout the drill core. They are usually microscopic but occasionally reach proportions of 0.5cm by 2 cm.

Anhydrite appears as pods or thin layers which increase in frequency and extent with depth. In some drill holes, anhydrite was a major constituent increasing with depth and in others, it was a minor constituent.

Gypsum of acceptable quality begins at the bedrock surface and is found to an average depth of 30 metres in most drill holes. The quarry area is bounded to the north, east and south by limestone and to the west by the Lussier River shelter belt.

Core assaying was done in Calgary by Core Laboratories Canada Ltd. and also combined water was analyzed at the Domtar Construction Materials plant in Calgary. The drill core is being stored at the Domtar plant in Calgary.

Yellow crystalline sulphur commonly occurs within gypsum layers, in trace amounts. Pyrite also has been observed in trace amounts, but only as disseminated specks within limestone.

### 3.03 Options Considered

The present site termed the Lussier Quarry was chosen instead of the sheep lick area (Eric Mineral claim) due to wildlife considerations.

Underground mining is an option to quarrying, but is totally uneconomical.

It was decided to operate the crusher at Canal Flats instead of at the quarry site due to the proximity of hydroelectricity and labour force.

### 3.04 Quarry Development

The quarry will be developed based on the experience gained during the 1983 exploration program. The initial development will occur as a continuation of that program at the same area, (see pictures). It is proposed to contract all quarrying operation, removal of overburden, drilling, blasting, loading and hauling to Canal Flats and reclamation work to Kennelly Contracting Ltd. of Cranbrook, B.C.

The soil and glacial till will be removed by scraper, backhoe and bulldozer and stockpiled for future reclamation work. The gypsum, once exposed, will be drilled by an air track mounted drill - 40mm dia holes - and blasted using ANFO. The gypsum will be mined in 8-16 metres benches having a final highwall sloped at an average slope of 55 degrees. The broken gypsum (minus 60 cm) will be loaded into 35 tonne trucks by rubber-tired front end loader. The trucks will transport the gypsum rock to Canal Flats, approximately 40 kilometres distance, via existing logging roads to the loading site for stockpiling. The loading site about 18 hectares will be leased with option to purchase from Crestbrook Forest Industries (CFI) of Cranbrook, B.C. Initial agreements have been reached with both CFI and CPR for the land use. For quarry development see Figures 9 and 10.

The site, employing Domtar people, will have a 500m long spur line, feeder, crusher, screening plant, loading and stacking conveyors and a 10m x 12m service building. (For arrangements see Figure 4.) The rock will be reclaimed by a rubber-tired front end loader and reduced in size to minus 6cm by the crusher before being loaded into covered railcars. The screening plant will be used to allow screened rock (minus 15cm plus 8cm) to be stockpiled for loading under extreme winter conditions.

All equipment will be sized to handle a production rate of 120 tonne per hour.

Note that great consideration was given in selecting the loading site as well as the equipment arrangement on it. Everything is "hidden", from all residential and recreational areas so as to minimize any inconvenience or nuisance.

### 3.05 Sewage & Garbage Disposal

There will be no water requirements at either site, outside of drinking water. Therefore there will be no sewage discharge as chemical toilets will be installed.

Garbage will be collected in bins and carted to a government approved disposal site.

### 3.06 Utilities

All equipment selected for the quarry is driven by diesel powered units while electrical power is available at the loading site.

### 3.07 Employment & Housing

Total manpower required for full operation is 12 workers that is made up of 4 at the quarry site, 6 truckdrivers and 2 at the loading site.

These people will be drawn from the nearby area. Since the number of people involved is relatively small it is not anticipated that the quarry will have a great influence on either housing or on the social structure.

### 3.08 Development Schedule

It is hoped that speedy approval of Domtar's application will be forthcoming and the actual quarrying operation could commence during the spring of 1984. Gypsum is already exposed, overburden removed, in an area that would allow the quarrying for 2-3 years. Since the roads leading to the loading site are closed between mid March and mid June, the facilities at the loading site could be completed by the time the roads are reopened which means that shipments of rock can begin at the same time. Gypsum reserves at the proposed quarry site, if production continues unabated, are estimated to be in sufficient quantities to supply the Calgary plant for over 25 years.

### 3.09 Reclamation Objectives

The proposed quarry site and surrounding area will be restored as near as possible to its original state. It will be an ongoing effort as quarrying progresses southward. During the 1983 exploration work all topsoil has been saved from the north half of the stripped area and has been piled just beyond the final north boundary of the quarry. The schedule of production suggests that initial grading and placement of soil on the re-graded slopes will be a minimum of 5 years from the onset of production, the final reclamation being deferred until the ultimate abandonment of the Lussier River Quarry. The sidewalls will then be resloped as near as possible to the natural angle of repose. Topsoil from the stockpile will be spread and a grass mix of 25% intermediate wheatgrass, 25% pubescent wheatgrass, 20% smooth brome grass, 10% hard fescue, 10% alfalfa and 5% sweet clover will be planted at a rate of 50 pounds per acre. A more indigenous grass mix for this area will be used if specified by the B.C. Ministry of Forests. Planting shall be done in the spring-time and a fertilizer of approximate blend 20-24-15 shall be spread over this area at a rate of 200 pounds per acre.

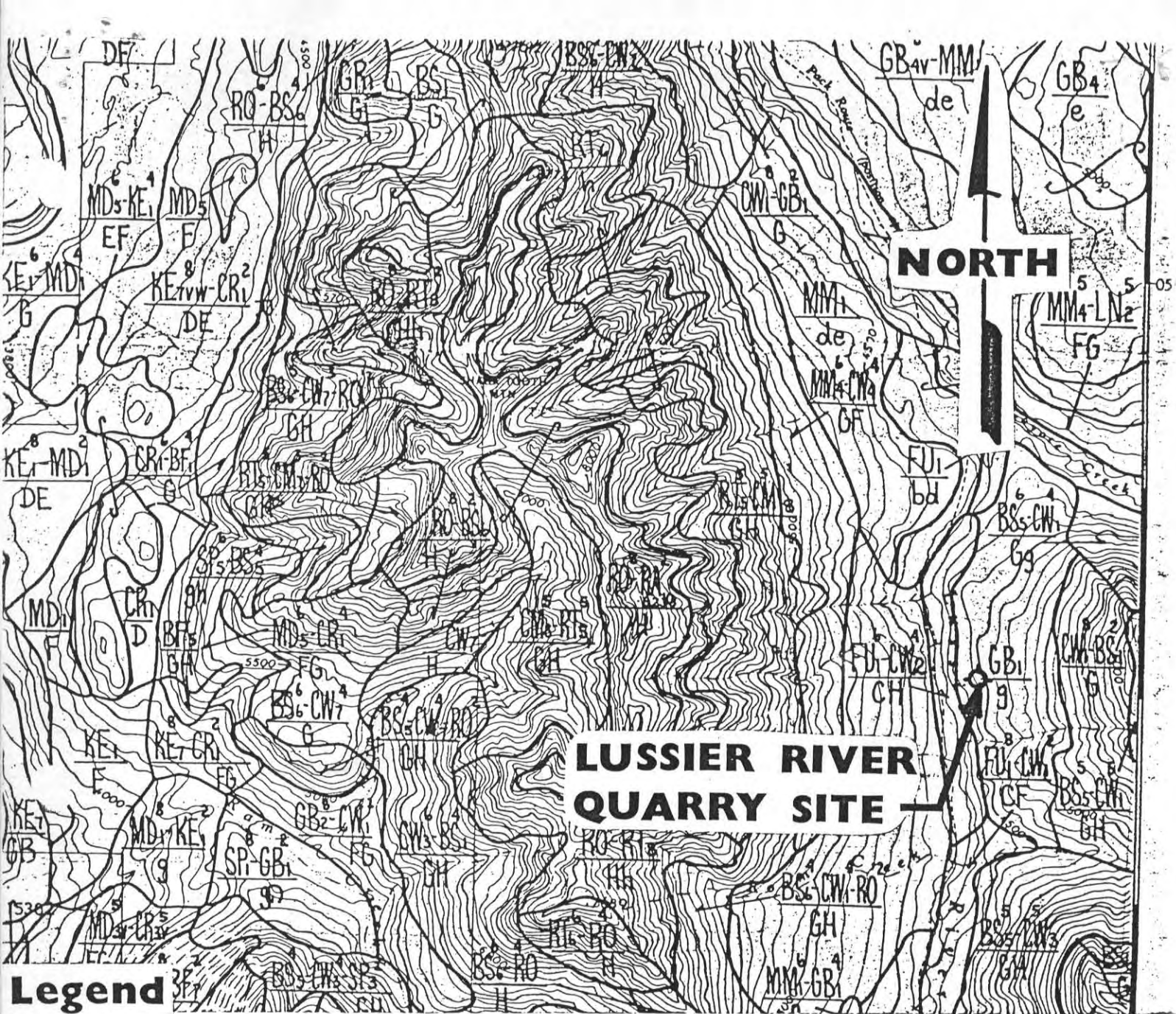
All roads will be properly ditched and drained during use and will be resloped after.

### 3.10 Drainage & Effluent Control

Gypsum is an inert rock that is non-toxic even in high concentrations. Surface runoff at the quarry is nil due to the excellent drainage of the surface gravels.

#### 4.0 ENVIRONMENTAL AND SOCIAL IMPACTS

Based on the foregoing it can be concluded that there will be only minor detrimental impact on the environment. However if some unforeseen environmental concern presented itself Domtar would stake it's established reputation, that of a good corporate citizen, and remedy the situation to the best of its capacity at once. The quarry, due to its size, will not drastically alter the life of the neighbourhood. Indeed it will be a welcome addition to the area's economy.

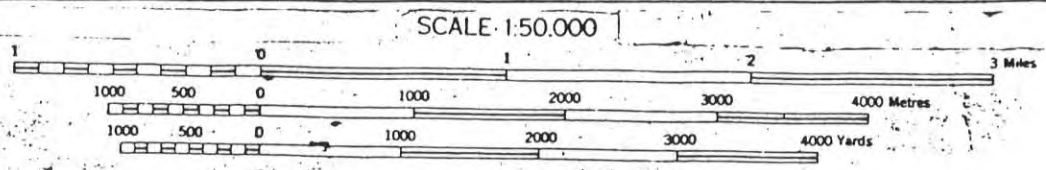


**LUSSIER RIVER QUARRY SITE**

**Legend**

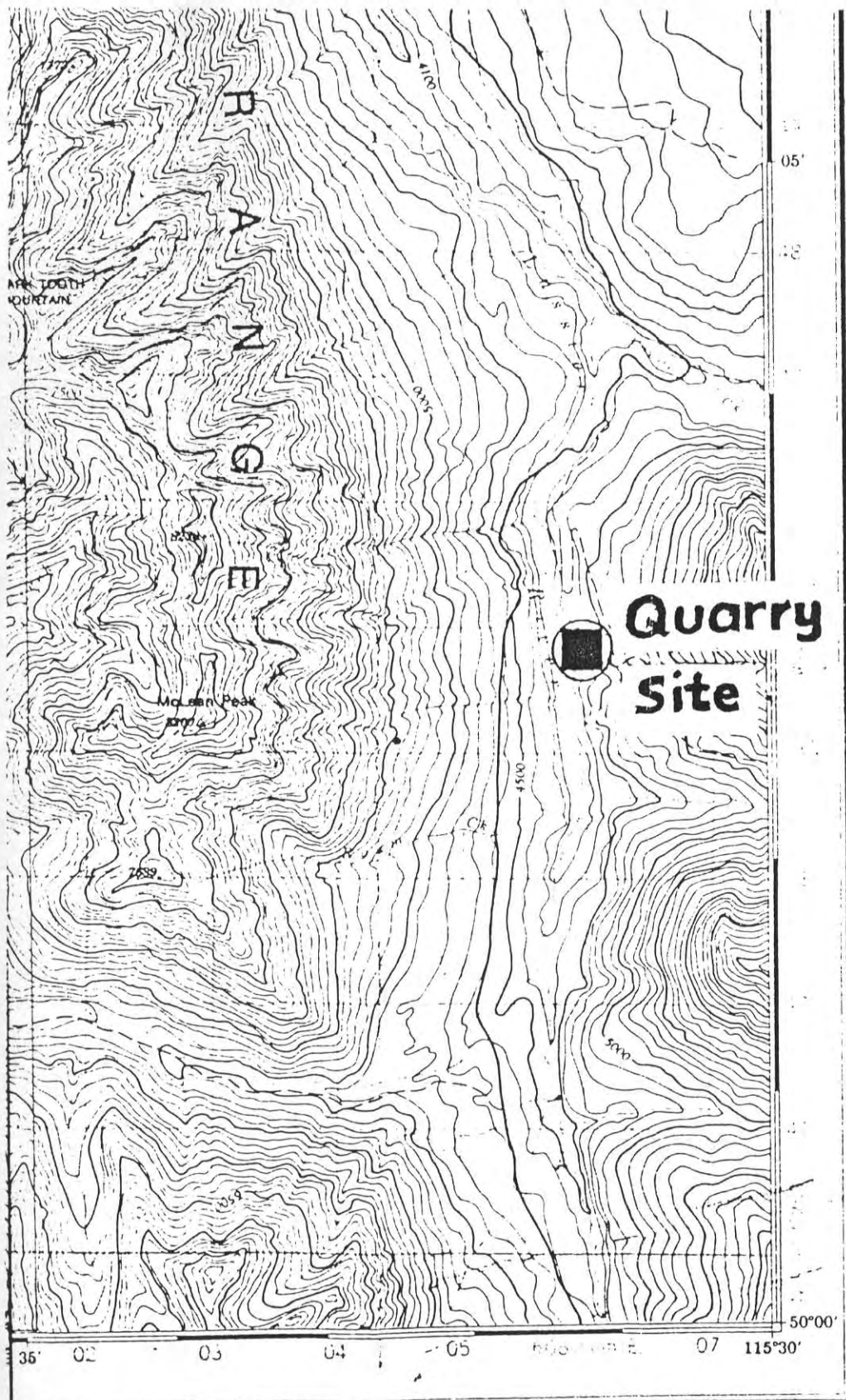
- $\frac{FU_6}{1} - \frac{CW_4}{2}$  (60% FU, 40% CW) CH = gentle-to extreme slopes
- CH (1=Common Modal Soil) g = hilly
- (2= Slightly Drier Than 1)
- SOIL TYPE
- $\frac{GB_1}{g}$  FU=Four Points [fluvial, limestone derived, well drained, floodplain soil ]
- CW=Couldron [colluvium, stoney, limestone soil, steep slopes ]
- GB=Gagnebin [fluvioglacial, limestone derived, terraces & fans ]

Macelle, 1978

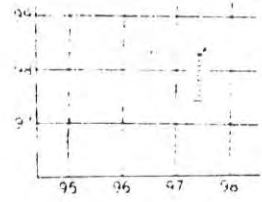


**FIG. 5 Canada Land Inventory ; SOILS**





TO GIVE A REFERENCE TO NEAREST 100 METRES  
 EXEMPLE DE LA METHODE EMPLOYEE  
 POUR FIXER DES REPERES A 100 METRES PRES

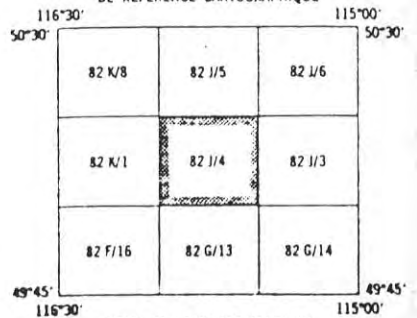


REFERENCE POINT CHURCH EGLISE (as shown  
 POINT DE REPERE ici dessus)

EASTING: Quad number on grid line immediately east of point	
NORTHING: Note the number on the line of the grid line immediately to the left of the point	97
Estimate tenths of a square from the line to the point	
Estimate the number of squares to the center of the line and the reference in direction east	5
	975
NORTHING: Read number on grid line immediately below point	
EASTING: Note the number on the line of the grid line immediately to the right of the point	98
Estimate tenths of a square from the line northward to point	
Estimate the number of squares to the center of the line and the reference in direction north	4
	984
GRID REFERENCE	975984
REFERENCE AU QUADRILLAGE	975984

Scale: 1:50,000 (1 inch = 1.27 kilometers / 1:25,000 (1 inch = 0.635 kilometers))

TABLEAU D'ASSEMBLAGE DU SYSTEME NATIONAL DE REFERENCE CARTOGRAPHIQUE



INDEX TO ADJOINING MAPS OF THE NATIONAL TOPOGRAPHIC SYSTEM

# FIG. 1

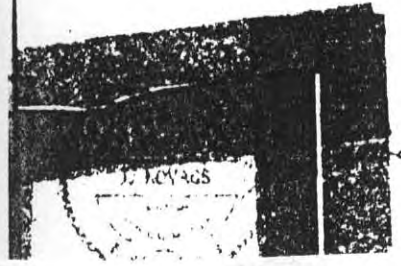
CANAL FLATS  
 82 J/4  
 EDITION 2

Établie par la DIRECTION DES LEVÉS ET DE LA CARTOGRAPHIE, MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES. Mise à jour à l'aide de photographies aériennes prises en 1972. Vérification des ouvrages en 1975. Renseignements à jour en 1975.

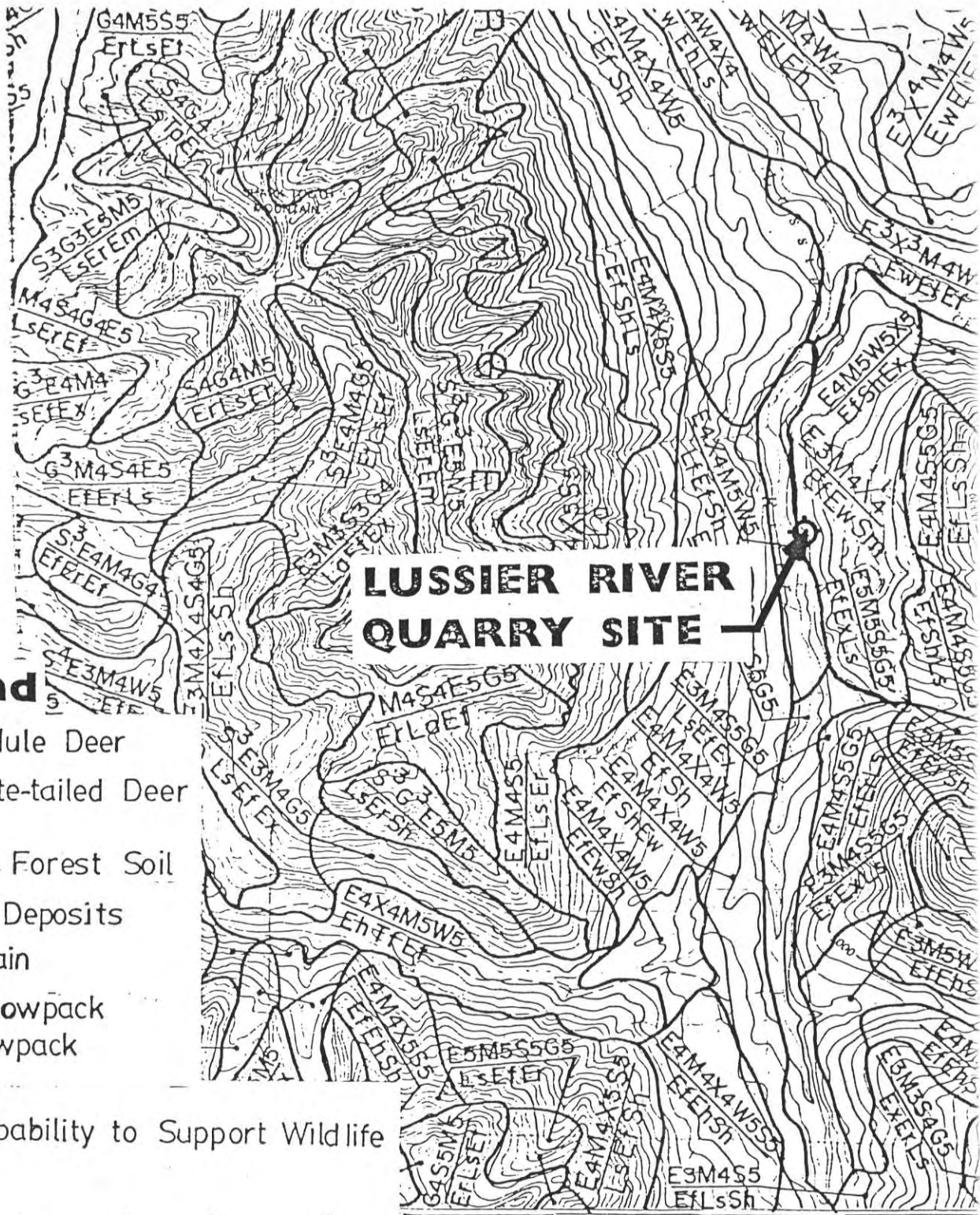
Ces cartes sont en vente au Bureau des Cartes du Canada, Ministère de l'Énergie, des Mines et des Ressources, Ottawa, ou chez le vendeur le plus près.

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# LOCATION MAP



**NORTH**



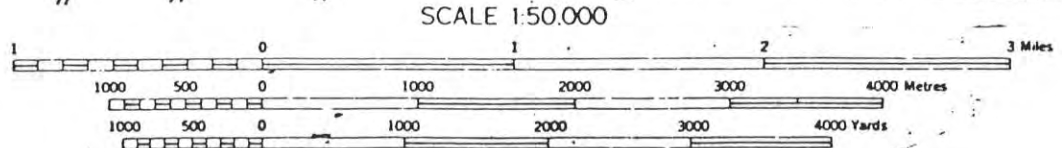
**LUSSIER RIVER  
QUARRY SITE**

**Legend**

TOP: E=Elk M=Mule Deer  
 X=Moose W=White-tailed Deer

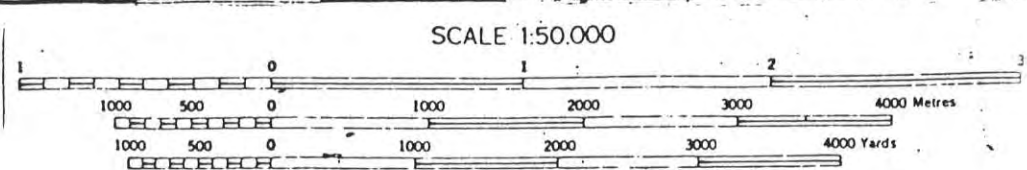
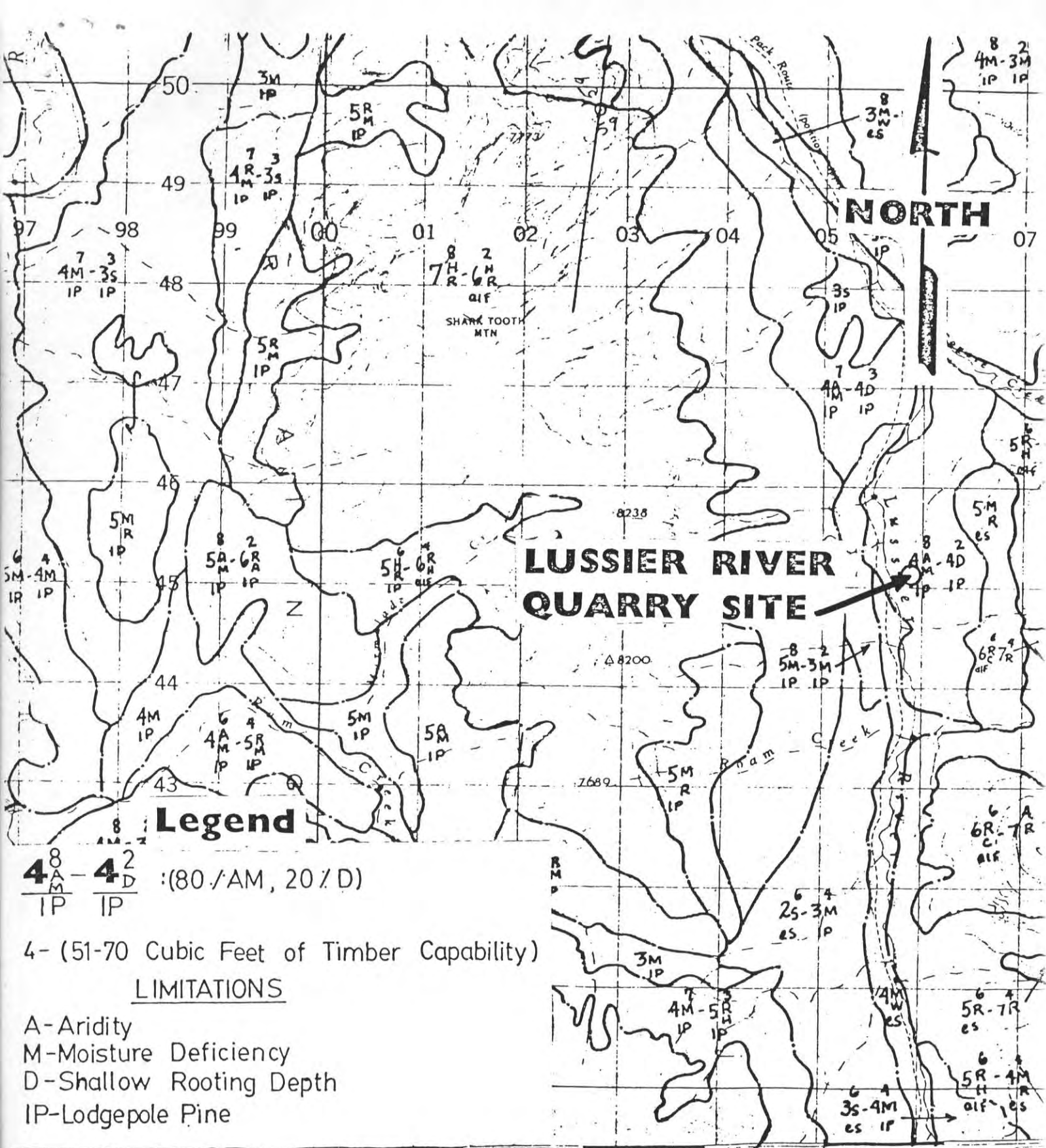
BOTTOM: Ef=Upland Forest Soil  
 Ew=Deep-Fluvial Deposits  
 Lf=Active Floodplain  
 Sm=0.5-1.0 m. Snowpack  
 Sh= 1.0m. Snowpack

1 = Very High Capability to Support Wildlife  
 ↓  
 5 = Very Low " " " "



**Canada Land Inventory  
Wildlife Capability**

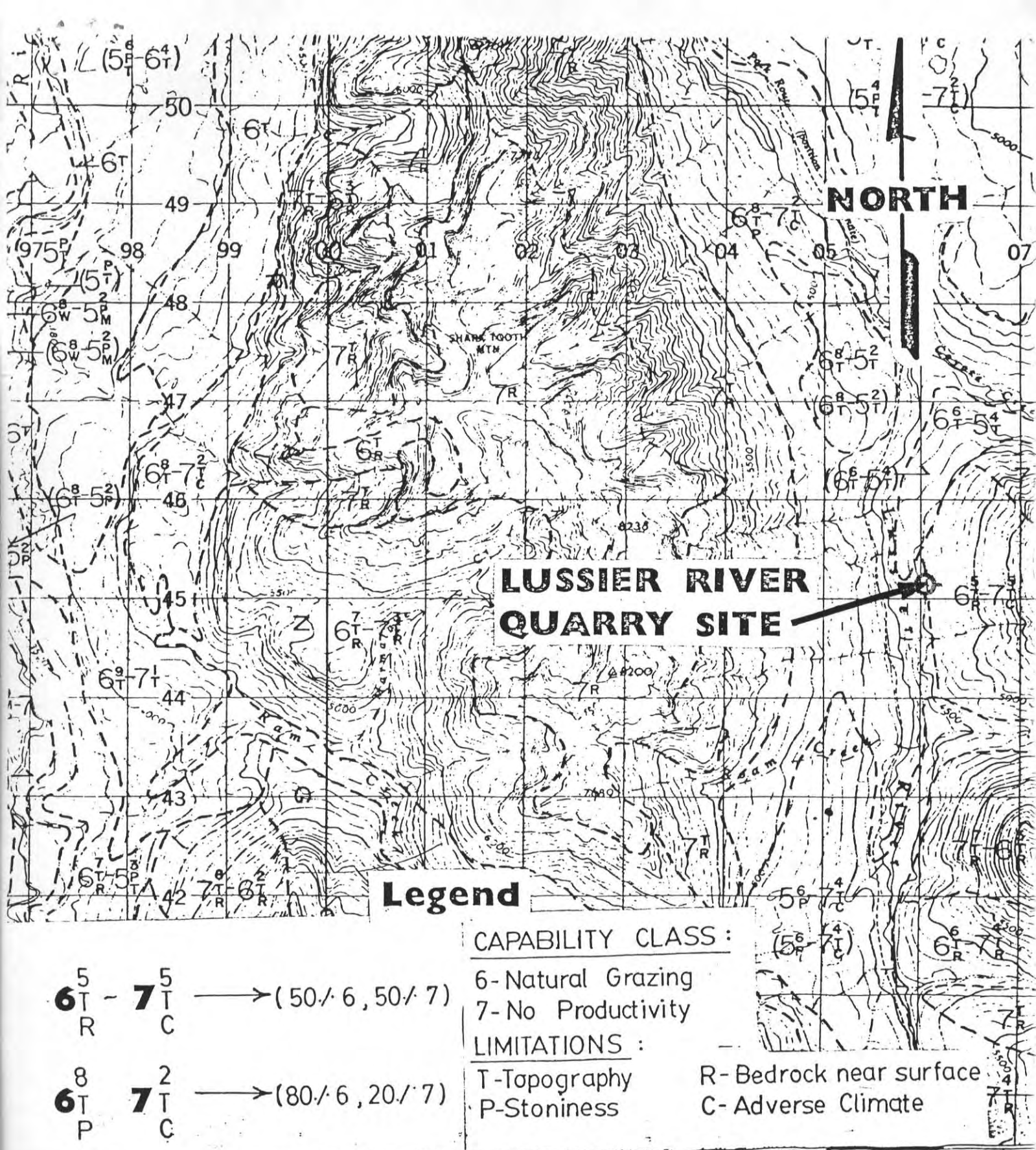
**Fig. 6**



**Canada Land Inventory**

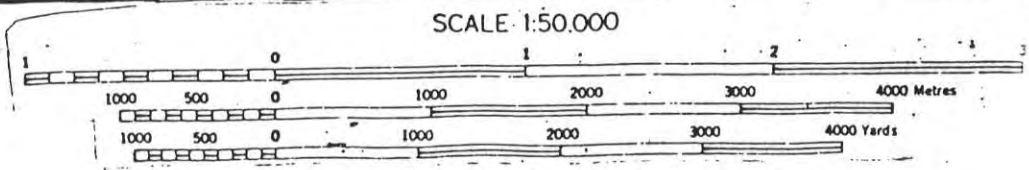
**Fig.7**

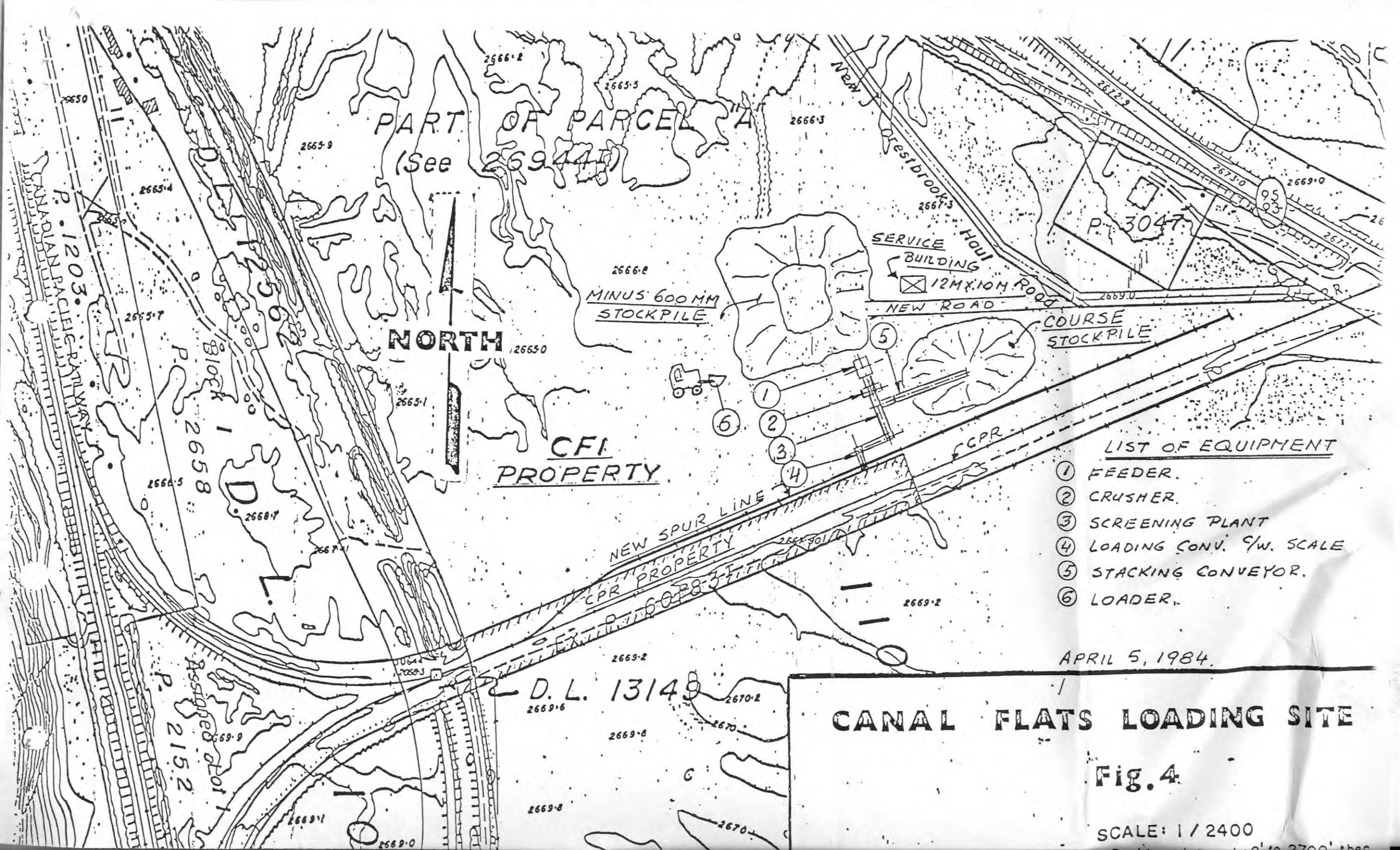
**Forest Capability**



**Fig. 8**

**Canada Land Inventory  
 Agricultural Capability**





- LIST OF EQUIPMENT
- ① FEEDER.
  - ② CRUSHER.
  - ③ SCREENING PLANT
  - ④ LOADING CONV. S/W. SCALE
  - ⑤ STACKING CONVEYOR.
  - ⑥ LOADER.

APRIL 5, 1984.

**CANAL FLATS LOADING SITE**

**Fig. 4**

SCALE: 1 / 2400