

DU PONT OF CANADA EXPLORATION LIMITED

REPORT ON WOLVERINE

COAL PROJECT

PEACE RIVER DISTRICT

BRITISH COLUMBIA

NTS : 93P, 93I

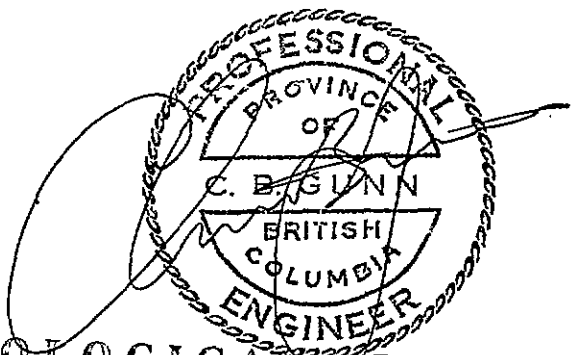
COAL LICENCES 3914 TO 3929

AUGUST - DECEMBER 1978

55° 05'

121° 07'

OPEN FILE



PROFESSIONAL
 PROVINCE OF
 C. B. GUNN
 BRITISH COLUMBIA
 ENGINEER

GEOLOGICAL BRANCH
 ASSESSMENT REPORT
 C. B. Gunn P. E. REPORT

May 1979

00 514

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Drawing No. wo 79-3	Geological compilation map scale 1:50,000	" ✓

SUMMARY

Sixteen contiguous coal licences granted to Du Pont of Canada Exploration Limited in June 1978 were reconnaissance mapped in September 1978. The mapping was carried out by a field party of four, under the direction of C. B. Gunn, on foot with the aid of a Hughes 500D helicopter.

The main elements of stratigraphy and structure were determined and are described in this report. The rocks exposed belong to the Compton and Shaftesbury formations of the Lower **Cretaceous** Fort St. John group. Coal seams were not directly observed in outcrops but **subcrops** below till and soil cover are possible. The presence of **potentially** economic coal seams on the licences is **inferred** from exposures in the adjoining licences held by Denison Mines and records of oil and gas test wells drilled on the property. No estimates of potential coal tonnage can be made on the basis of present information.

INTRODUCTION

This report describes fieldwork and office data compilation on the subject property carried out between August 1978 and January 1979. On August 1st the writer made a **reconnaissance** visit to the property. In September a field camp consisting of Atco trailers was set up on the property, supported by truck from Chetwynd. The field party consisted of two geologists (C. B. Gunn and L. K. **Eccles**) aided by two geological assistants. Between September 13th and 28th about 40 **mandays** of mapping were completed, using 8 hours of Hughes 400D helicopter support. During this period about 32 km of geological traversing was completed. Office compilation of data was carried out between October and December. In November the trailer camp was removed for the winter.

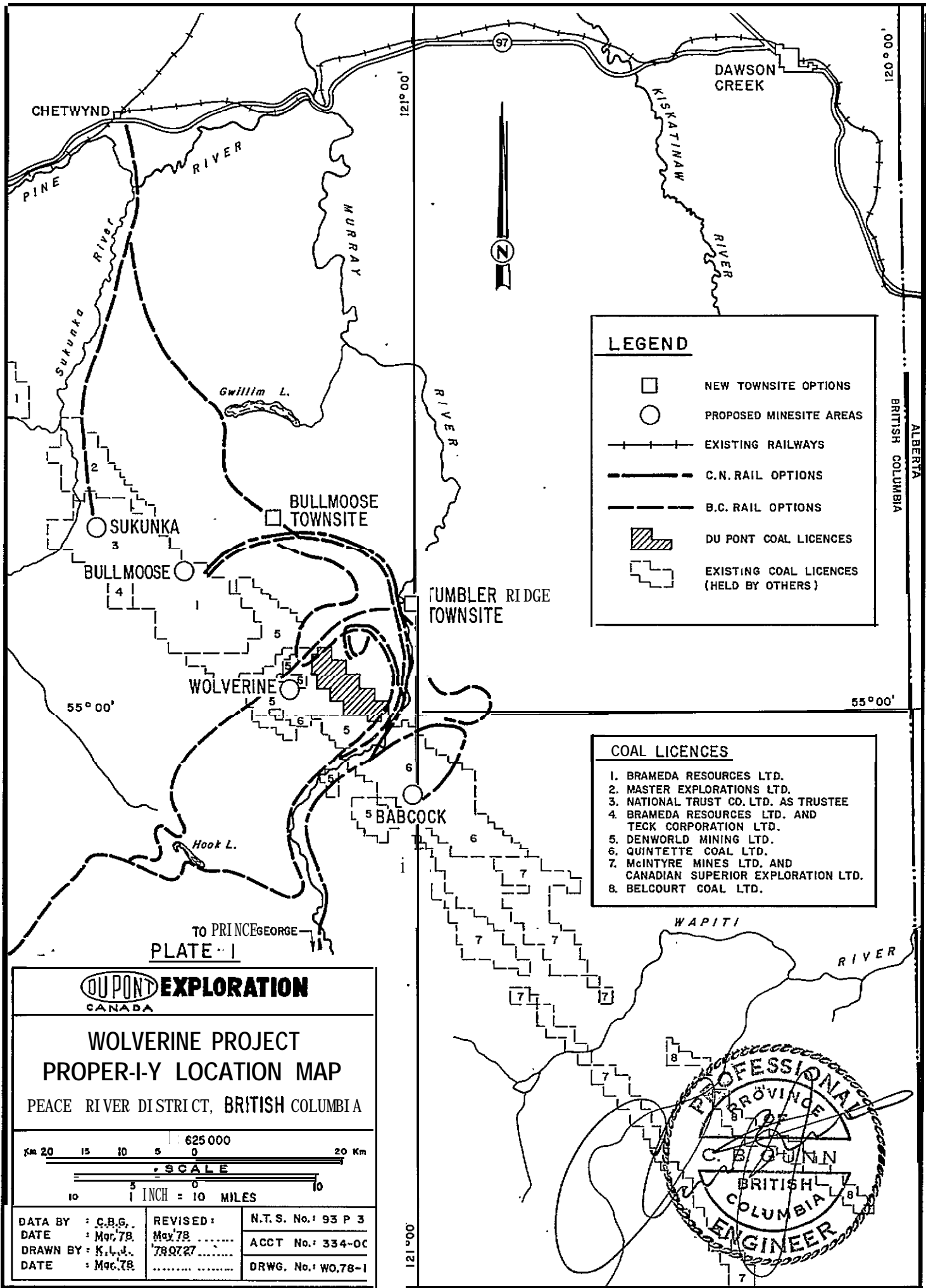
LOCATION AND ACCESS

The property is in the Peace River coalfield, British Columbia in NTS 93-I-14 and 93-P-3 (Plate 1). The **licence** area is 80 km south of the town of Chetwynd from which it is accessible by gravel surfaced 2-wheel drive logging road. A steel bridge constructed by Denison Mines gives access across the Wolverine River at Mast Creek. **From** there a 4-wheel-drive road to Denison's adjacent Sheriff Mountain open pit prospect passes through the centre of Du **Pont's** property. A good gravel airstrip suitable for Twin Otter aircraft is situated in the Wolverine River valley 2 km northwest of the property. Numerous helicopter pads exist on the property, chiefly along seismic lines cut for oil exploration. Elsewhere places where a helicopter can land are scarce because of dense forest or secondary growth in previously cleared areas.

PROPERTY

The property is comprised of sixteen (16) contiguous coal **licences**, granted to Du Pont of Canada Exploration Limited on 1979 06 23. These are listed below.

<u>Licence No.</u>	<u>Acreage</u>	<u>Hectares</u>	<u>NTS</u>	<u>Block</u>	<u>Unit</u>
3914	184	74	93-I-14	I	96
3915	734	297	93-P-3	A	5,6,15,16
3916	734	297	93-P-3	A	7,8,17,18
3917	734	297	93-P-3	A	9,10,19,20
3918	734	297	93-P-3	A	27,28,37,38
3919	734	297	93-P-3	A	29,30,39,40
3920	734	297	93-P-3	B	21,22,31,32
3921	733	297	93-P-3	A	49,50,59,60



LEGEND

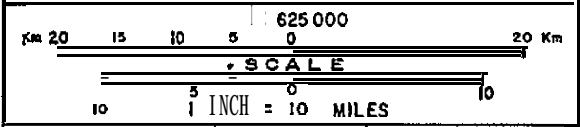
- NEW TOWNSITE OPTIONS
- PROPOSED MINESITE AREAS
- +—+— EXISTING RAILWAYS
- - - C.N. RAIL OPTIONS
- - - B.C. RAIL OPTIONS
- ▨ DU PONT COAL LICENCES
- EXISTING COAL LICENCES (HELD BY OTHERS)

COAL LICENCES

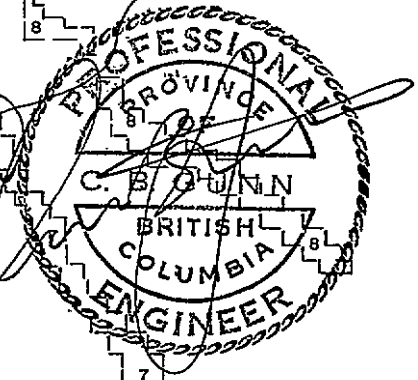
1. BRAMEDA RESOURCES LTD.
2. MASTER EXPLORATIONS LTD.
3. NATIONAL TRUST CO. LTD. AS TRUSTEE
4. BRAMEDA RESOURCES LTD. AND TECK CORPORATION LTD.
5. DENWORLD MINING LTD.
6. QUINTETTE COAL LTD.
7. McINTYRE MINES LTD. AND CANADIAN SUPERIOR EXPLORATION LTD.
8. BELCOURT COAL LTD.

DU PONT EXPLORATION
CANADA

**WOLVERINE PROJECT
PROPER-I-Y LOCATION MAP**
PEACE RIVER DISTRICT, BRITISH COLUMBIA



DATA BY : C.B.G.	REVISED : May '78	N.T.S. No.: 93 P 3
DATE : Mar '78	780727	ACCT No.: 334-0C
DRAWN BY : K.L.J.		DRWG. No.: W0,78-1
DATE : Mar '78		



121°15'

121°00'



WOLVERINE RIVER

MURRAY RIVER

West Cr.

W0.78-16

W0.78-17

DENISON CAMP

△6d-80-A

DU PONT CAMP

△6b-60-A

OUTLINE OF DU PONT COALLICENCES

DENISON

SHERIFF PIT

W0.78-18










W0.78-19

FRAME PIT

DENISON

55°00'

LEGEND

-  ROAD
-  CONTACT
-  FAULT
-  ANTICLINE
-  WELL
-  CAMP
-  OPEN PIT (PLANNED)
-  COMMOTION FORMATION
-  GEOLOGY MAP OUTLINE (SCALE 1:10 000)

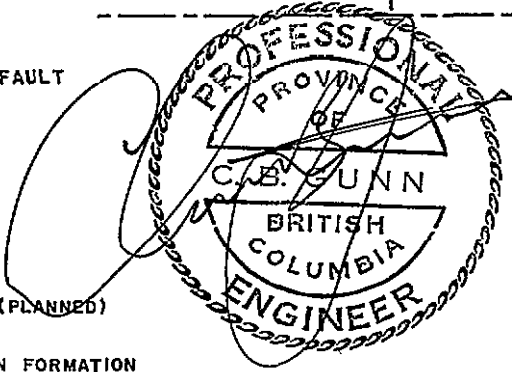
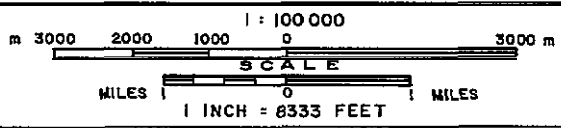


PLATE 2



WOLVERINE PROJECT
SUMMARY GEOLOGY
 PEACE RIVER DISTRICT, BRITISH COLUMBIA



DATA BY : C.B.G.	REVISED :	N.T.S. No. : 93 P 3
DATE : Jan. '79	ACCT No. : 334-00
DRAWN BY : K.L.V.	DRWG. No. : W0.79-1A
DATE : Jan. '79	

TABLE I

TABLE OF FORMATIONS

Series	Group	Formation	Thickness (feet)	Lithology	
Upper Cretaceous		Dunvegan	300-1,200	Marine and non-marine sandstone and shale	
	Lower Cretaceous	Fort St. John Group	Cruiser	350-800	Dark grey marine shale with sideritic concretions; some sandstone
Goodrich			50-1,350	Fine-grained, crossbedded sandstone; shale and mudstone	
Hasler			500(?) - 1,500	Silty, dark grey marine shale with sideritic concretions; siltstone and sandstone in lower part; minor conglomerate	
Commotion					
Boulder Creek Member			240-560	Fine-grained, well-sorted sandstone; massive conglomerate; non-marine sandstone and mudstone	
Hulcross Member			10-450	Dark grey marine shale with sideritic concretions	
Gates ¹			220-900	Fine-grained, marine and non-marine sandstones; conglomerate; coal; shale and mudstone	
Moosebar			100-1,000	Dark grey marine shale with sideritic concretions; glauconitic sandstone and pebbles at base	
			Gething	75-1,000	Fine- to coarse-grained, brown, calcareous, carbonaceous sandstone; coal, carbonaceous shale, and conglomerate
			Cadomin	45-600	Massive conglomerate containing chert and quartzite pebbles

¹Gates sandstones in Peace River region are considered as a formation; farther south they are included in Gates Member of Commotion Formation.

<u>Licence No.</u>	<u>Acreage</u>	<u>Hectares</u>	<u>NTS</u>	<u>Block</u>	<u>Unit</u>
3922	733	297	93-P-3	B	41,42,51,52
3923	733	297	93-P-3	B	43,44,53,54
3924	7.33	297	93-P-3	B	61,62,71,72
3925	733	297	93-P-3	B	63,64,73,74
3926	367	149	93-P-3	B	65,75
3927	733	297	93-P-3	B	83,84,93,94
3928	184	74	93-P-2	B	85
3929	<u>184</u>	<u>74</u>	93-I-14	I	97
1 6	<u>9 721</u>	<u>3 935</u>			

The boundaries and numbers of the **licences** are shown on the geological field maps (Wo 79, 16-19).

PREVIOUS WORK

There is no record of previous exploration for coal. Extensive coal exploration has been carried out by Denison Mines in the adjacent Sheriff Mt., some of which might be relevant to this property, but the results have not been made available to Du Pont.

Reconnaissance mapping for oil was carried out in the licence area by B. I. Nesbitt in 1951 for Spooner Oil and by P.B. Jones in 1959 for Triad Oil. During the summers of 1959-61 D.F. Stott mapped the area on a regional basis. His stratigraphic compilations (G.S.C. Paper 62-39) are used as a basis for Du Pont's field mapping. G.S.C. Map 19-1961 shows general geological relations in the region. G.S.C. Open-File 286 and the B.C. Ministry of Mines 1977 Compilation map of the Peace River Coalfield (B.P. Flynn 1977) also cover the licence area. All of the above appear to be based largely on air photo interpretation and lack detailed structural and stratigraphic information; nor do they agree in their interpretations.

In 1973 Kerr-McGee Corporation drilled a test well (Mast b-60-A) on licence No. 3921, and in 1974 a second well (Mast d-80-A) about 2 km to the north. Lithologic and electric logs for these wells indicate the presence of numerous subsurface coal **seams** and supplement our data obtained by surface mapping of outcrops. In 1978, Northern Geophysical, under contract to British Petroleum, carried out **seismic** profiling on four lines across the property but the results are presently confidential.

G E O L O G Y

Previous work indicated that the licence area, which is in the foothills belt of the Rocky Mountains, is underlain by a

generally eastward dipping sequence of Lower **Cretaceous** fresh water and marine sediments of the Fort St. John Group. The stratigraphic sequence and general lithology are shown in the Table I. More detailed lithological descriptions are given by Stott in G.S.C. Paper 62-39.

Previous work indicated a strong anticlinal structure immediately to the northwest of the Murray River in the southeast part of the licences. This feature is easily visible on aerial photographs. Some previous workers have postulated folds in the relatively low lying country of the licences between the Murray and Wolverine Rivers but these interpretations do not seem to have been based on detailed field mapping.

DU PONT FIELDWORK RESULTS 1978

Base Maps and Control

Using B.C. Government 1968' air photography, a photo mosaic was prepared by Pacific Survey Corporation at a scale of **1:10,000**. Contour information derived from government topographic sheets **93P/3E** and **92I/14E** at a scale of **1:50,000** was transferred to the semi-controlled mosaic for elevation control. This mosaic was used for location and mapping in the field. Mapping was also done directly on air photos with overlays. Selected photos from three series were used for this purpose:

- a. B.C. low level photos as approximately **1:17,000** scale.
- b. Federal high level photos at approximately **1:75,000** scale.
- c. Burnette Surveys 1975 photography at **1:15,000** flown for Denison Mines Ltd. and purchased from them.

Also purchased from Denison Mines were controlled topographic maps at **1:5,000** scale with contours at 5 m intervals and a controlled topographic map at **1:25,000** scale derived from the **1:5,000** map with contours at 20 m intervals. The latter map, enlarged to **1:10,000** scale serves as a base for the geological maps presented in this report.

Stratigraphic identification of the units shown on the Du Pont maps is based on general published descriptions of the lithology in the **area**, detailed descriptions and identifications in the two test wells (b-60-A, d-80-A), discussions with geologists experienced in the area and orientation visits in the Peace River Coalfield with government and industry geologists. Our

mapping shows that the geology of the **licence** area may be structurally complex and, in view of the general lithological similarity of some units of different ages, significant revisions to the map may be required as more information becomes available.

Outcrop

Distribution of outcrops is shown on the accompanying geological map (drawing No. Wo 79-16 to 19). All areas of outcrop were initially identified on air photographs, checked by helicopter reconnaissance and examined by geologists on ground traverses. It is unlikely that any substantial areas of outcrop have been missed but there may be additional small outcrops obscured by tall trees or dense underbrush. Most of the exposures occur in creek beds or on the high ridges in the southeast portion of the **licences**. Due to the reconnaissance nature of the mapping, the areas of outcrop as depicted on the map are somewhat **generalised**. Areas without outcrops are mantled by a cover of till and soil of unknown depth. Stream bank cuts and drill records *suggest* that the cover might exceed 100 m in places.

Lithology

Gates member. Outcrops assigned to the Gates member of the **Commotion** formation occur in the core of the anticlinal structure at the southeast end of the property (Dwg. Wo 78-19 and wo 79-2, section **D**). These are cross-bedded sandstones and pebble conglomerates. Lower lying ground between the ridges is believed to be underlain by shales, siltstones and possibly coal seams below till and soil cover. Extensive outcrops of similar rocks containing at least two thick coal seams were examined on adjacent ridges to the southwest of the property. The Gates member is estimated to be 300 m thick in this area, of which perhaps the top third **subcrops** in the core of the **anticline**.

Hulcross member. Dark grey concretionary **shale**, believed to be Hulcross crops out in a steep-walled creek bed in the south limb of the anticline previously described. Shales exposed in the creek in the core of the anticline on sections AA' and BB' are also ascribed to this unit. A relatively large area in the vicinity of section CC' may have subcropping Hulcross and possibly Gates at lower elevations but no outcrops were found.

The Hulcross member is a marine shale approximately 100 m thick in this area.

Boulder Creek member. Lithologically resistant and **topographically** prominent conglomerates and sandstones occur throughout

the length of the property. These are very similar in hand specimen to sandstones and conglomerates of the Gates but the coarseness and higher proportion of conglomerate, with frequent green **chert** and the general stratigraphic **relations** indicate that this unit is Boulder Creek. Between the conglomerate horizons are cross-bedded sands and minor shales. **Clastic** fragments of coal were seen in some outcrops and larger float coal fragments were found in creek beds in the northwest of the property. The Boulder Creek is estimated to be about 120 m thick. This is the highest member of the Commotion Formation.

Hasler Formation. Overlying the Boulder Creek, which is a useful marker horizon, is a thick series (about 750 m) of predominantly siltstones and sandstones. Where lithological subdivision is not possible these are described in total as the Shaftesbury Formation. Elsewhere they have been subdivided into three separate formations; the Hasler, Goodrich and Cruiser. This threefold division is used by us in the belief that the Goodrich is distinguishable from the Hasler. The Cruiser formation is not present on the property.

The Hasler is a unit of monotonous buff **weathering siltstones**, frequently with rusty concretions. Small to medium sized outcrops of Hasler occur in creek banks and road cuts in several parts of the property. The Hasler is estimated to be about 280 m thick.

Goodrich Formation. More massive cross-bedded sandstones **inter-bedded** with siltstones are ascribed to the Goodrich Formation. These form fairly persistent topographical features along the northeast flank of the property. Excellent exposures of both Goodrich and Hasler are to be seen in the incised creek draining southeast into the Murray River just to the northeast of the property. The more resistant Goodrich-forms two waterfalls at the northeast corner of **licence** No. 2918. The Goodrich Formation is estimated to be 350 m thick. In some outcrops it has not been possible to distinguish between Hasler and Goodrich.

Structure

The structural style of this part of the foothills belt is one of extensive en-echelon folds, frequently separated by westward dipping thrust planes. Intensity of deformation is generally strong in the southwest, decreasing northeastwards to the gentle uniform dips of the plains.

The **Wolverine area** the transition from foothills to plains structure appears to be marked by a steep westward-dipping thrust zone running roughly parallel to the strike of the folds along **Mast** Creek as far as the Denison Camp, beyond which it **seems to die out**. Minor local overturning or a detached fold are associated with this fault (see sections AA', **BB'**; Dwg. Wo 79-2).

The lack of unmistakable marker horizons and stratigraphic identifications based on cyclic and laterally discontinuous lithology make structural interpretation difficult and tentative at this stage. It is very likely that as more information becomes **available** the detailed picture will be considerably modified.

The main structural feature **recognised** is a strong anticline running the length of the **property**, as shown on Sections AA' to DD' (Dwg. No 79-2). Lack of exposure between sections CC' and DD' make the correlation of the anticlinal axes between the two sections very tentative at present.

A complex of folds (and possibly faults) to the southwest of the main anticlinal axis on section DD' probably continues northwest up the southwestern flank of the property; but lack of exposure in the rolling till plain makes this conjectural.

At the northwest end of the property dips and stratigraphic relations suggest the presence of another thrust but the actual fault plane was not observed.

In the southeastern extremity of the property a structural discontinuity observed in shales in a creek bank suggests the presence of a normal strike fault; an unexpected observation in an area of strong thrusting. In the larger creek to the north the Shaftesbury formation is nearly horizontal but slight folding along NW-SE axes is visible.

No cross-faults were observed but strong conjugate joint patterns were commonly observed and the presence of some cross-faulting may be suspected.

ECONOMIC GEOLOGY

No coal seams were found in place on the property. Coal which was seen cropping out on Denison ground to the southwest may be inferred to pass northeastwards in the same unit (Gates) in this property. The lateral continuity of individual seams is not known but the presence of multiple coal seams in the Gates on the property is confirmed by **the logs** of test wells b-60-A and d-80-A. In b-60-A coal is logged in at least nine horizons. The thickest section is the lowest one. In this latter section coal is reported over four successive 10 'foot intervals giving a total of 40 feet in one section, including partings.

Additional **impressive** looking coal seams were cut in the Gething formation underlying the **Moosebar** formation. For the present, Gething coals are not being considered as potentially economic as they are probably deeper than 700 m below surface, at which

0 depth, the problems of ground control could become too difficult to justify mining. Further exploration and **favourable structure** could change this assumption.

Lacking evidence to the contrary, the quality of the coal is believed to be high quality metallurgical **coking coal**, similar to that at Sheriff Mt. and Quintette. Some of the underlying Gething coals could have undesirably high sulphur content.

The next stage in exploration should include drilling to confirm stratigraphy and structure and to provide samples for testing. It is inappropriate to make estimates of potential reserves on the basis of present information.

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SELECTED REFERENCES

Stott, D.F. (1961) Dawson Creek Map-area, BC: Geological Survey of Canada Paper 61-10.

Stott, D.F. (1963) Stratigraphy of the Lower Cretaceous Fort St. John Group and Gething and Cadomin Formations, foothills of northern Alberta and British Columbia: Geological Survey of Canada Paper 62-39.

Nesbitt, B.I. (1951) Lone Mtn-Murray River area: B.C. Open File Report 84.

Suska-Krusche, M.M. (1953) Geol. Reconnaissance Bullmoose Creek area: B.C. Open File Report 344.

Jones, P.B. (1960) Geol. field work N. Monkman area and maps 863-3 (Bullmoose Ck, 93-P-3), 863-7 (Murray River, 93-I-14): B.C. Open File Report 863.

Jones, P.B. (1961) Geol. Fieldwork Monkman Pass Area, pp. 13-35, and map **927-8a**, Geol. map Murray River, and Section 927-11 (**22/I**) Cretaceous section: B.C. Open File Report 927.

Depetris, A.S. and P. Fuenning. Photogeologic and field Studies, Monkman Pass Area: B.C. Open File Report 1253 (1965).

Well History Log of KM AEG MAST d-80A, NTS 93-P-3 (Kerr McGee Corp.)

Well History log of KM et al MAST b-60A, NTS 93-P-3 (Kerr McGee Corp.)

Stott, D.F. and G.C. Taylor. Geological Survey of Canada Open File 286. Ottawa.

Flynn, B.P. (1977) Compilation Map of the Peace River Coalfield: B.C. Ministry of Mines.

Armstrong, W.M. et al. (1976) Coal in British Columbia, A Technical Appraisal: B.C. Coal Task Force Technical Committee Report.

Northeast Coal Study; Preliminary Environmental Report on Proposed Transportation Links and Townsites: Environment and **Landuse** Subcommittee on Northeast Coal Development. Victoria, B.C. (1977).

DU PONT OF CANADA EXPLORATION LIMITEDWolverine Project B.C.

Statement of Eligible Exploration

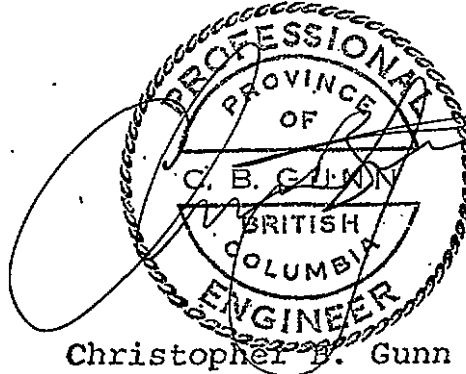
Expenses - August - December 1978

Consultant Fees		209.50
Legal Fees		275.00
Travel Expenses, Property Exam.	3	907.05
Camp Expenses	2	357.29
Mapping , Gr. Surveys, Maps, Repts.	12	046.64
Ground Clearing & Trenching	1	717.45
Freight, Hauling, Storage		59.15
Miscellaneous		10.50
Salaries - Regular	13	197.12
Salaries - Temporary	3	865.10
Equipment Rental	a	699.78
Telephone, Telex		198.79
Publications		30.00
Entertaining		15.25
Advertising & Public Relations		103.07
Auto Expenses		82.03
Repairs and Mtce (Excl. Auto)		205.76
Non-Capital Equip. Purchases	1	006.66
Depreciation Expenses		79.00
		<hr/>
TOTAL		<u>\$48 065.14</u>

CERTIFICATION

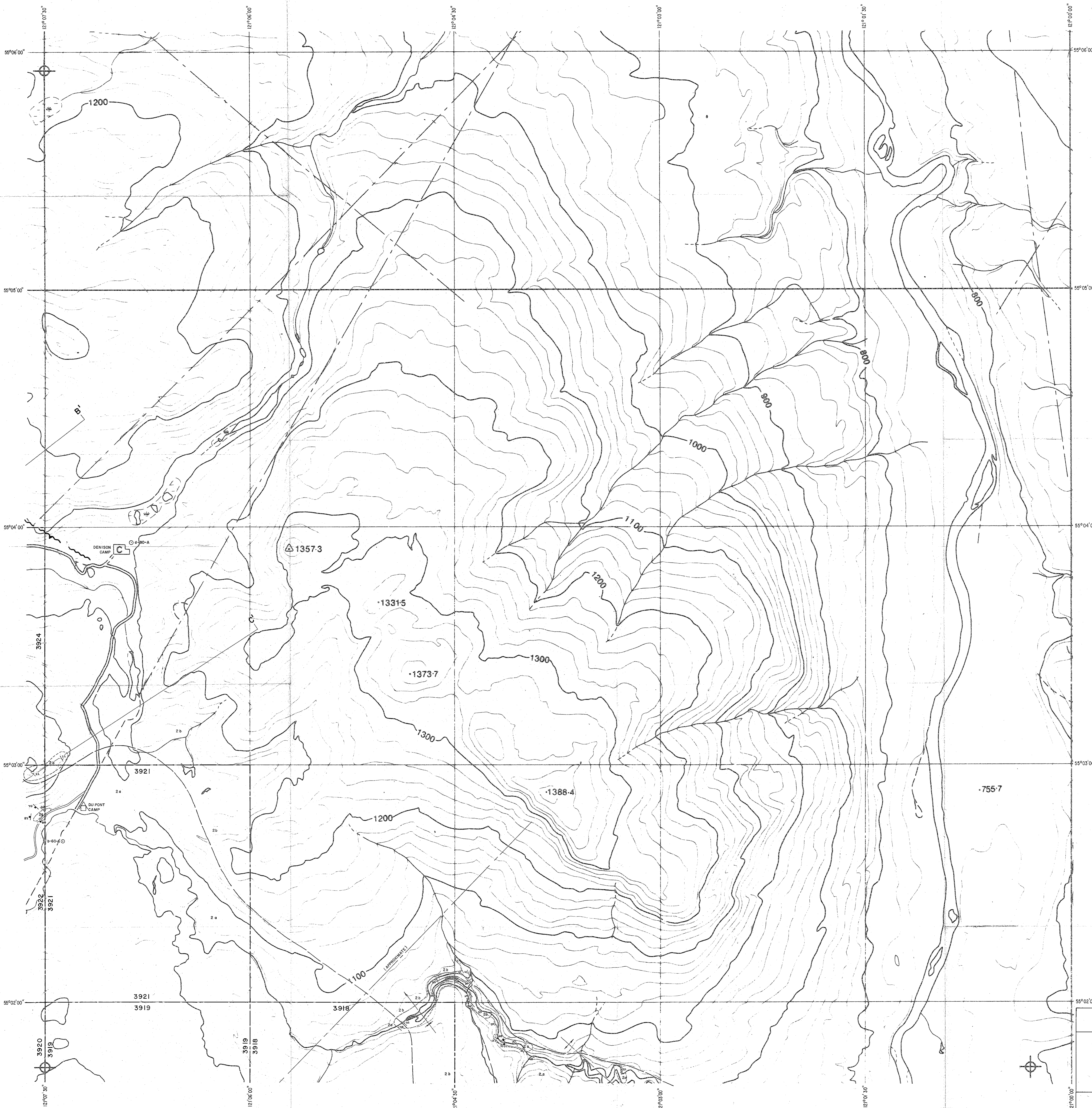
I, Christopher B. Gunn, of 2867 Panorama Drive, North Vancouver, B.C. hereby certify that:

1. I am a professional geologist and have been engaged in the practice of geology and mineral exploration since 1962 in Europe, Africa, Central and North America.
2. I hold a B.Sc. Honours degree in geology from the University of Wales and a Master of Science degree in geology from the University of Western Ontario.
3. I am a Registered Professional Engineer in the provinces of British Columbia and Ontario. I am also a Chartered Engineer of the United Kingdom.
4. The work described in this report was carried out by me or under my personal supervision.
5. I do not hold any beneficial interest, direct or indirect, in the subject property; nor do I expect to receive any such interest.

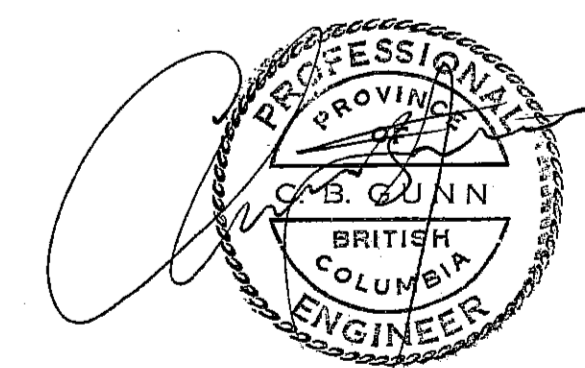


Christopher B. Gunn

May 4, 1979



- LEGEND**
- LOWER CRETACEOUS**
FORT ST. JOHN GROUP
- SHAFTSBURY FORMATION**
- 2c CRUISER FORMATION - SILTSTONE
 - 2b GOODRICH FORMATION - SANDSTONE, SHALE
 - 2a HASLER FORMATION - MARINE SHALE, SANDSTONE
- COMMOTION FORMATION**
- 1c BOULDER CREEK MEMBER - SANDSTONE, CONGLOMERATE
 - 1b HULCROSS MEMBER - MARINE SHALE
 - 1a GATES MEMBER - SANDSTONE, SHALE, SOAL
 - MOOSEBAR FORMATION (NOT ON MAP)
- SYMBOLS**
- OUTCROP
 - CONTACT
 - FAULT SHOWING DIRECTION OF MOVEMENT
 - THRUST FAULT
 - ANTICLINE
 - SYNCLINE
 - BEDDING
 - BEDDING OVERTURNED
 - JOINTING
 - DRILL HOLE
 - SURVEY PIN
 - SEISMIC LINE
 - ROCK SAMPLE
 - SECTION LINE
 - REFERENCE LINE
 - DU PONT COAL LICENCE BOUNDARY



NW SHEET	NE SHEET
DRWS NO. W0.78-16	DRWS NO. W0.78-17
SW SHEET	SE SHEET
DRWS NO. W0.78-18	DRWS NO. W0.78-19

SHEET INDEX **514**

DU-POINT
 PR. WOLVERINE T-1(A)

DU PONT EXPLORATION
 CANADA

WOLVERINE PROJECT
GEOLOGY
 MURRAY RIVER AREA, BRITISH COLUMBIA

SCALE
 1" = 1000 FEET

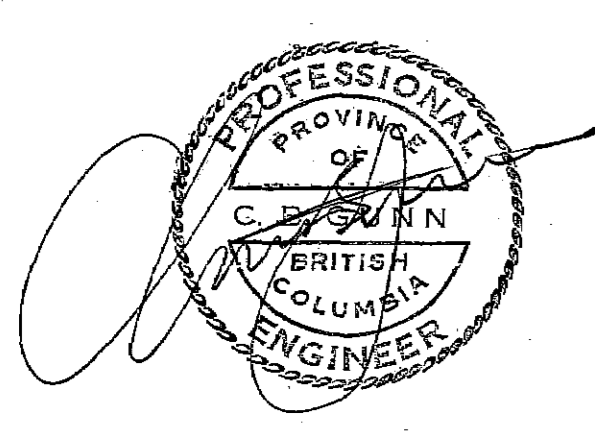
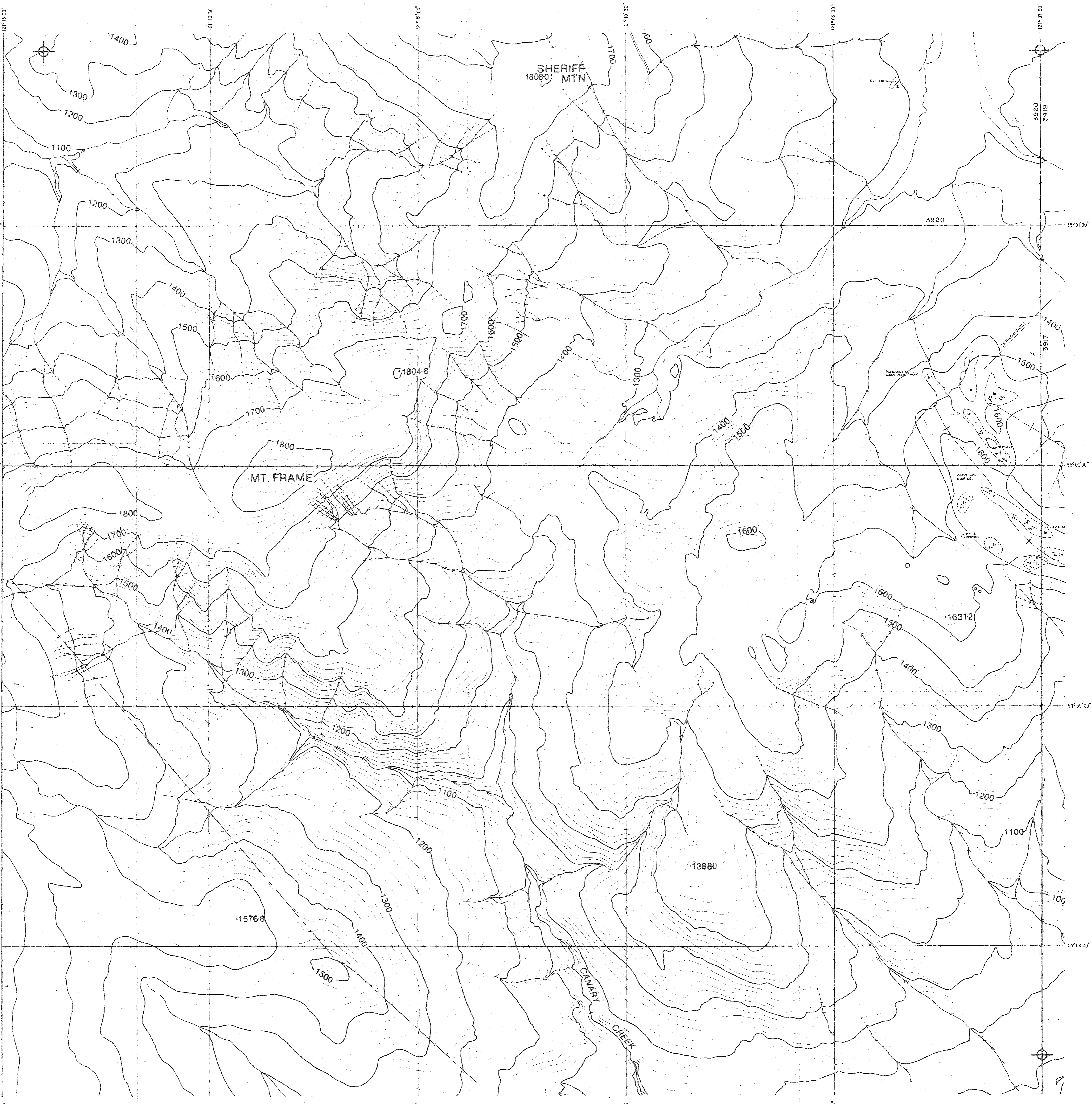
MAPPED BY: C.B.G., L.S.E.	REVISED:	N.T.S. No.: 93 P 3
DATE: SEPT. 78	ACCT No.: 334-00	
DRAWN BY: K.L.J.	DRWS No.: W0.78-17	
DATE: DEC. 78		

LEGEND

- LOWER CRETACEOUS**
FORT ST. JOHN GROUP
- SHAFTSBURY FORMATION**
- 2c CRUISER FORMATION - SILTSTONE
 - 2b GOODRICH FORMATION - SANDSTONE, SHALE
 - 2a HASLER FORMATION - MARINE SHALE, SANDSTONE
- COMMOTON FORMATION**
- 1c BOULDER CREEK MEMBER - SANDSTONE, CONGLOMERATE
 - 1b HULCROSS MEMBER - MARINE SHALE
 - 1a GATES MEMBER - SANDSTONE, SHALE, COAL
- MOOSEBAR FORMATION (NOT ON MAP)

SYMBOLS

- OUTCROP
- CONTACT
- FAULT SHOWING DIRECTION OF MOVEMENT
- THRUST FAULT
- ANTICLINE
- SYNCLINE
- BEDDING
- BEDDING OVERTURNED
- JOINTING
- DRILL HOLE
- SURVEY PIN
- SEISMIC LINE
- ROCK SAMPLE
- SECTION LINE
- REFERENCE LINE
- DUPONT COAL LICENCE BOUNDARY



NW SHEET	NE SHEET
SW SHEET	SE SHEET

SHEET INDEX

514

DUPONT EXPLORATION CANADA

WOLVERINE PROJECT

GEOLOGY

MURRAY RIVER AREA, BRITISH COLUMBIA

SCALE: 1 INCH = 1000 FEET

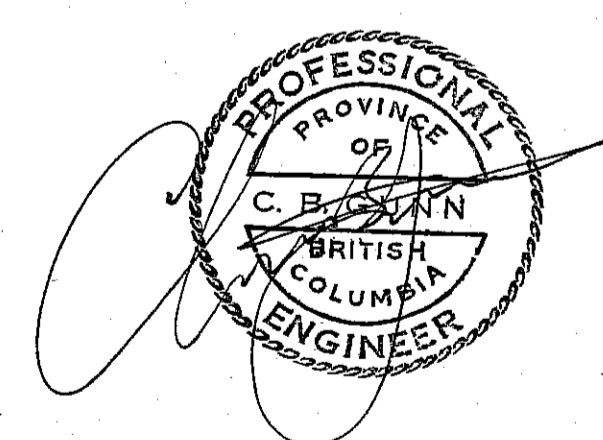
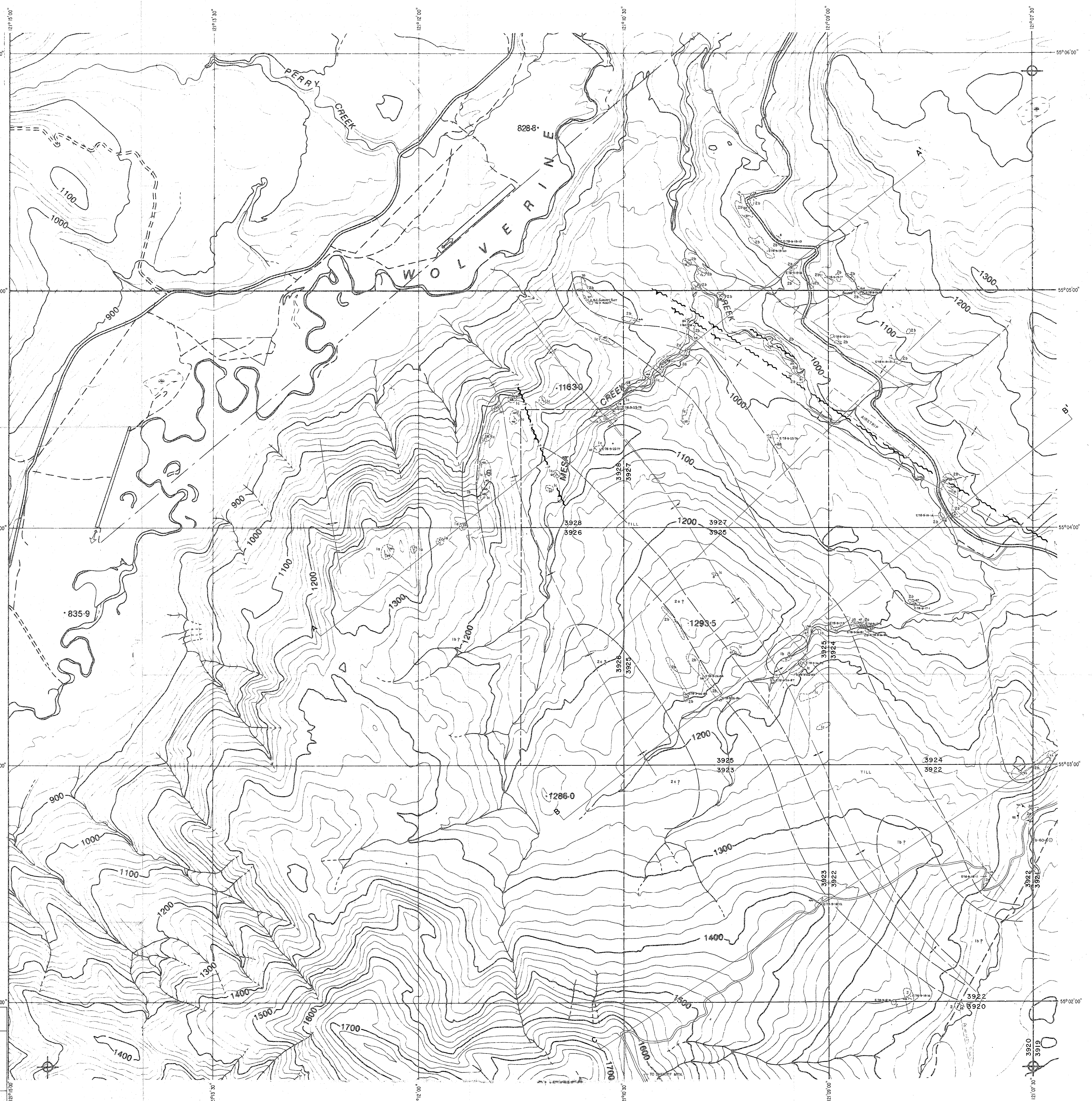
MAPPED BY: C.B., L.K.E. REVISIONS: N.T.S. No. 93 P. 3
DATE: SEPT. 78 ACT No. 324-00
DRAWN BY: K.L.W.
DATE: DEC. 78 DRWG No. W078-10

LEGEND

- LOWER CRETACEOUS
FORT ST. JOHN GROUP
- SHAFTSBURY FORMATION
- 2c CRUISER FORMATION - SILTSTONE
 - 2b GOODRICH FORMATION - SANDSTONE, SHALE
 - 2a HASLER FORMATION - MARINE SHALE, SANDSTONE
- COMMOTION FORMATION
- 1c BOULDER CREEK MEMBER - SANDSTONE, CONGLOMERATE
 - 1b HULCROSS MEMBER - MARINE SHALE
 - 1a GATES MEMBER - SANDSTONE, SHALE, COAL
- MOOSEBAR FORMATION (NOT ON MAP)

SYMBOLS

- OUTCROP
- CONTACT
- FAULT SHOWING DIRECTION OF MOVEMENT
- THRUST FAULT
- ANTICLINE
- SYNCLINE
- BEDDING
- BEDDING OVERTURNED
- JOINTING
- DRILL HOLE
- SURVEY PIN
- SEISMIC LINE
- ROCK SAMPLE
- SECTION LINE
- REFERENCE LINE
- DU PONT COAL LICENCE BOUNDARY



NW SHEET DRAWG NO. W078-15	NE SHEET DRAWG NO. W078-17
SW SHEET DRAWG NO. W078-16	SE SHEET DRAWG NO. W078-18

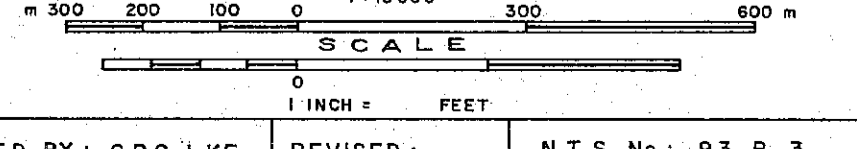
SHEET INDEX **514**

20-PANT
PR. WOLVERINE 78(C)A

EXPLORATION
CANADA

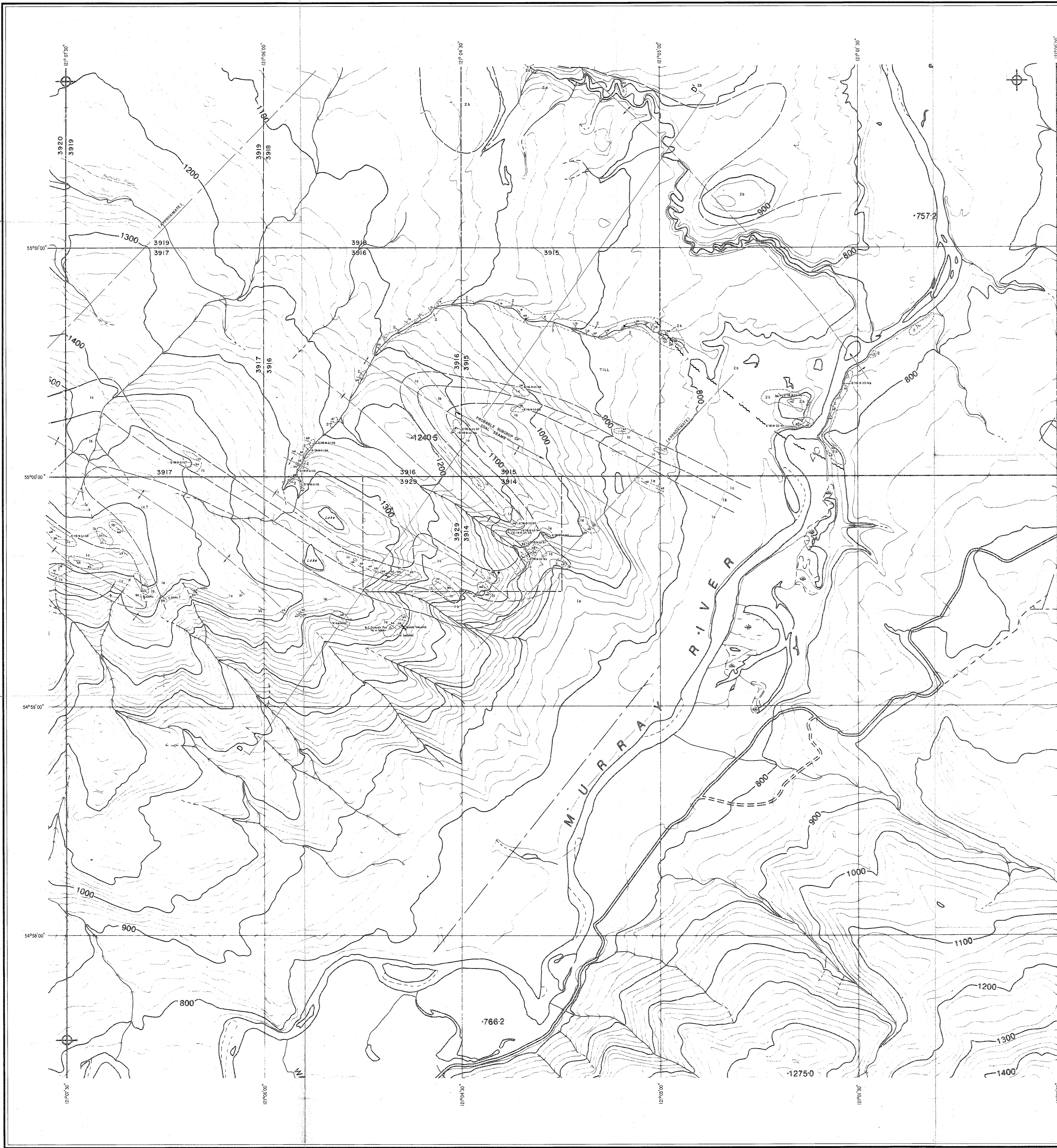
WOLVERINE PROJECT
GEOLOGY

MURRAY RIVER AREA, BRITISH COLUMBIA



MAPPED BY: C.B.L., L.M.E. REVISION: N.T.S. No. 93 P 3
 DATE: SEP. 78 ACCT No. 334-00
 DRAWN BY: K.L. DRWG No. W078-16
 DATE: DEC. 78

3922
3921
3920

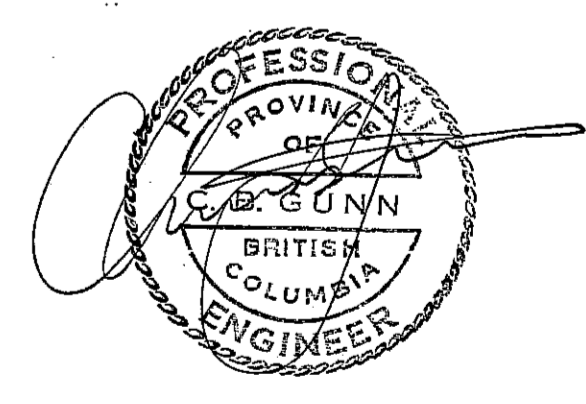


LEGEND

- LOWER CRETACEOUS**
FORT ST. JOHN GROUP
- SHAFTSBURY FORMATION
 - 2c CRUISER FORMATION - SILTSTONE
 - 2b GOODRICH FORMATION - SANDSTONE, SHALE
 - 2a HASLER FORMATION - MARINE SHALE, SANDSTONE
 - COMMOTION FORMATION
 - 1c BOULDER CREEK MEMBER - SANDSTONE, CONGLOMERATE
 - 1b HULCROSS MEMBER - MARINE SHALE
 - 1a GATES MEMBER - SANDSTONE, SHALE, COAL
 - MOOSEBAR FORMATION (NOT ON MAP)

SYMBOLS

- OUTCROP
- CONTACT
- FAULT SHOWING DIRECTION OF MOVEMENT
- THRUST FAULT
- ANTICLINE
- SYNCLINE
- BEDDING
- BEDDING OVERTURNED
- JOINTING
- DRILL HOLE
- SURVEY PIN
- SEISMIC LINE
- ROCK SAMPLE
- SECTION LINE
- REFERENCE LINE
- DU PONT COAL LICENCE BOUNDARY



NW SHEET DRWG NO. W078-16	NE SHEET DRWG NO. W078-17
SW SHEET DRWG NO. W078-18	SE SHEET DRWG NO. W078-19

SHEET INDEX

20-POINT
CR. WOLVERINE T(2)A. 514

DUPONT EXPLORATION
CANADA

WOLVERINE PROJECT

GEOLOGY

MURRAY RIVER AREA, BRITISH COLUMBIA

1:50,000
SCALE

1 INCH = 1250 FEET

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 DATE: SEP. 78 ACCT No. 334-00
 DRAWN BY: K.L.J. DATE: DEC. 78 DRWG No. W078-19

LEGEND
 LOWER CATEGORIES
 (1) Lower category (1:1)
 (2) Lower category (1:2)

SYMBOLS
 (1) Spot
 (2) Spot

LEGEND
 LOWER CATEGORIES
 (1) Lower category (1:1)
 (2) Lower category (1:2)

SYMBOLS
 (1) Spot
 (2) Spot

LEGEND
 LOWER CATEGORIES
 (1) Lower category (1:1)
 (2) Lower category (1:2)

SYMBOLS
 (1) Spot
 (2) Spot

LEGEND
 LOWER CATEGORIES
 (1) Lower category (1:1)
 (2) Lower category (1:2)

SYMBOLS
 (1) Spot
 (2) Spot

LEGEND
 LOWER CATEGORIES
 (1) Lower category (1:1)
 (2) Lower category (1:2)

SYMBOLS
 (1) Spot
 (2) Spot

LEGEND
 LOWER CATEGORIES
 (1) Lower category (1:1)
 (2) Lower category (1:2)

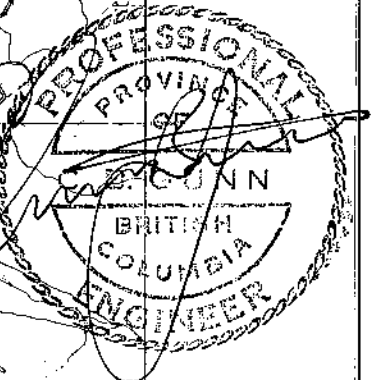
SYMBOLS
 (1) Spot
 (2) Spot

LEGEND
 LOWER CATEGORIES
 (1) Lower category (1:1)
 (2) Lower category (1:2)

SYMBOLS
 (1) Spot
 (2) Spot

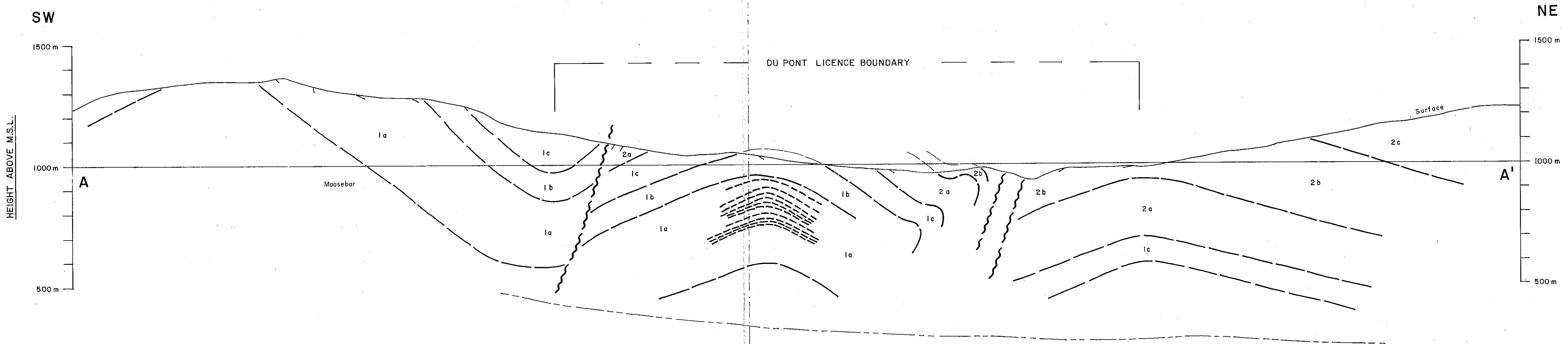
LEGEND
 LOWER CATEGORIES
 (1) Lower category (1:1)
 (2) Lower category (1:2)

SYMBOLS
 (1) Spot
 (2) Spot

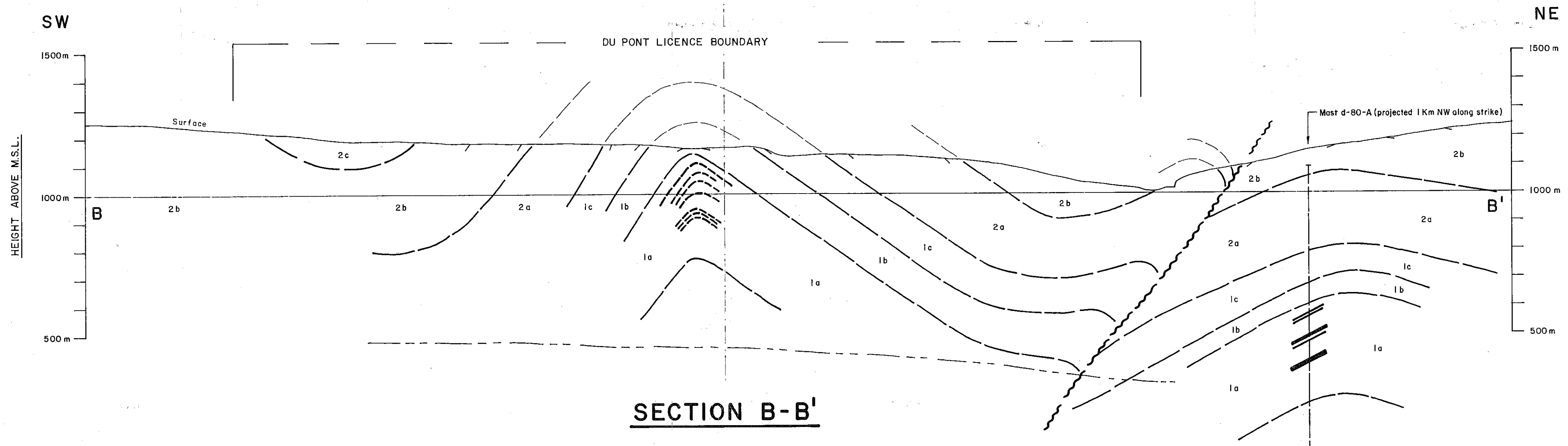


DU-PONT
 PR. WOLVERINE 78(2)A.

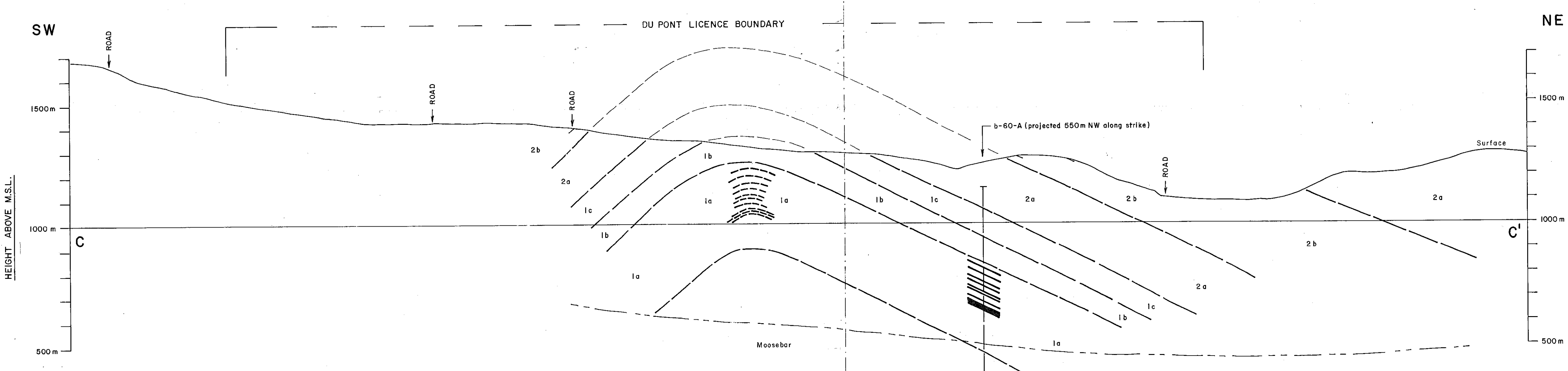
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 DRWG No. WO.79-3



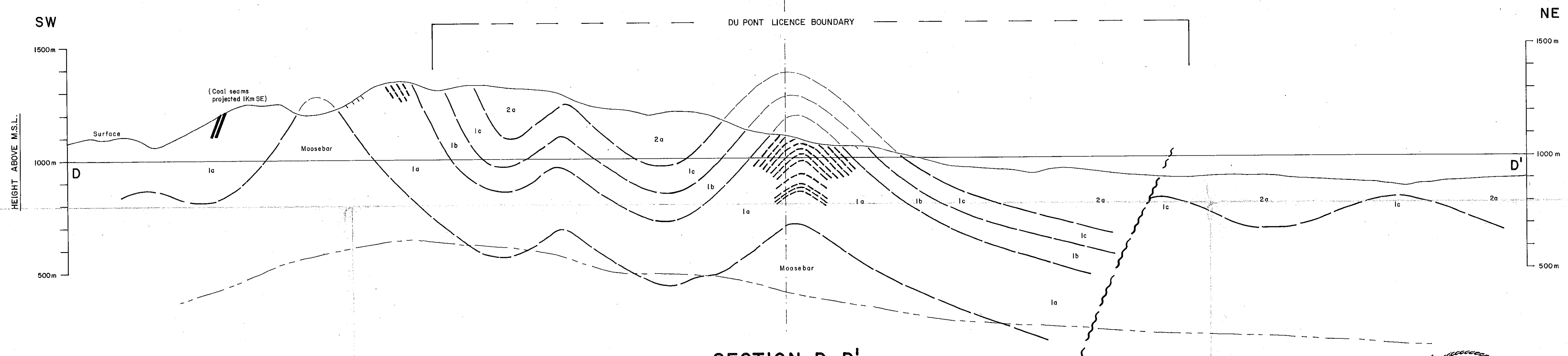
SECTION A-A'



SECTION B-B'



SECTION C-C'



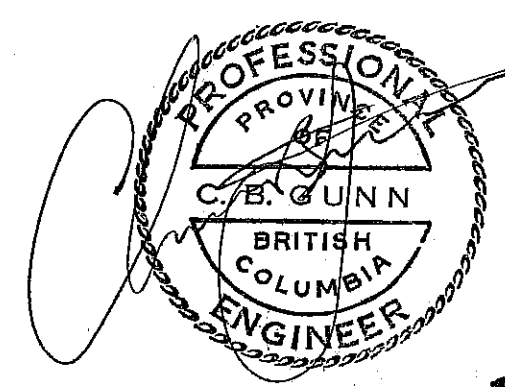
SECTION D-D'

LEGEND

- LOWER CRETACEOUS
FORT ST. JOHN GROUP**
- SHAFTSBURY FORMATION**
- 2c CRUISER FORMATION - SILTSTONE
 - 2b GOODRICH FORMATION - SANDSTONE, SHALE
 - 2a HASLER FORMATION - MARINE SHALE, SANDSTONE
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- 1c BOULDER CREEK MEMBER - SANDSTONE, CONGLOMERATE
 - 1b HULCROSS MEMBER - MARINE SHALE
 - 1a GATES MEMBER - SANDSTONE, SHALE, COAL
 - MOOSEBAR FORMATION

SYMBOLS

- CONTACT, INFERRED
- FAULT, INFERRED
- COAL SEAM
- COAL SEAM, INFERRED
- 700 METRES BELOW SURFACE
- REFERENCE LINE



DU PONT
PR. WOLVERINE 78 (2)A.

DU PONT EXPLORATION
CANADA

**WOLVERINE PROJECT
GEOLOGICAL SECTIONS**
LOOKING NORTHWEST
MURRAY RIVER AREA, BRITISH COLUMBIA

SCALE
1:10,000
1 INCH = FEET

DATE BY : C.B.G.	REVISED :	N.T.S. No. : 93 P 3
DATE : JAN. 79		ACCT No. : 334-00
DRAWN BY : M.S.G.		DRWG No. : W0, 79-2
DATE : JAN. 79		