94- B-1

# WILLISTON LAKE PROJECT
# HUDSON'S HOPE, BRITISH COLUMBIA

HUDBAY COAL COMPANY
and
CYPRUS ANVIL MINING CORPORATION

1980-09-23

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Hudson's Bay Oil and Gas Company Limited
Minerals and Coal - Coal Exploration

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## 1.0 RECONNAISSANCE MAPPING SUMMARY

The Williston Lake Project consisted of a helicopter supported reconnaissance mapping program to evaluate and isolate coal-bearing Cretaceous strata. The program was conducted by a party of 2 geologists and 2 assistants for a period of 69 days from mid-June to the latter part of August, 1980. Rented accommodations in Hudson's Hope, B. C. provided a base location from which to operate.

The main objectives were to locate geological boundaries of the Gething Formation, define and locate all structural features and isolate strippable reserves in the order of 20 million mineable tonnes along the Williston Lake shoreline. Potential production would be barged to the north end of Williston Lake to fuel a coal-fired generating system for the Gataga Mineral Prospect.

The first two weeks of the program was devoted to checking for errors in the geological map of the Williston Lake area. A great deal of activity had been generated in the N.E. British Columbia coal fields from 1978 to 1980 due to the discovery that coal-bearing geological units had been misinterpreted. Hudbay investigations confirmed that there was some confusion between the Dresser-Bernot Sequence and the Beattie Peaks Formation. Hudbay identified the prime interest as the Gething Formation and subsequently concentrated efforts in the Dunlevy Creek and Butler Ridge areas.

The exploration program concentrated on the determination of structure and stratigraphy within and on the periphery of the Dunlevy Creek syncline, primarily by the Gething Formation boundary. Few geological sections were observed due to vegetation and glacial cover. The majority of Gething exposures were located in stream and road cuts and in open shafts around the Packwood Minesite (UTM co-ordinates 6219500 m N, 544900 m E) near Cust Creek. The northern parts of the licenced area also showed the possibility of shaling-out.

The mapping program has resulted in the isolation of four areas with sufficient reserve potential to fulfill our objectives. These areas are:

Block 1. The area south of Dunlevy Lake shows a dip slope potential with regional reserves in the order of 15 million tonnes.

Block 2. The area on the west slope of Butler Ridge just north of the abandoned Packwood Minesite. This area is generally steep in a dip slope situation with regional reserve potential in the order of 5 million tonnes.

Block 3. The upper Gething Contact on the east side of Butler Ridge in which the Trojan Seam could provide regional reserves in the order of 5 million tonnes.

Block 4. The syn-anticline structure east of Butler Ridge in which the Lower Gething Seam could show structural thickening. Regional reserves of this area may be in the order of 10 million tonnes.

* Note: Refer to Reserve Area Map Page 3

Regional reserves in these four areas total 35 million tonnes.

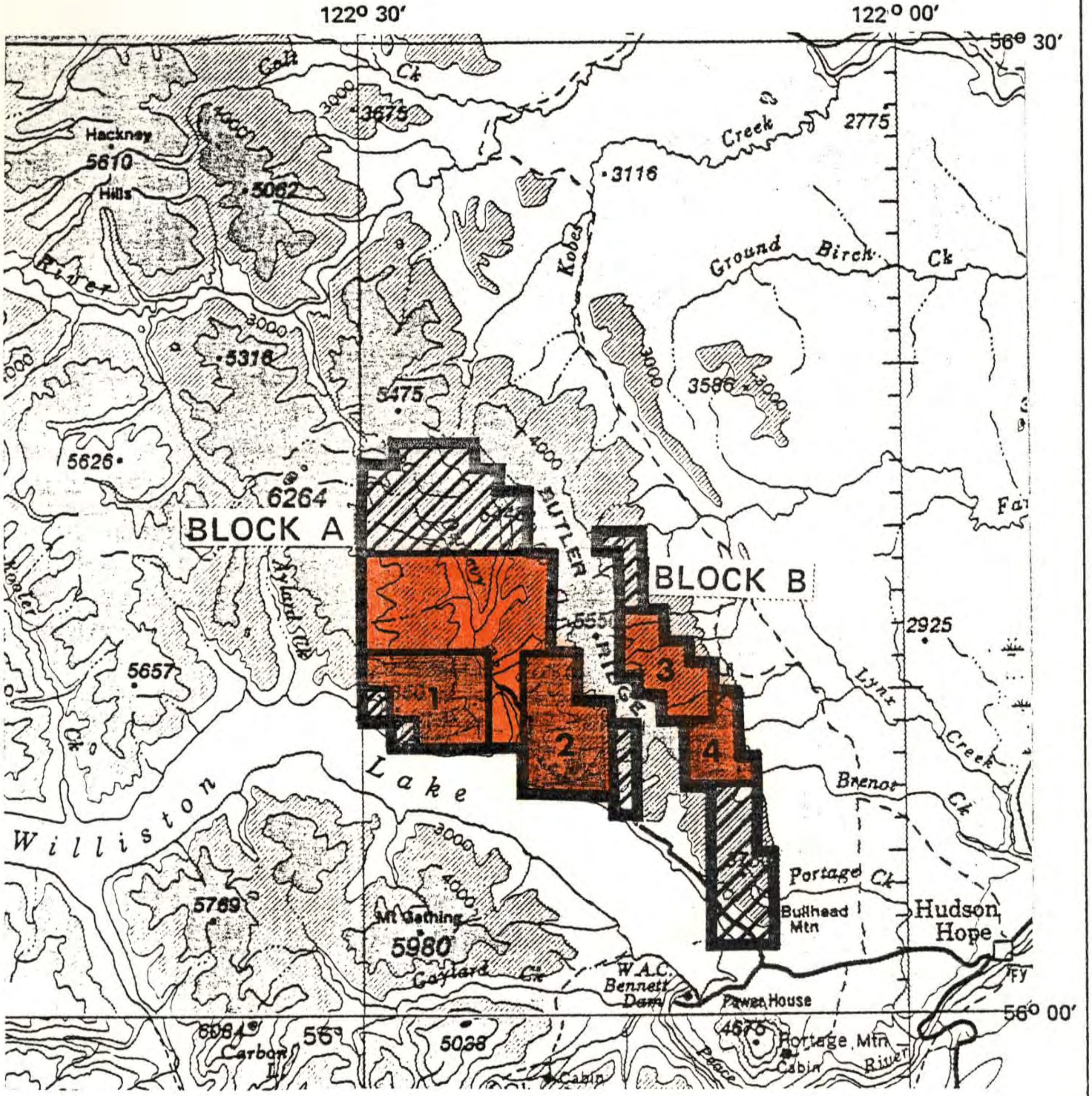
The total estimated cost to completion of the Williston Lake mapping project is $309 000. The cost can be distributed as follows:

| <u>Description</u> | <u>Cost</u> |
|---|---|
| Wages and Salaries | 18 000 |
| Telephone and Telegraph | 1 400 |
| Material and Supplies | 4 800 |
| Annual Rental & Fees | 161 250 |
| Miscellaneous | 3 750 |
| Aircraft Rental (Rotary Wing) | 70 000 |
| Automotive Rental | 6 800 |
| Travelling Expense | 21 000 |
| Drafting Services | 10 000 |
| Administrative Overhead | 12 000 |
| Total Program (Gross) Cost | $ 309 000 |

1400
4600
3750
21000

30950

[illegible] 27,000



**1–4** RESERVE AREAS

▨ PROPOSED LANDS RELEASED

🟥 LICENCED LAND RETAINED

inches
0 1
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centimetres

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WILLISTON PROJECT

RESERVE AREA MAP

SCALE:
DWN. BY:
DATE:
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HC 2199 R

## 2.0 RECOMMENDATIONS

Mapping results have indicated several areas in which total acreage could be reduced by releasing those portions of lands not encompassing economic coal-bearing strata. On this basis a total of 11 809 ha could be released leaving a remaining total of 20 169 ha. This remaining portion of land can be seen on the accompanying map series in the back folder of this report. It is recommended that any more land reduction be restricted until an exploratory drilling program has been completed. This program will provide definite knowledge of the geology at depth.

It is recommended that a drilling program consisting of 2000 m of open holes and 50 m of coring be implemented to define quality and structures at depth. A limited regional drilling program will necessitate restriction to available access.

The drilling program as described above will cost approximately $200 000. The cost break-down is as follows:

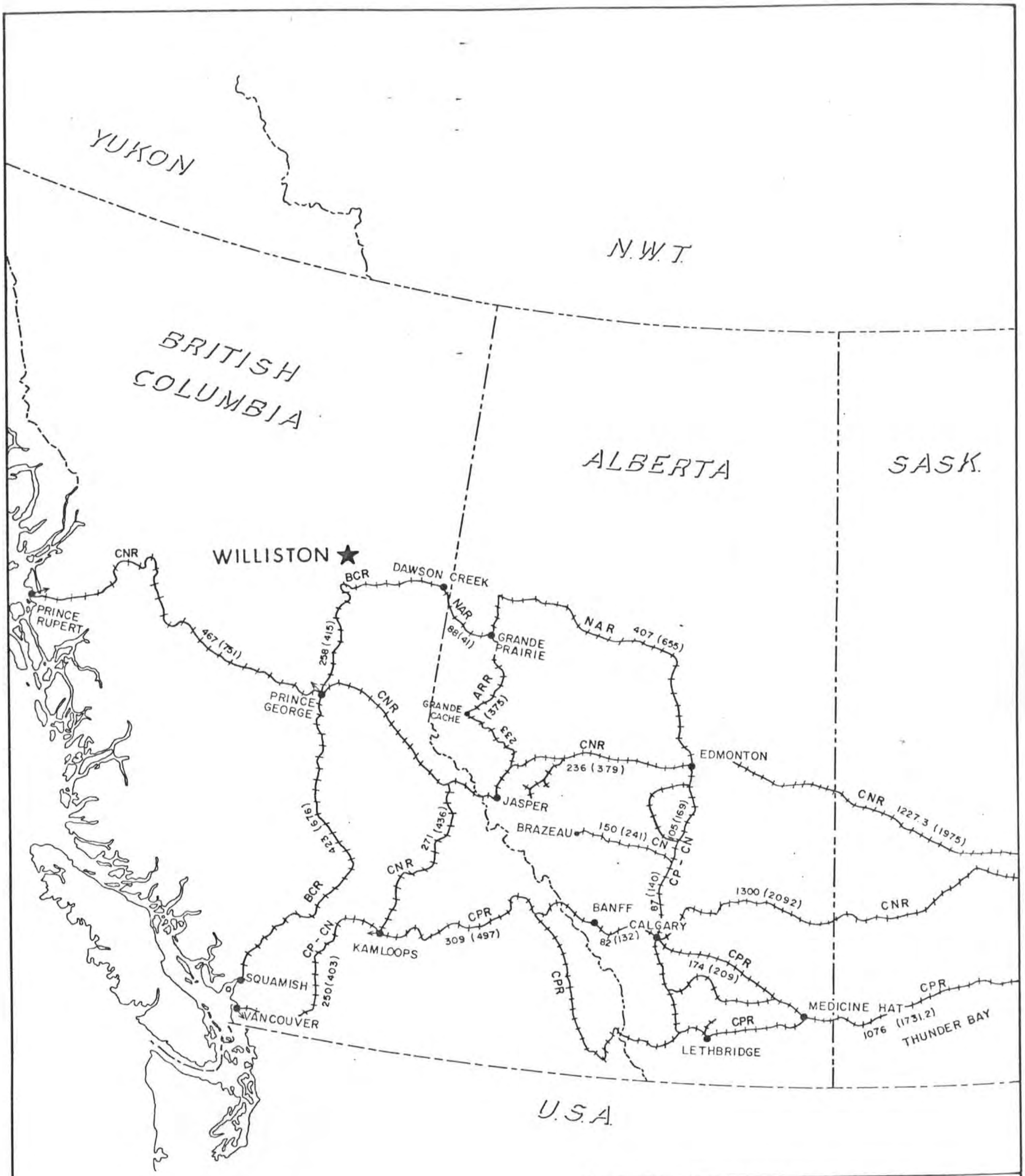
| | | | | |
|---|---|---|---|---|
| Wages & Salaries | | | | $ 9 000 |
| Office Supplies | | | | 500 |
| Drafting | | | | 6 000 |
| Telephone | | | | 500 |
| Automotive Expense | | | | 2 000 |
| Accommodation and Living Expenses | | | | 12 000 |
| Travelling Expense | | | | 1 000 |
| Contract Services | Drilling (openhole) | $ 50 000 | | |
| | Coring | 8 500 | 70,000 | |
| | Geophysical Logging | 22 000 | | |
| | Analysis | 35 000 | 5000 | |
| | Mapping & Surveying | 30 000 | | |
| | Other Services | 3 500 | | |
| | Logistics Vehicle | 20 000 | 0 8 | |
| | | 169 000 | | 169 000 |
| | Total Gross | | | $ 200 000 |
| | Net to Partners | | | $ 100 000 |

## 3.0 LOCATION, ACCESSIBILITY

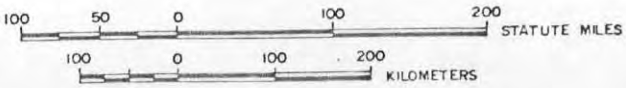
The Williston Lake Project is located in northeast British Columbia (Map Sheet 94-B-1, 94-B-2, 94-B-7, 94-B-8) approximately 25 km northwest of Hudson's Hope, B. C. The area of interest can be divided into two regions: East Butler Ridge and Dunlevy Creek.

The property access to the east of Butler Ridge is gained by the W.A.C. Bennett Dam Highway from Hudson's Hope then turning north through Beryl Prairie. Access onto the property is then made by using interconnected seismic lines and trails. Bullhead Mountain is accessible by the use of a forestry tower road.

Accessibility to the Dunlevy Creek area is by use of the Dunlevy Recreation area road which branches off the W.A.C. Bennett Dam Highway.



ARR - ALBERTA RESOURCES RAILWAY (CNR OPERATOR)
BCR - BRITISH COLUMBIA RAILWAY
CNR - CANADIAN NATIONAL RAILWAY
CPR - CANADIAN PACIFIC RAILWAY
NAR - NORTHERN ALBERTA RAILWAY



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WILLISTON

GENERAL LOCATION MAP

SCALE 1" = 125 miles
DWN BY J. Looder
DATE 1980-09
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HC 2189 R

## 4.0 LANDS

Hudbay Coal Company in a 50/50 joint venture with Cyprus Anvil Mining Corporation has applied for 111 licences of coal lands totalling 31 978 hectares.

These lands are as follows:

Map Sheet 94-B-1:

Block A, Units, 49,50,59,60; 69,70,79,80; 89,90,99,100.

Block B, Units, 41,42,51,52; 43,44,53,54; 61,62,71,72; 63,64,73,74; 81,82,91,92; 83,84,93,94.

Block E, Units, 61,62,71,72; 63,64,73,74; 65,66,75,76; 67,68,77,78; 81,82,91,92; 83,84,93,94; 85,86,95,96; 87,88,97,98; 89,90,99,100.

Block F, Units, 21,22,31,32; 41,42,51,52; 43,44,53,54; 45,46,55,56; 47,48,57,58; 61,62,71,72; 63,64,73,74; 65,66,75,76; 67,68,77,78; 69,70,79,80; 83,84,93,94; 85,86,95,96; 87,88,97,98; 89,90,99,100.

Block G, Units, 1,2,11,12; 3,4,13,14; 21,22,31,32; 23,24,33,34; 41,42,51,52; 43,44,53,54; 45,46,55,56; 63,64,73,74; 65,66,75,76; 83,84,93,94; 85,86,95,96; 87,88,97,98.

Block J, Units 5,6,15,16; 7,8,17,18; 9,10,19,20; 27,28,37,38; 29,30,39,40; 49,50,59,60.

Block K, Units 5,6,15,16; 7,8,17,18; 9,10,19,20; 21,22,31,32; 25,26,35,36; 27,28,37,38; 29,30,39,40; 41,42,51,52; 47,48,57,58; 49,50,59,60; 61,62,71,72; 67,68,77,78; 69,70,79,80; 81,82,91,92; 83,84,93,94; 89,90,99,100.

Block L, Units, 1,2,11,12; 3,4,13,14; 5,6,15,16; 7,8,17,18; 9,10,19,20; 21,22,31,32; 23,24,33,34; 25,26,35,36; 27,28,37,38; 29,30,39,40; 41,42,51,52; 43,44,53,54; 45,46,55,56; 47,48,57,58; 49,50,59,60; 61,62,71,72; 63,64,73,74; 65,66,75,76; 67,68,77,78; 69,70,79,80; 81,82,91,92; 83,84,93,94; 85,86,95,96; 87,88,97,98; 89,90,99,100.

Map Sheet 94-B-8:

Block C, Units, 9,10,19,20; 29,30,39,40.

Block D, Units, 1,2,11,12, 3,4,13,14; 5,6,15,16; 7,8,17,18; 9,10,19,20; 21,22,31,32; 23,24,33,34; 25,26,35,36; 27,28,37,38; 29,30,39,40; 41,42,51,52; 43,44,53,54; 45,46,55,56; 47,48,57,58; 49,50,59,60; 63,64,73,74; 65,66,75,76; 67,68,77,78;

Total of coal licences = 111. Total of hectares = 31,978

# 5.0 REGIONAL HISTORICAL REVIEW

The first white man to enter British Columbia was Alexander MacKenzie in 1793 on his westerly trek up the mighty Peace River to the Pacific Coast. Four years later, John Finlay established a North West Company trading post at the mouth of Tea Creek which was the original site of Fort St. John. In 1805 Simon Fraser established a trading post at Hudson's Hope which was later changed to a Hudson Bay Company post. From this time on the region was opened up with regular visits from agents and voyageurs of fur trading companies.

In the early 1900's coal was needed for local and industrial use and several small coal mines sprouted up in the Peace River Canyon area. The King Gething Mine, located on the east slope of Portage Mountain approximately 19 km west of Hudson's Hope, produced 12-20 tons of coal per day which was hauled by truck to Fort St. John and up the Alaska Highway. This mine was later abandoned with the advance of alternate fuel supplies, but remnants of this site can still be found. The Packwood Mine on the south end of Butler Ridge near Cust Creek, was located 35 km west of Hudson's Hope. It had a production rate of only 100-200 tons per year. In the mid-1940's this mine was finally abandoned due to poor access to markets.

The power of the Peace River was transformed into electrical energy with the completion of the W.A.C. Bennett Dam in 1968. This dam was the largest earth filled dam in North America with back waters forming one of the largest lakes in British Columbia (Williston Lake). In the latter part of 1980 a second, smaller, concrete dam was completed 10 km down stream of the W.A.C. Bennett Dam.

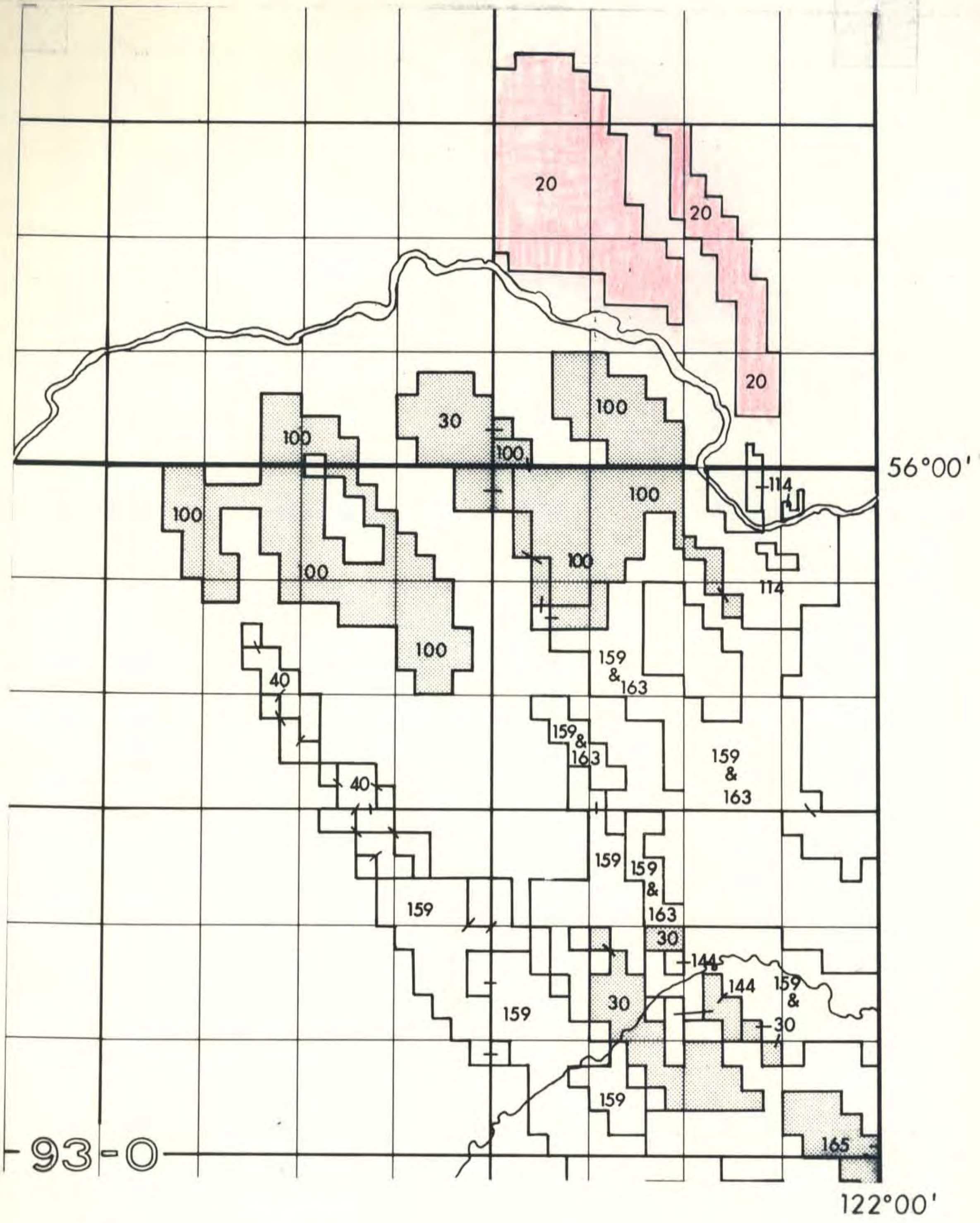
## 6.0 PREVIOUS GEOLOGICAL WORK

In 1970 Utah Mines Ltd. acquired 10 944 hectares of land stretching north from Williston Lake along the Dunlevy Syncline, past the Chowade River for the purposes of exploring for large reserves of metallurgical coals. Limited amounts of both geological mapping and drilling were done. In the Dunlevy Creek area only one drillhole was bored to a depth of 246 m. This hole was spudded in the Gething, cut 41 thin coal seams and was abandoned before entering the bottom Gething-Dresser contact. Since the economic coal seams within the Gething lie in the extreme top and bottom of the formation, this hole had no real value in assessing the potential of the area. Utah Mines Ltd. released these lands on the basis of poor reserve indicators.

Amax Coal Company obtained 14 066 hectares of coal lands in 1971 along the east slope of Butler Ridge. They drilled 4 holes north of Ruddy Creek to depths of about 365 m. Several coal seams were intersected with a few in the order of 1 to 1.5 m in thickness. Due to limited potential for large reserves these lands were later dropped.

Presently, coal licences in the region extend to the south shore of Williston Lake. It is thought that licencing north of the lake has been restricted by poorer access and the lack of positive data for large scale (70-100 million tonne) reserves.

Some of the land holders in the immediate lake area are Utah Mines Ltd., Cinnabar Peaks Ltd., Shell Canada Resources and Gulf Canada Resources. (Refer to Lease Map P.10)



| | |
|---|---|
| 20 | HUDSON'S BAY OIL & GAS CO. LTD. |
| 100 | UTAH MINES LTD. |
| 30 | SHELL CANADA |
| 159 | GULF |
| 163 | J. E. HUGHES |
| 40 | M. M. SUSKA |
| 144 | J. W. MACLEOD |

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## COAL LEASE HOLDINGS IN THE WILLISTON LAKE AREA

SCALE: 1:500 000
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DATE: 1980-10
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HC 2197 R

## 7.0 PHYSIOGRAPHY

The Williston Lake Project is located approximately 25 km northwest of Hudson's Hope, British Columbia along the north shoreline of Williston Lake.

Within the lease areas the topography is moderate with relief ranging from 600 m to 1680 m above sea level.

A great deal of dense tree cover blankets most of the lease areas. Abundant spruce and fir growth is found on side slopes with poplar and willow brush concentrated in drainage areas and swamps. Elevations above 1200 m are barren or sparsely treed with alpine meadow type flora.

Drainage in the Dunlevy area is to the south into Williston Lake while east of Butler Ridge the drainage is to the immediate east then to the southeast into the Peace River.

## 8.0 GEOLOGY

The formations of interest present in the area are of Cretaceous age and belong to the Fort St. John and Crassier groups. (see "Table of Formations")

The Fort St. John Group is divided into five formations. These formations in descending order are: The Cruiser, Goodrich, Hasler, Commotion and Moosebar. This group is mainly marine and composed primarily of shales with minor siltstone, sandstones and conglomerates.

The lowermost Moosebar Formation of the Fort St. John Group is of prime interest. It consists of 480 m of mainly marine shales and mudstones with the lower part of the formation exhibiting thin layers of Singrove sandstones and Conglomerates. The basal conglomerate immediately overlying the Gething coal-measures contains dark and varicoloured, well-rounded chert pebbles or cobbles. These clasts vary from 25 mm to 2.5 cm in diameter.

This Formation has low relief and no outcrops were observed within the mapping area.

The Crassier Group are coal measures containing shales, mudstones, siltstones, sandstones, conglomerates and coal. It is divided into three formations which, in descending order are: The Gething, Dresser and Brenot.

These formations are of non-marine origin and vary by differences in each of their cyclic deposition.

The Crassier coal measures show a past environment of shallow lakes, swamps and forested areas. Sediments were cyclically deposited filling a continually subsiding basin. Mudstones, shales and sandstones represent Lacustrine deposits; lithified seat earths represent swampy sedimentation; coals represent swamp and forest organic growth; and coarser grits and conglomerates represent river delta activity.

## TABLE OF FORMATIONS

| ERA | PERIOD OR EPOCH | FORMATION AND GROUP | | LITHOLOGY | THICKNESS (METRES) |
|---|---|---|---|---|---|
| MESOZOIC | UPPER CRETACEOUS | | Dunvegan Formation | Sandstone, shale and conglomerate (marine and non-marine) | 120 ± |
| | | | Sully Formation | Dark grey marine shale; with sideritic concretions; flaky black shale (marine) | 300 ± |
| | LOWER CRETACEOUS | Fort St. John Group | Sikanni Formation | Fine-grained, laminated sandstone and silty mudstone (marine) | 300 ± |
| | | | Commotion Formation | Shales, sandstones, siltstones, mudstones, congl., coal | 600 ± |
| | | | Moosebar Formation | Shales, sandstones, minor siltstones and conglomerate | 480 ± |
| | | Crassier Group | Gething Formation | Sandstone, shale, coal, conglomerate (non-marine) | 370 ± |
| | | | Dresser Formation | Sandstone (coarse-grained), grits, conglomerates, shales, siltstones and coal | 280 ± |
| | | | Brenot Formation | Sandstone (medium-grained), siltstones, shales, minor coal (mainly non-marine) | 130 ± |
| | | Beaudette Group | Monarch Formation | Sandstone and some shale (marine) | 90 ± |
| | | | Beattie Peaks Formation | Shale, sandy shale and sandstone (marine) | 270 ± |
| | | | Monteith Formation | Sandstone and quartzite (marine) | 300 ± |
| | JURASSIC | | Fernie Formation | Shale, siltstone and sandstone (marine) | 335 ± |
| | TRIASSIC | | Pardonet Formation | Limestone, calcareous sandstone, calcareous siltstone, shale (marine) | 460 ± |

The Gething Formation averages 370 m in thickness. It has a lesser amount of sandstones than other Crassier Group members, thus supporting higher amounts of shales and siltstones. It is deposited in well developed cyclothems which usually tend to be quite regular and complete, again distinguishing Gething from other Crassier members. These cyclic deposits range in intervals from 1.5 m to 7.5 m in thickness. A typical cyclic order of deposition consists of:

> Dark-grey mudstones and shales; shale and siltstones with sandstone interbeds; very fine to medium grained sandstones; silty, sandy mudstones and argillaceous silty sandstone; lithified seat earths; black soft mudstones; coals; black fissile carbonaceous shale.

There are numerous coal seams of good quality in the Gething Formation, of which many can be regionally correlated. Despite the ability to correlate seams over a distance, the variations in seam thickness are quite drastic.

Coals found in the Gething Formation are classified as medium volatile sub-bituminous C. A typical analysis of dull and bright coal taken at the King Gething Mine (by F.H. McLearn and E.J.W. Irish paper 44-15) is as follows:

| | |
|---|---|
| Moisture | 5.9% |
| Ash | 16.1% |
| Volatile | 26.8% |
| Fixed Carbon | 51.2% |
| Sulphur | 0.8% |
| Calorific Value | 6155 kCal/kg |

Of these coal seams only three have mineable possibilities. They are:

| Seam | Location | Average Thickness |
|---|---|---|
| Trojan | Extreme Upper Gething | 2.0 m |
| Grant King | Extreme Lower Gething | 1.5 m |
| Murray | Extreme Lower Gething | 1.5 m |

The Gething coal measures are less resistant than other Crassier members, thus having subdued topography. Due to glacial debris and dense vegetation, exposures are very limited.

On the east slope of Butler Ridge exposures are limited to sections cut by small streams and creeks. In the Dunlevy syncline exposed sections can be seen on the steep walls of Dunlevy Inlet, along parts of Dunlevy and Dresser Creeks and in some road cuts. The lower seams are also exposed at the old Packwood Mine site near Cust Creek.

The Dresser Formation consists mainly of 280 m of coarse grained grits, sandstones, conglomerates and coal which directly underlies the Gething coal measures. It's contact is gradationally marked by increasing amounts of grits, quartz, pebbly sandstones and conglomerates, making it difficult to identify.

The sedimentary environment of the Dresser is similar to that of the Gething Formation. These Cyclothems differ from Gething deposits by major development of coarser grained sandstone, grits and conglomerates. Coal seams in the Dresser are thin, usually less than 76 cm in thickness.

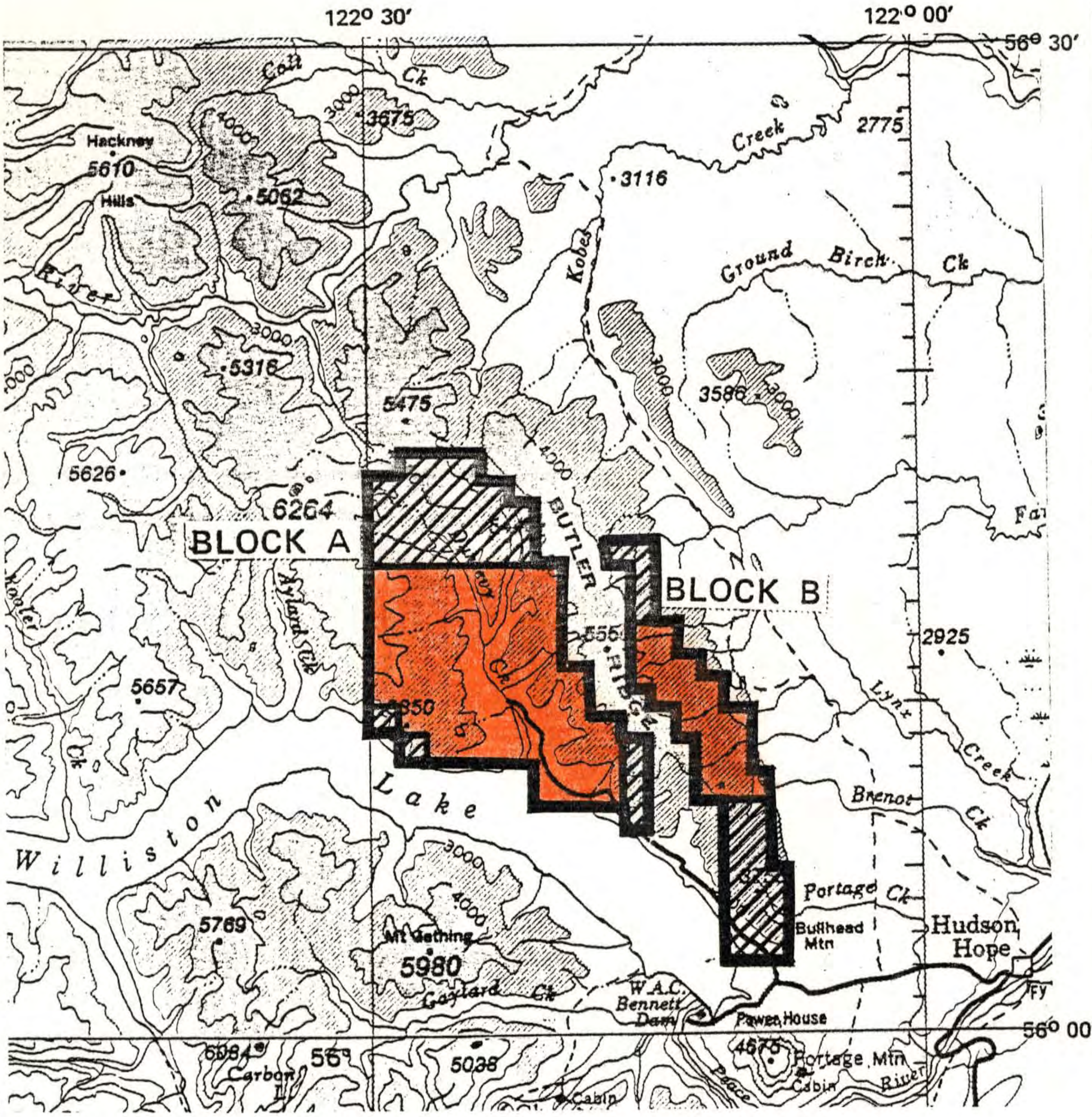
The Dresser Formation usually displays excellent relief against those of the Gething, with outcrops marking higher elevations and forming ridges in the area. A complete section of the Dresser Formation can be observed along the steep slope faces south of Dunlevy Lake down to the Williston Lake shoreline.

The Brenot Formation consists of 130 m of fine to medium grained sandstones, shales, siltstones and thin coals which gradationally underlies the Dresser. The boundary is usually quite obscure and very hard to locate. The distinguishable features of the Brenot are poorly developed, thin cyclothems and very thin or barren coal seams. These coal seams rarely exceed 0.5 m in thickness. This formation also displays lesser amounts of coarse grained grits, sandstone and conglomerates than that of the Dresser Formation. Outcrops of Brenot are commonly indicated by thin rust-coloured platy or flaggy sandstones which can be seen on most ridge slopes within the mapping area.

The base of the formation is marked by the massive quartzitic sandstone of the Monach Formation. This contact is thought to be a disconformity. The best exposures of Brenot strata can be seen on all ridges in the mapping area and below Dunlevy Lake near Rainbow Rocks.

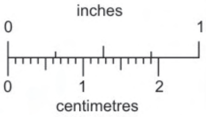
## 9.0 CONCLUSIONS

Hudbay Coal Company, a division of Hudson's Bay Oil and Gas Company Ltd., in a 50/50 joint venture with Cyprus Anvil Mining Corporation presently has applied for 31978 ha of coal lands in the Williston Lake Area. Of these lands, Hudbay proposes the release of 11809 ha outlined on the accompanying Lease Holding Map, (Page 17). Mapping has indicated that Economic coal-bearing strata does not exist in these areas. Further land reductions should be restricted until an exploratory drilling program and evaluation has been completed.



▨ PROPOSED LANDS RELEASED

🟧 LICENCED LAND RETAINED



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## WILLISTON PROJECT

## LEASE HOLDINGS MAP

SCALE :
DWN. BY :
DATE :
APPR. BY :
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| 1969 | The Gething Formation at Peace River Canyon, British Columbia<br>Geol. Surv. Can. Paper 68-28 |

## 11.0 MAPS AND DRAWINGS

# Lithology Of The Gething Formation

**MOOSEBAR FORMATION**

1M Shale, dark grey, silty, blocky . . . . . . . . . . . . . . . . . . . . . . . . . . . . 40 feet

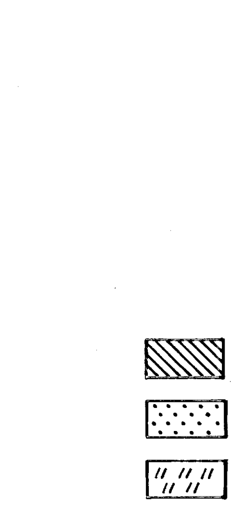
2M Conglomerate; mudstone matrix; pebbles, well rounded, more spherical than discoidal, chert and quartzite, averaging ½ - 1 inch but rare cobbles as much as 4 inches in diameter . . . . . . . . . . . . . . . . . . . . 1.5 feet

3M Shale, dark grey, silty. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1 foot

**GETHING FORMATION**

Overlying beds exposed in Aylard Creek (see preceding section)

| | | Thickness (feet) | Thickness (m) |
|---|---|---|---|
| 155 | Sandstone, fine-grained, argillaceous, laminated, brown | 10 | 3.0 |
| 154 | Sandstone, fine-grained, laminated, brown, thick-bedded | 4 | 1.2 |
| 153 | Coal. | 1.5 | 0.5 |
| 152 | Sandstone, fine-grained, laminated, carbonaceous, brown; thick-bedded. | 10 | 3.0 |
| 151 | Coal. | 0.5 | 0.15 |
| 150 | Siltstone, argillaceous, dark grey to brown. | 2 | 0.5 |
| 149 | Sandstone, silty, argillaceous, laminated, brown | 7 | 2.0 |
| 148 | Mudstone, silty, to siltstone, dark brown | 4 | 1.2 |
| 147 | Sandstone, fine-grained, laminated brown | 1 | 0.3 |
| 146 | Siltstone, argillaceous. | 2 | 0.6 |
| 145 | Coal. | 1.7 | 0.5 |
| 144 | Mudstone | 3 | 1.0 |
| 143 | Sandstone, fine-grained, laminated, carbonaceous, brown | 3 | 1.0 |
| 142 | Mudstone, to argillaceous siltstone | 7 | 2.0 |
| 141 | Sandstone, fine-grained. | 4 | 1.2 |
| | Axis of small anticline, measurement continues on undeformed beds | | |
| 140 | Sandstone, fine-grained. | 4 | 1.2 |
| 139 | Siltstone, sandy | 5 | 1.5 |
| 138 | Sandstone, fine-grained, carbonaceous, brown | 6 | 2.0 |
| 137 | Siltstone, sandy, laminated, carbonaceous, brown; platy. | 5 | 1.5 |
| 136 | Shale, black | 1 | 0.3 |
| 135 | Sandstone, fine-grained, laminated, cross-laminated, brown; thick-bedded | 8 | 2.5 |
| 134 | Mudstone; grading upward into siltstone, argillaceous, olive-brown. | 12 | 3.3 |
| 133 | Sandstone, fine-grained, silty at base, carbonaceous, brown; flaggy; ripple-marks. | 4 | 1.2 |
| 132 | Coal (equivalent to unit 6, Aylard Creek section). | 3 | 1.0 |
| 131 | Sandstone, argillaceous, dark grey; poorly bedded | 3 | 1.0 |
| 130 | Sandstone, fine-grained, laminated, brown; thick-bedded | 4.5 | 1.5 |
| 129 | Mudstone, olive-brown, carbonaceous | 7 | 2.0 |
| 128 | Coal. | 0.7 | 0.2 |
| 127 | Mudstone, olive-brown; some interbedded siltstone, argillaceous | 5 | 1.5 |
| 126 | Sandstone, fine-grained, laminated, carbonaceous, brown | 3 | 1.0 |
| 125 | Covered | 7 | 2.0 |
| 124 | Sandstone, fine-grained, carbonaceous; some coaly layers | 5 | 1.5 |
| 123 | Siltstone, argillaceous, carbonaceous, olive-brown, coal at top | 5 | 1.5 |
| 122 | Sandstone, fine-grained, carbonaceous, laminated, brown; thick-bedded. | 5 | 1.5 |
| 121 | Mudstone, carbonaceous, olive-brown | 3 | 1.0 |
| 120 | Sandstone, fine-grained, carbonaceous, brown | 4 | 1.2 |
| 119 | Covered | 4 | 1.2 |
| 118 | Sandstone, fine-grained, carbonaceous, laminated, brown; thick-bedded. | 6 | 2.0 |
| 117 | Covered. Some coal and shale. | 7 | 2.0 |
| 116 | Sandstone, fine-grained, laminated, brown; flaggy at top | 9 | 3.0 |
| 115 | Mudstone, silty; grading into argillaceous siltstone and platy sandstone | 8 | 2.5 |
| 114 | Shale, coaly | 0.3 | 0.1 |
| 113 | Siltstone, argillaceous, carbonaceous, black; platy | 8 | 2.5 |
| 112 | Sandstone, fine-grained, laminated, carbonaceous, brown; platy to flaggy; brown weathering | 7 | 2.0 |
| 111 | Mudstone, to argillaceous siltstone | 3 | 1.0 |
| 110 | Coal. | 0.3 | 0.1 |
| 109 | Shale, coaly, black; flaky. | 4 | 1.2 |
| 108 | Mudstone, silty, dark grey to dark olive-brown; some interbedded laminated sandstone | 14 | 4.3 |
| 107 | Sandstone, fine-grained, carbonaceous; carbonaceous mudstone | 2 | 0.6 |
| 106 | Mudstone, silty, carbonaceous, black. | 6 | 2.0 |
| 105 | Sandstone, fine-grained, laminated, brown; medium-bedded; brown weathering | 3 | 1.0 |
| 104 | Mudstone, silty; thin sandstone in middle | 2 | 0.6 |
| 103 | Partly covered. Sandstone, fine-grained, flaggy, and interbedded mudstone | 12 | 3.5 |
| 102 | Sandstone, fine-grained, laminated, brown; platy to flaggy | 8 | 2.5 |
| 101 | Covered. Some coal at top | 3 | 1.0 |
| 100 | Sandstone, fine-grained, laminated, cross-laminated, brown; thick-bedded; brown sandstone | 16 | 5.0 |
| 99 | Sandstone, interbedded with mudstone | 2 | 0.6 |
| 98 | Sandstone, fine-grained, laminated, carbonaceous, brown | 6 | 2.0 |
| 97 | Mudstone, silty; some platy sandstone | 4 | 1.2 |
| 96 | Coal. | 0.3 | 0.1 |
| 95 | Sandstone, coaly, black | 1 | 0.3 |
| 94 | Sandstone, fine-grained, carbonaceous to coaly; medium-bedded. | 3 | 1.0 |
| 93 | Mudstone, dark grey | 2 | 0.6 |
| 92 | Mudstone, olive-brown | 1 | 0.3 |
| 91 | Sandstone, fine-grained, carbonaceous | 2 | 0.6 |
| 90 | Mudstone, black. | 1.5 | 0.5 |
| 89 | Sandstone, carbonaceous to coaly, grey | 1.5 | 0.5 |
| 88 | Sandstone, very silty, carbonaceous, dark grey; some mudstone; ripple-marks | 4 | 1.2 |
| 87 | Mudstone, olive-brown. | 1.5 | 0.5 |
| 86 | Sandstone, fine-grained, silty, carbonaceous, brown | 1 | 0.3 |
| 85 | Mudstone, olive-brown. | 2 | 0.6 |
| 84 | Coal. | 1 | 0.3 |
| 83 | Sandstone, fine-grained, laminated, brown; carbonaceous; flaggy. | 3 | 1.0 |
| 82 | Shale, black; platy | 0.5 | 0.2 |
| 81 | Mudstone, coaly; grading upward into carbonaceous sandstone. | 2 | 0.6 |
| 80 | Coal. | 0.3 | 0.1 |
| 79 | Mudstone, carbonaceous, grey. | 1 | 0.3 |
| 78 | Sandstone, fine-grained, carbonaceous, grey. | 1 | 0.3 |
| 77 | Sandstone, fine-grained, laminated, brown; thin-bedded, ripple-marks. | 11 | 3.4 |
| 76 | Mudstone, silty at base, dark grey to olive-brown, blocky; some thin beds of siltstone; some concretions. | 9 | 3.0 |
| 75 | Sandstone, argillaceous, carbonaceous, black | 3 | 1.0 |
| 74 | Siltstone, argillaceous, laminated, dark olive-brown, carbonaceous; grading upward into sandstone, thick-bedded; prostrate logs; ripple-marks | 16 | 5.0 |
| 73 | Coal. | 0.5 | 0.2 |
| 72 | Sandstone, fine-grained, carbonaceous, laminated, brown; thick-bedded; brown weathering | 3 | 1.0 |
| 71 | Covered. Estimated | 15 | 4.6 |
| 70 | Sandstone, fine-grained, laminated, brown. | 2 | 0.6 |
| 69 | Siltstone, argillaceous, brown; platy | 4 | 1.2 |
| 68 | Coal. | 0.7 | 0.2 |
| 67 | Siltstone, argillaceous. | 1 | 0.3 |
| 66 | Sandstone, fine-grained, laminated, cross-laminated, carbonaceous. | 2 | 0.6 |
| 65 | Mudstone, silty, olive-brown. | 1.5 | 0.5 |
| 64 | Sandstone, silty, carbonaceous, dark olive-brown. | 2 | 0.6 |
| 63 | Mudstone, carbonaceous; prostrate logs | 3 | 1.0 |
| 62 | Sandstone, fine-grained, laminated, brown, silty | 3.5 | 1.1 |
| 61 | Mudstone, silty, olive-brown, carbonaceous, some small concretions. | 6 | 1.8 |
| 60 | Mudstone to argillaceous siltstone; some prostrate logs; lenses of coal and 2" coal near top | 5 | 1.5 |
| 59 | Coal. | 0.3 | 0.1 |
| 58 | Mudstone, silty, black; coaly at top. | 7 | 2.1 |
| 57 | Sandstone, fine-grained, laminated | 0.5 | 0.2 |
| 56 | Mudstone, silty, dark grey | 3.5 | 1.1 |
| 55 | Covered | 4 | 1.2 |
| 54 | Sandstone, fine-grained, laminated, carbonaceous, brown | 2 | 0.6 |
| 53 | Mudstone, silty | 3 | 1.0 |
| 52 | Sandstone, fine-grained, laminated, carbonaceous; some interbedded mudstone; plant fragments. | 5 | 1.5 |
| 51 | Coal. | 0.7 | 0.2 |
| 50 | Sandstone, fine-grained, laminated, brown. | 2 | 0.6 |
| 49 | Covered | 3 | 1.0 |
| 48 | Sandstone, fine-grained, laminated, interbedded silty mudstone | 4 | 1.2 |
| 47 | Mudstone, black. | 1 | 0.3 |
| 46 | Mudstone and some sandstone | 7 | 2.1 |
| 45 | Sandstone, fine-grained, laminated, cross-laminated, carbonaceous, brown; brown weathering | 2 | 0.6 |
| 44 | Siltstone, argillaceous, sandy, laminated, olive-brown, blocky to platy. | 2 | 0.6 |
| 43 | Coal. | 1 | 0.3 |
| 42 | Mudstone, carbonaceous, black; some silty sandstone | 8 | 2.4 |
| 41 | Sandstone and mudstone; black, carbonaceous, prostrate logs | 3 | 1.0 |
| 40 | Sandstone, silty, argillaceous, carbonaceous, laminated, cross-laminated, brown platy; brown weathering | 4 | 1.2 |
| 39 | Shale, coaly; 2 beds of coal, 1" thick; mudstone in lower half | 3 | 1.0 |
| 38 | Sandstone, fine-grained, laminated; cross-laminated | 3 | 1.0 |
| 37 | Siltstone, sandy, platy; interbedded mudstone | 4 | 1.2 |
| 36 | Sandstone, fine-grained, laminated, cross-laminated, brown, carbonaceous; platy; becoming more argillaceous and shaly at top with interbedded mudstone | 9 | 2.7 |
| 35 | Sandstone, medium-grained, homogeneous, carbonaceous, grey; brownish grey weathering | 1 | 0.3 |
| 34 | Coal (Index Seam) | 1.8 | 0.6 |
| 33 | Mudstone, silty | 2 | 0.6 |
| 32 | Sandstone, fine-grained, laminated, cross-laminated, brown; platy | 3 | 1.0 |
| 31 | Mudstone, silty, laminated; olive-brown | 2 | 0.6 |
| 30 | Shale, coaly, black; platy. | 3 | 1.0 |
| 29 | Mudstone, silty, dark grey | 2 | 0.6 |
| 28 | Sandstone, fine-grained, brown; brown weathering. | 2.5 | 0.8 |
| 27 | Mudstone, silty, olive-brown; blocky; brown weathering. | 5 | 1.5 |
| 26 | Siltstone, argillaceous, dark grey; coaly at top. | 2 | 0.6 |
| 25 | Sandstone, fine-grained, laminated, brown; thick-bedded, some crossbedding; brown weathering | 9 | 2.7 |
| 24 | Mudstone; silty in lower part; carbonaceous at top; some thin lenticular coal. | 3 | 1.0 |
| 23 | Sandstone, argillaceous, carbonaceous, laminated. | 4 | 1.2 |
| 22 | Mudstone, silty, brown. | 1 | 0.3 |
| 21 | Sandstone, fine-grained, laminated, cross-laminated; thickbedded but weathers flaggy | 5 | 1.5 |
| 20 | Coal, lenticular; some silty mudstone and siltstone. | 1.3 | 0.4 |
| 19 | Mudstone, silty; with 2" - 4" beds of carbonaceous sandstone | 4 | 1.2 |
| 18 | Sandstone, fine-grained, laminated; brownish grey, argillaceous, carbonaceous | 2 | 0.6 |
| 17 | Mudstone, silty. Partly covered. | 3 | 1.0 |
| 16 | Sandstone, f.g. laminated, carbonaceous, cross-laminated, brown; silty at base | 1.5 | 0.5 |
| 15 | Coal and coaly shale | 0.5 | 0.2 |
| 14 | Mudstone, silty; some beds of carbonaceous sandstone | 8 | 2.4 |
| 13 | Sandstone, fine to medium-grained, laminated to homogeneous, grey; medium-bedded; grey weathering; some shale near top | 4 | 1.2 |
| 12 | Sandstone, carbonaceous, laminated, cross-laminated, brown | 1.5 | 0.5 |
| 11 | Sandstone, fine to medium-grained, laminated to homogeneous, grey; brown to grey weathering; dinosaur tracks | 8 | 2.4 |
| 10 | Mudstone, black, hard | 2 | 0.6 |
| 9 | Coal; some carbonaceous shale at base (Grant Seam). | 5 | 1.5 |
| 8 | Mudstone, silty; platy; some beds of siltstone, argillaceous, platy, carbonaceous, laminated; grades laterally into beds of carbonaceous laminated sandstone. | 8 | 2.4 |
| 7 | Mudstone, silty, carbonaceous; grading upward into sandstone, fine-grained, laminated, carbonaceous, brown, platy. | 3 | 1.0 |
| 6 | Sandstone, fine-grained, argillaceous, laminated; massive; yellow brown weathering. | 3 | 1.0 |
| 5 | Sandstone, fine-grained, argillaceous, laminated, dark grey; flaggy | 1.5 | 0.5 |
| 4 | Mudstone, silty | 1 | 0.3 |
| 3 | Sandstone, argillaceous, brownish grey; thick-bedded | 9 | 2.7 |
| 2 | Covered | 6 | 1.8 |
| 1 | Coal (Riverside Seam) | 2.8 | 0.9 |



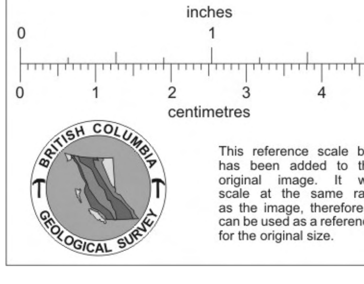
**DRESSER FORMATION**

| | | | |
|---|---|---|---|
| 1C | Sandstone, medium-grained, laminated, grey; massive | 19 | 6.2 |
| | Conglomerate; grading into coarse-grained sandstone at top; massive; pebbles, ¼" - ½" | 12 | 3.9 |
| | Conglomerate; pebbles, ¼" - 1", in matrix of coarse-grained sandstone | 6 | 1.9 |

*NOTE:* INFORMATION COMPILED IN PEACE RIVER CANYON AREA BY D. F. SCOTT (BULLETIN 152), 1958.

## LEGEND

- ▧ OVERBURDEN
- ⁘ SANDSTONE
- // SILTSTONE
- C MUDSTONE (CARBONACEOUS)
- ☰ SHALE
- ☒ ASH BENTONITE
- Fe SEAT EARTH
- ☐ VITRAIN
- ▥ CLARAIN
- ▧ CLARODURAIN
- ☒ COVERED INTERVAL
- ▤ DURAIN
- ▩ FUSAIN
- ▦ BONY COAL
- ○ CONGLOMERATE
- ░ COAL



inches
0 1 2
0 1 2 3 4 5
centimetres

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0 10 m 20 m

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CALGARY ALBERTA

WILLISTON PROJECT

LITHOLOGY OF THE
GETHING FORMATION

| | | | |
|---|---|---|---|
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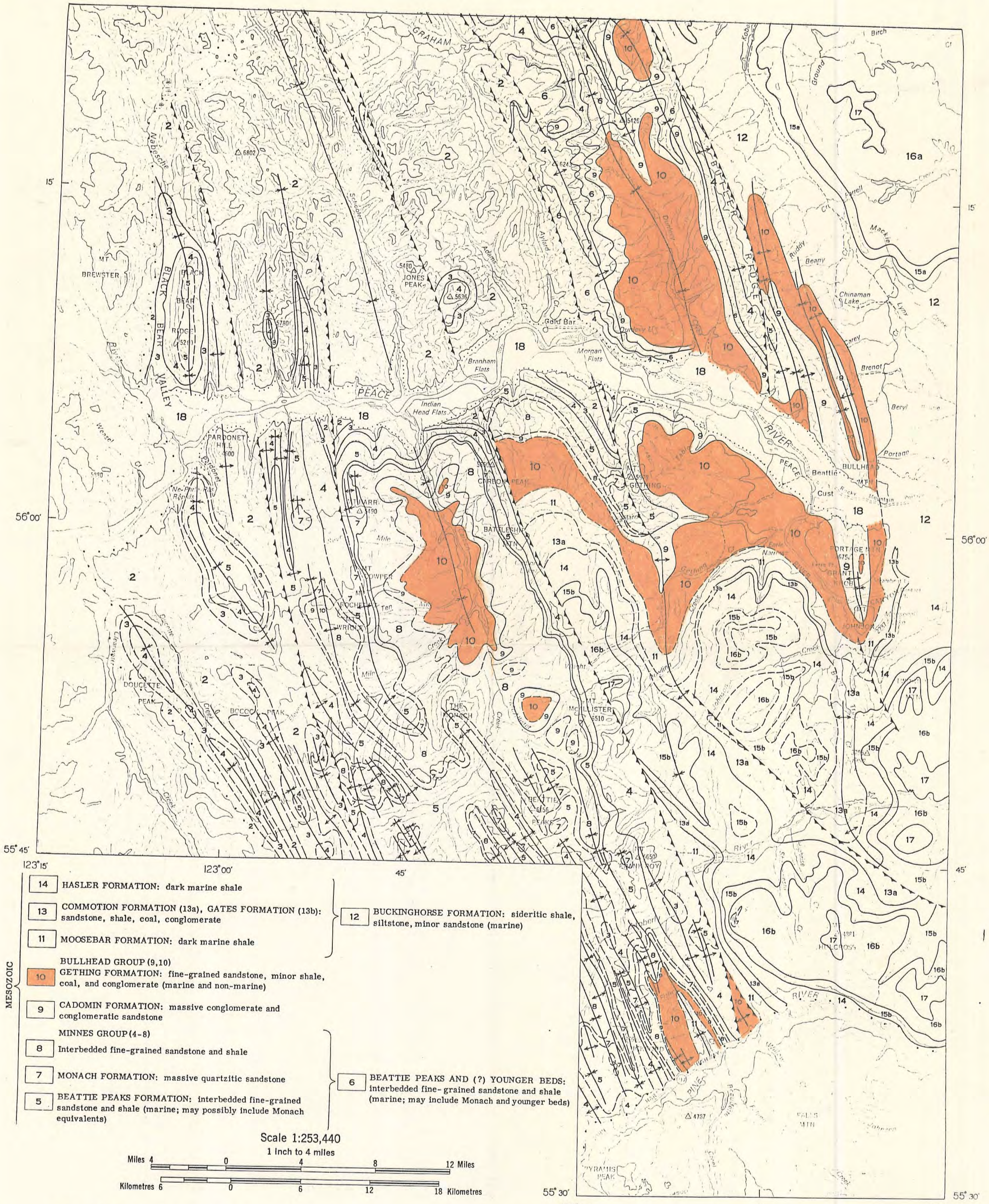
| APPR BY: | FILE No. | | HC 2486 L54 |



Published, 1968

Printed by the Surveys and Mapping Branch

Figure 2. Map showing distribution of Fernie and Minnes strata in northeastern British Columbia

inches 0 1

0 1 2 centimetres

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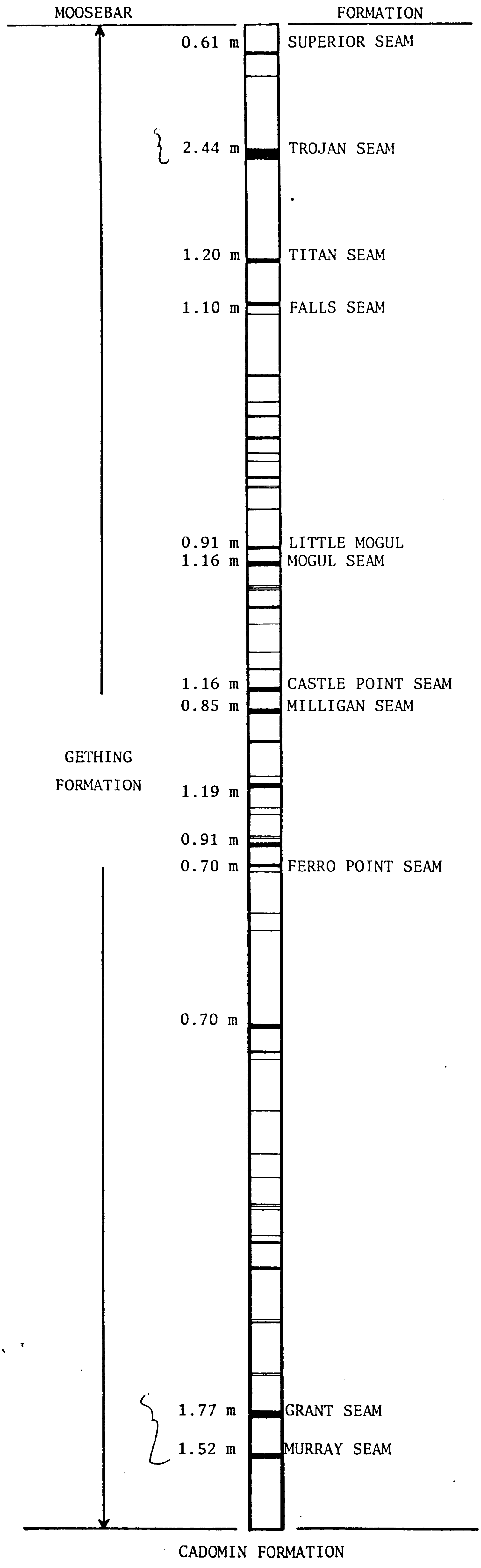
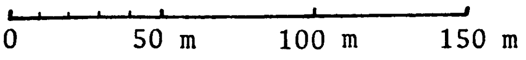
Figure 2



VERTICAL SCALE



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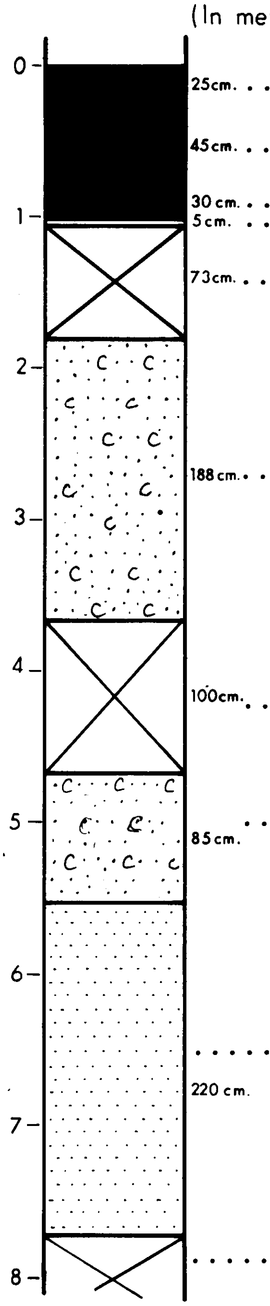
COAL SEAMS
in the
GETHING FORMATION

SCALE DWN BY: J.Loader DATE 80-05-23
APPD BY: FILE No.



25cm. Coal - thin bands vitrain (max. 1 mm) - about 20%

45cm. Coal - rocky, undisclosed amount of vitrain

30 cm. Coal - soft, undisclosed amount of vitrain

5 cm. Siltstone - carbonaceous

73cm. Cover

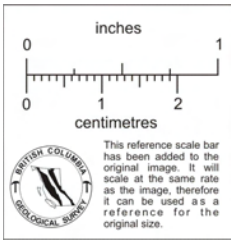
188 cm. Sandstone - medium-grained, massive bedded, slightly carbonaceous, some mudstone concretaions

100cm. Cover

85 cm. Sandstone - thinly bedded, carbonaceous, laminated, fine grained, buff weathering

220 cm. Sandstone - medium-grained, homogeneous, massive bedded, salt & pepper 1% carbon whisps, less than 30% quartz

Cover



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▨ OVERBURDEN

▦ SANDSTONE

" „ " SILTSTONE

-C- MUDSTONE (CARBONACEOUS)

☰ SHALE

☒ ASH BENTONITE

Fe SEAT EARTH

☐ VITRAIN

▥ CLARAIN

▨ CLARODURAIN

☒ COVERED INTERVAL OR LOST RECOVERY

▤ DURAIN

▩ FUSAIN

▩ BONY COAL

▦ CONGLOMERATE

■ COAL

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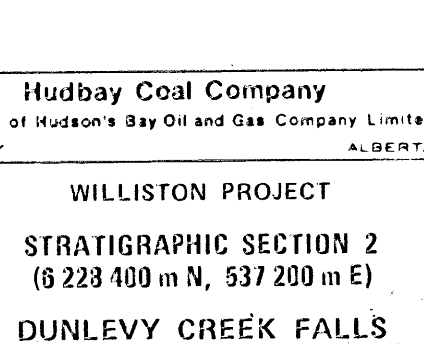
**WILLISTON PROJECT**
**STRATIGRAPHIC SECTION 1**
**(6 230 000 m N, 529 800 m E)**
ADAMS CREEK RIDGE

| | | | | | |
|---|---|---|---|---|---|
| SCALE | 1:50 | DWN. BY | J. Loader | DATE: | Sept. 80 |
| APPR. BY: | | FILE No. | | | HC 2192 R |

HC 2484 L54



☒ COVERED INTERVAL OR LOST RECOVERY

▨ OVERBURDEN
⁞ SANDSTONE
" " SILTSTONE
-C- MUDSTONE (CARBONACEOUS)
☰ SHALE

☒ ASH BENTONITE
Fe SEAT EARTH
☐ VITRAIN
▥ CLARAIN
▧ CLARODURAIN

▦ DURAIN
▩ FUSAIN
☒ BONY COAL
⁘ CONGLOMERATE
▒ COAL

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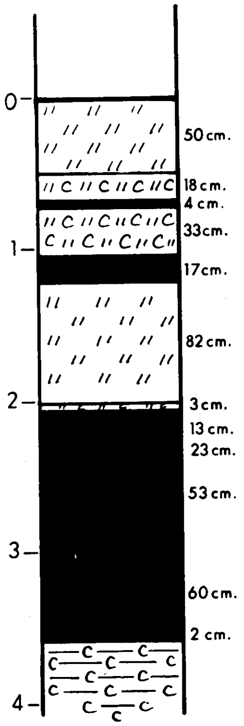
STRATIGRAPHIC SECTION 2
(6 228 400 m N, 537 200 m E)

DUNLEVY CREEK FALLS

| | | |
|---|---|---|
| SCALE: 1:50 | DWN BY J. Loader | DATE Sept. 80 |
| APPR. BY: | FILE No. | HC 2484 L54 |



| | |
|---|---|
| 50 cm. | Siltstone |
| 18 cm. | Siltstone - carbonaceous with bands of vitrain |
| 4 cm. | Coal - platy, shiny, banded, vitrain & dull bands - 40% vitrain |
| 33 cm. | Siltstone - gret, carbonaceous - leaf fossils, etc. |
| 17 cm. | Coal - hard, shiny, well cleated, vitrain, not banded |
| 82 cm. | Siltstone - grey |
| 3 cm. | Siltstone - grey, carbonaceous, leaf fragments, etc. |
| 13 cm. | Coal - platy, very shiny, rubbly, mostly vitrain |
| 23 cm. | Coal - very good cleating, clean, hard, 70% vitrain |
| 53 cm. | Coal - hard, dull, vitrain bands ($\simeq$2 mm in width)<br>20% vitrain, slightly better cleated |
| 60 cm. | Coal - hard, dull, poorly cleated, 10% vitrain |
| 2 cm. | Coal - very hard, no cleating, smooth surface |
| | Shale - coaly, cover |

- ▨ OVERBURDEN
- ⬚ SANDSTONE
- " " SILTSTONE
- -C- MUDSTONE (CARBONACEOUS)
- ☰ SHALE
- ☒ ASH BENTONITE
- Fe SEAT EARTH
- ☐ VITRAIN
- ▥ CLARAIN
- ▧ CLARODURAIN
- ☒ COVERED INTERVAL OR LOST RECOVERY
- ▤ DURAIN
- ▩ FUSAIN
- ▦ BONY COAL
- ⁘ CONGLOMERATE
- ■ COAL

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A Division of Hudson's Bay Oil and Gas Company Limited
CALGARY ALBERTA

WILLISTON PROJECT
STRATIGRAPHIC SECTION 3
(6 219 400 m N, 545 000 m E)

PACKWOOD
MINE VENTILATION SHAFT

| | | | | | |
|---|---|---|---|---|---|
| SCALE | 1:50 | DWN. BY | J. Loader | DATE: | Sept. 80 |
| APPR. BY: | | FILE No. | | HC 2193 R | |

N.B. 33 m of cover between bottom of Section 3A and top of Section 3C - Section 3B (Adit Section) lies within this interval.

inches 0 1 2
0 1 2 3 4 5 centimetres

BRITISH COLUMBIA GEOLOGICAL SURVEY

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▨ OVERBURDEN
⁘ SANDSTONE
" " SILTSTONE
-C- MUDSTONE (CARBONACEOUS)
--- SHALE
☒ ASH BENTONITE
Fe SEAT EARTH
☐ VITRAIN
▥ CLARAIN
▨ CLARODURAIN
☒ COVERED INTERVAL OR LOST RECOVERY
▦ DURAIN
▩ FUSAIN
▩ BONY COAL
⁘ CONGLOMERATE
▒ COAL

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**WILLISTON PROJECT**
**STRATIGRAPHIC SECTION 4**
**(6 218 700 m N, 544 900 m E)**
**ABOVE ADIT ON**
**DUNLEVY CREEK ROAD**

| | | | | | |
|---|---|---|---|---|---|
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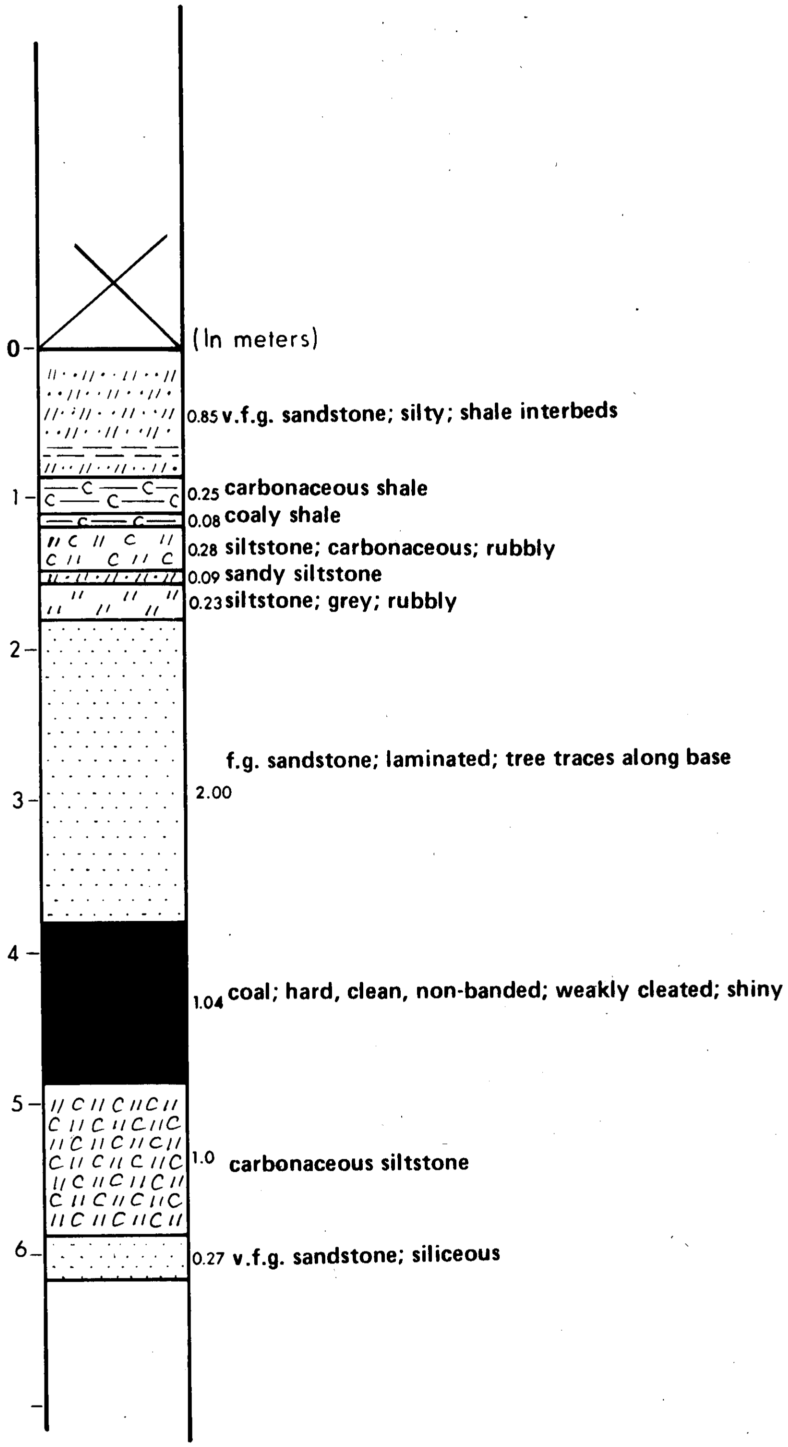
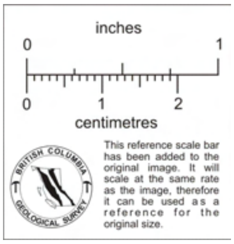
| APPR. BY: | | FILE No. | | | HC 2483 L54 |





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- ▧ OVERBURDEN
- ⬚ SANDSTONE
- " " SILTSTONE
- C MUDSTONE (CARBONACEOUS)
- ☰ SHALE
- ☒ ASH BENTONITE
- Fe SEAT EARTH
- ☐ VITRAIN
- ▥ CLARAIN
- ▧ CLARODURAIN
- ☒ COVERED INTERVAL OR LOST RECOVERY
- ▦ DURAIN
- ▩ FUSAIN
- ▦ BONY COAL
- ⁘ CONGLOMERATE
- ■ COAL

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A Division of Hudson's Bay Oil and Gas Company Limited
CALGARY ALBERTA

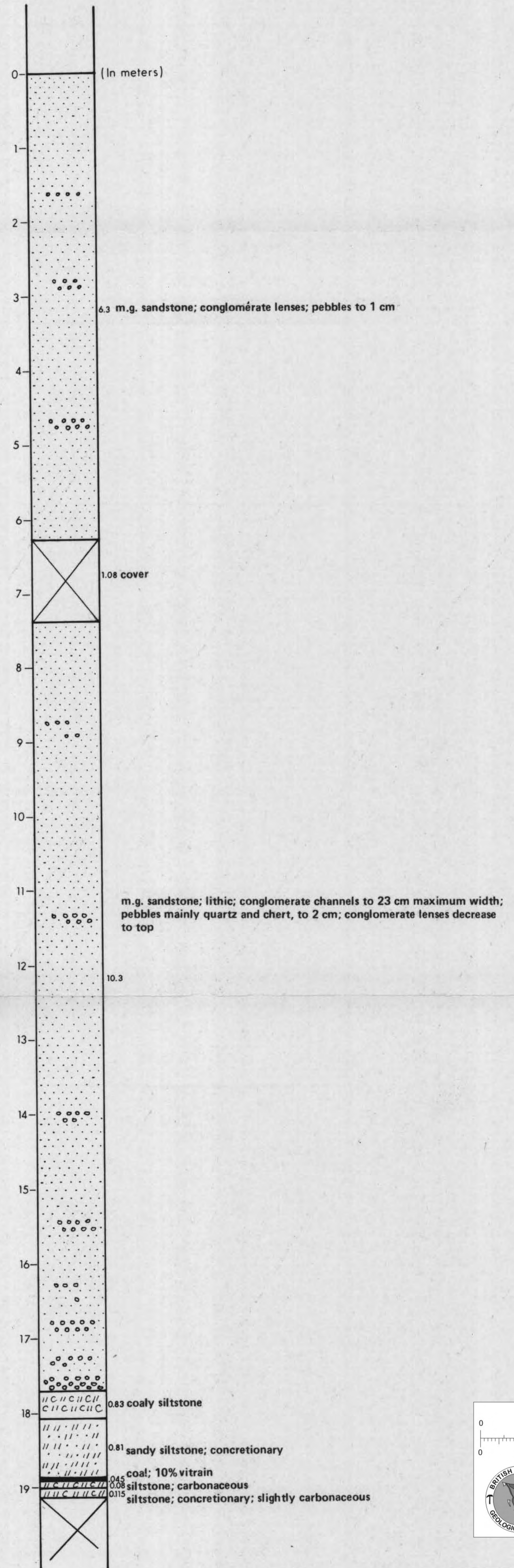
**WILLISTON PROJECT**

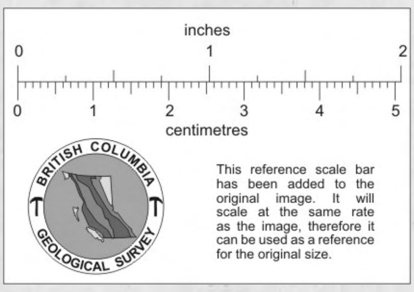
**STRATIGRAPHIC SECTION 5**
**(6 218 500 m N, 545 000 m E)**

**. AUDIT ON DUNLEVY CREEK ROAD**

| | | | | | |
|---|---|---|---|---|---|
| SCALE: | 1:50 | DWN. BY | J. Loader | DATE: | Sept. 80 |
| APPR. BY: | | FILE No. | | HC 2190 R | |

HC 2481 L54





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| | | |
|---|---|---|
| OVERBURDEN | ASH BENTONITE | COVERED INTERVAL<br>[illegible] RECOVERY |
| SANDSTONE | Fe SEAT EARTH | DURAIN |
| SILTSTONE | VITRAIN | FUSAIN |
| MUDSTONE (CARBONACEOUS) | CLARAIN | BONY COAL |
| SHALE | CLARODURAIN | CONGLOMERATE |
| | | COAL |

Hudbay Coal Company
A Division of Hudson's Bay Oil and Gas Company Limited
CALGARY ALBERTA

## WILLISTON PROJECT
## STRATIGRAPHIC SECTION 6
## (6 218 300 m N, 545 100 m E)
## BELOW ADIT ON DUNLEVY CREEK ROAD

SCALE 1:50 DWN BY J. Loader DATE Sept. 80
APPR BY HC 2481 L54

HC 2485 L54

( In meters)

| | |
|---|---|
| 4.0 | m.g. lithic sandstone with conglomerate lenses; 10% conglomerate; pebbles are sub-rounded to sub-angular; 25% quartz |
| 0.72 | grey concretionary siltstone |
| 0.10 | shaly siltstone |
| 0.22 | concretionary siltstone |
| 0.12 | shaly siltstone |
| 0.23 | laminated concretionary siltstone |
| 0.21 | rubbly shaly siltstone |
| 3.9 | cover |
| 0.45 | laminated grey siltstone |
| 0.69 | rubbly siltstone with concretions |
| 0.24 | f.g. laminated sandstone |
| 0.13 | rubbly grey carbonaceous siltstone |
| 0.09 | coaly shale |
| 0.08 | concretionary siltstone |
| 0.90 | f.g. laminated sandstone |
| 0.72 | grey rubbly siltstone |
| 0.10 | carbonaceous siltstone with coal lenses |
| 0.29 | hard, f.g. siltstone |
| 1.9 | m.g. hard sandstone, laminated, 60% quartz, carbon coatings along cross-bedding surfaces |
| 0.06 | v.f.g. carbonaceous sandstone |
| 6.0 | m.g. homogeneous, lithic, cross-bedded sandstone |
| 2.50 | c.g. sandstone with 25% pebble conglomerate; conglomerate lenses grade upwards into c.g. sandstone; conglomerate decreases to top of unit; maximum pebble size to 2 cm; rounded pebbles; some coal (<1%) |
| 3.60 | m.g. fairly homogeneous lithic sandstone; some coarser lenses |
| 0.55 | thinly bedded laminated siltstone |
| 4.0 | m.g. cross-bedded sandstone with coarser lenses; grading upwards into f.g. sandstone with whispy carbonaceous laminations |
| 0.04 | carbonaceous rubbly siltstone |
| 0.05 | soft, dirty coal; 10% vitrain |
| 0.07 | hard, poorly cleated coal; almost 100% vitrain |
| 0.65 | rubbly siltstone with discontinuous coal lenses near top of unit |
| 0.42 | v.f.g. siliceous sandstone becoming silty towards top of unit |
| 0.33 | thinly interbedded v.f.g. sandstone and siltstone |
| 0.72 | f.g. sandstone with few discontinuous layers of shale decreasing towards top |
| 0.37 | m.g. sandstone grading to f.g. at top; few discontinuous shale layers |
| 0.23 | m. - f.g. lithic sandstone |
| 0.16 | m. - f.g. sandstone with discontinuous shale lenses |
| 0.20 | m. - f.g. sandstone |
| 0.04 | interbedded f.g. sandstone and shale |
| 0.34 | m. - c.g. sandstone; lenses show graded bedding |
| 0.17 | f.g. sandstone with discontinuous shale lenses |
| 1.15 | m. - c.g. sandstone; inhomogeneous grain size, lenses are c.g.; slightly carbonaceous |
| 0.02 | silty coal: lenses of coal and siltstone |
| 0.20 | grey carbonaceous siltstone; coal lenses increase upwards |
| 1.01 | f.g. sandstone with silty lenses; shale clasts; vague cross-lamination |
| 0.03 | rubbly grey mudstone; thickness varies |
| 0.18 | well-cleated coal; 60% vitrain |
| 0.23 | grey carbonaceous siltstone |
| 0.27 | rubbly v.f.g. siltstone with discontinuous coal lenses to 4 mm thick |
| 0.72 | siltstone, light grey, carbonaceous, thick bedded |

▨ OVERBURDEN
▒ SANDSTONE
☐ SILTSTONE
☐ MUDSTONE (CARBONACEOUS)
☐ SHALE
☒ ASH BENTONITE
☐ SEAT EARTH
☐ VITRAIN
▥ CLARAIN
▨ CLARODURAIN
☒ COVERED INTERVAL OR LOST RECOVERY
▦ DURAIN
▩ FUSAIN
▩ BONY COAL
▒ CONGLOMERATE
▒ COAL

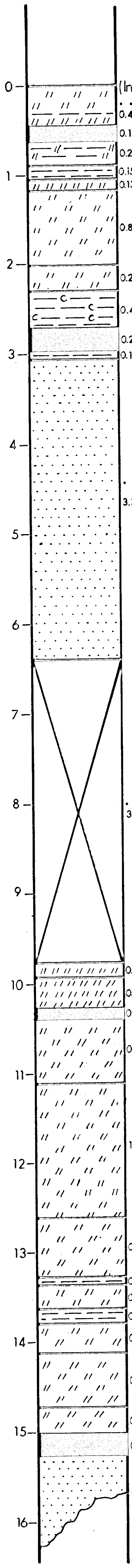
**Hudbay Coal Company**
A Division of Hudson's Bay Oil and Gas Company Limited
CALGARY ALBERTA

WILLISTON PROJECT

STRATIGRAPHIC SECTION 7
(6 217 500 m N, 546 000 m E)

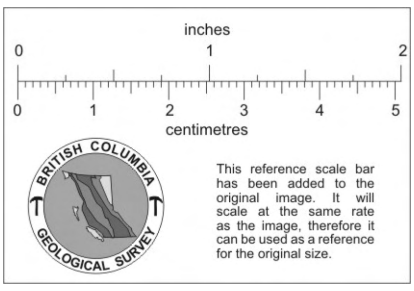
DUNLEVY INLET ROAD

SCALE : 1:50
DRN. BY J. Loader
DATE : Sept. 80
APPR. BY :
FILE No.
HC 2485 L54



(In meter)

| | |
|---|---|
| 0.43 | Grey shaly silts, weathers light grey |
| 0.18 | Coal, cleated, 50% vitrain, 40% clarain, 10% fusain |
| 0.23 | Grey shale, silty |
| 0.15 | Thin bedded shale, dark grey |
| 0.13 | Thin bedded silts, dark grey |
| 0.83 | Dark grey silts, weathers brown, shaly interbeds, concretions near bottom |
| 0.27 | Thin bedded brown silts |
| 0.4 | Dark grey shale, carbonaceous |
| 0.23 | Coal, 80% clarain, 10% vitrain, 10% fusain, dull |
| 0.1 | Thin bedded grey siltstone |
| 3.32 | Brown sandstone (weathered), banded dark, salt & pepper, medium grains, siliceous, sorted well, cross bedded |
| 3.36 | Covered |
| 0.16 | Grey thin bedded silts, carbonaceous bands |
| 0.34 | Grey siltstone, weathers brown |
| 0.11 | Coal, 60% clarain, 30% vitrain, 10% fusain |
| 0.70 | Grey thin bed silts, weathers brown |
| 1.5 | Siltstone, medium-grained, grey, weathers brown, carbonaceous, blocky |
| 0.64 | Thin bedded silts, grey |
| 0.08 | Black shale, coaly bands |
| 0.27 | Siltstone, grey, weathers brown |
| 0.17 | Dark grey shale, coaly bands |
| 0.32 | Thin bedded siltstone |
| 0.6 | Siltstone, medium-grained, weathers brown |
| 0.3 | Grey siltstone, medium-grained, carbonaceous, calcite & quartz crystals in fractures |
| 0.23 | Coal, banded, cleated, 70% vitrain, 20% clarain, 10% fusain |
| | Cross bedded sandstone (no floor) |



This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

- ▨ OVERBURDEN
- ⠿ SANDSTONE
- " " SILTSTONE
- -c- MUDSTONE (CARBONACEOUS)
- ☰ SHALE
- ☒ ASH BENTONITE
- Fe SEAT EARTH
- ☐ VITRAIN
- ▥ CLARAIN
- ▨ CLARODURAIN
- ☒ COVERED INTERVAL OR LOST RECOVERY
- ▤ DURAIN
- ▦ FUSAIN
- ▩ BONY COAL
- ⁘ CONGLOMERATE
- ░ COAL

**Hudbay Coal Company**
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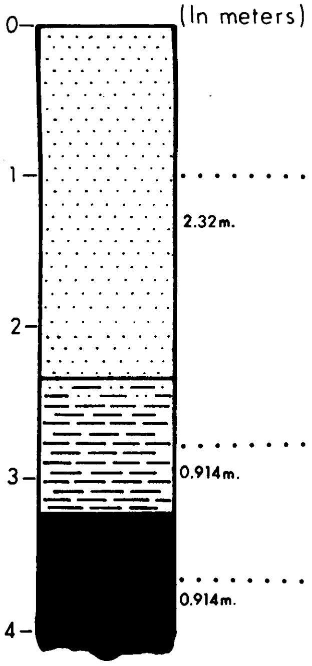
CALGARY ALBERTA

WILLISTON PROJECT
STRATIGRAPHIC SECTION 8
(6 211 900 m N, 554 200 m E)
ROAD NORTH OF
BULLHEAD MOUNTAIN

SCALE: 1:50
DWN. BY: J. Loader
DATE: Sept. 80
APPR. BY:
FILE No.
HC 2482 L54

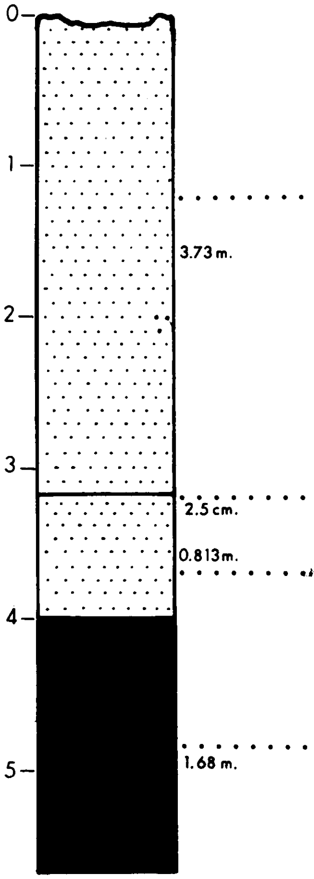


## TOP (KING) SEAM

Irregular bedded sandstone, m.g. orange and black banded, coaly inclusions, interbedded shales, siltstone with coal and carbonaceous lenses. Top of section covered.

Carbonaceous shales, sandy lenses near top.

(no floor) Coal, hard, highly weathered, small vitrain bands.



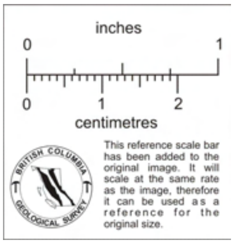
## BOTTOM (RIVER SIDE) SEAM

m.g. sandstone, orange and black banded, silty interbeds, tree impressions, coal inclusions, vitrain bands.

Vitrain band

m.g. - f.g. sandstone, orange and black banded, silty interbeds

Coal seam; hard, small vitrain bands



- ▨ OVERBURDEN
- ░ SANDSTONE
- " " SILTSTONE
- C MUDSTONE (CARBONACEOUS)
- ☰ SHALE
- ☒ ASH BENTONITE
- Fe SEAT EARTH
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- ░ CONGLOMERATE
- ■ COAL

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**WILLISTON PROJECT**

**STRATIGRAPHIC SECTION 9**
**(6 203 500 m N, 556 500 m E)**

**THE GRANT KING MINE**

| | | | |
|---|---|---|---|
| SCALE: 1:50 | DWN. BY: [illegible] | | DATE: Sept. 80 |
| APPR. BY: | FILE No. | | HC 2191 R |