

104 A / 16 W

680839

SUMMARY REPORT

- on the -

GROUNDHOG COAL LICENSES

#4395, 4400, 4406, 7540, 7541 and 7542

- prepared for -

GROUNDHOG COAL LTD.,

#904 - 675 W. HASTINGS STREET,

VANCOUVER, B.C.

prepared by:

KERR, DAWSON & ASSOCIATES LTD.

#206 - 310 NICOLA STREET,

KAMLOOPS, B.C. V2C 2P5

JOHN R. KERR, P. ENG.

FEBRUARY 10, 1984.

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SUMMARY

1). Groundhog Coal Ltd. has acquired six coal licenses covering some of the most significant coal outcroppings in the Groundhog coal fields. The coal fields are located at the headwaters of the Skeena River, some 180 km. due north of Hazelton, B.C. Access is possible only by small fixed-wing aircraft or helicopter.

2). The coal fields were discovered during the early 1900's, with only minor development reported during this period. Placer Development Ltd., operator of a joint venture during 1969 & 1970, drilled six diamond drill holes, three of these located on the existing Groundhog Coal Ltd. leases. During the early 1980's, several major oil and gas companies, including Imperial Oil, Gulf and Suncor have completed major development programmes within the Groundhog area. Gulf and Suncor own properties adjacent to the subject leases.

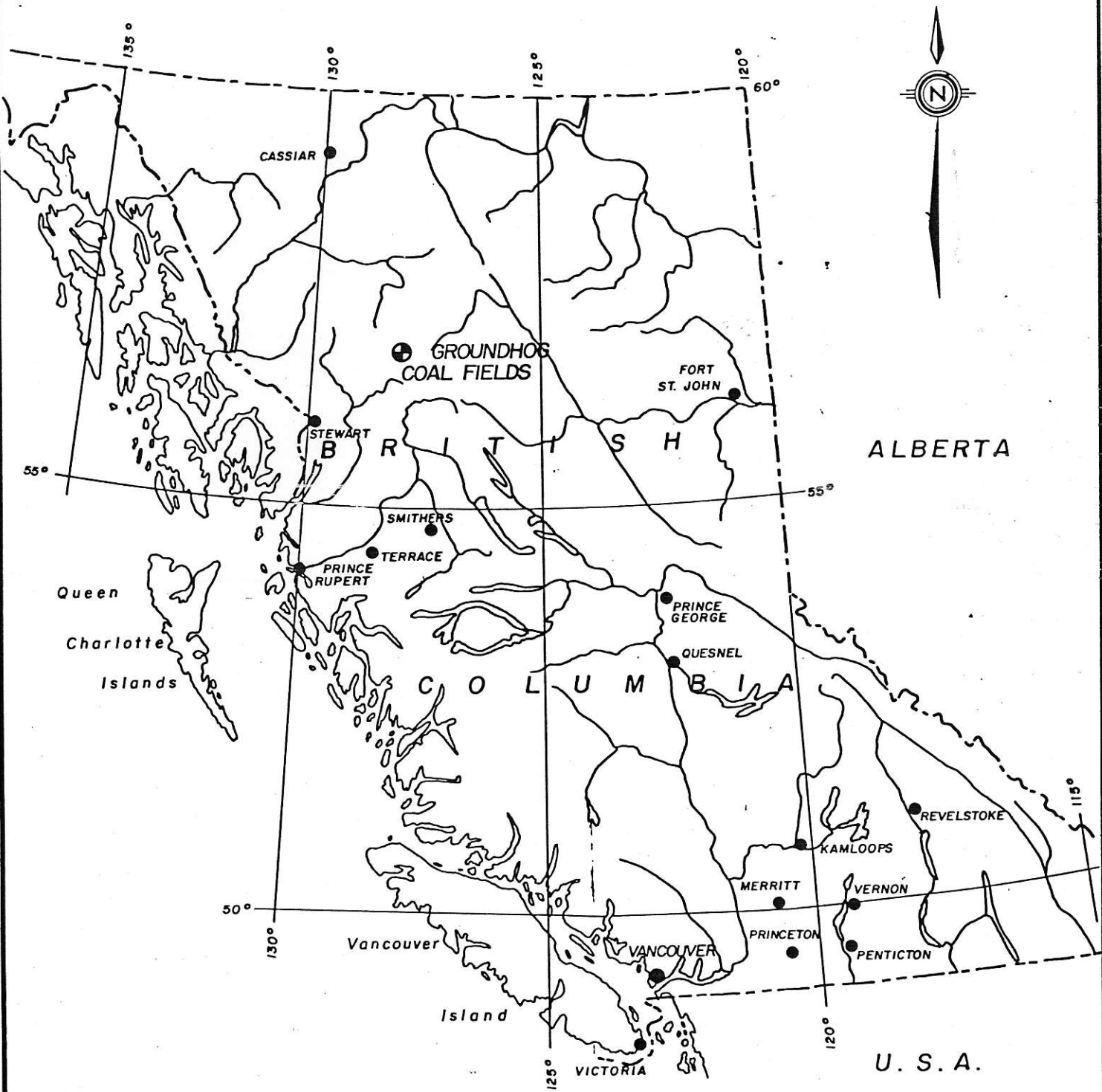
3). Coal seams occur in the second oldest stratigraphic unit of the Jurassic/Cretaceous Bowser Assemblage of sedimentary rocks. The coal seams are interbedded with sandstone, argillite, and carbonaceous shale. Seams within the coal fields range in thickness from 0.3 - 4.0 meters.

4). Two potentially economic coal seams are known to exist within the license area. The Upper Discovery Creek Seam is measured on surface to be 2.2 meters thick, and the Lower Discovery Creek Seam is measured to be 3.6 meters thick. Assuming a 12-15° dip to the sediments, the two seams are separated by a stratigraphic thickness of 60 meters. If these seams prove continuous, without major structural disturbance, the license area offers the potential of developing in excess of 70,000,000 tonnes of coal. The overall average dip of the sediments, with respect to the groundslope is critical in determining what percentage of these reserves could be developed for strip mining methods. The possibility exists that further reserves could be developed from other indicated seams.

5). Laboratory analysis of surface samples and drill core, indicates a thermal content ranging 8,800-12,000 BTU/lb., ash content ranging 13-36%, and sulphur content ranging .4 - 1.0%. The thermal content of a clean coal is estimated to approach 14,000 BTU/lb., a very high quality bituminous coal.

6). An aggressive, 2-Phase development drill programme is recommended for the license area. The programme allows for a total of 5,000 meters of drilling, with 25 holes (150-250 meters deep) spaced at 500-1,000 meter intervals. Costs of the programme are as follows:

Phase I (1,000 m)	\$220,000.00
Phase II (4,000 m)	640,000.00
Compilation of Data	<u>20,000.00</u>
TOTAL	\$880,000.00



GROUNDHOG COAL LTD.	
LOCATION MAP	
GROUNDHOG COAL FIELDS	
Technical Work by: Kerr, Dawson & Assoc. Ltd.	Date : Feb. 1984.
Scale : 1cm. = 87 km.	Dwg No. 189-1

INTRODUCTIONGeneral Statement:

Groundhog Coal Ltd. acquired 77 coal licenses in 1978 covering known coal outcroppings in the Groundhog Coal Fields at the headwaters of the Skeena River. All but three licenses were dropped during 1979. In 1980, under supervision of the writer, a geological exploration programme was completed on the licenses, to provide a stratigraphic and structural interpretation of the license area.

Three additional contiguous licenses were obtained in 1982 by Groundhog Coal Ltd. Mr. A.F. Reeve, President, requested that I review all available data, and update my December 31, 1980 report.

Location and Access:

The Groundhog coal field is located in north-western British Columbia, approximately 150 km. north-east of Stewart, and 180 km. due north of Hazelton. Geographic co-ordinates of the center of the three coal licenses are $56^{\circ} 52'N$, and $128^{\circ} 19'W$ (NTS 104A/16W).

Access to the licenses on the ground is difficult. The B.C.R. right-of-way has been cleared along the eastern bank of the Skeena River. A construction road follows the clearing. Several bridge wash-outs and slides block this road to rail-end at Chipmunk, ~ 35 km. to the southeast. Access to the licenses is best gained by helicopter. Several swampy areas provide easy landing sites. An airstrip is situated at the Kluatantan River, approximately 20 km. to the southeast. This airstrip is suitable for small fixed-wing aircraft.

Future development of the Groundhog coal fields would depend on completion of the B.C.R. rail line. Distance to Prince George is 495 km. Alternative access, providing direct routes to tidewater, are along the Skeena River to Hazelton, and along the Nass River to Greenville, distances of 200 - 250 km.

Topography and Vegetation:

The Groundhog coal fields lies at the headwaters of three major river systems. The Stikine River drains the northern portion; the Nass River drains the southwestern portion; and the Skeena River drains the southeastern portion. General terrain in the coal field is mountainous, with broad, relatively flat basins in the major river valleys.

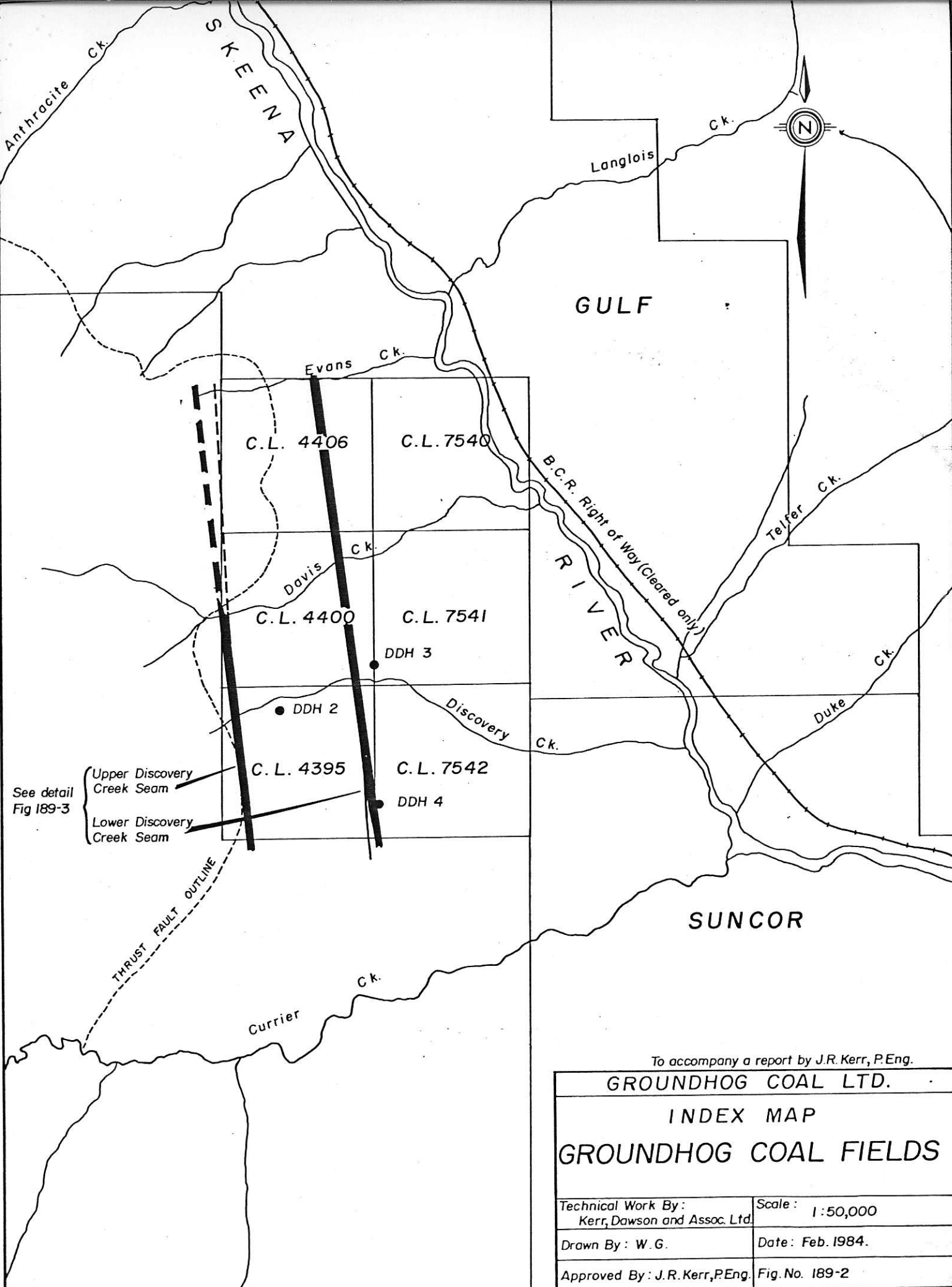
The six coal licenses are located on the western valley slopes of the Skeena River. Relief is flat to moderate, ranging from 1,060 m. (a.s.l.) in the northeast corner of the licenses to 1,460 m. (a.s.l.) in the southwest corner. The drainages of Discovery Creek, Davis Creek, and Evans Creek form local steep escarpments.

The license area is generally forested, with stands of spruce, balsam, and occasional poplar trees. Underbrush is light in the lower areas; however, in the higher elevations, thick, dense, low-lying alpine spruce occurs. There are numerous swamps within the license area, vegetation being swamp grass and tag alder.

Coal Licenses:

<u>License No.</u>	<u>Lot No.</u>	<u>Record Date</u>
4406	126	November 30, 1978
4400	127	November 30, 1978
4395	128	November 30, 1978
7540	131	November 25, 1982
7541	132	November 25, 1982
7542	133	November 25, 1982

All licenses are contiguous, and are owned by Groundhog Coal Ltd.



See detail Fig 189-3
 Upper Discovery Creek Seam
 Lower Discovery Creek Seam

To accompany a report by J.R. Kerr, P.Eng.

GROUNDHOG COAL LTD.	
INDEX MAP	
GROUNDHOG COAL FIELDS	
Technical Work By: Kerr, Dawson and Assoc. Ltd.	Scale: 1:50,000
Drawn By: W.G.	Date: Feb. 1984.
Approved By: J.R. Kerr, P.Eng.	Fig. No. 189-2

History:

The history of the Groundhog coal fields is well documented in "Geology of the Groundhog Coal Field" by Willard D. Tompson, March, 1977. The following summarizes Mr. Tompson's account.

The earliest recorded discovery of coal in the area was made in 1900, in the Spatsizi River area, some 30 km. northwest of the Groundhog. James McEvoy discovered coal on Discovery Creek in 1903. Subsequent discoveries were on Abraham Creek, Trail Creek, Telfer Creek and Beirnes Creek. During the period 1904-1913, development work was completed on all seams. Commercial production was never achieved.

Work in the coal field was idle until 1948, when the G.S.C. sent a crew into the area to evaluate and map the coal bearing lithologies. Due to mobilization problems, very little was accomplished during this programme.

Coastal Coal Ltd. acquired 24 licenses in 1966. Under the supervision of R.V. Best and J.M. Block, a party of eight geologists, assistants and prospectors geologically mapped a 1,500 square mile area. In 1969 and 1970, Placer Development Ltd., Quintana Minerals Corp., and National Coal Corp., geologically mapped 200 square miles in the Skeena River valley area. Six diamond drill holes were completed in late 1970. The licenses were permitted to lapse in the early 1970's.

Although coal licenses currently exist over most of the favourable coal bearing lithosome, no documented work was undertaken in the area during the period 1970-1980. Following the 1980 geological programme completed by the writer, several large companies have completed major development drill programmes. It is reported that Gulf Canada Resources have drill developed seven coal seams (accumulated width of 15 meters) on their Mt. Klappan property, at the northern end of the Groundhog coal field, some 50 km. northwest of the subject licenses. Gulf also is developing coal potential, a large block of licenses immediately to the north of the subject licenses. Suncor owns a block of licenses immediately to the southeast, and have completed development drilling during 1983.

GEOLOGY

General Geology:

The Groundhog coal fields are located in the southeastern portion of the Bowser Basin. The Bowser Basin is an assemblage of deltaic and basin sedimentary rocks of Upper Jurassic and Lower Cretaceous Age. The Groundhog area is mainly deltaic deposits, the coal seams deriving from thick peat bogs, common to most deltas.

Various lithologies within the Bowser Assemblage in the Groundhog area have been recognized since early development of the coal seams. The most recent attempt to classify these lithologies was made by Tompson, et al, from work completed during the 1969-70 field seasons. As the writer confined the 1980 programme to detail in the coal-bearing strata, very little can be added to Tompson's interpretation, and the following description of each "Lithosome" (stratigraphic unit), is summarized from Tompson's 1977 report.

I. McEVOY RIDGE LITHOSOME

Probably the oldest stratigraphic unit of the Groundhog area, this lithosome is characterized by well indurated, dark coloured, poorly sorted, fine to coarse grained clastic rocks. Mudstone and fine to coarse grained sandstone, occasionally grading to a chert pebble conglomerate, are the predominant rock. Bedding thicknesses vary from thin to medium.

II. COAL BEARING LITHOSOME

The Coal Bearing Lithosome conformably overlies the McEvoy Ridge Lithosome. The contact is exposed at the head of Anthracite Creek, and according to Tompson is a well-defined conformable contact.

Poorly indurated rocks of this lithosome are defined as carbonaceous shales and mudstones (85-90%) and fine-coarse grained clastic sandstones. It is within the carbonaceous shales that seams of dense, hard coal occur. Bedding thicknesses vary from medium to thick.

III. DEVIL'S CLAW CONGLOMERATE

The Devil's Claw Conglomerate conformably overlies the Coal Bearing Lithosome, the contact exposed on Table Mountain. Tompson defines the contact as well-defined and conformable.

The dominant rock type of this lithosome is a medium-coarse chert pebble conglomerate, occurring as irregular beds 10-60 meters thick. Pebbles are commonly 2-4 cm. in diameter; however, range as large as 10-15 cm. in diameter. Common pebble colours are black, green and cream. The matrix is generally a fine-medium grained, siliceous sandstone.

Intertongued with the conglomerate are mudstone and shale, similar to the dominant rock type of the Coal Bearing Lithosome.

IV. LONESOME MTN. LITHOSOME

The Lonesome Mtn. Lithosome conformably overlies the Devil's Claw Conglomerate, and is the youngest rock in the Groundhog area. Exposures of the contact are difficult to recognize; however, Tompson interprets one on Table Mtn. The contact is described as very gradational.

The dominant rock-type of this lithosome is a tan to dark brown, well indurated sandstone, occasionally grading into conglomerate. Mudstone and shale are interbedded with the sandstone, beds ranging in thickness from 4-9 meters. Irregular carbonaceous and coal lenses occur within the shale. Conglomerate beds and lenses are found in the lower portion of the Lonesome Mt. Lithosome.

Structure:

The structural features of the Groundhog area are very complex, marked by areas of intense disturbance and irregularities, and areas where the strata is relatively undisturbed and predictable. Several relatively flat-lying thrust faults have been interpreted, the most prominent being the Groundhog thrust, which lies approximately 3 km. SW of the Skeena River.

Several normal and reverse faults have been observed and interpreted within the Groundhog area. These have caused local disturbances to the strata. Drag folding development of cleavage, fracturing, and secondary alteration are associated with these faults.

Rocks in the upper plate of the Groundhog thrust are observed to be highly disturbed and contorted. This feature is easily observed, as rocks of the upper plate form mountainous terrain (Devil's Claw Mtn.) where outcrops are plentiful. Rocks of all lithosomes of the Bowser Assemblage have been identified in the upper plate. Rocks of the lower plate are located in the broad, relatively flat Skeena River valley. Outcrops are not plentiful; however, all mapped outcrops have been identified as belonging to the coal bearing lithosome. Seventy to eighty percent of the outcrops mapped in the Skeena River valley indicate a north to northwest strike and gentle dip ($5-20^{\circ}$) generally to the northeast.

Along the Skeena River, outcrops were examined in detail at two locations, where strata is highly disturbed and contorted. 2.2 km. northwest of Currier Creek, one outcrop showed a moderately dipping normal fault, with drag folding apparent in the upper plate. Detailed examination of the rock indicates that a secondary cleavage has developed in the shale, with bedding features crossing the cleavage planes. At Langlois Creek, apparent bedding attains a very steep dip ($> 70^{\circ}$). Detailed examination revealed that a secondary cleavage had developed; however, appears conformable to the bedding. The fault plane was not positively identified at this location.

At both locations, the disruptions appear very local, and are probably confined to the plane of the fault. At Langlois Creek, an outcrop 50-75 meters east of the disturbed rock, shows very flat-lying undisturbed bedding.

It is within this lower plate of the Groundhog thrust that the potential for developing coal reserves exists, and the six subject coal licenses of this report are located.

Property Geology:

Outcrops are scarce over most of the license area, being confined to the main creek valleys. Those mapped are mainly a fine-medium grained, gritty, well bedded, sandstone, and a black, fine grained occasionally carbonaceous, fissile shale or mudstone. At two locations on Discovery Creek, coal seams were located in outcrop. All rock outcrops examined were identified as belonging to the Coal Bearing Lithosome. Scarcity of outcrops made interpretation of various lithologies impossible.

The interpreted plane of the Groundhog thrust fault passes through the western portion of the coal licenses. Outcrops from the upper plate, however, were not recognized.

All bedding attitudes measured from outcrop on the license area were relatively flat, strikes ranging from 135° to 180° , and dips from $10-20^{\circ}$ E. There is no evidence of any major structural disturbance within the license area.

The two areas of coal outcroppings were mapped and sampled in detail (see Figure 189-3). Four coal seams ranging in thickness from 0.7 - 2.4 meters occur in carbonaceous shale. In the Upper Discovery Creek area, two coal seams (0.7 - 2.2 meters thick), are separated by 5.1 meters of interbedded sandstone and carbonaceous shale. In the Lower Discovery Creek area, two coal seams (0.9 and 2.3 meters thick) are separated by 0.4 meters of carbonaceous shale. This may be considered one large seam 3.6 meters thick, with a 0.4 meter shale parting. Coal

found as float in the creek banks 75 - 200 meters upstream from the Lower Discovery Creek showing, indicate that other coal seams probably exist in the strata.

It is impossible to develop a detailed stratigraphic section of the sediments within the coal licenses. The best section is provided from the detailed drill logs of DDH #70-2 and #70-3. As these holes are approximately 1,100 meters apart, correlation of the sediments and coal seams between the drill holes is impossible.

ECONOMIC POTENTIAL

Two potentially economic coal seams are known to exist within the license area.

UPPER DISCOVERY CREEK SEAM:

Two seams of coal were located; however, only one appears to have sufficient thickness (2.2m) for mining. The other seam is narrow (0.7m) and contains an unusually high content of sulphur (9.97%), mainly as sulphides.

The main seam was exposed and sampled at three various locations. Results of the laboratory proximate analysis of the samples over an average thickness of 2.2 m. is as follows:

	<u>As received</u>	<u>Dry</u>
% Moisture	15.58	--
% Ash	25.88	31.09
% Volatile	13.57	16.46
% Fixed Carbon	44.97	52.45
BTU/lb.	7,532	8,805
% Sulphur	.33%	.40%

Diamond drill hole #70-2 intersected the Upper Discovery Creek coal seam at vertical depths of 59.3 - 61.2 meters (thickness 1.9 m).

Analysis of the drill core is as follows:

% Moisture	.49%
% Ash	36.88%
% Volatile	4.21%
% Fixed Carbon	58.42%
BTU/lb.	8,966
% Sulphur	.43%

There is a good correlation of results of the drill core to the results of surface samples on a dry basis. The high moisture content in the surface sample was due to the fact that the samples were collected during spring break-up when snow was still on the ground.

If no major structural disturbances exist, the Upper Discovery Creek coal seam would exist over 90% of the six coal licenses. This would amount to possible geological reserves of approximately 32,000,000 tonnes.

LOWER DISCOVERY CREEK SEAM:

Two seams of coal were located and sampled in outcrop, separated by a 0.4 meter shale parting. Total thickness of coal (not including shale) is 3.2 meters. Average results of three samples collected from the seam are as follows:

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	18.16	--
% Ash	26.66	32.54
% Volatile	11.84	14.47
% Fixed Carbon	43.34	52.99
BTU/lb	7,788	9,523
% Sulphur	.34	.41

Diamond drill hole #70-3 intersected the Lower Discovery Creek coal seam at vertical depths of 16.3 - 18.3 meters (thickness - 2.0 m.). Analysis of the drill core is as follows:

% Moisture	.61
% Ash	13.20
% Volatile	5.43
% Fixed Carbon	80.76
BTU/lb.	11,966
% Sulphur	.97

Correlation of these results with those of the surface samples was not as good; however the surface samples were taken over a greater width than the drill core samples. The possibility of surface contamination or dilution can add to a high ash (low BTU/lb.) content. The high moisture content in the surface samples is due to conditions at time of sampling.

If continuous, the Lower Discovery Creek coal seam would exist over approximately 65% of the license area, provided no major structural problems exist. Possible geological reserves would be approximately 38,000,000 tonnes.

In summary, two coal seams of economic thickness are known to exist within the coal license area. In total, possible geological reserves amount to 70,000,000 tonnes. In addition, other coal seams may exist that are not exposed in surface outcrop. Diamond drilling at 500-1,000 meter centers is required to substantiate these reserves. Drill development would indicate depths of the seams at various locations within the licenses, which would allow for determination of the overall reserves that could be mined by strip-mining methods.

It is apparent that the quality of the coal is not truly represented from analysis of surface samples. Moisture content is excessively high, and analysis does not reflect the inherent moisture content. The ash content of surface samples can expect to be high due to surface contamination. It is estimated that clean coal (ash free) would contain 13,500 - 14,000 BTU/lb., a high quality bituminous coal product.

If it is found that a significant portion of the reserve potential underlying the coal licenses can be mined by strip-mining methods, a viable coal mining operation is envisioned for the license area. The following drill programme is recommended to establish these reserves.

RECOMMENDATIONS

To establish geological reserves of coal on the six licenses, it will be necessary to consider diamond drill holes, initially at 1,000 meter intervals, with further refinement to 500 meter intervals where structural irregularities are encountered or suspected. In total, 5,000 meters of drilling are required to test adequately the reserve potential of the license area, each hole 150 - 250 meters deep. (~25 holes).

It is recommended that the programme be broken into two success contingent phases, the second phase contingent upon the existence of coal seams encountered in the first phase drilling. The costing of the second phase allows for no demobilization or remobilization costs between the first and second phase.

PHASE I

Allow 1,000 meters (6 holes) to be collared near surface outcroppings of the known coal seams, and spaced at approximately 1,000 meter intervals. Results of this programme would allow for reliable projection of dips of coal seams, therefore the logical planning of second phase drill site locations.

<u>Costs:</u>	Mobilization/demobilization, purchase of camp materials, and construction of camp and core logging/storage facilities.	\$40,000.00
	Drilling - all inclusive, with supervision, drill site preparation, helicopter support, drill moves, laboratory analysis and camp operation. 1,000 meters @ \$180.00/meter.	<u>180,000.00</u>
	TOTAL PHASE I	\$220,000.00

PHASE II

Continued drilling at 1,000 meter centers, this interval being closed to 500 meters in areas of lithological or structural irregularities.

<u>Costs:</u>	Drilling - all inclusive, with supervision, drill site preparation, helicopter support, drill moves, laboratory analysis and camp operation. 4,000 meters @ \$160.00/meter.	\$640,000.00
	Compilation of Data & Report.	<u>20,000.00</u>
	TOTAL PHASE I & II	<u>\$880,000.00</u>

A well co-ordinated programme would permit the programme to be completed during the period June 1 - October 31 (the five available working months). Contingencies have been allowed for in the costing if a second drill is required towards the end of this period in order to complete the project.

Respectfully Submitted By:
KERR, DAWSON & ASSOCIATES LTD.,

John R Kerr
John R. Kerr, P. Eng.
GEOLOGIST.

APPENDIX A

UNIT COST BREAKDOWN

COST BREAKDOWN

PHASE I

Diamond Drilling (NQ)	
All inclusive - drilling, additives, allowance for moves and set-ups, core boxes, etc.	\$80.00/m
Supervision, core logging, sampling, analysis, and site preparation (three-man crew).	17.00/m
Camp costs (10 man camp) including all supplies and equipment.	10.00/m
Helicopter Support.	40.00/m
Contingencies (~ 20%).	<u>33.00/m</u>
TOTAL	\$180.00/m

PHASE II

Phase II unit cost breakdown is estimated less due to an anticipated more efficient rate of drilling, which would effectively reduce support costs, and a reduced contingency allowance. Costs are based on an average of 25 meters per 12 hour shift.

APPENDIX B

PROXIMATE ANALYSIS

COMMERCIAL TESTING & ENGINEERING CO.

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WESTERN CANADA OPERATIONS



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147 RIVERSIDE DRIVE, NORTH VANCOUVER, B.C.
V7H 1T6, CANADA
OFFICE TEL. (604) 929-2228

BRIAN MOUNTFORD & ASSOCIATES LTD.
811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by Brian Mountford & Associates

Kind of sample reported to us	Coal Sample - D1-01 (0-1.5)
Sample taken at	-----
Sample taken by	-----
Date sampled	-----
Date received	June 30, 1980

Analysis report no. 64-19559

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	14.69	xxxx
% Ash	73.38	86.01
% Volatile	8.82	10.34
% Fixed Carbon	<u>3.11</u>	<u>3.65</u>
	100.00	100.00
BTU	746	874
% Sulphur	0.23	0.27

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Division of Peabody International Corporation (Canada) Ltd.

S. Morrin
Regional Manager



Charter Member

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COMMERCIAL TESTING & ENGINEERING CO.

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WESTERN CANADA OPERATIONSPLEASE ADDRESS ALL CORRESPONDENCE TO:
147 RIVERSIDE DRIVE, NORTH VANCOUVER, B.C.
V7H 1T6, CANADA
OFFICE TEL. (604) 929-2228BRIAN MOUNTFORD & ASSOCIATES LTD.
811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by
Brian Mountford & Associates

Kind of sample reported to us	Coal Sample - D1-01 (1.5-2.6)
Sample taken at	-----
Sample taken by	-----
Date sampled	-----
Date received	June 30, 1980

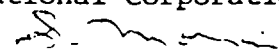
Analysis report no. 64-19560

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	11.07	xxxx
% Ash	71.56	80.47
% Volatile	8.83	9.93
% Fixed Carbon	8.54	9.60
	100.00	100.00
BTU	1405	1580
% Sulphur	0.13	0.15

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Division of Peabody International Corporation (Canada) Ltd.


S. Morrin
Regional Manager


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OFFICE TEL. (604) 929-2228BRIAN MOUNTFORD & ASSOCIATES LTD.
811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by Brian Mountford & Associates

Kind of sample reported to us	Coal Sample - D1-01 (2.1-4.0)
Sample taken at	-----
Sample taken by	-----
Date sampled	-----
Date received	June 30, 1980

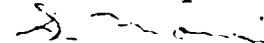
Analysis report no. 64-19561

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	6.85	xxxx
% Ash	22.45	24.10
% Volatile	9.87	10.60
% Fixed Carbon	<u>60.83</u>	<u>65.30</u>
	100.00	100.00
BTU	9817	10539
% Sulphur	0.35	0.38

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Division of Peabody International Corporation (Canada) Ltd.


S. Morrin
Regional Manager


Charter Member

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BRIAN MOUNTFORD & ASSOCIATES LTD.
811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by Brian Mountford & Associates

Kind of sample reported to us Coal Sample - D1-02 (0-1.9)
Sample taken at -----
Sample taken by -----
Date sampled -----
Date received June 30, 1980

Analysis report no. 64-19556

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	14.96	xxxx
% Ash	66.65	78.38
% Volatile	9.33	10.97
% Fixed Carbon	<u>9.06</u>	<u>10.65</u>
	100.00	100.00
BTU	1857	2184
% Sulphur	0.26	0.30

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.
Division of Peabody International Corporation (Canada) Ltd.

S. Morrin
Regional Manager



Charter Member

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

RESIDENT MANAGER
WESTERN CANADA OPERATIONS



PLEASE ADDRESS ALL CORRESPONDENCE TO:
147 RIVERSIDE DRIVE, NORTH VANCOUVER, B.C.
V7H 1T6, CANADA
OFFICE TEL. (604) 929-2228

BRIAN MOUNTFORD & ASSOCIATES LTD.
811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by Brian Mountford & Associates

Kind of sample reported to us	Coal Sample - D1-02 (2.4-4.6)
Sample taken at	-----
Sample taken by	-----
Date sampled	-----
Date received	June 30, 1980

Analysis report no. 64-19557

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	16.44	xxxx
% Ash	26.53	31.75
% Volatile	13.79	16.50
% Fixed Carbon	<u>43.24</u>	<u>51.75</u>
	100.00	100.00
BTU	7477	8948
% Sulphur	0.37	0.44

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Division of Peabody International Corporation (Canada) Ltd.

S. Morrin
S. Morrin
Regional Manager



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811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by
Brian Mountford & Associates

Kind of sample reported to us	Coal Sample -	DI-02 (4.6-5.1)
Sample taken at	-----	
Sample taken by	-----	
Date sampled	-----	
Date received	June 30,	1980

Analysis report no. 64-19558

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	9.51	xxxx
% Ash	83.06	91.79
% Volatile	5.77	6.38
% Fixed Carbon	<u>1.66</u>	<u>1.83</u>
	100.00	100.00
BTU	339	375
% Sulphur	0.24	0.26

Respectfully submitted,
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BRIAN MOUNTFORD & ASSOCIATES LTD.
811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by

Brian Mountford & Associates

Kind of sample reported to us Coal Sample - D2-01
Sample taken at -----
Sample taken by -----
Date sampled -----
Date received June 30, 1980

Analysis report no. 64-19563

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	7.90	XXXX
% Ash	23.01	24.98
% Volatile	7.43	8.07
% Fixed Carbon	<u>61.66</u>	<u>66.95</u>
	100.00	100.00
BTU	9505	10279
% Sulphur	9.18	9.97

Respectfully submitted,
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Regional Manager



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811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by
Brian Mountford & Associates

Kind of sample reported to us Coal Sample - D3-01
Sample taken at -----
Sample taken by -----
Date sampled -----
Date received June 30, 1980

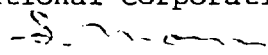
Analysis report no. 64-19564

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	23.46	xxxx
% Ash	28.65	37.43
% Volatile	17.05	22.27
% Fixed Carbon	<u>30.84</u>	<u>40.30</u>
	100.00	100.00
BTU	5303	6929
% Sulphur	0.28	0.37

Respectfully submitted,
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Regional Manager



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811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by

Brian Mountford & Associates

Kind of sample reported to us	Coal Sample - D4 (4.0-4.7)
Sample taken at	-----
Sample taken by	-----
Date sampled	-----
Date received	June 30, 1980

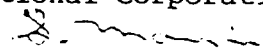
Analysis report no. 64-19565

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	12.37	xxxx
% Ash	67.64	77.19
% Volatile	7.54	8.60
% Fixed Carbon	<u>12.45</u>	<u>14.21</u>
	100.00	100.00
BTU	1683	1921
% Sulphur	0.05	0.06

Respectfully submitted,
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Division of Peabody International Corporation (Canada) Ltd.


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Regional Manager


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BRIAN MOUNTFORD & ASSOCIATES LTD.
811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by Brian Mountford & Associates

Kind of sample reported to us Coal Sample - D4 (4.7-5.6)
Sample taken at -----
Sample taken by -----
Date sampled -----
Date received June 30, 1980

Analysis report no. 64-19566

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	18.71	xxxx
% Ash	18.09	22.25
% Volatile	12.78	15.72
% Fixed Carbon	<u>50.42</u>	<u>62.03</u>
	100.00	100.00
BTU	9165	11274
% Sulphur	0.29	0.36

Respectfully submitted,
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S. Morrin
Regional Manager



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V6B 1N2

July 22, 1980

Sample identification
by Brian Mountford & Associates

Kind of sample reported to us Coal Sample - D4 (5.6-6.0)
Sample taken at -----
Sample taken by -----
Date sampled -----
Date received June 30, 1980

Analysis report no. 64-19567

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	6.64	xxxx
% Ash	86.35	92.49
% Volatile	4.93	5.28
% Fixed Carbon	<u>2.08</u>	<u>2.23</u>
	100.00	100.00
BTU	394	422
% Sulphur	0.21	0.23

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING

Division of Peabody International Corporation (Canada) Ltd.

S. Morrin
S. Morrin
Regional Manager



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OFFICE TEL. (604) 929-2228

July 22, 1980

BRIAN MOUNTFORD & ASSOCIATES LTD.
811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

Sample identification
by Brian Mountford & Associates

Kind of sample reported to us Coal Sample - D4 (6.0-7.1)
Sample taken at -----
Sample taken by -----
Date sampled -----
Date received June 30, 1980

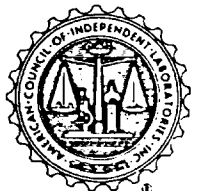
Analysis report no. 64-19568

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	18.01	xxxx
% Ash	28.02	34.17
% Volatile	13.54	16.51
% Fixed Carbon	<u>40.43</u>	<u>49.32</u>
	100.00	100.00
BTU	7563	9224
% Sulphur	0.26	0.32

Respectfully submitted,
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Division of Peabody International Corporation (Canada) Ltd.

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S. Morrin
Regional Manager



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811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by
Brian Mountford & Associates

Kind of sample reported to us	Coal Sample - D4 (7.1-8.3)
Sample taken at	-----
Sample taken by	-----
Date sampled	-----
Date received	June 30, 1980

Analysis report no. 64-19569

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	17.76	xxxx
% Ash	33.88	41.20
% Volatile	9.19	11.17
% Fixed Carbon	<u>39.17</u>	<u>47.63</u>
	100.00	100.00
BTU	6637	8070
% Sulphur	0.46	0.56

Respectfully submitted,
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Regional Manager



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811 - 675 West Hastings Street
VANCOUVER, BC
V6B 1N2

July 22, 1980

Sample identification
by

Brian Mountford & Associates

Kind of sample reported to us Coal Sample - D4 (8.3-9.0)

Sample taken at -----

Sample taken by -----

Date sampled -----

Date received June 30, 1980

Analysis report no. 64-19570

PROXIMATE ANALYSIS

	<u>As Rec'd.</u>	<u>Dry Basis</u>
% Moisture	11.72	xxxx
% Ash	74.96	84.91
% Volatile	8.77	9.93
% Fixed Carbon	<u>4.55</u>	<u>5.16</u>
	100.00	100.00
BTU	1208	1368
% Sulphur	0.13	0.15

Respectfully submitted,
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S. Morrin
Regional Manager



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APPENDIX C

WRITER'S CERTIFICATE

JOHN R. KERR, P. ENG.

Geological Engineer

#206 - 310 NICOLA STREET • KAMLOOPS, B.C. V2C 2P5 • TELEPHONE (604) 374-0544

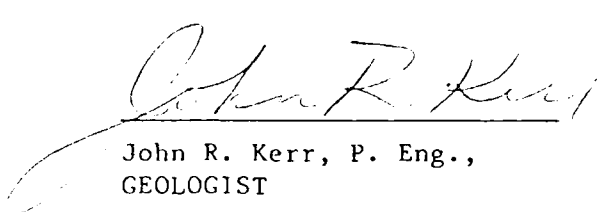
CERTIFICATE

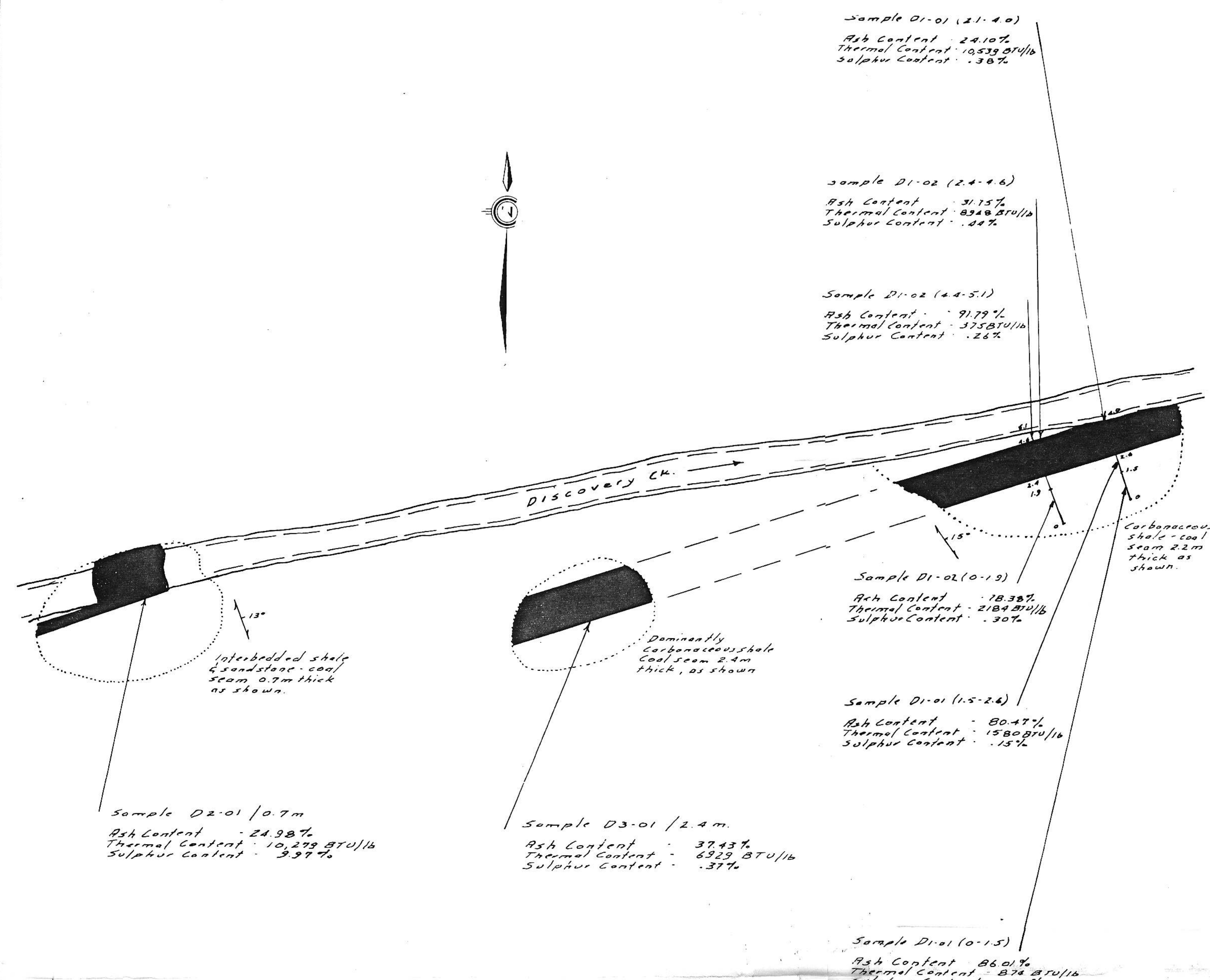
I, JOHN R. KERR, OF KAMLOOPS, BRITISH COLUMBIA, DO HEREBY CERTIFY THAT:

- (1). I am a member of the Association of Professional Engineers of British Columbia, and a Fellow of the Geological Association of Canada.
- (2). I am a geologist employed by Kerr, Dawson and Associates Ltd., of #206 - 310 Nicola Street, Kamloops, B.C.
- (3). I am a graduate of the University of British Columbia (1964), with a B.A. Sc. degree in Geological Engineering.
- (4). I have practised my profession continuously since graduation.
- (5). I have no direct nor indirect interest in the securities of Groundhog Coal Ltd., in the coal licenses as described, nor do I expect to receive any.
- (6). I supervised and assisted in the collection of data as compiled in this report. I am the author of this report which is based on the aforementioned data, and all available published and unpublished data on the Groundhog Coal Fields.
- (7). Permission is hereby granted Groundhog Coal Ltd., to use this report to satisfy requirements of the B.C. Securities Commission and the Vancouver Stock Exchange.

Kamloops, B.C.

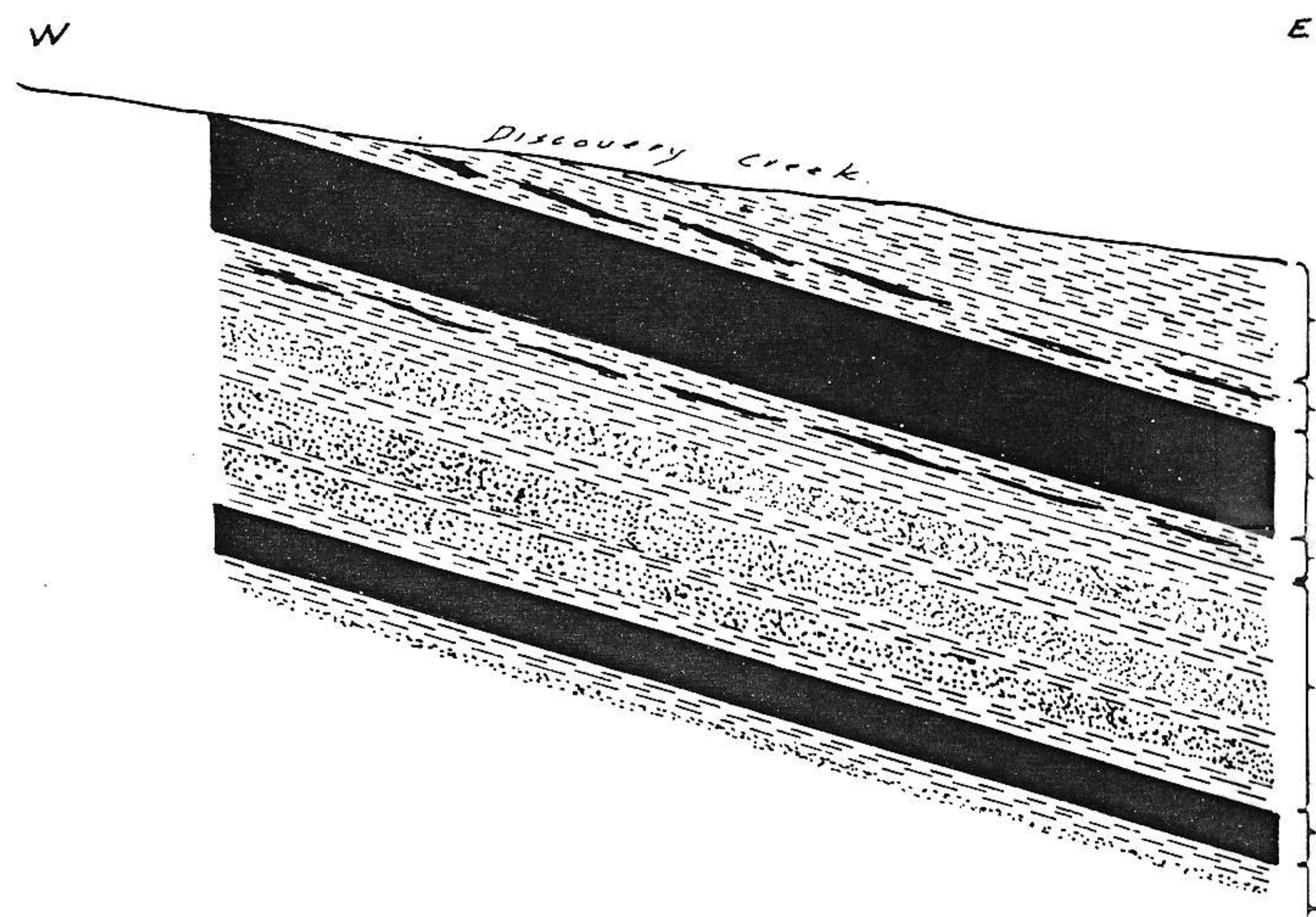
February 10, 1984.


John R. Kerr, P. Eng.,
GEOLOGIST

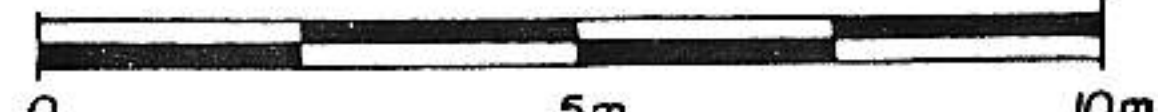


DETAILED PLAN-UPPER DISCOVERY CREEK

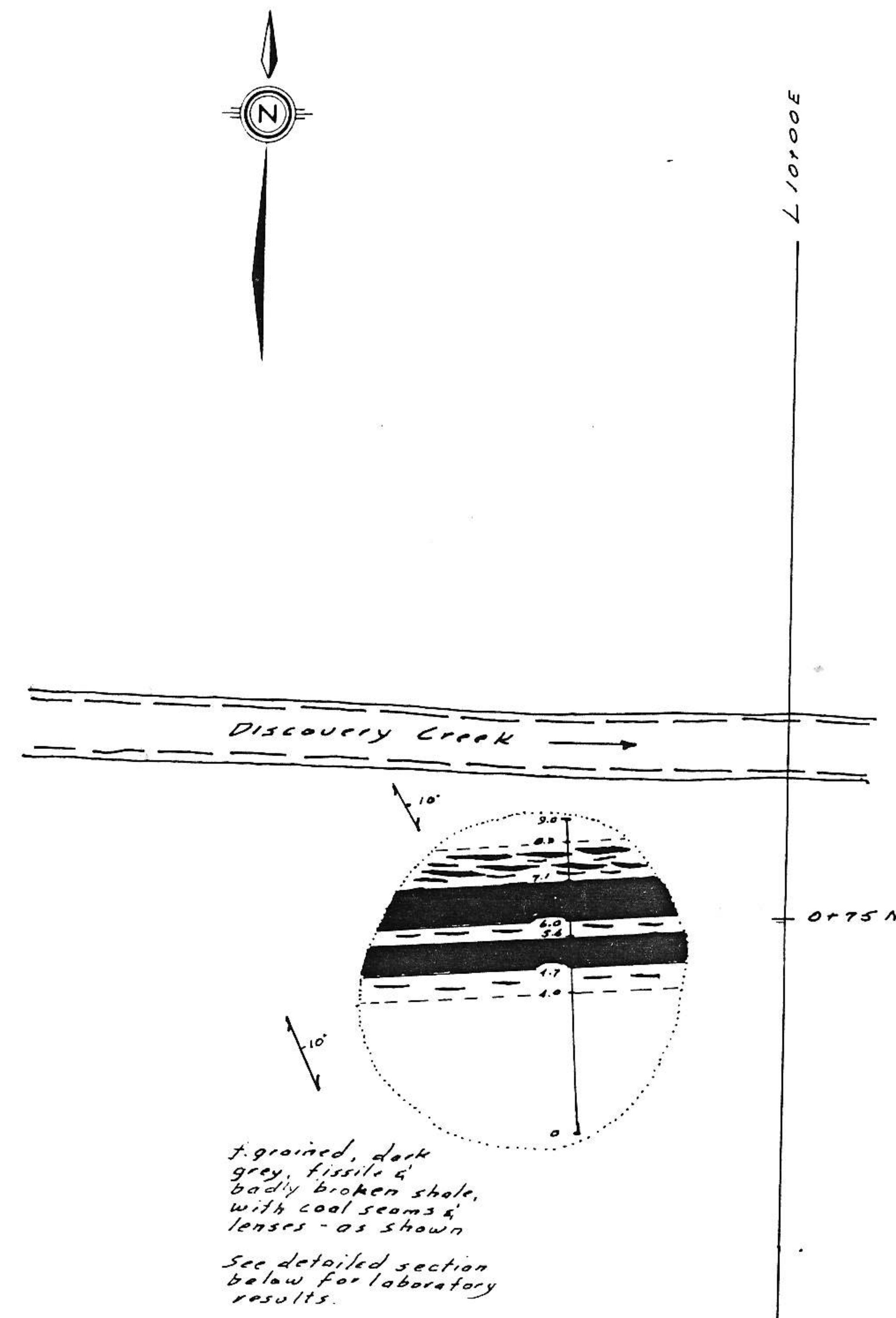
Showing Seams in Outcrop
D-1, D-2 & D-3
Scale 1:200



IDEALIZED SECTION
Upper Discovery Creek
Scale 1:200

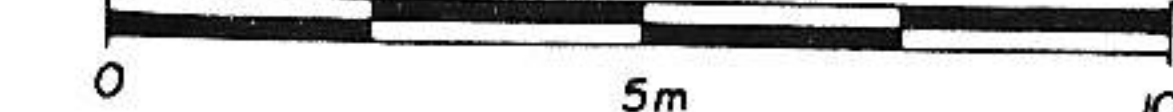


Description	Ash Content (average)	Thermal Cont (average)
Dominantly Carbonaceous Shale	82.20%	1529 BTU/lb
Carbonaceous Shale's Narrow Coal Lenses	80.4%	1580 BTU/lb
Block Hard Coal / 2.1m occasionally sheared	31.09%	8805 BTU/lb
Carbonaceous Shale	91.79%	375 BTU/lb
Interbedded shale & sandstone. Total section not exposed	Not sampled	
Block Coal - pyrite 9.9% Sulphur	24.98%	10,279 BTU/lb
Sandstone & shale	Not sampled	



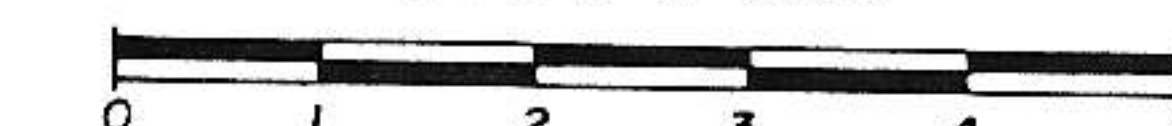
DETAILED PLAN-LOWER DISCOVERY CREEK

Showing Seams in Outcrop D-4
Scale 1:200



Description	Ash Content	Thermal Content	Sulphur Content
Overburden			
Dominantly 3-grained, dark grey fissile & broken shale. Some carbonaceous lenses	Not Sampled		
Carbonaceous shale, with minor coal lenses	77.19%	1921 BTU/lb	.08%
Hard, black coal	22.25%	11,274 BTU/lb	.36%
Shale - some coal	92.49%	422 BTU/lb	.23%
Hard black coal	34.17%	9224 BTU/lb	.32%
Shaly & sheared coal	41.20%	8070 BTU/lb	.56%
Shale, minor coal	84.90%	1368 BTU/lb	.15%
Overburden			
Discovery Creek			

IDEALIZED SECTION
Lower Discovery Creek
Scale 1:100



J. R. K.

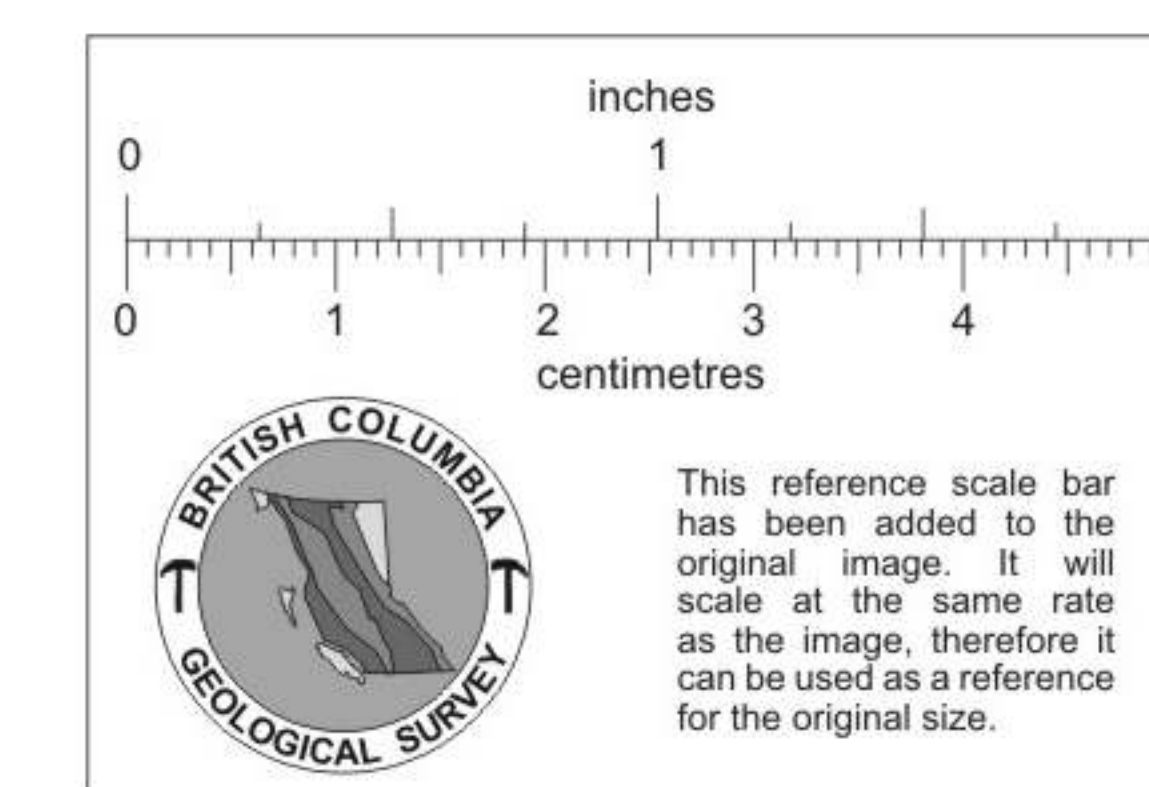
GROUNDHOG COAL LTD.

DETAILED PLAN

Coal Seam Occurrences

Discovery Creek C.L. 4395

GROUNDHOG COAL FIELDS



TECH. WORK BY: KERR, DAWSON AND ASSOC. LTD.	SCALE: AS SHOWN
DRAWN BY: J. R. K.	DATE: DEC. 1980
APP'D BY: J. R. K.	FIG. NO. 189-3