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A SUMMARY REPORT ON THE GROUNDHOG COALFIELD

BY

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To the Shareholders of Groundhog Coal Limited
c/o 904 - 675 West Hastings Street
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Gentlemen

The attached report summarises our 1978/79 activities and our current knowledge of the Groundhog Coalfield. The summary is based upon the considerable amount of research carried out during the last year augmented by three separate field trips.

Initially, when the exploration project was first contemplated (May 1978) the plan was as follows:-

- Confirmation that the geological interpretations were reasonable and the conclusions drawn from them were therefore valid.

- Investigation and development of markets including the possibility for consumer equity participation.

- Investigation of, and discussion with, selected major companies to whom the development of the Groundhog Coalfield would be particularly beneficial.

- Completion of the submitted exploration programme.

The programme presented to the Government of British Columbia, along with the licence application was, unfortunately, not carried out. The main reason being that the geology of the coalfield was not as clearly defined as was originally indicated.

In March of 1979, the programme was modified and the following success contingent steps initiated.

1. A major Joint Venture partner would be found who would be prepared to assist in the development.

2. A more limited programme would be carried out, principally oriented towards clarifying the structure and stratigraphy by field mapping. It was anticipated that any drilling would be located so as to facilitate structural and stratigraphic interpretations.

/.....

3. The drill programme aimed at developing surface mineable coal would be delayed until the field geology was defined and understood in sufficient detail to allow the planning of such a programme.

Since part 1. of the above modified plan was not achieved it was finally decided to concentrate on the more favourable areas and reduce the coal licences to a more financially manageable number. As a result three coal licences have been selected and these have been retained for the year 1980. It is proposed to carry out a detailed prospecting and mapping survey on them. In particular the licences appear to offer the following:-

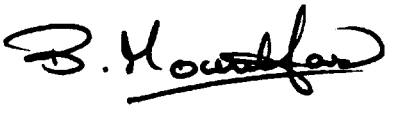
1. Favourable geology for surface and/or underground mining.

2. A significant coal outcrop that has been excavated and sampled (Upper Discovery Creek).

3. A detailed examination should improve our overall coalfield knowledge.

4. Financially we are able to fulfil the proposed programme and thus we can continue to participate in the development of this coalfield.

Yours truly



B. Mountford P.Eng.

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SUMMARY

The Groundhog Coalfield is possibly the only known but uncommitted coal deposit in British Columbia, in fact, in Western Canada. Simply as such it should be considered an excellent exploration prospect. Field work carried out in the Coalfield over a considerable time span has been scanty and sporadic; usually corresponding to times of energy crises and/or demand for coal. Non-the-less the field work that has been completed shows that the Groundhog Coalfield contains a sequence of coal bearing sediments, relatively ill-defined at this time, which appear to contain significant tonnages of coal.

Recent drilling (1970) and outcrop sampling has confirmed the presence of seams up to 3.5 metres thick, though the majority identified to date are in the 1.5 to 1.8 metre range. Seam continuity has not been established. Geologically, far more field information is essential to establish the structure and stratigraphy. The size of the field, the indications of both structural deformation and gently dipping beds, point to the possibility that a viable resource may be found in one or all of the following conditions:

(a) A multi-seam configuration amenable to conventional surface coal mining techniques.

(b) Areas of structurally thickened coal also amenable to surface mining.

(c) Particularly high grade zones exploitable by underground mining.

(d) Coal reserves that can be used for power generation on site and reserves of sufficient quality for off-site sales.

INTRODUCTION

Groundhog Coal Limited, during the period commencing December 1st 1978 and ending November 30th 1979 held 77 coal licences in the area of British Columbia referred to as the Groundhog Coalfield. The licences are numbered 4381 to 4457 inclusively.

During the licence year, it was found impractical and impossible, due to reasons previously explained, to carry out the proposed programme. However, sufficient work was done to indicate that the three coal licences (numbers 4395, 4400 and 4406) particularly warrant more detailed investigation. (See drawing number 6.)

LOCATION AND ACCESS (See drawing number 1.)

The Groundhog Coalfield is located in the Cassiar Land District of northwestern British Columbia; it is within an area bounded by 56° 47' to 56° 58' north latitude and 128° 07' to 128° 30' west longitude.

The area is shown on the northeast part of the Bowser Lake topographic map (N.T.S. 104A scale 1:250,000) and on the McEvoy Flats topographic map (N.T.S. 104A/16 scale 1:50,000).

Three major rivers have their headwaters near the area. The Skeena River rises 25km to the northwest and flows south-easterly through the centre of the coalfield. The Nass River heads 5km west of the coalfield and flows south-easterly along the western flank. The Stikine River rises 35km north of the coalfield and flows north-easterly around the Spatsizi Plateau.

Stewart, B.C., at the head of Observatory Inlet on the Portland Canal is located approximately 150km to the south-west. There is no road or rail access, however, the Stewart-Dease Lake road is some 80km to the south-west. There is a very rough access to this road along the grade of the B.C. Railway (B.C.R.) which bisects the coalfield. At the present time, railway steel of B.C.R. is approximately 40km from the southern edge of the coalfield (i.e. McEvoy Flats). The distance by rail to Prince George is 309 miles and to Vancouver a further 500 miles.

HISTORY

The first authentic discovery of coal in the Groundhog field was made by Mr James McEvoy in 1903. The location was called Discovery Creek, a name which is still used.

In 1908 and 1909 workers were in the field sampling the Discovery Creek coals and a new find on Abraham Creek. Considerable activity throughout the period 1910-1912 resulted in the location of most of the known outcrops. Several tunnels were excavated in seams found outcropping on the sides of the creeks. In the late summer of 1911, George Watkin Evans a coal mining engineer from Seattle, examined the various properties and exploration tunnels.

He particularly, made a full examination of the southern half of the field. He made these comments:

> "Portions of the field will prove fairly regular, while other portions are probably so faulted and folded as to be valueless.
> There are some beds containing coal of excellent quality - the best domestic coal, in fact, in the writer's knowledge on the Pacific Coast.
> For coal of this quality a reasonably good market is assured. In portions of the field, mining conditions admit of production at reasonable costs.
> In other portions cost will be prohibitive.
> Railway communication to tidewater is feasible and transportation charges will, in relation to the grade of coal, be moderate. Within the Skeena, Clappan and Nass watersheds will be found, it is believed, a sufficient quantity of high grade mineable coal to warrant the building of a railway."

In 1913 Lord Rhondda, a "Coal Baron" from the United Kingdom (actually the Welsh anthracite areas) sent a group of engineers to investigate the feasibility of production from the Groundhog Coalfield. The result was that Lord Rhondda purchased a part of the Nass and Skeena River Railway Charter which was owned by Scott and Benoit (two of the major prinicipals in the Groundhog). However World War 1 terminated all development efforts.

The next stage in the advancement of the Coalfield occured in 1948, when the Geological Survey of Canada sent a party into the Groundhog under the direction of A.F. Buckham assisted by B.A. Latour. The report, which culminated their work was published in 1950. This report summarised all the known previous work and recorded detailed information on most of the known occurrences. However, very little was known or determined of the structure or stratigraphy and consequently no conclusions were drawn as to the number of seams, their thickness, or their stratigraphic significance, nor were any efforts possible to correlate the numerous coal occurrences. Buckham and Latour concluded:

> "In a field of this great size it is probable that areas exist where the coal is sufficiently clean and sufficiently undisturbed to be mined successfully, but it will be expensive to find such areas and to determine their size relative to that field as a whole. It is not considered that prospecting for such areas is advisable unless, or until transportation conditions are much more favourable than at present."

During 1968 a party of 8 geologists, assistants and prospectors, using helicopter support, carried out geological mapping over a very large area. This area extended from Mount Jackson northwestward to the Little Klappan River from the Nass River northeastward to Buckinghorse Lake i.e. an area of some 375,000ha. The report of this work was prepared by J.M. Black in 1968 he concluded:

> "The Groundhog area and the area adjoining to the southwest do not contain mineable coal seams."

In 1969 and 1970 a Joint Venture, composed of Placer Development Limited, Quintana Minerals Corp. and National Coal Corp. geologically mapped about 50,000ha. and prospected a further 25,000ha. The work was under the direction of W.D. Tompson (a shareholder of Groundhog Coal Limited). Six diamond drill holes were drilled late in the season of 1970. The conclusions were:-

> "An area of about 30,000ha. is underlain by rocks of the Coal Bearing Lithosome. The coal bearing rocks crop out at the surface or are covered by a thin mantle of surface deposits. Strata over much of this area display minimum folding and faulting. Parts of the Coal Bearing Lithosome were tested by diamond drilling during 1970 and were shown to contain coal seams which have an aggregate thickness of more than 25ft.
>
> Coal reserves, based upon 25ft of coal over 119 sqare miles are in the order of four billion tons."

GEOLOGY (See drawing number 2.)

General

The Groundhog Coalfield lies in the Skeena Mountains of the Central Plateau and Mountain physiographic province.

Holland 1965, stated; "The Skeena Mountains are a distinctive (physiographic) unit, being formed largely of folded sedimentary rocks of Upper Jurassic and Lower Cretaceous Age. The principal rocks are black fine grained argillite and shale, and dark greywacke. Limestone or rocks directly of volcanic origin, are absent, igneous intrusions are few in number ..... The rock structures are extremely complex, the major folds averaging about 4 per mile with many overturned and recumbent outlines. Only in parts of the Groundhog Range, Upper Skeena Valley and Eaglenest Range do broad folds predominate..... Most of the fold axes are nearly horizontal or plunge gently northwest.

The rocks of the Groundhog Coalfield belong to the Bowser Assemblage and are Upper Jurassic to Lower Cretaceous in Age. The Coalfield and specifically, the area under consideration in this report lies in the east central portion of the Bowser Basin. During the Upper Jurassic, shales, greywacke and conglomerate accumulated in a marine basin which was open to the west. Subsequent Coast Mountains uplift later on in the Age resulted in the development of an inland basin. The occurrence of coal in the Groundhog suggests that the basin was filled in part by Deltaic deposition, thus creating alluvial fans and delta plains upon which the vegetation that is now the coal series was able to thrive.

Stratigraphy

The Groundhog area is underlain by fluvial clastic rocks, deposited by streams that flowed south-southwest. There is a wide range of deposition types from thick pebble conglomerates to Morly overbank series. W.T. Tompson during the period 1969-70 indentified four "lithosome" or rock units, one of which is reported by many investigators to be coal bearing (see table 1). During 1978-79 Tompson on behalf of Groundhog Coal Ltd. re-evaluated and revised his work, the results are presented on the geological map and sections (Drawing numbers 2, 3, 4 and 5).

Apart from the fourfold division of the outoropping lithologies no detailed correlations within the rock units have been achieved to date. The geological map (drawing number 2.) can be considered as reconnaisance in nature due to the limited amount of field work completed to date. The presence of coal seams within the Coal Bearing Lithosome has been established in many localities and particularly in outcrops along the Skeena River and feeder tributories. Small scale, in the seam, exploration in the 1908-1913 period is well documented and gives confidence in the conclusion that coal in potentially large tonnages could exist in the area.

From a purely stratigraphic sense, it is essential to continue prospecting and mapping to establish if an economic stratigraphic sequence can be defined.

Structure

Folding and related faulting are the dominant types of deformation seen in the area. On a regional basis the strata is in the form of a rectilinear block defined by the northwest parallel valleys of the Skeena and Nass Rivers.

Major faults within the block are indicated by the west-northwest trending valleys and the east-west valleys of Panorama and Currier creeks. Much of the area is dominated by tight folding usually adjacent to the faults which form fault block boundaries.

Areas at a distance from these boundaries are generally dominated by a more homoclinal structure some of which are gently dipping. Small scale offsets in the order of 5 to 20m. are numerous (Gilchrist and Richards 1979).

Within the area covered by the coal licences the indications are that both steeply dipping contorted strata and more gently dipping strata exist. The original structural concept (upon which the licences were acquired) is summarised as follows:-

1. The coal licence area forms a synclinal basin with its axis paralleling the Skeena River (i.e. running northwest). This synclinal basin plunges gently south-east.

2. The beds within the area are minimally disturbed and defamation along the margins of the basin is probably local.

3. Marginal stresses were not transmitted through the basin since the coal measures consist of incompetant rocks.

4. The dips of the coal seams approximate the slopes of the surface.

5. Drilling is necessary and it will discover more coal and facilitate stratigraphic correlation.

Further investigation of the available data, following the acquisition of the licences, resulted in a re-appraisal of the concept. There are certain aspects of the structural inferences expressed above that require reconciliation.

The first aspect is that the concept implies that the majority of faulting is virtually confined to the non-coal bearing rock units and the coal bearing unit is gently folded with localised steeply dipping sediments. Yet the lithologies of the faulted and folded McEvoy Ridge Lithosome are very similar to the stratigraphically higher Coal Bearing Lithosome. Additionally, detailed logging of the coal seams intersected in the 1977 drilling programme (6 holes) indicates that a reasonable proportion of the seams have undergone some structural defamation.

The investigation into this aspect also identified the area covered by Upper Discovery, Davis and Evans Creeks as being one where gentle dips had been established and coal outcrops discovered.

On the positive side, if any areas have been subjected to structural deformation then an exploration target exists for "structurally thickened" zones of coal.

The second aspect which required additional interpretation is the form in which the faulting occurs. The variability in the competance of coarse clastic sediments, in comparison to the underlying mudstone sequences, will affect the attitude of the fault traces. Upon further study some of the fault attitudes as originally interpreted appear to be anti-pathetic to the principal structural element as presently known (The Groundhog Thrust Fault). Again the resultant conclusion to this investigation was that considerably more prospective type field work and photo-interpretation is necessary. It is also essential to develop the basic stratigraphy of the area prior to delineating the structure.

COAL RESOURCES

The considerable amount of quality data generated over the last 80 years provides a reasonable indication of the clean coal quality. What is not so clearly defined is the clean coal yield from a washing facility or in fact "run-of mine" quality. Certain seams are cleaner than others and some seams clean very well with high yields whilst others are difficult to clean.

The coal occurring in the coalfield ranges in rank from low volatile bituminous to anthracite with the most analyses indicating a semi-anthracite coal.

The lastest compilation of all the known coal occurrences was carried out by W.T. Tompson in 1977. This was checked and updated in 1979, the result is shown in tabular form as follows.

COAL OCCURRENCES IN THE GROUNDHOG COALFIELD

(AFTER TOMPSON 1977)

TABLE NO. 1

SAMPLE LOCATION AND SAMPLER	DATE OF SAMPLE	STRIKE	DIP	SAMPLE WIDTH	ASH %	BTU	SULPHUR %	COMMENTS
S. Fk. Anthony Cr., G. S. Malloch	1911	N.76E.	17 S.E.	6.1 ft.	41.14			Raw coal anal.
McEvoy Ridge G.S. Malloch	1911			Spec.	19.65			"
Augustine Cr., G.W. Evans	1911	N.52W.	10 N.E.	1.7	27.10	10,290	0.86	"
Brewer Creek, G.W. Evans	1911	N.68W.	39 S.W.	3.8	20.80	11,900	2.31	"
Lower Trail Cr., top bench W.W. Leach	1904	N.47W.	17 N.E.	4.5	20.75			"
Lower Trail Cr., bottom bench, W.W. Leach	1904	N.47W.	17 N.E.	3.6	28.75			"
Lower Trail Cr., J. McEvoy	1911	N.47W.	17 N.E.	6.7	29.84	10,541	1.08	"
Lower Trail Cr., J.F. Walter	1904	N.47W.	17 N.E.	6.7	37.37			"
Lower Trail Cr., G.S. Malloch	1911	N.47W.	17 N.E.	6.5	42.41			"
Lower Trail Cr., W.F. Robertson	1912	N.47W.	17 N.E.	6.8	48.8			"
Trail Cr., W.F. Robertson	1912	N. 5W.	14 N.E.	Spec.	21.5			"
Trail Cr., W.F. Robertson	1912	N. 5W.	14 N.E.	3.8	38.3			"
Little Cr., G.W. Evans	1911	N.15W.	25 N.E.	2.3	30.04	9,930	1.61	"
Little Cr., Jackson No. 1, G.W. Evans	1911	N.15W.	25 N.E.	2.3	25.20	9,600	2.42	"
Jackson Cr., Jackson No. 2, G.W. Evans	1911	N.40W.	74 S.W.	4.0	29.73	10,280	1.93	"
Jackson Cr., Jackson No. 4, G.W. Evans	1911	N.56W.	20 N.E.	2.7	23.78	12,650	3.05	"
Jackson Cr., Jackson No. 3, G.W. Evans	1911	N.45W.	35 S.E.	4.4	25.84	11,520	1.90	"
Mt. Jackson, G.S. Malloch	1911	N.R.	N.R.	3.3	20.32			"
Mt. Jackson, G.S. Malloch	1911	N.53W.	40 S.W.	6.2	26.52			"
Lower Jackson Cr., W.W. Leach	1904	N.R.	N.R.	7.0	22.80			"
Skeena River below Duke Cr., W.W. Leach	1904	N.64W.	27 N.E.	3.5	35.22			"

COAL OCCURRENCES IN THE GROUNDHOG COALFIELD

(AFTER TOMPSON 1977)

TABLE NO. 1

SAMPLE LOCATION AND SAMPLER	DATE OF SAMPLE	STRIKE	DIP	SAMPLE WIDTH	ASH %	BTU	SULPHUR %	COMMENTS
Abraham Cr., J.F. Walter	1904	N.R.	N.R.	6.0	27.90			Raw coal anal.
Abraham Cr., J. McEvoy	1911	N.R.	N.R.	6.0	16.58	12,215	0.72	"
Abraham Cr., G.S. Malloch	1911	N.54E.	16½ N.	5.6	22.68			"
Abraham Cr., W.F. Robertson	1912	N.90E.	8 N.	5.9	27.1			"
Abraham Cr., G.W. Evans	1911	N.R.	N.R.	5.9	24.4			"
Abraham Cr., D.M. Jenkins	1970	N.90E.	15N.	2.0	4.96	13,149	0.40	
Discovery Creek, lower tunnel, J. McEvoy	1911	N.68E.	9 N.E.	5.3	11.17		0.99	"
Discovery Cr., lower runnel, J.F. Walter	1904	N.68E.	9 N.E.	5.6	27.66			"
Discovery Cr., lower tunnel Chas. Fergie	1904	N.68E.	9 N.E.	1.6	5.85	12,775	0.46	"
Discovery Cr., lower tunnel J. McEvoy	1911	N.68E.	9 N.E.	6.1	5.93	13,814	0.57	"
Discovery Cr., lower tunnel G.S. Malloch	1911	N.68E	9 N.E.	5.5	10.64			"
Discovery Cr., lower tunnel J. McEvoy	1911	N.68E	9 N.E.	Spec.	7.90			"
Discovery Cr., lower dump W.D. Tompson	1970			Grab	3.92	14,097	0.50	1.58 S.G.
Lower Discovery Cr., drill core, W.D. Tompson	1970	Core	Core	6.5	13.20	11,966	0.97	17.6% floated at 1.65 S.G.
Lower Discovery Cr., drill core, W.D. Tompson	1970	Core	Core	6.5	17.09	11,966	0.97	23.7% floated at 1.75 S.G.
Discovery Cr., upper tunnel, W.W. Leach	1904	N.22W.	16 N.E.	5.8	11.65			Raw coal anal.
Discovery Cr., upper tunnel, W.W. Leach	1904	N.22W.	16 N.E.	5.8	15.81			"
Discovery Cr., upper tunnel, J.F. Walter	1904	N.22W.	16 N.E.	5.4	7.55			"
Discovery Cr., upper tunnel, J. McEvoy	1911	N.22W.	16 N.E.	5.4	8.92	13,328	0.74	"

COAL OCCURRENCES IN THE GROUNDHOG COALFIELD

(AFTER TOMPSON 1977)

TABLE NO. 1

SAMPLE LOCATION AND SAMPLER	DATE OF SAMPLE	STRIKE	DIP	SAMPLE WIDTH	ASH %	BTU	SULPHUR %	COMMENTS
Discovery Cr., upper tunnel, W.D. Tompson	1970	N.10W.	15. E.	5.5	5.25	14,047	0.32	1.58 S.G.
Discovery Cr., upper tunnel, W.D. Tompson	1970	N.10W.	15. E.	5.5	4.91	14,012	0.45	1.75 S.G.
Upper Discovery Cr., drill core, W.D. Tompson	1970	Core	Core	6.2	36.88	8,966	0.43	Raw coal anal.
Upper Discovery Cr., drill core, W.D. Tompson	1970	Core	Core	6.2	9.43	13,552	0.43	58.3% floated at 1.75 S.G.
Lower Davis Cr., J. McEvoy	1911	N.R.	21 S.	4.7	21.86	11,788	1.60	Raw coal anal.
Lower Davis Cr., G.S. Malloch	1911	N.R.	21 S.	4.7	25.36			"
Upper Davis Cr., J. McEvoy	1911	N.70W.	N.E.		12.61		0.65	
Skeena River, G.S. Malloch	1911	N.R.	N.R.	Spec.	20.17			"
No. 1, Anthracite Cr., R.C. Campbell-Johnson	1911	N.R.	N.R.	4.9	14.73		0.16	"
No. 2, Anthracite Cr., G.F. Monckton	1911	N.23W.	45 S.W.	3.0	19.86		0.12	"
No. 3, Anthracite Cr., R.C. Campbell-Johnston	1911	N.88W.	21 S.	5.9	6.15		0.13	"
No. 3, Anthracite Cr., G.S. Malloch	1911	N.88W.	21 S.	3.9	14.69			"
Benoit seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.55W.	30 N.E.	6.3	15.0		0.8	"
Benoit seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.55W.	30 N.E.	6.3	10.0		0.8	"
Scott seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.R.	N.R.		19.19		0.02	"
Scott seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.R.	N.R.		10.00		0.8	"
Scott seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.R.	N.R.		13.13		0.04	"

COAL OCCURRENCES IN THE GROUNDHOG COALFIELD

(AFTER TOMPSON 1977)

TABLE NO. 1

SAMPLE LOCATION AND SAMPLER	DATE OF SAMPLE	STRIKE	DIP	SAMPLE WIDTH	ASH %	BTU	SULPHUR %	COMMENTS
Scott seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.R.	N.R.		13.0	12,323	1.0	Raw coal anal.
Scott seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.R.	N.R.		10.0	12,843	1.0	"
Scott seam, Beirnes Cr., W.D. Tompson	1970	N.65W.	29 N.E.	3.8	8.34	13,772	0.47	1.58 S.G.
Scott seam, Beirnes Cr., W.D. Tompson	1970	N.65W.	29 N.E.	5.9	9.60	13,747	0.52	1.58 S.G.
Scott seam, Drill core, W.D. Tompson	1970	Core	Core	5.7	52.81	6,298	0.53	Raw coal anal.
Scott seam, Drill core W.D. Tompson	1970	Core	Core	5.7	15.24	12,143	0.47	28.0% floated at 1.75 S.G.
Garneau seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.R.	N.R.	3.0	8.50	13,455	1.00	Raw coal anal.
Garneau seam, Beirnes Cr., W.D. Tompson	1970	N.55W.	29 N.E.	2.7	8.88	13,997	0.44	1.58 S.G.
Garneau seam, Drill core W.D. Tompson	1970	Core	Core	1.8	35.90	9,255	0.52	Raw coal anal.
Ross seam, Beirnes Cr., R.C. Campbell-Johnston	1911	N.R.	N.R.		8.96		0.77	"
Ross seam, top part, W.D. Tompson	1970	Core	Core	7.2	34.66	9,204	0.34	"
Ross seam, top part, W.D. Tompson	1970	Core	Core	7.2	10.99	12,894	0.46	58.1% floated at 1.75 S.G.
Ross seam, bottom part, W.D. Tompson	1970	Core	Core	2.3	22.90	11,418	1.23	Raw coal anal.
Ross seam, bottom part, W.D. Tompson	1970	Core	Core	2.3	11.11	13,109	0.84	75.1% floated at 1.75 S.G.
Beirnes No. 5, top part, W.D. Tompson	1970	Core	Core	3.5	32.93	9,560	1.87	Raw coal anal.

COAL OCCURRENCES IN THE GROUNDHOG COALFIELD

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TABLE NO. 1

SAMPLE LOCATION AND SAMPLER	DATE OF SAMPLE	STRIKE	DIP	SAMPLE WIDTH	ASH %	BTU	SULPHUR %	COMMENTS
Beirnes No. 5, bottom part, W.D. Tompson	1970	Core	Core	3.8	9.36	5,395	2.19	Raw coal anal.
Beirnes No. 5, top part W.D. Tompson	1970	Core	Core	3.5	No Assay data			
Beirnes No. 5, bottom part W.D. Tompson	1970	Core	Core	3.8	15.73	12,266	0.52	28.0% floated at 1.70 S.G.
Beirnes No. 6, Beirnes Cr. W.D. Tompson	1970	Core	Core	4.4	25.28	10,700	0.54	Raw coal anal.
Beirnes No. 6, Beirnes Cr. W.D. Tompson	1970	Core	Core	4.4	13,05	12,614	0.60	66.7% floated at 1.70 S.G.
Pelletier seam, Beirnes Cr. R.C. Campbell-Johnston	1911	N.55W.	82 N.E.		24.91		1.74	Raw coal anal.
Pelletier seam, Beirnes Cr. R.C. Campbell-Johnston	1911	N.55W.	82 N.E.		20.00	11,340	1.00	"
Pelletier seam, Beirnes Cr. R.C. Campbell-Johnston	1911	N.55W.	82 N.E.		28.00	10,374	1.00	"
Pelletier seam, Beirnes Cr. R.C. Campbell-Johnston	1911	N.55W.	82 N.E.		7.50		1.00	"
Beirnes Cr., opposite Geoffrey Cr., W.D. Tompson	1970			2.6	9.42	13,074	0.66	1.58 S.G.
Beirnes Cr., opposite Geoffrey Cr., W.D. Tompson	1970			2.5	6.73	13,199	0.44	1.58 S.G.
Beirnes Cr., opposite Geoffrey Cr., W.D. Tompson	1970			1.9	11.88	12,550	0.29	1.58 S.G.
Beirnes Cr., opposite Geoffrey Cr., W.D. Tompson	1970			6.5	8.28	13,523	0.67	1.58 S.G.
Telfer Cr., seam "A" G.W. Evans	1911	N.75W.	65 N.E.	4.7	21.75	11,980	0.99	Raw coal anal.
Telfer Cr., seam "A" (?) W.D. Tompson	1970	Core	Core	6.6	8.57	13,847	0.51	27.0% floated at 1.65 S.G.

COAL OCCURRANCES IN THE GROUNDHOG COALFIELD

(AFTER TOMPSON 1977)

TABLE NO. 1

SAMPLE LOCATION AND SAMPLER	DATE OF SAMPLE	STRIKE	DIP	SAMPLE WIDTH	ASH %	BTU	SULPHUR %	COMMENTS
Telfer Cr. No. 1 (?) W.D. Tompson	1970	Core	Core	6.0	7.74	14,022	0.74	16.6% floated at 1.65 S.G.
Telfer Cr., No. 2 G.W. Evans	1911	N.22W.	25 N.E.	5.1	34.36	9,600	1.57	Raw coal anal.
Telfer Cr., No. 2 (?) W.D. Tompson	1970	Core	Core	1.2	8.84	13,972	0.70	20.8% floated at 1.65 S.G.
Telfer Cr., No. 3 G.W. Evans	1911	N. 9E.	29 N.E.	3.3	41.52	7,800	0.99	Raw coal anal.
Telfer Cr., No. 3 (?) W.D. Tompson	1970	Core	Core	7.7	10.82	13,514	0.54	Approx 19 Avg. floated at 1.65 S.G.
Telfer Cr., No. 4 G.W. Evans	1911	N. 30W.	30 N.E.	5.0	34.21	9,580	0.60	Raw coal anal.
Telfer Cr., No. 4 (?) W.D. Tompson	1970	Core	Core	3.8	11.07	13,473	0.31	35.6% floated at 1.65 S.G.
Telfer Cr., No. 7 G.W. Evans	1911	N.90E.	17 N.	3.5	34.06	9,360	0.44	Raw coal anal.
Langlois Cr., elev. 3550 W.D. Tompson	1970	Float sample			6.7	14,074	0.66	1.58 S.G.
Langlois Cr., elev. 3650 W.D. Tompson	1970	"	"		7.58	13,822	0.64	1.58 S.G.
Langlois Cr., elev 3725 W.D. Tompson	1970	"	"		8.63	13,922	0.94	1.58 S.G.
Langlois Cr., elev. 3750 W.D. Tompson	1970	"	"		8.55	13,473	0.49	1.58 S.G.
Langlois Cr., elev. 3750 W.D. Tompson	1970	"	"		10.06	14,321	0.52	1.58 S.G.
Duke Cr. at Skeena Rv., D.M. Jenkins	1970	N.R.	N.R.	1.3	3.54	13,847	0.85	1.58 S.G.
Duke Cr., elev. 4650 upper, D.M. Jenkins	1970	N.R.	N.R.	1.5	11.80	12,101	0.38	1.58 S.G.
Duke Cr., elev. 4650 lower, D.M. Jenkins	1970	N.R.	N.R.	1.0	12.08	11,826	1.01	1.58 S.G.

COAL OCCURRENCES IN THE GROUNDHOG COALFIELD

(AFTER TOMPSON 1977)

TABLE NO. 1

SAMPLE LOCATION AND SAMPLER	DATE OF SAMPLE	STRIKE	DIP	SAMPLE WIDTH	ASH %	BTU	SULPHUR %	COMMENTS
Dave Cr., No. 3 D.M. Jenkins	1970	N.44W.	55 S.W.	6.0	5.19	13,174	0.50	1.58 S.G.
Beirnes Cr. - Currier Cr. pass, W.D. Tompson	1970	N.80E.	7 N.	4.0	8.25	13,847	0.58	1.58 S.G.
Beirnes Cr. - Currier Cr. pass, W.D. Tompson	1970		Float sample		4.62	13,797	0.49	1.58 S.G.
Jackson Cr., elev. 2990 D.M. Jenkins	1970	N. %E.	30 S.E.	8.3	63.33	10,304	0.46	1.58 S.G.
Abraham Cr. seam W.D. Tompson	1970	Core	Core	5.1	19.76	11,746	0.74	55.7% floated at 1.75 S.G.
Table Mtn. J.M. Black	1968	N.R.	N.R.	N.R.	35.4	N.R.	N.R.	N.R.
Table Mtn. J.M. Black	1968	N.R.	N.R.	N.R.	50.0	N.R.	N.R.	N.R.
Table Mtn. J.M. Black	1968	N.R.	N.R.	N.R.	50.0	N.R.	N.R.	N.R.

N.D. Not determined
N.R. Not recorded
Spec. Specimen

AREA COVERED BY UPPER DISCOVERY, DAVIS AND EVANS CREEKS

As described above, the research and investigation following the licence acquisition by Groundhog Coal Ltd. resulted in a narrowing of the target to a more immediate area of interest (see drawing number 6.). This was selected due to its potential for coal that may be amenable to surface mining.

Upper Discovery Creek

During the 1978/79 field season, the writer, accompanied by Tompson, traversed the creek, recorded the dips, rock types and dug out the Upper Discovery Creek coal seam for measurement and sampling purposes.

Measurement

Seam name - Upper Discovery Creek seam

Roof of highly weathered shale slightly carbonaceous.

Coal, bright, very hard	0.7 m	
Waste band hard-carbonaceous	0.15m	
Coal, bright and hard	0.98m	
Dirty coal - high ash?	0.45	
TOTAL SEAM	2.28m	
TOTAL COAL	1.68m	(neglecting dirty layer)

Analysis

A raw sample of the coal horizons within the seam was analysed as follows:-

	As received basis	Dry basis
Contained moisture	5.36%	-
Ash	6.72%	
Volatile matter	11.49%	
Fixed carbon	76.43%	
Btu per lb.	12,889	13,619
Sulphur	0.45%	

Tompson during his 1970 exploration programme also sampled the Upper Discovery Creek seam both on surface and in borehole number 2 (for location see drawing number 5.).

On surface the seam had a total coal thickness of 5.5' (1.68m.) and a float fraction at 1.58 S.G. had a yield of 85% and analysed:

Moisture	1.65%
Volatile matter	8.82%
Fixed carbon	84.49%
Ash	5.25%
Btu per lb	14,047
Sulphur	0.32%

The data from the borehole intersection is:-

	Interval	Feet
Carbonaceous shale (20-30% coal)	-	-
Coal	194.6-196.0	1.4
Carbonaceous shale	196.0-196.5	0.5
Coal	196.5-199.8	3.3
Carbonaceous shale	199.8-200.3	0.5
Coal	200.3-200.6	0.3
Carbonaceous shale	200.6-200.8	0.2
	TOTAL SEAM	6.2 (1.89m.)
	TOTAL COAL	5.0 (1.53m.)

The core was split, one half was analysed as raw coal and the other subjected to float sink testing:

	Raw Coal	Floats at 1.75 S.G.
Yield	100.00%	58.3%
Moisture	0.49%	Dry Basis
Volatile matter	4.21%	5.70%
Fixed carbon	58.42%	84.87%
Ash	36.88%	9.43%
Btu per lb.	8,966	13,552
Sulphur	0.43%	0.43%

Davis Creek

During the season very little exploration work was done in the Davis Creek area. A "quick" reconnaissance trip was made and rock types examined at the confluence with the Skeena. Coal float was noted in the Creek. In 1950 Buckham and Latour reported on their 1948 field examination. They recorded that they had examined coal outcrops both close to the Skeena and some distance up the Creek. Approximately 1,200ft above the Skeena confluence two seams outcrop. The upper seam measured 4.7ft, the lower, which is some 20ft vertically below the Upper, measured 3.7ft. Their analysis of this coal was:

	Upper Seam	Lower Seam
Moisture	1.40%	1.57%
Volatile matter	6.06%	7.55%
Fixed carbon	70.68%	65.52%
Ash	21.86%	25.36%
Btu per lb.	11,788	Not reported
Sulphur	1.60%	Not reported

Buckham and Latour also reported that they examined two seams approximately 2 miles above the Skeena.

During the summer of 1970 the W.T. Tompson party sampled the Davis Creek coal seams as follows:-

	Possibly the Upper seam	Possibly the Lower seam
Thickness	4.0ft	3.5ft
Moisture	1.92%	1.52%
Volatile matter	5.33%	4.25%
Fixed carbon	87.09%	88.04%
Ash	5.66%	5.59%
Btu per lb.	13,648	13,872
Sulphur	0.75%	0.64%

It should be noted that these analyses were carried out on a float fraction at 1.58 S.G. The yields were very low (less than 12%) in all probability as a result of the low cut point (S.G. 1.58) for this type of coal.

PROPOSED PROGRAMME 1980

The programme suggested for the 1980 field season consists of detailed work on the three licences retained by Groundhog Coal Ltd. This will be augmented as required for geological understanding by a general area reconnaissance and field examinations.

Specifically the work to be completed will be:-

1. Traverses of the three licences for geological mapping and prospecting.

2. Trenching, examination and bulk sampling of all seams identified.

3. Studies and data collation for stratigraphic and structural interpretations. (Include photo analysis.)

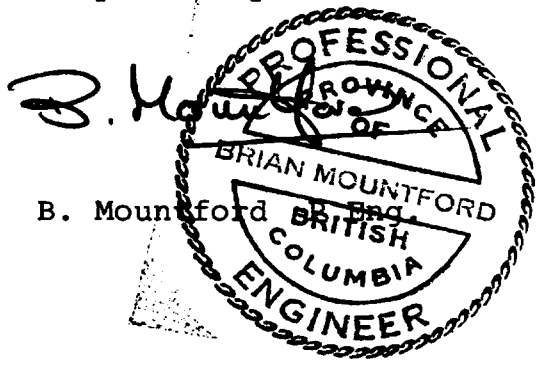
4. General reconnaissance and axamination as required for data collation under 3. above and for prospecting.

5. Post field work, testing and report.

Estimated Costs

Item 1.	10,000
2.	2,500
3.	2,500
4.	2,000
5.	3,000
TOTAL	$20,000

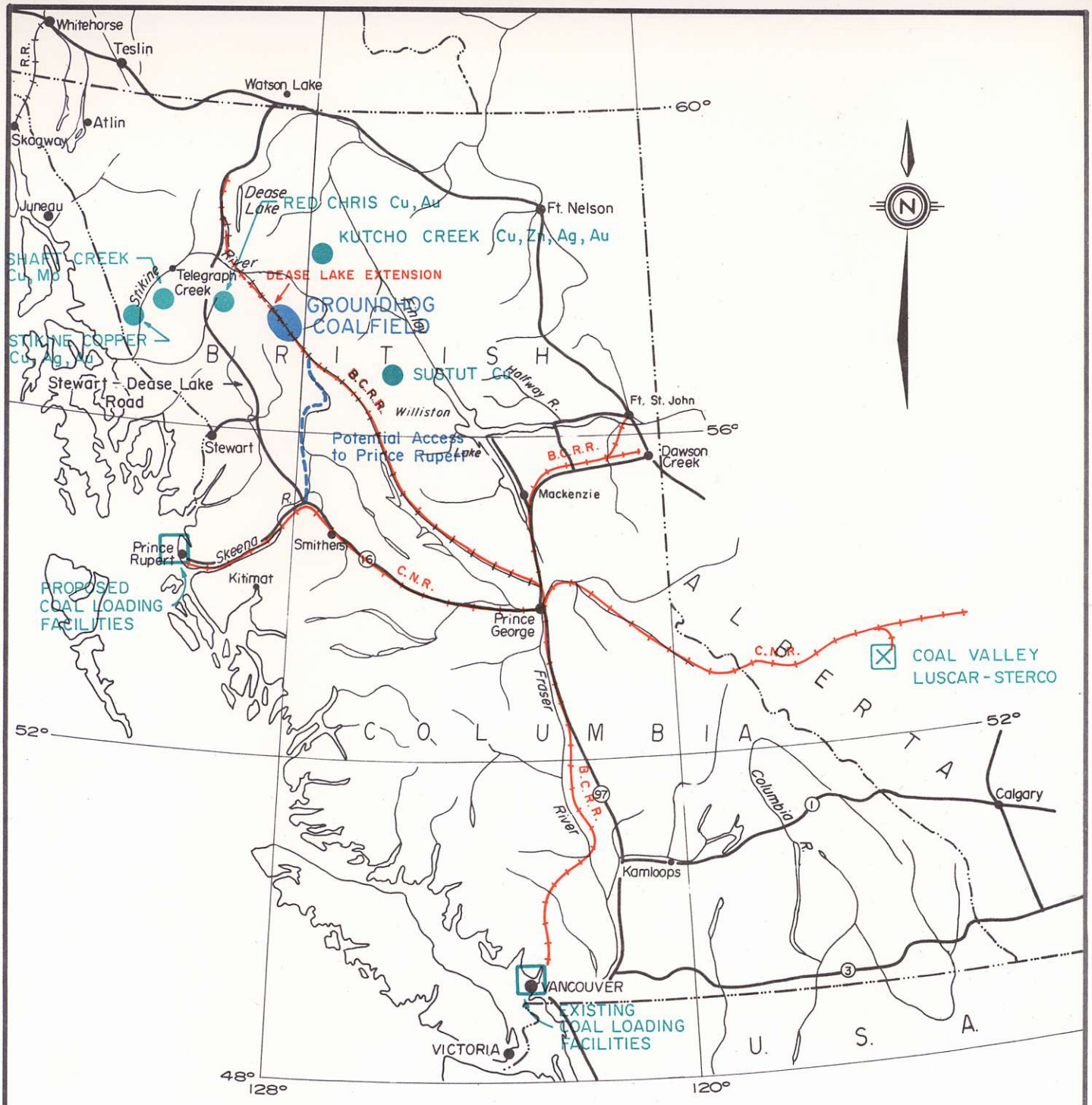
Respectfully submitted



B. Mountford, P. Eng.

STATEMENT OF EXPENDITURES
FOR THE INVESTIGATION
OF
COAL LICENCES 4395, 4400 & 4406
CASSIAR LAND DISTRICT
DECEMBER 1, 1978 - NOVEMBER 30, 1979

Mining Engineer's Fees	$7,500.00
Coal Analysis	30.50
Travel (Hotels, Fares, Meals & Parking)	1,240.14
Telephone & Postage	441.87
Freight, Express & Delivery	103.58
Printing & Drafting	433.61
	$9,749.70



GROUNDHOG COAL LTD.

LOCATION AND ACCESS MAP OF THE GROUNDHOG COALFIELD SHOWING OTHER ADJACENT MINERAL DEVELOPMENTS THAT REQUIRE POWER.

SCALE

MILES 150 0 150 300 450 MILES

KILOMETERS 225 0 225 450 675 KILOMETERS

DRAWING No.1

ROCKS ARE TIGHTLY FOLDED IN THIS AREA

ROCKS ARE TIGHTLY FOLDED IN THIS AREA

ROCKS ARE TIGHTLY FOLDED IN THIS AREA

ROCKS ARE TIGHTLY FOLDED IN THIS AREA

EXPLANATION

- LONESOME MOUNTAIN LITHOSOME – SOMBRE BROWN COLORED, WELL INDURATED, SPARSLEY FOSSILIFEROUS, CONGLOMERATIC SANDSTONES, SANDSTONES, MUDSTONES AND THIN, RARE, DISCONTINUOUS COAL BEDS.
- DEVIL'S CLAW CONGLOMERATE LITHOSOME – THICK BEDDED, COARSE GRAINED, CHERT PEBBLE CONGLOMERATE INTERBEDDED WITH MUDSTONE, SANDSTONE AND MINOR COAL
- COAL BEARING LITHOSOME – SOFT, MEDIUM TO THICK BEDDED MUDSTONES (70-75 PERCENT), CARBONACEOUS UNITS, (15 TO 20 PERCENT), AND GREY SANDSTONES (10 PERCENT) WEATHER BROWN TO ORANGE.
- McEVOY RIDGE LITHOSOME – DARK COLORED, WELL INDURATED MUDSTONES PREDOMINATE, WITH FINE GRAINED SANDSTONES AND SOME CARBONACEOUS MATTER. EVENLY BEDDED, 1 TO 5 FEET THICK.

A A' Cross Section

Air Photo Point

- STRIKE AND DIP OF COAL SEAM
- COAL IN PLACE, ATTITUDE UNKNOWN.
- STRIKE AND DIP OF BEDDING; INCLINED, HORIZONTAL, VERTICAL, AND OVERTURNED
- STRIKE AND DIP OF JOINTS.
- ROCK CONTACT, DASHED WHERE COVERED OR INFERRED
- THRUST FAULT, "T" ON UPPER PLATE.
- FAULT, DASHED WHERE INFERRED OR OBSCURED.
- STRIKE AND PLUNGE OF AXIS OF ANTICLINE. DASHED WHERE INFERRED.
- STRIKE AND PLUNGE OF AXIS OF SYNCLINE. DASHED WHERE INFERRED.
- A U OVERTURNED ANTICLINE AND SYNCLINE RESPECTIVELY.

inches 0 1 2

0 1 2 3 4 5 centimetres

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

GROUNDHOG COAL LTD.

GROUNDHOG COALFIELD GEOLOGICAL MAP

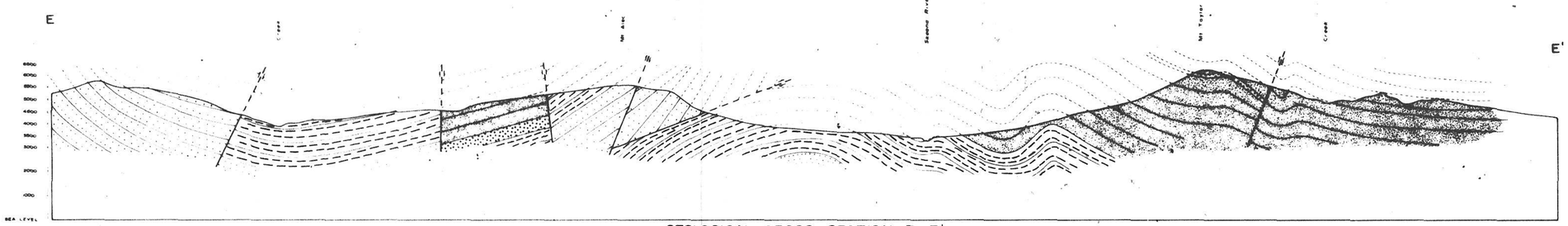
SKEENA RIVER AREA, BRITISH COLUMBIA

0 1 2 3 4 5 6 7 8 9 5,000 10,000 15,000 20,000 25,000 30,000

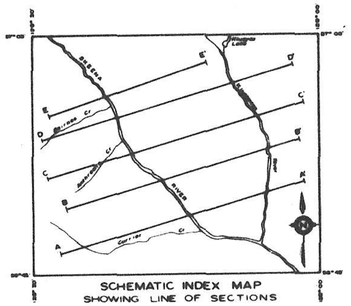
SCALE – 1:50,000

ORIG. GEOLOGY 1970 – REV. 1978

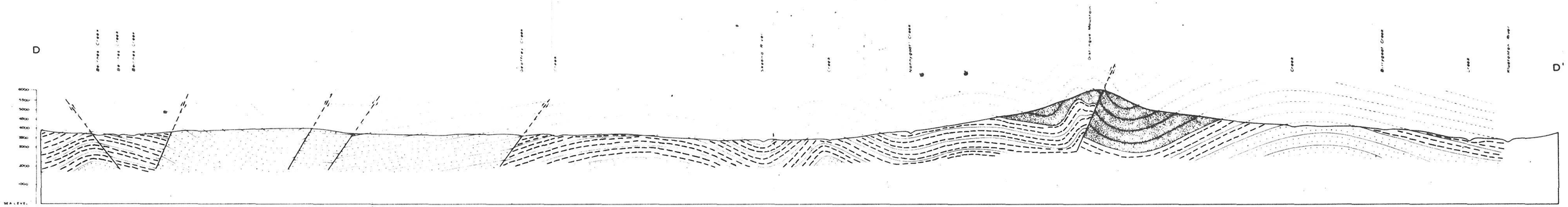
DRAWING Nº 2



GEOLOGICAL CROSS SECTION E-E'
SECTION LOOKING NNW. PLANE OF SECTION STRIKES N 61°E



SCHEMATIC INDEX MAP
SHOWING LINE OF SECTIONS



GEOLOGICAL CROSS SECTION D-D'
SECTION LOOKING NNW. PLANE OF SECTION STRIKES N 70°E

LEGEND

LONESOME MOUNTAIN LITHOSOME
Sombre brown coloured, well indurated, sparsely fossiliferous, conglomeratic sandstones, sandstones, mudstones and thin, rare, discontinuous coal beds.

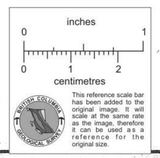
DEVIL'S CLAW CONGLOMERATE LITHOSOME
Thick bedded, coarse grained, chert pebble conglomerate interbedded with mudstone, and minor coal.

COAL BEARING LITHOSOME
Soft, medium to thick bedded mudstones (70-75%), carbonaceous units (15-20%), and grey sandstones (10%) which typically weather brown to orange.

Mc EVOY RIDGE LITHOSOME
Dark coloured, well indurated mudstones predominate, with some fine grained sandstones and some carbonaceous matter. Evenly bedded, 1-5 feet thick.

NOTES:

For Map Showing Section Lines
See Drawing No. 2



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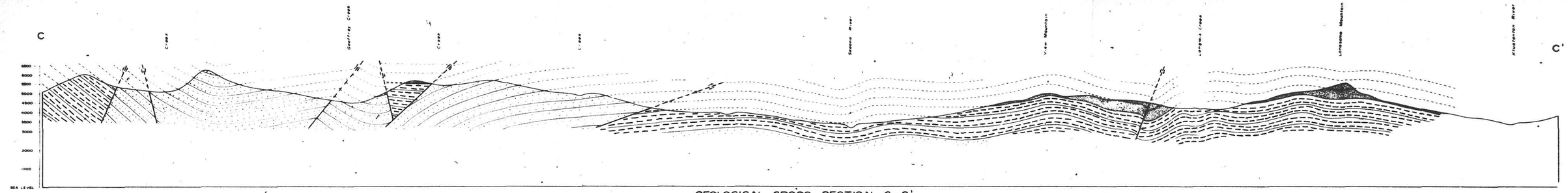
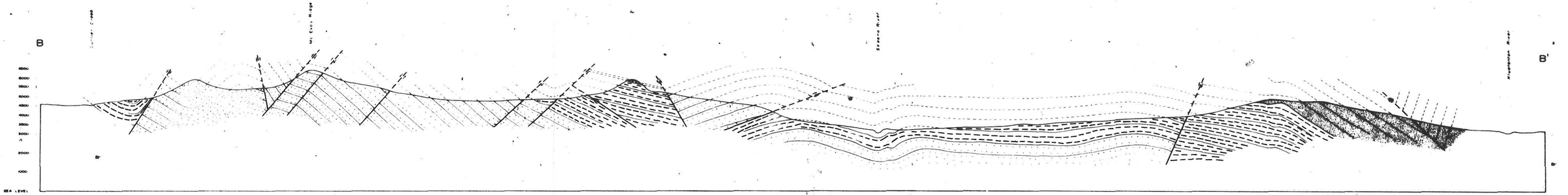
GROUNDHOG COALFIELD GEOLOGICAL CROSS SECTIONS

SCALE FEET 2000 0 2000 4000 6000 FEET

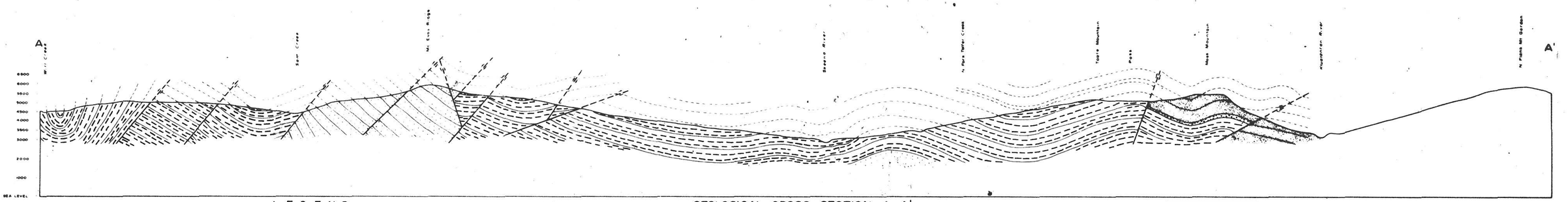
DRAWING No. 3



GEOLOGICAL CROSS SECTION C-C'
SECTION LOOKING NNW. PLANE OF SECTION STRIKES N 70°E



GEOLOGICAL CROSS SECTION B-B'
SECTION LOOKING NNW. PLANE OF SECTION STRIKES N 70°E



GEOLOGICAL CROSS SECTION A-A'
SECTION LOOKING NNW. PLANE OF SECTION STRIKES N 70°E

LEGEND

LONESOME MOUNTAIN LITHOSOME
Sombre brown coloured, well indurated, sparsely fossiliferous, conglomeratic sandstones, sandstones, mudstones and thin, rare, discontinuous coal beds.

DEVIL'S CLAW CONGLOMERATE LITHOSOME
Thick bedded, coarse grained, chert pebble conglomerate interbedded with mudstone, and minor coal.

COAL BEARING LITHOSOME
Soft, medium to thick bedded mudstones (70-75%), carbonaceous units (15-20%), and grey sandstones (10%) which typically weather brown to orange.

Mc EVOY RIDGE LITHOSOME
Dark coloured, well indurated mudstones predominate, with some fine grained sandstones and some carbonaceous matter. Evenly bedded, 1-5 feet thick.

NOTES:

For Map Showing Section Lines
See Drawing No. 3 & 6

inches
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centimetres
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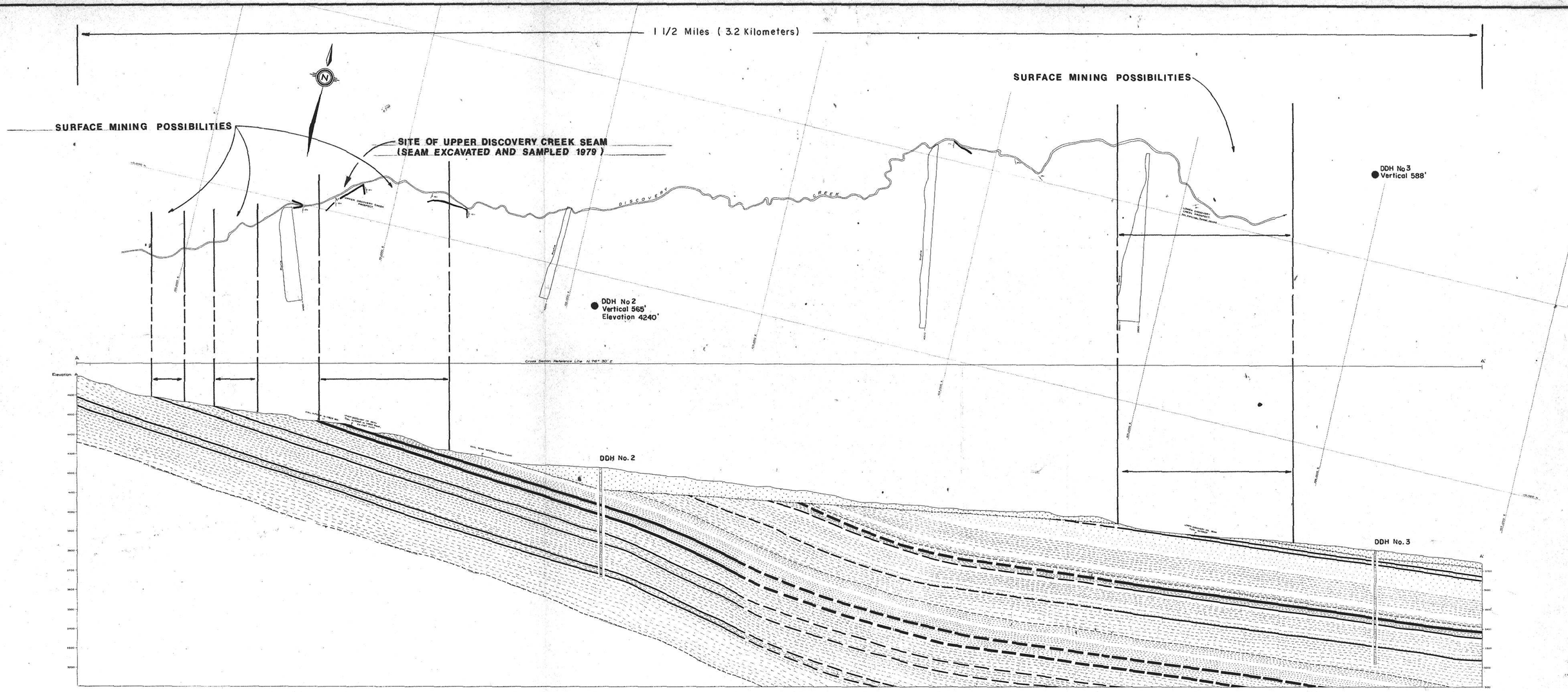
GROUNDHOG COAL LTD.

GROUNDHOG COALFIELD GEOLOGICAL CROSS SECTIONS

FEET 2000 0 2000 4000 6000 FEET
SCALE

DRAWING No. 4



L E G E N D

- OVERBURDEN
- COAL SEAM
- COAL SEAM, INFERRED POSITION
- SANDSTONE
- SHALE
- INTERBEDDED SANDSTONE AND SHALE
- DIAMOND DRILL HOLE
- CONTACT, DASHED WHERE INFERRED
- 10 — STRIKE AND DIP OF COAL SEAM
- 20 — STRIKE AND DIP OF BEDS
- ADIT, CAVED
- COAL OUTCROP

inches
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centimetres

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GROUNDHOG COAL LTD.

GROUNDHOG COALFIELD
GEOLOGICAL CROSS SECTION

(ALONG DISCOVERY CREEK AFTER THOMPSON & MOUNTFORD)

DISCOVERY CREEK AREA

100 0 100 200 300 400 500
SCALE IN FEET

DRAWING No. 5


LEGEND
DDH No. 1 DIAMOND DRILL HOLE
COAL LICENCES PROPOSED FOR 1980
COAL LICENCE AREA DURING 1979
A ——— A' SECTION LINE (FOR SECTION SEE DRAWING
inches
0 1
0 1 2
centimetres
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.
BRITISH COLUMBIA GEOLOGICAL SURVEY
GROUNDHOG COAL LTD.
GROUNDHOG COALFIELD
TOPOGRAPHIC MAP
SHOWING LOCATION OF DIAMOND DRILL HOLES, OUTCROPS, LICENCES, SECTION LINES, AND EXPLORATION TARGET AREAS.
SKEENA RIVER AREA, BRITISH COLUMBIA
SCALE - 1:50,000
DRAWING No. [redacted]
DDH No.1
DDH No.2
DDH No.3
DDH No.4
DDH No.5
DDH No.6
Beirnes Cr.
Currier Creek
Discovery Cr.
Telfer
C A S S I A R
Tp. 34
Tp. 33
Tp. 24
Tp. 23
MT. LAIDLAW
MT. GORDON
TABLE MTN
LONESOME MTN
MT. ALEX
128°00'
57°00'
56°45'