

CONFIDENTIAL FILE

1982 REPORT OF EXPLORATION ACTIVITIES

on the

WEST CARBON CREEK PROPERTY

Coal Licences Numbered
4104 to 4123 inclusive and 5171 to 5173
in the Liard Mining Division approximately
36km west from W.A.C. Bennett Dam
centred on
55°57'N, 122°50'W

Owned By: Utah Mines Ltd.

Report By: P.S. Cowley

of

Utah Mines Ltd.
1600 - 1050 West Pender Street
Vancouver, B.C.
V6E 3S7

Work performed between July 1 and August 1, 1982

submitted: May 30, 1983

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

00 509 (2)

TABLE OF CONTENTS

	<u>PAGE NO.</u>
ABSTRACT.....	1
LOCATION AND ACCESS.....	2
PROPERTY AND TITLE.....	2
PHYSIOGRAPHY.....	6
HISTORY OF EXPLORATION.....	6
1981 EXPLORATION PROGRAM.....	8
GEOLOGY - GENERAL AND LOCAL.....	11
STRATIGRAPHY.....	11
STRUCTURE.....	14
DRILL HOLE DATA.....	17
W.C.C. D.D.H.-82-8 A WELL COMPLETION REPORT	17
B COMMENTS	18
COAL SEAM CORRELATION.....	20
CONCLUSIONS AND RECOMMENDATIONS.....	21
SELECTED BIBLIOGRAPHY.....	23

APPENDICES

Appendix I - Descriptive Lithologic Data
W.C.C. D.D.H.-82-8

Appendix II - Legend of Symbols for Graphic Lithologic Log

Appendix III - Analytical Data
W.C.C. D.D.H.-82-8

Appendix IV - Cost Statement

Appendix V - Statements of Qualifications

ILLUSTRATIONS

<u>FIGURES</u>	<u>PAGE NO.</u>
1. West Carbon Creek Property Location Map.....	3
2. West Carbon Creek Property Regional Map.....	4
3. West Carbon Creek Coal Licences.....	5
4. Physiographic Subdivision, Northeast B.C.....	7
5. Structural Cross-Section 1:10,000 Scale.....	16
6. Coal Seam Correlation.....map folder ✓	
7. Recommended Licences for Abandonment and Retention.....	22

TABLE

I Coal Sample Analytical Procedure	10
II Nomenclature of the Formations	12

MAPS

1. West Carbon Creek Property - Bedrock Geology and Drill Hole Location.....	map folder
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LOGS

Discriptive Lithologic Log for W.C.C.-D.D.H. 82-8	Appendix I
Graphic Lithologic Log for W.C.C. D.D.H.-82-8	map folder ✓
Legend of Symbols for Graphic Lithologic Log	Appendix II
Gamma Ray-Density-Density Logs W.C.C. D.D.H.-82-8	map folder

ABSTRACT

The West Carbon Creek Property comprises 23 contiguous coal licences numbering 4104 to 4123 inclusive and 5171 to 5173. The licences were issued to Utah Mines Ltd. on August 15, 1978 and May 4, 1979. The property, located in the designated "Northeast Coal Block", lies within the Liard Mining and Peace River Land Districts.

An exploration program was formulated for the 1982 field season to provide further data on the extent, metallurgical quality and continuity of coal seams on the property, pursuant to the 1978, 1980 and 1981 programs. The drilling of one diamond drill hole and an extensive mapping program were planned to accomplish these objectives. Specifically, the extensive mapping program was to verify and refine stratigraphy, eliminate superfluous coal licences, and accrue inter-drill hole structural data for the purposes of a more reliable coal seam correlation.

A total of 432 metres of diamond drilling was completed in one helicopter supported hole penetrating 3 seams greater than 1.0 metres. Diamond drill hole WCC 82-8, on Coal Licence 4114, was located 0.8 kilometres east of WCC 78-1. The extensive mapping program redefined geologic boundaries on the property and resulted in a reinterpretation of the coal bearing sequence from strictly Bickford to Gething-Cadomin-Bickford. Mapping on the property had revealed 12 of the 23 licences to be underlain by severely deformed sediment that should be relinquished. Widely spaced holes and structural variability across the property still result in a tentative coal seam correlation despite the concentrated mapping and limited exposure between drill holes. The correlation shows numerous seams over 1.0 metres with minimal drill hole overlap. The 1982 exploration program provides a base for further exploration of the West Carbon Creek Property to verify tentative correlations and tonnage estimates.

LOCATION AND ACCESS

The West Carbon Creek Property is located within the area commonly referred to as the Northeast Coal Block in the Liard Mining Division. This area is covered by the National Topographic System designation 93 O/15. The twenty-three coal licences comprising the property are arranged in an irregular "horseshoe" configuration centred on Mount Rochfort at approximately 55°57'N; 122°50'W. The northeast corner of the property lies approximately 36 kilometres west of the W.A.C. Bennett Dam. Vancouver is approximately 770 kilometres south of the property (see Figure 1, page 3).

Road access is available only to the eastern boundary of the property. Highway 29, joining Chetwynd, Hudson's Hope and Fort St. John, passes approximately 53 kilometres to the east. Johnston Creek Road, built by Utah Mines and Canfor Ltd. (a major forest products company), departs Highway 29, 19 kilometres south of Hudson's Hope and heads west to the Carbon Creek Property. A gravel road, built by Utah Mines Ltd. in 1976, continues to the eastern boundary of the West Carbon Creek Property directly east of Mt. Rochfort. Alternate access to the Johnston Creek Road is possible along 13.7 kilometres of Utah Mines Ltd. road from the west end of the W.A.C. Bennett Dam (see Figure 2, page 4).

Access on the property is by helicopter or foot. Much of the property is above treeline (approximately 1500 metres) making access by helicopter convenient. Below treeline helicopter landing pads are restricted to drill sites and wide creek beds.

PROPERTY AND TITLE

The West Carbon Creek Property comprises twenty-three contiguous coal licences numbered 4104 to 4123 inclusive and 5171, 5172 and 5173. Licences 4104 to 4123 were issued on August 15, 1978. On May 8, 1979 licences 5171 to 5173 were issued. These licences encompass an area of 6678 hectares (rounded upward from 6666.58 hectares), (see Figure 3, page 5). The West Carbon Creek Property forms the western extension of the Carbon Creek Property. Lands north, south and west of the West Carbon Creek Property are presently unoccupied by other coal exploration companies.

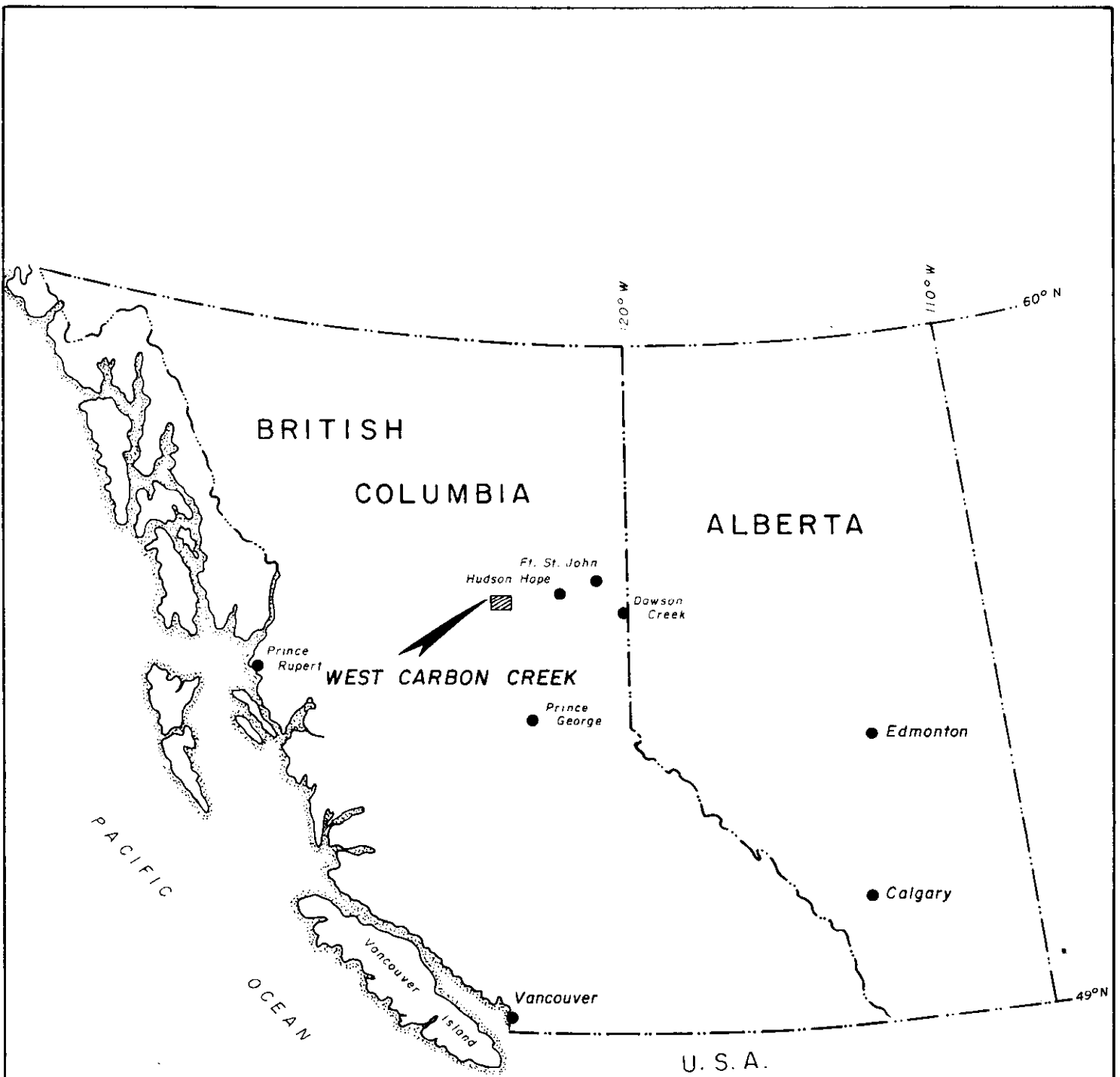


FIGURE - I
 UTAH MINES LTD.
 WEST CARBON CREEK
 LOCATION MAP

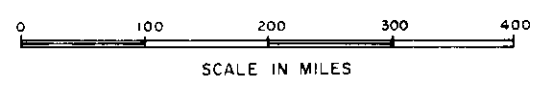






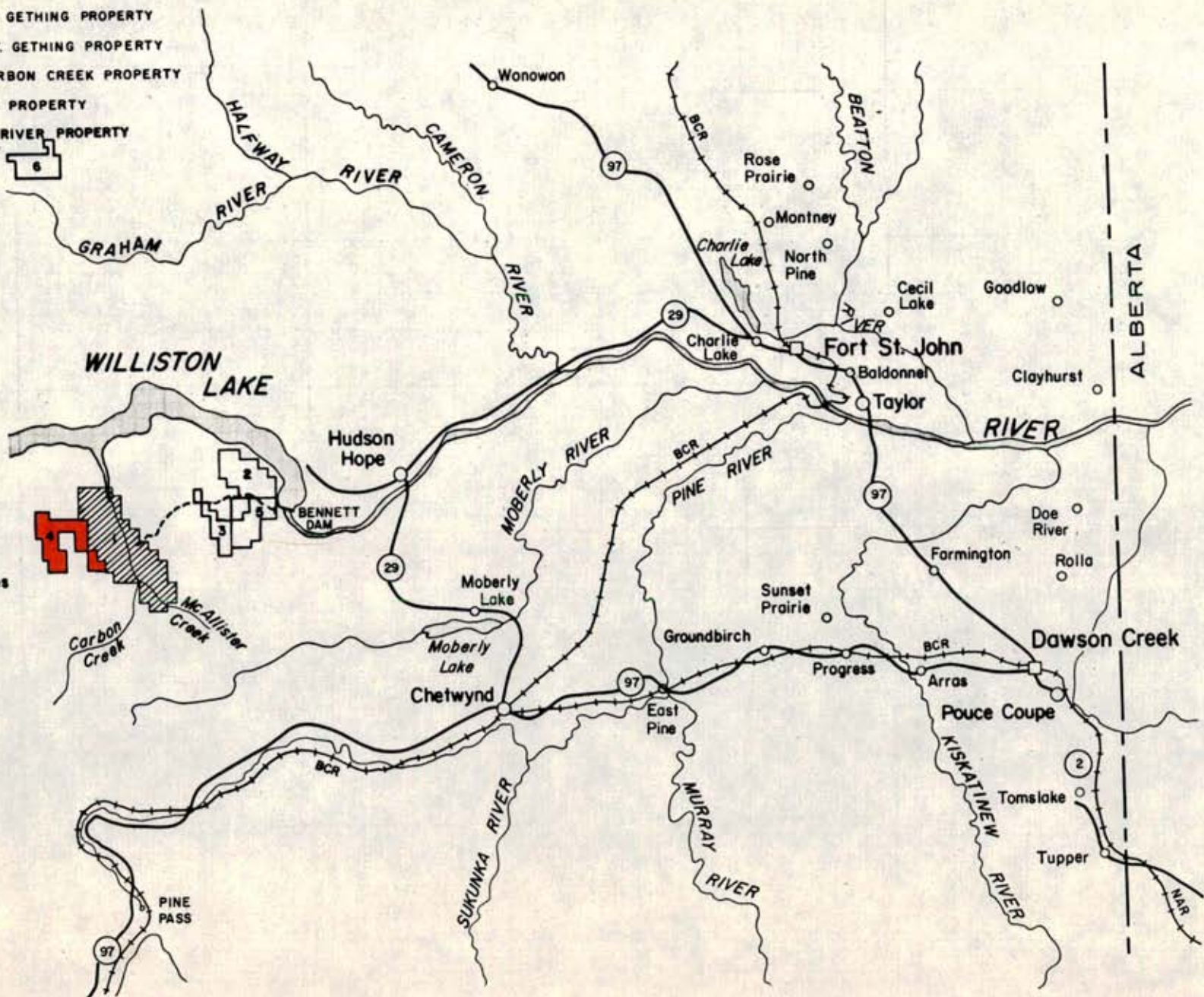


FIGURE - 2

PROPERTY LOCATION MAP

-  CARBON CREEK PROPERTY
-  EAST MT. GETHING PROPERTY
-  SOUTH MT. GETHING PROPERTY
-  WEST CARBON CREEK PROPERTY
-  BRI COAL PROPERTY
-  GRAHAM RIVER PROPERTY



SCALE: 1 inch = 16 miles



141

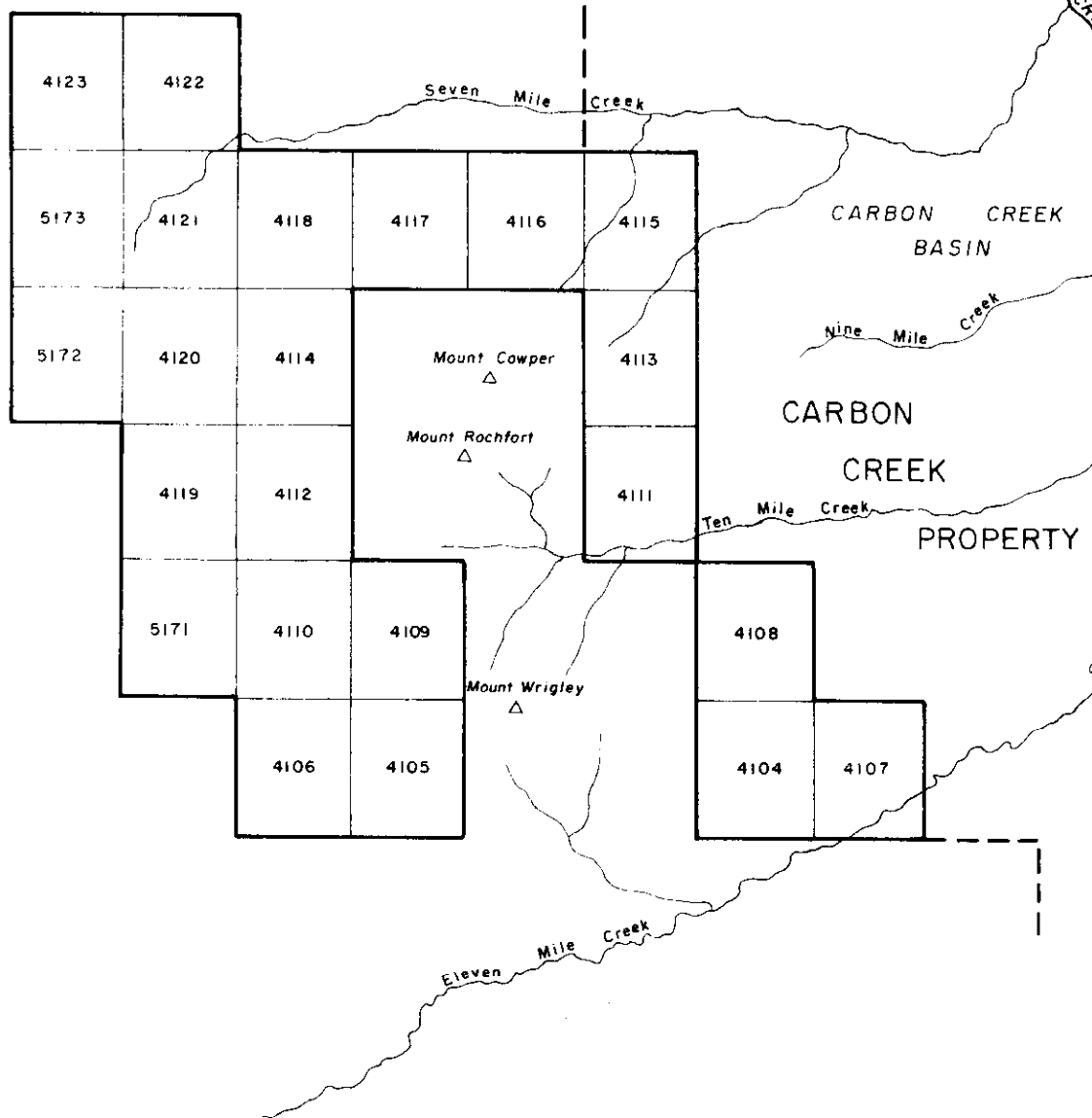


FIGURE — 3
WEST CARBON CREEK
COAL LICENCES



PHYSIOGRAPHY

The West Carbon Creek Property is situated in a mountainous region toward the western margin of the Rocky Mountain Foothills. The Foothills belt trends north-northwest and, in the area of Peace River, is approximately 72 kilometres wide. The western margin of the belt is considered to be the easternmost major fault which thrusts Paleozoic strata over Mesozoic strata (Holland, 1976). The eastern margin is less precisely defined but occurs where the deformed strata of the Foothills meets the flat lying to gently dipping strata of the Alberta Plateau (see Figure 4, page 7). Folding and southwest dipping thrust faulting within the Foothills belt trend north-northwesterly, closely paralleling the belt. Bedrock structure and lithology are commonly reflected by the topography and drainage.

Within the boundaries of the property, maximum relief is in the order of 850 metres. The lowest elevation of 1015 metres above sea level, occurs in a north-flowing tributary of Seven Mile creek. Elevations of peaks and ridge crests within the property boundaries rarely exceed 1850 metres above sea level. Mount Rochfort, which is surrounded by the property, reaches an elevation of 1989 metres above sea level.

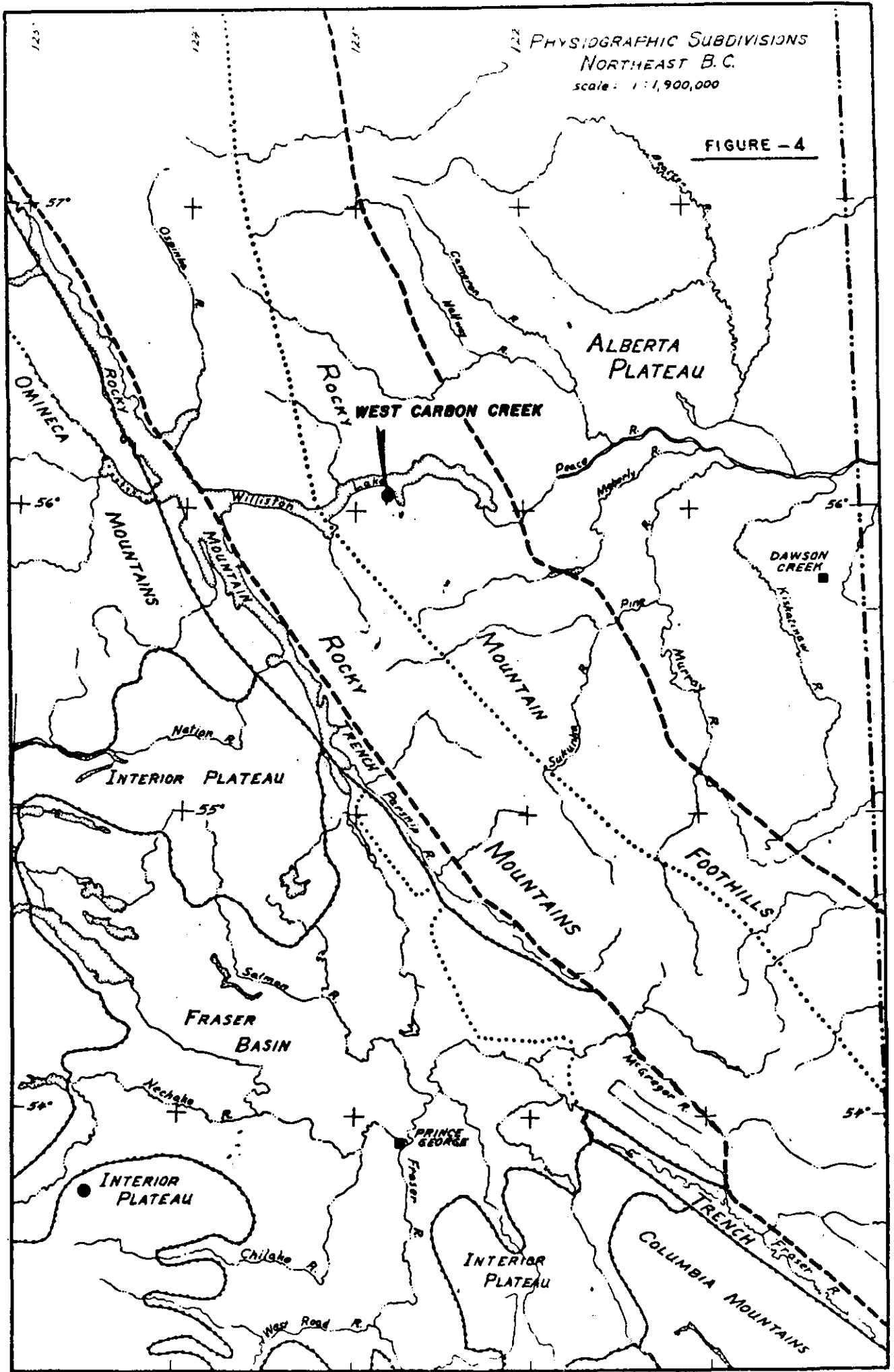
Peaks and ridges vary in form from flat or rounded to acute and rugged with abundant exposure. Slopes range from gentle to very steep. Dip slope surfaces and vertical cliffs are common. Most valleys are V-shaped in form. Many streams have steep to vertical walled canyons over portions of their length.

HISTORY OF EXPLORATION

Coal occurrences in the Carbon Creek area were first documented in the early 1900's by prospectors such as Rochfort, Barr and McAllister. In 1947, the British Columbia Department of Mines sent W.H. Mathews into the Carbon Creek Valley to investigate the coal resources. Mathews outlined the structure and distribution of coal-bearing rocks and exposures of coal of possible commercial interest. Subsequent regional investigations of the area were made by Muller (1961), Hughes (1964), and Stott (1973).

PHYSIOGRAPHIC SUBDIVISIONS
NORTHEAST B. C.
scale: 1:1,900,000

FIGURE - 4



In August of 1975, G.H. Raymer conducted a reconnaissance evaluation in the area of the present West Carbon Creek Property on behalf of Utah Mines Ltd. His work outlined shallow dipping coal measures, considered to be of Gething strata, along and adjacent to the synclinal axis on the western part of the property. The coal measures were estimated to be approximately 1040 metres thick, containing coal seams up to 2.23 metres thick.

In August of 1978, 20 coal licences were acquired, comprising the West Carbon Creek Property. An exploration program was designed to test the economically recoverable coal potential. Between May and September of 1978, geological mapping and diamond drilling was undertaken by R.B. Anderson and A.T. Armstrong of Utah Mines Ltd. A total of 371.55 metres of diamond drilling were completed in two holes. Twenty-one samples were taken from the core and analysed in the Utah International Inc. Minerals Laboratory in Sunnyvale, California. (Results can be found in the 1978 Property Report).

The 1980 Exploration program was designed to test the economically recoverable coal seam potential of the property, and refine the stratigraphy and structural complexities on the property. Extensive geological mapping conducted by J. Ridley lead to a reinterpretation of the coal-bearing unit from Gething to the Bickford Formation. Three diamond drill holes, totalling 617.92 metres were drilled. Twenty-one coal samples were taken from the core and analysed as above.

The 1981 Exploration program was formulated to provide further information on the extent, metallurgical quality and continuity of coal seams on the West Carbon Creek Property. Two helicopter supported diamond drill holes were completed, totalling 432 metres. Thirty coal samples were taken from the core and analysed as above. No mapping was performed on the property.

THE 1982 EXPLORATION PROGRAM

The 1982 exploration program was designed to provide further information on the extent, metallurgical quality and continuity of coal seams on the West Carbon Creek Property and refine stratigraphic interpretations.

One helicopter supported diamond drill hole was completed on the property. The drill hole was located on a grassy topped ridge. Slashing was restricted to a narrow walking path to the water supply pump. Natural clearings were used for the majority of the trail. Slashing was done by P. Cassar-Torrggiani and M. Syens. Roger's Drilling Services Inc. provided one BBS-25A drill rig and

drilling crews composed of G. Gagnon and M. Giroux, assisted by R. Gagne and R. Stevenson. Drilling commenced on July 2, 1982 and was completed on July 15, 1982. Rotortech Helicopters from Chetwynd, B.C. provided a Bell 206 helicopter for daily crew changes, supplies and both drill moves. Maple Leaf Helicopters from Chetwynd provided an A-star and Bell 205 to assist with drill moves.

A total of 432 metres were drilled in the one hole. Core descriptions were performed by K. Foellmer, S. Ridley and P. Cowley. A total of 34 coal samples were taken from the core. Samples were submitted to Utah International Inc. Minerals Laboratory at 1190 Bordeaux Drive, Sunnyvale, California, 94086. Analytical procedures followed the outline shown on the laboratory flow chart (Table I). Drill core from the hole is stored at Utah Mines Ltd. trailers at Lynx Creek, B.C. The descriptive log for the hole is found in Appendix III. The hole was probed with a Comprobe geophysical unit owned by Utah Mines Ltd. and operated by P. Cowley and H. Gale. Geophysical and graphic logs are found in the map pocket.

The mapping program ran concurrently with the drilling program. Mapping crews were lead by P. Cowley, K. Foellmer and S. Ridley and assisted by M. Vaskovic, M. Syens, P. Cassar-Torreggiani, and H. Gale. The mapping resulted in three major accomplishments. Geologic units were re-defined from previous interpretations. Severe structural deformation over much of the property warrants the termination of 12 coal licences. Further inter-drill hole structural data was acquired to aid in drill hole correlation. A 60 metre thick distinctive and mappable dark siltstone unit with pelecypods and gastropods was traced over much of the southwestern part of the property. The unit proved useful in visualizing structural complexities, establishing an upper Gething marker bed and estimating coal seam subcrops. The unit was thought to be Moosebar Formation by Stott. However, examination of the unit penetrated in D.D.H. 82-8 and mapping revealed two coal seams and numerous sandstone beds. The unit is thus interpreted as terrestrial Gething strata.

TABLE I

CANADIAN COAL - FLOW SHEET

Drill core
As Rec'd.

Air Dry & Weigh

Crush to Minus 3/8"

Split Out Head Sample

Screen
28 Mesh

3/8" x 28 Mesh

28M x 0 Mesh

Float-Sink Test

Sp. Gr.

1.300

1.350

Analyses

1.400 Prox, S,

1.450 Btu, FSI

1.500

1.550

1.600

1.800

Flotation

Conc. I

Analyses

Conc. II

Prox, S, Btu

FSI

Refuse

Analyses on the Head Sample (3/8" x 0)

- 1.) HGI
- 2.) Proximate, S, Btu, and FSI
- 3.) Ultimate Analysis
- 4.) Mineral Analysis of Ash
- 5.) Fusion Temperature of Ash
- 6.) Water Soluble Alkalies
- 7.) Sulfur Forms
- 8.) Equilibrium Moisture

GEOLOGY - GENERAL AND LOCAL

STRATIGRAPHY:

The West Carbon Creek Property is underlain by folded and faulted Upper Jurassic to Lower Cretaceous sediment of Minnes and Bullhead Groups (see Map 1 and 2, Map Folder). The Minnes Group consists of, in ascending order, Monteith, Beattie Peaks, Monach, and Bickford Formations (see Table II, page 12). Formations within the Minnes Group find their type section in the Carbon Creek basin and vary in thickness away from this location as a result of facies change or erosion. Units of the Bullhead Group include the Cadomin and Gething Formations.

The nearshore marine sediments of the Monteith Formation may be divided into two lithofacies; an upper unit of clean quartzitic sandstones and conglomerates, dirty sandstones and minor siltstones; and a lower unit of dirty sandstones and siltstones. The upper Monteith unit contains approximately 300 metres of an almost continuous sequence of fine-grained orthoquartzites to quartzite granular conglomerate with minor interbeds of fine-grained dirty sandstones and siltstones. The orthoquartzites may be white to light grey on a fresh surface and weather light grey. The clean quartzitic sandstones are massive with occasional cross-bedding but rarely may be thick to thin bedded. Beds range from 0.01m to 20m thick. Interbedded with the orthoquartzites are fine-grained, medium brown, thin to thick bedded sandstones and medium brown siltstones. The upper lithofacies of the Monteith Formation is easily recognized on the landscape by the light grey prominent cliff forming orthoquartzites.

The Monteith Formation conformably overlies the Jurassic Fernie shales and is overlain conformably by the Lower Cretaceous Beattie Peaks Formation. The Monteith-Beattie Peaks contact is assumed to be the contact between the last massive quartzose sandstone and the recessive strata of Beattie Peaks Formation.

The marine Beattie Peaks Formation is typically distinguishable from overlying and underlying strata by its recessive character. Lithologically the Beattie Peaks Formation consists of thinly interbedded siltstone, fine-grained sandstone, mudstone and rare coals. A facies variation of the Beattie Peaks exists on and in the vicinity of the property. Sandstone beds approach 5 metres are thick, heavily cross-bedded and frequently exhibit a joint pattern perpendicular to bedding. The sandstone may contain abundant pelecypods in medium thick beds. Load casts, worm tracks and burrows are common throughout the formation.

TABLE-II

NOMENCLATURE OF THE FORMATIONS

SERIES	GROUP	FORMATION	THICKNESS	LITHOLOGY	
	Fort St. John Group	Moosebar	200 - 300 m.	Dark grey shale	
Lower Cretaceous	Albian	Gething	900 - 1100 m.	Fine to coarse grained sandstones siltstone, coal carbonaceous shale and conglomerate.	
		Bullhead Group erosional	Cadomin unconformity	45 - 60 m.	Sandstone, coarse grained to massive conglomerate with quartz and chert pebbles.
	Minnes Group		Bickford	200 - 300 m.	Quartzite, sandstone, conglomerate, siltstone, coal, minor shale.
			Monach	250 - 300 m.	Quartzite, sandstone, conglomerate, minor shale and coal.
		Beattie Peaks	250 - 350 m.	Shale, flaggy sandstone.	
		Monteith	500 m. +	Sandstone, fine to coarse grained, quartzite.	
	Hauterivian				
Valanginian					
Tithonian					
Jurassic		Fernie	150 - 250 m.	Chiefly shale, sandy near the top.	

The Monach Formation, conformably overlying the Beattie Peaks Formation, consists mostly of massive quartz arenites and orthoquartzites interbedded with siltstones, mudstones and thin coal seams. The sediments were deposited in a nearshore marine environment. Stratigraphic similarity between the Monach Formation and the Monteith Formation renders identification difficult without exposure of the Beattie Peaks Formation. However, quartzite beds are typically more abundant and thicker (20 metres) in the Monteith than in the Monach (5 metres).

The deltaic Bickford Formation conformably overlies the Monach Formation. The Bickford Formation contains interbedded sandstones, siltstones, silty mudstones, mudstones, coal and occasional conglomerates. The sandstones range from fine to medium to coarse grained to granular conglomerate. The finer grained sandstones are moderate to high in quartz content. The coarser sandstones are quartz arenites deposited in medium to thick beds. Many sandstones have a secondary calcite cement. Rare calc-arenites containing recrystallized shell fragments occur in the middle of the formation.

The Bickford Formation is unconformably overlain by the Bullhead and Fort St. John Groups. Stott considers the Lower Cretaceous Bullhead and Fort St. John Groups to form a non-marine to marine sequence:

"The basal succession of Lower Cretaceous coalbearing sediments and massive conglomerates is included in the Bullhead Group. The overlying Lower Cretaceous marine sediments with tongues of carbonaceous, sandy sediments are included in the Fort St. John Group. The lower part of the sequence records widespread fluvial conditions that developed after initial deposition of conglomeratic sediments. The upper part records the complex intertonguing of marine transitional and flood plain environments along the coast line of the Early Cretaceous epicontinental sea"

In the property area, the Cadomin Formation is commonly a sequence 40 to 60 metres thick of interbedded sandstones and conglomerates. The sandstone beds are typically medium to coarse-grained, massive to coarsely cross-bedded and weather light red-brown in colour. The sandstones contain abundant quartz, chert and volcanic rock fragments, giving them a salt and pepper appearance on fresh surfaces. The sandstone beds range from less than one metre to over seven metres in thickness. The conglomerate units, ranging from 0.5 to 10 metres contain well rounded pebbles of chert, quartz and volcanic fragments. Rare thin mudstones and coal seams are interbedded with the sandstones and conglomerates.

The contact between the Cadomin and Gething Formations is transitional, not abrupt. Stott (1963, page 3) noted that the Cadomin and Gething Formations are actually "facies of a vertical transition from the Cadomin Formation to the Gething Formation. The contact between the two formations is placed at the top of the uppermost thick, coarse grained sandstone bed of the Cadomin Formation.

The character of the Gething Formation sediments underlying the property is typical; as described by Irish (1979, page 69), a sequence of:

"Interbedded, grey-and buff-weathering, medium-to fine grained, grey to dark brown sandstone, grey to black shales, dark siltstones and coal seams."

These sediments represent deposition in an aggrading flood plain environment. Some of the fine grained sandstones may represent bar finger and levee deposits and others may represent flood plain splay deposits (Stott, 1968, page 111). Sedimentary features attributable to these types of deposits are present in drill core and in outcrop on the West Carbon Creek Property.

Stott (1968, page 111) lists some of the features found in sandstones in the Gething Formation; well sorted nature but often containing considerable matrix, festoon cross-beds, laminae of plant debris and thin layers of silt and clay. The finer silts and clays represent deposition from water in areas practically devoid of current on the flood plain proper (Stott, 1968, page 112). These silts and clays accumulated between the river channels and the swamp and forest areas. The swamp and forest areas are the source of the present coals and are thought to be of several differing occurrences. Stott (1968, page 112) suggests that some may have originated in abandoned river channels, some paralleling major river channels and some on deltas.

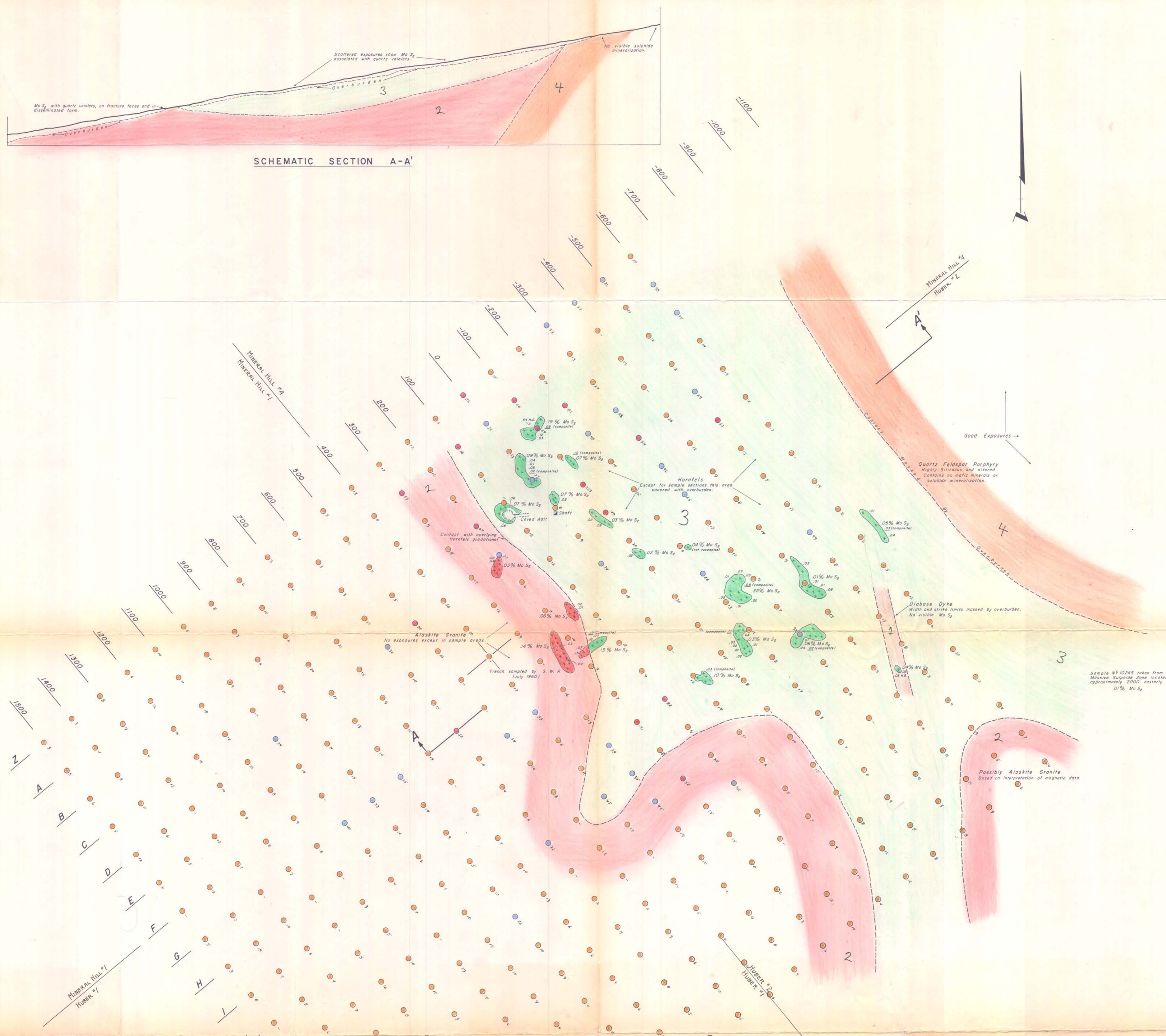
The Bullhead Group is overlain by marine sediments of the Fort St. John group, which comprises, from oldest to youngest, the Moosebar Formation, the Gates Formation, the Hasler Formation, the Goodrich formation and the Cruiser Formation (see Table 2). These formations have not been observed on the property in outcrop or in drill core.

STRUCTURE

At the western edge of the West Carbon Creek property the Pardonet Thrust positions Triassic Pardonet Formation onto the Lower

Cretaceous Monach Formation. The West Carbon Creek property exposes a major syncline and anticline with a series of en echelon folds trending north-northwest (see Figure 5, page 16). The major syncline, lying in the western half of the property, is broad in the southern half of the property but tightens northward with the development of en echelon folds. The Gething, Cadomin and Bickford Formation are exposed in the core. Drill core data from D.D.H. 81-6 and 82-8 reveal that the eastern limb of the syncline flexes abruptly. All drill core from the syncline exhibit slippage along bedding planes, occasionally lined with calcite. Frequently calcite veinlets are oriented perpendicular to bedding. The major anticline, lying on the eastern half of the property, develops into a box anticline towards the north.

Two reverse faults, dipping steeply to the west-southwest, extend along the eastern edge of the major anticlinal axis. Movement along the reverse faults are approximately 150 metres in the southern end on the property. Faulting is considered contemporaneous to the folding.



SCHEMATIC SECTION A-A'

- EXPLANATION**
- 4 Quartz Feldspar Porphyry.
 - 3 Argillaceous Hornfels.
 - 2 Alaskite Granite.
 - 1 Diabase Dyke.
 - Sample Area.
 - or .17% Mo₂S₅ Assay Value. — Loudon, Anderson Sampling
 - - - Contact Approximate or Inferred.

- GEOCHEMICAL SOIL SAMPLES**
- >100 ppm Mo
 - 50-100 ppm Mo
 - 25-50 ppm Mo
 - Nil or trace Mo < 25 ppm Mo

Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 509 MAP 1

SOUTHWEST POTASH CORPORATION
 MINERAL HILL Mo₂S₅ PROSPECT
 SURFACE PLAN SHOWING
GEOLOGY AND GEOCHEMICAL SAMPLING
 — SAMPLE AREAS —

SCALE 1" = 100'

R.E. Anderson
 Vancouver, October 4, 1963

DRILL HOLE DATA

D.D.H. W.C.C. 82-8

A. WELL COMPLETION REPORT

Location: In the alpine valley (cirque) 1.5 kilometres southwest
of WCC 78-1

UTM Co-ordinates: 6,200,560N x 508,025W

Coal Licence No. 4114

Elevation: 1712 metres

Orientation: Vertical

Core Size: NQ

Date Collared: 2 July 1982

Date Completed: 15 July 1982

Plugged: Yes - cemented

Overburden Depth: 6.10 metres

Casing Depth: 6.10 metres

Casing Size: N.W. - 8.99mm
recovered

Final Depth: 431.90 metres

Formations Encountered: 0m to 6.10m Overburden
6.10m to 431.90m Gething Formation

Core Description By: K. Foellmer, P. Cowley, S. Ridley

Coal Seams Sampled:

<u>Sample No.</u>	<u>Interval</u>	<u>Thickness</u>	
		<u>Core</u>	<u>Density Log</u>
1	10.19m to 11.73m	0.83m	1.54m
2	36.61m to 37.36m	0.51m	0.75m
3	122.08m to 122.78m	0.20m	0.70m
4	138.32m to 139.07m	0.66m	0.75m
5	156.47m to 156.85m	0.38m	0.38m
6	206.29m to 207.09m	0.77m	0.80m
7	208.51m to 209.11m	0.60m	0.60m
8	218.11m to 219.66m	0.54m	0.55m
9	230.57m to 231.12m	0.47m	0.55m
10	235.51m to 235.97m	0.35m	0.46m
11	248.88m to 249.98m	0.61m	1.10m
12	256.27m to 256.67m	0.37m	0.40m

13	259.96m to 260.56m	0.40m	0.60m
14	264.10m to 264.55m	0.30m	0.45m
15	274.43m to 275.04m	0.61m	0.61m
16	281.72m to 282.02m	0.27m	0.30m
17	283.49m to 294.04m	0.39m	0.55m
18	295.40m to 295.80m	0.12m	0.40m
19	295.80m to 296.10m	0.30m	Rock Split 0.30m
20	296.10m to 296.60m	0.20m	0.50m
21	297.10m to 297.40m	0.12m	0.30m
22	297.55m to 297.90m	0.28m	0.35m
23	309.30m to 309.74m	0.37m	0.44m
24	327.88m to 328.48m	0.36m	0.60m
25	341.61m to 342.01m	0.21m	0.40m
26	348.22m to 348.62m	0.22m	0.40m
27	349.47m to 349.72m	0.25m	0.25m
28	354.44m to 354.94m	0.33m	0.50m
29	358.96m to 359.41m	0.32m	0.45m
30	375.38m to 375.98m	0.51m	0.60m
31	382.53m to 383.43m	0.71m	0.90m
32	206.32m to 207.12m	0.25m	0.80m
33	208.63m to 209.24m	0.44m	0.61m
34	218.15m to 219.85m	0.65m	1.70m

Logs Run: Gamma, Density, Caliper by Utah Mines Ltd., performed by P. Cowley and H. Gale

B. COMMENTS

Diamond drill hole WCC 82-8, on C.L. 4114 was located on the crest of a grassy ridge. No slashing was required with the exception of a walking trail cut down to the water supply pump. Natural clearings were used where possible, for the trail. All equipment was flown in by Maple Leaf Helicopters A-star and Rotortech Helicopters' Bell 206. Crew changes were flown by Rotortech Helicopters' Bell 206. Upon completion of drilling, all equipment and garbage was removed from the site. Large timbers for the drill platform were stacked at the site for use in the 1983 program.

The descriptive lithologic log is found in Appendix I. Diamond drill hole WCC 82-8 penetrated the Gething sediments below 6.10 metres of overburden. A sequence of approximately 60 metres of siltstone with minor pelecypods and gastropods were intersected in the upper portion of the drill hole. Previous to the drilling, Stott had interpreted the shale unit exposed in outcrop as the Moosebar Formation. However, 2 minor coal seams found in the sequence indicates a terrestrial environment, not marine as is the Moosebar Formation. The sediments intersected in the remainder of the hole consisted of sandstone, siltstone, mudstone and coal. Bedding angles, measured from a vertical core axis, ranged from 80° to 90°.

A computer derived graphic lithologic log is present in the map folder. The legend of symbols in the graphic log is found in Appendix II.

A total of 33 coal samples and 1 rock split were removed from the core for analyses. Seams ranged in thickness from 0.04 metres to 1.70 metres. Analyses are present in Appendix III. The range in analyses from W.C.C. D.D.H. 82-8 is shown in the following table.

<u>AIR DRY BASIS</u>		<u>M.M. FREE</u>	
% H ₂ O	1.21 to 2.98	% Vol.	21.55 to 33.78
% Ash	2.56 to 39.38	% F.C.	36.86 to 70.95
% S	0.61 to 2.13	B.T.U.	8,841 to 14,934
% Vol	21.29 to 33.02		
% F.C.	36.16 to 69.39	Rank - High - Volatile A to	
B.T.U.	8,673 to 14,703	Medium - Volatile	
F.S.I.	1 to 8	Bituminous	

Diamond drill hole W.C.C. D.D.H. 82-8 was geophysically logged by a Comprobe unit owned and operated by Utah Mines Ltd. The Gamma, Density and Caliper log is found in the map pocket.

COAL SEAM CORRELATION

Attempts have been made to correlate coal seams of the Gething Formation on the West Carbon Creek Property despite considerable complications such as widespread drill holes, structural variability across the property and variable physical, chemical and geophysical drill hole data. With limited exposure between drill holes, general stratigraphic positioning of each hole becomes questionable. On other Utah Mines' properties in the vicinity, when stratigraphic positioning of drill holes is confident, chemical drill hole data can be significantly variable, and is not a reflection of inaccurate correlation. Geophysical drill hole data may be correlated with closely spaced drill holes but when spacing is one kilometre as on West Carbon Creek, data can be expected to be variable. Two reliable marker horizons have been established within the section from 1982 drilling and mapping. The 60 metre siltstone unit with pelecypods and gastropods found in the Upper Gething Formation proved useful in postulating coal seam subgroups. The Cadomin Formation traceable by air photos may be used as a marker horizon separating the Gething and Bickford sections but has not been penetrated in drill core. Beds of shell fragments have been recorded in several holes but it is common to have shell fragments, marine or fresh water, in isolated pods (Howard and Reineck, 1981). A correlation therefore is tentative at this time. The property requires closer spaced drilling be performed prior to the establishment of a reliable correlation.

Diamond drill holes WCC 78-2 and WCC 81-7 correlate and the units assigned to the lower Gething Formation. Diamond drill holes WCC 80-3, WCC 80-4 and WCC 80-5 have been correlated and represent the middle Gething Formation. Diamond drill holes WCC 78-1 and WCC 81-6 correlate and represent upper Gething Formation sediments (see Figure 7, map folder). There does not appear to be overlap between the three groups.

CONCLUSIONS AND RECOMMENDATIONS

The objective of the 1982 exploration program was to provide further information on the extent, metallurgical quality and continuity of coal seams on the West Carbon Creek Property. One diamond drill hole totalling 432 metres was spudded in the coal-bearing Gething Formation. Extensive mapping augmented the drilling program to verify stratigraphic relationships and obtain interdrill hole structural data.

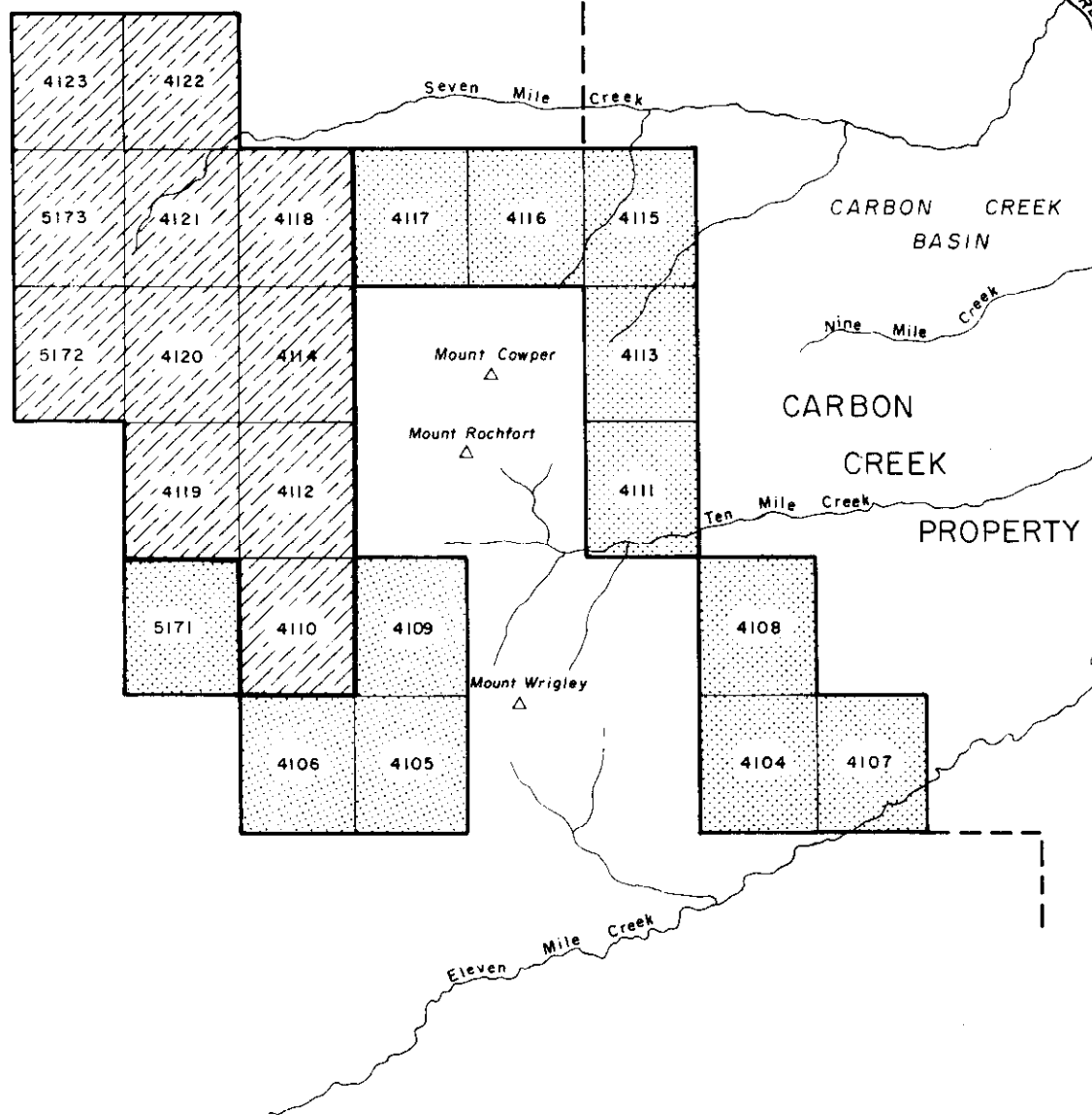
Extensive mapping has outlined an area of flat lying to gently dipping coal measures in the core of a syncline. The area is covered by eleven of the twenty-three coal licences making up the West Carbon Creek Property. Peripheral to this area, sediments are severely folded and faulted. It is recommended that the following licences be relinquished for stratigraphic or structural reasons: 4104 - 4109 inclusive, 4111, 4113, 4114 - 4117, and 5171 (See Fig. 7, page 22).

The second objective of the 1982 mapping program was to verify the stratigraphy, as a result of a discrepancy between interpretations presented by the Geological Survey of Canada and the 1980 Utah Report of Exploration Activities on the West Carbon Creek Property. Extensive mapping reinterpreted the coal bearing strata as a Gething-Bickford section.

Despite apparent weaknesses a tentative correlation of drill hole data is presented. The initial step in correlating the drill holes was to estimate rough stratigraphic positioning from geographic and structural considerations. The limited information available between widely spaced drill holes and structural variability across the property made estimation difficult and unreliable. The 1982 mapping program concentrated on the area of the syncline between drill holes to obtain as much structural information as possible which has aided in the correlation.

To date a total of 1854 metres of diamond drilling from eight holes has been completed in the flat lying core of the syncline. Correlation of the drill hole data shows numerous coal seams greater than 1.0 metres thick throughout the Gething and Bickford section on the West Carbon Creek Property. There is no overlap between the three groupings of drill holes and seams are rarely penetrated twice. In effect, the present drilling pattern has incompletely tested the Gething-Bickford section. Coal seam continuity is unreliable.

It is, therefore, recommended for the 1983 exploration program to conduct infill shallow rotary drilling to aid in correlation as opposed to peripheral drilling to further outline the structurally favourable area.



LEGEND



-  Proposed Coal Licences To Abandon
-  Proposed Coal Licences To Retain

FIGURE — 7

**WEST CARBON CREEK
PROPOSED COAL LICENCES
TO ABANDON AND RETAIN**



Scale — 1:100,000

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APPENDIX I

DESCRIPTIVE LITHOLOGIC DATA

W.C.C. D.D.H. 82-8

WEST CARBON CREEK DIAMOND DRILL HOLE 82-B

ELEVATION : 1712 M.
 COORDINATES: 6200560 N X 508025 E
 DATE SPUNDED: JULY 02, 1982.
 DATE COMPLETED: JULY 15, 1982.
 TOTAL DEPTH: 432 M.

LITHOLOGIC DESCRIPTIONS

THICKNESS (METRES)	DEPTH TO TOP (METRES)	LITHOLOGY	COMMENTS
8.10	0.0	CASING OR SURFACE	OVERBURDEN
3.00	6.10	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BDG 88 TO C/A-BURROWS-SLUMP @ BASE
0.90	9.10	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	VERT FRAC-SLUMP @ BASE-BDG 80 TO C/A
0.19	10.00	MASSIVE DARK GRAY SHALE	RUBBLY
1.54	10.19	COMMON BANDED COAL	57% REC-M. CLT-SAMPLE #1
0.17	11.73	MASSIVE DARK GRAY SHALE	ROOTLETS
1.14	11.90	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BURROWS
2.26	13.04	MASSIVE DARK GRAY SHALE	SHELLS-BIVALVES
0.03	15.30	MASSIVE HARD SANDSTONE	BDG 90 C/A
0.20	15.33	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	MINOR COALY STREAKS
0.62	15.53	MASSIVE DARK GRAY SHALE	SHELLS-MINOR BIVALVES
0.84	16.15	PARTLY CHURNED DARK GRAY SANDY SHALE	SHELLS-VERY MINOR BIVALVES
0.14	16.99	MASSIVE DARK GRAY SHALE	SHELLS-MINOR BIVALVES
4.18	17.13	BURROWED HARD SANDSTONE	MG IN MIDDLE
0.17	21.31	COAL WITH PYRITE STREAKS	P. CLT
0.99	21.48	MASSIVE DARK GRAY SANDY SHALE	COALY STREAKS-FRACTURE @ 20 C/A
0.25	22.47	BURROWED DARK GRAY SANDY SHALE	
0.33	22.72	PARTLY CHURNED DARK GRAY SANDY SHALE	BDG 80 C/A
0.42	23.05	MASSIVE DARK GRAY SHALE	SLICK & BROKEN THROUGHOUT
0.37	23.47	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	FRACTURE @ 25 & 40 C/A
1.59	23.84	BURROWED DARK GRAY SANDY SHALE	FRACTURE @ 20 C/A
0.11	25.43	HARD SANDSTONE WITH SHALE STREAKS	BDG 90 C/A
0.56	25.54	ROOTED GRAY SANDSTONE	
0.21	26.10	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.21	26.31	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	
0.12	26.52	HARD SANDSTONE WITH SHALE STREAKS	BURROWS-BDG 90 C/A
0.37	26.64	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.49	27.01	BURROWED HARD SANDSTONE	
0.33	27.50	ROOTED GRAY SANDSTONE	
0.67	27.83	BURROWED HARD SANDSTONE	BDG 75 C/A
0.36	28.50	HARD SANDSTONE WITH SHALE STREAKS	SLICK-RIPPLED
2.00	28.86	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED & PARALLEL LAM
1.67	30.86	BURROWED HARD SANDSTONE	PYR-FRACTURE ZONE @ 20 C/A
0.08	32.53	DARK GRAY SHALE WITH SANDSTONE STREAKS	BDG @ 86 C/A
0.10	32.61	CROSS-BEDDED HARD SANDSTONE	
0.45	32.71	BURROWED DARK GRAY SANDY SHALE	
0.57	33.16	BURROWED HARD SANDSTONE	
0.71	33.73	DARK GRAY SHALE WITH SANDSTONE STREAKS	SANDY @ BASE
0.11	34.44	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED
0.41	34.55	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.67	34.96	DARK GRAY SHALE WITH SANDSTONE STREAKS	WITH ROOTS
0.25	35.63	HARD SANDSTONE WITH SHALE STREAKS	MINOR BURROWS
0.56	35.88	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED @ TOP-FLAT @ BASE
0.17	36.44	MASSIVE DARK GRAY SANDY SHALE	RARE COAL STREAK
0.75	36.61	COMMON BANDED COAL	68% REC-M. CLT-SAMPLE #2
0.36	37.36	DARK GRAY SHALE WITH SANDSTONE STREAKS	COAL STREAKS
0.40	17.72	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	MINOR BURROWS
0.45	38.12	SANDY SHALE MUDFLOW	MINOR SLICK @ 88 C/A
0.50	38.57	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PARALLEL LAM-SLICK @ 88 C/A
2.32	39.07	CROSS-BEDDED HARD SANDSTONE	M.G-FINING UPWARDS-OTZ RICH
0.37	41.39	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS @ TOP
0.57	41.76	CROSS-BEDDED HARD SANDSTONE	
1.26	42.33	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BURROWS-RARE SLICK
0.11	43.59	MASSIVE HARD SANDSTONE	PYR ON SLICK
0.87	43.70	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	ABUN SLICK-BDG @ 80 C/A-BURROWS
1.58	44.57	BLACK SHALE WITH COAL STREAKS	PYR ON SLICK
0.13	46.15	MASSIVE DARK GRAY SHALE	
0.57	46.28	SANDY SHALE MUDFLOW	MINOR BURROWS
0.18	46.85	CROSS-BEDDED HARD SANDSTONE	
0.33	47.03	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	
0.30	47.36	SANDSTONE MUDFLOW	BURROWS
0.28	47.66	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-BURROWS-BDG 90 C/A
0.43	47.94	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BURROWS
0.19	48.37	HARD SANDSTONE WITH SHALE STREAKS	
0.44	48.56	BURROWED DARK GRAY SANDY SHALE	RARE ROOTS
0.58	49.00	DARK GRAY SHALE WITH COAL STREAKS	
0.82	49.58	BURROWED DARK GRAY SANDY SHALE	
1.23	50.40	BURROWED HARD SANDSTONE	RARE COAL STREAKS
0.26	51.63	MASSIVE HARD SANDSTONE	BDG 84 @ C/A-FRAC @ 15 C/A
1.29	51.89	BURROWED HARD SANDSTONE	FRAC @ 05 C/A
0.12	53.18	COAL WITH PYRITE STREAKS	COARSENING UPWARD-SILTY @ BASE
0.58	53.30	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	100% REC-P. CLT
0.27	53.88	SANDY SHALE MUDFLOW	FLAT-COAL STREAKS NEAR TOP-BURROWS
0.78	54.15	CROSS-BEDDED HARD SANDSTONE	BURROWS-SLICK @ 78 C/A
2.02	54.93	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RAKE SILT INTROS
3.37	56.95	BLACK SHALE WITH SANDSTONE STREAKS	FLAT-BURROWS
0.72	60.32	CROSS-BEDDED HARD SANDSTONE	SST INTROS NEAR BASE-BDG 85 C/A
0.14	61.04	MASSIVE HARD SANDSTONE	MG SST-BIO @ MID
0.21	61.18	BURROWED HARD SANDSTONE	
0.11	61.39	BURROWED HARD SANDSTONE	
0.51	61.50	BURROWED DARK GRAY SANDY SHALE	BIVALVE SHELLS & FRAGMENTS
0.17	62.01	SANDY SHALE MUDFLOW	
0.69	62.18	BURROWED DARK GRAY SANDY SHALE	
2.19	62.87	DARK GRAY SHALE WITH SANDSTONE STREAKS	BIVALVE SHELLS & FRAGS-SANDY @ BASE
0.39	65.06	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	MINOR THIN SST INTERBEDS-BDG 80 C/A
0.31	65.45	DARK GRAY SHALE WITH SANDSTONE STREAKS	SST MG-BURROWS
0.34	65.76	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	MINOR BURROWING
0.33	66.10	CROSS-BEDDED HARD SANDSTONE	MINOR BURROWING-SHARP LOWER CONTACT
4.43	66.43	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	CALC & PYR ON FRACTURE @ 5 C/A
0.93	70.86	DARK GRAY SHALE WITH SANDSTONE STREAKS	SST-MG-BURROWS-RARE PYR @ BASE
			BURROWS-BDG 86 C/A

2.19	71.79	DARK GRAY SHALE WITH SANDSTONE STREAKS	SHELLS-GASTROPODS
0.09	73.98	CROSS-BEDDED HARD SANDSTONE	FG
2.74	74.07	DARK GRAY SHALE WITH SANDSTONE STREAKS	SHARP LOWER CONTACT
1.52	76.81	SANDY SHALE MUDFLOW	MINOR BURROWS
1.91	76.33	DARK GRAY SHALE WITH SANDSTONE STREAKS	SLUMP @ TOP-BIVALVES-SLICK @ 80 C/A
0.76	80.24	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED
1.88	81.00	BURROWED DARK GRAY SANDY SHALE	BURROWS
2.67	82.88	MASSIVE DARK GRAY SANDY SHALE	RARE COAL STREAKS
0.44	85.55	DARK GRAY SHALE WITH SANDSTONE STREAKS	RARE WORM BURROWS
0.30	85.99	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-BDG 85 C/A
0.31	86.29	BURROWED HARD SANDSTONE	
0.44	86.60	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BURROWS
0.18	87.04	BURROWED DARK GRAY SANDY SHALE	LARGE SLT CLAST
0.26	87.22	CROSS-BEDDED HARD SANDSTONE	SLT INTRO WITH SLICK @ 76 C/A
0.12	87.48	BURROWED DARK GRAY SANDY SHALE	SLUMP @ BASE
0.12	87.60	CROSS-BEDDED HARD SANDSTONE	
0.38	87.72	BURROWED DARK GRAY SANDY SHALE	SLUMP @ BASE
0.69	88.10	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BURROWS
0.13	88.79	MASSIVE HARD SANDSTONE	
2.90	88.94	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BURROWS-BDG @ 85
0.10	91.84	MASSIVE HARD SANDSTONE	
1.06	91.94	DARK GRAY SHALE WITH SANDSTONE STREAKS	BDG @ 90 C/A
0.70	93.00	MASSIVE DARK GRAY SANDY SHALE	SANDY @ TOP
0.35	93.70	COAL	17% REC-GROUND
0.18	94.05	MASSIVE DARK GRAY SHALE	IRON STONE SAND-COAL STREAKS @ BASE
0.35	94.23	PARTLY CHURNED DARK GRAY SHALE	FINING UPWARDS
1.36	94.58	PARTLY CHURNED DARK GRAY SANDY SHALE	CALCITE VEINLET
0.64	95.94	CHURNED HARD SANDSTONE	
0.30	96.58	HARD SANDSTONE WITH SHALE STREAKS	
0.37	96.88	SANDSTONE MUDFLOW	
0.37	97.25	HARD SANDSTONE WITH SHALE STREAKS	
0.49	97.62	CHURNED HARD SANDSTONE	
0.39	98.11	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.37	98.50	MASSIVE DARK GRAY SANDY SHALE	COAL STREAKS
0.84	98.87	BURROWED HARD SANDSTONE	
0.96	99.71	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-BDG 96 C/A-SLICK
0.96	100.67	DARK GRAY SHALE WITH SANDSTONE STREAKS	COAL STREAKS
1.93	101.63	CROSS-BEDDED HARD SANDSTONE	
0.63	103.46	CHURNED HARD SANDSTONE	AROUND COAL STREAKS
0.48	104.09	BURROWED HARD SANDSTONE	
0.68	104.57	BURROWED DARK GRAY SANDY SHALE	
0.25	105.25	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.90	105.50	BLACK SHALE WITH COAL STREAKS	
0.21	106.40	BURROWED HARD SANDSTONE	PYRITE
0.56	106.61	MASSIVE DARK GRAY SHALE	AROUND COAL STREAKS
1.50	107.17	SANDY SHALE MUDFLOW	SLICKS @ 87 C/A
2.45	108.67	CHURNED HARD SANDSTONE	BURROWS
0.72	111.12	PARTLY CHURNED DARK GRAY SANDY SHALE	PYRITE LENS 3 CM LONG
1.08	111.84	MASSIVE DARK GRAY SANDY SHALE	MINOR SHELLS-PELECYFOS
0.63	112.92	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	SHELLS-PELECYFOS-REPLACED BY FYR
0.64	113.55	DARK GRAY SHALE WITH SANDSTONE STREAKS	BURROWS-BDG 85 C/A
0.29	114.19	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	CALCITE VEIN NET WORK
0.12	114.48	HARD SANDSTONE WITH SHALE STREAKS	CAIC ON SLICK
0.77	114.60	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.19	115.37	DARK GRAY SHALE WITH COAL STREAKS	SHELLS-PELECYFOS-MINOR GASTROPODS
0.35	115.56	BURROWED HARD SANDSTONE	
0.78	115.91	BURROWED DARK GRAY SANDY SHALE	BDG 85 C/A-COALY STREAKS
0.13	116.69	SANDSTONE MUDFLOW	
0.44	116.82	PARTLY CHURNED DARK GRAY SANDY SHALE	COALY STREAKS
0.16	117.26	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-BURROWS-BDG 88 C/A
0.56	117.42	BURROWED DARK GRAY SANDY SHALE	
0.24	117.98	BLACK SHALE WITH SANDSTONE STREAKS	
0.29	118.22	BURROWED DARK GRAY SANDY SHALE	
0.49	118.51	BURROWED HARD SANDSTONE	SST VFG-INDURATED
0.58	119.00	CROSS-BEDDED HARD SANDSTONE	
0.12	119.58	BURROWED DARK GRAY SANDY SHALE	
0.30	119.70	CROSS-BEDDED HARD SANDSTONE	
0.45	120.00	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BDG 86 C/A
0.38	120.45	CHURNED HARD SANDSTONE	INTERS 5 TO 7 CM THICK
1.25	120.83	MASSIVE DARK GRAY SHALE	
0.70	122.08	COMMON BANDED COAL	PELECYFOS-COALY STREAKS @ BASE
0.16	122.78	DARK GRAY SHALE WITH COAL STREAKS	29% REC-P.CLT-DIRTY-SAMPLE #3
0.19	122.94	MASSIVE BLACK SANDY SHALE	MUDDY TO BASE
0.92	123.13	DARK GRAY SHALE WITH SANDSTONE STREAKS	MINOR COALY STREAKS
0.55	124.05	MASSIVE DARK GRAY SANDY SHALE	SHELLS-PELECYFOS-FYR-BURROWS
0.82	124.60	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	MINOR SHELLS-PELECYFOS
0.36	125.42	MASSIVE BLACK SANDY SHALE	RIPPLED-BURROWS-VERTICLE FRACTURE
1.58	125.78	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	MUDDY IN CENTRE-COALY STREAKS
0.19	127.36	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-FREDDOM SAND-BURROWS
0.94	127.55	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED
0.33	128.49	MASSIVE BLACK SANDY SHALE	RIPPLED-FREDDOM SLT-BURROWS
3.87	128.82	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	SANDY STREAKS NEAR TOP
0.87	132.69	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-BDG @ 80-CALC ON SLICK @ 77
0.65	133.56	DARK GRAY SHALE WITH SANDSTONE STREAKS	RIPPLED-SCM CALC VEIN @ 84
1.51	134.21	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	MUDDY TOWARDS BASE-SLICK @ 81 TO C/A
0.25	135.72	DARK GRAY SHALE WITH COAL STREAKS	RIPPLED-BURROWS
0.12	135.97	HARD SANDSTONE WITH SHALE STREAKS	7CM COAL BAND-PYR ON CLEAT
1.43	136.09	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-MINOR BURROWS
0.25	137.52	MASSIVE DARK GRAY SANDY SHALE	RIPPLED-FREDDOM SLT-BURROWS
0.55	137.77	BLACK SHALE WITH COAL STREAKS	
0.75	138.32	COMMON BANDED COAL	DISSEM FYR-SILTY MST IN CENTRE
0.22	139.07	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	88% REC-P.CLT-FYR MOD-SAMPLE #4
0.13	139.29	DARK GRAY SHALE WITH COAL STREAKS	RIPPLED-INCR SST TO BASE
0.25	139.42	COAL WITH SHALE LAYERS	
0.78	139.67	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.17	140.45	BLACK SHALE WITH COAL STREAKS	5CM MST SPLIT
0.97	140.62	MASSIVE DARK GRAY SANDY SHALE	FREDDOM SLT-ROOTED
3.07	141.59	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	SLICK @ 80 TO C/A
0.83	144.66	MASSIVE DARK GRAY SANDY SHALE	FRACTURE @ 7 & 10 TO C/A
1.44	145.49	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-MUDFLOW-BURROWS-BDG @ 78
0.42	146.93	SANDY SHALE MUDFLOW	MINOR SST LENSES
0.64	147.35	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-FREDDOM SLT-BURROWS-BDG @ 80
1.56	147.99	DARK GRAY SHALE WITH SANDSTONE STREAKS	BURROWS-FRACTURE @ 22 TO C/A
0.15	149.55	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-BURROWS-ROOTLETS-SLT @ BASE
0.70	149.70	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BURROWS NEAR BASE
0.38	150.40	MASSIVE DARK GRAY SANDY SHALE	RIPPLED-MINOR BURROWS
			RIPPLED-FREDDOM SLT-SST BDG 1 TO 7CM

0.30	150.78	SANDY SHALE MUDFLOW	
0.53	151.08	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-MINOR BURROWS
0.12	151.61	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SILT-BDG @ 80-BURROWS
0.29	151.73	SANDY SHALE MUDFLOW	PYR ON FRACTURE
0.14	152.02	MASSIVE DARK GRAY SANDY SHALE	CALC ON SLICK
1.83	152.16	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-BDG @ 82-PRED SILT
0.21	153.79	MASSIVE DARK GRAY SANDY SHALE	MINOR COALY STREAKS
0.21	154.00	MASSIVE BLACK SHALE	MINOR COALY SPARS
0.40	154.21	DARK GRAY SHALE WITH COAL STREAKS	
0.32	154.61	BLACK SHALE WITH COAL STREAKS	PYR NODS & BAND
0.46	154.93	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SILT
1.08	155.39	MASSIVE DARK GRAY SANDY SHALE	COALY STREAKS @ BASE-FRAC @ 17
0.38	156.47	COAL WITH SHALE STREAKS	SAMPLE #5-4CM SST SPLIT
4.40	156.85	CHURNED DARK GRAY SANDY SHALE	FRED SILT-FRACTURE @ 28 TO C/A
0.70	161.25	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-PRED SILT-BDG @ 81
0.47	161.95	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED
1.26	162.42	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SST-BURROWS-BDG @ 86
0.39	163.68	BURROWED DARK GRAY SANDY SHALE	PRED SILT-FRACTURE @ 33 TO C/A
0.60	164.07	CROSS-BEDDED HARD SANDSTONE	RIPPLED-BURROWS-VERTICAL FRACTURE
0.59	164.67	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SST-PYR ON SLICK
14.22	165.26	CROSS-BEDDED HARD SANDSTONE	MG TO CG-S&P-PEBBLE BANDS
0.76	179.48	BLACK INTERBEDDED SANDSTONE AND SHALE	RIPPLED-PRED MST-PYR DISSEM
2.71	180.24	BLACK INTERBEDDED SANDSTONE AND SHALE	RIPPLED-PRED SILT-BURROWS-BDG @ 82
0.60	182.95	COMMON BANDED COAL	W.CLT
0.10	183.55	MASSIVE IRONSTONE	ABUND PYR
0.10	183.65	DARK GRAY SHALE WITH COAL STREAKS	MINOR SLICK
2.04	183.75	SANDY SHALE MUDFLOW	PRED SILT-COALY STREAKS
0.22	185.79	MASSIVE DARK GRAY SHALE	COALY STREAKS NEAR UPPER CONTACT
0.07	186.01	DARK GRAY SHALE WITH SANDSTONE STREAKS	BURROWS-MINOR SST STREAKS
1.15	186.08	BURROWED DARK GRAY SANDY SHALE	RIPPLED-BDG @ 87 TO C/A
0.70	187.23	DARK GRAY SHALE WITH SANDSTONE STREAKS	BURROWS
0.40	187.93	COMMON BANDED COAL	13% REC
0.10	188.33	MASSIVE DARK GRAY SHALE	COALY STREAKS
0.44	188.43	DARK GRAY SHALE WITH SANDSTONE STREAKS	PRED SILT-BDG @ 79 TO C/A
0.84	188.87	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.25	189.71	MASSIVE BLACK SHALE	MINOR COALY STREAKS
0.57	189.94	MASSIVE DARK GRAY SANDY SHALE	FRACTURE @ 24 TO C/A
0.70	190.53	SANDY SHALE MUDFLOW	BURROWS-ROOTLETS
0.13	191.23	DARK GRAY SHALE WITH COAL STREAKS	SLICK THROUGHOUT
1.34	191.36	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.67	192.70	MASSIVE DARK GRAY SANDY SHALE	FE STONE NODS-SLIGHTLY MUDDY IN MID
1.26	193.37	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SILT-BURROWS-BDG @ 87
0.22	194.63	MASSIVE BLACK SHALE	
0.27	194.85	COAL WITH SHALE STREAKS	74% REC-P. CLT-DIRTY
0.10	195.12	BLACK FIRECLAY	SLICK
2.49	195.22	DARK GRAY SANDY FIRECLAY	COALY STREAKS-BURROWS
1.36	197.71	SANDY SHALE MUDFLOW	BURROWS-CALC IN VEINLETS & ON SLICK
1.50	199.07	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SILT-BURROWS-BDG @ 87
0.51	200.57	MASSIVE DARK GRAY SANDY SHALE	SANDY STREAKS NEAR TOP-PELECYPODS
0.19	201.08	MASSIVE BLACK SHALE	SHELLS-PELECYPODS
1.35	201.27	MASSIVE BLACK SANDY SHALE	
0.10	202.62	MASSIVE BLACK SHALE	
0.93	202.72	MASSIVE DARK GRAY SANDY SHALE	COALY STREAKS-FE STONE NODS
0.53	203.45	GRAY SANDSTONE WITH COAL BANDS	AROUND COALY STREAKS-ROOTED-BURROWED
0.40	204.18	COMMON BANDED COAL	15% REC-W.CLT
0.05	204.58	BLACK SHALE WITH COAL STREAKS	CALC ON SLICK
1.40	204.63	PARTLY CHURNED DARK GRAY SANDY SHALE	BIOTURBATED MUDFLOW-PELECYPODS
0.26	206.03	BLACK SHALE WITH COAL STREAKS	COAL BAND UP TO 1 CM-CALC STRINGERS
0.80	206.29	COMMON BANDED COAL	96% REC-M.CLT-5 & 7CM MUD SPLIT-S #6
0.59	207.09	DARK GRAY SHALE WITH COAL STREAKS	COAL BANDS
0.04	207.68	COMMON BANDED COAL	SHEARED
0.06	207.72	MASSIVE DARK GRAY SHALE	CALC ON COALY STREAKS
0.73	207.78	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SILT-SLICK
0.60	208.51	COMMON BANDED COAL	100% REC-P.CLT-SAMPLE #7
0.34	209.11	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.77	209.45	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLE-BURROW-FRACTURE @ 3-BDG @ 85
0.14	210.22	SANDSTONE MUDFLOW	RIPPLED
2.74	210.36	BURROWED DARK GRAY SANDY SHALE	VERTICAL FRACTURE-PRED SST
0.19	213.10	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-BDG 90 TO C/A
0.14	213.29	SANDY SHALE MUDFLOW	CALCITE ON FRACTURE
0.50	213.43	MASSIVE DARK GRAY SANDY SHALE	PYRITE REPLACEMENT ON CARB DEBRIS
0.20	213.93	SANDY SHALE MUDFLOW	
0.59	214.13	SANDSTONE MUDFLOW	SLICK
1.06	214.72	HARD SANDSTONE WITH SHALE STREAKS	CALCITE ON FRACTURE
0.43	215.78	BURROWED DARK GRAY SANDY SHALE	
0.29	216.21	HARD SANDSTONE WITH SHALE STREAKS	MINOR COALY STREAKS
1.24	216.50	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	FRED SILT-BURROWS-BDG @ 84 C/A
0.37	217.74	PARTLY CHURNED DARK GRAY SANDY SHALE	
1.55	218.11	COMMON BANDED COAL	35% REC-SAMP #8-GROUND-3CM MST-P.CLT
0.34	219.64	CROSS-BEDDED HARD SANDSTONE	
1.33	220.00	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BDG @ 90-FAULT OFFSET 0.3CM
0.72	221.33	BLACK SHALE WITH COAL STREAKS	SLICK @ 75
0.37	222.05	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-BDG @ 85-MINOR SLICKS
1.38	222.42	HARD SANDSTONE WITH SHALE STREAKS	F-M-G-SLICKS-BDG @ 88
0.43	223.80	PARTLY CHURNED DARK GRAY SANDY SHALE	COALY STREAKS @ TOP
0.67	224.23	BURROWED DARK GRAY SANDY SHALE	PRED SILT
1.38	224.90	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.10	226.28	COMMON BANDED COAL	100% REC-M.CLT
0.20	226.38	DARK GRAY SHALE WITH COAL STREAKS	PYRITE REPLACEMENT
0.59	226.58	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-BURROWS
1.05	227.17	MASSIVE DARK GRAY SHALE	3CM SST INTBD
0.14	228.22	BLACK SHALE WITH COAL STREAKS	
0.64	228.36	DARK GRAY SHALE WITH COAL STREAKS	
0.75	229.00	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-BDG 88-RIPPLED-BURROWS
0.56	229.75	BURROWED DARK GRAY SANDY SHALE	
0.26	230.31	MASSIVE DARK GRAY SHALE	
0.55	230.57	COMMON BANDED COAL	
0.21	231.12	PARTLY CHURNED DARK GRAY SANDY SHALE	13% REC-P.CLT-SAMPLE #9
3.26	231.33	HARD SANDSTONE WITH SHALE STREAKS	COALY STREAKS-RANDOM CALC VEINLETS
0.92	234.59	BURROWED DARK GRAY SANDY SHALE	RIPPLED-BURROWS-BDG @ 88
0.46	235.51	COMMON BANDED COAL	PRED SILT-BURROWS
0.76	235.97	BURROWED DARK GRAY SANDY SHALE	76% REC-P.CLT-DIRTY @ BASE-SAMP #10
0.38	236.73	MASSIVE HARD SANDSTONE	PRED SST-CALC ON FRACTURE @ 75
0.36	237.11	BURROWED DARK GRAY SANDY SHALE	CALC FRACTURE @ 63
0.33	237.47	CROSS-BEDDED HARD SANDSTONE	CALC FRACTURE @ 60
0.35	237.60	BURROWED HARD SANDSTONE	
1.20	238.15	BURROWED DARK GRAY SANDY SHALE	CALC FRACTURE @ 10
			PRED SILT-SANDY INTBDS

0.54	239.35	DARK GRAY SANDY SHALE WITH FOSSIL SHELLS	CHURNED SHALE WITH SANDY STREAKS
1.14	239.89	DARK GRAY SHALE WITH FOSSIL SHELLS	
0.15	241.03	PARTLY CHURNED DARK GRAY SANDY SHALE	COALY STREAKS @ BASE
0.71	241.18	BURROWED HARD SANDSTONE	
0.19	241.89	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BDG @ 90-FLAT & RIPPLED
1.22	242.08	DARK GRAY SHALE WITH SANDSTONE STREAKS	PRED SST
1.61	243.30	MASSIVE DARK GRAY SHALE	RARE COALY STREAKS
0.68	244.91	HARD SANDSTONE WITH SHALE STREAKS	
0.21	245.59	CROSS-BEDDED HARD SANDSTONE	
0.63	245.80	DARK GRAY SHALE WITH SANDSTONE STREAKS	
1.46	246.43	BURROWED DARK GRAY SANDY SHALE	SHELL FRAGMENTS
0.52	247.89	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SLT-VERT FRAC-BURROWS-BDG 89
0.27	248.41	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.20	248.68	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-BDG @ 86 C/A
1.10	248.88	COMMON BANDED COAL	68% REC-P.CLT-SAMPLE #11-20CM SPLIT
0.63	249.98	BURROWED DARK GRAY SANDY SHALE	ABUND COAL STREAKS
0.71	250.61	DARK GRAY SHALE WITH COAL STREAKS	
2.18	251.32	BURROWED DARK GRAY SANDY SHALE	
0.50	253.50	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SLT
0.36	254.00	MASSIVE DARK GRAY SHALE	
0.30	254.36	COMMON BANDED COAL	13% REC-P.CLT
0.29	254.66	BURROWED DARK GRAY SANDY SHALE	FRACTURE @ 15
0.37	254.95	DARK GRAY SHALE WITH COAL STREAKS	
0.68	255.32	BURROWED DARK GRAY SANDY SHALE	
0.27	256.00	MASSIVE DARK GRAY SHALE	RARE PELECYPODS
0.40	256.27	COMMON BANDED COAL	40% REC-P.CLT-SAMPLE #12
3.23	256.87	BURROWED DARK GRAY SANDY SHALE	PRED SST-F-MG
0.06	259.90	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.60	259.96	COMMON BANDED COAL	67% REC-P.CLT-SAMPLE #13
0.34	260.56	DARK GRAY SHALE WITH SANDSTONE STREAKS	CALCITE VEINLETS THROUGHOUT
0.35	260.90	COMMON BANDED COAL	46% REC-P.CLT
0.21	261.25	DARK GRAY SHALE WITH COAL STREAKS	
1.32	261.46	DARK GRAY SHALE WITH SANDSTONE STREAKS	RARE COAL STREAKS
0.70	262.78	DARK GRAY SHALE WITH COAL STREAKS	
0.17	263.48	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-RIPPLED-BDG @ 86
0.45	263.65	MASSIVE DARK GRAY SANDY SHALE	COAL STREAKS ABUND
0.45	264.10	COMMON BANDED COAL	67% REC-P.CLT-SAMPLE #14
0.43	264.35	DARK GRAY SHALE WITH COAL STREAKS	
0.40	264.98	COMMON BANDED COAL	50% REC-M.CLT
0.10	265.38	DARK GRAY SHALE WITH COAL STREAKS	MINOR SANDY STREAKS
0.36	265.48	MASSIVE DARK GRAY SHALE	BDG @ 90
0.18	265.84	CHURNED HARD SANDSTONE	
0.32	266.02	MASSIVE DARK GRAY SHALE	MINOR COAL STREAKS
0.73	266.34	BURROWED HARD SANDSTONE	PYRITE REPLACEMENT
0.24	267.07	DARK GRAY SHALE WITH SANDSTONE STREAKS	
1.25	267.31	HARD SANDSTONE WITH SHALE STREAKS	CALC FRACTURE @ 10
0.50	268.56	SANDSTONE MUDFLOW	C-G SST W/SLT-CALC FRACTURES @ 85
0.27	269.06	BURROWED HARD SANDSTONE	
0.53	269.33	MASSIVE DARK GRAY SANDY SHALE	
0.74	269.86	CROSS-BEDDED HARD SANDSTONE	
2.19	270.60	DARK GRAY SHALE WITH SANDSTONE STREAKS	2CM MG SST INTBD
0.90	272.79	BURROWED HARD SANDSTONE	
0.36	273.67	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.38	274.05	MASSIVE DARK GRAY SHALE	
0.61	274.43	COMMON BANDED COAL	100% REC-P.CLT-DIRTY-SAMPLE #15
0.76	275.04	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SLT-BDG @ 89
0.16	275.80	SANDY SHALE MUDFLOW	
1.20	275.96	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-FLAT-BURROWS
1.31	277.16	BURROWED DARK GRAY SANDY SHALE	PRED SLT-SLICK
0.33	278.47	BURROWED HARD SANDSTONE	
0.44	278.80	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.67	279.24	BURROWED HARD SANDSTONE	MINOR FLAT INTBDS-BDG @ 87
1.40	279.91	MASSIVE DARK GRAY SANDY SHALE	RARE SANDY STREAKS-BIVALVES W/PYR
0.41	281.31	MASSIVE DARK GRAY SHALE	PYRITE
0.30	281.72	COMMON BANDED COAL	90% REC-P.CLT-SAMPLE #16
0.96	282.02	BURROWED DARK GRAY SANDY SHALE	
0.51	282.98	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.55	283.49	COMMON BANDED COAL	71% REC-P.CLT-SAMPLE #17
0.22	284.04	DARK GRAY SHALE WITH SANDSTONE STREAKS	RARE COAL STREAKS
0.20	284.26	MASSIVE DARK GRAY SANDY SHALE	
0.91	284.46	DARK GRAY SHALE WITH COAL STREAKS	
0.43	285.37	BURROWED DARK GRAY SANDY SHALE	
0.36	285.80	CROSS-BEDDED HARD SANDSTONE	BDG @ 90
0.28	286.16	SANDY SHALE MUDFLOW	
0.81	286.44	HARD SANDSTONE WITH SHALE STREAKS	
0.34	287.25	GRAY SANDSTONE WITH COAL SPARS	SLUMP OF MASSIVE SST
0.41	287.59	HARD SANDSTONE WITH SHALE STREAKS	COAL STREAKS
0.25	288.00	GRAY SHALE CONGLOMERATE	RARE COAL SPARS
0.21	288.25	SANDSTONE MUDFLOW	SLICK @ 74-MOST RIP UP CLASTS
3.09	288.46	CROSS-BEDDED HARD SANDSTONE	COAL STREAKS
0.63	291.55	GRAY SANDSTONE WITH COAL SPARS	WELL ROUNDED TO ANGULAR RIP UPS
0.09	292.18	GRAY SHALE AND IRONSTONE CONGLOMERATE	RARE MST CLASTS
1.46	292.27	MASSIVE HARD SANDSTONE	ANGULAR DARK ROUNDED CLASTS @ BASE
0.14	293.73	GRAY SHALE CONGLOMERATE	BDG @ 90
0.13	293.87	MASSIVE HARD SANDSTONE	
0.74	294.00	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.66	294.74	BLACK SHALE WITH SANDSTONE STREAKS	
0.40	295.40	COMMON BANDED COAL	30% REC-P.CLT-SAMPLE #18
0.30	295.80	MASSIVE DARK GRAY SHALE	SPLIT-SAMPLE #19
0.50	296.10	COMMON BANDED COAL	40% REC-SAMPLE #20
0.50	296.60	BLACK INTERBEDDED SANDSTONE AND SHALE	BURROWS
0.30	297.10	COMMON BANDED COAL	40% REC-SAMPLE #21-P.CLT
0.15	297.40	DARK GRAY SHALE WITH COAL STREAKS	
0.35	297.55	COMMON BANDED COAL	80% REC-P.CLT-SAMPLE #22
0.33	297.90	DARK GRAY SHALE WITH COAL STREAKS	
0.13	298.23	MASSIVE DARK GRAY SHALE	BDG @ 90
0.56	298.36	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SLT @ TOP-SST @ BASE-BURROWS
1.05	298.92	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.08	299.97	COMMON BANDED COAL	100% REC-P.CLT-DULL
0.30	300.05	MASSIVE DARK GRAY SANDY SHALE	ABUND COAL STREAKS
1.51	300.35	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.54	301.86	MASSIVE DARK GRAY SANDY SHALE	
3.30	302.40	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BDG @ 90-C-G SST LENSES
3.60	305.70	MASSIVE HARD SANDSTONE	C-G-SST-FLOATING PEBBLES-FRACT @ 10
0.44	309.30	COMMON BANDED COAL	84% REC-P.CLT-SAMPLE #23

1.37	309.74	DARK GRAY SHALE WITH SANDSTONE STREAKS	COAL STREAKS @ TOP
0.31	311.11	MASSIVE HARD SANDSTONE	
1.58	311.42	BURROWED DARK GRAY SANDY SHALE	
7.00	313.00	MASSIVE HARD SANDSTONE	CALC ON FRACTURE @ 05
1.67	320.00	BURROWED HARD SANDSTONE	
0.20	321.67	MASSIVE DARK GRAY SANDY SHALE	COAL STREAKS
0.48	321.87	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.42	322.35	MASSIVE DARK GRAY SANDY SHALE	
1.10	322.77	BURROWED HARD SANDSTONE	BDG @ 90
1.35	323.87	CHURNED DARK GRAY SANDY SHALE	
0.29	325.22	BURROWED DARK GRAY SANDY SHALE	
0.91	325.51	CHURNED DARK GRAY SANDY SHALE	BURROWS
0.37	326.42	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-BURROWS-BDG @ 90
1.09	326.79	BURROWED DARK GRAY SANDY SHALE	
0.60	327.88	COMMON BANDED COAL	95% REC-P.CLT-30CM SPLIT-SAMPLE #24
0.24	328.48	DARK GRAY SHALE WITH COAL STREAKS	SILTY @ BASE
0.91	328.72	HARD SANDSTONE WITH SHALE STREAKS	
0.59	329.63	MASSIVE DARK GRAY SANDY SHALE	
0.26	330.22	DARK GRAY SHALE WITH COAL STREAKS	SLICKS @ 85 TO 90
0.57	330.48	PARTLY CHURNED LIGHT SANDY SHALE	
1.66	331.05	MASSIVE LIGHT SANDY SHALE	RARE BURROWS
1.01	332.71	CROSS-BEDDED HARD SANDSTONE	RARE BURROWS NEAR TOP
0.26	333.72	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SLT-FLAT-BDG @ 90
0.58	333.98	CROSS-BEDDED HARD SANDSTONE	
0.70	334.56	DARK GRAY SHALE WITH SANDSTONE STREAKS	SANDY @ BASE
0.62	335.26	CROSS-BEDDED HARD SANDSTONE	
0.47	335.88	MASSIVE HARD SANDSTONE	CALC ON SLICK @ 80
0.31	336.35	HARD SANDSTONE WITH SHALE STREAKS	SLT RIP UP CLASTS
1.81	336.66	CROSS-BEDDED HARD SANDSTONE	ABUND SLICK WITH CALC @ 45 TO 60
0.16	338.47	HARD SANDSTONE WITH COAL SPARS	QTZ PEBBLE # 2 MDST CLASTS
0.17	338.63	CHURNED HARD SANDSTONE	RARE COAL CHIPS
1.13	338.80	PARTLY CHURNED LIGHT SANDY SHALE	ABUND FRAC WITH CALC
0.12	339.93	MASSIVE DARK GRAY SHALE	
0.15	340.05	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.12	340.20	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	
0.39	340.32	CROSS-BEDDED HARD SANDSTONE	
0.36	340.71	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	FRED SLT-RARE BURROWS
0.20	341.07	COMMON BANDED COAL	40% REC-P.CLT
0.34	341.27	DARK GRAY SHALE WITH COAL STREAKS	
0.40	341.61	COMMON BANDED COAL	53% REC-P.CLT-SAMP# 25
0.64	342.01	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.36	342.65	BURROWED DARK GRAY SANDY SHALE	
0.37	343.01	HARD SANDSTONE WITH SHALE STREAKS	
0.34	343.38	BURROWED DARK GRAY SANDY SHALE	
0.42	343.72	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	FRED SLT-BDG @ 90
0.30	344.14	BURROWED HARD SANDSTONE	
0.37	344.44	DARK GRAY SHALE WITH SANDSTONE STREAKS	
1.36	344.81	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-BURROWS
0.52	346.17	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.16	346.69	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.22	346.85	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	
0.60	347.07	BLACK SHALE WITH SANDSTONE STREAKS	
0.33	347.67	BURROWED HARD SANDSTONE	
0.22	349.00	BURROWED DARK GRAY SANDY SHALE	
0.40	348.22	COMMON BANDED COAL	55% REC-P.CLT-30CM MDST-SAMP#26
0.29	348.62	DARK GRAY SHALE WITH COAL STREAKS	COAL STREAKS
0.35	348.91	COMMON BANDED COAL	43% REC-P.CLT
0.21	349.26	DARK GRAY SHALE WITH COAL STREAKS	ABUND CALC FRAC
0.25	349.47	COMMON BANDED COAL	100% REC-P.CLT-SHEARED-SAMP#27
0.63	349.72	MASSIVE DARK GRAY SANDY SHALE	
0.30	350.35	CROSS-BEDDED HARD SANDSTONE	
0.45	350.65	MASSIVE BLACK SANDY SHALE	
0.48	351.10	BURROWED HARD SANDSTONE	
0.07	351.58	MASSIVE BLACK SANDY SHALE	
1.12	351.65	CHURNED HARD SANDSTONE	
0.27	352.77	CROSS-BEDDED HARD SANDSTONE	BDG @ 87
0.50	353.04	DARK GRAY SHALE WITH COAL STREAKS	
0.30	353.54	COMMON BANDED COAL	43% REC-P.CLT
0.50	353.84	DARK GRAY SHALE WITH COAL STREAKS	8CM SST & 5CM FE STONE INTBD
0.30	354.44	COMMON BANDED COAL	66% REC-P.CLT-SAMP#28
0.66	354.94	DARK GRAY SHALE WITH COAL STREAKS	
0.33	355.24	CROSS-BEDDED HARD SANDSTONE	
0.81	355.90	DARK GRAY SHALE WITH COAL STREAKS	
0.71	356.23	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-MINOR SLUMPS
1.21	357.04	MASSIVE BLACK SANDY SHALE	
0.45	357.75	HARD SANDSTONE WITH SHALE STREAKS	BURROWS-ROOTLETS
0.52	358.94	COMMON BANDED COAL	71% REC-P.CLT-MUDDY @ TOP-SAMP#29
0.82	359.41	DARK GRAY SHALE WITH COAL STREAKS	
1.15	359.93	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	FRED SLT-SST INTD 2 TO 4CM
0.90	360.75	CHURNED HARD SANDSTONE	
0.13	361.90	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	PRED SST-BDG @ 90
1.04	362.80	SANDY SHALE MUDFLOW	
0.17	362.93	BURROWED DARK GRAY SANDY SHALE	SLT RIP UP CLASTS-SLUMP
0.05	363.97	HARD SHALE PEBBLE CONGLOMERATE	
6.47	364.14	BLACK INTERBEDDED SANDSTONE AND SHALE	PRED SLT
0.47	364.19	CROSS-BEDDED HARD SANDSTONE	MG-CALC ON FRAC #29 & 15
0.14	370.66	HARD SANDSTONE WITH COAL SPARS	MG-MINOR SLT CLAST
0.13	371.13	CROSS-BEDDED HARD SANDSTONE	MG-MINOR COAL STREAKS
0.29	371.27	BLACK SHALE WITH COAL STREAKS	VERY COALY
0.13	371.46	COAL WITH PYRITE STREAKS	52% REC-P.CLT-SHEARED-PYR BANDS
0.31	371.69	BLACK SHALE WITH COAL STREAKS	
0.39	371.82	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-BDG @ 85
0.68	372.13	PARTLY CHURNED BLACK SHALE	MINOR COALY STREAKS
0.59	372.52	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-ROOTLETS-MUDFLOW
0.67	373.20	MASSIVE BLACK SANDY SHALE	BURROWS
0.72	373.79	PARTLY CHURNED DARK GRAY SANDY SHALE	
0.60	374.46	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-BDG @ 83
0.41	375.38	COMMON BANDED COAL	85% REC-P.CLT-5CM MDST+PYR-SAMP# 30
0.38	375.98	BLACK SHALE WITH COAL STREAKS	
0.22	376.39	MASSIVE BLACK SANDY SHALE	COALY STREAKS
0.82	376.77	SANDY SHALE MUDFLOW	
0.17	376.99	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-MINOR SLT BEDS
0.62	377.81	SANDY SHALE MUDFLOW	ROOTLETS-PRED SLT
0.09	377.98	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-V.FB
	378.60	PARTLY CHURNED DARK GRAY SANDY SHALE	

1.10	378.69	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-ROOTLETS-BDG @ 80
0.48	379.79	SANDY SHALE MUDFLOW	BURROWS-SLICK @ 55
0.41	380.27	HARD SANDSTONE WITH COAL BANDS	RIPPLED
0.65	380.68	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SLT-BURROWS-BDG @ 82
0.43	381.33	MASSIVE BLACK SANDY SHALE	COALY STREAKS
0.77	381.76	MASSIVE BLACK SHALE	MINOR COALY STREAKS
0.90	382.53	COMMON BANDED COAL	79% REC-P.CLT-5CM MDST-SAMP# 31
0.27	383.43	BLACK FIRECLAY	SILTY-COALY STREAKS
0.50	383.79	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SLT-ROOTLETS
0.39	384.20	CROSS-BEDDED HARD SANDSTONE	TROUGH X-BDG-ROOTLETS
0.17	384.59	HARD SHALE PEBBLE CONGLOMERATE	RIPPLED
1.51	384.76	CROSS-BEDDED HARD SANDSTONE	CALC ON VERT FRAC
0.55	386.27	COMMON BANDED COAL	36% REC-M.CLT-DIRTY @ BASE
0.24	386.82	DARK GRAY SHALE WITH COAL STREAKS	SLICK-BDG @ 80
1.09	387.06	BLACK SHALE WITH SANDSTONE STREAKS	CARB-BURROWS
0.40	388.15	CHURNED BLACK SANDY SHALE	
0.33	388.55	CHURNED DARK GRAY SANDY SHALE	FRED SLT
0.14	388.88	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-5CM CALC FRAC @ 78
0.21	389.02	SANDY SHALE MUDFLOW	MINOR BURROWS
0.47	389.23	CROSS-BEDDED HARD SANDSTONE	SILTY NEAR TOP-CALC ON FRAC @ 68
0.79	389.70	BURROWED DARK GRAY SANDY SHALE	FE STONE CLASTS
0.95	390.49	MASSIVE BLACK SANDY SHALE	
0.84	391.44	MASSIVE BLACK SHALE	HELLS-PELECYPODS & GASTROPODS
0.55	392.28	BLACK SHALE WITH FOSSIL SHELLS	SHELLS-PELECYPODS & GASTROPODS
0.12	392.83	COMMON BANDED COAL	P.CLT
0.17	392.95	BLACK FIRECLAY	ROOTLETS-CALC ON COALY STREAKS
0.46	393.12	MASSIVE DARK GRAY SANDY SHALE	SST LENSES NEAR BASE
0.62	393.58	DARK GRAY SHALE WITH SANDSTONE STREAKS	
0.62	394.20	MASSIVE DARK GRAY SANDY SHALE	
0.09	394.82	MASSIVE BLACK SHALE	MINOR COALY STREAKS
0.95	394.91	MASSIVE DARK GRAY SANDY SHALE	COALY STREAKS
0.12	395.86	MASSIVE BLACK SHALE	
0.24	395.98	BLACK SHALE WITH COAL STREAKS	
0.51	396.22	MASSIVE DARK GRAY SANDY SHALE	CALC ON COAL STREAKS
0.74	396.73	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SLT-SLT FLOW-BURROWS
0.59	397.47	LIGHT INTERBEDDED SANDSTONE AND SHALE	RIPPLED-PRED ID SST-BURROWS
0.60	398.06	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SLT-BURROWS
0.69	398.66	MASSIVE DARK GRAY SANDY SHALE	MINOR SST LENSE @ TOP-CALC ON BDG
0.40	399.35	COMMON BANDED COAL	33% REC-P.CLSHFARED
0.22	399.75	UNDIFFERENTIATED DEFORMED ROCK	FAULTED-MDST CLASTS-CALC VEINLETS
0.26	399.97	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SLT-ROOTLETS-BURROWS
0.37	400.23	MASSIVE BLACK SANDY SHALE	COALY STREAKS WITH CALC-MUD @ BASE
0.24	400.60	COAL WITH SHALE LAYERS	50% COAL-50% MDST-SLICK
0.09	400.84	BLACK SHALE WITH COAL STREAKS	SLICK ON BDG
0.13	400.93	COMMON BANDED COAL	100% REC-P.CLT
0.18	401.06	BLACK SHALE WITH COAL STREAKS	INCREASE SLT TO BASE
3.02	401.24	BLACK INTERBEDDED SANDSTONE AND SHALE	RIPPLED-BURROWS-BDG @ 82
0.87	404.26	BLACK SHALE WITH SANDSTONE STREAKS	BURROWS
0.87	405.13	MASSIVE BLACK SANDY SHALE	PELECYPODS-OSTRACODS
0.40	406.00	MASSIVE HARD SANDSTONE	V. HARD-ABUND PYR-LIMY
0.48	406.40	BLACK SHALE WITH COAL STREAKS	COAL STREAKS
0.18	406.88	DARK GRAY SHALE WITH SANDSTONE STREAKS	BURROWS
2.06	407.06	CROSS-BEDDED HARD SANDSTONE	SLT @ BASE
0.37	409.12	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	FLAT-PRED SST-BDG @ 85-BURROWS
1.08	409.49	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SLT-BURROWS
0.55	410.57	BLACK SHALE WITH SANDSTONE STREAKS	BURROWS
0.15	411.12	SLUMPED SANDSTONE	
0.07	411.27	SLUMPED SANDY SHALE	
0.25	411.34	MASSIVE HARD SANDSTONE	COALY STREAKS
0.98	411.59	CROSS-BEDDED HARD SANDSTONE	MINOR MDST LAM
1.21	412.57	HARD SANDSTONE WITH SHALE STREAKS	RIPPLED-BDG @ 84-BURROWS-SLT @ BASE
0.71	413.78	DARK GRAY SHALE WITH SANDSTONE STREAKS	BURROWS
0.32	414.49	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-BDG @ 82
0.28	414.81	HARD SANDSTONE WITH SHALE STREAKS	
0.24	415.09	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	BURROWS-RIPPLED-PRED SLT
0.25	415.33	COMMON BANDED COAL	40% REC
0.10	415.58	BLACK SHALE WITH COAL STREAKS	COAL BANDS UP TO 0.7CM
1.51	415.68	CHURNED DARK GRAY SANDY SHALE	
0.28	417.17	CHURNED HARD SANDSTONE	
0.09	417.47	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SST
1.43	417.56	CHURNED DARK GRAY SANDY SHALE	LAM NEAR TOP
1.61	418.99	SANDY SHALE MUDFLOW	SLUMPING-FRAC
0.32	420.60	CROSS-BEDDED HARD SANDSTONE	
0.17	420.92	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SST ROOTLETS-BDG @ 82
1.42	421.09	CROSS-BEDDED HARD SANDSTONE	CALC ON FRAC @ 80-VERT FRAC
0.44	422.51	SANDY SHALE MUDFLOW	
0.43	422.95	MASSIVE BLACK SHALE	MINOR LAM
0.35	423.38	COMMON BANDED COAL	23% REC-M.CLT
0.12	423.73	MASSIVE BLACK SHALE	COALY STREAKS
1.79	423.85	CROSS-BEDDED HARD SANDSTONE	ROOTLETS-MINOR FE STONE CLASTS
0.51	425.64	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SST-BDG @ 84
3.11	426.15	BURROWED BLACK SANDY SHALE	DECREASING BURROWS TO BASE
0.42	429.26	MASSIVE BLACK SHALE	CARB
0.40	429.68	PARTLY CHURNED DARK GRAY SHALE	CHURNING NOT INTENSE
0.64	430.08	MASSIVE DARK GRAY SANDY SHALE	
1.18	430.72	CHURNED DARK GRAY SANDY SHALE	SLT FLOW NEAR BASE-BURROWS
20.10	431.90	NO ROCK RECOVERED	WEDGE--- STARTS AT 206.08M
0.04	432.00	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SST-BURROWS
0.07	432.04	MASSIVE DARK GRAY SHALE	
0.13	432.11	DARK GRAY SHALE WITH COAL STREAKS	
0.80	432.24	COMMON BANDED COAL	
0.20	433.04	DARK GRAY SHALE WITH COAL STREAKS	31% REC W.CLT-7CM MDST-SAMP# 32
0.04	433.24	COMMON BANDED COAL	
0.17	433.28	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	100% REC-W.CLT
0.11	433.45	COAL WITH SHALE STREAKS	COALY MDST @ TOP & BASE
0.12	433.56	PARTLY CHURNED DARK GRAY SANDY SHALE	V. MUDDY
0.19	433.88	BLACK SHALE WITH COAL STREAKS	ABUND COALY STREAKS-ROOTLETS
0.68	433.87	DARK GRAY SHALE WITH SANDSTONE STREAKS	CALC ON SLICK
0.61	434.55	COMMON BANDED COAL	SST INCREASES @ BASE
0.24	435.16	PARTLY CHURNED DARK GRAY SANDY SHALE	72% REC-SHEARED-SAMP# 33
1.58	435.40	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	INCREASED SLT TO BASE
1.05	436.98	BURROWED DARK GRAY SANDY SHALE	RIPPLED-PRED SST-CALC ON VERT FRAC
1.19	438.03	SANDY SHALE MUDFLOW	SOME SLUMPING-COALY STREAKS-ROOTLETS
0.19	439.22	SANDSTONE MUDFLOW	MINOR BURROWS
0.35	439.41	PARTLY CHURNED DARK GRAY SANDY SHALE	VERT FRAC
0.48	439.76	CHURNED DARK GRAY SANDY SHALE	BDG @ 83
			SOME MUDFLOWXD-BURROWS

0.42	460.24	SANDY SHALE MUDFLOW	
0.20	460.66	HARD SANDSTONE WITH SHALE STREAKS	
0.30	460.86	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-PRED SLT-BURROWS
0.23	461.16	HARD SANDSTONE WITH SHALE STREAKS	
0.13	461.39	SANDY SHALE MUDFLOW	ROOTLETS-COALY STREAKS
0.69	461.52	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-SST H.FG-BDG @ 60
0.10	462.21	SANDSTONE MUDFLOW	
0.30	462.31	HARD SANDSTONE WITH SHALE STREAKS	
1.09	462.61	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	RIPPLED-BURROWS-BDG @ 81
0.11	463.70	BLACK SHALE WITH COAL STREAKS	1 CM COAL BAND
0.24	463.81	DARK GRAY SHALE WITH COAL STREAKS	COALY STREAKS @ BASE
1.70	464.07	COMMON BANDED COAL	33% REC-P.CLT-SHEARED-SAMP# 34
0.07	465.77	BLACK SHALE WITH COAL STREAKS	
0.03	465.84	COMMON BANDED COAL	
0.41	466.08	HARD SANDSTONE WITH SHALE STREAKS	100% REC-W.CLT-SHEARED
0.20	466.28	DARK GRAY INTERBEDDED SANDSTONE AND SHAL	MINOR COALY STREAKS
0.12	466.48	DARK GRAY SHALE WITH COAL STREAKS	RIPPLED-BURROWS
			SLICK @ 40

COMMAND?

APPENDIX II











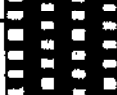




LEGEND OF SYMBOLS FOR
GRAPHIC LITHOLOGIC LOG

Jan, 1981

MISCELLANEOUS (00X AND 01X)

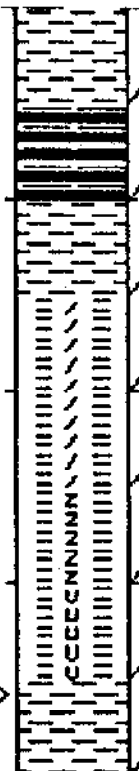
PLOT 0000	GEOLOGICAL 000			
				NO ROCK RECOVERED
0000	001			CASING OR SURFACE
0000	002			OPEN SPACE OR CREVICE
0000	004			CAVE LOST
0006	005	\$	\$	OPEN MINE
0000	006			INTERVAL NOT SAMPLED
0001	010			UNDIFFERENTIATED DEFORMED ROCK
0001	011			SLUMP OR MUDFLOW
0001	012			SLUMP DEPOSIT
0001	013			SLUMPED SHALE
0001	014			SLUMPED SANDY SHALE
0001	015			SLUMPED SANDSTONE
0002	016			MUDFLOW DEPOSIT
0002	017			SHALE MUDFLOW
0002	018			SANDY SHALE MUDFLOW
0002	019			SANDSTONE MUDFLOW

COAL AND BONE (02X AND 03X)

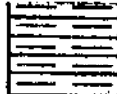


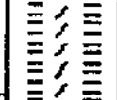
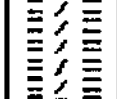
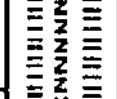


PLOT	GEOL.		
0020	020		COAL
0020	021		COMMON BANDED COAL
0020	022		COAL LAYERED WITH BONE
0020	023		COAL STREAKED WITH BONE
0020	024		DULL OR CANNEL COAL
0020	027		COAL WITH SHALE LAYERS
0020	028		COAL WITH SHALE STREAKS
0020	029		COAL WITH PYRITE STREAKS
0030	030		IMPURE COAL
0030	032		BONE LAYERED WITH COAL
0030	033		BONE STREAKED WITH COAL
0030	034		BONE
0084	037		BONE LAYERED WITH SHALE
0084	038		BONE STREAKED WITH SHALE
0030	039		BONE STREAKED WITH PYRITE

SHALES (10X)

PLOT	GEOLOGICAL	DESCRIPTION
0080	100	SHALE
0084	103	SHALE WITH COAL STREAKS
0080	104	MASSIVE SHALE
0085	105	PARTLY CHURNED SHALE
0085	106	CHURNED SHALE
0088	107	FIRECLAY
0089	108	BURROWED SHALE
0059	109	SHALE WITH FOSSIL SHELLS

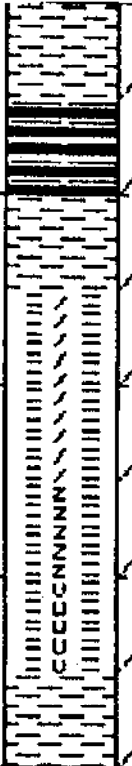


BLACK SHALES (11X)

PLOT	GEOL		
0081	110		BLACK SHALE
0084	113		BLACK SHALE WITH COAL STREAKS
0081	114		MASSIVE BLACK SHALE
0085	115		PARTLY CHURNED BLACK SHALE
0085	116		CHURNED BLACK SHALE
0088	117		BLACK FIRECLAY
0089	118		BURROWED BLACK SHALE
0069	119		BLACK SHALE WITH FOSSIL SHELLS

DARK GRAY SHALES (12X)

PLOT	GEOLOGICAL	DESCRIPTION
0080	120	DARK GRAY SHALE
0084	123	DARK GRAY SHALE WITH COAL STREAKS
0080	124	MASSIVE DARK GRAY SHALE
0085	125	PARTLY CHURNED DARK GRAY SHALE
0085	126	CHURNED DARK GRAY SHALE
0088	127	DARK GRAY FIRECLAY
0089	128	BURROWED DARK GRAY SHALE
0059	129	DARK GRAY SHALE WITH FOSSIL SHELLS



LIGHT SHALES (13X)

PLOT	GEOL		
0082	130		LIGHT SHALE
0084	133		LIGHT SHALE WITH COAL STREAKS
0082	134		MASSIVE LIGHT SHALE
0085	135		PARTLY CHURNED LIGHT SHALE
0085	136		CHURNED LIGHT SHALE
0088	137		LIGHT FIRECLAY
0089	138		BURROWED LIGHT SHALE
0079	139		LIGHT SHALE WITH FOSSIL SHELLS

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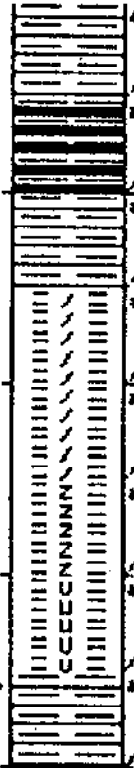
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PLOT
1081

GEOLOGICAL
210



BLACK SHALE WITH LIME NODULES

BLACK SHALES WITH LIME NODULES (21X)

1084 213

BLACK SHALE WITH COAL STREAKS AND LIME NODULES

1081 214

MASSIVE BLACK SHALE WITH LIME NODULES

1085 215

PARTLY CHURNED BLACK SHALE WITH LIME NODULES

1085 216

CHURNED BLACK SHALE WITH LIME NODULES

1088 217

BLACK FIRECLAY WITH LIME NODULES






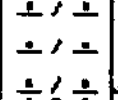
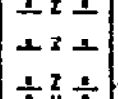
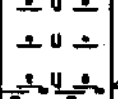

1089 218

BURROWED BLACK SHALE WITH LIME NODULES





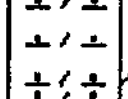
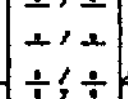
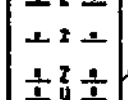


1069 219

BLACK SHALE WITH FOSSIL SHELLS AND LIME NODULES

SANDY SHALES (30X)

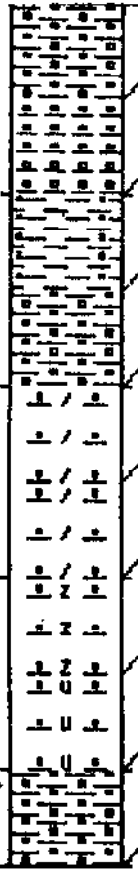
PLOT	GEOL.		
0090	300		SANDY SHALE
0091	302		INTERBEDDED SANDSTONE AND SHALE
0087	303		SHALE WITH SANDSTONE STREAKS
0090	304		MASSIVE SANDY SHALE
0073	305		PARTLY CHURNED SANDY SHALE
0073	306		CHURNED SANDY SHALE
0074	307		SANDY FIRECLAY
0075	308		BURROWED SANDY SHALE
0099	309		SANDY SHALE WITH FOSSIL SHELLS

BLACK SANDY SHALES (31X)

PLOT	GEOL		
0090	310		BLACK SANDY SHALE
0091	312		BLACK INTERBEDDED SANDSTONE AND SHALE
0087	313		BLACK SHALE WITH SANDSTONE STREAKS
0090	314		MASSIVE BLACK SANDY SHALE
0073	315		PARTLY CHURNED BLACK SANDY SHALE
0073	316		CHURNED BLACK SANDY SHALE
0074	317		BLACK SANDY FIRECLAY
0075	318		BURROWED BLACK SANDY SHALE
0099	319		BLACK SANDY SHALE WITH FOSSIL SHELLS

DARK GRAY SANDY SHALES (32X)

PLDT	GEOLOGICAL	DESCRIPTION
0090	320	DARK GRAY SANDY SHALE
0091	322	DARK GRAY INTERBEDDED SANDSTONE AND SHALE
0087	323	DARK GRAY SHALE WITH SANDSTONE STREAKS
0090	324	MASSIVE DARK GRAY SANDY SHALE
0073	325	PARTLY CHURNED DARK GRAY SANDY SHALE
0073	326	CHURNED DARK GRAY SANDY SHALE
0074	327	DARK GRAY SANDY FIRECLAY
0075	328	BURROWED DARK GRAY SANDY SHALE
0099	329	DARK GRAY SANDY SHALE WITH FOSSIL SHELLS



LIGHT SANDY SHALES (33X)

PLOT	GEOL		
0090	330		LIGHT SANDY SHALE
0091	332		LIGHT INTERBEDDED SANDSTONE AND SHALE
0087	333		LIGHT SHALE WITH SANDSTONE STREAKS
0090	334		MASSIVE LIGHT SANDY SHALE
0073	335		PARTLY CHURNED LIGHT SANDY SHALE
0073	336		CHURNED LIGHT SANDY SHALE
0074	337		LIGHT SANDY FIRECLAY
0075	338		BURROWED LIGHT SANDY SHALE
0099	339		LIGHT SANDY SHALE WITH FOSSIL SHELLS

PLOT
0040

GEOLOGICAL
500

SANDSTONES (50X)

0040 501

CROSS-BEDDED SANDSTONE

0041 503

SANDSTONE WITH SHALE STREAKS

0040 504

MASSIVE SANDSTONE

0044 505

PARTLY CHURNED SANDSTONE

0044 506

CHURNED SANDSTONE

0043 507

ROOTED SANDSTONE

0045 508

BURROWED SANDSTONE

0049 509

SANDSTONE WITH FOSSIL SHELLS



PLOT
0040

GEOL.
540

GRAY SANDSTONE

GRAY SANDSTONES (54X)

0040 541

CROSS-BEDDED GRAY SANDSTONE

0041 543

GRAY SANDSTONE WITH SHALE STREAKS

0040 544

MASSIVE GRAY SANDSTONE

0044 545

PARTLY CHURNED GRAY SANDSTONE

0044 546

CHURNED GRAY SANDSTONE

0043 547

ROOTED GRAY SANDSTONE

0045 548

BURROWED GRAY SANDSTONE

0049 549

GRAY SANDSTONE WITH FOSSIL SHELLS

CCCCNNNN



PLOT
0060

GEOL.
560

HARD SANDSTONE

HARD SANDSTONES (56X)

0060 561

CROSS-BEDDED HARD SANDSTONE

0061 563

HARD SANDSTONE WITH SHALE STREAKS

0060 564

MASSIVE HARD SANDSTONE

0063 565

PARTLY CHURNED HARD SANDSTONE

0063 566

CHURNED HARD SANDSTONE

0064 567

ROOTED HARD SANDSTONE

0065 568

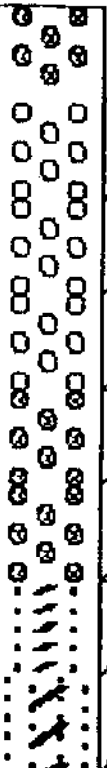
BURROWED HARD SANDSTONE

0039 569

HARD SANDSTONE WITH FOSSIL SHELLS

PLOT
0070

GEOLOGICAL
700



CONGLOMERATE

CONGLOMERATES (70X)

0071 701

SHALE AND IRONSTONE CONGLOMERATE

0071 702

SHALE CONGLOMERATE

0071 703

IRONSTONE CONGLOMERATE

0070 704

QUARTZ CONGLOMERATE

0070 705

ROCK CONGLOMERATE

0046 708

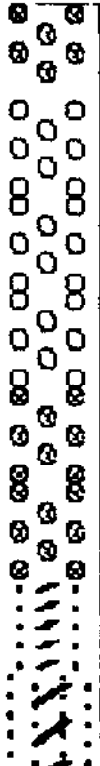
SANDSTONE WITH COAL BANDS

0042 709

SANDSTONE WITH COAL SPARS

PLOT
0070

GEOL
740



GRAY CONGLOMERATE

GRAY CONGLOMERATES (74X)

0071 741

GRAY SHALE AND IRONSTONE CONGLOMERATE

0071 742

GRAY SHALE CONGLOMERATE

0071 743

GRAY IRONSTONE CONGLOMERATE

0070 744

GRAY QUARTZ CONGLOMERATE

0070 745

GRAY ROCK CONGLOMERATE

0046 748

GRAY SANDSTONE WITH COAL BANDS

0042 749

GRAY SANDSTONE WITH COAL SPARS

PLOT
0070

GEOLOGICAL
750

CRYSTALLIZED CONGLOMERATES (75X)

CRYSTALLISED CONGLOMERATE

0071 751

CRYSTALLISED SHALE AND IRONSTONE CONGLOMERATE

0071 752

CRYSTALLISED SHALE CONGLOMERATE

0071 753

CRYSTALLISED IRONSTONE CONGLOMERATE

0070 754

CRYSTALLISED QUARTZ CONGLOMERATE

0070 755

CRYSTALLISED ROCK CONGLOMERATE

0056 758

CRYSTALLISED SANDSTONE WITH COAL BANDS

0052 759

CRYSTALLISED SANDSTONE WITH COAL SPARS

PLOT
0070

GENL.
760

HARD CONGLOMERATE

HARD CONGLOMERATES (76X)

0071 761

HARD SHALE AND IRONSTONE CONGLOMERATE

0071 762

HARD SHALE PEBBLE CONGLOMERATE

0071 763

HARD IRONSTONE PEBBLE CONGLOMERATE

0070 764

HARD QUARTZ CONGLOMERATE

0070 765

HARD ROCK PEBBLE CONGLOMERATE

0072 768

HARD SANDSTONE WITH COAL BANDS

0062 769

HARD SANDSTONE WITH COAL SPARS

APPENDIX III

ANALYTICAL DATA

W.C.C. D.D.H. - 82-8

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

DRILL HOLE DDH 82-8

HEAD ANALYSIS

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H ₂ O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
SAMPLE #1	2.98	8.12	0.75	28.63	60.27	13025	2 1/2	8.37	0.77	29.51	62.12	13425
SAMPLE #2	1.57	7.64	1.00	29.69	61.10	13837	6 1/2	7.76	1.02	30.16	62.08	14058
SAMPLE #3	2.02	37.66	0.61	21.31	39.01	8772	1	38.44	0.62	21.75	39.81	8953
SAMPLE #4	2.16	10.79	1.05	28.53	58.52	12785	2 1/2	11.03	1.07	29.16	59.81	13067
SAMPLE #5	1.65	31.08	2.13	27.46	39.81	9501	2	31.60	2.17	27.92	40.48	9660
SAMPLE #6	1.90	39.38	1.07	22.56	36.16	8673	3 1/2	40.14	1.09	23.00	36.86	8841
SAMPLE #7	2.26	7.88	1.08	27.51	62.35	13514	5 1/2	8.06	1.10	28.15	63.79	13826
SAMPLE #8	2.19	22.82	0.72	21.78	53.21	11110	1	23.33	0.74	22.27	54.40	11359
SAMPLE #10	2.08	19.42	0.85	23.28	55.22	11616	2	19.83	0.87	23.77	56.40	11863
SAMPLE #11	2.62	15.59	0.77	25.50	56.29	12242	5	16.01	0.79	26.19	57.80	12571
SAMPLE #13	2.21	2.92	0.70	25.48	69.39	14294	1 1/2	2.99	0.72	26.06	70.95	14617
SAMPLE #14	1.34	29.04	0.82	25.61	44.01	10449	6	29.43	0.83	25.96	44.61	10591
SAMPLE #15	1.38	30.31	1.29	25.30	43.01	10031	2 1/2	30.73	1.31	25.65	43.62	10171
SAMPLE #16	1.59	17.72	0.80	31.31	49.38	11398	4	18.01	0.81	31.82	50.17	11582
SAMPLE #17	1.73	14.29	1.18	28.25	55.73	12740	7	14.54	1.20	28.75	56.71	12964
SAMPLE #18	1.61	7.59	0.90	28.76	62.04	13779	6 1/2	7.71	0.91	29.23	63.06	14004

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COALDRILL HOLE DDH 82-8HEAD ANALYSIS

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H ₂ O	% ASH	% S	% VM	% FC	BTU	FST	% ASH	% S	% VM	% FC	BTU
SAMPLE #19	1.31	83.34	0.20	8.60	6.75	1987	0	84.45	0.20	8.71	6.84	2013
SAMPLE #20	1.72	18.99	0.71	28.51	50.78	11481	5 1/2	19.32	0.72	29.01	51.67	11682
SAMPLE #21	2.25	4.23	1.16	33.02	60.50	13829	6 1/2	4.33	1.19	33.78	61.89	14147
SAMPLE #22	1.42	22.27	0.83	26.66	49.65	11434	6 1/2	22.59	0.84	27.04	50.37	11599
SAMPLE #23	1.53	8.45	0.92	29.40	60.62	13555	7 1/2	8.58	0.93	29.86	61.56	13766
SAMPLE #24	1.35	10.08	1.18	31.20	57.37	13449	7 1/2	10.22	1.20	31.63	58.15	13633
SAMPLE #25	1.55	2.56	0.99	29.41	66.48	14703	7	2.60	1.01	29.87	67.53	14934
SAMPLE #26	1.21	29.32	0.63	21.29	48.18	10379	1 1/2	29.68	0.64	21.55	48.77	10506
SAMPLE #27	1.35	8.97	1.01	31.08	58.60	13627	8	9.09	1.02	31.51	59.40	13813
SAMPLE #28	1.64	4.79	0.94	29.57	64.00	14192	8	4.87	0.96	30.06	65.07	14429
SAMPLE #29	1.42	16.56	0.78	24.90	57.12	12466	4 1/2	16.80	0.79	25.26	57.94	12646
SAMPLE #30	1.61	6.08	1.31	31.78	60.53	14008	8	6.18	1.33	32.30	61.52	14237
SAMPLE #31	1.57	17.84	0.64	26.38	54.21	11680	1	18.12	0.65	26.80	55.08	11866
SAMPLE #32	1.83	35.23	0.75	23.46	39.48	9383	4 1/2	35.89	0.76	23.90	40.21	9558
SAMPLE #33	2.30	6.08	0.80	27.86	63.76	13730	4	6.22	0.82	28.52	65.26	14053
SAMPLE #34	2.46	4.41	0.72	26.09	67.04	14043	2	4.52	0.74	26.75	68.73	14397

APPENDIX IV
COST STATEMENT

NOTE: Represents a consolidation of the costs included in the Application to extend the Term of Licence for Coal Licence numbers 4110, 4112, 4114, 4118 - 4123, 5172, and 5173.

ON PROPERTY COSTS:

1.) Operators Fees, Salaries and Wages: Professional and Technical	\$ 17,507.
2.) Contractors: Roger's Drilling Services Inc. (Includes charges for direct drilling costs additives, expenses, for additional staff, etc.)	51,379.
3.) Field Camp Costs: Food Accommodation Telephone	1,224. 3,300. 205.
4.) Sampling, Analysis, and Testing: 34 samples @ \$28/sample Laboratory analysis of coal samples performed by Utah International Inc., Minerals Laboratory, Sunnyvale, California)	952.
5.) Supplies and Materials Costs: Operative and Maintenance supplies and Equipment Maintenance Costs	3,212.
6.) Transportation Costs: Bell 206 Jet Ranger from Rotortech Helicopters Chetwynd, B.C. A-Star from Maple Leaf Helicopters, Chetwynd, B.C. Suburban 4x4 from BowMac Truck Rentals Fuel, Parts and Repair (for helicopters and trucks)	20,204. 6,081. 641. 3,807.
7.) Equipment and Instruments Used: Comprobe logging unit (density-gamma-caliper @ \$4.25/metre)	1,836.
8.) Reclamation Work:	0.
TOTAL ON PROPERTY COSTS	<u>\$110,348.</u>

OFF PROPERTY COSTS

1.) Logistics, Field Support and Report Writing	\$ 5,594.
2.) Supplies and Services	339.
3.) Travelling Expenses	956.
TOTAL OFF PROPERTY COSTS	<u>\$ 6,889.</u>

TOTAL PROSPECT COST \$ 117,237.

APPENDIX V

STATEMENT OF QUALIFICATIONS

I, PAUL STUART COWLEY, of 2603 MacKenzie Street, Vancouver, British Columbia, do hereby certify that:

I am a graduate of the University of British Columbia, with a Bachelor of Science Degree in Honours Geology, 1979.

Since graduation I have been engaged in Coal Exploration in British Columbia, Yukon and Northwest Territories for Utah Mines Ltd.

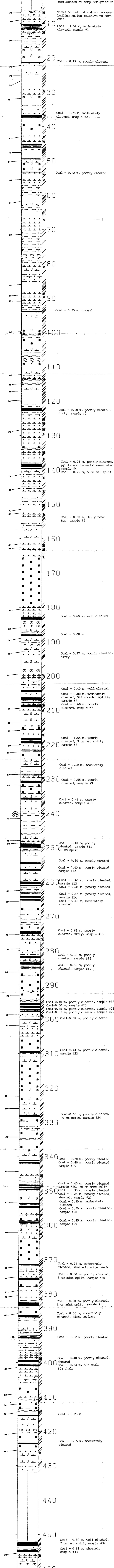


Paul S. Cowley

Vancouver, B.C.

Geologist

WES CARB BC
 LICENCE NO. - 4114
 HOLE NO. - WCC82-08
 E:508025 N:6200560
 SCALE 1:240.0
 ELEV 1712 DEPTH 432



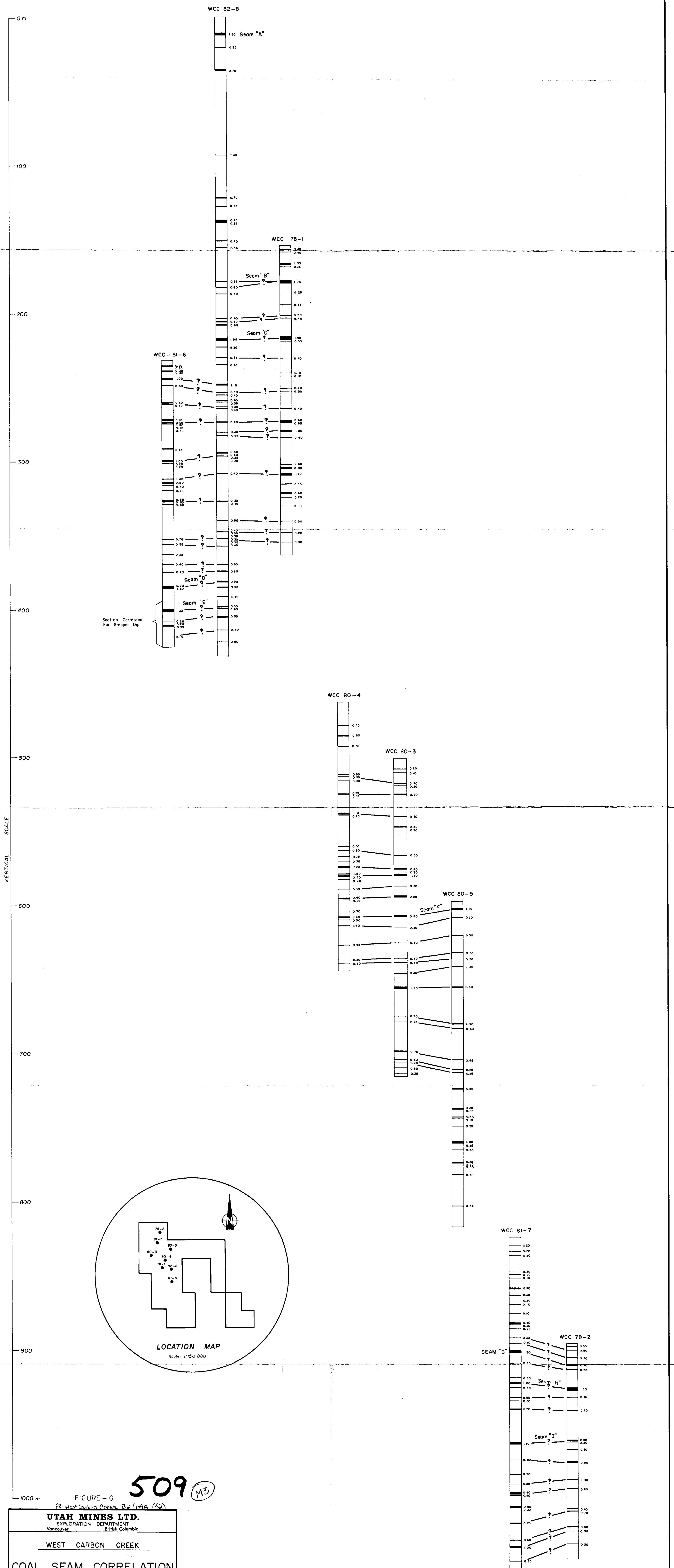


FIGURE - 6

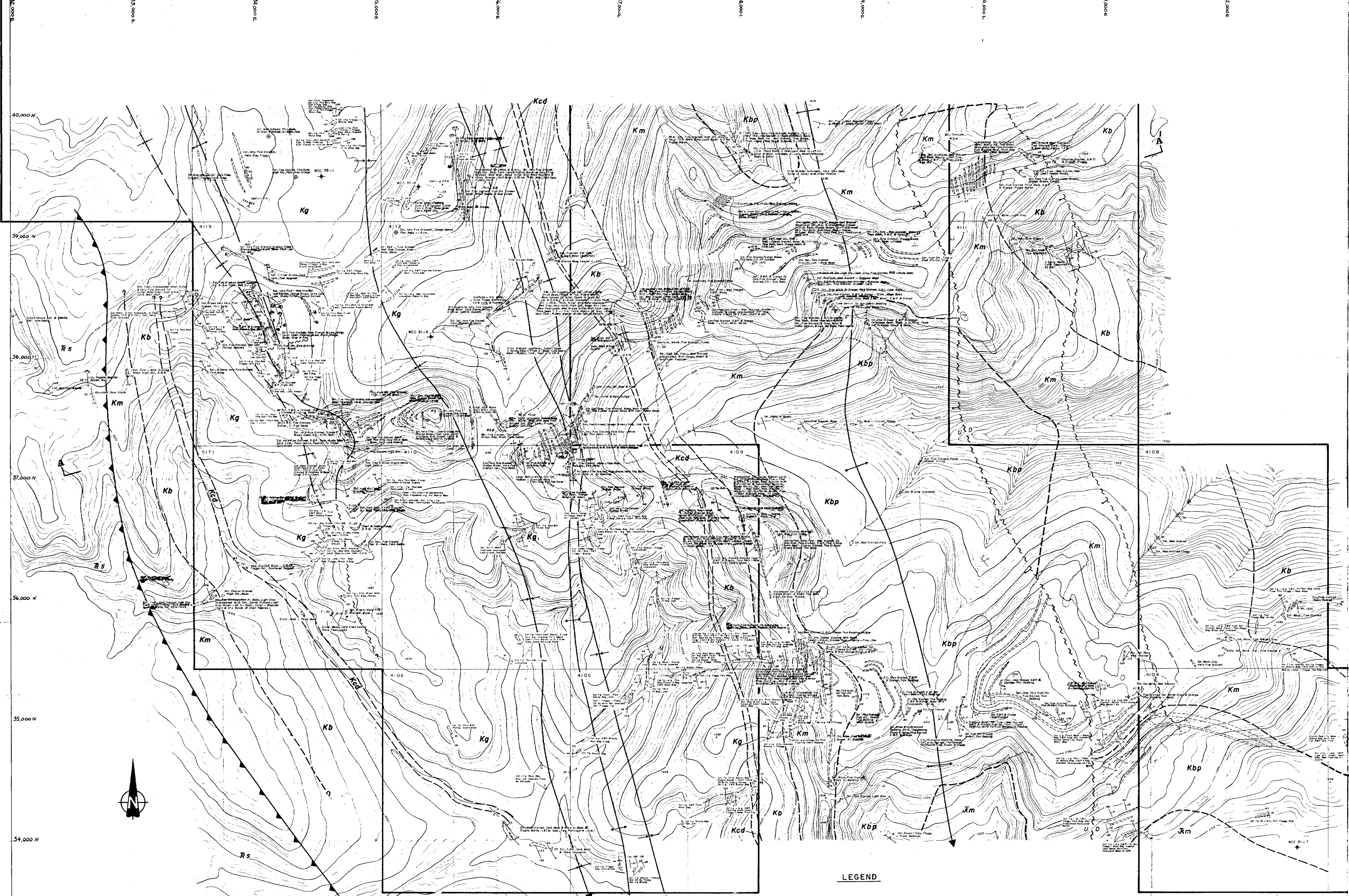
PR. West Carbon Creek B2 (1A) (K2)

UTAH MINES LTD.
EXPLORATION DEPARTMENT
Vancouver, British Columbia

WEST CARBON CREEK

COAL SEAM CORRELATION

Work by: P. Cowley Date: Dec. 1982 NTS Ref. 94 0/15
Drawn by: T. Drews Revised: Vertical Scale: 1:1000



LEGEND

- LOWER CRETACEOUS**
- Kb** BICKFORD FORMATION - Quartzite, Sandstone, Conglomerate, Siltstone, Coal, Minor Shale
 - Km** MONACH FORMATION - Quartzite, Sandstone, Conglomerate, Minor Shale and Coal
 - Kbp** BEATTIE PEAKS FORMATION - Shale, Fluffy Sandstone
- UPPER JURASSIC OR LOWER CRETACEOUS**
- Km** MONTEITH FORMATION - Sandstone, Fine To Coarse Grained, Quartzite
- JURASSIC**
- Jf** FERNIE FORMATION - Cherty Shale, Sandy Near The Top
- TRIASSIC**
- Ks** SCHOLLER GROUP - Calcareous Sandstone, Calcareous Siltstone, Limestone, Lignite (Moine)
- Geologic Contact
 Syncline
 Anticline
 (Outcrop) - Strike And Dip Of Bedding
 Drill Hole Location
 Coal Outcrop, Measured Thickness Where Indicated
 Outcrop
 Thrust Fault
 Coal License Number
 Sample Number
 Section Line Location
 Fault
 Direction Of Dip
 Relative Movement Of Beds

33,000 N

MAP-1 509

UTAH MINES LTD.
EXPLORATION DEPARTMENT
VANCOUVER BRITISH COLUMBIA

WEST CARBON CREEK
BEDROCK GEOLOGY AND
DRILL HOLE LOCATIONS

Drawn By: T. D. D.	Date: March 1988	NTS. Ref.: 95-2/10
Scale: 1:10,000		

Scale: 1:10,000
 Center Interval: 10 Metres
 Date: June 21, 1978
 Job No.: 06293-6
 Sheet No.: 8

UTAH MINES LTD.
CARBON CREEK
PRELIMINARY RECONNAISSANCE TYPE MAPPING

McElvanney
McElvanney Surveying & Engineering Ltd.
1200 West Pender Street Vancouver, B.C., Canada

47,000 N
45,000 N
44,000 N
43,000 N
42,000 N
41,000 N
40,000 N



509 (MS)

UTAH MINES LTD.
EXPLORATION DEPARTMENT
VANCOUVER BRITISH COLUMBIA

WEST CARBON CREEK
BEDROCK GEOLOGY AND
DRILL HOLE LOCATIONS

Map By: P. Corley Date: March 1981 NTS Ref: 93 G/18
Drawn By: T. Ores Revised: Dec. 1982 Scale: 1:10,000

0 100 200 300 400 500 600 800 Metres

MAP-2

LEGEND
SEE BEDROCK GEOLOGY AND DRILL HOLE LOCATIONS
MAP - 1

Scale and elevation datum based on barometric control resulting in good relative but uncertain absolute map accuracy.
Compiled from aerial photography at an approximate scale of 1 inch equals 5280 feet from 1970.

UTAH MINES LTD.

PRELIMINARY RECONNAISSANCE TYPE MAPPING

McElhenny
McElhenny Surveying & Engineering Ltd.
1200 West Fender Street, Vancouver, B.C., Canada

Scale: 1:10,000
Contour: 10 Metres
Date: June 21, 1978
Job No: 08298-4
Sheet No: 7

Widco

WELL LOG

COMPANY Utah Mines Ltd.
WELL REC-DH-82-8
LOCATION West Carbon Creek

COMPANY Utah Mines Ltd.
AREA West Carbon Creek
WELL WCC-DH-82-8
COUNTY Peace River Land Dist STATE B.C.

509

COORDINATES 39,250 N x
N 35,370 E
S
ELEVATION 1712 m
D.F.
K.B.
G.I.

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	14 Jul, 1982		Nature		
First Reading	431.00 m		Density		
Last Reading	0.00 m		Viscosity	@ °F	@ °F
Footage Logged	431.90 m		Resistivity	@ °F	@ °F
Bottom (Driller)	431.90 m		Res. @ BHT	@	@
Casing (From Log)	6.00 m		pH		
Casing (Driller)	6.10 m		Circ. Temp.		
Casing Size	NQ		S.H. Temp.		
Bit Size	NQ	2 63/64			
			Logged by		
			Witnessed by		

REMARKS Vertical Hole

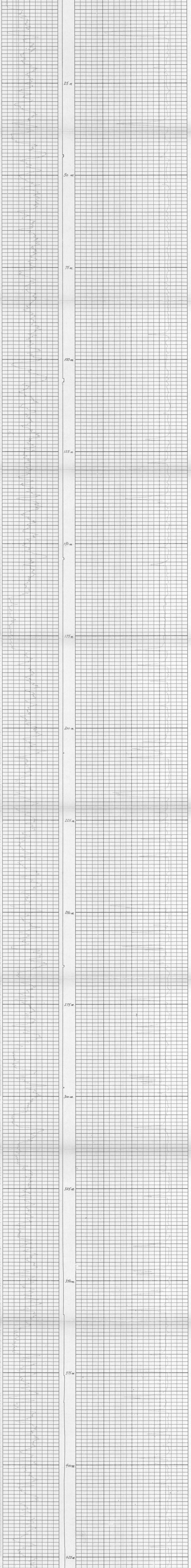
Reg. U.S. Pat. Off.

GAMMA

CALIPER

DENSITY

(1)



Peace River Land Dist

10/1/82