

1981 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

NTS 930

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 August 6 and August 23, 1981

Submitted May 6, 1982

CL# 4112
CL# 4121

D.H
WCC 816
WCC 817

~~CONFIDENTIAL~~

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	13
DRILL HOLE DATA	16
D.D.H. W.C.C.-81-6 A WELL COMPLETION REPORT	16
B COMMENTS	17
D.D.H. W.C.C.-81-7 A WELL COMPLETION REPORT	18
B COMMENTS	19
COAL SEAM CORRELATION	20
CONCLUSIONS AND RECOMMENDATIONS	21
SELECTED BIBLIOGRAPHY	22

APPENDICES

- Appendix I - Descriptive Lithologic Logs
D.D.H. W.C.C.-81-6 and 81-7
- Appendix II -- Analytical Data
D.D.H. W.C.C.-81-6 and 81-7
- Appendix III - Cost Statement
- Appendix IV - 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.....i,..	4
3. West Carbon Creek Coal Licences	5
4. Physiographic Subdivision , Northeast B.C.....	7
5. Nomenclature of Formations?.....	12
6: Structural Cross-Section 1:10,000 Scale	14
7. Coal Seam Correlation *....a.....	map folder ✓

TABLE

I Coal Sample Analytical Procedure	10
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MAPS

1. West Carbon Creek Property - Bedrock Geology and Drill Hole Location	map folder ✓
2. West Carbon Creek Property - Bedrock Geology and Drill , Hole Location	map folder ✓

LCXS

Graphic Lithologic Logs for D.D.H. W.C.C.-81-6 and W.C.C.-81-7.....*	map folder ✓
Gamma Ray-Density Logs D.D.H. W.C.C.-81-6 and W.C.C.-81-7.....	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 1981 field season to provide further data on the extent, metallurgical quality and continuity of coal s- on the property, pursuant to the 1978 and 1980 programs. The drilling of two diamond drill holes were planned to accomplish these objectives.

A total of 432 metres of diamond drilling was completed in two helicopter supported holes. Diamond drill hole WCC 81-6, on Coal Licence 4112, was located 1.5 kilometres southeast of WCC 78-1. Diamond drill hole WCC 81-7, on Coal Licence 4121, was situated 1.1 kilometres southwest of WCC 78-2. The correlation of all drill hole data is tentative due to considerable disadvantages such as widely spaced holes and structural variability across the property. The correlation showed numerous seams over 1.0 metres with minimal drill hole overlap. The 1981 exploration program provides a base for further exploration of the West Carbon Creek Property.

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 from 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 of the property. Johnston Creek Road, built by Utah Mines and Canfor Ltd. (a major forest products company), leaves 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 by travelling over 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 only. Much of the property is above treeline (approximately 1500 metres) making access by helicopter convenient. Heavy tree cover below treeline restricts helicopter landing pads 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. Licences 5171 to 5173 were issued on May 8, 1979. 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.

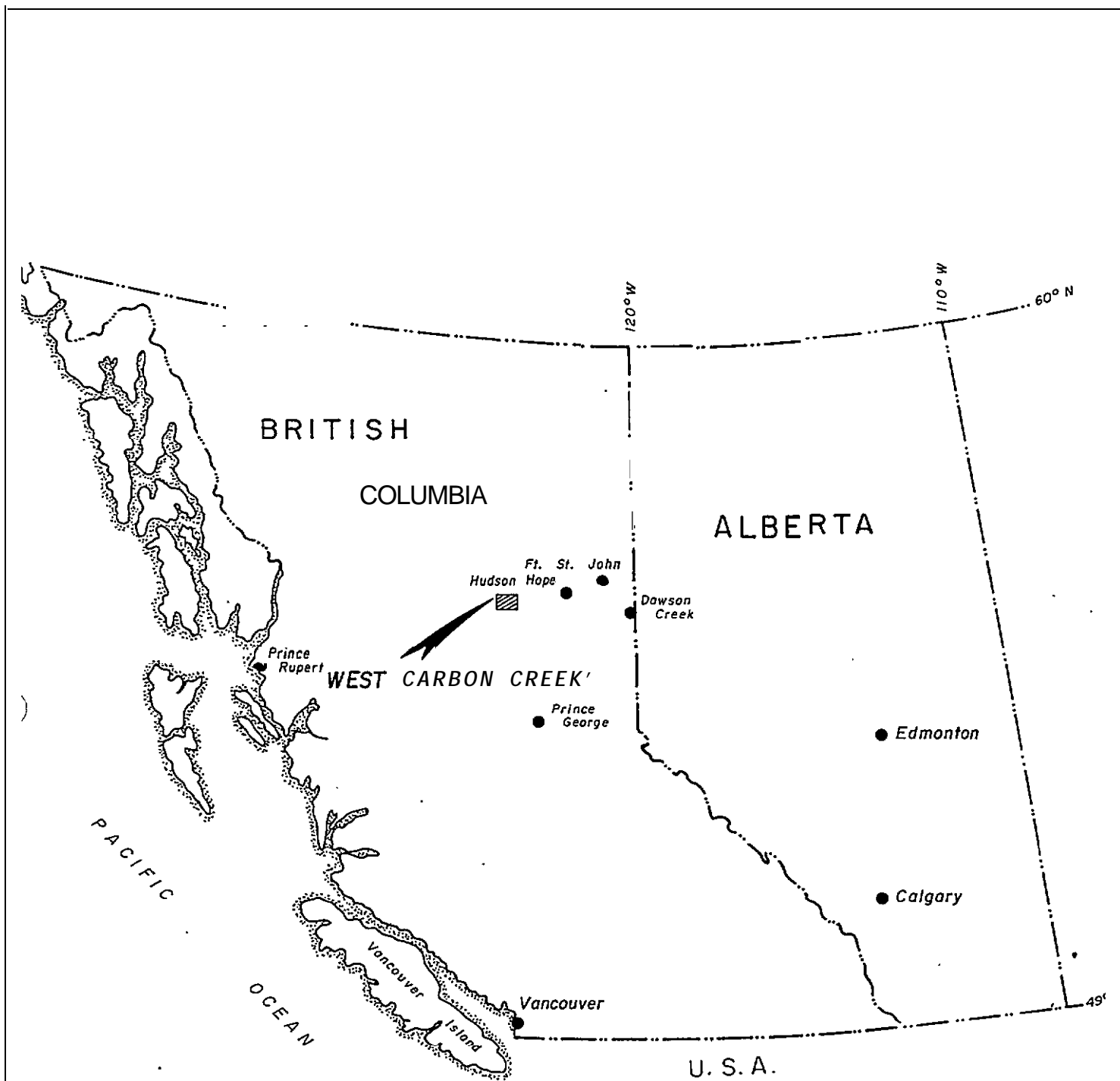


FIGURE-I
 UTAH MINES LTD.
WEST CARBON CREEK
LOCATION MAP

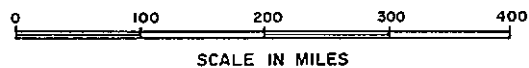






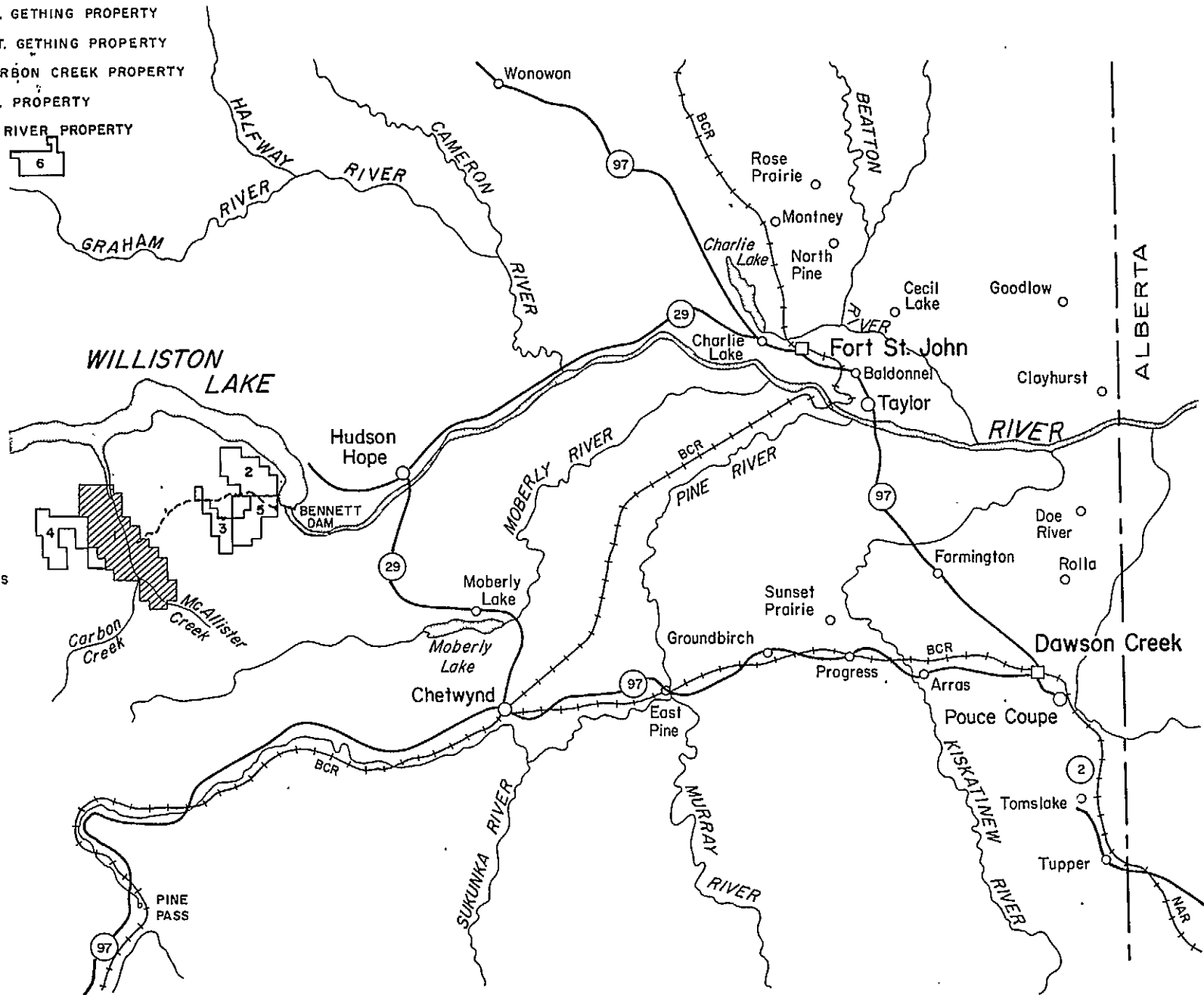


FIGURE - 2

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



14-1

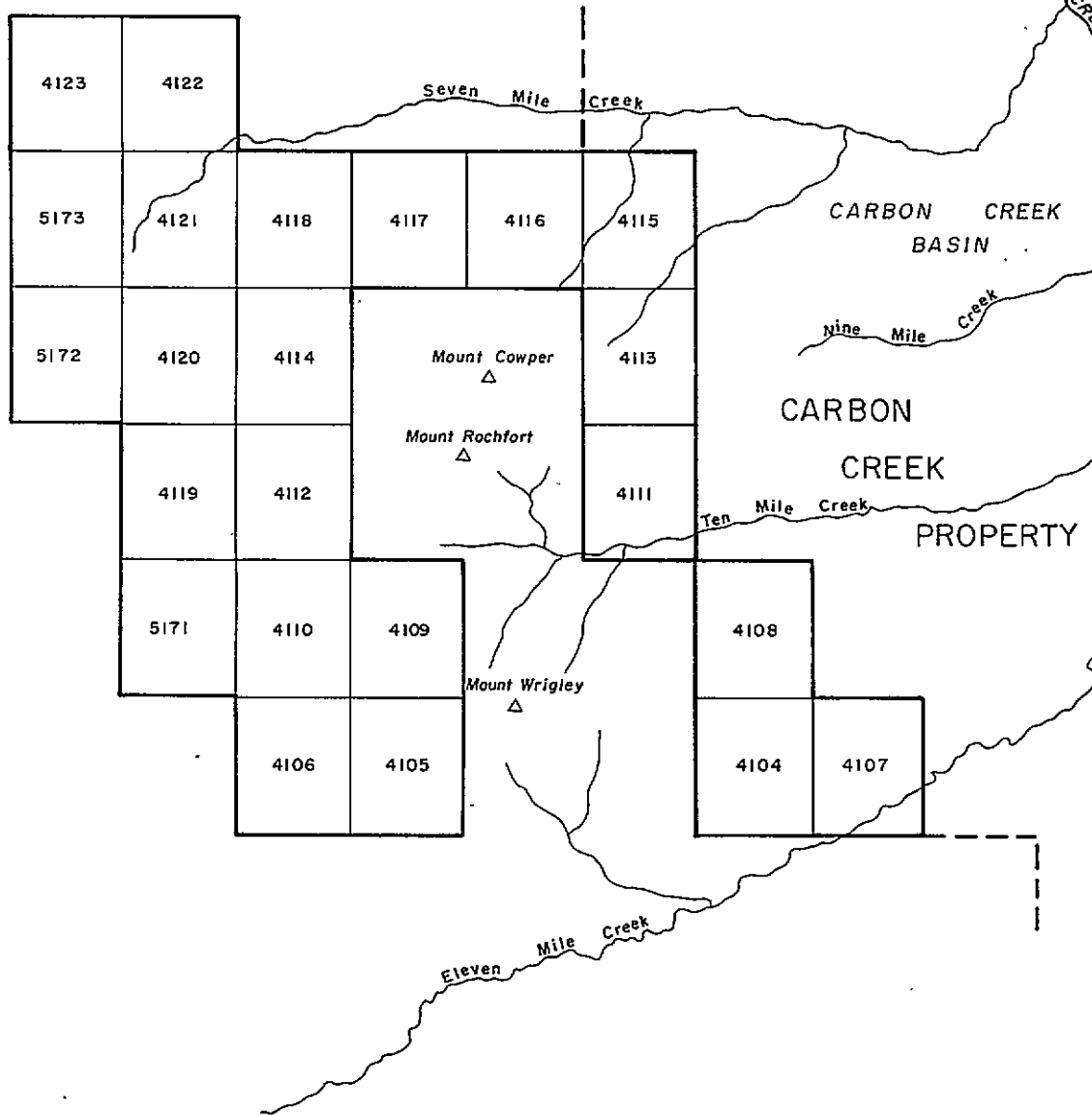
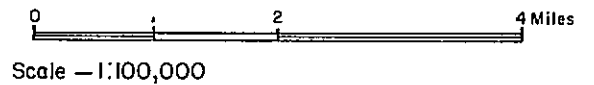


FIGURE — 3
WEST CARBON CREEK
COAL LICENCES



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 thrust faulting within the Foothills **belt** trend north-northwesterly, closely paralleling the belt. Thrust faults dip to the southwest. Bedrock structure and **lithology** are **commonly** reflected **by** the **topography**.

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 1989.1 metres **above** Sea level.

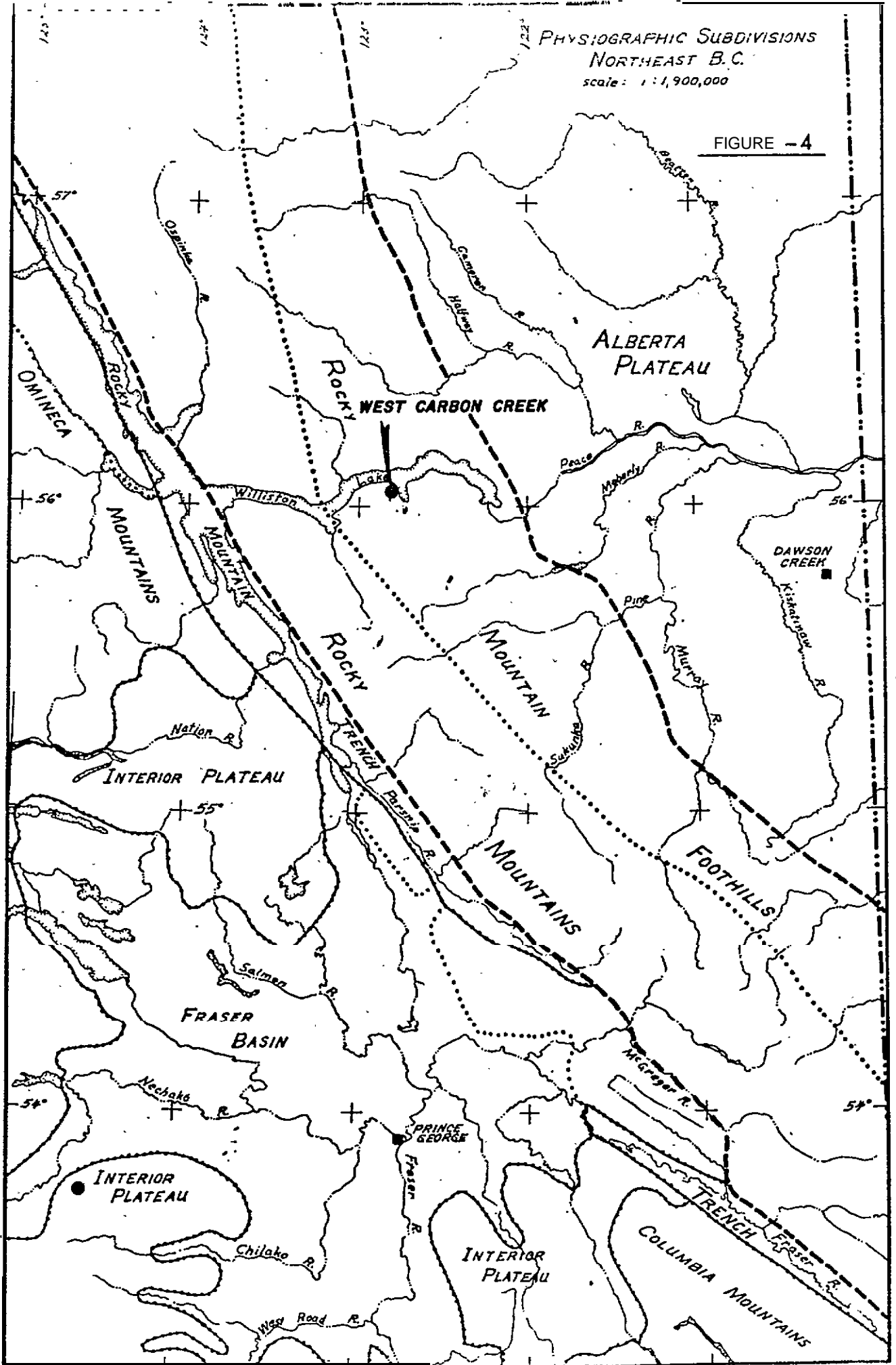
Peaks and ridges range in form **from** flat or rounded to acute **and** rugged. Slopes range **from** gentle to very **steep**. Dip slope surfaces **and** vertical **cliffs** are common. **Most** valleys are V-shaped in form with **minor** gravel deposits in their bottoms. **Many** streams have steep to vertical walled **canyons** over a part 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**. The, British **Columbia** Department of Mines then sent W.H. **Mathews** into the area to investigate the coal resources. Most of his **work** involved the structure and distribution of coal-bearing **rocks** **and** exposures of coal of possible commercial interest (Mathews, 1947). Since that time, several **other** geologists have mapped the area at regional scales. The **most** noteworthy contributions have been 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** made 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** the **Gething Formation, 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 several coal seams, one measuring **2.23 metres thick**.'

In August of 1978, 20 coal **licences** were acquired, **making up** 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. In total, **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 potential of the property, and to get a better understanding of the **stratigraphy and** 'structural **complexity** on the property. Extensive geological mapping conducted by **J. Ridley** led to a reinterpretation of the coal-bearing unit **from Gething** 'to the **Bickford** Formation. Three **diamond** drill holes with a total of 617.92 metres were drilled. **Twenty-one** coal samples were taken **from** the more end **analysed** as above.

1981 EXPLORATION PROGRAM

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.

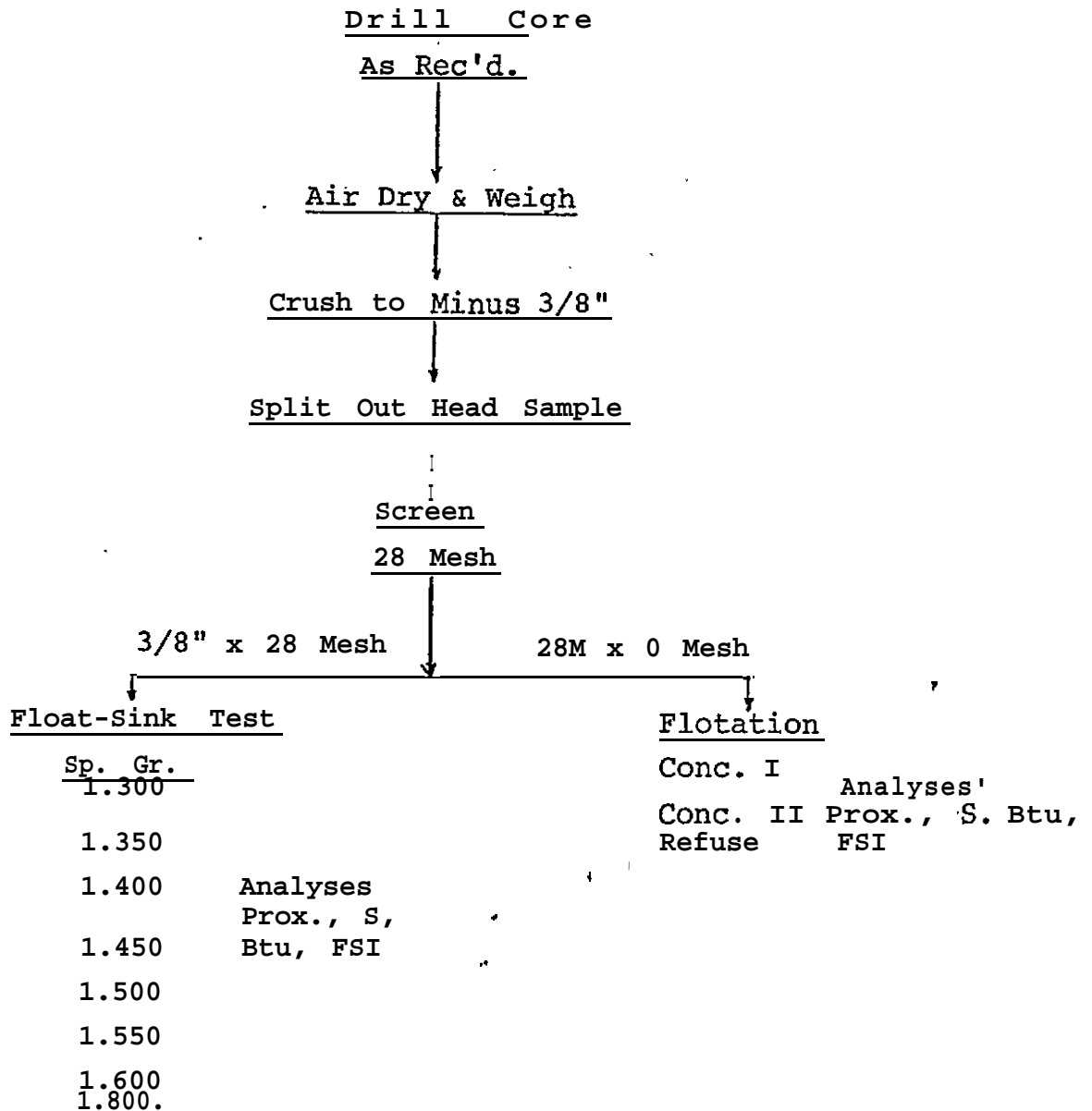
Two **helicopter supported** diamond drill holes were spudded on the **property**. Slashing crews for the 50 metres x 75 metres drill clearings consisted of K. Sheen and **J. Franz**. Longyear Canada Ltd. provided one '38' drill rig and drilling crews composed of **R. Marseille** and **R. Landry**, assisted by **C. McIvor** and B. Dakford. Drilling commenced **August 8, 1981** and was **completed August 20, 1981**. **Northern Mountain Helicopters** from Prince George, B.C. provided a **Bell 205** helicopter for the drill moves. **Rotortech** from Chetwynd, B.C. **supplied** a **Bell 206** helicopter for daily crew changes, supplies and the final drill move.

A total of 432 metres were drilled in the two holes. Core was described by **K. Foellmer** and **P. Cowley**. The **two holes** were probed by

Utah Mines personnel using Utah Mines, owned. Comprobe geophysical unit. A total of 30 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 1). Drill axe from the two holes is stored on Utah Mines Bri-Dowling Creek Property, at. D.D.H. BC80-22. Descriptive log.5 are found in Appendix III. Geophysical logs can be found in the map folder.

TABLE- I

CANADIAN COAL - FLOW SHEET



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
Water Soluble Alkalies
- 7) Sulfur Forms
- 8) Equilibrium Moisture

GEOLOGY - GENERAL AND LOCAL

STRATIGRAPHY:

The West **Carbon** Greek Property is underlain by folded **and** faulted Minnes Group sediments of Upper-Jurassic to Lower Cretaceous age (see **Map** 1 and 2, **Map** Folder),. The Minnes Group consists of, in ascending order, Monteith, **Beattie** Peaks, **Monach**, and **Bickford** Formations (see Figure 5, page 12). Formations within the Minnes Group find their type section in the Carbon Greek basin **and** vary in thickness away from this location as a result of **facies** change or erosion.

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. The upper **Monteith** unit contains approximately 300 metres of an almost continuous sequence of fine-grained orthoquartzites to **quartzite granular** conglomerate with mirror 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 **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 Beattie** Peaks Formation.

The marine **Beattie** Peaks Formation is distinguished **from** overlying and underlying strata by its recessive, thinly inter-bedded siltstone, fine-grained sandstone, **mudstone and** rare coals. **Casts, worm** tracks and burrows **are** common. The sandstone may contain abundant **pelecypods** in medium beds, making **good** marker beds in the formation.'

The, **Monach** Formation, **conformably** overlying the **Beattie** Peaks Formation, consists mostly- of massive quartz arenites and orthoquartzites **interbedded** with **some** siltstones, **mudstones** and thin **coal** s - . The sediments' **were** deposited in a **nearshore** marine

NOMENCLATURE OF THE LOWER CRETACEOUS BULLHEAD

AND FORT ST. JOHN GROUP

FIGURE - 5

		Muller 1961	Stott 1968 Pine River Foothills	(used in this report) Stott 1968 Upper Peace River	Flynn 1976		
Upper Cretaceous		Dunvegan Fm.	Dunvegan Fm.	Dunvegan Fm.			
			Cruiser Fm.	Cruiser Fm.			
Lower Cretaceous	Fort St. John Group	Cruiser Fm.	Fort St. John Group	Fort St. John Group	Hosler Fm. & Younger		
		Goodrich Fm.				Goodrich Fm.	
		Hosler Fm.				Hosler Fm.	
		Commotion Fm.				Commotion Fm. Boulder Creek Member Hulcross Member	Hosler Fm.
							Gotes Fm.
		Moosebor Fm.				Moosebor Fm.	Moosebar Fm.
	Bullhead Group	Gething Fm.	Bullhead Group	Bullhead Group	Bullhead Group	Gething Fm.	
		Monach Fm.					
		Beattie Peaks Fm. Montieth Fm.					Codomin Fm.
	Lower Cretaceous & Jurassic	Fernie Group	Minnes Group	Minnes Group	Minnes Group		
Jurassic		Fernie Group	Fernie Group				

environment. The stratigraphic similarity between the **Monach Formation** and the **Monteith Formation** makes identification difficult without exposure of the **Beattie** Peeks Formation.

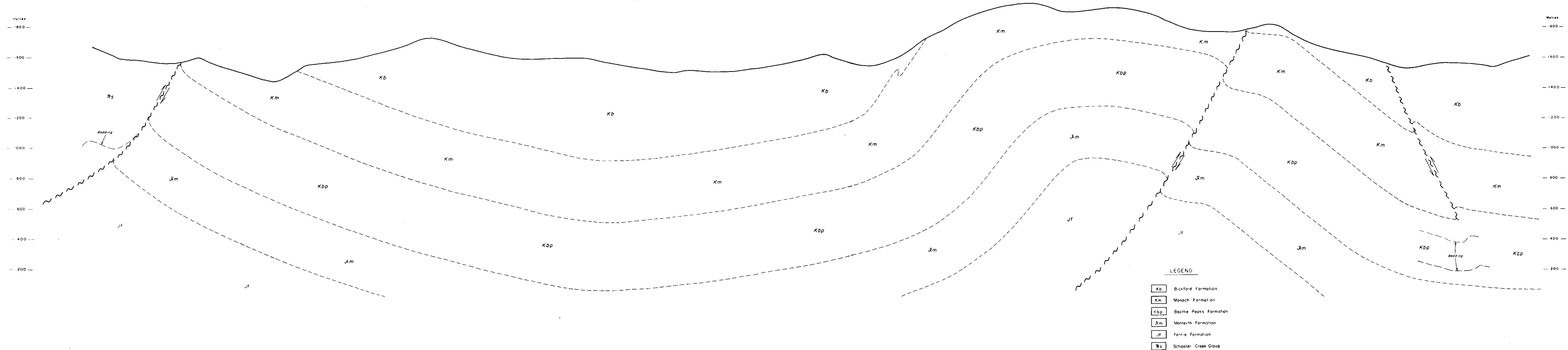
The nearshore deltaic Bickford Formation conformably overlies the **Monach** Formation. The Bickford Formation contains interbedded sandstones, siltstones, silty-**mudstones**, mudstones, coal and occasional conglomerates. This is the target' formation for metallurgical grade **coals** on the West Carbon Creek Property. 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** and **orthoquartzites** deposited in medium to thick beds. Many sandstones have a secondary calcite cement. Pure calc-arenites containing recrystallized shell fragments occur in the middle of the formation. The chert-quartzite pebble conglomerates, lenticular in distribution, range from 0.5 metres to 10 metres thick. The formation contains a higher percentage of siltstones and muddy siltstones than true mudstones.

A regional erosional unconformity exists between the Bickford Formation and the overlying Cadomin Formation. The Cadomin Formation is not exposed on the West Carbon Creek Property. In the vicinity the formation consists of approximately 60 metres of coarse **grained** sandstone with **lenticular** beds of **chert** and quartz pebble **conglomerate** and rare thin **mudstones** and **coal** seams. The stratigraphic similarity between the Bickford Formation and the overlying **Gething** Formation makes identification difficult without exposure of the intervening **Cadomin** Formation.

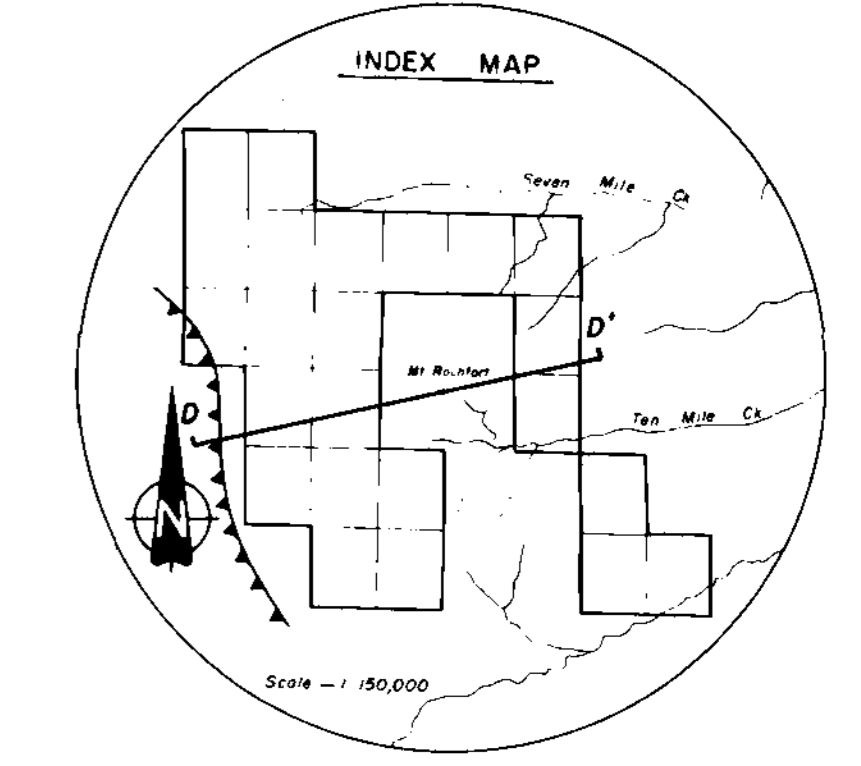
From several traverses on the West Carbon Creek Property late in 1981, **Stott** has relabelled the stratigraphic units on the property. The basis for the change results from the observation of a **mudstone** unit approximately 60 metres thick which he interprets as the **Moosebar** Formation. If this is true the 'coal-bearing unit on the property is **Gething** or Gething-Bickford sequence. This has yet to be verified by Utah Mines' personnel and until so the mapping of the West Carbon Creek Property remains as interpreted by **J. Ridley** in 1980. "

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 6, page 14). The major



- LEGEND
- Km Monach Formation
 - Kbp Beattie Peaks Formation
 - Jm Montevith Formation
 - Jf Fennie Formation
 - Rs Schooter Creek Group



UTAH MINES LTD.		
EXPLORATION DEPARTMENT Vancouver British Columbia		
WEST CARBON CREEK		
STRUCTURAL CROSS SECTION		
D — D'		
LOOKING NORTH		
Work by: J. Ridley	Date: April 1981	NTS Ref. 93 0 / 15
Drawn by: T. Drews	Revised:	Scale — 1:10,000
FIGURE — 6		

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 **Bickford** Formation is exposed in the **core**. The major **anticline**, lying on the **eastern half** of the **property, spreads** into a box **anticline** towards the north.

A reverse fault, dipping steeply to the **west-southwest, extends** along the eastern edge of the major anticlinal axis. **Movement** along the reverse fault is approximately 150 metres in the southern end **on** the **property**. There is at least one other fault in the West carbon creek area. **This** is a reverse, close to vertical, **block** fault. Movement is approximately 80 metres. Faulting is considered **contemporaneous** to **the folding**.

DRILL HOLE DATA

D.D.H. W.C.C. 81-6

A. WELL COMPLETION REPORT

location: In the alpine valley (**cirque**) 1.5 kilometres southwest
of WCC 78-1
McElhanney Co-ordinates: 38,175m N x 35,460m E
Coal Licence No. 4112

Elevation: 1505 metres

Orientation: Verticle

Date Collared: 8 August 1981

Date Completed: 11 August 1981 Plugged:- cemented

Overburden Depth: 3.66 metres

Casing Depth: 3.66 metres Casing Sir-e: H.W. - 114.3mm
recovered

Final Depth: 206.04 metres

Formations Encountered: 0m to 3.66m Overburden
3.66m to 206.04m Bickford Formation

Core Description By: K. Foellmer

Coal Seams Sampled:

<u>Sample No.</u>	<u>Interval</u>	<u>Thickness</u>	
		<u>Core</u>	<u>Density Log</u>
1	17.83m to 18.48m	0.65m	0.80m
2	34.57m to 35.46m	0.89m	1.20m
3	45.67m to 46.55m	0.88m	0.80m
4	48.10m to 49.23m	1.13m	1.20m
5	65.13m to 65.74m	0.61m	0.78m
6	73.13m to 73.76m	0.63m	1.00m
7	75.50m to 75.81m	0.31m	0.80m
8	86.15m to 86.49m	0.35m	0.60m
9	88.47m to 88.81m	0.34m	0.79m
10	89.50m to 90.04m	0.54m	0.43m
11	93.64m to 94.10m	0.46m	0.68m
12	101.37m to 101.85m	0.48m	1.15m

1 3	103.06m to 103.82m	0.76m	0.79m
1 4	126.57m to 127.15m	0.58m	0.60m
15	158.19m to 159.98m	1.79m	1.98m
16	174.34m to 175.66m	1.32m	1.68m
17	188.30m to 188.93m	0.63m	1.24m

Logs Run: Gamma, Density, Caliper by Utah Mines Ltd.

B. COMMENTS

Diamond drill hole WCC 81-6, on C.L. 4112, was located on the fringe of an alpine meadow. The few trees cleared to make a useable area were bucked into four foot lengths. All equipment was flown in by Northern Mountain's Bell 205 helicopter. Crew changes were flown by Rotortech's Bell 206 helicopter. Upon completion of drilling, all equipment and garbage was removed from the site.

Diamond drill tile WCC 81-6 penetrated the Bickford Formation, below 3.66 metres of overburden. The sediments intersected consisted of sandstones, siltstones, mudstones, and coals. Bedding angles, measured from a vertical axis, ranged from 79° to 85°. However, the lower 25 metres, with angles from 44° to 60° to core axis, indicates folding. The fold had been anticipated from surface mapping.

A total of 17 coal samples were removed from the core for analyses. Seams ranged in thickness from 0.03 metres to 1.98 metres. The range in analyses is shown in the following table..

AIR DRY BASIS		M.M. FREE	
%H ₂ O	0.92 to 1.77	%Vol.	25.42 to 32.70
%Ash	2.10 to 23.84	%F.C.	67.30 to 74.58
%S	0.63 to 1.96	BTU	14080 to 15139
%Vol	22.07 to 30.19	Rank -	High-Volatile A to
BTU	51.22 to 70.60		Medium-Volatile Bituminous
F.S.I.	11094 to 14544		
	1/2 8 1/2		

A. WELL COMPLETION REPORT

Location: 1.1 kilometres southsouthwest of WCC 78-2
McElhanney Co-ordinates: 42,615m N x 33,940m E
Coal Licence No. 4121

Elevation: 1255 metres

Orientation: **Verticle**

Date Collared: 16 August 1981

Date Completed: 20 August 1981 **Plugged** - yes, cemented

Overburden Depth: 2.13 metres

Casing Depth: 213 metres **Casing Size:** HW-114.3mm
recovered

Final Depth: 224.50 metres

Formations Encountered: 0m to 2.13m Overburden
2.13m to 224.50m Bickford Formation

Core Description By: K. Foellmer and P.S. Cowley

Coal Seams Sampled:

<u>Sample No.</u>	<u>Interval</u>	<u>Thickness</u>	
		<u>Core</u>	<u>Density Log</u>
1	9.87m to 10.65m	0.63m	0.78m
2	58.17m to 59.03m	0.64m	0.86m
3	77.35m to 78.35m	0.89m	1.00m
4	95.20m to 95.70m	0.38m	0.50m
5	98.80m to 99.69m	0.71m	0.79m
6	108.57m to 109.30m	0.54m	0.73m
7	116.79m to 117.39m	0.56m	0.60m
8	139.23m to 140.02m	0.89m	0.79m
9	174.58m to 175.18m	0.34m	0.60m
10	182.50m to 183.80m	1.19m	1.30m(0.20m split)
11	193.42m to 194.17m	0.56m	0.75m
12	205.00m to 205.60m	0.30m	0.60m
13	209.35m to 210.45m	0.66m	1.10m

Logs Run: Gamma, Density, Caliper

B. COMMENTS

An area approximately 50 metres x 75 metres was cleared for WCC 81-7. All trees were bucked into four foot lengths or less. Northern Mountain Helicopters supplied a Bell 265 helicopter for the initial equipment move. Rotorteck Helicopters provided a Bell 206 helicopter for crew changes and the final removal of equipment. All garbage was removed from the drillsite.

The Bickford Formation was penetrated below 2.13 metres of overburden. The rock types encountered were sandstone, siltstone, mudstone, coal and minor conglomerate. Bedding angles ranged from 78° to 88° from vertical core axis.

Thirteen samples were taken from the core and analysed. Seams ranged in thickness from 0.02 metres to 1.19 metres. The following table illustrates analytical variations in the s- analysed.

AIR DRY BASIS		M.M. FREE	
%H ₂ O	1.06 to 1.64	%Vol.	23.26 to 28.34
%Ash	1.74 to 26.58	%F.C.	71.66 to 74.74
%S	0.58 to 1.10	BTU	15188 to 15582
%Vol	20.75 to 26.89	Rank	Medium Volatile Bituminous
%F.C.	51.46 to 71.50		
BTU	10881 to 15045		
FSI	6 1/2 to 8		

COAL SEAM CORRELATION

Attempts have been made to correlate coal seams of the Bickford 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. Structure is variable across the West Carbon Creek Property. 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. A reliable marker horizon has not been established within the Bickford Formation where drilling has been restricted to West Carbon Creek. Beds of shell fragments have been recorded in WCC 80-4 but marine or non-marine, it is common to have shell fragments in isolated pods (Howard and Reineck, 1981). The result of these correlation problems is a very tentative correlation until closer spaced drilling is performed.

Diamond drill holes WCC 78-2 and WCC 81-7 have been correlated together as the lower Bickford Formation. Diamond drill holes WCC 80-3, WCC 804 and WCC 80-5 have been correlated as the middle Bickford Formation. Diamond drill holes WCC' 78-1 and WCC 81-6 were correlated as upper Bickford Formation (see Figure 7, map folder). There does not appear to be overlap between the three groups. Tonnage calculations have not been performed because coal seam continuity is unknown.

CONCLUSIONS AND RECOMMENDATIONS

The objective of the 1981 exploration program was to provide further information on the extent, metallurgical quality and continuity of coal seams on the West Carbon Creek Property. Two diamond drill holes totalling 432 metres were spudded in the coal-bearing Bickford Formation:

The northwest portion of the property appears to be the only structurally favourable area with high quality economically recoverable coal seams. To date a total of 1422 metres of drilling from seven diamond drill holes have outlined an area approximately ten square kilometres of flat lying to gently dipping coal measures in the core of a syncline. The area is covered by nine, of the twenty-three coal licences making up the West Carbon Creek Property. Away from this area, sediments are severely folded and faulted. It is recommended that an extensive mapping program be conducted in 1982, so that the substantial number of coal licences covering severely deformed sediments be reconsidered for termination.

The s-d objective of the proposed 1982 mapping program will be to verify the stratigraphy on the West Carbon Creek Property. There is a discrepancy between interpretations presented by the Geological Survey of Canada and the 1981 Report of Exploration Activities on the West Carbon Creek Property. Extensive mapping will put this question to rest.

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 geographical and structural considerations. The limited information available between widely spaced drill holes and structural variability across the property made estimation difficult and unreliable; It will be the third objective of the proposed 1982 mapping program to concentrate between drill holes to obtain as much structural information as possible to aid in the correlation.

Correlation of the drill hole data shows numerous coal seams greater than 1.0 metres thick throughout the Bickford section on the West Carbon Creek Property. There is no overlap between three groupings of drill holes. Overlap is so poor that seams are rarely penetrated twice. In effect, the present drilling pattern has only tested the Bickford Formation and incompletely at that. Coal seam continuity is indeterminate so tonnage calculations are not performed. It is; therefore; recommended for the 1982 exploration program to conduct infill drilling to aid in correlation and tonnage estimates as opposed to peripheral drilling to further outline the structurally favourable area.

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APPENDIX I

DESCRIPTIVE LITHOLOGIC LOGS

D.D.H. W.C.C. - 81-6 and 7

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0

CORE DESCRIPTION

HOLE# WCC-DDH-81-6 From 0 To 7.60
 Area West Carbon Creek By K. Foellmer

FROM	TO	DESCRIPTION
0	3.66	OVERBURDEN
3.66	5.18	Cored and triconed; only 0.70m of core in box; . measurements are estimated only.
3.66	3.71	Sandstone - medium grained, salt and pepper; very highly broken - difficult to determine true thickness minor iron staining; coaly streaks; carbonaceous plant debris.
3.71	4.32	COAL 0.61m - core loss 0.48m; sheared, broken, pyrite on sheared surfaces, calcite on fractured surfaces; poorly cleated: predominantly clar0-durain due to broken core.
4.32	4.62	Mudstone - dark brown, core loss 0.19m; very hard, abundant calcite stringers, carbonaceous plant debris pyrite; fracture at about 4.39m angling at 60° to core axis; coaly streaks near lower contact.
4.62	4.93	COAL 0.31m core loss 0.23m; black; highly sheared, broken, minor pyrite disseminated throughout; pyrite on sheared surfaces; predominant clarodurain; difficult to determine composition due to shearing.
4.93	5.00	Sandy siltstone - medium grey; abundant calcite stringers, coaly streaks, fractured.
5.00	5.31	Silty mudstone - medium grey; coaly streaks; carbonaceous plant debris; minor calcite; minor slickensides.
5.31	6.49	Coaly mudstone - black (core loss 0.80m?); broken; abundant carbonaceous plant debris; coaly streaks; fractured; calcite on fracture.
6.49	7.18	Siltstone - sandstone interlaminated; siltstone - medium grey; sandstone.- fine grained, salt and pepper; convoluted bedding, coaly streaks near upper contact surrounded by calcite, minor worm burrows, carbonaceous plant debris, scouring, calcareous cement, ripple marks.
7.18	7.52	Mudstone - dark grey to black, silty near upper contact, minor pyrite, minor coaly streaks, shell molds - Bivalvia, calcareous cement:
7.52	7.60	COAL 0.08m; black, highly sheared, broken, bright,

FROM	TO	DESCRIPTION
		unable to determine composition.
7.60	8.46	Siltstone, sandstone, mudstone - interbedded and interlaminated; convoluted bedding; scouring, load casts; slickensides at 7.72 angling at 72° to core axis, and at 7.93 angling at 80° to core axis; calcite on slickenside surfaces, minor calcite stringers throughout, abundant carbonaceous plant debris, minor worm burrows, minor coaly streaks, pyrite on plant debris, calcareous cement.
8.46	8.76	Siltstone - medium grey, slightly muddy in centre of section, carbonaceous plant debris, minor coaly streaks, pyrite and calcite on plant debris, calcareous cement.
8.76	9.10	Sandstone - salt and pepper, fine grained to medium grained, fine grained, medium grey from 9.00 to 9.10m; minor carbonaceous mudstone laminae, cross bedded, almost vertical fracture from 8.76 to 8.99m, minor carbonaceous plant debris, minor scouring, calcareous cement, calcite stringer at 9.06m angling at 85° to core axis.
9.10	9.38	Mudstone - dark grey to black, minor siltstone laminae abundant coaly streaks near base, calcite surrounding coaly streaks, abundant carbonaceous plant debris, calcareous cement.
9.38	9.57	COAL 0.19m; core loss of 0.09m, broken, sheared, bright laminae predominantly clarodurain.
9.57	9.84	Mudstone - dark grey to black, coaly in places; abundant coaly streaks, coal band at 9.80m, minor slickensides, minor pyrite, carbonaceous plant debris
9.84	9.93	COAL 0.09m; black, abundant slickensides, sheared, bright laminae, minor pyrite, about 30% vitrain, 70% clarodurain.
9.93	9.99	Mudstone - dark grey to black; abundant coaly streaks, carbonaceous plant debris.
9.99	10.92	Sandstone, siltstone, mudstone interbedded, sandstone salt and pepper, fine grained; siltstone, - medium

HOLE+ WCC-DDH-81-6From 10.92 To 17.40

FROM	TO	DESCRIPTION
		grey; mudstone - dark grey; decreasing amount of mudstone towards base, minor convoluted bedding, scouring, load structures, slump structures, carbonaceous plant debris, minor coaly streaks.,
10.92	11.29	Siltstone - medium grey; minor carbonaceous plant debris, possible minor shell fragments, calcareous cement.
11.29	11.69	Siltstone - minor fine grained sandstone laminae near base, medium grey to medium dark grey; increased mud content towards-base, shell-molds, calcite replacement of shell, shell fragments, minor carbonaceous plant debris, calcareous cement.
11.69	12.26	Mudstone - dark grey to black; minor carbonaceous plant debris, minor burrows, coaly streaks near base.
12.26	12.46	COAL 0.20m; core loss of 0.16m; black, sheared,, predominantly clarodurain, poorly cleated.
12.46	12.58	Coaly mudstone - black; abundant coaly streaks,, fractured, pyrite on fracture surfaces; carbonaceous plant debris, pyrite on carbonaceous plant debris.
12.58	13.79	Siltstone - minor fine grained sandstone laminae; medium grey; core loss of 0.20m, fracture at 12.88 and angles at 14° to core axis; and fracture at 13.09m angling at 30° to core axis: carbonaceous plant debris, calcite on carbonaceous plant debris,, carbonaceous plant debris more abundant towards base, calcareous cement, minor worm burrows.
13.79	15.27	Siltstone - medium grey; minor fine grained sandstone near base; fracture at 14.61 angling at 29° to core axis; partial vertical fracture at 15.00m, coaly streaks in centre of section, carbonaceous plant debris, minor worm burrows, calcareous cement.
15.27	17.40	Sandstone - siltstone interbedded and interlaminated; sandstone - salt and pepper, fine grained to medium grained, cross laminated; siltstone - medium grey, slightly muddy in places; cross bedding, planer laminated, ripple marks, minor convoluted laminae,

HOLE#

WCC-DDH-81-6

From 17.40

T o 26.17

FROM	TO	DESCRIPTION
		worm burrows, siltstone more abundant near upper contact, several vertical fractures, fracture at 15.52 angling at 22° to core axis, minor carbonaceous plant debris, bedding angles at 84° to core axis, minor scouring and load structures, calcite cement.
17.40	17.72	Siltstone - medium grey; increased mud content towards base, minor carbonaceous plant debris, minor shell molds, calcareous cement.
17.72	17.83	Mudstone - black; minor carbonaceous plant debris, coaly streak near upper contact; gradational lower contact.
17.83	18.48	COAL black 0.65m thick; core loss of 0.15m; sheared, poorly cleated, muddy near upper contact; about 5% vitrain, about 95% clarodurain; mudstone split from 17.09m to 17.94m; distinct lower contact angles at 87° to core axis; recovery; sample #1.
18.48	18.60	Carbonaceous mudstone - to black; abundant carbonaceous plant debris; abundant coaly streaks.
18.60	19.00	Muddy sandstone - dark grey; minor carbonaceous plant debris; small shell molds (bivalvia); shell fragments; calcite cement.
19.00	21.55	Sandstone - salt and pepper, fine grained; minor siltstone laminae; cross bedding; ripple marks; rip up silt clasts; minor worm burrows; minor carbonaceous plant debris; calcite cement.
21.55	22.68	Sandstone - siltstone - mudstone laminae, interbedded; sandstone - fine grained, salt and pepper, cross laminated; siltstone - medium grey; mudstone - dark grey; increased amount of mudstone to base; mudstone slightly carbonaceous, scouring; load structures; planar laminae, abundant worm burrows; bedding angles at 82° to core axis; minor carbonaceous plant debris; calcareous cement; coaly streaks near base.
22.68	26.17	Sandstone - siltstone - interbedded; sandstone - salt and pepper, fine grained to medium grained; siltstone

HOLE# WCC-DDH-81-6

From 26.17 TO 29.03

FROM	TO	DESCRIPTION
		medium grey to medium dark grey, slightly muddy in places; convoluted bedding; coaly streaks, carbonaceous plant debris; scouring; minor slickensides; fractures at 23.07 angling at 68° to core axis; 23.11m angles at 79° to core axis; 23.16m, angles at 84° to core axis; 23.18, angles at 87° to core axis; at 23.66 angles at 76° to core axis; at 24.10m, angles at 70° to core axis; calcite on fracture surfaces; calcite brecciated zone from 24.19 to 24.25; calcareous cement minor worm burrows; possible shell fragments!
26.17	26.70	Siltstone - medium grey, minor fine grained sandstone laminae; scouring; carbonaceous plant debris;
26.70	27.04	Mudstone - black; shell fragments; pyrite replacement of shell fragments; shell molds - Bivalvia; minor carbonaceous plant debris; fracture at 26.94m and angles at 12° to core axis.
27.04	27.40	Muddy siltstone - medium dark grey; shell molds; minor carbonaceous plant debris; minor calcite on plant debris..?
27.40	27.50	Mudstone - dark grey; broken, minor carbonaceous plant debris, calcite on slickenside surface.
27.50	28.21	Siltstone - medium grey to medium dark grey; gradational from mudstone at upper contact: fracture at 28.07, angles at 68° to core axis; calcite on fracture surface; minor calcite stringers around fracture surface; plant rootlets; carbonaceous plant debris; coaly streaks; calcareous cement.
28.21	28.64	Sandy siltstone - medium light grey; fractures at 28.41 and angle at 55° to core axis; at 28.59m angle at 38° to core axis; calcareous cement.
28.64	29.03	Sandstone - siltstone interlaminated; sandstone - salt and pepper, fine grained, cross laminated; siltstone - medium grey; minor worm burrows, vertically fractured throughout section, ripple marks, calcite on fracture, minor pyrite on fracture surface; bedding angles at 80° to core axis; scouring; load structures

HOLE? WCC-DDH-81-6From 29.03 To 34.26

FROM	TO	DESCRIPTION
		calcareous 'cement.
29.03	30.31	Siltstone - medium grey, minor sandstone laminated in centre of section, slightly muddy near base; vertically fractured in upper half of section; calcite on fracture surface; fracture at 29.98, and angles at 30° to core axis; minor coaly streaks in lower half of section; minor carbonaceous plant debris; calcareous cement.
30.31	30.90	Muddy siltstone - medium dark grey; increased mud content towards base; partial vertical fracture towards lower section; coaly streaks: shell fragments: pyrite replacement of shell fragments; calcite surrounding coaly streaks; 'carbonaceous plant debris.
30.90	31.98	Siltstone - medium grey, slightly muddy near base; 'minor carbonaceous plant debris; coaly streaks; pyrite and calcite on coaly streaks; calcareous cement calcite stringers from 31.42 to 31.46m.
31.98	32.24	Silty mudstone - dark grey to brown; abundant coaly streaks; abundant carbonaceous plant debris; slickensides at 32.08 angles at 82° to core axis; at 32.05 angles at 87° to core axis; calcite on slickenside surface; calcareous cement.
32.24	32.39	Sandstone - salt and pepper, medium grained to fine. grained; fine grained, medium grey from 32.35 to 32.39 minor carbonaceous mudstone laminated; scouring: ripple marks; planar laminae; bedding angles at 84° to core axis; carbonaceous plant debris; minor coaly streaks; calcareous cement.
32.39	33.88	Siltstone with minor sandstone laminae; siltstone - medium grey; scouring; minor load casts: carbonaceous debris; shell fragments: calcite on plant debris; bedding angles at 85° to core axis; calcareous cement; worm burrows.
33.88	34.26	Sandstone - siltstone interlaminated; sandstone - salt and pepper, fine grained; siltstone - medium grey; worm burrows; minor calcite stringers: minor carbon-

HOLE+

WCC-DDE-81-6

From 34.26

To 38.12

FROM	TO	DESCRIPTION
		aceous plant debris; ripple marks; load structures; scouring; planar and cross laminated; -bedding angles at 85° to core axis; calcareous cement.
34.26	34.57	Mudstone - dark grey to brown; slightly silty; abundant carbonaceous plant debris; minor pyrite; possible minor shell fragments.
34.57	35.46	COAL 0.89m BLACK; core loss 0.28m; broken and sheared near upper and lower contacts; bright laminae; about 10% vitrain; 90% clardurain; minor fusain; poorly cleated; recovery; lower contact distinct angle at 74° to core axis; upper contact distinct angle at 83° to core axis; sample 2.
35.46	35.72	Muddy siltstone - dark grey; abundant carbonaceous plant debris with calcite on debris; minor coal streaks; minor pyrite.
35.72	35.91	COAL 0.19m BLACK; highly broken; core loss 10 cm; calcite on sheared surfaces; unable to determine composition due to shearina.
35.91	35.99	Mudstone - dark grey; carbonaceous plant debris; minor coaly streaks; slickensides at 35.92m angles at 84° to core axis; calcareous cement.
35.99	36.63	Sandstone - siltstone interlaminated and interbedded; sandstone - salt and pepper, -fine grained to medium grained; siltstone - medium grey; sandstone more predominant near upper contact; planar laminae; minor convoluted bedding; slump structures; load structures; minor coal streaks surrounded by calcite; carbonaceous plant debris; worm burrows, calcareous cement.
36.63	37.42	Silty mudstone - medium dark grey; higher mud content in centre of section; minor slickensides; abundant carbonaceous plant debris; coaly streaks; calcite on coaly streaks; abundant-calcite stringers from 36.92 to 37.02m; calcareous cement.
37.42	38.12	Sandstone - salt and pepper, medium grained; minor siltstone laminated near upper contact; minor carbon-

FROM	TO	DESCRIPTION
		aceous mudstone laminated throughout; minor scouring; cross bedding; minor carbonaceous plant debris; minor coaly streaks; worm burrows in upper half of section; calcite on plant debris; calcareous cement; bedding angles at 84° to core axis.
38.12	38.41.	Mudstone - dark grey; fractured and broken from 38.24 to 38.34m; minor carbonaceous plant debris: small shell molds; minor worm burrows in upper half of section; pyrite replacement of shell debris: calcareous cement.
38.41	38.96.	Siltstone - medium grey, slightly sandy in places; minor worm burrows; coaly streaks; abundant carbonaceous plant debris: calcite on carbonaceous debris; minor shell fragments near upper contact; calcareous cement.
38.96	39.87	Siltstone - sandstone interbedded; siltstone - medium grey to medium dark grey, predominant; sandstone - salt and pepper to light medium grey; fine grained; scouring; load structures; minor convoluted bedding; carbonaceous plant-debris; pyrite and calcite on plant-debris; minor worm burrows; calcareous cement; vertical fracture from 38.96 to 39.52m; fracture at 39.52m angles at 83° to core axis; calcite on fracture surfaces.
39.87	40.68	Sandstone - salt and pepper, medium grained, minor siltstone laminated; siltstone bed from 40.31m to 40.35m; fracture at 39.89m angles at 65° to core axis, 39.94m angles at 74° to core axis: abundant slump structures in lower half of section; scouring; load structures; calcite on fractures; minor carbonaceous plant debris; minor coaly streaks; calcareous cement; plant rootlet.
40.68	41.10	Siltstone - medium dark grey to dark grey; muddy in centre of section; slickensides at 40.74 angling at 86° to C/A, and @ 40.81m angling at 60° to C/P. and @ 40.86 angling at 69° to C/A and @ 41.02m angling @ 68° to C/A & 41.10m angling @ 70° to C/a calcite

HOLE# WCC-DDH-81-6.

From 41.10 To 45.32

FROM	TO	DESCRIPTION
		on fracture surfaces, minor calcite stringers .
		throughout, minor coaly streaks, minor carbonaceous
		plant debris calcite cement; possible shell frag-
		ments
41.10	41.90	Sandstone, salt & pepper, fine grained to medium
		grained, increasing grain size to base, minor
		siltstone lam. near upper contact, ripple marks,
		X-bedding, scouring, minor worm burrows, calcite
		stringers, fracture zone from 41.41 to 41.49m,
		slickensides @ 41.24 anqing @ 70° to C/A
		anqing @ 41.31, anqing, . @ 84° C/A anqing
		@ 41.49m with anqing @ 88° to C/A; partial
		vertical fracture from 41.58 to 41.75m with calcite
		fracture surfaces, minor carbonaceous plant debris,
		calcareous cement, bedding anqing @ 81° to C/A
41.90	42.20	Muddy Siltstone, medium dark grey to dark grey,
		fractures @ 41.90m anqing @ 70° to C/A anqing
		@ 41.96 anqing @ 62° to C/A and @ 42.18m anqing
		@ 80° to C/A., coaly streaks: calcite on fracture
		surfaces, carbonaceous plant debris, calcite
		surrounding coaly streaks, calcareous cement
42.20	44.56	Sandstone, salt & pepper, fine grained - medium
		grained, carbonaceous mudstone lams @ 43.37m to
		43.65m; siltstone bedding @ 42.44 to 42.47m;
		ripple marks, X-bedding, scouring, minor -load
		structure, fractured through upper 1/2 of section
		predominately vertical fractures ie @ 43.31m
		anqing @ 19° to C/A, @ 44.00 anqing
		@ 69° to C/A; calcite on slickenside surfaces,
		calcareous cement, minor carbonaceous plant debris,
		minor worm burrows in upper 1/2 of section
44.56	45.12	Siltstone, medium dark grey, minor fine grained
		sandstone lams. vertically fractured throughout,
		carbonaceous plant debris, calcareous cement:
		shell molds'
45.12	45.32	Eludstone, dark grey to black, shell molds bi valvia,
		shall fragments, fractured vertically through section:
		calcareous cement

FROM	TO	DESCRIPTION
45.32	45.36	COAL - 0.04m black, highly broken sheared, slightly muddy in places, unable to determine composition
45.36	45.40	Siltstone, medium grey, abundant carbonaceous plant debris, calcareous cement
45.40	45.56	Sandstone, salt & pepper, fine grained, minor carbonaceous mudstone laminae, X-bedding, minor carbonaceous plant debris, minor coaly streaks, lead structures
45.56	45.67	Siltstone medium grey, coaly streaks, carbonaceous plant debris; Calcareous Cement, calcite on plant debris
45.67	46.55	COAL - 0.88m Black 0.18m core loss from 45.80 to 45.86 mudstone split, coaly streaks, fractured, bright lams., calcite on shear surface ~ 15% vitrain, 5% fusain, 80% claro durain RECOVERY 88% upper contact distinct angle @ 82° to C/A, lower contact distinct 80° to C/A SAMPLE 3
46.55	46.84	Sandstone, Siltstone interlam. Sandstone Salt & Pepper fine grained, siltstone medium grey Sandstone predominant ripple marks, X-bedding, Minor carbonaceous plant debris, minor scouring
46.84	47.07	Mudstone-medium dark grey to dark grey, slightly silty near upper and lower contacts, coaly streaks, carbonaceous plant debris, calcareous cement, minor slickensides
47.07	48.03	Sandstone, salt & pepper medium grained, minor siltstone lam; mud rip up clasts from 47.97 to 48.00m/ minor convoluted bedding, minor coaly streaks, minor carbonaceous plant debris, minor slickensides, calcareous cement, fracture @ 47.80m angled @ 9° to C/A
48.03	48.10	Silty Mudstone; dark grey; abundant plant debris minor coaly streaks
48.10	49.23	COAL 1.13m Black, core loss 0.12m Mudstone lenses from 48.90 to 49.02m; poorly cleated bright banded ~ 6% fusain; 17% vitrain, 77% claro durain, sheared, sheared near lower

FROM	TO	DESCRIPTION
		contact/ upper contact distinct angle @ 78° to C/A
		lower contact gradational SAMPLE 4
		RECOVERY
49.23	49.71	Siltstone medium grey; slightly muddy near upper contact, coaly streaks near upper contact, carbonaceous plant debris; minor fine grained sandstone lams near base
49.71	49.83	Sandstone, Siltstone, interbedded, sandstone salt & pepper medium grained; siltstone medium grey, worm burrows; coaly streaks, minor carbonaceous plant debris, bedding angle @ 84° to C/A; Sandstone has calcareous cement.
49.83	50.06	Muddy siltstone medium dark grey; abundant coaly streaks, abundant carbonaceous plant debris
50.06	50.11	Mudstone black, broken, slickensides, carbonaceous plant debris
50.11	50.24	COAL 0.13m black 0.05m core loss; cleated, broken, predominant vitrain, bright
		RECOVERY 18%
50.24	50.34	Mudstone dark grey to black, abundant plant debris, abundant coaly streaks, minor slickensides
50.34	50.44	COAL - 0.10m Black 0.04m core loss; highly broken, contains mudstone unable to determine location, 40% vitrain 60% claro durain
50.44	50.54	Coaly mudstone black, abundant coaly streaks, abundant carbonaceous plant debris
50.54	51.40	Siltstone; Sandstone interbedded, siltstone medium grey, predominant; sandstone salt & pepper to medium light grey fine grained, mudstone bedding @ 51.03 to 51.05m; scouring, load structures; Minor convoluted bedding, minor worm burrows, coaly streaks, carbonaceous plant debris, calcite surrounding coaly streaks, fracture @ 50.67m, Angled at 15° to C/A, calcite cement, coaly chips in centre of section
51.40	51.68	Coaly mudstone, dark grey brown - black, abundant coaly streaks, carbonaceous plant debris with calcite. on debris, slickensides 51.48m angled @ 75° to C/A

HOLE#

WCC-DEH 81-6

From 51.68

TO 56.34

FROM	TO	DESCRIPTION
51.68	51.80	COAL - 0.12m - coreloss ~ 0.05m black; highly broken and sheared bright banded ~ 10% vitrain ~ 90% claro-durain
51.80	51.89	Mudstone - black Abundant carbonaceous plant debris, coaly streaks
51.89	52.06	COAL - 0.17m black, CORE LOSS ~ 0.05m broken, contains possible mudstone splits, fractured bright lam. ~ 35% vitrain, ~ 65% claro-durain
52.06	52.94	Mudstone - dark grey to black - minor silt content from 52.74 to 52.84 abundant coaly streaks near base, small shell molds, minor carbonaceous plant debris, calcite on carbonaceous debris, broken core from 52.08 to 52.31m
52.94	52.96	COAL - 0.02m black, cleated 100% vitrain, pyrite on cleat pyrite band < 0.01m at upper contact on slickenside surface
52.96	53.49	Mudstone, Muddy Siltstone - mixed Mudstone, black, slightly carbonaceous, muddy silt- stone, medium dark grey mixed and convoluted bedding carbonaceous plant debris, minor slickensides, calcite on slickenside surface, coaly streaks, calcite stringers near base, abundant pyrite from 53.33m to 53.40m.
53.49	53.69	Mudstone, dark grey - minor silt content to base minor carbonaceous plant debris, small shell molds calcareous cement near base, gradational lower contact
53.69	56.34	Siltstone, medium grey, slightly muddy in places, minor fine grained sandstone lam. near base; calcare- ous cement Minor scouring, minor worm burrows, minor carbonaceous plant debris Fractures @ 53.79m angled at 81° to C/A, 55.39m angled at 81° to C/A, 55.40m angled @ 82° to C/A, 55.56m angled @ 37° to C/A, 55.68m angled @ 70° to C/A, 55.92m angled @ 78° to C/A. Fracture zone from 55.79m to 55.84m, calcite on fractures

HOLE#

WCC-DDH-81-6

From 56.34

To 62.88

FROM	TO	DESCRIPTION
56.34	57.82	Siltstone, sandstone, interbedded
		Siltstone, medium grey, slightly muddy in places, predominant throughout, sandstone, salt & pepper, fine grained to medium grained
		worm burrows, planar lam., scouring, load structures, Bedding angled @ 81° to C/A., calcareous cement
57.82	58.60	Siltstone, medium grey
		Carbonaceous plant debris, minor coaly streaks
58.60	59.32	Sandstone, siltstone, interbedded, interlam.
		Sandstone, salt & pepper, fine grained, X-lam.
		Siltstone, medium grey
		Ripple marks, X-bedding, scouring, worm burrows, minor carbonaceous plant debris
59.32	62.53	Sandstone, salt & pepper, fine grained to coarse grained, increasing grain size from medium grained to coarse grained from 59.32m to 61.96m, increasing grain size from fine grain to very coarse grain from 61.96 to 62.54m
		Minor carbonaceous mudstone lam near upper contact
		Silty mudstone, rip up clasts from 59.68 to 59.72m, from 60.90m to 61.07m, from 61.89m to 61.93m; minor calcite stringers in centre of section
		Fracture zone from 59.73m to 59.85m
		Fracture @ 60.99m angled @ 60° to C/A; 61.18m angled @ 62° to C/A
		Vuggy calcite veinlet @ 60.96m/ minor slickensides
		Very minor carbonaceous plant debris, minor chert-quartz pebbles up to 0.03cm in diameter near lower contact
		Calcareous cement
62.53	62.88	Conglomerate - quartz-chert pebble; pebbles from 0.01cm to 0.10cm in diameter, largest pebbles in centre of section; coarse grain sandstone matrix, matrix up to 80% from 62.53 to 62.61m decreasing to base ~ 30% near base, calcareous cement, minor coaly chips

HOLE#

WCC-DDH-81-6

From 62.88

To 69.80

FROM	TO	DESCRIPTION.
62.88	63.17	Silty Mudstone - dark grey Carbonaceous plant debris, coaly streaks Slickensides @ 63.01m angled @ 60° to C/A, 63.09m angled @ 67° to C/A minor calcite on slickensides, minor calcareous cement
63.17	63.27	Coaly mudstone, black abundant coaly streaks, abundant carbonaceous plant debris
63.27	64.87	Sandstone, muddy siltstone, interbedded, interlam. Bedding angled @ 89° to C/A Sandstone, salt & pepper, fine grain to medium grain - X-lam. Sandstone increasing to base Muddy siltstone, medium grey, mup rip up clasts @ - ripple marks, minor convoluted bedding, scouring load structures, minor slumping, plant rootlets, minor carbonaceous plant debris, minor worm burrows, Fractures @ 64.36 angled at 90° to C/A @ 64.46m angled @ 70° to C/A, calcite on Fracture, calcareous cement 64.63 to 64.65m
64.87	65.13	Silty Mudstone, dark grey - carbonaceous near base minor carbonaceous plant debris, minor worm burrows near upper contract, coaly streaks near base, minor calcareous cement
65.13	65.74	COAL - 0.61m CORE LOSS 0.05m black, muddy in centre of section, mudstone split from 65.49m to 65.53m, bright banded, sheared and difficult to determine composition due to shearing ~ 3% fusain, ~ 10% vitrain, ~ 87% claro durain RECOVERY 72% SAMPLE # 5
65.75	66.06	Coaly Mudstone - dark brown to black Abundant coaly streaks, abundant carbonaceous plant debris, slickensides
66.06	69.80	Sandstone, Mudstone, interbed in upper half of section, interlam in lower half/minor siltstone lam.

FROM	T	O	DESCRIPTION
			sandstone, salt & pepper, fine grained to medium grey, X-lam., predominant in upper half
			Mudstone, dark grey, slightly carbonaceous in places, predominant in lower half
			scouring, load structures, worm burrows, minor slump structures, minor X-bedding
			Bedding angled @ 82° to C/A., minor slickensides along bedding
			Fracture zone from 69.00m to 69.24m, abundant slickensides from 69.53 to 69.61m., minor calcite on slickensides, calcite veinlet @ 69.75m angled @ 86° to C/A
			Minor carbonaceous plant debris, calcareous cement
69.80	69.95		Silty Mudstone, dark grey
			carbonaceous plant debris, minor worm burrows, calcareous cement
69.95	70.54		Sandstone, salt & pepper, fine grained to medium grained
			Siltstone bedding from 70.27 to 70.29m, minor convoluted bedding @ upper contact, worm burrows, ripple marks, X-bedding, fracture @ 70.14m
			angled @ 63° to C/A., calcite on fracture surface, calcareous cement
70.54	70.83		Muddy Siltstone, medium grey, fine grained sandstone bed from 70.69 to 70.72m
			Minor worm burrows, slump structures, minor scouring, carbonaceous plant debris
70.83	71.25		Sandstone, salt & pepper, medium grained, minor carbonaceous mudstone lam.
			minor worm burrows, minor coaly streaks, X-lam. Ripple marks, calcareous cement
71.25	72.21		Siltstone - medium grey, increasing mud content near base
			Minor fine grained sandstone lam. in centre of section
			Worm burrows, minor convoluted bedding scouring carbonaceous plant debris, calcareous cement

HOLE# WCC-DDH-81-6

From 72.21 To 75.50

FROM	TO	DESCRIPTION
72.21	73.13	Mudstone, dark grey to black, minor fine grain sandstone lam. from 72.52 to 72.69m Minor carbonaceous plant debris, calcareous cement, minor coaly streaks
73.13	73.76	COAL - 0.63m - black, lower contact distinct angle @ 84° to C/A Fractured, cleated in places, calcite on cleat, bright banded, upper contact is variable broken ~ 2% fusain, ~ 22% vitrain ~ 76% claro durain mudstone split from 73.47m to 73.49m. Recovery 63% SAMPLE # 6
73.76	74.14	Silty Mudstone - medium dark grey increasing silt content to base - coaly streaks near upper contact, abundant carbonaceous plant debris calcareous cement
74.14	75.07	Sandstone, Siltstone, Mudstone, interbed Sandstone, salt & pepper, fine grained, predominant, X-lam. Siltstone, medium grey, increasing mud content to base Salty Mudstone - dark grey predom near base - abundant normal burrows; convoluted bedding in centre of section; X-bedding in upper part of section planar lam in lower part of section - scouring; load structures; minor slump structures - carb plant debris, calcite on carb debris, minor coaly streaks slickensides; calcite cement.
75.07	75.29	Coal - 0.22m - Black, - cleated, bright banded ~ 40% vitrain ~ 60% claro durain
75.29	75.50	Mudstone - black to dark grey. - Minor slicken sides, calcite in slicken sides, Carbonaceous plant debris, coaly streaks, slicken sides @ 75.32m angle to @ 79 degrees to Core Axis.

FROM	TO	DESCRIPTION
75.50	75.81	Coal - 0.31m, 0.05m - Core loss - Black, bright-banded, slicken sides, poorly cleated, ~ 1% fusain, 9% vitrain, 90% claro-durain - upper contact is gradual, lower contact is distinct, lower contact angled @ ~ 80° to Core Axis. Recovery 93% SAMPLE #7
75.81	75.95	Mudstone - Dark grey - brown to black - minor slicken sides, carbonaceous plant debris, coaly streaks.
75.95	76.13	Siltstone - Medium grey - increasing sand contact to base. - carbonaceous plant debris, calcite on plant debris.
76.13	77.92	Sandstone - Siltstone, interbedded Sandstone - Salt & Pepper, medium grain- coarse grain increased grain size of beds towards base, Siltstone - Medium grey, slightly muddy in center of section and @ base. - planar lam., coaly streaks, coaly streaks increase towards base, carbonaceous, plant debris, calcite on carbonaceous, plant debris, Calcareous cement Bedding angled at 81° to Core Axis
77.92	77.96	Coaly Mudstone - Black - Abundant coaly streaks, carbonaceous, plant debris, pyrite modules
77.96	77.98	Coal - 0.02m - cleated, ~ 80% vitrain, 20% claro durain
77.98	78.08	bright Mudstone dark grey, brown - increased siltstone content towards base, coaly streaks, abundant carbonaceous, plant debris.
78.08	79.05	Siltstone - Sandstone, interlaminated, interbedded, minor mudstone laminate. Sandstone - Salt & Pepper Fine grained - medium grain. Siltstone - Medium grey - Planar angle to X-lam., scouring, load structures, minor worm burrows, bedding angled @ 80 to Core Axis

HOLE+

WCC-DDH-81-6

From 79.05

To 86.87

FROM	T O	DESCRIPTION
78.08	79.05	Minor carbonaceous plant debris, minor coaly streaks, calcareous cement.
79.05	81.36	Muddy Siltstone.- medium grey. - Mudstone bed from 78.22 to 79.24, Fine grained.
		Sandstone bed from 79.78 to 79.82m from 81.41 to 81.44m, coal bed @ 79.31m, minor worm burrows, carbonaceous plant debris - Sandstone beds have minor calcite cement.
81.36	84.89	Sandstone - Siltstone - Mudstone, interbedded, interlaminated. Sandstone - 'Salt & Pepper, Medium grained, fine grain near base. X-lam. Siltstone - Medium grey. Mudstone - Dark Grey increased towards base. - Minor convoluted bedding, planar lam., minor worm burrows, ripple marks, minor scouring & lead structures, bedding angled @ 80° core axis, minor cross bed, slicken sides @ 83.84m & angled @ 84° to C/A, @ 84.01 angled at 80° to core axis; calcite on slicken side surfaces, carbonaceous plant debris, Sandstone has calcareous cement.
84.89	85.89	Silty Mudstone - Decreased silt content, minor fine grained sandstone laminated near upper contact.. minor carbonaceous plant debris, minor worm borrows near upper contact.
85.89	86.15	Mudstone - Dark grey to black - Minor carbonaceous plant debris, possible shell molds.
86.15	86.49	Coal - 0.34m - Core loss 0.04m - Black - Mud split @ 86.29m to 86.31m - very poorly cleated - Bright banded, sheared ~ 3% fusain, ~ 10% vitrain, ~ 87% claro-durain - upper contact is indistinct, lower contact distinct angled @ 86° to Core Axis RECOVERY 50% SAMPLE #8
86.49	86.87	Muddy Siltstone - Medium grey - brown - decrease mud content to base.

HOLE # WCC-DDH-81-6

From 86.87 To 90.04

FROM	TO	DESCRIPTION
86.49	86.87	-coaly streaks, carbonaceous plant debris, minor calcite on coaly streaks
86.87	87.48	Sandstone - Siltstone; Interbedded Sandstone - Salt & Pepper, medium grey, medium grain to fine grain, decreased grain size to base. Siltstone - Medium grey - Minor convoluted bedding, minor scouring, worm burrows, minor carbonaceous plant debris, minor coaly streaks, calcareous cement.
87.48	88.47	Siltstone - Medium grey - Muddy near base, mudstone at base. - Carbonaceous plant debris, calcite on carbonaceous debris. - coaly streaks near base, shell fragments. - Minor shell molds; calcareous cement.
88.47	88.81	Coal - 0.34m - Black - Bright & dull banded, cleated ~ 5% fusain & 25% Vitrain ~ 70% Claro durain, distinct upper contact angled @ 75° to core axis. - Gradational lower contact - RECOVERY 43% SAMPLE #9
88.81	88.97	Coaly Mudstone - Dark brown to black - Abundant coaly streaks, carbonaceous plant debris, pyrite disseminated throughout
88.97	89.25	Muddy Sandstone - medium grain, dark grey - Minor convoluted bedding, scouring, minor calcite stringers, minor slickensides, calcareous cement.
89.25	89.50	Mudstone - Black - Slightly carbonaceous to base, Minor fine grained Sandstone laminated near base. Small shell molds, minor carbonaceous plant debris near base, sandstone has calcareous cement.
89.50	90.04	Coal - 0.54m - Core loss ~ 0.14m - Black - Mud split @ 89.56m to 89.58m, fractured - Coal is sapropelic with minor vitrain bands, - Conchoidal, dull grey, upper contact distinct angled @ 79° core axis, lower contact distinct angled @ 80° RECOVERY 93% SAMPLE #10

FROM	TO	DESCRIPTION
90.04	90.10	Mudstone - Black - Slightly carbonaceous - coaly streaks, carbonaceous plant debris, calcite on coal.
90.10	91.25	Siltstone - Sandstone - Interbedded Siltstone - Medium grey - Sandy in places Sandstone - medium grain, Salt & Pepper - worm burrows, X-lam, scouring, load structures, minor slump structures - Carbonaceous plant debris, calcareous cement, calcite along partial vertical fractures in lower half of section, shell fragments, slickensides @ 91.12m angled @ 80° to core axis, calcite on slickensides.
91.25	92.37	Sandy Silt - Medium light grey - Fractured, slicken sides @ 91.42, angled @ 89° to core axis; @ 91.44m angled @ 60° to core axis; 91.64m angled @ 78° to core axis; @ 91.86m angled @ 66° to core axis, worm burrows, calcareous cement, minor shell fragments, minor carbonaceous plant debris.
92.37	93.20	Sandstone - Siltstone - Interbedded, interlaminated Sandstone - Salt & Pepper, Fine Grained, Grain size decreased towards base. Siltstone - Medium grey to medium dark grey, slightly muddy @ base - Minor convoluted laminated scouring, worm burrows load structures, minor carbonaceous pillow lava debris, calcareous cement.
93.20	93.64	Mudstone - Dark grey to black - Carbonaceous @ base - Broken, slickensides on lower half of section - Pyrite on slickensides, calcite on slickensides - Minor carb. plant debris
93.64	94.10	Coal - 0.46m - Core Loss - 0.10m - Black; sapropelic from 93.64m to 93.78m, conchoidal humic coal from 93.78 to 94.10m - contains abundant calcite stringers throughout, minor pyrite, sheared large fine grained sandstone clast in section. - Difficult to determine composition due to shearing, nedom claro-durain
		RRCOVERY 53% SAMPLE #11

FROM	TO	DESCRIPTION
94.10	94.74	Muddy Siltstone - Siltstone, Muddy siltstone - Medium grey, silt-medium grey - Hard. - Two units divided by a coal band - 0.01m angled at 10° to core axis. - Abundant calcite stringers, abundant coaly streaks - Abundant carb. plant debris, calcite on coal. - Pyrite on fracture.
94.74	96.29	Muddy Siltstone - Medium grey - Minor fine grained Sandstone lenses. - Minor carb. plant debris, minor worm burrows - Possible shell fragments, minor calcite on carb. debris, calcareous cement.
96.29	96.72	Mudstone - Dark grey - Slightly silty in places - Shell molds, shell fragments, calcareous cement.
96.72	97.63	Siltstone - Medium grey - Slightly sandy towards the base. - Shell fragments, calcareous cement, minor carb. plant debris.
97.63	100.26	Sandstone - Siltstone - Interlaminated Sandstone - Salt & Pepper, fine grained X-lam. Siltstone - Medium grey - Minor convoluted bedding, scouring, load structures, upper marks, minor worm burrows, carb. plant debris, coaly streaks near base, calcite on coaly streaks, calcareous cement; bedding angled @ 80° to core axis
100.26	100.53	Coal - 0.27m - Black, cleated ~ muddy near base, bright banded, fractured ~ 30% vitrain, ~ 1% fusain, ~ 69% claro-durain
100.53	101.37	Coaly Mudstone - dark grey to Black ~ Coaly streaks, carb. plant debris, calcite on carb. debris, coal bands @ 97.97m, @ 98.08m, @ 98.48m - Minor slickensides
101.37	101.85	Coal - 0.48m - Black - Bright & Dark banded; poorly cleated ~ 10% fusain, ~ 5% vitrain, ~ 85% claro-durain. - Indistinct upper & lower contacts;
		RECOVERY 42% SAMPLE #12

FROM	TO	DESCRIPTION
101.85	102.04	Coaly Mudstone - Black less than 0.01m at lower contact; abundant coaly streaks, abundant carb. plant debris. - Minor calcite on plant debris.
102.04	102.59	Siltstone - Medium grey, Mud content to base, coaly streaks, abundant carb plant debris, calcareous cement
102.59	102.65	Mudstone - Black, Slightly carbonaceous. - coaly streaks, carb. plant debris.
102.65	102.77	Coal - 0.12m - Black - Cleated, bright banded; ~ 90% vitrain ~ 10% clarodurain
102.77	103.06	Mudstone, dark grey brown, sandy in center of section - coaly streaks, abundant carbonaceous plant debris minor fine grained, Sandstone lenses, minor calcite, minor slicken sides, coal band @ 103.01m
103.06	103.82	COAL - 0.76m black bright banded, cleated in places ~ 3% fusain ~ 15% vitrain ~ 82% clarodurain 'upper contact indistinct, lower contact distinct angled @ 85° to C/A RECOVERY 96% SAMPLE #13
103.82	103.98	Sandy Siltstone, dark grey abundant coaly streaks, carbonaceous plant debris,
103.98	105.92	Sandstone, mudstone interbedded Sandstone, salt & 'pepper, medium grained, predominant mudstone, dark grey to black, slightly carbonaceous and sandy in places worm burrows, scouring, load structures-, minor coaly streaks, slickensides along bedding planes, minor calcite stringers, bedding angled @ 80° to C/A,
105.92	106.02	COAL - 0.10m black, cleated, bright, ~ 50% vitrain, 50% clarodurain
106.02	106.06	Coaly Mudstone, 'dark brown to black

HOLE# WCC-DDH-81-6

From 106.06 To 113.42

FROM	TO	DESCRIPTION
		carbonaceous plant debris, coaly streaks,
106.06	107.18	Siltstone, medium grey, minor fine grained sandstone beds near lower contact
		- minor coaly streaks near upper contact, minor carbonaceous plant debris
107.18	109.39	Siltstone, Sandstone interbedded
		Siltstone, medium grey, sandstone, salt & pepper, fine grained - coarse grained, coarse grained near centre of section, X-bedding, convoluted bedding, scouring, load structures, minor worm burrows, silt rip up clasts @ 108.22 to 108.23m., minor carbonaceous plant debris, calcareous cement
109.39	110.89	Sandstone, salt & pepper to light grey, medium grey X-bedding, minor siltstone lam. near upper contact, minor carbonaceous plant debris, ripple marks
110.89	111.86	Sandstone, siltstone, mudstone, interlam.
		Sandstone, salt & pepper, light to medium grey, fine grained, X-lam.
		Siltstone, medium grey
		Mudstone, dark grey to black, carbonaceous base
		Mud content base, mudstone bedding @ 111.67 to 111.73m
		scouring, minor worm burrows, minor convoluted lam, planar lam, scouring, bedding angled @ 79° to C/A., minor carbonaceous plant debris, calcareous cement, slickensides along bedding angles.
111.86	112.79	Siltstone, medium grey slight muddv. @ upper and lower contacts, coaly streaks near upper contact, sandstone bedding @ 112.06 to 112.12m., carbonaceous plant debris, calcareous cement.
112.79	113.19	Silty Mudstone, dark grey
		abundant coaly streaks, abundant carbonaceous plant debris, slicken sides @ lower contact, angled @ 65° to C/A, minor calcareous cement
113.19	113.42	Siltstone, medium grey
		minor fine grained sandstone lam., carbonaceous plant debris, minor coaly streaks

FROM	TO	DESCRIPTION
113.42	115.03	Sandstone, Siltstone interbedded
		Sandstone, salt & pepper, light to medium grey, X-lam., predominant siltstone, medium grey
		Mudstone bed from 114.90 to 114.92 containing coaly streaks
		X-bedding, minor convoluted bedding, ripple marks, scouring, load structures, fractures, several almost vertical fractures, i.e., 114.70 angled @ 9° to C/A, coaly chips, calcite on fracture surfaces, minor carbonaceous plant debris, minor slicken sides, minor calcareous cement
115.03	116.19	Silty mudstone, medium dark grey to dark grey silt content towards base, gradational mudstone bedding @ 115.98m to 116.01m (contains abundant coaly streaks)
		Coaly streaks throughout, minor convoluted bedding in centre of section, carbonaceous plant debris, calcite on carbonaceous plant debris, minor slicken sides,
116.19	116.25	Sandstone, light grey, fine grained fractured (almost vertically), very hard, (ironstone), calcite on fracture surface, minor carbonaceous plant debris
116.25	116.62	Siltstone, medium grey, increasing sand content to base, minor carbonaceous plant debris almost vertical fracture from 116.47m to 116.62m gradational lower contact
116.62	118.58	Siltstone, sandstone interbedded, Bedding angled @ 84° to C/A
		Siltstone, medium grey, sandstone, salt & pepper, medium light grey, medium grained - increasing gradationally to base
		- worm burrows scouring, load structures, ripple marks, - almost vertical fractures throughout section; slickensides @ 117.80m angled @ 50° to C/A
		- minor carbonaceous plant debris

FROM	TO	DESCRIPTION
118.58	126.57	Sandstone, salt & pepper, light medium grey, medium grained to very coarse grained, grain size increases to base, very fine grained @ base grains up to 0.10cm, sandstone is clean, almost quartzite X-bedding, minor siltstone lam. near upper contact Mud rip up clasts @ 119.40 to 119.41m, 123.31m to 123.36m - abundant coaly chips from 124.14m to 126.57, random chert pebbles up to 0.8 cm in diameter from 126.16m to 126.57m Almost vertical fracture from 119.21 to 120.07m Very minor carbonaceous plant debris, calcareous cement in upper half of section increasing to base, calcareous cement @ base in very coarse grained sandstone
126.57	127.15	COAL - 0.58m black - bright and dull banded, cleated, minor slickensides - upper contact distinct angled @ 84° to C/A Lower contact distinct angled @ 78° to C/A ~ 15% fusain ~ 10% vitrain ~ 75% claro durain RECOVERY SAMPLE #14
127.15	127.32	Siltstone, Sandstone - interlam interbed Siltstone, medium grey, slightly muddy in places Sandstone, salt & pepper, medium coarse grained, fine grained, X-lam. Ripple marks, scouring, load structures, abundant carbonaceous plant debris, minor slump structures, minor calcite on plant debris, minor coaly streaks, calcareous cement, Bedding angled @ 84° to C/A
127.32	128.48	Siltstone, medium grey carbonaceous plant debris, decreasing to base, minor calcite on carbonaceous debris, minor coaly streaks, calcareous cement
128.48	129.55	Mudstone, black, minor fine grained sandstone lam., slightly carbonaceous at base, abundant coaly streaks near upper contact, carbonaceous plant debris, pyrite nodules, minor fractures

HOLE*

WCC-DDH-81-6

From 129.55 To 137.07

FROM	TO	DESCRIPTION
129.55	130.05	COAL - 0.50m CORE LOSS 0.24m - black, dull banded poorly cleated ~ 7% fusain ~ 5% vitrain ~ 85% claro-durain RECOVERY
130.05	130.38	Mudstone, dark grey to black - increasing silt content to base coaly streaks, abundant carbonaceous plant debris, coal bands @ 130.36 and 130.39m, slickensides @ 130.15m angled @ 85° to C/A @ 130.17m angled @ 70° to C/A @ 130.36 angled @ 75° to C/A
130.38	130.56	Siltstone, medium grey increasing sand content to base, abundant coaly streaks, gradational upper contact, carbonaceous plant debris, minor calcite on plant debris
130.56	131.33	Sandstone, siltstone, interlam. Sandstone, salt & pepper, fine grained, predominant X-lam. siltstone, medium grey, convoluted bedding, ripple marks, scouring, coaly streaks, slicken sides @ 131.10m angled @ 70° to C/A calcite on slickensides, carbonaceous plant debris calcareous cement
131.33	131.58	Silty Mudstone, dark grey increasing silt content to base, gradational lower contact Minor slickensides in centre of section, calcite on slickensides, coaly streaks, carbonaceous plant debris, calcareous cement
131.58	135.90	Siltstone, medium grey, slightly sandy in places minor carbonaceous plant debris, minor coaly streaks calcareous cement, shell fragments near lower contact
135.90	137.07	Sandstone, Siltstone, interbed Sandstone, salt & pepper, fine grained, X-lam., calcareous cement Siltstone, medium grey, increasing to base Convoluted bedding, ripple marks, scouring, load structures, worm burrows, slickensides @ 136.05m Bedding @ 65° to C/A., calcite on slickensides;

FROM	TO	DESCRIPTION
		Bedding angled @ 81° to C/A
137.07	138.03	Siltstone, medium grey, minor fine grained sandstone lam. contains some hard siltstone beds (ironstone?) minor carbonaceous plant debris, minor worm burrows, calcareous cement
138.03	138.87	Carbonaceous Mudstone, black, fractured, silty near lower contact, carbonaceous plant debris, calcareous cement - coaly streaks near upper contact
138.87	139.00	Sandstone/Mudstone interlam. sandstone, medium grained, salt & pepper mudstone dark grey to black abundant carbonaceous debris, minor coaly streaks
139.00	139.13	Sandstone, salt & pepper, fine grained to medium grained, carbonaceous plant debris abundant slickenside @ 139.12m @ angle 60° from C/A Calcite cement, abundant calcite crystals on slickenside surface
139.13	139.47	Siltstone, increasing muddy content towards base, medium grey, minor fine grained sandstone beds load structures, worm burrows, abundant carbonaceous plant debris
139.47	139.66	Mudstone, dark grey abundant carbonaceous plant debris
139.66	140.16	Siltstone, medium grey increasing content toward base, minor carbonaceous plant debris, shell fragments, calcite cement
140.16	141.84	Sandstone/Siltstone, interlam to interbedded sandstone fine grained salt & pepper siltstone medium grey convoluted bedding, load structures, abundant carbonaceous plant debris, minor X-lams., calcite cement abundant where sandstone dominant
141.84	143.63	Sandstone minor siltstone near upper contact clean sandstone for remainder of interval; salt and pepper, medium grained to coarse grained

HOLE# WCC-81-6From 143.63 To 148.72

FROM	TO	DESCRIPTION
		X-laminated throughout, abundant carbonaceous plant debris near upper contact;
		fracture @ 143.12 angled @ 50° to C/A
		Minor slickensides near upper contact
143.63	143.65	Coaly Mudstone, dark grey to black
		Abundant coaly streaks
143.65	144.03	COAL - black, dull, minor mudstone near upper contact 0.38m vitrain, 10% claro durain 88%
		fusain 2% not banded nor cleated, low recovery of coal, not enough for a sample core loss 28cm
144.03	144.75	Mudstone, dark grey to black, coaly @ upper contact
		carbonaceous plant debris abundant @ upper contact decreasing toward base, minor calcite or fracture surfaces
144.75	145.10	Sandstone, Siltstone interlam to interbedded to minor mudstone lam. sandstone, salt & pepper fine grained to medium grained, siltstone, medium grey; mudstone, dark grey fracture @ 144.90 angled @ 20° to C/A
		Calcite on surface
		Load structures, slump structure, minor worm burrows, minor carbonaceous plant debris
145.10	145.82	Silty Mudstone, medium dark grey to dark grey
		Minor carbonaceous plant debris
		Calcite crystals in places
145.82	147.95	Sandstone, Salt & pepper, medium grained, X-lam. minor convoluted bedding
		abundant calcite stringers, carbonaceous plant debris
		fracture @ 80° to C/A. slickensides
		mud rip up clasts near base
147.95	148.72	Muddy Siltstone with minor sandstone lams. and lenses, Siltstone, medium to dark grey, Sandstone salt and pepper fine grained
		load structures, worm burrows, carbonaceous plant debris, mud content toward base = silty mudstone
		calcite disseminations on fracture surfaces.

HOLE*

WCC-81-6

From 148.72 To 151.76'

FROM	TO	DESCRIPTION
148.72	148.95	COAL - 0.23m black shiny, mudstone split < 1 cm at base, banded, cleated vitrain: 45% claro durain 58% fusain < 2%
148.95	148.99	mudstone, coaly vitrain bands throughout carbonaceous plant debris slickenside @ 148.95 @ angled 85° to C/A
148.99	149.02	Coal 0.03m black shiny 10% vitrain, 90% claro durain
149.02	149.08	Siltstone, medium grey, carbonaceous plant debris slightly muddy
149.08	149.98	Sandstone, Siltstone interlam. Sandstone salt & pepper fine grained to medium grained Siltstone, medium grey, concoluted bedding load structures, minor possible worm burrows, calcite stringers, carbonaceous plant debris
149.98	151.62	Siltstone, muddy on centre of interval, very minor sandstone lams. medium grey to dark grey slickensides ie @ 87° to C/A abundant carbonaceous plant debris, shell fossils pelecypoda?
151.62	151.96	Sandstone, Siltstone interlam. Sandstone salt and pepper, fine grained, siltstone medium grey carbonaceous plant debris, calcite cement, convoluted/ bedding
151.96	153.16	Siltstone slightly muddy medium to dark grey very minor small sandstone lenses near base
153.16	153.45	Sandstone, Mudstone interbedded, Sandstone salt and pepper fine grained, mudstone medium grey to dark grey, convoluted bedding, minor carbonaceous debris, possible worm burrows
153.45	153.90	Mudstone, dark grey to black, very minor carbonaceous plant debris
153.90	154.76	Mudstone, Siltstone, Sandstone, interlam to interbed convoluted bedding, Mudstone, dark grey to black Siltstone, dark grey Sandstone, salt & pepper, very fine grained

HOLE#

WCC-81-6

From 154.76 To 160.92

FROM	TO	DESCRIPTION
		minor worm burrows, load structures, evidence of slumping, minor carbonaceous plant debris, shell fragments
154.76	155.13	Mudstone, dark grey to black
		minor carbonaceous plant debris and thin coaly streaks, possible shell fragments, minor slickensides
155.13	155.77	Siltstone with minor sandstone near base
		Siltstone medium dark grey, sandstone, very fine grained, salt & pepper, carbonaceous plant debris
155.77	157.00	Sandstone with minor mudstone lams. near upper contact, salt & pepper medium grained, abundant carbonaceous plant debris
		slickensided @ 156.77m angled @ 80° to C/A (calcite crystals on surface
		X lam. load structures, worm burrows
157.00	158.19	Siltstone, Sandstone interbedded, Siltstone medium dark grey, sandstone salt & pepper fine grained to medium grained
		convoluted bedding, X lams, abundant worm burrows
		carbonaceous plant debris
		calcite on bedding and fracture surfaces
		minor load structures, slump structures
158.19	159.98	Coal 1.79m black shiny slickensided banded
		Mudstone splits @ 158.53 to 158.55 @ 158.70 to 158.72
		vitain at 35% claro durain, 65% fusain ~ 10%
		SAMPLE: 15 RECOVERY 90%
159.98	160.32	Mudstone coaly @ upper contact
		coaly streaks toward base, abundant carbonaceous plant debris
160.32	160.52	siltstone, medium dark grey, abundant carbonaceous debris (plant minor sandstone lenses in base)
160.52	160.92	sandstone, Mudstone interlam. Sandstone fine grained, mudstone medium dark grey laminated
		load structures, bioturbation, calcite stringers, minor carbonaceous plant debris

HOLE#

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From 160.92

To 170.81

FROM	TO	DESCRIPTION
160.92	161.92	Siltstone minor sandstone lenses Convoluted bedding load structures, very minor carbonaceous plant debris
161.92	163.18	Sandstone, with minor siltstone and mudstone lams. sandstone salt & pepper very fine grained to coarsly grained Siltstone - medium grey mudstone dark grey convoluted bedding, X-bedding, x lams. load structures, minor carbonaceous plant debris slickenside @ 163.11 @ angle 82° to C/A
163.18	164.02	Siltstone slightly muddy with minor fine grained salt & pepper sandstone lams. Siltstone medium grey to dark grey bioturbation abundant (worm burrows) very minor carbonaceous debris
164.02	164.63	Siltstone slightly muddy dark grey very minor carbonaceous debris, very minor shell fragments
164.63	165.26	Mudstone, dark grey to black shell fossils bivalvia, some pyritized, abundant calcite on shell surfaces
165.26	165.46	COAL - 0.20m very broken shiny black 10% vitrain 90% claro durain
165.46	165.54	Coaly mudstone, black abundant coaly streaks throughout carbonaceous debris
165.54	165.77	Silty mudstone, medium dark grey with minor dark grey beds, abundant carbonaceous plant debris, calcite patches
165.77	170.81	Siltstone, Sandstone interbedded siltstone medium grey to dark grey, Sandstone, salt & pepper, fine grained, slump structures, worm burrows, convoluted bedding, carbonaceous debris plant, calcite stringers and calcite on fractures fracture @ 165.84m angled @ 40° to C/A calcite cement minor mudstone content near base

FROM	TO	DESCRIPTION
170.81	172.68	Sandstone, Siltstone interlam. interbed, sandstone salt & pepper fine grained to medium grained X-lam., siltstone slightly muddy mudstone, dark grey, slump structure, rip up clasts, convoluted bedding, load structures, worm burrows, sandstone contains carbonaceous lamination @ base, abundant calcite stringers from 171.12 to 171.24m with bedding highly convoluted in this area, vertical fracture from 172.29 to 172.36m with calcite and pyrite on fracture surface angled @ 10° to C/A, calcareous cement, minor carbonaceous plant debris, occasional mudstone dark grey lams.
172.68	172.69	Mudstone dark grey, silty
172.69	173.13	Sandstone Medium grained, salt & pepper, X-lam. carbonaceous lams throughout, plant debris minor coal band \times 0.01m @ 172.99m, contains pyrite slickensides @ 172.93 angled @ 71° to C/A angled @ 172.98m angled @ 75° C/A calcareous cement
173.13	173.25	Siltstone, Sandstone, Mudstone intermixed Siltstone, medium grey, Sandstone salt & pepper medium grained, mudstone dark grey, convoluted bedding throughout, fractured throughout, abundant pyrite on fracture surfaces, coaly chip abundant plant debris, minor slickensides, calcite stringers, calcite on slickenside surfaces
173.25	174.34	Sandstone, Siltstone, Sandstone fine grained to very fine grained medium grey, Siltstone medium grey, Sandstone grades to siltstone, highly bioturbated throughout, siltstone is muddy @ base, minor plant debris, abundant coaly streaks from 174.20 to 174.34m, fracture @ 174.28 angled at 50° to C/A
174.34	175.66	COAL - 1.32m black, core loss 0.61m coal becomes slightly muddy @ base, well cleated @ top of unit to sheared and broken from 174.60m ~ 40% vitrain, 2% fusain, 58% claro durain SAMPLE 16 RECOVERY 96%

HOLE# WCC-81-6

From 175.66 To 183.53

FROM	TO	DESCRIPTION
175.66	175.97	Silty Mudstone. Mudstone interbed-interlam; silty mudstone medium dark grey, mudstone dark grey, abundant carbonaceous plant debris minor coaly streaks
175.97	176.00	Carbonaceous mudstone, black, abundant coaly streaks, abundant carbonaceous plant debris
176.00	176.27	COAL - 0.27m Black, highly broken, 10cm core loss ~ 35% vitrain, -65% claro-durain , highly fractured
176.27	176.32	Mudstone, dark grey; abundant coaly streaks, abundant carbonaceous plant debris
176.32	180.24	Siltstone, Sandstone, Mudstone , interbed-intermix, siltstone ; medium grey to dark grey, sandstone medium grey fine grained, mudstone dark grey, appears in lower section only, sandstone beds highly, bio-turbated , coaly streaks @ 177.15m to 177.17m, abundant calcite stringers. from 178.39 to 178.61, slickensides @ 177.95m angled @ 65° to C/A angled @ 177.84m angled @ 62° to C/A, carbonaceous plant debris with calcite on debris surface.
180.24	180.86	Siltstone, Mudstone, Siltstone interlam., sandstone salt & pepper, medium grained, mudstone dark grey, siltstone medium grey, convoluted bedding, worm burrows, ripple marks, bedding angled @ 60° to C/A., minor slickensides with calcite on surfaces, minor plant debris
180.86	180.91	Siltstone medium grey, minor plant debris, calcite stringers,
180.91	181.42	Sandstone, siltstone intermixed, sandstone medium grained salt & pepper, siltstone medium dark grey, beds highly convoluted and bioturbated, calcite stringers, carbonaceous plant debris, minor slickensides, fracture @ top of unit (180.91m) angled @ 80° to C/A, carbonaceous laminations throughout
181.42	183.53	Siltstone, mudstone, siltstone medium grey grading to mudstone dark grey coaly streaks @ base of unit, very minor carbonaceous plant debris, shell molds

FROM	TO	DESCRIPTION
		bivalvia, carbonaceous mudstone @ base
183.53	183.92	COAL - 0.39m, SLACK, 10cm core loss no sample
		highly broken - muddy sections throughout
183.92	183.99	Mudstone dark grey, carbonaceous, coaly streaks
		slickenside @ 183.96 angled @ 59° to C/A
183.99	184.98	Siltstone medium grey, fracture @ 184.09m'
		angled @ 55° to C/A and @ 184.71m angled
		@ 65° to C/A
184.98	185.43	Sandstone, Siltstone interbedded, sandstone, fine
		grained salt & pepper, Siltstone medium grey
		bedding angled @ 50° to C/A., load structures,
		parallel lams; fracture @ 185.06m angled @ 54°
		to C/A.,
185.43	186.32	Sandstone, very fine grained to fine grained medium
		grey to salt & pepper, convoluted bedding, vertical
		fracture from 185.43 to 185.61m, minor carbonaceous
		plant debris, calcareous cement
186.52		Sandstone, Siltstone intermixed, sandstone fine
		grained salt & pepper, siltstone medium grey,
		sandstone 'is X-lam.; load structure, worm burrows
186.52	187.76	Siltstone, mudstone; Siltstone medium grey, mudstone
		dark grey, siltstone grading to mudstone, mudstone
		contains coaly streaks, minor carbonaceous plant
		debris
187.76	187.94	COAL - 0.18m BLACK, fractured, 8cm core loss
		bright banded, poorly to non cleated, ~25% vitrain
		75% claro durain minor fusain
187.94	188.01	Mudstone black', abundant carbonaceous plant debris,
		fractured coaly streaks
188.01	2 3	COAL 0.22m Black highly broken and sheared, poorly
		cleated, mudstone sections throughout
		core loss 0.15m
188.23	188.30	Carbonaceous mudstone, black: abundant coaly streaks,
		abundant plant debris, recovery
188.30	188.93	COAL - 0.63m black, abundant fracturing, bright
		banded, minor mud lenses near base, ~10% vitrain
		90% claro durain, minor fusain SAMPLE 17 :

HOLE'

WCC-81-6

From 188.93 To 193.76

FROM	TO	DESCRIPTION
188.93	189.22	Siltstone -Sandstone; Siltstone medium grey grades to fine grained sandstone medium grey, 'carbonaceous' plant debris
189.22	189.81	Sandstone, medium grained to coarsly grained, X-lam, salt & 'pepper, minor carbonaceous plant debris minor carbonaceous lams.
189.81	190.12	Siltstone medium grey, minor sandstone lenses throughout, slightly muddy, minor carbonaceous plant debris
190.12	190.77	Sandstone', fine grained, salt & pepper to light grey 'fracture @ 190.48m angled.@ 52° to C/A with calcite on fracture surface, X-lam: plant rootlets
190.77	191.77	'Siltstone, sandstone interbed, siltstone medium grey sandstone fine grained to medium grained, salt & pepper, sandstone beds highly bioturbated, ripple marks, load and. flame structures, carbonaceous plant debris, minor abundant @ top fracture @ top of unit 190.77 angled.@ 42° to C/A
191.77	192.10	Siltstone medium grey, minor shell molds, very minor plant debris
192.10	192.21	Sandstone, medium grained, salt & pepper, minor carbonaceous laminations throughout
192.21	192.44	Siltstone with minor sandstone lenses throughout, Siltstone medium grey, sandstone fine grained salt & pepper, very minor carbonaceous plant debris
192.44	192.63	Siltstone, Sandstone interbedded, siltstone medium dark grey, sandstone medium grey, fine grained, ripple marks, worm burrows (minor); bedding angled @ 54° to C/A
192.63	192.98	Siltstone medium grey, carbonaceous plant debris with minor coaly bits
192.98	193.11	Siltstone, sandstone interlam., siltstone medium grey, sandstone fine grained salt & pepper, ripple marks; slump structure, carbonaceous plant debris.
193.11	193.76	Muddy siltstone medium to dark grey, becomes muddier towards base, minor carbonaceous plant debris increasing to base

FROM	TO	DESCRIPTION
193.76	194.00	Mudstone, dark grey to black, abundant coaly streaks in lower 1/2 of section; carbonaceous to base, carbonaceous plant debris
194.00	194.14	Sandstone, mudstone interlam., sandstone fine grained salt & pepper, mudstone black - carbonaceous bedding angled @ 60° to C/A
194.14	196.52	Sandstone fine grained to medium grained salt & pepper, medium grained grading to fine grained @ base; carbonaceous laminations; X-lam, calcite stringers features @ 194.14 angled @ 57° to C/A and @ 194.39 angled @ 65° to C/A 194.68m angled @ 55° to C/A & @ 125.29m angled @ 63° to C/A and fracture @ 125.38 angled @ 51° to C/A., minor carbonaceous plant debris
196.52	199.76	Siltstone, Sandstone, Mudstone interbedded, siltstone medium grey, sandstone very fine grained to fine grained salt & pepper; mudstone dark grey to black; load structures; worm burrows; Siltstone content increases to base; flame structure; very minor carbonaceous plant debris; bedding angled @ 55° to C/A
199.76	200.23	Muddy Siltstone dark grey - mud content, decreases to base shell molds vivalvia, minor carbonaceous plant debris, minor coaly streaks; calcite stringers from 200.03 to 200.07m
200.23	200.48	Mudstone dark grey; vertically fractured throughout with calcite on fracture
200.48	200.77	COAL 0.29m, BLACK, core loss, 14cm; highly broken and fractured ~ 20% vitrain claro durain 5% fusain non cleated
200.77	200.84	Mudstone black carbonaceous; abundant coaly streaks; plant debris
200.84	201.05	Siltstone, Sandstone intermixed; siltstone dark grey; sandstone medium grey fine grained; convoluted bedding, calcite stringers
201.05	201.49	Siltstone medium grey; muddy to base; very minor carbonaceous plant debris; fracture @ 201.39m angled @ 21° to C/A W/Calcite

FROM	TO	DESCRIPTION
		on fracture surface
201.49	201.58	Mudstone dark grey; carbonaceous plant debris; coaly streaks
201.58	202.45	Siltstone medium grey; minor sandstone near base; minor slickensides, minor carbonaceous plant debris
202.45	203.87	Sandstone salt & pepper fine grained to medium grained, carbonaceous laminations throughout; abundant calcite stringers; X-lam; medium grained in center of section fractures @ 202.69 angled @ 40° to C/A and @ 203.01m angled @ 41° to C/A and angled @ 203.24m angled @ 36° to C/A and fractures @ 203.45m angled @ 30° to C/A slickensides on all fracture surfaces; carbonaceous plant debris, minor coaly streaks throughout; calcite stringers disappear to base
203.87	206.04	Sandstone, Siltstone, Mudstone interlam - interbed; sandstone, fine grained to medium grained salt and pepper; siltstone medium grey, mudstone black to dark grey, load structures; worm burrows; parallel lams; bedding angled @ 44° to C/A fractures along bedding plane throughout; minor calcite stringers; calcite on fracture surfaces; fracture @ 204.01m angled @ 15° to C/A abundant pyrite and calcite on surface, minor carbonaceous plant debris; sandstone is X-lam.
		END OF HOLE @ 206.04m

CORE DESCRIPTION

HOLE' DDH-WCC-81-7 From 0m To 10.58m
 Area West Carbon Creek BY Paul Cowléy

FROM	TO	DESCRIPTION
0	2.13	OVERBURDEN BICKFORD FM.
2.13	2.37	Sandstone - fine grained, medium grey, broken and weathered, iron stained.
2.37	4.34	Mudstone - dark grey, rare minute pyrite blebs, gradational lower contact.
4.34	4.84	Siltstone - medium grey, rare minute pyrite blebs; gradational lower contact.
4.84	5.62	Sandstone - fine grained, medium grey; carbonaceous laminae; bedding angles at 77° to core axis at 5.10m; sharp lower contact
5.62	5.74	Mudstone - dark grey; very carbonaceous; gradational lower contact.
5.74	6.54	Siltstone - medium grey; minor calcite at 5.83m, 1cm x 1cm; minor plant fossils, gradational lower contact.
6.54	7.07	Sandstone - fine grained, medium grey to light grey; carbona- ceous laminae; rare coaly streaks; moderately sharp lower contact; bedding angles at 88° to core axis.
7.07	7.14	Siltstone - medium grey.
7.14	7.30	Mudstone - dark grey; carbonaceous; minor coaly streaks; abundant plant fossils.
7.30	7.47	Siltstone - medium grey; occasional plant fossils; moderately sharp lower contact.
7.47	7.75	Sandstone - siltstone interbedded and interlaminated; sandstone fine grained, light grey in lenses and beds; siltstone - medium grey; minor worm burrows; sharp lower contact; bedding angles at 85° to core axis.
7.75	8.44	Siltstone - medium grey; rare plant fossils; moderately sharp lower contact.
8.44	9.42	Sandstone - siltstone interbedded and interlaminated; bedding angles at 82° to core axis.; sandstone - fine grained, medium grey; well laminated; parallel and cross laminated; siltstone - medium grey; carbonaceous laminae; gradational lower contact.
9.42	9.85	Muddy siltstone; dark grey; medium sharp lower contact.
9.85	10.58	Sandstone - siltstone interbedded and interlaminated; sandstone fine grained, light grey; bedding disturbed; siltstone - medium grey; carbonaceous laminae; plant fossils; minor shearing on

FROM	TO	DESCRIPTION
		some bedding surfaces at random orientations; bedding angles at 85° to core axis; gradational lower contact.
10.58	11.00	Siltstone - medium grey; occasional minute lenses of very fine grained sandstone; pelycypod horizon at 10.94m; gradational lower contact.
11.00	11.17	Mudstone - dark grey; carbonaceous minute sandstone lenses.
11.17	11.27	COAL 0.10m BLACK; dirty coal; matte surface; blocky; sapropelic.
11.27	11.35	Mudstone - sandstone; mudstone - dark grey, very carbonaceous with frequent fine grained sandstone lenses; frequent worm burrows.
11.35	11.63	Siltstone - medium grey; gradational lower contact.
11.63	12.56	Mudstone - dark grey; silty in places; minor plant debris; gradational lower contact.
12.56	13.09	Siltstone - dark grey; moderately sharp lower contact.
13.09	13.54	Sandy siltstone - medium grey; abundant plant debris; sharp lower contact.
13.54	13.94	Mudstone - dark grey; silty in places; minor plant debris; rare pyrite on bedding surface replacing plant fossils.
13.94	14.02	COAL 0.08m BLACK; blocky, 100% clarodurain.
14.02	14.35	Mudstone - dark grey; sheared at top; minor coaly streaks; rare pyrite on fracture surfaces; disseminated base is broken.
14.35	16.40	Siltstone - medium grey; becomes sandy near base; plant debris near top; gradational lower contact.
16.40	18.58	Sandstone - siltstone interbedded - interlaminated; intermixed; sandstone - fine grained, light grey, occasional worm burrows; bedding very disturbed; siltstone - medium grey; minor plant debris; minor slickensides with calcite at 18.47m.
18.58	18.59	Calcite; grey with coarse grain crystals.
18.59	19.95	Siltstone - sandstone interlaminated; siltstone - medium grey; sandstone - fine grained, medium grey; in thin lenses.
19.95	24.47	Siltstone - medium grey; rare very fine grained sandstone laminae; bedding angles at 85° to core axis; minor plant debris; sharp lower contact.
24.47	24.50	Sandstone - fine grained, light grey with coaly streaks; sharp lower contact.
24.50	24.60	Mudstone - dark grey; carbonaceous.

FROM	TO	DESCRIPTION
24.60	24.63	COAL 0.08m BLACK and blocky, 20% vitrain, 80% clarodurain.
24.63	24.80	Mudstone - coal; mudstone - dark grey, very carbonaceous with thick coaly streaks.
24.80	25.09	COAL 0.29m BLACK and blocky, 20% vitrain, 80% clarodurain.
25.09	25.23	Mudstone - dark grey, very carbonaceous with coaly streaks.
25.23	25.27	COAL 0.04 BLACK and blocky; dirty 50% vitrain, 50% clarodurain.
25.27	25.63	Mudstone - dark grey; plant fossils; coaly streaks in places; moderately sharp lower contact.
25.63	26.48	Siltstone - medium grey; abundant plant fossils; calcite veinlette; 45° to core axis at 26.21m; occasional irregular calcite veinlettes throughout.
26.48	27.03	Mudstone - dark grey; very carbonaceous; calcite slickensides at top with angles at 77° to core axis; slickensides angle at 45° to core axis; very carbonaceous at base with thick coal streaks; coal on graphic log 0.40m.
27.03	27.32	Siltstone - medium grey with abundant plant fossils.
27.32	27.43	Mudstone - dark grey; carbonaceous; minor coaly streaks.
27.43	28.75	Siltstone - medium grey; occasional plant fossils; calcite veinlette at 61° to core axis at 27.55m; sandy near base displaying disturbed bedding; sharp lower contact; minor worm burrows at base.
28.75	28.99	Sandstone - fine grained, light grey, cross laminated; calcite veinlette at 77 to core axis at 28.98m; sharp lower contact; carbonaceous laminae.
28.99	29.23	Sandstone - very fine grained, medium grey; disturbed bedding; abundant plant fossils; minor coaly streaks.
29.23	29.35	Mudstone - dark grey broken rock; abundant slickenside surfaces; coaly streaks.
29.35	29.44	Sandstone - very fine grained, medium grey; sharp lower contact; disturbed bedding.
29.44	31.33	Sandstone - fine grained to medium grained; light grey; cross laminated, parallel laminae; cross bedding; rare siltstone laminae at base of unit; gradational lower contact.
31.33	31.73	Siltstone - sandstone interlaminated; siltstone - medium grey; sandstone - fine grained, light grey in lenses and beds; minor worm burrowing; gradational lower contact; abundant plant fossils; bedding angles at 84° to core axis at 31.40m.

HOLE+ DDH-WCC-81-7From 31.73To 42.76.

FROM	TO	DESCRIPTION
31.73	32.77	Mudstone - dark grey; silty at top; sharp lower contact.
32.77	34.04	Sandstone with minor siltstone; sandstone - fine grained to medium grained cross bedded, medium grey bedding disturbed at top; worm burrows throughout; minor siltstone interlaminaes and interbeds.
34.04	35.15	Siltstone - mudstone interbedded; siltstone - medium grey; mudstone - dark grey.
35.15	35.64	Sandstone - siltstone interbedded; sandstone - fine grained, light grey cross laminated with minor thin siltstone beds medium grey; minor plant debris at base, muddy at base.
35.64	36.27	COAL 0.63m BLACK blocky, 10% vitrain, 90% clarodurain; trace fusain. Recovery: 81%. SAMPLE #1.
36.27	37.64	Siltstone, sandstone and mudstone - mudstone - dark grey at top rapidly grades to medium grey siltstone with abundant plant fossils and occasional coal streaks, grades to fine grained light grey cross laminated sandstone at base, carbonaceous laminae, sharp lower contact.
37.64	38.63	Siltstone - medium grey, sandy near top, muddy at middle, abundant plant fossils, worm burrows near top, gradational lower contact.
38.63	39.53	Sandstone - fine grained at top, grading to medium grained at base, cross laminated, occasional plant fossils and carbonaceous laminae, sharp lower contact, sandstone - light grey.
39.53	40.14	Sandstone and siltstone interbedded; sandstone - fine grained, light grey, cross laminated; siltstone - medium grey, thinly interbedded, calcite veinlette 68° to core axis at 39.76m, gradational lower contact.
40.14	40.99	Siltstone and mudstone - siltstone - medium grey, calcite veinlettes concentrated in 1cm band with slight brecciation at 40.44m, bottom 10cm grades to mudstone.
40.99	41.77	COAL 0.23m, black, blocky, 5% vitrain, trace fusain, 95% clarodurain
41.22'	41.81	Muddy siltstone - medium dark grey, increased mud content to base; abundant carbonaceous plant debris, coaly streaks; calcite on coaly streaks; gradational lower contact.
41.81	-42.76	Mudstone - dark grey, 'slightly silty in places: calcite stringers from 42.07 to 42.08m angling at 80° to core axis; slickensides at 42.42m angling at 72° to core axis: 42.45m angling at 71° to core axis; calcite on slickensides; carbonaceous plant debris

HOLE*

WCC 81-7

From 42.76

TO 45.82

FROM	TO	DESCRIPTION
		gradational lower contact.
42.76	43.17	Siltstone - sandstone interbedded and interlaminated; siltstone medium dark grey, predominant; sandstone - salt and pepper, fine grained, cross laminated; minor slump structures; minor worm burrows; planar laminated; very minor carbonaceous plant debris; fracture at 42.99m angling at 10° to core axis; bedding angles at 85° to core axis; slickensides at 43.14m angling at 81° to core axis.
43.17	43.52	Sandstone - salt & pepper, fine grained - ripple marks; X-bedding; minor slickenside; minor carbonaceous plant debris calcareous
43.52	43.82	Muddy Siltstone - medium dark grey fracture @ 43.57m angled @ 30° to C/A, minor fine grained sandstone lam., minor worm burrows, very minor carbonaceous plant debris, calcareous cement
43.82	44.05	Siltstone - medium grey fracture @ 43.87 and angled @ 25° to C/A, minor calcite on surface, minor slickensides throughout section minor carbonaceous plant debris, coaly streaks; abrupt contact, calcareous cement
44.05	44.31	Mudstone, dark grey to black - partial vertical fracture in lower half of section, small shell molds.
44.31	44.69	COAL 0.38m (0.13m core loss) Black, blocky, cleated, fractured, minor fusain, ~ 10% vitrain 90% claro-durain, RECOVERY 64%
44.69	45.09	Silty Mudstone - dark grey: silt content increasing to base abundant coaly streaks in upper half of section (decreasing towards base), abundant carbonaceous plant debris, minor calcite on coaly streaks in upper half of section
45.09	45.82	Sandstone - siltstone interlam. Sandstone - fine grained, medium grained, salt & pepper, grain size increasing to base Siltstone - medium grey - amount of siltstone ↓ towards base, gradational lower contact, X-lam., load structures, planar lam.

HOLE# WCC-81-7'

From 45.82 TO 47.82

FROM	TO	DESCRIPTION
45.09	45.82	minor convoluted bedding; scouring, fractures,
	Cont'd.	abundant calcite stringers @ base, slickensides
		@ 45.72 angled @ 60° to C/A, bedding angled @ 86°
		to C/A., minor worm burrows, carbonaceous plant
		debris
45.82	46.18	Sandstone - salt & pepper, medium grained
		Minor mudstone lam., X-bedding, ripple marks, worm
		burrows, calcareous cement, very minor carbonaceous
		plant debris, sharp lower contact
46.18	46.74	Siltstone, Sandstone interlam. - interbedded
		Siltstone, Mudstone grey to medium dark grey, muddy
		in places
		Sandstone, salt & pepper, fine grained, calcareous
		cement in sandstone
		- convoluted bedding, scouring, coaly streaks in
		center of section, mud rip up clasts @ 46.55
		@ 46.64, carbonaceous plant debris, distinct
		lower c o n t a c t
46.74	47.00	Mudstone, dark grey to black, coaly @ base
		- carbonaceous plant debris, coaly streaks, fractured
		in lower half of section
47.00	47.21	silty Mudstone ↑ mud content towards base, dark grey-
		brown
		- coaly streaks @ base, abundant carbonaceous plant
		debris, minor slickensides, minor calcite on
		carbonaceous plant debris
47.21	47.31	Siltstone - medium dark grey
		- coaly streaks, carbonaceous plant debris, calcite
		on carbonaceous plant debris
47.31	47.82	Sandstone - Siltstone interbedded
		Sandstone, salt & pepper, medium grey, X-lam.
		calcareous cement
		Siltstone - Mudstone dark grey, slightly muddy
		in places - worm burrows, slump and load structures,
		scouring, ripple marks, carbonaceous plant debris,
		bedding angled @ 86° to C/A,

HOLE#

WCC-81-7

From 47.82.

To 54.30

FROM		DESCRIPTION
47.82	48.91	Siltstone --medium dark grey - [↑] mud content towards base, minor fine grained sandstone lam. - vertically fractured throughout section, sandstone has calcareous cement, very minor carbonaceous plant debris
48.91	49.02	COAL - 0.11m (Core loss 0.06m) - abundant pyrite, bright banded, ~ 20% vitrain, 80% claro-durain
49.02	49.15	Siltstone, medium grey, muddy @ upper contact - abundant coaly streaks, abundant carbonaceous plant debris
49.15	52.80	Sandstone, Siltstone, Mudstone interlam, interbedded Sandstone, salt & pepper, fine grained, X-Lam., calcareous cement, predominant throughout section Siltstone, medium grey, [↑] mud content towards base, - Siltstone content increases towards base Mudstone - dark grey to black, carbonaceous towards base, abundance in lower half of section - worm burrows, slump structures, scouring, load structures, small shell molds in lower half of section, minor carbonaceous plant debris, slickensides @ 49.53, angled @ 78° to C/A & @ 49.67, angled @ 71° to C/A, bedding angled @ 85° to C/A, fracture @ 72.70 & angled @ 15° to C/A, minor calcite stringers near lower contact, minor pyrite near lower contact, calcareous cement
52.80	53.28	Muddy Siltstone - medium dark grey, decreasing mud content to base Muddy Siltstone - medium dark grey, decreasing mud content to base - carbonaceous plant debris, coaly streaks; calcite on plant debris
53.28	54.30	Siltstone, medium grey; slightly muddy in centre of section - calcite stringers from 53.74 to 53.77 - minor carbonaceous plant debris; minor coaly streaks; vertical fracture in lower half of section

HOLE# DDH-WCC-81-7

From 54.30 To 60.83

FROM	TO	DESCRIPTION
53.28	54.30	- calcite stringers from 53.74m to 53.77
	Cont'd.	- minor carbonaceous plant debris; minor coaly streaks
		- vertical fracture in lower half of section
54.30	54.69	Silty Sandstone - salt & pepper to medium grained, fine grained
		- carbonaceous plant debris, minor coaly streaks; calcareous cement - sharp lower contact
54.69	58.67	Sandstone, salt & pepper; medium grained - x-bedding, minor fine grained sandstone beds
		- coaly chips @ 50.22m, coaly streaks; minor slickensides,
		random mud rip up clasts; minor carbonaceous plant debris
58.67	59.15	Mudstone, dark grey - brown to black - slightly silty near upper contact - coaly streaks; carbonaceous plant debris
59.15	59.79	COAL - 0.64m core loss 0.04m - black - fractured; Poorly cleated; bright banded;
		- smells; distinct upper contact angled @ 85° to C/A
		- gradational lower contact angled @ 75° to C/A
		~ 3% fusain ~ 16% vitrain ~ 81% claro-durain
		RECOVERY 100%
		SAMPLE #2
59.79	60.00	Mudstone, dark grey to brown - hard - carbonaceous in places - coaly streaks, calcite stringers; minor fine grained sandstone near base; calcareous cement
60.00	60.25	COAL - 0.25m - black - cleated: bright banded
		Indistinct upper contact; distinct lower contact angled @ 85° to C/A
		~ 20% fusain ~ 8% vitrain ~ 72% claro-durain
		RECOVERY 100%
" 60.25	66.83	Siltstone - Medium grey - medium dark grey
		- coal band @ 60.34m; carbonaceous plant debris, coaly streaks - calcite on coaly streaks

HOLE#

WCC -81-7

From 60.83

TO 69.84

FROM	TO	DESCRIPTION
60.83	62.08	Sandstone, Siltstone - interbedded
		Sandstone, salt & pepper, fine grained to medium grained, X-lam. - more abundant in upper half
		Siltstone - medium grey - muddy in places
		worm burrows, minor calcareous cement; scouring; load structures; carbonaceous plant debris;
		Bedding angled @ 86° to C/A
62.08	62.14	COAL - 0.06m - black, cleated; bright; sheared;
		~ 45% vitrain ~ 55% claro-durain
		RECOVERY 14%
62.14	64.49	Siltstone, medium grey to medium dark grey, muddy @ upper contact - sandy near lower gradational contact, coaly streaks, coaly mudstone from 62.58 to 62.60m., carbonaceous plant debris, minor slickensides, calcite on slicken sides and plant debris, minor calcareous cement, minor worm burrows near lower contact
64.49	65.24	Sandy Siltstone, - medium grey
		Minor convoluted bedding near lower contact, minor worm burrows & carbonaceous plant debris, minor calcareous cement, plant rootlet near lower contact
65.24	69.19	Siltstone, Sandstone convoluted bedding throughout siltstone - medium grey, slightly muddy in places
		Sandstone - fine grained to medium grained, salt and pepper
		- scouring, minor ripple marks, worm burrows, minor carbonaceous plant debris, calcareous cement, coaly streaks near base, distinct lower contact
69.19	69.38	Carbonaceous mudstone - black
		minor carbonaceous plant debris, minor slickensides, pyrite nodules, shell fragments, coaly streaks near lower contact.
69.38	69.46	COAL - 0.08m
		- broken, black, blocky, bright banded,
		~ 20% vitrain, 80% claro-durain
69.46	69.84	Muddy Siltstone - medium dark grey
		-↑ silt content towards base, gradational lower

HOLE*

WCC-81-7

From 69.84 To 74.86.

FROM	TO	DESCRIPTION
69.46	69.84	contact, coal streaks, carbonaceous plant debris,
	Cont'd.	calcite on carbonaceous plant debris, [↑] calcareous
		cement increases towards base
69.84	71.00	Sandstone, Siltstone convoluted bedding
		Siltstone, medium grey, slightly muddy in places
		Sandstone, salt and pepper, fine grained
		- worm burrows, scouring, calcareous cement,
		minor carbonaceous plant debris
71.00	71.51	Sandstone, Silty Mudstone - interbedded
		Sandstone, salt & pepper, medium grained to coarsly
		grained, X-lam., silty mudstone; medium grey
		- X Bedding, convoluted bedding; slump structures;
		- minor calcite stringers; scouring; load structures
		carbonaceous plant debris, Bedding angled @ 84° to
		C/A - sharp lower contact
71.51	72.89	Sandstone, Mudstone, interlam, interbedded
		Sandstone, salt & pepper, fine grained to medium
		grained, decreasing grain size to base
		predominant in upper half of section
		Mudstone, dark grey to black; carbonaceous to base;
		predominant in lower half of section
		worm burrows, minor slump structures; scouring;
		load structures; fractured; shell molds pelecypods
		- minor carbonaceous plant debris; calcareous cement
		Bedding angled @ 86° to C/A
72.89	73.07	COAL 0.18m black; bright banded;
		- cleated; distinct upper and lower contacts
		~ 8% fusain, ~ 12% vitrain, 80% claro-durain
		RECOVERY 31%
73.07	74.86	Siltstone, medium dark grey, slightly muddy @ upper
		contact, fine grained sandstone bed from 74.00 to
		74.16m
		Coaly streaks @ upper contact, carbonaceous plant
		debris, minor slickensides, calcareous cement,
		slickensides @ 74.50, angled @ 76° to C/A, minor
		worm burrows possible shell fragments, @ 74.49 to
		74.50 is a pyrite band

HOLE#

WCC-81-7

From 74.86

To 79.52

FROM	-TO	DESCRIPTION
74.86	75.33	Sandy Siltstone, medium grey, minor fine grained sandstone lam. - worm burrows, carbonaceous plant debris, convoluted bedding, carbonaceous plant debris, calcareous cement, calcite stringers @ 75.17m., angled @ 74° to C/A
75.33	75.96	Siltstone, medium dark grey, slightly muddy near upper contact - worm burrows, minor convoluted bedding, coaly streaks, calcite surrounding coaly streaks, calcareous cement
75.96	76.29	Sandstone, Siltstone convoluted bedding Sandstone, light grey to salt & pepper, fine grained Siltstone, medium dark grey - coaly streaks, scouring, mixed, carbonaceous plant debris, calcareous cement,
76.29	78.32	Siltstone, medium grey to medium dark grey, increasing mud content to base - gradational, coaly streaks, calcite surrounding coaly streaks, carbonaceous plant debris, calcite on carbonaceous plant debris, small shell molds in muddy section.
78.32	78.35	COAL - 0.03m - black - cleated, bright banded ~ 30% vitrain ~ 70% claro-durain
79.35	78.53	Coaly Mudstone - black abundant carbonaceous plant debris; abundant coaly streaks, calcite on plant debris
78.53	79.37	COAL - 0.84m - black pyrite band from 78.84m to 78.88m - minor shearing; cleated; bright banded; calcite on pyrite; upper contact distinct angled @ 86° to C/A; lower contact indistinct ~ 10% fusain ~ 20% vitrain ~ 70% claro-durain
		RECOVERY
		SAMPLE #3
79.37	79.52	Coaly Mudstone - dark grey brown abundant carbonaceous plant debris, abundant coaly streaks; calcite on carbonaceous debris, minor slickensides

HOLE# WCC-81-7 From 79.52 To 85.79

FROM	TO	DESCRIPTION
79.52	80.97	Siltstone, Sandstone, interlam; interbed; minor mudstone lam near base
		Siltstone, medium grey, Sandstone; salt & pepper, X-lam. - planar lam; scouring; load structures; minor slump structures; worm burrows
		Bedding angled @ 85° to C/A; carbonaceous plant debris
80.97	81.02	COAL - 0.05m - black - blocky; bright lam; ~ 5% vitrain ~ 95% claro-durain
		RECOVERY 23% - calcite stringers @ upper contact
81.02	81.06	Coaly Mudstone - dark grey black - abundant carbonaceous plant debris; abundant coaly streaks; calcite stringers @ lower contact
81.06	82.41	Sandstone, salt & pepper, fine grained to medium grained increasing grain size to base
		- minor medium grey siltstone lam.
		- X-bedding; plant rootlets; minor coaly streaks; ripple marks; abundant calcite stringers and calcite crystals @ 81.88m angled @ 84° to C/A with minor quartz crystals
		- occasional mudstone rip-up clasts, calcareous cement - minor carbonaceous plant debris
82.41	83.45	Siltstone - medium grey, minor fine grained sandstone beds - scouring; worm burrows; load structures; slump structures, calcareous cement; sandstone is X-lam., minor carbonaceous plant debris;
		Bedding angled @ 83° to C/A
83.45	83.67	Coaly Mudstone - dark grey brown to black
		- abundant carbonaceous plant debris; abundant coaly streaks - coal bands @ 83.49; 83.55m; 83.65m
83.67	84.43	Muddy Siltstone - medium dark grey
		fractured almost vertically; fracture @ 83.98m angled @ 20° to C/A; carbonaceous plant debris
84.43	85.79	Sandstone, salt and pepper to light grey; fine grained to medium grained; increasing grain size to base - muddy siltstone bed from 85.05m to 85.07m
		- minor carbonaceous mudstone lam. in upper half of section

FROM	TO	DESCRIPTION
84.43	85.79	- convoluted bedding in upper half of section,
	Cont'd.	X-bedding throughout; worm burrows; scouring; slump structure; ripple marks; minor slickensides
		minor carbonaceous plant debris; calcareous cement
		- Bedding angled @ 87° to C/A
85.79	86.08	Sandstone, Siltstone interbedded
		Sandstone, salt & pepper; coarse grained to very coarse grained, contains mud rip up clasts
		Siltstone, medium grey, X-lam; minor mudstone lam. calcareous cement, slickensides @ bedding contacts, worm burrows, minor scouring
86.08	86.43	Muddy Siltstone, Sandstone interbedded
		Muddy Siltstone - Mudstone dark grey to dark grey / mud content towards the base
		Sandstone, salt & pepper, fine grained, convoluted bedding in center of section
		- scouring, load structures, minor worm burrows, carbonaceous plant debris, calcite on carbonaceous plant debris
86.43.	86.62	Mudstone - dark grey brown
		- almost vertical fracture throughout section, minor carbonaceous plant debris
86.62	86.81	COAL - 0.19m (3 cm core löss)
		black, bright. banded, cleated,
		~ 1% fusain, 30% vitrain, 69% claro-durain
		fractured, distinct upper contact, indistinct lower contact
86.81	87.51	Silty Sandstone - increasing sand content to base
		salt & pepper to medium light grey, fine grained - convoluted bedding coaly streaks, almost vertical fracture throughout section, calcareous cement, carbonaceous plant debris, calcareous cement
87.51	88.25	Siltstone - medium dark grey to medium dark grey
		- muddy in centre of section
		@ 87.91m coal band, gradational lower contact becoming sandier, abundant carbonaceous plant debris, calcite on carbonaceous plant debris, minor coaly streaks, worm burrows, calcareous cement

HOLE* WCC-81-7 From 88.25 To 95.94

FROM	TO	DESCRIPTION
88.25	90.20	Sandstone, Siltstone interbedded
		Sandstone, salt & pepper, fine grained - medium grained, X-lam.
		Siltstone - medium grey to medium dark grey, [↑] mud content → base convoluted bedding, X-bedding, mud rip-up clasts, worm burrows, scouring, carbonaceous plant debris, calcareous cement
90.20	91.39	Siltstone, slightly muddy in places, minor fine grained sandstone lam. in center of section, worm burrows, fracture @ 90.79 angled @ 5° to C/A., very minor carbonaceous plant debris
91.39	92.63	Sandstone, Siltstone - interlam; interbedded
		Sandstone, salt & pepper, fine grained to medium grained, X-lam.
		Siltstone - medium dark grey - increasing mud content to base
		X-bedding; ripple marks; scouring; minor worm burrows; carbonaceous plant debris
		Bedding angled @ 86° to C/A; minor coaly streaks; occasional mud rip-up clasts; calcareous cement
92.63	93.43	Muddy Siltstone - medium dark grey to dark grey increasing mud content to base; minor fine grained sandstone lam.
		- minor carbonaceous plant debris; scouring; sandstone has calcareous cement, minor worm burrows
93.43	94.05	Mudstone - black - slightly carbonaceous fractured in centre of section
		- minor carbonaceous plant debris
94.05	95.94	Sandstone & muddy siltstone - interbedded
		- Sandstone, salt & pepper, medium grained to coarsely grained, decreasing grain size to base; X-bedding - muddy siltstone - medium dark grey increasing mud content to base
		- scouring, worm burrows; ripple marks; load structures - X-lam., Bedding angled @ 87° to C/A; calcareous cement

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FROM	TO	DESCRIPTION
95.94	96.42	Mudstone, dark grey to black - carbonaceous towards base
		- carbonaceous plant debris; probable shell molds
96.42	96.78	COAL - 0.38m - black
		- highly broken in centre of section; cleated
		- bright banded; upper contact indistinct
		lower contact abrupt angled @ 80° to C/A
		minor fusain ~ 50% vitrain ~ 50% claro-durain
		RECOVERY 76%
		SAMPLE #4
96.78	Ej8.76	Sandstone, muddy siltstone - interbedded
		Sandstone - salt & pepper to medium grained; fine grained; X-lam.
		Muddy Siltstone - medium dark grey increasing toward base - convoluted bedding; minor X-bedding;
		calcareous cement; slickensides @ 97.73m angled @ 29° to C/A., minor worm burrows; coaly at upper contact; fractured
		- fracture @ 97.10 angled @ 85° to C/A;
		calcite and minor quartz crystals on fracture surface; minor carbonaceous plant debris
98.76	99.97	Mudstone, dark grey to black - slightly silty in places
		- carbonaceous plant debris; minor coaly streaks
99.97	100.68	COAL - 0.71m - black - cleated; bright and dull banded; fractured
		- upper contact indistinct; lower contact distinct angled @ 75° to C/A
		~ 4% fusain ~ 35% vitrain ~ 61% claro-durain
		RECOVERY 90%
		SAMPLE #5
100.68	101.04	Siltstone - medium dark grey - increasing mud content to base
		- abundant coaly streaks; abundant carbonaceous plant debris
		- minor calcareous cement on carbonaceous debris
		gradational lower contact

FROM	TO	DESCRIPTION
101.04	101.90	Coaly Mudstone - dark grey brown to black
		Siltstone bed from 101.14m to 101.24m
		- abundant coaly streaks; abundant carbonaceous plant debris
		- minor slickensides; calcite on slickensides
		- coal bands @ 101.53; 101.57m; 101.76m
		- minor shearing
101.90	102.66	Sandstone, Siltstone, interbedded
		Sandstone, salt & pepper to light medium grey; fine grained; X-lam.
		Siltstone - medium grey - muddy in centre of section
		- coaly streaks; minor pyrite nodule; minor worm burrows
		- scouring, load structures; minor convoluted bedding; calcareous cement; carbonaceous plant debris; calcite on carbonaceous debris, minor fractures
102.66	103.05	Siltstone, medium grey to medium dark grey
		- partial fracture; calcite on fracture
		- abundant carbonaceous plant debris; calcite on plant debris
		- coaly streaks; calcareous cement
103.05	103.41	Silty Mudstone, dark grey to black; pyrite band @ 103.32m
		- coaly from 103.25m to 103.32m; coaly streaks; carbonaceous plant debris; minor slickensides
103.41	103.64	COAL - 0.23 - black; bright banded; cleated
		- sheared; calcite on sheared surface
		~ 2% fusain; ~ 25% vitrain; ~ 73% claro-durain
		RECOVERY 40%
103.64	105.08	Mudstone, black - carbonaceous in places
		- shell molds (bivalvia); minor carbonaceous plant debris
		- minor calcite; fractured
		- gradational lower contact
105.08	106.16	Silty Mudstone - dark grey
		- almost vertically fractured throughout section
		- calcite on fracture; calcareous cement; minor

HOLE#

WCC-81-7

From 106.16

110.43

FROM	TO	DESCRIPTION
105.08	106.16	- calcite on fracture; calcareous cement; minor
	Cont'd.	shell molds; minor carbonaceous plant debris
		- calcareous cement
106.16	108.06	Sandstone - Siltstone - interbed - Bedding angled @ 86° to C/A
		Sandstone - salt & pepper, medium grained, X-lam.
		Siltstone - medium dark grey
		- convoluted bedding in upper half of section
		- scouring; slump structures; calcareous cement;
		minor load structures; carbonaceous plant debris
		minor coaly streaks
108.06	108.14	Sandstone, salt & pepper; medium grained - X-bedding,
		calcareous cement
108.14	108.63	Sandstone, salt & pepper, fine grained to medium
		grained - increasing grain size to base; minor
		worm burrows;
		- minor carbonaceous plant debris; calcareous
		cement
		- possible shell fragments
108.63	109.57	Sandstone - Mudstone interbed; interlam
		Sandstone - salt & pepper, medium grained to fine
		grained decreasing grain size to base
		- predominant in upper half of section
		mudstone - dark grey to black - carbonaceous to base
		- scouring; load structures; abundant worm burrows;
		calcareous cement; Bedding angled @ 85° to C/A.
109.57	109.69	Carbonaceous Mudstone - black - fractured;
		carbonaceous plant debris
109.69	110.23	COAL - 0.54m - black; bright; cleated
		- upper contact distinct angled @ 87° to C/A;
		lower contact indistinct
		~ 5% fusain ~ 15% vitrain ~ 80% claro-durain
		Recovery 74%
		SAMPLE #6.
110.23	110.43	Coaly Mudstone - black - abundant carbonaceous
		plant debris; abundant coaly streaks
		minor slickensides

FROM	TO	DESCRIPTION
110.43	110.45	COAL - 0.02m - black - cleated bright lam; ~ 95% claro-durain ~ 5% vitrain
110.45	110.52	Coaly Mudstone - black - abundant coaly streaks abundant carbonaceous plant debris; silty towards base gradational lower contact
110.52	111.09	Muddy Siltstone - medium dark grey - abundant coaly streaks; calcite on cleat; abundant carbonaceous plant debris
111.09	111.48	Silty Mudstone - dark grey brown to black - mud con tent increasing to base coaly streaks; coal bands @ 111.25m and 111.31m; minor slickensides
111.48	111.83	Coaly Mudstone - black - coal - mudstone - interlam. abundant coaly streaks; abundant carbonaceous plant debris
111.83	111.86	COAL - 0.03m black; cleated, blocky, bright; ~ 90% vitrain; 10% claro-durain
111.86	112.14	Mudstone, black; abundant coaly streaks; slickensides abundant carbonaceous plant debris
112.14	112.28	Coaly Mudstone; black; coaly lams; ^{coal} band < 0.01m @ 112.23m Abundant carbonaceous plant debris
112.28	112.50	COAL - 0.22m black 8cm core loss; poorly cleated; bright banded ~ 15% vitrain; 85% claro-durain, minor fusain
112.50	112.59	Coaly Mudstone; black; coaly lams; carbonaceous plant debris; minor slickensides
112.59	113.23	Siltstone medium dark grey increasing mudstone content to base; gradational lower contact coaly streaks; carbonaceous plant debris
113.23	113.65	Silty Mudstone, dark grey to black; coaly streaks; 4 cm core loss; coal band @ 113.78m; pyrite
113.65	114.63	Sandstone - Siltstone interbedded; sandstone salt and pepper, fine grained to medium grained X-lam X-bedding; siltstone medium dark grey;

HOLE+

WCC-81-7

From 114.63

To 118.97

FROM	TO	DESCRIPTION
113.65	114.63	convoluted bedding; slump structures; scouring
	cont'd.	worm burrows; minor carbonaceous plant debris
		bedding angled @ 84° to C/A
114.63	114.96	Sandstone salt & pepper, medium grained; X-bedding, mud rip-up clasts @ 114.68m; carbonaceous plant debris
114.96	115.92	Siltstone - Sandstone interbedded siltstone predominant; siltstone medium dark grey; sandstone salt & pepper to medium grey, fine grained; convoluted bedding; worm burrows; carbonaceous plant debris; minor calcareous cement, scouring
115.92	116.64	Muddy Siltstone dark grey; minor carbonaceous plant debris; minor worm burrows
116.64	116.90	Mudstone - Sandstone interlam; mudstone black, slightly carbonaceous, predominant sandstone Sandstone, salt & pepper to light grey; fine grained; scouring minor load structures; slumping; carbonaceous plant debris; sandstone has calcareous cement
116.90	117.99	Mudstone dark grey to black; vertically fractured throughout lower half of section; slightly silty from 117.07m to 117.19m; scouring; worm burrows in upper half; 7cm core loss; minor pyrite; carbonaceous towards base
117.99	118.55	COAL - 0.56m 7cm core loss BLACK; cleated; bright banded - 2% fusain, ~ 17% vitrain ~ 81% claro-durain RECOVERY SAMPLE 7
118.55	118.73	Mudstone dark grey brown to black; increasing siltstone contact to base; abundant coaly streaks with calcite on coaly streaks, carbonaceous plant debris with calcite on debris, minor slickensides
118.73	118.97	Muddy Siltstone, medium dark grey to dark grey; slightly sandy in places; carbonaceous plant debris; minor coaly streaks; minor calcite

HOLE+ WCC-81-7From 118.97 To 133.38

FROM	TO	DESCRIPTION
118.97	124.12	Siltstone (muddy) - sandstone interbed; siltstone predominant over sandstone; muddy siltstone medium dark grey; sandstone salt & pepper to medium grey fine grained; minor convoluted bedding; minor X-bedding in centre of section; worm burrows; scouring; load structures; pyrite; minor coaly streaks; minor carbonaceous plant debris; pyrite nodules 0.02m in diameter @ 123.11m - nodules arranged in band - contain calcite; sandstone has calcareous cement
124.12	7 . 8 0	Siltstone, Sandstone - interlam. Siltstone, medium grey increasing mud content to base Sandstone, salt & pepper, fine grained to medium grained; calcareous cement convoluted lam. in upper half of sect on planar lam. in lower half; scouring; load structures abundant worm burrows; minor mud rip-up clasts up to 0.33cm in diameter; carbonaceous plant debris slickensides @ 124.94m angled @ 50° to C/A; Bedding angled @ 81° to C/A
127.80	129.82	Sandstone, salt & pepper, fine grained to medium grained, grain size increasing towards base, minor siltstone lam. in upper half of section: muddy siltstone bed from 129.60m to 129.70m: worm burrows, g-bedding; minor scouring Bedding angled @ 85° to C/A
129.82	133.20	Sandstone, salt & pepper, coarsly grained to very coarsly grained, increasing grain size to base minor fine grained buff. sandstone beds; random chert pebbles up to 0.01m in diameter; pebble bands @ 130.87m @ 131.35; @ 131.50; silt ironstone concretions @ 131.06m; 133.01m - X-bedding; abundant coaly streaks in lowest third of section; minor carbonaceous plant debris
133.20	133.38	COAL - 0.18m - black - dull; minor bright lam. at base - sheared; slightly sapropelic; minor fusain; ~ 2% vitrain ~ 98% claro-durain

HOLE#

WCC-81-7

From 133.38

TO 141.77

FROM	TO	DESCRIPTION
133.38	133.60	Silty Mudstone - medium dark grey to medium grey - increasing silt content to base - minor fine grained lam near base - worm burrows; coaly streaks; minor calcareous cement; scouring
133.60	135.71	Sandstone, salt & pepper to medium grey; fine grained X-bedding; ripple marks; minor worm burrows - carbonaceous plant debris; calcareous cement; calcite stringer @ 134.88m.
135.71	140.43	Sandstone, Siltstone, Mudstone, interlam; interbed. Sandstone, salt & pepper, fine grained to medium grained increasing grain size towards the base X-lam; large beds near upper contact decreasing in size towards base Siltstone, medium grey - increasing mud content towards base; very minor in bottom half of section Mudstone, black - in lower half of section; carbonaceous towards the base - abundant worm burrows in siltstone and mudstone - minor slickensides along bedding; scouring; load structures; minor fractures; pyrite on slickensides; occasional calcite stringers along bedding - Bedding angled @ 83° to C/A
140.43	141.32	COAL - 0.89m ~ 0.05m core loss - black; contains a 0.01m mudstone split in lower half of section, unable to determine location due to broken core; calcite on split fractured; cleated in places; bright and dull lams. ~6% fusain ~ 17% vitrain ~ 77% claro-durain - upper contact distinct angled @ 78° to C/A; lower contact indistinct; RECOVERY 100% SAMPLE #8
141.32	141.77	Siltstone, medium grey to medium dark grey - slightly sandy near lower contact; -carbonaceous debris; minor coaly streaks; minor iron oxide stain at upper contact: gradational lower contact

HOLE# WCC-81-7From 141.77. To 149.77

FROM	TO	DESCRIPTION
141.77	141.98	Sandstone - salt & pepper; fine grained to medium grained - coaly streaks in upper half of section; minor slickensides; calcite and pyrite on slickensides - minor carbonaceous plant debris; minor calcareous cement
141.98	142.24	Sandstone - Siltstone - interlam. interbed; gradational lower contact Sandstone - salt & pepper, fine grained, X-bedding, predominant in upper half of section Siltstone - medium grey; predominant in lower half of section -carbonaceous plant debris; calcite on carbonaceous debris; -minor worm burrows; scouring.
142.24	143.94	Siltstone - medium dark grey -carbonaceous plant debris; minor coaly streaks
143.94	144.44	Mudstone - dark grey-brown; silty near lower contact -coal band at 144.15m; coaly mudstone in centre of section; core loss 0.10m; slickensides; calcite on slickenside surface; minor calcite stringers; coal streaks; carbonaceous plant debris
144.44	146.39	Sandstone - Siltstone - interbed - sandstone - salt & pepper - fine grain to coarsely grained increased grain size to base, predominant in lower half section Siltstone - medium dark grey - slightly muddy near upper contact. -predominant in upper half of section. - convoluted bedding; X-bedding; scouring; load structures, minor slump structure; carbonaceous plant debris - minor slump structure; carbonaceous plant debris - minor calcareous cement in coarse grain sandstone near base - occasional Mud rip-up clasts - Bedding angled @ 85° to C/A
146.39	146.65	Muddy Siltstone - medium dark grey to dark grey - coaly streaks; carbonaceous plant debris
146.65	147.36	Sandstone - salt & pepper to light grey; fine grain - clean - minor carbonaceous plant debris; scouring; - minor slump structure: gradational Lower contact
147.36	149.77	Siltstone - Sandstone - interbed - siltstone medium grey

HOLE#

WCC-81-7

From 149.77

To 157.52

FROM	TO	DESCRIPTION
		-sandstone - salt & pepper, fine grained - contains abundant worm burrows
		- souring; load structures; minor convoluted bedding
		- minor carbonaceous plant debris
		- gradational lower contact
149.77	151.48	Muddy Siltstone - Sandstone - interlam
		- muddy siltstone - dark grey - increased to base
		- sandstone - salt & pepper; fine grain - X-lam
		-scouring; load structures; minor worm burrows planar lam
		- Bedding angled @ 86° to C/A; calcareous cement; possible shell molds
151.48	152.14	Silty mudstone - dark gray - minor fine grain sandstone lam
		-partial almost vertical fractures; minor worm burrows in sandstone, shell molds (bivalvia?) scouring
152.14	152.39	Carbonaceous mudstone - black
		-minor carbonaceous plant debris; fractured vertically
152.39	152.63	COAL 0.24 - core loss 0.11m
		- black; broken; bright banded; cleated
		- difficult to determine composition due to broken core
		- predominantly clarodurain; distinct lower contact angled @ 86° to C/A
		- calcite on lower contact. Recovery 33%
152.63	152.76	Mudstone - dark grey-brown to black - coaly in places
		- coaly streaks, minor calcite stringers;
		- minor carbonaceous plant debris
152.76	153.80	Silty Mudstone - dark grey - increased silt content toward base
		fracture @ 153.22m angled @ 11° to C/A
		- coaly streaks; calcite stringer @ 152.94m angled @ 79° to C/A
		- abundant carbonaceous plant debris
153.80	157.52	Siltstone - Sandstone - interbed
		- siltstone - medium dark grey - slightly muddy in places, increased to base
		- forms beds up to 0.22m thick
		Sandstone - salt & pepper; fine grained to medium grained -
		- X-lam; X-bedding
		- coaly mudstone bed from 154.94m to 155.06m
		- carbonaceous plant debris, minor coaly streaks; worm burrows;

HOLE#

WCC-81-7

From

157.52

To

161.96

FROM	TO	DESCRIPTION
		Bedding angled at 86° to C/A; shell molds
		-minor pyrite on shell molds; calcareous cement
157.52	158.35	Mudstone - dark gray to black, carbonaceous toward the base
		- minor carbonaceous plant debris; partial fracture
158.35	158.57	Carbonaceous Mudstone - Sandstone - interlam
		- carbonaceous mudstone - Sandstone - salt & pepper to light grey; fine grained
		- abundant coaly streaks; coal band @ 158.45m
		- carbonaceous plant debris; calcite on plant debris.
158.57	158.69	Siltstone - Sandstone - convoluted bedding
		- siltstone - medium dark grey
		- sandstone - salt & pepper to medium grey; fine grained
		- worm burrows, carbonaceous plant debris; calcareous cement
158.69	159.18	Muddy siltstone - dark grey to medium dark grey; decreased mud content to base
		- coal band @ 158.69m; 158.86m
		- slickensides @ 158.93m angled @ 75° to C/A
		- carbonaceous plant debris
159.18	160.19	Siltstone - interbed; interlam
		Sandstone - salt & pepper, fine grained - X-lam
		Siltstone - medium grey - not very abundant
		- convoluted bedding and lam in upper half of section;
		-X-bedding in lower half; planar lam; worm burrows, slump structures; ripple marks; scouring
		- carbonaceous plant debris; fractured near base; calcareous cement
160.19	160.67	Siltstone - medium grey
		- carbonaceous plant debris; calcareous cement; minor calcite on carbonaceous debris
160.67	161.35	Sandstone - Siltstone - interbed
		Sandstone - salt & pepper, light grey to medium grey - fine grained to medium grained.
		Siltstone - medium dark grey
		- worm burrows, scouring, load structures; minor ripple marks
		- slickensides 160.97m angled @ 79° to C/A; calcite on slickensides
		- minor coaly streaks, Bedding angled @ 84° to C/A
161.35	161.96	Siltstone medium grey minor fine grained sandstone

HOLE# WCC-81-7

From 161.96 To 168.07

FROM	TO	DESCRIPTION
		decreased to base
		- scouring; worm burrows; Bedding angled @ 84° to C/A
		- carbonaceous plant debris
161.96	162.15	Mudstone - black
		- minor carbonaceous plant debris; fractured
162.15	162.21	COAL 0.06m - black, cleated Recovery 13%
		- brightbanded 15% vitrain 85% clarodurain Recovery 13%
162.21	162.36	Silty Mudstone dark grey
		- minor slickensides, abundant carbonaceous plant debris;
		minor coaly streaks
162.36	163.00	Sandy Siltstone - medium grey to light grey; fine grained
		- convoluted bedding; worm burrows; scouring; minor carbonaceous
		plant debris; calcareous cement
163.00	163.45	Sandstone - salt & pepper to light medium grey; fine grained-
		massive
		- fracture @ 163.23m angled at 76° to C/A calcite on slickenside
		- abundant partial fractures from 163.23m to 163.45m
		- very minor carbonaceous plant debris; calcareous cement
163.45	163.92	- Siltstone - Sandstone - interlam
		Siltstone - medium grey; Sandstone; salt & pepper to medium
		light grey; fine grained; X-lam
		- scouring; load structures; minor worm burrows;
		- Bedding angled @ 86° to C/A; minor carbonaceous plant debris
163.92	164.86	Muddy Siltstone - dark grey - higher mud content in centre
		of section; coaly streaks, more abundant in lower half of
		section, coaly streaks, more abundant in lower half of section;
		abundant carbonaceous plant debris increased to base, shell
		fragments decreased to base; calcareous cement
164.86	168.07	Sandstone - Siltstone- Mudstone - interbed, interlam in lower
		part of section.
		Sandstone - salt & pepper, fine grained to medium grained; X-lam
		Siltstone- medium grey - increased mud content to base
		Mudstone - dark grey; more abundant than siltstone near base
		- abundant worm burrows; scouring; load structures; carbonaceous
		plant debris, minor convoluted bedding, pyrite in lower half
		- minor slickensides @ 165.06m angled @ 86° to C/A; 165.34m
		angled @ 87° to C/A; 165.67m angled @ 78° to C/A; 165.69m angled
		@ 80° to C/A; 167.61m angled @ 88° to C/A

HOLE+

WCC-81-7

From 168.07

TO

176.04

FROM	TO	DESCRIPTION
168.07	168.51	Coaly Mudstone - dark grey-brown to black; minor salt & pepper sandstone lam - abundant coaly streaks; carbonaceous plant debris; coal band 0.01m
168.51	169.63	Siltstone - Sandstone - interbedded and mixed - Siltstone - medium grey to medium dark grey - more abundant in upper half of section, becoming sandy near base Sandstone - salt & pepper - fine grained - convoluted bedding; worm burrows; minor shell fragments; calcareous cement; slickensides @ 169.33m - minor carbonaceous plant debris Bedding angled @ 86° to C/A
169.63	170.37	Sandstone - salt & pepper; medium grained - X-bedding; coaly streaks; minor carbonaceous plant debris; calcareous cement.
170.37	174.01	Sandstone - Siltstone - interbed Sandstone - salt & pepper to light grey, fine grained to coarse grained, grainsize increased to base Siltstone - medium dark grey - slump structures, minor convoluted bedding - planar bedding, scouring; load structures; calcareous cement - minor worm burrows; Bedding angled @ 84° to C/A
174.01	174.55	COAL 0.54m core loss 0.16m : dull black; poorly cleated; upper contact distance angled @ 88° to C/A; lower contact distinct angled @ 81° to C/A 10% fusain 2% vitrain 88% clarodurain
174.55	175.79	Siltstone - Sandstone - interbedded Siltstone medium dark grey - sandy in places Sandstone - salt & pepper; fine grained to medium grained - minor planar bedding; convoluted bedding; worm burrows; coaly streaks; slickensides @ 175.55m angled at 40° to C/A @ 175.68m angled @ 80° to C/A; calcite and pyrite on slickenside surface; minor calcite stringers in lower part of section; very hard mudstone rip up clasts up to 0.02 m in diameter from 175.38m to 175.40m; and from 175.09m to 175.13m; carbonaceous plant debris; -calcareous cement
175.79	176.04	Mudstone - dark grey brown - very soft, broken and sheared

HOLE #

WCC-81-7

From 176.06 To 181.10

FROM	TO	DESCRIPTION
		from 175.90m to 176.00m
		-abundant calcite stringers, carbonaceous plant debris
		-minor slickensides
176.04	176.38	COAL - 0.34m - black
		- cleated; bright and dull lam; minor pyrite (?) on cleat;
		distinct upper contact 90° to C/A distinct to lower contact
		88° to C/A 5% fusain, 15% vitrain 80% clarodurain
		Recovery - 57%
		Sample #9P
176.38	177.38	Siltstone - Sandstone - interbed
		- gradational from predominantly siltstone to predominantly
		sandstone @ lower contact; scouring; minor worm burrows;
		- minor convoluted lam; load structures
		- coaly streaks decreased to base; minor slickensides along
		bedding; minor carbonaceous plant debris
177.38	177.50	COAL 0.12m - black, cleated, bright banded 1% fusain
		15% vitrain 84% clarodurain
177.50	177.89	Mudstone - dark grey-brown; very hard; abundant calcite
		stringers, poorly defined slickensides throughout
		- coaly mudstone from 177.77 to 177.83m, coaly streaks
		- carbonaceous plant debris
177.89	179.53	Sandstone - salt & pepper, medium grained to coarse grained
		- grain size increased to base
		- minor mudstone lam, mudstone bedding from 178.72m to 178.74m
		from 179.20m to 179.26m
		- X-bedding, ripple marks, minor coaly streaks
		- minor slickensides along mudstone, calcareous cement
		- minor carbonaceous plant debris
179.53	180.52	Mudstone - Sandstone - interlam
		- Mudstone - black - carbonaceous towards the base
		- Sandstone - salt & pepper; medium grained - X-lam near
		upper contact
		- Mudstone increased towards the base; scouring; load structure
		- minor wormburrows; Bedding angled @ 87° to C/A
		- partial vertical fracture near upper contact
		- minor carbonaceous plant debris
180.52	181.10	Silty Mudstone - dark grey to black; increased silt content
		to base

HOLE #

WCC-81-7

From

181.10

To

185.17

FROM	TO	DESCRIPTION
		- coal band at 180.56m; fractur @ 180.76m angled @ 70° to C/A
		- calcite on fracture, minor calcite stringers near upper contact; carbonaceous plant debris; minor calcite on carbonaceous debris.
181.10	181.80	Muddy siltstone - interlam; interbed
		Sandstone - salt & pepper, fine grained to medium grained; grain size increased to base
		-X-lam
		Muddy Siltstone - medium dark grey to dark grey
		- planar lam, scouring; rip up clasts; minor load structures; minor worm burrows
		- calcareous cement; minor iron staining; fractures @ 181.39 angled @ 44° to C/A; @ 181.50m angled @ 90° to C/A
		Bedding angled @ 85° to C/A
181.80	182.54	Sandstone - salt & pepper; medium grained to coarse grained
		- coarse grained in centre of section.
		- mud rip up clasts @ 182.20m; mudstone beds @ 182.31m to 182.35m; from 182.43m to 182.45m
		- minor worm burrows in mudstone; ripple marks
		- X-bedding; calcareous cement
182.54	183.15	Sandstone - Mudstone - interlam
		Sandstone - salt & pepper, medium grained - X-lam;
		calcareous cement
		- Mudstone - medium brown or black
		- scouring; slump structures; load structures
		- Bedding angled @ 83° to C/A; worm burrows; carbonaceous plant debris
183.15	183.71	Silty Mudstone - dark grey
		- minor carbonaceous plant debris; minor worm burrows
183.71	184.90	COAL 1.19m - black
		- Mudstone split from 184.31 to 184.37m; from 184.45 to 184.54
		- cleated in places; bright lam;
		- upper contact distinct angled 83° to C/A lower contact distinct angled @ 80° to C/A
		1% fusain 20% vitrain 79% clarodurain
		Recovery 100%
		Sample #10
184.90	185.17	Sandstone - salt & pepper to light medium gray; fine grained hard.

: HOLE# WCC-81-7 From 185.17 T O 191.88

FROM	TO	DESCRIPTION
		- fracture @ 185.01m, pyrite on fracture surface
		- coal band @ 185.13m
185.17	185.32	COAL 0.15m black; broken; bright banded
		- contains a large fine grained sandstone clast
		30% vitrain 70% clarodurain
185.32	185.42	Sandstone - Coal - interlam
		Sandstone - salt & pepper fine grained; X-lam
		Coal - black
		- slickensides throughout.
185.42	187.73	Sandstone, salt & pepper, fine grained, X-bedding - very minor carbonaceous mudstone laminae
		pressure soln surface 187.21m and 187.42m
		ripple marks
187.73	188.17	Muddy Siltstone - dark grey
		carbonaceous plant debris; minor coaly streaks
		soft and medium brown 187.78m to 187.81m
188.17	188.27	Sandstone, salt & pepper, medium grained - minor mudstone laminae near base - worm burrows, calcareous cement, X bedding - minor carbonaceous plant debris
188.27	189.33	Silty Mudstone - medium dark grey, decreasing silt content toward base - minor fine grained sandstone laminae, calcareous cement, minor worm burrows, minor carbonaceous plant debris; scouring - mudstone bed from 189.16m to 189.20m, coaly streaks near base
189.33	189.75	Sandy Siltstone - medium dark grey
		- minor carbonaceous plant debris; coaly streaks; calcareous cement
189.75	191.88	Muddy Siltstone - sandstone interlam Bedding angled @ 85° to C/A
		Muddy Siltstone - medium dark grey to dark grey increasing mud content to base
		- predominant throughout section
		- sandstone, salt & pepper, fine grained, calcareous cement; X-lam. - scouring; load structures; abundant shell molds (bivalvia) fractured vertically; pyrite; minor carbonaceous plant debris

HOLE# WCC-81 -7From 191.88 To 198.44

FROM	TO	DESCRIPTION
191.88	192.18	Silty Mudstone - dark grey - higher mud content near upper contact; vertical fracture throughout section; carbonaceous plant debris - calcite on carbonaceous plant debris
192.18	194.87	Sandstone, Siltstone, Mudstone - interbed in upper half grading to interlam in lower half Sandstone, salt & pepper; medium grained to fine grained, grain size decreasing to base Siltstone, medium grey - increasing mud content to base, mudstone, dark grey, predominant near base - scouring; load structures; slump structures. - worm burrows; Bedding angled @ 85° to C/A/ coaly streaks; carbonaceous plant debris; calcareous cement, abrupt lower contact
194.87	195.43	COAL - 0.56m CORE LOSS 0.03m - black; sheared; bright banded; abrupt upper contact angled @ 88° to C/A; abrupt lower contact angled @ 84° to C/A - pyrite on lower contact - difficult to determine composition due to shearing; minor fusain; predominant claro-durain; calcite on shear RECOVERY SAMPLE 11P
195.43	196.18	Silty Mudstone - dark grey to medium dark grey - increasing silt content to base - minor fine grained sandstone lam. @ 195.92m; carbonaceous plant debris decreasing to base; minor coaly streaks
196.18	198.44	Sandstone, Siltstone - interbed interlam. Sandstone - salt & pepper; medium grained grain size decreasing to base - predominant bedded; X-lam. decreasing to base Siltstone, medium grey to medium dark grey increasing mud content to base - predominant laminae increasing to base X-bedding; scouring, load structures; minor fractures; Bedding angled @ 86° to C/A; minor carbonaceous

FROM	TO	DESCRIPTION
196.18	198.44	plant debris; worm burrows
198.44	199.14	Mudstone, Sandstone - interlam. Bedding angled @ 85° to C/A; Mudstone - dark grey to black; slightly carbonaceous Sandstone, salt & pepper; fine grained - scouring; worm burrows; minor slickensides, @ 86° to C/A, calcite on slickensides; shell molds, (bivalvia), calcareous cement
199.14	199.59	Mudstone - black - abundant shell molds (bivalvia); fractured; minor pyrite
199.59	199.79	Carbonaceous Mudstone - Sandstone interlam Carbonaceous Mudstone - black; sandstone - salt and pepper, medium grained, X-lam. - scouring bioturbation; carbonaceous plant debris; minor calcite stringer; coal band < 0.01m @ 199.79m
199.79	200.62	Muddy Siltstone - medium dark grey, increasing silt content to base; carbonaceous plant debris; decreasing to base; broken and sheared with abundant calcite from 199.90m to 199.95m; minor coaly streaks near upper contact; minor calcareous cement, increasing to base
200.62	201.31	Siltstone, medium grey, minor convoluted bedding near upper contact - abundant calcite stringers throughout; fracture @ 200.90m angled @ 15° to C/A; calcareous cement
201.31	203.17	Sandstone, Siltstone interbed. Sandstone, medium grained to coarsly grained, coarsly grained in centre of section - X-Lam. Siltstone - medium grey - scouring; load structures; minor convoluted lam; - worm burrows; minor carbonaceous plant debris; minor coaly streaks; calcareous cement
203.17	204.28	Mudstone, Sandstone - interlam. Mudstone - dark grey to black - silty near upper contact Sandstone, Salt & Pepper, Medium Grained

HOLE# WCC-E1-7 From 204.28 To 208.02

FROM	TO	DESCRIPTION
203.17	204.28	- scouring, load structure; minor worm burrows
	cont'd.	- minor pyrite on bedding planes: minor carbonaceous plant debris
204.28	206.07	Siltstone, Sandstone, interbed
		Siltstone, medium grey to medium dark grey, slightly muddy in places
		- Sandstone, salt & pepper; fine grained, X-lam.
		- calcareous cement - worm burrows; - scouring; load structures; fracture @ 205.04m angled @ 30° to C/A; minor convoluted bedding; minor carbonaceous plant debris; bedding angled @ 85° to C/A
		- possible shell- fragments
		- slickensides @ 205.64m angled @ 65° to C/A; @ 205.76m angled @ 86° to C/A
		@ 205.79m; @ 205.81m; @ 205.87m angled @ 74° to C/A; @ 205.91m; @ 205.92m angled @ 60° to C/A;
		@ 205.96m - soft and fractured from 205.98m to 206.07m calcite on fractures
206.07	206.35	Mudstone - black - slightly carbonaceous; fractured calcite infilling from 206.20m to 206.35m; minor carbonaceous plant debris
206.35	206.65	COAL - 0.30m - black, cleated; bright lam.
		- upper contact distinct angled @ 84° to C/A;
		lower contact indistinct, minor fusain ~ 15% vitrain ~ 85% claro-durain
		RECOVERY - 67%
		SAMPLE 12P
206.65	206.82	Coaly mudstone, dark grey - brown to black - silty toward base - abundant carbonaceous debris: abundant coaly streaks
206.82	208.02	Sandstone - Mudstone interbed
		- Sandstone, salt & pepper, medium grained, X-bedding predominant
		- mudstone - dark grey - minor
		- minor scouring, minor load structures; worm burrows;
		- occasional mud rip-up clasts; minor carbonaceous plant debris; calcareous cement

FROM	TO	DESCRIPTION
208.02	210.49	Sandstone, salt & pepper, medium grained, minor mudstone lam in centre of section fractures @ 208.21m angled @ 69° to C/A; 208.38m angled @ 65° to C/A - @ 209.59m angled @ 71° to C/A; minor carbonaceous plant debris; minor coaly streaks; X-bedding; ripple marks; calcareous cement - Bedding angled @ 85° to C/A
210.49	210.82	Siltstone, Sandstone, mixed Siltstone, medium dark grey; sandstone, salt & pepper; fine grained to medium grained - convoluted bedding; scouring; minor carbonaceous plant debris; minor coaly streaks; minor calcite on plant debris
210.82	211.48	COAL- 0.66m - core loss 0.05m - black; fractured; bright banded; cleated; ~ 1% fusain ~ 16% vitrain ~ 83% claro-durain upper contact distinct angled @ 79° to C/A; lower contact distinct angled @ 86° to C/A RECOVERY 76% SAMPLE 13P
211.48	212.53	Siltstone - medium grey - minor medium grained sandstone lam in upper third of section; worm burrows; carbonaceous plant debris, calcite veinlet at 211.92m angled @ 79° to C/A; minor coaly streaks; minor calcite on carbonaceous debris
212.53	214.50	Sandstone, Siltstone, interbed; interlam. Sandstone, salt & pepper, medium grained to coarse grained; coarse grained in centre of section Siltstone - medium grey to medium dark grey - more abundant in lower half of section - scouring; load structures; worm burrows; calcareous cement - planar lam; minor X-lam; fracture zone from 213.49m to 213.55m, calcite filling fractures - minor carbonaceous plant debris; bedding angled @ 83° to C/A

HOLE#

WCC-8.1-7

From 214.50 To 220.44

FROM	TO	DESCRIPTION
214.50	215.81	Silty Mudstone - dark grey to black - minor fine grained sandstone lam. throughout; abundant shell molds (bivalvia); minor scouring; shell fragments; minor calcite
215.81	215.96	COAL - 0.15m - black; bright banded; cleated ~ 3% fusain ~ 10% vitrain ~ 87% claro-durain RECOVERY - 75%
215.96	216.50	Muddy Siltstone - medium dark grey - abundant carbonaceous plant debris; abundant coaly streaks; minor calcite; gradational lower contact
216.50	218.14	Muddy Siltstone - Sandstone - bedded - mixed Muddy Siltstone - medium dark grey Sandstone - salt & pepper, fine grained to medium grained - increasing grain size to base - convoluted bedding; minor planar bedding; slump structures; scouring; worm burrows; shell fragments in upper half of section; minor carbonaceous plant debris; calcareous cement; Bedding angled @ 86° to C/A
218.14	220.15	Sandstone, Mudstone, Siltstone - interbed near upper contact; interlam. towards base Sandstone, salt & pepper, fine grained to medium grained, grain size decreasing downwards mudstone - dark grey to black, carbonaceous towards the base; most abundant in lower half of section Siltstone - medium grey - minor throughout section - abundant bioturbation; scouring; load structures; planar bedding; Bedding angled @ 86° to C/A., Sandstone is x-bed in upper half of section; calcareous cement, carbonaceous plant debris; gradational lower contact
220.15	220.44	Mudstone - dark grey - brown to black - pyrite replacement of worm burrows - worm burrows; coaly streaks; carbonaceous plant debris;

HOLE# WCC-81-7From 220.44 To 225.82

FROM	TO	DESCRIPTION
220.15	220.44	- minor calcite on carbonaceous debris
		cont'd.
220.44	220.62	COAL - 0.18m core loss 0.04m
		- black; well cleated; bright banded;
		~ 30% vitrain ~ 70% claro-durain, abrupt lower
		contact RECOVERY 40%
220.62	221.89	Siltstone, medium dark grey to medium grey,
		slightly muddy near upper contact
		- minor medium grained sandstone lam. in section,
		scouring; minor wormburrows; coaly streaks;
		carbonaceous plant debris; slumping @ upper contact
221.89	222.17	Sandstone, salt & pepper, medium grained - i-bedding;
		minor worm burrows: minor buff sandstone lam.,
		minor carbonaceous plant debris
222.17	222.44	Sandy Siltstone - medium grey increasing sand
		content to base
		minor convoluted -bedding, minor carbonaceous plant
		debris; minor worm burrows near lower contact
222.44	225.82	Sandstone, salt & pepper, medium grained to coarsly
		grained; coarse grained in centre of section;
		clean
		- minor carbonaceous mudstone lam. in lower half of
		section
		- mudstone beds from 223.62m to 223.66m; from
		224.40 to 224.47m
		- X-bedding, minor calcareous cement; minor
		carbonaceous plant debris
	T.D.	225.82m END OF HOLE!

APPENDIX 11

ANALYTICAL DATA

D.D.H. W.C.C.'- 81-6 and 7

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE DDH-WCC-8 1-6

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	1.37	22.94	0.84	23.90	51.7 ⁹	110 ⁹ 4	8	23.26	0.85	24.23	57.51	11248
SAMPLE #2	1.35	4.45	0.84	26.13	68.07	14097	7	4.51	0.85	26.4 ⁹	6 ⁹ .00	142 ⁹ 0
SAMPLE #3	1.44	15.7 ⁸	0.74	25.57	57.71	12475	8	16.01	0.75	25.04	58.05	12657
SAMPLE #4	1.71	11.04	0.71	26.04	61.21	12736	3 1/2	11.23	0.64	26.4 ⁹	62.28	129.58
SAMPLE #5	1.29	12.50	0.85	27.07	59.14	12651	6	12.66	0.86	27.47	59.92	12816
SAMPLE #6	1.39	11.98	1.96	27.57	59.06	17647	7	12.15	1.99	27.96	59.89	12825
SAMPLE #7	1.18	23.84	0.87	23.76	51.22	11145	7	24.12	0.88	24.04	51.84	11278
SAMPLE #8	1.10	7.47	0.94	29.11	62.32	13468	8	7.55	0.95	29.43	63.02	13618
SAMPLE #9	1.27	7.75	0.8%	76.52	fi4.46	13691	8	7.85	0.83	76.86	65.2 ⁹	13867
SAMPLE #10	0.92	13.80	0.75	22.07	57.21	11877	1 1/2	19.98	0.76	22.27	57.75	11987
SAMPLE #11	1.15	1A.25	0.83	37.67	56.93	11890	5 1/2	1A.47	0.84	27.99	57.5 ⁹	12028
SAMPLE #12	1.77	7.53	0.78	24.10	66.60	13673	4 1/2	7.67	0.79	24.53	67.80	13868
SAMPLE #13	1.36	8.27	0.00	30.10	60.18	13473	8 1/2	8.39	0.91	30.61	61.01	13658
SAMPLE #14	1.35	2.10	0.87	77.55	69.00	14544	7	7.33	0.88	27.03	69.94	14743
SAMPLE #15	1.72	20.60	1.01	7.7.92	54.67	11.671	8	21.05	1.03	73.32	55.63	11824
SAMPLE #16	1.76	2.97	0.72	24.58	70.6"	14274	6	3.07	0.73	25.02	71.96	14530
SAMPLE #17	1.45	14.4 ⁹	0.83	23.2 ⁹	50.77	12628	6 1/2	1A.70	0.84	73.63	61.67	17814

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE DM-WCC-81-6

HFAD ANALYSIS

SULFUR FORMS

PRODUCT	AIR DRY BASIS				MOISTURE FREE BASIS			
	SULFATE SULFUR AS % S	PYRITIC SULFUR	ORGANIC SULFUR	TOTAL	SULFATE SULFUR AS % S	PYRITIC SULFUR	ORGANIC SULFUR	TOTAL
SAMPLE #4	<0.01	0.04	0.59	0.63	<0.01	0.04	0.60	0.64
SAMPLE t1.5	<0.01	0.57	0.44	1.01	<0.01	0.58	0.45	1.03
SAMPLE #16	(0.01	0.0 ^a	0.63	0.77	LO. 01	0.09	0.64	0.73

WATER SOLUBLE ALKALIES

PRODUCT	AIR DRY BASIS		MOISTURE FREE BASIS	
	% K ₂ O	% Na ₂ O	% K ₂ O	% Na ₂ O
SAMPLE #4	<0.01	0.01	<0.01	0.01
SAMPLE #15	<0.01	0.02	<0.01	0.02
SAMPLE #16	<0.01	0.02	<0.01	0.07

SUNNYSIDE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE DDF-WCC-81-6

SAMPLE #4

HEAD ANALYSTS

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2251	2110
Softening (H=W)	2255	2129
Softening (H=1/2 W)	2380	2146
Fluid	2526	2201

% EQUILIBRIUM MOISTURE = 10.80

HARDGROVE GRINDABILITY INDEX = 64

O-

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL.

POLE DD1-100-81-6

SAMPLE #15

ITAD ANALYSIS

FUSION TEMP. OF A!!?

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2327	2324
Softening (H=M)	>2780	>2780
Softening (H=1/2 M)	>2780	>2780
Fluid	>2780	>2780

* EQUILIBRIUM MOISTURE = 2.27

HARDGROVE CRINDABILITY INDEX = 71

11/12/71

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE DDH-500-27-6

SAMPLE #16

HFAD ANALYSIS

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2311	2080
Softening (H ₂ O)	2345	2114
Softening (H ₂ O + 1/2 W)	2385	2154
Fluid	2514	2412

% EQUILIBRIUM MOISTURE = 6.85

HARDGROVE GRINDABILITY INDEX = 70

- 25 / 100 / 100 / 100

SUNNYSIDE MINERALS LABORATORY

WEST CARRON CREEK COAL
 DRILL HOLE DDH-VCC-81-7
 HEAD ANALYSTS

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H2O	% ASH	% S	% VM	% FC	BTU	FST	% ASH	% S	% VM	% FC	BTU
SAMPLE #1	1.38	3.69	0.81	76.15	68.78	14556	7 1/2	3.74	0.82	26.52	69.74	14760
SAMPLE #2	1.22	7.01	0.74	24.64	67.14	14143	7	7.10	0.75	24.94	67.96	14316
SAMPLE #3	1.64	5.03	0.91	25.04	68.29	14342	7	5.11	0.93	25.46	69.43	14581
SAMPLE #4	1.10	23.22	0.73	22.96	57.77	11648	7 1/2	23.48	0.74	23.22	53.30	11778
SAMPLE #5	1.40	6.41	0.71	24.66	67.53	14208	7 1/2	6.50	0.72	25.01	68.49	14410
SAMPLE #6	1.18	6.03	0.73	24.89	67.90	14298	8	6.10	0.74	25.19	68.71	14469
SAMPLE #7	1.08	9.29	0.58	25.07	64.60	13726	7	9.39	0.59	25.30	65.31	13876
SAMPLE #8	1.06	7.19	0.86	23.83	67.92	14136	6 1/2	7.27	0.87	24.09	68.64	I A 7 8 7
SAMPLE #9	1.08	3.63	0.74	26.98	68.31	14701	8	3.67	0.75	27.77	69.06	14862
SAMPLE #10	1.21	26.58	0.60	20.75	51.46	10881	7	26.91	0.61	21.00	52.09	11014
SAMPLE #11	1.15	3.76	1.01	25.84	69.25	14641	8	3.80	1.02	26.14	70.06	14811
SAMPLE #12	1.14	5.53	0.68	24.85	68.48	14403	7	5.59	0.69	25.14	68.77	14569
SAMPLE #13	1.19	1.74	0.73	25.57	71.50	15045	8	1.76	0.74	25.88	72.36	15226

P/C

SUNNYSIDE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE DDH-WCC-81-7

SAMPLE #3

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	41.30
Alumina, Al ₂ O ₃	10.60
Titania, TiO ₂	0.44
Ferric oxide, Fe ₂ O ₃	20.10
Lime, CaO	9.06
Magnesia, MgO	6.20
Potassium oxide, K ₂ O	0.63
Sodium oxide, Na ₂ O	0.76
Sulfur trioxide, SO ₃	10.16
Phos. pentoxide, P ₂ O ₅	0.54
Undetermined	0.21
Total	<u>100.00</u>

ALKALIES AS Na₂O, DRY COAL BASIS = 0.06

SILICA VALUE = 53.87

BASE: ACID RATIO = 0.70

FOULING INDEX = 0.53

SLAGGING INDEX = 0.65

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE DDH-WCC-81 -7

SAMPLE #3

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.64	—
% CARBON	81.14	82.49
% HYDROGEN	4.63	4.71
% NITROGEN	1.35	1.37
% CHLORINE	0.16	0.16
% SULFUR	0.91	0.93
% ASH	5.03	5.11
% OXYGEN (DIFF.)	5.14	5.23
TOTAL	100.00	100.00

FUSION TFMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2210	2085
Softening (H=W)	2247	2125
Softening (H=1/2 W)	22R0	2147
Fluid	2489	2310

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE DDH-WCC-81-7

SAMPLE #10

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	70.90
Alumina, Al ₂ O ₃	18.30
Titania, TiO ₂	0.84
Ferric oxide, Fe ₂ O ₃	2.38
Lime, CaO	1.91
Magnesia, MgO	0.67
Potassium oxide, K ₂ O	2.13
Sodium oxide, Na ₂ O	0.40
Sulfur trioxide, SO ₃	0.33
Phos. pentoxide, P ₂ O ₅	1.31
Undetermined	0.83
Total	<u>100.00</u>

ALKALIES AS Na₂O, DRY COAT, BASIS = 0.40

SILICA VALUE = 93.46

BASE: ACID RATIO = 0.08

FOULING INDEX = 0.03

SLAGGING INDEX = 0.05

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE DDH-WCC-81-7

SAMPLE #10

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.21	--
% CARBON	63.62	64.40
% HYDROGEN	3.92	3.07
% NITROGEN	1.24	1.26
% CHLORINE	0.09	0.09
% SULFUR	0.60	0.61
% ASH	26.58	26.91
% OXYGEN (DIFF.)	2.74	2.76
TOTAL	100.00	100.00

FUSION TEMP. OF Ass

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2240	2310
Softening (H=W)	2720	2660
Softening (H=1/2 W)	>2780	3740
Fluid	>2780	>7780

WEST CARBON CREEK COAL
HOLE DDH-WCC-81-7

SULFUR FORMS

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	AIR DRY BASIS				MOISTURE FREE BASIS			
	SULFATE SULFUR AS % S	PYRITIC SULFUR	ORGANIC SULFUR	TOTAL	SULFATE SULFUR AS % S	PYRITIC SULFUR	ORGANIC SULFUR	TOTAL
SAMPLE #3	< 0.01	0.21	0.70	0.91	< 0.01	0.21	0.72	0.93
SAMPLE #10	< 0.01	0.10	0.50	0.60	< 0.01	0.10	0.51	0.61

APPENDIX III

COST STATEMENT

NOTE: Represents a consolidation of the costs included in the Application to Extend the Term of **Licence** for **Coal Licence** numbers 4104 - 4123 and 5171 - 5173.

ON PROPERTY COSTS:

1.) Operators Fees, Salaries and Wages: Professional and Technical	\$ 17,351.
2.) Contractors: Longyear Canada Inc. (Includes charges for direct drilling costs, expenses, for additional staff, etc.)	35,335.
Slashing Crews: (Includes charges for slashing, clearing and preparation of drill site)	3,624.
3.) Equipment and Instruments Used: Comprobe logging unit (density-gamma-caliper @ \$3.85/metre for first 300 metres)	1,663.
4.) Field Camp Costs Food Accommodation Telephone	4,000. 3,637.. 1,280.
5.) sampling, Analysis, and Testing (30 samples): (Laboratory analysis of coal samples performed by Utah International Inc., Minerals Laboratory, Sunnyvale, California)	2,090.
6.) Supplies and Materials Costs: operative and Maintenance Supplies Equipment Maintenance Costs	27,065. 2,516.

7.) Transportation Costs:	53,095.
Bell 206B Jet Ranger from Okanagan Helicopters Ltd. and Maple Leaf Helicopters Ltd., Chetwynd, B.C., Bell 205 from Northern Mountain Helicopters' Inc., Prince George, B.C. and Rotor Tech Helicopters Ltd.	
Ford Van from Arena Motors - Kamloops	1,944.
Fuel, Parts, Repairs (For helicopters, bulldozers and trucks)	4,921.
8.) Reclamation Work:	0.
TOTAL ON PROPERTY COSTS	\$158,521.

OFF PROPERTY COSTS

1.) Logistics and Field Support	\$ 6,658.
2.) Technical and Feasibility Studies	3,250.
3.) Mobilization and Demobilization of Equipment and Supplies	2,585.
4.) Reproduction Expense - Maps	316.
5.) Travelling Expenses	1,431.
TOTAL OFF PROPERTY COSTS	\$ 14,240.
<u>TOTAL PROSPECT COST</u>	<u>\$172,761.</u>

APPENDIX IV

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 **Geology**, 1979.

Since graduation I have been engaged in **Coal** Exploration in British **Columbia** for Utah Mines Ltd.,



Paul S. Cowley

Geologist

Vancouver, B.C.



UTAH MINES LTD.
 WEST CARBON CREEK
 BEDROCK GEOLOGY AND
 DRILL HOLE LOCATIONS
 MAP - 1

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, Raggy Sandstone.
- UPPER JURASSIC OR LOWER CRETACEOUS**
- Km** MONTEITH FORMATION - Sandstone, Fine To Coarse Grained, Quartzite.
- JURASSIC**
- Jf** FERRIE FORMATION - Cherty Shale, Sandy Near The Top.
- TRIASSIC**
- Rs** SCHOOLER GROUP - Calcareous Sandstone, Calcareous Siltstone, Limestone, Dolomite (Marine).
- 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

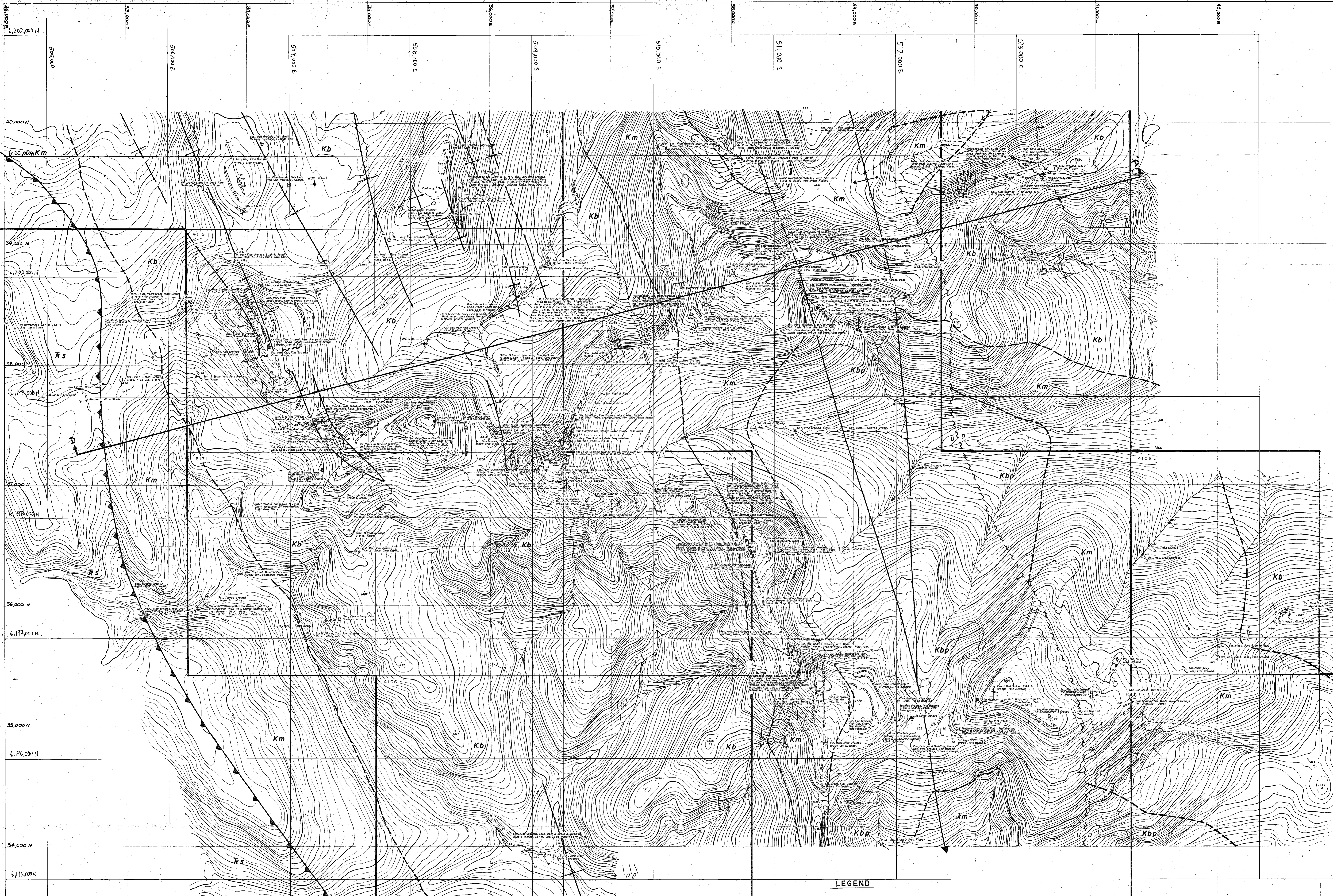
UTAH MINES LTD.

PRELIMINARY RECONNAISSANCE TYPE-MAPPING

McElhenny
 McElhenny Surveying & Engineering Ltd.
 100 West Carbon Creek, Carbon, Utah

Scale: 1:10,000
 Contour: 10 Metres
 Date: June 25, 1978
 Job No.: 04239-4

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



LEGEND

LOWER CRETACEOUS			
Kb	BICKFORD FORMATION - Quartzite, Sandstone, Conglomerate, Siltstone, Coal, Minor Shale	- - - - -	Geologic Contact
Km	MOUND FORMATION - Quartzite, Sandstone, Conglomerate, Minor Shale and Coal	- + - + -	Syncline
Kbp	BEATHE PEAKS FORMATION - Shale, Fossiliferous Sandstone	- - - - -	Anticline
UPPER JURASSIC OR LOWER CRETACEOUS		(Outcrop) - Strike And Dip Of Bedding	
Km	MONTEITH FORMATION - Sandstone, Fine To Coarse Grained, Quartzite	+	Drill Hole Location
Jr	ERNIE FORMATION - Chiefly Shale, Sandy Near The Top	x 20m	Coal Outcrop, Measured Thickness Where Indicated
TRIASSIC		○	Outcrop
R s	SCHOOLER GROUP - Calcareous Sandstone, Calcareous Shale, Limestone, Dolomite (Marine)	- - - - -	Thrust Fault
		4118	Coal License Number
		T-12	Sample Number
		A	Section Line Location
		↘	Foot
		↙	Direction Of Dip
		↕	Relative Movement Of Beds

508 PR Carbon Creek West Bl(A)

UTAH MINES LTD.
EXPLORATION DEPARTMENT
VANCOUVER BRITISH COLUMBIA

WEST CARBON CREEK
BEDROCK GEOLOGY AND
DRILL HOLE LOCATIONS

Made by: J.C. Ridgway Date: March 1960 N.T.S. Ref: 93 07/15
Drawn by: T. Drews Revised: Scale: 1:10,000

MAP - 2

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

UTAH MINES LTD.

CARBON CREEK

PRELIMINARY RECONNAISSANCE TYPE MAPPING

Scale: 1:10,000
Contour Interval: 10 Metres
Date: June 21, 1978
Job No.: 06298-6
Sheet No.: 8

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

UTAH MINES LTD.
GRAPHIC CORE LOG

HOLE NO. D.D.H. WCC 81-6

HOLE NO. D.D.H. WCC 81-6

LOG BY: K. Foellmer

ELEV: 1505m

HOLE SIZE: 110 (96mm)

PROJECT: West Carbon Creek

DATE: August 12, 1981

N: 38,175

AIR WATER

LEASE: 4112

E: 35,460

T.D. 205.1m p.d.

SEC. T. R.

% REC	DEPTH	STAMP LOG	THICK	SAMPLE NO.	GRAN.	LITHOLOGY	ANALYSIS
	0					OVERBURDEN 0-3.66m	
100%	100		0.08			Coal - highly sheared	
61%	10		0.19			Coal - sheared, predominantly claro-durain	
			0.09			Coal - sheared, minor ovyrite, 30% vitrain, 70% Claro-durain	
3%	82		0.20			Coal - sheared, Claro-durain	
	84						
63%	20		0.63	1		Coal - sheared, 95% Claro-durain, 5% vitrain Mudstone split 17.90m to 17.94m	
	80						
	80						
	30						
	84						
	85						
	85						
88%	88		0.89	2		Coal - sheared, 90% Claro-durain, 10% vitrain, trace fusain Coal - Calcite on shear surfaces	
	84		0.19				
	40						
	81						
	88		0.04			Coal - sheared	
	88		0.88	3		Coal - Mudstone split from 48.80 to 45.86, 80% Claro-durain, 15% vitrain, 5% fusain, calcite on sheared surfaces	
	84		1.13	4		Coal - mud lenses from 48.90 to 49.02, 77% Claro-durain, 17% vitrain, 6% vitrain, sheared	
18%	84		0.13			Coal - vitrain	
17%			0.10			Coal - 60% Claro-durain, 40% vitrain	
32%			0.12			Coal - sheared, 90% Claro-durain, 10% vitrain	
			0.17			Coal - 65% Claro-durain, 35% vitrain	
			0.02			Coal - with pyrite	
	81						
	60						
	81						
72%	81		0.61	5		Coal - Mudstone split from 65.49 to 65.53, sheared, 87% Claro-durain, 10% vitrain, 5% fusain	
	82						
	76						
	63%		0.65	6		Coal - Mudstone split 73.47 to 73.49m, 76% Claro-durain, 22% vitrain, 2% fusain	
	93%		0.22			Coal - 60% Claro-durain, 40% vitrain	
	81		0.81			Coal - sheared, 90% Claro-durain, 9% vitrain, 1% fusain	
100%	81		0.02			Coal - 80% vitrain, 20% Claro-durain	
	80						
	80						
	82						
50%	82		0.34	8		Coal - Mudstone split 86.29 to 86.31m, sheared, 87% Claro-durain, 10% vitrain, 3% fusain	
43%	82		0.34	9		Coal - 70% Claro-durain, 25% vitrain, 5% fusain	
93%	90		0.54	10		Coal - mudstone split 89.56 to 89.58, sapropelic	
53%			0.46	11		Coal - 93.64 to 93.78 sapropelic 93.78 to 94.10 humic, calcite stringers, minor pyrite, sheared	
	60						
100%	100		0.27	12		Coal - 69% Claro-durain, 30% vitrain, 1% fusain	
42%			0.48			Coal - 85% Claro-durain, 10% fusain, 5% vitrain	
96%			0.12			Coal - 90% vitrain, 10% Claro-durain	
			0.76	13		Coal - 82% Claro-durain, 15% vitrain, 3% fusain	
33%	86		0.10			Coal - 50% Claro-durain, 50% vitrain	
	110						
	79						
	84						
	120						
	97%		0.58	14		Coal - 75% Claro-durain, 15% fusain, 10% vitrain	
	84						
58%	130		0.50			Coal - 88% Claro-durain, 7% fusain, 5% vitrain	
	81						
	140						
69%			0.38			Coal - 88% Claro-durain, 10% vitrain, 2% fusain	
29%			0.23			Coal - 58% Claro-durain, 45% vitrain, 2% fusain	
156			0.03			Coal - 90% Claro-durain, 10% vitrain	
90%	160		1.79	15		Coal - Mudstone split @ 158.53 to 158.55 @ 158.70 to 158.72 - 55% Claro-durain, 35% vitrain, 10% fusain	
67%			0.20			Coal - broken, 90% Claro-durain, 10% vitrain	
	170						
	86%		1.77	16		Coal - muddy at base - 58% Claro-durain, 40% vitrain, 2% fusain	
			0.27			Coal - 65% Claro-durain, 35% vitrain, highly fractured	
	180						
	60						
97%			0.39			Coal - highly broken	
	50						
94%			0.18			Coal - 75% Claro-durain, 25% vitrain, Trace fusain	
			0.22			Coal - highly broken and sheared	
			0.63	17		Coal - Mudstone lenses near base, 90% claro-durain, 10% vitrain	
	190						
	0%		0.54				
	68						
	55						
38%	200		0.29			Coal - highly broken, 75% Claro-durain, 20% vitrain, 5% fusain	
	210					TD - 206.04m	

508

Wideo WELL LOG

8756

COMPANY: Utah Jones Inc.
 AREA: West Carbon Creek
 WELL: D.D.H. WCG 81-6
 COUNTY: Peace R. Land Dist. STATE: B.C.

508

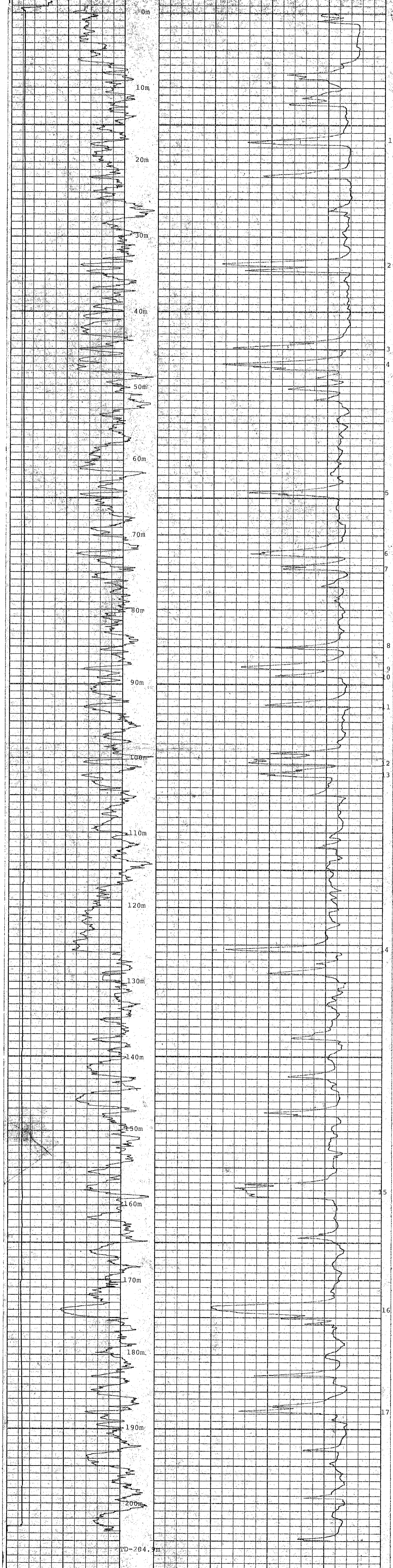
COORDINATES:
 N 38 175 W
 ELEVATION: 1305 m
 OF
 R/B
 G/L

WELL NO. 81-6
 LOCATION: WEST CARBON CREEK
 COUNTY: PEACE R. LAND DIST. STATE: B.C.

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	11 August 1981		None		
First Reading	204.90 m		Density		
Last Reading	0.00 m		Viscosity	@	@
Footage Logged	206.04 m		Resistivity	@	@
Bottom (Driller)	206.04 m		Res. @ BHT	@	@
Casing (From Log)	3.66 m		pH		
Casing (Driller)	3.66 m		Circ. Temp.		
Casing Size	HP (114.3 mm)		B.H. Temp.		
BR Size Surface	5 5/8"		Logged by	A. Boelmer	
BR Size Main	HO (96 mm)		Witnessed by	D. Kenkel, B. Thomas	

REMARKS:

CALIBER: GAMMA DENSITY
 100 CPS 1000 CPS



TD-204.9m

Widco

WELL LOG

81-7
AR Carbon Creek & 1(3)A

COMPANY: Dean Mines, Inc.
AREA: West Carbon Creek
WELL: DDR WCO-81-7

508

COORDINATES:
N 42,615 N
E 33,940 E
ELEVATION: 1255 E.M.
D.F.
K.S.
G.I.

COMPANY: Dean Mines, Inc.
WELL: DDR WCO-81-7
LOCATION: West Carbon Creek

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	20 August 1961				
First Reading	224.50 m		Nature		
Last Reading	0200 m		Density		
Footage Logged	225.82 m		Viscosity	@	@
Bottom (Driller)	225.82 m		Resistivity	@	@
Casing (From Log)	2.13 m		Res. @ BHT	@	@
Casing (Driller)	2.13 m		pH		
Casing Size	HQ (1.433 mm)		Circ. Temp.		
Bit Size (in) Face	5.5 (142.88 mm)		B.H. Temp.		
Bit Size (in) Tail	HO (96 mm)				
			Logged by	P. Cowley - K.	Boellmer
			Witnessed by	D. Kenkel	

REMARKS:

Reg. U.S. Pat. Off.

