

PR - CARBON CREEK 72(1)A

**CONFIDENTIAL**

CARBON CREEK COAL BASIN

SUMMARY REPORT

1972 FIELD SEASON

UTAH MINES LTD.  
EXPLORATION DEPARTMENT  
412-510 WEST HASTINGS STREET  
VANCOUVER 2., B.C.  
CANADA

SUBMITTED TO: E.S. RUGG  
BY: D.S. FULLERTON

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**GEOLOGICAL BRANCH  
ASSESSMENT REPORT**

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CONTENTS

	<u>PAGE</u>
ABSTRACT	1
INTRODUCTION	2
PROPERTY	3
LOCATION AND ACCESS	5
ECOLOGICAL STUDIES	5
SUMMARY OF 1971 EXPLORATION WORK	5
FIELD SEASON - 1972 - LOGISTICS	6
MOBILIZATION	6
ROAD CONSTRUCTION	7
DRILLING	8
FIELD RECONNAISSANCE	13
GENERAL GEOLOGY	14
STRUCTURE	14
FIELD SEASON - 1972 - EXPLORATION	17
OBJECTIVES	17
NORTHERN AREA	17
CENTRAL AREA	18
SOUTHEAST AREA	22
COAL GEOLOGY	22
GENERAL	22
PRINCIPLE COAL SEAMS	23
COAL QUALITY	26
COAL RESERVES	28
EXPLORATION COSTS	31
SUMMARY OF 1972 EXPLORATION PROGRAMME	33
BIBLIOGRAPHY	34

APPENDIX A } REFER TO: PR-CARBON CREEK 72(4)A  
APPENDIX B } CONFIDENTIAL ANALYSIS FILE  
FOR: COAL ANALYSIS FILE

ILLUSTRATIONS

		<u>PAGE</u>
FIGURE 1	Locations of Licenced Coal Blocks	4
FIGURE 2	List of Formations	5
TABLE 1	Summary of Average Quality @ 1.40 Specific Gravity	28
TABLE 2	In-Place Coal Reserve Estimates	30
APPENDIX A	Summary of Known Coal Seams In the northern and central areas, Carbon Creek.	
APPENDIX B	Coal Analysis of Coal Samples From DH's 72-10 to 72-23 inclusive.	
POCKET 1	Drill log 72-10 to 72-18 inclusive.	
PHOTO 1	Aerial View of Second Campsite.	8
PHOTO 2	Log Bridge Over Carbon Creek.	10
PHOTO 3	Longyear's "44" Wireline Drill.	11
PHOTO 4	Probing a Core Hole.	12
PHOTO 5	A Tight Fold On North Fork Of Eleven Mile Creek.	19
PHOTO 6	Fault Exposed On Access Road To DH 72-15.	20
PHOTO 7	Coal Bed Located On South Fork Of Eleven Mile Creek.	24

MAPS - IN LEAF

PLATE 1	Carbon Creek Coal Basin. ✓	
PLATE 2	Geological Map Of Carbon Creek Coal Basin (West Half) ✓	
PLATE 3	" " (East Half) ✓	
PLATE 4	Structural Cross-Section, Northern Area. ✓	
PLATE 5	" " Central Area. ✓	
PLATE 6	" " Southeast Area. ✓	
PLATE 7	Gamma-Ray Cross-Section, Southeast Area. ✓	
PLATE 8	Composite Stratigraphic Section of Gething Formation in Carbon Creek. ✓	
PLATE 9	Cross-Section of Drill Hles Showing Correlation Of Coal Beds. ✓	
PLATE 10	Bed No. 14, Coal Isopach With Panel Section of Coal Bed. ✓	
PLATE 11	Bed No. 15, " " ✓	

CONTINUED

MAPS

- PLATE 12 Bed No. 31, ✓  
PLATE 13 Bed No. 40, Isopach With Panel Section Of Coal Bed. ✓  
PLATE 14 Bed No. 46, " " ✓  
PLATE 15 Bed No. 47, " " ✓  
PLATE 16 Bed No. 51, Map Showing Thickness of Seam Split, With Panel Section ✓  
of Coal Bed.  
PLATE 17 Bed No. 51, Coal Isopach of Bed No. 51 and Lower Bench. ✓  
PLATE 18 Bed No. 51A, " " 51A ✓  
PLATE 19 Bed No. 52, Coal Isopach With Panel Section of Coal Bed. ✓  
PLATE 20 Bed No. 54, " " ✓  
PLATE 21 Bed No. 55, " " ✓  
PLATE 22 BED NO. 58, " " ✓  
PLATE 23 Bed No. 59, " " ✓

## ABSTRACT

During the summer of 1972, Utah Mines Ltd., a wholly owned subsidiary of Utah International Inc., conducted a coal exploration program in the Carbon Creek Coal Basin of northeastern British Columbia. The area covered in this second year of exploration totals 65 square miles, 55 square miles of coal licences-nos. 1736 to 1790 inclusive, and 10 coal leases-nos. 319 to 328 inclusive, held by P. Burns Foundation Ltd., under option to Utah Mines Ltd.

The main objective of the 1972 exploration program was a continuation of obtaining geological data by core drilling and geologic reconnaissance. This data will be utilized to further evaluate and define the coking coal potential of Carbon Creek for possible development into a future economic coal mining venture.

On 26th May, 1972, mobilization commenced by barging all necessary equipment from Dunlevy Landing (a docking area on Williston Reservoir approximately 10 miles west of W.A.C. Bennett Dam) to Carbon Creek. Initial camp facilities to accommodate 20 to 50 men were built one-half mile north of Seven Mile Creek, a tributary of Carbon Creek. This campsite was used in Utah's 1971 exploration program. A second campsite was constructed in late July, approximately seven miles south on Carbon Creek to facilitate transportation problems arising from drilling operations which were located northeast of the McAllister Creek area.

Upon returning to the Carbon Creek area, all access roads constructed during the 1971 exploration season were found to be in good to excellent condition, barring an occasional fallen tree or rock slide. Continued spring thawing and unusually heavy seasonal rains during June washed out several bridges and abutments. Replacements of these structures during 1972 was required. During 1972, an additional 14 miles of access road were constructed to drillsite locations. Slashing, burning and burying debris in accordance with Forest Service requirements was carried out during the road-building program.

Drilling operations (Canadian Longyear, drilling contractor) commenced on

5th June, 1972, and were completed 31st August, 1972. Fourteen HQ (2½") diamond drill core holes were completed for a total drilled footage of 9,296 feet. All coal core samples of importance were field tested for their free-swelling properties, and then forwarded to laboratories for additional controlled analysis. All rock cored was studied and lithologically described. In addition, each drill hole, when hole conditions were feasible, was probed using a geophysical instrument which recorded a gamma-ray curve and resistivity curve of the stratigraphic section.

Utah's exploratory drilling in the Carbon Creek Coal Basin has tested approximately 3,000 feet of the coal-bearing Lower Cretaceous Bullhead Group. This drilling has indicated that numerous coal seams are present in the Gething Formation ranging in thickness from several inches to greater than six feet in some seams.

Individual seams change markedly in both thickness and quality between drill holes. These factors along with varying seam intervals and lack of out-crop make field correlation difficult.

Structurally, the Carbon Creek Coal Basin is a broad synclinal feature located in the Inner Foothills Belt of the Rocky Mountains. The Foothills Belt is generally characterized by complex folds and major west-dipping thrust faults. Relatively simple structural conditions are recognized in the Carbon Creek area, as compared to the more complex structures within this deformed belt.

Utah's program to monitor the environment of the Carbon Creek area was continued in 1972 by B.C. Research. These ecological studies of the flora, fauna and physical parameters will be utilized as a base guide to minimize environmental disturbance in the event a future coal mine development occurs.

#### INTRODUCTION

This report is a presentation of geological data acquired from exploratory investigations conducted by Utah Mines Ltd. in the Carbon Creek area during the 1972 field season.

Early in 1971, Utah International Inc., parent company of Utah Mines Ltd., negotiated with Trend Exploration Ltd., a Colorado corporation, the transfer of 143 coal licences covering 89,753 acres in northeastern British Columbia. Contiguous with 55 coal licences in the Carbon Creek area are ten alienated coal leases, totaling 6,400 acres, acquired through negotiation with the Burns Foundation Ltd. of Calgary.

Evaluation of the coal properties was assigned to the Exploration Department, with a systematic exploratory program commencing during the 1971 field season. The initial phase of evaluating the area was understanding the stratigraphy of the coal-bearing Gething Formation and its structural setting. Nine core holes, totaling 6,752 feet and representing 2,300 feet of Gething Formation strata were drilled in the 1971 program. Approximately twenty miles of access road were constructed to support this drilling program.

Results of the 1971 exploration program indicated favorable conditions for a continued exploration effort. The 1972 program, oriented to continue a systematic exploratory evaluation of the metallurgical coal potential of the Carbon Creek area was conducted by Utah Mines Ltd. Fourteen core holes totaling 9,296 feet were drilled, supported by an additional 14 miles of constructed access roads.

#### PROPERTY

The Carbon Creek property, one of four licenced areas, (figure 1) comprising a total of 89,753 acres, was acquired through a negotiated agreement with Trend Exploration Ltd., a Colorado Corporation. This licenced area, (Plate 1) is comprised of a total of 65 square miles of coal licences nos. 1736 to 1790, inclusive, and 10 alienated coal leases nos. 319 to 328 inclusive, held by P. Burns Foundation Ltd. of Calgary and under option agreement to Utah Mines Ltd.

Details as to the ownership agreements and interests concerning the coal properties are not contained in this report. Utah Mines Ltd. is sole operator of the property at this time and has all available legal documents pertaining to working agreements.

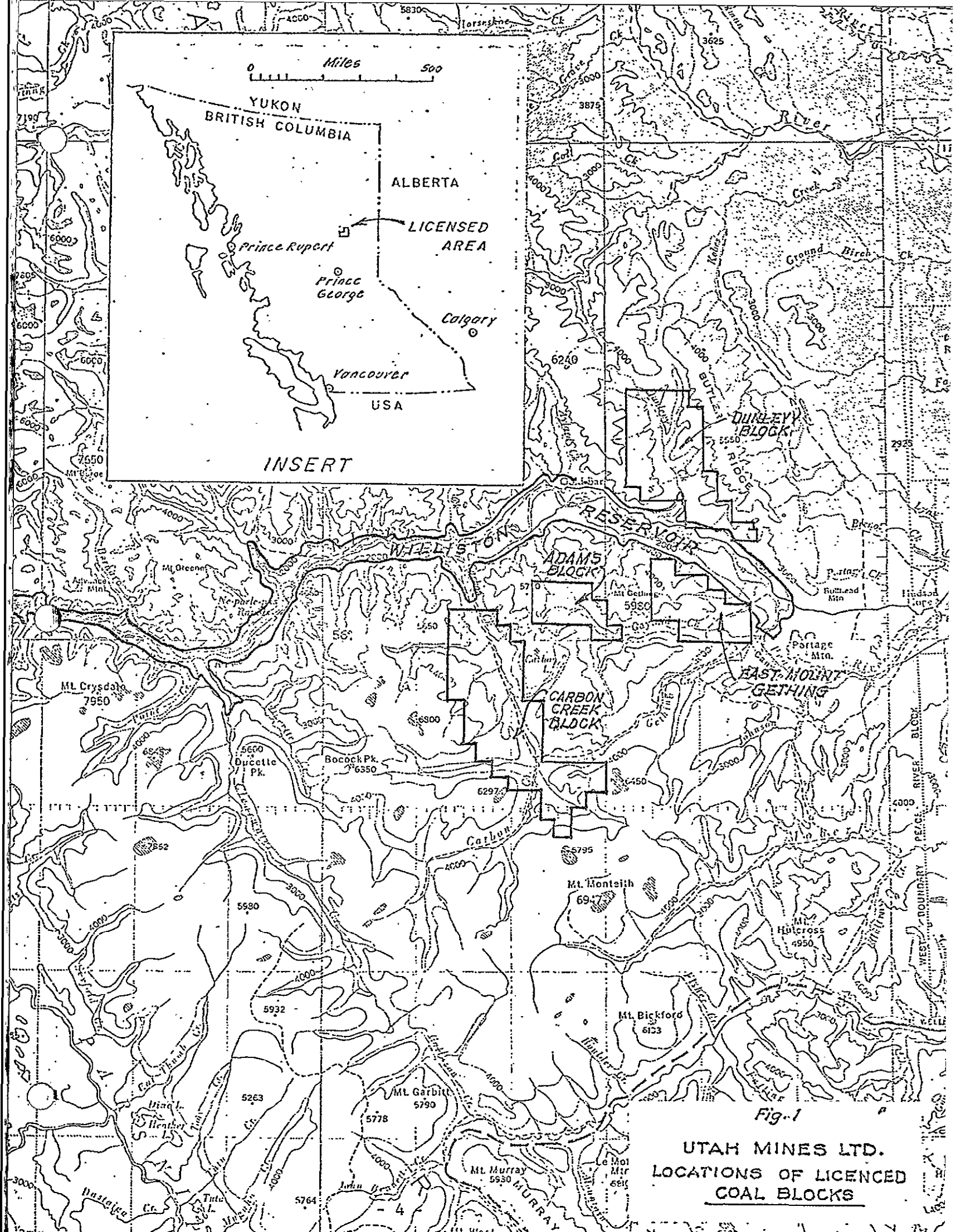
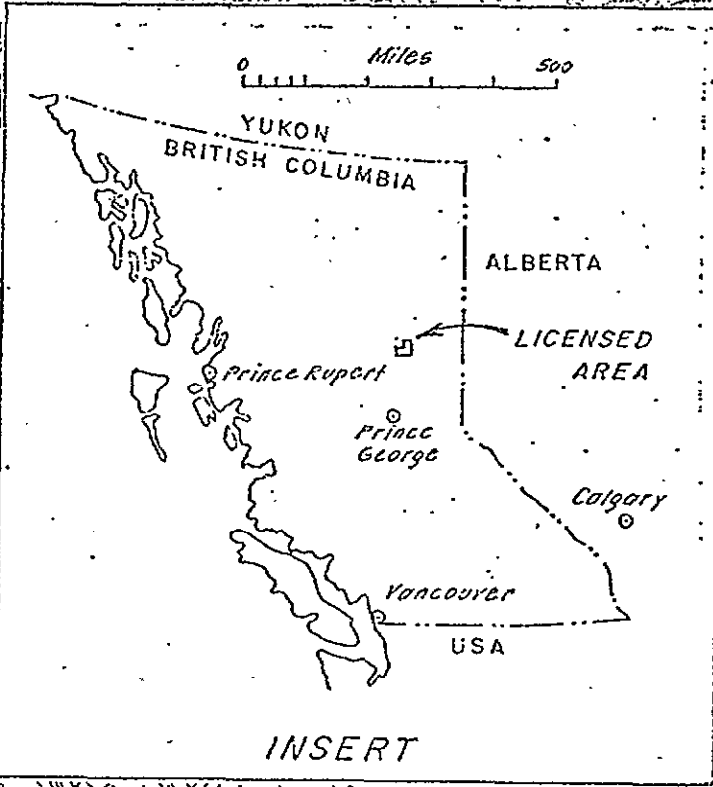


Fig-1  
UTAH MINES LTD.  
LOCATIONS OF LICENCED  
COAL BLOCKS



## LOCATION AND ACCESS

The Carbon Creek property is located about 20 miles west of the W.A.C. Bennett Dam, and approximately 25 miles north of the John Hart Highway which connects Prince George and Dawson Creek. Chetwynd is approximately 45 miles to the southeast and MacKenzie is 40 miles to the southwest. No public or private access roads exist allowing vehicular access into the Carbon Creek area.

The Carbon Creek embayment of the Williston Reservoir extends five miles southward from the main part of the lake providing access to the northern end of the property. From Dunlevy Landing (a docking site approximately ten miles northwest of the W.A.C. Bennett Dam) to Carbon Creek, an over-water distance of 25 miles, adequate water depth permits large boats and barges easy access into the area.

Access via chartered float plane or helicopter is available from MacKenzie or Fort St. John.

## ECOLOGICAL STUDIES

B.C. Research, an independent group supported by the British Columbia Research Council, continued an ecological survey of the Carbon Creek area. The survey commenced during Utah's 1971 exploration program and is designed to monitor the existing environment. The survey includes studies of wildlife, fish, vegetation, water quality, with stream bed and soil sampling. Float trips down Carbon Creek, helicopter-supported field trips, road and off-road traverses were conducted by two-man teams at various periods during the course of the summer. This survey was performed to provide a base guideline in which subsequent environmental changes due to exploration activities or mine development may be compared.

## SUMMARY OF 1971 EXPLORATION RESULTS

1. Nine core holes were completed, totaling 6,752 feet of drilling in the Carbon Creek Coal Basin, representing approximately 2,300 feet of the

Gething Formation stratigraphic section.

2. Approximately ninety-three coal samples acquired through core drilling were shipped to laboratories for coal quality analysis.
3. Nineteen miles of main road and access roads with the construction and completion of four bridges supported the exploration program.
4. An ecological monitoring program was initiated by B.C. Research at Utah's request for environmental studies in the Carbon Creek area for the development of base guidelines in the event of a future mining development.
5. Geological reconnaissance traverses were made through the area to examine the coal-bearing Gething Formation and local geologic structures.
6. At the termination of the 1971 program, contract aerial photography was flown for the construction of an accurate topographic map. This map was drawn to a horizontal scale of 1"=400 feet, with a 20 foot contour interval.

The 1971 exploration work has been described in a confidential company report "Carbon Creek Coal Basin, Progress Report, 1971 Field Season" by D.O. Birkholz and D.S. Fullerton.

#### FIELD SEASON - 1972 - LOGISTICS

##### MOBILIZATION

The field equipment, which included four pickup trucks, four bulldozers, two skidders, a road grader, a 50 foot trailer and tons of other miscellaneous items, was trucked to Dunlevy Landing, 18 miles west of Hudson's Hope and loaded aboard a 40 X 60 foot barge. Guardian Marine Industries Ltd. of Vancouver, contracted to provide marine services for Utah, towed the barge by tugboat to the Carbon Creek landing on 26th May, 1972. Reconstruction of the base camp used during 1971 and located about one-half mile north of Seven Mile Creek on the west side of the inlet, took place while several additional days were required to barge in the remaining supplies from Dunlevy Landing. A total of eight plywood and canvas tents were built to accommodate and board all project personnel. The road construction crews lived in a trailer which was supplied by the heavy equipment contractor. A large generator provided electricity for lights and kitchen equipment, while a nearby stream provided an ample water supply for cooking and washing purposes.

In addition to the tugboat, a 27 foot crew boat was retained for hauling foodstuff, mail and other small items from Dunlevy Landing. The tugboat and barge were used for moving fuel, drilling supplies and the heavy equipment.

Communications were achieved by use of a truck-mounted radio-telephone, and single side band radio provided by Northern Thunderbird Air Ltd. personnel based in MacKenzie. Communication with base camp and boat was also achieved by a small radio. A 4-channel single side band radio was utilized for communication between camp and Vancouver.

The campsite remained at this location during the first two months of the summer while drilling operations were in progress in the northern part of the property. During the first week of August, camp facilities, (Photo 1), were moved seven miles southward, to an area just east of the Carbon Creek bridge. This site provided support to Utah's drilling operations in the area north of McAllister Creek.

#### ROAD CONSTRUCTION

Peter and Paul Demeulemeester Ltd., of Chetwynd, were contracted to build access roads to the various drillsites. The contractor also supplied slashers with chainsaws to cut felled and leaning trees along the new roads to conform with Forest Service regulations pertaining to Utah's road construction.

The roads and bridges built during the 1971 field season were in good condition upon arrival with only a few mud slides and fallen trees which were quickly cleared. Heavy June rains quickly turned the area into a quagmire with floods washing away two of the bridges. The existing road required constant maintainance with all new road construction being delayed and expensive. The run-off from the spring rains, which lasted well into August, raised the level of Williston Reservoir over 35 feet and reportedly caused some concern at the W.A.C. Bennett Dam.

With much perseverance, fourteen miles of new drill access roads were constructed which totaled to 33 miles on the Carbon Creek property in two



PHOTO 1: Aerial View of second campsite located on east side of Carbon Creek. Bridge over Carbon Creek and main road leads northward to the Central and Northern part of the Carbon Creek Coal Basin

years. The bridges were replaced at the North and South Forks of Eleven Mile Creek, and a 60 foot bridge utilizing huge spruce stringers capable of holding a D-8 catipillar was built across Carbon Creek, (Photo 2). This bridge span was pulled away from the creek at the termination of the field season to eliminate the possibility of log jams during the spring runoff.

DRILLING

As in 1971, Canadian Longyear Ltd. was contracted by Utah for core drilling activities, (Photo 3), on the 1972 Carbon Creek project. Fourteen core holes, totaling 9,296 feet, were drilled during the 1972 program. Two year totals of 23 holes and 16,048 feet of HQ (2½" diameter) core are as follows:

1971

<u>DRILL HOLE</u>	<u>TOTAL DEPTH IN FEET</u>
1	824
2	830
3	887
4	996
5	657
6	677
7	617
8	737
9	<u>527</u>
	6,752



PHOTO 2: Log bridge over Carbon Creek. This 60 foot bridge was constructed using 36" diameter spruce logs to span the creek. The bridge easily supported a D-8 "Cat". At the termination of the exploration program, the bridge span was removed to prevent log jams which may occur from spring thaws and heavy spring rains.



PHOTO 3: Canadian Longyear's "44" wire-line diamond core drill. This location is DH 72-20 located in the southeast area of Carbon Creek property.



PHOTO 4: Probing a core hole. This portable logging unit is capable of recording a Gamma-Ray and Electrical log. These geophysical logs were run on all drill holes having unobstructed hole conditions which prevent possible loss of probe-head. See Pocket I for logs.



1972

<u>DRILL HOLE</u>	<u>TOTAL DEPTH IN FEET</u>
72-10	547
72-11	657
72-12	627
72-13	357
72-14	836
72-15	864
72-16	767
72-17	1,001
72-18	627
72-19	527
72-20	801
72-21	491
72-22	497
72-23	697
	9,296

Three drilling shifts per day averaged 3,000 feet of hole per month. The holes were cased through surface alluvium and cored from the top of bedrock to total depth. A core recovery of greater than 95 per cent was achieved.

#### FIELD RECONNAISSANCE

A helicopter supported project of reconnaissance mapping was conducted prior to the project's termination. This work was carried out in order to add geologic control in areas where data was lacking and to examine any exposures of coal. Approximately fifty line miles of traverses were completed, generally along stream beds. Most tributaries on the east side of Carbon Creek were traversed, as well as several interesting ridges on the west side of Carbon Creek.

## GENERAL GEOLOGY

The Carbon Creek map area is located within the structural foothills belt of the Rocky Mountains. This belt, characterized by a series of synclines, anticlines and major west dipping thrust faults, is underlain predominantly by Mesozoic rocks. The high northwesterly trending ridges and steep-sided valleys are generally parallel with the strike of the underlying strata.

These formations, as defined by the Geological Survey, are present in the area: Upper Jurassic Fernie Formation; Lower Cretaceous Monteith, Beattie Peaks, Monarch, Cadomin and Gething. (Figure 2). Only the Gething Formation is known to contain coal of commercial quantities. Rocks younger than the Gething Formation occur east of the map area; rocks older than the Fernie occur west of the area. Detailed descriptions of the various formations and the lithological variations within the formations are contained in literature. For detailed description of the Gething Formation in Carbon Creek, see "Carbon Creek Coal Basin, Progress Report, 1971 Field Season".

## STRUCTURE

The Carbon Creek basin, an intervening syncline embraced by two major anticlinal belts, is approximately eight miles wide with a fold axis 20 miles long trending in a N 20° W direction. Mathews states "the eastern anticlinal belt, representing the north-westerly continuation of the "Pine River anticline", is relatively simple, but it is intersected in the Carbon Creek area by a major fault which follows the fold axis for approximately 15 miles from Mount McAllister to the Peace River. The western anticlinal belt consists of several en echelon folds in the area of the Monarch, and a single major fold between Mount Wrigley and Mount Barr.

The central synclinal belt of the Carbon Creek Basin contains infolded coal-measures of the Gething Formation. The northern part of the structure, north of Ten Mile Creek, is a simple synclinal fold plunging gently south-eastward. The southern part of the basin is more complex with several subsidiary folds and flexures.

Figure 2.

## List of Formations

## Carbon Creek Coal Basin

\*after Stott, 1968 and Matthews, 1947

Series	Group	Formation	Thickness	Lithology
Holocene	erosional surface		0-187'	Alluvium
Pleistocene				Terraced drift Glacial till
Lower Cretaceous	Bullhead Group	Gething	3000'	Fine to coarse grained, grey, calcareous, carbonaceous sandstone, <u>coal</u> , carbonaceous shale, and conglomerates
		Cadomin.	600'+	Sandstone, coarse grained to massive conglomerate, contain- ing chert and quartzite pebbles
	Minnes Group	"unnamed" transi- tion beds	1000'- 1500'+	Sandstone, fine grained, brown, laminated, crossbedded; <u>coal</u>
		Monach	300'-430'	Sandstone, well-sorted, fine grained
		Beattie Peaks	750'-1200'	Shales, shaly sand- stones and sandstone
		Monteith	1000'	Sandstone, fine - to coarse grained, quartzose
	Upper Jurassic		Fernie	

In the vicinity of Eleven Mile Creek, the basin is complicated by a high-angle, westward dipping thrust fault (here referred to as the Carbon Creek fault) trending N 10° W (See 1971 Progress Report). Westward from the Carbon Creek Fault, two eastward dipping high-angle reverse faults are present.

A central fault, though not exposed, has been interpreted from local dips, airphoto anomalies and projected drill hole control.

The southeastward extent of these faults is presently unknown. It is anticipated that their traces parallel the trend of the major fold axis of the Carbon Creek syncline and are obscured by tight folding in the southeastern part of the area.

A tightly folded zone in the coal-measures is seen from the confluence of the North and South Forks of Eleven Mile Creek eastward toward Carbon Creek. Several en echelon folds, mapped by the Burns Foundation, are recognized in this area. Northward and southward from Eleven Mile Creek, a thick veneer of glacial drift masks these folded structures.

A monoclinial fold flexure can be traced from just east of the mouth of Eleven Mile Creek southeastward to the McAllister Creek area. On the west side of this flexure, dips range from 30° SW to 70° SW striking generally in a northwesterly direction. On the east side of the fold, dips range from 5° to 15° in a southwest to northwest direction with strikes from northwest to northeast.

These structures are shown by 20 structural cross-sections normal to the northwest structural trend. Details may probably best be seen by studying these sections in which the structural and bedding features may be traced from line to line.

FIELD SEASON - 1972 - EXPLORATION

OBJECTIVES: The 1972 exploration programme was oriented toward the continuation of a systematic evaluation of the metallurgical coal potential of the Carbon Creek area. The programme was carried out with the following technical objectives in mind:

- (a) A further understanding of the stratigraphy of the coal-bearing Gething Formation by means of core-drilling.
- (b) Confirm the continuity of coal seams, seam thicknesses and quality of the principle coal beds.
- (c) Obtain unweathered coal samples suitable for laboratory and washability studies.
- (d) Assess areas on the Carbon Creek property having an economic potential for future mine development.

Three target areas in the Carbon Creek Coal Basin warranted a continued exploration effort with the above objectives in mind. These areas are;

1) Northern Area, 2) Central Area, and 3) Southeast Area.

Gamma-rays logs from the 1972 drilled holes in these areas showing lithology, coal bed thicknesses, bed identification numbers, and laboratory sample numbers are found in Pocket I (72-10 to 72-18 inclusive) and Plate 7 (72-19 to 72-23 inclusive).

The geological Map of the Carbon Creek Coal Basin, Plates 2 and 3 was completely remapped at the completion of the 1972 programme. All 1971 and 1972 drill hole data, measured strata attitudes and aerial photography was utilized in the preparation of this map.

NORTHERN AREA; This area lies immediately north of Seven Mile Creek, extending northward and westward to the boundary of the licenced property and eastward to the embayment of Carbon Creek by the Williston Reservoir.

Three HQ (2½" diameter) diamond-drill holes have been put down in this area - numbers 1, 72-14 and 72-17. These drill holes tested approximately 1,100

feet of the Lower Gething Formation and intercepting two coal beds (Beds 14 and 15) of potential economic significance. Approximately 200 feet of Cadomin Formation underlying the Gething Formation was cored in D.H. 72-17.

The coal seams encountered and the correlation of these beds in the northern part of Carbon Creek are shown on Plate 8.

Structurally, the northern area occupies the northern sector of the western arm of the Carbon Creek syncline. Here, the Gething Formation dips from 5° to 10° southeastward in the northern part of the area to approximately 10° eastward in the western and southern part of the area along Seven Mile Creek. See Cross-Section A-A' to E-E', Plate 4.

CENTRAL AREA: This erosionally dissected area lies south of Seven Mile Creek, west of Carbon Creek and north of the North Fork of Eleven Mile Creek. The western edge of the central area is the west limit of the coal licences.

A total of fifteen HQ (2½" diameter) diamond-drill holes have tested approximately 2,000 feet of the Gething Formation in this area. Core hole numbers 72-10, 11, 12, 13, 15, 16 and 18 were drilled during the 1972 programme. The purpose of these test holes was to define seam characteristics and confirm seam quality in an area composed of the Gething Formation which contained numerous principle coal beds. All 1972 drill holes in this area tested Beds 40 to 52 inclusive, with three of the core holes testing Beds 54 to 59 inclusive.

Structurally, the central area is located on the western arm of the Carbon Creek syncline. The Gething Formation dips gently eastward with dips increasing to as much as 20° near the western edge of the property.

Three faults have disturbed the Gething Formation in this area, Plate 5. The faults may be identified as : 1) Carbon Creek fault, a high angle reverse fault, dipping steeply westward and generally paralleling the axial trace of the Carbon Creek syncline. Strata eastward from this fault to the Carbon Creek have been folded and faulted,



PHOTO 5: A tight fold on north Fork of Eleven Mile Creek near confluence with the South Fork. These strata are steeply dipping along the trace of the Carbon Creek fault.



PHOTO 6: Fault exposed on access road to DH 72-15. View looks northward, with strata dipping westward, on east side of photo to vertical in center of photo. Fault trace located in gouged zone in center of left-half of photo.



restricting feasible exploration in this area. See Cross-Section K-K', Plate 5, and Photo 5. Thick deposits of glacial material overlying this area restrict outcrops to Eleven Mile Creek valley.

- 2) A central located, high angle, east dipping reverse fault, See Cross-Section K-K', Plate 2. This fault, though not exposed, by outcrop, has been inferred in this area, from the projection of coal beds from DH 72-18, measured bedrock attitudes and aerial photo anomalies. Westward dips on the road between the North and South Forks of Eleven Mile Creek are analogous to dips associated with exposed occurrences of faulting in the area. An ~~estimated~~ throw of 200 feet is estimated on this fault in the vicinity of the North Fork of Eleven Mile Creek.
- 3) Paralleling the central fault, a second high angle, east dipping reverse fault traces southward, starting on the hill-top north of Ten Mile Creek. This fault has been exposed on the access road to DH 72-15, Photo 6, and southward on the access road between 1971 drill holes 5 and 6. This fault, extending southward, can be traced on airphotos to the vicinity of the South Fork of Eleven Mile Creek. Throw on this fault increases southward from approximately 220 feet on the DH 72-15 access road to approximately 500 feet on the access road between DH's 5 and 6.

SOUTHEAST AREA: This area is located in the southeast part of Carbon Creek property, northeast of McAllister Creek, and south of the creek which flows westward from the vicinity of Wright Lake, here referred to as "East Fifteen Mile Creek". See Plate 1.

Approximately ten miles of road were constructed from the Carbon Creek bridge to gain surface access to this area. Five HQ (2½" diameter) diamond-drill holes were put down in this area - numbers 72-19, 20, 21, 22 and 23. Approximately 1,100 feet of the Gething Formation was core tested in this area. See Plate 7.

Though numerous coal beds are present in the area, the seams are very discontinuous, thin and lenticular.

Structurally, this area is ideally situated for either a strip or underground mine potential, but unfortunately, lacks economic coal seams from the tested Gething Formation. The Gething Formation dips gently northwestward from 5° to 10°. No faulting is known to be present in the area. See Plate 3.

## COAL GEOLOGY

### GENERAL

In addition to the known principle coal seams of the Carbon Creek area, as described forthwith, a summary of all known coal beds follows this report in Appendix A. The system of seam numbering remains unaltered from the 1971 Project Report, though only a few new numbers have been added. The composite stratigraphic section of the Gething Formation in the Carbon Creek area, Plate 8, and the cross-section of drill holes showing the correlation of the coal beds, Plate 9, identifies the respective seams to their stratigraphic position.

The coal beds of the Gething Formation in the Carbon Creek area are irregular in thickness, exhibiting a lenticular character. The seams are often interbedded or split with carbonaceous shale, siltstone or sandstone. The roof material immediately overlying the beds consists of any clastic sediment, but most often a competent shale or siltstone. The floor rocks con-

sist of strong carbonaceous shales, siltstones or sandstones.

PRINCIPLE COAL BEDS: The following review gives a brief description as to the occurrence, thickness and continuity of the principle coal beds. These principle beds have been mapped on the geologic map (Plates 2 and 3) by projection of drill hole coal intercepts utilizing all recorded structural control.

COAL BED 14, located approximately 800 feet above the Cadomin Formation, is stratigraphically the lowest potentially economic coal bed encountered to date in the evaluation of the Carbon Creek area. The seam has been intersected in two drill holes in the northern area, DH 1 and DH 72-14, with a range in thickness from 9.0 feet to 13.2 feet, respectively. A 0.5 foot zone of hard, fine grained, bony coal 1.5 feet from the top of the seam in DH 1, increases northward toward DH 72-14 to a 5.6 foot thick carbonaceous shale 2.2 feet from the top of the seam. Though the split probably continues northward and increasing in thickness toward DH 72-17, the thickness of the split and both benches of the seam is unknown because of its removal by pre-glacial erosion between DH 72-14 and 72-17. See Plate 10.

COAL BED 15, one hundred feet above Bed 14, varies in thickness from 5.0 feet at an outcrop on Seven Mile Creek to 10.2 feet in DH 72-14. The seam is quite uniform in character having a high percentage of bright attritus and vitrain. No significant partings are present in this seam. As in Coal Bed 14, Bed 15 has been removed by pre-glacial erosion in the vicinity of DH 72-17. The seam thickness is shown on Plate 11, with a panel section illustrating the continuity of the bed between DH 1 and DH 72-14.

COAL BED 31 is approximately 700 feet above Bed 15. This seam was intercepted in 1971 by drill holes nos. 3, 6 and 9 and is discussed in detail in the 1971 Progress Report. A coal exposure on the South Fork of Eleven Mile Creek, examined in 1972 (Photo 7) and measuring approximately 10 feet thick, has been tentatively correlated with Bed 31. The inferred widespread occurrence of this bed shown on Plate 12, maintains an average thickness of approximately 6 feet.



PHOTO 7: Coal Bed located on south Fork of Eleven Mile Creek. Bed dips  $20^{\circ}$  eastward with a thickness approximately 10 feet. Geologic pick indicates top of seam which is overlain by 18 inches of dark gray carbonaceous shale and siltstone. Orange color on coal face is oxidized Iron sulfide leached from coal. This Coal Bed is tentatively correlated with Bed 31.

COAL BED 40, stratigraphically 400 feet to 430 feet above Bed 31, underlies an area south of Seven Mile Creek to the North Fork of Eleven Mile Creek. This coal is overlain by a massive sandstone unit 70 to 90 feet thick associated with thin-bedded shales and siltstones. Bed 40 varies in thickness from 1.7 feet to 7.0 feet seam which has a relatively thin clastic parting. This parting increases to a 5.6 foot shale split in DH 6. See Plate 13.

COAL BED 46, approximately 240 feet above Bed 40, overlies a persistent stratigraphic sequence of 4 to 8 thin coal beds; See 1971 Progress Report. The extent of this seam is confined to the area between Seven Mile Creek and Ten Mile Creek. The seam thickness, Plate 14, ranges from a cored interval of 4.6 feet in DH 72-16 to 9.2 feet in DH 72-12. A clastic split in the northwest part of the area ranges up to 18.1 feet, with the upper and lower bench averaging less than 4.0 feet of coal.

COAL BED 47 varies from 22.0 feet to 60.3 feet above Bed 46. The bed ranges in thickness from less than 3.0 feet to 6.8 feet, Plate 15, in an area between Seven Mile Creek and the North Fork of Eleven Mile Creek.

COAL BED 51 and 51A, confined to the area between Seven Mile Creek and Ten Mile Creek, is separated by a clastic split ranging up to 33.7 feet thick, Plate 16. The seams have not been tested south of Ten Mile Creek. Coal Bed 51, the full seam and lower bench, Plate 17, varies in thickness from 2.3 feet to 8.5 feet. The lower bench splits into beds less than 3.0 feet thick separated by 7.3 feet of shale in an area northwest of DH 72-12. Coal Bed 51A, or upper bench, Plate 18, varies in thickness from 3.4 feet to 6.8 feet. As in the lower bench or Bed 51, 51A also splits in the area northwest of DH 72-12 to two thin benches less than 3.0 feet thick.

COAL BED 52 varies from 32.0 feet above Bed 51A in DH 72-15 to 59.5 feet in DH 8. This seam is overlain by a shale sequence up to 15.0 feet thick followed by an Upper Gething massive sandstone unit 125.0 to 150.0 feet thick. Bed 52 ranges in thickness from 1.1 feet in DH 72-16 to 7.7 feet in DH 8. The areal extent and seam continuity is best illustrated in Plate 19.

COAL BED 54, Plate 20, varies in thickness from 4.5 feet to 5.4 feet. This coal overlies the upper Gething massive sandstone unit by 20 to 25 feet, and is present only on the hillslope between Nine and Ten Mile Creeks. North of Nine Mile Creek, only the lower part of the upper Sandstone unit is present. The sequence of coal-bearing strata above this sandstone unit has been removed by erosion.

COAL BED 55 is separated by 21.0 feet to 24.0 feet of interbedded sandstones, siltstones and shale from the underlying Bed 54. The seam thickens south-eastward on the hillslope between Nine and Ten Mile Creeks from a cored thickness of 4.8 feet to a 7.8 feet split seam with the upper bench 2.2 feet thick and lower bench 2.9 feet thick, Plate 21.

COAL BED 58, Plate 22, occupies a limited area on the hillslope between Nine and Ten Mile Creek. In the 1971 Progress Report, though less than 4.0 feet, Bed 58 was included as a principle seam because of its continuity between DH 4 and DH 8. DH 72-13, drilled to better define the coal sequence above the upper massive sandstone unit, has shown that Bed 58 is actually a split seam by correlation with the equivalent interval in DH 8. Because of the deterioration of the seam's uniform character, this bed is not regarded as a principle seam.

COAL BED 59 varies in gross seam thickness from 14.3 feet to 14.5 feet with a total coal thickness of 5.3 feet and 9.6 feet, respectively. The areal distribution is limited to a small area on the hillslope between Nine and Ten Mile Creek. Because of the increase of partings in this seam, Plate 23, and its very limited extent, this bed is no longer regarded as a principle coal seam.

#### COAL QUALITY

One hundred and twenty-nine coal samples (coal beds greater than 1.0 feet in thickness) recovered from coring operations during the 1972 Carbon Creek program were sent to Utah's Palo Alto laboratory for proximate analysis, Free-Swelling tests, and washability studies. Proximate analysis, including sulfur and BTU determinations were made by the analytical laboratory at Utah's Nayajo Mine located at Farmington, New Mexico. The free swelling

index determinations were made at Palo Alto, as well as at the exploration site. Ash analysis were also determined at Palo Alto.

The purpose of these tests was to accumulate analytical and coal preparation data so that one could make a classification by rank and determine the quality of the coal seams, mainly using the proximate analysis, F.S.I. and washability data. This information will augment other geological data in order to establish the presence of mineable an/or exploitable coal seams.

Laboratory procedures in the handling of the coal samples are as follows:

- 1) Unseal and air-dry (65° to 90° f) and (24 to 36 hours).
- 2) All individual seam samples crush through 1". (starting DH 72-17, crush through 3/8").
- 3) Core and quarter out head sample.
- 4) Seams of greater than three feet thickness to washability testing and screen sizing - minus 28 mesh to froth flotation.
- 5) All seams to single gravity separation at 1.400.
- 6) Selected heads or gravity separation float products for petrography and comprehensive analyses.
- 7) Laboratory analyses of ash and FSI - other analytical procedures by Navajo Mine.
- 8) Compute material balances.

Results of washability studies on the principle coal beds are shown on Table 2, "Summary of Average Coal Analyses at 1.40 Specific Gravity". Head analyses on all coal samples from DH 72-10 to DH 72-23 inclusive, with washability analyses on those seams greater than 3.0 feet in thickness are shown in Appendix B.

1972

TABLE I  
Summary of Average Coal Analyses at 1.40 Specific Gravity

<u>SEAM</u>	<u>THICKNESS</u>	<u>% REC.</u>	<u>H<sub>2</sub>O</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>	<u>FSI</u>
14	8.2'	85.7	1.15	3.50	0.62	21.9	75.8	14,871	3.5
15	9.1'	93.6	1.24	3.09	0.54	22.4	76.4	14,940	3.5
31	6.0'	66.0	1.30	6.08	0.96	25.9	66.3	14,229	7.6
40	4.6'	84.9	1.78	3.20	0.99	29.2	67.9	14,485	6.6
46	5.1'	88.1	2.05	2.96	0.86	28.9	68.6	14,441	3.6
47	4.3'	76.2	2.52	3.39	0.96	27.1	69.9	14,209	2.3
51	5.7'	87.2	2.21	2.67	0.79	26.2	71.0	14,412	2.6
51A	4.4'	90.1	2.14	2.92	0.86	26.6	70.6	14,384	2.7
52	4.4'	67.0	1.90	4.61	1.57	30.8	64.6	14,114	5.0
54	4.9	90.8	2.32	2.35	0.73	28.0	69.6	14,402	2.0
55	5.0	85.8	2.35	3.90	0.73	30.3	65.8	14,169	3.1

COAL RESERVES

Estimates of in-place coal reserves in this report are based on the following assumptions:

- 1) Coal having a minimum recoverable seam thickness of 3.0 feet.
- 2) Coal with a maximum overburden cover of 1,000 feet.
- 3) Only those areas which could be exploited feasibly by either underground or strip mining methods.

On the accompanying in-place coal reserve estimate chart, Table 2, the estimated coal in-place is shown, followed by an estimated recoverable coal reserve at a 5.0 to 1 and 10.0 to 1 strip ratio. The strip ratios are expressed as cubic yards of overburden removed per ton of coal recovered. All figures shown are in thousands of net short tons.

The in-place figures are broken down into "measured", "indicated" and "inferred" categories. All estimates of "measured" reserves include beds for which positive information is available as to thickness and lateral continuity. The outer limit of a block of measured reserves is usually about ¼ mile from the last point of definite information.



Reserves classified as "indicated" are computed partly from specific measurement and partly from projection of visible data for considerable distances on geologic evidence. The points of observation are approximately one mile apart, or as much as  $1\frac{1}{2}$  miles for beds of known continuity.

"Inferred" reserves are those for which estimates are based largely on broad knowledge of the geological characteristics of the bed, supported by few or no actual exposures or measurements. These reserves are beyond the limits defined for measured and indicated reserves, but only in areas where there is good evidence for believing that coal in the thickness and of the rank is actually present.

Recoverable strip coal reserves are based on estimates derived from individually mined seams. Highwalls range from 55 feet to 100 feet at a 5.0 to 1 strip ratio and 100 feet to 180 feet at a 10.0 to 1 strip ratio, each depending upon the relative thickness of the coal seam to be removed.

The total volume of coal in-place within the northern and central area of this study is estimated to be over 240 million tons. These reserves are calculated on 11 principle coal seams.

The total estimated recoverable coal at a 5.0 to 1 stripping ratio is approximately 12 million tons on about 1,300 acres. Approximately 24 million tons of recoverable coal may be realized having a strip ratio of 10.0 to 1 on about 2,500 acres.

TABLE 2

IN-PLACE COAL RESERVE ESTIMATES - 1972  
NORTHERN AND CENTRAL EXPLORED AREA - CARBON CREEK, B.C.

COAL IN-PLACE IN THOUSANDS OF NET SHORT TONS

RECOVERABLE RESERVES

<u>BED NUMBER</u>	<u>MEASURED</u>	<u>INDICATED</u>	<u>INFERRED</u>	<u>TOTALS</u>	<u>RECOVERABLE RESERVES</u>			
					<u>ACRES</u>	<u>STRIP RATIO</u>	<u>ACRES</u>	<u>STRIP RATIO</u>
						5.0-1		10.0-1
55	4,250	2,750	-----	7,000	216	2,140	350	3,410
54	4,220	2,150	-----	6,370	185	1,540	344	2,890
52	6,010	9,490	-----	15,500	218	2,020	447	4,080
51A	6,690	8,220	-----	14,910	115	990	326	2,870
51	4,370	7,040	-----	11,410	151	1,460	272	2,590
47	7,110	9,890	-----	17,000	119	1,050	220	1,960
46	6,540	11,310	-----	17,850	54	540	125	1,240
40	10,120	16,400	-----	26,520	36	260	64	460
31	3,830	22,720	18,900	45,450	64	700	116	1,250
15	4,900	38,200	3,460	46,560	63	850	168	2,230
14	3,240	28,350	4,390	35,980	45	460	103	1,060
<b>GRAND TOTAL</b>	<b>61,280</b>	<b>156,520</b>	<b>26,750</b>	<b>244,550</b>	<b>1,266</b>	<b>12,010</b>	<b>2,535</b>	<b>24,040</b>

## EXPLORATION COSTS

The following statement covers expenditures for cost exploration (through 31st October, 1972) in the Carbon Creek Coal Basin of the Peace River District by Utah Mines Limited.

<u>ITEM</u>	<u>TOTAL COST</u>	<u>COST ALLOCATED TO COAL LICENCES (66%)</u>
1. Drilling		
Coal Licences 6,134 feet (66%)		
Burns Leases <u>3,162</u> feet (34%)		
Total 9,296 feet (100%)	\$137,056	\$ 90,457
2. Road Building		
Machinery operation, drillsite clearing, bridge construction, slash removal, road maintainance		
Coal licences - 11 miles		
Burns Leases - <u>3 miles</u>		
Total - 14 miles	\$115,383	\$ 90,691
3. Barge and Tug Services		
Mobilization and demobilization, camp support.	\$ 40,761.	\$ 26,902
4. Labour		
Geologists and assistants salaries	\$ 19,290	\$ 12,731
5. Expense Accounts		
Travel expenses to and from exploration area.	\$ 7,458	\$ 4,922
6. Vehicle Rentals	\$ 5,839	\$ 3,854
7. Aircraft Charter		
Helicopter and fixed wing	\$ 7,493	\$ 4,945
8. Supplies		
Camp supplies, bridge construc- tion materials, culverts, core boxes, fuel, etc.	\$ 4,302	\$ 2,839
9. Camp Costs	\$ 7,633	\$ 5,038
10. Probe Rental	\$ 2,980	\$ 1,967



Summarizing the 1972 Carbon Creek Project:

1. Fourteen HQ (2½") core holes were drilled in the Carbon Creek area totaling 9,296 feet.
2. Coal quality analyses were determined on approximately 130 coal core samples. These determinations are proximate analysis on head samples on a natural and dry basis.
3. Fourteen miles of new access road and construction of three bridges were completed in the project area.
4. Geological studies of core samples, geophysical logs and outcrops were conducted.
5. Ecological studies were continued in order to monitor environmental disturbance and formulate a basic guide for any future development.
6. A contract prepared topographic map suitable for a detailed geologic study was completed.

Respectfully Submitted



D.S. Fullerton,  
District Geologist,  
Coal Exploration.

DSF/mw

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APPENDIX A

APPENDIX A

Summary of known coal seams in the Carbon Creek area from northern and Central areas.

<u>NUMBER</u>	<u>THICKNESS</u>	<u>PHYSICAL PROPERTIES</u>
7	3.9'	A moderately bright attrital seam, having a 0.8' shale parting. See DH 72-17, Head analysis and Washability Test, Sample 4.
8	.7 to 1.3'	Highly sheared, moderately bright See DH 72-17, Head Sample 3.
9	1.4 to 2.1'	Moderately bright to dull and boney. See DH 72-14, Head Sample 9 and DH 72-17, Head Sample 2.
10	1.0'	Bright attritus with 20% vitian
11	1.8 to 3.9'	Dull attritus, crushed, See DH 72-14, Head analysis, Sample 8 7 DH 72-17 Head Analysis Sample 1.
12	1.3'	Bright, high luster
13	1.0'	Dull, bon in top .3', vitrain <50% in lower part, abundant cleat.
-14	9.0' to 13.2' split	See Coal Geology - Principle Coal Beds.
-15	8.0' to 10.2'	" "
16	1.4'	Bright, attrital.
17	.3' to 1.3'	High luster, >78% vitrain, with siltstone laminae in upper 0.5'.
18	1.1' to 1.4'	Clean, bright attrital, cleat prominent, crumbles easily. See DH 72-14 Head analysis Sample 4
19	2.0 2.0'	Bright attrital, vitrain 30% thin.
20	2.2'	Sheared.
21	1.7 to 2.4'	Moderately bright, with thin vitrain bands, fusainous, weathered. See DH 72-14, Head Analysis Sample 3.



NUMBERTHICKNESSPHYSICAL PROPERTIES

22	3.0' to 4.2'	Bright attrital, vitrinous and fusainous fractured, pyritic, weathered. See DH 72-14, Head Analysis, Sample 2.
23	1.0'	Fractured, Boney, 20% vitrain.
24	2.4' to 3.5'	80% Bright attrital, clean, 20% thin vitrain bands throughout. See DH 72-14, Head analysis, Sample 1.
25	1.9'	Bony, 10% vitrain; metallic luster, hard.
26	1.0'	30% Vitrain, calcite in cleat.
27	.3' to 2.5'	Medium Vitrain 40%, pyritic.
28	1.2' to 1.7'	Dull attrities with 0.2' shale split.
29	0.7' to 1.4'	Very shaley.
30	1.2' to 1.4'	Very shaley.
~31	5.6' to 6.0'	See Coal Geology Section Principle Coal Beds.
32	1.0' to 2.5'	Bright luster, high vitrain contact, bony in upper part.
33	1.0' to 2.0'	Moderately bright attrities, with abundant pyritic sulfur, broken
34	1.1'	Dull, with moderate attrities
35	1.2'	Dirty.
36	2.1'	Pyritic.
37	2.0' to 2.4'	Bright to medium luster, upper 1.0' bright attrities, Lower 1.0' bony pyritic.
38	.7' to 4.1'	Dull to med. bright attrital, with thin shale parting
38A	3.7'	Bright attrities.
39	.6' to 2.7'	Bright to dull attrities with thin shale parting, calcite on cleat faces.
~40	1.7' to 13.3' split q	See Coal Geology Section Principle Coal Beds.
41	1.0' to 1.7'	Discontinuous, Fusain abundant, pyrite, moderatly bright.
42	1.0' to 4.1'	High vitrian content, bright to Moderately bright.

NUMBERTHICKNESSPHYSICAL PROPERTIES

43	1.0' to 4.0'	Moderately bright, cleated with no mineralization.
44	.2' to 3.8'	Discontinuous, thin vitrain bands, Dull attrities.
45	1.0' to 3.4'	Moderately bright attrities, boney at base, fusion abundant
<u>46</u>	.0' to 9.2'	See Coal Geology Section, Principle Coal Beds.
<u>47</u>	2.2' to 5.8'	" "
48	1.0' to 3.5'	Moderately bright, pyrite in cleat, oxidized, sheared.
49	1.1' to 1.8'	Moderate bright attrities, bony See Head Analysis DH 72-11, Sample 6. " " DH 72-12, Sample 4. " " DH 72-18, Sample 1.
50	1.1' to 1.4'	Bright attrities
<u>51</u>	2.3' to 11.9'	See Coal Geology Section Principle Coal Beds.
<u>51A</u>	2.4' to 6.2'	" "
<u>52</u>	1.1' to 7.7'	See Coal Geology Section "Principle Coal Beds".
53	1.5' to 2.3'	Bright, high vitrain content, bony in part.
<u>54</u>	4.5' to 5.4'	See Coal Geology Section "Principle Coal Beds".
<u>55</u>	4.8' to 7.7'	" "
56	1.2' to 5.6' split	Bright attrities.
57	1.4'	Bony, fractured, weathered
<u>58</u>	3.5' to 5.8' split	Weathered, moderately attrities.
59	14.3' to 14.5' split	Moderately bright attrital. Seam has several shale and sandstone splits.
60	1.4'	Moderately bright, Head analysis DH 72-13, Sample 1.
61	5.0'	Weathered, road outcrop.

PR-CARBON CREEK 72(4)A

APPENDIX B

## HEAD ANALYSES

Hole: 72-10

Location: 354,000N-61,100E

Elevation: 3,310

Burns Coal Lease #326

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	17.0-25.5	8.5	2 1/2	2.78	4.04	0.69	27.16	66.02	13829	4.16	0.71	27.94	67.91	14224
2	124.0-125.3	1.3	2	1.37	21.38	4.03	24.08	53.17	11365	21.68	4.09	24.41	53.91	11523
3	129.3-132.8	3.5	3	2.07	26.32	0.86	23.46	48.15	10411	26.88	6.88	23.96	49.17	10631
4	162.8-167.4	4.6	2	2.58	9.13	1.03	23.93	64.36	12988	9.37	1.06	24.56	66.06	13332
5	179.0-182.1	3.1	2	1.89	26.77	2.56	22.44	48.90	10438	27.29	2.61	22.87	49.84	10640
6	187.6-190.3	2.7	2											
7	308.1-309.6	1.5	2	2.14	15.17	1.12	23.92	58.77	12126	15.50	1.14	24.44	60.06	12391
8	328.7-332.8	4.1	4	1.96	4.66	0.76	27.77	65.61	13956	4.75	0.78	28.33	66.92	14235
9	388.7-390.2	1.5	7	1.58	26.47	1.50	26.05	45.90	10687	26.89	1.52	26.47	46.64	10859
10	427.4-430.4	3.0	8	1.69	5.69	1.07	28.84	63.78	13916	5.79	1.09	29.34	64.88	14155
11	474.1-476.2	2.1	2 1/2	1.89	5.20	0.88	25.57	67.34	13835	5.30	0.90	26.06	68.64	14102
12	491.0-492.9	1.9	8	1.40	11.00	2.07	30.12	57.48	13230	11.16	2.10	30.55	58.30	13418

## HEAD ANALYSES

Hole: 72-11  
 Location: 352,800N-53,650E  
 Elevation: 4,500 est  
 Trend Cl #1752

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	88.5-92.0	3.5	3	2.14	19.78	2.08	27.11	50.97	11408	20.21	2.13	27.70	52.08	11657
2	134.8-135.9	1.1	4	2.10	16.21	0.89	24.90	56.79	12070	16.56	0.91	25.43	58.01	12329
3	138.8-141.6	2.8	2	2.15	15.41	0.93	28.17	54.27	12126	15.75	0.95	28.79	55.46	12392
4	160.6-163.8	2.8	2 1/2	2.10	18.71	1.23	28.33	50.86	11502	19.11	1.26	28.94	51.95	11749
5	253.5-255.1	1.6	6 1/2	1.75	6.22	3.52	31.96	60.07	13571	6.33	3.58	32.53	61.14	13813
6	280.6-281.9	1.3	5 1/2	2.00	29.32	1.08	24.54	44.14	10000	29.92	1.10	25.04	45.04	10204
7	308.7-311.8	3.1	3	2.00	28.19	0.74	23.86	45.95	10242	28.77	0.76	24.35	46.89	10451
8	376.1-377.8	1.7	5	2.17	4.43	0.90	30.59	62.81	13868	4.53	0.92	31.27	64.20	14176
9	458.6-461.9	3.3	2 1/2	2.03	19.43	0.85	27.05	51.49	11290	19.83	0.87	27.61	62.56	11524
10	481.9-484.2	2.3	2 1/2	2.01	13.33	1.59	31.72	52.94	12019	13.60	1.62	32.37	54.03	12266
11	490.9-492.0	1.1	7 1/2	1.76	4.57	1.28	30.62	63.05	14024	4.65	1.30	31.17	64.18	14275
12	507.0-508.0	1.0	7	2.11	8.41	0.94	31.37	58.11	13177	8.59	0.96	32.05	59.36	13461
13	569.3-570.6	1.3	4 1/2	1.29	30.10	1.46	26.53	42.08	10123	30.49	1.48	26.88	42.63	10255
14	599.0-602.8	3.8	2	2.05	10.30	0.80	30.22	57.43	12803	10.52	0.82	30.85	58.63	13071

Hole: 72-12

Location: 351,300N-57,600E

Elevation: 3,800

Trend C.L. #1752

Sample No.	Footage	No. Of Feet	Lab Assay PSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	100.3-104.9	4.6	4 1/2	2.35	13.44	2.18	30.01	54.20	12348	13.79	2.24	30.80	55.41	12671
2	148.4-153.1	4.7	2 1/2	2.70	4.78	.77	27.32	65.20	13681	4.91	.79	28.08	67.01	14061
3	168.4-173.4	5.0	2	2.43	7.34	.77	26.81	63.42	13348	7.52	.79	27.48	65.00	13680
4	255.3-256.5	1.2	6 1/2	1.45	16.49	7.10	29.17	52.89	12083	16.73	7.20	29.60	53.67	12261
5	326.6-332.0	5.4	1 1/2	2.44	28.10	.86	21.77	47.69	10087	28.80	.88	22.31	48.88	10339
6	( 364.1-367.1	3.0	2 1/2	2.59	3.70	1.06	28.26	65.45	13947	3.80	1.09	29.01	67.19	14318
	( 369.0-373.3	4.3												
7	450.2-452.0	1.8	4	1.75	10.78	.99	28.84	58.63	12904	10.97	1.00	29.35	59.67	13134
8	490.2-492.8	2.6	3 1/2	1.91	5.74	1.16	29.02	63.33	13657	5.85	1.18	29.59	64.56	13923
9	574.7-576.0	1.3	7	1.34	14.55	1.74	29.82	54.29	12522	14.75	1.76	30.23	55.03	12692
10	607.5-612.7	5.2	3	1.99	11.51	.84	27.78	58.72	12023	11.74	.86	28.34	59.91	13083

Hole: 72-13

Location: 349,000N-60,000E

Elevation: 3,900

Burns Coal Lease #323

Natural Basis

Dry Basis

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	97.4-98.8	1.4	3 1/2	1.66	25.41	.76	28.31	44.62	10554	25.84	.77	28.79	45.37	10732
2	136.8-139.9	3.1	2 1/2	2.61	6.41	.70	30.97	60.01	13408	6.58	.72	31.80	61.62	13767
3	142.8-144.2	1.4	2	1.86	19.69	.69	31.77	46.68	10859	20.06	.70	32.37	47.56	11065
4	149.9-151.1	1.2	2 1/2	2.06	8.74	.92	28.60	60.60	12989	8.85	.93	28.95	61.34	13147
5	175.3-177.1	1.8	3	2.30	12.26	1.10	29.36	56.08	12396	12.55	1.13	30.08	57.40	12688
6	179.4-181.0	1.6	3											
7	225.1-226.3	1.2	7	1.66	9.24	1.12	31.51	57.59	13386	9.40	1.14	32.04	58.56	13612
8	259.4-264.6	5.2	2 1/2	2.43	8.58	.64	28.19	60.80	13144	8.79	.66	28.89	62.31	13471
9	284.7-289.2	4.5	2	2.47	5.46	.82	26.29	65.78	13653	5.60	.84	26.96	67.45	13999

CARBON CREEK  
HEAD ANALYSES

Hole: 72-14  
Location: 369,000N-55,300E  
Elevation: 2,750  
Total C.C. 1789

Sample No.	Footage	Dr Feet	Lab	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				H <sub>2</sub> O Ash	AsH	S	UM	FC	BTU	AsH	S	UM	FC	BTU
1	58.1-61.6	3.5	0	1.22	70.58	.71	10.02	18.18	3764	71.45	.72	10.14	18.40	3810
2	118.9-123.1	4.2	1 1/2	1.10	31.46	.59	26.60	40.84	8788	31.81	.60	26.90	41.29	8886
3	196.8-199.1	2.3	2 1/2	1.38	18.08	.72	20.31	60.23	12254	18.33	.73	20.59	61.07	12425
4	283.1-284.5	1.4	8	0.91	23.59	.70	20.57	54.93	11506	23.81	.71	20.76	55.43	11612
5	402.8-413.0	10.2	4 1/2	0.98	9.65	.50	21.36	68.01	13541	9.75	.50	21.57	68.68	13675
6	511.6-513.7	2.1	5	1.00	7.78	.70	20.96	70.26	14010	7.86	.71	21.17	70.97	14152
7	519.4-524.8	5.4	4 1/2	1.20	11.10	.41	20.56	67.14	13395	11.23	.41	20.81	67.96	13558
8	629.0-631.5	2.5	8 1/2	0.94	9.75	.66	21.66	67.65	13897	9.84	.67	21.87	68.29	14029
9	789.7-791.1	1.4	1 1/2	0.94	7.09	.62	19.89	72.08	14222	7.16	.63	20.08	72.76	14357
6 & 7	511.6-524.8	7.5	2	1.35	7.58	.58	19.03	72.04	14010	7.68	.59	19.29	73.03	14202



HEAD ANALYSIS

Hole: 72-15  
 Location: 346,000N-60,000E  
 Elevation: 3,640' Est.  
 Burns Coal Lease #323  
 Total Depth: 864'

Dry Basis

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Analysis						Analysis				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	43.0-45.1	2.1	3	2.44	18.21	.82	27.65	51.70	11615	18.67	.84	28.34	52.99	11905
2	92.2-94.4	2.2	6 1/2	1.92	11.36	.85	28.81	57.91	12744	11.58	.87	29.37	59.04	12993
3	97.0-99.9	2.9	4 ?							10.31	.88	28.96	60.73	13163
4	120.0-125.4	5.4	2	2.59	6.57	.79	26.62	64.22	13383	6.74	.81	27.33	65.93	13739
5	321.4-322.9	1.5	8	1.79	2.82	1.75	30.38	65.01	14335	2.87	1.78	30.93	66.19	14596
6	324.1-328.5	4.4	6 1/2	1.95	22.18	1.22	26.56	49.31	11205	22.62	1.24	27.09	50.29	11428
7	360.5-364.5	4.0	1 1/2	2.41	4.27	.81	25.02	68.30	13849	4.38	.83	25.64	69.99	14191
8	397.2-402.0	4.8	1 1/2	2.37	11.63	.71	25.54	60.46	12421	11.91	.73	26.16	61.93	12723
9	473.1-474.1	1.0	4	1.57	7.74	4.56	28.71	61.98	13612	7.86	4.63	29.17	62.97	13829
10	537.0-539.2	2.2	2	2.72	5.81	.89	25.72	65.75	13517	5.97	.91	26.44	67.59	13895
11	592.0-597.5	5.5	2	2.43	4.00	.61	26.45	67.12	14011	4.10	.63	27.11	68.79	14360
12	680.1-682.6	2.5	7 1/2	1.71	10.72	.92	29.63	57.94	12943	10.91	.94	30.15	58.95	13168
13	711.0-712.0	7.0	3 1/2	0.27	6.35	.86	26.23	65.15	13722	6.50	.98	26.84	66.66	14041
14	854.1-857.5	3.4	4	1.87	11.99	.74	27.69	65.15	14330	2.13	.96	28.42	69.45	14660
2 & 3	92.2-99.9	5.1	3 1/2	2.72	10.09	.93	28.31	58.88	12904	10.37	.96	29.10	60.53	13265
5 & 6	321.4-328.5	5.9	4	2.27	21.43	1.34	25.62	50.68	11092	21.93	1.37	26.22	51.86	11350

HEAD ANALYSES

Note: 72-16

17.5000-04, DRY

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	165.2-166.3	1.1	2 1/2	1.70	5.16	3.00	29.31	63.83	13874	5.25	3.05	29.82	64.93	14114
2	220.5-224.1	3.6	2	2.42	3.97	0.91	25.82	67.79	13941	4.07	0.93	26.46	69.47	14287
3	252.0-255.2	3.2	2	2.79	3.73	1.00	25.46	68.02	13890	3.84	1.03	26.19	69.97	14289
4	378.1-382.2	4.1	2	2.22	19.60	0.89	21.63	56.55	11558	20.04	0.91	22.12	57.83	11820
5	416.7-421.3	4.6	2	2.49	2.40	0.70	24.46	70.65	14262	2.46	0.72	25.08	72.45	14626
6	635.6-638.2	2.6	2	1.89	11.39	1.11	28.57	58.15	12521	11.61	1.13	29.12	59.27	12762
7	670.3-672.0	1.7	5	1.72	5.19	0.99	29.04	64.05	13817	5.28	1.01	29.55	65.17	14059
8	738.1-740.1	2.0	8 1/2	1.37	12.37	2.65	27.39	58.87	12921	12.54	2.69	27.77	59.69	13100

CARBON CREEK

HEAD ANALYSES

Hole: 72-17  
 Location: 371,000N-53,900E  
 Elevation: 2,823.7'  
 Trend License #1740

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	259.6-261.4	1.8	8 1/2	1.12	6.17	.70	23.53	69.18	14416	6.24	.71	23.80	69.96	14579
2	415.1-417.2	2.1	2	1.10	17.71	.51	18.57	62.62	12394	17.91	.52	18.78	63.32	12532
3	427.4-428.7	1.3	8 1/2	0.89	18.42	.61	22.07	58.62	12397	18.59	.62	22.27	59.15	12508
4	461.7-465.6	3.9	1 1/2	1.14	34.37	.39	15.73	48.76	9750	34.77	.39	15.91	49.32	9862

33  
CARBON CREEK

HEAD ANALYSES

Hole: 72-18  
Location: 344, 200N-65, 300E  
Elevation: 3,150  
Burns Lease #321

Sample No.	Footage	Feet	Lab.	Natural Basis							Dry Basis				
				Navajo Mine Assay							Navajo Mine Assay				
				% Fe	% Ni	% Mn	% Cu	% Zn	% Pb	% Ash	% S	% Vol	% PC	Btu	
1	31.7- 32.8	1.1	8	1.55	6.48	2.34	29.94	62.03	13826	6.58	2.38	30.41	63.01	14044	
2	51.0- 52.0	1.0	8	2.05	4.42	1.02	28.92	64.61	13995	4.51	1.04	29.53	65.96	14288	
3	80.9- 84.8	3.9	2	2.74	2.34	0.77	22.53	72.39	14100	2.41	0.79	23.16	74.43	14497	
4	122.8-127.3	4.5	1 1/2	2.58	1.49	0.68	23.35	72.58	14290	1.53	0.70	23.97	74.50	14668	
5	237.4-238.4	1.0	2	2.03	15.46	0.98	25.33	57.18	11939	15.78	1.00	25.85	58.36	12186	
6	371.9-374.3	2.4	5 1/2	2.05	7.32	1.01	26.52	64.11	13546	7.47	1.03	27.08	65.45	13830	
7	442.0-443.8	1.8	8 1/2	1.77	15.39	3.29	27.39	55.45	12325	15.67	3.35	27.88	56.45	12547	

## HEAD ANALYSES

Hole: 72-19

Location: N322,800-E63,000

Elevation: 3,140

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Natural Basis						Dry Basis				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	49.0-50.5	1.5	2	.95	9.90	.78	18.84	70.31	13691	9.99	.79	19.02	70.98	13822
2	172.0-175.1	3.1	3	.91	9.81	.72	18.68	70.60	13793	9.90	.73	18.85	71.25	13920
3	275.0-278.2	3.2	1	.92	9.70	.69	17.83	71.55	13656	9.79	.70	18.00	72.21	13783
4	295.0-296.1	1.1	1	.98	24.45	.69	15.22	59.35	11545	24.69	.70	15.37	59.94	11659
5	390.0-393.0	3.0	1	.88	38.30	.59	13.31	47.51	9238	38.64	.60	13.43	47.93	9320
6	446.5-447.6	1.1	8 1/2	.84	11.50	.74	20.31	67.35	13669	11.60	.75	20.48	67.92	13785

## HEAD ANALYSES

Hole: 72-20  
 Location: 320,300N-91,000E  
 Elevation: 4,450  
 Trend Coal 1777

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	98.3-100.4	2.1	1	1.62	15.79	0.80	19.59	63.00	12637	16.05	.81	19.91	64.04	12845
2	158.6-161.0	2.4	8 1/2	1.75	22.63	0.82	21.78	58.84	11497	23.03	.83	22.17	59.89	11702
3	172.2-175.9	3.7	3 1/2	1.74	35.41	1.24	18.49	44.36	9373	36.04	1.26	18.82	45.15	9559
4	205.3-211.3	6.0	7 1/2	1.50	6.99	1.01	23.87	67.64	14069	7.10	1.03	24.23	68.67	14283
5	397.8-400.2	2.4	7	1.46	7.28	0.78	22.75	68.51	14079	7.39	0.79	23.09	69.53	14288
6	428.2-429.5	1.3	1	1.35	42.05	0.62	14.83	41.77	8550	42.63	0.63	15.03	42.34	8667
7	489.6-492.1	1.5	7 1/2	1.29	21.26	0.74	19.70	57.75	11896	21.54	0.75	19.96	58.50	12051
8	516.0-518.5	2.5	1	1.38	22.42	2.24	22.58	53.62	10926	22.73	2.27	22.90	54.37	11079
9	751.0-752.0	1.0	3	1.40	4.88	0.81	20.39	73.33	14481	4.95	0.82	20.68	74.37	14637
10	767.9-770.6	2.7	1	1.25	33.74	0.63	15.67	49.34	9805	34.17	0.64	15.87	49.96	9929

## HEAD ANALYSES

H.L.C. 12-31

Location: 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

Lab. No.:

Trend C.L. #102

Sample No.	Footage	No. Of Feet	Lab Assay PSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	157.3-158.8	1.5	7 1/2	1.49	7.14	.99	21.96	69.41	14006	7.25	1.00	22.29	70.46	14218
2	280.2-281.2	1.0	6 1/2	1.04	9.98	.82	19.29	69.69	13846	10.08	0.83	19.49	70.42	13992
3	213.1-315.8	3.7	6 1/2	1.21	6.46	.77	19.48	72.85	14282	6.54	0.78	19.72	73.74	14457
4	352.1-353.1	1.0	1	1.31	9.31	.68	18.01	71.37	13841	9.43	0.69	18.25	72.32	14025
5	440.1-441.1	1.0	2	1.23	8.75	.70	18.49	71.53	14011	8.86	0.71	18.72	72.42	14185

CARBON CREEK

HEAD ANALYSES

Hole: 72-22  
 Location: 315,000N-86,300E  
 Elevation: 4,000 (Est.) 24 - 3500 -  
 Trend C.L. #1781

Sample No.	Footage	No. Of Feet	Lab Assay FSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Asn	% S	% VM	% FC	Btu
1	99.3-101.3	2.0	1	1.39	11.32	.68	17.95	69.34	13449	11.48	.69	18.20	70.32	13639
2	122.9-124.6	1.7	1	1.10	16.70	.86	17.34	64.86	12513	16.89	.87	17.53	65.58	12652
3	174.9-176.1	1.2	5 1/2	1.04	6.45	.78	18.82	73.69	14505	6.52	.79	19.02	74.46	14657
4	207.5-208.7	1.2	1	1.15	11.39	.66	15.41	72.05	13583	11.52	.67	15.59	72.89	13741
5	211.9-214.0	2.1	1	1.26	2.92	.65	17.50	78.32	14962	2.96	.66	17.72	79.32	15153
6	234.0-236.0	2.0	3 1/2	1.28	8.78	.78	16.90	73.04	13971	8.89	.79	17.12	73.99	14152
7	400.7-403.7	3.0	1	1.40	6.43	.63	17.19	74.98	13693	6.52	.64	17.43	76.04	13827
8	410.6-415.8	5.2	1	1.22	27.60	.55	13.67	57.51	10970	27.94	.56	13.84	58.22	11105



HEAD ANALYSES

Hole: 72-23

Location: 318,500N-87,700E

Total Depth: 677'

Sample No.	Footage	No. Of Feet	Lab. Assay FSI	Natural Basis						Dry Basis				
				Navajo Mine Assay						Navajo Mine Assay				
				% H <sub>2</sub> O	% Ash	% S	% VM	% FC	Btu	% Ash	% S	% VM	% FC	Btu
1	150.3-152.9	2.6	8	1.34	15.09	1.07	22.66	60.91	12798	15.30	1.08	22.97	61.74	12972
2	189.3-191.5	2.2	2 1/2	1.21	41.45	0.76	15.43	41.91	8415	41.96	0.77	15.62	42.42	8518
3	259.4-262.2	2.8	2 1/2	1.16	32.24	0.83	18.91	47.69	9323	32.62	0.84	19.13	48.25	10039
4	312.7-314.0	1.3	3	1.31	16.87	0.74	22.53	59.29	12689	17.09	0.75	22.83	60.08	12857
5	319.7-320.7	1.0	7 1/2	1.42	11.79	0.76	22.47	64.32	13185	11.96	0.77	22.79	65.25	13375
6	331.5-333.9	2.4	6 1/2	1.12	8.78	0.89	20.98	69.12	13834	8.88	0.90	21.22	69.90	13991
7	354.9-355.9	1.0	1	1.13	42.25	0.67	15.39	41.23	8319	42.73	0.68	15.57	41.70	8414
8	393.4-397.0	3.6	8	1.16	11.90	0.80	23.84	63.10	13381	12.04	0.81	24.12	63.84	13538
9	462.5-463.9	1.4	7 1/2	0.92	17.56	0.76	27.81	53.71	11953	17.72	0.77	28.07	54.21	12064
10	523.0-525.0	2.0	7 1/2	1.23	22.66	0.94	19.59	56.52	11673	22.94	0.95	19.83	57.22	11818
11	583.1-585.7	2.6	2	0.82	14.85	0.68	26.67	57.66	12121	14.97	0.69	26.89	58.14	12221
12	602.1-603.7	1.6	8 1/2	1.02	7.18	0.87	22.30	69.50	14285	7.25	0.88	22.53	70.22	14432
13	693.3-696.0	2.7	6	0.98	6.81	0.75	20.48	71.73	14181	6.88	0.76	20.68	72.44	14321