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REPORT 72-10

COAL OCCURRENCES, ATHABASCA-SMITH AREA, ALBERTA

by

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Abstract

The Athabasca-Smith area, Alberta, which lies between longitudes 113° and 114° 15′ west, and latitudes 54° 30′ and 55° 15′ north, is underlain by the Upper Cretaceous shaly, marine Lea Park Formation and by thin basal beds of the Upper Cretaceous nonmarine, clastic, coal-bearing Belly River Formation. A central upland is covered by thick till and glacial outwash sediments and rimmed in part by glacially disturbed coal-bearing strata. Three regions underlain by coal deposits are outlined, but only one of these, the Lincoln deposit, about the northeast corner of Tp. 65, R. 14, W.4th Mer., is of any commercial significance. Here approximately 16 million tons of low rank coal in a 4-5 foot seam lie under less than 40 feet of easily removable overburden.

INTRODUCTION

In continuing its inventory of the strippable low-rank coal resources of the Plains region of the Province of Alberta, the Research Council of Alberta focussed its coal survey activities during the summer of 1965 on the region within the big, northward loop of the Athabasca River north of township 66.[1] An area bounded by longitudes 113° and 114° 15′ west and latitudes 54° 30′ and 55° 15′ north, centered on the Athabasca River loop, is here designated the Athabasca-Smith area.

Topography in the Athabasca-Smith area is dominated by two broad lowlands trending north-south, separated by a low rolling upland which lies between range 14, west of the fourth meridian and range 1, west of the fifth meridian. The Athabasca River, the major stream of the area, after flowing northward in the western lowland almost to the northwest corner of the area, turns sharply southeastward and cuts across the upland by way of a narrow, incised channel. Reaching the eastern lowland in the vicinity of Athabasca town, it turns sharply and flows northward again. Terrain, almost completely mantled by drift, is rolling to rough, but relief is not great. The highest point in the area, 2 430 feet in elevation, is the peak of a morainal ridge in Lsd. 9, Sec. 34, Tp. 65, R. 24, W.4th Mer., while the lowest point is on the Athabasca River in Sec. 4, Tp. 69, R. 20, W.4th Mer., with an elevation of 1 650 feet.

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[1] Objectives and organization of the Research Council of Alberta coal survey activities are presented in previous reports of the Coal Division (Campbell and Almadi, 1964; Pearson, 1959).

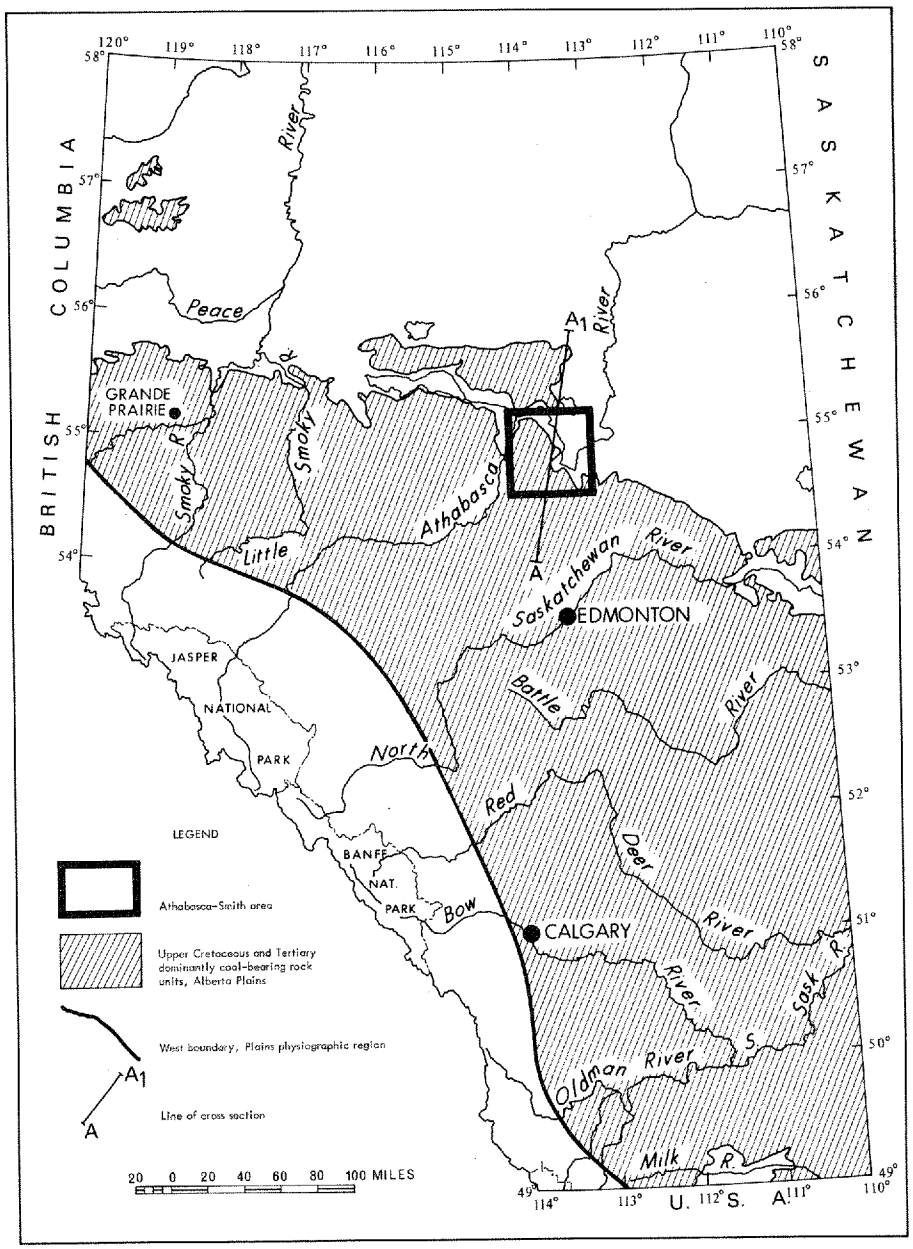

FIGURE 1. Location of study area.

The climate and natural biota of the Athabasca-Smith area are typical of the mixedwood boreal forest zone (Halliday, 1937; Rowe, 1959), with a normal subclimax of willow brush and aspen poplar followed by climax dominated by white spruce (*Picea glauca*).

Mixed farming agriculture, almost entirely restricted to the topographic lowlands, is the dominant economic enterprise of the residents. Some sawtimber is cut from small berths on the central upland, and several large forest industries operate west and north of the Athabasca River, with sawmills at Calling Lake, Smith, Chisholm and Athabasca. A number of wildcat wells have been drilled for oil and gas over a period of 60 years, but except for a small gas field, one of the oldest in Alberta, which supplies gas for the town of Athabasca, few significant discoveries have been made. One small coal mine was registered within the area and operated for a short period, and several other coal prospects were exploited by local residents on a very small scale during the depression years, but generally the abundance of wood made it unnecessary for settlers to seek other fuel.

Access to the eastern lowland is provided by the CN Railway and by Highway 2, and to the western lowland by the Northern Alberta Railway and by Highway 44; Highway 2 also traverses the northern part of the upland. The lowlands south and east of the Athabasca River are moderately well served by a network of country roads, but elsewhere only a few trails and seismic cut lines are available, and access is difficult.

The only community of any size within the area is the town of Athabasca, a thriving agricultural center founded nearly a century and a half ago by the Hudson's Bay Company as its transportation gateway to the Mackenzie River basin.

Methods

A major reason for beginning survey activities in the Athabasca-Smith area was to adapt methods originally devised for use in the settled prairie regions of Alberta to a frontier bush environment. As in previous years, almost complete reliance was placed on testholes, drilled 100-150 feet deep and about 2 miles apart with a conventional mud-rotary shothole drilling rig, described lithologically from mudstream cuttings dipped at 5-foot depth intervals, and electric logged for spontaneous potential and resistivity using a single-point portable miniaturized instrument. But in an attempt to circumvent the considerable access difficulties posed by the extensive mantle of bog and uncleared vegetation, a small track-mounted shothole drilling rig was used. This equipment proved satisfactory in most bush and muskeg terrain, although operated near its rated depth capacity[2] much of the time; it was, however, frequently turned back by beaver dams and

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2 In highly bentonitic lake clays, it was only possible to approach rated depth with the aid of phosphate mud-thinner and special box-joint bits.

watercourses, and proved unnecessarily clumsy and slow in travelling in the settled areas. In particular it was found inadvisable to operate more than 3 or 4 miles from the nearest truck roads; consequently, in bush areas, the pattern of coal testhole distribution (Fig. 4) was governed largely by logistics and had to depart from the preferred regular staggered 2-mile grid.

In all, 139 coal testholes totalling 16 800 feet, were drilled within the Athabasca-Smith area, 117 in 1965 using the small track-mounted rig, and 22 supplementary holes in 1969 using a conventional truck-mounted rig. Locations of all these are shown in figure 4[3] while their logs, "corrected" by collating lithologs with electric logs, are given in the appendix.

Acknowledgments

Research Council of Alberta Coal Division survey activities in the Athabasca-Smith area were supported financially by Canadian Utilities Limited, and Calgary Power Limited, members at that time of the *ad hoc* steering committee. Their encouragement and support were invaluable in carrying out this project. Thanks are also due numerous residents of the area who tendered information and encouragement.

GEOLOGIC SETTING

Bedrock Geology

Bedrock geology of much of the Athabasca-Smith area has been studied by Feniak (1944) who also reviewed the history of geological investigation. Only two formations underlie the area: the marine Upper Cretaceous Lea Park Formation (referred to by Feniak as upper part of the La Biche Formation) which outcrops in the lower valley of the Athabasca River, and the overlying, continental Upper Cretaceous, potentially coal-bearing Belly River Formation (Fig. 4). The contact between the two formations is irregularly diachronous; by reference to the well-known Upper Cretaceous marker horizon, the "First White Speckled Shale," it appears that the contact is appreciably higher (and hence younger) at Baptiste Lake (Tp. 67, R. 24, W.4th Mer.) than it is at either Westlock (Tp. 59, R. 26, W.4th Mer.) south of the area or at Pelican Hills (Tp. 77, R. 22, W.4th Mer.) north of the area (Fig. 3, section A-A').

It is believed that Belly River strata are only 100-200 feet thick at most places where they occur within the area, with the exception of the range of hills

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3 The testhole location at northeast corner of the southeast quarter of Sec. 11, Tp. 66, R. 24 W.4th Mer., beside the Lincoln mine site, was drilled twice in June, 1965, and a third time in September, 1969; 11 hole locations are positioned about 1/4 mile apart along a cut line across a muskeg between Sec. 24, Tp. 67, R. 25, W.4th Mer. and Sec. 33, Tp. 67, R. 24, W.4th Mer.

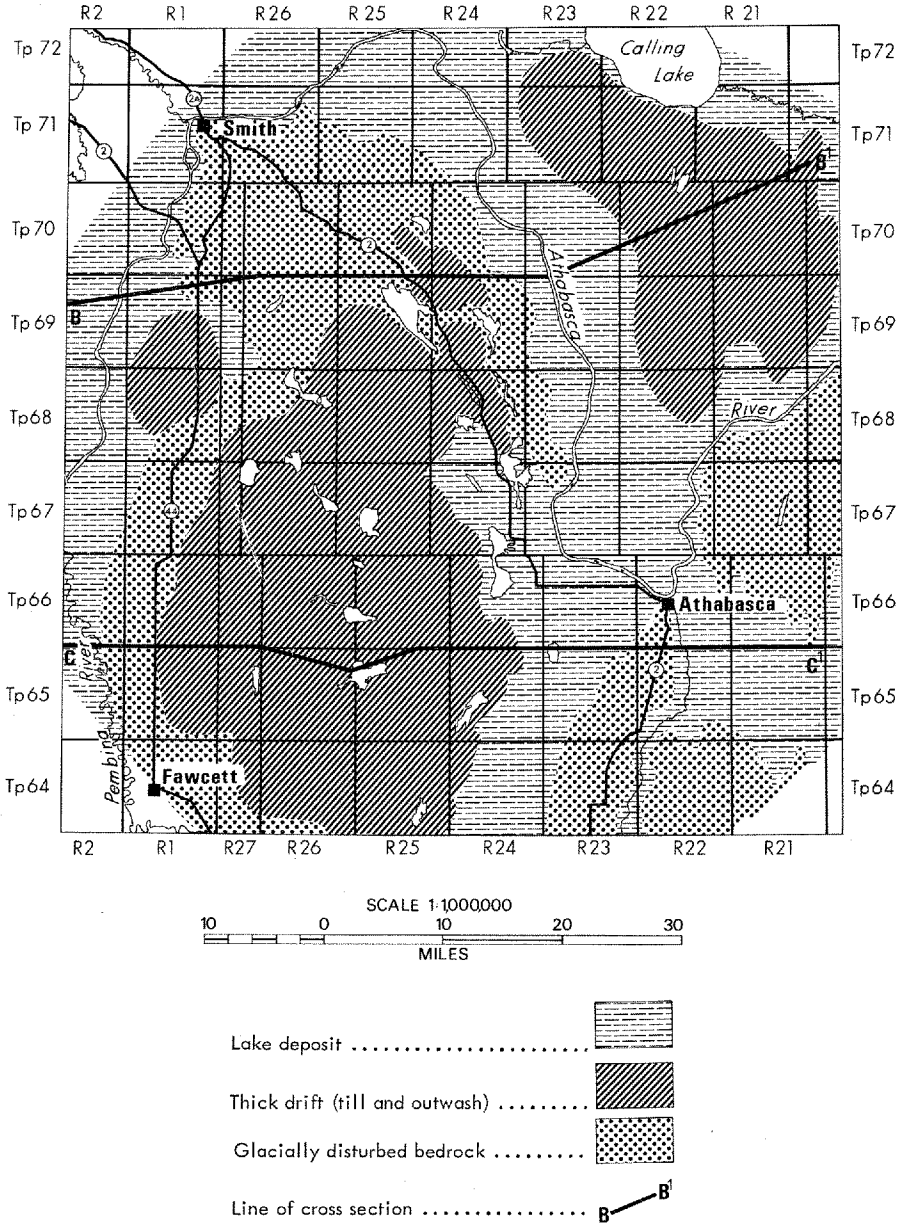

FIGURE 2. Quaternary features.

that bound the central upland on the west. Here, as for example at Flatbush about Tp. 65, R. 1, W.5th Mer. (Fig. 3, section B-B') and in the Hondo Road region about Tp. 69, R. 26, W.4th Mer. (Fig. 3, section C-C'), it is believed that the apparently greater thickness (possibly exceeding 400 feet) is the result of extensive glacial deformation (Fig. 3). The coal seam at Lincoln about the northeast corner of Tp. 65, R. 24, W.4th Mer., the only one in the Athabasca-Smith area believed to be relatively undisturbed by glacial action, appears to lie within 100 or 150 feet above the Lea Park-Belly River contact.

No nonmarine Cretaceous strata were observed northeast of the Athabasca River on the Calling Lake road although 8 testholes were drilled there.

Quaternary Geology

Most of the central upland of the Athabasca-Smith area appears to be underlain by a blanket of drift 150-350 feet thick which makes shallow exploration for coal in this area almost impossible. The slightly depressed central part of the upland is believed, partly from the evidence of a water well in Cross Lake Provincial Park (Lsd. 10, Sec. 25, Tp. 65, R. 26 W.4th Mer.) where the drift is 245 feet thick, to consist largely of glacial outwash deposits; however, the east rim consists mostly of till forming a narrow (1- to 3-miles wide) morainic ridge which includes the highest elevations in the Athabasca-Smith area and which buries the western portion of the Lincoln coal deposit in Tps. 65-66, R. 24, W.4th Mer. (Fig. 2; Fig. 3, sections B-B', C-C').

The western rim of the upland, narrow for most of its length but broadening markedly north of township 68 towards the bend of the Athabasca River, is known to consist of coal-bearing bedrock of the Belly River Formation, probably extensively deformed by glacial ice-push and, in the broader northern region at least, by extensive slumping (Fig. 2; Fig. 3, sections B-B', C-C').

There are also several smaller areas of strongly disturbed bedrock at lower elevations, especially on either side of the Tawatinaw River near Meanook, where thin coal seams show in road cuts but could not be intersected by testholes. The broad hill centered on Tp. 70, R. 22, W.4th Mer., traversed by the Calling Lake road appears to consist largely of a thick blanket of till.

The lowlands of the Athabasca-Smith area are almost entirely underlain by extensive postglacial lake deposits 20-100 feet thick. In exploration testholes drilled by conventional mud-rotary methods, these deposits are extremely difficult to distinguish from the underlying marine Lea Park Formation. The lake deposits tend to be more bentonitic and plastic than the marine shales, but both show similar uniform bedding, and the former probably originated by glacial reworking of the latter.

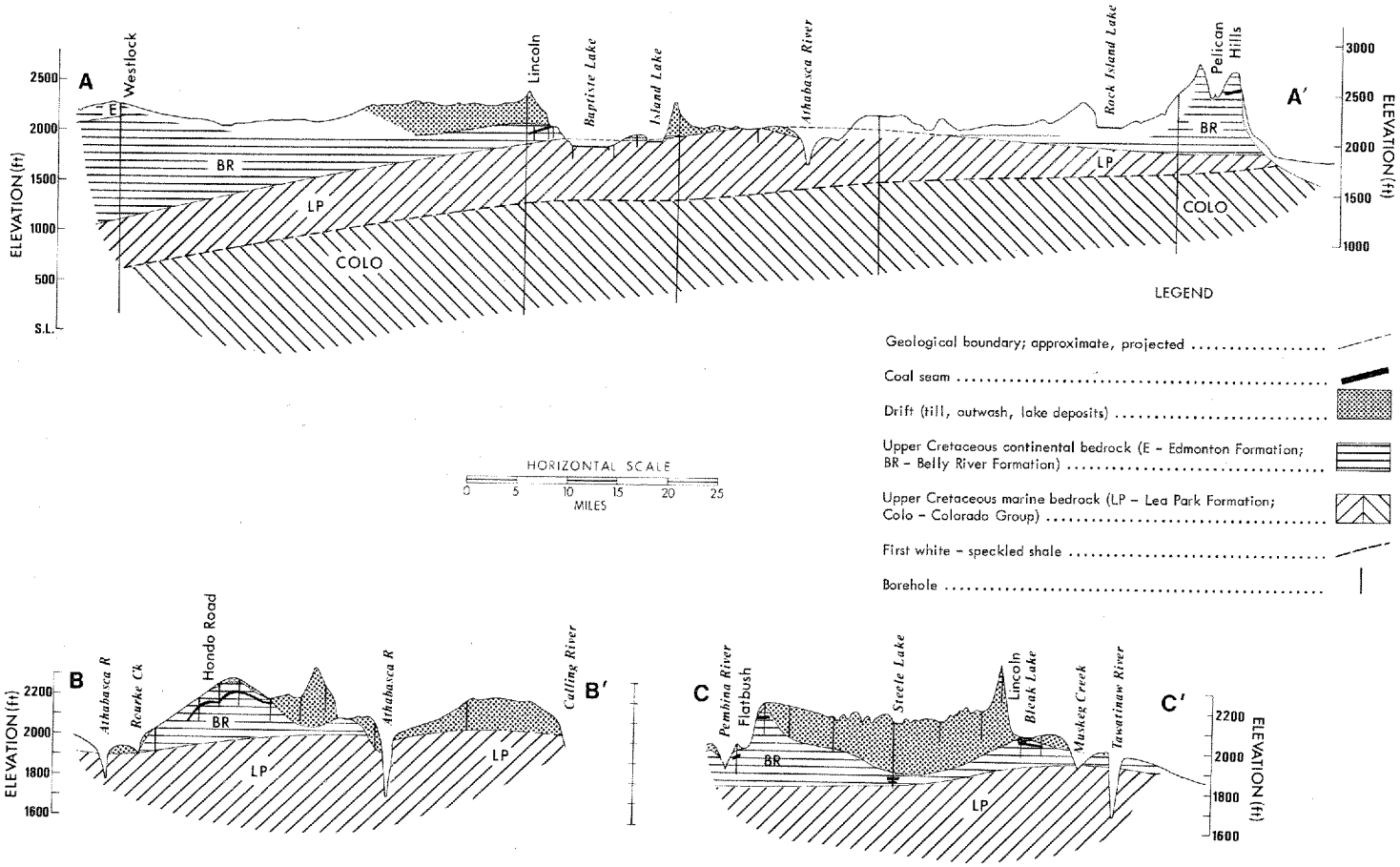

FIGURE 3. Generalized cross-sections.

A number of sand-dune fields are related to the areas of glacial lake deposit; the dune field at Hondo (Tp. 70, R. 1, W.5th Mer.) overlies a mass of glacially deformed bedrock which contains some coal deposits, and materially adds to the difficulty of interpreting these.

COAL RESOURCES

Mines

Only one mine has been registered within the Athabasca-Smith area, a small strip pit (No. 1686) that operated from 1948 to 1951 at Lincoln in Lsd. 8, Sec. 11, Tp. 66, R. 24, W.4th Mer.; a 5-foot seam was exploited under about 15 feet of cover. Five very small mines were registered for short periods less than 10 miles south of the south boundary of the area, but attempts to trace their seams northward met with no success.

Some coal was won for local consumption during the depression years from a 1.5-foot seam in Lsd. 7, Sec. 5, Tp. 66, R. 1, W.5th Mer., from a 4-foot seam in Lsd. 15, Sec. 8, Tp. 70, R. 26, W.4th Mer. and possibly from the same 4-foot seam in Sec. 10, Tp. 70, R. 26, W.4th Mer.; in every case the amount taken was extremely small and the pits are now overgrown and almost unrecognizable. Feniak (1944) reports that a thin seam was prospected along the Tawatinaw River in Sec. 12, Tp. 64, R. 23, W.4th Mer.

Coal Distribution

Coal deposits were found in the course of the Research Council coal testhole program in three separate regions of the Athabasca-Smith area: near Fawcett and Flatbush in the southwestern part of the area, east of Hondo in the northern part of the area, and at Lincoln in the southeast (Fig. 4). Each deposit consists of only a few thin seams, and the Hondo and Lincoln deposits at least are believed to occur stratigraphically within the basal 100-150 feet of the Belly River Formation; only the Lincoln deposit is considered economically significant.

In the Fawcett-Flatbush region, available data is scanty but coal appears to consist of a few, very thin seams irregularly distributed in the western slope of the bedrock rim of the central upland. Near Fawcett, two testholes in Tp. 64, R. 27 W.4th Mer. each encountered a 2-foot coal bed; if these are intercepts of the same seam, they indicate an exceptionally steep dip (for the Alberta Plains) of 35 feet a mile. The testhole at northeast corner Lsd. 8, Sec. 5, Tp. 66, R. 1 W.5th Mer. intersected the 1.5-foot seam that was casually mined at a spring in legal subdivision 7 of the same section, but in the nearby testhole at northeast corner Sec. 31, Tp. 65, R. 1 W.5th Mer., observed coal could not be correlated and the bedrock appeared to be glacially distorted. Nearly 300 feet lower in elevation, a thin coal stringer was encountered in the testhole at northeast corner Lsd. 14,

Sec. 36, Tp. 65, R. 2, W.5th Mer. in bedrock that appeared to have been glacially disturbed; the setting, in the Athabasca-Pembina river lowlands, with pitted topography and inconsistent drift-base elevations, suggest extreme disturbance (Fig. 3, section B-B'). Possibly Belly River strata in the hills east of Flatbush in R. 1, W.5th Mer., owe their present apparent thickness (over 400 feet, the thickest recognized within the area) to glacial distortion.

The northern coal deposit, east of Hondo and centered on Tp. 70, R. 26, W.4th Mer., has also been distorted by glacial ice-push. What appears to be a single 3- to 4-foot seam was intercepted in 7 coal testholes and observed in two disturbed outcrops; it is quite badly broken and has a local domal structure with a relief in excess of 200 feet (Fig. 3, section C-C') rising to nearly 300 feet above the assumed Belly River-Lea Park contact near the northeast corner of Tp. 69, R. 26, W.4th Mer. On the other hand, coal was encountered in a seismic shothole in Sec. 7, Tp. 71, R. 26, W.4th Mer. near Smith, below the elevation at which Lea Park strata are to be expected. These anomalies are believed to be evidence of glacial distortion and large-scale postglacial slumping. Although there is no doubt considerable coal in this region the thinness of the seam, the thick overburden in places, the rough terrain and the disturbed strata combine to make this a distinctly unattractive prospect.

The Lincoln coal deposit, best considered a single coal zone, was intersected in 14 Research Council coal testholes drilled at 12 locations. In a central region of maximum coaliness around the old coal mine (Lsd. 8, Sec. 11, Tp. 66, R. 24, W.4th Mer.) and two testhole locations (northeast corner of Sec. 36, Tp. 65, R. 24 W.4th Mer. and northeast corner of Sec. 11, Tp. 66, R. 24, W.4th Mer.), it consists of four seams, the uppermost of which exceeds 4 feet in thickness; from here the deposit extends southward and southeastward, thinning markedly and losing seams. The uppermost seam is believed to have the greatest areal extent, appearing at every hole location except the two farthest northwest which lie in the region of subcrop. The structure of this seam, shown by contour in figure 4, appears to be a very gentle open syncline, probably glacially induced, with its axis trending slightly south of east, dipping on the limbs as much as 25 feet a mile. Only this upper seam is mineable; it apparently maintains a thickness in excess of 4 feet over an area of about 4 square miles in the central region of maximum coaliness (Fig. 4). Within this area, limited on the west by the steep rise of the morainal upland rim, overburden is never greater than 40 feet (Fig. 4, section A-A'), but most of the land is a flat muskeg surrounding a shallow lake (Bleak Lake) and the old strip pits are now full of clear water; doubtless a difficult seepage problem exists which could be expensive to combat. Still, the Lincoln coal deposit, around the northeast corner of Tp. 65, R. 24, W.4th Mer., probably contains about 16 million tons of relatively easily strippable coal.

Analyses

Cutting samples were collected from a Research Council coal testhole, redrilled in 1969, at the northeast corner of Lsd. 8, Sec. 11, Tp. 66, R. 24, W.4th

Mer. (beside the old Lincoln mine) and analysed in Council's Coal Analytical Laboratory. The analyses, presented below in tabular form, in common with all drill-cutting samples, give no reliable indication of ash contents (hence analyses are here reported on an "ash-free" basis); however, they do provide a valid basis for evaluating the Lincoln coal deposit.

REFERENCES CITED

Campbell, J. D. and Almadi, I. S. (1964): Coal occurrences of the Vulcan-Gleichen area, Alberta; Res. Coun. Alberta Prelim. Rept. 64-2, 58 pages.

Feniak, M. (1944): Athabasca-Barrhead map-area, Alberta; Geol. Surv. Can. Paper 44-6, 20 pages.

Halliday, W. E. D. (1937): A forest classification for Canada; Canada Dept. Mines and Resources, Forest. Serv. Bull. 89, 50 pages.

Pearson, G. R. (1959): Coal reserves for strip-mining, Wabamun Lake district, Alberta; Res. Coun. Alberta Prelim. Rept. 59-1, 47 pages.

Rowe, J. S. (1959): Forest regions of Canada; Canada Dept. N. Affairs and Nat. Resources, Forestry Branch Bull. 123, 71 pages.

APPENDIX

RCA COAL TESTHOLES
ATHABASCA-SMITH AREA, ALBERTA

Appendix: Research Council of Alberta Coal Test Holes; Athabasca-Smith Area, Alberta

Depth (feet)	Location[1] W 4th Mer. Top elevation (feet); Date
	NE cor. 20-64-21 2128; Sept. 21/69
0-5	Rusty weathered sandy clay
5-15	Brown weathered soft clay
15-20	Soft blue clay; some coarse sand
20-25	Fine shield gravel
25-30	Blue & yellow clay; some shale; some pebbles
30-35	Dark grey slightly silty soft shale (el. bedrock 2098)
35-45	Light grey slightly silty soft shale
45-50	Dark brown grey bentonitic shale
50-60	Light grey fine s & p ss
60-65	Greenish grey slightly bentonitic shale
65-80	Grey & brownish grey slightly bentonitic shale
80-100	Grey bentonitic s & p ss
100-125	Dark grey slightly bentonitic shale
125-130	Dark grey silty slightly bentonitic shale
130-150	Grey slightly bentonitic shale
	Lsd. 12-1-64-22 2180; Sept. 25/69
0-10	Brown clay
10-25	Brown grey clay
25-120	Grey silty to sandy clay; many pebbles & few boulders
120-135	Dark grey very silty shale (el. bedrock 2060)
135-140	Dark grey coarse siltstone
140-143	Grey ss with very hard ledge @ 143'; abandoned
	Lsd. 9-24-64-22 2120; Sept. 21/69
0-5	Brown weathered sandy clay
5-20	Brown weathered clay; few small pebbles
20-25	Brown grey slightly bentonitic clay
25-100	Blue grey clay; few thin sand stringers
100-105	Light blue bentonitic shale
105-110	Light blue grey coarse bentonitic siltstone
110-115	Soft clay
115-130	Brown shale (el. bedrock 2005)
130-135	Blue s & p ss with considerable coal chips
135-140	Soft brown ss
140-150	Dark grey argillaceous siltstone

[1]All locations are west of the 4th Meridian, unless otherwise indicated

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 9-35-64-22 2030; Sept. 21/69
0-10	Light brown & brown clay
10-15	Sand & some grey clay
15-35	Grey silty clay
35-40	Gravel stringer in grey clay
40-45	Grey clay
45-55	Grey clay with some gravel stringers
55-150	Grey clay with narrow sand & fine gravel stringers; few small coal fragments
	NE cor. 20-64-23 2247; June 11/65
0-10	Brown sandy clay; few pebbles
10-47	Silty to sandy blue grey clay
47-51	Fine gravel
51-86	Silty to sandy blue grey clay
86-88	Fine gravel
88-120	Silty to sandy blue grey clay
	NE cor. 22-64-23 2290; June 11/65
0-20	Brown sandy clay; few pebbles
20-65	Blue grey fine sandy clay; few pebbles
65-86	Blue grey fine sandy clay with many boulders
86-89	Fine to medium gravel
	NE cor. 31-64-23 2077; June 9/65
0-10	Brown sandy clay; many boulders
10-15	Blue grey clay
15-30	Blue grey & brown grey siltstone (el. bedrock 2062)
30-40	Dark grey & brown carbonaceous shale
40-45	Grey fine ss
45-80	Grey siltstone
80-85	Blue grey fine ss
85-90	Brown grey shale; traces of coal
90-94	Blue green siltstone
94-95	Very hard ss ledge; abandoned
	NE cor. 33-64-23 2155; June 10/65
0-5	Muskeg
5-60	Blue grey clay; few pebbles
60-100	Blue grey silty clay; many small pebbles
	NE cor. 35-64-23 2252; June 10/65
0-10	Brown clay
10-15	Fine brown sand; little gravel
15-40	Glacial gravel; some coal chips
	NE cor. 24-64-24 2133; June 14/65
0-4	Muskeg
4-10	Brown clay
10-45	Blue grey sandy clay
45-55	White grey sand
55-65	Sand; little gravel
65-80	Gravel; little white grey sand; lost circulation; abandoned

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 33-64-24 2190; June 9/65
0-10	Brown sandy clay; some pebbles
10-40	Blue grey sandy clay; some pebbles
40-70	Blue grey silty clay; many pebbles
70-140	Grey silty clay; many pebbles
	NE cor. 35-64-24 2120; June 9/65
0-15	Brown silty to sandy clay; few pebbles
15-35	Blue grey clay; some pebbles
35-40	Brown & grey weathered siltstone (el. bedrock 2085)
40-70	Blue grey silty shale; some blue grey ss
70-75	Coal traces in blue grey silty shale
75-100	Grey & blue grey silty shale
100-110	Blue silty shale
	NE cor. 10-64-27 2120; Sept. 19/69
0-20	Light brown & grey clay
20-25	Fine gravel stringer in grey clay
25-30	Brown weathered siltstone (el. bedrock 2095)
30-39	Grey silty shale
39-41	Coal seam (el. top coal 2081)
41-45	Dark grey & brown carbonaceous shale
45-75	Grey silty shale
75-80	Grey silty shale; some white boney material
80-105	Grey siltstone; some fine grey ss
105-110	Grey very soft silty shale
110-150	Grey siltstone; some fine grey ss
	NE cor. 23-64-27 2280; Sept. 19/69
0-10	Brown clay; many small pebbles
10-15	Brown grey clay; many small pebbles
15-105	Grey clay; few small pebbles
105-130	Greenish grey siltstone (el. bedrock 2175)
130-135	S & P ss
135-140	Grey & dark grey shale; trace of coal
140-150	Medium to dark grey silty shale
	Lsd. 6-15-64-1-W5 2015; Sept. 20/69
0-25	Light brown & grey lake clay, very well sorted
25-55	Grey silty clay with seam of gravel
55-70	Grey siltstone; little fine grey ss (el. bedrock 1960)
70-90	Grey silty shale
90-95	Grey siltstone
95-100	Harder light grey siltstone
100-105	Grey siltstone
105-110	Mostly grey fine ss; some grey siltstone; lost circulation
110-125	Grey shale
125-135	Grey fine ss
135-150	Grey silty shale

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 8-65-23 2023; June 10/65
0-7	Muskeg
7-15	Brown clay & small pebbles
15-30	Brown grey & blue clay
30-90	Grey & blue grey siltstone; little shale (el. bedrock 1993)
90-95	Dark grey & brown grey shale; very little coal
95-105	Grey shale
105-110	Grey shale; very little coal
110-130	Grey to dark grey siltstone
130-150	Grey & brown grey shale
	NE cor. 10-65-23 2173; June 10/65
0-5	Very sandy brown grey clay
5-95	Fairly hard blue & light grey sand
95-100	Sand; very little clay
	NE cor. 12-65-23 2165; June 10/65
0-10	Very coarse sand; brown clay; many pebbles
10-15	Very sandy clay
15-40	Blue grey clay; pebbles
40-45	Clay & fine gravel
45-50	Sandy brown clay
50-95	Coarse brown grey & grey sand
95-120	Blue grey sand
	NE cor. 19-65-23 2020; June 15/65
0-30	Brown & blue clay; few pebbles
30-45	Blue grey shale; few brown harder ledges (el. bedrock 1990)
45-70	Grey siltstone; few ledges of harder ss
70-75.5	Grey & brown siltstone
75.5-77	Coal seam (el. top coal 1944.5)
77-80	Grey & brown siltstone
80-94	Grey & brown carbonaceous shale
94-97	Coal seam with thin parting
97-100	Brown carbonaceous shale
100-110	Grey shale
	NE cor. 32-65-23 2027; June 4/65
0-15	Brown silty clay
15-30	Blue grey clay
30-55	Grey clay; pebbles
55-60	Grey & brown shale; some creamy white bentonite; very thin coal seam (el. bedroc 1972)
60-120	Grey siltstone; some fine ss
	NE cor. 8-65-24 2302; June 8/65
0-15	Sandy brown grey clay; many pebbles
15-45	Sand; little clay; some fine gravel
45-130	Sandy grey clay; many pebbles

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 10-65-24 2165; June 8/65
0-10	Brown sandy clay; few pebbles
10-105	Blue grey sandy clay; few pebbles
105-120	Grey siltstone (el. bedrock 2060)
120-135	Grey shale
135-140	Brown grey shale; very little coal
140-145	Brown grey shale
145-150	Grey siltstone
	NE cor. 12-65-24 2049; June 8/65
0-5	Muskeg
5-15	Brown clay; some coarse sand & pebbles
15-45	Blue clay; some small pebbles
45-67	Blue grey & dark grey shale (el. bedrock 2004)
67-68.5	Coal seam (el. top coal 1982)
68.5-95	Grey to light grey silty shale
95-100	Brown grey carbonaceous shale
100-110	Grey very silty shale
	NE cor. 19-65-24 2305; June 15/65
0-15	Brown sandy clay
15-20	Mostly fine gravel; some sand; little clay
20-25	Mostly sand; little brown clay
25-50	Brown clay; few pebbles
50-90	Sandy grey clay; few gravel stringers
90-116	Sandy grey clay; some gravel; large boulder @ 116'; abandoned
	NE cor. 21-65-24 2300; June 14/65
0-10	Brown clay; some pebbles
10-40	Blue silty lake clay
40-150	Grey sandy to very sandy clay with many narrow gravel stringers
	NE cor. 23-65-24 2104; June 7/65
0-75	Brown, brown grey & blue grey clay; pebbles; boulder @ 75'
75-120	Grey shale (el. bedrock 2029)
120-130	Brown carbonaceous shale; trace of coal
130-140	Dark blue grey shale
140-150	Grey siltstone
	NE cor. 32-65-24 2185; June 15/65
0-10	Brown sandy clay
10-25	Blue grey sandy clay
25-30	Brown sandy clay
30-100	Blue grey silty clay
100-150	Grey sandy clay; many thin gravel stringers

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 34-65-24 2348; June 6/65
0-35	Brown sandy clay; few pebbles
35-85	Blue grey silty clay
85-141	Blue grey sandy to silty clay
141-143	Sandy clay & gravel
143-150	Blue grey sandy clay
	NE cor. 36-65-24 2029; June 6/65
0-10	Brown silty clay; some pebbles
10-25	Grey & blue grey sandy clay
25-26	Brown shale (el. bedrock 2004)
26-29.5	Coal seam (el. top coal 2003)
29.5-40	Light grey & blue grey shale; some white bentonite
40-45	Little coal in brown shale
45-50	Blue grey siltstone
50-55	Little coal in blue grey shale
55-75	Brown grey & blue grey shale
75-80	Very little coal in brown grey shale
80-90	Blue grey & brownish shale
	NE cor. 19-65-25 2147; June 24/65
0-7	Muskeg
7-52	Very silty greyish white clay; many small shells (recent lake deposit)
52-60	Quicksand; abandoned

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 21-65-25 2220; June 24/65
0-30	Brown clay; few pebbles
30-40	Gravel; little sand
40-50	Brown sand; some brown sandy clay
50-120	Blue grey silty clay; some gravel stringers
	NE cor. 34-65-25 2135; June 23/65
0-8	Muskeg
8-20	Very coarse sand
20-87	Grey to brown grey sand
87-89	Gravel; lost circulation; abandoned
	NE cor. 36-65-27 2145; Sept. 25/69
0-10	Light & dark brown weathered soft clay; few pebbles
10-65	Dark blue grey clay; sand stringers; few pebbles
65-75	Dark blue grey very soft clay; some sand; small pebbles & some coal chips
75-125	Dark blue grey sandy clay with very fine gravel stringers
125-150	Light grey very uniform plastic clay

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 32-65-1-W5 2225; Sept. 20/69
0-30	Light brown very silty clay
30-35	Very fine gravel stringer
35-45	Silty grey clay; few large pebbles
45-55	Very soft grey shale (el. bedrock 2180)
55-60	Very thin seam of coal in grey shale
60-100	Light grey fine siltstone with trace of coal
100-105	Grey silty shale
	NE cor. 32-65-1-W5 2205; Sept. 20/69
0-20	Brown sandy clay; many pebbles
20-25	Brown coarse sand; little clay
25-30	Brown clay; some sand
30-35	Brown coarse sand
35-70	Grey silty & sandy clay
70-80	Grey silty shale; very small trace of coal (el. bedrock 2135)
80-90	Grey siltstone
90-95	Grey ss; some light brown shale; very small trace of coal
95-110	Grey siltstone
110-120	Grey silty shale
120-135	Grey shale
135-140	Light grey s & p ss
140-150	Grey siltstone

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 34-65-1-W5 2260; Sept. 20/69
0-5	Light brown silty clay
5-15	Brown silty clay
15-25	Grey clay; few pebbles
25-30	Coarse sand; some fine gravel
30-150	Grey silty clay; few sandy stringers; some small pebbles
	NE cor. 36-65-2-W5 2003; Sept. 20/69
0-15	Soft light brown clay
15-45	Soft brown grey clay; few small pebbles
45-100	Grey clay; small pebbles; very small coal fragments
100-110	Coarse grey siltstone (el. bedrock 1903)
110-115	Little coal in grey silty shale
115-125	Light grey bentonitic shale
125-135	No samples; lost circulation; abandoned
	Lsd. 14-31-66-22 1928; Sept. 24/69
0-15	Fine to very fine brown sand
15-40	Light brown & grey very sandy clay
40-65	Grey sandy clay; some sand & gravel stringers
65-70	Coarse sand & fine gravel
70-105	Grey sandy clay; fine and thin gravel stringers
105-150	Uniform grey siltstone (el. marine? bedrock 1823)

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 9-66-23 2017; June 4/65
0-5	Brown sandy clay
5-10	Brown weathered shale and ironstone (el. bedrock 2012)
10-15	Brown weathered siltstone and black shale; very small trace of coal
15-50	Brown weathered ss
50-70	Brown & grey to creamy white ss
70-115	Blue grey siltstone
115-140	Grey shale
	Lsd. 8-18-66-23 2035; June 4/65
0-5	Brown grey clay
5-15	Blackish grey sand
15-30	Brown & grey clay
30-40	Grey shale (el. bedrock 2005)
40-45	Grey shale; trace of coal
45-50	Grey & light brown shale
50-105	Grey ss
105-110	Grey shale
110-115	Grey coarse siltstone to fine ss
115-120	Grey shale
	NE cor. 20-66-23 1985; June 3/65
0-10	Brown sandy clay; few pebbles
10-60	Blue grey clay; pebbles
60-110	Grey uniform shale (el. marine? bedrock 1925)

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 7-66-24 2150; June 16/65
0-15	Brown clay; few pebbles
15-35	Blue grey clay
35-40	Sand; little blue clay
40-50	Fine brown grey sand
50-110	Grey very silty clay
	NE cor. 9-66-24 2110; June 16/65
0-15	Silty brown clay; few pebbles
15-30	Silty blue lake clay
30-65	Sandy clay; sand & fine gravel
65-125	Blue grey sandy clay; pebbles; little sand
125-150	Blue grey siltstone (el. bedrock 1985)
	Lsd. 8-11-66-24 2065; June 6/65
0-5	Brown fine silty lake clay
5-11	Brown & blue grey lake clay
11-15.5	Coal (el. bedrock & top coal 2054)
15.5-20	Light grey shale
20-25	Grey shale
25-27	Coal
27-35	Light grey medium to fine ss
35-40	Grey siltstone
40-45	Blue grey shale
45-50	Grey shale

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 8-11-66-24 2065; Sept. 24/69
0-6	Brown weathered ss; some ironstone (el. bedrock 2065)
6-11	Coal seam (el. top coal 2059)
11-21.5	Dark brown carbonaceous shale
21.5-23	Coal seam
23-25	Green silty shale
25-53	Grey siltstone
53-54	Coal seam
54-60	Grey siltstone
	NE cor. 20-66-24 2030; June 17/65
0-10	Brown silty clay
10-35	Brown sand; some brown silty clay; few pebbles
35-150	Silty to fine sandy blue grey clay; many boulders
	NE cor. 22-66-24 1950; June 5/65
0-10	Brown clay
10-45	Grey clay; few pebbles
45-120	Grey very uniform shale; hard ledge @ 119' (el. marine? bedrock 1905)
	NE cor. 24-66-24 1975; June 5/65
0-25	Brown grey clay
25-60	Grey clay; few pebbles
60-100	Grey shale (el. marine? bedrock 1915)

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 31-66-24 2187; June 29/65
0-20	Brown clay; very few pebbles
20-28	Blue grey clay
28-34	Fine to medium gravel; sand; little clay
34-95	Grey & brown sandy clay; pebbles & boulders
95-120	Grey blue sandy clay; many pebbles
	NE cor. 11-66-25 2176; June 23/65
0-22	Brown & blue silty clay
22-29	Fine gravel; little sand
29-35	Blue fine sandy clay
35-47	White to light brown sand
47-54	Fine gravel; little sandy clay
54-120	Blue sandy clay; boulders & small pebbles
	NE cor. 24-66-25 2170; June 21/65
0-15	Brown sandy clay; many boulders & pebbles
15-120	Blue grey sandy to silty clay; many fine gravel stringers; sand; many boulders
	Lsd. 9-27-66-25 2310; June 21/65
0-20	Brown sandy clay; many boulders
20-110	Sand; sandy clay; many boulders; some pebbles

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 35-66-25 2262; June 21/65
0-10	Brown grey clay; few small boulders
10-35	Dark blue silty lake clay
35-55	Light brown sandy clay; few small pebbles
55-60	Dark blue grey silty lake clay
60-120	Blue grey silty clay; few pebbles
	NE cor. 18-67-23 2065; July 7/65
0-15	Brown sandy clay; many pebbles
15-45	Blue grey clay
45-47	Gravel
47-110	Silty grey clay; small boulders & pebbles
	NE cor. 29-67-23 1990; July 7/65
0-10	Brown sandy clay; many small pebbles
10-65	Blue grey sandy clay; some pebbles
65-150	Brown to brown grey lake clay; few very small pebbles
	Lsd. 6-31-67-23 1975; July 8/65
0-15	Brown sandy clay; many boulders
15-70	Blue grey sandy clay; few small pebbles
70-100	Very plastic grey clay

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 9-67-24 1907; June 30/65
0-5	Brown silty lake clay; many shell particles
5-45	Brown grey & blue grey clay; few small pebbles
45-70	Grey clay & grey fine sand; coal fragments
70-100	Grey fine sand; some clay; coal fragments
100-120	Silty to sandy grey clay; coal fragments
120-140	Grey fine sand; clay; coal fragments
140-150	Brown grey silty soft shale (el. bedrock 1767)
	NE cor. 11-67-24 1962; July 7/65
0-25	Brown & blue grey silty clay; few pebbles
25-40	Very silty blue grey well sorted lake clay
40-50	Grey silty clay
50-75	Grey very fine siltstone (el. bedrock 1912)
75-100	Grey very silty and uniform shale (el. marine? 1887)
	NE cor. 22-67-24 2020; June 30/65
0-25	Brown & brown grey clay; some pebbles
25-50	Brown grey fine sand
50-70	Rusty brown shale; some blue grey ss (el. bedrock 1970)
70-90	Blue, brown grey & grey soft ss
90-130	Grey to light grey soft silty shale

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 13-29-67-24 1950; July 2/65
0-3	Muskeg
3-8	Brown clay
8-21	Fine gravel & brown sand
21-28	Blue grey clay
28-35	Brown grey weathered shale (el. bedrock 1922)
35-80	Grey silty shale (el. marine? 1915)
	Lsd. 3-30-67-24 2125; July 2/65
0-15	Brown clay; many small pebbles
15-45	Blue grey clay; many boulders
45-120	Plastic and very silty clay
	Lsd. 4-30-67-24 2200; July 2/65
0-25	Light brown clay; some pebbles
25-28	Fine gravel & sand
28-60	Blue & grey clay; boulders
60-70	Sand; little grey clay
70-85	Grey clay; pebbles
85-125	Mostly fine grey sand; little clay
125-140	Grey silty clay; pebbles
	Lsd. 6-30-67-24 2030; July 2/65
0-8	Sandy brown clay; pebbles
8-15	Fine gravel
15-50	Blue grey clay
50-90	Grey clay
90-115	Grey fine unconsolidated sand
115-150	Grey clay; thin gravel stringers
	Lsd. 2-32-67-24 1962; July 1/65
0-15	Brown silty clay; few pebbles
15-25	Blue grey silty clay; few pebbles
25-35	Grey fine siltstone (el. bedrock 1937)
35-50	Grey silty shale
50-70	Grey fine siltstone
	Lsd. 3-32-67-24 1960; July 1/65
0-3	Muskeg
3-9	Fine gravel
9-13	Light brown clay
13-30	Blue grey clay
30-50	Grey shale (el. marine? bedrock 1930)
50-60	Fine grey siltstone
60-80	Grey shale
	Lsd. 8-32-67-24 1960; July 1/65
0-8	Brown grey clay
8-25	Brown grey sand; some fine gravel
25-35	Coarse grey sand
35-80	Grey uniform shale (el. marine?bedrock 1925)

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 12-33-67-24 1955; July 1/65
0-10	Muskeg
10-20	Brown silty clay
20-35	Blue grey silty clay
35-120	Very uniform grey shale (el. marine? bedrock 1920)
	Lsd. 12-33-67-24 1958; July 1/65
0-15	Brown clay; small pebbles
15-20	Dark blue grey clay; few pebbles
20-25	Brown grey siltstone (el. bedrock 1938)
25-60	Uniform grey siltstone (el. marine? 1933)
60-70	Grey shale
	Lsd. 14-33-67-24 2000; July 1/65
0-20	Brown silty clay; few coal fragments
20-55	Brown grey & blue grey fine sand
55-70	Blue grey siltstone; few ledges (el. bedrock 1945)
70-95	Blue grey siltstone
95-120	Blue grey silty shale
	Lsd. 15-33-67-24 2030; June 30/65
0-15	Brown clay; few pebbles
15-20	Light brown unconsolidated sand
20-30	Blue grey clay; pebbles
30-55	Blue grey unconsolidated sand
55-60	Blue grey unconsolidated sand; little clay
60-80	Unconsolidated sand; lost circulation; abandoned
	NE cor. 33-67-24 2050; June 30/65
0-15	Brown clay; few pebbles
15-30	Blue clay; many coal fragments
30-70	Blue fine sand
70-77	Blue grey fine & hard ss; lost circulation (el. bedrock 1980)
77-100	Very soft ss; no circulation; abandoned
	Lsd. 4-33-68-22 2085; Sept. 23/69
0-5	Brown weathered plastic sandy clay
5-20	Grey & blue grey plastic sandy clay
20-30	Blue grey clay
30-35	Brittle dark grey siltstone (el. bedrock 2055)
35-150	Blue grey slightly brittle silty shale

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 6-68-23 2115; July 8/65
0-5	Brown grey silty clay
5-60	Blue grey clay; some pebbles
60-80	Hard brown grey & reddish brown fine ss (el. bedrock 2055)
80-87	Very hard green grey & reddish brown fine ss
87-120	Grey to brown grey hard siltstone
	Lsd. 10-9-68-23 2003; July 11/65
0-15	Brown silty clay; many boulders
15-65	Blue grey silty clay; many boulders
65-100	Grey silty clay; many small pebbles
	NE cor. 17-68-23 2065; July 9/65
0-15	Brown clay; few pebbles
15-70	Blue grey clay; few pebbles
70-120	Sandy to very sandy clay; pebbles
	Lsd. 14-18-68-23 2080; July 12/65
0-6	Muskeg
6-50	Sandy grey clay; few boulders
50-85	Silty grey clay; few small pebbles
85-120	Uniform grey shale (el. marine? bedrock 1995)

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 10-27-68-23 2177; July 11/65
0-10	Light brown silty clay; boulders
10-40	Blue grey silty clay; few boulders
40-110	Grey silty uniform shale (el. marine? bedrock 2137)
	NE cor. 30-68-23 2095; July 9/65
0-25	Brown & blue grey clay; few pebbles
25-30	Some pea gravel in grey clay
30-40	Grey clay
40-110	Clay with some bedrock fragments
110-120	Grey soft silty shale (el. bedrock 1985)
	NE cor. 10-68-24 2175; July 5/65
0-15	Brown silty clay; few pebbles
15-135	Grey silty to sandy plastic clay
	Lsd. 6-20-68-24 2205; July 5/65
0-15	Light brown silty clay
15-30	Grey silty clay; many boulders
30-35	Gravel
35-110	Grey silty clay; many boulders

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 21-68-24 2175; July 6/65
0-5	Brown grey sandy clay; pebbles
5-20	Brown sandy clay; pebbles
20-90	Grey sandy clay; many boulders
90-140	Grey silty clay; many pebbles
	Lsd. 7-23-68-24 2180; July 6/65
0-15	Brown sandy clay; boulders
15-110	Grey silty clay; many boulders
	NE cor. 32-68-24 2227; July 13/65
0-20	Brown grey & light brown sandy clay; boulders
20-25	Brown grey silty clay
25-55	Grey silty clay; pebbles & boulders
55-130	Grey silty clay; many pebbles
	Lsd. 15-34-68-24 2260; July 13/65
0-25	Brown silty clay; boulders
25-29	Gravel
29-90	Grey silty clay; many boulders
	NE cor. 8-69-22 2160; Sept. 23/69
0-15	Brown & grey plastic sandy clay
15-25	Blue grey clay; pebbles
25-30	Grey clay; boulders; some coarse sand
30-35	Coarse sand
35-40	Very soft grey clay; some coarse sand
40-50	Soft grey clay; some very small pebbles
50-80	Grey & blue grey clay; few sandy stringers
80-90	Dark grey & blue grey clay
90-145	Dark grey slightly brittle clay; few boulders
145-150	Dark grey slightly brittle shale (el. bedrock 2015)
	NE cor. 20-69-22 2215; Sept. 23/69
0-15	Brown weathered soft plastic clay; small pebbles
15-18	Brown & blue clay; some pebbles; some sand
18-26	Unconsolidated brown sand
26-40	Blue, dark grey & brown plastic clay
40-45	Soft brown clay
45-65	Very soft slightly silty brown clay; few pebbles
65-150	Dark blue grey clay
	Lsd. 15-33-69-22 2210; Sept. 23/69
0-15	Brown sandy clay; some pebbles
15-30	Fine to very coarse sand
30-50	Grey & brown grey clay
50-150	Mostly reworked bedrock; some clay; some coal fragments

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 9-4-69-23 1980; July 11/65
0-10	Brown silty clay; boulders
10-75	Blue grey silty clay; boulders
75-120	Grey silty clay; pebbles & boulders; some small coal fragments
	Lsd. 11-7-69-23 2110; July 9/65
0-10	Silty brown clay; many boulders
10-62	Silty blue grey clay; many boulders
62-74	Pea gravel
74-100	Silty grey clay; few pebbles
	Lsd. 9-17-69-23 2100; July 10/65
0-15	Brown silty clay; boulders
15-100	Grey silty clay; boulders
	Lsd. 11-19-69-23 2125; July 10/65
0-15	Brown clay; boulders & pebbles
15-65	Very silty lake clay
65-100	Uniform grey silty shale (el. marine? bedrock 2060)

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 8-31-69-23 2105; July 10/65
0-10	Brown silty clay
10-100	Blue grey very silty uniform clay; boulders
	NE cor. 7-69-24 2228; July 13/65
0-10	Brown silty clay
10-62	Blue grey clay
62-68	Gravel in grey clay
68-80	Gravel; abandoned
	NE cor. 9-69-24 2200; July 14/65
0-5	Coarse sand
5-13	Fine gravel
13-25	Blue grey sandy clay
25-30	Blue grey fine sand
30-90	Grey silty clay; boulders
	Lsd. 13-19-69-24 2127; July 15/65
0-10	Brown lake clay
10-15	Brown clay; some gravel
15-60	Blue & blue grey silty very plastic clay
60-100	Grey & brown sandy clay
100-120	Light grey slightly brittle argillaceous ss (el. bedrock 2027)
120-130	Light grey s & p argillaceous ss

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 2-28-69-24 2068; July 14/65
0-5	Light brown silty clay
5-75	Grey silty clay; few boulders
75-110	Grey uniform shale (el. marine? bedrock 1993)
	Lsd. 15-32-69-24 2252; Sept. 14/65
0-20	Brown & grey clay
20-25	Coarse sand & fine gravel
25-35	Fine gravel
35-85	Grey clay
85-90	Grey fine unconsolidated sand
90-95	Grey clay; gravel stringers
95-105	Grey sandy clay
105-115	Yellow brown coarse sand
115-140	Grey silty clay
140-145	Grey sandy clay
145-150	Grey sand; little clay
	Lsd. 5-36-69-25 2190; July 15/65
0-5	Plastic brown clay; pebbles
5-15	Very plastic brown clay; pebbles
15-40	Very plastic blue clay; pebbles
40-60	Blue clay
60-75	Grey soft sandy clay
75-120	Grey sandy clay; some rust stains; some coal fragments

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 7-69-26 2200; Aug. 19/65
0-10	Fine sandy brown clay; few pebbles
10-15	Blue grey coarse sand
15-40	Fine grey sandy clay; few pebbles
40-55	Silty grey clay
55-112	Grey & brown grey shale (el. bedrock 2145)
112-113	Coal seam (el. top coal 2088)
113-122	Grey siltstone & some brown shale
122-124	Coal seam
124-138	Grey shale; some fine grey siltstone; some brown carbonaceous shale
138-150	Grey fine siltstone with ledge of hard siltstone
	Lsd. 11-9-69-26 2160; Aug. 19/65
0-45	Brown & blue grey clay; some pebbles & boulders
45-65	Silty grey clay
65-95	Soft grey fine siltstone (el. bedrock 2095)
95-140	Grey uniform shale
140-145	Grey uniform shale; some brown & brown grey shale
145-150	Grey siltstone; some rust stained fine ss

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 15-20-69-26 2225; Aug. 18/65
0-10	Muskeg; many small shells (recent lake)
10-25	Sandy brown grey & grey clay
25-80	Well sorted dark grey lake clay
80-90	Grey fine siltstone (el. bedrock 2145)
90-95	Brown grey & black shale
95-130	Grey & brown grey shale
130-135	Brown, grey & black carbonaceous shale; trace of coal
135-140	Grey soft siltstone
	NE cor. 22-69-26 2265; Aug. 12/65
0-10	Brown clay; boulders & pebbles
10-15	Brown coarse sand
15-20	Brown grey silty clay; pebbles
20-30	Brown & grey sand; some pebbles
30-35	Fine to medium brown grey sand
35-50	Very coarse grey sand; some fine gravel
50-80	Grey clay; few pebbles
80-120	Grey silty clay; many small pebbles

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 31-69-26 2160; Aug. 12/65
0-50	Brown & grey clay; boulders & pebbles
50-80	Silty grey clay; few pebbles
80-99	Grey & some brown carbonaceous shale (el. bedrock 2080)
99-101	Coal seam with thin parting (el. top coal 2061)
101-110	Brown grey slightly carbonaceous shale
110-120	Grey soft shale
120-150	Grey silty shale; some yellow brown shale
	NE cor. 33-69-26 2245; Aug. 11/65
0-10	Sandy light brown clay; little sand; few pebbles
10-15	Yellow brown sand
15-20	Sandy grey clay; few pebbles
20-90	Silty grey clay; many pebble
90-97	Grey shale (el. bedrock 2155)
97-101.5	Seam of coal (el. top coal 2148)
101.5-120	Silty grey shale
120-125	Little coal in brown carbonaceous shale
125-140	Grey shale; trace of white bentonite
140-145	Thin coal seam in grey shale
145-150	Grey shale

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 35-69-26 2255; Aug. 11/65
0-5	Muskeg
5-15	Brown clay; boulders; few pebbles
15-70	Grey clay; boulders; few pebbles
70-95	Grey silty shale (el. bedrock 2185)
95-100	Grey silty shale; some very light grey bentonitic shale
100-101.5	Seam of coal (el. top coal 2155)
101.5-130	Grey bentonitic shale
	NE cor. 24-69-27 2165; Aug. 17/65
0-10	Brown clay; little sand; few small pebbles
10-15	Blue grey clay; little fine gravel
15-25	Brown & grey clay
25-58	Well sorted blue grey clay
58-70	Silty grey clay
70-95	Grey soft silty shale (el. bedrock 2095)
95-150	Uniform grey soft shale
	Lsd. 6-2-69-1-W5 2210; Aug. 25/65
0-40	Brown & blue grey silty clay; few pebbles
40-70	Grey silty clay
70-80	Grey sand; some sandy clay
80-85	Grey clay; fine gravel stringer
85-90	Grey sandy clay
90-150	Grey fine to medium sand; little clay

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 6-14-69-1-W5 2090; Aug. 20/65
0-10	Brown sand; little brown grey clay
10-15	Coarse to medium brown grey sand
15-55	Silty grey clay; few boulders
55-70	Silty grey clay; fine gravel
70-80	Silty grey clay
80-150	Sandy to very sandy grey clay; little gravel; many boulders
	Lsd. 15-24-69-1-W5 2060; Aug. 20/65
0-10	Brown silty clay; few boulders
10-70	Grey silty clay; few boulders
70-125	Very silty grey clay; 2 thin gravel stringers
125-150	Very sandy grey clay; some pebbles; many boulders
	Lsd. 5-35-69-1-W5 2035; Aug. 25/65
0-10	Sand; little brown clay
10-15	Brown grey sandy clay
15-60	Well sorted grey lake clay
60-90	Grey to light grey shale (el. bedrock 1975)
90-105	Grey to very dark grey shale
105-115	Light brown & yellow shale; little grey shale
115-140	Light grey to grey shale
140-150	Blue grey soft shale

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 16-70-22 2195; Sept. 23/69
0-10	Light brown sandy clay
10-15	Brown grey clay
15-40	Grey clay; pebbles & boulders
40-45	Coarse sand; little clay
45-105	Very sandy grey clay; many pebbles
105-150	Grey sandy clay with some gravel stringers
	Lsd. 10-27-70-22 2210; Sept. 24/69
0-30	Brown & grey silty clay; few pebbles
30-35	Fine gravel & coarse sand; little grey clay
35-45	Grey silty clay
45-50	Some fine gravel in grey sandy clay
50-150	Grey silty to sandy clay with many gravel stringers
	Lsd. 5-35-70-22 2215; Sept. 24/69
0-70	Brown, brown grey & grey well sorted lake clay
70-120	Grey sandy clay; gravel stringers throughout
120-150	Very little clay; mostly coarse sand & fine gravel

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 15-3-70-25 2192; July 15/65
0-15	Brown sandy clay; pebbles
15-20	Brown & blue sandy clay
20-40	Blue clay
40-45	Fine shield gravel
45-50	Fine shield gravel with some bedrock fragments
50-55	Grey soft clay
55-60	Unconsolidated fine sand
60-62	Very hard s & p ss (el. bedrock 2132)
62-70	Blue grey very soft ss
70-80	Grey shale; few coal fragments
80-108	Grey & light grey soft shale
108-	Hard ledge of siltstone; abandoned
	Lsd. 4-4-70-25 2152; Sept. 13/65
0-5	Brown clay
5-15	Brown clay; some sand & gravel
15-60	Brown & grey clay
60-65	Gravel
65-75	Grey to dark grey shale (el. bedrock 2087)
75-80	Grey siltstone
80-85	Very small trace of coal in brown grey shale
85-90	Grey & little brown carbonaceous shale
90-142	Grey siltstone to very coarse grey siltstone
142-144	Very hard brown ss; abandoned

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 12-12-70-25 2260; Sept. 14/65
0-40	Brown clay; few pebbles
40-45	Brown very fine sand
45-80	Grey silty clay
80-150	Grey sand; little clay with gravel stringers
	Lsd. 2-17-70-25 2146; July 16/65
0-10	Brown silty clay
10-55	Blue grey silty clay
55-65	Coarse grey siltstone (el. bedrock 2091)
65-75	Hard fine grey ss
75-85	Grey siltstone
85-120	Silty grey shale
	NE cor. 3-70-26 2300; Aug. 3/65
0-5	Brown silty clay
5-10	Gravel; little sand & clay
10-30	Brown silty clay; many boulders
30-90	Grey silty clay; many small pebbles
	Lsd. 8-8-70-26 2200; Aug. 4/65
0-5	Brown silty clay
5-15	Fine gravel & sand
15-20	Brown sand
20-35	Brown sandy clay
35-55	Very plastic grey clay
55-75	Very plastic grey clay; few coal fragments
75-90	Grey fine siltstone (el. bedrock 2125)
90-110	Grey silty shale
	Lsd. 9-8-70-26 2135; Aug. 10/65
0-10	Coarse brown sand
10-15	Fine brown sand
15-45	Brown grey & grey clay; some pebbles
45-50	Thin seam of poor coal in grey & brown grey shale (el. bedrock 2090)
50-75	Very silty grey shale
75-77	Seam of poor coal (el. top coal 2060)
77-80	Grey shale
80-85	Little coal in brown bentonitic shale
85-90	Brown & some brown grey silty shale
90-100	Grey very silty shale
	Lsd. 8-10-70-26 2147; Aug. 4/65
0-10	Brown silty clay
10-55	Grey very silty clay
55-60	Grey siltstone (el. bedrock 2092); lost circulation; abandoned

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 10-70-26 2100; Aug. 3/65
0-2	Brown sandy soil
2-5	White silty shale; some brown grey siltstone (el. bedrock 2098)
5-15	Brown weathered siltstone; much red brown weathered ironstone
15-25	Brown weathered soft coarse siltstone
25-55	Grey soft coarse siltstone
55-65	Grey siltstone (el. marine? 2045)
65-70	Hard grey siltstone
70-122	Grey uniform siltstone
122-125	Grey hard siltstone; some grey white very silty shale
125-130	Grey very silty shale
	NE cor. 13-70-26 2155; July 16/65
0-10	Brown clay; many boulders
10-30	Grey clay; many boulders
30-41	Fine gravel
41-90	Grey silty clay; many boulders
	NE cor. 22-70-26 2050; Aug. 2/65
0-5	Light brown silty clay
5-14	Brown silty to sandy clay; few pebbles
14-27	Grey fine sandy clay
27-34	Grey sand
34-45	Well sorted grey silty clay
45-95	Uniform grey silty shale (el. marine? bedrock 2005)
95-140	Grey very silty shale

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 9-36-70-26 2155; Sept. 9/65
0-10	Light brown clay
10-15	Coarse sand & fine gravel
15-25	Brown & grey sandy clay
25-60	Well sorted plastic lake clay
60-110	Grey shale; little grey ss (el. bedrock 2095)
110-120	Grey shale & very light grey siltstone
120-150	Fine grey ss, few ledges
	Lsd. 6-13-70-27 2053; Aug. 26/65
0-8.5	Brown to yellow brown weathered siltstone; some ironstone (el. bedrock 2053)
8.5-11.5	Coal seam (el. top coal 2044.5)
11.5-25	Chocolate brown shale
25-50	Grey & little brown carbonaceous shale
50-55	Grey shale; some creamy white bentonitic shale
55-90	Grey silty shale
90-120	Grey shale
	Lsd. 8-11-70-1-W5 2005; Aug. 26/65
0-5	Rusty brown fine sand
5-45	Brown grey & blue grey sand
45-50	Blue grey sand; little clay
50-55	Grey sandy clay; few pebble
55-60	Well sorted grey plastic clay
60-120	Silty to fine sandy clay; pebbles & boulders

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	Lsd. 13-3-71-26 2010; Sept. 8/65
0-10	Brown clay; few boulders; many pebbles
10-35	Grey silty clay; few pebbles
35-55	Grey clay
55-60	Grey shale (el. bedrock 1955)
60-110	Uniform grey shale (el. marine? 1950)
	NE cor. 16-71-26 2100; Sept. 17/65
0-10	Brown clay; few pebbles
10-20	Brown fine sand
20-25	Brown sandy clay
25-60	Blue grey well sorted lake clay
60-65	Little grey clay; mostly grey fine sand
65-70	Silty grey clay
70-75	Grey sand; little clay
75-95	Silty grey clay
95-100	Gravel stringer in grey clay
100-115	Grey fine soft siltstone (el. bedrock 2000)
115-150	Grey soft shale
	NE cor. 23-71-26 2018; Sept. 7/65
0-15	Yellow brown & brown grey medium to coarse sand
15-20	Some fine sand; little grey clay
20-25	Blue grey sand
25-88	Blue grey clay
88-90	Large boulder
90-97	Blue grey clay; lost circulation; abandoned

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 12-71-1-W5 1990; Sept. 1/65
0-10	Brown grey sand
10-20	Brown to light brown clay and sand
20-85	Sandy to silty grey clay
85-90	Silty grey clay
90-140	Soft grey silty clay
140-150	Very coarse sand, almost fine gravel
	NE cor. 27-71-1-W5 2105; Sept. 1/65
0-2	Sandy soil
2-25	Light brown to yellow weathered shale (el. bedrock 2103)
25-30	Brown to dark brown shale
30-35	Grey fine siltstone
35-40	Yellow brown shale
40-105	Grey, blue grey & brown grey shale
105-110	Brown grey shale
	Lsd. 11-14-72-1-W5 2055; Sept. 26/69
0-15	Brown sandy clay; pebbles
15-65	Grey sandy clay; few pebbles
65-100	Fairly well sorted plastic clay
100-142	Sandy grey clay; few small pebbles; few very solid gravel stringers

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 22-70-1-W5 1960; Aug. 27/65
0-15	Fine brown sand
15-25	Blue grey clay
25-30	Very plastic grey clay
30-80	Grey clay; few pebbles
80-130	Grey very uniform shale (el. bedrock 1880)
130-135	Very little coal in grey shale
135-150	Grey shale
	Lsd. 1-25-70-1-W5 1935; Aug. 31/65
0-15	Brown fine sand
15-20	Brown grey sand; little clay
20-110	Clay; few boulders; gravel stringers
110-120	Fine grey siltstone (el. bedrock 1825)
120-145	Grey soft shale
145-150	Grey shale
	Lsd. 12-35-70-1-W5 1952; Aug. 27/65
0-5	Brown fine sand
5-10	Brown clay & brown sand
10-15	Brown fine sand
15-70	Grey sandy clay
70-75	Gravel
75-85	Grey sandy clay
85-105	Silty grey clay
105-110	Sandy grey clay

Depth (feet)	Location W 4th Mer. Top elevation (feet); Date
	NE cor. 36-70-1-W5 1952; Aug. 31/65
0-60	Brown, brown grey & black sand
60-70	Blue grey coarse sand; little grey clay
70-75	Brown grey fine sand
75-100	Grey well sorted lake clay
100-115	Very silty clay; few coal fragments
115-130	Grey fine unconsolidated sand
130-150	Plastic grey clay
	SE cor. 2-71-26 2155; Sept. 9/65
0-5	Sand & little brown clay
5-10	Brown grey weathered siltstone & ss (el. bedrock 2150)
10-20	Brown grey weathered siltstone
20-25	Little weathered coal in grey shale
25-35	Brown & grey ss
35-65	Grey siltstone
65-70	Grey shale
70-90	Grey siltstone; traces of white bentonite
90-100	Silty grey shale
100-120	Grey to light grey shale

COAL OCCURRENCES AND GEOLOGY
ATHABASCA - SMITH AREA
FIGURE 4

LEGEND

- R.C.A. coal testhole intersecting coal > 2 feet thick .....
- R.C.A. coal testhole intersecting coal trace .....
- R.C.A. coal testhole penetrating bedrock, no coal .....
- R.C.A. coal testhole intersecting drift only .....
- Other boreholes intersecting coal .....
- Known surface coal occurrence (outcrop, mine) .....
- Land parcel licensed for coal mining .....
- Line of coal outcrop, subcrop; approximate .....
- Structure contour on top of coal seam (interval 50 feet) 1950
- Strippable coal deposit, overburden < 40 feet .....
- Belly River Formation .....
- Lea Park Formation .....
- Topographic contour (interval 100 feet) 2300

SCALE 1:250,000
1 Inch to 4 Miles Approximately

Miles 5 0 5 10 15 20

Kilometres 5 0 5 10 15 20 25 30

RESEARCH COUNCIL OF ALBERTA

Coal Geology by J. D. Campbell 1968 - 69

KEY MAP