

1979 REPORT OF EXPLORATION ACTIVITIES
ON THE SOUTH MOUNT GETHING PROPERTY

Coal License Numbers 4129 to 4152 Inclusive
Peace River Land Dist. & Liard Mining Divis.
N.T.S. Designation 93 O/16 W. & 94 B/1 W.

LAT. 55° 58'N; LONG. 122°25'W

Owned and Operated by Utah Mines Ltd.

Report by: D.N. Duncan of Utah Mines Ltd.

Field Work Performed Between

May 7, 1979 and August 14, 1979

Report Submitted April 28, 1980

638

1979 REPORT OF EXPLORATION ACTIVITIES
ON THE SOUTH MOUNT GETHING PROPERTY

Coal Licence Numbers 4129 to 4152 Inclusive

Located In

Peace River Land District
and Liard Mining Division

National Topographic System Designation

93 0 16 West and 94 B 1 West

Centered on Lat. $55^{\circ} 58'N$; Long. $122^{\circ} 25'W$

Owned and Operated by Utah Mines Ltd.

Report by: D.N. Duncan
of Utah Mines Ltd.

Field Work Performed Between
May 7, 1979 and August 14, 1979

Report Submitted April 28, 1980

CONFIDENTIAL

TABLE OF CONTENTS

	<u>PAGE NO.</u>
Abstract	1
Location and Access	2
Property and Title	6
Physiography	8
Exploration of the South Mount Gething Property	
Previous Exploration	11
1979 Exploration Program	12
Geology - General and Local	18
Structure	25
Drill Hole Data <i>SEE: SOUTH MT GETHING 79 (3) A</i>	
D.D.H. SMG-79-4	
A - Well Completion Report	28
B - Comments	29
D.D.H. SMG-79-5	
A - Well Completion Report	32
B - Comments	33
D.D.H. SMG-79-6	
A - Well Completion Report.	36
B - Comments	37
D.D.H. SMG-79-7	
A - Well Completion Report	40
B - Comments	41
D.D.H. SMG-79-8	
A - Well Completion Report	45
B - Comments	46
D.D.H. SMG-79-9	
A - Well Completion Report	49
B - Comments	50
D.D.H. SMG-79-10	
A - Well Completion Report	53
B - Comments	54
Correlation of Coal Seams	57

Table of Contents - cont'd.

PAGE NO.

Conclusions and Recommendations

60

Selected Bibliography

62

Appendices

Appendix I - Descriptive Lithologic Logs
D.D.H. SMG-79-4,5,6,7,8,9,10

SEE: PR-SOUTH MT GETTING
79(3)A

II - Analytical Data
D.D.H. SMG-79-4,5,6,7,8,9,10

SEE: PR-SOUTH MT GETTING
79(4)A Confidential
Coal Analysis File.

III - Cost Statement

IV - Statement of Qualifications

ILLUSTRATIONS

<u>Figure</u>	<u>PAGE NO.</u>
1. South Mount Gething Property Location Map	3
2. South Mount Gething Property Regional Map	4
3. South Mount Gething Coal Licences	7
4. Physiographic Subdivisions - Northeast B.C.	9
5. South Mount Gething Drill Hole Locations	14
* 6. 1:10,000 Scale East-West Section @ 6,202,500N (McElhanney Coordinates)	(Pocket)
* 7. 1:10,000 Scale East-West Section @ 6,199,400N (McElhanney Coordinates)	(Pocket)
8. 1:50,000 Scale East-West Section @ 55°58'03" North	27
* 9. Tentative Coal Seam Correlation Between D.D.H. SMG-78-2&3 and SMG-79-4,5&6.	(Pocket)
* 10. Tentative Coal Seam Correlation Between D.D.H. SMG-79-7,8,9.	(Pocket)
* 11. Tentative Coal Seam Correlation Between D.D.H. SMG-78-1 and SMG-79-10.	(Pocket)
* 12. Tentative Coal Seam Correlation Between Drill Holes and Measured Sections	(Pocket)

Table

1. Flow Chart for Analysis of Diamond Drill Hole Samples.	17
2. Formational Nomenclature-Fort St. John & Bullhead Groups	24

* See: FR- SOUTH MT GETHING 79(2)A

Illustrations - cont'd.

PAGE NO.

*

Map

Sheets 1,2 and 3 - 1:10,000 Scale-Bedrock Geology
and Drill Hole Locations

(Pocket)

*

Logs

Gamma Ray - Density Logs for Diamond Drill Holes
SMG-79-4, SMG-79-5, SMG-79-6, SMG-79-7, SMG-79-8,
SMG-79-9, SMG-79-10.

(Pocket)

Graphic Lithologic Logs for Diamond Drill Holes
SMG-79-4, SMG-79-5, SMG-79-6, SMG-79-7, SMG-79-8,
SMG-79-9, SMG-79-10.

(Pocket)

* See: PR-SOUTH MT GETAINA 79(2)A

* See: PR-SOUTH MT GETAINA 79(3)A

ABSTRACT

The twenty-four (24) contiguous coal licences, numbered 4129 to 4152 inclusive, which comprise the South Mount Gething Property were issued to Utah Mines Ltd. on August 15, 1978. The property is located in the Liard Mining Division and the Peace River Land District. The 1979 exploration program for the property was designed to provide further information on the extent, metallurgical quality and continuity of coal seams on the property, pursuant to the 1978 program. A program of diamond drilling and limited geological mapping was undertaken to accomplish these objectives.

Seven diamond drill holes, totalling 1493 metres, were drilled on widely spaced centres on the property. Access to the three holes drilled in the northeastern portion of the property was facilitated by the construction of access roads, totalling 3021 metres in length. The remaining four drill holes, in the southern and western portions of the property, were accessible by helicopter. Geological mapping was completed in several locations throughout the property, mainly to add information on areas not fully covered in the 1978 program.

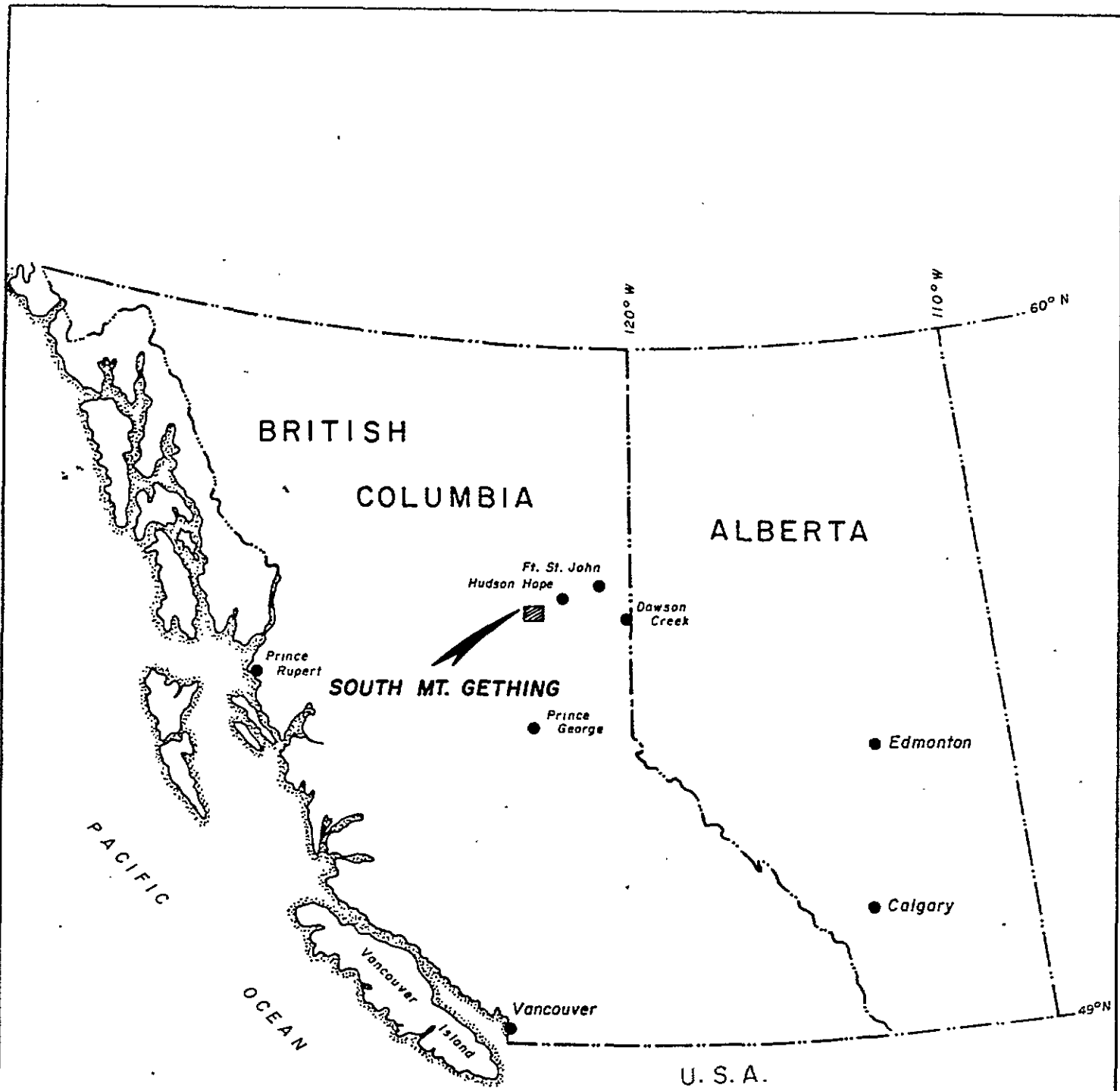
The 1979 exploration program greatly improved the understanding of the property's geology and economic potential and provides a base for further exploration of the South Mount Gething Property.

LOCATION AND ACCESS

South Mount Gething Property is located in the designated "Northeast Coal Block", lying within the Liard Mining Division and the Peace River Land District. Geographical coordinates of the centre of the property are $55^{\circ} 58' N$; $122^{\circ} 25' W$. The coal licences are within the area covered by the National Topographic System designation 93-0-16 and 94-B-1W. The property, which is roughly triangular in shape, is largely confined between Dowling Creek on the east and Gaylard Creek on the north, with two licences lying within and north of the Gaylard Creek Valley.

The central part of the property lies approximately 15 kilometres west-southwest from the W.A.C. Bennett Dam, 36 kilometres west-southwest of the town of Hudson's Hope and 60 kilometres northwest of the town of Chetwynd. Vancouver is approximately 770 kilometres south of the property. (See Figure 1, page 3 , figure 2, 4 .)

Highway 29, joining Chetwynd, Hudson's Hope and Fort St. John, passes approximately 31 kilometres to the east of the property. Canfor Limited's (a major forest products company) Johnson Creek-Track Creek Road, which joins Highway 29 at 19 kilometres south of Hudson's Hope, and several secondary logging roads provide direct road access to various parts of the property. (See maps 1 and 2 in pocket.)



UTAH MINES LTD.
SOUTH MT. GETHING
LOCATION MAP

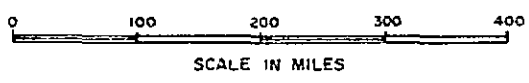


FIGURE — 1

Alternate access to the Johnson Creek - Track Creek Road is possible by travelling over the 13.7 kilometres of Utah Mines Ltd. road from the west end of the W.A.C. Bennett Dam. Drill access roads to diamond drill hole sites SMG-78-2, SMG-79-4, SMG-79-5 and SMG-79-6 provide road access to the northeastern portion of the property. Away from these roads, access to much of the property is possible only by helicopter or on foot. The diamond drill holes in the western and southern portions of the property have helicopter landing pads which provide easier access to this portion of the property. (See maps 1 and 2 in pocket.)

PROPERTY AND TITLE

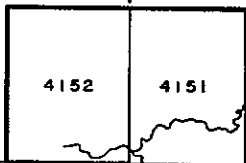
The South Mount Gething Property comprises 24 contiguous coal licences number 4129 to 4152 inclusive. These licences encompass 6892 hectares (rounded upward from, more precisely, 6880.99 hectares.) (See Figure 3, page 7 .)

Application for title to the licences included in the South Mount Gething Property was made in the prescribed manner by the Utah Mines Ltd. in the spring of 1978. The licences were issued on August 15, 1978 and, subsequently, signed by the Minister of Energy, Mines and Petroleum Resources. This property forms a natural westward extension of the Bri Coal Property, held by Utah Mines Ltd. under an agreement formed with Bri Coal Mining Ltd., Bow River Resources Ltd. and Rainier Energy Resources Ltd.

With the exception of part of the northern boundary, the property is surrounded by other adjoining coal properties. Shell Canada Resources Limited holds adjacent coal licences to the northwest, west, south and southeast. The East Mount Gething Property, also owned by Utah Mines Ltd., adjoins the South Mount Gething Property on the northeast. (See Figure 3, page 7 .)



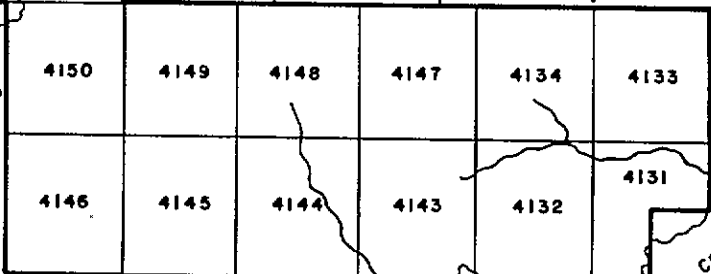
56°00'



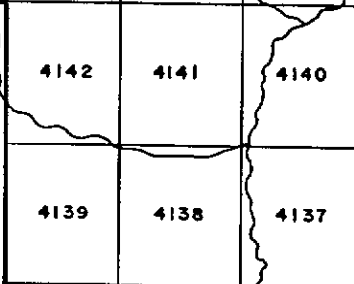
Gaylord

EAST MT. GETHING

Creek



Creek

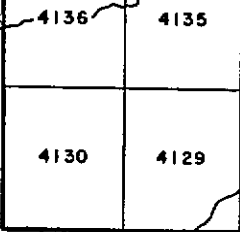


SHELL CANADA

BRI COAL
PROPERTY

Dowling

Creek



Gething

SHELL CANADA

122° 25'

FIGURE — 3

SOUTH MT. GETHING

COAL LICENCES



Scale — 1:100,000

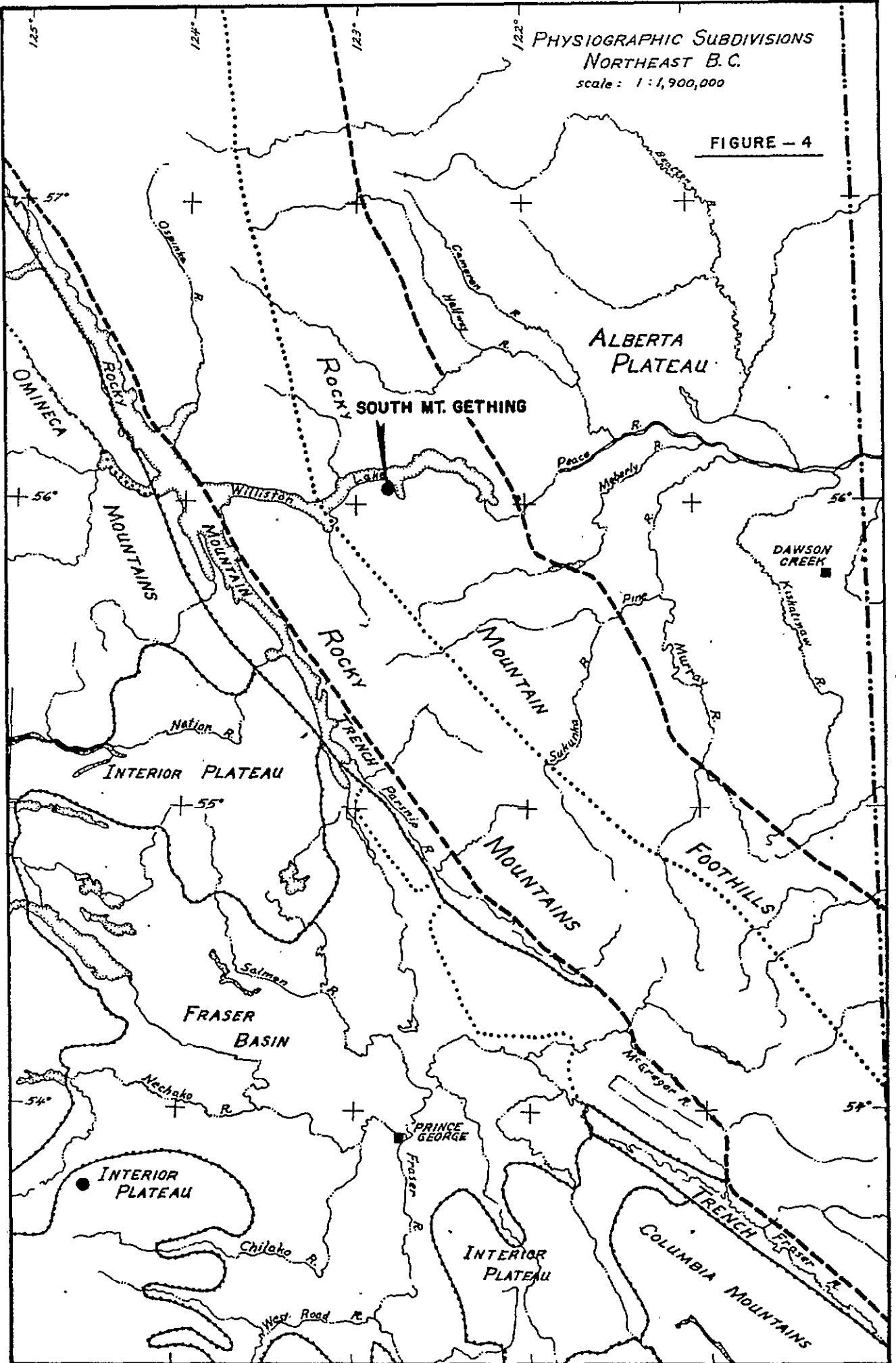
PHYSIOGRAPHY

The South Mount Gething Property is situated in the outer (eastern) belt of the Rocky Mountain Foothills. (See Figure 4, page 9.) To the west, the margin of the Foothills belt is considered to be the easternmost major fault which thrusts Paleozoic strata over Mesozoic strata. The eastern margin is a series of en-echelon thrust faults, which separate the folded and faulted strata of the Foothills from the gently dipping to flat-lying strata of the Alberta Plateau (Holland, 1976.) Within this belt, major fold axes and thrust faults trend in a northerly to northeasterly direction with the thrusts dipping to the southwest. Structural deformation is considerable near the western margin of the Foothills and diminishes in extent and complexity toward the eastern margin.

The Property is underlain by a broad, south plunging anticline. This prominent structural feature is reflected in the topography of the property. South Mount Gething itself approximates the form of a slice from a cone, with the apex to the south. This conic form is contained to the west, south and east by numerous hills and ridges occurring in a roughly parabolic pattern. Segments of many streams follow and accentuate this pattern.

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

FIGURE - 4



Topographic relief in the immediate area of the property is moderate. Elevations range from approximately 770 metres in Gething Creek Valley at the eastern property boundary, to 1532 metres at the summit of South Mount Gething. Surface slopes are generally shallow to moderate. A few areas of steep slopes and vertical cliffs occur on South Mount Gething to the north and northwest. Stream valleys are commonly broad and V-shaped with moderate to shallow gradients. Gaylard Creek Valley and the lower part of Gething Creek Valley are alluvium filled and relatively broad and flat bottomed in form.

EXPLORATION OF THE SOUTH MOUNT GETHING PROPERTY

Previous Exploration

Coal has been known to exist in the Peace River area since 1792, when Sir Alexander MacKenzie noted the existence of a "bituminous substance which resembles coal" in Peace River Canyon. Exploration, specifically designed to test the coal potential of the area covered by South Mount Gething Property, had not been undertaken prior to the acquisition of the property by Utah Mines Ltd. in 1978.

General reference to the area is made in various Geological Survey of Canada and British Columbia Ministry of Energy, Mines and Petroleum Resources publications (eg. McLearn and Kindle, 1950; Hughes, 1964; Stott, 1963.) Geological Survey of Canada Map 11 - 1961 provides a useful basic interpretation of the geology of the property. There are several reports which deal with specific adjacent map areas and contain information which is useful in the interpretation of the geology of this property (eg. Stott, 1969; LeNobel, 1975, 1977; Anderson and Armstrong, 1978.)

The 1978 exploration program for the South Mount Gething Property provided a preliminary appraisal of the coal potential of the property. A program of geological mapping and limited diamond drilling was undertaken which resulted in coverage of the property area at 1:10,000 scale and the drilling of three widely spaced diamond drill holes. In total, 606.86 metres of diamond drilling were completed in the three holes. Thirty-seven samples were taken from the core recovered from the drill holes and four samples were taken from trenches.

All data and logs derived from the 1978 exploration program may be referred to in the 1978 Report of Exploration Activities on South Mount Gething Property by A.T. Armstrong of Utah Mines Ltd.

1979 Exploration Program

The 1979 exploration program for the South Mount Gething Property was designed to provide further information on the extent, metallurgical quality and continuity of coal seams on the property, pursuant to the 1978 program. Exploration activities commenced on the property on May 18, 1979 and were concluded on August 15, 1979. The determination of the extent of the thick coal seam intersected in D.D.H. SMG-78-1, which was drilled during the 1978 program, was considered a priority. It was also particularly important to determine the continuity of coal seams from the Bri Coal Property to the South Mount Gething Property. A program of diamond drilling and limited geological mapping was undertaken to provide the information required to fulfill the objectives of the program.

A limited geological mapping program, designed to fill in areas not covered in the 1978 program, was undertaken intermittently from May 18, 1979 to August 15, 1979. Traverses were made along creek valleys and on hill sides where the potential for finding outcrop was greatest. This work was performed by Utah Mines Ltd. field crews made up of P. Cowley, J. Ridley and D.N. Duncan, assisted by P. Zell, K. Broadbent and J. Kozak. Field data and airphoto interpretive data from the 1978 and 1979 programs facilitated the development of the geological interpretation shown on Maps 1, 2 and 3 (included in the map pocket.)

The exploration program included the drilling of seven (7) diamond drill holes (See Figure 5, page 14.) Diamond drilling was performed by Longyear Canada Ltd. using a Longyear "38" diamond drilling rig. The drilling rig was mobilized from Vancouver to the property and drilling commenced at the first site on May 18, 1979. The drilling crew consisted of W. Castle (foreman), M. Bouchard (runner), J. Perrault (runner) who was later replaced by P. McDonald, C. Tucker (helper), and P. Pepin (helper) who was later replaced by G. Rohrback. The drilling equipment was removed from the last site on June 30, 1979.

Of the seven diamond drill holes in the 1979 program, three (SMG-79-4, SMG-79-5, and SMG-79-6) were located at the end of access roads constructed by Utah Mines Ltd. The contractor for access road and drill site construction was P. Demeulemeester. The work included the slashing, clearing, clean-up and general construction of 3021 metres of road, averaging approximately 10 metres in width. Culverts were installed across the roads where needed to provide road drainage and free flow of small streams. The three sites, each approximately 35 metres in diameter, were also slashed, cleared and levelled. A temporary mud sump was excavated by bulldozer at each site. A minor clearing was required at the sites to provide a location for the water supply pump.

The four helicopter accessible drill sites (SMG-79-7, SMG-79-8, SMG-79-9 and SMG-79-10) were slashed using crews supplied by P. Demeulemeester. Maple Leaf Helicopters Ltd. of Chetwynd, B.C. provided a Bell 205 helicopter for the movement of the Longyear "38" diamond drilling rig and related equipment

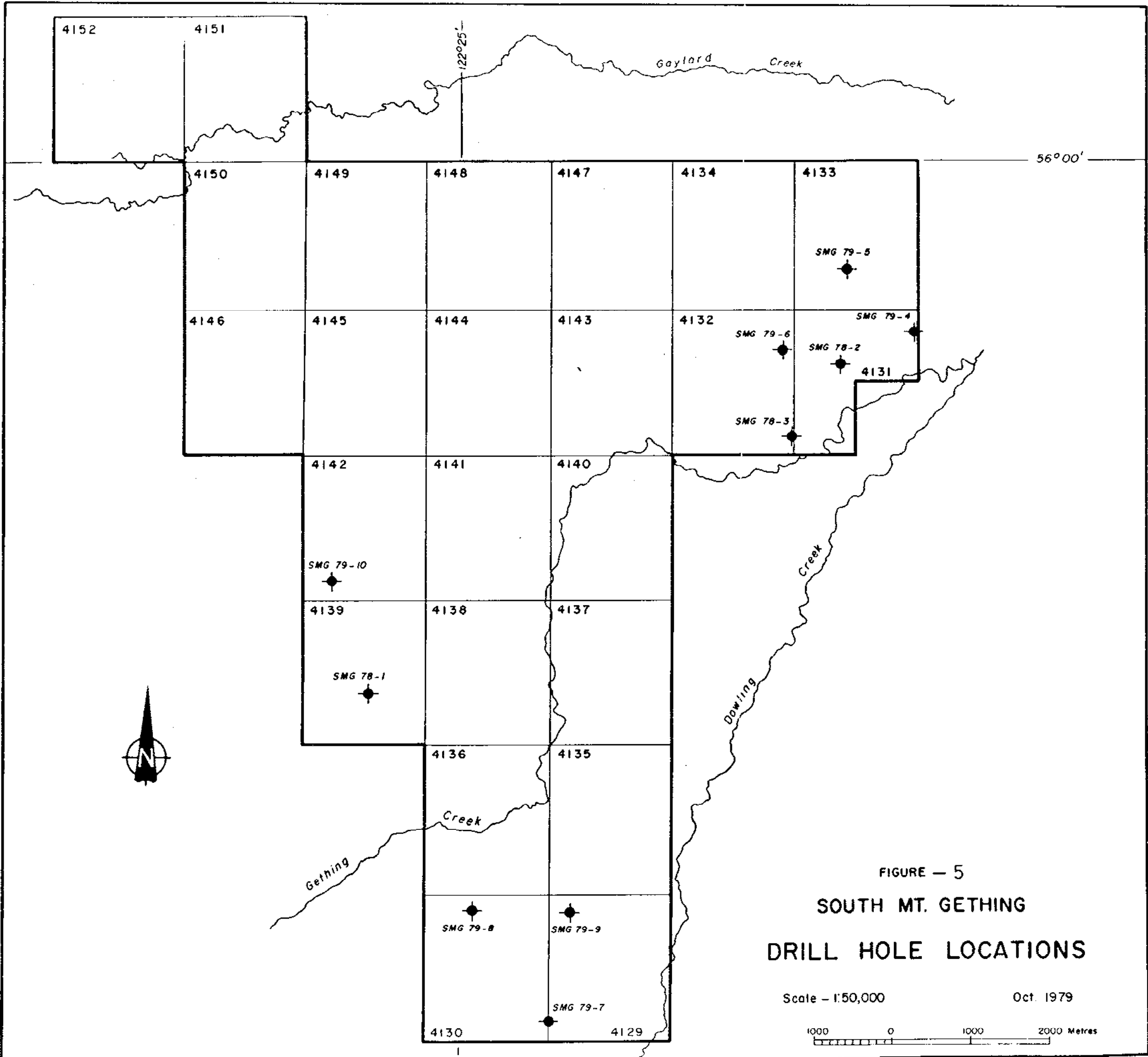


FIGURE — 5
 SOUTH MT. GETHING
 DRILL HOLE LOCATIONS

Scale — 1:50,000

Oct. 1979



and supplies between drill sites. Maple Leaf Helicopters Ltd. also provided Bell 206 Jet Ranger service for crew changes, moving of supplies and drill core, and transporting slashing crews.

Reclamation of disturbed ground was conducted by P. Demeulemeester as an ongoing part of the program. Roads and road accessible drill sites were cleaned up and recontoured after moving the drilling rig from each site. Mud sumps were refilled and levelled. The drill sites and their access roads were sown with the grass seed mixture recommended by the Reclamation Branch of the British Columbia Ministry of Energy, Mines and Petroleum Resources for forested areas of the Northeast Coal Block. Upon completion of the program, culverts were removed, water bars were installed on all steep road grade and, in some places, special ditches were excavated to assure adequate drainage and to minimize erosion. The four helicopter drill sites each measured approximately 50m X 100m. All felled trees were limbed and bucked into four foot lengths, in compliance with British Columbia Forest Service specifications.

All construction equipment required during the 1979 exploration program was provided by P. Demeulemeester. Caterpillar D7G, D6C and D6D bulldozers and a small John Deere crawler equipped with a cyclone seeder were used in the course of the program. One or more 3/4 ton, Ford four-wheel drive pickup trucks were used to transport personnel, fuel and supplies. This equipment was used for road and drill site construction and maintenance, reclamation work, drill moves and servicing the drill.

A total of 1493 metres of diamond drilling were completed in the seven drill holes. The core was logged by J. Ridley, A.T. Armstrong, R.B. Anderson and D.N. Duncan of Utah Mines Ltd. Descriptive lithologic logs and graphic lithologic logs were prepared for each hole (included in the map pocket.) Mechanical logs, consisting of gamma ray and density logs, were run on each hole by Utah Mines Ltd. personnel. The mechanical logger used was either a portable Gearhart-Owens Model 06-3200 Widco Logger with an electric hoist or a truck mounted Widco Logger with a hydraulic hoist and a combination down hole tool (logs are included in the map pocket.)

Forty-six coal samples were taken from core recovered from the seven drill holes. These samples were submitted for analysis to the Utah International Inc. Minerals Laboratory at 1190 Bordeaux Drive, Sunnyvale, California, 94086. Analyses were conducted following the procedures outlined on the laboratory flow chart on the following page (Table 1.)

Upon completion of the 1979 field program, the drill core was shipped to the Charlie Lake core storage facility of the British Columbia Ministry of Energy, Mines and Petroleum Resources.

FLOW CHART FOR ANALYSIS OF DIAMOND DRILL HOLE SAMPLES

INCOMING SAMPLE

AIR DRIED

- 1) CRUSH 3/4"
- 2) CRUSH 3/8"
- 3) WEIGH TOTAL INCOMING SAMPLE

SPLIT ~ 1000 GRAMS

SPLIT SMALL AMOUNT FOR RUN
OF MINE (R.O.M.) SAMPLE

EXCESS SAMPLE
FOR STORAGE

- HEAD (R.O.M.)
~ 1000 GRAMS
- 1) PULVERIZE 60 MESH
 - 2) MAKE SAMPLE & DUPLICATE
 - 3) RUN ASSAYS
 - a) FSI
 - b) %MOISTURE
 - c) %ASH
 - d) %SULPHUR
 - e) %VOLATILE MATTER

WASH (1.4 SPECIFIC GRAVITY)

1.4 FLOAT

- 1) AIR DRY
- 2) WEIGH SAMPLE*
- 3) PULVERIZE (60 MESH)

1.4 SINK

- 1) AIR DRY
- 2) WEIGH SAMPLE*
- 3) PULVERIZE (60 MESH)

- 4) MAKE SAMPLE & DUPLICATE SAMPLE
- 5) RUN ASSAYS
 - a) FSI
 - b) %MOISTURE
 - c) %ASH
 - d) %SULPHUR
 - e) %VOLATILE MATTER

*WEIGHT RECOVERY OF COAL INSIDE SAMPLE

GEOLOGY - GENERAL AND LOCAL

The South Mount Gething Property is underlain by folded and faulted sediments of Lower Cretaceous and earlier (?) age. The oldest rocks exposed on the property are thought to be the upper units of the Upper Jurassic (?) to lower Cretaceous Minnes Group. Unconformably overlying these rocks are sediments of the Lower Cretaceous Bullhead Group, which comprises Cadomin and Gething Formations. The Bullhead Group is, in turn, disconformably overlain by the Fort St. John Group. The Moosebar Formation, the oldest member of the Fort St. John Group, is the only formation of this group which is found on the property.

The Minnes Group contains recessive, fine grained, argillaceous sediments of marine and/or continental origin on the property. These sediments are exposed on the northern flank of South Mount Gething. The upper portion of the Minnes Group contains sediments of non-marine origin in the area to the south of the South Mount Gething Property. These sediments are referred to by Stott (1968) as the Unnamed Unit which consists of interbedded fine grained sandstones, siltstones, mudstones and minor coal seams.

The contact between the Minnes Group and overlying sediments of the Cadomin Formation of the Bullhead Group is an abrupt, regional erosional unconformity (Stott; 1968, Page 14.) This unconformity is present in the Peace River area and extends north, south and west along the Rocky

Mountain Foothills and into the Alberta Plateau. The total amount of sediments removed and the exact time interval involved in this erosional event is not known and may vary from area to area in the region.

The majority of the South Mount Gething Property is underlain by the Cadomin and Gething Formations of the Bullhead Group. Stott (1968, page 7) considers the Bullhead Group and the overlying Fort St. John Group to form a complete nonmarine and marine sequence:

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

Typically, the Cadomin Formation section consists of massive conglomerates containing well rounded pebbles, cobbles and boulders of extremely resistant rocks. In the property area, the Cadomin Formation occurs as a series of coarse grained, massive to coarsely cross-bedded sandstone beds containing thin bands and lenses

of pebble conglomerate. The formation is exposed in the summit area of South Mount Gething and in an area extending southeast and south from the summit. The environment of deposition for the Cadomin Formation is considered to have been a piedmont alluvial plain (Stott, 1968, page 108.) The lack of extensive massive conglomeratic beds in the property area, in favour of coarse grained sandstones, indicates that the area was a distal portion of the alluvial plain.

The contact between the Cadomin and Gething Formations is not clearly defined in the property area. McLearn and Kindle (1950, page 65) noted that the contact may not occur at the same stratigraphic horizon from area to area. Irish (1970, page 68) noted that to the northeast of South Mount Gething Property:

"in Peace River Canyon, coarse sandstones of the Cadomin Formation grade laterally into interbedded coal, sandstones and shale of the Gething Formation, and therefore the formations are in part lateral equivalents."

This indicates that the contact between the two formations is transitional, not abrupt. Stott (1963, page 3) noted that the Cadomin and Gething Formations are actually "facies of one depositional sequence." Thus, there is a transition from the Cadomin Formation to the Gething Formation both laterally and up the stratigraphic column. To make mapping

and core logging easier, the lower contact of the Gething Formation is placed at the top of the uppermost thick, coarse grained sandstone bed of the Cadomin Formation.

The character of the Gething Formation underlying the property is typical; as described by Irish (1970, page 68), a sequence of:

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

These sediments represent deposition in an aggrading flood plain environment. Some of the fine grained sandstones may represent bar finger and levee deposits and others may represent flood plain splay deposits (Stott, 1968, page 111). Sedimentary features attributable to these types of deposits are present in drill core and in outcrop on the South Mount Gething Property. Stott (1968, page 111) lists some of the features found in sandstones in the Gething Formation; well sorted nature but often containing considerable matrix, festoon crossbeds, laminae of plant debris and thin layers of silt and clay. The finer silts and clays represent deposition from water in areas practically devoid of current on the flood plain proper (Stott, 1968, page 112). These silts and clays accumulated between the river channels and the swamp and forest areas. The swamp and forest areas are the source of the present coals and are thought to be of several differing occurrences. Stott (1968, page 112)

suggests that some may have originated in abandoned river channels, some paralleling major river channels and some on deltas.

Work by Stott (1969, page 4) indicates a minimum thickness of 1,600 feet (488 metres) for the Gething Formation in this area. The total thickness approaches 1800 feet (549 metres) if a postulated fault is absent. This formation is but one of several which contain the metallurgical grade coals which are explored for throughout the Northeast Coal Block. The Gething Formation underlies much of the property, extending to the west, south and east from the flanks of South Mount Gething.

The Bullhead group is overlain by marine sediments of the Fort St. John Group, which comprises, from oldest to youngest, the Moosebar Formation, the Gates Formation, the Hasler Formation, the Goodrich Formation and the Cruiser Formation (See Table 2, page 24). Of these formations, only the Moosebar Formation is thought to underlie the property on the western and southern extremities.

The Moosebar Formation of the Fort St. John Group directly overlies the Gething Formation. It consists mainly of dark grey to black, rubbly to blocky shales. Often a thin pebbly basal sandstone to conglomerate lies abruptly on carbonaceous Gething Formation sediments. The lower part of the Moosebar Formation is typically strongly glauconitic and contains thin ash (bentonite) bands. McKechnie (1955, page 7) noted that the basal conglomerate of the Moosebar Formation:

"...is a typical mud-flats conglomerate ranging from a few inches to about 4 feet thick, and is composed of well rounded grey and black chert pebbles about one quarter inch in diameter in a mudstone matrix."

Ironstone concretions occur in bands at various levels in the section. Toward the top of the formation, the shales become gritty and thin beds of fine grained sandstone and siltstone are present.

NOMENCLATURE OF THE LOWER CRETACEOUS BULLHEAD

AND FORT ST. JOHN GROUP

TABLE - 2

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

STRUCTURE

The South Mount Gething Property is located within the Foothills structural belt, which is underlain by folded and thrust faulted Mesozoic strata (Irish, 1968). The general trend of the structures is northwesterly, with most of the thrust faults dipping in a southwesterly direction. Where the sediments are thick in this belt, as in the property area, the dominant form of deformation is folding.

The property is underlain by Minnes Group and Bullhead Group sediments which have been folded into a broad, south plunging anticline. The anticlinal axis, which is somewhat distorted, extends in a southerly direction from the summit of South Mount Gething. A discontinous thrust fault to the west of the summit of South Mount Gething has a strike which is parallel to the trend of the fold axis. Irish (1968), on his structural map of northeastern British Columbia, shows the South Mount Gething anticline splitting into two thrust faults to the north of the property. In the same bulletin, Irish states that, in the property area, most thrust faults:

"...have resulted from the breaking of tightly compressed anticlines, and begin and/or terminate in compressed, asymmetrical anticlines...."

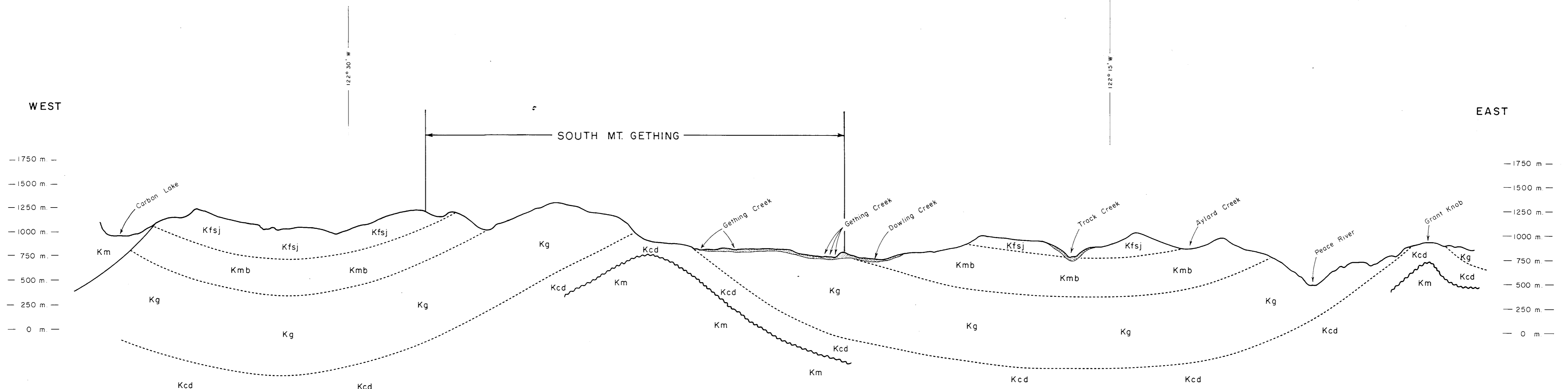
(Irish, 1968, page 24)

The thrust which occurs on South Mount Gething may be a splay from another thrust which underlines the anticline at depth.

Aside from the thrust on South Mount Gething, faulting is not a prominent structural feature in the property area. Some faulting was noted in the drill core, but the dip angles of the faults closely approximate bedding dip angles and are probably the result of slight movement, in response to folding, along bedding surfaces. Fractures and tight slickensided shears are common in the core and have been produced as an accommodation to stresses associated with folding and thrust faulting.

Minor folding has been noted in several road cuts along the Gething Creek Road and in several localized areas, widely variable bedding orientations were measured which are suggestive of small scale folding. Bedding orientations in the upper part of D.D.H. SMG-78-3 and the lower part of D.D.H. SMG-79-5 are also indicative of small scale folding.

Structural geology for the property area is shown on 1:10,000 scale cross sections (Figures 6 and 7) which are included in the map pocket. A 1:50,000 scale cross section showing structural form and stratigraphic relationships is found on the following page.



STRATIGRAPHY







-  Quaternary Alluvium
- Fort St. John Group {
 -  Fort St. John Group (undifferentiated)
 -  Moosebar Formation
- Bullhead Group {
 -  Gething Formation
 -  Cadamin Formation
- Minnes Group {
 -  Minnes Group (undifferentiated)

FIGURE — 8

UTAH MINES LTD.		
EXPLORATION DEPARTMENT		
VANCOUVER BRITISH COLUMBIA		
SOUTH MOUNT GETHING		
EAST — WEST SECTION		
@ 55° 58' 03" NORTH		
LOOKING NORTH		
Work by: N. Duncan	Date: March 1980	NTS Ref.
Drawn by: T. Drews	Revised:	Horizontal Scale — 1:50,000
		Vertical Scale — 1:25,000

CORRELATION OF COAL SEAMS

In the South Mount Gething Property area, the most precisely correlatable horizon is the contact between the Gething Formation and the overlying Moosebar Formation. None of the diamond drill holes on the property intersected this contact as the Moosebar Formation occurs only on the very edge of the western property boundary. The sections drilled are thought to be within the upper portion of the Gething Formation based on the proximity of the contact to the drill holes. In the Peace River area, the coal seams of the Gething Formation show significant variability in thickness and lateral extent (Stott, 1969). While coal seams are correlatable over one to two kilometre distances, correlations are at best tentative when drill holes are more widely separated. Stott (1969, page 8) stated that:

"Current work shows that considerable variation occurs within each individual coal seam, that thickness may change rapidly, and that both coal seams and sandstone units are lenticular and have limited extent."

As a result, correlation of coal seams between drill holes becomes complex, involving physical, chemical and geophysical drill derived data.

For the purpose of correlation, the diamond drill holes on the South Mount Gething property have been divided into three groups. The drill holes in each group are relatively close together, which allows more definite correlation of the coal seams between the holes. Correlations for the three groups are shown in figures 9, 10 and 11 (in the pocket). Between

the three groups a definite coal seam correlation is not feasible at this time because of lack of drill information in the intervening areas.

Diamond drill holes SMG-78-2, SMG-78-3, SMG-79-4, SMG-79-5 and SMG-79-6, located in the northeast portion of the property, were included in one group. This group is close to the Bri Coal Property and information from Bri drill holes was used in the correlation (see figures 9 and 12 in the pocket). The "Trojan" seam, the highest named seam in the cored sections, was intercepted in a group of drill holes consisting of SMG-78-2, SMG-78-3 and SMG-79-4. Diamond drill holes SMG-79-5 and SMG-79-6 did not intercept the "Trojan" seam and it is postulated that the seam subcrops between these holes and the above three holes. The "Titan" seam located approximately 60 metres below the Gething-Moosebar contact was cored in all drill holes except SMG-79-5, which entered the Gething Formation section below the level of the seam. The seam maintains a thickness of approximately one metre in diamond drill holes SMG-78-2, SMG-78-3 and SMG-79-6, but thins in the direction of SMG-79-4 where it is 0.49 metres thick. The "Falls" seam, normally found 76 to 90 metres below the Gething-Moosebar contact, was intercepted in all of the diamond drill holes in this group. It is thickest in D.D.H. SMG-79-4 and SMG-79-5 and is split in all the holes except SMG-78-2. The seams cored below the "Falls" seam were not named. In D.D.H. SMG-78-3 and SMG-79-6 a thick, split coal seam was cored. This seam thins rapidly to the northeast in diamond drill holes SMG-78-2, SMG-79-4 and SMG-79-5.

Diamond drill holes SMG-79-7, SMG-79-8 and SMG-79-9, located on the southern end of the property, were grouped together for the purpose of correlation. The correlation for these holes (figure 10 in pocket) is not considered to be as reliable as the correlation for the first group as the drill holes are more widely spaced and no control data can be used from the adjoining Bri Property, a separation of two kilometres. The seams are not named as the exact distance to the Moosebar Formation - Gething Formation contact is not known. The sections drilled are thought to be from the upper to middle portion of the Gething Formation as evidenced by their proximity to the Moosebar contact to the south and the west of the drill holes.

Diamond drill holes SMG-78-1 and SMG-79-10 were grouped together for correlation. This correlation (figure 11 in pocket) is considered to be very tentative as there is a need for more drill data in the area. Also, the dips of the strata in the area are steep, up to 30° from the core axis, so that a small separation on the surface can be a large separation in the section. Several thick coal seams are present in the cored sections. A thick seam at 39.93 metres from the collar in drill hole SMG-78-1 is thought to be too high in the section to be cored by SMG-79-10. The upper thick seam in drill hole SMG-79-10, at 49.15 metres from the collar, thins rapidly to SMG-78-1 where it is only 1.6 feet (0.49 metres) thick. The thick seam toward the base of SMG-78-1 thickens toward SMG-79-10 where it is split into three benches. The two drilled sections were corrected for dip (see figure 11 in pocket) as an aid in correlating the coal seams.

CONCLUSIONS AND RECOMMENDATIONS

The northeastern, southern and western coal licences of the South Mount Gething property have potential for the discovery of economically mineable coal. Exploration work to date has primarily involved extensive geological mapping and 2099.86 metres of diamond drilling in 10 widely spaced holes. Most additional activities are related to this exploration.

The three holes drilled during the 1978 exploration program were very widely separated and provided an initial examination of the coal seams underlying the property. The results of this program provided areas of interest for further exploration in 1979.

In 1979, seven widely spaced drill holes, in 3 groups, were drilled on the property. Diamond drill holes SMG-79-4, SMG-79-5 and SMG-79-6 further examined the northeastern portion of the property. The coal seams cored in these holes were of insufficient thickness to be economically mined by today's standards, with the exception of the split seam from 92.73 metres to 95.97 metres in D.D.H. SMG-79-6. This seam was also intersected in D.D.H. SMG-78-3 and further drilling on coal licence 4132 should be undertaken to examine the extent of this seam.

Diamond drill holes SMG-79-7, SMG-79-8 and SMG-79-9, in the southern portion of the property, did not intersect any coal seams of metallurgical quality, thickness and lateral extent as to lend themselves to mining.

Diamond drill holes SMG-79-10 did not intersect the 5.64 metres thick coal seam cored in D.D.H. SMG-78-1, but two other

seams, from 49.15m to 51.03m (1.88m) and from 184.04m to 189.56m (3.75m net coal, with two thick mudstone splits), of significant thickness were cored. Further drilling on coal licences 4139 and 4142 is necessary to further define the form and character of the major coal seams encountered in SMG-78-1 and SMG-79-10. The steep bedding dips, up to 30° from the core axis, must be considered when locating drill holes in this area. A program with flexibility in the positioning and final depth of drill holes is imperative.

Further geological mapping is recommended in the northern portion of the property (in the South Mount Gething area) and near the southeastern boundary. This mapping would greatly increase knowledge of the structure and lithology of the formations underlying the South Mount Gething coal licences.

SELECTED BIBLIOGRAPHY

Anderson, R.B., and Armstrong, A.T.,

- 1979: 1978 Report of Exploration Activities on the Bri-Dowling Creek Property. (unpublished report)

Armstrong, A.T., and Anderson, R.B.,

- 1979: 1979 Report of Exploration Activities on the Bri-Dowling Creek Property (unpublished report)

Armstrong, A.T.,

- 1979: 1978 Report of Exploration Activities on the South Mount Gething Property (unpublished report)

Dyson, I.P.,

- 1972: Preliminary Report, Peace River Coal Project (unpublished report)
- 1976: Peace River Coal Project, of Bow River Resources Ltd. & Rainier Energy Resources Ltd. (unpublished report)

Holland, Stuart S.,

- 1976: Landforms of British Columbia, A Physiographic Outline; British Columbia Department of Mines and Petroleum Resources, Bulletin 48.

Hughes, J.E.,

- 1964: Jurassic and Cretaceous Strata of the Bull-head Succession in Peace and Pine River Foot-hills; British Columbia Department of Mines and Petroleum Resources, Bulletin 51.
- 1967: Geology of the Pine Valley Mount Wabi to Solitude Mountain Northeastern British Columbia; British Columbia Department of Mines and Petroleum Resources, Bulletin 52.

Irish, E.J.W.,

- 1965: Geology of the Rocky Mountain Foothills, Alberta (between latitudes 53°15' and 54°15'); Geological Survey of Canada, Memoir 334.
- 1968: Structure of the Northern Foothills and Eastern Mountain Ranges, Alberta and British Columbia, (between latitudes 53°15' and 57°20'); Geological Survey of Canada, Bulletin 168.
- 1970: Halfway River Map - Area British Columbia; Geological Survey of Canada, Paper 69-11.

leNobel, D.N.,

- 1977: Coal Submittal; Gething - Dowling Creek Coal Licences. (private company memo)
- 1977: Bri Coal. (private company memo)
- 1977: 1977 Report of Exploration Activities on the East Mount Gething Property. (unpublished report)

Mathews, W.H.,

- 1947: Geology and Coal Resources of the Carbon Creek-Mount Bickford Map - Area; British Columbia Department of Mines, Bulletin 24.

McKechnie, N.D.,

- 1955: Coal Reserves of the Hasler Creek-Pine River Area; British Columbia Department of Mines, Bulletin 36.

McLearn, F.H., and Kindle, E.D.,

- 1950: Geology of Northeastern British Columbia; Geological Survey of Canada, Memoir 259.

Muller, J.E.,

- 1959: Geology, Pine Pass, British Columbia; Geological Survey of Canada, Map 11-1961

Roberts, N. Eric,

- 1977: Peace River Coal Project of Bow River Resources Ltd./Rainier Energy Resources Ltd. and Bri-Coal Mining Ltd. (unpublished report)

Stott, D.F.,

- 1960: Cretaceous Rocks between Smoky and Pine Rivers, Rocky Mountain Foothills, Alberta and British Columbia; Geological Survey of Canada, Paper 60-16
- 1961: Dawson Creek Map - Area, British Columbia; Geological Survey of Canada, Paper 61-10
- 1961: Type sections of some formations of the Lower Cretaceous Fort St. John Group near Pine River, British Columbia; Geological Survey of Canada, Paper 61-11
- 1963: Stratigraphy of the Lower Cretaceous Fort St. John Group and Gething and Cadomin Formations, Foothills of Northern Alberta and British Columbia; Geological Survey of Canada, Paper 62-39
- 1967: Fernie and Minnes Strata North of Peace River, Foothills of Northeastern British Columbia; Geological Survey of Canada, Paper 67-19 (Part A)
- 1968: Lower Cretaceous Bullhead and Fort St. John Groups, between Smoky and Peace Rivers, Rocky Mountain Foothills, Alberta and British Columbia; Geological Survey of Canada, Bulletin 152.
- 1969: Fernie and Minnes Strata North of Peace River, Foothills of Northeastern British Columbia; Geological Survey of Canada, Paper 67-19 (Part B)
- 1969: The Gething Formation at Peace River Canyon, British Columbia; Geological Survey of Canada, Paper 68-28.

APPENDIX III

COST STATEMENT

Note: represents a consolidation of the costs included in the Application to Extend the Term of Licence for Coal Licence Numbers 4129 to 4143 inclusive.

On-Property Costs

1) Operator's Fees, Salaries and Wages: Professional and Technical	\$ 6,650.40
2) Contractors and Consultants: Longyear Canada Ltd. (includes charges for direct drilling Costs, drill mud and additives, ex- penses for additional staff, etc.)	\$116,717.33
P. Demeulemeester (includes charges for slashing, clearing and construction of roads, drill sites, reclamation work)	\$ 13,528.00
3) Equipment and Instruments Used: Gearhart-Owen Model 3200 logging unit	\$ 4,479.00
4) Field Camp Costs:	
Food	\$ 1,867.55
Accommodation	\$ 4,181.76
Fuel	\$ 4,956.10
Other	\$ 150.00
5) Sampling, Analysis and Testing: Laboratory analysis of coal samples performed by Utah International Inc., Minerals Laboratory, Sunnyvale, California	\$ 1,380.00
Production of Gamma Ray and Density Logs:	\$ 8,958.00
6) Supplies and Material Costs:	
Operating and maintenance supplies	\$ 4,885.75
Office and technical supplies	\$ 716.98
Other supplies and materials	\$ 797.80

7) Transportation Costs:	
Bell 206B Jet Ranger from Maple Leaf Helicopters Ltd.	\$ 30,696.83
Bell 205 A-1 from Maple Leaf Helicopters Ltd.	\$ 18,658.88
Bell 204B from Maple Leaf Helicopters Ltd.	\$ 588.60
1-4 wheel drive Chevrolet Pick-up from Westminster Chev-Olds Leasing	\$ 2,463.70
8) Reclamation Work:	
Grass seed mixture supplied by Buckerfield's Seed Division	\$ 677.75
Total On-Property Costs	\$222,354.43

Off-Property Costs

a) Logistics and field support	\$ 1,500.00
b) Technical and feasibility studies	\$ 10,000.00
c) Preparation of reports	\$ 3,600.00
d) Supplies and services (drafting)	\$ 3,600.00
e) Mobilization and demobilization of equipment	\$ 209.00
f) Travelling expenses	\$ 727.26
Total Off-Property Costs	\$ 19,636.26
TOTAL PROJECT COSTS	<u>\$241,990.69</u>

APPENDIX IV

STATEMENT OF QUALIFICATIONS

I, DONALD NORMAN DUNCAN of #303-1985 Woodway Place,
Burnaby, British Columbia, do hereby certify that:

I am a graduate of the University of
British Columbia, with a Bachelor of
Science Degree in Geology, 1977.

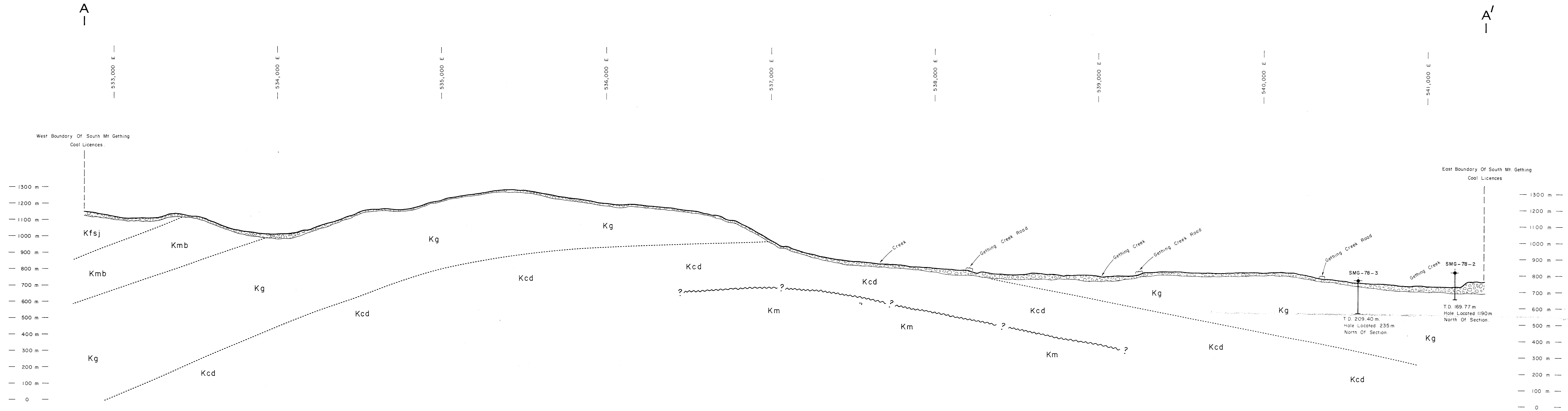
Since graduation I have been engaged
in Mineral and Coal Exploration in
British Columbia, the Yukon and Alaska
for Utah Mines Ltd.

I am a member of the Canadian Institute
of Mining and Metallurgy.

A handwritten signature in black ink that reads "D. N. Duncan". The signature is written in a cursive style with a large, looped initial "D".

Vancouver, B.C.

D.N. Duncan
Geologist



LEGEND

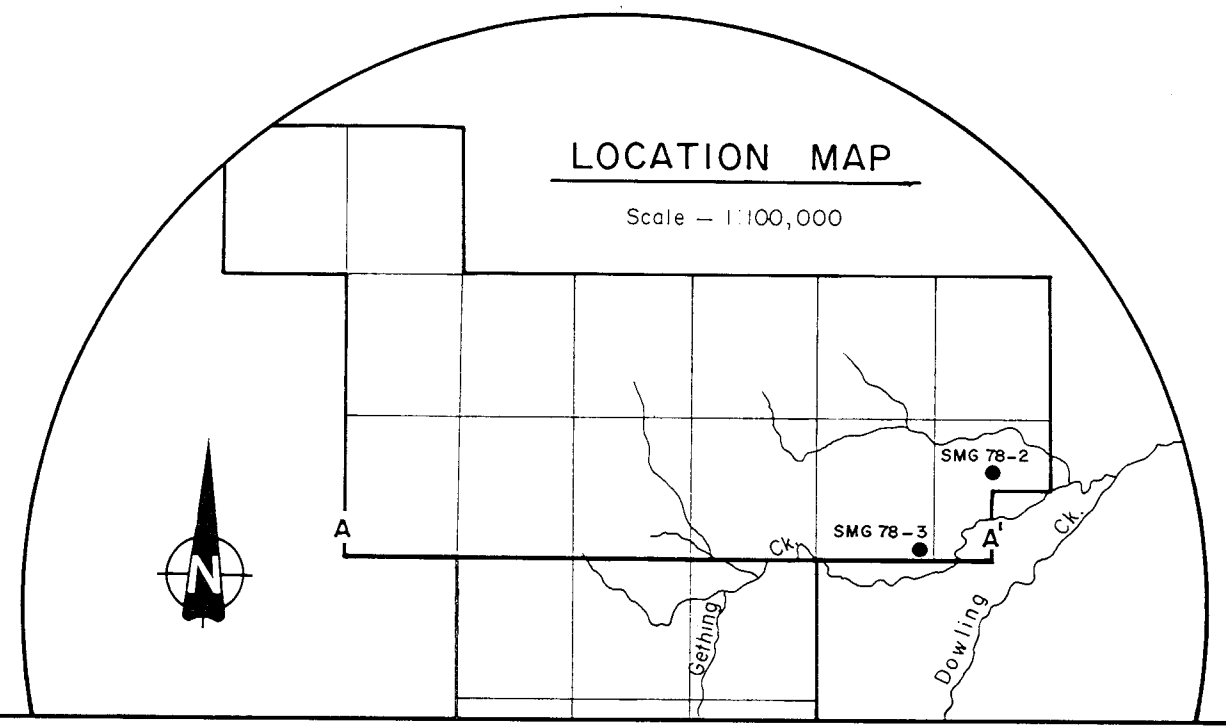
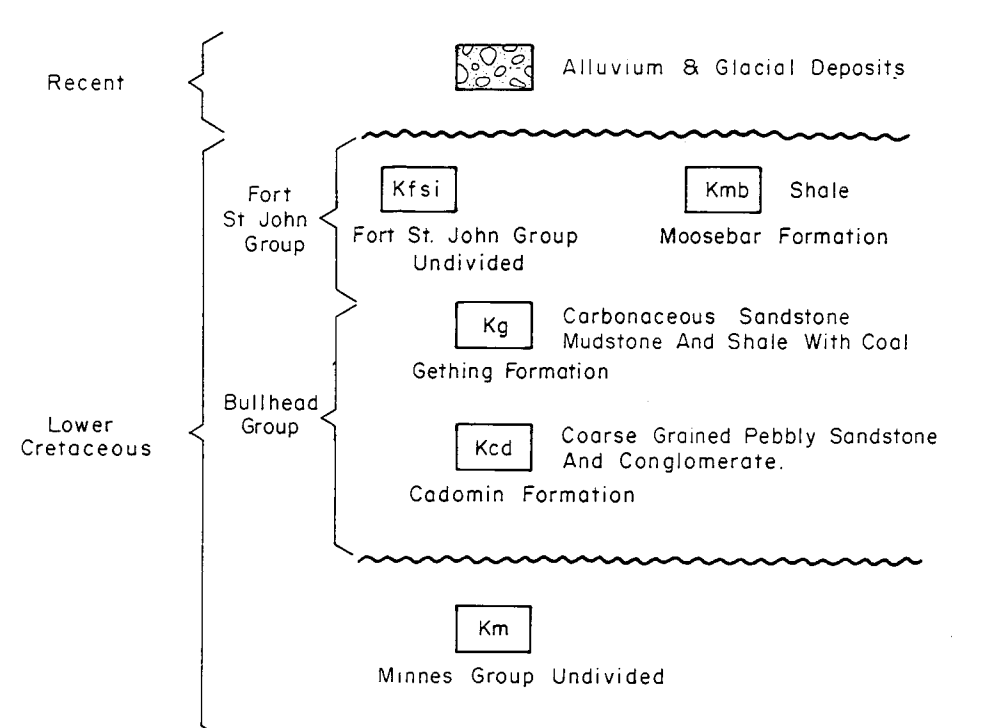


FIGURE - 6
PR- SOUTH MT GETHING 79(2)A

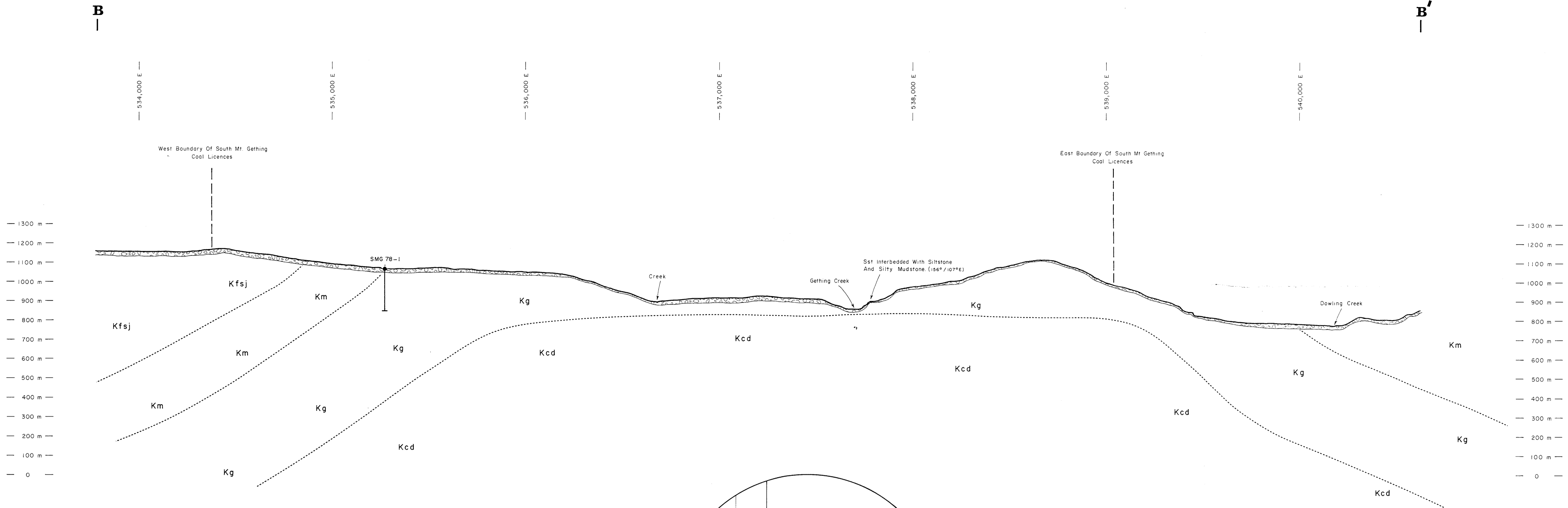
UTAH MINES LTD.
EXPLORATION DEPARTMENT
VANCOUVER BRITISH COLUMBIA

SOUTH MOUNT GETHING
EAST - WEST SECTION
@ 6,202,500 N (McElhanney Coordinates)

LOOKING NORTH

Work by: A. Armstrong	Date: March 1980	NTS Ref.
Drawn by: T. Drews	Revised:	Horizontal Scale - 1:10,000 Vertical Scale - 1:10,000

638



LEGEND

Recent		Alluvium And Glacial Deposits
Lower Cretaceous		Fort St. John Group
		Shale
		Moosebar Formation
		Carbonaceous Sandstone Mudstone And Shale With Coal Gething Formation
Lower Cretaceous		Bullhead Group
		Coarse Grained Pebbly Sandstone And Conglomerate Cadomin Formation

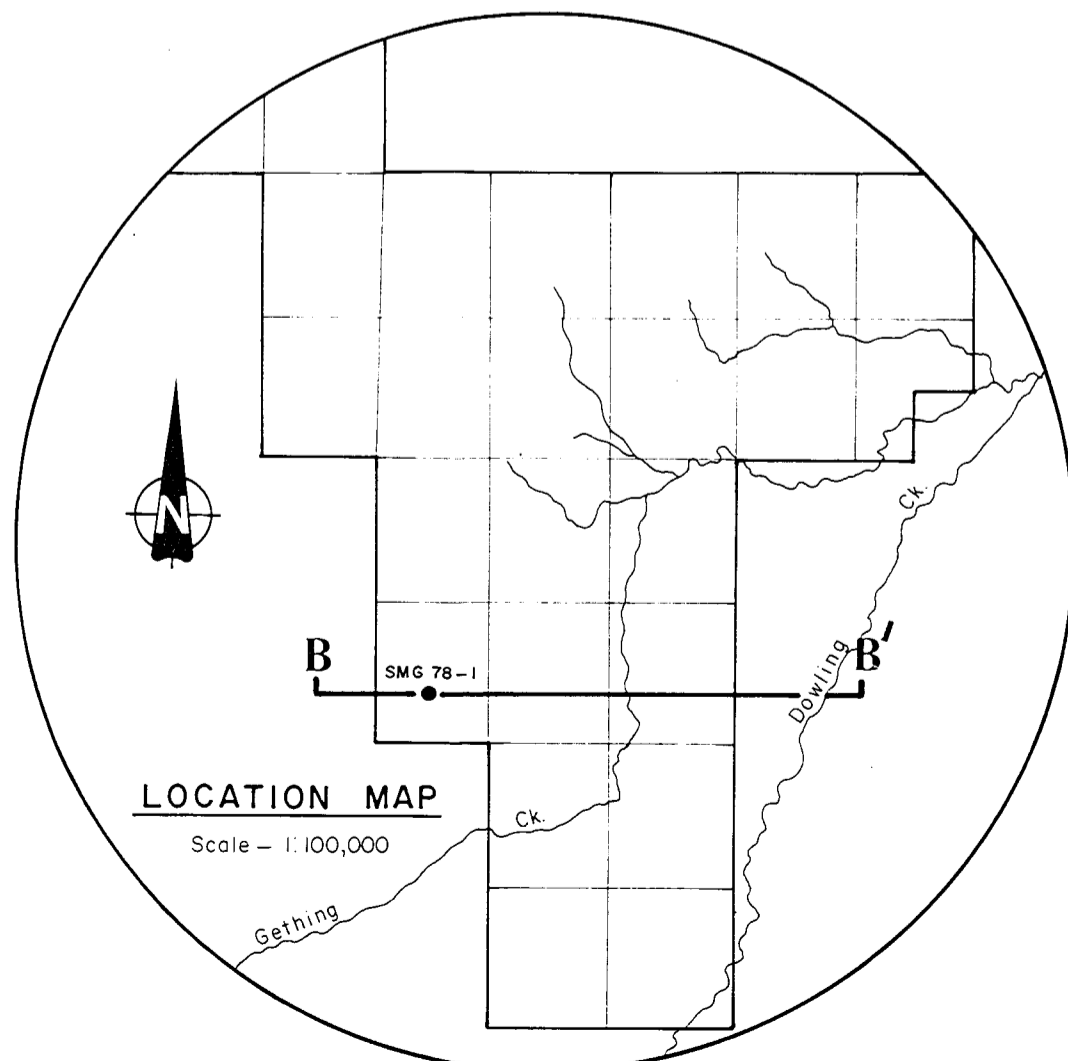


FIGURE - 7

DL-SOUTH MT GETHING 79(2)A

UTAH MINES LTD.
EXPLORATION DEPARTMENT
VANCOUVER BRITISH COLUMBIA

SOUTH MOUNT GETHING
EAST - WEST SECTION
@ 6,199,400 N (McElhanney Coordinates)
LOOKING NORTH

Work by: A. Armstrong	Date: March 1980	NTS Ref.
Drawn by: T. Drews	Revised:	Horizontal Scale - 1:10,000 Vertical Scale - 1:10,000

638

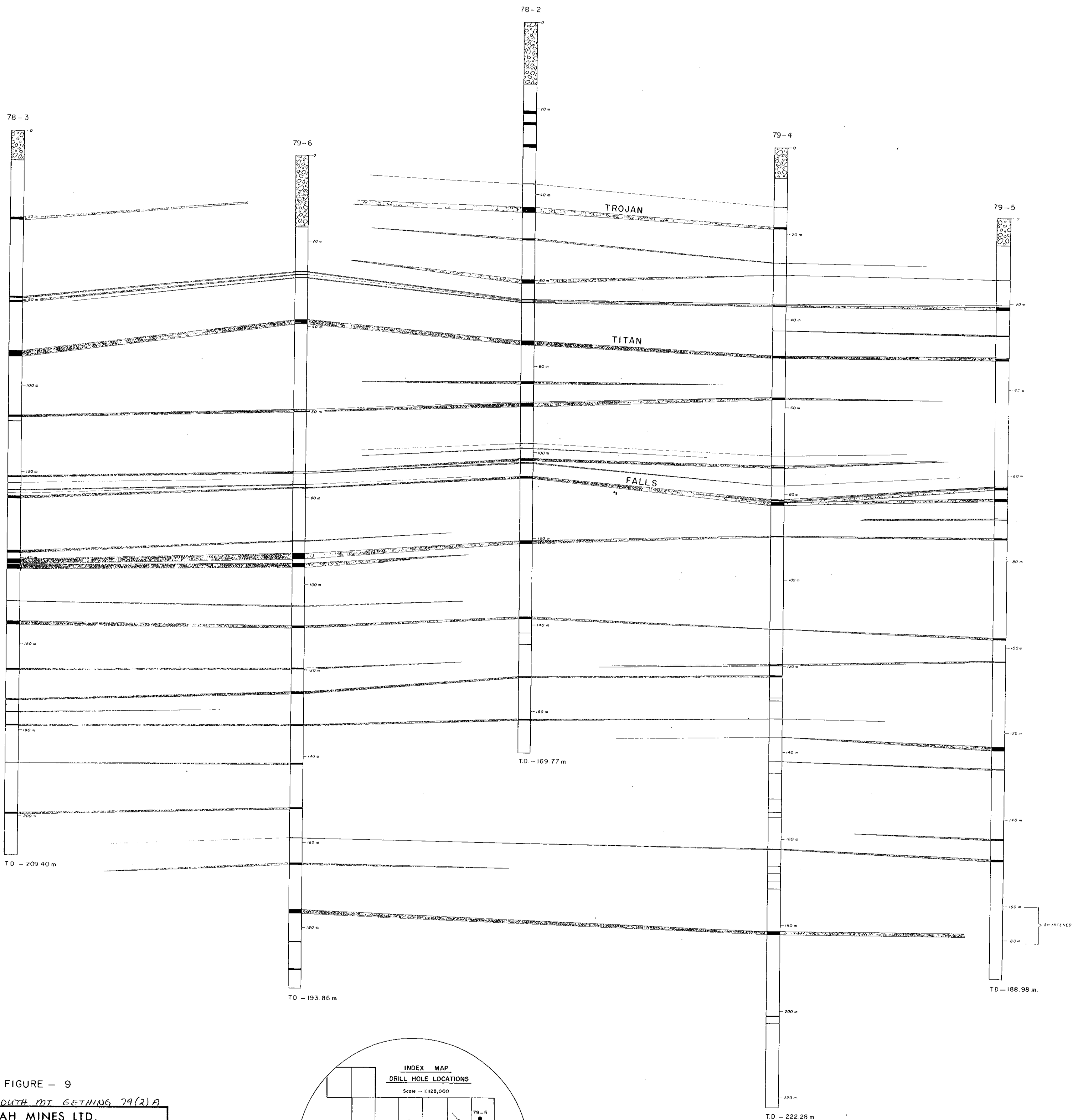
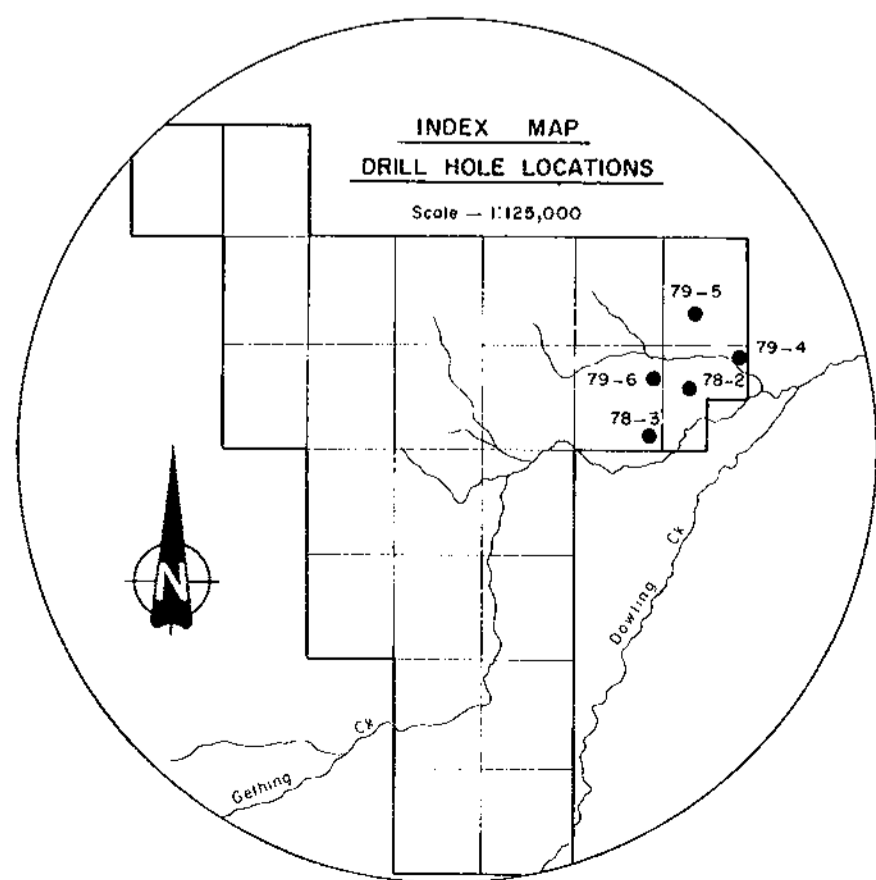


FIGURE - 9

PK - SOUTH MT GETHING 79(2)A

UTAH MINES LTD. EXPLORATION DEPARTMENT VANCOUVER BRITISH COLUMBIA		
SOUTH MT. GETHING PROPERTY		
TENTATIVE COAL SEAM CORRELATION Diamond Drill Holes SMG 78-2 & 3, SMG 79-4, 5 & 6		
Work by N. Duncan	Date February 1980	NTS Ref 93 0/16
Drawn by T. Drews	Revised	Vertical Scale - 1:480
SCALE IN FEET		



638

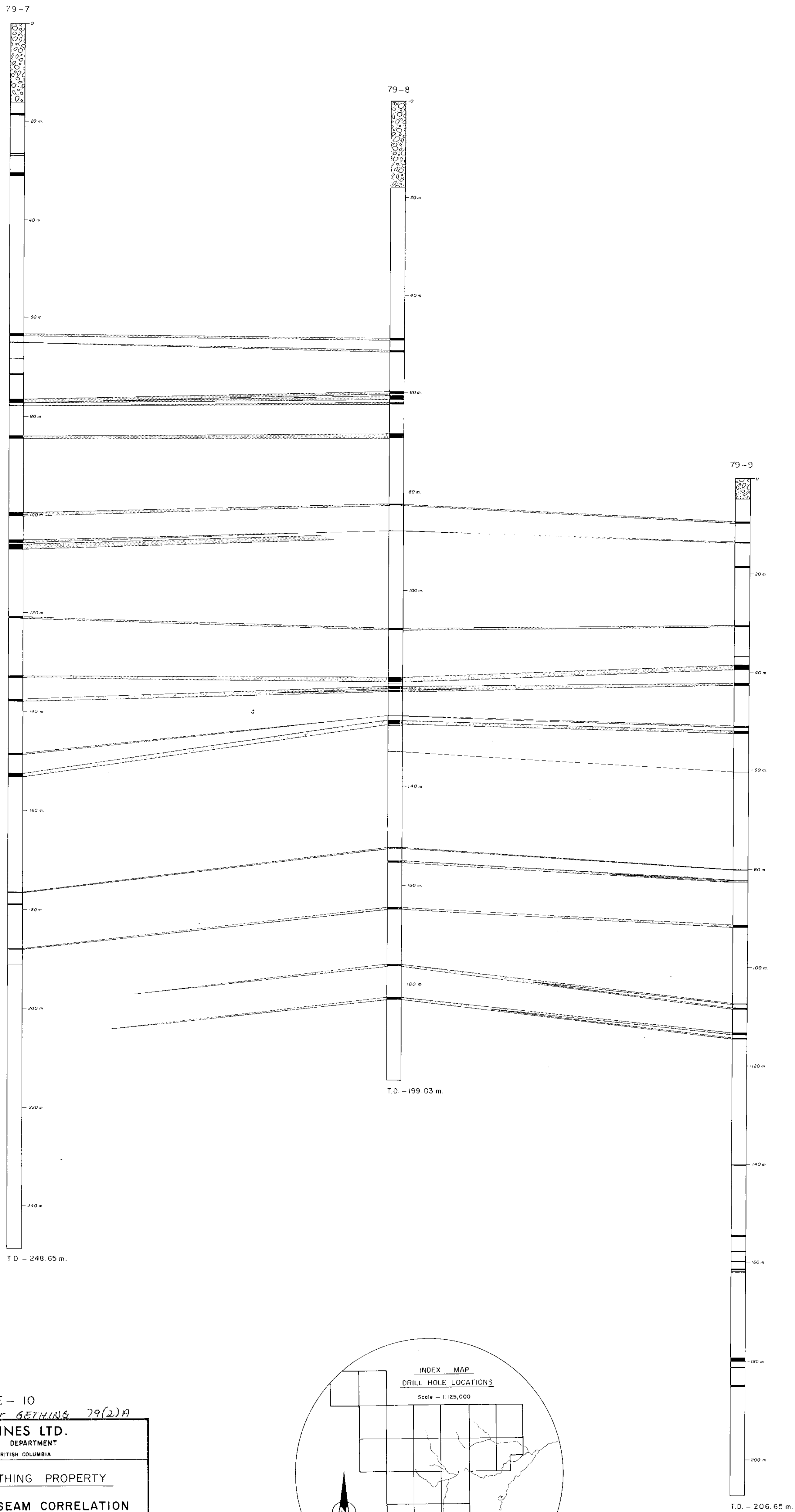
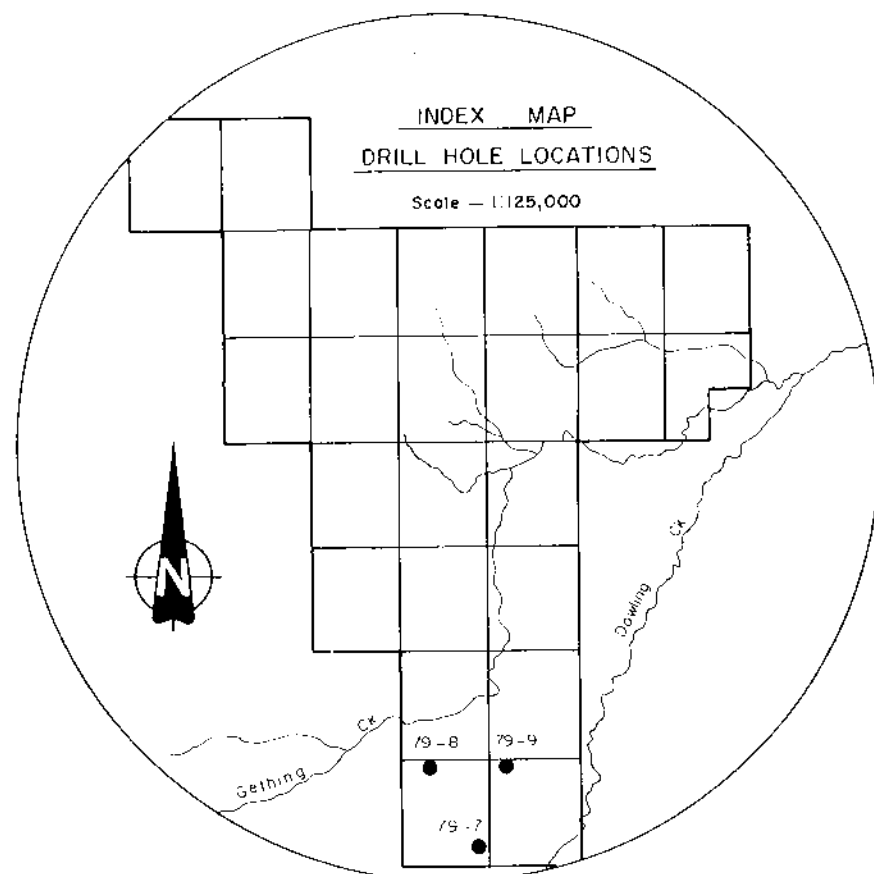


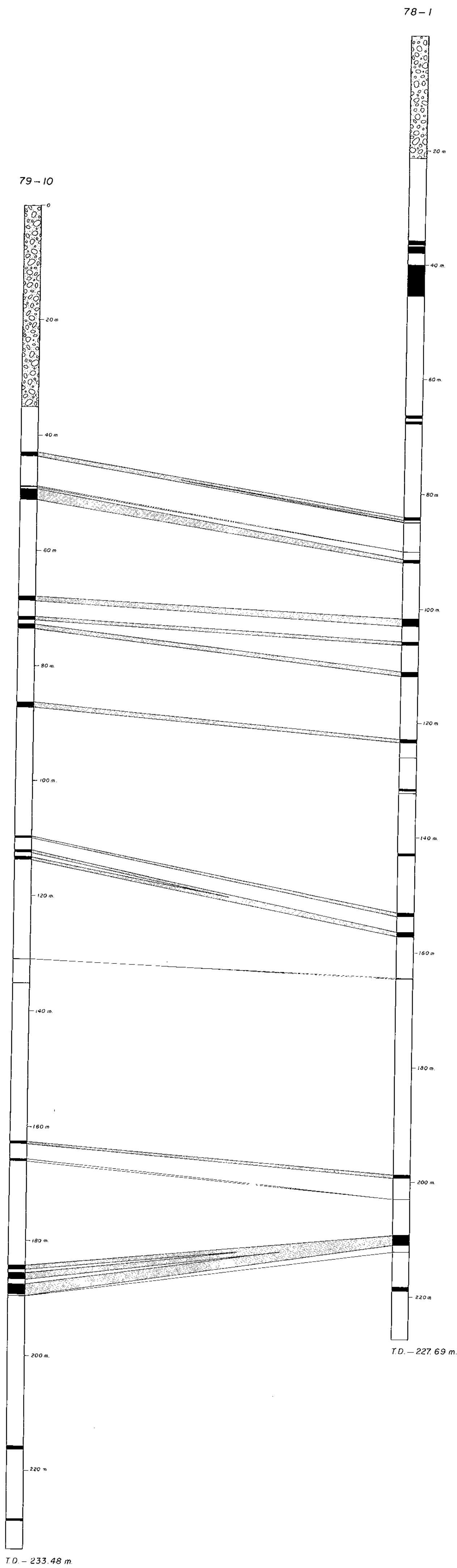
FIGURE - 10
PR-SOUTH MT GETHING 79(2)A

UTAH MINES LTD.		
EXPLORATION DEPARTMENT		
VANCOUVER BRITISH COLUMBIA		
SOUTH MT. GETHING PROPERTY		
TENTATIVE COAL SEAM CORRELATION		
Diamond Drill Holes - SMG 79-7, 8 & 9		
Work by: N. Duncan	Date: February 1980	NTS Ref. 93 0/16
Drawn by: T. Drews	Revised:	Vertical Scale - 1:480
SCALE IN FEET		



638

AS DRILLED



CORRECTED FOR DIP

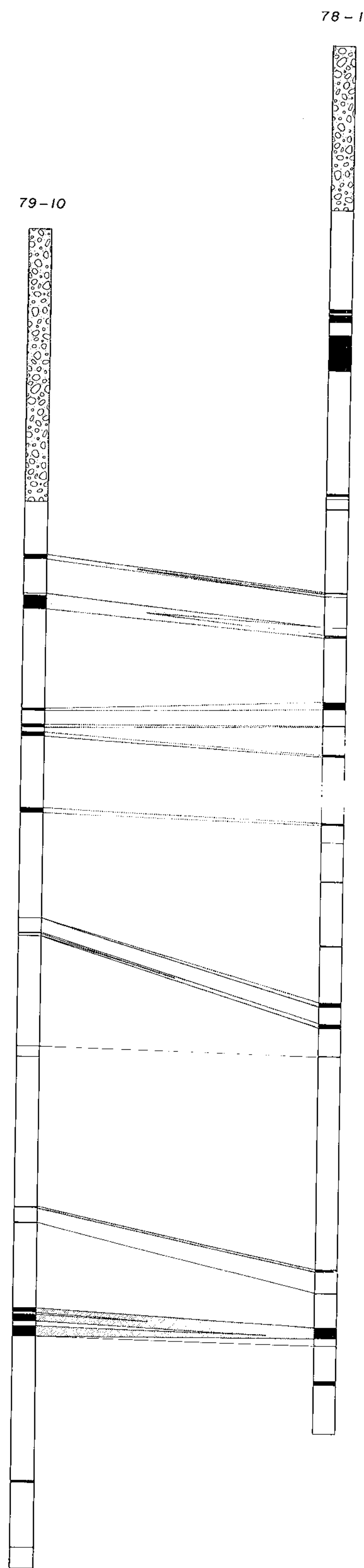
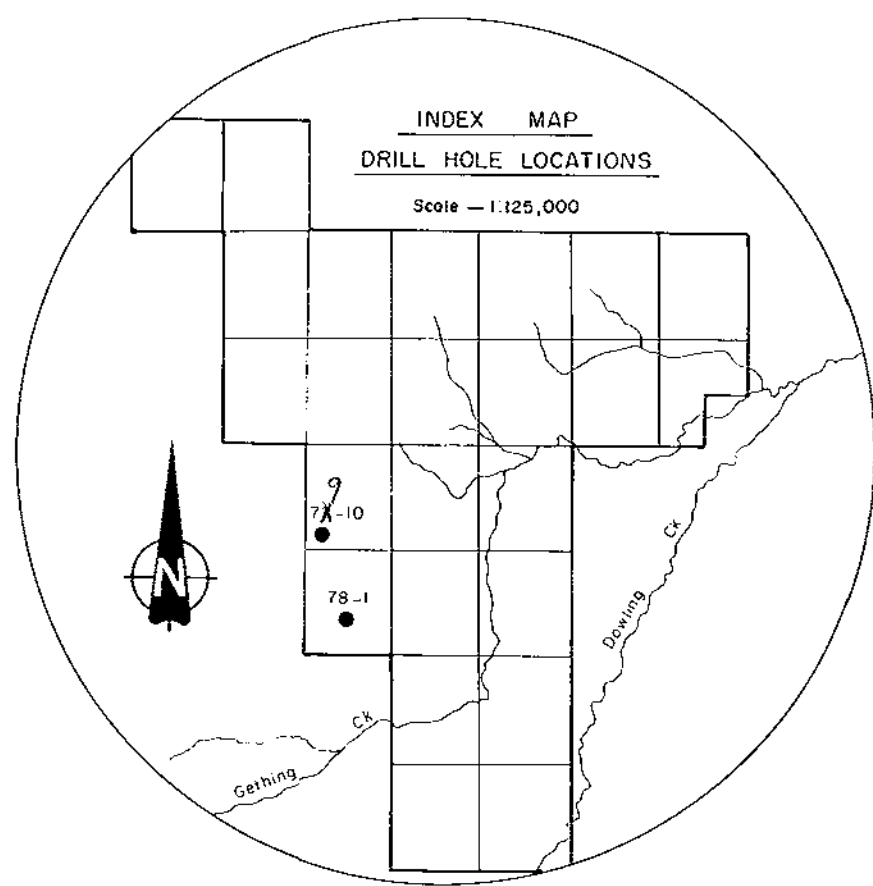


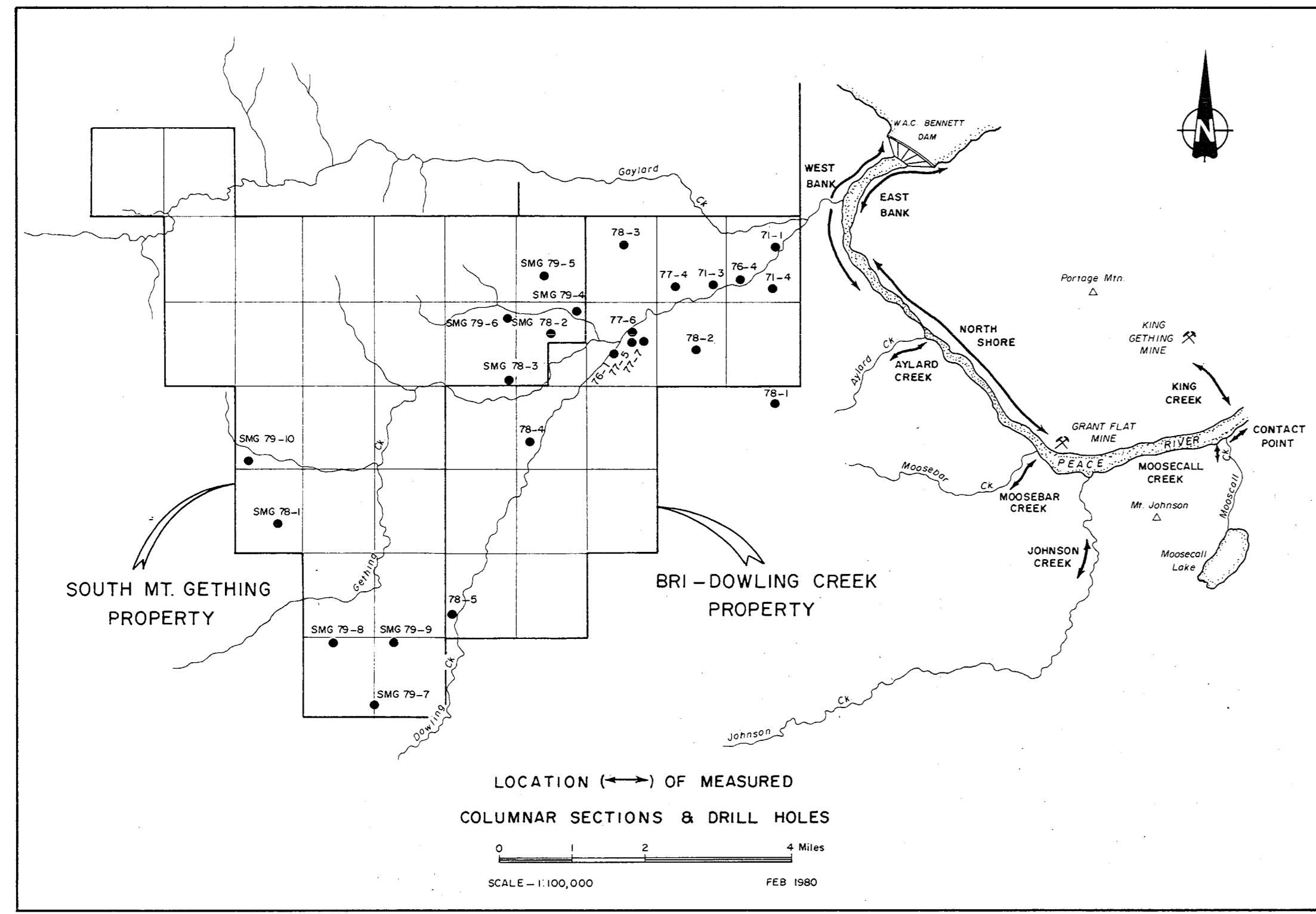
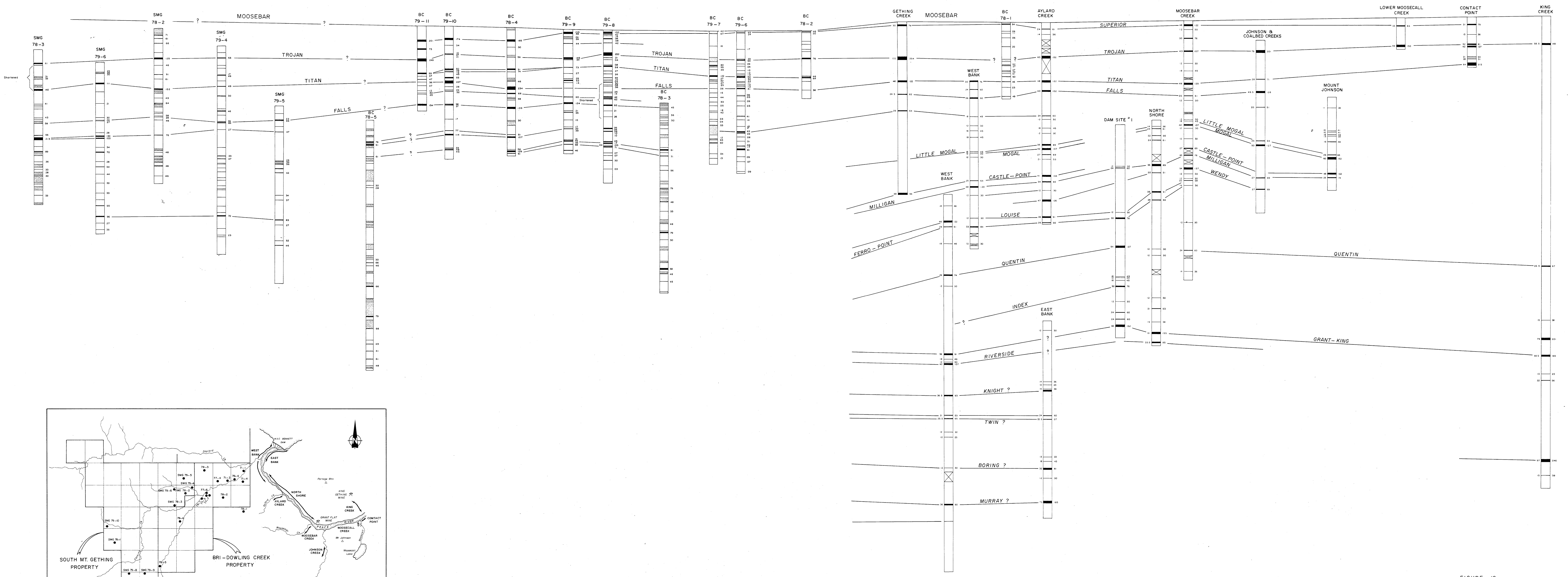
FIGURE - II
 Pt. SOUTH MT. GETHING 79(2)A

UTAH MINES LTD.		
EXPLORATION DEPARTMENT		
VANCOUVER BRITISH COLUMBIA		
SOUTH MT. GETHING PROPERTY		
TENTATIVE COAL SEAM CORRELATION		
Diamond Drill Holes - SMG 78-1 & 79-10		
Work by: N. Duncon	Date: February 1980	NTS Ref: 93 O/16
Drawn by: T. Drews	Revised:	Vertical Scale - 1:480
SCALE IN FEET		

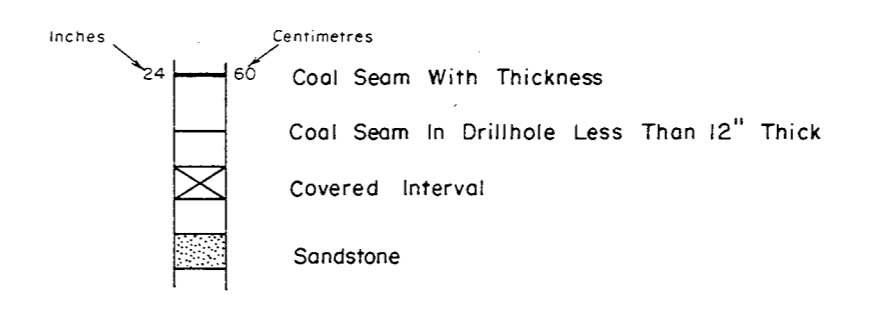


638

VERTICAL SCALE
 0
 100'
 200'
 300'
 400'
 500'
 600'
 700'
 800'
 900'
 1000'
 1100'
 1200'
 1300'
 1400'
 1500'
 1600'
 1700'
 1800'
 1900'
 2000'
 2100'



LEGEND



NOTES

1. Most Coal Seams in Outcrop Less Than 12 inches Have Been Omitted
2. Thickness for Seams in Drillholes Are Intersection Thicknesses

FIGURE-12
 PR. SOUTH MT. GETHING 79(2)A

UTAH MINES LTD.
 EXPLORATION DEPARTMENT
 VANCOUVER BRITISH COLUMBIA

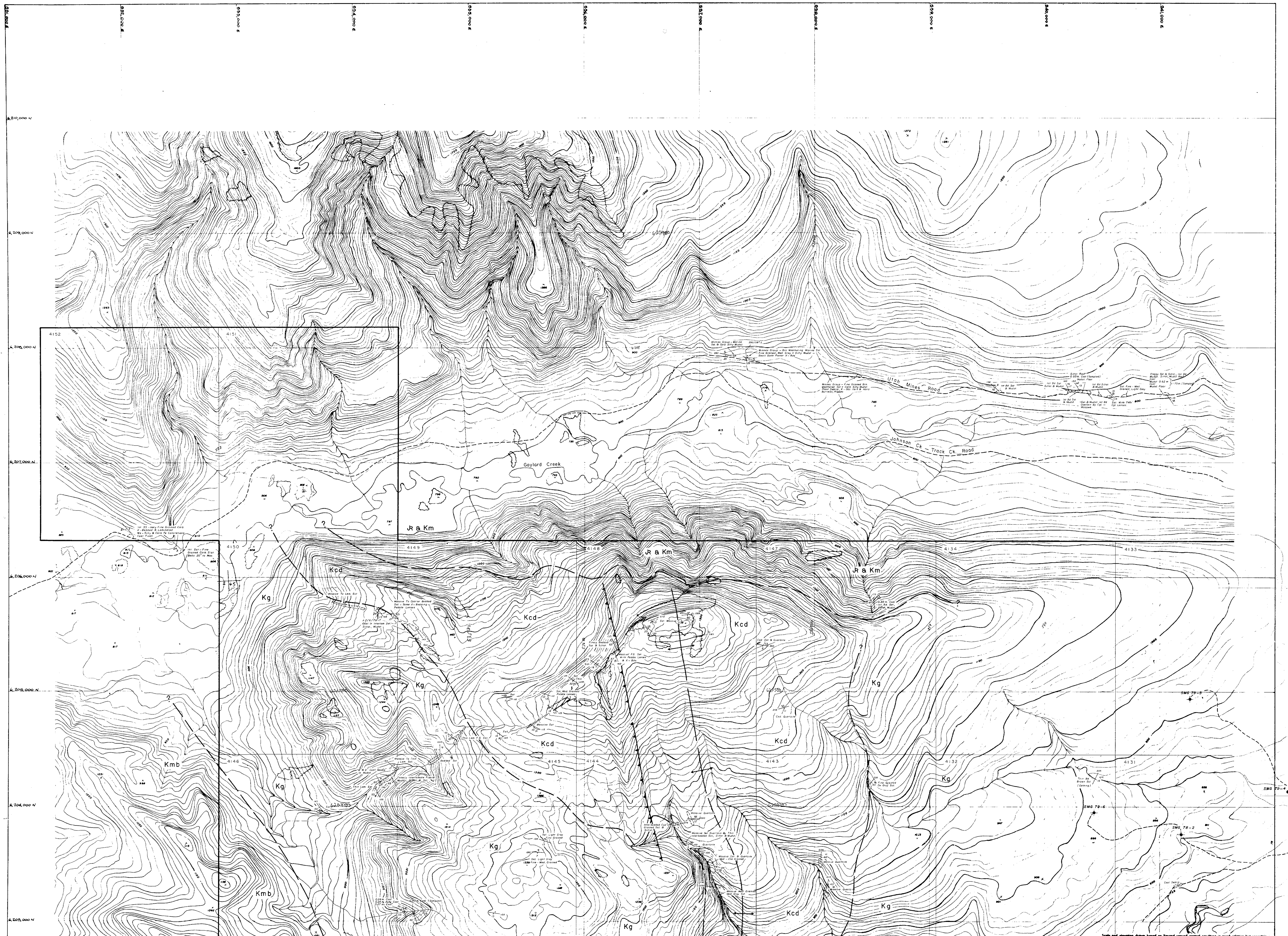
SOUTH MT. GETHING PROPERTY

TENTATIVE COAL SEAM CORRELATION
 BETWEEN DRILL HOLES
 AND MEASURED SECTIONS

Work by N. Duncan	Date February 1980	NTS Ref 93 O/16
Drawn by T. Drews	Revised	Vertical Scale - 1" = 100'

SCALE IN FEET

638



UTAH MINES LTD.
EXPLORATION DEPARTMENT
VANCOUVER BRITISH COLUMBIA

SOUTH MT. GETHING

BEDROCK GEOLOGY AND
DRILL HOLE LOCATIONS

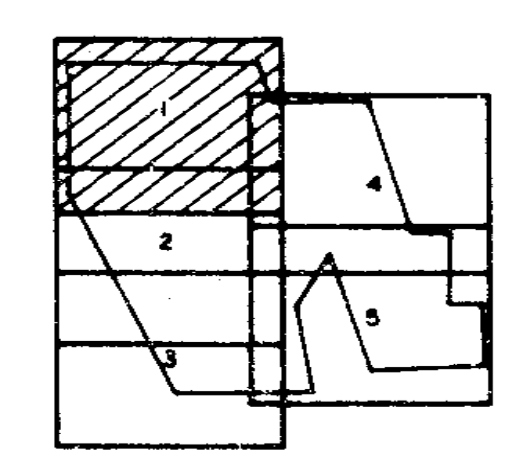
Work by: A. Armstrong Date: February 1979 MTS Ref: 532/16, 946/1
Drawn by: T. Dineen Revised: Scale: 1:10,000

MAP - I

638

LEGEND

- | | | | |
|------------------|---------------------|--------|--|
| Lower Cretaceous | Fort St. John Group | Kfj | Fort St. John Group - Undifferentiated |
| | | Kmb | Moosebar Formation |
| | | Kg | Getting Formation |
| | Bullhead Group | Kc | Cobadin Formation |
| Jurassic (?) | Mines Group | J & Km | Undifferentiated |
| Lower Cretaceous | | | |
-
- | | |
|--|--|
| | Geologic Contact |
| | Syncline |
| | Anticline |
| | (Outcrop) Strike And Dip Of Bedding |
| | Drill Hole Location |
| | Coal Outcrop, Measured Thickness Where Indicated |
| | Outcrop |
| | Access Road |
| | Coal Licence Number |



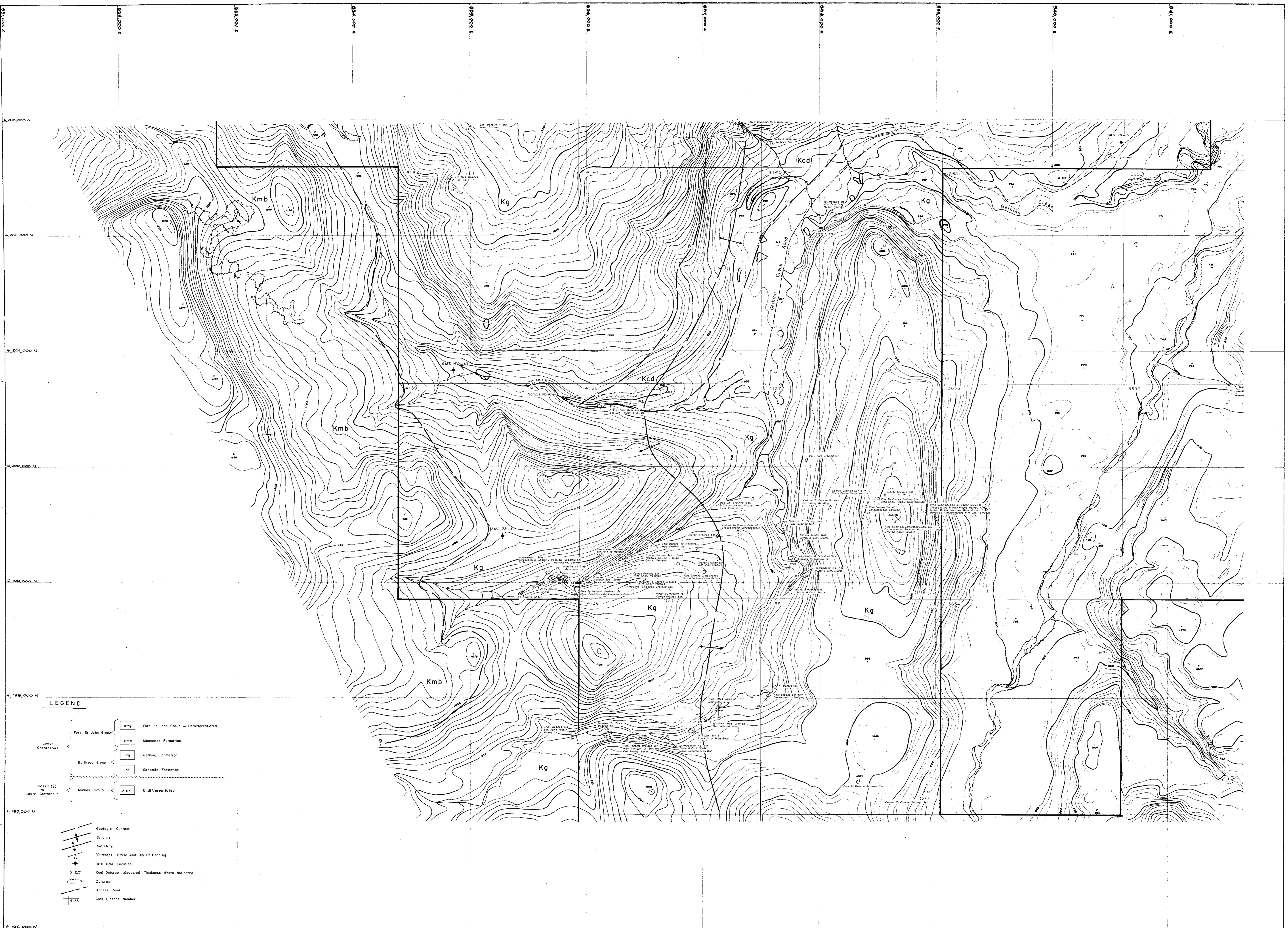
Scale and elevation datum based on nearest ground control resulting in good relative, but uncertain absolute, elevations. Compiled from aerial photographs at an approximate scale of 1 inch equals 5280 feet flown in 1970.

UTAH MINES

PRELIMINARY RECONNAISSANCE TYPE MAPPING

Scale: 1:10,000
Contour: 10 meters
Date: June 18, 1978
Job No.: 08298-4
Sheet No.: 1

McElhinney Surveying & Engineering Ltd.
1300 West Fender Street, Vancouver, B.C., Canada



LEGEND

Lower Cretaceous	Fort St John Group	(Kfs)	Fort St John Group - Undifferentiated
	Bullhead Group	(Kmb)	Moosebar Formation
		(Kg)	Gething Formation
Jurassic (?) to Lower Cretaceous	Minnes Group	(Kc)	Cadomin Formation
		(Kx & Km)	Undifferentiated

- Geologic Contact
- Syncline
- Anticline
- (Outcrop) Strike And Dip Of Bedding
- Drill Hole Location
- Coal Outcrop, Measured Thickness Where Indicated
- Outcrop
- Access Road
- Coal Licence Number

SOUTH MT. GETHING 75(2)A

UTAH MINES LTD.
EXPLORATION DEPARTMENT
VANCOUVER BRITISH COLUMBIA

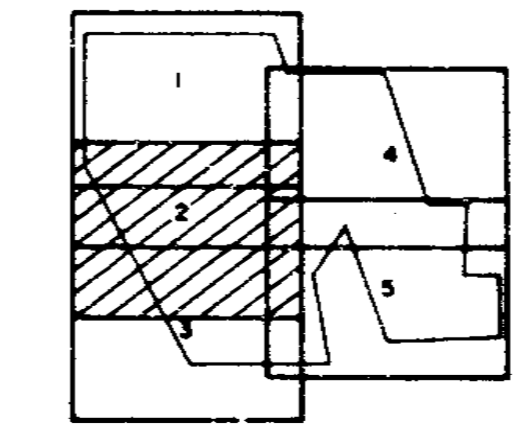
SOUTH MT. GETHING

**BEDROCK GEOLOGY AND
DRILL HOLE LOCATIONS**

Work by: J. Armstrong	Date: February 1978	NTS Ref: 93.0/6, 94.8/1
Drawn by: T. Drees	Revised:	Scale: 1:10,000

MAP - 2

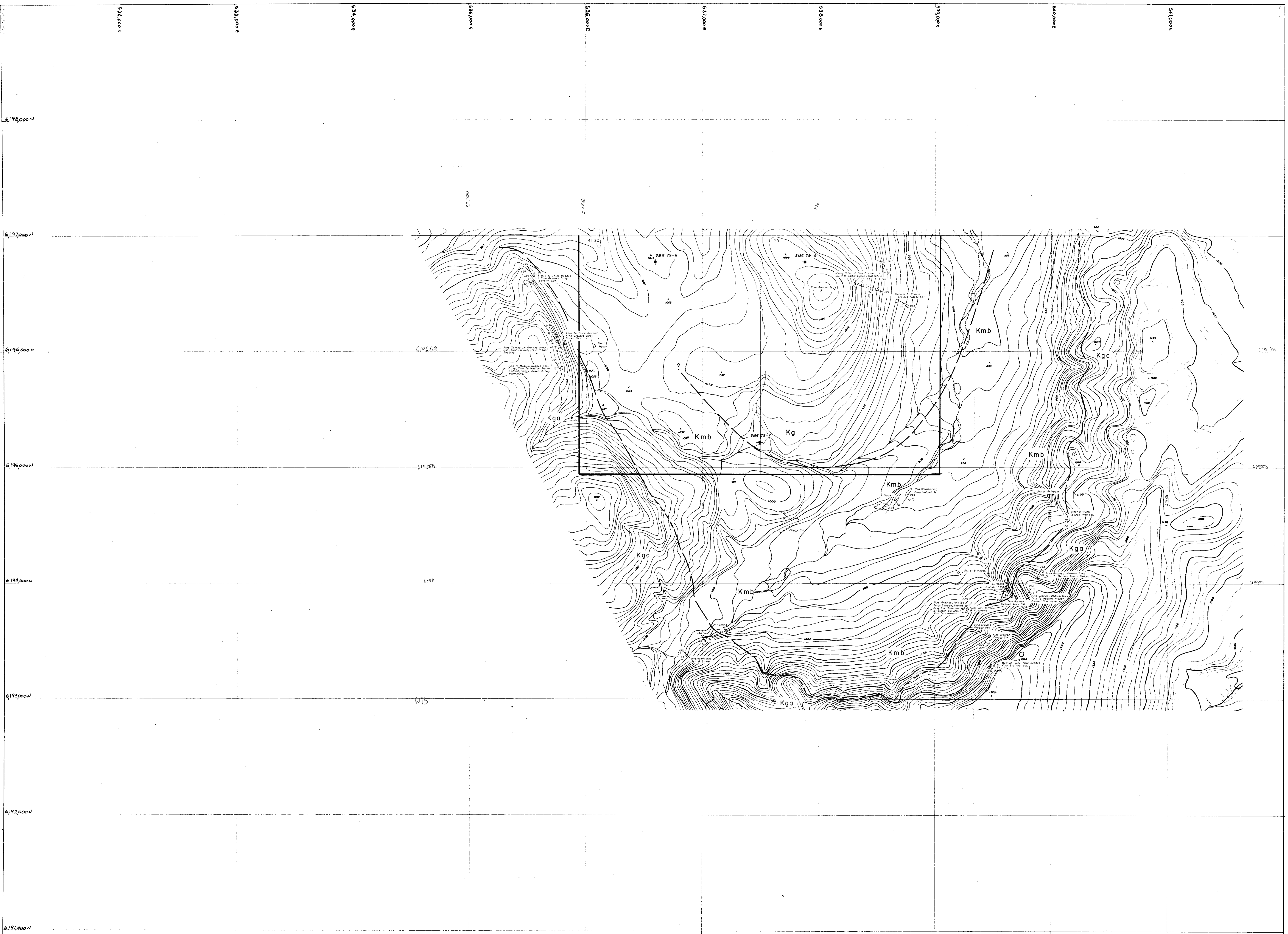
638



Scale and elevations shown based on limited ground control resulting in good relative, but uncertain absolute map accuracy. Contours from aerial photography at an approximate scale of 1 inch equals 5000 feet based on 1970 datum.

UTAH MINES	
PRELIMINARY RECONNAISSANCE TYPE MAPPING	
Scale: 1:10,000	Contour: 10 Metres
Date: June 16, 1978	Job No: 08298-4
1900 West Packer Street, Vancouver, B.C., Canada	Sheet No. 2

McElhenny Surveying & Engineering Ltd.



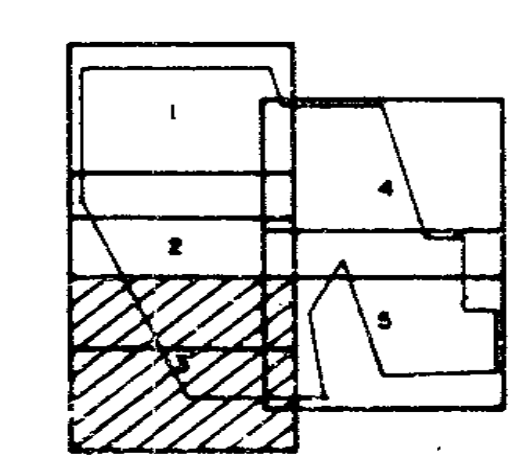
PE-SOUTH MT. GETHING 79(2)A
 UTAH MINES LTD.
 EXPLORATION DEPARTMENT
 VANCOUVER BRITISH COLUMBIA

SOUTH MT. GETHING
 BEDROCK GEOLOGY AND
 DRILL HOLE LOCATIONS

Work by: A. Armstrong Date: March 1979 NTS Ref: B3 Q/16, 94 B/
 Drawn by: T. Dreas Revised: Scale: 1:10,000

MAP - 3

638



UTAH MINES

PRELIMINARY RECONNAISSANCE TYPE MAPPING

Scale: 10,000
 Control: 10 stations
 Date: June 16, 1978
 Job No.: 28289-4
 Sheet No.: 3

McKENNEY Surveying & Engineering Ltd.
 1500 West Pender Street, Vancouver, B.C., Canada

BOREHOLE DATA
LOGS
OPEN

638

DRILL HOLE DATA

D.D.H. SMG-79-4:

A. WELL COMPLETION REPORT:

Location: - On a newly constructed access road (by Utah Mines Ltd) 462 metres from its junction with Canfor's Johnston Creek - Track Creek Road at Kilometre 42.23.
- McElhanney Coordinates: 6,204,135 m Nx542,115m E
- Coal Licence No. 4131

Elevation: 781 metres

Orientation: Vertical

Date Collared: May 18,1979

Date Completed: May 21,1979 Plugged: Yes

Overburden Depth: 7.62 metres

Casing Depth: 7.62 metres Casing Size: HW 4.5"-recovered

Final Depth: 222.28 metres

Formations Encountered: 0 to 7.62 m Overburden

7.62 to 222.28 m Gething Fm.

GEOLOGICAL BRANCH
ASSESSMENT REPORT

00 638

Core Description By: A.T. Armstrong and D.N. Duncan

Coal Seams Sampled:

<u>Sample No.</u>	<u>Seam Name</u>	<u>Interval</u>	<u>Thickness</u>	
			<u>Core</u>	<u>Density Log</u>
1	Trojan	18.92m to 19.45m	0.53	0.79m
2A		36.80m to 36.97m	0.17m	0.85m
2B		37.15m to 37.64m	0.49m	
3A	Falls	81.81m to 82.20m	0.39m	1.34m
3B	Falls	82.36m to 83.25m	0.89m	

Logs Run: Gamma and Density - by Utah Mines Ltd.

B. COMMENTS:

During the construction of drill site SMG-79-4 and its access road, all slashed timber was bucked into short lengths and buried under the right-of-way. The site was cleaned up after the removal of the drilling rig on May 21, 1979 and reclamation of the road and site was completed on July 13, 1979. Disturbed ground was sown with the grass seed mixture recommended by the Reclamation Branch of the British Columbia Ministry of Energy, Mines and Petroleum Resources for forested areas of the Northeast Coal Block.

Below 7.62 metres of overburden, D.D.H. SMG-79-4 penetrated 214.66 metres of Gething Formation sediments. The sedimentary sequence encountered is typical of the formation, consisting of often carbonaceous, interbedded and inter-laminated, fine to medium grained sandstones, siltstones,

mudstones, and coal. Many of the beds and laminae are mixtures of these components (eg. sandy siltstone, silty mudstone, etc.) The sedimentary sequence and textures are indicative of deposition in an alluvial flood plain environment.

The sandstones encountered in drilling the hole were generally fine grained, seldom massive with mudstone or siltstone laminations, commonly crossbedded and salt and pepper in colour. Sandstone beds became more abundant in the lower part of the drill hole. The mudstones and siltstones cored occurred most often as fine inter-laminations, often bioturbated by worm burrowing. The siltier mudstones and siltstones often displayed textural features such as ripple marks, cross lamination and graded bedding. Infrequently, the siltstones and mudstones contained pyrite nodules and disseminated pyrite, this could be indicative of a marine incursion into the area. When a coal seam occurred below these pyrite rich sediments, it commonly had a high pyrite content as well.

Bedding angles, measured from the vertical core axis, ranged from 75 to 85 degrees with the majority being in the 80 degree range. With many of the highly bioturbated units, it was difficult or impossible to determine bedding orientation. Fractures and calcite healed fractures were noted in only a few rock units, most commonly sandstone. Minor slickensides occurred in some mudstone units along carbonaceous surfaces.

Forty-two coal seams, ranging in thickness from 0.02 metres to 0.89 metres, were cored in D.D.H. SMG-79-4. Five seams were removed for analysis in three samples. Samples number 2 and 3 had mudstone splits of 0.18 metres and 0.16 metres respectively and were divided into two benches. Most of the seams cored were banded in appearance and many contained abundant vitrain. Canneloid coal was cored in eight seams, including the upper bench of sample number 3 seam (3A). Disseminated pyrite was observed in three seams, including the upper bench of sample number 2 seam (2A).

Head analyses conducted on the five samples taken from D.D.H. SMG-79-4 (See Appendix II) show considerable variation in coal quality. Volatile matter contents range from 17.0% to 21.3%, ash contents range from 2.70% to 22.81% and sulphur concentrations range from 0.66% to 0.96%. B.T.U. values varied from 11,150 B.T.U./lb. to 14,745 B.T.U./lb. with the lower values coming from samples with higher ash content. Free Swelling Indices ranged from 0 to 2 1/2.

A 1.4 specific gravity float separation conducted on each sample (See Appendix II) produced a better quality product. Ash contents were reduced to less than 4.8% for all the samples, while B.T.U. values were increased to greater than 14,670 B.T.U./lb. Sulphur concentrations in the separated fractions did not vary significantly from the Air Dried analyses. Free Swelling Indices were moderately improved in some of the samples, but the 0 to 2 1/2 range of values did not change for the samples as a whole.

A. WELL COMPLETION REPORT:

Location: - On a newly constructed access road (by Utah Mines Ltd.) 1,480 metres from its junction with Canfor's Johnston Creek-Track Creek Road at Kilometer 42.23.
- McElhanney Coordinates: 6,204,940m N x 541,260m E.
- Coal Licence No. 4133

Elevation: 920 metres

Orientation: Vertical

Date Collared: May 23, 1979

Date Completed: May 26, 1979

Plugged: No

Overburden Depth: 6.70 metres

Casing Depth: 6.70 metres

Casing Size: HW 4.5" - recovered

Final Depth: 188.98 metres

Formations Encountered: 0 to 6.70m Overburden
6.70m to 188.98m Gething Formation

Core Description by: A.T. Armstrong and J. Ridley

Coal Seams Sampled:

<u>Sample No.</u>	<u>Seam Name</u>	<u>Interval</u>	<u>Thickness</u>		
			<u>Core</u>	<u>Density</u>	<u>Log</u>
1A	Falls	20.64m to 20.87m	0.23m	1.37m	
1B	Falls	21.16m to 21.75m	0.69m		
2A		63.05m to 63.28m	0.23m	0.61m	
2B		63.36m to 63.90m	0.54m		

Logs Run: Gamma and Density - by Utah Mines Ltd.

B. COMMENTS:

Site SMG-79-5 was cleaned up, the mud sump refilled and the drill site and access road were levelled upon the removal of the drilling rig. All disturbed ground on the site and the access road were sown with the recommended grass seed mixture on July 14, 1979.

Below 6.70 metres of overburden, D.D.H. SMG-79-5 penetrated 182.28 metres of Gething Formation sediments. Mud, silt and sand components and mixtures of these components occurred as inter laminations and as discrete beds. Intercalated throughout this sequence of sediments were a number of coal seams of varying thickness, quality and physical character. Toward the bottom of the section cored by this hole the number and thickness of sandstone beds increased. Many of these sandstone units displayed prominent cross-bedding and foreset bedding, which is probably representative of deposition in a stream channel. The sediments and textures cored in this hole are typical of alluvial flood plain and deltaic environments of deposition.

Bedding angles, measured from the vertical core axis, ranged from 0 to 85 degrees. The steepest dip angles occurred toward the base of the drilled section. The pattern of bedding orientations from 150 metres to 180 metres below the collar suggests the presence of an S-shaped fold. Fracturing and calcite healed fractures were observed throughout the section. Small scale soft sediment folding was noted in mudstones and siltstones throughout the drilled section.

Nineteen coal seams, ranging in thickness from 0.02 metres to 0.83 metres were cored in D.D.H. SMG-79-5. Of these, two seams were removed for analysis. Sample number 1 comprised two benches (1A and 1B) separated by an 0.29 metre mudstone split. Sample 1A was a dull, canneloid coal with abundant pyrite at the base while sample number 1B was dull and ashy at the top, changing to banded durain and vitrain at the base of the seam. Sample number 2 also comprised two benches (2A and 2B) with a mudstone split 0.08 metres thick separating the benches. Sample number 2A was dull and canneloid at the top, becoming brighter, cleated and pyritic toward the base. Sample number 2B was a dull coal with a few bright vitrain streaks throughout the seam.

Head analysis conducted on the coal core samples taken from D.D.H. SMG-79-5 show considerable variation in the qualities of the samples. The volatile matter content of the samples range from 18.50% to 26.70%. B.T.U. values, which range from 10,011 B.T.U./lb. to 14,569 B.T.U./lb.

are inversely proportional to ash contents, which range from 4.00% to 29.4%. Sulphur analyses range from 0.77% to 0.96% and Free Swelling Indices range from 0 to 3.

Single gravity tests at 1.4 specific gravity were conducted on all of the samples. The resulting floats all showed a marked decrease in ash content with a corresponding increase in B.T.U.'s. Sulphur contents of the samples were not significantly reduced, which seems to indicate that the majority of the sulphur is inherent to the coal. Volatile matter content remained relatively constant and F.S.I. values were not improved.

D.D.H. SMG-79-6

A. WELL COMPLETION REPORT

Location: - On a newly constructed access road (by Utah Mines Ltd.)
1,079 metres from its junction with drill site SMG-78-2
- McElhanny coordinates: 6,203,950m Nx 540,428m E
- Coal Licence No. 4132

Elevation: 894 metres

Orientation: Vertical

Date Collared: May 28, 1979

Date Completed: May 31, 1979 Plugged: No

Overburden Depth: 16.76 metres

Casing Depth: 17.37 metres Casing Size: HW 4.5" -
recovered

Final Depth: 193.85 metres

Formations Encountered: 0 to 16.76m Overburden
16.76m to 193.85m Gething Formation

Core Description By: A.T. Armstrong and J. Ridley

Coal Seams Sampled:

<u>Sample No:</u>	<u>Seam Name</u>	<u>Interval</u>	<u>Thickness</u>	
			<u>Core</u>	<u>Density Log</u>
1A	Titan	38.40m to 39.20m	0.80m	0.60m
1B	Titan	39.32m to 39.52m	0.20m	0.30m
2		92.73m to 94.07m	1.30m	1.00m
3		94.97m to 95.97m	1.00m	0.75m
4		109.40m to 110.10m	0.70m	0.68m
5		175.57m to 176.53m	0.96m	0.90m

Logs Run: Gamma and Density - by Utah Mines Ltd.

B. COMMENTS:

Site SMG-79-6 and the access road leading to it, were cleaned up, levelled and the mud sump refilled upon the removal of the drilling rig. Disturbed soil areas at the site and access road were sown with the recommended grass seed mixture on July 31, 1979.

Below 16.76 metres of overburden, 177.09 metres of Gething Formation sediments were penetrated. The sedimentary sequence cored in the drill hole is typical of the formation, including sandstones, siltstones, mudstones, and coal seams. Many of the individual units are mixtures of these components (eg. muddy siltstone, silty sandstone, etc.). The rock units are typically interbedded to interlaminated. Soft sediment deformation and bioturbation often destroy the laminations in the rocks. The

sandstone units encountered in the core are typically fine grained and salt and pepper in colour. Toward the base of the cored section, the sandstone units become thicker, more abundant and tend to be coarser grained. Sedimentary textures observed in the sandstones include graded bedding, cross bedding, ripple marks and trough and festoon cross bedding. Silty mudstone and siltstone laminae commonly exhibit cross bedding and graded bedding. The sediments and sedimentary textures and structures present in the sediments are indicative of deposition in an aggrading alluvial flood plain environment.

Bedding angles, measured from the vertical core axis, range from 65 to 80 degrees, with the average bedding angle being 80 degrees. Fracturing and calcite veins were observed in a few sections of the core. Most of the fracturing and movement along slip surfaces appears to have been confined to the coal seams, especially those in the upper part of the drilled section, which have been highly broken. Calcite veinlets were most abundant toward the top of the section where they appeared to heal fractures. Strong breakage of the coal seams in the upper part of the section seriously affected the recovery of coal in the core. In some instances, all the coal in the section may have been lost upon drilling.

In total, twenty-six coal seams, ranging in thickness from 0.04 metres to 1.30 metres, were cored in D.D.H. SMG-79-6. Six seams were removed for analysis. Sample number 1 consisted of two benches, A and B, separated by a 0.12 metre

mudstone split. Most of the coal seams observed in the core were composed of vitrain and durain with minor fusain. Cleating was poor in most seams, however the highly broken nature of the seams could have disguised the cleat. Canneloid coal was cored in sample number 5 toward the top of the coal seam. Sample number 5 also had a highly pyritic zone in the middle of the seam.

Head analyses, conducted on the six samples taken from D.D.H. SMG-79-6, show considerable variation in coal quality. Volatile matter contents for the coal seams sampled range from 18.90% to 22.50%. Ash contents range from 1.79% to 28.20% and are inversely proportional to B.T.U. values, which range from 10,769 B.T.U./lb. to 14,600 B.T.U./lb. Sulphur analyses range from 0.71% to 0.95%. An interesting result of the sulphur analyses is the low sulphur content of sample number 5 (0.75% sulphur), which has a strongly pyritic zone in the middle of the seam. Free Swelling Indices range in value from 0 to 1 1/2, with the average value being 1.

Single gravity tests at 1.4 specific gravity were conducted on all the samples except 1B, which was included in sample 1AB. In every case except sample number 2, the ash content of the coal was significantly reduced. B.T.U. values increased in all the samples, while sulphur values were not significantly altered, with the exception of sample number 1AB, which increased in sulphur content from 0.71% to 1.00%. Volatile matter contents were not significantly changed, F.S.I. values did not change radically, with the exception of sample numbers 1A and 1AB, which were increased to 3 from 1 and 1 1/2 respectively.

D.D.H. SMG-79-7

A. WELL COMPLETION REPORT

Location: - In the drainage valley of an east
flowing tributary of Dowling Creek,
near the southern property boundary.
- McElhanney Coordinates: 6,195,220m
' Nx 537,497m E
- Coal Licence No. 4130

Elevation: 973 metres

Orientation: Vertical

Date Collared: June 4,1979

Date Completed: June 8,1979 Plugged: No

Overburden Depth: 15.85 metres

Casing Depth: 16.46 METRES Casing Size: HW 4.5"-
recovered

Final Depth: 248.72 metres

Formations Encountered: 0 to 15.85 m Overburden
15.85m to 248.72 m Gething Formation

Core Description By: J. Ridley and A.T. Armstrong.

Coal Seams Sampled:

<u>Sample No.</u>	<u>Seam Name</u>	<u>Interval</u>	<u>Thickness</u>	
			<u>Core</u>	<u>Density Log</u>
1		30.22m to 30.89m	0.67m	0.55m
2		62.70m to 63.25m	0.55m	0.60m
3A		76.08m to 76.65m	0.57m	0.60m
3B		76.72m to 76.87m	0.15m	0.20m
4		83.58m to 84.18m	0.60m	0.80m
5		99.36m to 100.04m	0.68m	0.75m
6		104.92m to 105.46m	0.54m	0.40m
7A		105.89m to 105.94m	0.05m	
7B		105.98m to 106.25m	0.27m	1.05m
7C		106.30m to 106.82m	0.52m	
7D		106.88m to 106.97m	0.09m	
8		152.24m to 153.00m	0.76m	1.85m
9		137.24m to 137.77m	0.53m	0.47m

Logs Run: Gamma and Density - by Utah Mines Ltd.

B. COMMENTS:

Site SMG-79-7 was a helicopter accessible site. The site, which measured approximately 50m x 100m, was slashed and all felled timber was limbed and bucked into four foot lengths or less. Upon the completion of drilling, the site was cleaned up and seeded with the recommended grass seed mixture. Grass seed was dispersed only in areas where the ground had been disturbed by drilling activities.

Below 15.85 metres of overburden, D.D.H. SMG-79-7 penetrated 232.87 metres of typical Gething Formation sediments. The sedimentary sequence cored consisted of interlaminated and interbedded sandstones, siltstones, mudstones and coal seams. Many individual units were mixtures of the above components. Bioturbation of some units completely destroyed all evidence of previous sedimentary textures. The sandstones observed in the core were typically fine to medium grained and salt and pepper in appearance, with many units exhibiting pronounced cross bedding and current ripple laminations. One sandstone unit (from 44.08m to 55.8m below the collar) contained bands of pebbles up to 0.05 metres in diameter, numerous small, lensoidal vugs with fine calcite deposited on the walls, and calcite lined and healed fractures and brecciated zones. Toward the middle of the section, several conglomeratic units were observed, containing highly angular rip-up clasts of sandstone and siltstone in a muddy-silty matrix. One muddy coal seam, at 71.32m to 71.59m below the collar, contained what appeared to be bands of volcanic ash.

Bedding angles, measured from the vertical core axis, vary from 65 to 73 degrees with flatter lying strata occurring in the basal portion of the drill hole. Abundant calcite healed fractures and brecciated zones, and shear zones occur in the upper portion of the cored section. This may be related to the generally steeper dips encountered in the coal seams, which seem to preferentially accommodate movement parallel to bedding.

Twenty-six coal seams, ranging in thickness from 0.04m to 0.79 metres, were intercepted in D.D.H. SMG-79-7. Thirteen samples were removed from the core for analysis. Samples numbered 3B and 7A,B, and D were too thin to be analysed individually and were combined with samples 3A and 7C respectively. Sample number 3 seam contained a 0.07 metre mudstone split and was divided into two benches. Sample number 7 seam contained three mudstone splits and was divided into four benches. Most of the coal seams observed were banded and well cleated, with four seams containing shear zones with slickensides. Calcite veinlets were observed in one thin coal seam toward the top of the drilled section.

Head analyses conducted on the 13 samples show a wide variation in coal quality from seam to seam. Volatile matter contents for the samples range from 19.72% to 28.22%. B.T.U. values range from 7,444 B.T.U./lb. to 14,095 B.T.U./lb. and are inversely proportional to ash contents, which range from 6.00% to 45.67% (the highest ash content is from sample number 7ABCD, which included the mudstone splits). Sulphur analyses range from 0.65% to 2.33% with four seams having greater than 1.00% sulphur. F.S.I. values range from 0 to 3 1/2, with 12 of the samples having values of 1 or less.

Single gravity tests at 1.4 specific gravity were conducted on all of the samples. In all of the samples, ash content was markedly reduced and the B.T.U. values were enhanced in the float fraction. In most samples volatile matter and

sulphur contents were not significantly changed. However, samples number 2 and 7ABCD showed a significant decrease in sulphur content in the float fractions. F.S.I. values were generally increased, especially in sample number 8 which increased in value from 3 1/2 to 7.

D.D.H. SMG-79-8

A. WELL COMPLETION REPORT

Location: -On a ridge between two north flowing tributaries of Gething Creek, near the southwestern boundary of the property.

-McElhanney Coordinates: 6,196,770m

Nx 536,595m E

-Coal Licence No. 4130

Elevation: 1011 metres

Orientation: Vertical

Date Collared: June 11, 1979

Plugged: No

Date Completed: June 15, 1979

Overburden Depth: 17.68 metres

Casing Size: HW 4.5" - recovered

Casing Depth: 17.68 metres

Final Depth: 199.03 metres

Formations Encountered: 0 to 17.68m Overburden
17.68m to 199.03m Gething Formation

Core Description By: A.T. Armstrong and J. Ridley

Coal Seams Sampled:

<u>Sample No.</u>	<u>Seam Name</u>	<u>Interval</u>	<u>Thickness</u>	
			<u>Core</u>	<u>Density Log</u>
1A		59.73m to 60.14m	0.41m	0.40m
1B		60.43m to 61.39m	0.96m	0.95m
2		68.29m to 69.17m	0.88m	0.85m
3A		117.54m to 118.47m	0.93m	1.05m
3B		118.76m to 118.88m	0.12m	0.15m
4A		119.31m to 119.81m	0.50m	0.45m
4B		120.01m to 120.43m	0.42m	0.20m
5A		126.21m to 127.14m	0.93m	1.20m
5B		127.25m to 127.31m	0.06m	

Logs Run: Gamma and Density - by Utah Mines Ltd.

B. COMMENTS

Site SMG-79-8 was a helicopter accessible site, measuring approximately 50m x 100m. The site was slashed with all felled trees limbed and bucked to four foot or shorter lengths. The site was cleaned up after the drill was removed and the approved grass seed mixture was dispersed where the ground had been disturbed by drilling activities.

Below 17.68 metres of overburden, D.D.H. SMG-79-8 penetrated 181.35 metres of Gething Formation strata. The sediments cored were typical of the Gething Formation: interlaminated and interbedded sandstones, siltstones,

mudstones and coal seams. Frequently, mixtures of the above components were observed within the section cored. Bioturbation, in the form of worm burrows, and soft sediment deformation in many cases obscured or totally destroyed layering in individual units. Carbonaceous debris and coaly streaks were commonly observed on the bedding planes of many units.

The abundant sandstone units encountered in the drilled section were generally fine to medium grained. One sandstone unit containing pebble bands, with pebbles ranging up to 0.02 metres in diameter, was observed in the upper part of the section. This sandstone unit was very similar in composition to the pebbly sandstone unit observed in the upper part of D.D.H. SMG-79-7. Abundant pyrite nodules were observed in close association with the pebble bands.

Bedding angles, measured from the vertical core axis, ranged from 62 to 75 degrees in D.D.H. SMG-79-8. The steeper angles may have been measured on foreset and large scale cross-bedded surfaces. Fractures and calcite veins were noted in only a few rock units. One sandstone unit, in the lower part of the drilled section, contained a calcite filled tension fracture which dipped at 20 degrees to the core axis. In this part of the section many of the units, especially the coal seams, were crushed and slickensides were abundant.

Twenty-five coal seams were cored in D.D.H. SMG-79-8, ranging in thickness from 0.05 metres to 0.96 metres. Nine coal core samples were removed for analysis. Only five seams were present with mudstone splits separating sample number 1,3,4, and 5 seams into two benches. Sample number 5B was too thin for analysis and was combined with sample number 5A to form the sample 5AB. Canneloid coal was observed in only one seam, which was too thin to be sampled. Thin, volcanic ash (?) bands were noted in samples numbered 4B and 5B.

Head analyses conducted on the sampled coal seams show considerable variation in coal quality between the seams. Volatile matter contents range from 18.27% to 28.97%. Ash contents range from 3.53% to 21.35% and are inversely proportional to B.T.U. values, which range from 11,418 B.T.U./lb to 14,558 B.T.U./lb. Sulphur values range from 0.56% to 1.02% while F.S.I. values range from 0 to 8, with the majority of the samples having indices of 1 to 1 1/2.

A 1.4 specific gravity float separation was conducted on each sample. In most cases, a higher quality coal resulted. In all cases, ash contents were reduced below 4.53% and B.T.U. values exceeded 14,627 B.T.U./lb. Sulphur content was not changed significantly, except for sample number 5AB, which increased from 0.93% to 1.09% sulphur indicating an inherent nature. Free Swelling Indices were moderately improved with five samples having values in the range of 2 to 8 1/2.

D.D.H. SMG - 79 - 9

A. WELL COMPLETION REPORT:

Location: - On a northwest trending ridge, near the summit of a hill lying between Gething Creek and Dowling Creek, in the southern portion of the property.
- McElhanney Coordinates: 6,196,770m N x 537,880m E
- Coal Licence No. 4129

Elevation: 1098 metres

Orientation: Vertical

Date Collared: June 17, 1979

Date Completed: June 21, 1979 Plugged: No

Overburden Depth: 4.57 metres

Casing Depth: 5.80 metres Casing Size: HW 4.5"-
recovered

Final Depth: 206.65 metres

Formations Encountered: 0 to 4.57m Overburden
4.57m to 206.65m Gething Formation

Core Description By: A.T. Armstrong and J. Ridley

Coal Seams Sampled:

<u>Sample No.</u>	<u>Seam Name</u>	<u>Interval</u>	<u>Thickness</u>	
			<u>Core</u>	<u>Density Log</u>
1		38.10m to 39.04m	0.94m	1.15m
2		41.66m to 42.18m	0.52m	0.53m

Logs Run: Gamma and Density - by Utah Mines Ltd.

B. COMMENTS

A clearing, measuring approximately 50m x 100m, was slashed for site SMG-79-9. All felled trees were limbed and bucked into four foot or shorter lengths. All equipment, including the drilling rig, mud tanks and mixer, and drilling supplies were flown into the site using a Bell 205 helicopter. Upon removal of the drill, the site was cleaned up and disturbed ground was seeded with the recommended grass seed mixture.

Below 4.57 metres of overburden, D.D.H. SMG-79-9 cored 202.08 metres of typical Gething Formation sediments. The sediments cored included interbedded to interlaminated sandstones, siltstones, mudstones and coals. Many of the units encountered were mixtures of the above components (eg. silty mudstone). Carbonaceous debris was observed along bedding surfaces throughout the section.

A sandstone unit at the top of the cored section may have been overburden, not bedrock. It was highly broken, weathered and iron stained. This sandstone could be a glacially deposited boulder lying directly upon bedrock or it could be highly broken and weathered bedrock. The iron staining in the sandstone is caused by the weathering of disseminated pyrite which is found in many sandstone units throughout the Gething Formation. A pebble bearing sandstone was intersected by the drill from 79.30 metres to 79.52 metres below the hole collar. This sandstone also contained several thin coals approximately 0.05 metres thick.

Bedding angles, measured from the vertical core axis, ranged from 50 to 85 degrees. The steeper angles occurred in the lower part of the cored section and appeared to be related to faulting. Fractures and calcite veins are fairly common below 64 metres in depth below the collar. One sandstone intersected in the core had a calcite filled fracture and shearing and slickensides are evident throughout the lower part of the section, particularly in coal seams. One fault and a drag fold (?) were noted in the core at 193.13 metres and 141.00 metres below the collar respectively.

A total of 28 coal seams were cored in D.D.H. SMG-79-9, ranging in thickness from 0.07 metres to 0.94 metres. Two of these seams were removed for analysis. Core recovery of the seams in the section ranged from 30% to 100%. Many of the seams were highly broken and sheared, especially in the lower portion of the drilled section. The coal seams

cored were generally banded, bright and well cleated. Three coal seams (including sample number 1) had ashy bands and lenses within the coal and two seams contained pyritic bands. Only one seam of canneloid coal was observed in the cored section.

Analyses of the two coal seams sampled from the cored section show that the seams are similar in quality. Volatile matter contents were 26.39% and 27.79%, ash contents were 14.35% and 18.80%, and B.T.U. values were 11,443 B.T.U./lb and 12,169 B.T.U./lb. Sulphur contents, however, vary widely for the two samples: sample number 1 contained 0.78% sulphur, while the sulphur content of sample number 2 was 1.83%. F.S.I. values for samples 1 and 2 were 1/2 and 1 1/2 respectively.

A 1.4 specific gravity float separation conducted on the samples produced an improved product in both cases. Ash contents were reduced, sulphur contents were lowered to less than 1.00%, B.T.U. values increased and volatile matter decreased. F.S.I. values also changed, with sample number 1 increasing to an index of 2 1/2, while sample number 2 decreased to a value of 1.

D.D.H. SMG - 79 - 10

A. WELL COMPLETION REPORT:

Location: - On a flat lying area between two
forks of an east flowing tributary
of Gething Creek, near the western
property boundary.
- McElhanney Coordinates: 6,200,835m
N x 534,850m E
- Coal Licence No. 4142

Elevation: 945 metres

Orientation: Vertical

Date Collared: June 23,1979

Date Completed: June 29,1979 Plugged: Yes

Overburden Depth: 35.05 metres

Casing Depth: 35.96 metres Casing Size: HW 4.5"-
recovered

Final Depth: 233.48 metres

Formations Encountered: 0 to 35.05m Overburden
35.05m to 233.48m Gething Formation

Core Description By: R.B. Anderson, J. Ridley and A.T. Armstrong

Coal Seams Sampled:

<u>Sample No.</u>	<u>Seam Name</u>	<u>Interval</u>	<u>Thickness</u>	
			<u>Core</u>	<u>Density Log</u>
1		42.88m to 43.56m	0.73m	0.70m
2		49.15m to 51.03m	1.88m	1.75m
3		67.87m to 68.54m	0.67m	0.55m
4		86.20m to 87.17m	0.97m	0.75m
5		184.04m to 184.71m	0.67m	0.95m
6		185.42m to 186.50m	1.08m	0.85m
7		187.49m to 189.28m	1.79m	1.70m

Logs Run: Gamma and Density - by Utah Mines Ltd.

B. COMMENTS

Helicopter drill site SMG-79-10 was located in a swampy area and, as a result, less clearing and slashing was required than for the other helicopter drill holes. The trees that were felled were limbed and bucked into four foot or shorter lengths. After the drilling rig and equipment was removed, the site was cleaned up and the recommended grass seed mixture was dispersed on disturbed ground.

Below 35.05 metres of overburden, D.D.H. SMG-79-10 intersected 198.43 metres of typical Gething Formation sediments. The sediments cored comprised sandstones, siltstones, mudstones and coal and mixtures of these rock types (eg. silty mudstone). The sediments were interbedded to interlaminated

and this texture was observed everywhere in the section, except where bioturbation and soft sediment deformation has destroyed the bedding. The sedimentary sequence and textures are indicative of deposition in an alluvial flood plain environment.

The cored section contained abundant sandstone units. A sandstone unit in the middle portion of the drilled section (between 154.28m and 154.44m) contained siltstone rip-up clasts. A conglomeratic unit was found in the section from 156.90 metres to 157.13 metres below the collar. This conglomerate is similar to Cadomin Formation conglomerates, as it is composed of chert pebbles which range from 0.002 metres to 0.02 metres in diameter.

Bedding angles, measured from the vertical core axis, varied from 35 to 60 degrees. The variation in bedding dip could be the result of small scale folding of the rocks in response to faulting. Fractures, calcite veins, calcite filled tension gashes, calcite welded breccia zones and fault gouge were noted in core throughout the drilled section. Many units were sheared, especially the coal seams, and displayed prominent slickensides.

Twenty-two coal seams, ranging in thickness from 0.05 metres to 1.88 metres, were cored in D.D.H. SMG-79-10. Seven of these seams were removed for analysis in seven samples. Core recovery of the coal seams was highly variable, ranging from 25% to 100%. Most seams displayed some shearing

and slickensides. The coal seams were generally bright, banded and cleated. Sample number 2 contained a 0.08 metre ash band near the top of the seam. A calcite veinlet was observed in sample number 4 at the top of the seam and a coal seam at 162.51 metres below the collar contained abundant pyrite (unsampled).

Head analyses conducted on the seven coal samples indicate a wide variation in coal quality from seam to seam. Volatile matter ranged from 15.53% to 25.61% and sulphur concentrations ranged from 0.68% to 1.02%. Ash contents ranged from 3.31% to 37.25% and were inversely proportional to B.T.U. values, which ranged from 8,907 B.T.U./lb to 14,587 B.T.U./lb. Free Swelling Indices ranged from 1/2 to 8, with two samples having values of 5 and 8.

Single gravity tests at 1.4 specific gravity were conducted on all of the samples. The sulphur content increased slightly in all cases. In all float fractions, ash content was markedly reduced and B.T.U. values increased. Volatile matter did not change significantly in the floats with the exception of sample number 4, which increased from 15.53% to 20.75%. F.S.I. values were moderately improved in most cases, sample number 3 increased from an index of 5 to an index of 8.