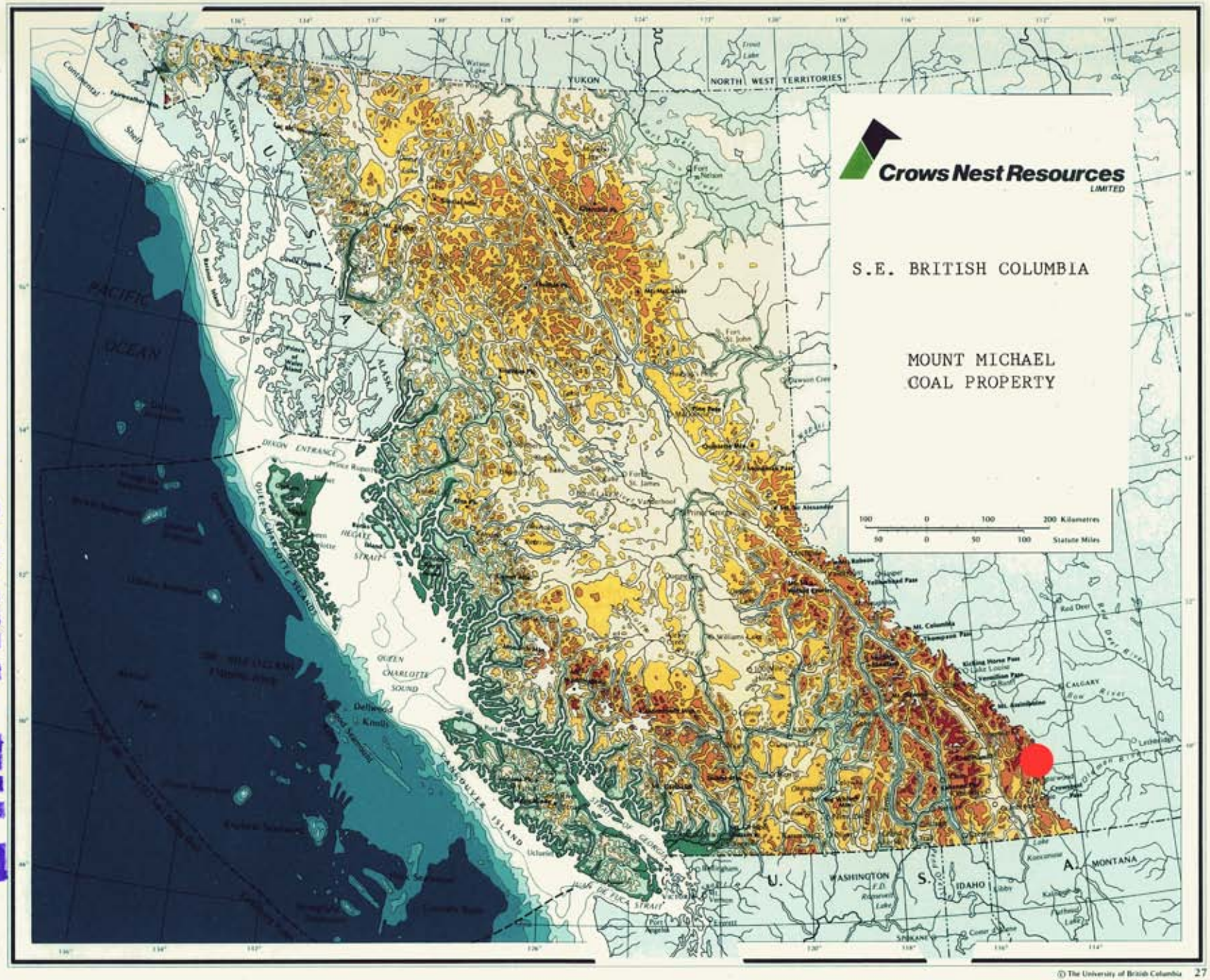
MOUNT MICHAEL PROJECT
SOUTH EASTERN BRITISH COLUMBIA

1981 GEOLOGICAL REPORT

BY: A. WHITE

JANUARY '82



K-Shell Mt. Michael 81(1)A

Crows Nest Resources LIMITED
Eau Claire Place, 525 - 3rd Avenue S.W., Calgary, Alberta (403) 232-4355
P.O. Box 2699, Station M, Calgary, Alberta T2P 2M7 Telex 03-822505

February 26, 1982

Ministry of Energy, Mines and Petroleum Resources,
VICTORIA, British Columbia.

Gentlemen:

Enclosed please find our report on the Mount Michael Project.

This report has been prepared by Mr. A. White who has been employed by Crows Nest Resources Limited as a geologist since 1980.

Mr. A. White, B.Sc. (honours) graduated in geology from the University of Waterloo in 1977. Between graduation and joining Crows Nest Resources in 1980, Mr. White worked as a geologist on a number of mineral exploration programs in Northern Ontario, the Northwest Territories and British Columbia.

His work in 1981 was carried out under the supervision of our District Manager, British Columbia, Mr. Frank Martonhegyi.

In my opinion both of the above are fully qualified to carry out their respective duties in the preparation of this report of work done under their direct supervision.

Yours truly,

H. G. Rushton, P.Geol.
Vice-President, Exploration

/ld

Enc.

MOUNT MICHAEL PROJECT

SOUTHEASTERN BRITISH COLUMBIA

1981 GEOLOGICAL REPORT

B.C. COAL LICENCES

285, 286, 289, 290, 291, & 304

HELD BY:

SHELL CANADA RESOURCES LIMITED

OPERATED BY:

CROWS NEST RESOURCES LIMITED

KOOTENAY LAND DISTRICT

NTS 82G/15

LAT: 49°58' NORTH

LONG: 114°45'30" WEST

SUBMITTED: FEBRUARY, 1982

REPORT BY: ALAN M. WHITE

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(Copy of Application to Extend Term of Licence Group #264 Mt. Michael only)

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MOUNT MICHAEL

SUMMARY

The Mount Michael Project is part of the Upper Elk Coalfield in the Rocky Mountains of southeastern British Columbia. The name refers to the ridge which is between the Horseshoe Ridge Project and the Ewin Pass Project encompassed by B.C. Coal Licences 285, 286, 289, 290, 291 and 304. It is two kilometers north of Crows Nest Resources' Line Creek open pit mine development. A large coal preparation plant and railway loading facility are under construction 9.5 kilometers further away on the mine hauling road. From there it is approximately 20 kilometers to the town of Sparwood and 1150 kilometers to the Vancouver area coal ports.

In regional geological terms, the Horseshoe Ridge and Mt. Michael projects are located almost contiguously on the eastern limb of the Fording Syncline. The Line Creek development is on the western limb of this syncline on the opposite side of Line Creek from Horseshoe Ridge. The surface topography follows the geological structure with dip slopes on the synclinal limbs.

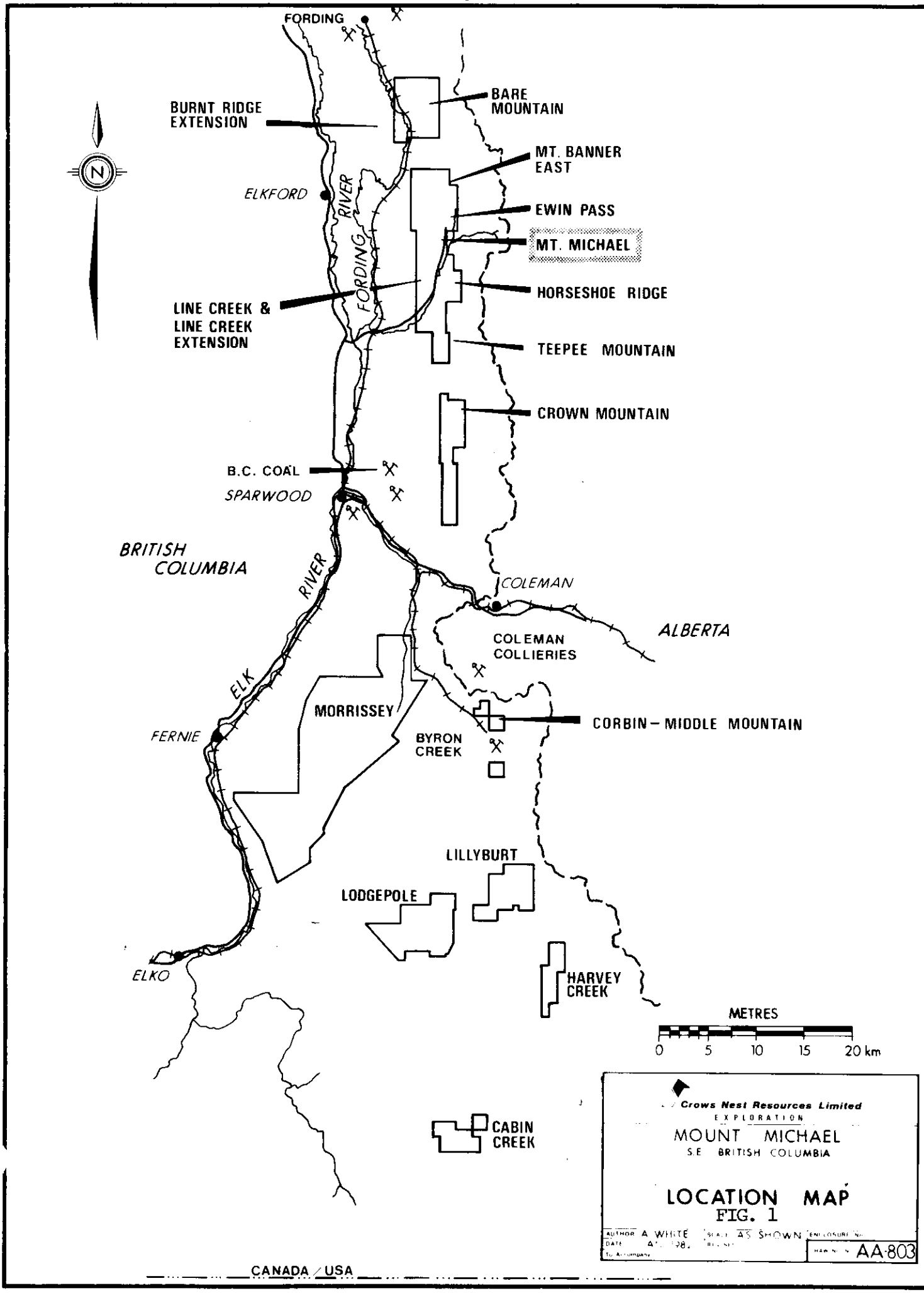
On Mount Michael there exists not only the entire early Cretaceous coal bearing Mist Mountain Formation of the Kootenay Group, but it is repeated due to thrust faulting.

Work to date on Mt. Michael has consisted of some bulldozer trenching in the past which was re-examined in a reconnaissance manner in 1978 (reported in 1979) by Crows Nest Resources Limited. During the fall of 1980 a program of surface geological mapping and hand trenching was carried out on the west slopes of Mt. Michael. In 1981 a program of detailed geological mapping and extensive hand trenching was carried out. To date there have been 118 hand trenches dug totalling over 775 meters in length.

From the data collected by this means, it appears that we can expect to find 39 meters of coal within a 235 meter stratigraphic succession under the western slopes of Mt. Michael.

Analytical results of the west slope hand trenches are not yet available. Middle to upper range medium volatile bituminous rank coal is expected, based on the stratigraphic position of the coal seams and on information from the surrounding properties. The quality of coal in the lower strata outcropping on the east slope, is expected to range between that of Horseshoe Ridge and that of Ewin Pass (i.e. medium volatile bituminous ranging in volatile matter from 24.6% to 27%).

The Mt. Michael project is well established now, but it is still in the grass roots phase. It is at a stage when drilling is needed for further evaluation. Building an access road and continuous core (diamond) drilling were proposed for 1981, however due to delay in receiving governmental approval, it is now proposed to do this work in 1982.


FORDING
BURNT RIDGE EXTENSION
BARE MOUNTAIN
MT. BANNER EAST
ELKFORD
FORDING RIVER
EWIN PASS
MT. MICHAEL
HORSESHOE RIDGE
LINE CREEK & LINE CREEK EXTENSION
TEEPEE MOUNTAIN
CROWN MOUNTAIN
B.C. COAL
SPARWOOD
BRITISH COLUMBIA
ELK RIVER
COLEMAN
ALBERTA
COLEMAN COLLIERIES
MORRISSEY
FERNIE
BYRON CREEK
CORBIN – MIDDLE MOUNTAIN
LILLYBURT
LODGEPOLE
ELKO
HARVEY CREEK
CABIN CREEK
METRES
0 5 10 15 20 km
CANADA / USA
Crows Nest Resources Limited
EXPLORATION
MOUNT MICHAEL
S.E. BRITISH COLUMBIA
LOCATION MAP
FIG. 1
AUTHOR A. WHITE
DATE APR. 1984
SCALE AS SHOWN
ENCLOSURE No.
DRAWING No. AA-803

2.0 INTRODUCTION

2.1 Location and Physiography

The Mount Michael licences are located 12 km southeast of Elkford in the Upper Elk Coalfield of southeastern B.C. (Figures 1 & 2). They are centered at approximately 114°45'30" west longitude, 49°58' north latitude (NTS Map Sheet 82G/15 Tornado Mountain). These licences (285, 290, 291, 304 and parts of 286 and 289) cover an area of 944 hectares (Figure 3).

In elevation, the property varies between 1800 m and 2475 m. A north trending ridge is the main physiographic feature, with a steep, east facing slope and a more moderate west facing slope. The eastern slope has very little tree cover and has several avalanche chutes. Outcrop is fairly abundant, with some sandstone beds being exposed laterally over several hundred meters. Vegetation on the western slope varies from moderately thick spruce forest at the valley bottom to sub-alpine shrubs and grasses near the ridge top. Outcrop is rare on the lower slopes but becomes more common near the top of the ridge.

2.2 Access

Currently only the lower elevations on Mt. Michael can be reached by vehicular traffic. On the east side, the Ewin Pass access road traverses across the lower part of the slope from Line Creek to Ewin Pass. On the west side an old fire access road along Dry Creek allows four-wheel drive access to the bottom of the west slope from the Fording Highway. These roads are shown on Figure 2.

During 1981 a helicopter was used to gain access to the top of the ridge and the lower slopes were explored from the aforementioned roads.

3.0 SUMMARY OF WORK DONE

3.1 Previous Work

Only limited work has been done on the Mt. Michael licences prior to 1981. The Geological Survey of Canada published a geological report by R. A. Price in 1961 which included the Mt. Michael project area. This report showed that the Mt. Michael area contained the Jurassic/Cretaceous coal-bearing strata.

Prior to 1978 Crows Nest Industries explored the lower part of the eastern slope by bulldozer trenching while in the process of building the Ewin Pass access road. N. Elphinstone also covered the area briefly in the report on his reconnaissance in 1951.

John Fisher (1978) mapped the eastern slope as part of his reconnaissance mapping of the North Central Block for Crows Nest Resources Limited. He measured several stratigraphic sections and coal seams along the east slope. The west side of the ridge was looked at briefly and one stratigraphic section was measured. The geology was plotted on 1:5,000 air photo blow-ups. Mr. Fisher made special note of a 6 meter thick seam seen roughly paralleling the top of the ridge which he tentatively identified as the number 7 seam. In his report he recommended examining that seam and several others in detail as they occurred in a dip slope situation.

In 1980 a four week program of mapping at 1:5,000 scale and hand trenching of ten coal seams, was carried out. This was reported in a report entitled Mount Michael, South East British Columbia, 1980 Geological Report.

3.2 Scope and Objectives of the 1981 Program

The 1981 exploration program on Mt. Michael was planned to further explore B.C. Coal Licences 285, 286, 289, 290, 291 and 304.

The objective of the program was to produce a detailed geologic map which could be used to further evaluate the development potential of the property.

3.3 Work Done in 1981

- 600 hectares were mapped at 1:2,000 and 1:5,000 scales, with the results presented at 1:5,000.

- 108 hand trenches totalling 759 meters were dug through the coal seams. The seams were then described in detail and sampled. True thickness stratigraphic sections of the trench logs were drawn up and are presented in Enclosures 6, 7, and 8.

- The U.T.M. co-ordinates of 75 trenches were determined photogrammetically from new low level air photos.

- Nine airphoto targets were established and their locations surveyed in by Sheltech (Figure 4). These targets are being used as control points for new 1:2,000 scale topographic maps of the west slope of Mt. Michael.

- A total of $243,429 were spent on the Mt. Michael project in 1981. An itemized cost breakdown of these expenses is presented in Appendix I.

4.0 GEOLOGY

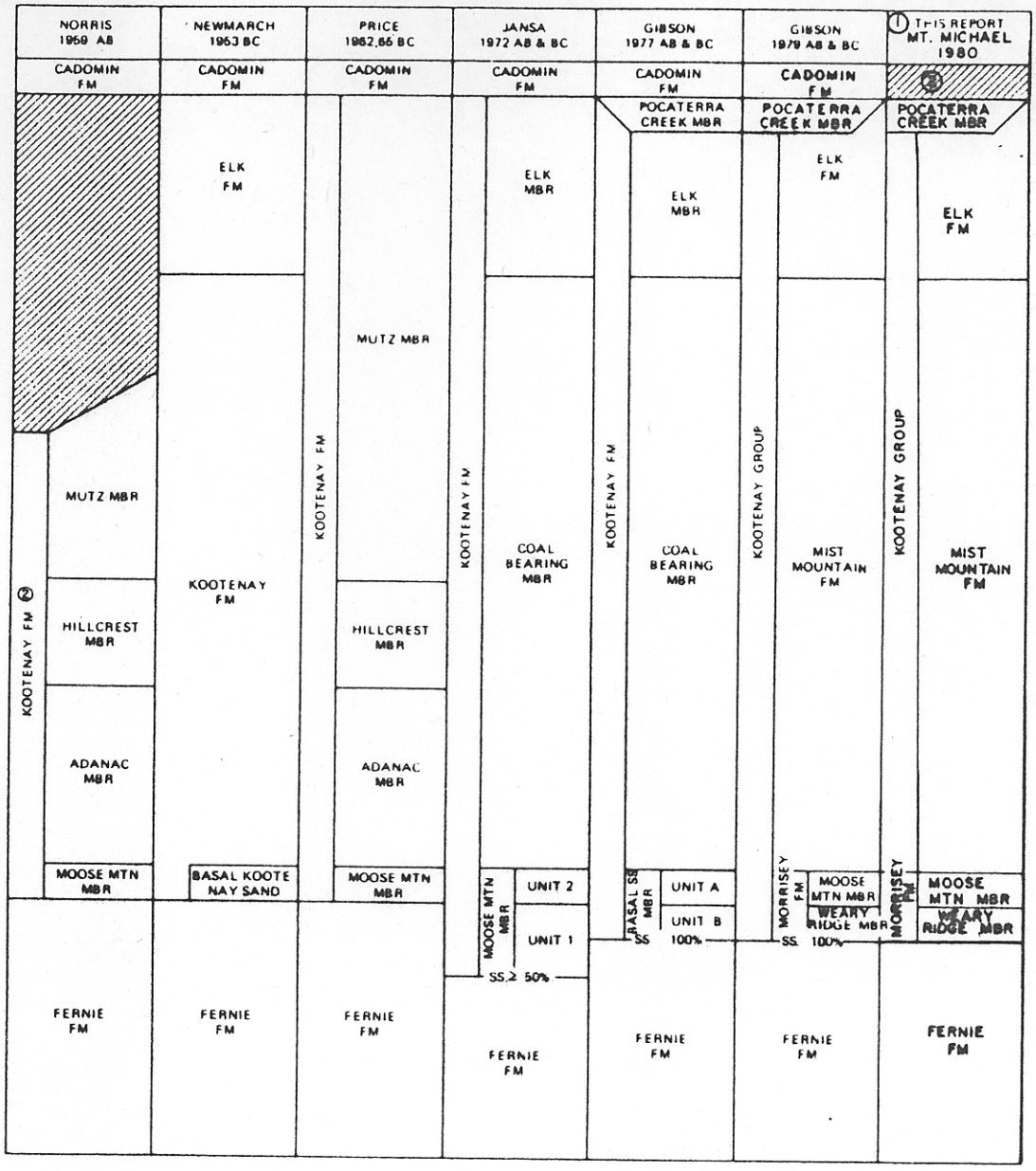
4.1 Regional Stratigraphy

This report follows the stratigraphic nomenclature proposed by D. W. Gibson of the Geological Survey of Canada in 1979. It is shown in a tabulated form on Figure 5. Jurassic-Cretaceous Kootenay Group strata were investigated.

Withdrawal of the Fernie Sea northeastward and deposition of the Kootenay Group strata were initiated by an epierogenetic uplift of the source area on the southwest during an early phase of the Columbian Orogeny in late Jurassic time.

Kootenay Group strata, a thick sequence of clastic sediments, represent a delta pro-gradation northeastward, an environment favourable for coal deposition. It is a transition from a marine (underlying shales of the Fernie Formation) to a fully alluvial (overlying conglomerates and coarse sandstones of the Blairmore Group) environment.

There is coal present throughout the Kootenay Group strata, however all workable seams occur in the Mist Mountain Formation. The Moose Mountain Member of the Morrissey Formation and the Elk Formation lie respectively under and over the main coal bearing formation. Prior to 1979 these stratigraphic units were called the Moose Mountain, Coal Bearing and Elk Members of the Kootenay Formation.



① The terminology for this report follows that of Gibson 1979.

② The Cadomin Formation does not outcrop on Mt. Michael, but does appear slightly to the northeast on the peak of Mt. Banner.

Crows Nest Resources Limited
EXPLORATION

SE BRITISH COLUMBIA

FORMATIONAL DIAGRAM

MT. MICHAEL

A. WHITE 81·03·25 NTS

DRAWING NO. AA-543

The Moose Mountain Member is a resistant, generally cliff forming unit comprised of massive, medium to coarse-grained, medium-gray weathering sandstone. There are commonly two coal horizons within this sandstone, but their small thickness (rarely over one meter) and the overlying massive sandstone make them unattractive for economic consideration. The distinctive nature and prominence of this unit makes it an easily traceable marker horizon throughout the Crows Nest Coalfield of southeastern B.C.

The Mist Mountain Formation is the main coal bearing unit of the Kootenay Group. It overlies conformably but abruptly the Moose Mountain Member.

It is comprised of a generally recessive, interbedded sequence of brownish tinted sandstones, gray to brown siltstones, gray and black shales, gray mudstones and coal seams. In the Elk Coalfield this formation ranges in thickness between 400 meters and 660 meters. The coal seams attain a thickness of up to 10 meters and a lateral extent of several kilometers.

The Elk Formation lies conformably but abruptly over the Mist Mountain Formation. It consists of an interbedded sequence of cliff forming sandstones, shales and siltstones and thin (less than 1 m), sporadic coal seams.

The exact base of the Elk Formation is somewhat arbitrary as it is defined as being "the base of the first major sandstone or conglomerate above the uppermost major coal seam in the Mist Mountain Formation" (Gibson, 1979). Therefore the stratigraphic position of the Mist Mountain-Elk formational contact may vary slightly from project to project.

4.2 Regional Structure

The Mount Michael prospect area is affected by two main structural elements, the Fording Thrust Fault and the Fording Syncline.

The Fording Thrust has caused a repeat of the coal bearing Kootenay Group strata. The Fording Thrust and sequences of the lower plates outcrop along the steep east facing slopes and dip westward under the uppermost plate.

The northerly plunging Fording Syncline dominates the upper plate structures. Dry Creek is the surface expression of the synclinal axis with coal licences on the west limb (Burnt Ridge) being held by B.C. Coal Ltd. The west facing slopes of the prospect area are the surface expression of the east limb of this syncline. This so called dip slope situation is favourable for open pit mine development. Such potential is further enhanced by the underlying, coal bearing, lower plate.

Figure 6: "Geologic Compilation" shows the regional stratigraphic and structural features.

4.3 Mt. Michael Geology

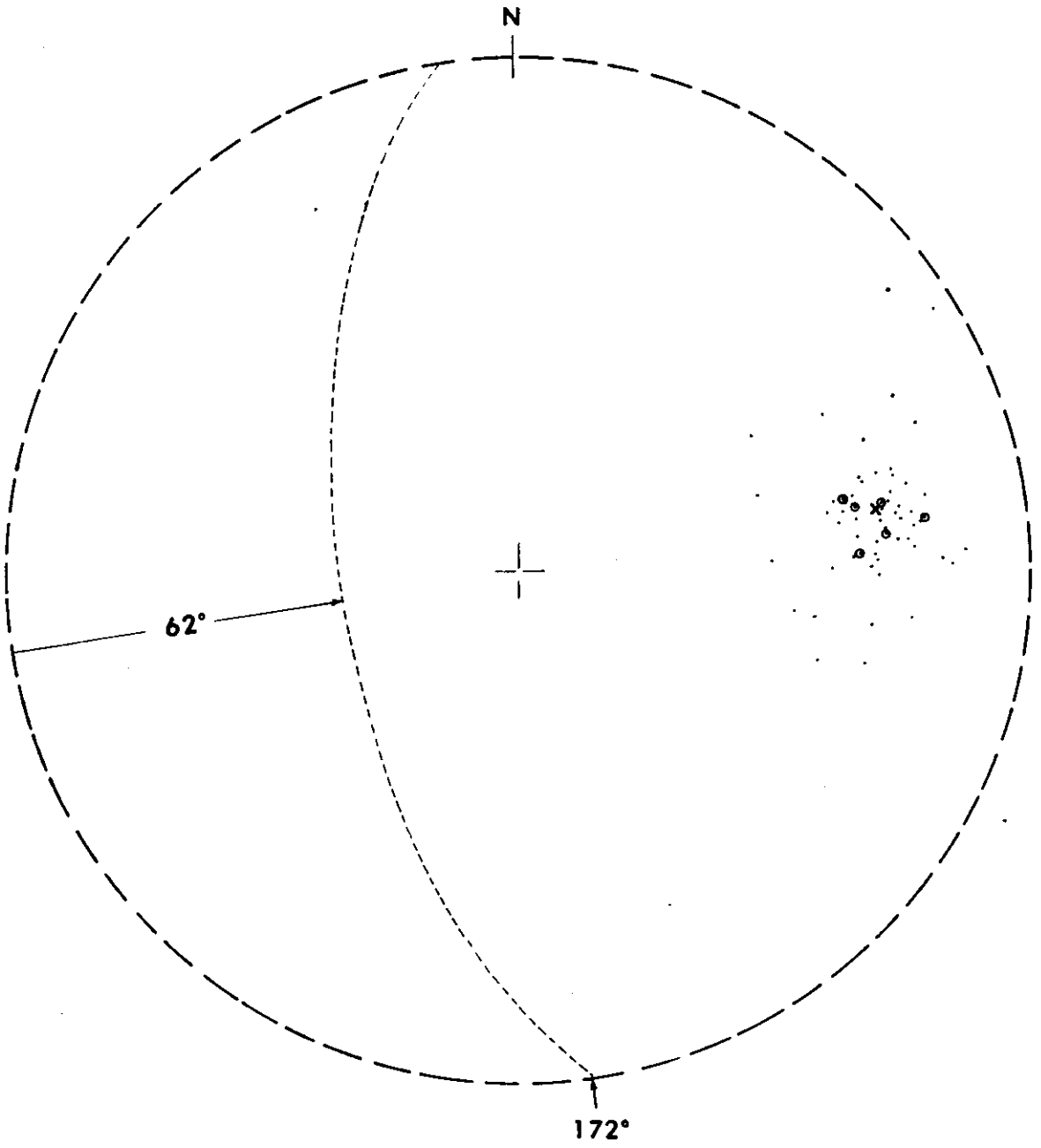
The results of the 1981 mapping program are presented in Figure 7 "Geology Map".

In 1981 the surface outcropping of the Fording Thrust was located on the east slope of Mt. Michael. Kootenay Group strata, which occur below the thrust, are repeated in the upper plate. Near the southern half of the property Moose Mountain sandstone has been thrust over Elk Formation strata, indicating a vertical displacement of 400 - 600 metres along the fault.

Within the upper plate, trenching and mapping revealed 10 to 12 seams, ranging between 1.5 and 7.2 meters in thickness. The aggregate thickness of these seams is 39 meters within a 235 meter stratigraphic section. This coal thickness does not include Seam 10 which occurs just above the Fording Thrust at the north and south ends of the property. This seam, which in trench MS-5 is at least 20 meters true thickness, has a strike length of over 2,000 meters but has been cut off by the thrust in the central portion of the property. A 150 to 200 m section of recessive shales, siltstones and mudstones with only minor (i.e. less than 1.0 meter) coal seams separates Seam 10 from the rest of the major coal seams.

A stereographic analysis of bedding attitudes from the upper thrust plate indicates an average strike of 172 degrees and an average dip of 62° westerly (Figure 8). Bedding measurements taken in 1981 support these averages from 1980.

Figure 9 (Cross Section A-A') is a cross section based on all of the data collected to date. The information on the lower thrust plate is the result of drilling and surface work on the Ewin Pass property while the upper plate interpretation is based on mapping and hand trenching only.



AVERAGE STRIKE AND DIP OF EAST LIMB IS 172°/62°W
BASED ON 60 BEDDING MEASUREMENTS

· 1 POLE
⊙ 2 POLES
× AVERAGE OF POLES

Crows Nest Resources Limited EXPLORATION		
FIG. 7 MT. MICHAEL (WEST) EAST LIMB OF SYNCLINE POLES TO BEDDING		
AUTHOR: A. WHITE	SCALE:	ENCLOSURE No:
DATE:	REVISED:	DRAWING No: AA-516
To Accompany MT. MICHAEL REPORT		

4.4 Mineability

Surface mapping and interpretation indicate that Mt. Michael has good potential for open pit mine development. Eleven coal seams, with an aggregate thickness of 39 meters within a 235 meter section occur in a dip slope situation on the western slope of Mt. Michael. The seams dip an average 62° westerly beneath a 25° west dipping slope. Deep drainage cuts have had the effect of removing a large amount of the overburden, without substantially affecting the coal, thus improving the overburden to coal ratio.

Cross section A-A' (figure 9) gives an indication of the mining potential on Mt. Michael. On the upper plate coal could initially be open pit mined at a very low overburden to coal ratio. Potential exists to mine over fifty million tonnes of coal from the upper plate at an ratio of approximately seven bank cubic meters waste per tonne of coal. The further potential exists at slightly higher ratios (approximately 9:1) to mine both the upper and lower plates. This would increase the potential to between 100 and 200 million tonnes.

Based on the coal quality of surrounding properties, and the fact that all of the upper Mist Mountain coal seams occur on Mt. Michael, we expect mid to high medium volatile bituminous coal in the upper plate. The coal seams in the lower thrust plate are the same seams which occur on the Horseshoe Ridge and Ewin Pass

properties therefore we expect the coal to range in quality between that of the two properties (i.e. medium volatile bituminous with 24.6% volatile matter at Horseshoe Ridge and 27% volatile matter at Ewin Pass).

In addition to the potential for large reserves of very good quality coal, Mt. Michael is only nine kilometers from the existing Crows Nest Resources prep plant and load out facilities on the railway at the mouth of Line Creek gorge. The Line Creek mine haul road actually extends as far as the south end of Mt. Michael. Only five to seven kilometers of new road would have to be built to allow coal from Mt. Michael to be trucked to the wash plant.

Another option would be to truck the coal to the north along Dry Creek to reach the rail line at the Fording River. This would require about 12 kilometers of new road and a new wash plant.

4.5 Recommendations for Further Work

Mapping and hand trenching in 1981 have further established Mt. Michael as a sound project. It has been shown that not only does a full stratigraphic section of the coal bearing Mist Mountain Formation including the upper, higher volatile seams exist but the section has been repeated by the Fording thrust. This coal bearing section containing large volumes of upper medium volatile coal in a dip slope situation at relatively low overburden to coal ratios has excellent potential for open pit mining.

To date the property has been mapped in detail and 108 hand trenches totalling 759 meters have been dug. The property is now at a stage when drilling is essential to determine the geometry, continuity and quality of the coal seams in the subsurface. It is also necessary to obtain bulk samples of unoxidized coal for quality determinations.

Due to the large volume of machinery work necessary to further explore Mt. Michael road access to the coal measures must be built. It would be unfeasible to attempt to do the required amount of work with helicopter transportation only. Routes for an access road via either Dry Creek from the north or Line Creek from the south, are being examined at to determine the best alternative.

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

APPLICATION TO EXTEND TERM OF LICENCE

I, LESLIE GRAMANTIK (Name) agent for SHELL CANADA RESOURCES LIMITED (Name)

P.O. BOX 100 (Address) CALGARY (Address)

ALBERTA T2P 2M7

Valid FMC No. 244642

hereby apply to the Minister to extend the term of Coal Licence(s) No(s). 278,279,282-291,304

1300,1301, 15 LICENCES, GROUP NO: 330, 2889 HECTARES

for a further period of one year.

2. Property name EWIN PASS & MOUNT MICHAEL, KOOTENAY LAND DISTRICT

3. I am allowing the following Coal Licence(s) No(s). to forfeit N/A

4. I have performed, or caused to be performed, during the period FEBRUARY 1, 1981 to JANUARY 31, 1982, work to the value of at least $ 737,643.00 on the location of coal licence(s) as follows:

CATEGORY OF WORK	Licence(s) No(s).	Apportioned Cost
Geological mapping	285,286,288-293, & 304	201,755
Surveys: Geophysical	-	-
Geochemical	-	-
Other (LOCATION)	282,286,287	14,557
Road construction	286	15,735
Surface work	286,289,290,291	16,484
Underground work	286	100,686
Drilling	282,286,287	234,337
Logging, sampling, and testing	282,286,287	54,634
Reclamation	282,286,287	53,940
Other work (specify)	-	-
Off-property costs GEOLOGICAL REPORTS		45,515

5. I wish to apply $ 737,643.00 of this value of work on Coal Licence(s) No(s). 278,279,282-291 304,1300,1301

6. I wish to pay cash in lieu of work in the amount of $ N/A on Coal Licence(s) No(s).

7. The work performed on the location(s) is detailed in the attached report entitled REPORTS WILL BE SUBMITTED IN 90 DAYS

JANUARY 27, 1982 (Date)

(Signature)

ASSISTANT LANDMAN (Position)

(FORMS AND REPORT TO BE SUBMITTED IN DUPLICATE)

GEOLOGICAL MAPPING Yes ☒ No ☐

	Area (Hectares)	Scale	Duration
Reconnaissance			
Detail: Surface	1600	1:2000 & 1:5000	342 MAN DAYS
Underground			
Other* (specify)			

Total Cost $ 201,755

GEOPHYSICAL/GEOCHEMICAL SURVEYS Yes ☒ No ☐

Method	
Grid LOCATION	9,257
Topographic	
Other* (specify) LOCATION	5,300

Total Cost $ 14,557

ROAD CONSTRUCTION Yes ☒ No ☐

Length 1,000 M Width

On Licence(s) No.(s)

Access to DRILL SITES

Total Cost $ 15,735

SURFACE WORK Yes ☒ No ☐

	Length	Width	Depth	Cost
Trenching	759 M	0.75 M	1 M	
Seam Tracing				
Crosscutting				
Other* (specify)				

Total Cost $ 16,484

UNDERGROUND WORK Yes ☒ No ☐

	No. of Adits	Maximum Length	No. of Holes	Total Metres	Cost
Test Adits	1	72M			
Other workings*					

Total Cost $ 100,686

DRILLING Yes ☒ No ☐

	Hole Size	No. of Holes	Total Metres	Cost
Core: Diamond				
Wireline				
Rotary: Conventional				
Reverse circulation	5 1/8"	5	1643	
Other* (specify)				

Contractor

Where is the core stored?

Total Cost $ 234,337

LOGGING, SAMPLING, AND TESTING Yes ☐ No ☐

Lithology:	Drill samples	☒	Core samples	☐	Bulk samples	☐
Logs:	Gamma-neutron	☒	Density	☒		

Other* (specify)

Testing:	Proximate analysis	☐	FSI	☐	Washability	☐
	Carbonization	☐	Petrographic	☐	Plasticity	☐

Other* (specify)

Total Cost $ 54,634

RECLAMATION Yes ☒ No ☐

Details Total Cost $ 53,940

OTHER WORK (Specify details) Yes ☐ No ☐ Cost

Total Cost $

OFF-PROPERTY COSTS Yes ☐ No ☐

Details GEOLOGICAL REPORTS Total Cost $ 45,515

Total Expenditures $ 737,643.00

Jan. 28/82 (Date)

(Signature)

MANAGER - ACCOUNTING CNRL (Position)

*A full explanation of other work is to be included.

MOUNT MICHAEL GROUP NO: 330

GEOLOGICAL MAPPING Yes ☒ No ☐

	Area (Hectares)	Scale	Duration
Reconnaissance			
Detail: Surface	1600	1:2000 & 1:5000	342 MAN DAYS
Underground			
Other* (specify)			

Total Cost $ 201,755

GEOPHYSICAL/GEOCHEMICAL SURVEYS Yes ☒ No ☐

Method
Grid
Topographic
Other* (specify) (LOCATION)

Total Cost $ 5,300

ROAD CONSTRUCTION Yes ☐ No ☒

Length Width
On Licence(s) No.(s)
Access to

Total Cost $

SURFACE WORK Yes ☒ No ☐

	Length	Width	Depth	Cost
Trenching (HAND)	759 M	0.75 M	1 M	
Seam Tracing				
Crosscutting				
Other* (specify)				

Total Cost $ 16,484

UNDERGROUND WORK Yes ☐ No ☒

	No. of Adits	Maximum Length	No. of Holes	Total Metres	Cost
Test Adits					
Other workings*					

Total Cost $

DRILLING Yes ☐ No ☒

	Hole Size	No. of Holes	Total Metres	Cost
Core: Diamond				
Wireline				
Rotary: Conventional				
Reverse circulation				
Other* (specify)				

Contractor
Where is the core stored?

Total Cost $

LOGGING, SAMPLING, AND TESTING Yes ☐ No ☒

Lithology:	Drill samples ☐	Core samples ☐		Bulk samples ☐	
Logs:	Gamma-neutron ☐	Density ☐			

Other* (specify)

Testing:	Proximate analysis ☐	FSI ☒		Washability ☒	
	Carbonization ☐	Petrographic ☐		Plasticity ☐	

Other* (specify)

Total Cost $

RECLAMATION Yes ☐ No ☒

Details Total Cost $

OTHER WORK (Specify details) Yes ☐ No ☒ Cost

Total Cost $

OFF-PROPERTY COSTS Yes ☒ No ☐

Details GEOLOGICAL REPORT Total Cost $ 19,890

Total Expenditures $243,429.00

Jan. 28/82
(Date)

(Signature)

MANAGER - ACCOUNTING CNRL
(Position)

* A full explanation of other work is to be included.

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2A/CWc.25

K-Mount Michael 81(2)A

436

Shell K-Mt. Michael 8162 A

436

M E M O R A N D U M

DATE : JANUARY 26, 1982

T O : CROWS NEST RESOURCES LIMITED (C.N.R.L.)

FROM : SHELTECH CANADA

SUBJECT: MT. MICHAEL (4151-G) - S.E. BRITISH COLUMBIA

The survey in the Mt. Michael area consisted of a network of points to be used for photo control. This network was based on the Crows Nest Control Network using results established from the fall of 1980. Sheltech's involvement was to assist Bill Moir in calculations and data collection.

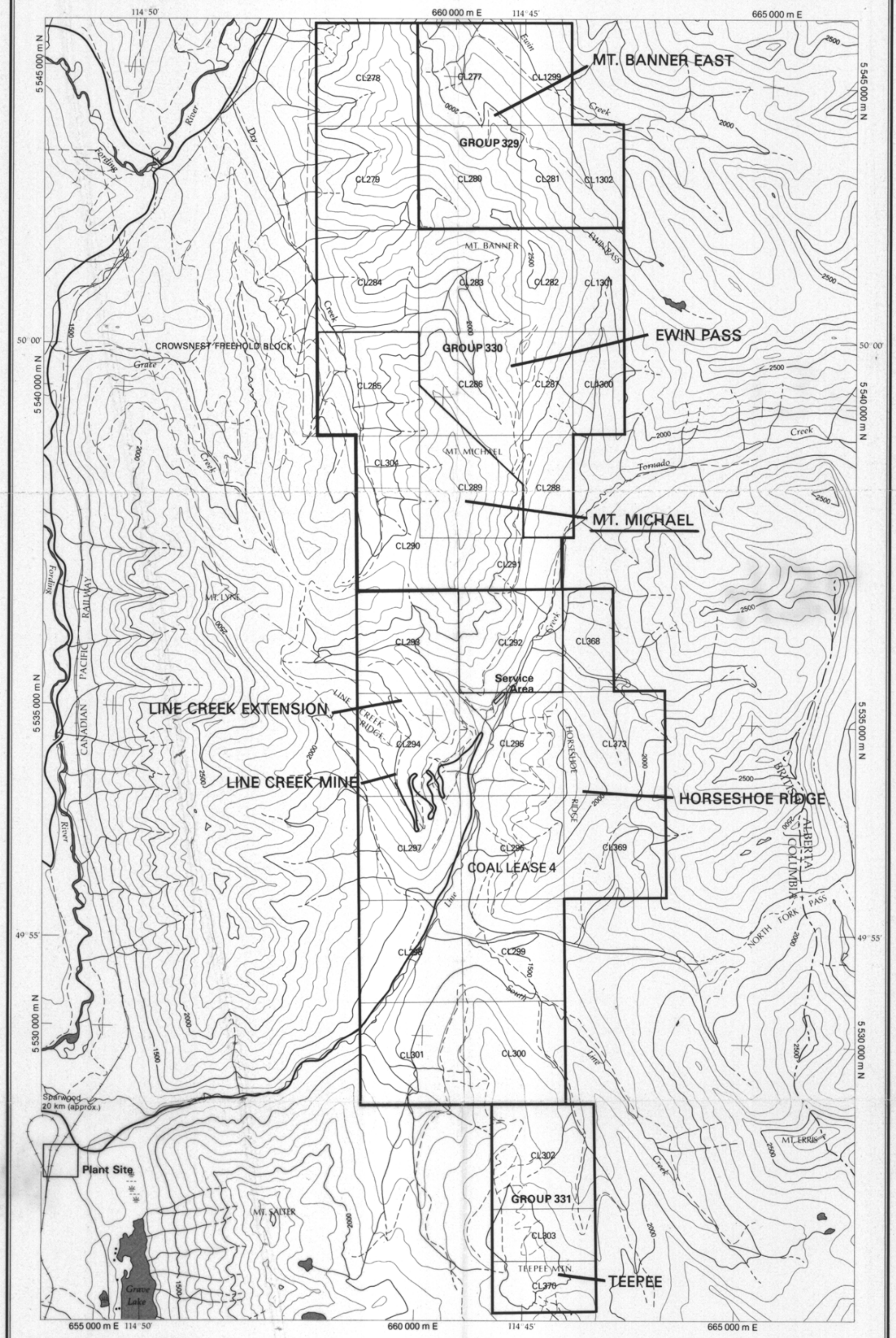
The photo control network consisted of the four stations from the Crows Nest Network "103", "Peak", "Nob" and "Timber" and nine other stations. The nine stations were also referenced.

Conventional survey methods using a 1" theodolite and electronic distance measuring equipment were used to obtain survey data. Repetitive observations and reciprocal vertical measurements were used to ensure very accurate results. All calculations were done in the UTM system with distances being reduced to plane and bearings referenced to 117°W. The results were given to C.N.R.L. personnel in both tabular and map form.

A. L. Melton

RB/cm

s665



Reference map produced by the Surveys and Mapping Branch, Department of Energy, Mines and Resources in 1975 and updated from 1979 Province of British Columbia 1:100,000 mapping. Metric contours were manually interpolated.

Scale 1:50 000

Kilometres 0.5 0 0.5 1.0 1.5 2.0 2.5 3.0 Kilometres

Miles 0.5 0 0.5 1.0 1.5 2.0 Miles

Contour Interval 100m

Transverse Mercator Projection

Universal Transverse Mercator Grid Zone II

T.N. 1°43' Grid North

Legend

- Road; Highway, Main road
- Road; Loose surface, Dry weather
- Track or trail
- Railway
- River
- Stream
- Contours (2000, 1500)
- Licence boundary
- Licence group boundary

HARDY ASSOCIATES (1978) LTD.

Shell
K-Mount Michael 8(2)A

Crows Nest Resources Limited
EXPLORATION

MOUNT MICHAEL
S.E. BRITISH COLUMBIA
INDEX MAP
AND COAL LICENSES

82 G/15 & 82 J/2

AUTHOR: A. WHITE	SCALE: 1:50 000	ENCLOSURE No. 1
DATE: 82-01-22	REVISED:	CA-271
To Accompany 1981 GEOLOGY REPORT		

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114°50'
660 000 m E
114°45'
665 000 m E
5 545 000 m N
50° 00'
5 540 000 m N
5 535 000 m N
49° 55'
5 530 000 m N
655 000 m E

ELKFORD
11 Km (APPROX)
FORDING
River
HIGHWAY
Dry
DRY CREEK ROAD
Fording
LOGGING ROAD
C.N.
CROWSNEST FREEHOLD BLOCK
Grave
Creek
Fording
RAILWAY
PACIFIC
CANADIAN
River
MT. LYNX
2500
2000
1500

CL278
CL277
CL1299
Ewin
Creek
MT. BANNER EAST
GROUP 329
CL279
CL280
CL281
CL1302
MT. BANNER
EWIN PASS
CL284
CL283
CL282
CL1301
Creek
DIP CREEK ROAD
GROUP 330
CL285
CL286
CL287
CL1300
MT. MICHAEL
CL304
CL289
CL288
Tornado
MT. MICHAEL
CL290
CL291
CL293
CL292
CL368
Service Area
LINE CREEK EXTENSION
LINE CREEK RIDGE
CL294
CL295
CL373
HORSESHOE RIDGE
LINE CREEK MINE
CL297
CL296
CL369
COAL LEASE 4
Line
CL298
CL299
South
CL301
CL300
NORTH FORK PASS
MT. ERRIS
CL302
GROUP 331
CL303
TEEPEE MTN.
CL370
TEEPEE
MT. SALTER
Grave Lake
LINE CREEK MINE ROAD
Sparwood
20 km (approx.)
Plant Site

Reference map produced by the Surveys and Mapping Branch, Department of Energy, Mines and Resources in 1975 and updated from 1979 Province of British Columbia 1:100,000 mapping. Metric contours were manually interpolated.

Scale 1:50 000

Kilometres 0.5 0 0.5 1.0 1.5 2.0 2.5 3.0 Kilometres

Miles 0.5 0 0.5 1.0 1.5 2.0 Miles

Contour Interval 100m
Transverse Mercator Projection
Universal Transverse Mercator Grid Zone II

Legend

- Road; Highway, Main road
- Road; Loose surface, Dry weather
- Track or trail
- Railway
- River
- Stream
- Contours (2000, 1500)
- Licence boundary
- Licence group boundary

T.N. 1°43' Grid North

HARDY ASSOCIATES (1978) LTD.

Shell
K-Mount Micheal 81(2)A

Crows Nest Resources Limited
EXPLORATION

MOUNT MICHAEL
S.E. BRITISH COLUMBIA

LOCATION AND ACCESS

N.T.S. 82 G/15 & 82 J/2

AUTHOR A. WHITE	SCALE 1:50 000	ENCLOSURE No. 1
DATE 82-01-22	REVISED	CA-272
To Accompany 1981 GEOLOGY REPORT		

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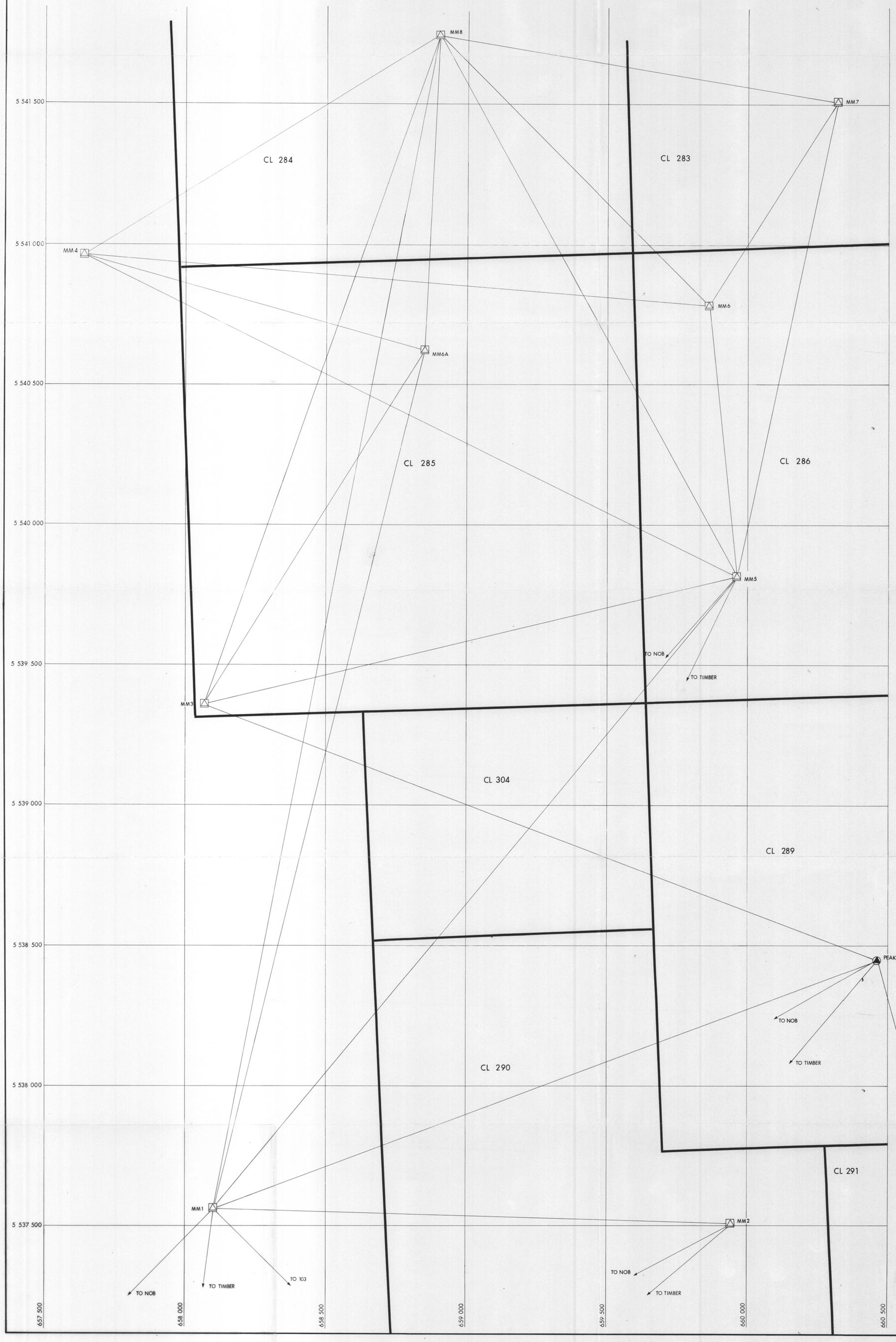

PHOTO TARGET STATIONS

STATION	UTM COORDINATES N	UTM COORDINATES E	ELEV.	GROUND ELEV.
103*	5533521.87	662278.98	2158.1	
Peak	5538446.07	660460.20	2481.1	
Knob	5536912.09	657454.95	2406.0	
Timber* (1980 Sept.)	5535363.99	657849.70	2261.6	
mm1	5537560.36	658099.26	2316.34	2316.12
mm2	5537504.94	659944.21	2206.55	2206.38
mm3	5539364.68	658061.28	2097.50	2097.38
mm4	5540962.99	657637.87	1823.09	1823.03
mm5	5539814.78	659963.75	2405.43	2405.09
mm6	5540782.45	659865.80	2111.20	2110.16
mm6A	5540621.18	658852.57	1985.20	1984.99
mm7	5541508.11	660325.37	2072.50	2072.33
mm8	5541749.89	658904.22	2121.64	2121.37
Peak o/s	5538444.10	660459.37	2480.83	2480.83

* Elevations for '103' & 'Timber' are to the top of cement pad, all others are to top of post.

PHOTO TARGET REFERENCES

STATION	REFERENCE	GRID BEARING	SLOPE DISTANCE	DESCRIPTION	NORTHING	EASTING
MM1	1	183°	10.41	NAIL IN 4" PINE	5537549.96	658098.72
	2	267°	7.75	" 4" TAMARACK	5537559.95	658091.52
	3	91°	13.89	" 4" TAMARACK	5537560.12	658113.15
MM2	1	94°	4.57	" 3" SPRUCE	5537504.62	659948.77
	2	143°	9.24	" 10" SPRUCE	5537497.56	659949.77
	3	172°	6.31	" 3" SPRUCE	5537498.69	659945.09
MM3	1	272°	10.42	" 3" SPRUCE	5539365.04	658050.87
	2	314°	11.24	" 6" PINE	5539372.49	658053.19
	3	104	16.83	" 5" PINE	5539360.61	658077.61
MM4	1	270°	16.82	" 2" SPRUCE	5540962.99	657621.05
	2	348°	19.22	" 3" SPRUCE	5540981.79	657633.87
	3	20°	19.24	" 12" PINE	5540981.07	657644.45
MM6	1	9°	8.85	" 10" PINE	5540791.19	659867.18
	2	112°	15.00	" 5" SPRUCE	5540776.83	659879.71
	3	114°	17.85	" 3" SPRUCE	5540768.01	659876.29
MM6A	1	15°	10.80	" 5" SPRUCE	5540631.61	658855.37
	2	56°	13.60	" 10" PINE	5540628.79	658863.84
	3	82°	10.35	" 10" PINE	5540622.62	658862.82
MM7	1	356°	16.21	" 4" SPRUCE	5541524.28	660324.24
	2	103°	11.62	" 4" SPRUCE	5541505.50	660336.69
	3	146°	13.04	" 8" PINE	5541497.30	660332.66
MM8	1	12°	23.80	" 12" SPRUCE	5541773.17	658909.17
	2	75°	21.92	" 2" PINE	5541755.56	658925.39
	3	124°	17.08	" 8" PINE	5541740.34	658918.38

ALL DISTANCES ARE REDUCED TO THE UTM PLANE AND ARE IN METRES AND DECIMALS THEREOF

BEARINGS ARE REFERRED TO 117° W

SURVEY PERFORMED BY Sheltech Canada, 1981

LEGEND

- PHOTOTARGET IRON POST
- CNRL CONTROL MONUMENT
- 3' REBAR WITH CAP AND MARKER POST
- 12" NAIL
- 6" NAIL
- DRILL HOLE
- ADIT
- OUTCROP
- TRENCH
- COAL LICENCE BOUNDARY (approximate)

T.N. G.N.

100 50 0 100 200 300 400 500

SCALE 1:5000

Crows Nest Resources Limited
EXPLORATION

MOUNT MICHAEL
S.E. B.C.

CENTRAL BLOCK

TRAVERSE SURVEY MAP

N.T.S. 82 G/15 — U.T.M. ZONE 11

AUTHOR: SHELTECH	SCALE: 1:5000	ENCLOSURE No: 2
DATE: 81·11·24	REVISED:	DRAWING No: HE-94 A
To Accompany		

Shell
K-Mount Michael 81(2)A

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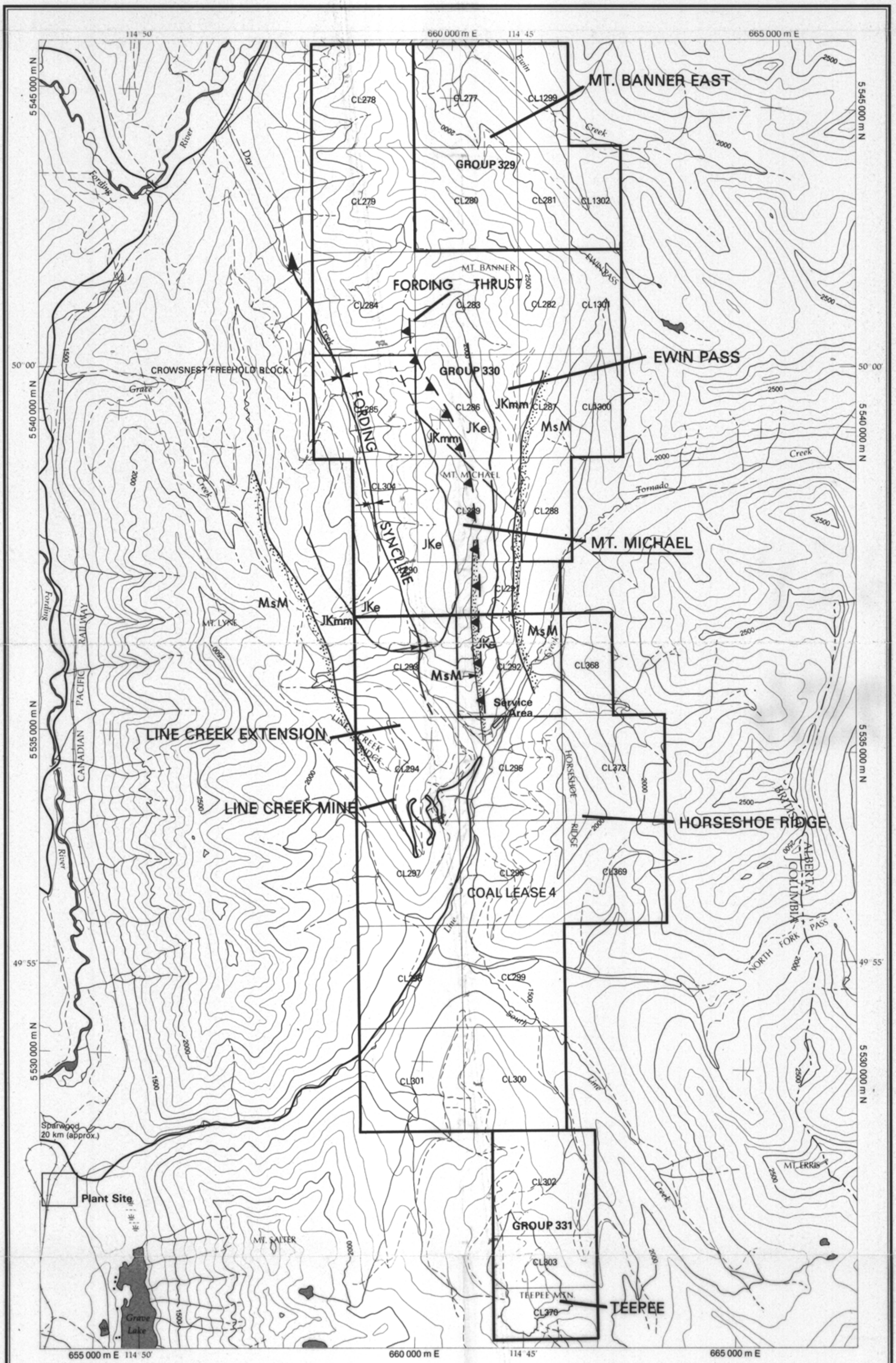

Reference map produced by the Surveys and Mapping Branch, Department of Energy, Mines and Resources in 1975 and updated from 1979 Province of British Columbia 1:100,000 mapping. Metric contours were manually interpolated.

Scale 1:50 000

Kilometres 0.5 0 0.5 1.0 1.5 2.0 2.5 3.0 Kilometres

CONTOUR INTERVAL 100m.

GEOLOGICAL LEGEND

JURASSIC - CRETACEOUS

- JKk — Kootenay Group
- JKe — Elk Formation
- JKmm — Mist Mountain Formation
- JKm — Morrissey Formation
- MsM — Moose Mountain Member
- WrM — Weary Ridge Member

GEOLOGICAL SYMBOLS

- Sandstone
- Syncline
- Thrust Fault

Legend

- Road; Highway, Main road
- Road; Loose surface, Dry weather
- Track or trail
- Railway
- River
- Stream
- Contours 2000 / 1500
- Licence boundary
- Licence group boundary

T.N. 1°43' Grid North

HARDY ASSOCIATES (1978) LTD.

Crows Nest Resources Limited
EXPLORATION

MOUNT MICHAEL
S.E. BRITISH COLUMBIA
GEOLOGIC COMPILATION

82G/15 & 82J/2

AUTHOR: A. WHITE	SCALE: 1:50 000	ENCLOSURE No.: 3
DATE: 82-01-22	REVISED:	CA-270
To Accompany 1981 GEOLOGY REPORT		

Sheet K-Mount Micheal 82(2)A *1

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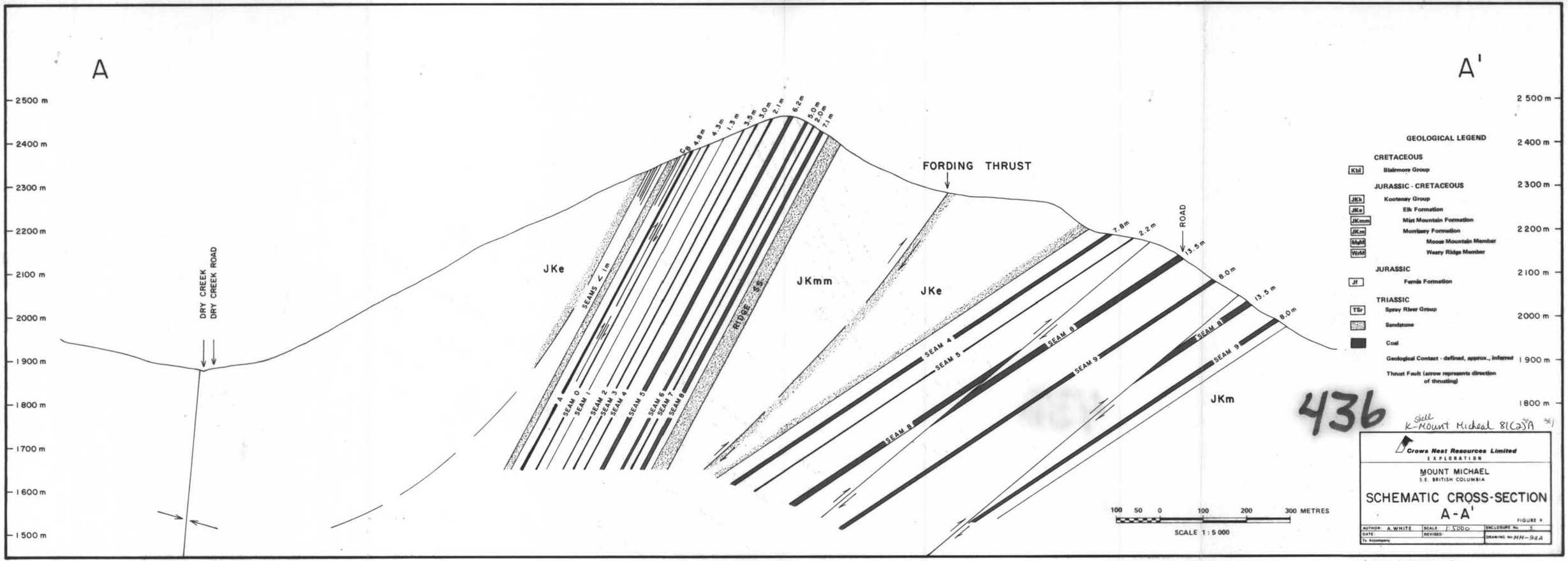

location 5 538 500 m N

GEOLOGICAL LEGEND

	CRETACEOUS		Sandstone (Ss) Medium Grain
Kbl	Blairmore Group		Sandstone (Ss) Fine Grain
	JURASSIC - CRETACEOUS		Siltstone (Sltst)
JKk	Kootenay Group		Shale (sh)
JKe	Elk Formation		Coal
JKmm	Mist Mountain Formation		Geological Contact - defined, approx., inferred
JKm	Morrissey Formation		Thrust Fault
MsM	Moose Mountain Member	25 / 220	Bedding Strike & Dip
WrM	Weary Ridge Member		Hand Trench
	JURASSIC		Axial Trace: Syncline, Anticline
Jf	Fernie Formation		Coal Licence Boundary
	TRIASSIC		
TSr	Spray River Group		

REFERENCE

MAIN ROAD		RIVER, LAKE	
SECONDARY ROAD		INTERMITTENT RIVER	
TRACK OR TRAIL		TREED AREA	
RAILWAY		LINE OF TREES	
HEDGE FENCE		INDIVIDUAL TREES	
BRIDGE CULVERT		VERTICAL INTERVAL	
CUT FILL		DEPRESSION	
SWAMP		SPOT HEIGHT	
DRILL HOLE		CONTROL POINT	

MAP PROJECTION : UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 117° W.

PREPARED BY :
NORTH WEST SURVEY CORPORATION (YUKON) LTD.
JOB NO. 11-104

100 50 0 100 200 300 METRES
SCALE 1 : 5 000

MAP INDEX AND AERIAL PHOTO INDEX
82J/2
1:50000

L		K	J	I
E		F	G	H
D		C	B	A

Crows Nest Resources Limited
EXPLORATION

MOUNT MICHAEL
S.E. BRITISH COLUMBIA

GEOLOGY MAP

FIG. 7
NTS 82G/15
U.T.M. ZONE 11

AUTHOR: WHITE - STOBERNACK	SCALE: 1:5000	ENCLOSURE No : 4
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