

K-SHELL-HARVEY CX 836A

402



Crows Nest Resources

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LIMITED

CONFIDENTIAL

December 21, 1983

Ministry of Energy, Mines and Petroleum Resources
Parliament Buildings
Victoria, B.C.
V8V 1X4

Attention: Mr. Paul Hagen

Dear Sir:

RE: Coal Licences 588 to 594 inclusive, 4090 and 4092 (Group 352)

Attached please find our report dated October, 1983 on the above licences. This report covers work done during September and October 1983.

The author of the report, David D'Andrea is a 1981 graduate of the Northern Alberta Institute of Technology, and is employed by our company as a Geological Technologist, having joined us in 1981. During this program, his work was supervised by Brian McKinstry M.Sc., Staff Geologist.

I consider the above Crows Nest Resources personnel well qualified to conduct the geological field work described in this report. I am satisfied that the attached report has been competently prepared and contains all pertinent information.

Yours very truly,

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

Attachment

00 402

HARVEY CREEK

S.E. British Columbia

1983 GEOLOGICAL REPORT

B.C. COAL LICENCES 588 TO 594 INCLUSIVE,
4090 AND 4092 (GROUP 352)

OWNED BY SHELL CANADA RESOURCES LTD.
OPERATED BY CROWS NEST RESOURCES LTD.

LOCATED IN THE KOOTENAY LAND DISTRICT

NTS 82 G2 AND 82 G7

LATITUDE 49° 15' TO 49° 19' NORTH
LONGITUDE 114° 32' TO 114° 36' WEST

D. J. D'ANDREA

EXPLORATION PERIOD: SEPTEMBER, 1983
REPORT DATE: OCTOBER, 1983

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1.0 SUMMARY

The Harvey creek Project is located 40 air kilometres southeast of Fernie, British Columbia. The property covers some 1 215 hectares and encompasses 9 coal licences which make up Group 352.

In the Harvey Creek region, coal bearing rocks of the Jura-Cretaceous Kootenay Group are preserved in a Graben structure bounded by the Shepp Fault on the west and the Flathead Fault on the east. The Kootenay Group is divided into three formations: the basal Morrissey Formation; the middle Mist Mountain Formation (coal bearing), and; the upper Elk Formation which is not evident on the Project area. The Cretaceous Cadomin Formation of the Blairmore Group directly overlies the Mist Mountain Formation.

The 1983 exploration program confirmed that the Mist Mountain Formation is 160 to 180 metres thick and that it contained eight coal seams. Four of the seams range in thickness from 1.3 to 8.8 metres; their aggregate thickness being 15.3 metres. The program consisted of three rotary holes and 2 042 metres of road construction.

The overall dip of the Mist Mountain Formation is 55° to the east. Topographic relief is flat. Mineable reserves based on a 60 metre deep open pit are about 10.6 million tonnes in place with a stripping ratio of 2:1.

Underground reserves, to a maximum depth of 460 metres, (calculated using the 4 seams greater than 1 metre thick) are estimated to total some 110 million tonnes in place.

2.0 INTRODUCTION

2.1 LOCATION AND PHYSIOGRAPHY

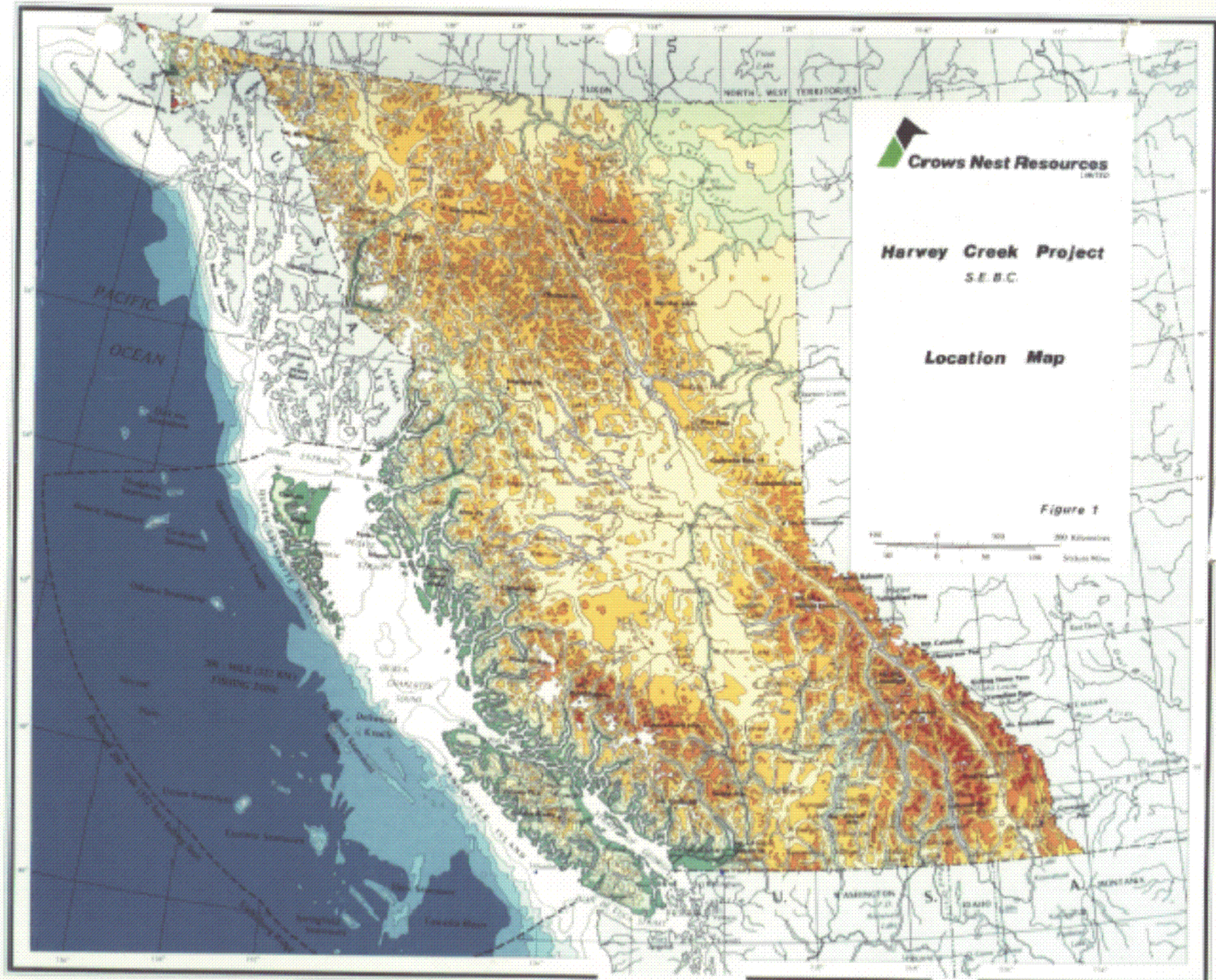
The Harvey Creek property is located in the Flathead River Valley approximately 40 air kilometres southeast from Fernie (Figure 1). The property is bounded by latitudes $40^{\circ} 15'$ and $49^{\circ} 19'$ and longitudes $114^{\circ} 32'$ and $114^{\circ} 36'$. It is located on NTS map sheet 82G.

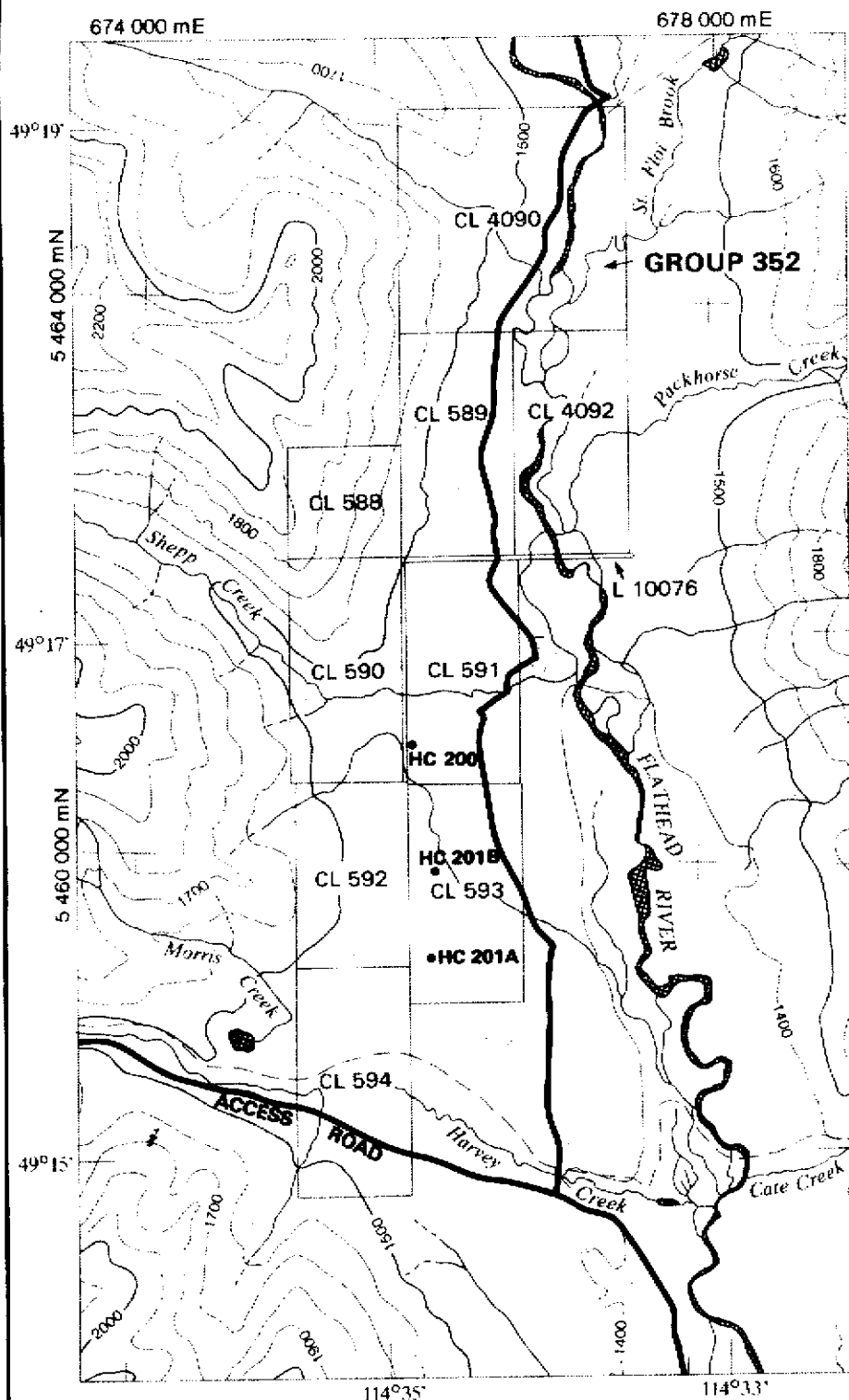
The general area forms part of the Front ranges of the Rocky Mountains. The property straddles the broad flat valley of the Flathead River but encompasses some higher ground to the west and east. Relief varies from a low of 1 430 m to a high of 1 950 m. Pollock Creek flows into the Flathead River at the north end of the property and Harvey Creek flows eastward to join the Flathead River at the south end of the property. The western part of the property is underlain by alluvial terraces of the Flathead River.

2.2 ACCESS AND INFRASTRUCTURE

Vehicular access from Morrissey station, which is 13 kilometres south of Fernie, on Provincial Highway No. 3, is by the Lodgepole and Harvey creek Forest Development Roads (Figure 2). Total road distance from Fernie is approximately 65 kilometres. In addition, access can be obtained from Sparwood via the Corbin Townsite and the Flathead Forest Development Roads.

Nearest rail access is located at Morrissey Station on CPR's route to Vancouver. Distance from the coal handling facilities at Roberts Bank in Vancouver to Morrissey Station is approximately 1 050 kilometres. It is an additional 50 kilometres by road from Morrissey to the property.





• Rotary Drill Hole

Reference map produced by the Surveys and Mapping Branch, Department of Energy, Mines and Resources in 1973, Province of British Columbia 1:125 000 map used for metric contours.

FIG. 2

Crows Nest Resources Limited

HARVEY CREEK PROJECT

**ACCESS
AND INFRASTRUCTURE MAP**

NTS - 82G/2 & 7

Legend

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

T.N. 82G/2
G.N. 82G/7
1954

2.3 COAL LAND TENURE AND PREVIOUS WORK

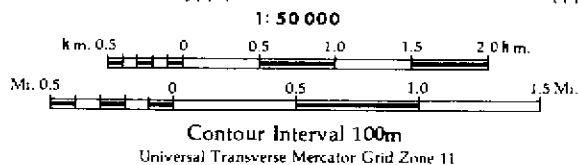
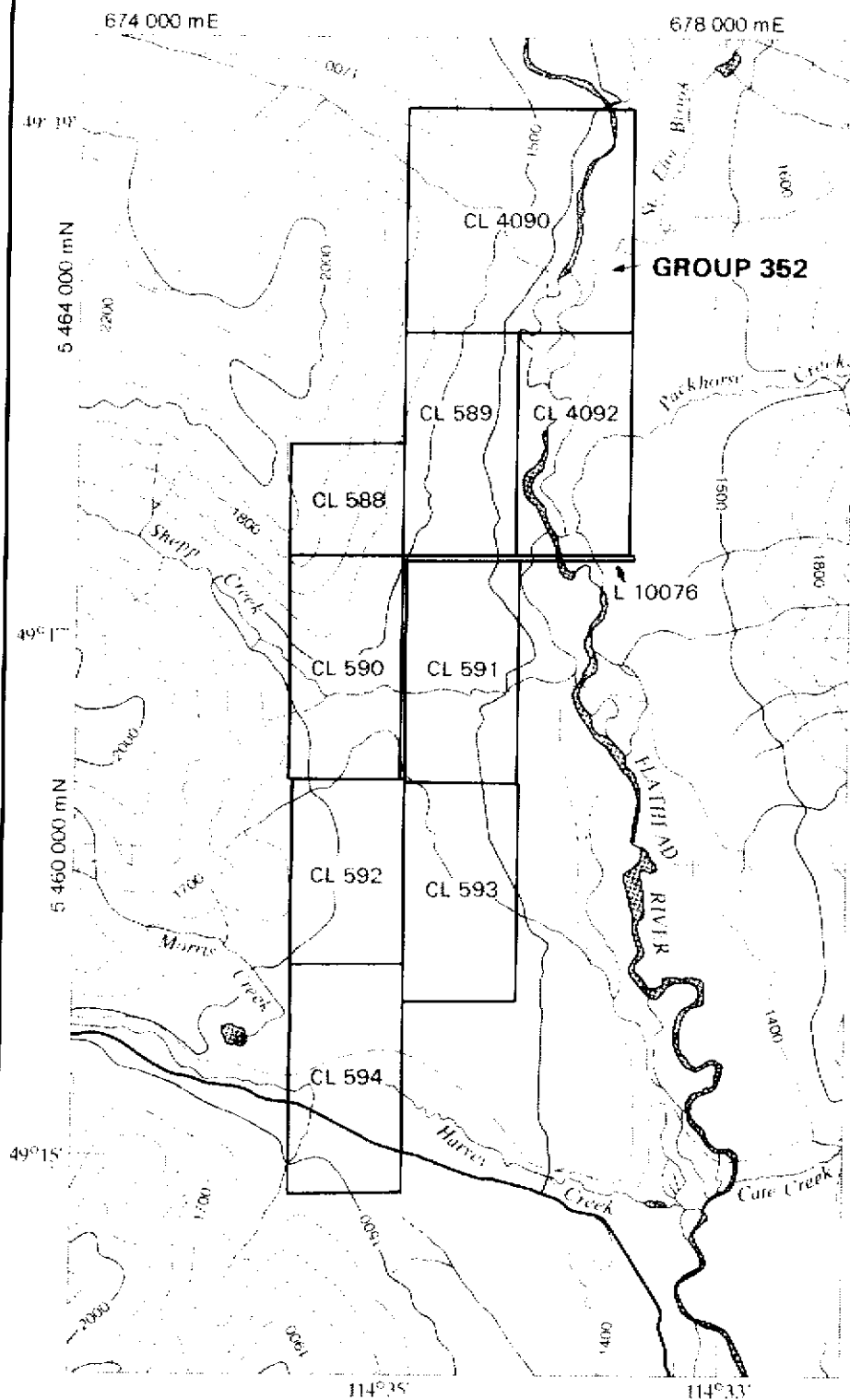
In June of 1975, coal licences 588 to 594 inclusive were issued to Crows Nest Industries (CNI) of Fernie, British Columbia. In January, 1976, these licences were assigned to CNI's wholly owned subsidiary, the Crows Nest Pass Oil and Gas Company Limited. In 1978, the purchase of CNI by SCRL included the acquisition of the above mentioned coal licences.

SCRL applied for additional coal lands (licences 4090 to 4102 inclusive) east of the original CNI licences in 1978. Licences 4091 to 4102 were subsequently surrounded in 1979. The remaining block of 9 licences encompass approximately 1 215 hectares and make up coal Group No. 352 (Figure 3).

Activity in the early 1900's on the Harvey creek property included exploration tunnels and hand trenches. In 1975, a 550 metre road was built by CNI to intersect the old prospect. Also, a 76 metre branch road was excavated perpendicular to the trend of the rocks; subsequently, a 45 metre trench was sampled, measured and backfilled. Minor "pot holing" was conducted near the south end of the main access road. In 1978, CNRL, a wholly owned subsidiary of SCRL, conducted an exploration program which included a diamond drill core hole (HC 101 on Enclosure 1), mechanical trenching and geodetic surveying. Details of the 1975 and 1978 programs are more fully described in CRABB (1976) and FIETZ (1979).

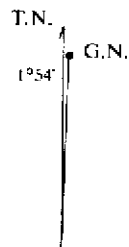
2.4 WORK PERFORMED IN 1983

Field operations conducted in the early fall of 1983 entailed road building and rotary drilling, with spot coring in one of the holes (HC 200). To gain access to the drill sites, 2 042 metres of road was constructed using a D-7 Caterpillar Bulldozer. The road traverses licences 591 and 593.



Legend

Road; Highway, Main road	—————
Road; Loose surface, Dry weather	- - - - -
Track or trail
Railway	—+—+—+—
River	~~~~~
Stream	~~~~~
Contours	~~~~~ 2000
Licence boundary	—————



Reference map produced by the Surveys and Mapping Branch, Department of Energy, Mines and Resources in 1973. Province of British Columbia 1:125 000 map used for metric contours.

FIG. 3



Crows Nest Resources Limited

HARVEY CREEK PROJECT

INDEX MAP OF COAL LICENCES

NTS - 82G/2 & 7

Two 60° angle rotary drill holes, HC 200 and HC 201B, were drilled to depths of 223 metres and 210 metres respectively. Hole HC 200 is collared on licence 591 and hole HC 201B is collared on licence 593. A further hole, HC 201A, encountered drill difficulties in the gravel overburden and was abandoned at 33 metres. The drilling was achieved with the use of Schramm 65 rotary drill rig. core and chip samples were logged on site and are stored at CNRL core storage facilities at Line Creek, British Columbia. Chip descriptions for holes HC 200 and HC 201B are included in Enclosures 4 and 5 respectively.

Drill holes are located and coordinates provided in Enclosure 1. Survey of drill holes and new roads was performed by D. D'Andrea using a 1:5 000 topographic base map, Brunton Hand Transit and Hip Chain; locations are considered accurate to within 5 metres vertically and 10 metres horizontally.

Drill hole lengths and orientations are summarized in Table 4.

Only HC 200 was geophysically logged. Due to the thickness of the rotary rig drill pipes, substantial difficulty was encountered in obtaining definite expressions from the geophysical sondes run through the pipe. An open hole Natural-Gamma-Density-Resistivity Log was obtained to a depth of 100 metres. Table 5 summarizes the geophysical results of HC 200 as obtained by Davies Exploration Logging Limited. The geophysical logs are in Enclosure 4.

The cost of the 1983 program was 70,837.00. An application to Extend Term of Licence (Table 6) and a B.C. Coal Licences Tenure Standing (Table 7) are included.

TABLE 4

SUMMARY OF DRILL HOLE ORIENTATIONS & DEPTHS

HOLE NO.	AZIMUTH	INCLINATION	CASING DEPTH (m)	TOTAL DEPTH (m)
HC 200	296	60°	22	223
HC 201A	296	60°	-	33
HC 201B	296	60°	14	210

TABLE 5

SUMMARY OF DRILL HOLE GEOPHYSICAL DATA - HOLE HC 200

LOG	DEPTH (m)	DEFINITION
NATURAL GAMMA	218	FAIR
LONG SPACED DENSITY	218	POOR
NEUTRON	218	POOR
CALIPER	100	GOOD
NATURAL GAMMA	100	GOOD
LONG SPACED DENSITY	100	FAIR
RESISTIVITY	100	FAIR



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

APPLICATION TO EXTEND TERM OF LICENCE

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

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

ALBERTA T2P 2M7

Valid FMC No. 257677

hereby apply to the Minister to extend the term of Coal Licence(s) No(s). 588 to 594, 4090 and 4092,
9 LICENCES, 1215 HECTARES

for a further period of one year.

2. Property name HARVEY CREEK, KOOTENAY LAND DISTRICT

3. I am allowing the following Coal Licence(s) No(s). to forfeit NA

4. I have performed, or caused to be performed, during the period JUNE 3RD, 1982 to
DECEMBER 30th 19 83, work to the value of at least \$ 70,837

on the location of coal licence(s) as follows:

CATEGORY OF WORK

	Licence(s) No(s).	Apportioned Cost
Geological mapping	588-594 4090 & 4092	5,579
Surveys: Geophysical	-	-
Geochemical	-	-
Other	-	-
Road construction	591 & 593	5,393
Surface work	-	-
Underground work	-	-
Drilling	591 & 593	46,760
Logging, sampling, and testing	-	691
Reclamation	-	1,140
Other work (specify)	-	-
Off-property costs	-	11,274

5. I wish to apply \$ 70,837 of this value of work on Coal Licence(s) No(s). 588-594
4090 & 4092

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

7. The work performed on the location(s) is detailed in the attached report entitled THE GEOLOGICAL
REPORT IS ATTACHED

DECEMBER 20th, 1983
(Date)

Gramantik
(Signature)

ASSISTANT LANDMAN
(Position)

(FORMS AND REPORT TO BE SUBMITTED IN DUPLICATE)

GEOLOGICAL MAPPING

Yes ☒ No ☐

Area (Hectares)

Scale

Duration

Reconnaissance 1200 15 MAN-DAYS

Detail: Surface

Underground

Other* (specify)

Total Cost \$ 5,579

GEOPHYSICAL/GEOCHEMICAL SURVEYS

Yes ☐ No ☒

Method

Grid

Topographic

Other* (specify)

Total Cost \$

ROAD CONSTRUCTION

Yes ☒ No ☐

Length 2042 m Width 10 m

On Licence(s) No(s) 591 & 593

Access to DRILL HOLES

Total Cost \$ 5,393

SURFACE WORK

Yes ☐ No ☒

Length

Width

Depth

Cost

Trenching

Seam Tracing

Crosscutting

Other* (specify)

Total Cost \$

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 3 466

Reverse circulation

Other* (specify)

Contractor

Where is the core stored?

Total Cost \$ 46,760

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 \$ 691

RECLAMATION

Yes ☒ No ☐

Details Total Cost \$ 1,140

OTHER WORK (Specify details)

Yes ☐ No ☒

Cost

Total Cost \$

OFF-PROPERTY COSTS

Yes ☒ No ☐

Details REPORT PREPARATION & REPRODUCTION Total Cost \$ 11,274

Total Expenditures \$ 70,837

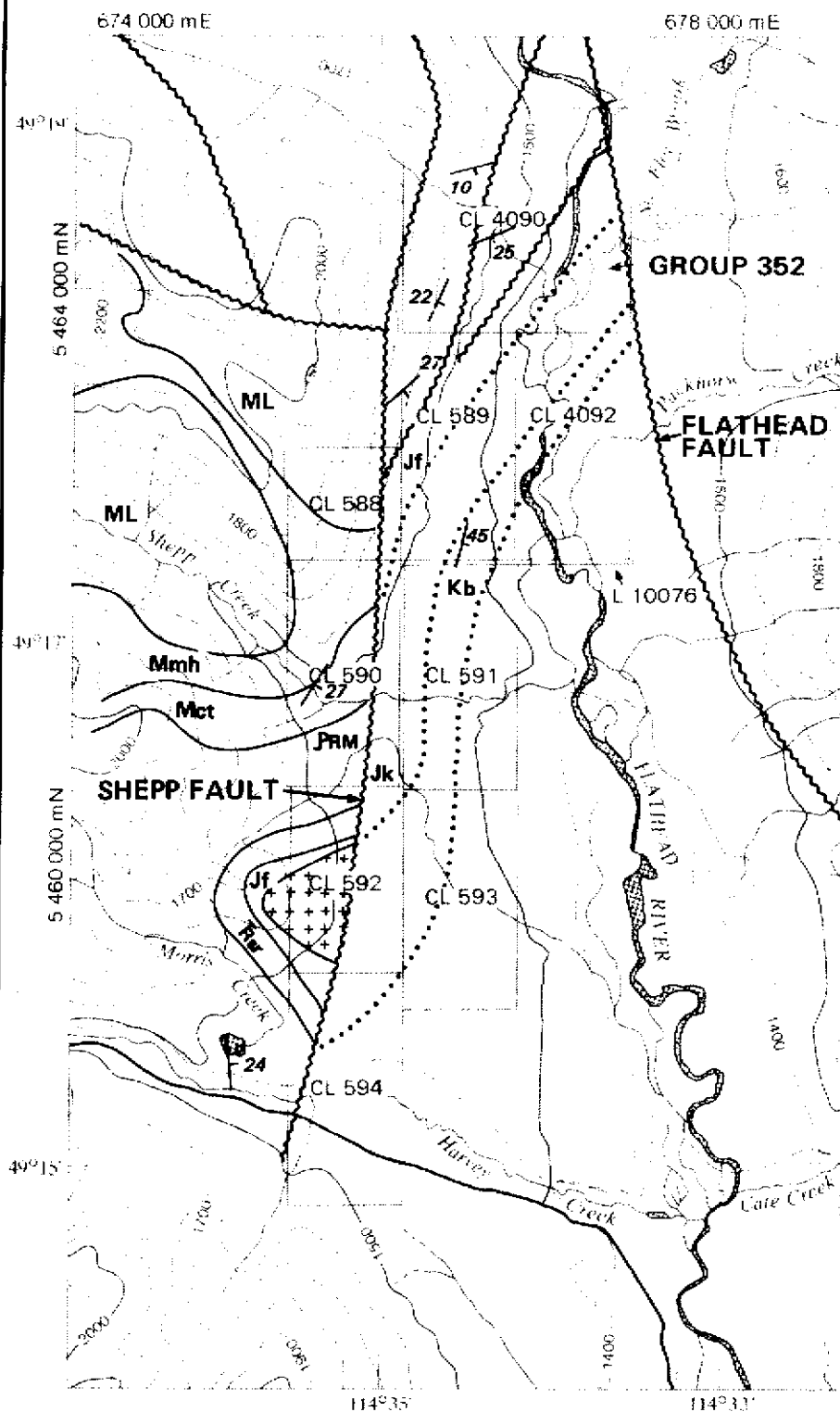
B-12-30 (Date)

(Signature)

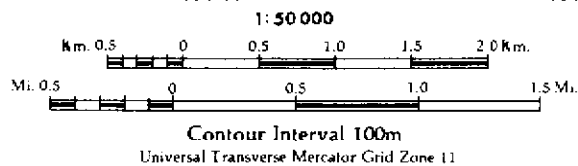
MANAGER - ACCOUNTING

(Position)

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



- | | |
|------------|---|
| | CRETACEOUS
Trachyte, syenite |
| Kb | LOWER CRETACEOUS
BLAIRMORE GROUP: sandstone, mudstone conglomerate, minor limestone |
| Jk | UPPER JURASSIC & LOWER CRETACEOUS
KOOTENAY FORMATION: sandstone, siltstone, shale coal |
| Jf | JURASSIC
FERNIE GROUP: shale, siltstone, sandstone |
| Rsr | TRIASSIC
SPRAY RIVER FORMATION: siltstone, sandstone, shale |
| Prm | PENNSYLVANIAN
ROCKY MOUNTAIN FORMATION: quartzite, sandstone, dolomite |
| Mct | MISSISSIPPIAN
ETHERINGTON FORMATION: calcarenite, limestone, dolomite |
| Mmh | MOUNT HEAD FORMATION: limestone, dolomite |
| ML | LIVINGSTONE FORMATION: limestone, calcarenite |
-
- | | |
|--|---|
| | Bedding Attitude; strike and dip |
| | Normal Fault |
| | Extrapolated or Inferred Geological Contact |



Reference map produced by the Surveys and Mapping Branch, Department of Energy, Mines and Resources in 1973. Province of British Columbia 1:125 000 map used for metric contours.

- Legend**
- | | |
|----------------------------------|--|
| Road: Highway, Main road | |
| Road: Loose surface, Dry weather | |
| Track or trail | |
| Railway | |
| River | |
| Stream | |
| Contours | |
| Licence boundary | |

T.N.
1954
G.N.

Crows Nest Resources Limited

HARVEY CREEK PROJECT

GEOLOGICAL COMPILATION MAP

NTS - 82G/2 & 7

FIG. 8

3.0 1983 PROGRAM

3.1 OBJECTIVES OF THE 1983 PROGRAM

Exploration activities in 1983 were designed to:

- a) further delineate the geological boundaries between the coal bearing Kootenay Formation, the Blairmore Group and the Jurassic Fernie Formation, within the coal licences,
- b) verify the structural and stratigraphic information obtained from the 1978 program, and
- c) obtain further coal samples from the thicker seams for analysis.

3.2 GEOLOGICAL SETTING

The Harvey Creek Project is part of the Flathead Graben structure. Coal measures are confined to the upper Jurassic-lower Cretaceous Kootenay Formation and occur as scattered erosional remnants. Locally, the licence block encompasses a steeply dipping down-faulted segment of the Kootenay Formation, which is overlain by the Cadomin conglomerate of the lower Cretaceous Blairmore Group, (Figure 8).

3.3 REGIONAL STRATIGRAPHY

Regional stratigraphy is dominated by the flathead Valley Graben structure. West of the Shepp Creek fault, strata of Devonian to Triassic age predominate. Rock types are typically limestone, dolomite, calcarenite and rare shale, reflecting the carbonate shelf environment suggested for these strata. East of the Flathead Fault, rocks of the Precambrian Purcell group are

evident. Characteristic rock types for these strata are argillites, dolomites, limestones and sandstone of marine origin. Between the Flathead and Shepp Creek Faults are down faulted blocks of Mesozoic and Tertiary strata. The Harvey Creek Property is located within this structural environment and local geology consists of strata from the Jurassic Fernie Formation, Jura-Cretaceous Kootenay Group and the Cretaceous Blairmore Group (Figure 9).

The Fernie Formation is composed of marine shales, siltstones, mudstones and occasional calcareous sandstones. The upper part of the Fernie, locally referred to as the "Passage Beds", appears to be a transitional unit of marine to non-marine sediments, consisting of alternating siltstone, sandstone and shale. Conformably overlying the passage beds is the lower part of the non-marine Kootenay Group known as the Morrissey Formation; a cliff forming sandstone unit of probable beach environment. A 29 m length of the Morrissey Formation was intersected in the 1978 drill hole HC 101, which is located on Enclosure 1.

Overlying the Morrissey Formation is the coal-bearing Mist Mountain Formation. It is composed of sandstone, mudstone, siltstone and coal of deltaic origin. Most of the economical coal deposits are located within this formation. In other areas of the southeast British Columbia coal fields, notably the Fernie Basin, the Mist Mountain Formation is overlain conformably by the Elk Formation. This formation is dominated by sandstone, siltstone, mudstone and cannel coal of possible upper deltaic or braided stream environment. However, on the Harvey Creek Property there is no evidence of the Elk Formation, possibly due to non-deposition. Instead, the Mist Mountain Formation is conformably overlain by the Cadomin Formation of the Blairmore

Group. This group is a succession of non-marine sandstone, shale and conglomerates, characterized by a basal unit of thick resistance conglomerate (32 cm intersected in drill hole HC 101). There is evidence to indicate that a substantial thickness of Blairmore Group sediment is present on the property. Rotary hole HC 201B was drilled to a total depth of 210 metres, all within Blairmore strata. Data from this hole indicates a minimum true thickness of 185 metres for the Blairmore. Based on the results of the 1983 drilling, the Blairmore Group-Kootenay Group contact has been shifted a considerable distance westward from its previous mapped location (Price, 1965) (Enclosure 1).

A composite stratigraphic section emphasizing coal measures was established from corehole data (HC 101, HC 200) (Enclosure 2) it may apply to surrounding coal properties.

3.4 STRUCTURAL GEOLOGY

As discussed previously, the Harvey Creek Property lies within an asymmetrical Graben structure, bounded on the east by the west dipping Flathead Normal Fault and on the west by the east dipping Shepp Creek Normal Fault. Earlier, structural interpretation suggested that the strata within the Graben area had been disrupted by a series of subsidiary small normal faults, producing many small fault blocks (Price, 1965). Although this may be true on a regional scale, 1983 drilling indicates the correlation over a distance of 1 600 m is unaffected by a normal faulting.

Structure contour maps of the top of the Morrissey Formation and the base of 3 seam (Enclosures 3 and 4) reveal no evidence of faulting between boreholes HC 200 and HCD 101.

3.5 COAL STRATIGRAPHY

The Mist Mountain Formation varies from 160 to 180 metres in thickness. On the property, drill results indicate that there are five seams greater than one metre in thickness. Seam 1 occurs 3 m above the Morrissey Formation and varies from 3 m in HC 101 to 2.3 m in HC 200. It appears to have 2 to 3 thin shale partings in the middle of the seam, lending a pronounced ashy nature to the seam.

Seam 2 occurs 15.5 m stratigraphically above seam 1 and averages 1.8 m in thickness, with the upper part of the seam grading into shale.

Seam 3 is the thickest seam on the property averaging 11.0 m. It occurs 13.5 m above 2 seam. It is characterized by numerous 0.1 to 0.2 m shale partings, imparting a very high ash nature to it.

Ten metres above 3 seam is a very clean thin coal seam averaging 1 m in thickness, designated 4 seam. Only 3 metres separates 4 seam and 5 seam. Technically, the two seams could define a coal zone. Number 5 seam is 0.3 to 0.4 m thick and is the thinnest coal seam on the property.

Forty metres of strata separate 5 seam from 6 seam. Number 6 seam coal is within a shaley zone between two thick distinct sandstone units. It is similar to 1 seam in having several very ash-rich bands in the coal. Number 6 seam averages 1.6 m in thickness. In HC 200, evidence indicates that the seam has separated into two distinct bands separated by a mudstone unit.

3.6 COAL QUALITY

Water pressures in hole HC 200 prevented the collection of coal samples from any of the seams encountered. However, correlation between it and HC 101 is considered good. Table 11 is a summary of the 1978 HC 101 coal quality data. The data indicates that the majority of seams are of medium volatile bituminous rank, and of thermal quality.

TABLE OF FORMATIONS

TABLE 9

ERA	PERIOD	FORMATION		LITHOLOGY	THICKNESS
MESOZOIC	Lower Cretaceous	Cadomin Fm.		non-marine: sandstone, conglomerate and shale	360 - 1980
	LOWER CRETACEOUS AND JURASSIC	Pocaterra Creek		non-marine: sandstones, conglomerate siltstones and shales	
		ELK FORMATION		non-marine: Interbedded medium to coarse grain sandstone, chert-pebble conglomerate with minor siltstone shale and uneconomic coals	Not Present at Harvey Creek
		MIST MTN. FORMATION		non-marine and brackish: interbedded coal, siltstones, shales, and sandstones	160 - 180
		MORRISSEY FORMATION	Moose Mtn.	non-marine: massive cliff-forming sandstone	40 - 60
			Weary Ridge		
	Jurassic	Fernie Fm.		marine: shales, siltstone, sandstone limestone	180 - 380

TABLE 10

SUMMARY OF THE 1978 HC 101 DDH COAL QUALITY DATA

SEAM	SEAM TRUE THICKNESS (m)	% RESIDUAL MOISTURE	% ASH	% VOLATILE MATTER	FSI	%YIELD	SPECIFIC GRAVITY
1	1.6	0.24	29.41 12.43	22.82	1.0 2.5	50.8	RAW 1.5 ✓
2	2.0	0.48	25.09 8.31	23.76	0.5 2.0	61.0	RAW 1.5 ✓
3	11.7	1.10	28.9* 7.4*	26.9*	1.5 2.5	52.5*	RAW 1.5 ✓
4	.8	0.34	29.41 12.43	22.82	1.0 2.5	50.3	RAW 1.5 ✓
5	.4	1.21	13.44 6.92	28.17	2.0 2.0	63.9	RAW 1.5 ✓
6	1.2	1.09	33.0 10.08	31.1	3.0 5.5	46.1	RAW 1.5 ✓

NOTE: RESULTS ON AN AIR-DRY BASIS

* WEIGHTED AVERAGE

3.7 COAL RESERVES

The in-place coal reserves of the four seams greater than one metre in thickness, calculated to a maximum depth of 460 metres, are 110 million tonnes.

Strippable in-place coal reserves for the thick 3 seam, calculated to a depth of 60 metres, total 10.6 million tonnes. Because of the steep dip, an open pit would be a long narrow trench-like excavation (Fietz, 1979).

Data collected in the 1983 exploration program is insufficient to make any changes to the reserves calculated by Fietz (1979).

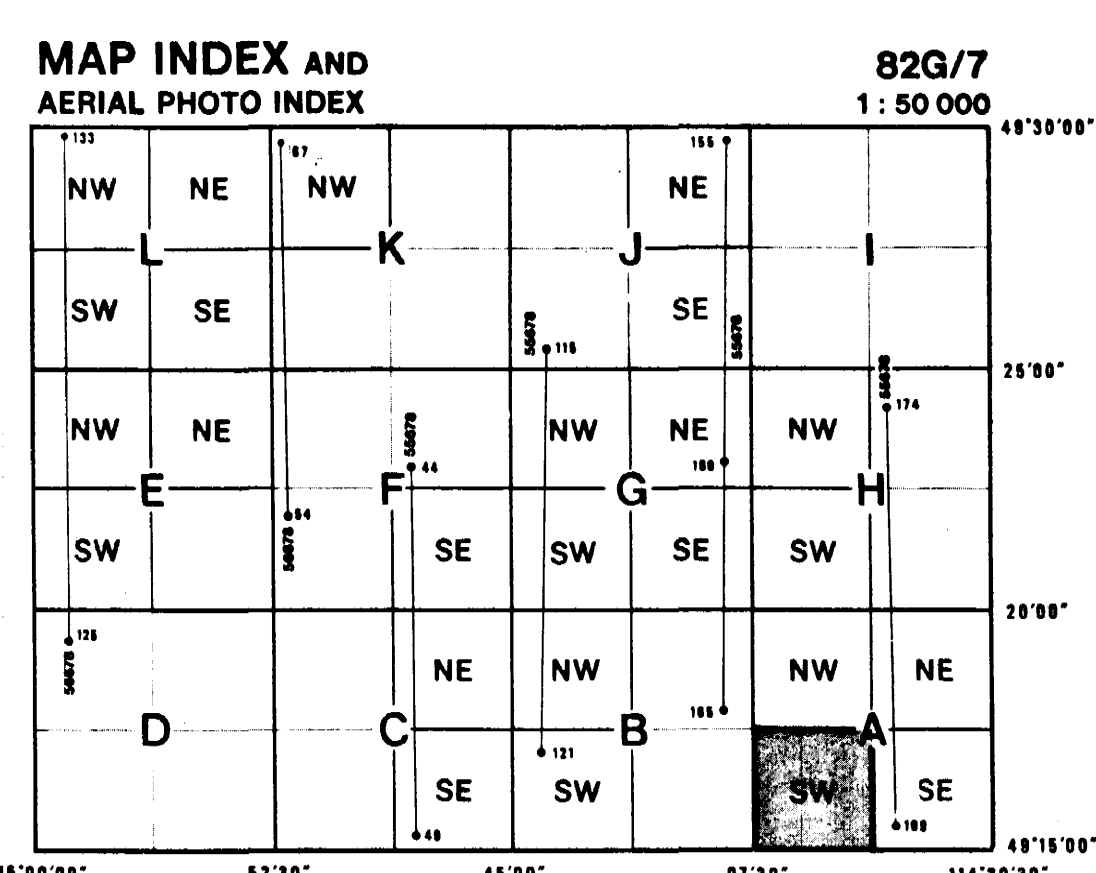
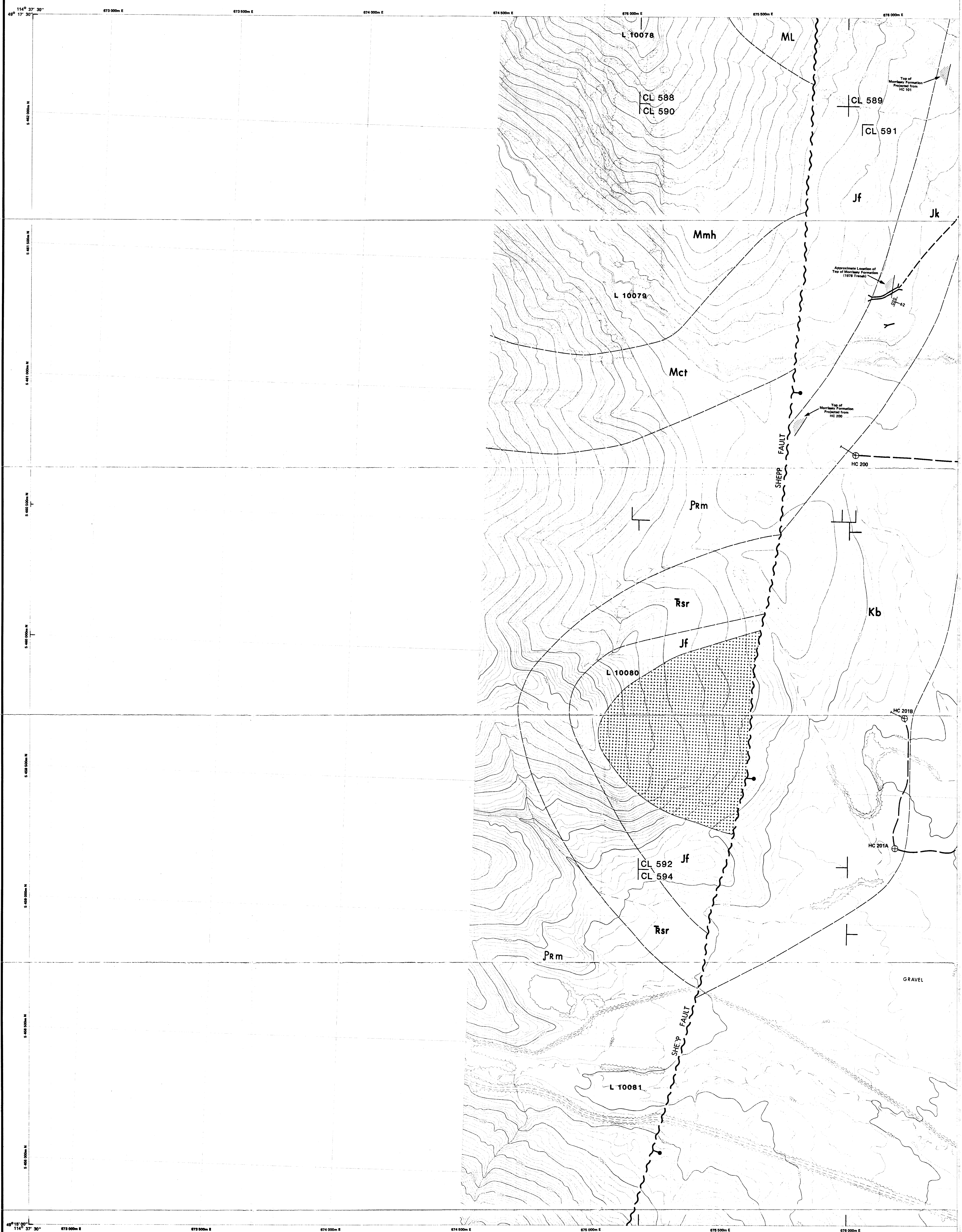
4.0 CONCLUSIONS AND RECOMMENDATIONS

The Harvey Creek coal prospect is located in a Graben complex bound by opposing normal faults of the east and west in the Flathead Valley of southeastern British Columbia. Exploration to date has confirmed in-place thermal coal reserves within the property in excess of 100 million tonnes. However, mineability is limited to a difficult underground situation. Proximity of the Flathead River drainage system and the sensitive environmental aspects of the Flathead Valley are further factors to be considered.

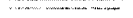


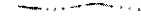












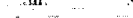

Although development of the Harvey Creek area is unlikely in the immediate future, a small carefully conceived drilling program could establish good geological control of the property. It is suggested that two rotary holes be drilled to establish the northern limits of the Kootenay Group within the property limits, and a core hole be drilled to aid with structural and quality evaluation of the project.

5.0 BIBLIOGRAPHY

- CRABB, J. Preliminary Report Coal Licences Nos. 588 to 601
(1976) inclusive, Kootenay District B.C.M.M.P.R. Open File.
- FIETZ, D. Report on Coal Licences 588 to 594 inclusive and
(1979) 4090 to 4103 inclusive. Harvey Creek Project
Kootenay District, B.C. B.C.M.M.P.R. Open File.
- PRICE, R. Flathead Map - Area British Columbia and Alberta.
(1965) G.S.C. Memoir 336.



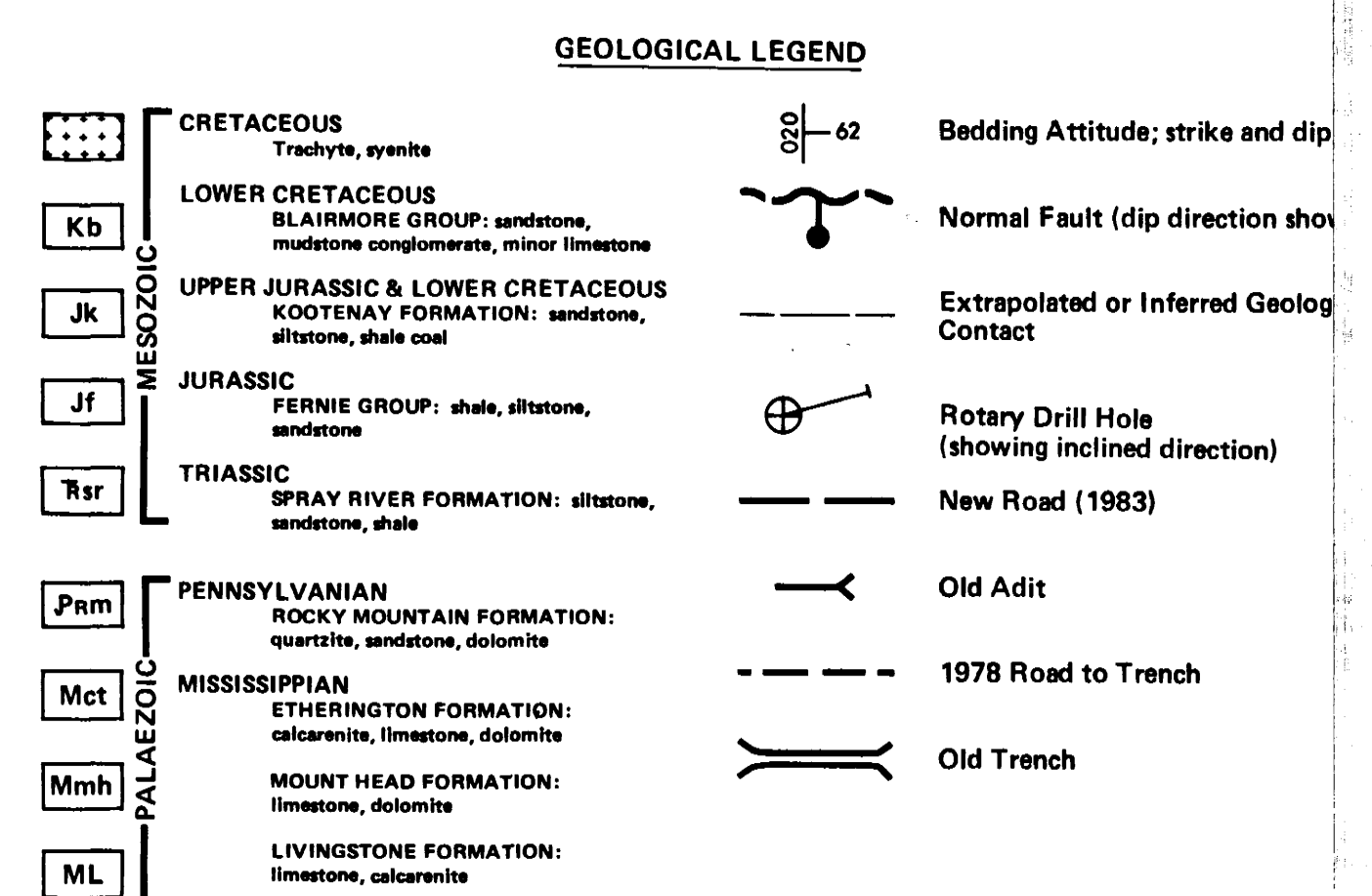
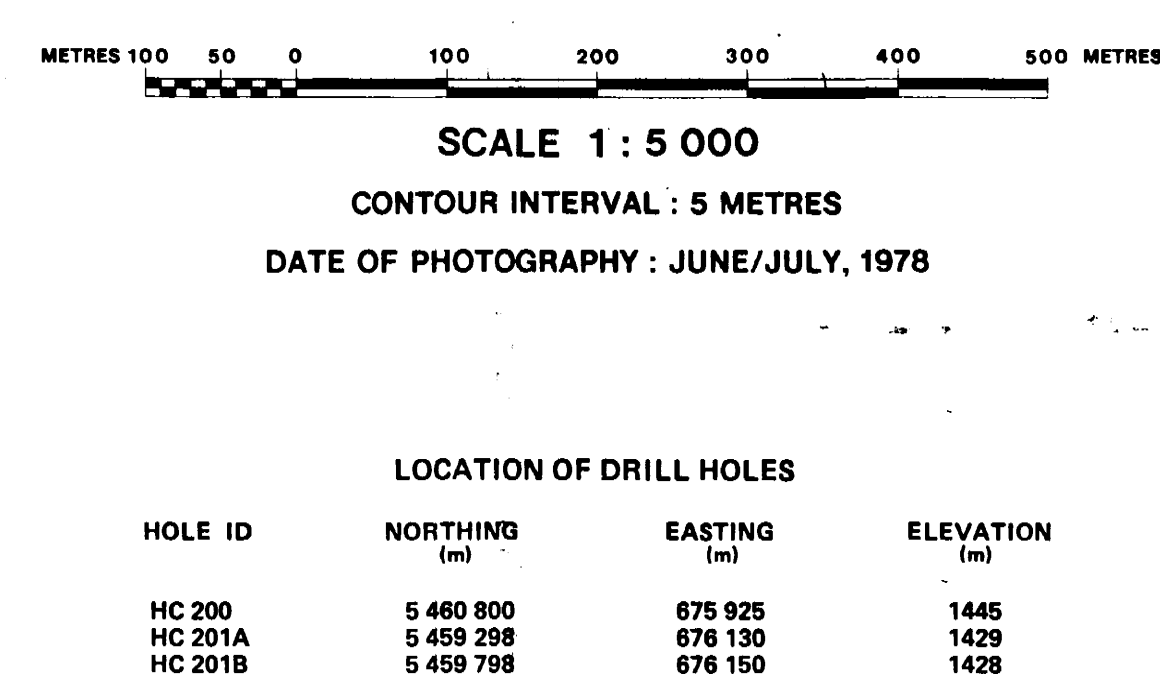
REFERENCE

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

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

PREPARED BY :
NORTH WEST SURVEY CORPORATION (YUKON) LTD.

ISSUED NO. 12-108



674 000m E

674 500m E

675 000m E

675 500m E

676 000m E

676 500m E

677 000m E

113° 33' 45"

N 49° 17' 30"

L 10078

ML

L 10077

CL 588
CL 590

CL 589

CL 4092

CL 591

L 10076

Jf

Jk

Kb

Mmh

L 10079

Mct

Approximate Location of
Top of Montney Formation
Projected from
1978 TrenchTop of
Montney Formation
Projected from
HC 200

HC 200

L 9826

CL 593

GRAVEL

Rsr

Kb

L 10080

HC 201B

L 10075

CL 592
CL 594

HC 201A

Rsr

Prm

GRAVEL

L 10081

SHEEP FAULT

SHEEP FAULT

674 000m E

674 500m E

675 000m E

675 500m E

676 000m E

676 500m E

677 000m E

114° 49' 15" 00"

N 49° 32' 45"

REFERENCE

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

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

PREPARED BY :
NORTH WEST SURVEY CORPORATION (YUKON) LTD.

JOB NO. 75-108

METRES 100 50 0 100 200 300 400 500 METRES

SCALE 1 : 5 000

CONTOUR INTERVAL : 5 METRES

DATE OF PHOTOGRAPHY : JUNE/JULY, 1978

LOCATION OF DRILL HOLES

HOLE ID	NORTHING m	EASTING m	ELEVATION m
HC 200	5 489 800	675 925	1445
HC 201A	5 489 298	676 130	1428
HC 201B	5 489 798	676 150	1428

GEOLOGICAL LEGEND

- CRETACEOUS
Trachyte, syenite
LOWER CRETACEOUS
BLAIRMORE GROUP: sandstone,
mudstone conglomerate, minor limestone
UPPER JURASSIC & LOWER CRETACEOUS
KOOTENAY FORMATION: sandstone,
siltstone, shale, coal
JURASSIC
FERNIE GROUP: shale, siltstone,
sandstone
TRIASSIC
SPRAY RIVER FORMATION: siltstone,
sandstone, shale
PENNSYLVANIAN
ROCKY MOUNTAIN FORMATION:
quartzite, sandstone, dolomite
MISSISSIPPIAN
ETHERINGTON FORMATION:
calcarenite, limestone, dolomite
MOUNT HEAD FORMATION:
limestone, dolomite
LIVINGSTONE FORMATION:
limestone, calcarenite
- Bedding Attitude; strike and dip
Normal Fault (dip direction shown)
Extrapolated or Inferred Geological Contact
Rotary Drill Hole (showing inclined direction)
New Road (1983)
Old Adit
1978 Road to Trench
Old Trench

402

K. SHEW-HARVEY CORP. 83*1/2/8

Crows Nest Resources Limited
EXPLORATION
HARVEY CREEK PROJECT
S.E.C.

ENC 1
INFORMATION BASE
AND
GEOLOGY MAP

U.T.M. ZONE 11

N.T.S. 82 G/7

AUTHOR: D.J. D'ANDREA

SCALE: 1:5 000

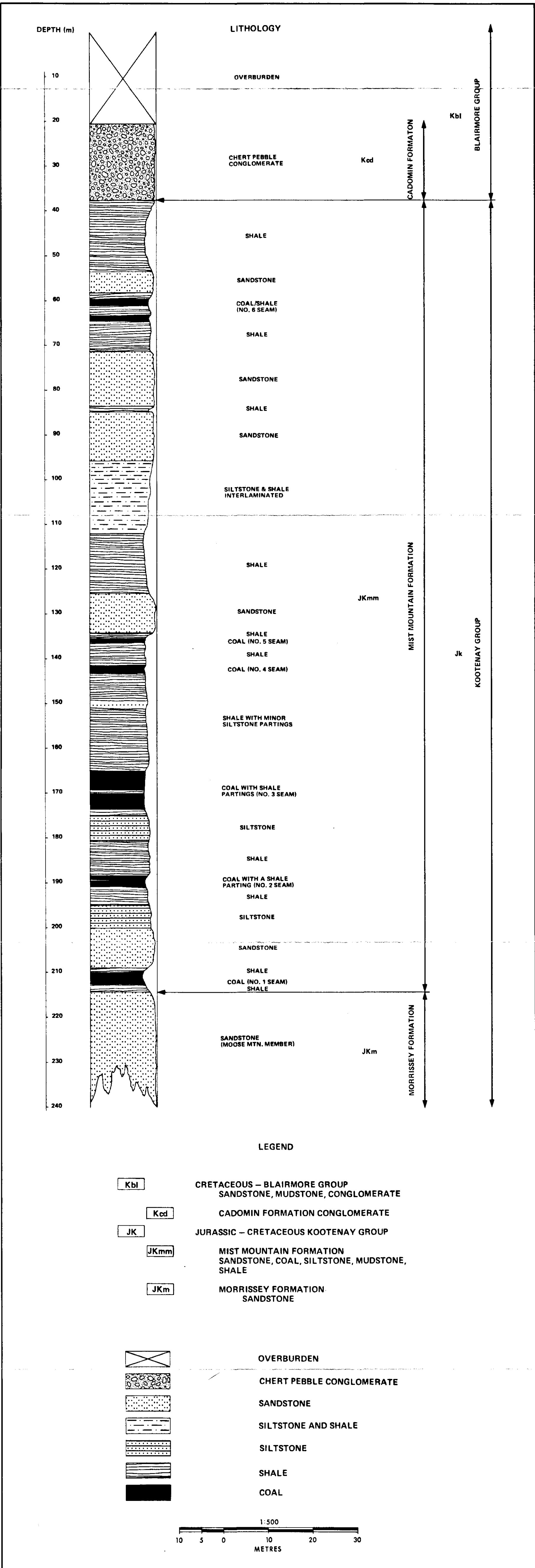
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DATE: 85-10

REVISED:


DRAWING No: HC2U03

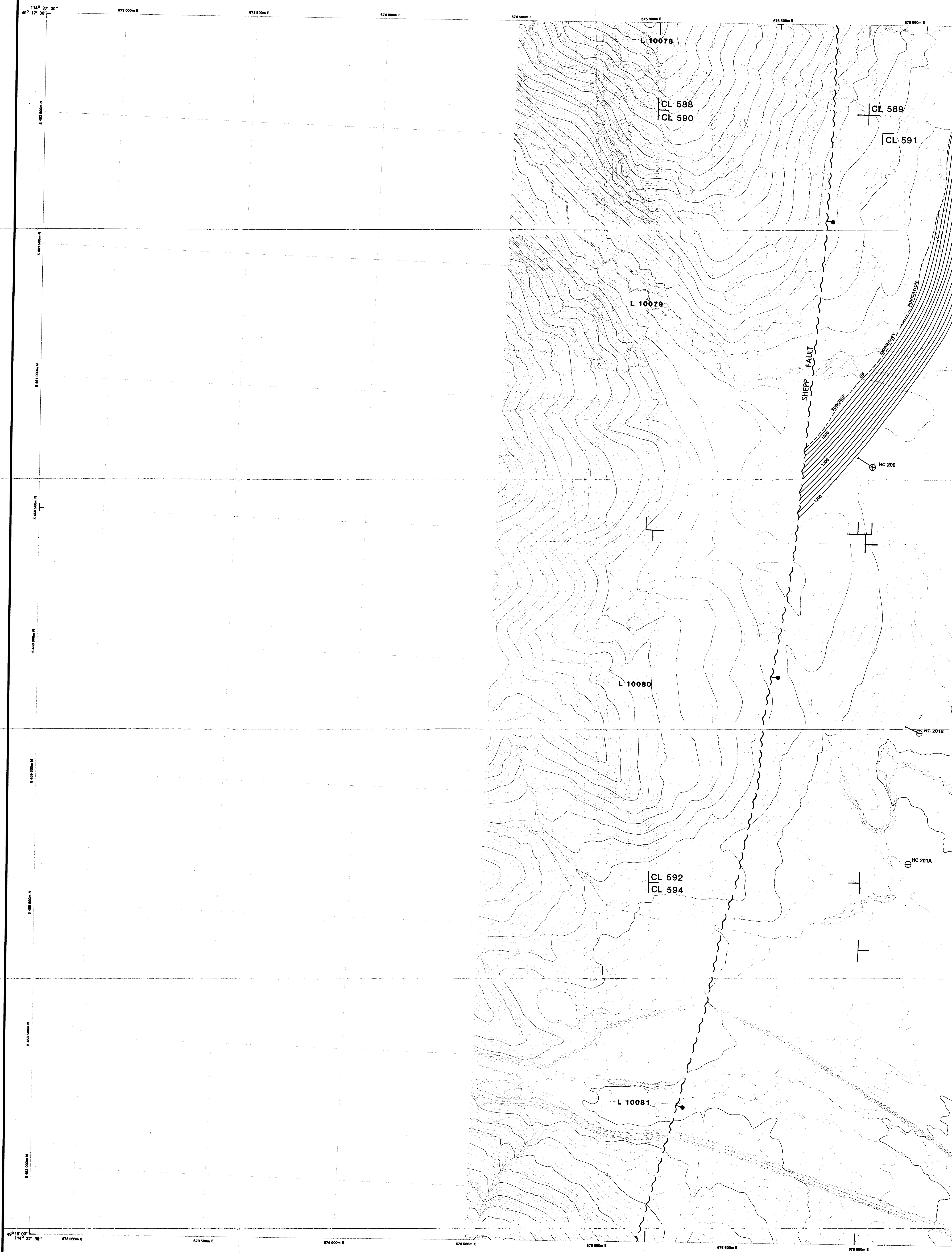
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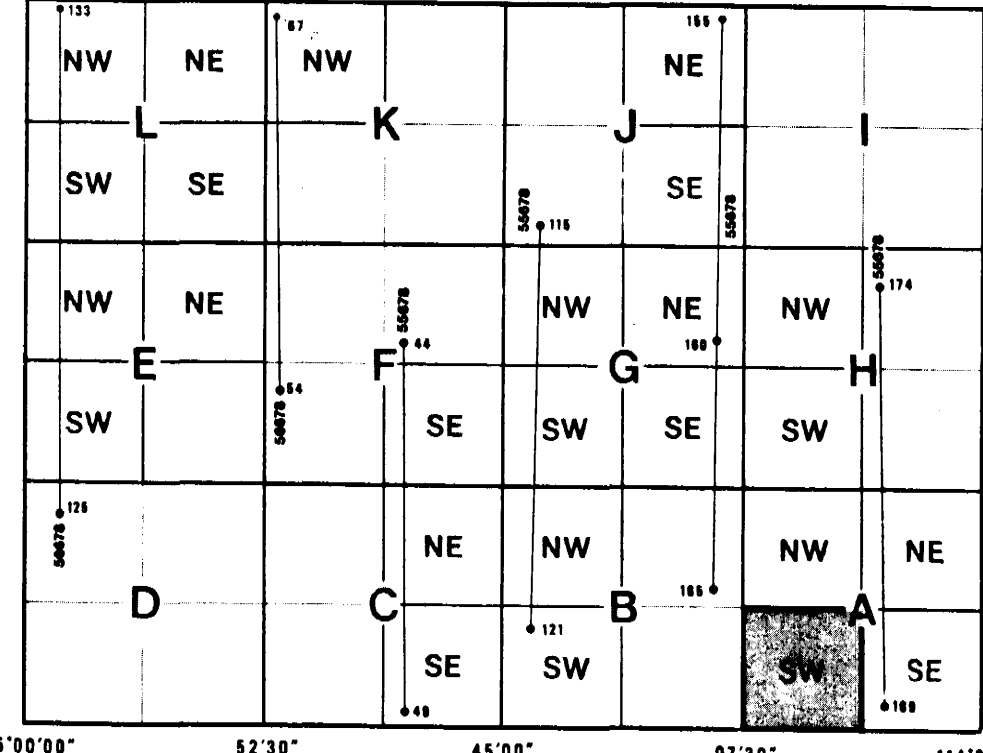
402

K-SHELL-HARVEY CREEK 83/2A*(1)

 Crows Nest Resources Limited ENGINEERING		
HARVEY CREEK PROJECT S.E. B.C.		
ENCL 2 COMPOSITE STRATIGRAPHIC SECTION		
②		
AUTHOR: D.J. D'ANDREA	SCALE: 1:500	DRAWN BY:
DATE: 83-10	REVISED:	DRAWING No: HC-6X-01
To Accompany		



MAP INDEX AND
AERIAL PHOTO INDEX



82G/7
1:50 000

- REFERENCE
- | | | | | | | | |
|----------------|--------------------|------------|---------------|------------------|-------------------|------------|-------------|
| MAIN ROAD | INTERMITTENT RIVER | THICK AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |
| SECONDARY ROAD | WATER | THIN AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |
| RAILWAY | WATER | THIN AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |
| HEDGE FENCE | WATER | THIN AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |
| BRIDGE CULVERT | WATER | THIN AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |
| CUT FILL | WATER | THIN AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |
| SWAMP | WATER | THIN AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |
| DRILL HOLE | WATER | THIN AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |
| CONTROL POINT | WATER | THIN AREA | LINE OF TREES | INDIVIDUAL TREES | VERTICAL INTERVAL | DEPRESSION | SPOT HEIGHT |

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

PREPARED BY :
NORTH WEST SURVEY CORPORATION (YUKON) LTD.

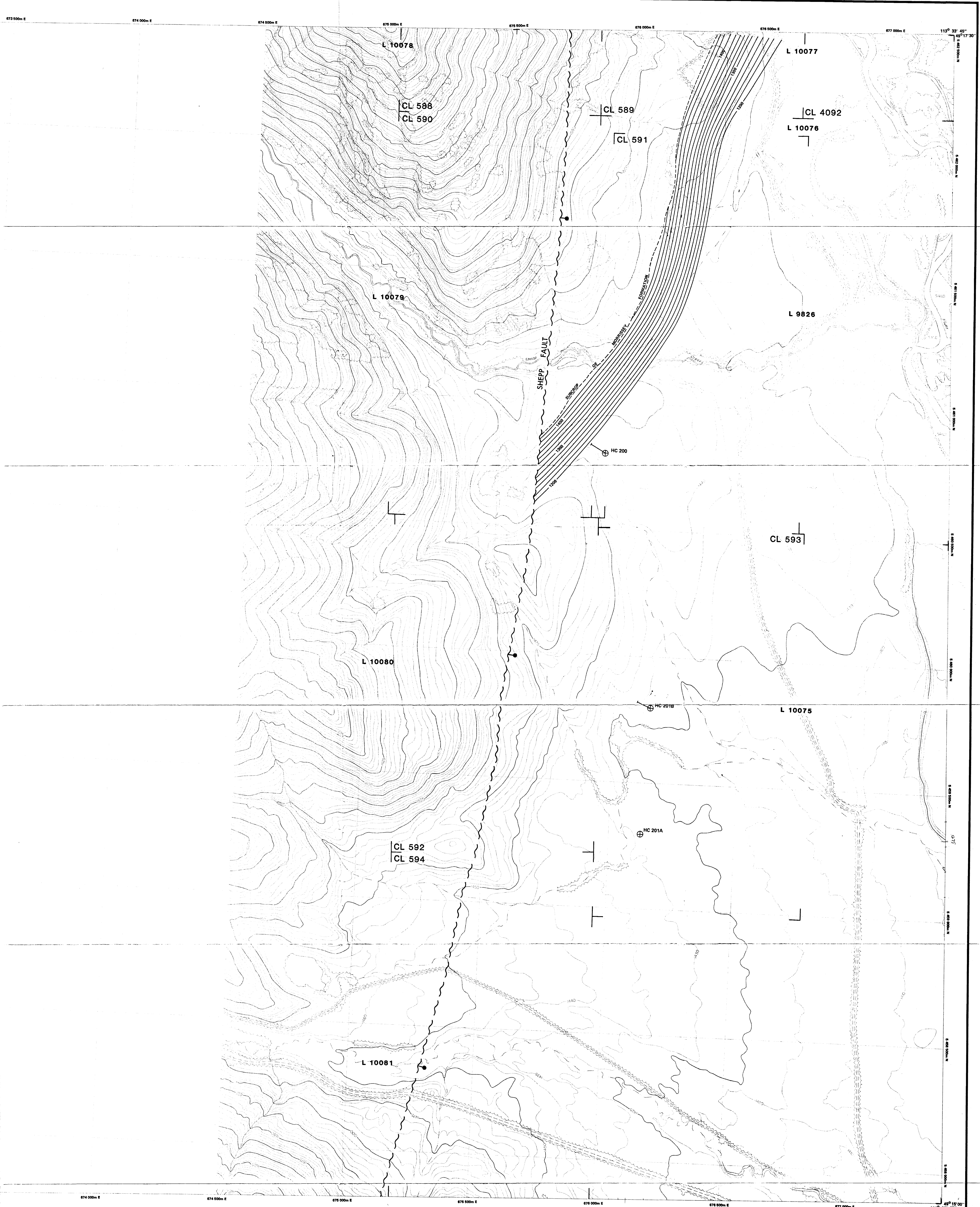
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CONTOUR INTERVAL : 5 METRES
DATE OF PHOTOGRAPHY : JUNE/JULY, 1978

LOCATION OF DRILL HOLES

HOLE ID	NORTHING (m)	EASTING (m)	ELEVATION (m)
HC 200	5 489 200	675 925	1445
HC 201A	5 489 288	676 130	1429
HC 201B	5 489 798	676 150	1428

LEGEND

- Normal Fault (dip direction shown)
Rotary Drill Hole (showing inclined direction)
Structural Contours (Contour Interval 20 metres)



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. 178-109

SCALE 1 : 5 000
CONTOUR INTERVAL : 5 METRES
DATE OF PHOTOGRAPHY : JUNE/JULY, 1978

LOCATION OF DRILL HOLES

HOLE ID	NORTHING (m)	EASTING (m)	ELEVATION (m)
HC 200	5 480 800	676 925	1445
HC 201A	5 459 288	676 130	1428
HC 201B	5 459 798	676 150	1428

LEGEND

- Normal Fault (dip direction shown)
- Rotary Drill Hole (showing inclined direction)
- Structural Contours (Contour Interval 20 metres)

Crows Nest Resources Limited
EXPLORATION

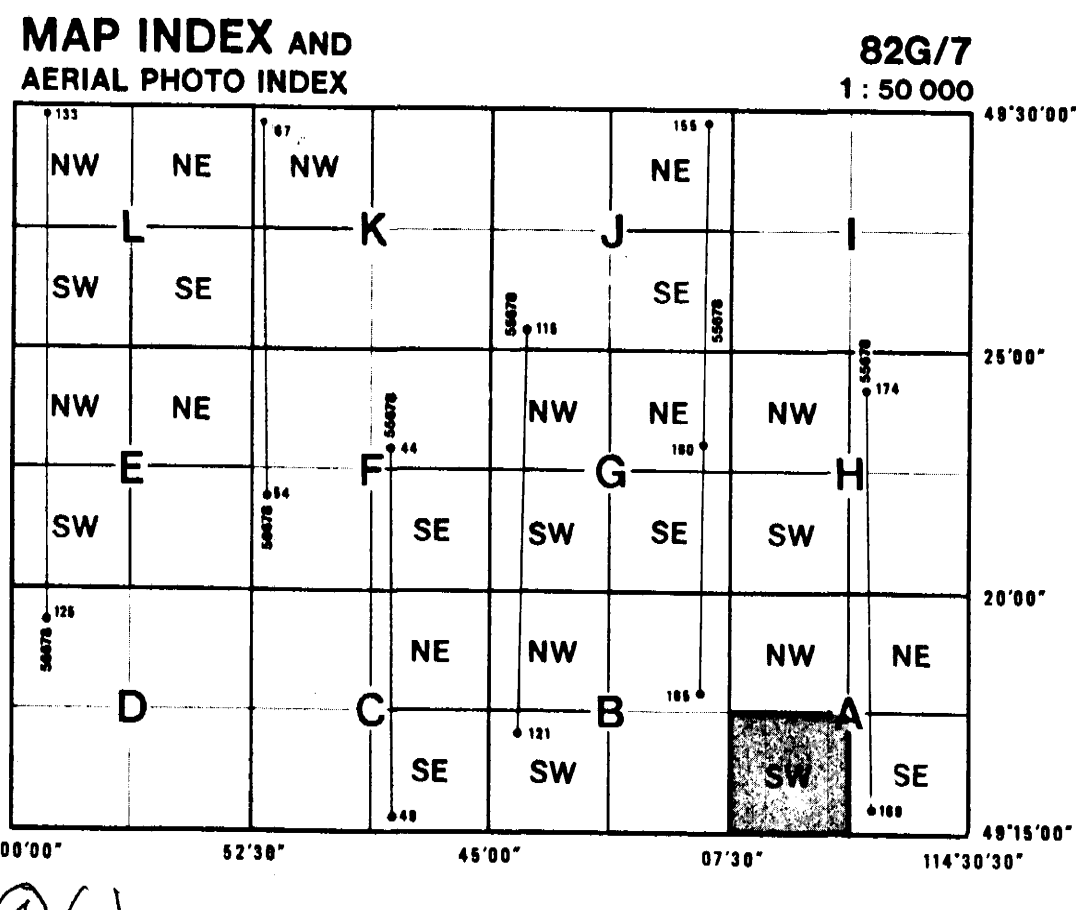
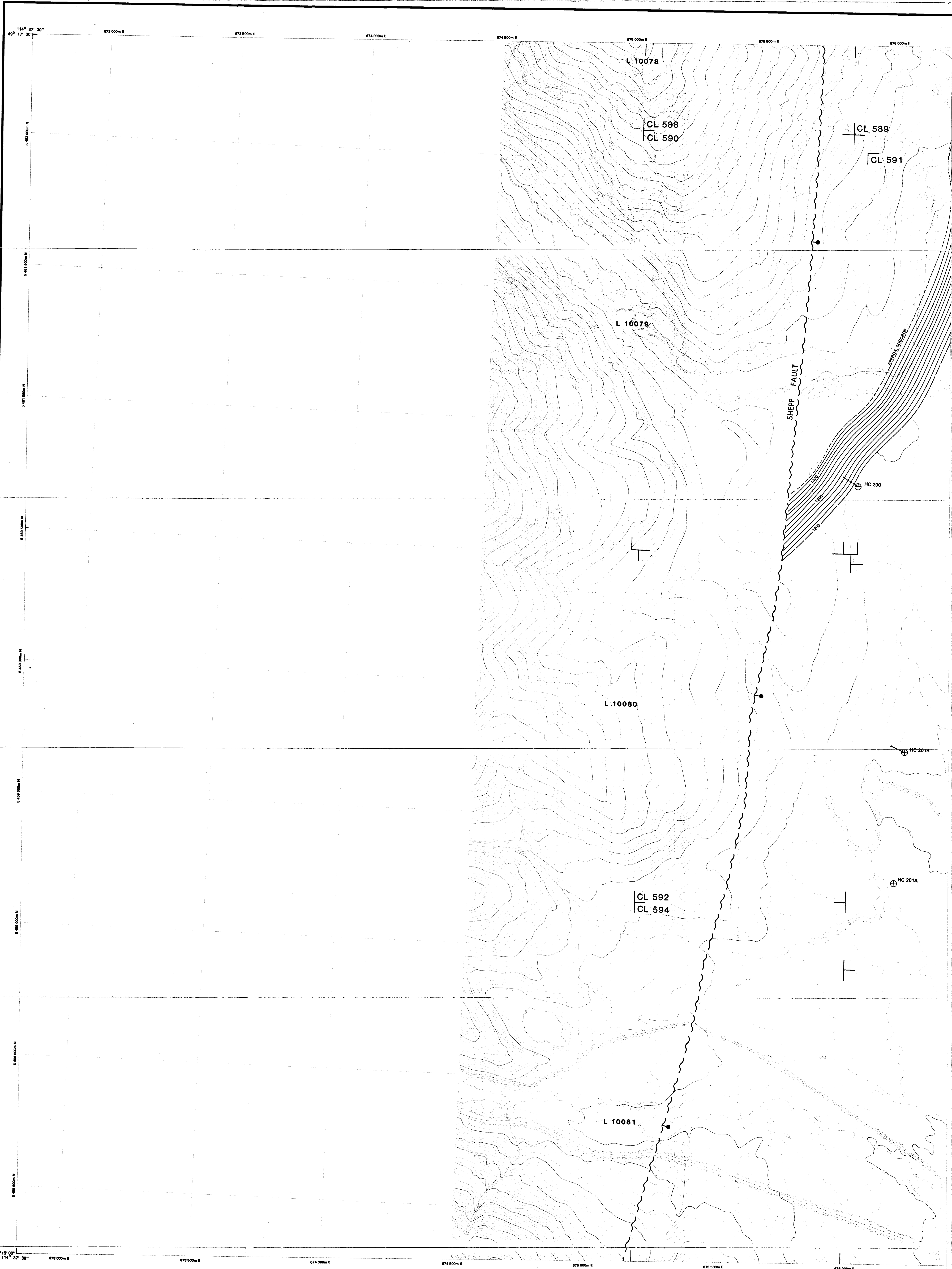
HARVEY CREEK PROJECT
S.E. B.C.

STRUCTURE CONTOUR MAP
(CONTOURS EXTRAPOLATED DOWN TO 1200m ABOVE SEA LEVEL)

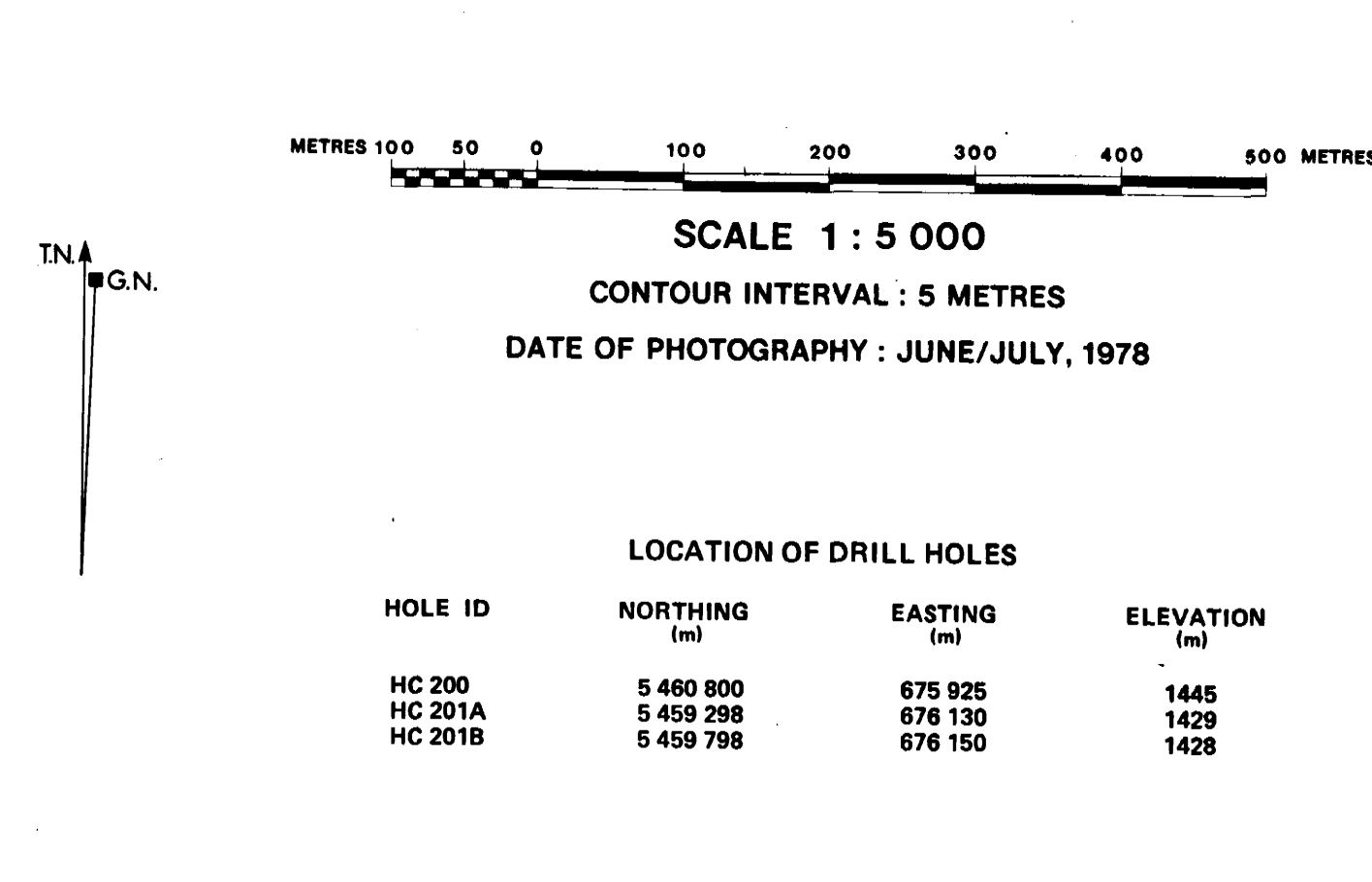
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AUTHOR: D.J. D'ANDREA	SCALE: 1:5 000	DRAWN BY:
DATE: 83-10	REVISED:	
To Accompany		DRAWING No: HC2U01

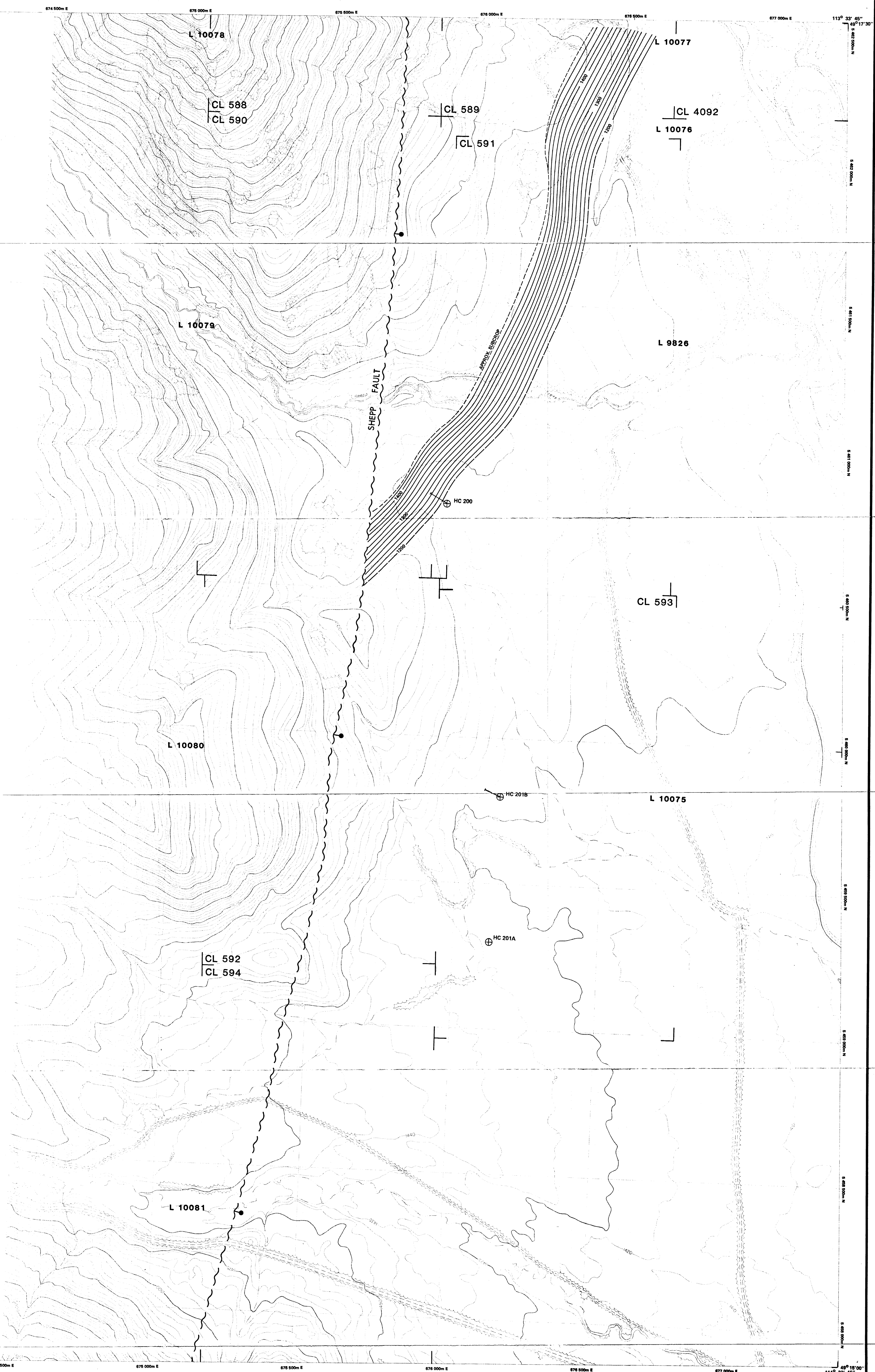
ENC 3 **402** *(3b)*



- REFERENCE**
- MAIN ROAD
 - SECONDARY ROAD
 - TRACK OR TRAIL
 - RAILWAY
 - RODGE FENCE
 - BRIDGE CULVERT
 - CUT FILL
 - SWAMP
 - DRILL HOLE
 - MAP PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
CENTRAL MERIDIAN REFERENCE 117° W.
 - PREPARED BY:
NORTH WEST SURVEY CORPORATION (YUKON) LTD.
- REFERENCE**
- RIVER, LAKE
 - INTERMITTENT RIVER
 - TREED AREA
 - LINE OF TREES
 - INDIVIDUAL TREES
 - VERTICAL INTERVAL
 - DEPRESSION
 - SPOT HEIGHT
 - CONTROL POINT



- LEGEND**
- Normal Fault (dip direction shown)
 - Rotary Drill Hole (showing inclined direction)
 - Structural Contours (Contour Interval 20 metres)



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 INTERVA
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.

SCALE 1 : 5 000
CONTOUR INTERVAL : 5 METRES
DATE OF PHOTOGRAPHY : JUNE/JULY, 1978

LOCATION OF DRILL HOLES

HOLE ID	NORTHING (m)	EASTING (m)	ELEVATION (m)
HC 200	5 469 800	876 925	1445
HC 201A	5 469 298	876 130	1429
HC 201B	5 469 758	876 150	1428

LEGEND

- Normal Fault (dip direction shown)
- Rotary Drill Hole (showing inclined direction)
- Structural Contours (Contour Interval 20 metres)

Crows Nest Resources Limited
EXPLORATION
HARVEY CREEK PROJECT
S.E. B.C.

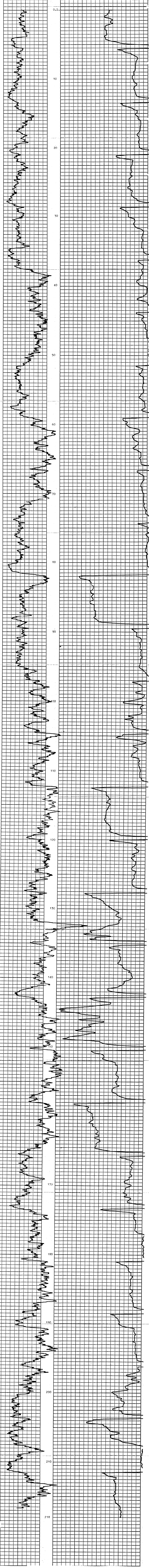
ENC 4
STRUCTURE CONTOUR MAP
BASE OF NO. 3 SEAM

N.T.S. 82G/7		U.T.M. ZONE 11
AUTHOR: D.A. D'ANDREA	SCALE: 1:5,000	DRAWN BY:
DATE: 83.10	REVISED:	DRAWING No: HC2U02
To Accompany		

402

K - SHELO HARVEY CREEK 83(3)A
#20

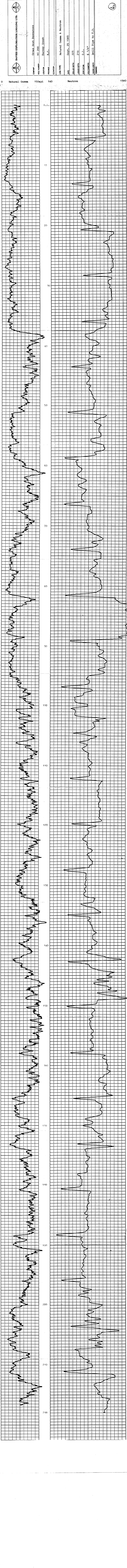
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DAVIES EXPLORATION LOGGING LTD.	
COMPANY	Crows Nest Resources
WELL NUMBER	HC 200
LOCATION	Harvey Creek
PROVINCE	B.C.
ELEVATION	
LOG TYPE	Natural Gamma & Density
DATE	Sept. 25 1993
DRILLED DEPTH	223
LOGGED DEPTH	218
LOG SCALE	G.I.
WELL DIAMETER	6 1/4"
CORRECTION	Drill Pipe to S.D.
REMARKS	

5

402

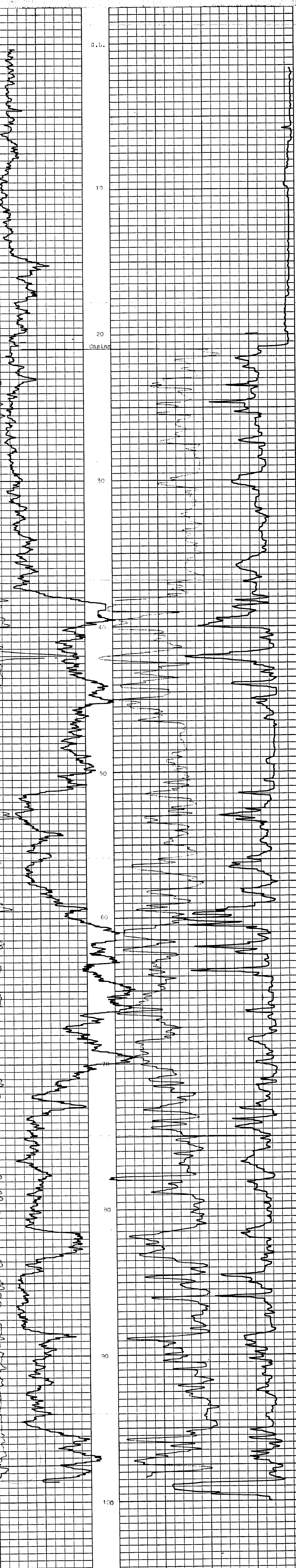


DAVIES EXPLORATION LOGGING LTD.	
COMPANY	Crows Nest Resources
HOLE NUMBER	HC 200
LOCATION	Harvey Creek
PROVINC	B.C.
ELEVATION	
LOG TYPE	Natural Gamma & Neutron
DATE	Sept. 25 1983
LOGGED DEPTH	223
LOGGED DEPTH	218
LOG DATE	9.1.83
HOLE DIAMETER	6 1/4"
CASING LOG	Drill Pipe to T.D.
LOGS	

6

402

CALIPER 31 NATURAL GAMMA 15 api RESISTIVITY 6.5 DENSITY



DAVIES EXPLORATION LOGGING LTD.	
COMPANY	Crows Nest Resources
HOLE NUMBER	HQ 200
LOCATION	Harvey Creek
PROVINCE	B.C.
ELEVATION	
LOG TYPE: CALIPER, NATURAL GAMMA, RESISTIVITY, DENSITY	
DATE	Sept. 28, 1983
DRILLED DEPTH	218
LOGGED DEPTH	100
ZERO DATUM	G.L.
HOLE DIAMETER	6 1/4"
CASING LENGTH	21
REMARKS	

7

K. Shell Harvey Creek 83(30) (1)

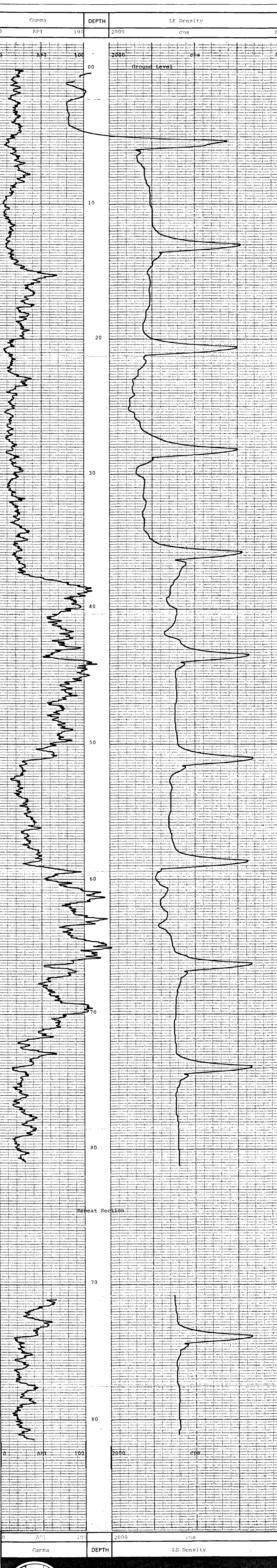
402



GAMA DAY / LS DENSITY	
BOREHOLE	HC - 200
CLIENT	Crows Nest Resources Ltd.
AREA	Harvey Creek, B.C.
COUNTRY	Canada
DATE LOGGED	25 Sep 93
DEPTH SCALE	1 of 1000
BOREHOLE DATA	
PERMANENT DATION	Ground Level
ELEVATION OF D	8 P 8
DRILLER	G.L.
DEPTH REACHED	81 m
DEPTH REACHED	232 m
CASING SHOE	1 TO 2 TO
BIT SIZES	3 TO 4 TO
CASING SIZES	1 TO 2 TO
FLUID DATA	
NATURE	Water
SG	1.00 g/cc
LEVEL	5 m
VISCOSITY	
RM mass temp	
RM T	
OPERATION DATA	
FIRST READING	81 m
LAST READING	0 m
INTERVAL LOGGED	81 m
UNIT - TRUCK No	34/V213
ENGINEER	Rood
WITNESS	D Andree

EQUIPMENT AND RECORDING DATA											
LOG	EQUIPMENT			TAPING			PANEL		CAL		DEPTHS
	SONDE	SOURCE	CALIBRATOR	LOG TAPED	RECORD SPEED	DIRECT REPLAY	SPEED	T/C SECS	NORM	CAL COEFF	
Gamma	90		336	Yes	9	R	9	1		1.74	FROM TO INTERVAL
Density	90	0042		Yes	9	R	9	1			81 0 81

ADDITIONAL SONDES RUN						REFER TO ADDITIONAL HEADINGS	REMARKS
SONDE	LOG	GENERAL SCALE LOG	DETAIL SCALE LOG				
							Single function sondes run inside drill rods. Instruments would not pass below 81 m due to small diameter of drill rod joints.



Gamma	DEPTH	LS Density
0	100	2000
0	100	2000

BOREHOLE	HC - 200	AREA	Harvey Creek, B.C.
CLIENT	Crows Nest Resources Ltd.	COUNTRY	Canada



MY 93160 R

CHIP LOG DESCRIPTIONS

PROSPECT: HARVEY CREEK
ROTARY HOLE NO. HC 200

CORE DESCRIPTION BY: D. D'ANDREA

DATE BEGUN: September 20, 1983

DATE FINISHED: September 24, 1983

ELEVATION: 1 445 m

NORTHING: 5 460 300 mN

EASTING: 675 935 mE

TOTAL DEPTH: 223 m

ANGLE: 60° (from horizontal)

AZIMUTH: 296°

LOGS RUN: Natural Gamma - Density
Natural Gamma - Neutron
Caliper, Natural Gamma, Density, Resistivity

ROTARY HOLE NO. HC 200

<u>Sample Depth (m)</u>		<u>Lithology (Chip Samples)</u>
<u>From</u>	<u>To</u>	
2	18	Overburden, gravel mostly limestone pebbles with some carbonaceous siltstone pebbles
18	20	As above with medium to dark grey brown weathered sandstone
20	22	Coarse grain lightly weathered dark grey and white sandstone (into bedrock)
22	24	Fine grained grey brown sandstone with evidence of carbonaceous debris (plant fragments) in the bigger pebbles
24	26	As above with black shale and minor calcite
26	28	As above
28.5	30.5	SPOT CORE: Chert pebble conglomerate with a coarse gain salt and pepper sandstone matrix. 0.9 m of core recovered for a total of 45%. Lightly fractured with iron staining on fractures. Bedding Angles (measured from core axis) 50° 62° Depth 28.97 29.3
32	36	Coarse grain salt and pepper sandstone with chert pebbles

<u>Sample Depth (m)</u>		<u>Lithology (Chip Samples)</u>
<u>From</u>	<u>To</u>	
36	38	Dark grey siltstone and mudstone
38	40	Dull powdery coal, high ash
40	42	Coal as above with less ash
44	50	Dark grey slightly carbonaceous siltstone
50	53	SPOT CORE:
		0.95 m of medium grain salt and pepper sandstone thinly laminated, lightly slickensided, minor pyrite, stick and broken stick. 0.3 m of coarse grain carbonaceous salt and pepper sandstone, rubble and powder.
		1.25 m of core recovered for 42%.
		Bedding Angles (measured from core axis)
		63°
		52°
		65°
		65°
		Depth (core run)
		.18 m
		.3 m
		.5 m
		.7 m
54	58	Coarse grain salt and pepper sandstone
58	74	Black mudstone with some siltstone
76	96	Dark grey and white medium grained sandstone, slightly carbonaceous

<u>Sample Depth (m)</u>		<u>Lithology (Chip Samples)</u>
<u>From</u>	<u>To</u>	
98	106	Dark grey siltstone and mudstone
108	130	Dark grey siltstone and mudstone with minor calcite at 126-128
132	140	Dark brown siltstone and mudstone
142	200	Carbonaceous mudstone with minor coal
202	222	As above with minor coarse grain sandstone (Moose Mountain)

CHIP LOG DESCRIPTIONS

PROSPECT: HARVEY CREEK
ROTARY HOLE NO. HC 201B

CORE DESCRIPTION BY: D. D'ANDREA

DATE BEGUN: September 29, 1983

DATE FINISHED: September 30, 1983

ELEVATION: Approximately 1 428 m

NORTHING: 5 459 780 mN

EASTING: 676 150 mN

TOTAL DEPTH: 210 m

ANGLE: 60° (from horizontal)

AZIMUTH: 296°

LOGS RUN: NIL

ROTARY HOLE NO. HC 201B

<u>Sample Depth (m)</u>		<u>Lithology (Chip Samples)</u>
<u>From</u>	<u>To</u>	
0	14	Gravel, mostly limestone pebbles
14	16	Red brown; powder as is the entire hole
18	20	Medium brown powder
20	22	Green brown powder
22	24	Grey blue powder
24	26	Medium brown powder
26	28	Brown grey powder
30	34	Grey brown powder
34	36	Grey powder
36	38	Brown red powder
38	40	Medium brown powder
40	42	Red brown powder; reacts to acid
42	44	Red brown powder; reacts to acid
44	46	Medium brown powder; reacts to acid
46	48	Brown green powder; reacts to acid
48	50	Red brown powder; reacts to acid
50	52	Medium brown powder
52	54	Green brown powder
54	56	Red brown powder
56	58	Green brown powder
58	60	Red brown powder
60	62	Grey/green brown powder; reacts to acid
62	64	Red brown powder
64	66	Medium brown powder
66	68	Grey/green brown powder; reacts to acid

Sample Depth (m)Lithology (Chip Samples)

<u>From</u>	<u>To</u>	
68	70	Red brown powder
70	72	Grey/green brown powder; reacts to acid
72	74	Medium brown powder
74	76	Grey/green brown powder; reacts to acid
76	78	Red brown powder
78	80	Green brown powder
80	82	Grey/green brown powder; reacts to acid
84	88	Medium brown powder
88	90	Light grey
92	100	Medium brown powder
100	102	Yellow brown powder
104	106	medium brown powder
106	108	Green brown powder
108	110	Red brown powder
112	114	Medium brown powder
114	116	Grey powder
116	118	Red brown powder
118	120	Medium brown powder
120	122	Grey brown powder; reacts to acid
122	124	Red brown powder; reacts to acid
124	126	Medium brown powder; reacts to acid
126	128	medium brown powder; reacts to acid
130	140	Yellow brown powder; 136-140 reacts to acid
142	158	Blue grey powder; all reacts to acid
160	166	Red brown powder
166	168	Grey powder
170	172	Yellow brown powder
176	182	Yellow brown powder; all react to acid
182	184	Red brown powder; reacts to acid
186	202	Red brown powder