

PR - PINE RIVER 79(1)A

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ASSESSMENT REPORT

REPORT ON THE GEOLOGICAL MAPPING PROGRAM
ON PARTS OF COAL LICENSES 3986-3993 INCLUSIVE
PINE RIVER AREA
LIARD MINING DIVISION

NTS 93 0/9

Latitude 55°36'North
Longitude 122°14'West

HAROLD G. JONES, C. Eng. **GEOLOGICAL BRANCH**
ASSESSMENT REPORT

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G. A. NOEL AND ASSOCIATES
CONSULTING GEOLOGISTS
VANCOUVER, B. C.

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Latitude 55°36' North
Longitude 122°14' West

OWNER OF COAL LICENSES - J. W. MacLEOD, P.Eng.
OPERATOR - J. R. BILLINGSLEY, P.Eng.,
CONSULTANT - H. M. JONES, P.Eng.
G. A. NOEL & ASSOCIATES, INC.

AUTHOR - HAROLD M. JONES, P.Eng.

DATE SUBMITTED - AUGUST 8, 1979

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*(EXTENSION OF TERM OF COAL LICENSES (C.L. 3986, 1979
EXPIRY DATE - Aug 8, 1980)*

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SUMMARY

Between July 10 - 30, 1979 a three man crew conducted a geological reconnaissance program on coal licenses 3986-3993 inclusive. These licenses are located in the Peace River district of northeastern British Columbia. They are adjacent to the Pine River valley, through which passes both the B.C. Railway and highway 97. One license is readily accessible to the highway, while seven require fording the Pine River during periods of low water.

Work was conducted on parts of six licenses. Coal was seen in all areas examined but usually in poor outcrop. In most areas, outcrop is very sparse.

On license 3989, three coal seams, 1.2-1.4m, 1.7m and 0.5m, wide respectively, are exposed in both limbs of a tight anticline. While the grade of the coal might be good, this structure may not be receptive for present day mining methods.

All other licenses contain numerous coal seams, already partially explored by the Coal Division of the British Columbia Department of Lands and Forests during 1946-51. Reconnaissance geology in parts of these areas during this program located a few poor coal outcrops.

It is concluded that the area covered by the licenses contains an appreciable amount of coal. More work should be done to test the various coal seams. Since outcrop is so limited, all future work should be in the form of trenching and diamond drilling.

A program of backhoe trenching and H.Q. diamond drilling is recommended. The first stage is estimated to cost \$190,000, the second stage \$550,000. It is recommended that this work be carried out in the fall of the year when Pine River can be forded.

INTRODUCTION

G. A. Noel & Associates, Inc. conducted between July 10-30, 1979 a reconnaissance geological mapping program over selected parts of eight coal licenses in the Pine River Area of Northeastern British Columbia. This work was performed at the request of J. R. Billingsley, optionee of the coal licenses. A crew consisting of one senior geologist, one junior geologist and one field assistance carried out the field work.

The purpose of the program was two-fold: to attempt to locate the northern extension of coal seams previously tested by the British Columbia Department of Mines during their 1946-1951 coal program; to satisfy assessment work requirements.

Seven coal licenses, located south of Pine River, were inaccessible by vehicle at the time of this investigation. These licenses were mapped by working out of fly camps, helicopter supported.

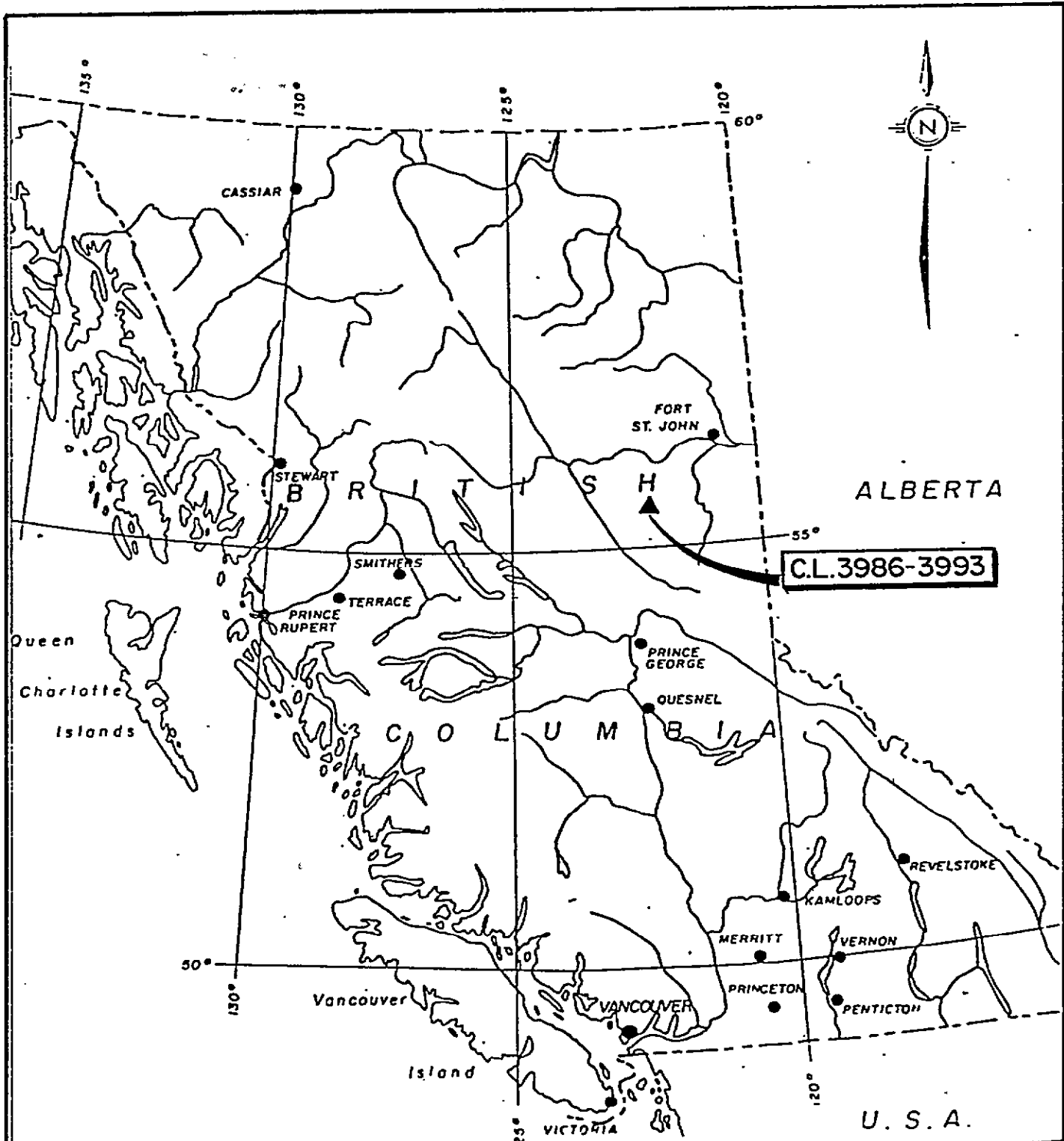
One license is located north of the Hart Highway (highway 97) and has good access. When exploring this license the crew operated out of a motel in Chetwynd.

LOCATION AND ACCESS

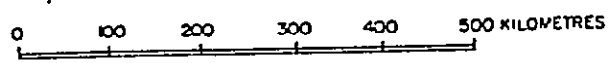
The property is located at the following approximate co-ordinates:

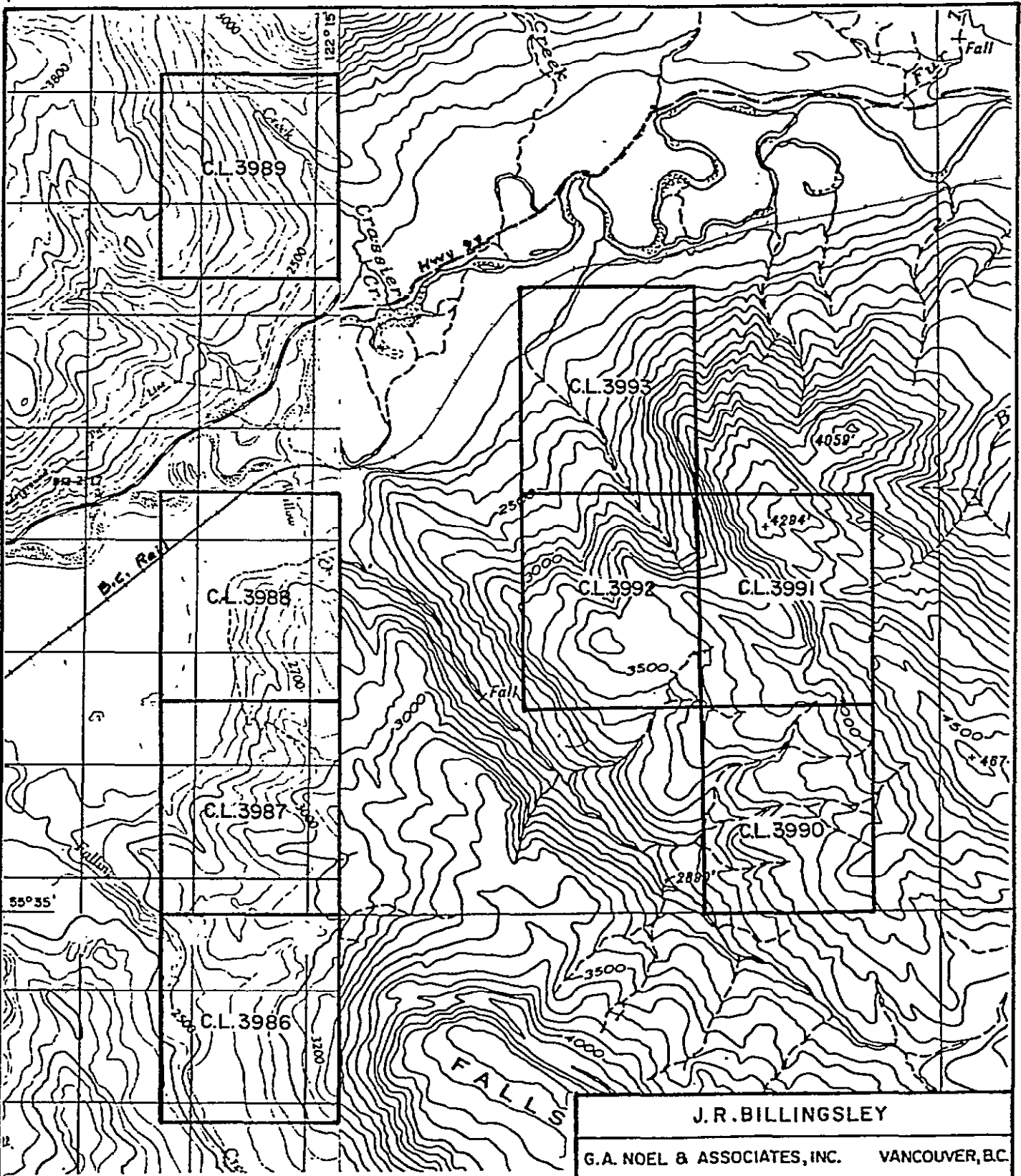
55°36' north latitude
122°14' west longitude

The coal licenses are located in the Peace River district of Northeast British Columbia (see Figure 1). They are situated adjacent to the Pine



J. R. BILLINGSLEY		
G.A. NOEL & ASSOCIATES, INC.		VANCOUVER, B.C.
LOCATION MAP COAL LICENCES 3986-3993 PINE RIVER AREA, B.C. LIARD M.D.		
SCALE: 1 cm. = 87 Km		AUGUST 1979
H. JONES		
		FIG. 1





55°35'

Falls

C.L. 3989

C.L. 3993

C.L. 3988

C.L. 3992

C.L. 3991

C.L. 3987

C.L. 3990

C.L. 3986

FALLS

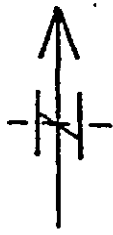
J.R. BILLINGSLEY

G.A. NOEL & ASSOCIATES, INC. VANCOUVER, B.C.

COAL LICENCE MAP

C.L. 3986 - 3993

PINE RIVER AREA, B.C.
LIARD M.D.



Ronald M. Jones

0 1 2 3 KILOMETRES

SCALE: 1:50,000

AUGUST 1979

FIG. 2

H. JONES

River approximately 38 km. west of Chetwynd and 190 km. north northeast of Prince George.

While the coal licenses are centered at the above mentioned co-ordinates, they are not contiguous (see Figure 2). Seven of them lie to the south of the Pine River, Licenses 3986 to 3988 inclusive are located between Falls and Willow Creeks and cover the north and west slopes of the higher ground in this area. Elevations range from 640 m. in Pine Valley to 1070 m. on the west slopes of Falls Mountain.

Licenses 3990 to 3993 inclusive cover most of the higher ground to the northeast of Willow Creek. They extend from Pine River southeasterly for approximately 6 km. Elevations range from 640 m. in Pine Valley to 1310 m. on the peak at the head of Brown Creek.

License 3989 is located immediately north of highway 97 and covers a part of the southeast nose of the mountain, which is bounded here by Crassier Creek and Pine Valley. Elevations range from 640 m. in Pine Valley to 1070 m. on the upper slopes.

Access to the general area is via British Columbia highway 97, which is an all weather road connecting Prince George to Dawson Creek. It passes through Pine Valley and Chetwynd. B. C. Rail also passes through Pine Valley, with the highway on the north side and the railway on the south side of the Pine River. Both pass within a few metres of the coal licenses.

Dawson Creek and Fort St. John, approximately 100 km. and 160 km. respectively north of Chetwynd, are serviced with daily flights by commercial airlines.

Only coal license 3989 is presently readily accessible. A power line crosses northerly through the license which is serviced by a reasonably good dirt road. It originates at the Crassier Creek crossing on highway 97, then follows up the creek for 2 km., then swings westerly up the hill to join the power line, It fords Crassier Creek several times but this presents no problems except in times of high run-off.

The coal licenses to the south of Pine River are readily accessible by 4-wheel drive vehicles in times of low water. The Pine River has many meanders and gravel bars, some of which can be used as fords. At the time of the field program the river was still too high for vehicle traffic.

Once across the river, several good roads are available (see Figure 3). One follows the east side of Willow Creek for approximately 5 km. This road was used to service oil and gas exploration. Several drill sites are located along the road, one of which has a capped gas well. A jeep road branches from this road approximately 3.5 km. from highway 97 and joins a bulldozed seismic line which trends northeast across license 3993 and part way across license 3991. Parts of this latter road may need upgrading due to wet areas and windfalls.

Within licenses 3990-3993 old roads constructed between 1946-1951 by the B. C. Department of Mines are present but are inaccessible due to dense second growth alder and pine and numerous windfalls. These could be made servicable with a minimum amount of work with a small bulldozer.

A second road, which branches off the Willow Creek oil and gas road 1 km. south of highway 97, trends west for 1 km. then swings to the south and

then southeast where it eventually joins the southwest continuation of the seismic line mentioned earlier. This road provides excellent access to licenses 3987 to 3988.

TOPOGRAPHY AND VEGETATION

The coal licenses are located on the eastern foothills of the Rocky Mountains. The area is characterized by relatively low, rounded, northwest-southeast trending ridges and valleys dissected by the north-east trending 1.5 km. wide Pine River Valley. In the licenses area there is a change in elevation relative to the Pine Valley of only 670 metres (Figure 3).

All coal licenses are well forested by jackpine and minor spruce. Poplar stands are common in low areas, like Pine Valley, and in wet areas, such as creeks and seepages,

Most of the forested terrain may be classified as open forest, i.e. with little or no underbrush. The exception to this is in wet areas where willows and devil's club are common.

PROPERTY

The property consists of eight coal licenses (Figure 2). They are:

<u>Coal License</u>	<u>Hectares</u>	<u>Expiry Date</u>
3986	293.0	August 8, 1989
3987	292.0	"
3988	292.6	"
3989	292.2	"
3990	292.6	"
3991	292.6	"
3992	292.6	"
3993	292.6	"
Total area	2341 Hectares	

The coal licenses are owned by:

J. W. MacLeod, P.Eng.
1220 Arbutus Street
Vancouver, B. C.

They are presently held under option by:

J. R. Billingsley
631 - 837 West Hastings Street
Vancouver, B. C.

HISTORY

Coal in the Peace River district of northeastern British Columbia was known for many years. The better known coal area was the Peace River Canyon coal field where coal was first noted along the canyon walls by Alexander Mackenzie in 1793. The first coal licenses in the Peace River district were acquired in this area in 1908.

From 1908 to the late 1960's very limited tonnages of coal were mined intermittently from four mines, three of which were located in or near the Peace River Canyon and one 15 km. south of the Pine River.

Between 1946 and 1951 the Coal Division of the B. C. Department of Lands of Forests conducted a coal exploration program in the Peace River district adjacent to the proposed (at that time) right-of-way of the Pacific Great Eastern Railway (now B. C. Rail). This work was carried out in the Pine River area. The project area extended from several kilometres north-west of Pine River to approximately 25 km. southeast of it.

Their program consisted of geological mapping, bulldozer trenching,

diamond drilling and sampling (McKechnie 1955). Eighty-one holes were diamond drilled totalling 14,829 metres of which coal seams 0.3 m. or thicker accounted for 428 m. of the total.

Their program tested three areas. These areas and their estimated tonnages are:

Hasler Creek	8	million short tons
Willow Creek	23.8	" " "
Noman Creek	9.0	" " "

The above estimates were made using only seams of 1.2 m. or greater in thickness.

Coal licenses 3986 to 3993 inclusive fall mostly within the above Willow Creek area.

The Government work tested only parts of the above areas. It did not include the coal area at Crassier Creek (license 3989) nor did it include coal in some of the more structurally disturbed areas. No serious work was carried out after the government's program in the Pine River area until 1969 when Bremeda Resources Ltd. conducted a trenching and drilling program on the Noman Creek coal seams. They drilled 22 holes totalling 4567 metres and traced two main seams for approximately 3 km. to the north-west of the highway. While the grade of the coal was high, tight folding and limited tonnage made the property unattractive. The writer supervised this program.

Also, in 1969, Bremeda Resources Ltd., at the writer's recommendation, commenced work on the Bullmoose coal field located approximately 55 km. south east of the Pine River area. Early work in this area quickly indi-

cated the potential of the Bullmoose area as a major coal field. This initiated a coal exploration "boom" in the Peace River district which is still continuing.

Two major coal deposits have now been proven up. They are the Bullmoose and Quintette properties, each a multimillion ton deposit of metallurgical grade sub-bituminous coal. When rail transportation is available, both deposits will be put into production.

FIELD WORK

The object of the field program was to attempt to locate the northern extension of the coal seams intersected during the Government's 1946-51 exploration program. It was also planned to explore, initially, only the extreme southwest and northeast limbs of the Willow Creek anticline. The geology in these areas is not as disturbed as toward the center of the fold structure and bedding dips are shallower.

One license located north of the highway was not explored during the Government's program. It was planned to map this license in moderate detail.

A base map, on a scale of 1:5000 and contoured at 20 metre intervals, was obtained for a control on field work. It was prepared by Pacific Survey Corporation from existing photography. When conducting field traverses the above map was used in conjunction with air photos and pocket altimeters. Roads, seismic lines, creeks, cliffs, open areas, etc. were identified in the field and on the air photos and thus traverses and data could be plotted with reasonable accuracy on the base maps.

For closer control, reconnaissance grids were laid out in two areas.

A summary of field work conducted in each area is described in the order in which it was done.

a) Coal Licenses 3990, 3991, 3992 and 3993

A fly camp was established on license 3992 near the headwaters of an unnamed northwesterly flowing creek located 2 km. northeast of Willow Creek. This camp location was selected because it afforded one of the few helicopter landing sites in the general area which also coincided with a water supply. A widening in the bulldozed seismic line provided the space for landing.

By using air photos, several old trenches and the approximate location of DDH W-38 (McKechnie 1955) were located. All old workings and roads are now completely overgrown with alder and pine.

A 1600 metre baseline, striking N45W, was laid out using the east end of trench WR 115 (McKechnie 1955) as the origin and as a recognizable control point (Figure 6). Cross lines were run perpendicular to the baseline at 100 m. or 200 m. in intervals for variable lengths to the southwest and northeast. The lines terminated to the northeast and southwest at creeks which approximately parallel the baseline.

Lines were surveyed by the compasses and hip chain (a lost thread device) and marked with flagging tape. Geology was noted on and between lines and plotted on a map on a scale of 1:2500. This map was later reduced to 1:5000 and all data then transferred to the base map (Figure 6).

b) Coal Licenses 3986, 3987 and 3988

A fly camp was established on Willow Creek at the intersection of the oil and gas drilling road and the road to licenses 3987 and 3988 (see Figure 5). This required a helicopter move from the first mentioned camp site. This second camp site was also chosen because it provided a safe landing area coincident with a water supply.

Field work on these licenses included the laying out of a reconnaissance grid, mapping along the grid and along all roads and random traverses using air photos and the base map for control.

A 600 m. base line was laid out due east-west in the vicinity of the switchbacks on the main access road. Cross lines were run south for 800 metres and north for 100 to 500 metres, where they terminated at a major creek gully. All lines were run using a compass and hip chain.

The main access road through the licenses was mapped from the lowest switchback southward to the seismic lines. Six poorly exposed coal seams were seen south of the switchbacks. When plotted on the base map it was difficult to interpret whether or not most exposures were of the same seam or of several seams. This problem arose because the road as plotted on the base map was "smoothed out", thus omitting some minor curves which were important tie points in mapping. To help better locate these seams a careful survey was made of the mapped portion of the road, tying in each seam when encountered. A revised road location, with geology, was plotted on 1:5000 scale and is shown on Figure 5.

Old Government roads in the area were also examined while searching for DDH W-18 & 19 (McKecknie 1955). These roads are totally overgrown with dense alder, jackpine and locally devil's club. Cut banks on these roads are now sluffed, consequently very little geology is exposed.

The approximate location of DDH W-19 was found, its site being marked by a stack of decayed boxes full of drill core. The site of DDH W-18 was not found but a bulldozed sump was located, indicating the proximity of a drill hole. Both areas are completely overgrown, especially DDH W-18 which is obscured by acres of devil's club.

Random traverses were made over the northern half of license 3988. It was not feasible to grid this area due to the abundance of cliffs.

A traverse was also run down the creek gulley located at the north end of the grid. A part of the south side of this gulley is a well defined canyon wall offering almost total outcrop exposure for 240 m. along its length.

Data from all field surveys are shown on Figure 5.

c) Coal License 3989

Roads on this license provide most of the exposed geology (see Figure 4). For this reason, all roads were simultaneously surveyed and mapped. The data was plotted on copies of the base maps which were used as field sheets. Geology along highway 97, while being off the license to the south, was also mapped.

In addition to road mapping, one traverse was run up Crassier Creek from the highway to the power line, and several random traverses were made between the power line and Crassier Creek.

All surveys and traverses were made using compass and hip chain in conjunction with air photos and the base map.

GEOLOGY

Regional Geology

The Rocky Mountains consist of a complex series of closely folded, faulted and thrust blocks of sedimentary rocks ranging in age from Proterozoic to Lower Cretaceous. To the east of the Rockies the deformation decreases gradually, resulting in the formation of low amplitude simple folds.

Lower Cretaceous coal bearing beds outcrop extensively along the Foothills of Alberta and Northeast British Columbia. They occur in sediments assigned to the Blairmore, Bullhead, and Fort St. John groups.

Bullhead and Fort St. John Formations outcrop in the Pine River area on and in the vicinity of coal license 3986-3993. In this area they occur in a broad anticlinorium near the eastern limit of the strong Foothills deformation. Considerable literature is available on the Foothills belt of northeast British Columbia. This includes:

- a) Regional studies by the Geological Survey of Canada and published as Stott (1968) and Stott (1971).
- b) Several localized stratigraphic and mapping projects have been completed within the area by both the British Columbia Department of Mines and the Geological Survey of Canada. These are documented by Hughes (1964), Hughes (1967), McLean and Kindle (1950), McKechnie (1955), and Spivak (1944).

- c) A series of compilation maps were prepared by the British Columbia Department of Mines by Gilchrist (1978).

The above literature is listed under "References" in this report.

Local Geology

It was quickly discovered while mapping in the three selected areas that outcrop is generally very sparse. Other than in areas of substantial cliffs, outcrop is almost entirely restricted to exposures along road cuts, to an occasional creek gulley, and beneath uprooted trees.

a) Licenses 3990 - 3993.inclusive

Grid mapping attempted to trace northward the coal intersected in DDH W-38 and the old trenches (McKechnie 1955). Because of the scarcity of outcrop this effort was not successful. Only four coal exposures were found. They were located on the grid (see Figure 6) at:

380N, 100W	-	bright coal beneath uprooted tree
385N, 45W	-	" " " " "
415N, 35W	-	" " " " "
460N, 35W	-	small exposure bright crumbly coal beneath 1 m. thick sandstone cliff - like outcrop

All exposures except that at 380N, 100E occur approximately along strike over a length of only 70 metres. They are assumed to be parts of the same seam. The fourth exposure is approximately 65 m. southwest of the others and must be assumed to be a second coal seam.

The northern most exposure is only 240 m. northwest of trench WR a:118 (McKechnie 1955). No coal was found north of this point.

The only rock forming good outcrops in the map area is a light to dark brown, fine grained to silty, well bedded sandstone. It is often cross-bedded and may contain small pieces of thin coaly detrital material. This unit usually occurs on the upper western edge of narrow ridges and obviously is one of the more resistant rock units in the immediate area.

Black shale interbedded with siltstones is well exposed in the unnamed creek to the northeast of the grid. This is in an area inferred by Hughes (1967) and Gilchrist (1978) to be Moosebar Fm. Black shale is also poorly exposed on the southwest slopes of the grid. This latter area is probably within the Gething Fm.

Bedding attitudes commonly range from N30-60W/25-40 NE. The more westerly attitudes occur at the south end of the grid indicating a slight eastward curving of the beds along the northern trend.

Scattered exposures along the seismic line southwest of the camp consisted of sandstone, siltstone and carbonaceous shale. Attitude variations show the presence of folding. No coal seams were exposed, but black carbonaceous shale, slightly coaly, were located at the southwest end of the line. This was at the top edge of the steep slope into Willow Creek.

All rock seen to this point, except for that thought to be Moosebar Fm., is probably Gething Fm. A traverse over the high ground to the northeast of the camp located a geological sequence, from bottom to top, consisting of:

- a) Sandstone, siltstone, sandstone with thin interbeds of chert pebble conglomerate, chert pebble conglomerate.
- b) Sandstone, siltstone and/or claystone.
- c) Sandstone and chert pebble conglomerate.

This sequence a), b) and c) appears to follow the general description given by Hughes (1967 p.46) of the Gates, Hulcross and Boulder members of the Compton Fm. The location of these units approximately coincide with the compilation by Gilchrist (1978).

All data is shown on Figure 6 which accompanies this report.

b) Coal Licenses 3986, 3987 and 3988

Coal is poorly exposed at six locations southeast of the switchbacks on the road to the seismic line (see Figure 5). There are two coal seams exposed in this area which vary from 0.6 to 1 metre wide. They are separated by 30-40 metres of siltstone(?) and sandstone(?). All are poor exposures of black, bright, soft, crumbly coal.

On the same road 52 metres south of 400W baseline good outcrops were found exposing two coal seams, each 2.1 m. wide separated by 1.2 m. grey carbonaceous siltstone. These appear to be good coal with little or no partings.

One poor exposure of coal was seen on the old road to DDH W-19. It consisted of sluffed coal mostly obscured by overburden. Nearby, coaly soil is exposed in a sluffed bank.

In the creek at the north end of the grid cliffs expose alternating beds of sandstone, siltstone and carbonaceous shale. While the latter

beds contain narrow coaly seams no significant coal was seen.

Cliffs at the north end of the mapped area are predominantly fine bedded sandstone and sandy siltstone, both commonly cross-bedded. Minor black carbonaceous shale is also present here. One small exposure of coaly soil was observed.

This entire map area is within the Gething Fm. The southwestern part is mostly alternating carbonaceous shales, siltstones, sandstones and coal whereas the northeastern part appears to be mostly sandstones and siltstones.

All data is shown on Figure 5 which accompanies this report.

c) Coal License 3989

The power line construction road provided, while not complete, a reasonably good section through a part of the Gething Fm. Coal seams were observed at several locations (see Figure 4), with the better ones occurring at the south end of the license. Here they occur in an anticline having a relatively high amplitude relative to its wave length. Three coal seams were observed in each limb.

On the east limb of the fold the seams, from top to bottom, are 1.4 m., 1.7 m., and 0.5 m. thick, strike N40W and dip 33-38°NE. On the west limb the same seams are 1.2 m., 1.7 m., and 0.5 m. thick, strike N25W, and dip 60°SW.

While the coal seams appear to be much the same the rocks between the

seams do not exactly correlate. For example, on the east limb the 1.7 m. and 0.5 m. seams are separated by 0.2 m. of sandstone while on the west limb they are separated by 1.2 m. of dark shaley siltstone with lesser black shale. Neither limb has sufficient exposures to detail the rock between the 1.4 m. and 1.7 m. seams. There may be approximately 5 m. more rock between them on the west limb than on the east.

Several narrow coal seams are exposed south of the license on highway 97. These are in the east limb of the fold and may correlate with two of the seams seen in the east limb to the north.

Three other coal seams were observed to the north-northwest of the above anticline. This places them approximately 225-300 metres higher in the Gething Fm. Two of these seams are 0.3 and 0.45 m. wide respectively, the width of the third is unknown. The latter occurs as soft, black powder at the edge of the road bed.

A nearly continuous exposure of chert pebble conglomerate outcrops in the north central part of the license. It consists of poorly defined beds which grade quickly from fine to coarse. The fine grained variety has pebbles ranging from 2-4 mm. in diameter while in the coarser variety they range from 50-80 mm. in diameter. The pebbles are white, grey and black chert cemented with sand sized, rounded chert grains. A few are stained hematite-red. All are well rounded. This unit is thought to be the base of the Moosebar Fm. and this defines a Gething Fm.-Moosebar Fm. contact. This contact trends N35W, dips 50°NW. The location of this contact coincides with that shown by Hughes (1967).

All data is plotted on Figure 4 which accompanies this report.

CONCLUSIONS

It is readily apparent from field observations and literature research that an appreciable amount of coal is present within the areas covered by coal license 3986-3993 inclusive.

Geological mapping was conducted over three selected areas within the licenses. Coal seams were found in all areas but lack of outcrop prevented proper assessment of them.

The only license with sufficient outcrop to permit a structural interpretation is coal license 3989. On the license an anticline was mapped which has a relatively high amplitude compared to its wavelength. Three coal seams, each 1.2 - 1.4 m., 1.7 m. and 0.5 m. wide respectively are located in the fold structure. All seams appear to be of relatively good grade, i.e. few partings. However, the tonnage potential is limited unless other coal licenses along strike to the northwest are obtained. Also, the structure may be too disturbed for present day mining methods.

It is concluded that licenses 3986-88 and 3990-3992 inclusive require more exploration to assess the various coal seams seen during the field work and also those known to be present from past Government work. New work must be in the form of trenching and diamond drilling since most of the surface information has now been obtained.

An exploration program is recommended.

RECOMMENDATION

A program of backhoe trenching and diamond drilling is recommended. This

work should initially be conducted in proximity to that previously done by the Government, so that new work may be correlated with the existing data.

The first holes should be drilled in the vicinity of old DDH W-19 and 38 since down hole geophysical logging was not done at the time of the old drilling. This type of logging of the new holes would provide excellent information as to the nature of the seams reported by McKechnie (1955).

Working from known information backhoe trenches could be planned to expose the coal seams. Once they are located, the drill holes could be properly located to give the best information.

Since the property is accessible in times of low water by fording the Pine River the work program should be conducted in the fall of the year. At this time equipment can be easily moved to the property. It would also permit, if desired, boarding personnel in Chetwynd rather than constructing a camp.

The following is a cost estimate for the recommended program.

COST ESTIMATE

Stage I

Diamond Drilling - 1220 metres H.Q. @ \$82.50/metre including camp costs	\$100,650.00
Bulldozing - road work, drill site preparation D6 Cat @ \$50/hr, for two weeks	7,000.00

Backhoe - for trenching, John Deere 450 crawler type @ \$30/hr., for 2 months	\$ 18,000.00	
Assaying - at \$500/complete analysis, say	10,000.00	
Geophysical Down Hole Logging - say	12,000.00	
Vehicle @ \$600/mo. & mileage and fuel, for 2 months, say	1,500.00	
Geology, Engineering, Supervision - @ \$200/day for 2 months	12,000.00	
Travel	1,000.00	
Compilation of all data, including reports, maps, etc.	<u>2,000.00</u>	
	Sub-total	\$164,150.00
Contingencies @ 15%		<u>24,623.00</u>
	Total	\$188,773.00
	Say	<u><u>\$190,000.00</u></u>

Stage II

Contingent on the results of Stage I, the second stage would be mostly drilling and would require a much larger expenditure. Assuming a minimum of 3600 metres of H.Q. drilling at an overall cost of \$148.50 per metre the total cost would be

	\$534,600.00
Say	<u><u>\$550,000.00</u></u>

Respectfully submitted,



HAROLD M. JONES, P.Eng.

REFERENCES

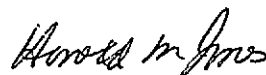
- Gilchrist, R. D. (1978): Coal Resources, Peace River Coal Field, Northeastern British Columbia; B. C. Min. of Mines and Pet. Resources, Preliminary Maps.
- Hughes, J. E. (1964): Jurassic and Cretaceous Strata of the Bullhead Succession in the Peace and Pine River Foothills; B. C. Dept. of Mines and Pet. Res., Bull. No. 51.
- Hughes, J. E. (1967): Geology of the Pine Valley, Mount Wabi to Solitude Mountain, Northeastern British Columbia; B. C. Dept. of Mines & Pet. Res., Bull. No. 52.
- McLearn, F. H. and Kindle, E. D. (1950): Geology of Northeastern British Columbia; Geol. Surv. Can., Mem. 259.
- McKechnie, N. D. (1955): Coal Reserves of the Hasler Creek-Pine River Area; B. C. Dept. of Mines, Bull. No. 36.
- Stott, D. A. (1960): Lower Cretaceous Bullhead and Fort St. John Groups, between Smokey and Peace Rivers, Rocky Mountain Foothills, Alberta and British Columbia; Geol. Surv. Can. Bull. No. 152, pp.279.
- Stott, D. A. (1971): Lower Cretaceous Bullhead Group between Bullmoose Mountain and Tetsa River, Rocky Mountain Foothills, Northeastern British Columbia; Geol. Surv. Can., Open File Report.
- Stott, D. A. (1974): Lower Cretaceous Coal Measures of Foothills of West Central Alberta and Northeastern British Columbia; C.I.M. Bull. Sept. 1974.

CERTIFICATE

I, Harold M. Jones, of the City of Vancouver, British Columbia do hereby certify that:

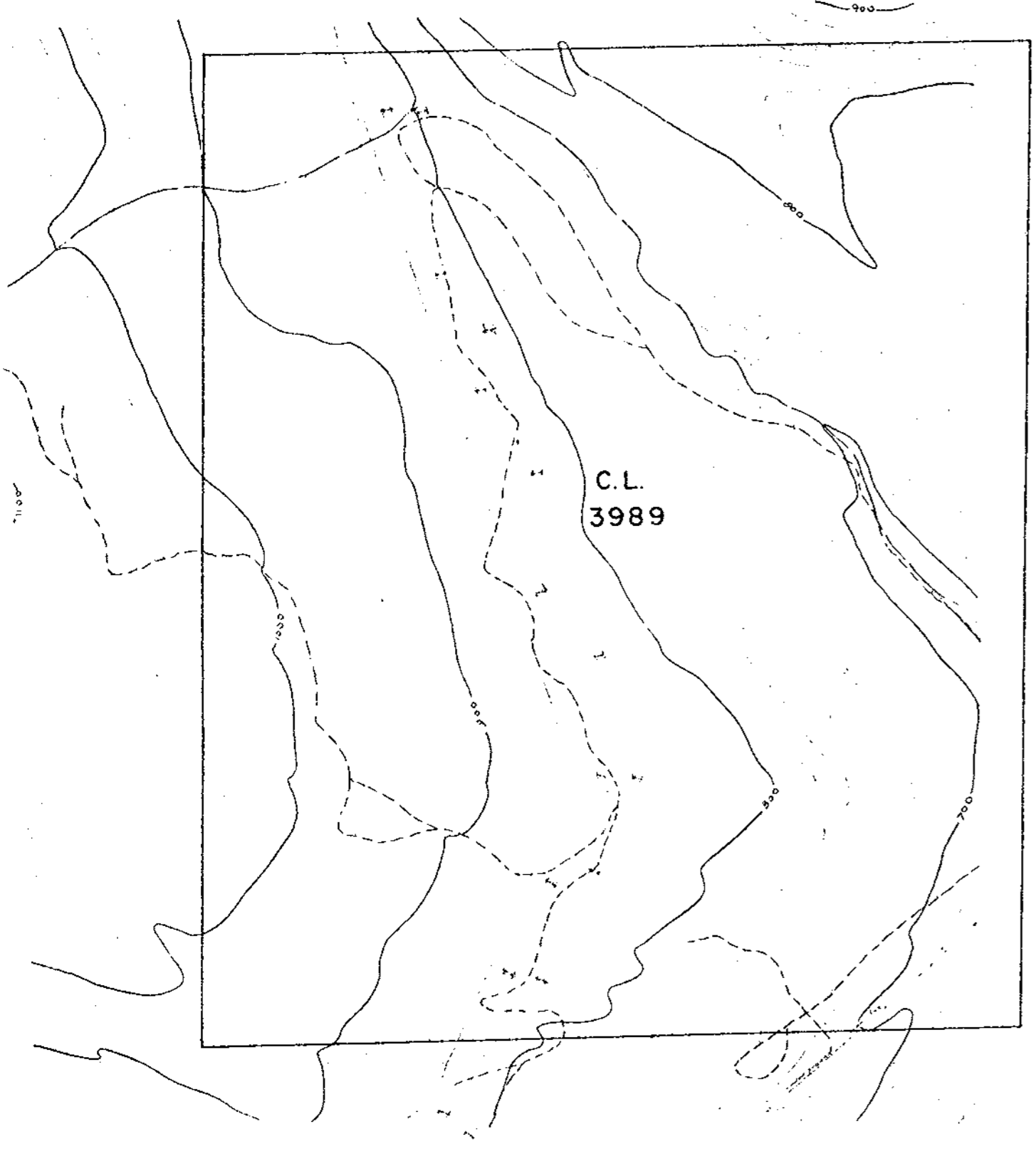
1. I am a Consulting Engineer, and a partner in the firm of G. A. Noel & Associates.
2. I am a graduate of the University of British Columbia in Geological Engineering, 1956.
3. I am a registered Professional Engineer of the Province of British Columbia and also a member of the Canadian Institute of Mining and Metallurgy.
4. I have practised my profession continuously since 1956 in mining exploration in British Columbia, Saskatchewan, Yukon and Northwest Territories, Alaska, Arizona and Australia.
5. I have reviewed all the data listed under References in this report as well as worked on coal licenses 3986 - 3993 inclusive from July 10-30, 1979.
6. I have not received, nor do I expect to receive any interest, direct or indirect in the coal licenses.
7. J. R. Billingsley is hereby given permission to reproduce this report, or any part of it, for the purposes of a financial prospectus; provided, however, that no portion may be used out of context in such a manner as to convey a meaning differing materially from that set out in the whole.

DATED at VANCOUVER, B. C. this 7th day of August, 1979.



HAROLD M. JONES, P.Eng.

122° 14'



G. A. NOEL & ASSOCIATES	
PINE RIVER BC.	
DATE: 1980	SCALE: 1:10,000
PROJECT: 79-129	DATE: 11/80
BY: G.A. NOEL	CHECKED: G.A. NOEL
DATE: 11/80	DATE: 11/80
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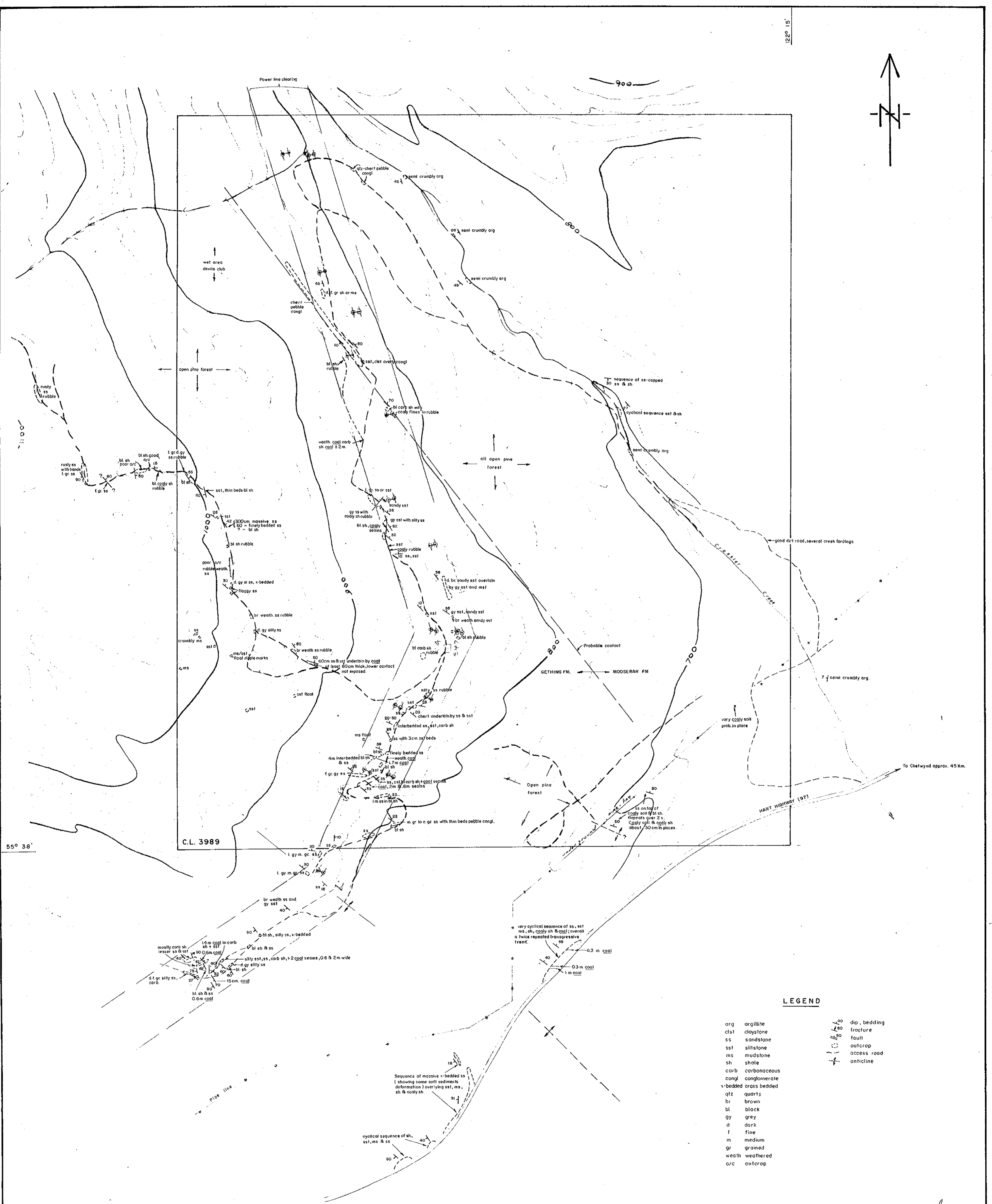
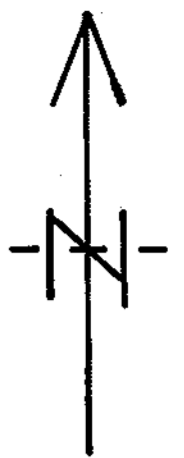
REDUCED TO SCALE 1:10,000

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593

TOPOGRAPHY MAP
 FIGURE 3
 G.A. NOEL & ASSOCIATES INC.
 PA - PINE RIVER 79(2)A.

120° 15'



55° 38'

LEGEND

- arg argillite
- clst claystone
- ss sandstone
- sst siltstone
- ms mudstone
- sh shale
- carb carbonaceous
- congl conglomerate
- v-bedded cross bedded
- qtz quartz
- br brown
- bl black
- gy grey
- d dark
- f fine
- m medium
- gr grained
- weath weathered
- orc outcrop

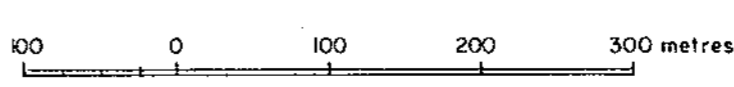
- 20 dip, bedding
- 40 fracture
- 60 fault
- 80 outcrop
- access road
- anticline

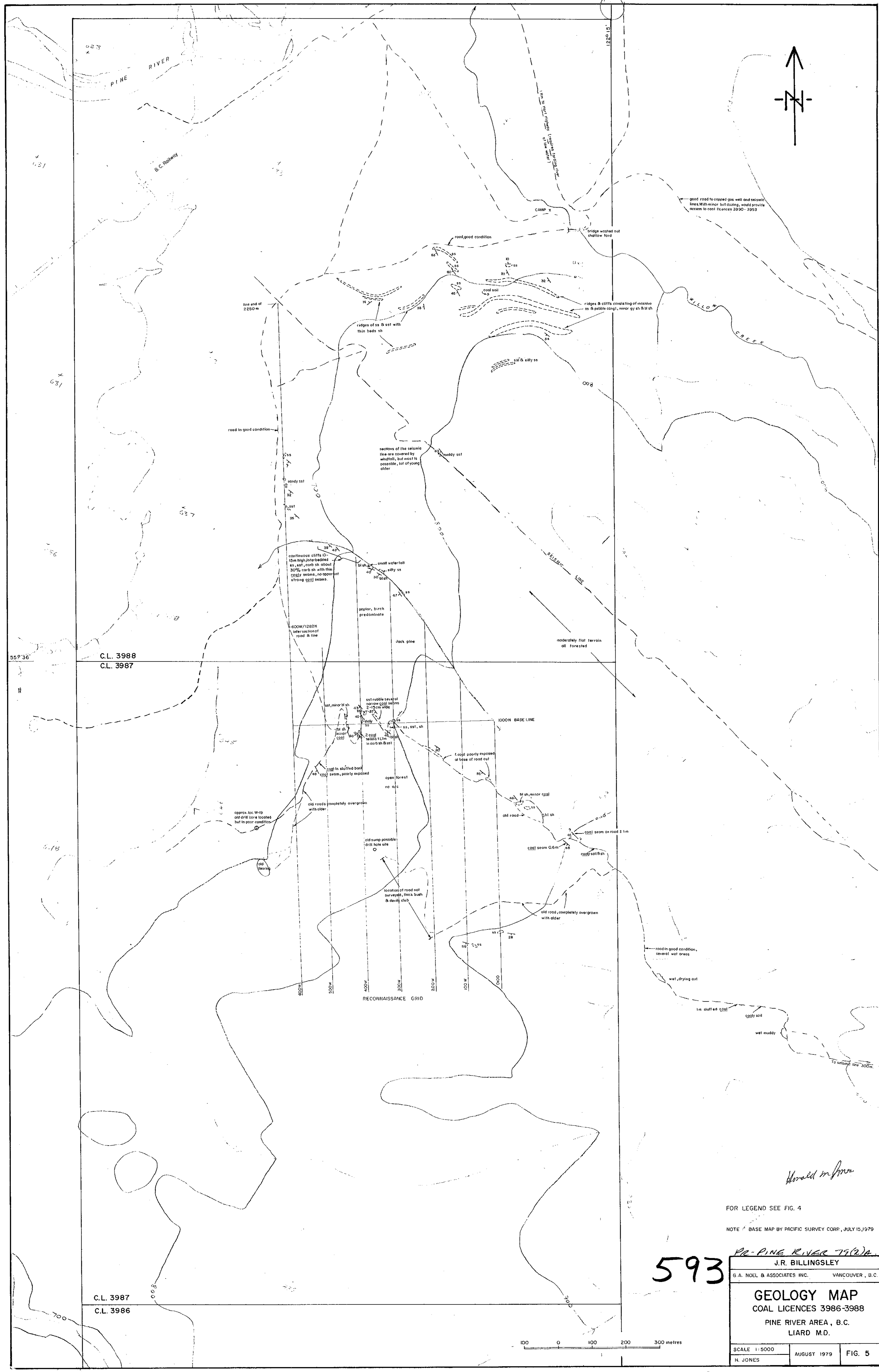
Harold M. Jones

593

PR-PINE RIVER 79(D)A.
 J.R. BILLINGSLEY
 G.A. NOEL & ASSOCIATES INC. VANCOUVER, B.C.
GEOLOGY MAP
 COAL LICENCE 3989
 PINE RIVER AREA, B.C.
 LIARD M.D.
 SCALE 1:5000
 AUGUST 1979
 H. JONES
 FIG. 4

NOTE: BASE MAP BY PACIFIC SURVEY CORP., JULY 15, 1979.

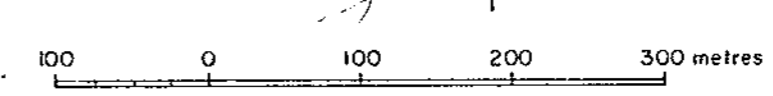




C.L. 3988
C.L. 3987

C.L. 3987
C.L. 3986

RECONNAISSANCE GRID



FOR LEGEND SEE FIG. 4
NOTE: BASE MAP BY PACIFIC SURVEY CORP., JULY 15, 1979

593

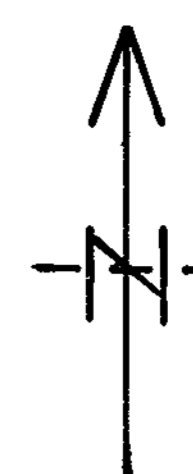
Harold M. Jones

RR-PINE RIVER 79(2)A

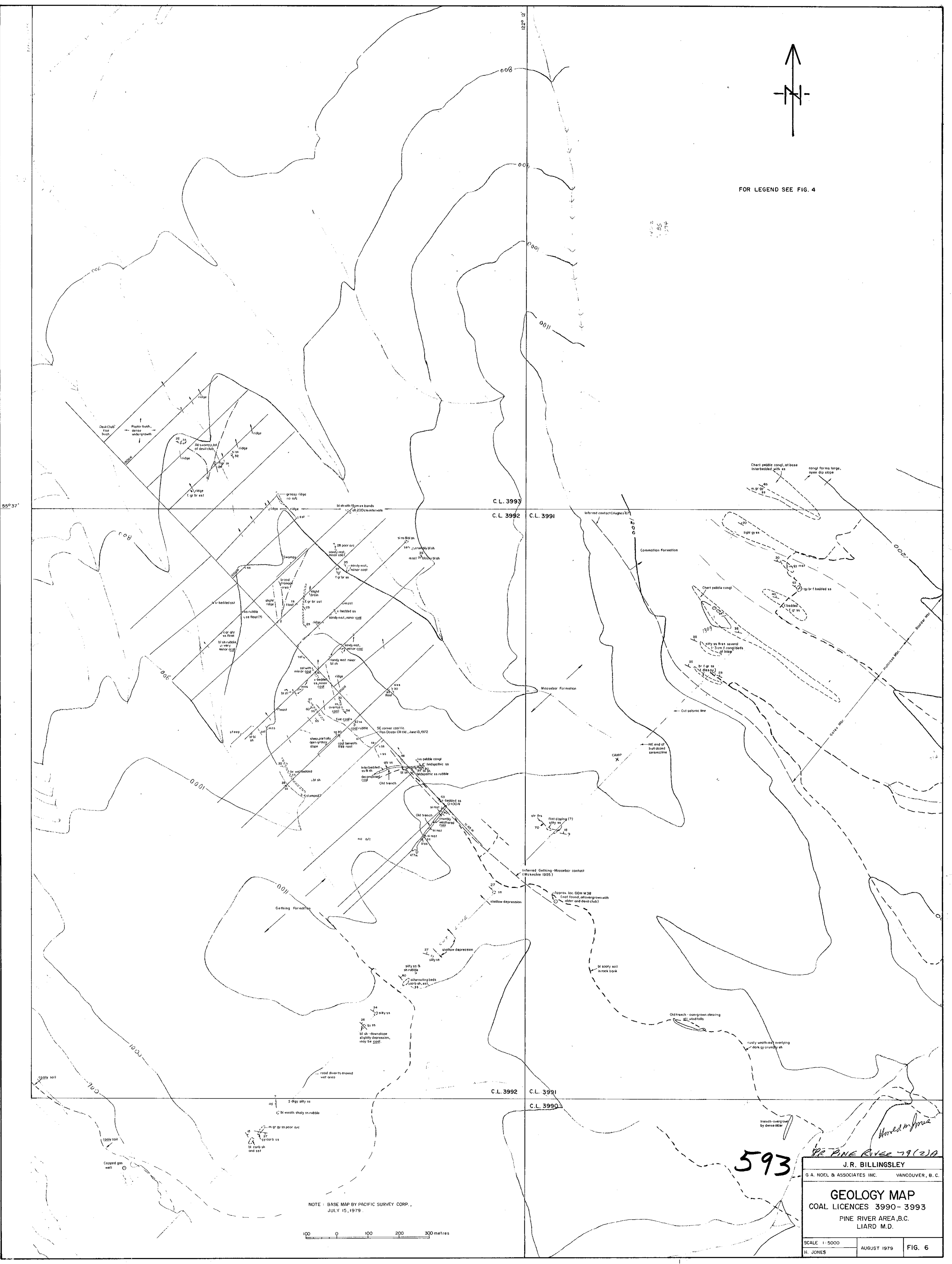
J.R. BILLINGSLEY
G.A. NOEL & ASSOCIATES INC. VANCOUVER, B.C.

GEOLOGY MAP
COAL LICENCES 3986-3988
PINE RIVER AREA, B.C.
LIARD M.D.

SCALE 1:5000	AUGUST 1979	FIG. 5
H. JONES		



FOR LEGEND SEE FIG. 4



55° 37'

C.L. 3993
C.L. 3992

C.L. 3991

C.L. 3992

C.L. 3991

C.L. 3990

593

593 PINE RIVER 79(2)A

J. R. BILLINGSLEY

G. A. NOEL & ASSOCIATES INC. VANCOUVER, B. C.

GEOLOGY MAP
COAL LICENCES 3990-3993
PINE RIVER AREA, B.C.
LIARD M.D.

SCALE 1:5000
AUGUST 1979
H. JONES

FIG. 6

NOTE - BASE MAP BY PACIFIC SURVEY CORP.,
JULY 15, 1979.

